

INFORMATION ON LULUCF ACTIONS IN THE CZECH REPUBLIC

Report under LULUCF Decision 529/2013/EU Article 10

Submission to the European Commission (2017 update)

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Ministry of the Environment
of the Czech Republic

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Introduction

The information on LULUCF actions by the Czech Republic was prepared pursuant to the Article 10 of Decision No 529/2013/EU of the European Parliament and of the Council of 21 May 2013 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. It also takes into account additional guidance provided by the European Commission.

The main sources of information compiled in this document are the National Inventory Report 2017, Sixth National Communication of the Czech Republic to the UNFCCC, national greenhouse gas projections, Submission of information on forest management reference levels by the Czech Republic and several sector specific studies.

The report has been prepared by the Ministry of the Environment of the Czech Republic in cooperation with experts from the Ministry of Agriculture and Institute for Forest Ecosystem Research (IFER).

According to paragraph 4 of Article 10 of Decision No 529/2013/EU Member States shall submit to the Commission, by the date halfway through each accounting period, a report describing the progress in the implementation of their LULUCF actions. The information provided in this Report has been updated in line with the latest available national emission inventory and greenhouse gas projections. The information on potential to reduce emissions, appropriate measures, existing and planned policies, has also been updated in line with the policy developments since the initial Report submission.

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National Circumstances

Forests and Forestry

The Czech Republic is one of the countries with high forest coverage. The area of forests has been growing since the second half of the 20th century, mostly due to a long-term trend of afforestation of infertile cropland (in recent years the annual gain has been approximately 2 000 ha). Total area of forest land reached 2 668 thousand ha in 2015, which is approximately one-third of the Czech territory (34% of the total territory). This is somewhat less than the average in Europe (37.6% in 2015).

In afforestation, there has been an effort to increase the share of broadleaved species at the expense of conifers. In 2015, more than 72.3% of forests were coniferous forests (76.5% in 2000) and 26.5% broadleaved (22.3% in 2000). Total wood supply in the Czech Republic has been growing and reached 692.6 million m³ in 2015.

Trends in the area of forest land in 1920 – 2015 (thousand ha)

	1920	1930	1945	1950	1960	1970	1980	1990	2000	2005	2010	2015
Area	2 369	2 354	2 420	2 479	2 574	2 606	2 623	2 629	2 637	2 647	2 657	2 668

Source: Ministry of Agriculture

Trends in the total standing stock of wood in forests in 1930 – 2015 (million m³)

	1930	1950	1960	1970	1980	1990	2000	2005	2010	2015
Standing stock	307	322	348	445	536	564	631	663	681	693

Source: Ministry of Agriculture

Trends in some basic characteristics of forest management in 1990 – 2015 (million m³/year)

	1990	1995	2000	2005	2010	2015
Total harvest	13.3	12.4	14.4	15.5	16.7	16.2
Salvage logging	9.8	7.9	3.3	4.5	6.1	8.2
Salvage logging in % from total harvesting	74%	64%	23%	29%	36%	51%
Total increment	17.0	18.0	19.8	20.5	21.2	21.8
Ratio of increment and harvest	78%	69%	73%	76%	79%	74%

Source: Ministry of Agriculture, Forest Management Institute, Czech Statistical Office

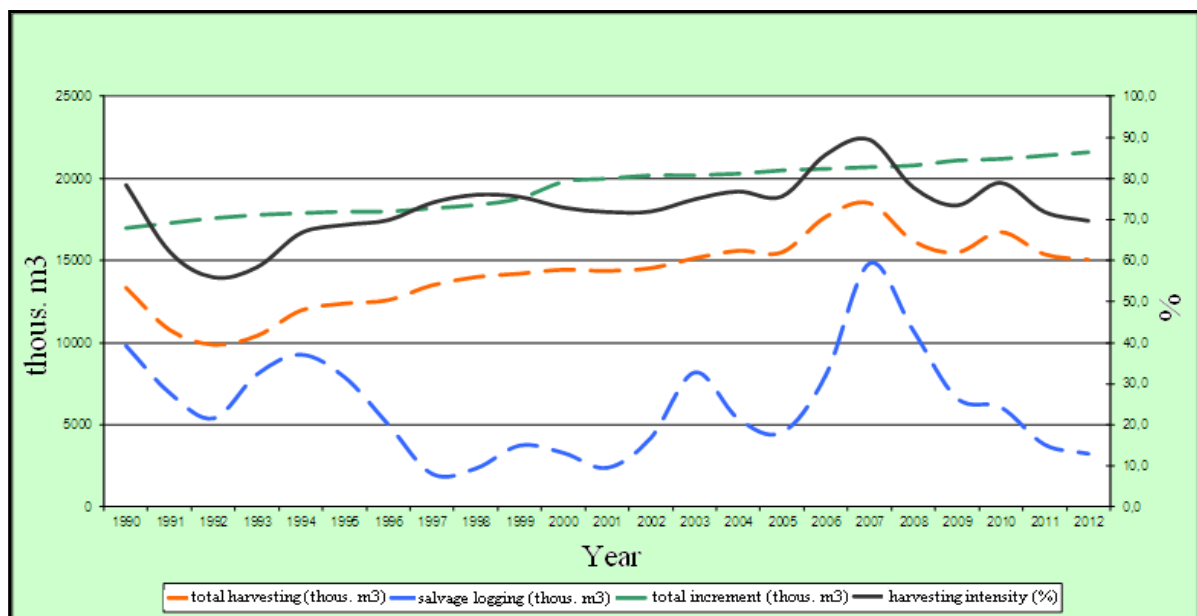
With regard to the ownership, 58.69% of the forests are owned by the state, 16.96% by cities and municipalities, 19.28% by private persons, 3.01% by legal entities and 2.06% by other owners (2015 data). Lesy CR s.p. (Czech Forests, state enterprise), respectively Vojenske lesy s.p. (state enterprise) and National Park Administrations manage forests owned by the state. With regard to the function of forests, there are production forests (74.4%), protective forests (2.1%) and special-purpose forests (23.5%). Forests dominantly used for wood production are administered by the Ministry of Agriculture. Forests in national parks and their protective zones are administered by the Ministry of the Environment.

The share of the forestry sector in the creation of gross value added fluctuates between 0.5 and 0.8% in recent years (in current prices).

In previous decades, forests have been severely damaged by industrial pollution. Despite dramatic decrease in pollutant emissions into the air (especially SO₂), forest health is improving only slowly. The persisting sensitivity of forest health is mainly due to long-term forest soil acidification and nutrient degradation, as well as intensive forest exploitation. Forests are also being affected by high concentrations of tropospheric ozone and weather extremes, such as wind-brakes and drought spells, which are usually accompanied by fungal and pest infestations.

The area of forest land of the Czech Republic has been steadily slightly growing. Between 2014 and 2015, this area grew by 2 016 ha. The increase has been caused by afforestation of infertile cropland.

Comparison of total increment with harvesting [million m³]; Forest Management Institute



Broadleaved species have been expanding at the expense of conifers in terms of forest composition, which is becoming more mixed, with spruce and pine tree species relatively declining, being replaced by beech, oak, ash and maple tree species. This is a result of a long-term effort to achieve a more balanced and natural composition of the forests in the Czech Republic. There is also a specific financial state support focused on ensuring the necessary ratio of ameliorative and reinforcing woody species during forest restoration.

The Land Use, Land-Use Change and Forestry (LULUCF) sector closely relates to agriculture and forestry. The most important LULUCF land category in the Czech Republic in relation to greenhouse gas emission balance are the forest areas. Forestry in the Czech Republic is regulated by the Forest Act (Act No. 289/1995 Coll., on Forests, as amended), which forms the fundamental legislative instrument. While Forest Act does not directly determine the specific targets for forest carbon stocks, its provisions indirectly regulate carbon stocks and reduction of greenhouse gas emissions in many respects.

Strong emphasis has been placed on issues related to carbon stocks and emissions from the forestry sector during the negotiation and elaboration of the National Forestry Programme II. This programme was approved by the Government Resolution No. 1221/2008. The National Forestry Programme contains “Key Action 6” – aiming to “Reduce impacts of anticipated global climate change and extreme meteorological events”, formulated in 12 specific measures. These measures are focusing on creating more resilient forest ecosystems by supporting diversified growth with the highest possible use of natural processes, diverse wood plant composition, natural capacity for restoration and variability of afforestation methods.

It may be anticipated that forest carbon sink will be decreasing in the coming years. The main reason is the unfavorable age structure of forests in the Czech Republic. The temporary decrease in sinks will also be due to the planned increase of broadleaved species representation. Nevertheless, this measure is a significant adaptation measure, which aims to ensure long-term stability of forest stands and also carbon accumulation over a long-term horizon. In the future, we also expect a more extensive use of biomass for energy purposes and larger volume of carbon accumulated in harvested wood products.

Area according to IPCC category [thousand ha]; NIR 2017

Territorial category	1990	2015
Forest Land	2 629.5	2 668.4
Grassland	832.5	1 000.6
Cropland	3 455.0	3 211.3
Wetlands	157.5	165.5
Settlements	704.6	736.3
Other	107.2	104.9

Agriculture

Agriculture has typical central European character with predominance of food production and high share of arable land (71.3%). Zonal character of agriculture is driven by altitude rather than latitude. Agricultural production is sufficient to cover domestic demand in terms of basic products. Crop production prevails over animal production. Yield converted to area is lower than in neighboring countries. Contribution of agriculture to GDP is about average in the EU.

