UNOFFICIAL TECHNICAL TRANSLATION

Russian Federation

Submission under the AD-HOC Working Group on Further Commitments for Annex I Parties under Kyoto Protocol (AWG-KP)

Land Use, Land Use Change and Forestry

Russian Federation represents new data on sinks and emissions of greenhouse gases resulted from forest management in relation to recalculations made in 2010 and submitted in last National inventory of anthropogenic emissions from sources and absorptions by sinks of greenhouse gases of Russian Federation not regulated by Montreal Protocol for 1990-2008, chapter of reporting under Article 3.4 of Kyoto Protocol. These recalculations made to perform consistent time series of estimations as well as conformity of current national inventory data on emissions and sinks in managed forests to the methodology used for projections.

I. Inventory data for establishment of reference level of sinks in managed forests.

In 2010 National inventory of anthropogenic emissions from sources and absorptions by sinks of greenhouse gases of Russian Federation not regulated by Montreal Protocol for 1990-2008 for estimation of annual carbon sinks in managed forests within all reporting period for the first time was applied the methodology on the difference of annual carbon increment and carbon losses instead previously used method on stock changes (GPG, 2003). The estimates were performed for all pools: 1) woody biomass; 2) dead organic matter (standing and fallen dead wood); 3) litter; 4) organic soils matter, including mineral and organic soils. The change of the methodology made in order to address major recommendations of the ERT received by Russia during in-country review of GHG inventory conducted in 2009.

Main forest species included in estimations: coniferous (pine, spruce, fir, larch, Siberian and Korean pine), hard broadleaved trees (high-forest oak, coppice-forest oak, stone birch and others) and soft broadleaved trees (birch, aspen and others).). Besides, all other tree species are estimated as a sum (Hornbeam eastern, Amur cork tree, Cork-tree etc.). For the estimations the activity data on land area under forest, area of cutting sites, fire-sites, dead tree stands, as well as data on the area and stocks of living tree stands by dominant species were disaggregated by regions of Russia. All these activity data obtained from statistical materials of State Forest Register (SFR). Calculations of carbon sinks and losses conducted for territory of managed forests in every Russian region (without area under bushes), grouped by 12 zone-regional polygons. Assessment of carbon losses from biomass pool in a result of thining and other types of selective logging, as well from ground fires made on the base of total national data.

Territory of Russia situated in the different natural zones and, therefore, carbon parameters significantly vary between zones and regions. In GHG inventory the principle of zonal- provincial division of Russian territory was applied (firstly this principle was suggested by Isaev et al., 1995. In accordance to that principle the territory of Russia divided by next macroregions: European-Ural part, Western Siberia, Eastern Siberia and Far East. Further each of these macroregions divided by 3 latitudinal (zonal) belts: northern (northern sparse growth of trees and northern taiga), central (middle taiga) and

southern (southern taiga, mixed and broad-leaved forests, and forest-steppe). Boundaries of 12 zonal-regional polygons match to administrative boundaries of subjects of federation. That facilitates usage of statistical information of SFR in GHG estimations as reporting made by forest management units or by subjects of Russian Federation. Selection of equation parameters (conversional ratios, etalon average values) is made by respective zonal belt or by zonal-regional polygon.

Carbon in biomass pool is estimated with use of volume wood stocks in tree stands, provided in SFR materials and conversional factors. These factors are ratios of carbon stocks in biomass to total stock of stem wood by every age group of dominant tree species (Zamolodchikov, Utkin, Chestnykh, 2003). Equations and conversional factors for biomass pool and all other carbon pools are provided in Chapter 7 of National GHG Inventory Report of Russian Federation submitted in 2010. Carbon stocks in litter and soil (layer 0-30 cm) are assessed on the base of activity data on the area of tree stands under each dominant specie and average stock per unit of the area. These values on average stock per area are specific for each zonal-regional polygon and by the age group of tree stands.

Then, average carbon stocks per area calculated in consequent age groups and with regard to duration of stay of tree stands in given age group we estimated mean year carbon accumulation in biomass of this group. By multiplication on area under considered age group of the dominant specie the total value of carbon absorption in biomass was obtained. Carbon accumulation in oldest age group (overripe) assumed to be a zero.

