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Information technology for spatial greenhouse gas emission inventory ready to use for any part of Poland, and any time period

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Geoinformation technologies, spatio-temporal approaches, and full carbon account for improving accuracy of GHG inventories

Deliverable 1.3. Information technology for spatial greenhouse gas emission inventory ready to use for any part of Poland, and any time period

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Work package 1. Spatially resolved greenhouse gas inventory for Poland

Deliverable 1.3.Information technology for spatial greenhouse gas emission inventory ready to use for any part of Poland, and any time period

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6. Geoinformation technology for spatial GHG inventory: LULUCF sector

Forestry sector and land use change areimportantfor the reduction of the greenhouse gas emission. The forest ecosystems are the most powerful CO_2 absorbers. The data on forestry sector in Poland is available on the regional level. The methodology for spatial inventory of greenhouse gas emissions has been developed and its main components are presented in *Figure6.1*.

Performing the inventory of GHG emissions at the level of every elementary object in the forestry sector and land use changeincludethe following six main components (*Figure6.2*):

A. Forest Land;
B. Cropland;
C. Grassland;
D. Wetlands;
E. Settlements;
F. Other Land.

Annual changes in carbon stocks in biomass are presented in *Figure 6.3*.

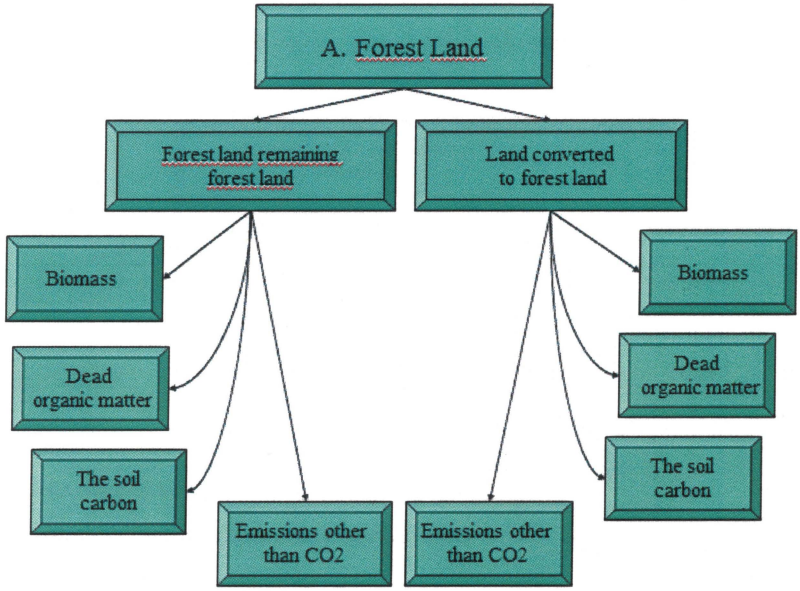

Figure 6.1. The main components of the forestry sector.

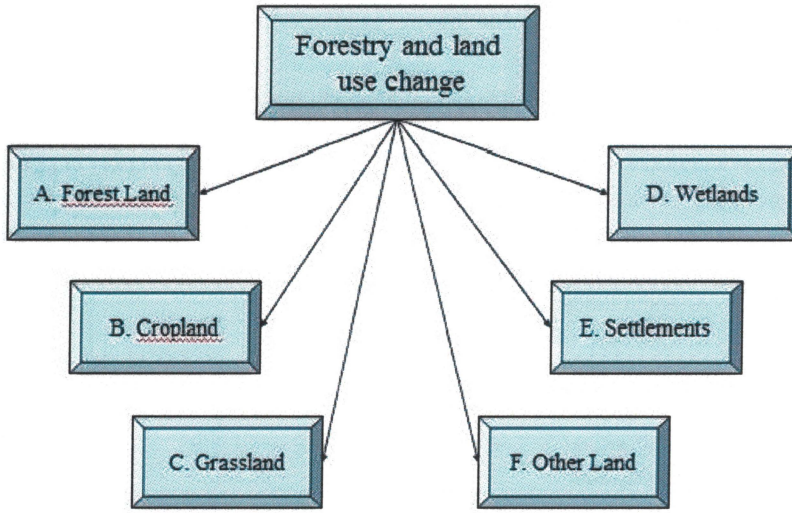

Figure 6.2. Main components of the spatial greenhouse gas emissions inventory in the forestry sector.

