LULUCF

7.1. Overview

This sector includes both sources and sinks of CO_2 . During the 1990-2007 period, removals by LULUCF increase intermittently (Figure 7.1).

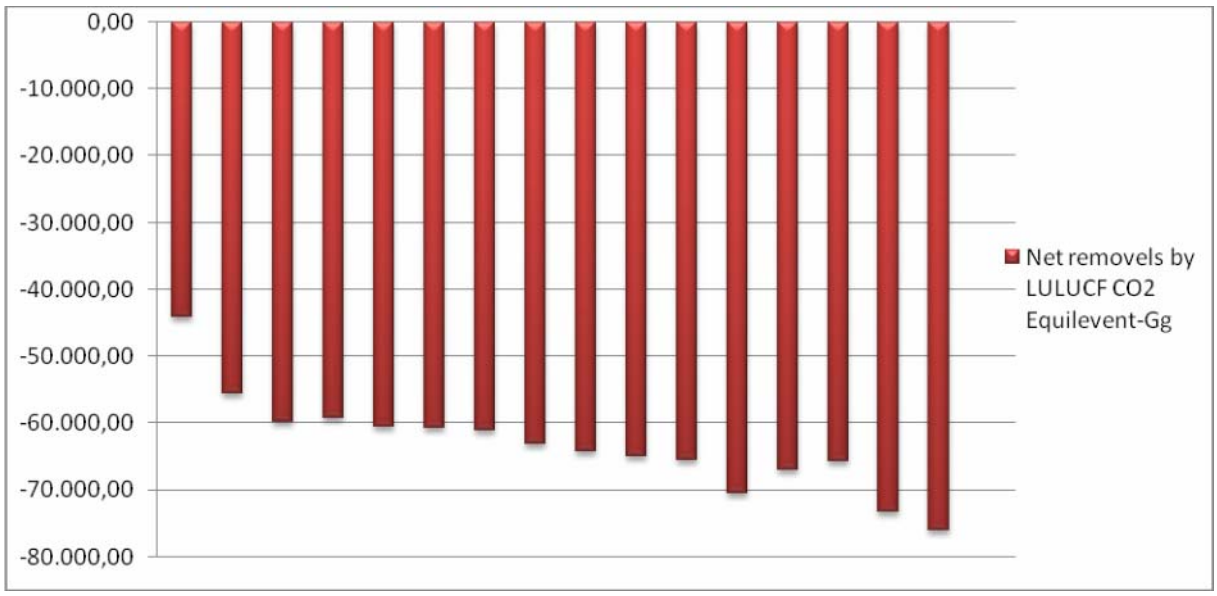

Figure 7.1 CO2 removals by LULUCF during 1990-2007 period in Turkey

Table 7.1 Changes in the Other Greenhouse Gasses Caused by Forest Fires Between the years of 1990-2007

Years	Greenhouse Gasses			
	CH_4 Gg	CO Gg	N_2O Gg	NO_x Gg
1990	0,001780	0,015563	0,000012	**0,000442**
1991	0,001047	0,009147	0,000007	**0,000260**
1992	0,001580	0,013848	0,000011	**0,000393**
1993	0,001993	0,017430	0,000014	**0,000495**
1994	0,004933	0,043178	0,000034	**0,001226**
1995	0,000993	0,008692	0,000007	**0,000247**
1996	0,001933	0,016893	0,000013	**0,000480**
1997	0,000820	0,007152	0,000006	**0,000203**
1998	0,000873	0,007653	0,000006	**0,000218**
1999	0,000753	0,006568	0,000005	**0,000187**
2000	0,003413	0,029843	0,000023	**0,000847**
2001	0,000960	0,008377	0,000007	**0,000238**
2002	0,001100	0,009637	0,000008	**0,000274**
2003	0,000860	0,007525	0,000006	**0,000214**
2004	0,000633	0,005518	0,000004	**0,000157**
2005	0,000200	0,001785	0,000001	**0,000051**
2006	0,001272	0,011129	0,000009	**0,000316**
2007	**0,002065**	**0,018066**	**0,000014**	**0,000513**

Emissions from LULUCF arise from biomass burning in the forest lands. Other greenhouse gasses amounts change depending on the burned forest areas and there is no definite and significant trend for the other gasses (Table 7.1 and Figure 7.2).

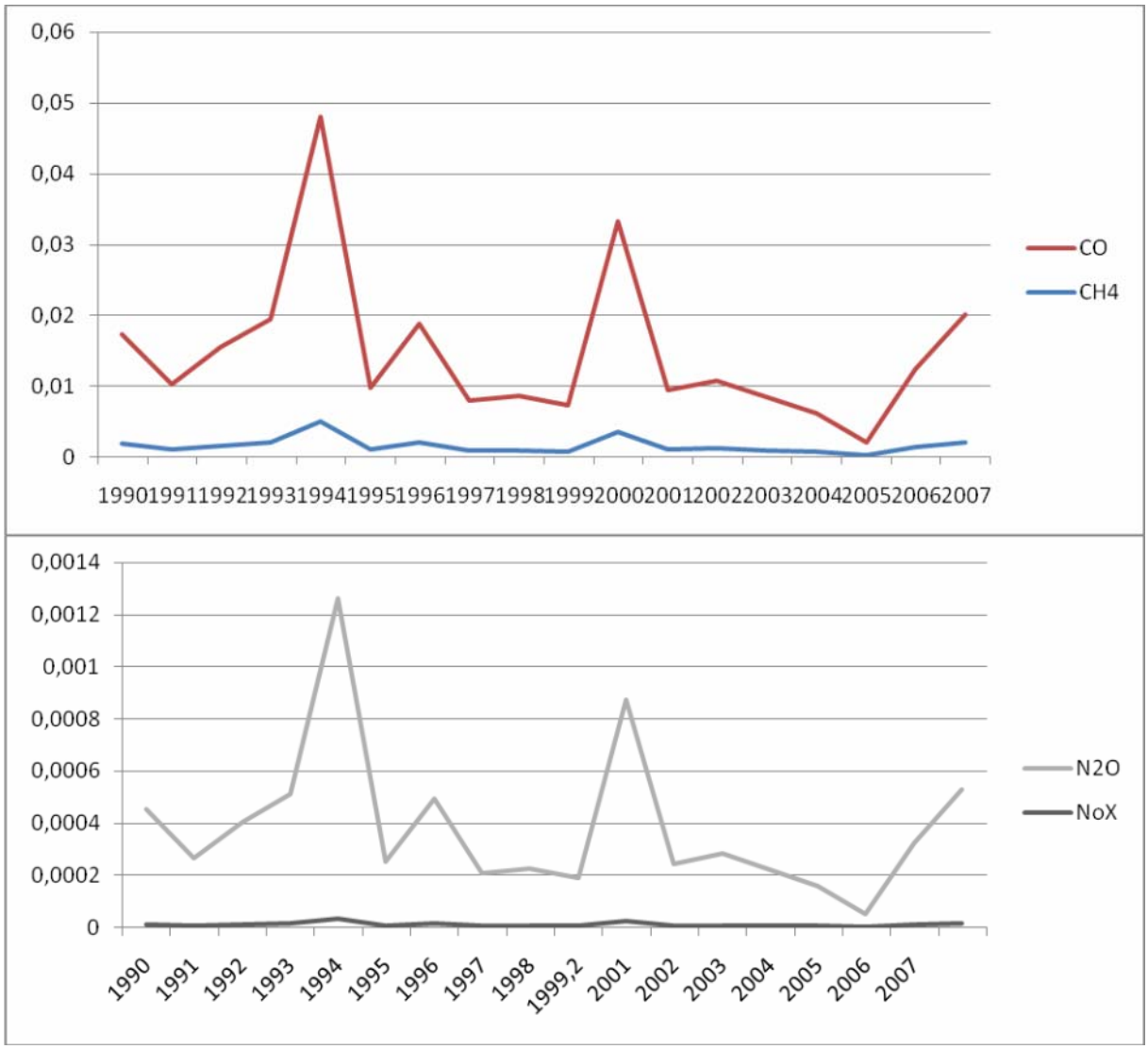

Figure 7.2 Other greenhouse gasses from forest fires between 1990-2007 years

Due to accounted as a carbon lost from forest fires in the total carbon lost, CO2 emissions were not considered here to avoid double counting in the LULUCF inventory.
Miscalculations related to forest fires were recalculated as mentioned by the expert review team during the in-country inventory review. Therefore, non-CO2 emission estimations changed completely. The calculations for 1990-2006 were recalculated. 3.2.19 and 3.2.20 formulas were used for this period. The parameters were chosen appropriate to method described in Section 3.2.1.4.2.1. The parameters have been used from 3.A.1.13. and 3.A.1.14 tables. country specific datawere used for the amount of burning biomass and burning efficiency Data changes were entered in to table 5(5). For the year of 2007, estimations were calculated with correct method as mentioned above.

