Ministry of Agriculture, Nature and Food Quality of the Netherlands

Information on LULUCF actions, The Netherlands

Reporting in accordance to Article 10 of Decision No 529/2013/EU

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Wageningen Environmental Research

Dit rapport is in opdracht van het Ministerie van Landbouw, Natuur en Voedselkwaliteit opgesteld door Wageningen Environmental Research in overleg met het Ministerie van LNV en de 'National Inventory Entity' bij de Rijksdienst voor Ondernemend Nederland.

This report was commissioned by the Dutch Ministry of Agriculture, Nature and Food quality (LNV) and has been prepared by Wageningen Environmental Research in consultation with the Ministry of LNV and the Dutch National Inventory Entity.

Project number BO-43-012.02-013

1 Introduction

Background and context

On 21 May 2013 the European Parliament and the Council of the European Union adopted decision No 529/2013/EU on "*accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities*" (EU LULUCF decision).

Article 10 of the decision 529/2013/EU (EU LULUCF decision) asks EU Member States for information on current and future LULUCF actions to limit or reduce emissions and maintain or increase removals resulting from activities referred to in Article 3(1), i.e. afforestation (A), reforestation (R), deforestation (D) and forest management (FM); Article 3(2), i.e. cropland management (CM) and grazing land management (GM) and where applicable Article 3(3) on re-vegetation and wetland drainage and rewetting.

This report provides the information required in response to Article 10 of Decision No 529/2013/EU and is an update of the previous two reports (in January 2015 as an annex to the Dutch Low Carbon Development Strategy and in December 2017 as a separate report "Information on LULUCF actions, The Netherlands").

This report provides the information on actions related to the activities the Netherlands reports and accounts under the Kyoto Protocol AR, D and FM, and the activities covered in its report relating to Article 3.2(b) of the EU LULUCF decision, CM and GM. The report follows the structure and content required by the subparagraphs in Article 10 sub 2 of the EU LULUCF decision:

a) *a description of past trends of emissions and removals including, where possible, historic trends, to the extent that they can reasonably be reconstructed;*
b) *projections for emissions and removals for the accounting period;*
c) *an analysis of the potential to limit or reduce emissions and to maintain or increase removals;*
d) *a list of the most appropriate measures to take into account national circumstances, including, as appropriate, but not limited to the indicative measures specified in Annex IV, that the Member State is planning or that are to be implemented in order to pursue the mitigation potential, where identified in accordance with the analysis referred to in point (c);*
e) *existing and planned policies to implement the measures referred to in point (d), including a quantitative or qualitative description of the expected effect of those measures on emissions and removals, taking into account other policies and measures relating to the LULUCF sector;*
f) *indicative timetables for the adoption and implementation of the measures referred to in point (d).*

This introductory section includes as a background some information on national circumstances that are of particular importance to the LULUCF sector, including land area information and key sources of CO_2 emissions in the LULUCF sector.

Stakeholder consultation

The chapter on measures and policies is based on the National Climate Agreement[1] (NCA) that was agreed on by the Dutch Government and which is supported by a large number of societal organisations and companies. The measures to reduce emissions and increase removals for the NCA were identified in sectoral platforms and round tables discussion in which many sectoral stakeholders were actively involved representing societal organisations, companies and government. The

[1] https://www.government.nl/topics/climate-change/climate-policy

agriculture and land use sector had round table discussions on three focus areas for LULUCF related measures: 1) peat meadows, 2) agricultural soils, and 3) trees, forest, nature.

Reporting and accounting under the Kyoto Protocol
Under the second commitment period of the Kyoto Protocol (KP2) the Netherlands reports and accounts only the three mandatory activities, Afforestation/Reforestation (AR), Deforestation (D) and Forest Management (FM). For this The Netherlands considers all AR and D as human induced. All forest land in The Netherlands is considered to be managed.

The Netherlands has not elected any of the voluntary KP Article 3.4 activities for accounting and reporting under KP2. Reporting of Cropland Management (CM) and Grazing land Management (GM) therefore needs to be elaborated specifically to allow for the compulsory reporting as required by the EU LULUCF decision 2013/529. For the reporting of these activities the Netherlands applies a pragmatic approach allowing reporting of CM and GM estimates as required under the EU LULUCF Decision. For CM and GM reporting we maintain a cost effective and stable monitoring system. Further improvements in the monitoring and reporting are ongoing and will be mainly directed at the land-based reporting and accounting requirements under the LULUCF regulation 2018/841 covering the period 2021-2030

National circumstances most relevant for the LULUCF sector
Here we provide a summary of the National circumstances, focussing on issues that are most relevant to understand the LULUCF sector and the assumptions and decisions taken in this note. For a more comprehensive overview of national circumstances covering all emission sectors, we refer to the relevant chapters in the NC6 of December 2013 and the NIR 2016.

The Netherlands is a densely populated country. In 2020, the population increased to 17.4 million people, with approximately 517 persons per km^2. A further important demographic factor influencing the pressure on the environment is a decrease in the number of persons per household to 2.17 in 2020 (all data CBS Statline).

The Netherlands is a low-lying country situated in the delta of the rivers Rhine, IJssel and Meuse, with around 24% of the land below sea level. The highest point is 321 metres above sea level, at the border with Belgium and Germany, and the lowest point is 7 metres below sea level. The total land area is 4,153 kha, of which about 55% is used as agricultural land. While the use of land for agriculture is decreasing, land use for settlements and infrastructure is increasing. The Netherlands is located in the 'temperate climate zone'. The 30-year annual average temperature in the centre of the country is about 10°C, while the mean annual average at 52^{o}N is close to 4°C.

Agriculture in the Netherlands focuses on dairy farming, crop production and horticulture; of which greenhouse horticulture is the most important subsector. The amount of horticulture in total agricultural production is increasing over time. The amount of fuel consumed by the greenhouse horticultural sector is comparable to fuel consumption in the commercial and public service sector (taking cogeneration into account).

Cultivated organic soils are an important source of CO_2 emissions in the Netherlands (see below). About 260,000 ha (or 6% of the total land area) of The Netherlands are covered by peat soils. About 198,000 ha of this total peat area are under agricultural land use, mainly as permanent pastures for dairy farming, which is an economically important sector in the Netherlands. The strong modernisation and mechanisation of dairy farming about 45 years ago, required improved drainage and bearing capacity of the pastures on peat soils. To allow for this, in large areas ground water levels are lowered, causing subsidence of the peat soils and associated emissions of greenhouse gases. As a result of this the peat layer is decreasing in those areas resulting in a decreasing area of peatland over time.

The forested area in the Netherlands in 2017 was 365.5 kha, which covers 9% of total land area. After almost all forests had been degraded or cut from the Middle Ages until the 19th century, from the end of the 19th century on reforestation began, largely contributing to the forest area to date. The largest part of the forested area in the Netherlands was planted using regular spacing and just one or two species in even-aged stands, with wood production being the main purpose. A change towards multi-purpose forests (e.g. nature, recreation), which was first started in the 1970s, has had an impact on the management of these even aged stands. Between 2013 and 2017 a loss of total forest area was observed. This was largely attributed to temporary forests on agricultural soils that were planted about 30 years ago and that now were taken into agricultural production again. Also partly this resulted from conversion as part of nature restoration activities converting forests to heathland (Schelhaas et al. 2017).

Most of the forested areas in the Netherlands are currently managed according to Sustainable Forest Management principles. Newly established forests are also developed according to these principles. The results of this management style are clearly shown in the 6th National Forest Inventory (Schelhaas et al. 2014). Unmixed coniferous stands decreased in favour of mixed stands. Natural regeneration plays an important role in the transformation process from the even-aged, pure stands into those with more species and more age classes.

Greenhouse gas emissions in the Netherlands

Total GHG emissions in the Netherlands in 2018 were 188.2 Mton CO_2 eq. excluding LULUCF and 193.1 including LULUCF (NIR 2020; Ruyssenaars et al. 2020). Net emissions from LULUCF as reported to the Convention were 4.9 Mton CO_2 (see **Table 1.1**), corresponding to **2.5%** of total GHG emissions in the Netherlands. The largest source of carbon emissions from LULUCF is from oxidation of organic soils (peat and peaty soils) due to drainage and cultivation resulting in ground surface lowering and an estimated emission of 5.6 Mton of CO_2 that are reported under Grassland, Cropland and Settlements (**Table 1.1**). The majority of emissions (4.1 Mton CO_2) are from drained peat meadows in the western and northern part of the Netherlands. These are important areas for dairy farming, which constitutes an important economic sector in the Netherlands and are considered part of the natural, cultural heritage of the image of the Netherlands.

Forest land in the Netherlands in 2018 was a net sink of 1.9 Mton CO_2. The other land-use categories constituted a net source, adding up to the 4.9 Mton emissions from LULUCF.

