REFLECTING ENVIRONMENTAL LAND USE NEEDS INTO EU POLICY: PRESERVING AND ENHANCING THE ENVIRONMENTAL BENEFITS OF "LAND SERVICES": SOIL SEALING, BIODIVERSITY CORRIDORS, INTENSIFICATION / MARGINALISATION OF LAND USE AND PERMANENT GRASSLAND

Reference: ENV.B.1/ETU/2008/0030

TECHNICAL ANNEXES TO FINAL REPORT

31st January 2010

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REFLECTING ENVIRONMENTAL LAND USE NEEDS INTO EU POLICY: PRESERVING AND ENHANCING THE ENVIRONMENTAL BENEFITS OF "LAND SERVICES": SOIL SEALING, BIODIVERSITY CORRIDORS, INTENSIFICATION / MARGINALISATION OF LAND USE AND THE PERMANENT GRASSLAND

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TECHNICAL ANNEXES TO FINAL REPORT

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ANNEX 1. LAND COVER DATA AND ANALYTICAL METHODS

ANNEX 1.1. LAND COVER/USE AGGREGATED INTO CLC LEVEL 1 FOR THE HISLU60, CLC1990 AND CLC2000 DATASETS, AT NUTS0 LEVEL

Annex 1.1a Land cover for EU 27 at NUTS0 for the year 1960 (km^2) based on HISLU1960.

Key: artificial surfaces (1), agricultural areas (2), forest and semi-natural areas (3), wetlands (4) and water bodies (5)

NUTS0/HISLU1960	0	1	2	3	4	5	6	7	Total
AT	0	21336	26620	28072	6930	360	611	0	83929
BE	7	12814	9873	6931	266	0	749	24	30664
BG	25	60139	8153	39103	1537	825	973	43	110797
CY	18	5368	1971	1523	96	26	56	191	9247
CZ	0	37216	10060	26547	3889	154	999	0	78865
DE	30	173725	72875	95678	2065	1982	10093	1230	357678
DK	111	30277	4077	4824	667	323	745	2337	43360
EE	33	597	27103	9081	4872	1752	136	1756	45330
ES	143	230665	130654	118319	15304	1429	997	1028	498539
FI	440	26791	917	212501	52481	40634	130	3905	337798
FR	77	236413	184705	114899	5969	1185	4343	1578	549169
GR	386	45211	52622	20127	8314	822	401	4136	132020
HU	0	54964	18101	13261	3576	1486	1628	0	93015
IE	123	13784	44634	1323	7043	1210	334	1726	70177
IT	338	156427	73622	56957	8463	2134	1611	1873	301424
LT	1	1583	51173	9968	1566	194	236	172	64892
LU	0	948	545	878	148	0	77	0	2596
LV	7	1317	36556	20342	5178	419	296	488	64603
MT	8	101	47	0	97	0	2	60	316
NL	15	12887	14367	3094	1563	400	1425	3605	37357
PL	4	161613	57544	86410	2599	1219	2264	241	311894
PT	22	51124	1217	26703	9054	61	259	628	89068
RO	3	114066	45879	61474	10373	2882	2588	676	237942
SE	637	40395	7981	228348	123442	41910	2647	4085	449446
SI	1	3766	5597	9571	1283	0	41	15	20275
SK	0	19787	8779	18244	1855	54	307	0	49026
UK	587	79950	116113	15174	15264	1242	10729	5661	244720
Total	3015	1593264	1011787	1229351	293889	102703	44678	35458	4314147

Annex 1.1b. Land cover at CLC level 1 for EU 27 at NUTS0 for the year 1990 (km^2) based on CLC1990.

Key: artificial surfaces (1), agricultural areas (2), forest and semi-natural areas (3), wetlands (4) and water bodies (5)

NUTS0/CLC1990	0	1	2	3	4	5	Total
AT	0	3401	27547	52055	254	672	83929
BE	7	6063	17835	6476	96	187	30664
BG	25	5367	57308	47080	106	911	110797
CY	9247	0	0	0	0	0	9247
CZ	0	4758	45659	27819	90	539	78865
DE	31	27369	216020	108764	1563	3931	357678
DK	115	2951	33396	5393	809	697	43360
EE	33	893	14778	25565	1965	2097	45330
ES	296	6616	253931	241413	1050	2679	505984
FI	337798	0	0	0	0	0	337798
FR	78	25334	330042	187983	1693	4040	549169
GR	399	2468	52967	74426	596	1164	132020
HU	0	5210	63536	21536	1038	1695	93015
IE	123	1013	47565	7169	12696	1612	70177
IT	335	13399	157812	126104	681	3093	301424
LT	2	2135	40034	20898	570	1253	64892
LU	0	209	1439	937	0	10	2596
LV	7	849	28355	32632	1558	1202	64603
MT	316	0	0	0	0	0	316
NL	19	3696	26189	3845	502	3106	37357
PL	4	10260	201132	94928	1170	4400	311894
PT	3141	1696	43467	42759	283	842	92187
RO	6	14836	134956	80590	3791	3763	237942
SE	449446	0	0	0	0	0	449446
SI	1	541	7082	12538	31	81	20275
SK	0	2762	24597	21376	59	231	49026
UK	244294	7	279	36	83	21	244720
Total	1045721	141832	1825926	1242321	30684	38226	4324711

Annex 1.1c. Land cover areas at CLC level 1 for EU 27 at NUTS0 for the year 2000 (km^2) based on CLC2000.

Key: artificial surfaces (1), agricultural areas (2), forest and semi-natural areas (3), wetlands (4) and water bodies (5)

NUTS0/CLC2000	0	1	2	3	4	5	Total
AT	0	3507	27433	52057	254	678	83929
BE	7	6241	17656	6468	95	196	30664
BG	25	5397	57274	47080	109	911	110797
CY	18	688	4421	4087	20	14	9247
CZ	0	4808	45563	27849	90	556	78865
DE	31	28957	213958	109064	1547	4121	357678
DK	111	3079	33188	5459	822	702	43360
EE	33	912	14764	25554	1972	2097	45330
ES	294	8303	254249	239021	1069	3048	505984
FI	414	4668	29392	249282	22512	31530	337798
FR	78	26561	329011	187666	1687	4166	549169
GR	401	2850	52816	74202	597	1154	132020
HU	0	5288	63097	21853	1048	1728	93015
IE	123	1332	47127	8319	11675	1600	70177
IT	337	14222	156379	126703	681	3102	301424
LT	2	2140	40028	20895	570	1255	64892
LU	0	226	1423	936	0	10	2596
LV	7	850	28354	32632	1556	1204	64603
MT	8	87	152	68	0	0	316
NL	19	4529	25158	3978	530	3143	37357
PL	4	10409	200812	95084	1104	4481	311894
PT	3141	2393	42660	42814	282	896	92187
RO	6	14900	134913	80576	3783	3764	237942
SE	615	6001	39383	337180	28793	37474	449446
SI	1	543	7082	12537	32	80	20275
SK	0	2765	24369	21553	45	294	49026
UK	586	18096	143156	74722	5848	2313	244720
Total	6259	179755	2033819	1907639	86720	110519	4324711

ANNEX 1.2. AREAS (KM^2) OF 31 LAND COVER/USE CLASSES AS DEFINED IN ANNEX 1 FOR EU 27 AT NUTS0 FOR THE YEARS 1990 AND 2000

Key for CLC 31 Classes (see Table 3.1)

Code	Description	Code	Description	Code	Description
1	Continuous urban fabric	12	Non-irrigated arable land	22	Natural grasslands
2	Discontinuous urban fabric	13	Permanently irrigated land	23	Moors and heath lands
3	Industrial and commercial units	14	Rice fields	24	Sclerophyllous vegetation
4	Road and rail networks and associated land	15	Vineyards, fruit trees and berry plantation and olive groves	25	Transitional woodland-scrub
5	Port areas	16	Pastures	26	Beaches, sand, dunes, bare rocks, sparsely vegetated areas, burnt areas and glaciers and perpetual snow.
6	Airports	17	Annual cops associated with permanent crops, complex cultivation patterns, and land principally occupied by agriculture with significant natural vegetation	27	Inland marshes
7	Mineral extraction sites	18	Agro-forestry areas	28	Peat bogs
8	Dump sites	19	Broad-leaved forest	29	Salt marshes, salines, intertidal flats
9	Construction sites	20	Coniferous forest	30	Water courses and water bodies
10	Green urban areas	21	Mixed forest	31	Coastal lagoons, estuaries, sea and ocean
11	Port and leisure facilities				

Annex 1.2a. Areas (km^2) of 31 land cover/use classes as defined in Annex 1 for EU 27 at NUTS0 for the year 1990.

NUTS0 / CLC1990	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total classes 0-18
AT	0	72	3060	96	23	1	31	61	3	11	24	18	11063	0	0	703	8266	7515	0	30,948
BE	7	48	5053	404	93	52	56	76	14	32	44	190	6756	0	0	76	3609	7394	0	23,905
BG	25	10	4073	761	41	4	36	272	42	3	45	78	38809	0	235	2241	4150	11874	0	62,700
CY	9247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9,247
CZ	0	15	3577	521	48	1	56	181	154	21	65	117	35535	0	0	440	2529	7155	0	50,417
DE	31	231	21260	2490	165	110	467	1198	173	73	423	779	139455	0	0	2779	44340	29445	0	243,420
DK	115	62	1874	223	8	28	70	36	2	1	112	535	28145	0	0	4	563	4685	0	36,462
EE	33	4	493	187	33	8	24	69	36	1	24	14	6627	0	0	20	2789	5341	0	15,703
ES	296	2510	2294	765	39	44	145	460	61	165	45	89	103700	20309	997	33558	6591	64886	23890	260,842
FI	337798	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	337,798
FR	78	468	19254	2746	262	91	432	750	85	144	198	905	153345	22	352	14295	88074	73950	4	355,454
GR	399	166	1580	287	19	8	83	175	2	65	11	73	15636	6138	245	8225	735	21989	0	55,834
HU	0	32	4125	471	35	4	60	59	51	9	56	308	49578	0	148	2151	6809	4849	0	68,746
IE	123	50	701	38	3	7	21	55	3	10	35	92	4023	0	0	0	38125	5418	0	48,701
IT	335	1454	8816	1929	125	80	204	430	18	66	103	175	80567	407	2763	21862	4552	45784	1876	171,546
LT	2	2	1471	374	60	4	29	60	9	25	75	25	21829	0	0	100	4889	13216	0	42,171
LU	0	7	165	18	3	0	3	2	6	0	2	1	223	0	0	16	306	894	0	1,648
LV	7	8	518	150	22	6	18	34	3	1	82	7	9097	0	0	36	9332	9890	0	29,211
MT	316	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	316
NL	19	0	2541	383	52	102	62	13	3	133	102	306	7924	0	0	73	11383	6809	0	29,904
PL	4	83	7714	983	112	27	216	316	140	66	275	328	139860	0	0	904	27689	32679	0	211,396
PT	3141	120	1218	156	5	14	38	64	3	21	13	43	11642	1232	558	5794	531	18028	5682	48,304
RO	6	107	12840	1354	67	17	28	211	71	18	64	58	81049	3	351	8059	25338	20154	2	149,797
SE	449446	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	449,446
SI	1	2	417	65	13	2	7	12	3	5	3	12	1126	1	0	194	1161	4600	0	7,624
SK	0	10	2226	275	16	3	24	33	16	52	12	96	16741	0	0	408	3188	4259	0	27,359
UK	244294	0	5	0	0	0	0	0	0	0	0	0	7	0	0	0	209	63	0	244,580
Total	1045721	5461	105276	14677	1243	613	2110	4566	899	921	1814	4251	962737	28112	5649	101937	295157	400880	31454	3,013,479

NUTS0 / CLC1990	19	20	21	22	23	24	25	26	27	28	29	30	31	Total classes 19-31	Total
AT	3442	21400	12739	5439	2741	0	74	6220	221	33	0	672	0	52981	8,3929
BE	2017	1403	2633	10	175	0	227	11	42	48	6	147	40	6759	30,664
BG	23274	5436	6095	3970	323	0	7414	567	88	13	5	911	0	48097	110,797
CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9,247
CZ	2500	16547	5855	404	25	0	2484	3	53	38	0	539	0	28448	78,865
DE	23955	56667	23480	1962	569	0	1435	695	491	901	171	3696	235	114258	357,678
DK	726	1990	1383	265	483	0	468	77	294	258	256	367	331	6899	43,360
EE	4343	8446	8542	387	155	0	3621	70	737	1224	4	2086	11	29627	45,330
ES	37808	40394	14518	27006	9578	55069	44438	12602	542	8	500	2501	178	245142	505,984
FI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	337,798
FR	88861	37173	18842	13513	4570	4793	10734	9496	726	47	920	3149	891	193715	549,169
GR	12433	7762	4111	12065	527	23475	11680	2373	239	0	357	1089	75	76186	132,020
HU	14337	974	1519	2257	0	0	2426	24	913	125	0	1695	0	24268	93,015
IE	305	2487	232	934	591	0	2140	480	184	12373	138	1314	297	21476	70,177
IT	54666	13207	10294	14494	2754	9574	10101	11013	158	0	522	2172	921	129878	301,424
LT	4185	7517	7498	9	36	0	1621	32	182	388	0	1247	6	22721	64,892
LU	642	127	162	2	0	0	5	0	0	0	0	10	0	948	2,596
LV	5785	9871	12674	64	0	0	4197	41	248	1310	0	1202	0	35392	64,603
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	316
NL	499	1627	936	260	375	0	6	141	296	76	130	3101	5	7453	37,357
PL	14688	55450	22120	453	40	0	1833	345	1079	91	0	4395	5	100498	311,894
PT	11500	7764	5471	1948	3698	2267	8331	1780	9	0	273	495	347	43883	92,187
RO	48118	11545	9976	3472	730	0	6278	472	3774	10	8	3221	542	88144	237,942
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	449,446
SI	4430	2483	4471	209	226	0	431	288	25	0	6	81	0	12651	20,275
SK	10414	5367	3548	321	136	0	1472	119	57	2	0	231	0	21667	49,026
UK	1	11	3	1	1	0	19	0	1	83	0	21	0	140	244,720
Total	368928	315648	177103	89445	27734	95178	121436	46849	10361	17026	3297	34343	3883	1311232	4,324,711

Annex 1.2a. Areas (km^2) of 31 land cover/use classes as defined in Annex 1 for EU 27 at NUTS0 for the year 2000.

NUTS0 / CLC2000	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total classes 0-18
AT	0	72	3093	111	26	1	35	76	4	3	23	64	10991	0	0	702	8241	7500	0	30,940
BE	7	48	5108	503	109	61	57	85	14	16	43	197	6717	0	0	83	3555	7301	0	23,904
BG	25	10	4075	763	41	4	36	300	42	3	45	78	39054	0	89	2114	4126	11890	0	62,697
CY	18	6	436	118	3	3	25	29	3	18	11	38	2443	193	0	353	9	1424	0	5,127
CZ	0	15	3623	548	53	1	57	172	139	9	66	127	32615	0	0	446	5319	7182	0	50,371
DE	31	231	22212	3068	173	110	474	1045	178	74	426	966	136762	0	0	2522	45351	29323	0	242,946
DK	111	62	1913	253	9	29	70	52	3	3	112	574	27938	0	0	4	568	4679	0	36,378
EE	33	4	507	188	33	8	24	71	37	2	24	14	6635	0	0	20	2577	5531	0	15,708
ES	294	2694	2834	1205	74	47	154	645	70	318	60	203	100019	22417	1338	34665	6507	64816	24486	262,846
FI	414	0	3572	521	17	21	77	209	21	9	67	154	16058	0	0	0	40	13294	0	34,474
FR	78	468	19789	3121	368	95	439	851	76	145	198	1011	153465	22	356	14260	87366	73539	4	355,651
GR	401	166	1636	356	97	8	97	272	5	124	11	78	15354	6306	285	8199	700	21973	0	56,066
HU	0	32	4140	498	48	4	61	69	52	12	56	317	49487	0	118	2025	6623	4844	0	68,386
IE	123	50	863	60	20	7	22	82	3	28	37	160	5436	0	0	0	36295	5396	0	48,582
IT	337	1458	9314	2170	135	80	205	471	20	74	103	192	79891	406	2800	21772	4476	45236	1798	170,938
LT	2	2	1479	376	60	4	29	62	9	18	75	25	22221	0	0	98	4262	13447	0	42,170
LU	0	7	175	21	4	0	4	3	7	0	2	3	220	0	0	15	303	886	0	1,650
LV	7	8	518	150	22	6	18	35	3	1	82	7	9151	0	0	32	9281	9890	0	29,212
MT	8	3	65	6	0	2	4	4	0	0	2	2	1	1	0	1	0	149	0	247
NL	19	0	2982	618	57	124	61	24	7	132	112	411	7725	0	0	78	10717	6639	0	29,706
PL	4	83	7796	1013	119	27	217	373	125	54	273	329	139702	0	0	896	27525	32688	0	211,225
PT	3141	139	1612	289	23	16	42	130	5	44	14	79	10924	1946	534	6034	378	17246	5598	48,194
RO	6	107	12872	1370	67	18	28	231	71	14	65	58	81424	3	77	7812	25274	20320	2	149,819
SE	615	45	4008	618	223	16	143	101	68	4	339	435	30035	0	0	18	2570	6760	0	45,999
SI	1	2	417	66	18	2	7	12	3	2	3	12	1124	1	0	194	1162	4601	0	7,626
SK	0	10	2256	284	18	3	24	35	15	9	11	99	16680	0	0	359	2994	4336	0	27,134
UK	586	286	12203	1410	77	116	449	544	70	49	578	2312	60809	0	0	176	67314	14857	0	161,838
Total	6259	6008	129496	19704	1895	813	2857	5980	1050	1166	2838	7948	1062881	31295	5600	102876	363534	435745	31888	2,219,833

NUTS0 / CLC2000	19	20	21	22	23	24	25	26	27	28	29	30	31	Total classes 19-31	Total
AT	3441	21409	12728	5440	2741	0	81	6218	221	33	0	678	0	52989	83,929
BE	2035	1419	2663	9	169	0	163	11	41	48	6	156	41	6760	30,664
BG	23358	5396	6136	3907	323	1	7407	552	91	13	5	911	0	48100	110,797
CY	8	1552	4	320	0	1602	284	318	0	0	20	14	0	4120	9,247
CZ	2533	16986	6040	392	26	0	1870	2	53	37	0	556	0	28494	78,865
DE	24006	56304	23626	1750	562	0	2096	720	490	884	173	3887	234	114732	357,678
DK	719	1798	1326	268	496	0	773	79	308	258	256	371	331	6982	43,360
EE	4330	8240	8360	382	154	0	4011	75	736	1232	4	2086	11	29622	45,330
ES	38002	39849	15012	26167	9322	53476	44700	12493	551	8	510	2870	178	243138	505,984
FI	7432	99936	88625	35	4175	0	47943	1137	255	22209	47	31503	27	303324	337,798
FR	88973	37171	18916	13440	4525	4840	10498	9302	722	47	918	3275	891	193518	549,169
GR	12360	7294	4085	11937	528	23236	12353	2408	245	0	352	1081	73	75953	132,020
HU	14811	1003	1569	2238	0	0	2209	23	924	124	0	1728	0	24629	93,015
IE	304	2406	221	925	584	0	3400	479	179	11358	138	1303	298	21595	70,177
IT	55264	13354	10385	14194	2752	10047	9648	11059	159	0	522	2183	918	130486	301,424
LT	4147	7271	7216	9	36	0	2186	32	182	388	0	1250	6	22721	64,892
LU	634	119	156	2	0	0	25	0	0	0	0	10	0	946	2,596
LV	5635	9443	11966	64	0	0	5482	41	248	1307	0	1204	0	35391	64,603
MT	0	1	2	0	0	56	2	8	0	0	0	0	0	69	316
NL	584	1617	943	322	376	0	15	120	338	78	114	3137	6	7651	37,357
PL	14698	55071	22169	477	42	0	2335	292	1015	89	0	4477	5	100670	311,894
PT	12211	6912	5252	1853	3364	1954	9633	1636	10	0	272	550	346	43992	92,187
RO	48591	11235	10029	3460	730	0	6062	469	3766	10	8	3223	542	88123	237,942
SE	19878	216399	16360	1930	27726	0	44034	10854	595	28185	13	37395	79	403447	449,446
SI	4424	2483	4470	209	226	0	441	283	26	0	6	80	0	12649	20,275
SK	10649	5050	3619	312	136	0	1673	114	42	2	0	294	0	21892	49,026
UK	6627	12679	510	19617	29144	0	1910	4235	179	5141	528	2198	116	82883	244,720
Total	405655	642400	282384	109658	88136	95212	221235	62959	11376	71452	3892	106420	4099	2104877	4,324,711

ANNEX 1.3. OVERVIEW OF ALL MODEL ASSUMPTIONS FOR THE REFERENCE SCENARIO (BASED ON WUR/MNP, 2008)

The storylines of the scenario are translated in simulation model settings. These settings mostly correspond with the driving factors of land use change. However, in some cases the driving factors can only be represented by proximate factors. This may be due to the lack of appropriate data to represent such as driver or due to the structural characteristics of the models used. Each model is a simplification of reality and therefore ignores or simplifies a number of processes that are, under the assumptions of the model, are having a relatively small influence on the system dynamics. In the table below the model settings are described ordered by main themes/drivers relevant to the scenario. In the table it is indicated for which of the three models used (GTAP/IMAGE/Dyna-CLUE) these assumptions are important and how these are specified in time. Temporal dynamics are important because not all settings for the scenario are directly implemented in the first year, which would give unrealistic dynamics to the system. Therefore, a number of the scenario settings are implemented in 2010 or 2020 instead. All simulations were started in 2000 as result of the most recent land cover data available (CLC2000).

A number of scenario settings are uniform for the whole European territory while others are spatially distinct and aimed at specific regions. An example of such a spatially diverse policy is the Less Favoured Areas scheme in which, in specific areas support is provided to farmers to keep farming practices. