

Corrigendum of Chapter 6 of the NIR

Chapter 6.

Land use, land-use change and forestry (CRF sector 4)

6.1. Overview of sector

Cyprus is an island in the Mediterranean Sea. It measures 240 kilometers long from end to end and 100 kilometers wide at its widest point. It lies between latitudes 34° and 36° N, and longitudes 32° and 35° E. Since 1974 the northern part of Cyprus has been under occupation by Turkey and **beyond the effective control of the Cyprus Government**. For comparability purposes with the rest of the National Inventory sectors of this report, following the recommendations of the U.N. Experts Review Team (September 2016 Saturday Paper Report) GHG emissions/ removals are reported only for the lands under the effective control of the Government as managed land. The rest of the island is considered to be “unmanaged” and no GHG emissions/removals calculations will be included in this report, even though, the activity data is available for the whole of the country.

6.1.1. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Land areas are represented using the IPCC Approach 2 (total land-use area, including changes between categories). The essential feature of Approach 2 is that it provides an assessment of both the net losses or gains in the area of specific land-use categories and what these conversions represent (i.e., changes both from and to a category) but without spatially-explicit location data. The final result of this Approach is presented as a non-spatially explicit land-use conversion matrixes covering the period 1990 until the currently reported year.

Land use data for Cyprus are sourced from the CORINE land cover (CLC) inventory¹ data (for details see Chapter 6.2.3). Five CORINE data sets covering the years 1990, 2000, 2006, 2012 and 2018 were included in the preparation of this NIR. In order to retain consistency among GHG estimates reported for different years the total land area for 1990, 2000, 2006 and 2012 was adjusted using a proportional approach to the area covered by the 2018 CORINE data set. The adjusted data allowed for establishment of four land use matrixes, 1990-2000, 2000 – 2006, 2006 – 2012 and 2012-2018. All matrixes were linearly interpolated/ extrapolated to obtain annual land use change data for all individual years within these periods. The new activity data led to substantial recalculations, especially for the period 1990-2000.

The surface area of the smallest unit mapped in the CORINE project is 25 hectares however, the sensitivity for land cover change is 5 ha. As the first approximation, it is assumed that the possible overestimation and underestimation of the individual land use categories and land use changes among these land use categories within the smallest units mapped in the CORINE nullify within the reporting unit. This assumption will be checked against other data of sensitivity comparable to the threshold area used in the definition of forest when the data are available.

6.1.2. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

The IPCC 2006 identifies six broad land-use categories for the purpose of estimating and reporting greenhouse gas emissions and removals from land use and land-use conversions: (i) Forest Land; (ii) Cropland; (iii) Grassland; (iv) Wetlands; (v) Settlements; and (vi) Other Land. In the preparation of this

¹ <http://land.copernicus.eu/pan-european/corine-land-cover/view>

inventory the generic definitions of the categories referred to in IPCC 2006 guidelines were implemented in a country specific way described below based on the national definition of forest.

6.1.2.1. Definition of forest

Cyprus adopted the following definition of Forest for GHG reporting under the Convention and the Kyoto Protocol:

Forest comprises of land covered by forest trees which covers at least 0.3 hectares, where the tree crown cover is at least 10 per cent and the minimum tree height is of 5 meters (at maturity).

The forest definition adopted by Cyprus is in line with the Forest National Law of 2012 (25 (I)/2012) and in accordance with the definition used for its reporting for the Global Forest Resource assessment under the Food and Agriculture Organization of the United Nations (FAO FRA 2015). This definition is also consistent with the guidance of the national definition of forest contained in Decision 16/CMP.1.

It should be noted that the Department of Forests (Department of Forests, CY-1414 Nicosia, Cyprus) applied the following definition of forest in its reporting under the FRA 2015²: Forest comprises land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds at maturity in situ. It does not include land that is predominantly under agricultural or urban land use.

It should also be noted that according to the Forest National Law of 2012 (25 (I)/2012) the area threshold of 0.3 hectare is to be implemented in all future reports covering any period since the year 2012.

6.1.2.2. The land-use categories for greenhouse gas inventory reporting

Subsequent to the guidance contained in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories the following national definitions of land-use categories were developed for the purpose of preparation of the GHG inventories:

(i) Forest Land

This category contains all lands that meet the definition of forest. It also includes forest roads, cleared tracts, firebreaks and other small open areas within the forest as well as reforested areas or burnt areas or other areas that temporarily have low plant cover due to human intervention or natural causes, but does not include municipal parks and gardens. Forest land contains only areas covered with trees that according to the Forest National Law of 2012 (25 (I)/2012) are considered as forest trees.

The forest land is further divided into two subcategories: coniferous forest and broadleaved forest based on the dominant tree species.

(ii) Cropland

This category contains cropped land, including lands with woody vegetation (i.e. fruit trees) where the vegetation does not meet the definition of forest. In particular, this category includes land principally occupied by agriculture, including: arable land, annual and permanent crops as well as vineyards, fruit trees and berry plantations, olive groves and other similar types of cultivation.

The cropland is further divided into two subcategories: annual cropland and woody cropland based on the dominant type of cultivated vegetation.

(iii) Grassland

This category includes rangelands and pasture land that are not considered Cropland. It also includes systems with woody vegetation and other non-grass vegetation such as bushes and sclerophyllous

² Forest Data Reporting Package for 2015, FAO, page 12, Table 1.2.1 Data sources.

vegetation that fall below the threshold values used in the Forest Land category. The category also includes all pastures, natural grassland and scarcely vegetated areas.

The grassland is further divided into two subcategories: grass and woody grassland based on the dominant type of land cover.

(iv) Wetlands

This category contains areas of land that is covered or saturated by water for all or part of the year and that does not fall into the Forest Land, Cropland, Grassland or Settlements categories. In particular, it contains: inland and salt marshes, water courses and water bodies.

(v) Settlements

This category contains all developed land, including transportation infrastructure and human settlements of any size. In particular, it contains: industrial and commercial units, urban areas, port areas, airports, construction, mineral extraction and waste dump sites.

(vi) Other Land

This category includes bare soil, rock, beaches, dunes and sand plains and all land areas that do not fall into any of the other five categories. It allows the total of identified land areas to match the national area, i.e. to retain the entire Cyprus area unchanged among the reported years.

Table 6.1 presents the implementation of the CORINE land cover (CLC) inventory³ data to land categorization approach based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table 6.1. The correspondence between the CORINE land cover categories identified in Cyprus and the IPCC 2006 six broad land-use categories as implemented in the Cyprus conditions.

LULUCF Land-Use Categories	CORINE land cover	CLC code
Broadleaved Forest	Broad leaved forest	311
Coniferous Forest	Coniferous forest	312
Coniferous Forest	Mixed forest	313
Coniferous Forest	Transitional woodland/shrub	324
Woody CL	Vineyards	221
Woody CL	Fruit trees and berry plantations	222
Woody CL	Olive groves	223
Woody CL	Complex cultivation	242
Woody CL	Land principally occupied by agriculture, with significant areas of natural vegetation	243
Annual CL	Non-irrigated arable land	211
Annual CL	Permanently irrigated land	212
Annual CL	Annual crops associated with permanent crops	241
Woody GL	Sclerophyllous vegetation	323
Grass GL	Pastures	231
Grass GL	Natural grassland	321
Grass GL	Scarcely vegetated areas	333
SL	Continuous urban fabric	111
SL	Discontinuous urban fabric	112
SL	Industrial or commercial units	121
SL	Road and rail networks and associated land	122
SL	Port areas	123
SL	Airports	124
SL	Mineral extraction sites	131
SL	Dump sites	132
SL	Construction sites	133

³ <http://land.copernicus.eu/pan-european/corine-land-cover/view>

LULUCF Land-Use Categories	CORINE land cover	CLC code
SL	Green urban areas	141
SL	Sport and leisure facilities	142
WL	Inland marshes	411
WL	Salt marshes	421
WL	Water courses	511
WL	Water bodies	512
OL	Beaches, dunes and sand plains	331
OL	Bare rock	332
	Burnt areas*	334

*Burned areas were distributed among the remaining land use categories based on the previous land use. In Cyprus, burning of vegetation does not lead to land use change.

The CORINE land cover (CLC) categories listed in Table 6 above exhaust all land uses existing in Cyprus. This ensures that the land categories system implemented in this inventory is complete hence, all land areas may be classified by these categories in a unique way without duplication.

All lands subject to the effective control of the Republic of Cyprus are considered as managed.

Table 6.2 presents the areas of the IPCC 2006 land-use sub/categories based on the raw data from the CORINE annual land use data set (k ha).

Table 6.2. The IPCC 2006 land-use sub/categories data based on the raw data from the CORINE annual land use data set (k ha). Resolution for detection of individual land uses is 25 ha. The data refer to the areas under the effective control of the Cyprus Government (Managed Lands).

	Year 1990 k ha	Year 2000 k ha	Year 2006 k ha	Year 2012 k ha	Year 2018 k ha
Managed Lands					
Broadleaved Forest	0.631	0.631	0.624	0.623	0.623
Coniferous Forest	157.486	157.573	157.702	157.800	158.107
Annual Cropland	132.920	129.941	128.039	127.395	127.186
Woody Cropland	123.523	124.819	123.965	123.033	122.512
Grass Grassland	24.451	26.175	25.252	24.721	25.546
Woody Grassland	107.045	106.572	105.213	104.832	103.596
Wetland	3.977	3.977	3.966	4.005	4.049
Settlements Land	48.871	49.174	54.096	56.448	57.252
Other Land	2.915	2.957	2.961	2.961	2.947
Total Managed Land Area (k ha)	601.818	601.818	601.818	601.818	601.818
Unmanaged Lands					
All categories (kha)	322.348	322.348	322.348	322.348	322.348
Total Land Area (k ha)	924.166	924.166	924.166	924.166	924.166

6.1.3. GHG emissions and removals by LULUCF categories

Emissions (-) and removals (+) from Sector 4 LULUCF by sub-categories are presented in Table 6.3. Note that the emission/removal data for harvested wood products (HWP) are included in the estimates for Forest Land (includes Forest Land remaining Forest Land and Land converted to Forest Land) hence, the column HWP is provided for information only.

Table 6.3. Emissions and removals (+/-) from Sector 4 LULUCF by sub-categories (k t CO₂ eq).