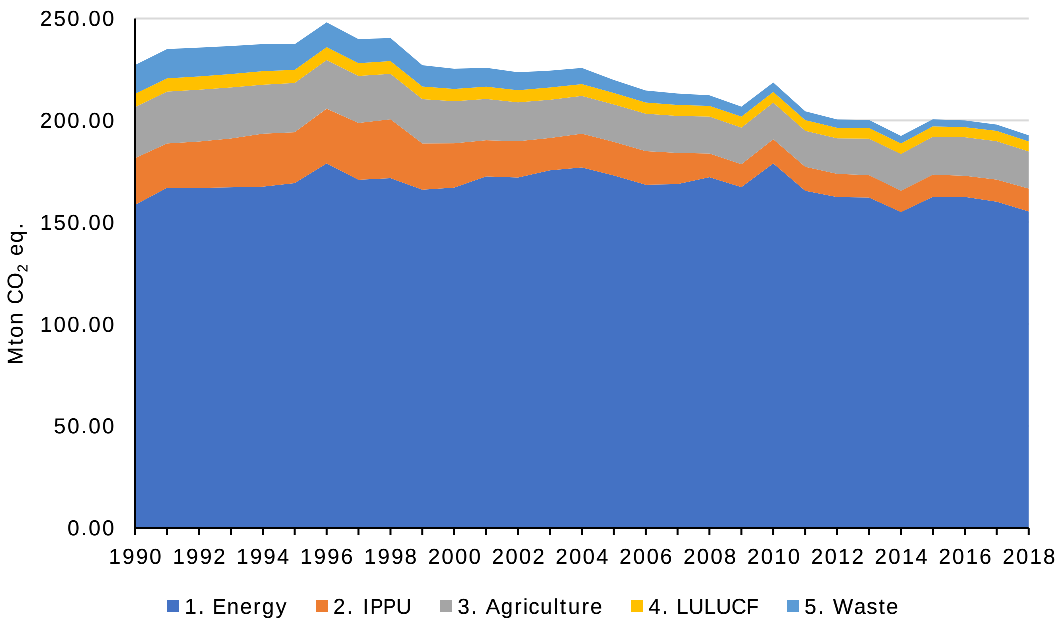

Figure 1.1. *Emission trend per source category (Mton CO_2 eq.). Source: Dutch NIR 2020 (Ruyssenaars et al. 2020).*

Removals and emissions from afforestation, reforestation, forest management and deforestation as reported to KP-LULUCF are only a small part of the total LULUCF emissions that are reported under the Convention.

Table 1.1 shows the integral set of values reported for main land use categories in the NIR 2020, including activity data, for 1990 (baseline year) and 2018.

Table 1.1. *Sector report for LULUCF of net CO_2 emissions or removals in 1990 and 2018 as submitted in the NIR 2020. NE: not estimated.*

LULUCF categories		**Activity data (1000 ha)**		**Net CO_2 emissions/ removals (Mton CO_2)**	
	Reporting year	**1990**	**2018**	**1990**	**2018**
Total LULUCF		**4,153.01**	**4,153.01**	**6.48**	**4.81**
4A. Forest Land		**362.67**	**361.22**	**-1.73**	**-1.86**
1. Forest Land remaining Forest Land		*360.1*	319.6	-1.77	-1.36
2. Land converted to Forest Land		*2.6*	41.7	0.03	-0.49
4B. Cropland		**1,013.7**	**833.1**	**1.82**	**1.62**
1. Cropland remaining Cropland		*999.3*	545.4	1.64	0.47
2. Land converted to Cropland		*14.3*	287.7	0.18	1.15
4C. Grassland		**1,521.5**	**1,458.6**	**5.54**	**3.19**
1. Grassland remaining Grassland		1,505.7	931.9	5.32	3.27
2. Land converted to Grassland		15.7	526.7	0.22	-0.08
4D. Wetlands		**795.1**	**821.9**	**0.09**	**0.04**
1. Wetlands remaining Wetlands		792.9	770.8	0.00	0.00
2. Land converted to Wetlands		2.2	51.1	0.09	0.04
4E. Settlements		**420.7**	**637.7**	**0.91**	**1.53**
1. Settlements remaining Settlements		408.3	436.6	0.42	0.37
2. Land converted to Settlements		*12.4*	201.1	0.49	1.16
4F. Other Land		***39.45***	**40.57**	**0.03**	**0.17**
1. Other Land remaining Other Land		*39.10*	29.95	NE	NE
2. Land converted to Other Land		*0.34*	10.62	0.03	0.17
4G. Harvested Wood products				**-0.16**	**0.11**

2 Past emissions and removals

In this chapter emissions and removals of the LULUCF accounting categories are provided based on the most recent data from LULUCF reporting until the year t-2. This addresses the following article of the LULUCF decision:

EU LULUCF Article 10 sub 2.(a): A description of past trends of emissions and removals including, where possible, historic trends, to the extent that they can reasonably be reconstructed.

Land use matrix

The Netherlands has developed an approach to assess land-use changes over time based on wall-to-wall overlays of land-use maps. Currently four land-use maps have been included: 1 January 1990, 1 January 2004, 1 January 2009, 1 January 2013 and 1 January 2017 resulting in four land-use change matrices 1990-2004, 2004-2009, 2009-2013 and 2013-2017 (Arets et al. 2020). Land-use changes past the latest land-use map are extrapolated from the latest matrix.

Forest land

Based on the land-use change matrices the annual changes in land use to and from forest land are identified. In the period from 1990 to 2013 the annual area of afforestation and reforestation exceeds the area of deforestation, resulting in a small net increase in forest area over time (**Table 1.1**). However, a new land use map for 1 January 2017 showed that between 2013 and 2017 gross deforestation exceeded afforestation, resulting in net deforestation in The Netherlands (see Arets et al. 2020; Schelhaas et al. 2017).

Due to the way deforested land is reported and accounted for under the Kyoto Protocol, reforestation on D land remains to be reported under D land (see **Table 2.2**). Hence, from 2004 onwards, part of the D land thus has forest growing on it. The main sources of deforestation are conversion to grassland and to settlement (see the NIR 2020, Ruyssenaars et al. 2020). Because the land use changes are based on four consecutive land use change matrices, there are small areas of land that were first deforested in the period 1990–2004, then reforested during 2004–2009 and deforested again after 2009. In the **Table 1.1** such units of land are considered conversions “from FL” while in **Table 2.2** they are included under ‘D land remaining D land’.

Table 2.1. *Annual area conversion to and from Forest Land (FL) in kha for the periods between the four land-use maps of 1990, 2004, 2009,2013 and 2017.*

Period	To FL (kha yr^{-1})	From FL (kha yr^{-1})	Net change in FL (kha yr^{-1})
1990-2004	2.559	1992	0.567
2004-2009	3.201	2.513	0.688
2009-2013	3.883	3.317	0.566
2013-2017	2.236	4.778	-2.542

Table 2.2. *Results of the calculations of the area change (in kha) of re/afforestation (AR), deforestation (D) and Forest Management (FM) in the period 1990-2018.*

Year	AR land remaining AR land	Land converted to AR land	AR land converted to D land	FM land converted to D land	D land remaining D land	FM land remaining FM land	Land in KP art. 3.3 ARD	Other (not in KP art. 3.3)
1990	0.0	2.6	0.0	2.0	0.0	360.1	4.6	3,788
1991	2.6	2.6	0.0	2.0	2.0	358.1	9.1	3,786
1992	5.1	2.6	0.0	2.0	4.0	356.1	13.7	3,783
1993	7.7	2.6	0.0	2.0	6.0	354.1	18.2	3,781
1994	10.2	2.6	0.0	2.0	8.0	352.1	22.8	3,778
1995	12.8	2.6	0.0	2.0	10.0	350.1	27.3	3,776
1996	15.4	2.6	0.0	2.0	12.0	348.2	31.9	3,773
1997	17.9	2.6	0.0	2.0	13.9	346.2	36.4	3,770
1998	20.5	2.6	0.0	2.0	15.9	344.2	41.0	3,768
1999	23.0	2.6	0.0	2.0	17.9	342.2	45.5	3,765
2000	25.6	2.6	0.0	2.0	19.9	340.2	50.1	3,763
2001	28.2	2.6	0.0	2.0	21.9	338.2	54.6	3,760
2002	30.7	2.6	0.0	2.0	23.9	336.2	59.2	3,758
2003	33.3	2.6	0.0	2.0	25.9	334.2	63.7	3,755
2004	35.0	2.5	0.9	1.6	27.9	332.6	67.9	3,753
2005	36.6	2.5	0.9	1.6	30.4	330.9	72.1	3,750
2006	38.3	2.5	0.9	1.6	32.9	329.3	76.2	3,747
2007	39.9	2.5	0.9	1.6	35.4	327.7	80.4	3,745
2008	41.6	2.5	0.9	1.6	37.9	326.0	84.5	3,742
2009	42.7	2.9	1.4	1.9	40.5	324.1	89.3	3,740
2010	44.3	2.9	1.4	1.9	43.7	322.3	94.1	3,737
2011	45.9	2.9	1.4	1.9	46.9	320.4	98.9	3,734
2012	47.5	2.9	1.4	1.9	50.1	318.5	103.8	3,731
2013	48.1	1.6	2.3	2.0	53.4	316.5	107.4	3,729
2014	47.3	1.6	2.3	2.0	57.7	314.4	111.0	3,728
2015	46.6	1.6	2.3	2.0	62.1	312.4	114.6	3,726
2016	45.9	1.6	2.3	2.0	66.4	310.4	118.2	3,724
2017	45.5	2.0	1.9	2.0	70.8	308.4	122.1	3,722
2018	45.5	2.0	1.9	2.0	74.7	306.4	126.1	3,720