Cropland in the Czech Republic, same as in other EU Member States, suffers from real estate development, because the main urban centres in the Czech Republic are situated in the most productive agricultural areas. Despite the fact that, the Czech Republic remains one of the countries with the largest shares of crop land in total agricultural land area in the EU. The main crop is grain, especially wheat.

During the last fifteen years, there has been a marked drop in size of livestock, despite the fact, that livestock numbers increased in certain neighboring countries. This is apparent in international comparison, where livestock numbers are below average even within the framework of the EU. Animal production corresponds to livestock numbers, and within the EU the meat production is also below average. Milk production has been falling despite the increased milk yield per cow, which is not sufficient to compensate for falling numbers of

cows. However the Ministry of Agriculture of the Czech Republic in its Strategy to 2030 intends to focus on increasing self-sufficiency, including the increase of livestock numbers. From the total territory of the state (approximately 7.9 million ha) the agricultural / farming land covered 53.4% in 2015, which represents approximately 0.4 ha per inhabitant. Consumption of mineral fertilizer and calcic substances has been stagnating in recent years, along with decrease of livestock, where production fell along with consumption of manure.

Development of organic farming is a positive trend. The number of organic farms has been growing in the recent years. However, the economic crisis and also the termination of support within the framework of the Rural Development Programme for 2007 – 2013 caused that, number of the organic farms has been consolidating. Number of distributors and producers of organic food is also growing.

After the transformation of the agricultural sector in 1990, there has been a considerable decrease in the use of mineral fertiliser and calcic substances due to cost reductions. In 1994, the application of mineral fertiliser and calcic substances increased again, and since then, it has been fluctuating slightly. At present time, the fertiliser application in the Czech Republic in comparison with the EU average is, more often than not, lower.

The concept of sustainable and multifunctional agriculture in the Czech Republic takes into account the reduction of greenhouse gas emissions and possible needs for adaptation measures, along with other environmental and socio-economic considerations. These objectives can be achieved by the measures included in Common Agricultural Policy of the EU, as well as through national measures. New national measures to reduce greenhouse gas emissions are being prepared and introduced continuously.

The implemented agrarian policies and measures should increase CO₂ fixation in the agricultural land while at the same time maintaining appropriate level of agricultural production and its intensity. The policies and measures in agriculture leading to greenhouse gas mitigation are based on prudent application of fertilizers, cultivation of cover crops, development of organic farming, implementation of modern and innovative technologies, monitoring fermentation of crop residues, etc. Recent agrarian policy has declared the goal of reducing nitrogen leaching and run-off.

Important measures to reduce emissions of GHGs in agriculture are optimal timing of fertilization, the exact amount of fertilizer application to crop use and optimal (covered) storage of manure. In the very advanced form all of these principles are included in the so called precision agriculture.

Description of past trends of emissions and removals (Article 10.2 a)

Information on past trends of emissions and removals 1990- - 2015 is in line with the “National GHG Inventory Report of the Czech Republic 1990 – 2015” submitted under the United Nations Convention on Climate Change (UNFCCC) and the Kyoto Protocol. For additional information please refer to the submitted report.

LULUCF sector includes emissions and removals of GHGs from forest land, cropland, grassland, wetlands, settlements and other land. Since 1990 LULUCF has been a net sink in the Czech Republic. The most important key category is Forest Land (5.A), in particular Forest Land remaining Forest Land (5.A.1).

GHG estimates in Sector 4 (LULUCF) for the period 1990 – 2015; NIR 2017

Land use Category/ GgCO ₂ eq.	4 Total	A Forest Land	B Cropland	C Grassland	D Wetlands	E Settlements	F Other land	G Harvested Wood Products
1990	-6487.71	-4858.64	120.62	-145.34	21.51	85.09	0	-1712.95
1991	-9608.86	-9251.66	112.46	-196.84	27.51	38.17	0	-340.45
1992	-10096.28	-10857.60	114.75	-187.45	9.74	63.41	0	759.02
1993	-9692.70	-9564.27	153.29	-183.46	8.86	177.38	0	-286.26
1994	-7569.01	-7114.52	131.64	-292.96	6.17	124.10	0	-425.05
1995	-8046.44	-7116.58	127.91	-325.56	9.11	90.72	0	-833.50
1996	-8393.65	-7344.99	133.08	-543.67	11.51	121.02	0	-771.80
1997	-7476.59	-6533.13	134.07	-373.86	13.91	122.13	0	-840.74
1998	-7621.31	-7111.96	258.18	-309.15	24.34	183.88	0	-667.90
1999	-7905.05	-7048.49	120.72	-408.09	25.18	207.80	0	-803.37
2000	-8805.07	-7279.56	89.27	-496.90	26.46	132.24	0	-1277.79
2001	-9133.21	-7604.33	56.42	-500.09	12.60	112.30	0	-1211.24
2002	-8765.67	-7330.91	38.10	-513.06	32.51	114.74	0	-1108.15
2003	-7266.25	-5512.72	54.03	-514.27	22.55	178.02	0	-1494.95
2004	-7788.08	-5945.60	44.63	-531.61	19.11	178.23	5.88	-1559.80
2005	-8134.59	-6407.45	49.02	-526.97	21.24	164.42	10.27	-1446.21
2006	-5969.29	-3177.03	39.12	-554.56	18.93	128.98	4.95	-2430.75
2007	-3759.54	-428.06	27.53	-558.59	19.25	101.90	14.39	-2937.05
2008	-6910.63	-4455.80	46.42	-576.61	19.87	103.29	8.09	-2056.97
2009	-7932.08	-6433.00	23.78	-595.80	18.41	114.71	4.94	-1066.23
2010	-7200.07	-5125.56	30.67	-628.68	34.26	128.58	7.21	-1647.68
2011	-8388.97	-7096.58	85.55	-558.70	37.45	120.23	7.18	-985.24
2012	-8552.72	-7420.26	17.87	-574.37	24.67	95.02	12.73	-709.54
2013	-7920.23	-7383.61	19.81	-592.02	31.41	88.56	41.53	-127.07
2014	-7801.09	-7318.76	17.14	-569.10	26.76	127.60	8.55	-94.41
2015	-6640.69	-6052.84	4.67	-550.34	25.18	88.12	7.55	-164.15

More detailed GHG estimates in Sector 4 (LULUCF) and its categories in 1990 (base year) and 2015; NIR 2017

Sector/category	Emissions 1990 Gg CO ₂ eq.	Emissions 2015 Gg CO ₂ eq.
4 Total LULUCF	-6 488	-6 641
4A Forest Land	-4 859	-6 053
4A1 Forest Land remaining Forest Land	-4 518	-6 828
4A2 Land converted to Forest Land	-321	-482
4B Cropland	121	5
4B1 Cropland remaining Cropland	-2	-76
4B2 Land converted to Cropland	123	93
4C Grassland	-145	-550
4C1 Grassland remaining Grassland	0	-274
4C2 Land converted to Grassland	-145	-295

Sector/category	Emissions 1990 Gg CO ₂ eq.	Emissions 2015 Gg CO ₂ eq.
4D Wetlands	22	25
4D1 Wetlands remaining Wetlands	(0)	(0)
4D2 Land converted to Wetlands	22	27
4E Settlements	85	88
4E1 Settlements remaining Settlements	(0)	(0)
4E2 Land converted to Settlements	85	128
4F Other Land	(0)	8
4G Harvested Wood Products	-1 713	-164

The following table contains the estimates of the net emissions/removals for the activities afforestation, reforestation and deforestation under Article 3, Paragraph 3 of the Kyoto Protocol for the first commitment period. The estimate for forest management is also included since the Czech Republic has elected to account for this activity under Article 3, Paragraph 4 of the Kyoto Protocol for the first commitment period. As the Czech Republic did not elect neither Cropland Management (CM) or Grassland management (GM) for the reporting under the Kyoto Protocol (KP), the system to estimate emission and removals from CM and GM is developed directly in response to Decision 529/2013/EU.

The methodology for estimating emissions from CM and GM is solely guided by the IPCC methodologies, namely IPCC 2006 Guidelines for National Greenhouse Gas Inventories (IPCC 2006) and 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (IPCC 2014). The system is being prepared in accordance with the UNFCCC reporting requirements on greenhouse gas emission and removals.

The system for CM and GM emission estimates can rely on high resolution data on land use, which is the fundament of the Czech LULUCF inventory. The Czech land-use representation and land-use change identification system is solely based on the cadastral system nationally administered by Czech Office for Surveying, Mapping and Cadastre (COSMC; www.cuzk.cz). In its initial phase, it is expected that CM and GM estimation methods will use Tier 1 approaches, except changes in soil carbon pool, which is of highest relevance. For this, the country-specific activity data on soil carbon stock will be used in combination with locally derived management factors derived from the detailed spatially explicit database of Land Parcel Identification System (LPIS), affecting the estimates. This approach ranks as Tier 2 methodology.