Table 7.2 Comparison of emissons and removals in 1990-2007 period in Turkey

Years	Net removals by LULUCF(CO_2 Equivalent -Gg)	TOTAL GHG Emissions(CO_2 Equivalent -Gg)	Percentage of net removals from LULUCF in Total GHG Emissions (%)
1990	-44.086,92	**170.058,74**	**-25,92**
1991	-55.572,63	**181.963,67**	**-30,54**
1992	-59.718,55	**193.635,55**	**-30,84**
1993	-59.160,16	**203.979,59**	**-29,00**
1994	-60.466,38	**200.463,48**	**-30,16**
1995	-60.736,83	**220.719,27**	**-27,52**
1996	-61.066,23	**242.091,77**	**-25,22**
1997	-63.087,07	**255.513,40**	**-24,69**
1998	-64.285,99	**256.633,50**	**-25,05**
1999	-65.024,93	**256.775,79**	**-25,32**
2000	-65.609,05	**279.955,98**	**-23,44**
2001	-70.481,69	**262.098,21**	**-26,89**
2002	-67.038,90	**270.617,14**	**-24,77**
2003	-65.753,39	**286.282,49**	**-22,97**
2004	-73.244,45	**296.601,93**	**-24,69**
2005	-69.432,92	**312.420,27**	**-22,19**
2006	-76.104,63	**331.763,40**	**-22,94**
2007			

As it is seen on the table 7.2, however there was an increasing course in total GHG emisssions, the average percentage of net removals from LULUCF was 26% during the 1990-2007 period.

The methodology adviced in the IPCC Good Practice Guidance for land Use, Land Use Change and Forestry, 2003 was followed to estimate removals/emissions from LULUCF . According to the Guidance, a climate map of Turkey was firstly prepared and used a base for all land use category (Figure 7.3).

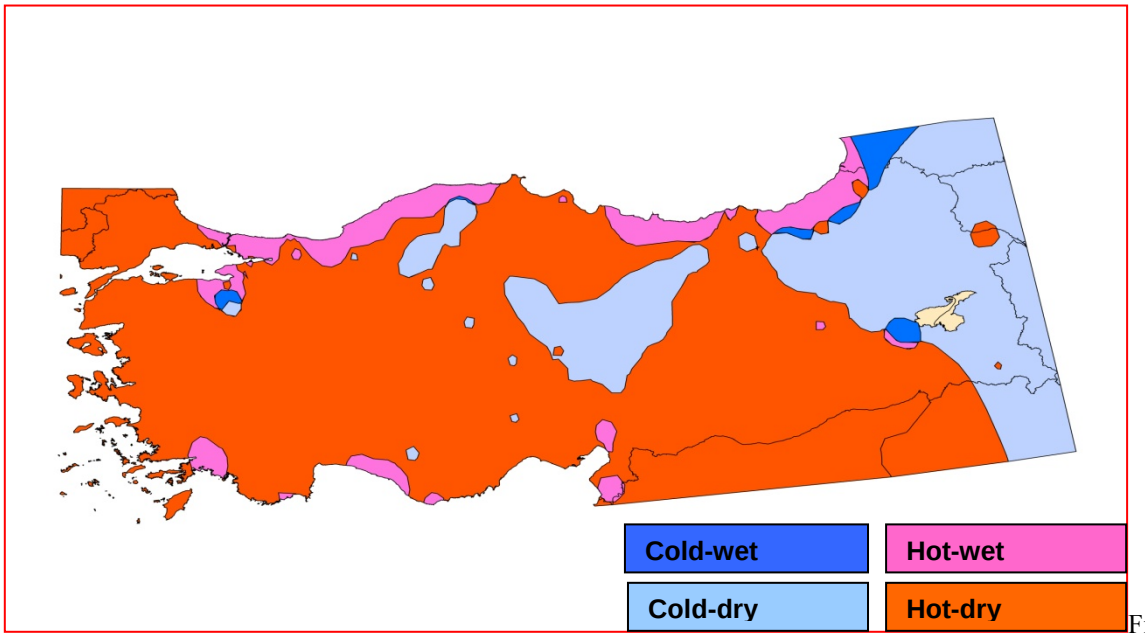

Figure 7.3 Climate zones of Turkey due to LULUCF Guidance

Uncertainty

The uncertainty levels of the LULUCF inventory are stated in each land use section.

Completeness
As regards the inventory completeness, sinks and sources that could not be reported in the CRF tables are charted as follows:

Sink/source category	GHG	Explanation
Forest lands, soils	CO_2	**Lack of adequate data on the carbon stocks in the soil organic matter**
Forest lands, litter	CO_2	**Lack of adequate data on the carbon stocks in the litter**
Forest lands, soils	N_2O	**N fertilization does not occur in the forestry activities**
Forest lands, drained soils	Non-CO_2	**Drainage does not occur in the forests**
Drained wetlands	"	**No available data**
Limestone application in croplands and grasslands	CO_2	**Limestone application does not occur in the agricultural lands and grasslands.**
Croplands, grasslands, wetlands and settlements,biomass burning	CO_2, CH_4 and N_2O	**No available data**
Croplands, disturbance associated with land use conversion to cropland	N_2O	**No available data**
Wetlands	CO_2	**No available data after the 2002 year**
Settlements	**CO_2**	**No available data after 2000 year**

7.2 Forest Land- Category 5A
The inventory studies related forest lands were accomplished by the Ministry of Environment, the Department of Research and Development, Forest Research Directorates and Istanbul University , Forestry Faculty (Prof. Dr. Unal ASAN) .

7.2.1 Source/sink category description
According to the figures given by the Forest Management Planning Department of the General Directorate of Forestry, Turkey has 21,2 millions ha forest area approximately with regard to its own forestry legislative. Since all the woody areas having more than 3 ha magnitudes are accepted in forest regime disregarding their crown closure, this figure differs with the figure given in FAO's (10,225 Mill. Ha. for the year of 2000) resources. FAO's figures cover the woody areas having more than %40 crown closure only. Because of the forcing situation initiating from the protective rules of constitution and forestry regulations current in Turkey, the figures given by forestry organisation were accepted and used during the estimation of net annual amount of carbon uptake or release in the forests of Turkey.
The figures concerning forest resources in Turkey for2007 year are given in table 7.3:

Table 7.3 Forest inventory results of Turkey at the end of 2007 (x1000

Table 7.3.A: Areas

Tree Species	High Forests (Ha)			Coppices (Ha)			TOTAL (Ha)		
	Normal[1]	Degraded[2]	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	7.170,71	5.712,50	12.883,20	0,00	0,00	0,00	7.170,71	5.712,50	**12.883,20**
Deciduous	2.043,20	1.026,08	3.069,28	1.561,68	3.820,26	5.381,94	3.604,88	4.846,34	**8.451,22**
Total	**9.213,91**	**6.738,58**	**15.952,49**	**1.561,68**	**3.820,26**	**5.381,94**	**10.775,59**	**10.558,83**	**21.334,42**