Removals from AR land increased to 617 Gg CO_2 eq. in 2018 (**Figure 2.1**), while the emissions from D land where 1306 Gg CO_2 in the same year (**Figure 2.1**). These emissions are mainly the result of loss of forest biomass in the year of deforestation, but also removals from reforestation under D land and soil emissions from subsequent land use changes are included in the net emissions presented. Wood harvests in Dutch forests currently are at a modest 55% of the annual increment and as a result carbon stocks in forests remaining forests are still increasing. However, because of deforestation the area of FM decreases over time resulting in decreasing removals from FM.

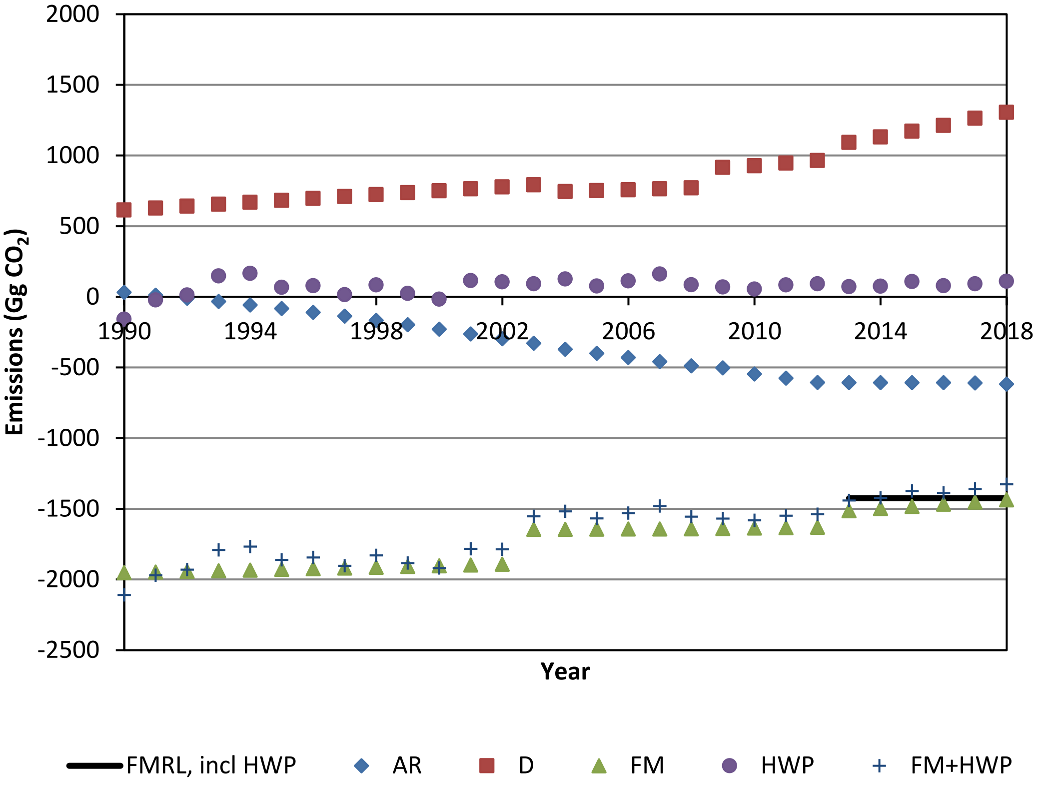

Figure 2.1. *Emissions for AR, D, FM and HWP from Afforestation/reforestation (AR), Deforestation (D), Forest Management (FM) and Harvested Wood Products (HWP). The Forest Management Reference Level incl. its HWP are provided, but will still receive a technical correction.*

In 2018 the removals from FM including HWP were calculated at 1325 Gg CO_2, which is close to the projected (uncorrected) FMRL[2] under the KP of 1425 Gg CO_2 (**Figure 2.1**). A technical correction of the FMRL is expected for the NIR 2021.

Grazing land and cropland management

The Netherlands has not elected any of the voluntary KP Article 3.4 activities for accounting and reporting under KP2. Reporting of Cropland Management (CM) and Grazing land Management (GM) therefore is elaborated specifically to allow for the reporting as required by the EU LULUCF decision 2013/529. The Netherlands considers a pragmatic approach of estimating emissions and removals for CM and GM using the emissions and removals as calculated for reporting Cropland (CL) and Grassland (GL) under the convention as the basis for CM and GM. To estimate emissions and removals for CM, the emissions and removals on units of Cropland that are classified as Deforestation are subtracted from the emissions and removals as reported for CL under the convention. Similarly to estimate emissions and removals for GM, emissions and removals on units of Grassland that are classified as Deforestation are subtracted from the emissions and removals as reported for GL under the convention. Also see the 2020 Art 3.2b report[3] of the Netherlands. Once land is classified as deforested (D land), it remains in this category.

An important source of carbon emissions under CM and GM activities are carbon emissions from cultivated organic soils. To allow for agricultural use the groundwater level of these organic soils is lowered, resulting in oxidation of the organic substrate. Time series of the extent of organic soils, show that the extent of organic soils is decreasing as a result of the continuing loss of organic matter

[2] This is the FMRL to which not yet a technical correction is applied
[3] http://cdr.eionet.europa.eu/nl/eu/mmr/lulucf/envxmphwa/NLD_2020_529-3.2b_final.pdf

in these cultivated lands (see the LULUCF chapter in Ruyssenaars et al. 2019 and Arets et al. 2020). As a result the peat and/or peaty layers have been lost. What remains is a mineral soil type.

Until 2013 the net emissions from CM increase slightly over time (**Figure 2.2**), while the total area of CM decreases (**Figure 2.3**). This is because although the area of cropland remaining cropland decreases strongly (in particular due to conversion to grassland), this is partly compensated by conversions from other land uses to cropland (especially grassland, and excluding conversions from forests, which are included under deforested land). In general conversions from grassland to cropland result in in carbon stock losses in mineral soils (Arets et al. 2020, Ruyssenaars et al. 2020) and hence emissions from mineral soil increase in CM. The increase in emissions in mineral soils in turn is compensated by a decrease in the emissions from organic soils resulting from the decreasing extent of peat and peaty soils.

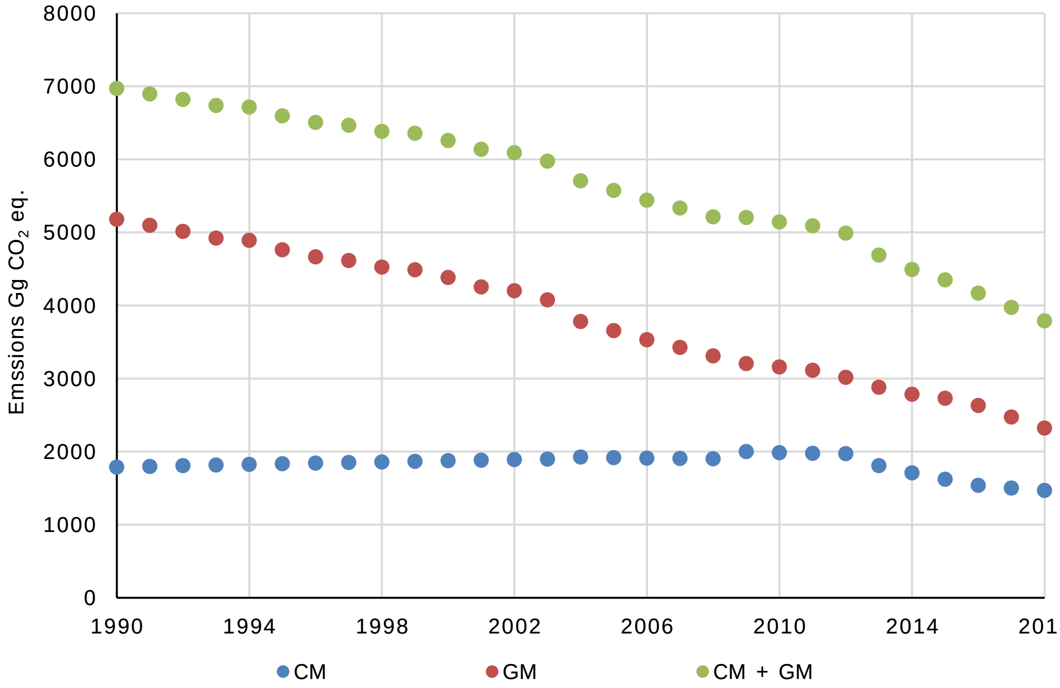

Figure 2.2 *Estimated net annual emissions (Gg CO_2) from CM and GM.*

After 2012 the rate of conversion from cropland to grassland increases, resulting in a net decrease in cropland and hence CM area. As a result emissions from CM decrease more strongly from 2013 onwards.

Emissions in GM continuously decrease over time (**Figure 2.2**). Partly this is due to a decreasing area of GM (**Figure 2.3**) and CO_2 removals resulting from the conversions from cropland to grassland (mirrored from the emissions resulting from conversions of grassland to cropland described above, also see Arets et al. 2020; Ruyssenaars et al. 2020). However, the decreasing emissions are predominantly due to a reduction in the emissions from organic soils as explained above for CM.

Total emissions of CM and GM together decreased from 6,968 Gg CO_2 in 1990 to 3,789 Gg CO_2 in 2018. This reduction in total CM and GM emission is mainly due to the reduced emissions from cultivated organic soils which decline from 7,034 Gg CO_2 in 1990 to 4,883 Gg CO_2 in 2018. This is the result of a decreasing area of organic soils, as the peat and peaty soils were (partly) lost due to oxidation and disturbances. These were mainly the soils where deep drainage was applied and therefore emissions were high. The overall emission factor slightly decreased over time because of this reduction in total CM and GM emission. In addition, during the period 2013-2017 more cropland was converted to grassland than the other way around, which results in a net carbon sequestration for mineral soils

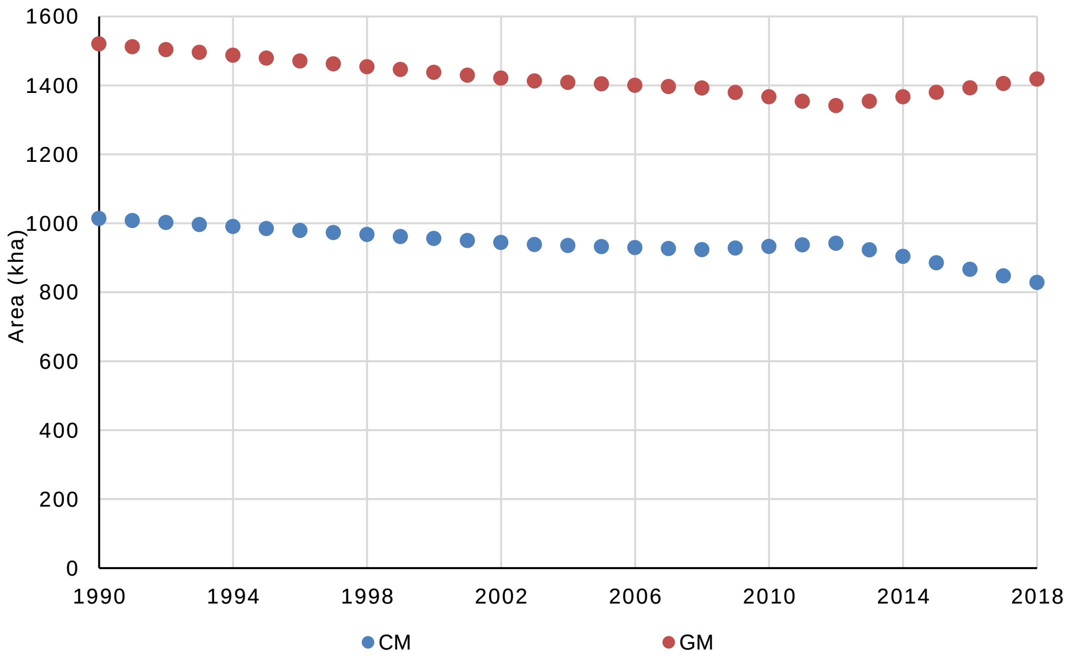

Figure 2.3 Area (kha) of CM and GM over time.

Changes compared to the Article 10 report of December 2016

When comparing the information to the previous Art 10 report (December 2016) be aware that the Netherlands has updated and improved its monitoring and reporting for subsequent inventory reports. The most important changes related to:

- Including the category of Trees outside Forests under Grassland instead of Forest land (see NIR 2018, Coenen et al. 2018). This category of Trees outside Forests comprises units of land with trees that do not meet the minimum area requirement for the forest definition (0.5 ha). In the earlier NIR's these units of land were nevertheless included under Forest land.
- A new land-use map representing land-use on 1 January 2017 was included. As a result now the actual land-use changes observed between the previous land-use map of 1 January 2013 and the new map have been used. This replaces the previous estimates of land-use changes from 2013 onwards that were based on the extrapolation of changes observed in the land-use change matrix 2009-2013.
- Addition of a new soil map for 2014 allowed a better assessment of the development of organic (peat and peaty) soil area in the Netherlands. The results indicated that previously the area of organic soil in 1990 was underestimated by 22 kha and hence emissions from organic soils as result of drainage were underestimated. At the same time the results showed that the area of organic soil decreased by 64 kha over time between 1990 and 2014 as a result of continuing oxidation and subsequent loss of peat. Therefore, the total annual emissions from organic soils have decreased since 1990 (NIR 2019, Ruyssenaars et al. 2019). After 2014 the decrease in the area of peat and peaty soils is extrapolated (NIR 2020, Ruyssenaars et al. 2020). This has resulted in a reduction in emissions from organic soils in AR, D and FM, with emissions decreasing over time since 1990.
- In line with the update of the organic soil activity data also the emission factors for drainage of peat and peaty soils have been adjusted to take into consideration the changed area of organic soils. Emission factors decreased from an average 19.0 (peat) or 13.0 (peaty) ton CO_2 per ha of drained organic soil in 2000 to 17.7 (peat) or 12.0 (peaty) ton CO_2 per ha of drained organic soil in 2014. Between 2004 and 2014 the trend in decreasing emission factors is interpolated and after 2014, it is extrapolated (NIR 2020, Ruyssenaars et al. 2020). This has resulted in a further reduction in emissions from organic soils in AR, D and FM.

See Coenen et al. (2018), Ruyssenaars et al. (2019), and Ruyssenaars et al. (2020) for more detailed information on all methodological improvements.

3 Projections for emissions and removals for the accounting period

In this chapter emissions and removals of the LULUCF accounting categories are projected until the end of the accounting period (2020) to address the following article of the LULUCF decision:

EU LULUCF Article 10 (b): Projections for emissions and removals for the accounting period.

Forest land
A projection of emissions and removals for the accounting period 2015-2020 was carried out under the assumption that the rate of land-use change as observed from 2013-2017 will remain unchanged until 2020. Changes of standing stocks in forests were projected until 2020 using the EFISCEN model (Schelhaas et al. 2007), which was parameterised using information from the 6th National Forest Inventory (NFI6; Schelhaas et al. 2014). This approach is similar to the approach used to report to the Convention and Kyoto Protocol for years from the latest NFI inventory onwards, until information from a new NFI will become available (Arets et al. 2020). Wood harvests from forests were assumed to remain similar to those in 2018 (~1.5 million m^3).