Emissions and removals resulting from Article 3.3 and Article 3.4 activities for the years 2013 and 2014; Reporting under Dec. 529/2013, 2016

GREENHOUSE GAS SOURCE AND SINK ACTIVITIES	Net emissions/removals	
	2013	2014
	(Gg CO ₂ eq.)	
A. Article 3.3 activities	-258,35	-318,56
A.1. Afforestation and Reforestation	-492,61	-549,75
A.2. Deforestation	234,27	231,19

GREENHOUSE GAS SOURCE AND SINK ACTIVITIES	Net emissions/removals	
	2013	2014
	(Gg CO ₂ eq.)	
B. Article 3.4 activities	-6 755,99	-6 631,79
B.1. Forest Management	-6 405,52	-6 282,19
B.2. Cropland Management (if elected)	-77,31	-75,93
B.3. Grazing Land Management (if elected)	-273,16	-273,67
B.4. Revegetation (if elected)	NA	NA
B.6 Wetland drainage and rewetting (if elected)	NA	NA

Forest land (4A)

The Czech Republic is a country with a long forestry tradition. Practically all the forests can be considered to be temperate-zone managed forests under the IPCC definition of forest management (2006 IPCC Guidelines, Volume 4). Within the Czech land use representation and land use change identification system, land use category 4A Forest land is represented by the forest land category of the Czech cadastral system. With respect to the definition thresholds of the Marrakesh Accords, forest is defined as land with woody vegetation and with tree crown cover of at least 30%, over an area exceeding 0.05 ha containing trees able to reach a minimum height of 2 m at maturity. As this definition of forest excludes the areas of permanently unstocked cadastral forest land, such as forest roads, forest nurseries and land under power transmission lines, these are discounted in all emission estimates involving Forest Land using the annually updated information on the ratio of timberland to cadastral forest land. In this way, the area of cadastral forest land is also linked to the national definition of timberland (Czech Forestry Act 84/1996). In 2015 (1990), the area of Forest Land equalled 2 668 (2 629) th. ha, whereas the stocked forest area (timberland) corresponded to 2605 (2 583) thousand ha, representing 97.6 (98.2)% of the cadastral forest land in the Czech Republic. Hence, the permanently unstocked area represents 2.4 (1.8)% of the forest land according to the Czech cadastral data.

Forests (cadastral forest land) currently occupy 34% of the area of the country. The tree species composition is dominated by conifers, which represent 72.3% of the timberland area. The four most important tree species in this country are spruce, pine, beech and oak, which account for 50.6, 16.5, 8.2 and 7.1% of the timberland area, respectively. Broadleaved tree species have been favoured in new afforestation since 1990. The proportion of broadleaved tree species increased from 21% in 1990 to over 26% in 2015. The total growing stock (merchantable wood volume) in forests in the country has increased during the reported period from 564 mil. m³ in 1990 to 693 mil. m³ (under bark) in 2015.

Cropland (4B)

In the Czech Republic, Cropland is predominantly represented by arable land (92.5% of the category in 2015), while the remaining area includes hop-fields, vineyards, gardens and

orchards. These categories correspond to five of the six real estate categories for agricultural land from the database of “Aggregate areas of cadastral land categories” (AACLC), collected and administered by Czech Office for Surveying, Mapping and Cadastre (COSMC).

Cropland is spatially the largest land-use category in the country. Simultaneously, the area of Cropland has constantly decreased since the 1970s, with a particularly strong decreasing trend since 1990. In 1990 Cropland represented approx. 44% of the total area of the country and this share decreased to less than 41% in 2015. It can be expected that this trend will continue. The conversion of arable land to grassland is actively promoted by state subsidies. Conversion to grassland concerns mainly lands of less productive regions of alpine and sub-alpine regions. In addition, there is a growing demand for land for infrastructure and settlements.

Grassland (4C)

Through its spatial share of nearly 13% in 2015, the category of Grassland ranks third among land-use categories in the Czech Republic. Its area has been increasing since 1990, specifically in the early 1990s. Grassland as defined in the inventory corresponds to the grassland real estate category, one of the six such categories of agricultural land in the database of “Aggregate areas of cadastral land categories” (AACLC), collected and administered by COSMC. This land is mostly used as pastures for cattle and meadows for growing feed.

The importance of Grassland will probably increase in this country, both for its role in production and for preserving biodiversity in the landscape. According to the national agricultural programs, the fraction of Grassland should further increase to about 18% of the area of the country. The dominant portion should be converted from Cropland, the share of which is still considered excessive. After implementation of subsidies in the 1990s, the area of Grassland has increased by over 20% (in 2015) since 1990.

Wetlands (4D)

Category 4D Wetlands as classified in the emission inventory includes riverbeds and water reservoirs such as lakes and ponds, wetlands and swamps. These areas correspond to the real estate category of water area of the “Aggregate areas of cadastral land categories” (AACLC), collected and administered by COSMC.

The area of 4D Wetlands currently covers 2.1% of the total territory. It has been increasing steadily since 1990 with even a stronger trend earlier. It can be expected that this trend will continue and that the area of Wetlands will increase further. This is mainly due to programs aimed at increasing the water retention capacity of the landscape, specifically in relation to adaptation strategies proposed to deal with changing climate.

Settlements (4E) and Other Land (4F)

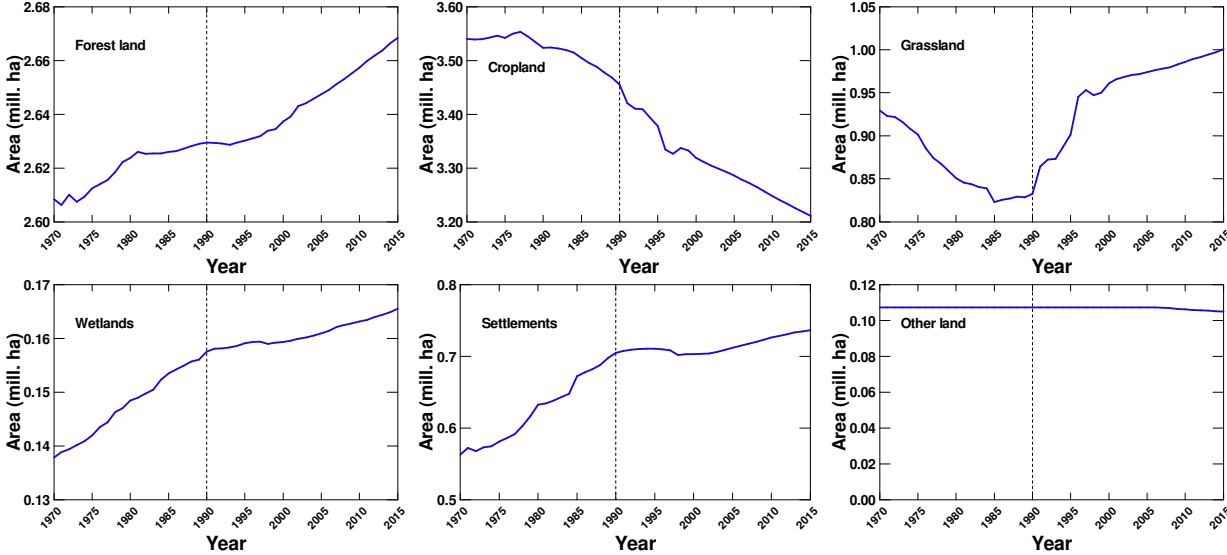
Category 4E Settlements is defined by IPCC (2006) as all developed land, including transportation infrastructure and human settlements. The area definition under category 4E Settlements was revised since the NIR 2013 submission to better match the IPCC (2006) default definition. The category currently includes two categories of the “Aggregate areas of cadastral land categories” (AACLC) database, collected and administered by COSMC,

namely “Built-up areas and courtyards” and “Other lands”. Of the latter AACLC category, all types of land-use were included with the exception of “Unproductive land”, which corresponds to category 4F Other Land. Hence, the Settlements category also includes all land used for infrastructure, as well as that of industrial zones and city parks. This category also includes all military areas (earlier considered as Grassland) in the country.

The category of Settlements as defined above currently represents about 9.3% of the area of the country. The area of this category has increased since 1990, especially during the most recent years

Since the 2008 inventory submission, category 4F Other Land has represented unmanaged (unmanageable) land areas, matching the IPCC (2006) default definition. These areas were assessed from the database of “Aggregate areas of cadastral land categories” (AACLC), collected and administered by COSMC. It is part of the AACLC “Other lands” category with the specific “Unproductive land” land use category assessed from the 2006 land census of COSMC. Since the 2016 inventory submission, the newly acquired data on land use from COSMC permitted a more detailed assessment of changes in areas of “Unproductive land” since 2004. Hence, this category was considered to be constant until 2004, involving land-use conversions only since that year. The Other Land category represents only 1.3% of the territory of the country.

Trends in areas of the six major land-use categories in the Czech Republic between 1970 and 205 (based on information from the Czech Office for Surveying, Mapping and Cadastre)



Harvested Wood Products (4G)

Category 4.G Harvested Wood Products considers primarily woody products generated from wood produced in the country. Hence, these emissions originate in land use category 4A Forest land.

The methodology for estimating the contribution of HWP to emissions and removals was based on 2006 IPCC Guidelines and the 2013 KP supplement. The estimation follows the

Tier 2 method of first order decay function. The default half-life constants were used for the major categories: 35 years for sawnwood, 25 years for wood-based panels and 2 years for paper and paperboard.

The fraction corresponding to source material originating from deforested land was estimated based on deforested areas as reported under Act. 3.3 Deforestation of the Kyoto protocol. Although quantitatively insignificant (0.016 and 0.017% in 1990 and 2015, respectively), the contribution of this fraction to Harvested Wood Products Pool was estimated using instantaneous oxidation.

The removals from category 4G Harvested Wood Products fluctuate during the reporting period 1990 - 2015, where the mean contribution reached -1.01 Mt CO₂/year.

Projections for emissions and removals from the LULUCF sector for the respective accounting period (Article 10.2 b)

The latest national GHG emission projection to be submitted to the European Commission in March 2017 under the Monitoring Mechanism Regulation is used for this report. It includes the estimates for “with measures” scenario (WEM) and “with additional measures” scenario (WAM) to 2035.