Table 7,3.B: Growing Stock

Tree Species	High Forests (m^3)			Coppices(m^3)[3]			TOTAL (m^3)		
	Normal	Degraded	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	850.441,9	51.232,2	901.674,2	0,0	0,0	0,0	850.441,9	51.232,2	**901.674,2**
Deciduous	321.846,6	11.967,5	333.814,1	87.491,7	29.761,8	117.253,5	409.338,2	41.729,4	**451.067,6**
Total	**1.172.288,5**	**63.199,8**	**1.235.488,3**	**87.491,7**	**29.761,8**	**117.253,5**	**1.259.780,2**	**92.961,6**	**1.352.741,8**

Table 7,3.C: Annual Volume Increment

Tree Species	High Forests (m^3)			Coppices (m^3)[3]			TOTAL (m^3)		
	Normal	Degraded	Total	Normal	Dedraded	Total	Normal	Degraded	Total
Coniferous	22.986,90	1.171,39	24.158,29	0,00	0,00	0,00	22.986,90	1.171,39	**24.158,29**
Deciduous	7.990,16	289,08	8.279,24	4.599,47	1.173,32	5.772,79	12.589,64	1.462,40	**14.052,03**
Total	**30.977,06**	**1.460,47**	**32.437,53**	**4.599,47**	**1.173,32**	**5.772,79**	**35.576,54**	**2.633,79**	**38.210,33**

Source: Forest Management Planning Department of General Directorate of Forestry.
1)Crown closure between 0,11-1,00
2)Crown closure between 0,01-0,10
3)0,75 coefficient was used in order to convert the ster volume into m^3 volume

Pinus brutia, P. nigra and, P.silvestris are the most important coniferous species among the other coniferous such as 4 kinds of Abies, Picea orientalis, Cedrus libani atc. In portion of these three pine species is more than 80 % as in totally volume of growing stock. Fagus orientalis and 22 Quercus spp have 80% ratio in total volume of the deciduous trees such as Tilia, Ulmus, Alnus, Castanea species.

Olden Data Concerning the Forest Resources

There are only two documents concerning the national forest inventory results in Turkey. The first document showing the 1972 situation was presented in 1980, and the second was prepared at the end of 2004 . Because of the absence of regular national forest inventory works in Turkey, both of the results were obtained basing on the summaries of management plans data renewed in each 10 years time interval.

Forest data given in first document is shown in Table 7.4:

Table 7.4: Forest inventory results of Turkey at the end of 1972

Table 7.4.A: Areas (*1000000)

Tree Species	High Forests (Ha)			Coppices (Ha)			TOTAL (Ha)		
	Normal[1]	Degraded[2]	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	5,170	4,260	9,430				5,170	4,260	**9,430**
Deciduous	1,007	0,498	1,505	2,679	6,585	9,265	3,686	7,083	**10,769**
Total	**6,177**	**4,758**	**10,935**	**2,679**	**6,585**	**9,265**	**8,856**	**11,343**	**20,199**

Table 7.4.B: Growing Stock (*1000000)

Tree Species	High Forests (m^3)			Coppices (m^3)[3]			TOTAL (m^3)		
	Normal	Degraded	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	548,559	44,417	592,976				548,559	44,417	**592,976**
Deciduous	210,033	9,942	219,975	117,734	45,506	163,240	327,768	55,448	**383,215**
Total	**758,592**	**54,359**	**812,951**	**117,734**	**45,506**	**163,240**	**876,326**	**99,865**	**976,191**

Table 7.4.C: Annual Volume Increment (*1000000)

Tree Species	High Forests (m^3)			Coppices (m^3)[3]			TOTAL (m^3)		
	Normal	Degraded	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	15,593	1,093	16,686				15,593	1,093	**16,686**
Deciduous	5,199	0,251	5,450	6,418	1,486	7,904	11,616	1,737	**13,353**
Total	**20,792**	**1,344**	**22,135**	**6,418**	**1,486**	**7,904**	**27,209**	**2,830**	**30,039**

Source: Türkiye Orman Envanteri - Ankara 1980 Bülteni (Forest Inventory of Turkey-Ankara,1980 Bulletin).

1) Crown Closure between 0,11 – 1,00

2) Crown Closure between 0,01 – 0,10

3) 0,75 coefficient was used in order to convert the ster volume into cubic meter (m3) volume

Table7. 5: Forest inventory results of Turkey at the end of 2004

Table 7.5.A: Areas (*1000000)

Tree Species	High Forests (Ha)			Coppices (Ha)			TOTAL (Ha)		
	Normal[1]	Degraded[2]	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	7,083	5,689	12,772				7,083	5,689	**12,772**
Deciduous	1,857	0,810	2,667	1,681	4,068	5,749	3,538	4,878	**8,416**
Total	**8,940**	**6,499**	**15,439**	**1,681**	**4,068**	**5,749**	**10,621**	**10,567**	**21,188**

Table 7.5.B: Growing Stock (*1000000)

Tree Species	High Forests (m^3)			Coppices (m^3)[3]			TOTAL (m^3)		
	Normal	Degraded	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	818,556	51,070	869,626				818,556	51,070	**869,626**
Deciduous	310,014	14,367	324,381	70,464	23,654	94,118	380,478	38,021	**418,499**

Total	**1128,570**	**65,437**	**1194,007**	**70,464**	**23,654**	**94,118**	**1199,034**	**89,091**	**1288,125**

Table 7.5.C: Annual Volume Increment (*1000000)

Tree Species	High Forests (m^3)			Coppices (m^3)[3]			TOTAL (m^3)		
	Normal	Degraded	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	22,235	1,165	23,400				22,235	1,165	**23,400**
Deciduous	7,674	0,353	8,027	3,926	0,929	4,855	11,600	1,282	**12,882**
Total	**29,909**	**1,518**	**31,427**	**3,926**	**0,929**	**4,855**	**33,835**	**2,447**	**36,282**

Source: Forest Management Planning Department of General Directorate of Forestry.
1) Crown Closure between 0,11 – 1,00
2) Crown Closure between 0,01 – 0,10
3) 0,75 coefficients was used in order to convert the ster volume into cubic meter (m^3) volume

The changes and plus/minus differences among the forest forms and tree species between the years of 1972 and 2004 are outlined in Table 7.6.

Table7.6: Differences between forest inventory results of Turkey for the years of 2004 and 1972

Table 7.6.A: Arial changes among the forest forms and tree species (*1000000)

Tree Species	High Forests (Ha)			Coppices (Ha)			TOTAL (Ha)		
	Normal[1]	Degraded[2]	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	2,023	1,464	3,487				2,023	1,464	**3,487**
Deciduous	0,740	0,278	1,018	-0,998	-2,517	-3,515	-0,258	-2,239	**-2,497**
Total	**2,763**	**1,742**	**4,505**	**-0,998**	**-2,517**	**-3,515**	**1,765**	**-0,775**	**0,990**

Table 7.6.B: Growing Stock changes among the forest forms and tree species (*1000000)

Tree Species	High Forests (m^3)			Coppices (m^3)[3]			TOTAL (m^3)		
	Normal	Degraded	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	269,998	6,653	276,519				269,998	6,653	**276,519**
Deciduous	99,980	4,425	104,406	-23,783	-13,967	-37,750	76,198	-9,542	**66,656**
Total	**369,978**	**11,078**	**380,925**	**-23,783**	**-13,967**	**-37,750**	**346,196**	**-2,889**	**343,175**

Table 7.6.C: Annual Volume Increment changes among the forest forms and tree species (*1000000)

Tree Species	High Forests (m^3)			Coppices (m^3)[3]			TOTAL (m^3)		
	Normal	Degraded	Total	Normal	Degraded	Total	Normal	Degraded	Total
Coniferous	6,642	0,072	6,714				6,642	0,072	**6,714**
Deciduous	2,475	0,102	2,577	-1,183	-0,247	-1,430	1,292	-0,145	**1,147**
Total	**9,117**	**0,174**	**9,291**	**-1,183**	**-0,247**	**-1,430**	**7,934**	**-0,073**	**7,861**

Source: Forest Management Planning Department of General Directorate of Forestry.
1) Crown Closure between 0,11 – 1,00
2) Crown Closure between 0,01 – 0,10
3) 0,75 coefficients was used in order to convert the ster volume into cubic meter (m^3) volume

The last columnes of Tables 7.6.A, B, C are compiled in Table 7.7 in order to find the average changes annually.