Except carbon accumulation in forest fund there are losses of carbon connected to different disturbances of forest cover. Most significant of those are cuttings and fires. Carbon losses in various carbon pools of forest ecosystems in result of harvesting and fires estimated on the base of average carbon stocks in relevant pools of forests for every subject of Federation.

Immediate CO_2 emissions from crown fires are included in estimated loses from destructive forest fires: estimations made on the base of the national methodology, developed in the Center of Ecology and Productivity of Forests (Isaev et al., 1995). This methodology corresponds to Tier 2 of GPG (2003) and described in National GHG Inventory report of Russian Federation submitted in 2010. Additionally we estimated immediate CO_2 emissions from ground fires those not usually lead to a death of forest stands.

Managed lands under forest cover in Russia annually absorbed 248.9 to 273.5 mln. t C/yr during 1990-2008. In average 73% of absorbed carbon accumulated by phytomass, 11% by dead wood pool, 3% – by litter and 13% - by soils (table 1, pic. 1).

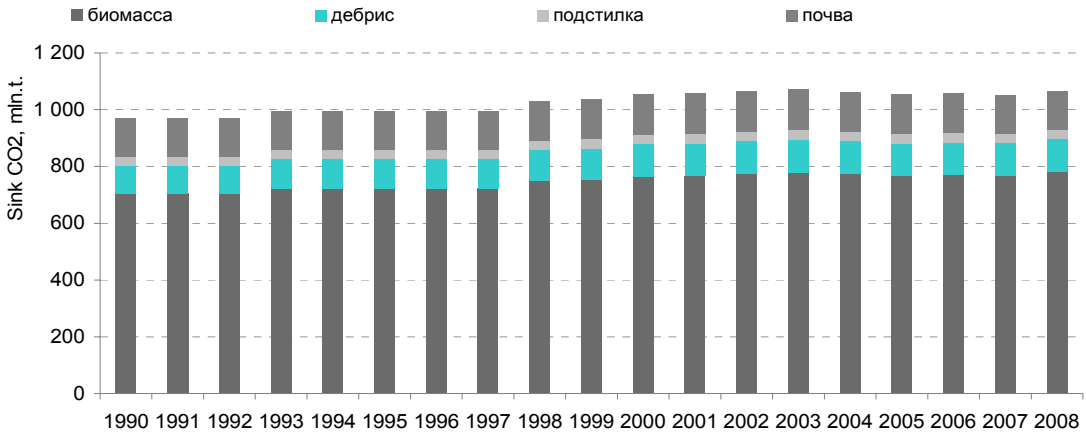
Carbon losses from harvesting and death of tree stands in the result of fires and other factors on the territory of managed forests varies from 159.5 to 228.6 mln. t C/yr within considered period (in average – 189.3 mln. t C/yr) (table 2, pic. 2). In average 65% of carbon losses were in phytomass pool, 11% – in dead wood, 3% – in litter, and 18% – in soils. In the beginning of 90s significant part of carbon losses was connected to high level of harvesting in our forests. However, to 1998 annual harvesting rate reduced more than twice (see submission of Russian Federation to secretariat of UNFCCC from 30 October 2009). Second important factor of carbon losses in Russia forests is a death of tree stands from destructive fires.

Table 1

Accumulation of carbon in managed forests (without area under bushes) by groups of tree species and by pools, th. tones C