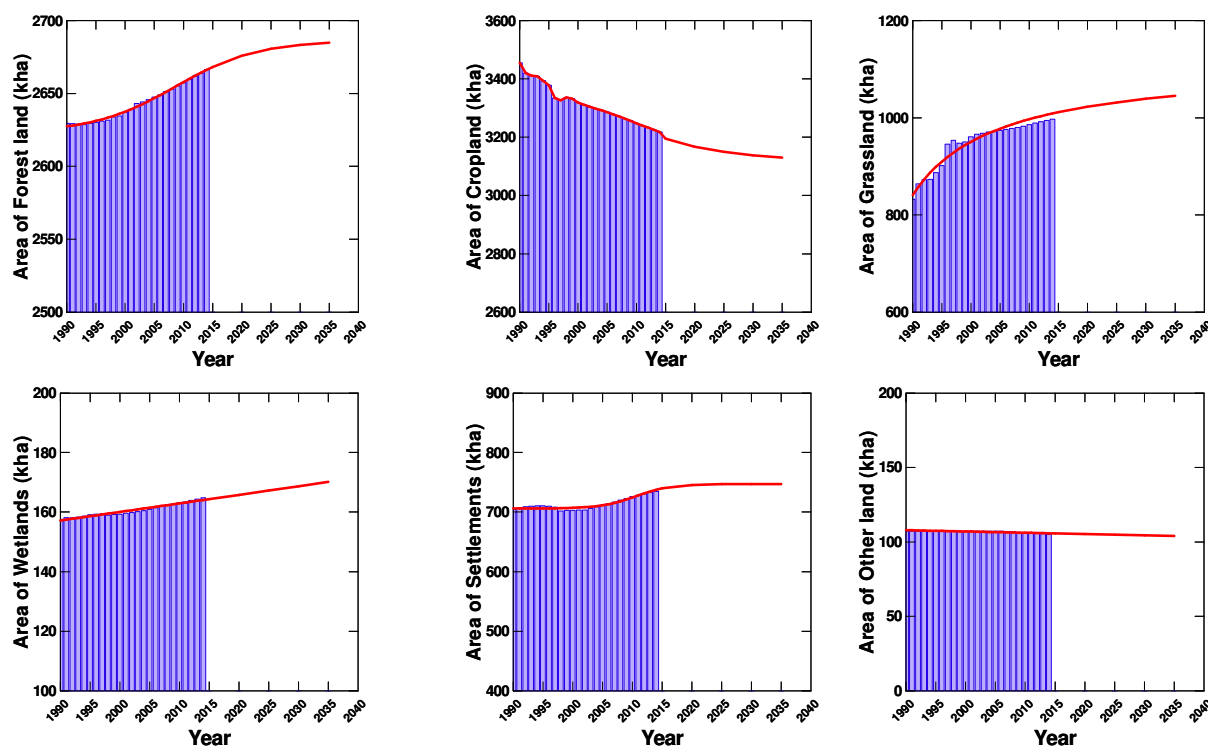
The projections are based on the observed trends and anticipation of gradually less intensive land use changes until 2035. The historical and projected land use areas are shown below. No dramatic changes are foreseen. There is a slight increase in forest, grassland and wetland land use categories while the areas of cropland and other land are expected to further decrease. The change in cropland land use category is in both relative and absolute numbers the most significant shift in land use expected in the country for the period since 2014 until 2035, the end year of the projection period. During that time, the area share of cropland would decrease from 40.8 % to 39.7 % in the country, which means a loss of 88 kha in this 20-year period. In general, the solely assumption implied for the land use change is that the rate of the observed changes in land use would tend to decrease for the projected period until year 2035 by a half relative to the rates observed for the previous two decades.

Land use areas (kha): reported until 2014, projected until 2035

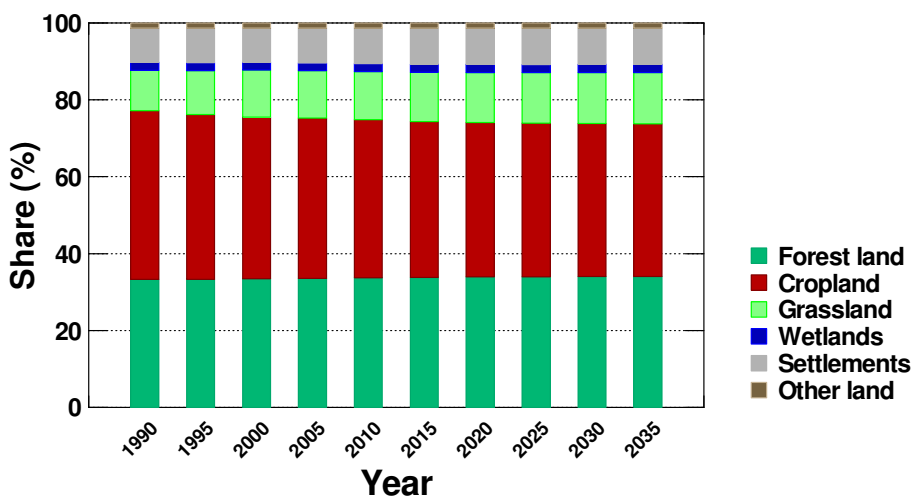
Land use category	Year											
	Reported area (kha)							Projected area (kha)				
	2000	2005	2010	2011	2012	2013	2014	2015	2020	2025	2030	2035
Forest Land	2637	2647	2657	2660	2662	2664	2666	2668	2676	2681	2683	2685
Cropland	3319	3286	3248	3240	3233	3225	3218	3195	3168	3150	3138	3131
Grassland	961	974	986	989	992	994	997	1014	1027	1037	1045	1052
Wetlands	159	161	163	163	164	164	165	164	166	167	169	168
Settlements	703	712	726	728	731	733	735	740	746	747	747	747
Other Land	107	107	106	106	106	106	105	106	105	105	104	104

Source: NIR 2016, IFER

Actual areas of the major IPCC land use categories in the Czech Republic for the period 1990 to 2014 and the projected trends shown for the period until 2035



Share of areas for the six IPCC land use categories in 5-year intervals since 1990 to 2035, using the actual data until 2014 (until year 2010 in the graph) and projections until 2035.



Following the setup of land use areas, the projection of emission estimates was prepared. The specific attention is given to forest land, which always represents one of the key emission categories in the Czech emission inventory. For this reason, the projections related to forestry are elaborated on the basis of scenario modelling using EFISCEN – the European Forest Information Scenario Model. The projections of greenhouse gas emissions related to other land use categories besides Forest Land are based on simple correlations of estimated emissions for the reference year linked exclusively to the corresponding land areas for the predicted years. The exception is the emission contribution of Harvested Wood Products, which are newly reported under UNFCCC and Kyoto Protocol since 2015 annual inventory submission. HWP contribution was projected using the constant activity data as reported for the base year of 2014 in the 2016 submission of the National Inventory Report.

The EFISCEN projections of greenhouse gas balance of Forest Land are based on the study performed within the project CzechForScen (Contribution of forestry to the emission balance of the Czech Republic and model prediction of forest management scenarios in the conditions of the Czech Republic), funded by the Czech Ministry of Education, Youth and Sports¹. The calibration data used were obtained from the database of forest management plans administered by the Forest Management Institute, Brandys n. L. They corresponded to the state of the Czech forests as of 2010. The model EFISCEN, ver. 3.3² was applied on matrices on the level of 27 specific management units, 17 age classes and aggregation of five major tree species used in the Czech Forestry. The model predictions were constrained by the actual recommendations of the Czech Forestry Act as for the regeneration period, thinning and felling that were accordingly implemented on the level of individual management groups. The felling level request was adopted in the model identically across model scenarios. It was constructed as an average felling volume of the last known 5-year period (2009 to 2013), including the share of so called unregistered felling volumes, which relate to the harvest loss and accidental (sanitary/unplanned) felling in individual years. This way constructed total felling (thinning and final cut) reached 17.29 mil m³ of merchantable wood volume annually. This includes 15.60 mil. m³ harvested volume as reported by the official statistics, while the rest represents the unregistered harvest loss and losses reported by the Czech Statistical Office. This is consistent with the felling volumes as used in the emission inventory of the Czech Republic.

Definition of WEM and WAM scenarios in LULUCF projection

The WEM (With Existing Measures) scenario includes the development of land areas of individual land use categories as shown above. That development of land areas and land use changes drives the emissions of the reference year (2014) in response to the projected are change for the individual land use categories with exception of CO₂ emissions from Forest Land. For Forest Land and Harvested Wood Products contribution. For Forest Land the EFISCEN model scenario is used that includes the currently implemented forest management recommendations of the Czech Forestry Act and actual species composition as of the reference year. The felling request remains stable and as of today (17.29 mil. m³/year, incl. felling residues and loss) for the entire projection period with exception of year 2015 with its already reported and available felling quantity. For Harvested Wood Products contribution, the input activity data of 2014 were applied across the entire projected period until year 2035.