Table 7.7: Total and average changes on forest resources between the years of 1972 and 2004

Tree Species	Change on Area (Ha) (*1000000)		Change on Growing Stock (m^3) (*1000000)		Change on Annual Increment (m^3) (*1000000)	
	Total	**Average**	**Total**	**Average**	**Total**	**Average**
Coniferous	3,487	0,109	276,519	8,641	6,714	**0,210**
Deciduous	-2,497	-0,078	66,656	2,083	1,147	**0,036**
Total	**0,990**	**0,031**	**343,175**	**10,724**	**7,861**	**0,246**

Evaluation of Table 7.6 and 7.7 can be outlined as below:
1-Total amount of areas, growing stocks and volume increments of the coppice forests reduced while high forests were increasing. Highest amount of decrease occurred in degraded coppices.
2-Total amount of growing stocks and annual volume increment of the coniferous and deciduous tree species increased. More than 80% of the increase occurred on coniferous tree species.
3-Total increase on area is 0,99 Mill. Ha; on growing stock and volume increment are 343,175 and 7,861 Mill m^3 respectively.
The change of forest area is 0.99 million ha in the years between 1972-2004. This change was considered to be linear. The land converted to forest land area in the last 20 years is 618,408 Ha as it is mentioned in the first national inventory report in 2004 and the average annual increase is assumed to be equivalent to 30,920 Ha. The backward calculation of time-series of for the years 1990-2004, annual total converted area has been given only 30,920 ha by mistake as rather than cumulative area. This fault was noticed during the country review in November 2008. The error was corrected in 2007. Regarding to the converted area, GHG emissions has been calculated again for the years 1990-2004. The Formula 3.2.22 has been used in this calculation and entered into the table 2.2.2. The calculations for the years 2005-2007 were done using the correct method as mentioned above. Therefore no changes have been made for this period.

4-Althoug the reduction on the areas of deciduous tree species, total growing stock and current annual increment accrued because of conversion the coppices into high forests, and leaving of tree cuttings on some olden managed forests for nature protection.
According to the results of these two inventories, forest areas increased (0,99/20,199)= 5% while the growing stock volume (343,175/976,191)= 35%, and annual volume increment (7,861/ 30,039)= 29% were getting high during the 32 years time period between the years of 1972-2004.
Considerable reasons of these changes are:
1-Moving to province centres from the rural areas,
2-Giving up old fashion goat breeding and cattle grazing in the forests and the meadows adjacent to forests,
3-Abandonment of some forest lands occupying on steep slopes and having non-economic management conditions,
4-Changing considerations on forestry applications towards multi functional use of forest resources in the framework of sustainable forest management concept,
5-Converting of coppices into high forests,
6-Afforestration activities on the bare lands and degraded forests accomplished by the Forestry Service
All the factors focused here played affecting roles on these increases.
Almost whole of the Turkey's forests is natural forest and categorized under the temperate climate zone. In this zone, there are 4 sub-climate type are identified (Figure 7.3).

For estimating carbon stocks in the forest areas, this category was divided into category 5.A.1 Forest remaining Forest Land and Category 5.A.2 Land converted to Forest Land. Each sub-categorize was separated into coniferous and deciduous and then managed and unmanaged forests. The distribution of Turkey's forests due to climate and mangement types and tree species in 2006 is presented hereunder:

Table 7.8 The Distribution of Turkey's forests in 2007

Subcategories in 2007	Management Units	Area of forest land (kha)
Hot-dry managed coniferous	1787	8.774,57
Hot-dry managed deciduous	788	3.446,67
Hot-dry unmanaged coniferous	914	2.911,52
Hot-dry unmanaged deciduous	399	1.156,33
Sub-Total	**3888**	**16.289,10**
Hot-wet managed coniferous	429	1.064,60
Hot-wet managed deciduous	531	1.027,49
Hot-wet unmanaged coniferous	201	367,86
Hot-wet unmanaget deciduous	328	531,27
Sub-Total	**1489**	**2.991,22**
Cold -dry managed coniferous	149	888,15
Cold -dry managed deciduous	66	480,24
Cold -dry unmanaged coniferous	56	246,55
Cold -dry unmanaged deciduous	48	188,01
Sub-Total	**319**	**1.802,95**
Cold –wet managed coniferous	27	121,26
Cold –wet managed deciduous	16	58,94
Cold –wet unmanaged coniferous	11	23,45
Cold –wet unmanaged deciduous	13	47,51
Sub-Total	**67**	**251,15**
managed coniferous	2392	10.848,59
managed deciduous	1401	5.013,34
unmanaged coniferous	1182	3.549,38
unmanaged deciduous	788	1.923,11
Coniferous	3574	14.397,97
Decidoous	2189	6.936,45
Grand total	**5763**	**21.334,42**

All forest statistics were obtained from the General Directorate of Forestry under the Ministry of Environment and Forestry.

Data on Forest Fires:

The information about the forest fires was received from the Department of Forest Protection and Fighting Fires of General Directorate of Forestry and written on the table 7.9:

Table 7.9 Forest Fires in 2007

Fire	Total area	Fire Types	
Number	(Ha)	Ground Vegetation (ha)	Crown (ha)
2829	11.664	2.718,3	8.945,7

These statistics contain forest area exposed to fire, fire type and standing volume with bark removed from forest because of the fire. Non-CO_2 greenhouse gasses emitted by wildfire were calculated based on the biomass burned with 45% burning productivity. This rate was taken from IPCC Guidance table 3A.1.12.

Existing document concerning the forest resources and forestry activities permitted to second level communication (Tier 2 methods) mainly during the calculation of carbon uptake and the other greenhouse gasses inventory. Since there was no adequate and baseline data on land use changes concerning the olden time, first level communication (Tier 1 methods) was applied for the estimation of carbon sequestrations and greenhouse gasses emissions between the years 1990–2007.

The required data on the dead organic matter cover the dead trees and felling residues (harvesting waste) for the forests older than 20 years old. Litter amounts were not included into calculations because of the absence of specific researches in this scope. Carbon contents in the forest soils were not considered too due to same reason. Thus, both of these carbon pools were not taken into account because of the lack of document suitable for these purposes. Due to the extraordinary pecularities among the geographical regions in Turkey (southern and western parts of the country have Mediterranean forest conditions while the northern part looks like typical west European forests) default values for these pools given in the Guidance annexes tables could not be used.

7.2.2 Methodology

Carbon stocks in living biomass in the forest areas were evaluated as two category divided into 5.A.1 Forest remaining Forest Land and 5.A.2 Land converted to Forest Land (Table 7.10).