Year	Total	FL	CL	GL	WL	SL	OL	HWP
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1990	-305.0	-36.7	-135.8	-136.2	NO	0.0	0.5	3.3
1991	-298.2	-38.4	-135.8	-135.2	NO	0.0	0.5	10.8
1992	-298.6	-40.4	-135.9	-134.3	NO	0.0	0.5	11.4
1993	-307.7	-37.8	-136.0	-133.3	NO	0.0	0.5	-1.1
1994	-290.9	-25.9	-136.1	-132.3	NO	0.0	0.5	2.9
1995	-300.9	-37.7	-136.2	-131.3	NO	0.0	0.5	3.8
1996	-300.5	-36.6	-136.3	-130.3	NO	0.0	0.5	2.1
1997	-275.7	-22.1	-136.4	-129.3	NO	0.0	0.5	11.6
1998	-225.8	33.8	-136.5	-128.3	NO	0.0	0.5	4.7
1999	-318.7	-57.4	-136.6	-127.3	NO	0.0	0.5	2.1
2000	-67.2	178.0	-136.7	-126.3	NO	0.0	0.5	17.3
2001	-208.4	24.0	-136.0	-123.2	NO	1.7	NO	25.1
2002	-290.2	-62.0	-135.7	-122.2	NO	3.3	NO	26.4
2003	-290.3	-65.5	-135.3	-121.2	NO	4.8	NO	26.9
2004	-280.7	-58.9	-135.0	-120.2	NO	6.3	NO	27.1
2005	-292.0	-73.0	-134.7	-119.2	NO	7.8	NO	27.1
2006	-284.0	-66.3	-134.4	-119.2	NO	9.3	NO	26.5
2007	-140.8	82.2	-134.1	-119.4	0.0	9.7	NO	20.9
2008	-317.8	-94.2	-133.9	-119.4	-0.1	10.3	NO	19.5
2009	-327.6	-111.1	-133.8	-119.3	-0.3	10.9	NO	25.9
2010	-295.3	-79.9	-133.7	-119.2	-0.4	11.5	NO	26.4
2011	-336.6	-121.8	-133.7	-119.1	-0.5	12.1	NO	26.4
2012	-328.3	-113.8	-133.7	-119.1	-0.6	12.7	NO	26.1
2013	-353.1	-139.0	-133.3	-118.7	-0.6	12.6	NO	25.9
2014	-354.9	-140.1	-133.4	-118.6	-0.7	12.6	NO	25.2
2015	-357.4	-142.4	-133.4	-118.5	-0.7	12.6	NO	25.0
2016	16.8	232.0	-133.4	-118.4	-0.7	12.7	NO	24.7
2017	-360.5	-145.1	-133.4	-118.3	-0.8	12.7	NO	24.3
2018	-348.7	-133.1	-133.4	-118.2	-0.8	12.7	NO	24.1
2019	-348.8	-133.1	-133.4	-118.1	-0.8	12.8	NO	23.8
2020	-348.8	-132.4	-133.4	-118.0	-0.9	12.8	NO	23.1

6.1.4. Emission Trends

The total LULUCF sector represents GHG sink during the entire period 1990 – 2020, except for year 2016 due to very exceptional wildfires that took place. Overall, the sink has a slight increasing tendency; however, in years of exceptional extent of forest fires (2000, 2007 and 2016) the tendency is visibly broken (see Figure 6. 1). Overall the sink in the total LULUCF increases from -305.0 kt CO₂ eq. in 1990 to -348.8 kt CO₂ eq. in 2020 but drops (emissions) due to forest fires to 16.8 kt CO₂ eq. in 2016.

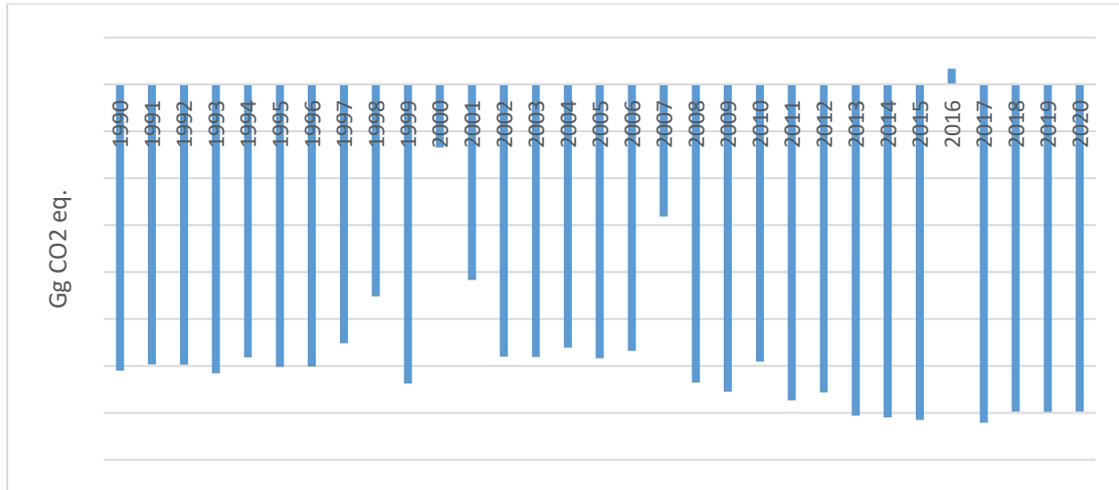


Figure 6.1. Removal (-) trend for the entire LULUCF sector in the period 1990 – 2020

6.2. Forest Land (4A)

6.2.1. Description

Area and ownership of Cyprus forest

The total area of State forests (high forests) is about 172,700 ha and forest occupies the 11,57% of the total area of Cyprus. An area of about 139,053 ha or 80,46% of the total State forest area is situated in the area under the control of the Government whilst the remaining 19,54% is found in the area of Cyprus beyond the control of the Government. According to the last survey, private forests and other forested State land cover 24,74% of the total area of Cyprus. Private forests are small holdings scattered all over Cyprus and are mainly located in distant mountainous and rural areas.

Floristic composition of Cyprus forests

Nearly half the area of the island is covered by tree vegetation that has been degraded by human activities. Forest is composed mainly of coniferous species like the Calabrian pine (*Pinus brutia*), the black pine (*Pinus nigra*), the Cedar (*Cedrus brevifolia*) and the Cypress (*Cypressus sempervirens*). Maquis vegetation includes species like Lentisk (*Pistacia lentiscus*), Juniper (*Juniperus phoenicea*), Maple (*Acer obtusifolium*) and Strawberry tree (*Arbutus andrachne*), while garigue lands consist of the Rock rose (*Cistus spp.*), Thyme (*Thymus capitatus*), Thorny-broom (*Calycotome villosa*), Thorny gorse (*Genista fasselata*) and Spiny burnet (*Sarcopoterium spinosum*). There are also minor areas consisting of young coniferous plantations (source: Forest Department, Ministry of Agriculture, Rural Development and Environment, Cyprus).

6.2.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Approach for representing land areas and land use databases, is described in Chapter 6.1.1 “Information on approaches used for representing land areas and on land-use databases used for the inventory preparation”.

2020	0,623	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,623
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Table 6.5 presents data on land converted to/remaining in the Coniferous Forest subcategory. Any piece of land converted to this subcategory remains in the relevant sub/category of land converted to Coniferous Forest for 20 years until it is finally transferred to the Coniferous Forest subcategory.

Table 6.5. Data on area of land remaining in the same land use subcategory (from Coniferous Forest to Coniferous Forest) and areas of land converted to Coniferous Forest subcategory from other land use sub/categories.

Year	Land converted to Coniferous Forest from:								Total area k ha
	Broadl. Forest	Conif. Forest	Annual CL	Woody CL	Grass GL	Woody GL	Settle-ments	Other Land	
	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	
1990	0,000	157,486	0,000	0,000	0,000	0,009	0,000	0,000	157,495
1991	0,000	157,486	0,000	0,000	0,000	0,009	0,000	0,000	157,495
1992	0,000	157,486	0,001	0,000	0,000	0,017	0,000	0,000	157,504
1993	0,000	157,486	0,001	0,000	0,000	0,026	0,000	0,000	157,513
1994	0,000	157,486	0,001	0,000	0,000	0,034	0,000	0,000	157,522
1995	0,000	157,486	0,002	0,000	0,000	0,043	0,000	0,000	157,531
1996	0,000	157,486	0,002	0,000	0,000	0,052	0,000	0,000	157,540
1997	0,000	157,486	0,003	0,000	0,000	0,060	0,000	0,000	157,549
1998	0,000	157,486	0,003	0,000	0,000	0,069	0,000	0,000	157,558
1999	0,000	157,486	0,003	0,000	0,000	0,078	0,000	0,000	157,567
2000	0,000	157,486	0,004	0,000	0,000	0,086	0,000	0,000	157,576
2001	0,000	157,477	0,004	0,000	0,008	0,086	0,000	0,025	157,600
2002	0,000	157,469	0,004	0,000	0,016	0,086	0,000	0,049	157,624
2003	0,000	157,460	0,004	0,000	0,024	0,086	0,000	0,074	157,648
2004	0,000	157,452	0,004	0,000	0,032	0,086	0,000	0,099	157,672
2005	0,000	157,443	0,004	0,000	0,040	0,086	0,000	0,123	157,696
2006	0,000	157,434	0,004	0,000	0,048	0,086	0,000	0,148	157,720
2007	0,000	157,428	0,004	0,000	0,050	0,086	0,000	0,167	157,735
2008	0,000	157,422	0,004	0,000	0,052	0,086	0,000	0,186	157,750
2009	0,000	157,417	0,004	0,000	0,054	0,086	0,000	0,205	157,764
2010	0,000	157,411	0,004	0,000	0,056	0,086	0,000	0,223	157,779
2011	0,000	157,414	0,003	0,000	0,057	0,078	0,000	0,242	157,794
2012	0,000	157,417	0,003	0,000	0,059	0,069	0,000	0,261	157,809
2013	0,000	157,412	0,006	0,046	0,059	0,085	0,000	0,273	157,882
2014	0,000	157,406	0,010	0,092	0,059	0,102	0,000	0,286	157,955
2015	0,000	157,401	0,013	0,138	0,059	0,118	0,000	0,298	158,028
2016	0,000	157,396	0,017	0,184	0,059	0,135	0,000	0,310	158,101
2017	0,000	157,391	0,021	0,230	0,059	0,169	0,000	0,323	158,193
2018	0,000	157,386	0,024	0,276	0,059	0,185	0,000	0,335	158,266

2019	0,000	157,381	0,028	0,323	0,059	0,219	0,000	0,347	158,357
2020	0,000	157,376	0,032	0,369	0,059	0,244	0,000	0,359	158,439

6.2.4. Methodological issues

Forest area is an area with vegetation cover that meets the national definition of forest. It includes stands of different age including areas transiently deprived of vegetation which are expected to revert to forest and lands recently afforested and reforested. All data collected by the Forest Department refer to the entire forest area. It includes also areas converted to forest in the IPCC 2006 sense. Consequently, all calculations involving biomass growth are performed on the entire forest area basis. However, estimates relating specifically to the conversion process (e.g. accumulation/release of carbon from soil) are calculated specifically for the relevant conversion areas.

The growing stock and annual increment for all subcategories included in this category are defined as follows⁴:

Growing stock = Volume over bark of all living trees more than 12 cm in diameter at breast height. Includes the stem from stump height up to a top diameter of 7cm. It does not include branches.

Annual increment = Average annual volume of gross increment over the given reference period less that of natural losses on all trees, measured to minimum diameters as defined for “Growing stock”. The annual increment when expressed on the per hectare basis is averaged over the entire net area of forest in current year that is the area of forest remaining forest plus the areas converted to forest minus areas converted from forest to other uses in that year. Note: annual increment includes volume of trees harvested in that year.

National data on growing stock and annual increment are presented in Table 6.6.

Table 6.6. National data on growing stock and annual increment

Year	Growing stock	Coniferous Forest	Broadleaved Forest
	m3/ha	m3/ha/year	m3/ha/year
1990	45.96	0.5799	n.a.*
2000	45.90	0.5405	n.a.
2003		0.6976	n.a.
2004		0.6976	n.a.
2005	48.50	0.6954	n.a.
2006		0.6954	n.a.
2007		0.6954	n.a.
2008		0.8445	2.0000
2009		0.9431	2.0000
2010	57.39	0.9435	2.0000
2011		1.1687	2.0000
2012	61.06	1.1688	2.0000
2015		1.1691	2.0000
2016		1.1691	2.0000
2017		1.1691	2.0000
2018		1.1691	2.0000
2019		1.1691	2.0000
2020		1.1691	2.0000

*- Data not available

⁴ FAO. Forest Data Reporting Package for 2015. Cyprus

Data provided in Table 6.6 were interpolated and extrapolated to cover the entire period 1990 to the reported year.