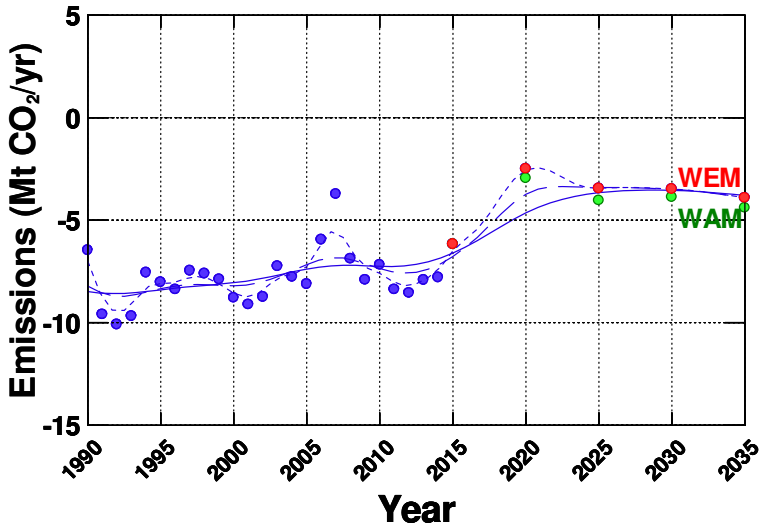
The WAM (With Additional Measures) scenario is similar to WEM. It differs in the applied EFISCEN model scenario for Forest Land and CO₂ emissions, the key category of the LULUCF emission inventory. Specifically, it includes the proposed change of dominantly spruce even-aged forests stand to more diverse stands with higher share of broadleaved tree species such as beech and oak. The proposed species change is driven by the actual management groups and by altitude of their locations. This is the essence of the recommendations of the currently elaborated National Forest Program II, Key Action 6.

¹ Cienciala E. 2012. Model prediction of the effects of key forest adaptation measures in the Czech forestry on growing stock development and carbon balance. Project report to the Czech Ministry of Education, Youth and Sports (CzechForScen, OC10003), 26 pp.

² Schelhaas M.-J., 2007. Model documentation for the European Forest Information Scenario model (EFISCEN 3.1.3). Alterra-rapport 1559, EFI Technical Report 26, pp. 118.

The historical data and projections using the WEM and WAM scenarios are shown below. It can be observed that for the nearest decades, the LULUCF sector continues to act as a sink of emissions under the current harvest demand for both WEM and WAM scenario. The difference between the WEM and WAM scenarios is notable, but quantitatively insignificant in relation to both the overall trend and annual fluctuations of emissions in this sector. For the period predicted period until 2035, the emissions under the WAM scenario tend to be somewhat lower as compared to WEM. Although the net effect of WAM scenario is only 6 %, it should be noted that there are additional benefits associated with WAM. Specifically, the WAM scenario should result in more resilient and stable forest stands, which is essential for long-term sustainability of forest production and wide spectrum of services that forests provide.

Historic and projected (scenarios WEM and WAM) emissions of GHG for the LULUCF sector. The historic data (blue) and the WEM scenarios are accompanied by a least square smooth lines using different tension values that determine the local flex.



Historic and projected emissions of GHG for the LULUCF sector [Mt CO₂ eq.]

Scenario	1990	2014	2015	2020	2025	2030	2035	2014- 2035
Historic data and WEM	-6.47	-7.79	-6.17	-2.49	-3.45	-3.48	-3.91	49.8%
Historic data and WAM	-6.47	-7.79	-6.17	-2.95	-4.04	-3.88	-4.40	43.6%

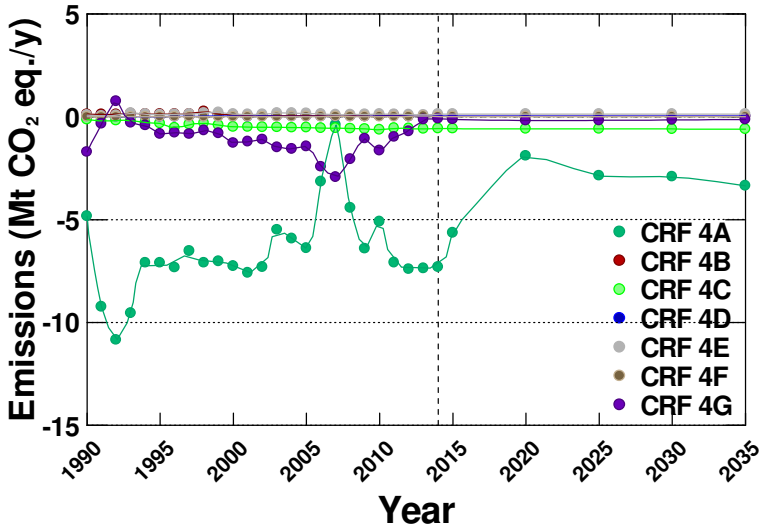
Breakdown of historic and projected emissions of GHG by gases in LULUCF for historic data and WEM and WAM scenario

Gas [Mt CO ₂ eq]	1990	2014	2015	2020	2025	2030	2035	2014-2035
WEM scenario								
CO ₂	-6.606	-7.878	-6.260	-2.579	-3.538	-3.568	-3.996	49.3%
CH ₄	0.118	0.073	0.082	0.074	0.074	0.074	0.074	0.7%
N ₂ O	0.021	0.012	0.007	0.012	0.012	0.012	0.012	-1.0%
Total (Mt CO ₂ eq.)	-6.468	-7.793	-6.172	-2.493	-3.452	-3.482	-3.911	49.8%
WAM scenario								
CO ₂	-6.606	-7.878	-6.260	-3.037	-4.122	-3.963	-4.484	43.1%
CH ₄	0.118	0.073	0.082	0.074	0.074	0.074	0.074	0.7%
N ₂ O	0.021	0.012	0.007	0.012	0.012	0.012	0.012	-1.0%
Total (Mt CO ₂ eq.)	-6.468	-7.793	-6.172	-2.952	-4.037	-3.877	-4.398	43.6%

It can be seen that the sink of CO₂ observed in LULUCF for the previous decades to a large extent diminishes. In relation to the base year of 2014, the sink of emissions would decrease by about 50 and 44% in 2035 of that observed in 2014 for the WEM and WAM scenarios, respectively.

The breakdown of historical and projected (WEM scenario) emissions by individual land use categories is shown below. The emissions in the LULUCF sector are mostly determined by carbon stock changes in the category 4A Forest Land and partly by the newly reported contribution of the category 4G Harvested Wood Products.

Breakdown of historic and projected (WEM scenario) emissions of GHG by land categories within LULUCF, namely Forest Land (CRF 4A), Cropland (CRF 4B), Grassland (CRF 4C), Wetlands (CRF 4D), Settlements (CRF 4E), Other land (CRF 4F), plus the quantified HWP contribution (CRF 4G).



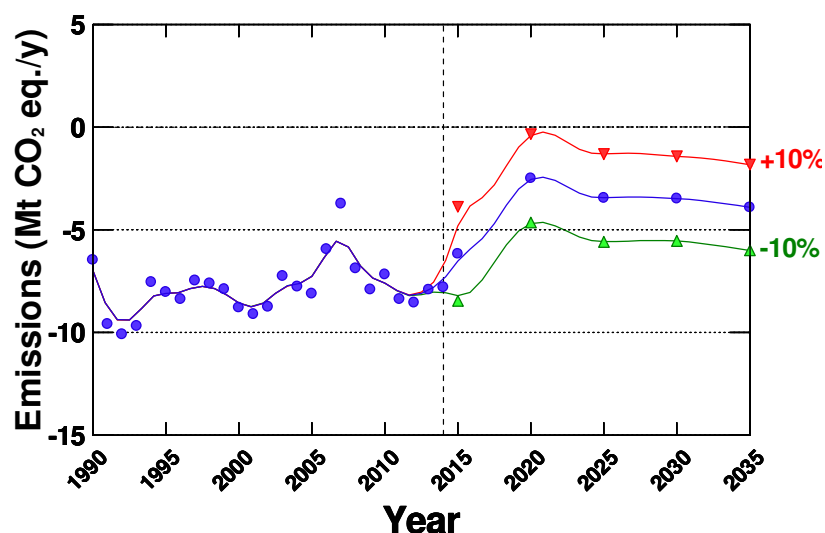
Breakdown of historic and projected emissions of GHG by the major sub-categories of the LULUCF sector for WEM and WAM scenario

Gas [Mt CO ₂ eq]	1990	2012	2015	2020	2025	2030	2030	2014/2035
WAM scenario								
4A Forest Land	-4.84	-7.31	-5.64	-1.90	-2.87	-2.91	-3.36	54%
4B Cropland	0.12	0.02	0.02	0.02	0.02	0.02	0.02	3%
4C Grassland	-0.15	-0.57	-0.58	-0.59	-0.59	-0.60	-0.60	-6%
4D Wetlands	0.02	0.03	0.03	0.03	0.03	0.03	0.03	-2%
4E Settlements	0.09	0.13	0.13	0.06	0.04	0.04	0.03	77%
4F Other land	0.00	0.01	0.01	0.01	0.01	0.01	0.01	-21%
4G HWP	-1.71	-0.09	-0.13	-0.19	-0.18	-0.16	-0.14	-45%
WAM scenario								
4A Forest Land	-4.84	-7.31	-5.64	-2.36	-3.45	-3.31	-3.84	47%
4B Cropland	0.12	0.02	0.02	0.02	0.02	0.02	0.02	3%
4C Grassland	-0.15	-0.57	-0.58	-0.59	-0.59	-0.60	-0.60	-6%
4D Wetlands	0.02	0.03	0.03	0.03	0.03	0.03	0.03	-2%
4E Settlements	0.09	0.13	0.13	0.05	0.03	0.03	0.02	86%
4F Other land	0.00	0.01	0.01	0.01	0.01	0.01	0.01	-21%
4G HWP	-1.71	-0.09	-0.13	-0.19	-0.18	-0.16	-0.14	-45%

Sensitivity analysis

The key category of the Czech emission inventory is biomass carbon stock change in the emission sub-category 4A.1 Land remaining Forest Land. This basically represents the forest management and its effect on growing stock volume. Here, the loss is determined by harvest demand including thinning and final felling. This is to be offset by annual woody increment. Therefore, harvest regime is the most prominent factor affecting carbon balance in the sector. Its role is demonstrated on the sensitivity analysis using smaller or larger overall harvest demand by 10% with respect to the selected baseline (17.29 mil. m³ annually) using the EFISCEN model. The outcome for the WEM scenario is shown below. It is apparent that a relatively small change in harvest demand would indeed have significant effect on emissions from the LULUCF sector. A smaller harvest demand would result in continuous carbon sink in forestry, while a larger felling would increase the change of changing the LULUCF sector from sink into a source category. It should also be noted that harvest demand is a more powerful short-term factor affecting emissions as compared to the management measures that distinguish WEM and WAM scenarios.