Table 7.10. Annual change of net carbon stocks in the forest areas of Turkey with regard to sub-categories, 2007

Tree Species	Change of Carbon Stocks in the Pools of Forest Lands Remaining Forest Lands				Change of Carbon Stocks in the Pools of Other Lands Converted to Forest Lands			
	Areas kha	In Living Biomass Gg	In Dead Organic Matter Gg	In Forest Soil Gg	Areas kHa	In Living Biomass Gg	In Dead Organic Matter Gg	In Forest Soil Gg
Managed Coniferous	10.370,84	6.744,95	611,91	0,00	477,75	457,91	0,00	**0,00**
Managed Deciduous	4.982,88	2.803,94	282,78	0,00	30,46	22,86	0,00	**0,00**
Managed Total	15.353,72	9.548,89	894,69	0,00	508,21	480,77	0,00	**0,00**
Unmanaged Coniferous	3.429,09	1.765,40	10,15	0,00	120,29	142,29	0,00	**0,00**
Unmanaged Deciduous	1.880,30	1.134,21	5,50	0,00	42,82	32,04	0,00	**0,00**
Unmanaged Total	5.309,39	2.899,61	15,64	0,00	163,11	174,33	0,00	**0,00**
TOTAL	**20.663,11**	**12.448,50**	**910,33**	**0,00**	**671,32**	**655,10**	**0,00**	**0,00**

Table 7.11. Annual change of net carbon stocks and CO2 equivalents in the whole forests of Turkey, 2007

Tree Species	Areas kHa	In Living Biomass Gg	In Dead Organic Matter Gg	In Forest Soil Gg	Forest Fires Gg	TOTAL Gg	CO_2 Equivalent (Removal) Gg
Managed Coniferous	10.848,59	7.360,97	611,44	0,00	-129,05	7.843,36	**-28.759,00**
Managed Deciduous	5.013,34	3.129,46	402,30	0,00	0,00	3.531,76	**-12.949,78**
Managed Total	15.861,93	10.490,42	1.013,74	0,00	-129,05	11.375,12	**-41.708,77**
Unmanaged Coniferous	3.549,38	1.814,32	10,15	0,00	0,00	1.824,47	**-6.689,72**
Unmanaged Deciduous	1.923,11	1.336,41	5,50	0,00	0,00	1.341,90	**-4.920,31**
Unmanaged Total	5.472,49	3.150,73	15,64	0,00	0,00	3.166,37	**-11.610,03**
TOTAL	**21.334,42**	**13.641,15**	**1.029,38**	**0,00**	**-129,05**	**14.541,49**	**-53.318,81**

Net carbon sequestration and removals between the years 1990-2007 in the forests of Turkey are outlined in table 7.12 and shown in Figure 7.4.

Tablo 7.12: Net carbon sequestration and removals between the years 1990-2007 in the forests of Turkey

Years	Carbon Increases		Carbon Lost			Net carbon sequestration	CO_2 Equivalent
	Living biomass Ton/year *(1000)	Dead organic matter Ton/year *(1000)	Commercial Cutting Ton/year *(1000)	Fuel Wood Gathering Ton/year *(1000)	Other *(Forest Fires) Ton/year *(1000)	Ton/year *(1000)	Gg/year
1990	17017,05	966,59	4291,57	1468,15	111,25	12.023,85	**-44.087,46**
1991	17139,72	934,88	4141,36	1468,15	65,44	12.347,44	**-45.273,96**
1992	17263,34	930,38	4120,01	1468,15	98,75	12.427,47	**-45.567,39**
1993	17387,92	935,40	4143,82	1468,15	124,56	12.487,25	**-45.786,59**
1994	17513,47	811,29	3555,83	1468,15	308,31	12.745,69	**-46.734,20**
1995	17639,99	945,45	4191,43	1468,15	62,06	12.814,11	**-46.985,06**
1996	17767,50	946,14	4194,71	1468,15	120,81	12.833,54	**-47.056,31**
1997	17896,00	868,87	3828,62	1468,15	51,25	13.376,14	**-49.045,86**
1998	18025,49	837,28	3678,96	1468,15	54,56	13.617,19	**-49.929,70**
1999	18156,00	822,96	3611,10	1468,15	47,06	13.815,20	**-50.655,75**
2000	18287,52	824,51	3618,49	1468,15	213,31	13.656,29	**-50.073,07**
2001	18420,06	780,33	3409,18	1468,15	60,00	14.215,42	**-52.123,21**
2002	18553,64	851,66	3747,08	1468,15	68,75	14.066,11	**-51.575,73**
2003	18688,25	828,90	3639,29	1468,15	53,75	14.312,99	**-52.480,97**
2004	18823,92	888,39	3921,09	1468,15	39,56	14.252,08	**-52.257,62**
2005	18538,82	870,99	3897,60	1518,51	12,50	13.970,63	**-51.225,66**
2006	19211,94	913,95	4108,51	1312,10	79,50	14.688,61	**-53.858,22**
2007	**19284,70**	**1029,38**	**4262,96**	**1380,58**	**129,06**	**14.541,49**	**-53.318,81**

*Other carbon lost from insect and fungus disturbances are not included

Net carbon uptake was calculated by taking commercial cutting, fuel wood gathering and biomass lost from forest fires out the aboveground and belowground living biomass.

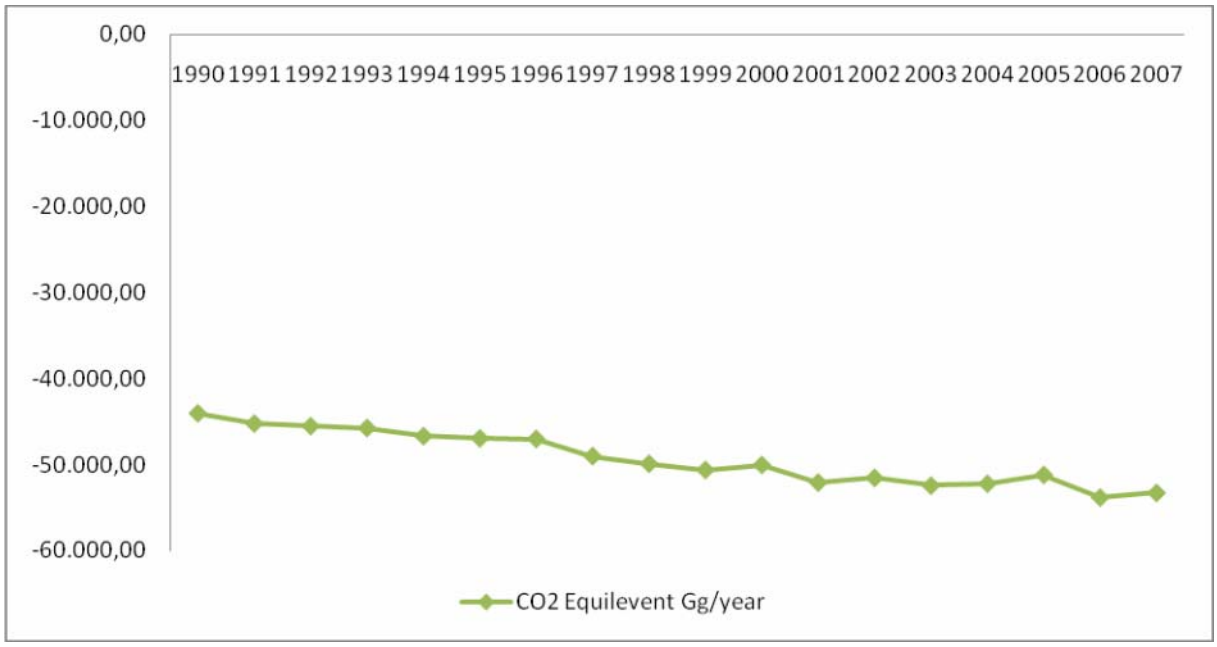

Figure 7.4 Net CO2 removals between the years 1990-2007 in the forests of Turkey

Removals and emissions related to Forest land were calculated by the following Equation 3.2.1 of IPCC GPG 2003.

EQUATION 3.2.1 $\Delta CFF = (\Delta CFFLB + \Delta CFFDOM + \Delta CFFSoils)$

Annual Increase In Carbon Stocks Due To Bıomass Increment In Forest Land

Removals (annual increase in carbon stocks due to biomass growth) were calculated due to the following Equation 3.2.4 and 3.2.5 of IPCC GPG 2003.

$\Delta C_{FF\text{-}LB} = (C_{t2} - C_{t1}) / (t_2 - t_1)$ (Equation 3.2.3)

$C=[V*D*BEF_2] * (1+R)*CF$

$G_{TOTAL} = G_W * (1+R)$ (Equation 3.2.5)

$G_W = I_V * D * BEF_1$

$G_{TOTAL} = [(I_V * D* BEF_1) * (1+R)]$

For annual increase in carbon stocks, both the national and default data were used. National forestry data was mainly come from the General Directorate of Forestry.

