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DRAINED ORGANIC SOILS IN THE NORWEGIAN GHG-INVENTORY UNDER UN CONVENTION

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Seminar on peatland management in the context of GHG emission inventory

November 3-4, 2015

OUTLINE

Land-use classes in the GHG-inventory

- Definitions, area distribution, net emissions and removals

Activity data

- National Forest Inventory (NFI), aerial photos, other data sources

IPCC Guidelines: 2013 Wetland supplement

Drained organic soils – human induced emissions

- Forest, cropland, grassland, peat extraction (wetland) and land-use change to settlements

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LAND-USE CLASSES

Definitions

Area distribution

Net emissions and removals

FOREST LAND

Definition:

- Tree crown cover > 10 %
- Land must be minimum 0.1 ha & 4 m wide
- Young trees should be able to reach a minimum height of 5 m at maturity in situ.

CROPLAND

Definition:

- Annually cropped or harvested
- Regularly cultivated or/and plowed
- Annual or perennial crops
- Grass leys in rotations with cereals
- Temporarily grazed fields

GRASSLAND

Definition:

- Utilized for grazing on an annual basis.
- Grass may be mechanically harvested.
- More than 50 % of area covered with grass.
- Partly covered with trees, bushes, stumps, rocks etc.

WETLAND

Includes mires/bogs, lakes and rivers and areas regularly covered or saturated by water for some time of the year.

- Mostly pristine mires
- But do also include peat extraction lands

SETTLEMENT

- Roads, airports, trains, gravel pits, mines (vegetation very unlikely).
- Residential areas and all types of built-up land; houses, gardens, villages, industrial areas, towns, cities (little vegetation).
- Power lines within forests, and cabins areas, parks, golf courses, and recreational areas (some vegetation).

OTHER LAND

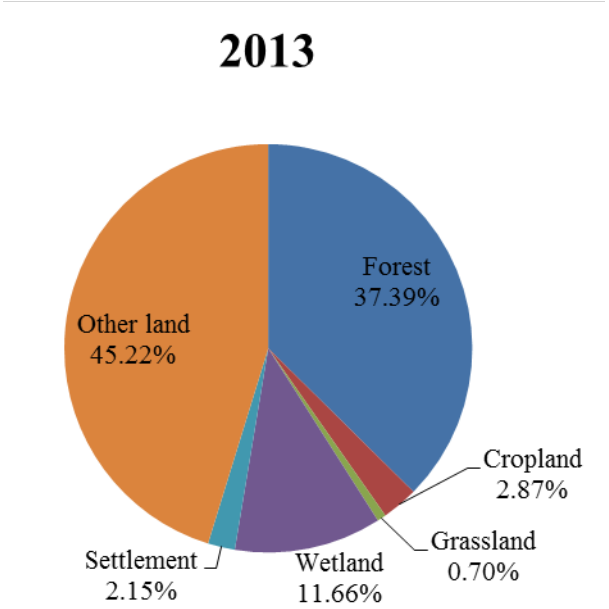
Definition:

- Waste land, bare rocks, ice, and shallow soils that may have particularly unfavorable climatic conditions.
- Included heath lands and other wooded land (i.e. land with sparse tree cover on mineral soil).