Sensitivity analysis using variable harvest demand and its effect on emissions in LULUCF under WEM scenario



Information on potential to reduce emissions, appropriate measures, existing and planned policies (Article 10.2 c-f)

Identification of appropriate measures in Agriculture

Due to the major significance of land / soil, its sustainable use (for instance, by protecting against erosion and degradation, or by improving its retention capacity and maintaining fertility), remains the crucial aspect of both climate change adaptation and mitigation. Potential solutions should be based on the following principles of sustainable farming:

- Suitable spatial arrangement of agricultural land,
- Soil-protecting and anti-erosion measures,

- Improvement of soil structure,
- Increasing the proportion of organic matter in the soil.

All these measures are very complex in their nature and linked to a number of factors. One factor is the relationship of owners to the land, which predetermines the possibilities that the above measures are actually implemented.

Agricultural ecosystems have the potential to mitigate climate change especially in terms of accumulating carbon in soil and reducing greenhouse gas emissions released within the sector, especially N₂O released from the soil and CH₄ generated by livestock. In this respect, the primary significance should be placed on increased content of organic carbon in soil, use of soil protecting technology or sustainable management of grasslands. Agriculture is the actual or potential source or raw materials for energy use. This involves energy plants or short rotation coppice cultivated on farming land, biologically degradable waste and secondary products. Their use reduces consumption of fossil fuels as well as limits releases of CH₄ from non-decomposed biomass.

Considering the diversity of agricultural measures, these may be classified in the following groups.

Land-use planning

Land-use planning creates conditions for rational management by property owners. Properties are thus classified in terms of space and function and provision is made for access to them. An integral part of all land-use planning also consists in a plan for joint facilities, encompassing, amongst other things, water management and anti-erosion measures (to protect the land fund and improve the water regime in the landscape) and measures to protect and create the environment and measures to increase the ecological stability of the territory (TSES and other green areas). Thus, land-use planning substantially reduces the impacts of extreme meteorological situations, prevents erosion of the soil and helps prevent floods.

Land-use planning measures are **already underway**. Estimates of the necessary and planned costs amount to 550 million CZK annually.

Agro-environmental measures

These measures were proposed in accordance with Council Regulation (EC) No. 1257/1999 and Commission Regulation (EC) No 817/2004, as well as Government Regulation No. 242/2004 Coll., on performance of agro-environmental measures, as amended.

The new programming period (2014 – 2020) of the Rural Development Programme implements agro-environmental-climatic activities. The measures aim to maintain the existing high-quality ecosystems in order to strengthen the higher carbon (C) sequestration potential, reduce risk of nitrogen-related (N) emission impact in connection with more extensive farming and their appropriate adjustment will contribute to both climate change adaptation and mitigation by:

- Suitable treatment of grassland in wetland locations which have considerably higher potential to fix C and N;

- Maintenance of stable ecosystems in areas suffering from deteriorating moisture conditions which minimises negative impact of wind erosion and threatened increased C and N loss;
- Sustaining increased C sequestration and N retention at waterlogged locations;
- Management of steppe locations minimises negative impacts of certain specific climate effects;
- Appropriate management on organic soil prevents increased greenhouse gas emissions;
- General management approaches supporting development of specific ecosystems with high adaptation potential to specific effects in their environment;
- Maintenance of existing high-quality ecosystems leading to maintenance or strengthening of increased sequestration potential;
- Reducing nitrogen emissions consequences;
- Maintenance of strengthening of N retention capacity by implementing of appropriate soil management practices, respectively transition to cultures with higher potential;
- Strengthening of anti-erosion measures with high sequestering effect especially in vulnerable locations, land areas endangered by erosion and in protective zones around water sources;
- Supporting sequestering potential of arable land temporarily influenced by water logging.

Measures created for the purposes of reducing negative effect of agricultural production on the environment **are already in effect** and at present time, majority of these measures are also adopted as a part of climate change-driven adaptation measures. Additional measures are a part of the framework of the Rural Development Program 2014-2020. The necessary and actual costs cannot be defined at present time.

Agro-environmental measures work in synergy with measures implemented under the Operational Programme Environment (OPE) 2014-2020 in the area concerned with management of valuable biotopes.

Afforestation and grass planting

Changing arable land to forest with good species composition or to permanent grassland operates as a measure combating wind and (in case of forests, partially) water erosion and reduces soil moisture loss. This measure also has a mitigation effect as forests and grassland accumulate more carbon than arable land and even non-aerated soil reduces oxidation processes leading to nitrous oxide and carbon dioxide emissions. Similar significance should be placed upon groves, balks and free standing trees.

The Rural Development Program 2014 – 2020 supports afforestation and grass planting measures within the framework of agro-environmental and climatic activities since 2015.

These **measures are already in the process of implementation**. The necessary or planned costs cannot be defined at present time.

Organic farming

Principles applied in organic farming create prerequisites for achieving higher average carbon content and humus in soil, better treatment of organisms living in soil etc. They also

support biodiversity of organism cultures as well as organisms that are directly or indirectly linked to farming land, which reduces the speed of genetic erosion. Organic farming may contribute to adaptation of agriculture to climate change by maintaining genetic sources of indigenous species and plants, maintaining traditional knowledge, methods and pest control processes, methods limiting water consumption and soil erosion or methods of biological protection of plants (which is the preferred method of protection due to ban on chemical protection and GMO use).

The main measure supporting development of organic farming is stable support and activities with emphasis on non-farming functionality with adaptation effects.

This is a **continuously implemented** measure. Organic farming is supported under The Rural Development Program 2014 – 2020 as an independent area of intervention.

Research, cultivation and biotechnology in farming

Research focuses especially on cultivation of agricultural crops and on selection of suitable species and plants that are resistant to climate change and on cultivation of new and revitalization of original species and cultivars of arable crops and livestock that are aimed at producing good yield while being pest-resistant and coping well with drought, heat waves, high air temperatures, soil erosion etc.

The Czech Republic is involved in two European projects operated under Food security, Agriculture and Climate Change (FACCE) focusing on simulation and adaptation of agricultural systems. At national level, there are numerous partial research activities involving individual plants including their cultivation with respect to their increased resilience, i.e. increased ability to cope with new climate change effects and pests. Research projects focused on the mitigation and adaptation measures in the agriculture are supported by National Academy for Agricultural Research (NAZV) programmes.

These are **measures already under way** requiring continuing support. The Ministry of Agriculture, acting as one of support providers, estimates that support of these measures will amount to 10-15% of the total cost of agricultural research.

Measures combating agricultural drought

Keeping in mind the anticipated more frequent occurrences of agricultural dry periods it will be necessary to also support measures contributing to increased water retention capacity of the landscape and optimisation of irrigation systems as well as minimizing negative effects of drainage systems on accelerated runoff of water from the land. These measures relate to application of technologies and research results contributing to reduced water consumption and reduced losses of soil moisture. Irrigation systems also depend on continuous availability or irrigation water.

Specifically, these measures include construction and upgrades of irrigation systems which use irrigation water more efficiently and make crop production possible even during longer periods of drought. Irrigation systems should only subsidize moisture deficits preventing damage to soil structure and preventing other negative effects on production. Technologies and methods reducing the so-called non-productive evaporation and promoting more efficient use of soil moisture by plants represents also an important measure.

Measures are **already partially underway**. To face the impacts of drought the Ministry of the Environment and the Ministry of Agriculture established an interdepartmental commission WATER-DROUGHT as an immediate response to the drought events in 2014. The outcome of the WATER-DROUGHT commission, „Preparation of Measures to Mitigate the Negative Effects of Drought and Water Scarcity“, was released in 2015. The aim of the document is to define the sectors involved and the most effective measures to be used to protect against droughts in the coming years. It includes about fifty monitoring, legislative, operational, economic, technical and environmental activities for the years 2015 - 2017. This document is the first step towards setting out a comprehensive, long-term strategy to protect the country from the harmful effects of potential future droughts. Such strategy should be presented to the Government by June 2017. Ensuring soil stability against erosion

Water erosion in the Czech Republic threatens almost 50% of land. Wind erosion threatens approximately 14% of the agricultural land in the most productive area of the Czech Republic.

Grass planting applied to arable land or creation of grassy strips on sloping parcels constitute some of the anti-erosion measures implemented during the monitored period; other measures include plough-free soil processing, planting methods protecting the soil, implementation of protective elements and zones and planting of anti-erosion barriers.