- area of forest land: It exists for each management class in the forest management plans (Tier 2).
- Average annual net increment in volume suitable for industrial processing (Iv): It exists for each management class in the forest management plans (Tier 2).
- Basic wood density (D): It was determined for all fundemental tree species which form a stand in the Turkey's forests (Table 7.13)(Tier 2). This coefficient was determined as :

  -0,496 for largely coniferous mixed forests

  -0,638 for largely deciduous mixed forests

Table 7.13 The ovendry weihgt of Turkey's fundemental tree species

Coniferous		Ovendry weight (g/cm^3)	Deciduous		Ovendry weight (g/cm^3)
Pinus brutia	Kızılçam	0,530	Fagus orientalis	Kayın	**0.640**
Pinus nigra	Karaçam	0,516	Quercus robur	Meşe	**0.650**
Pinus silvetris	Sarıçam	0,496	Carpinus	Gürgen	**0.790**
Abies bornmülleriana	Göknar	0,400	Alnus barbata	Kızılağaç	**0.490**
Picea orientalis	Ladin	0,401	Populus nigra	Karakavak	**0.410**
Cedrus libani	Sedir	0,480	Castanea sativa	Kestane	**0.590**
Juniperus excelsa	Ardıç	0,508	Fraxinusexcelsior	Dişbudak	**0,650**
Pinus pinea	Fıstıkçamı	0,465	Tilia grandiflora	Ihlamur	**0.490**
Cupressus sempervi.	Servi	0,480	Platanus orientalis	Çınar	**0.580**
Pinus halepensis	Halepçamı	0,514	Eucalyptus rostrata	Okaliptüs	**0.547**
Pinus maritima	Sahilçamı	0,430	Liquidambar orientalis	Sığla	**0.680**
Pinus radiata	**P.Radiata**	**0,380**	**Robinia pseudoacaccia**	**Yalancı akasya**	**0.720**

Source: AS ve Ark. (2001)

- Biomass expansion factor for conversion of annual net increment (including bark) to aboveground tree biomass increment (BEF_1 and BEF_2): Calculated for both coniferous and deciduous species seperately(Tier 2).

Table 7.14 Comparison of BEF1 and BEF2 coefficients between LULUCF Guidance and those calculated for Turkey to use for the natural and plantation forest locatedin the temperate zone

Tree Species	Data resource	BEF_2	Uncertainty %	BEF_1	Uncertainty %
Coniferous	in LULUCF Guidance	1,30 (1,15-3,40)	-	1,15 (1,05-1,20)	-
	Calculated for Turkey	1,24 (1,08-1,39)	12,27	1,22 (1,15-1,29)	**14,72**
Deciduous	İn LULUCF Guidance	1,40 (1,15-3,40)	-	1,20 (1,10-1,30)	-
	Calculated for Turkey	**1,26 (1,08-1,40)**	**10,94**	**1,24 (1,06-1,42)**	**5,69**

Source: ASAN Unal,2006

- Root-to-shoot ratio (R) : Default data used for temperate zone in the Guidance (Table 3A) and accounted distinctly for each management class based on the growing stock in hectar.
- Carbon fraction of dry matter (CF): Default value of Guidance (0.5) was used for carbon fraction of dry matter (CF).

Annual Decrease in Carbon Stocks Due to Biomass Loss in Forest Land

Annual decrease in carbon stocks due to biomass loss in forest land was calculated by using the following Equation 3.2.6 of LULUCF Guidance.

Equation 3.2.6 $\Delta CFFL = L_{fellings} + L_{fuelwood} + L_{other\ losses}$

Annual Carbon Loss Due To Commercıal Fellıngs

Equation 3.2.7 $L_{fellings} = H \bullet D \bullet BEF2 \bullet (1 - fBL) \bullet CF$

H: Wood harvesting data includes whole harvested woods as industrial harvesting including planned harvests. (Tier 2).

Annual Carbon Loss Due To Fuelwood Gatherıng

Equation 3.2.8 $L_{fuelwood} = FG \bullet D \bullet BEF2 \bullet CF$

FG = Fuelwood gathering and illegal cutting data obtained from the General Directorate of Forestry and 8th Five Years Development Plan was used here (Tier 1).

Annual Other Losses Of Carbon

Equation 3.2.9 $L_{other\ losses} = A_{disturbance} \bullet BW \bullet (1 - fBL) \bullet CF$

$A_{disturbance}$ = Forest areas burnt by fires were taken into account (Tear 1).

BW = It was estimated that average biomass in the fired areas could be burned with 45% percent of burning productivity. This biomass did not cover the litter. Relevant burning rate was fixed to the Guidance(Tables 3A.1.12) (Tear 1).

Annual Change In Carbon Stocks In Dead Organıc Matter In Forest Land

Equation 3.2.10 $\Delta CFFDOM = \Delta CFFDW + \Delta CFF\ LT$

Dead organic matter as a carbon pool divided into dead wood and litter. Dead wood data in the "Forest remaining Forest Land" was reached from forest management plans and added to the felling residues data.

But there was no sufficient data on the litter in the Turkey's forests , the carbon stock change in the litter was assumed as zero according to the Guidance.

Annual Change In Carbon Stocks In Dead Wood In Forest Land

Equation 3.2.11 $\Delta CFFDW = [A \bullet (B_{into} - B_{out})] \bullet CF$

B_{into} = Calculated from the forest management plans and the felling residues was added to it.

B_{out} = Decay period of dead wood in the forest was assumed as an average of 10 years. 1/10 of dead wood was decreased in each year.

7.2.3 Uncertainty and time–series consistency

To estimate the uncertainty levels in parameters and formulas, LULUCF Guidance recommends to use the 5.2.1 and 5.2.2 equations :

Equation 5.2.1 $U_{toplam} = \sqrt{U_1^2 + U_2^2 + ... + U_n^2}$

Equation 5.2.2 $U_E = \dfrac{\sqrt{(U_1 \bullet E_1)^2 + (U_2 \bullet E_2)^2 + ... + (U_n \bullet E_n)^2}}{|E_1 + E_2 + ... + E_n|}$

Whole calculated uncertainty levels are expressed as follow:

Uncertainty According to The Expert View :

For parameters related the forest areas from the GDF* source ……% 0,03
" " " the volume " " " …… %10
" " " the volume increment " " …… %10
" " " the commercial wood volume from SPO** .. . %5
" " " the fuel wood gathering " " ... %15
" " " the burned forest areas " " … %10

*GDF : the General Directorate of Forestry
**SPO: the State Planning Organization

7.15 Uncertainty estimates of parameters :

Parameters	Uncertainty (%)
Ovendry weight	
-Coniferous	**20**
-Deciduos	**26**
-BEF1	
Coniferous	**15**
Deciduous	**6**
-BEF2	
Coniferous	**12**
Deciduous	**11**
f_{BL}	**43**
Dead wood	**44**
Root the shoot (R)	**30**
CF	**2**
Aboveground biomass	
-Coniferous	**40**
-Deciduos	**41**

7.16 Uncertainty of equations

Equations	Uncertainty (%)
Forest remaining forest land	
-Annual living biomass increment	
-Coniferous	**40**
-Deciduous	**41**
-Annual living biomass lost	
-Coniferous	**73**
-Deciduous	**69**
-Dead organic matter	**44**
-Forest fires	**87**

Time series consistency:

Since there are two forest inventory carried out by the General Directorate of Forestry for 1972 and 2004 years, the data on the forest areas, growing stocks and annual valume increments during 1990-2004 period were calculated by interpolation between these two inventory data. Thus, the annual increase of forest areas were assumed as linear as well growing stocks and volume increments were accepted to increase with the compound interest basis. The data for the 2005 and 2006 years also were obtained annually from the General Directorate of Forestry .