Year	Carbon accumulation in managed forests by pools, th. t C				
	biomass	dead wood	litter	soils	all pools
Coniferous					
1990	102216.5	13542.4	5829.9	20084.3	141673.1
1993	106403.2	15645.7	5476.6	18574.2	146099.6
1998	109338.6	17110.7	5226.8	17441.2	149117.3
1999	109409.7	17299.4	5292.3	17803	149804.4
2000	112037.5	17764.7	5384.3	18281.1	153467.6
2001	112045.8	17825.4	5302.9	18119.5	153293.6
2002	113449.3	18059	5376.1	18371.2	155255.7
2003	114406	18125.2	5258.3	18072.1	155861.6
2004	113589.3	18021.4	5152.9	17844.4	154608.1
2005	111520.4	17678.5	5040.5	17834.5	152073.8
2006	111922.9	17964.5	4981.6	17594	152463
2007	111854.6	17986.4	4863.8	17190.7	151895.5
2008	112830.4	18151.7	4852	17066.9	152900.9
Hard broadleaved					
1990	8982.7	1300.1	77.9	303.5	10664.2
1993	8515.2	1312.1	67.9	248.8	10144
1998	8703.8	1341.9	63	234.2	10343
1999	8824.7	1366.4	63.6	235.7	10490.5
2000	8790.3	1361.3	62.2	229.7	10443.5
2001	8913.4	1385.9	62.3	230.6	10592.3
2002	8929.9	1384.4	62.1	230.3	10606.8
2003	8862.5	1388.6	57.7	214.4	10523.2
2004	8889.6	1396.6	55.2	204.5	10545.8
2005	8825.9	1379.9	54.1	200.3	10460.1
2006	8804.9	1377.6	52.4	194.6	10429.5
2007	8769.2	1369.2	51.8	190.7	10380.8
2008	8720.4	1351.6	51.7	190.6	10314.3
Soft broadleaved					
1990	70690.8	9314.4	3108.9	13372	96486.1
1993	74041.9	9891.8	3002.4	13346.3	100282.4
1998	76804.8	10068.8	3122.7	13809.7	103806
1999	77268	10170.5	3099.4	13755.1	104293
2000	78592	10405.9	3104	13830.9	105932.8
2001	78981.6	10500.2	3122.4	13948.7	106552.8
2002	79447.4	10530.5	3132.5	14028.3	107138.8
2003	79444.6	10470.1	3065.5	13919.4	106899.7
2004	79624.8	10428.6	2988.1	13702.9	106744.4
2005	79855	10413.9	2924	13629.9	106822.8
2006	79897.5	10390	2886.2	13602.3	106776.1
2007	79962.1	10339.5	2843.1	13434.9	106579.5
2008	80204.8	10333.2	2832.7	13381.9	106752.7
Others					
1990	99.3	12.5	2.7	9.6	124.1
1993	116	11.7	2.4	8	138
1998	139.2	12.8	1.9	6.4	160.3
1999	163.3	15.3	1.7	5.7	186

Year	Carbon accumulation in managed forests by pools, th. t C				
	biomass	dead wood	litter	soils	all pools
2000	155.4	14.7	1.4	4.8	176.4
2001	146.7	14.5	1.2	4	166.4
2002	156.4	15.9	1.1	3.6	177
2003	160.3	16.8	1	3.3	181.4
2004	153.1	15.9	1	3.4	173.4
2005	146.2	15.5	0.9	3	165.6
2006	159.5	17.9	0.9	2.9	181.1
2007	158.1	17.4	0.9	2.9	179.3
2008	155.7	16.9	0.9	2.9	176.3
Total for all groups of trees					
1990	181989.3	24169.4	9019.4	33769.4	248947.5
1993	189076.3	26861.3	8549.3	32177.3	256664.0
1998	194986.4	28534.2	8414.4	31491.5	263426.6
1999	195665.7	28851.6	8457.0	31799.5	264773.9
2000	199575.2	29546.6	8551.9	32346.5	270020.3
2001	200087.5	29726.0	8488.8	32302.8	270605.1
2002	201983.0	29989.8	8571.8	32633.4	273178.3
2003	202873.4	30000.7	8382.5	32209.2	273465.9
2004	202256.8	29862.5	8197.2	31755.2	272071.7
2005	200347.5	29487.8	8019.5	31667.7	269522.3
2006	200784.8	29750.0	7921.1	31393.8	269849.7
2007	200744.0	29712.5	7759.6	30819.2	269035.1
2008	201911.3	29853.4	7737.3	30642.3	270144.2