National data on the growing stock and volume increment are averaged over the entire net area of forest in current year (that is the area of forest remaining forest plus the areas converted to forest minus areas converted from forest to other uses in that year).

National data on the volume of harvest is expressed as volume under bark. The volume of bark is assumed as 12 % of the harvested volume based on forest expert advice. The annual harvest when expressed on the per hectare basis is averaged over the entire net area of forest in current year (that is the area of forest remaining forest plus the areas converted to forest minus areas converted from forest to other uses in that year).

In Cyprus, salvage loggings are part of forest harvest however, data on salvage logging are also published separately from data on forest harvest. Salvage logging are included in calculation of emissions from harvest. Consequently, they do not appear in calculation of emissions from wildfires.

The root/shoot ratio for all forest is 0.28 (read from Table 6.4.4 for subtropical dry forest, based on the ERT advice).

The carbon fraction of wood is 0.47 tC/t d.m. (based on the ERT advice).

The biomass conversion factors were read Table 6.4.5 (p. 4.51) for Mediterranean dry tropical, subtropical climatic zone and growing stock level 41 – 100 m³/ha. These factors are presented in Table 6.7.

Table 6.7. Numerical data for BCEF values used in carbon source/sink calculations.

Forest type	BCEF	Value used in calculations
Broadleaved Forest	BCEF _S	0.8 t biomass/m ³ wood volume
	BCEF _I	0.55 t biomass/m ³ wood volume
	BCEF _R	0.89 t biomass/m ³ wood volume
Coniferous Forest	BCEF _S	0.6 t biomass/m ³ wood volume
	BCEF _I	0.45 t biomass/m ³ wood volume
	BCEF _R	0.67 t biomass/m ³ wood volume

Forest fires

Combustion factor Cf=0.45 (default all other temperate forests, Table 6.2.6 p.2.48) is used in all calculations relating to forest fires. All forest fires are reported under the land use category Forest remaining Forest.

Land converted to forest land

All emissions/removals relating to change in carbon stocks in above- and below-ground biomass are estimated under the Forest remaining Forest section. This is due to national data specificity as explained earlier. Consequently, the Land converted to Forest Land section covers only changes in carbon stocks in dead organic matter (includes dead wood and litter) and carbon stocks in soils.

A default 20-year transition period is used in calculations regarding changes in biomass and soil organic carbon. It is assumed that all other carbon pools (litter and dead wood) reach equilibrium values in the year of transition. The assumption is based on expert judgement.

It is further assumed that conversion of land to forest land does not lead to non-CO₂ GHG emissions because in the Cyprus situation such conversion does not require fertilization, the use of fire, drying of wetlands, etc.

Change in carbon in dead organic matter

Following the Tier 1 approach it is assumed that dead organic matter pool is zero in all non-forest land-use categories. For Forest Land land-use category, the default values of 28.2 t C/ha and 20.3 t C/ha for broadleaved and coniferous forest types, respectively, are used (Table 6.2.2, p. 2.27, warm temperate dry climate).

Change in carbon stocks in soils

The reference stocks in soil organic carbon are read from Table 6.2.3 of the 2006 IPCC Guidelines (p. 2.31). All non-wetland soils in Cyprus are considered to be high activity clay soils and the default value of 38 t C/ha is used (Table 6.2.3, warm temperate dry climate). For wetland soils, the default value of 88 t C/ha is used (Table 6.2.3, warm temperate dry climate).

Tier 1 approach is implemented hence, the stock change factors for input, management and disturbance regime, are equal to 1. Consequently, the reference default value of 38 t C/ha is used in all calculations relating to changes in soil carbon in mineral soils.

Dead wood carbon stocks are assumed zero before and after conversion (default data are not available).

Default values for carbon stocks in litter in mature forests are read from Table 6.2.2, p. 2.27 for subtropical climate, i.e. 2.8 tC/ha for broadleaved forests and 4.1 tC/ha for coniferous forests.

All calculations are performed using the IPCC generic equations.

6.2.5. Uncertainties and time-series consistency

Uncertainty analysis will be performed when area data of resolution comparable to the area threshold used in the forest definition (0.3 ha) will be available.

Uncertainties are mainly affected by the lack of precise data on area of land converted to/from forest, area and net annual increment in private forests and to a lesser extent by potentially imprecise assessment of net annual increment in deciduous forest managed by the State Forest administration.

Time series for the land-use categories Forest Land remaining Forest Land and Land converted to Forest (for Coniferous and Broadleaved Forest together) are presented in Figure 6.2 and Figure 6.3.

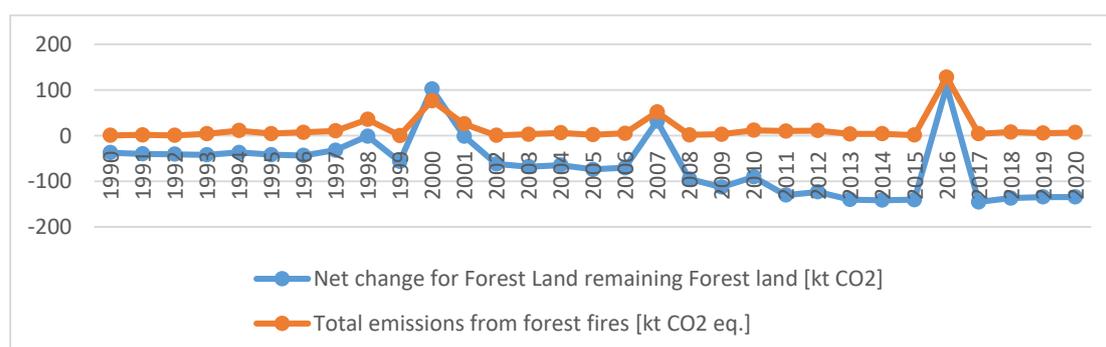


Figure 6.2. Forest Land remaining Forest Land: Net change in CO2 (blue line) and CO2 eq. emissions from forest fires (red line) during the period 1990 – 2020.

Figure 6.2 presents data that are consistent in time. A trend of increasing sink in Forest remaining Forest is clearly distinguishable. The trend is transiently broken in years of exceptional extent of forest fires.

6.2.6. Category-specific QA/QC and verification

The following category specific QA/QC and verification approaches were implemented during preparation of this NIR:

- Check of correctness/plausibility of activity data and emission factors used in calculations and their units;
- Check of plausibility of input data;
- Check of completeness of data;
- Check of plausibility of results;
- Check of references and assumptions applied in processing of the data;
- Check of the correctness of all equations for estimation of the GHG fluxes
- Check of the consistency of the total area of the lands under the effective control of the Republic of Cyprus in all years of the reported period.

6.2.7. Category-specific recalculations

Change of BCEFI (biomass conversion and expansion factor for increment) from 0.645 tC/m³ to the default value 0.450 tC/m³ (Table 6.4.5, p. 4.51, value for Mediterranean, dry tropical and subtropical coniferous forest).

Use of interpolated and extrapolated data provided in Table 6.6 to cover the entire period 1990 to the reported year instead of using an average (0.844 m³/ha/yr) for the entire period (coniferous forest).

Use of corrected data for area of land remaining in Forest Land category and converted to Forest Land category. The correction reflects the implementation of the rule of 20-year transition period to Forest Land.

6.2.8. Category-specific planned improvements

1. The interpretation of the satellite images and related the CORINE land cover data used for calculation of LUC matrixes should be further continued until a consistency with the annual land use data is met. Net area changes calculated using the CORINE land use change data (resolution 5 ha) should be equal (within the defined error range) to net area changes calculated from the CORINE annual land use data set (resolution 25 ha).

2. An approach should be developed to obtain a numerical assessment of land use changes involving individual areas from 0.3 ha to 5 ha and their impact on the numerical estimates of land use changes obtained at the 5 ha resolution. The national definition of forest requires assessment of land use changes at the resolution of 0.3 ha. This may be achieved by means of establishing a correlation between the area of land use changes detected at the resolution of 5 ha and “true” area of land use changes estimated based on the threshold of 0.3 ha.

6.3. Cropland (4B)

6.3.1. Description

6.3.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Approach for representing land areas and land use databases are described in Chapter 6.1.1 “Information on approaches used for representing land areas and on land-use databases used for the inventory preparation”.

6.3.3. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

Land-use definitions are provided in Chapter 6.1.2.2 “The land-use categories for greenhouse gas inventory reporting”. Table 6.8 presents data on lands converted to Annual Cropland. Note that Forest and Woody Grassland land-use categories are not converted to Annual Cropland. Table 6.9 presents data on lands converted to Woody Cropland. Note that Broadleaved Forest land-use category is not converted to Woody Cropland. Wetlands are not converted to both Annual and Woody Cropland (not shown in Table 6.8 and Table 6.9).

Table 6.8. Data on area of land remaining in the same land use subcategory (from Annual Cropland to Annual Cropland) and areas of land converted to Annual Cropland subcategory from other land use sub/categories. Note that any piece of land after remaining for 20 years in the transitional land use sub/category is transferred to the final land use sub/category.

Year	Land converted to Annual Cropland from:								Total area
	Broadl. Forest	Conif. Forest	Annual CL	Woody CL	Grass GL	Woody GL	Settle-ments	Other Land	
	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	
1990	0,000	0,000	132,596	0,001	0,000	0,025	0,000	0,000	132,622
1991	0,000	0,000	132,299	0,001	0,000	0,050	0,000	0,000	132,350
1992	0,000	0,000	132,001	0,002	0,000	0,074	0,000	0,000	132,077
1993	0,000	0,000	131,703	0,003	0,000	0,099	0,000	0,000	131,805
1994	0,000	0,000	131,405	0,004	0,000	0,124	0,000	0,000	131,532
1995	0,000	0,000	131,107	0,004	0,000	0,149	0,000	0,000	131,260
1996	0,000	0,000	130,809	0,005	0,000	0,174	0,000	0,000	130,988
1997	0,000	0,000	130,511	0,006	0,000	0,198	0,000	0,000	130,715
1998	0,000	0,000	130,213	0,006	0,000	0,223	0,000	0,000	130,443
1999	0,000	0,000	129,915	0,007	0,000	0,248	0,000	0,000	130,170
2000	0,000	0,000	129,618	0,008	0,000	0,273	0,000	0,000	129,898
2001	0,000	0,000	129,233	0,009	0,088	0,273	0,000	0,000	129,603
2002	0,000	0,000	128,913	0,010	0,175	0,273	0,000	0,000	129,371
2003	0,000	0,000	128,592	0,011	0,263	0,273	0,000	0,000	129,139
2004	0,000	0,000	128,271	0,013	0,350	0,273	0,000	0,000	128,907
2005	0,000	0,000	127,950	0,014	0,438	0,273	0,000	0,000	128,675

2006	0,000	0,000	127,629	0,015	0,525	0,273	0,000	0,000	128,442
2007	0,000	0,000	127,641	0,026	0,525	0,273	0,001	0,000	128,467
2008	0,000	0,000	127,576	0,038	0,525	0,273	0,002	0,000	128,415
2009	0,000	0,000	127,511	0,050	0,525	0,273	0,003	0,000	128,363
2010	0,000	0,000	127,447	0,061	0,525	0,248	0,004	0,000	128,285
2011	0,000	0,000	127,382	0,071	0,525	0,223	0,005	0,000	128,207
2012	0,000	0,000	127,317	0,082	0,525	0,198	0,007	0,000	128,130
2013	0,000	0,010	127,258	0,111	0,525	0,177	0,007	0,000	128,088
2014	0,000	0,020	127,229	0,140	0,525	0,156	0,007	0,000	128,077
2015	0,000	0,029	127,201	0,169	0,525	0,136	0,007	0,000	128,066
2016	0,000	0,039	127,172	0,198	0,525	0,115	0,007	0,000	128,055
2017	0,000	0,049	127,143	0,226	0,525	0,094	0,007	0,000	128,044
2018	0,000	0,059	127,114	0,255	0,525	0,073	0,007	0,000	128,033
2019	0,000	0,068	127,085	0,284	0,525	0,052	0,007	0,000	128,022
2020	0,000	0,078	127,057	0,313	0,525	0,031	0,007	0,000	128,011

Table 6.9. Data on area of land remaining in the same land use subcategory (from Woody Cropland to Woody Cropland) and areas of land converted to Woody Cropland subcategory from other land use sub/categories. Note that any piece of land after remaining for 20 years in the transitional land use sub/category is transferred to the final land use sub/category.