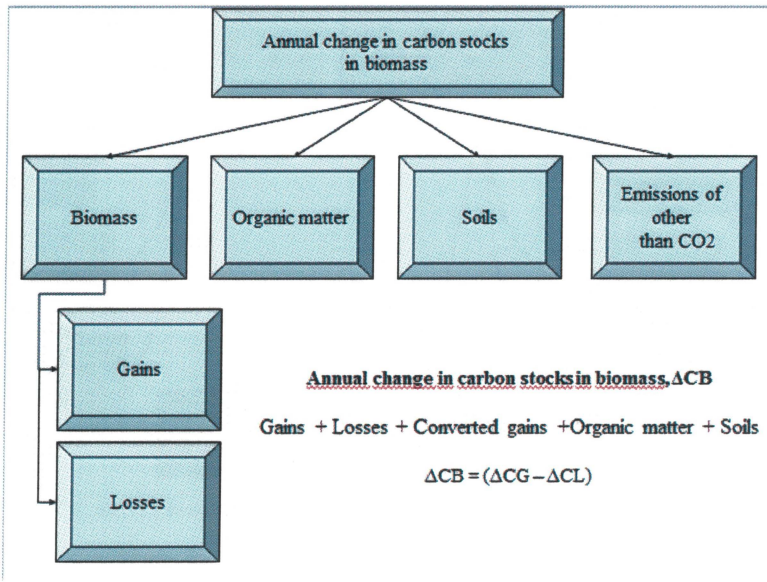

Figure 6.3. Annual change in carbon stocks in biomass.

The information technology was built to apply the developed methodology. The logical structure of the software is presented in *Figure6.4*. Each step of this methodology was implemented as a program module, using a geographic information system. The IPCC methodology recommends a three-tier general scheme for greenhouse gas inventory in the forest and land-use change.The order of processing of primary materials is ilustrated in *Figure 6.5*.

The methods of the first level are the simplest in the practical application. To evaluate the emissions, the appropriate default formulas and parameters are used (for example, the value of the emission factors and changes in reservoirs). When using this level of inventory, the data on economic activity at the national level are needed. However,in many cases only the data on the activities assessed at a higher, sometimes even global, level are available (for example, the rate of deforestation, statistics, global maps of land cover, etc.). Therefore, these data are usually in a low spatial resolution.

At the second level, the same methodological approach can be used, but the applied emission factors andthe data on changes in stocks must be derived from the data for a particular country or a particular region (they can be identified by the country, and for the most important categories of land). As a part of the secondlevel, more detailed data are typically used for the activities with higher temporal and spatial resolution, in order to conform to the designated coefficients for specific regions and specialized land use categories.

As a part of the third level, the special methods are applied, including models and systems of measurements for cadastres, adapted to specific national conditions. They can use the results of repeated measurements, and the data on better definedactivities, including the data disaggregated to the regional level. The data on economic activity at the level of separate enterprise can be applied, or a level of basic areas of a certain size, for example, 2km × 2km can be used. These methods provide an inventory with estimates of a higher degree of certainty, than at lower levels of inventory.Such methods and systems may include a full inventory of the sample in the field, repeated at regular intervals or based on the GIS systems, the data on ageclass, productivity of the stand, soils conditions, and other. The information about the activities in the field of land use and management, which combines the results of several types of monitoring, is also under consideration. Plots of land on which there is a change of land use, can usually be controlled in time, at least statistically.

The georeferenced database contains the results of the GHG emission inventory and consists of geographic elements and a table of attributes, with activity dataand disaggregated emissions of CO_2. The results may be presented in the form of thematic maps, using the GIS-tools. The final georeferenced database is ready to use in further research.

The order of processing of primary materials is presented in *Figure 6.5*, and a part of the database at the regional level is ilustrated in *Table 6.1*.

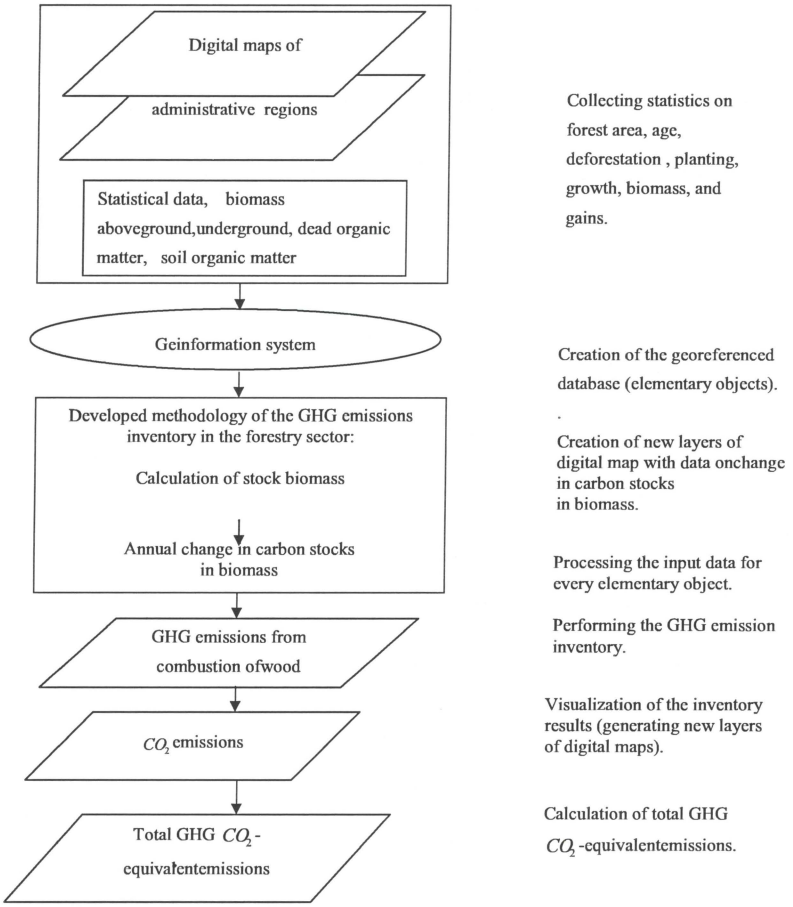

Figure 6.4. The logical structure of the software.