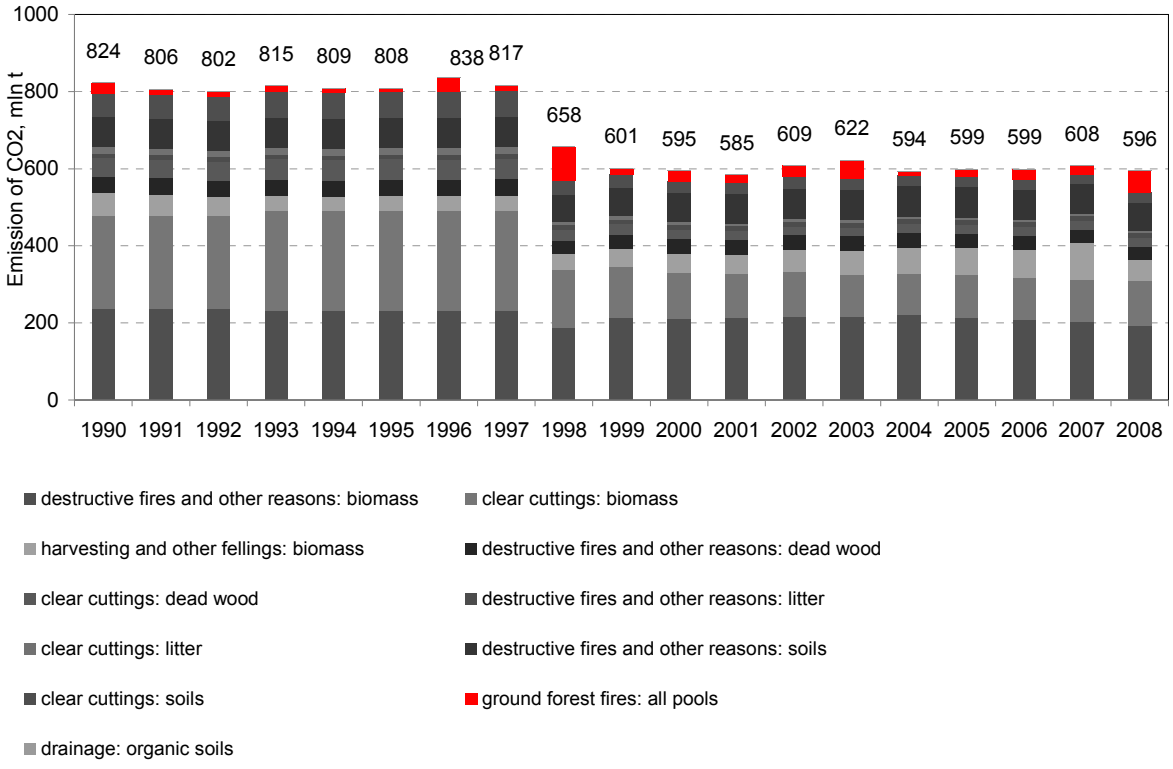
Picture 1. Dynamics of carbon accumulation in managed forests by pools within the period 1990-2008

biomass
dead wood
litter
soils

Table 2

Carbon losses in managed forests in result of fires and other anthropogenic impacts (th. t C)