Year	Land converted to Woody Cropland from:								Total area k ha
	Broadl. Forest	Conif. Forest	Annual CL	Woody CL	Grass GL	Woody GL	Settle-ments	Other Land	
	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	
1990	0,000	0,000	0,137	123,514	0,000	0,002	0,000	0,000	123,653
1991	0,000	0,000	0,274	123,643	0,000	0,004	0,000	0,000	123,921
1992	0,000	0,000	0,411	123,773	0,000	0,006	0,000	0,000	124,189
1993	0,000	0,000	0,548	123,902	0,000	0,008	0,000	0,000	124,458
1994	0,000	0,000	0,685	124,032	0,000	0,010	0,000	0,000	124,726
1995	0,000	0,000	0,821	124,162	0,000	0,012	0,000	0,000	124,995
1996	0,000	0,000	0,958	124,291	0,000	0,014	0,000	0,000	125,263
1997	0,000	0,000	1,095	124,421	0,000	0,016	0,000	0,000	125,532
1998	0,000	0,000	1,232	124,550	0,000	0,018	0,000	0,000	125,800
1999	0,000	0,000	1,369	124,680	0,000	0,020	0,000	0,000	126,069
2000	0,000	0,000	1,506	124,809	0,000	0,022	0,000	0,000	126,337
2001	0,000	0,000	1,598	124,551	0,007	0,087	0,036	0,000	126,279
2002	0,000	0,000	1,689	124,355	0,014	0,153	0,073	0,000	126,283
2003	0,000	0,000	1,781	124,158	0,020	0,219	0,109	0,000	126,287
2004	0,000	0,000	1,872	123,962	0,027	0,284	0,145	0,000	126,291
2005	0,000	0,001	1,553	123,765	0,034	0,344	0,182	0,000	125,878
2006	0,000	0,001	1,507	123,568	0,041	0,408	0,218	0,000	125,743
2007	0,000	0,001	1,374	123,615	0,041	0,409	0,218	0,000	125,658

2008	0,000	0,001	1,241	123,467	0,041	0,411	0,218	0,000	125,379
2009	0,000	0,001	1,108	123,320	0,041	0,412	0,218	0,000	125,100
2010	0,000	0,001	1,933	123,173	0,041	0,427	0,218	0,000	125,794
2011	0,000	0,001	1,800	123,026	0,041	0,429	0,218	0,000	125,515
2012	0,000	0,001	1,667	122,879	0,041	0,430	0,218	0,000	125,236
2013	0,000	0,010	1,534	122,785	0,041	0,438	0,218	0,003	125,030
2014	0,000	0,018	1,402	122,710	0,042	0,447	0,218	0,005	124,842
2015	0,000	0,027	1,269	122,636	0,042	0,455	0,218	0,008	124,655
2016	0,000	0,036	1,136	122,561	0,042	0,464	0,218	0,011	124,468
2017	0,000	0,045	1,003	122,486	0,043	0,472	0,218	0,014	124,281
2018	0,000	0,054	0,870	122,411	0,043	0,481	0,218	0,016	124,093
2019	0,000	0,062	0,738	122,336	0,043	0,489	0,218	0,019	123,906
2020	0,000	0,071	0,605	122,262	0,044	0,497	0,218	0,022	123,719

The decreasing tendency in the area of cropland in Cyprus is consistent with international data provided e.g. by the World Bank⁵.

There is no conversion of Wetlands to Cropland.

6.3.4. Methodological issues

Tier 1 method following the guidance contained in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories was applied due to the lack of national data (except activity data). In particular, all emission factors are default IPCC data read from the 2006 IPCC Guidelines.

Annual Cropland remaining Annual Cropland

By definition this land-use category contains no woody vegetation. Due to the lack of data on changes in management in Annual Cropland, it is assumed that the management remains constant since before 1990 hence, the annual vegetation component does not affect the GHG sinks and sources on annual basis. It is further assumed that soil organic carbon remains unchanged following the lack of changes in the management of these lands.

Use of fire is not a part of management in lands classified as Annual Cropland.

Lands converted to Annual Cropland

Lands converted Annual Cropland are subject to changes in woody vegetation, dead wood, litter and soil organic carbon. Tier 1 approach was implemented to calculate GHG sinks and sources resulting from the conversion.

Use of fire is not a part of management in lands classified as Lands converted to Annual Cropland.

Woody Cropland remaining Woody Cropland

Woody Cropland differs from the Annual Cropland due to the presence of the woody vegetation (as detected using the CORINE land cover data). However, there is no national data on stock and net annual increment of this vegetation. Consequently, the default data provided in Table 6.5.1 (2006 IPCC Guidelines, p. 5.9) have been used in the GHG sink/source estimation for this land-use category.

⁵ <http://www.factfish.com/statistic-country/cyprus/permanent+crops+area+of+total+area>

It is further assumed that dead wood, litter and soil organic carbon remain unchanged following the lack of changes in the management of lands reported under this land-use category.

Use of fire is not a part of management in lands classified as Woody Cropland. Due to the lack of data it is assumed that wild fires do not occur in Woody Cropland (this assumption is further justified by the fact that woody vegetation is sparse in this land what prevents initiation and propagation of fire).

Lands converted to Woody Cropland

Lands converted Woody Cropland are subject to changes in woody vegetation, dead wood, litter and soil organic carbon. Tier 1 approach was implemented to calculate GHG sinks and sources following the conversion.

It is assumed that there is no dead wood in Lands converted to Woody Cropland however, Woody cropland contains litter that amounts to 10% of litter present in forest (based on the default data). These assumptions are based on expert judgement.

Use of fire is not a part of management in lands classified as Lands converted to Woody Cropland.

Organic carbon in soil

The IPCC 2006 default reference value for soil organic C stocks in high activity clay mineral soils (warm temperate dry climate region) SOCREF = 38 t C/ha (Table 6.2.3, pg.2.31, Vol.4, IPCC 2006) is selected for all calculations involving soil carbon in Annual Cropland and Woody Cropland.

Table 6.10 presents the default relative soil organic carbon stock change factors used in calculations.

Table 6.10. The IPCC default relative soil organic carbon stock change factors.

	Relative stock change factor	Error	Remarks on the default values read from Table 6.5.5, p.5.17
Annual CL	Land use FLU= 0.58	+/- 61%	tropical dry moisture regime, long term annual cultivation
Annual CL	Tillage FMG= 1.0	NA	full level tillage
Annual CL	Input FI= 1.0	NA	medium level residue return for tropical dry climate
Woody CL	Land use FLU= 1.0	+/- 50%	all temperature regimes, long term perennial tree crops
Woody CL	Tillage FMG= 1.0	NA	reduced level tillage
Woody CL	Input FI= 1.04	+/- 13%	high level w/o manure residue return for tropical dry climate

6.3.5. Uncertainties and time-series consistency

Uncertainty analysis will be performed when area data of resolution comparable to the area threshold used in the forest definition (0.3 ha) will be available.

Uncertainties are mainly affected by the lack of precise data on area of land converted to/from Annual Cropland and Woody Cropland and area and net annual increment in Woody Cropland. The applicability of default data for woody vegetation stock, growth and harvest (provided in Table 6.5.1 of the 2006 IPCC Guidelines) should be further examined. In particular, the default data result in stock estimates that are greater than similar estimates for forest which may not be true.

All GHG sink/source estimates for Croplands are highly affected by uncertainties in activity data and emission factors (uncertain CORINE data and the use of default data). Greater availability of national data on this land-use category could potentially decrease uncertainties in the estimates.

6.3.6. Category-specific QA/QC and verification

See para 6.2.6 above.

6.3.7. Category-specific recalculations

6.3.8. Category-specific planned improvements

6.4. Grassland (4C)

6.4.1. Description

6.4.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Approach for representing land areas and land use databases are described in Chapter 6.1.1 “Information on approaches used for representing land areas and on land-use databases used for the inventory preparation”.

6.4.3. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

Land-use definitions are provided in Chapter 6.1.2.2 “The land-use categories for greenhouse gas inventory reporting”.

Table 6.11 presents numerical data on the area of Grassland remaining Grassland in the period 1990 - 2016.

Table 6.11. Data on area of land remaining in the same land-use subcategory (Grass Grassland remaining Grass Grassland) and areas of land converted to Grass Grassland subcategory from other land-use sub/categories. Note that there is no conversion of any land to Grass Grassland.

Year	Land converted to Grass Grassland from:								Total area k ha
	Broadl. Forest	Conif. Forest	Annual CL	Woody CL	Grass GL	Woody GL	Settle-ments	Other Land	
	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	
1990	0,000	0,000	0,132	0,000	24,451	0,040	0,000	0,000	24,623
1991	0,000	0,000	0,264	0,001	24,623	0,081	0,000	0,000	24,968
1992	0,000	0,000	0,395	0,001	24,796	0,121	0,000	0,000	25,313
1993	0,000	0,000	0,527	0,001	24,968	0,161	0,000	0,000	25,658
1994	0,000	0,000	0,659	0,002	25,141	0,202	0,000	0,000	26,003

1995	0,000	0,000	0,791	0,002	25,313	0,242	0,000	0,000	26,348
1996	0,000	0,000	0,923	0,002	25,485	0,282	0,000	0,000	26,693
1997	0,000	0,000	1,054	0,003	25,658	0,323	0,000	0,000	27,038
1998	0,000	0,000	1,186	0,003	25,830	0,363	0,000	0,000	27,382
1999	0,000	0,000	1,318	0,003	26,003	0,403	0,000	0,000	27,727
2000	0,000	0,000	1,450	0,004	26,175	0,444	0,000	0,000	28,072
2001	0,000	0,000	1,450	0,004	26,129	0,444	0,000	0,000	28,025
2002	0,000	0,000	1,450	0,004	25,909	0,444	0,000	0,000	27,806
2003	0,000	0,000	1,450	0,004	25,690	0,444	0,000	0,000	27,587
2004	0,000	0,000	1,450	0,004	25,471	0,444	0,000	0,000	27,368
2005	0,000	0,000	1,450	0,004	25,252	0,444	0,000	0,000	27,149
2006	0,000	0,000	1,450	0,004	25,032	0,444	0,000	0,000	26,929
2007	0,000	0,000	1,450	0,004	24,970	0,444	0,000	0,000	26,867
2008	0,000	0,000	1,450	0,004	24,908	0,444	0,000	0,000	26,805
2009	0,000	0,000	1,450	0,004	24,846	0,444	0,000	0,000	26,743
2010	0,000	0,000	1,318	0,003	24,783	0,403	0,000	0,000	26,508
2011	0,000	0,000	1,186	0,003	24,721	0,363	0,000	0,000	26,273
2012	0,000	0,000	1,054	0,003	24,659	0,323	0,000	0,000	26,039
2013	0,000	0,005	0,923	0,002	24,638	0,476	0,000	0,000	26,043
2014	0,000	0,010	0,791	0,002	24,815	0,629	0,000	0,000	26,247
2015	0,000	0,015	0,659	0,002	24,993	0,782	0,000	0,000	26,451
2016	0,000	0,020	0,527	0,001	25,170	0,936	0,000	0,000	26,654
2017	0,000	0,025	0,395	0,001	25,348	1,089	0,000	0,000	26,858
2018	0,000	0,030	0,264	0,001	25,525	1,242	0,000	0,000	27,062
2019	0,000	0,035	0,132	0,000	25,702	1,396	0,000	0,000	27,265
2020	0,000	0,040	0,000	0,000	25,880	1,549	0,000	0,000	27,469

According to the available data there is no conversion of Land to Grass Grassland.

Table 6.12 presents numerical data on the area of Woody Grassland remaining Woody Grassland and area of Lands converted to Woody Grassland in the period 1990 -2019. Note that the conversion of Land to Woody Grassland was detected only since 2006.

Table 6.12. Data on area of land remaining in the same land use subcategory (from Woody Grassland to Woody Grassland) and areas of land converted to Woody Grassland subcategory from other land use sub/categories.

Year	Land converted to Woody Grassland from:								Total area k ha
	Broadl. Forest	Conif. Forest	Annual CL	Woody CL	Grass GL	Woody GL	Settle-ments	Other Land	
	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	
1990	0,000	0,000	0,035	0,003	0,000	107,045	0,000	0,000	107,083

1991	0,000	0,001	0,070	0,007	0,000	106,997	0,000	0,000	107,075
1992	0,000	0,001	0,105	0,010	0,000	106,950	0,000	0,000	107,066
1993	0,000	0,001	0,140	0,014	0,000	106,903	0,000	0,000	107,057
1994	0,000	0,001	0,175	0,017	0,000	106,856	0,000	0,000	107,049
1995	0,000	0,002	0,209	0,021	0,000	106,808	0,000	0,000	107,040
1996	0,000	0,002	0,244	0,024	0,000	106,761	0,000	0,000	107,032
1997	0,000	0,002	0,279	0,028	0,000	106,714	0,000	0,000	107,023
1998	0,000	0,003	0,314	0,031	0,000	106,667	0,000	0,000	107,015
1999	0,000	0,003	0,349	0,034	0,000	106,619	0,000	0,000	107,006
2000	0,000	0,003	0,384	0,038	0,000	106,572	0,000	0,000	106,997
2001	0,000	0,003	0,384	0,038	0,000	106,525	0,000	0,000	106,950
2002	0,000	0,003	0,384	0,038	0,000	106,263	0,000	0,000	106,688
2003	0,000	0,003	0,384	0,038	0,000	106,000	0,000	0,000	106,425
2004	0,000	0,003	0,384	0,038	0,000	105,738	0,000	0,000	106,163
2005	0,000	0,003	0,384	0,038	0,000	105,475	0,000	0,000	105,900
2006	0,000	0,003	0,384	0,038	0,000	105,213	0,000	0,000	105,638
2007	0,000	0,003	0,384	0,038	0,043	104,950	0,006	0,000	105,425
2008	0,000	0,003	0,384	0,038	0,086	104,927	0,013	0,000	105,450
2009	0,000	0,003	0,384	0,038	0,129	104,903	0,019	0,000	105,476
2010	0,000	0,003	0,384	0,038	0,171	104,879	0,025	0,000	105,501
2011	0,000	0,003	0,384	0,038	0,214	104,855	0,032	0,000	105,526
2012	0,000	0,003	0,384	0,038	0,257	104,832	0,038	0,000	105,552
2013	0,000	0,003	0,384	0,050	0,278	104,808	0,038	0,000	105,561
2014	0,000	0,003	0,384	0,061	0,299	104,566	0,038	0,000	105,351
2015	0,000	0,003	0,384	0,073	0,320	104,323	0,038	0,000	105,141
2016	0,000	0,003	0,384	0,085	0,340	104,081	0,038	0,000	104,931
2017	0,000	0,003	0,384	0,096	0,361	103,839	0,038	0,000	104,721
2018	0,000	0,003	0,384	0,108	0,382	103,596	0,038	0,000	104,512
2019	0,000	0,003	0,384	0,119	0,403	103,354	0,038	0,000	104,302
2020	0,000	0,003	0,384	0,131	0,424	103,112	0,038	0,000	104,092

6.4.4. Methodological issues

Tier 1 method following the guidance contained in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories was applied due to the lack of national data (except activity data). In particular, all emission factors are default IPCC data read from the 2006 IPCC Guidelines.

Grass Grassland remaining Grass Grassland

By definition this land-use category contains no woody vegetation. Due to the lack of data on changes in management in Grass Grassland, it is assumed that the management remains constant since before 1990 hence, the annual vegetation component does not affect the GHG sinks and sources on annual basis. It is

further assumed that soil organic carbon remains unchanged following the lack of changes in the management of these lands.

Use of fire is not a part of management in lands classified as Grass Grassland.

Lands converted to Grass Grassland

According to the available data there is no conversion of Land to Grass Grassland.

Woody Grassland remaining Woody Grassland

Woody Grassland differs from the Grass Grassland due to the presence of the woody vegetation (as detected using the CORINE land cover data). However, there is no national data on stock and net annual increment of this vegetation. Consequently, the default data provided in Table 6.5.1 (2006 IPCC Guidelines, p. 5.9) have been used to estimate the GHG sink/source for this land-use category.

It is further assumed that dead wood, litter and soil organic carbon remain unchanged following the lack of changes in the management of lands reported under this land-use category.

Use of fire is not a part of management in lands classified as Woody Grassland. Due to the lack of data, it is further assumed that wild fires do not occur in Woody Grassland (this assumption is further justified by the fact that woody vegetation is sparse in this land what prevents initiation and propagation of fire).

Lands converted to Woody Grassland

Lands converted Woody Grassland are subject to changes in woody vegetation, dead wood, litter and soil organic carbon. Tier 1 approach was implemented to calculate GHG sinks and sources following the conversion. It is assumed that there is no dead wood in Lands converted to Woody Grassland however, litter in Woody Grassland amounts to 10% of litter present in forest (based on the default data). These assumptions are based on expert judgement.

Use of fire is not a part of management in lands classified as Lands converted to Woody Grassland.

Organic carbon in soil

The IPCC 2006 default reference value for soil organic C stocks for high activity clay mineral soils (warm temperate dry climate region) SOCREP = 38 t C/ha (Table 6.2.3, pg.2.31, Vol.4, IPCC 2006) is selected for all calculations involving soil carbon in Grass Grassland and Woody Grassland. All relative stock change factors were read from Table 6.5.5, p. 5.17, Vol.4, IPCC 2006. All these factors are equal to 1 for Cyprian conditions.

All IPCC default relative soil carbon stock change factors for Grass Grassland and Woody Grassland are equal to 1 (Table 6.6.2, p. 6.16, vol.4, IPCC 2006).

6.4.5. Uncertainties and time-series consistency

Uncertainty analysis will be performed when area data of resolution comparable to the area threshold used in the forest definition (0.3 ha) will be available. Uncertainties are mainly affected by the lack of precise data on area of land converted to/from Grass Grassland and no data on area of land converted to/from Woody Grassland before 2006. Additionally, there is no national data on the net annual increment in Woody Grassland. The applicability of default data for woody vegetation stock, growth and harvest (provided in Table 6.5.1 of the 2006 IPCC Guidelines) should be further examined. In particular, the default data result in stock estimates that are greater than similar estimates for forest which may not be true.

6.4.6. Category-specific QA/QC and verification, if applicable

See para 6.2.6 above.

6.4.7. Category-specific recalculations, if applicable, including changes made in response to the review process

Not applicable (the results of calculations are reported for the first time).

6.4.8. Category-specific planned improvements, if applicable (e.g., methodologies, activity data, emission factors, etc.), including those in response to the review process

See para 6.2.8 above.

6.5. Wetland (4D)

6.5.1. Description

6.5.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Approach for representing land areas and land use databases are described in Chapter 6.1.1 “Information on approaches used for representing land areas and on land-use databases used for the inventory preparation”.

6.5.3. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

Land-use definitions are provided in Chapter 6.1.2.2 “The land-use categories for greenhouse gas inventory reporting”.

Table 6.1 provides data on area of Wetlands remaining Wetlands and Lands converted to Wetlands reported annually during the period 1990 – 2019.

Table 6.1. Data on area of land remaining in the same land use category (from Wetland to Wetland) and areas of land converted to Wetland category from other land use sub/categories. Note that any piece of land after remaining for 20 years in the transitional land use category is transferred to the final land use category.

Year	Land converted to Wetlands from:									Total area
	Broadl. Forest	Conif. Forest	Annual CL	Woody CL	Grass GL	Woody GL	Wetlands	Settlements	Other Land	
	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	
1990	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
1991	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
1992	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
1993	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977

1994	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
1995	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
1996	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
1997	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
1998	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
1999	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
2000	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
2001	0,000	0,000	0,000	0,000	0,000	0,000	3,977	0,000	0,000	3,977
2002	0,000	0,000	0,000	0,000	0,000	0,000	3,975	0,000	0,000	3,975
2003	0,000	0,000	0,000	0,000	0,000	0,000	3,972	0,000	0,000	3,972
2004	0,000	0,000	0,000	0,000	0,000	0,000	3,970	0,000	0,000	3,970
2005	0,000	0,000	0,000	0,000	0,000	0,000	3,968	0,000	0,000	3,968
2006	0,000	0,000	0,000	0,000	0,000	0,000	3,966	0,000	0,000	3,966
2007	0,000	0,006	0,000	0,000	0,000	0,000	3,963	0,009	0,000	3,978
2008	0,000	0,012	0,000	0,000	0,000	0,000	3,972	0,017	0,000	4,001
2009	0,000	0,018	0,000	0,000	0,000	0,000	3,980	0,026	0,000	4,024
2010	0,000	0,024	0,000	0,000	0,000	0,000	3,989	0,034	0,000	4,047
2011	0,000	0,030	0,000	0,000	0,000	0,000	3,997	0,043	0,000	4,070
2012	0,000	0,036	0,000	0,000	0,000	0,000	4,005	0,052	0,000	4,093
2013	0,000	0,041	0,000	0,000	0,000	0,001	4,014	0,053	0,000	4,108
2014	0,000	0,046	0,000	0,000	0,000	0,001	4,021	0,054	0,000	4,122
2015	0,000	0,051	0,000	0,000	0,000	0,002	4,028	0,055	0,000	4,136
2016	0,000	0,057	0,000	0,000	0,000	0,003	4,035	0,056	0,000	4,150
2017	0,000	0,062	0,000	0,000	0,000	0,004	4,042	0,057	0,000	4,164
2018	0,000	0,067	0,000	0,000	0,000	0,004	4,049	0,058	0,000	4,178
2019	0,000	0,073	0,000	0,000	0,000	0,005	4,056	0,059	0,000	4,192
2020	0,000	0,078	0,000	0,000	0,000	0,006	4,063	0,059	0,000	4,206

6.5.4. Methodological issues

Tier 1 method following the guidance contained in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories was applied due to the lack of national data (except activity data). In particular, all emission factors are default IPCC data read from the 2006 IPCC Guidelines.