As an example of the results obtained, we presented digital maps of the spatial inventory of greenhouse gas emissions for Poland (*Figure6.6* – the specific CO_2 absorption for 2010; *Figure 6.7*– the total results inLULUCF sector, carbon balance and land use change at the level of elementary objects for 2010; *Figure 6.8* – the total balance of emissions and removals of CO_2 by voivodeships for 2010), andfor Subcarpathian voivodeship (*Figure6.9* and *Figure 6.10* – forest map of Subcarpathian voivodeship with superimposed grid 2 km x 2 km; achieved plots with coniferous, deciduous, and mixed forests). These taskswere implemented, using the GIS technologies. A fragment of the georeferenced database, with the results of the spatial inventory of greenhouse gas

emissions in the forestry sector for Subcarpathian voivodeship – total balance of emissions and removals of CO_2 by voivodeshipsis presented in *Table 6.2.* (explanation of columns of the attribute table for LULUCF sector is described in *Table 6.3*).Main indicators of phytomass, and forest carbon deposited in Subcarpathian voivodeship for 2010 are presented in *Table 6.4.* The total stock of carbon in the forests of Poland by voivodeship for 2010 is presented in *Table 6.5.*

For correct operation the following softwarehas to be used:

- IBM-compatible PC;
- Windows Service Pack 3 / Windows 7;
- MS Office (MS Excel 2010);
- GIS MapInfo 8,0 +;
- Module of IPCC methodologies for MSExcel.

Table 6.1. Part of the database at the regional level – forest areas.

Code	Voivodeship	Area of hardwood and mixed forests	Total stock	Aboveground and underground Phytomass
		ha, 2010	M^3, 2010	M^3, 2010
02	dolnośląskie	587847	158652701	247668669
04	kujawsko-pomorskie	418732	103249961	154956857
06	lubelskie	573662	140334084	213561662
08	lubuskie	683810	170138101	257628714
10	łódzkie	382291	91649324	138186206
12	małopolskie	432720	127347400	201756995
14	mazowieckie	802076	183366346	278960600
16	opolskie	249318	65433100	99542362
18	podkarpackie	663797	194675366	302122018
20	podlaskie	614094	157457755	241872965
22	pomorskie	661404	169022939	256847686
24	śląskie	391204	101228699	156305476
26	świętokrzyskie	326488	78607548	119561689
28	warmińsko-mazurskie	735366	193962734	297410982
30	wielkopolskie	763221	184773282	278598511
32	zachodniopomorskie	803062	216457191	330973153
Total		**9089092**	**2336356531**	**3579209269**

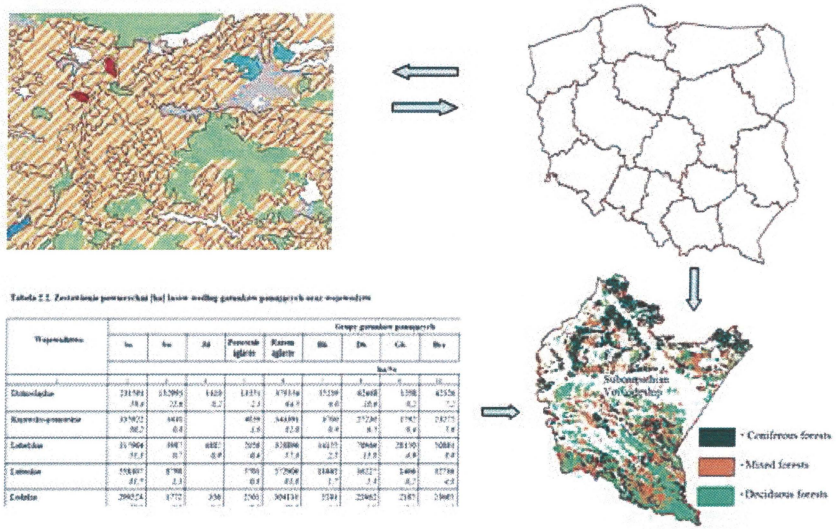

Figure 6.5. The order of processing of primary materials.

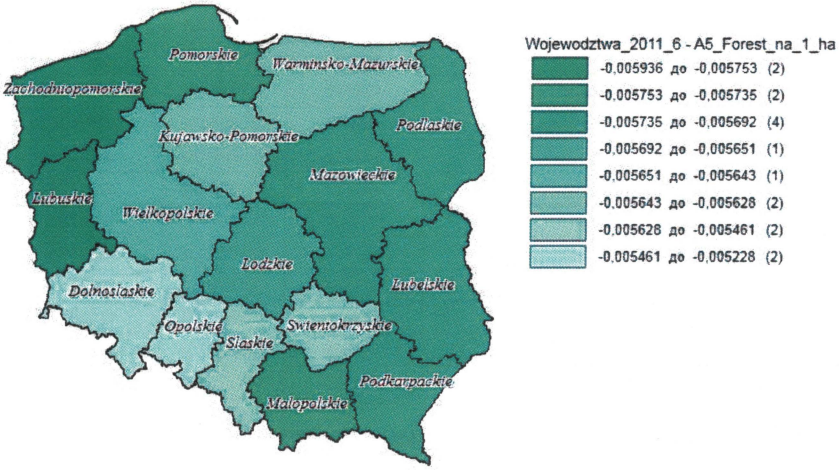

Figure 6.6. Specific CO_2 absorption (2010; Gg/ha).

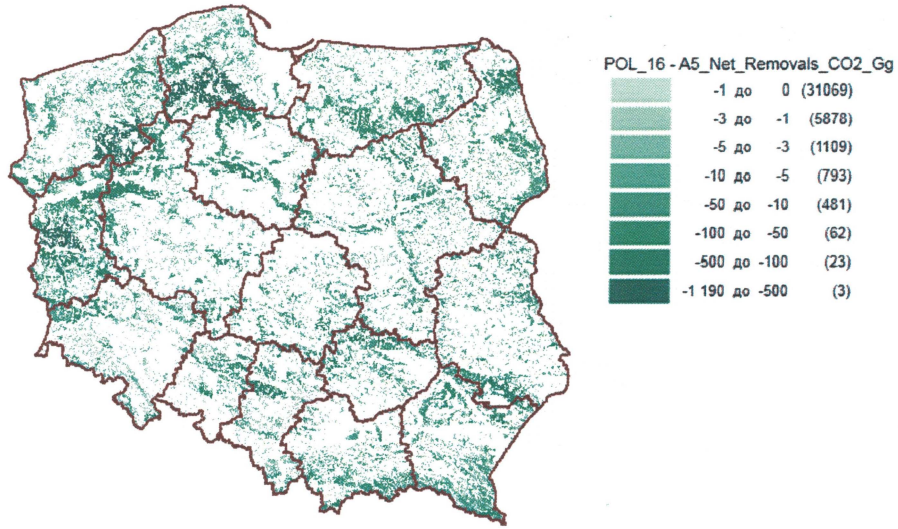

Figure 6.7. The total results in sector 5 (carbon balance and land use change at the level of elementary objects; 2010; Gg).

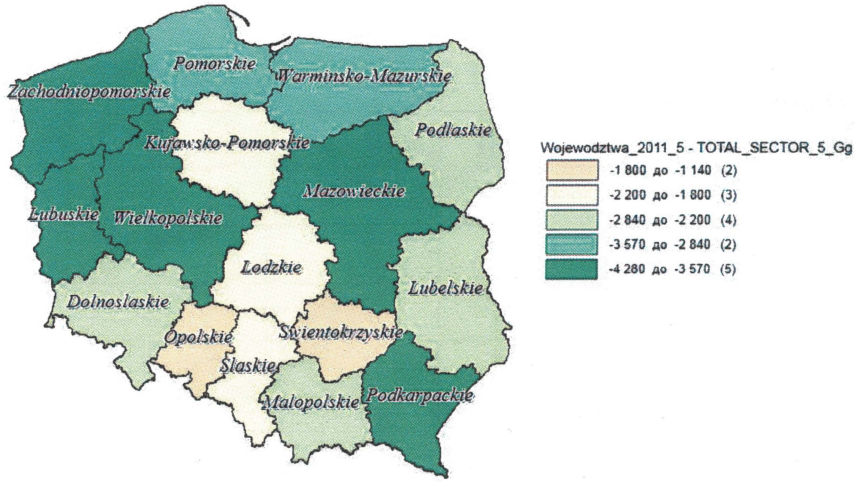

Figure 6.8. The total balance of emissions and removals of CO_2 by voivodeships (Gg; 2010).

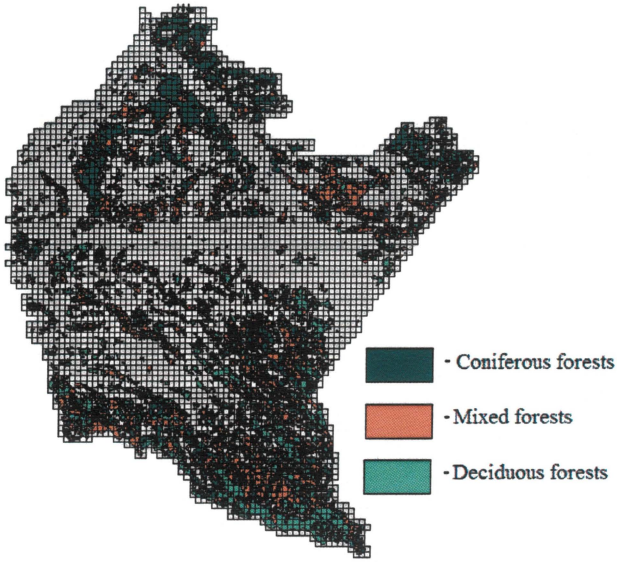

Figure6.9. Forest map of Subcarpathian voivodeship with superimposed grid (2 km x 2 km).