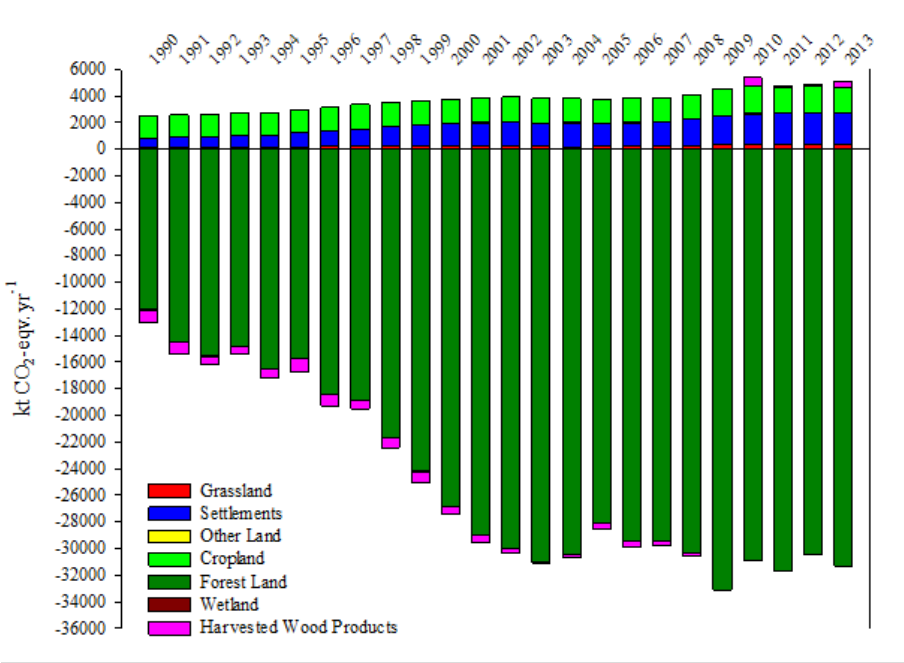
DISTRIBUTION LAND-USE CATEGORIES

Area distribution (%) of the IPCC land-use categories for 2013.

Only small changes since 1990.



NET EMISSIONS AND REMOVALS IN CO_2–EQV.



Net emissions and removals from the LULUCF sector by land-use category from 1990 to 2013. Kt CO_2-equivalents per year (i.e. including emissions of N_2O and CH_4).

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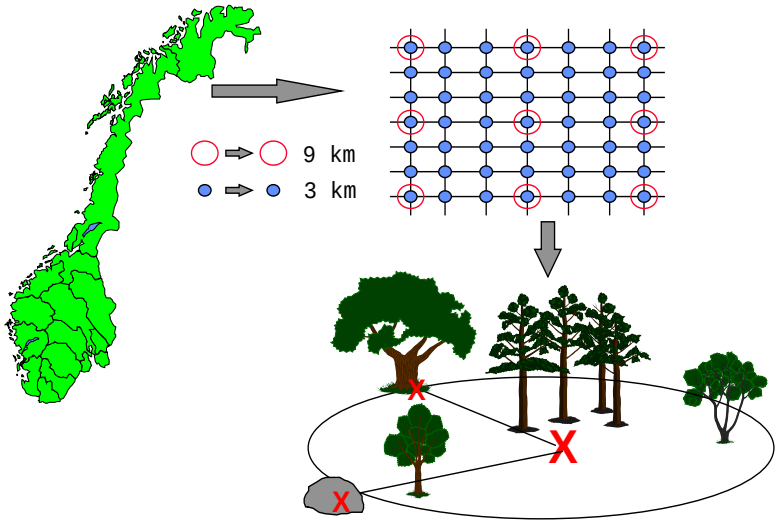
ACTIVITY DATA

- National Forest Inventory (NFI)
- Other data sources

INVENTORY DESIGN: PERMANENT SAMPLE PLOTS

- 3×3 km network of permanent plots (approximately 11000 plots in forest)
- 5-years measurement interval
- 2250 forest plots are measured every year
- plots is accurately localized by GPS



PHOTOGRAMMETRY

– DETECTION OF LAND-USE CHANGE

OTHER DATA SOURCES

- The Norwegian land resource map (AR5)
- The agricultural soil map for Norway
- Subsidy statistics
- Other statistics

Foto: Hilde Olsen, NIBIO

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2013 WETLAND SUPPLEMENT

Norway has chosen to use the: 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands

ESTIMATION OF CO2 AND N2O EMISSIONS

In general the emissions for CO2 and N2O is estimated as:

$$\text{Emission} = EF_{CO2,\ N2O} \times \text{area}_{CO2,\ N2O}$$

ESTIMATION OF CH4 EMISSIONS – TIER 1

The method accounts for methane fluxes both in the drainage ditches and on the land using the flowing equation:

$$CH_4 = A \times ((1- Frac_{ditch}) \times EF_{CH4\_land} + Frac_{ditch} \times EF_{CH4\_ditch})$$

Where, A is the area of drained organic soil; $Frac_{ditch}$ is the fraction of the area occupied with ditches; and EF_{CH4_land} EF_{CH4_ditch} are the emissions factor for the land and the ditch, respectively.

Default values $Frac_{ditch}$:

2.5 % for forest land

5 % for cropland, grassland and peat extraction

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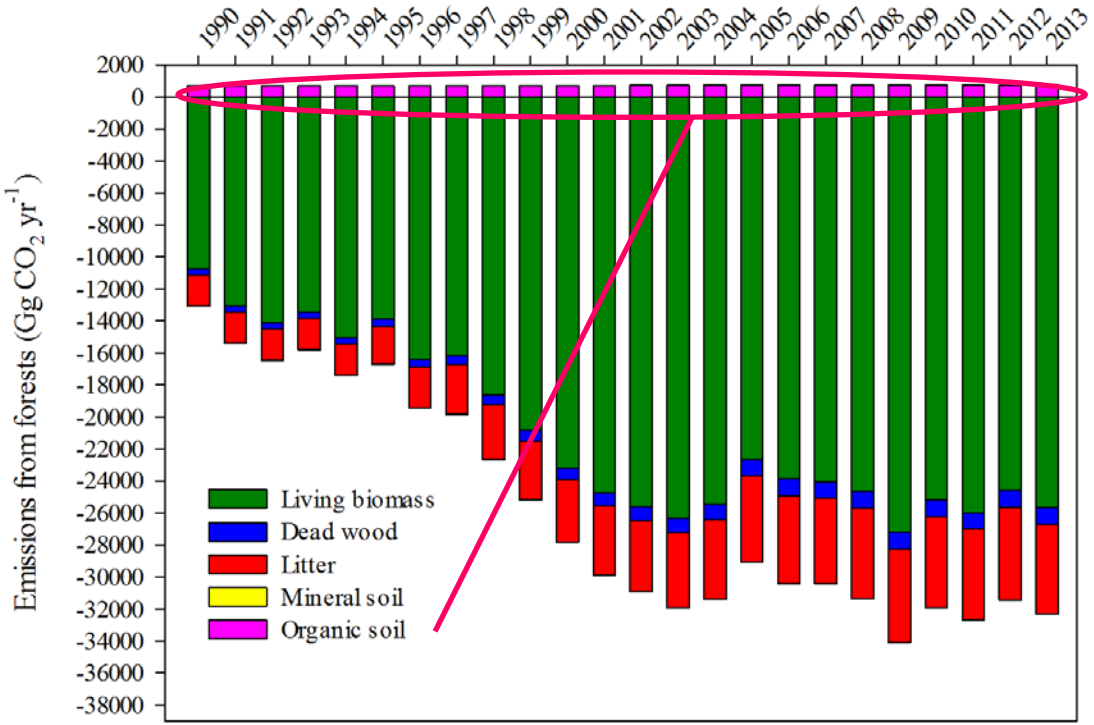
DRAINED ORGANIC SOILS

Forest, cropland, grassland, peat extraction (wetland)
and land-use change to settlements

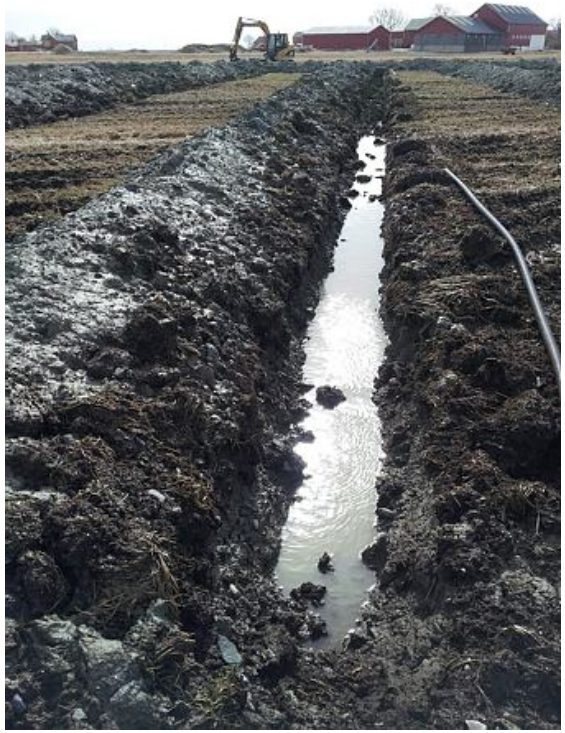
EMISSIONS AND REMOVALS OF CO_2 ON FOREST LAND

- Peaks in the 1930s and in the 1950 and 60s
- Inventory based on data on given subsidies, data series starting in 1950
- Established project to record ditches in NFI



CROPLAND AND GRASSLAND

- Drainage of mires for agricultural purposes still allowed
- Lack data in NFI on soil type
- Utilize different data sources



PEAT EXTRACTION

- Very small source, however, very high interest in media
- Very poor activity data, both regarding area and production volume
- Established project to establish better activity data

Tjerbo Torvfabrikk (Østfold)

Sundland Torv og Jord (Vestfold)

PEAT EXTRACTION

Off-site

National factor: 0.05

On-site

Default EF from 2013 Wetland supplement

Kallak Absorbent AS (Østfold)

SETTLEMENTS

Settlements as land-use class is increasing (and all other decreasing)