The statistics on the forest fires and commercial roundwood production for the same period were taken from the same Dirctorate.

Also, fuelwood gathering data was reached from utilizing the State Planning Organization's source and it was accepted as the same quantity for each year.

7.2.4 Planned Improvements

It was seen during the preparation of GHG inventory of LULUCF , there is a need to improve the forest resources inventory studies, the quality assurance of relevant data and increase the researches to obtain the country specific data. For this aim, a project has been started to set carbon stocks changes in the forest soils and litter by the Turkish Western Blacksea Forestry Research Directorate . Also planned activities are:

-Establishment of the permenant team to work for the LULUCF studies and improving the capacity of the concerned staffs and institutions.

-A project to determine and monitor the carbon stocks in the Turkey's forests.

-7.3.&7.4.&7.5.&7.6.&7.7.& Croplands (CRF sector 5.B), Grasslands (CRF sector 5.C), Wetlands (CRF sector 5.D), Settlements (CRF sector 5.E), Other lands (CRF sector 5.F)

The removals from these 5 types of land uses were calculated by the Ministry of Agriculture and Rural Affairs , General Directorate of Agricultural Production and Development, Remote Sensing and Agricultural Land Information Centre(UTABIM) and Harran University, Agricultural Faculty (Assoc. Prof. Halil KIRNAK).

7.3 Croplands (CRF sector 5.B):

Calculation of carbon uptakes by croplands under LULUCF-GPG was based on soil map which is in digital format for whole Turkey, climate data which also is digital format, land use change data which is in tabular digital format.

1. **Soil map**: The soil survey studies in Turkey were initiated in 1960. The soil survey and soil orders studies of whole lands of country were completed by using 1:25000 map scales. This study was updated in 1980. The study was done based on US soil taxonomy system. All maps were digitized in 1999, and attributes of soils were connected with polygons via help of GIS. This is the only digital soil map available in Turkey.
2. **Climate data**: The meteorological measurements were being made at 260 point at local stations in Turkey. Each station reflects its own characteristic. Point based meteorological data was converted to regional data using local statistical methods by help of GIS (ArcGIS). Later, overlap analysis in GIS was done to form climatic zones mentioned in LULUCF Guidance (Figure 7.3).

7.3.1 Cropland remaining cropland: Tier 1 approach was used for estimating carbon uptake from cropland. While calculating C changes in soils, we only considered mineral soils since area of the organic soils in Turkey was insignificant compared to the area of the mineral soils. The area of the organic soils was only about 0.3% of all soils in Turkey. Besides, three was no lime application in Turkey based on state statistics records The Turkish Statistics Institute (TURKSTAT) and Ministry of Agriculture and Rural Affaires. Therefore, ΔC_{soil} is equal to $\Delta C_{CCmineral}$. We have no country specific data for stock change factors. The relative stock change factors such as F_{LU}, F_{MG}, and F_I were selected based on climate regime from Table 3.3.4 of LULUCF Guidance.

Concerning calculation of CO_2 removals by biomass , the land where converted from annual crop to permanent crop was taken into consideration. Also calculation CO_2 comes from soil, this transformation was taken into consideration as high tillage to less tillage .

TURKSTAT and Ministry of Agriculture and Rural Affairs collaborated on collection of farmer records for each cultivated crops yearly.These records were collected by town branches of Ministry of Agriculture and Village Affairs and were sent to TURKSTAT yearly. The records were gathered in the scale of town and consisted of whole crops grown in the town. Again, since all these records were kept in a suitable database format, any queries could be made and printed. In this study, land use data were obtained from TURKSTAT.

As a result, land use change data which was in tabular digital format was used in this study. Digital land use data based on map was not available for Turkey. Total area of croplands in Turkey was not considered. Only amount of land where was converted from annual crop to permanent crop on town scale was taken into consideration year by year. Average area converted from annual crop lands to the permanent crop lands for year 1990 to 2005 is about 2.322.581 ha.(Table 7.17).

Table 7.17 Annual crop lands converted to permanent cropland

Year	Area (Hectare)
1991	2.078.977
1992	2.075.876
1993	2.126.516
1994	2.149.600
1995	2.193.689
1996	2.209.369
1997	2.238.606
1998	2.258.673
1999	2.286.478
2000	2.309.663
2001	2.334.258
2002	2.524.969
2003	2.594.926
2004	2.510.280
2005	2.946.832
Total	34.838.711
Average	2.322.581

Land use changes on agricultural land in Turkey are pretty high. Main land use changes on croplands are non irrigated arable land to irrigated land, annual crops to permanent crops (orchards). Turkish agricultural policies are supporting fruit production from 1990 to now. Because of this support and irrigation projects, permanent crop productions are being extended. This transformation is very big advantage for carbon uptake in agricultural land. Also there is some land use changes from other land use type to settlement area. We haven't available data on that area. But generally it is not easy to convert arable land to settlement because of very strict laws. However, land where converted from annual crop to permanent crop are taken into consideration, it is assumed that there is no any change on remaining arable land. Also it is obvious; cropland is positive effect on greenhouse gasses emissions.

7.4 Grasslands or range lands (CFR sector 5.C): Tier 2 approaches were used. It was assumed that 75% of annual biomass growth of perennial woody biomass was lost. It means that $L_{perennial} = G_{perennial} * 0.75$ based on expert knowledge in Turkey. In the calculations of C stocks originated from soils, only mineral soils were considered. Default stock change factors were selected from LULUCF Guidance.

Grasslands and range lands data are not available in digital format or tabular digital format for Turkey. Maybe there are some inventory information concerning grasslands but this data is not based on real state. So this data are not taken into consideration. However, a range land rehabilitation project is being applied by Ministry of Agriculture and Rural Affairs. So instead of total area of range land, yearly rehabilitated area was taken in to consideration. For example 1000 hectare area are rehabilitated at 2005, we assumed that 1000 hectare area of range land converted from over grazing to less grazing.

The grassland areas considered during the calculation of carbon uptake by these lands are given below:

Table 7.18 Grassland areas considered for inventory between 2000-2005 years in Turkey

Year	2000	2001	2002	2003	2004	2005	Area of total project (Ha)
TOTAL	**660.8**	**881.1**	**6,810.80**	**9,771.30**	**72,502.34**	**81,613.77**	**172,240.11**

7.5 Flooded land areas (CRF sector 5.D): CO_2 emissions associated with peat extractions was assumed to be zero since three was no peat production from wetlands in Turkey. The C stock change is originated only from land converted to flooded land (reservoirs) in wetlands under the conditions of Turkey.

In order to determine area of flooded land , list of the dams constructed between 1990 and 2006 was taken from State Hydraulic Department and Former General Directorate of Rural Affairs. The water surface area of dams constructed both agricultural and hydropowers were measured on the digital hydraulic map of Turkey by using GIS techniques.

7.6 Settlements(CRF sector 5.E): Tier "1a" approach was used. This approach uses changes in C stocks per tree crown cover area as a removal factor.

CORINE 2000 data base was used to determine the crown areas of trees located on the settlements areas. CORINE 2000 considers only lands bigger then 25 ha. Based on this limitation tree planted area in cities in the year of 2000 were tabulated below. Total planted area was 16173 ha. We assume that %50 percentage of this plantation cover was before 1990. And then an equal increments rate was accepted and distributed to the years.

Table 7.19 Increment in plantation on year base in urban.

Year	Area (Ha)
1990	8,086.50
1991	8,895.15
1992	9,703.80
1993	10,512.45
1994	11,321.10
1995	12,129.75
1996	12,938.40
1997	13,747.05
1998	14,555.70
1999	15,364.35
2000	16,173.00

7.7 Other lands (CRF sector 5.F): In Turkey, there is no land converted to other land based on TURKSTAT database. After 1990 marginal land were not opened to cultivated land so that no calculation was done under this category.