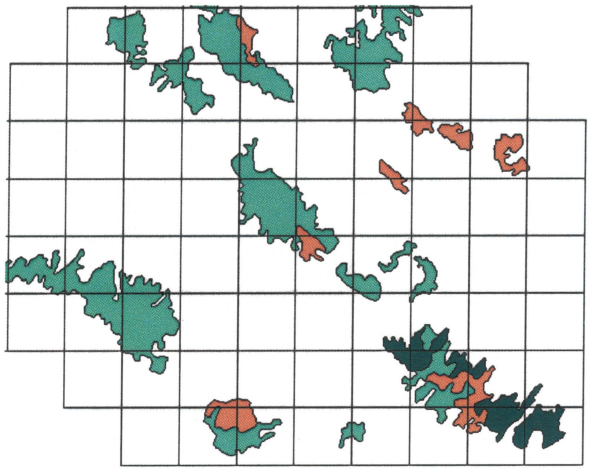

Figure6.10. Fragment of the forest map with a net of 2 km x 2 km.

Table 6.2. Part of the georeferenced database with the results of the spatial inventory of greenhouse gas emissions in the forestry sector (Subcarpathian voivodeship).

CENTROID_X	CENTROID_Y	Wojewodstwo	Woj_skrot	Woj_KOD	AREA	PERIMETER	CLC00_PL_	CLC00_PL_I	CODE_00	XV_LIS_ZAPAS_M3	L_LIS_ZAPAS_M3
21,192974	50,023574	Podkarpackie	PKR	18	36,5452	2 604,89	129 502	129 439	312	11 250,38	0
23,130126	49,968893	Podkarpackie	PKR	18	80,1672	7 217,33	129 532	129 469	313	0	0
21,372607	50,016362	Podkarpackie	PKR	18	70,1952	3 673,58	129 541	129 478	313	0	0
22,944164	49,969054	Podkarpackie	PKR	18	174,009	9 057,5	129 596	129 533	312	53 568,44	0
22,045688	49,993781	Podkarpackie	PKR	18	30,7011	3 047,16	129 737	129 674	311	0	8 425,62
21,629806	49,998542	Podkarpackie	PKR	18	109,608	7 543,18	129 758	129 695	311	0	30 080,83
21,192097	50,006707	Podkarpackie	PKR	18	216,775	11 294,1	129 804	129 741	313	0	0
22,245614	49,959853	Podkarpackie	PKR	18	755,158	35 272,94	129 926	129 863	313	0	0
21,335962	49,996932	Podkarpackie	PKR	18	77,7171	4 809,34	130 039	129 976	313	0	0
22,675838	49,962341	Podkarpackie	PKR	18	31,9743	2 964,87	130 101	130 038	311	0	8 775,04
21,436902	49,989866	Podkarpackie	PKR	18	38,1036	4 511,33	130 207	130 144	311	0	10 457,18
22,321933	49,966507	Podkarpackie	PKR	18	59,7549	4 656,9	130 218	130 155	311	0	16 399,18
22,698386	49,954450	Podkarpackie	PKR	18	106,125	6 634,13	130 234	130 171	313	0	0
21,788342	49,975453	Podkarpackie	PKR	18	100,201	6 041,15	130 240	130 177	311	0	27 499,1
22,523254	49,956319	Podkarpackie	PKR	18	74,027	4 948,15	130 316	130 253	313	0	0
21,876335	49,961336	Podkarpackie	PKR	18	55,7818	5 348,13	130 584	130 521	311	0	15 308,8
21,676414	49,966575	Podkarpackie	PKR	18	42,8865	2 750,9	130 653	130 590	312	13 202,54	0
22,291045	49,946095	Podkarpackie	PKR	18	94,2209	6 931,33	130 668	130 605	313	0	0
21,819696	49,960386	Podkarpackie	PKR	18	32,2459	3 024,92	130 673	130 610	313	0	0
22,125988	49,951061	Podkarpackie	PKR	18	55,8988	3 961,86	130 737	130 674	311	0	15 340,91
22,205179	49,944979	Podkarpackie	PKR	18	84,5175	6 133,12	130 749	130 686	312	26 018,55	0
22,151726	49,946335	Podkarpackie	PKR	18	25,9946	2 387,85	130 845	130 782	313	0	0
21,466624	49,956024	Podkarpackie	PKR	18	137,352	6 007,92	130 871	130 808	311	0	37 694,91
21,993692	49,927491	Podkarpackie	PKR	18	553,074	24 729,99	130 958	130 895	311	0	151 785,96
21,424768	49,950454	Podkarpackie	PKR	18	57,0105	3 666,1	131 046	130 983	311	0	15 646

Table 6.2. (Continuation 1).Part of the georeferenced database with the results of the spatial inventory of greenhouse gas emissions in the forestry sector (Subcarpathian voivodeship).