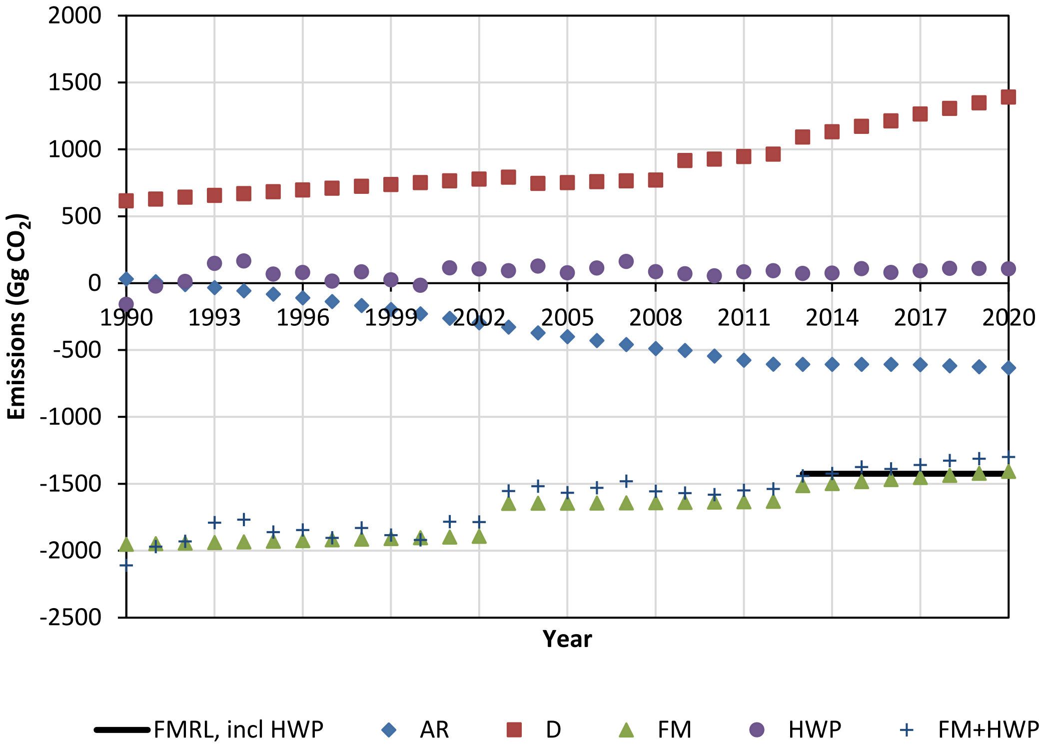

***Figure 3.1**. Projections of removals and emissions from Afforestation/reforestation (AR), Deforestation (D), Forest Management (FM) and Harvested Wood Products (HWP). The Forest Management Reference Level incl. its HWP are provided, but will still receive a technical correction.*

Emissions from deforestation (D) are projected to further increase from 1,306 Gg CO_2 in 2018 to 1,391Gg CO_2 in 2020 (**Figure 3.1**). Emissions on new D land are mainly due to the loss of forest biomass. For a small part these emissions are compensated by biomass growth in the new land use. Over time subsequent changes in land use, including reforestation with gradually increasing removals, slow down the increasing net emissions from D land. Removals from afforestation and reforestation (AR) will increase from 617 Gg CO_2 in 2015 to 632 Gg CO_2 in 2020. Removals from reforestation on D land are already included under D land and therefore accounted as reduced emissions on D land. In the first years after afforestation the removals are limited, but accelerating growth of young forests over time also results in accelerating removals on AR land. As a result the effect of afforestation will still increase over time. The removals under forest management increase from 1,436 Gg CO_2 in 2018 to 1,406 Gg CO_2 in 2020.

For accounting purposes the emissions and removals from FM need to be compared to the Forest Management Reference level (FMRL). The Dutch FMRL was established following a common approach by the Joint Research Centre of the European Commission that was applied for several EU member states. However, due to the fact that the FMRL was established before the 2013 Guidelines were adopted, the methods used to calculate FM differ from the guidelines. Moreover new information from the NFI6 is available for which the parameters of the model to do the projection of age class distribution needs to be adjusted. As a result a technical correction on the FMRL is needed. This technical correction will be included in the forthcoming NIR 2021.

The projected results can still change, however, as in 2021 data from the 7th National Forest Inventory will become available, the projections of forest development that are now done using the EFISCEN model will be replaced by the observed changes from the NFI data. Moreover it should be noted, that the land-use changes beyond 2017 are an extrapolation of the changes between 2013 and 2017. For the final accounting under the Kyoto Protocol the areas of AR, D and FM between 1 January 2017 and 1 January 2021 will be updated using a new land-use map dated 1 January 2021.

Given the public and political debate on deforestation and the policy developments regarding the NCA it is likely that the deforestation rate has decreased and the rate of afforestation increased since 2017. Provincial governments have now agreed on policies that make compensation of deforestation that is required as part of Natura 2000 restoration measures (e.g. restoration and expansion of heathland areas) compulsory. These potential effects will only become clear once the new land-use map for 1 January 2021 has been implemented.

As part of the NCA, the national government and provinces developed a forest strategy that includes measures to reduce deforestation and increase afforestation, and also measures focusing on climate smart forestry (see Chapter 5).

Grazing land and cropland management
Similarly as for the calculation of the historic trends, the emissions and removals from CM and GM are projected on the basis of CL and GL categories for the UNFCCC, correcting for those emissions and removals that are already considered under deforestation. Like was done for the projections for Forest land, the land-use change trends from 2013-2017 are extrapolated to 2020. Similar to the historic trends, the projected net emissions for the period to 2020 are mainly resulting from cultivated organic soils.

Total emissions of CM and GM together are projected to further decrease from 3,789 Gg CO_2 in 2018 to 3,426 Gg CO_2 in 2020 (**Figure 3.2**). Again this reduction is mainly the result of decreased emissions from organic soils, which decrease from 4,883 Gg CO_2 in 2018 to 4,716 Gg CO_2 in 2020.

Over the past couple of years drainage of organic soils has received increased societal and political attention. Partly as a result of the implications for GHG emissions, but also due to the resulting land subsidence. Especially in urban areas where the lowering of ground water under peat soils increasingly affects infrastructure and buildings. At the moment, however, no specific measures have been implemented yet beyond pilot phases. The reported reduced emissions from cultivated organic soils are not yet the result of improved management of agricultural soils. Nevertheless, the discussions have led to the problem being recognized and reduction targets for emissions from peat meadows have been included in the NCA – see Chapter 5.

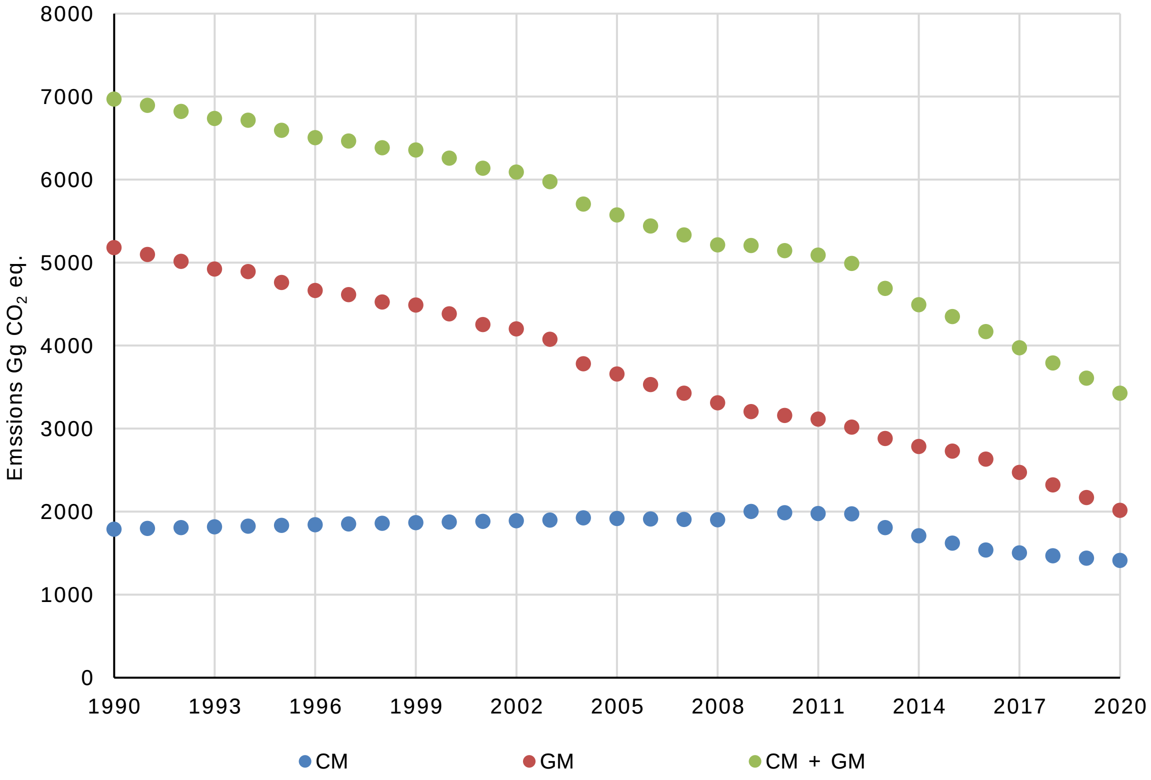

Figure 3.2. Net annual emissions from CM and GM (Gg CO_2) with projections between 2018 and 2020.