Wind erosion effects will gradually grow in importance, especially in warm and dry areas of Southern Moravia. The proposed anti-erosion elements and their individual parts will need to be corrected in this respect. Any proposal involving long-term high-cost anti-erosion measures (terraces, wind barriers, anti-erosion reservoirs etc.) must take into consideration potential climate change effects.

Measures are already being partially implemented as a part of general agriculture management. Additional anti-erosion measures were implemented in framework of the Rural Development Programme 2014-2020. The required and actually planned costs cannot be defined at this stage.

Diversification of agriculture

Systems, where an agricultural enterprise has more revenue sources (from other than just agricultural production) reduces risks arising in connection with agricultural production alone, especially when these risks are exacerbated by climate change.

The Rural Development Programme and other activities at national level provide support to production and processing of biomass used outside food processing industry as well as agrotourism and other services. Use of biomass as renewable energy source must observe sustainability principles without exacting more negative influence on the environment or food prices. Impact on the environment is being continuously assessed (in terms of soil erosion, biodiversity, effect on farms / enterprises, energy security, consumption of water etc.).

These measures have already been **implemented**.

Good Agricultural and Environmental Conditions (GAECs)

GAEC-compatible farming activities have favourable influence on the content of organic substances in the soil, protection of soil structure, help in protecting various landscape features and permanent grasslands; they also partially limit spreading of invasive plant species etc.

Compliance with these measures, such as use of soil protecting technology in cultivating crops, bans on erosion hazardous plants and compliance with post-harvest soil cover in location that are prone to erosion, is being rigorously monitored.

These measures are presently **being implemented**.

Existing policies implementing the measures in Agriculture

Common Agricultural Policy (CAP)

The EU Common Agricultural Policy (CAP) has a significant relationship to the extent, orientation and profitability of agriculture. The CAP in the EU is based on three principles – a common market for agricultural products based on common prices, preferences for agricultural production in the EU countries against external competition and financial solidarity - financing from common funds to which everyone pays contributions. The implementation of the CAP can affect the trend in GHG emissions from agriculture (methane and nitrous oxide emissions) in both directions (up or down) depending on the individual implemented measures, practices and policies in the Czech Republic.

Since 2004, the Czech Republic has applied the Single Area Payment Scheme (SAPS) and “phasing in” module, according to Council Regulation (EC) No. 1782/2003 of 29 September 2003, establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers. In 2010, the EU subsidies for CR attained 70 % of the EU 15 level. By the end of 2010, more than CZK 186 billion had been paid to the beneficiaries within this program (SAIF, 2011). The subsidies continue to be provided after the 2013 CAP reform. In 2015 about 18 billion CZK was paid to the beneficiaries.

Cross Compliance

Cross compliance has been employed in the Czech Republic since 1 January 2009. The direct payments and other selected subsidies can be granted only on the condition that a beneficiary meets the statutory management requirements addressing the environment, public health, the health of animals and plants, and animal welfare, the GAEC standards, and minimum requirements for fertilizer and plant protection product use as part of agro-environmental measures.

The implementation of Cross Compliance should reduce direct emissions from fertilizers (N₂O) and emissions from enteric fermentation (CH₄) by improvement of breeding management and a healthier animal population.

In 2012, the scientists from Research Institute of Agricultural Engineering published an invention related to litter production of manure. Thanks to a special composting technology working with biological heat can you get rid of pathogenic microorganisms in the separated slurry, from which it is made of plastic litter for cattle. Litter is just as comfortable as straw, but the animals are cleaner and there is no contamination of their milk. Introducing a new technology will increase food safety and competitiveness of Czech farmers. Increased milk production and changes in manure management affects the balance of N₂O emissions.

Rural Development Programme

For the 2007 – 2013 program period, the European Agricultural Fund for Rural Development (EAFRD) was founded on the basis of European Council Regulation No. 1290/2005 on the financing of the CAP. With the purpose of withdrawing finances, the Czech Republic prepared basic strategic and program documents specifying in detail the measures for meeting the objectives of the development of rural areas in the Czech Republic.

The program consisted of 4 basic parts (Axis = groups of measures), each of them meeting some of its objectives, A1 - improving the competitiveness of the agricultural, food and forestry sectors falls within the first group of measures A2 - increasing biodiversity, water and soil protection and mitigating climate change is a joint objective of the second group of measures, A3 – improving the quality of life in rural areas and encouraging the diversification of economic activities there, and A4 - helping the residents of rural micro-regions (applying the “from bottom to top” principle) to work out their local development strategy and to support projects related to the development of the region they live in, called the LEADER method.

The new Rural Development Programme 2014-2020 is being implemented since 2015. Its most relevant interventions are described further in text. The Rural Development Programme 2014-2020 is more focused on the agri-environment-climate payments and organic farming and 30% of funding allocated for these measures has already been disbursed.

Rural development and Multifunctional Agriculture (Agriculture OP)

The program includes and specifies measures jointly financed by the guidance section of the European Agricultural Guidance and Guarantee Fund (EAGGF) and jointly financed by Financial Instrument for Fisheries Guidance (FIFG). It covers the area of the Czech Republic. The purpose of processing the Agriculture OP is to support agricultural primary production and the processing of agricultural products, to support forest and water management and to ensure the continually sustainable development of the countryside. The program also ensures i) Development and modernization of agricultural holdings, ii) Support of young farmers and iii) Diversification into non-agricultural activities.

Horizontal Rural Development Plan of the Czech Republic

The program was commenced in 2004 following approval by the European Commission. The main objective of the program was to ensure sustainable development of agriculture, the countryside and its natural resources. The program objectives included i) preservation and support of agricultural systems with low inputs, ii) protection and support of sustainable agriculture meeting environmental demands and iii) preservation and strengthening of a viable social structure in rural areas. The most important share in the total allocation was represented by agro-environmental measures related to support for less-favoured areas. By the end of 2010, more than CZK 25 billion had been paid to the beneficiaries within this program.

The implementation of the rural development program can affect the trend of GHG emissions from agriculture (methane and nitrous oxide emissions) in both directions (up or down) depending on specific implemented measures, practices and policies.

Organic farming

Organic farming is an integral part of the agricultural policy of the Czech Republic. Its importance lies not only in the production of good-quality organic-foodstuffs but mainly in the farming methods that, through their environmentally friendly influence on nature, contribute substantially to the preservation of the rural character of the countryside, especially in the mountains and foothills of the Czech Republic. An important benefit lies in reduction of nitrate leaching, retention of N in biomass before the onset of winter, increased biodiversity, creating a suitable environment for beneficial organisms and effects on plant health.

The state administers support for organic farmers through subsidies and the National Rural Development Program (see above). Disbursements under the grant in the area of organic agriculture rapidly increased during in the 1998-2009 period, from 1.9 million Euros in 1998 to 39.2 million Euros in 2009 (www.eagri.cz).

The organic farming legislation limits the number of organic farms in the area of livestock and thereby reduces the number of animals and CH₄ emissions from enteric fermentation and manure storage. Organic farming does not use industrial fertilizers, the production of which creates large amounts of CO₂ and for the growing of feed for organic farming is based on substantially reduced use of inorganic fertilizers. Pesticides (herbicides) and growth regulators and the resulting production CO₂ emissions are prohibited in organic agriculture. Organic farming promotes the application of nitrogen at the appropriate time, when its uptake by plants is greatest, and thus reduces the amount of N in the soil and N₂O emissions, which are determined on the amount of N in the soil.

Action Plan for Development of Organic Farming 2016–2020

Adopted by the Government on 20th November 2015, the Action plan describes the strategy for the development of organic farming in the Czech Republic to 2020. From analysis carried out on fulfilment of the previous Action Plan it is apparent that, although many partial activities were successfully carried out within individual priority areas, the majority of aims set out in the AP have not yet been achieved. However at the end of June 2015, a total of 4,176 farms worked organically on 503,000 ha of land, which represents a 12% share of the overall agricultural land fund.

It includes priority areas and a number of recommended measures for the following five priority areas: Economic viability of organic farms, Organic food market – production and marketing, Consumption of organic foods, Benefits to the environment and animal welfare and Research – education – consultancy.

Action plan includes the following quantified targets for 2020:

- Increase the proportion of income from production in total income of organic farms compared to subsidies (improvement on present situation)
- Increase the value of organic farm production by 15% (according to FADN method)
- Increase the proportion of Czech products on the organic food market to 60%
- Achieve a 3% share of organic foods in total food and drink consumption
- Raise consumer confidence – raise average expenditure on organic foods to 600 CZK per person/year
- Increase the real benefit of to the environment and animal welfare = achieve a 15% organic farming share of total agricultural land in the Czech Republic

- Achieve a proportion of at least 20% arable land in total acreage of organically farmed land
- Ensure finances for research and consultancy in organic farming to a level corresponding to the proportion of organic farming acreage in total agricultural land (15%)

Decree 75/2015 defines the conditions for implementation of agro-environmental measures and Decree 76/2015 defines the conditions for implementation of organic farming measures.

Act No. 242/2000 concerns ecological agriculture. This act administers and describes the activities of agro-environmental programs (implementation of new technologies, procedures in protected areas, landscape cultivation, etc). Directives 834/2007 and 889/2008 have been adopted and implemented in the Czech Republic.

Nitrate Directive

Action Program No. 103/2003 is closely linked to the Nitrates Directive (91/676/EEC). The program consists of a system of compulsory measures in vulnerable areas to reduce the risk of nitrogen leaching into surface waters and groundwaters. Endangered and protected areas were delimited in the Czech Republic in 2003. Since 2004, Action Plans have been implemented in these areas.