MISH_LIS_ZAPAS_M3	SUM_ZAPAS_LIS_M3	XV_SER_ZAPAS_NA_1ha	L_SER_ZAPAS_NA_1ha	MISH_SER_ZAPAS_NA_1ha	XV_SCHILN_049	L_SCHILN_047	VAL_ZAPAS_NA_1ha
0	11 250,38	307,84826	0,00000	0,00000	0,49	0,47	470,01
22 346,54	22 346,54	307,84826	0,00000	278,74911	0,49	0,47	432,708
19 566,84	19 566,84	307,84826	0,00000	278,74911	0,49	0,47	432,708
0	53 568,44	307,84826	0,00000	0,00000	0,49	0,47	470,01
0	8 425,62	307,84826	274,44072	0,00000	0,49	0,47	435,927
0	30 080,83	307,84826	274,44072	0,00000	0,49	0,47	435,927
60 425,92	60 425,92	307,84826	0,00000	278,74911	0,49	0,47	432,708
210 499,6	210 499,6	307,84826	0,00000	278,74911	0,49	0,47	432,708
21 663,56	21 663,56	307,84826	0,00000	278,74911	0,49	0,47	432,708
0	8 775,04	307,84826	274,44072	0,00000	0,49	0,47	435,927
0	10 457,18	307,84826	274,44072	0,00000	0,49	0,47	435,927
0	16 399,18	307,84826	274,44072	0,00000	0,49	0,47	435,927
29 582,35	29 582,35	307,84826	0,00000	278,74911	0,49	0,47	432,708
0	27 499,1	307,84826	274,44072	0,00000	0,49	0,47	435,927
20 634,95	20 634,95	307,84826	0,00000	278,74911	0,49	0,47	432,708
0	15 308,8	307,84826	274,44072	0,00000	0,49	0,47	435,927
0	13 202,54	307,84826	0,00000	0,00000	0,49	0,47	470,01
26 263,98	26 263,98	307,84826	0,00000	278,74911	0,49	0,47	432,708
8 988,51	8 988,51	307,84826	0,00000	278,74911	0,49	0,47	432,708
0	15 340,91	307,84826	274,44072	0,00000	0,49	0,47	435,927
0	26 018,55	307,84826	0,00000	0,00000	0,49	0,47	470,01
7 245,98	7 245,98	307,84826	0,00000	278,74911	0,49	0,47	432,708
0	37 694,91	307,84826	274,44072	0,00000	0,49	0,47	435,927
0	151 785,96	307,84826	274,44072	0,00000	0,49	0,47	435,927
0	15 646	307,84826	274,44072	0,00000	0,49	0,47	435,927

Table 6.2. (Continuation 2).Part of the georeferenced database with the results of the spatial inventory of greenhouse gas emissions in the forestry sector (Subcarpathian voivodeship).

VAL_ZAPAS_M3	ZAPAS_ABS_SUX_BIOM_T	ZAPAS_C_T	A5_Forest_hGg	Przyrost_M3_na_1ha	Roczny_wsrost_10_M3	Pozyskanie_10_M3	Pozyskanie_Z_1ha_10_M3	Martwe_drzewa_10_M3
17 176,6	8 276,69	4 138,34	-0,242287	7,00294	255,924	128,846	3,52567	129,644
34 689,02	18 156,12	9 078,06	-0,531492	6,49267	520,499	255,926	3,19241	284,394
30 374,02	15 897,66	7 948,83	-0,465379	6,49267	455,754	224,091	3,19241	249,018
81 786,03	39 409,28	19 704,64	-1,15364	7,00294	1 218,58	613,499	3,52567	617,299
13 383,41	6 953,12	3 476,56	-0,203541	5,83316	179,084	96,4954	3,14306	108,912
47 780,93	24 823,75	12 411,88	-0,726676	5,83316	639,36	344,504	3,14306	388,834
93 800,47	49 094,85	24 547,43	-1,43717	6,49267	1 407,45	692,035	3,19241	769,011
326 763,08	171 026,71	85 513,36	-5,00654	6,49267	4 902,99	2 410,77	3,19241	2 678,93
33 628,81	17 601,21	8 800,6	-0,515247	6,49267	504,591	248,104	3,19241	275,702
13 938,43	7 241,47	3 620,73	-0,211982	5,83316	186,511	100,497	3,14306	113,429
16 610,37	8 629,63	4 314,82	-0,252619	5,83316	222,264	119,762	3,14306	135,173
26 048,75	13 533,18	6 766,59	-0,396162	5,83316	348,56	187,814	3,14306	211,981
45 921,32	24 035,07	12 017,53	-0,703589	6,49267	689,037	338,795	3,19241	376,48
43 680,07	22 693,22	11 346,61	-0,664308	5,83316	584,486	314,937	3,14306	355,462
32 032,08	16 765,48	8 382,74	-0,490783	6,49267	480,632	236,324	3,19241	262,611
24 316,78	12 633,36	6 316,68	-0,369822	5,83316	325,384	175,326	3,14306	197,886
20 157,07	9 712,85	4 856,43	-0,284328	7,00294	300,332	151,204	3,52567	152,14
40 770,15	21 338,96	10 669,48	-0,624664	6,49267	611,745	300,791	3,19241	334,249
13 953,06	7 302,98	3 651,49	-0,213783	6,49267	209,362	102,942	3,19241	114,392
24 367,78	12 659,86	6 329,93	-0,370597	5,83316	326,067	175,694	3,14306	198,301
39 724,02	19 141,35	9 570,68	-0,560333	7,00294	591,871	297,98	3,52567	299,826
11 248,1	5 887,22	2 943,61	-0,172339	6,49267	168,775	82,9855	3,19241	92,2161
59 875,28	31 107,16	15 553,58	-0,910613	5,83316	801,195	431,705	3,14306	487,256
241 099,56	125 259,08	62 629,54	-3,66676	5,83316	3 226,17	1 738,35	3,14306	1 962,03
24 852,39	12 911,63	6 455,81	-0,377967	5,83316	332,551	179,188	3,14306	202,245