7.8 Uncertainty: Land use data which was used in this study is based on field survey. Each town was taken up with crop types for each parcel by field trip. It means this data are not generated by using satellite images or any other mapping tools. So there should be some uncertainty which belong to town. Those numbers are given in the national report. Concerning range land, this area where was used in calculations is 100% correct number. But we haven't information about remaining range land. It is same for flooded land, the area which was generated by using dams' data, is correct but remaining wetland area is unknown. Also settlements information is not sufficient.

Cropland Remaining Cropland

$\Delta C_{CC} = \Delta C_{CCLB} + \Delta C_{CCsoils}$

Change in carbon stocks in living biomass

$\Delta C_{CCLB} = A * (G-L)$

Annual area of cropland with perennial woody biomass comes from administrative records of TURKSTAT. Based on expert judgment, an uncertainty in the area estimates of 10% was accepted. Annual growth rate of perennial woody biomass (G) and annual carbon stock in biomass removed (L) were default coefficients given in Table 3.3.2 of the Guidance. Therefore, a default uncertainty level of 75% of the parameter value has been assigned.

$$U\Phi = \frac{\sqrt{\left(U_{C_G} \bullet C_G\right)^2 + \left(UC_L \bullet C_L\right)^2}}{\left|C_G + C_L\right|} \qquad U_{TOTAL} = \sqrt{U_1^2 + U_2^2 + ... + U_n^2}$$

Change in carbon stocks in mineral soils

$\Delta C_{CCmineral} = (SOC_0 - SOC_{(0-T)})\ A$

$SOC_0 = SOC_{ref} * F_{LU(0)} * F_{MG(0)} * F_{I(0)}$

$SOC_{(0-T)} = SOC_{ref} * F_{LU(0-T)} * F_{MG(0-T)} * F_{I(0-T)}$

The default reference soil organic C stocks were obtained from Table 3.3.3 of LULUCF Guidance with an uncertainty of 95%. The uncertainty of F_{LU} is 11% (Table 3.3.4) for long-term cultivated management practices. F_{MG} was chosen as 1.0 with zero uncertainty based on Table 3.3.4 for full tillage practices. F_I was assigned to 0.915 with 6% uncertainty based on Table 3.3.4 for "low"organic matter input.

Grassland Remaining Grassland

$\Delta C_{GG} = \Delta C_{GGLB} + \Delta C_{GGsoils}$

Annual change in C stocks in living biomass in grassland remaining grassland

$\Delta C_{GGLB} = \Delta B_{grass} * CF$

$\Delta B_{grass} = A * (Ggrass-Lgrass)$

Default emission factor of G and L are provided from Guidance tables with 75% of uncertainty. The uncertainty in land area covered with grass was accepted as 10% based on expert knowledge.

Annual change in C stocks in mineral soils in grassland remaining grassland

$\Delta C_{GGmineral} = (SOC_0 - SOC_{(0-T)}) A$

$SOC_0 = SOC_{ref} * F_{LU(0)} * F_{MG(0)} * F_{I(0)}$

$SOC_{(0-T)} = SOC_{ref} * F_{LU(0-T)} * F_{MG(0-T)} * F_{I(0-T)}$

The default reference soil organic C stock was obtained from Table 3.4.4 of Guidance with an uncertainty of 95%. The F_{LU} was chosen as 1.0 with zero uncertainty based on Table 3.4.5 for all level and all climate regimes. F_{MG} was 0.95 with 12% uncertainity based on Table 3.4.5 for moderately degraded grassland. F_I was assigned to 1 with zero uncertainity based on Table 3.4.5 for nominal level.

Total change in C stocks in land converted to grassland

$\Delta C_{LG} = \Delta C_{LGLB} + \Delta C_{LGsoils}$

Changes in carbon stocks in living biomass in land converted to grassland

$\Delta C_{LGLB} = (L_{conversion} + \Delta C_{growth}) A$

$L_{conversion} = C_{after} - C_{before}$

A carbon stock in biomass immediately after conversion is assumed to be zero, i.e., the land is cleared of all vegetation before planting crops. The uncertainity of C_{after} was assumed zero based on LULUCF Guidance. If initial land use is CL, the uncertainty of C_{before} is 75% based on table 3.4.8. The uncertainity value of ΔC_{growth} was 75% based on table 3.4.9. Again, the uncertainty of area of land converted to grassland was assumed 10% based on expert judgments.

Changes in carbon stocks in soils in land converted to grassland

$\Delta C_{LGsoils} = \Delta C_{LGmineral} - \Delta C_{LGorganic} - \Delta C_{LGlime}$

We have only $\Delta C_{LGmineral}$ factor. So, the uncertainty of $\Delta C_{LGmineral}$ factor was calculated based on tables given in Guidance. The default reference soil organic C stock was obtained from LULUCF-GPG with an uncertainty of 95%. The uncertainty of F_{LU} was zero based on table given in the Guidance. $F_{MG\ (0-T)}$ was 0.7 with 50% uncertainty based on table 3.4.5 for severely degraded level while the uncertainty of $F_{MG\ (0)}$ was 12%. F_I was assigned to 1 with zero uncertainty based on table 3.4.5 for nominal level.

1.1 Wetlands

Land converted to flooded land (reservoirs)

$\Delta C_{LW\ flood\ LB} = CF\ (B_{after}-B_{before})\ A$

The uncertainties of A, $B_{after,}$ $B_{before,}$ and CF were 10%, 0%, 75% and 75%, respectively, based on the Guidance and expert judgment.

1.2 Settlements

Annual C stock change in living biomass in settlements remaining settlements

$\Delta C_{SSLB} = \Delta B_{SSG} - \Delta B_{SSL}$

$\Delta C_{SSG} = A*CRW$

The uncertainty of CWR(crown cover area-based growth rate) based on Tier 1a was 50% according to Guidance. The uncertainity in A was accepted as 10% based on expert judgment.

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Table 7.20 :Uncertainty values in the GHG inventory of croplands, grasslands, wetlands and settlements

Years	$U_{\Delta c}$ (cropland remaining cropland_living_biomass)	$U_{\Delta c}$ (cropland_remaining_cropland_mineral soils)	$U_{\Delta c}$ (grassland_remaining_grassland_livingbiomass)	$U_{\Delta c}$ (grassland_remaining_mineral_soils)	$U_{\Delta c}$ (Land_converted_to_grasland_soil)	$U_{\Delta c}$ (Land_converted_to_grassland_in living and dead biomass)	$U_{\Delta c}$ (settlemnts_remaining_settlemnts_livingbiomass)	$U_{\Delta c}$ (wetland)	U_{Total}
2004	0,572304541		0,74	0,71	0,96	0,55		0,76	0,45
2003	0,571703537	0,73	0,74	0,71	0,96	0,55		0,76	0,64
2002	0,57208291	0,73	0,74	0,71	0,96	0,55		0,76	0,52
2001	0,573772515	0,73	0,74	0,71	0,96	0,55		0,76	0,47
2000	0,573772515	0,73	0,74	0,71	0,96	0,55	0,51	0,76	0,52
1999	0,573772515	0,73					0,51	0,76	0,56
1998	0,573772515	0,73					0,51	0,76	0,56
1997	0,573772515	0,73					0,51	0,76	0,56
1996	0,573772515	0,73					0,51	0,76	0,55
1995	0,573772515	0,73					0,51	0,76	0,56
1994	0,571065557	0,73					0,51	0,76	0,55
1993	0,571065557	0,73					0,51	0,76	0,55
1992	0,570149342	0,73					0,51	0,76	0,51
1991	0,569217315	0,72					0,51	0,76	0,72

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7.9. Planned Improvement

CORINE-2000 Land Cover project is recognised as an important data set for Turkey regarding themes like soil, geology ,climate and land use.

The studies on CORINE-2000 are still continued by National Knowledge Center under the supervision of Ministry of Agriculture and Village Affaires. The digital land use maps will be completed in June of 2007. It can be considered an important step, criteria and success for LULUCF since the year of 2000 can be used as a reference point for both in the projections of other years and in the test of methodology developed.

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