Wetlands remaining Wetlands

In Cypriot conditions this land-use category contains no woody vegetation. According to the available data there is no peatlands and organic soils in Cyprus.

Due to the lack of data on changes in management in Wetlands, it is assumed that the management remains constant since before 1990. Consequently, it is assumed that soil organic carbon remains constant following the lack of changes in the management of these lands. Therefore, the Wetlands remaining Wetlands land-use category does not affect the GHG sinks and sources on annual basis.

Use of fire is not a part of management in lands classified as Wetlands.

Lands converted to Wetlands

Lands converted Wetlands are subject to changes in woody vegetation, dead wood, litter and soil organic carbon. Tier 1 approach was implemented to calculate GHG sinks and sources following the conversion. It is assumed that there is no woody vegetation, dead wood and litter in Lands converted to Woody Grassland. These assumptions are based on expert judgement.

Use of fire is not a part of management in lands classified as Lands converted to Wetlands.

Organic carbon in soil

The reference stock in soil organic C is read from Table 6.2.3 of the 2006 IPCC Guidelines. For wetland soils, the default value of 88 t C/ha is used (Table 6.2.3, warm temperate dry climate).

Tier 1 approach is implemented hence, the stock change factors for input, management and disturbance regime, are equal to 1. Consequently, the default value of 88 t C/ha is used in all calculations relating to soil carbon in Wetland mineral soils. Note that there are no organic soils in Cyprus.

6.5.5. Uncertainties and time-series consistency

Uncertainty analysis will be performed when area data of resolution comparable to the area threshold used in the forest definition (0.3 ha) will be available.

All GHG sink/source estimates for Wetlands are highly affected by uncertainties in activity data and emission factors (uncertain CORINE data and the use of default data). Greater availability of national data on this land-use category could potentially decrease uncertainties in the estimates.

The applicability of default data for organic carbon in soil should be further examined.

In particular, it seems unlikely that there is no conversion of Coniferous Forest and Settlements to Wetlands before 2006. The fact that such conversion was detected after 2006 increases probability that similar conversions might have occurred also earlier. Additionally, the lack of conversion of Broadleaved Forest, Annual Cropland, Woody Cropland, Grass Grassland and Woody Grassland requires further research.

Figure 6.7 presents consistent data series for CO₂ removals in Lands converted to Wetlands during the period 1990 – 2020.

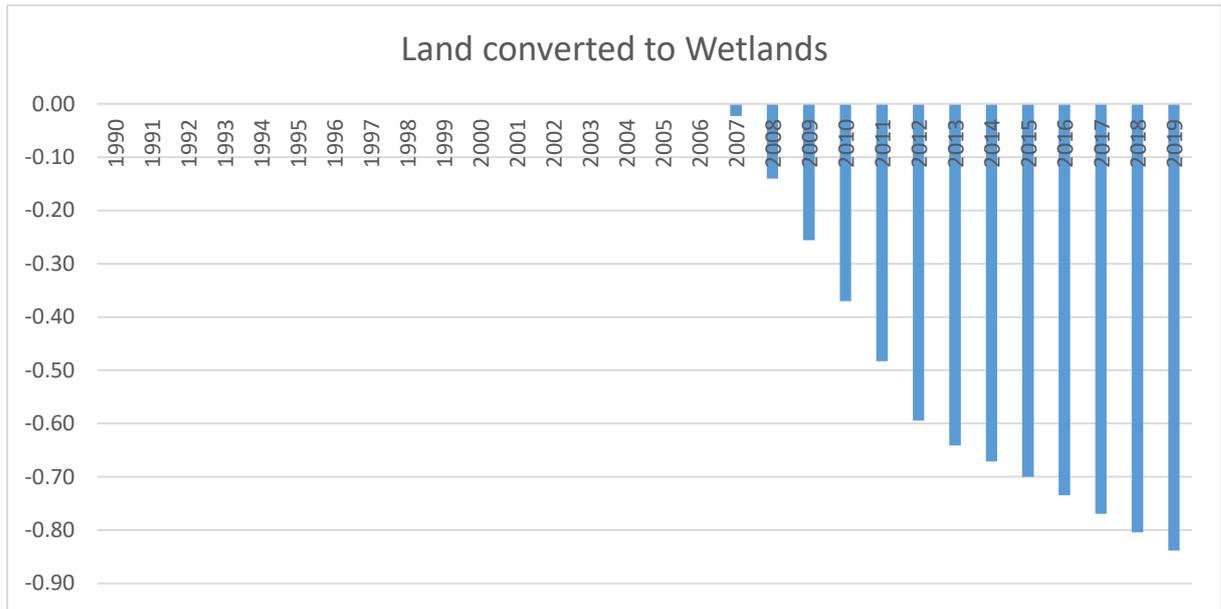


Figure 6.7. Lands converted to Wetlands: CO2 removals during the period 1990 – 2019

6.5.6. Category-specific QA/QC and verification

See para 6.2.6 above.

6.5.7. Category-specific recalculations

Not applicable (the results of calculations are reported for the first time).

6.5.8. Category-specific planned improvements

See para 6.2.8 above.

6.6. Settlements (4E)

6.6.1. Description

6.6.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Approach for representing land areas and land use databases are described in Chapter 6.1.1 “Information on approaches used for representing land areas and on land-use databases used for the inventory preparation”.

6.6.3. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

Land-use definitions are provided in Chapter 6.1.2.2 “The land-use categories for greenhouse gas inventory reporting”. Table 6.14 provides data on area of Settlements remaining Settlements and Lands converted to Settlements reported annually during the period 1990 – 2020.

Table 6.14. Data on area of land remaining in the same land use subcategory (from Settlements to Settlements) and areas of land converted to Settlements category from other land use sub/categories. Note that any piece of land after remaining for 20 years in the transitional land use sub/category is transferred to the final land use sub/category.

Year	Land converted to Settlements from:									Total area k ha
	Broadl. Forest	Conif. Forest	Annual CL	Woody CL	Grass GL	Woody GL	Wetlands	Settlements	Other Land	
	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	
1990	0,000	0,000	0,019	0,003	0,000	0,008	0,000	48,871	0,000	48,902
1991	0,000	0,000	0,039	0,005	0,000	0,016	0,000	48,902	0,000	48,962
1992	0,000	0,000	0,058	0,008	0,000	0,024	0,000	48,932	0,000	49,023
1993	0,000	0,000	0,078	0,011	0,000	0,033	0,000	48,962	0,000	49,083
1994	0,000	0,000	0,097	0,014	0,000	0,041	0,000	48,992	0,000	49,144
1995	0,000	0,000	0,117	0,016	0,000	0,049	0,000	49,023	0,000	49,204
1996	0,000	0,000	0,136	0,019	0,000	0,057	0,000	49,053	0,000	49,265
1997	0,000	0,000	0,155	0,022	0,000	0,065	0,000	49,083	0,000	49,325
1998	0,000	0,000	0,175	0,024	0,000	0,073	0,000	49,113	0,000	49,386
1999	0,000	0,000	0,194	0,027	0,000	0,081	0,000	49,144	0,000	49,446
2000	0,000	0,000	0,214	0,030	0,000	0,089	0,000	49,174	0,000	49,507
2001	0,001	0,008	0,532	0,426	0,117	0,286	0,002	49,204	0,000	50,575
2002	0,003	0,017	0,850	0,821	0,234	0,483	0,005	50,183	0,000	52,592
2003	0,004	0,025	1,168	1,217	0,350	0,680	0,007	51,161	0,000	54,608
2004	0,005	0,034	1,486	1,613	0,467	0,877	0,009	52,139	0,000	56,625
2005	0,006	0,042	1,804	2,009	0,584	1,073	0,011	53,118	0,000	58,642
2006	0,008	0,051	2,122	2,405	0,701	1,270	0,014	54,096	0,000	60,658
2007	0,008	0,051	2,195	2,548	0,718	1,340	0,020	55,075	0,000	61,947
2008	0,008	0,051	2,269	2,690	0,736	1,409	0,026	55,350	0,000	62,531
2009	0,008	0,051	2,343	2,833	0,754	1,479	0,032	55,624	0,000	63,115
2010	0,008	0,051	2,416	2,976	0,771	1,548	0,038	55,899	0,000	63,699
2011	0,008	0,051	2,490	3,118	0,789	1,618	0,044	56,174	0,000	64,284
2012	0,008	0,051	2,563	3,261	0,806	1,687	0,050	56,448	0,000	64,868
2013	0,008	0,051	2,627	3,275	0,806	1,728	0,050	56,723	0,000	65,262
2014	0,008	0,051	2,691	3,289	0,806	1,769	0,050	56,829	0,000	65,486
2015	0,008	0,051	2,755	3,303	0,806	1,811	0,050	56,934	0,000	65,711
2016	0,008	0,051	2,819	3,317	0,806	1,852	0,050	57,040	0,000	65,936
2017	0,008	0,051	2,884	3,331	0,806	1,893	0,050	57,146	0,000	66,160
2018	0,008	0,051	2,948	3,345	0,806	1,934	0,050	57,252	0,000	66,385
2019	0,008	0,051	3,012	3,358	0,806	1,975	0,050	57,357	0,000	66,610
2020	0,008	0,051	3,076	3,372	0,806	2,016	0,050	57,463	0,000	66,834

6.6.4. Methodological issues

Tier 1 method following the guidance contained in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories was applied due to the lack of national data (except activity data). In particular, all emission factors are default IPCC data read from the 2006 IPCC Guidelines.

In Cypriot conditions Settlements land-use category contains all developed land, including transportation infrastructure and human settlements of any size. In particular, it contains: industrial and commercial units, urban areas, port areas, airports, construction, mineral extraction and waste dump sites. Urban areas contain densely and sparsely populated areas (e.g. cities and villages). The category also includes lands covered with woody vegetation typical for inhabited areas that were not classified as Forest, Woody Cropland and Woody Grassland. It also includes lands containing annual vegetation present in urban areas.

Settlements remaining Settlements

Due to the lack of data on changes in management in Settlements remaining Settlements, it is assumed that the management remains constant since before 1990 hence, this land-use category does not affect the GHG sinks and sources on annual basis. It is further assumed that soil organic carbon remains unchanged following the lack of changes in the management of these lands.

Use of fire is not a part of management in lands classified as Settlements.