The list of endangered and protected areas was updated in December 2012, when the Third Action Plan has been implemented (incl. in WAM scenario). The limit of 170 kg N/ha for application of organic fertilizers is presented, thereby reducing the amount of N in the soil and emissions of N₂O. The Third Action Plan brings new rules: i) period of prohibition of fertilization, ii) manure storage rules, iii) balancing fertilization, iv) an application of fertilization on sloping, wet, frozen and snow covered land, in vulnerable areas.

Good Agricultural Practices, applied in ecological farms, include BAT technologies and techniques as: reduction of waste nitrogen by phase diets in feed, reduction of ammonia emission by adding enzyme substances to feed, partly grated floor, plastic and concrete grids with vacuum system removes manure, steel manure storage tanks etc.

Identification and implementation of appropriate measures in Forestry

The potential for mitigation in relation to forestry activities is mainly connected to:

- Afforestation of agricultural land with low productivity
- Replacing fossil energy with bioenergy, including from harvesting residues.
- Replacing greenhouse gas intensive materials with harvested wood products.

The most important land category of the Czech LULUCF sector in terms of greenhouse gas emission balance is Forest Land. Forestry in the Czech Republic is regulated by the Forestry Act (The Act no. 289/1995 Coll. on Forests and Amendments to some Acts), which is the principal legislative instrument. Also this instrument does not specifically target carbon

balance, but its provisions affect carbon budget and greenhouse gas emissions & removals in numerous ways indirectly.

Beyond the legislation above, the National Forest Program II for the period 2008 to 2013 (NLP II) is the basic national strategic document for forestry and forestry-related sectors. Implemented within the environmental pillar, specifically Key Action 6 lists the measures being or to be implemented to alleviate the impact of expected global climate change and extreme meteorological conditions. These measures generally focus on creating more resilient forest ecosystems by promoting diversified forest stand utilizing to the greatest possible extent natural processes, varied species composition and variability of silvicultural approaches, reflecting the current international treaties, agreements, conventions and EU directives.

The Conclusions of the Coordinating Council for the implementation of the National Forestry Program II (2013) summarized the recommendations for implementing the proposed measures of NLP II after lengthy consultations by forestry experts in the country. For the emission balance of the LULUCF sector, particularly important are the elaborated recommendations of Key Action 6 NLP II which are directly aimed at reducing the impacts of global climate change and extreme weather events.

The essence of the key measures recommended by the above material is included in the “with additional measures” (WAM) scenario above.

Species, age and spatial diversity

The aspect of species diversity is connected particularly with reduction of spruce stands and increasing the share of broad-leaved and fir trees. The number of broad-leaved trees in the natural composition of forests should be approximately three times their current quantity.

Spatial diversity means provision for adequate girth and height differentiation of the forest and is related to age and species diversity. Trees of various ages fill the space of a forest stand at various levels, mixing tree species with various requirements on light and temperature and with various natural root depths facilitate more effective utilization of the above-ground and soil space for the formation of biomass capturing carbon, and trees of various sizes are exposed to different risk factors. Forest differentiation thus reduces the risk of extensive decomposition of the forest and substantially contributes to stabilization of carbon stocks.

Adaptation measures in this area focus on cultivation of spatial and species-related variety of tree stands using the natural processes in the greatest possible degree, while maintaining diverse composition, natural restoration processes and variability of silvicultural methods, use of wider spectrum of tree species, including pioneering and advance species; we anticipate a wider use of species with broader ecological amplitude and stabilization function.

These are **continuously implemented** measures as defined in Principal Forestry Policy (Government Resolution No. 249/1994) and the Forests Act (Act No. 289/1995 Coll.).

Prioritizing natural restoration of forests

Natural restoration of forests should be taking place on at least 20% of the total area. In order to ensure that these processes take place, it is necessary to minimise technical drainages of forest land, while increasing use of amelioration, pioneering and advance tree species, creation of regulated pools, smaller reservoirs etc. A funding system must be in

place in order to maintain increased share of ameliorative and stabilizing tree species in tree stands even after initial stabilization.

These measures are a part of existing legislation and require additional support to extend their application.

Implementation of sounder management methods and elimination of pressure from game

Sounder management methods reduce the use of clear-cutting and prefer noncompartmentalized or undergrowth forms of management and natural renewal, contributing to increasing the species, spatial and genetic diversity of forest ecosystems. High numbers of game do not permit natural renewal with a suitable species composition and cause further damage and are a demonstrable limiting factor for effective introduction of adaptation measures in relation to climate change. Game populations must therefore be limited to a degree that is manageable for forest ecosystems, so as to allow natural restoration of an entire spectrum of tree species, without having to apply measures for area-wide forest protection.

Timber production must comply with processes limiting or slowing down surface rainfall water runoff, or be accompanied by sufficient measure combating soil erosion.

These measures are being **implemented only marginally** and require more prominent support.

Reduction of the risk with respect to increased populations of insect pests, vascular mycosis and especially root rot

Measures aiming to eliminate or reduce risks due to an increase of populations of insect pests monitoring of the state of health of forests and the dynamics of insect pest populations (by satellite and air-borne monitoring, insect traps etc.)

In addition to the use of traditional methods for liquidation of insect pests, chemical means with minimum impact on the other components of nature are also used in calamity situations in exceptional cases and to a minimum degree (where possible biological means are preferred).

These measures are being **implemented already**.

Stabilization of carbon volumes bound in forest ecosystems

Promoting forest management techniques ensuring permanent soil cover with long-term or uninterrupted recovery periods with the objective of minimising fluctuations in top humus layers and use of tree species with high primary production and favourable effect on pedosphere support stabilization of accumulated carbon. Another necessary measure is represented by stabilization of area in terms of forest types groups influenced by water and protection of wetlands in forests.

It is expected that these measures will continue to be implemented within the framework of the new programming period of the Rural Development Programme 2014-2020, especially in terms of support provided to increased share of ameliorative and strengthening tree species using the forestry-environmental payments. Maintenance of the existing high-quality ecosystems will contribute to maintenance or strengthening of increased sequestering potential of forest soil and stocking in forest biomass.

These measures are **implemented** in framework of the Rural Development Programme 2014-2020.

Measures within the National Forestry Programme

The updated version of the National Forestry Programme 2013 (Government Resolution No. 1221/2008) contains the following measures aiming to reduce climate change impacts, focusing on:

- Supporting species and ecotypes of more resilient tree populations which are able to maintain high and stable production of wood;
- Supporting ecologically suitable afforestation of farming land especially by fast-growing tree species;
- Extending statutory deadlines for afforestation and ensuring tree cover in connection with natural recovery of forests;
- Reducing soil degradation and increasing volumes of carbon stocked in soil;
- Focusing subsidy rules on support to be provided toward adaptation measures reducing climate change impact.

These principles were gradually implemented within OPE (2007 – 2013), Rural Development Programme (2007 – 2013), OPE 2014 – 2020, Rural Development Programme 2014-2020 and Programme of renewal of the natural functions of the landscape (2009 – 2018).

Biomass Action Plan 2012 -2020

The Biomass Action Plan analyses the potential of biomass utilization for energy use in the Czech Republic by 2020. The potential for energy use was estimated at 133.9 – 186.8 PJ by 2020 for agricultural biomass and 26.3 – 30.4 PJ for forest dendromass while guaranteeing the condition of 100% food security. The total figure corresponds to doubling the energy use of biomass by 2020 from the current figure. The energy potential of biodegradable waste was estimated at additional 28 PJ by 2020.

The main conclusions and recommendations of the Biomass Action Plan are:

- Agricultural and forestry biomass could potentially constitute up to 16 – 20 % of final energy consumption by 2020;
- Support to energy use of biomass from waste, residues and agricultural by-products should be prioritized;
- Support for highly-efficient use of biomass (co-generation), increased use of biomass for domestic heating and sustainable production of bioenergy crops could also address other serious environmental issues.

Strategy on Adaptation to Climate Change in the Czech Republic

The Adaptation Strategy was adopted by the Government in 2015 for the years 2015 – 2020 with outlook to 2030. It includes several measures which are important both for the adaptation and mitigation.

In the area of Forestry the following recommended actions³ are particularly relevant:

- Accelerating shift towards national species composition to increase the stability and resilience of forest stands

³ These actions to a large extent build on the appropriate measures as identified above.

- Promoting close to nature forest management
- Prioritizing natural restoration of forests
- Supporting measures to facilitate water retention, improve the water regime and prevent soil erosion
- Targeted support to maintain increased share of ameliorative and stabilizing tree species in tree stands even after initial stabilization
- Improve game management to decrease game numbers
- Monitoring of forest pests and pathogens and promoting more resistant species
- Stabilization of the forest carbon stocks
- Promoting forest management techniques ensuring permanent soil cover
- Protection of wetlands in forests
- Improving the methods of monitoring changes in the carbon stocks of forest soils

In the area of Agriculture the following recommended actions are particularly relevant:

- Preservation of agricultural land and optimizing its structure
- Measures to protect soil and prevent erosion
- Improving soil structure
- Increasing the organic matter content of soil
- Promoting organic farming
- Measures preventing draught
- Measures to increase water retention in landscape
- Afforestation and establishment of permanent grassland (especially in vulnerable areas)
- Sustainable production of biomass for energy purposes

The Adaptation Strategy is **being implemented** by the National Action Plan on Adaptation to Climate Change adopted by the Government in January 2017.