New roads, houses, etc. also targets organic soils

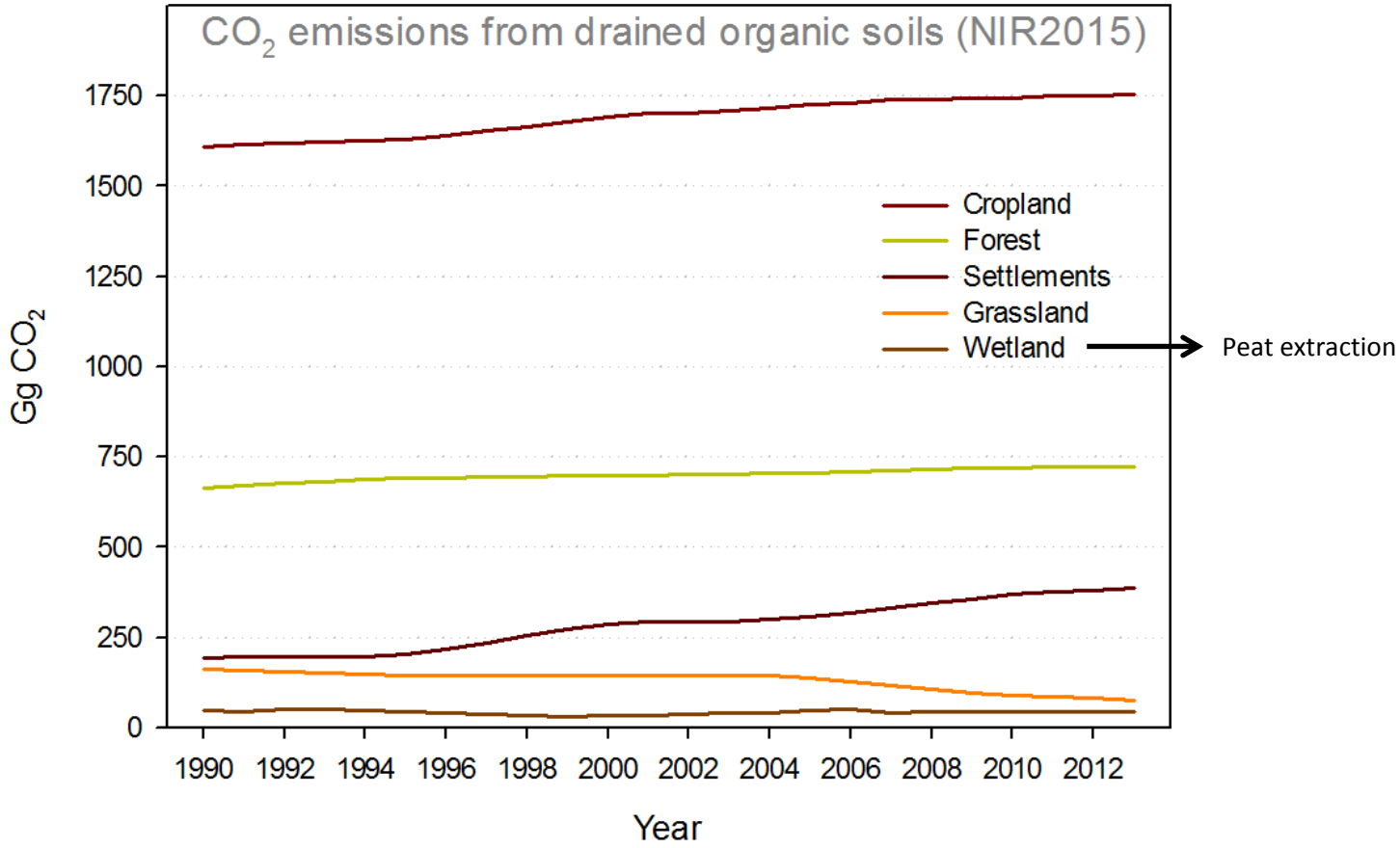
Same emission factors as for Cropland

EMISSION FACTORS – DRAINED ORG. SOILS

Tier 1 approach with default emission factors according to IPCC Wetland Supplement.

Source	CC	GG	PE	FF
CO2-C for drained organic soils (Mg ha-1 yr-1)	7.9	6.1	2.8	0.79
N2O for drained organic soils (kg N-N2O yr-1)	13	8.2	0.30	2.57
CH4 for drained organic soils (kg CH4 yr-1)	0	16	6.1	2.97
CH4 for drainage ditches (kg CH4 yr-1)	1165	1165	542	217

NB! Some numbers represents means, as EFs vary with climate zone and nutrient status


CO_2 emissions from drained organic soils (NIR2015)
Gg CO_2
1750
1500
1250
1000
750
500
250
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Year
Cropland
Forest
Settlements
Grassland
Wetland
Peat extraction

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THANK YOU FOR YOUR ATTENTION!