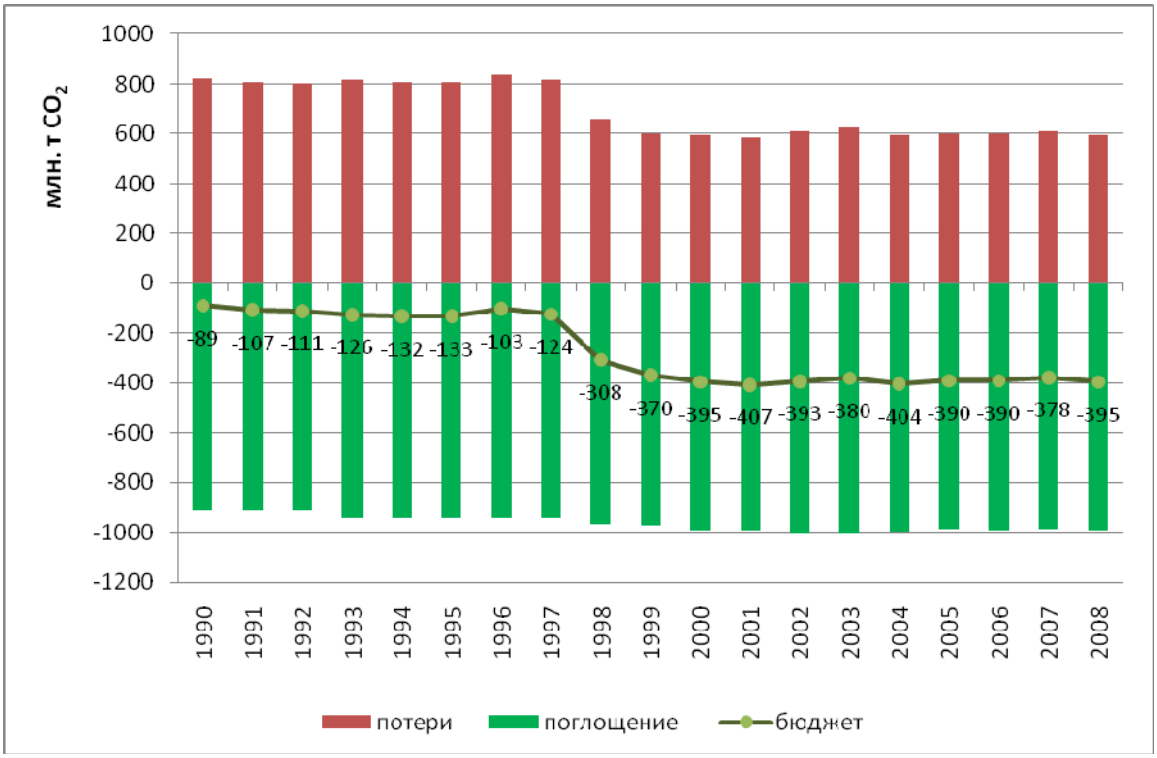
Years	Carbon losses in managed forests, th. t C					
	Destructive fires and other reasons of death of tree stands	Ground forest fires	Clear cuttings	Intermediate fellings	Drainage of organic soils	Total losses
1990	100 791.2	7 213.3	99 736.4	16 520.5	374.5	224 635.9
1991	100 791.2	3 669.5	99 736.4	15 252.6	374.5	219 824.2
1992	100 791.2	4 007.5	99 736.4	13 756.9	374.5	218 666.5
1993	98 852.8	4 136.7	108 600.6	10 379.6	374.5	222 344.2
1994	98 852.8	3 027.4	108 600.6	9 736.8	374.5	220 592.1
1995	98 852.8	2 113.2	108 600.6	10 533.1	374.5	220 474.2
1996	98 852.8	10 487.0	108 600.6	10 292.8	374.5	228 607.7
1997	98 852.8	3 893.9	108 600.6	11 051.8	374.5	222 773.6
1998	81 955.4	23 526.6	62 163.3	11 374.6	374.5	179 394.5
1999	92 624.6	3 877.5	54 528.7	12 529.4	362.9	163 923.1
2000	91 540.4	7 398.7	49 627.5	13 464.7	351.3	162 382.7
2001	93 503.9	5 392.7	46 451.4	13 791.1	339.7	159 478.7
2002	94 576.7	7 979.8	48 134.3	14 977.1	328.1	165 996.0
2003	94 675.8	13 164.6	44 443.6	17 130.5	316.4	169 730.9
2004	95 960.9	2 874.5	44 522.8	18 348.5	316.4	162 023.2
2005	93 733.8	5 086.7	44 802.1	19 299.0	316.4	163 238.0
2006	91 121.8	7 541.3	44 446.6	20 024.1	316.4	163 450.1
2007	88 708.7	6 104.0	45 192.9	25 596.1	316.4	165 918.1
2008	83 836.5	15 409.3	48 248.1	14 681.5	312.0	162 487.5



Picture 2. Dynamics of CO_2 emissions in managed forests by pools as a result of anthropogenic activity within the period 1990-2008.

During all considered period carbon accumulation in managed forests of Russia exceeded its losses, that resulted in the net sink of atmospheric carbon in the range from 24.3 mln. t C/yr in 1990 to 111.1 mln. t C/yr in 2001 (average – 73.7 mln. t C/yr). In 2008 carbon budget was 107.7 mln. t C/yr, that corresponds to the sink of 394.7 mln. t CO_2 /yr (pic. 3).

Total values of carbon balance in managed forests of Russian Federation reflect all measures of management in a whole: forest utilization, reforestation, protection and maintenance of forests. One of the major reasons why managed forests were a net sink during all considered period is double reduction in the level of forest utilization (harvesting) happened in the beginning of 90s.