4 Assessment of mitigation potential

In this chapter the potential is assessed of a number of relevant measures aiming at reducing emissions or increasing removals to address the following article of the LULUCF decision:

EU LULUCF Article 10 (c): An analysis of the potential to limit or reduce emissions and to maintain or increase removals.

Forest land

In the accounting of the LULUCF sector under KP2 afforestation/reforestation and deforestation play an important role. Although until 2013 the annual area of afforestation/reforestation was larger than the annually deforested area, the net emissions from D land are higher than the net removals from AR land (**Figure 3.1**). This is the result of the high loss of forest biomass in the actual year of deforestation, while it takes a longer time to reach the same amount of biomass after conversion to forest. Moreover if cropland or grassland are converted to forests, CO_2 emissions from soil and biomass in the first years are higher than the CO_2 removals due to tree growth. In the period between 2013 and 2017, the deforested area was even larger than afforestation, resulting in a net loss of forest area.

Increased afforestation and reforestation

After 30 years of tree growth, the carbon stocks in tree biomass will reach 0.11 Gg C per ha of AR land. This corresponds with cumulative net removals of 0.4 Gg CO_2 per ha over the 30 years period.

Based on an initial assessment of the carbon sequestration revenues of potential developments in forest management and the possible roles of the Dutch forest and wood sector in the bio-economy (Nabuurs et al. 2016), and after consultations with various stakeholder in the forest and wood sector in the Netherlands, the sector presented an action plan for investments and development of the forest and wood sector and related carbon storage possibilities in October 2016. Amongst other suggestions for improvements in management, the action plan also proposes actions potentially adding up to planting 100,000 ha (~25% increase in the current forest area) of new forest in the Netherlands and increasing the use of wood as substitution for fossil-energy-intensive materials in, for instance, construction. According to the plan of the forest and wood sector this should be implemented between 2020 and 2050 depending on policy developments and availability of finance. The Dutch Ministry of Economic Affairs and the Provinces agreed to look together with the sector at the feasibility of the different elements of the plan in the coming period and take into account other interests to see what steps can be taken towards implementation. In general afforestation in the Netherlands is hampered particularly because of high competition on land area for other purposes and the associated high prices for land.

In November 2020 the Ministry of Agriculture, Nature and Food Quality (LNV) presented its Forest Strategy to the Parliament. The strategy aims to achieve an increase of forest area with 10% compared to the area in 2013. This means an increase of approximately 37,000 ha of forest. The national government and provinces are committed to an increase of more than 18,000 ha of forest and are exploring the possibilities to supplement this with 19,000 ha of forest.

Avoiding deforestation

Since emissions from deforestation are instantaneous, and because deforestation is a relatively important factor in LULUCF accounting under KP2, and probably also in future accounting schemes, avoiding deforestation should be considered as an important mitigation mechanism under LULUCF in the Netherlands.

Direct emissions from deforestation result from the removal of tree biomass dead wood and litter. With average forest biomass still increasing in Dutch forests, the emissions are expected to even increase over time (Figure 4.1). By 2020 avoiding 1 ha of deforestation would prevent the emissions of 0.52 Gg CO_2.

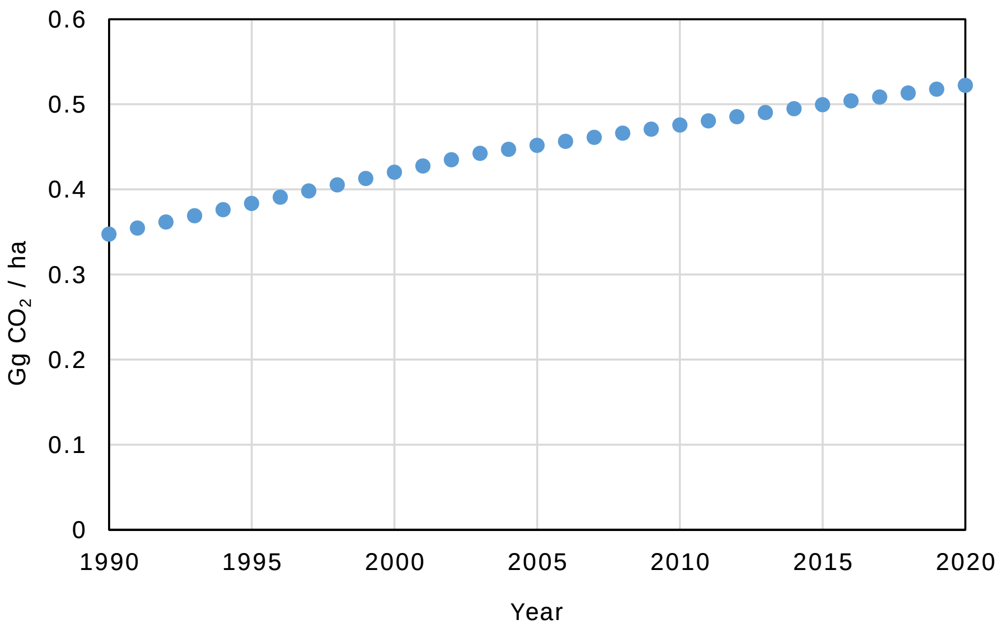

Figure 4.1. *Direct emissions associated with 1 ha of deforestation as a result of loss of tree biomass, dead wood and litter.*

In the Netherlands in some cases deforestation is allowed if this is compensated by afforestation in another area. On the long term this will guarantee that carbon stocks are maintained, but during the first 30 years this creates a carbon debt, particularly in the accounting where currently wood harvests from deforestation are accounted for assuming instantaneous oxidation. Yet in reality part of the wood that will become available from deforestation will be used as raw material for the same purposes as the wood harvested from managed forests, which for the accounting enter the HWP pool in which the carbon of the wood remains for a given time depending on its application. Another part of the wood may be used as source for bioenergy production resulting in substitution of fossil energy sources. The conversion of forest to other types of nature is currently allowed under the Nature Protection law, without compensation. The Forest Strategy estimates that an area of 3,400 ha is converted or still to be converted to nature to comply with Natura 2000 obligations in the period 2017-2030. Although not mandatory, it is announced that this area will be compensated elsewhere.

Improved forest management

Nabuurs et al. (2016) assessed options for improving forest management and increasing domestic wood supply in the Netherlands. Currently the annual harvest in the Netherlands is around 1.5 million m^3, which provides about 10% of the wood demand in the Netherlands of around 15 million m^3 of round wood equivalents (rwe). Future demand is expected to increase to 25 million m^3 per year by 2030 (Nabuurs et al. 2016). At the same time the potential of domestic forests to provide wood and biomass is largely underutilised in the Netherlands (Schelhaas et al. 2014), with about 55% of annual increment harvested. According to scenario assessments in Nabuurs et al. (2016) this can sustainably be increased to 75-80% of annual increment (corresponding with 1.7-1.8 million m^3 rwe). Under such scenarios, growing stocks will still increase, but the net annual increment will decrease. In carbon terms, this means that the carbon stocks in forests still increase, but that the annual removals will decrease. However, the Forest Strategy puts biodiversity forward as one of the most important goals and strives for an increase of the forest area that is designated for nature conservation from 30% to 40%. This would leave little room for an increase in the harvesting level. Although this is not ruled out, it would need to come from an increase in increment in the existing forest, to be realised by revitalisation.

Wood produced from sustainably managed forests, can be an important source of raw material for many purposes, including building and energy. Where wood substitutes energy demanding raw materials and or fossil energy sources, it can offset emissions from those sources while the carbon in wood used in products with long life cycles is stored in those harvest wood products (HWP) for longer time periods. Actual emission reductions that will be achieved will depend on materials substituted and on which sources from the wood chain are used for substitution. Insights from 'carbon debt' studies, for instance, show that wood used for bio-energy should come best from residual wood flows to allow a net reduction in greenhouse gas emissions. Shifting the use of wood to applications with longer life spans will increase the carbon stored in the HWP carbon pool (see also Nabuurs et al. 2016). This is also articulated in the Forest Strategy.

The NCA of 2019 led to formation of the Climate Envelopes Forest, Nature and Wood by the Dutch Ministry of Agriculture, Nature and Food Quality. The Climate Envelope consists of pilots for climate smart forestry and nature area management. Its purpose is to acquire experience with measures that must help to realise the ambition of the NCA for the sector agriculture and land use. Pilots of the Climate Envelope have been carried out in 2018, 2019 and 2020. The main themes are:

- Forest management
- Afforestation
- Agroforestry
- Landscape elements
- Wetlands
- Wood chain

The pilots are based on planting experiments, modelling research and policy support actions. Monitoring of the pilots has started in 2020. The results and experiences are used to fill an online toolbox, where forest managers, policy makers and others involved can retrieve the information.