Table 6.2. (Continuation 3). Part of the georeferenced database with the results of the spatial inventory of greenhouse gas emissions in the forestry sector (Subcarpathian voivodeship).

Area_grunty_nielene_10_ha	Area_POZARY_10_ha	A5_Gains_C_Gg	A5_Converted_gains_C_Gg	A5_Losses_C_Gg	A5_Net_change_C_Gg	A5_Organic_matter_C_Gg	A5_Soils_C_Gg	A5_Net_Removals_CO2_Gg
0,001279	0,004405	0,0927932	0,00639744	-0,0469432	0,0458501	0,000778924	0,0225678	-0,253722
0,002806	0,009662	0,188723	0,0140337	-0,0932897	0,0954336	0,00170868	0,0495058	-0,53771
0,002457	0,008461	0,165248	0,0122881	-0,0816854	0,0835625	0,00149614	0,0433477	-0,470823
0,006091	0,020973	0,441833	0,0304613	-0,223519	0,218314	0,00370883	0,107456	-1,20809
0,001075	0,003700	0,0649326	0,00537439	-0,0351772	0,0297554	0,000654362	0,0189589	-0,181018
0,003837	0,013211	0,23182	0,0191874	-0,125588	0,106232	0,00233618	0,0676862	-0,646264
0,007588	0,026128	0,510315	0,0379477	-0,252259	0,258056	0,00462035	0,133866	-1,45399
0,026434	0,091018	1,77773	0,132195	-0,878769	0,898964	0,0160954	0,466334	-5,06511
0,002720	0,009367	0,182955	0,0136048	-0,0904385	0,0925168	0,00165646	0,0479927	-0,521275
0,001119	0,003854	0,0676254	0,00559727	-0,0366361	0,0309893	0,000681499	0,0197451	-0,188525
0,001334	0,004593	0,080589	0,00667025	-0,0436591	0,0369299	0,00081214	0,0235302	-0,224665
0,002092	0,007202	0,126381	0,0104604	-0,0684671	0,0579143	0,00127362	0,0369005	-0,352324
0,003715	0,012791	0,249832	0,0185778	-0,123497	0,126335	0,00226196	0,0655357	-0,71182
0,003508	0,012077	0,211924	0,0175407	-0,11481	0,0971141	0,00213567	0,061877	-0,590798
0,002591	0,008922	0,174268	0,0129588	-0,0861444	0,088124	0,00157781	0,045714	-0,496525
0,001953	0,006723	0,117978	0,00976492	-0,0639147	0,0540636	0,00118893	0,034447	-0,328898
0,001501	0,005169	0,108895	0,00750752	-0,0550887	0,053806	0,000914083	0,0264838	-0,297747
0,003298	0,011356	0,221807	0,0164939	-0,109644	0,112163	0,00200822	0,0581843	-0,631972
0,001129	0,003887	0,0759107	0,00564482	-0,0375242	0,0383865	0,000687289	0,0199128	-0,216284
0,001957	0,006737	0,118226	0,0097854	-0,0640488	0,054177	0,00119143	0,0345193	-0,329588
0,002959	0,010187	0,214601	0,0147953	-0,108565	0,106037	0,0018014	0,0521922	-0,586778
0,000910	0,003133	0,0611945	0,00455051	-0,0302497	0,0309448	0,00055405	0,0160525	-0,174355
0,004808	0,016555	0,290498	0,0240442	-0,157377	0,133121	0,00292752	0,084819	-0,809847
0,019360	0,066661	1,16975	0,0968187	-0,633711	0,536038	0,0117882	0,34154	-3,26101
0,001996	0,006871	0,120577	0,00998	-0,0653225	0,0552544	0,00121512	0,0352058	-0,336143

Table 6.3. Explanation of columns of the attribute table (LULUCF sector).