Lands converted to Settlements

Lands converted Settlements are subject to changes in woody vegetation, dead wood, litter and soil organic carbon. Tier 1 approach was implemented to calculate GHG sinks and sources following the conversion. It is assumed that there is no dead wood and carbon stocks in litter amount to 5% of the stocks in litter found in Forest land-use category. These assumptions are based on expert judgement.

Use of fire is not a part of management in lands classified as Lands converted to Settlements.

Organic carbon in soil

Cyprus does not yet have available data on the magnitude of the change in the soil organic carbon in Settlements hence, a method based on the default approach is applied. The IPCC 2006 default reference value for soil organic C stocks for high activity clay mineral soils (warm temperate dry climate region) SOCREF = 38 t C/ha (Table 6.2.3, pg.2.31, Vol.4, IPCC 2006) is selected for all calculations involving soil carbon in Lands converted to Settlements.

Due to the diverse structure of lands classified as settlements calculation of a product of the relative stock change factors is performed using the following approach:

Step 1: Calculation of the average product of the relative stock change factors FLU, FMG and FI for lands to be converted to Settlements.

Almost all lands converted to Settlements originate from Annual CL (approx. 30%), Woody CL (approx. 39%), Grass GL (approx. 11%) and Woody GL (approx. 19%). The default values of the relative stock change factors FLU, FMG and FI for these land-use categories are available from Table 6.5.5, p. 5.17, Vol.4, IPCC 2006. Table 6.15 presents calculation of the average product of the relative stock change factors FLU, FMG and FI for lands to be converted to Settlements.

Table 6.15. Calculation of the average product of FLU, FMG and FI applicable to Lands to be converted to Settlements

Land converted to Settlements	Share	Land use FLU	Tillage FMG	Input FI	Product
Annual CL	30%	0.58	1	1	0.175
Woody CL	39%	1	1	1.04	0.403
Grass GL	11%	1	1	1	0.108
Woody GL	19%	1	1	1	0.193
Average product FLU, FMG and FI					0.879

Step 2: Calculation of the average product of the relative stock change factors FLU, FMG and FI for Settlements remaining Settlements (or 20 years after the conversion to Settlements).

In order to estimate GHG sink/source in soil organic carbon attributed to the conversion of lands to Settlements a numerical value of the product of the relative stock change factors FLU, FMG and FI that characterizes the soil organic carbon for Settlements remaining Settlements. As the first approximation, it is assumed that the Settlement remaining Settlement area consists in 60% of area that is paved over, 20 % of area that is turfgrass, and 20 % of area that has cultivated soil and is wooded. This approximation is based on expert judgement.

An approach proposed in Chapter 8.3.3.2, p. 8.24, Vol. 4, IPCC 2006 is applied to calculate an average value of the product of FLU, FMG and FI applicable to settlements at equilibrium (20 years after conversion). In particular, it is assumed that in the paved areas 20% of the soil carbon is lost (relative to the pre-conversion state, p. 8.24). For the turfgrass the relative stock change factor FMG= 1.17 (for improved grassland in tropical climate zone – Table 6.6.2, p. 6.16), and for the wooded and cultivated soil the relative stock change factor FMG= 1.17 (no-till FMG value from Table 6.5.5, p. 5.17, with FI equal to 1) were applied. Details of the calculation are presented in Table 6.16.

Table 6.16. Calculation of the average product of FLU, FMG and FI applicable to Settlements remaining Settlements

Land cover within Settlements	Average product FLU, FMG and FI for Lands converted to Settlements (see Error! Reference source not found.)	Share	FMG for lands under specific land cover within Settlements	Product
Area that is paved over (and equivalent)	0.879	60%	0.8	0.422
Turfgrass	0.879	20%	1.17	0.206
Wooded and cultivated soil	0.879	20%	1.17	0.206
Average product FLU, FMG and FI for Settlements				0.834

The final value of the product of FLU, FMG and FI applicable to settlements in equilibrium (Settlements remaining Settlements) is 0.834. Consequently, the soil carbon stock in Settlements is $0.834 \times 38 \text{ t C/ha} = 31.692 \text{ t C/ha}$.

6.6.5. Uncertainties and time-series consistency

Uncertainty analysis will be performed when area data of resolution comparable to the area threshold used in the forest definition (0.3 ha) will be available. The character of conversions to/from the Other Land land-use category suggest that it contains more diversified lands than

All GHG sink/source estimates for Settlements are highly affected by uncertainties in activity data and emission factors (uncertain CORINE data and the use of default data). Greater availability of national data on this land-use category could potentially decrease uncertainties in the estimates.

The applicability of default data for organic carbon in soil should be further examined.

6.6.6. Category-specific QA/QC and verification, if applicable

See para 6.2.6 above.

6.6.7. Category-specific recalculations, if applicable, including changes made in response to the review process

Not applicable (the results of calculations are reported for the first time).

6.6.8. Category-specific planned improvements, if applicable (e.g., methodologies, activity data, emission factors, etc.), including those in response to the review process

See para 6.2.8 above.

6.7. Other Land (4F)

6.7.1. Description

This land-use category includes bare soil, rock, beaches, dunes and sand plains and all land areas that couldn't be classified into any of the other five land-use categories by means of interpretation of the CORINE land cover data. It also allows the total of identified land areas to match the national area, i.e. to retain the entire Cyprus area unchanged among the reported years.

6.7.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Approach for representing land areas and land use databases are described in Chapter 6.1.1 "Information on approaches used for representing land areas and on land-use databases used for the inventory preparation".

6.7.3. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

Land-use definitions are provided in Chapter 6.1.2.2 "The land-use categories for greenhouse gas inventory reporting".

The Other Land land-use category is characterized by increased dynamics of lands converted to and from the category. In particular, majority of pieces of land converted to this category do not remain in it for a prolonged time (expert judgement, see Table 6.17). However, it may happen that some pieces of land stay longer in the category but the currently available CORINE land cover data do not allow for distinguishing the share of land that stays permanently in this category. Consequently, it was assumed that any piece of land converted to this category is reported under it without any transition period. This assumption may be abandoned when more precise data on land dynamics in this category is available.

Table 6.18. Data on area of land remaining in the same land use category (from Other Land to Other Land) and areas of land converted to Other Land category from other land use sub/categories. Note that the rule that any piece of land after remaining for 20 years in the transitional land use sub/category is transferred to the final land use sub/category is not implemented for this category due to high dynamics of lands in this category.

Year	Land converted to Other Land from:									Total area k ha
	Broadl. Forest	Conif. Forest	Annual CL	Woody CL	Grass GL	Woody GL	Wetlands	Settlements	Other Land	
	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	k ha	
1990	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,915	2,919
1991	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,919	2,923
1992	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,923	2,927
1993	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,927	2,931
1994	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,931	2,936
1995	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,936	2,940
1996	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,940	2,944
1997	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,944	2,948
1998	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,948	2,952
1999	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,952	2,957
2000	0,000	0,000	0,000	0,002	0,000	0,002	0,000	0,000	2,957	2,961
2001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2002	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2003	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2004	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2005	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2006	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2007	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2008	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2009	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2010	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2011	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2012	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2013	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,961	2,961
2014	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,958	2,958
2015	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,955	2,955
2016	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,953	2,953
2017	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,950	2,950
2018	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,947	2,947
2019	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,944	2,944
2020	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	2,942	2,942

6.7.4 Methodological issues

Tier 1 method following the guidance contained in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories was applied due to the lack of national data (except activity data). In particular, all emission factors are default IPCC data read from the 2006 IPCC Guidelines (or derived from the IPCC default data).

In Cypriot conditions Other Land land-use category contains a diversified group of lands described in para 6.7.1 above).

Other Land remaining Other land

Due to the lack of data on changes in management in Other Land remaining Other Land, it is assumed that the management remains constant since before 1990 hence, this land-use category does not affect the GHG sinks and sources on annual basis. It is assumed that lands falling into the Other Land land-use category do not contain woody and annual vegetation, dead wood and litter. These assumptions are based on expert judgement. It is further assumed that soil organic carbon remains unchanged following the lack of changes in the management of these lands.

Use of fire is not a part of management in lands classified as Other Land.

Lands converted to Other Land

Lands converted Other Land lose all woody vegetation, dead wood and litter. These lands are also subject to changes in soil organic carbon. Tier 1 approach was implemented to calculate GHG sinks and sources following the conversion.

Use of fire is not a part of management in lands classified as Lands converted to Settlements.

Organic carbon in soil

Cyprus does not yet have available data on soil organic carbon in lands falling into the Other Land land-use category. However, taking into account land-use categories that are converted to and from the Other Land it is clear that assumption that the organic carbon stock is zero for lands belonging to this category does not hold. Note that Other Land in Cyprus includes beaches, dunes, sand plains and bare rock but also a balance area allowing the reported area remain unchanged among the reported years. It is also important to note that lands classified as Other Land are converted to Coniferous Forest and Woody Cropland (see Table 6.17 above). Consequently, an approach developed for the estimation of the average product of FLU, FMG and FI applicable to Settlements remaining Settlements (see Chapter 6.6.4 above) was implemented for the estimation of the average product of FLU, FMG and FI applicable to Other Land remaining Other Land. Table 6.19 presents details of the calculations.

Table 6.19. Calculation of the average product of FLU, FMG and FI applicable to Other Land remaining Other Land

Land converted to Other Land	Share	Land use FLU	Tillage FMG	Input FI	Product
Broadl. F	2.4%	1	1	1	0.024
Coniferous F	0.3%	1	1	1	0.003
Annual CL	6.8%	0.58	1	1	0.039
Woody CL	1.5%	1	1	1.04	0.015
Grass GL	25.9%	1	1	1	0.259
Woody GL	63.1%	1	1	1	0.631
Settlements	0.1%	0.834			0.001
Average product FLU, FMG and FI					0.972

CORINE land cover data did not allow for precise estimation of the share of rock, beaches, dunes and sand plains in the entire area of the Other Land land-use category hence, it was assumed that the share equals 0.5 (expert judgement). Finally, the average product of Land use FLU*Tillage FMG*Input FI =0.972/2=0.486.

6.7.5. Uncertainties and time-series consistency

Uncertainty analysis will be performed when area data of resolution comparable to the area threshold used in the forest definition (0.3 ha) will be available. The character of conversions to/from the Other Land land-use category suggest that it contains more diversified lands than bare soil, rock, beaches, dunes and sand plains. Use of more advanced information on land use may allow for attribution of significant part of the current Other Land land-use category to other categories.

In general, GHG sink/source estimates for Other Land are highly affected by uncertainties in activity data and emission factors (uncertain CORINE data and the use of default data). Greater availability of national data on this land-use category could potentially decrease uncertainties in the estimates.

The applicability of default data for organic carbon in soil should be further examined.

6.7.6. Category-specific QA/QC and verification

See para 6.2.6 above.

6.7.7. Category-specific recalculations

Not applicable (the results of calculations are reported for the first time).

6.7.8. Category-specific planned improvements

See para 6.2.8 above.

6.8. Harvested Wood Products (4G)

6.8.1. Description

Harvested Wood Products (HWP) include all wood material (including bark) that leaves harvest sites. Slash and other material left at harvest sites are regarded as dead organic matter in the associated land-use category.

In Cyprus, all domestically produced HWP originate only from harvest occurring in Forest Land land-use category.

6.8.2. Information on approaches used and on databases used for the inventory preparation

All calculations of the HWP contribution under the Convention are performed using the IPCC Harvested Wood Products (HWP) Model as developed by Kim Pingoud and further modified by the authors of Chapter 12 of Volume 4 of the 2006 IPCC Guidelines. The model referred to as “HWP Worksheet (Zipped MS-Excel file)” is available from the IPCC website at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>. All relevant data were collected from the FAO database

“Forestry Production and Trade” (Last update: January 13th, 2021) available at <http://www.fao.org/faostat/en/#data/FO>.

6.8.3. Category specific definitions and the classification systems used

Definitions contained in “FAO Forest Products Definitions”⁶ are used in this inventory.

6.8.4. Methodological issues

The annual change in HWP carbon stocks in Cyprus are judged to be significant however, due to a limited availability of the country specific data and following the guidance contained in decision tree presented in Figure 6.12.1 (page 12.10 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories) Tier 1 approach was selected to calculate an estimate of HWP Contribution. In particular, the following elements of the IPCC approach are applied (page 12.6):

1. All CO₂ released from HWP is included in the AFOLU Sector;
2. CO₂ released from wood burnt for energy in the Energy Sector is not included in the Energy Sector totals (although CO₂ emissions from biofuels are reported as a memo item for QA/QC purposes). CH₄ and other gases from HWP used for energy is included in the Energy Sector;
3. CO₂ released from HWP in SWDS is not included in the Waste Sector totals although CH₄ emissions from HWP are included.

6.8.4.1. Data for the calculation of an estimate of HWP Contribution under the Convention

All relevant data were collected from the FAO database “Forestry Production and Trade” (Last update: December 14, 2016)⁷. Table 6.20 lists the FAO items and their codes that were the source of numerical data for all calculations in this chapter.

Table 6.20. The FAO items and their codes that were the source of numerical data for all calculations relating to the HWP GHG contribution.

Item	Item Code
Roundwood	1861
Sawnwood	1872
Wood-Based Panels	1873
Paper+Paperboard	1876
Wood Pulp plus Rec. Paper (aggregated items)	1875 (wood pulp) 1669 (recycled paper)
Industrial Roundwood	1865
Other Industrial Roundwood	1871
Chips and particles	1619
Wood charcoal	1630
Wood residues	1620

The FAO data for wood pulp production in Cyprus were not complete for the period 1992 – 2015. The missing data (referred to as estimates in Table 6.21) were obtained in the following way: (i) Estimates for 2000 and 2001 were assumed to amount to 10,000 tonnes based on the data from the period 1992 – 1997; (ii) All other estimates were calculated via proportional interpolation/extrapolation however, if data for production are lower than data for export then it is assumed that production is equal to export (to avoid a negative balance of the pulp production and export).

⁶ available at: <http://www.fao.org/forestry/34572-0902b3c041384fd87f2451da2bb9237.pdf>

⁷ available at <http://www.fao.org/faostat/en/#data/FO>

Table 6.21. Wood pulp production in Cyprus 1992 – 2019 (FAO data and estimates calculated based on them)

Year	Data / Estimate	Pulp production	Pulp production adjusted to the export data
		tonne	tonne
1992	Data	10000	10000
1993	Data	10000	10000
1994	Data	10000	10000
1995	Data	10000	10000
1996	Data	10000	10000
1997	Data	10000	10000
1998	Estimate	10000	10000
1999	Estimate	10000	10000
2000	Estimate	10000	11050
2001	Estimate	10000	11410
2002	Data	11000	11380
2003	Estimate	13450	13450
2004	Estimate	14675	14675
2005	Data	15900	15900
2006	Data	16860	16860
2007	Data	23295	23295
2008	Data	25760	25760
2009	Estimate	35461	35461
2010	Data	45162	45166
2011	Estimate	44239	44239
2012	Data	43316	43317
2013	Estimate	42558	44969
2014	Data	41800	41800
2015	Estimate	41042	42243
2016	Data	43627	43627
2017	Data	47255	47255
2018	Data	50322	50322
2019	Data	47805	47805
2020	Data	44401	44422

Estimates for wood pulp production the period 1961 – 1991 were assumed to be zero, unless data for pulp export were provided by the FAO. In such situation, it was assumed that pulp production is equal to pulp export.

Default half-lives for the estimation of “products in use” carbon pools and associated fraction retained each year were read from Table 6.12.7 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (see Table 6.22).

Table 6.22. The default half-lives and associated decay rates for solid wood products and paper products

	Solid wood products	Paper products
Half-life (years)	30 yr	2 yr
Decay rate k ($k = \ln(2)/ \text{half-life}$)	0.023 yr^{-1}	0.347 yr^{-1}

Conversion factors used in the calculation of the HWP contribution were read from Table 6.12.4 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The factors are presented in Table 6.23.

Table 6.23. Conversion factors used in the calculation of the HWP contribution

Conversion factor	Value
Sawn wood, other industrial roundwood	0.260 tC/m^3^*
Wood-based panels	0.294 tC/m^3
Paper products	0.450 tC/adt

Charcoal	0.765 tC/adt
Bark	1.12 tC _{overbark} /t C _{underbark}

* Average for temperate species and tropical species

An IPCC default estimated growth rate of HWP consumption prior to 1961 for Europe was used (0.0151 yr⁻¹)

6.8.4.2. Calculation of an estimate of HWP Contribution under the Convention

All calculations of the HWP contribution under the Convention are performed using the IPCC Harvested Wood Products (HWP) Model as developed by Kim Pingoud and further modified by the authors of Chapter 12 of Volume 4 of the 2006 IPCC Guidelines. The model referred to as “HWP Worksheet (Zipped MS-Excel file)” is available from the IPCC website at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>.

Cyprus has selected the Production Approach (described in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, page 12.29 onwards) to be used for the UNFCCC reporting purposes. The Production Approach (PA) estimates changes in carbon stocks in the forest pool (in Cyprus, all domestically produced HWP originate only from harvest occurring in Forest Land land-use category) of the reporting country and the wood products pool containing products made from wood harvested in the reporting country. The wood products pool also includes products made from wood collected at domestic harvest that are exported and stored in uses in other countries.

The Production Approach involves equations: (i) 12.1 (to estimate the first-order decay); (ii) 12.3 (to estimate HWP products produced annually from domestic harvest); and (iii) 12.A.6 (to estimate HWP contribution from the production approach) of volume 4 of the 2006 IPCC Guidelines. The estimation of HWP contribution from the production approach using equation 12.A.6 is explained below:

$$\text{HWP Contribution to AFOLU Net CO}_2 \text{ emissions PA} = -44/12 \bullet (\text{H} - \uparrow\text{CHWP DH})$$

$$\text{and } \uparrow\text{C HWP DH} = \text{H} - \Delta\text{C HWP IU DH} - \Delta\text{C HWP SWDS DH}$$

where:

H = Harvest of wood to be used for HWP (including fuelwood)

$\Delta\text{CHWP IU DH}$ = Annual change in carbon stock in HWP in use (Variable 2A),

$\Delta\text{CHWP SWDS DH}$ = Annual change in carbon stock in HWP in solid waste disposal sites where the wood in the products came from domestic harvest (Variable 2B)

The annual change in carbon stock in HWP in use (Variable 2A) is estimated in this chapter while the annual change in carbon stock in HWP in solid waste disposal sites where the wood in the products came from domestic harvest (Variable 2B) should be estimated under the Waste sector. Numerical values of estimated variables 2A and 2B for the period 2010 – 2020 are presented in Table 6.24.

Table 6.24. Numerical values of estimated variables 2A and 2B

kt C	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Variable 2A	-7,201	-7,196	-7,112	-7,067	-6,862	-6,811	-6,74	-6,638	-6,578	-6,498	-6,295
Variable 2B	0,5	0,5	0,66	0,58	0,53	0,47	0,32	0,2	0,21	0,19	0,22

The HWP CRF Table 6 requires calculation of HWP produced and consumed domestically and HWP produced and exported separately for solid wood and paper products. The share of HWP produced and consumed domestically (HWP domestic prod/con) is calculated by means of the following formula:

$$\text{HWP domestic prod/con} = (\text{Sawnwood}_{\text{production}} - \text{Sawnwood}_{\text{export}}) / (\text{Sawnwood}_{\text{production}})$$

Where:

$$\text{Sawnwood} = \text{FAO Item Code 1872 (Sawnwood)}$$

The coefficient HWP domestic prod/con is multiplied by the relevant data for HWP from domestic harvest to obtain numerical values for HWP from domestic harvest consumed domestically. The remaining HWP from domestic harvest (not consumed domestically) are assumed to be exported.

Note: According to the FAO data Cyprus does not produce paper or paper board hence domestic consumption of domestically produced paper is zero.

6.8.5. Uncertainties and time-series consistency

The HWP Contribution to LULUCF emissions/removals reveals trend from 1990 to about 1999 was averaging around 5 kt CO₂ per year and then stabilization of emissions at the level close to 25 kt CO₂ per year. Figure 6.10 presents consistent data series of HWP contribution to LULUCF emissions or removals as appropriate.

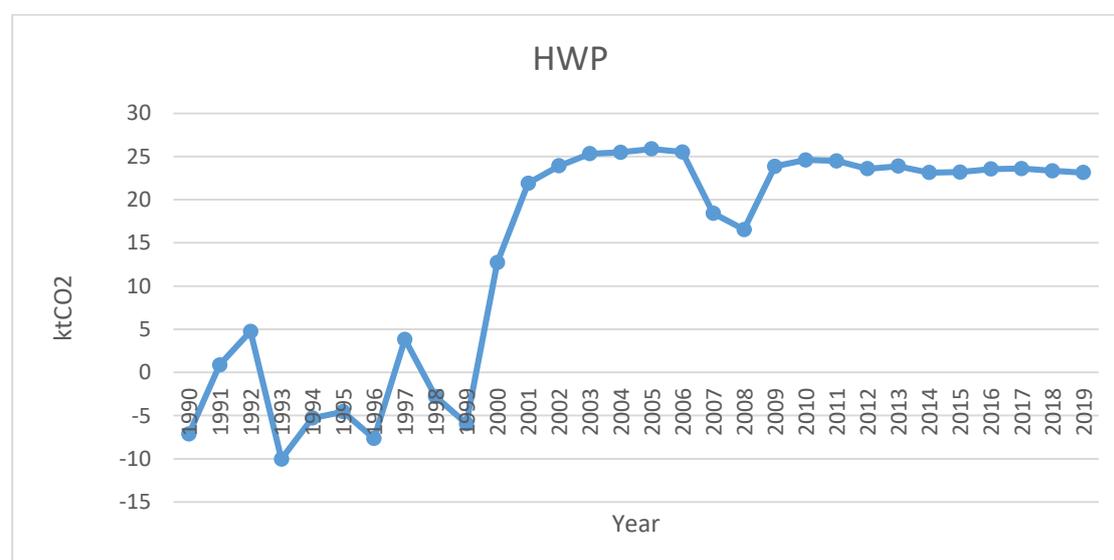


Figure 6.10. HWP Contribution to LULUCF emissions/removals. Note: negative numbers denote removals; positive numbers denote emissions.

6.8.6. Category-specific QA/QC and verification

Not applicable. All data are read from the FAO website.

6.8.7. Category-specific recalculations

Not applicable (the results of calculations are reported for the first time).

6.8.8. Category-specific planned improvements

Not applicable. All data are read from the FAO website. The methodology implements the IPCC proposed approach. No other approaches are available.