Cropland and grazing land management

Increasing removals on mineral soils

With the current pragmatic approach for reporting CM and GM under 2013/529 it is not possible yet to assess the effects of specific cropland or grassland management activities on reported emissions. However, following the National Climate Agreement with specific targets for soil carbon sequestration and reduction of emissions from organic soils, a more elaborated methodology is being developed, to be able to account for the effects of specific measures for the new accounting periods of the LULUCF regulation.

The target for soil carbon sequestration was based on results from a study of Lesschen et al. (2012), who calculated the mitigation potential for several soil carbon measures (Table 4.1).

Estimation of mitigation potential

To quantify carbon sequestration by these mitigation measures, the MITERRA-NL accounting model has been used. This model assesses the effects and interactions of policies and measures in agriculture on greenhouse gas emissions on a regional scale. The calculation of the change in soil carbon stocks was based on the IPCC 2006 guidelines in combination with soil carbon stocks resulting from the Dutch soil database (LSK). For a combination of these selected measures a realistic SOC sequestration potential of about 0.8 Mton/year was calculated (Table 4.1), which formed the basis for the 2030 target in the Dutch climate agreement of 0.4-0.6 Mton CO_2/year.

With the Dutch climate agreement also an impulse was given to research on soil carbon, resulting in the start of a large programme named 'Smart Land Use', which will promote the uptake of soil carbon measures substantiated by data. Data are collected in different project initiatives of the programme. The long-term experiments in this programme collect data on the effect of specific soil carbon measures on the soil carbon stock. Carbon sequestration is a slow process and therefore it is important to run these kinds of long-term experiments. In addition, the data will be used to validate model results.

Table 4.1. *Calculated potential CO_2-sequestration in soils (Lesschen et al. 2012)*

Measure	**Max. total potential** kton CO_2/year	**Implementation of measure** %	**Realistic sequestration** kton CO_2/year	**Max. per ha** kg CO_2/ ha/year
Reduced tillage	475	50	238	608
No-tillage	912	20	182	1167
Catch crop/green manure	311	50	156	398
Improvement of crop rotation	942	20	188	1205
Leave crop residues on the fields	628	20	126	803
Establishment of field margins	145	40	58	186
Grassland renovation	710	30	213	3586
Total of realistic combinations	**2,270**		**790**	**2316**

In 2018 the programme carried out an intensive soil sampling campaign. The analysed soil samples provide a reference of the status of Dutch agricultural soils. This reference will be used for monitoring changes in the soil status. Models (e.g., Miterra-NL, NDICEA) are used to predict the potential effect of soil carbon measures. A farm tool on soil carbon provides insight in the current carbon balance, and provides farmers the opportunity to test the effect of farm-specific soil carbon measures. The implementation of carbon measures is stimulated through network groups of arable and livestock farmers.

Based on the new knowledge that has been collected in the programme, but also from international studies, an update of the mitigation potential for soil carbon sequestration is being made. This update comprises a new set of soil carbon measures, a new modelling approach using the dynamic soil carbon model RothC and better underpinning with national data from the Smart Land Use programme. The new set of carbon measures include;

- agroforestry,
- not ploughing grassland,
- improve crop rotation,
- maize in grassland,
- application of additional compost,
- replace liquid manure for solid manure,
- leave crop residues on the field,
- management of field margins and bird fields,
- species rich grassland,
- improved crop production,
- include deep rooting grasses,
- reduced tillage,
- change temporary grassland into permanent grassland.

The effect of some of these measures was tested in the long-term experiments. These results are given in Table 4.2. The carbon sequestration that can be realised by improved crop rotation strongly depends on the cultivated corp. Reduced tillage has, neither on clay as on sand, a positive effect on carbon sequestration. Increasing the organic matter input seems to have a positive effect on clay when applying solid manure, and on sand when applying compost. Permanent grassland has a strong positive effect on clay soils.

The main change compared to the study by Lesschen et al. (2012) is exclusion of the reduced and no tillage measures, as new insights and results show that the mitigation potential was overestimated. For no-tillage, the Dutch arable systems are not applicable, as rotation schemes feature several root crops (potato, sugar beet, union), which do not do well when applying no-tillage. Reduced tillage is possible in many cases and already adopted by quite some farmers. However, the results from experiments show that the increase in soil carbon in the topsoil is compensated by a loss in soil carbon deeper in the profile. Under the climate conditions in the Netherlands, no net soil carbon sequestration effect is therefore observed. The new mitigation potentials will be published in 2021.

***Table 4.2**. Calculated potential CO_2-sequestration in soils Results of the long-term experiments based on Koopmans et al. (2020). The numbers are compared to the carbon sequestration values of Lesschen et al. (2012) and Koopmans et al. (2018).*

Measure	Description	Soil type	Soil layer	ton C / ha / yr	ton CO_2 / ha / yr	Literature value in t CO_2 / ha / yr
Improved crop rotation	3 to 6 year rotation	Clay	0-30	0.00-1.74	0.0-6.4	1.2-1.8
	Extensification	Sand	0-30	-3-3.15	-11-11.6	1.2-1.8
Reduced tillage	Tossing	Clay	0-30	-0.11	-0.4	0.6
	Tossing	Peat	0-30	1.18	4.3	
	Tossing	Sand	0-30	-1.57	-5.8	1.7
Increase organic matter input	Liquid manure	Clay	0-30	-0.06	-0.2	0.0
	Compost	Clay	0-30	-0.06	-0.2	0.4-2.0
	Solid manure	Clay	0-30	0.17	0.6	1.4
	Compost	Peat	0-30	11.62	42.6	0.4-2.0
	Compost + tagetes	Peat	0-30	-6.90	-25.3	
	Liquid manure	Sand	0-30	-0.48	-1.8	0.0
	Extra compost	Sand	0-30	1.38	5.1	0.4-2.0
Permanent grassland	9-19 years	Clay	0-10	2.80	10.3	0.0
	9-19 years	Clay	0-30	1.67	6.1	
	>20 years	Clay	0-10	2.02	7.4	0.4-2.0
	>20 years	Clay	0-30	2.38	8.7	1.4
	4-6 years	Sand	0-10	2.40	8.8	0.4-2.0
	4-6 years	Sand	0-30	1.01	3.7	
	>10 years	Sand	0-10	1.87	6.9	0.0
	>10 years	Sand	0-30	-0.09	-0.3	0.4-2.0
Reduced tillage	Milling	Clay	0-30	0.28	1.0	7.2
	Tossing	Clay	0-30	0.69	2.5	
	Milling	Sand	0-30	0.29	1.1	7.2
	Tossing	Sand	0-30	0.00	0.0	

Reducing emissions from organic soils

As indicated before, emissions from cultivated organic soils are a key source of emissions from the LULUCF sector in the Netherlands. Raising the ground water table would substantially reduce the emissions, but because of the presence of various stakeholders in the peat areas with different demands for ground water levels it is difficult to find satisfactory solutions. A solution might be provided by raising ground water levels using submerged drains in pastures on peat soils. Pilot projects show promising results. They allow dairy farmers to continue using these grasslands as pastures, while it seems feasible to reduce rate of subsidence and peat oxidation by up to 50% on peat land with such submerged drains.

A recent study by van den Born et al. (2016) provided estimates for reduced CO_2 emissions for three measures: water level fixation (i.e. no further lowering of the drainage depth), submerged drains and conversion to nature of wet agriculture (assumed for 10% of the peatland area). Full implementation of the first measure would result in a reduction by 0.95 Mton CO2/year, for submerged drains by 0.6 Mton CO_2/year and conversion to nature and wet agriculture 0.4 Mton CO_2/year by 2050. Combining these measures could result in a total reduction by 1.25 Mton CO_2/year (van den Born et al. 2016).

However, the underpinning of these mitigation potentials is limited, as only very few actual GHG emission measurements have been performed, and most data are derived from indirect measurements of soil subsidence. Therefore a large research programme on GHG emissions from peat-meadow systems (https://www.nobveenweiden.nl/) started in 2020, in which at 5 different locations a range of mitigation measures will be tested and GHG emissions will be measured for at least 3-4 years. The results will be used to guide future mitigation measures. Based on the results of this programme, also new emission factors can be derived for the different mitigation practices to be used in future reporting.

5 Measures and policies

This chapter lists appropriate national measures to take into account, identifies existing and planned policies to implement measures and were possible provides the relevant timelines to address the following articles of the LULUCF decision;

- *Article 10(d): A list of the most appropriate measures to take into account national circumstances, including, as appropriate, but not limited to the indicative measures specified in Annex IV, that the Member State is planning or that are to be implemented in order to pursue the mitigation potential, where identified in accordance with the analysis referred to in point (c, Chapter 4).*
- *Article 10(e): Existing and planned policies to implement the measures referred to Article 10(d), including a quantitative or qualitative description of the expected effect of those measures on emissions and removals, taking into account other policies and measures relating to the LULUCF sector.*
- *Article 10 (f): indicative timetables for the adoption and implementation of the measures.*

In the Netherlands until recently no specific policies and measures were in place to decrease emissions or increase removals from the LULUCF sector. With the Paris Climate Agreement and the determination of the Dutch implementation, and the increasing public and political attention for deforestation and emissions from peat meadows this has changed as is also reflected in the NCA and Forest Strategy. Improving the climate performance of land use is an new and relevant component of current policy making. Additionally the inclusion of LULUCF in the EU climate and energy framework has put LULUCF more on the policy agenda.

In order to increase its climate mitigation ambitions, the Dutch government started a stakeholder process to define and agree on policies and measures to reduce greenhouse gas emissions in 5 sectors: electricity, industry, built environment, traffic and transport, and agriculture and land-use. In each sectoral platform round tables were organised in which sectoral stakeholders representing societal organisations, companies and government were actively involved. The agriculture and land use sector had round tables on three focus areas for LULUCF related measures: 1) peat meadows, 2) agricultural soils, and 3) trees, forest, nature. This process resulted in the NCA that contains agreements with the sectors on what they will do to help achieve these climate goals. The NCA was presented on 28 of June 2019.

Eventually the Government's ambition to reduce the Netherlands' greenhouse gas emissions by 49% by 2030, compared to 1990 levels, and a 95% reduction by 2050 was laid down in a Climate Act on 28 May 2018[4]. Under the Climate Act, the government is required to draw up a Climate Plan setting out measures to ensure that the targets indicated in the Climate act actually are achieved. Although the LULUCF sector is not included in the 49% reduction target, for each of the LULUCF topics reduction targets are agreed on in the NCA (Table 5.1). A subsequent assessment of feasibility of reaching this target with the proposed measures and policies and allocated financial resources indicated that likely not all targets will be met without additional measures or resources. Additional research should indicate how additional measures could contribute to meeting the targets.

The Climate Agreement is an essential part of the Climate Plan, and of the National Energy and Climate Plan (NECP) that the Netherlands submitted to the EU in December 2019.

[4] https://www.government.nl/topics/climate-change/climate-policy

Below briefly the policies and measures for the three LULUCF topics from the climate agreement are provided. The text contains the most important elements, partly copied from the agreement. Further details can be found in the agreement.

Table 5.1. *Reduction targets for the different LULUCF topics in the NCA and estimated reduction that is feasible with the intended policies and allocated resources according an assessment of the NCA by PBL (2019).*

LUULCF topic in NCA	Reduction target (Mton CO_2 eq. per year by 2030)	Estimated feasibility (Mton CO_2 eq. per year by 2030)
Peat meadows	1.0	0.6 - 0.9
Trees, forest and nature	0.4 - 0.8*	0.4 - 0.8
Agricultural soils	0.5	0.3 - 0.5
Total	1.9 - 2.3	1.3 - 2.3

*At least 0.4 Mton CO2 eq year by 2030, aim to achieve 0.8 Mton CO2 eq year by 2030.

Peat meadows

Emission reductions in the peat meadow areas should be achieved with regional and area specific measures tailored to farmers' future prospects, water management options and the type of peat soil. The key starting point is the business perspective of farmers, where existing business models will only be cast off once alternative business models are available.

Peat meadow areas will receive a stimulus, which will involve identifying where the most urgent problems lie. In some situations, this may relate to supporting farmers in relocating, in less intensive farming (including compensation for loss of income) or voluntarily cessation of farming operations. In other situations, there will be a greater emphasis on technical modifications, such as drainage techniques. This will require various types of instruments: land use, compulsory land consolidation and voluntary plot exchange (which may also involve government-owned land), fiscal support, write-off of land with financial compensation.

The roll-out of the approach as of 2021/2023 for approximately 90,000 hectares of peat meadows will consist of a combination of measures with a substantial contribution of approximately 10,000 hectares of conversion to agricultural nature (including peat moss cultivation), transition to wet crops, increasing summer water levels to benefit meadow birds and underwater drainage techniques. The government has earmarked €100 million for the voluntary cessation scheme (including the buying of rights), will enter into a dialogue with provinces, water boards and municipalities regarding additional funding for supporting policies and has set aside €176 million in total for other measures up to 2030.

Possibilities for implementing measures and the effect measures will resort strongly depends on the regional context. Area specific approaches are needed for successful implementation of measures. To address the regional difference Regional Peat Meadow Strategies are being developed to develop and implement area specific approaches. The strategy foresees two phases. In the first phase (2020-2022) measures are implemented and tested for their effect in the regional context. The results will be used to further develop and implement the strategies for the second phase (2023-2030) which will be targeted to meeting the reduction targets by 2030.

A National Knowledge Programme on Soil Subsidence (Nationaal Kennisprogramma Bodemdaling) is established for;

- evaluation and knowledge development,
- addressing issues from the specific meadow areas, including sustainable business and land management models,
- knowledge development from pilot projects (2019 – 2021) in order to identify the technical potential and feasibility of measures, like submerged drains.

Trees, Forest and Nature
Emission reduction under this topic should be achieved through improved forest management and climate-inclusive nature conservation policy and management. Important elements include:

- prevention of deforestation. Deforestation should be limited to what cannot be avoided. In cases where deforestation is necessary, for example as a result of international agreements on the natural environment, collective commitments will be made for adequate carbon compensation.
- increasing carbon sequestration in existing forests and nature areas. Existing forests, nature conservation areas, landscape elements and public spaces provide opportunities to increase carbon capture, including through changes to their management;
- expansion of forest and trees in the landscape. Planting and creating additional trees, woodland areas and nature conservation areas inside and outside the National Nature Network, in public spaces, in infrastructure and on agricultural land, will increase carbon capture. This will see maximum coordination with national parks and objectives in relation to biodiversity, spatial quality, urbanisation challenges, recreation, etc.
- enhancing carbon capture in the supply chain. The use of timber, cuttings and other natural products (cascading) in the supply chain that are produced as a result of the management of green spaces will increase carbon capture and will prevent carbon dioxide emissions as a result of the use of alternative building materials.

The national government has allocated €51 million worth of climate funds for:

- The construction of a joint Forest Strategy, drawn up by the national government and provinces.
- a Natura 2000 deforestation approach/creation of a compensation pool (a way to have parties that have felled a forest for nature restoration or expansion in the context of Natura 2000, fund the planting of a different forest elsewhere);
- development of government-owned land (including infrastructure networks);
- the restoration of landscape elements/agroforestry, subsidy scheme for farmers planting forests on their land;
- research pilots with practice-oriented research for climate-smart management of forests, trees and the natural environment[5]

The Forest Strategy was published in November 2020. It gives a perspective for Dutch forests until 2030, with several ambitions. The strategy aims for an expansion of the Dutch forest area with 10% in 2030 (i.e. 37.000 ha). A part of this expansion (15.000 ha) will happen in the Dutch Nature Network, the other part (22.000 ha) will be outside the Dutch Nature Network. Furthermore, the strategy aims to revitalise poor, old forests, to increase their productivity and resilience. There is also room for a small increase in wood harvest and the use of bio-based materials will be stimulated. The Forest Strategy has no financing scheme of its own, but will connect with other financing schemes, such as the NCA, the Dutch Nature Program and private financing.

Agricultural soil and outdoor cultivation
The emission reductions in this field should be achieved through an increase of organic matter levels in agricultural soils and reduced emission of nitrous oxide from these soils. This requires an integrated approach of sustainable soil management, addressing intrinsically linked issues such as organic matter content, soil life and soil compaction.
Emissions reduction should be achieved through the following measures:

- increasing carbon in the soil on arable land through a sustainable cultivation plan, including the following components:
    - increase in the extent of reduced and no tillage; increase in extent of application of catch crops and green manure;
    - increase of acreage of protein and intermediate crops;
    - use of organic soil improvers;
    - stimulation of the use of organic and other circular fertilisers

[5] https://www.vbne.nl/klimaatslimbosennatuurbeheer/

- reduction of nitrous oxide emissions through the use of precision agriculture on at least 50% of the available area of land used for agriculture by 2030; optimisation of site, weather, soil and time-specific dosage of the appropriate fertiliser dependent on the crop and the crop yield; increased use of fixed driving paths; greater use of machinery with a low ground pressure for cultivation activities, without farmers being forced to make additional expenditures,
- reduction of greenhouse gases on grassland as a result of reduced/no tillage of grassland; improvement of crop rotation; sowing or undersowing of catch crops for corn; use of grass clover for new seeding.

The strategy to achieve this will focus on taking measures in the short term, whilst simultaneously, focusing on research into entirely sustainable soil management, carbon capture and nitrous oxide reduction in the long term.

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