Column name	Explanation
CENTROID_X	elementary object ID (coordinate x)
CENTROID_Y	elementary object ID (coordinate y)
Wojewodstwo	name of the region
Woj_skrot	short name of the region
Woj_KOD	region ID
AREA	area of elementary object, (ha)
PERIMETER	perimeter of elementary object, (m)
CODE_00	code of the elementary object
XV_LIS_ZAPAS_M3	stock of biomass in coniferous forest, (m^3)
L_LIS_ZAPAS_M3	stock of biomass indeciduous forest, (m^3)
MISH_LIS_ZAPAS_M3	stock of biomass inmixedforest, (m^3)
SUM_ZAPAS_LIS_M3	totalstock of biomass in all forest, (m^3)
XV_SER_ZAPAS_NA_1GA	averagestock of biomass of coniferous foreston1ha, (m^3/ha)
L_SER_ZAPAS_NA_1GA	averagestockdeciduous foreston1ha, (m^3/ha)
MISH_SER_ZAPAS_NA_1GA	averagestockmixedforest on1ha, (m^3/ha)
XV_SCHILN_049	density ofsoftwood
L_SCHILN_047	density of hardwood
VAL_ZAPAS_NA_1GA	grossmargin (stock) for1ha, (m^3/ha)
VAL_ZAPAS_M3	grossstock, (m^3)
ZAPAS_ABS_SUX_BIOM_T	stock of completelydryphytomass, (T)
ZAPAS_C_T	carbonstock, (T)
A5_Forest_hGg	flowof carbon in theforestsector, (Gg)
Pzyrost_M3_na_1ha	phytomassincrementof 1ha, (m^3/ha)
Roczny_wsrost_10_M3	annual growth, (m^3)
Pozyskanie_10_M3	woodremoved, (m^3)
Pozyskanie_Z_1ha_10_M3	woodremovedfrom 1 ha, (m^3/ha)
Mertwe_drzewa_10_M3	deadwood, (m^3)
Area_grunty_nielene_10_ha	removedforestarea, (ha)
Area_POZARY_10_ha	forestareadestroyed by fire, (ha)
A5_Gains_C_Gg	gains carbon, (Gg)
A5_Converted_gains_C_Gg	convertedgains carbon, (Gg)
A5_Losses_C_Gg	losses carbon, (Gg)
A5_Net_change_C_Gg	net change, (Gg C)
A5_Organic_matter_C_Gg	carbon stock change in dead organic matter, (GgC)
A5_Soils_C_Gg	carbon stock change in soils, (GgC)
A5_Net_Removals_CO2_Gg	net CO_2 emissions/ removals, (Gg)

Table 6.4. Main indicators of phytomass, and forest carbon deposited in Subcarpathian voivodeship (2010).

Index	Value	Data unit
Area	17846,66	km^2
Forest	37,2	%
The area covered by forest	663797	ha
The area covered by coniferous forest	374240	ha
The area covered by deciduous forest	289557	ha
Gross industrial wood	194,68	million m^3
The gross volume of business softwood	115,21	million m^3
The gross volume of business hardwood	79,47	million m^3
Number of separate areas of forest in a digital map	2510	units.
The average stock of biomass per 1 hectare of forest	455,14	m^3/ha
The average stock of biomass of coniferous forests per 1 hectare	473,80	m^3/ha
The average stock of biomass of deciduous forests per 1 hectare	435,93	m^3/ha
Average stock of deposited carbonper 1 hectare of forest	115,35	t / ha
Average stock of deposited carbon per 1 hectare of coniferous forests	100,76	t / ha
Average stock of deposited carbon per 1 hectare of deciduous forests	134,22	t / ha
Gross stock of forest biomass	302,12	million m^3
Stock in absolutely dry biomass	153,14	million tons
Stock of deposited carbon in forest biomass	76,57	million tons

Table 6.5. Stock of carbon in the forests of Poland (2010).

Regions	Total forest area, ha	Average stock completely dry phytomass,t/ha	Stock absolute dry phytomass, t	Stock of accumulated carbon, C, T
Dolnośląskie	563911,07	216,713650	122207226,26	61103613,13
Kujawsko-pomorskie	419032,57	179,971551	75413941,49	37706970,74
Lubelskie	580028,24	190,166887	110302164,48	55151082,24
Lubuskie	700372,30	179,633868	125810585,12	62905292,56
Łódzkie	383745,63	177,054307	67943816,73	33971908,36
Małopolskie	442148,33	217,565024	96196011,81	48098005,91
Mazowieckie	812373,16	168,292254	136716110,13	68358055,06
Opolskie	231529,68	214,088102	49567749,78	24783874,89
Podkarpackie	676188,49	226,478076	153141868,10	76570934,05
Podlaskie	621938,71	190,636840	118564430,28	59282215,14
Pomorskie	675710,15	191,029705	129080710,83	64540355,41
Śląskie	379496,94	205,836499	78114321,51	39057160,76
Świętokrzyskie	325482,98	178,244388	58015514,50	29007757,25
Warmińsko-mazurskie	735178,5000	202,835581	149120358,28	74560179,14
Wielkopolskie	765052,4500	179,917453	137646288,44	68823144,22
Zachodniopomorskie	846698,1600	196,761047	166597216,66	83298608,33
Total:	9158887,36		1774438314,40	887219157,20

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