Picture 3. CO_2 budget of managed forests in Russia without area under bushes (in sum for pools of biomass, dead wood, litter and soil).mln.t CO_2

red –losses, green – accumulation, line - budget

II. Projections

The CBM-CFS (Carbon Budget Model) model of Canadian Forest Agency was applied to projection of forest carbon budget of Russian. This model is consistent with standards of IPCC[1]. Applicability of CBM-CFS model to forests of Russian Federation was tested for some selected regions[2]. More explanatory information on methodology of conducting

[1] Kurz W.A., Dymond C.C., White T., Stinson G., Shaw C.H., Rampley G., Smyth C., Simpson B.N., Neilson E.T., Trofymow J.A., Metsaranta J., Apps M.J. CBM-CFS3: a model of carbon-dynamics in forestry and land-use change implementing IPCC standards. Ecological Modelling. 2009. V. 220. No 4. P. 480-504.

[2] Zamolodchikov D.G., Grabowsky V.I., Korovin G.N., Kurz W.A. Assesment and projection of carbon budget in forests of Vologda region using the Canadian model CBM-CFS. Russian Forest Science, No 6, 2008. P. 3-14. (in Russian); Bakaeva Z., Zamolodchikov D., Grabowsky W. Projection of carbon budget of

projections have been submitted by Russian Federation to UNFCCC Secretariat on 30 October 2009. The estimates of projected carbon budget provided in present submission are slightly different from data presented in our previous submission. This change is due to improvements in modeling of litter pool, soils and dead wood.

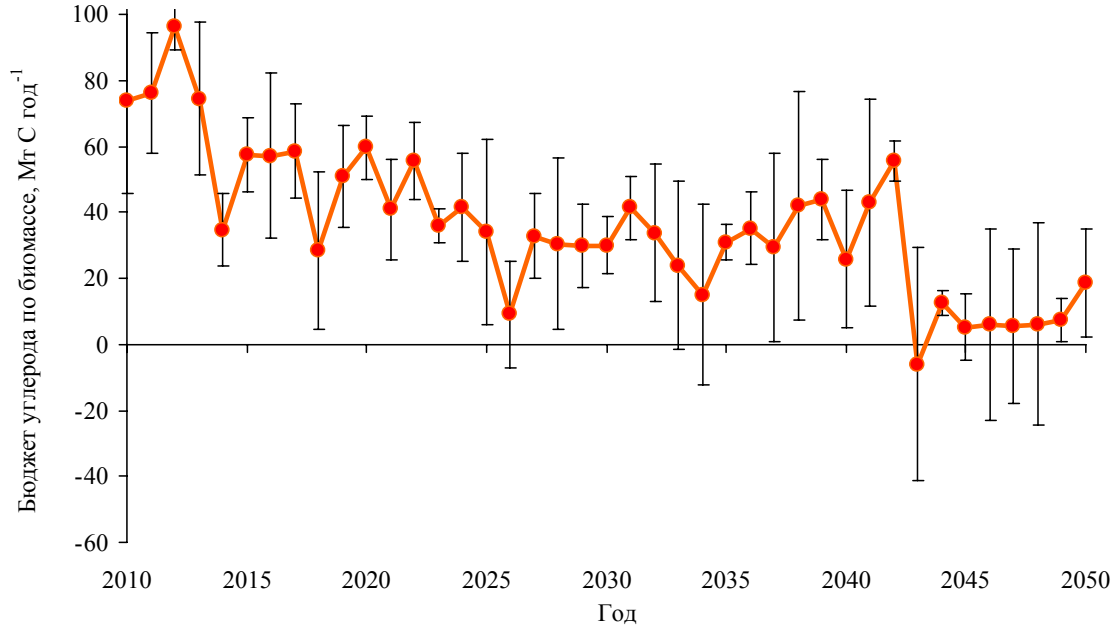
Table 3.

Projected values for annual carbon budget in a result of management in forests of Russia within the period from 2010 to 2020

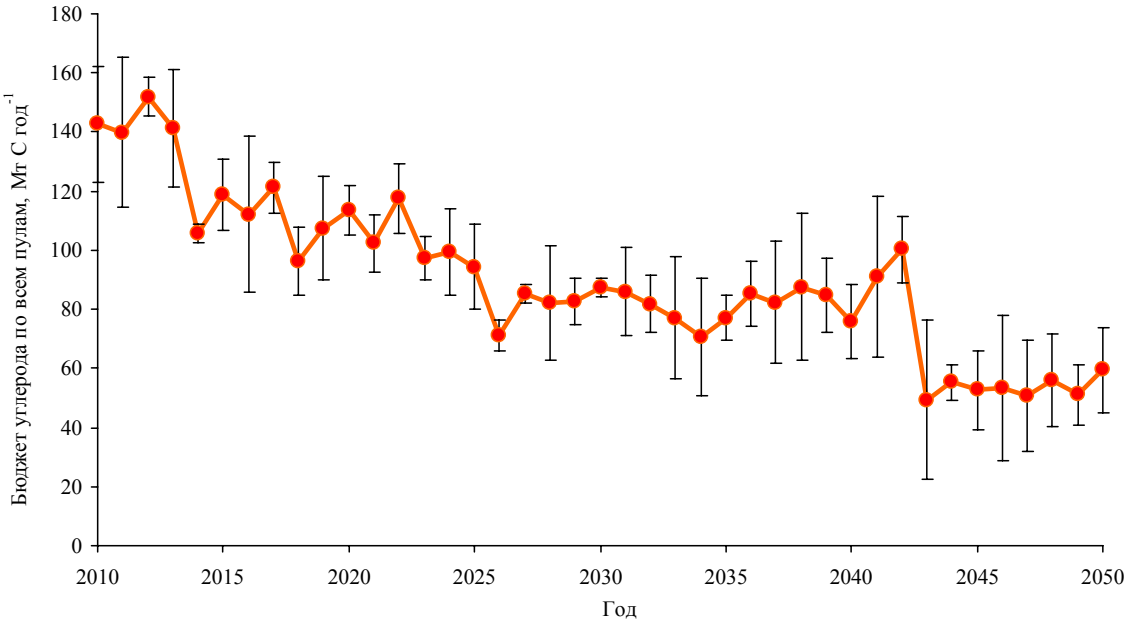
Year	Biomass, mln. t C yr^{-1}		Totals for managed forests, mln. t C yr^{-1}	
	average	uncertainty	average	uncertainty
2010	73.98	28.48	142.68	19.77
2011	76.09	18.21	139.91	25.49
2012	96.06	6.88	151.90	6.68
2013	74.50	23.00	141.42	19.77
2014	34.73	11.00	105.66	3.07
2015	57.40	11.39	118.64	12.08
2016	57.11	24.94	112.16	26.35
2017	58.55	14.36	121.33	8.69
2018	28.47	23.75	96.23	11.67
2019	50.98	15.38	107.45	17.62
2020	59.67	9.59	113.70	8.34

The baseline for projected estimates include scenario of forest management development adopted by *Strategy of Forest Development in Russian Federation for the Period to 2020* **(**Order of Ministry of Agriculture #482 and Ministry of Industry and Trading #248 from 31 October 2008). In accordance to this strategy the harvesting rate planned to rise by 57% to 2020, which gives 5.7% of increase per year. After 2020 the annual harvesting rate is assumed to stabilize.

forests of Northern Caucasus by model CBM-CFS. Problems of regional ecology, No 1, 2009. P. 51-56. (In Russian).



Picture 3. Prognosis of carbon budget for biomass pool on the territory of managed forests of Russia from 2010 to 2050, mln. t C/yr



Picture 4. Prognosis of carbon budget for all carbon pools in total on the territory of managed forests of Russia from 2010 to 2050

III. Data on forest management.

A	B	C	D	E	F	G	I
1990 emissions/ removals ($MtCO_2e/yr$)	Proposed reference level & reference interval (if any) ($MtCO_2e/yr$)	Forecast for 1st CP[3] ($MtCO_2e/yr$)	Forecast for 2013-2020 ($MtCO_2e/yr$)	Forecast based on 1990 ($MtCO_2e/yr$) (E=D-A)	Forecast based on reference level ($MtCO_2e/yr$) (F=D-B)	Forecast based on 1st CP ($MtCO_2e/yr$) (G=D-C)	Comments
-89.1	-89.1 from 0 to -89.1 $MtCO_2e/yr$	-489.4	-420.1	-331.0	-331.0	69.3	For forecast 2013-2020 age structure of forests, species distribution, increase of harvesting rate by 5.7 per cent per year and average damage from fires during last 17 years are included. Data for 2009 for conducting the forecast for 1st CP (2008-2012) obtained by using an interpolation of data between 2008 and 2010.

[3] Absolute numbers, without application of the cap listed in the appendix to decision 16/CMP.1.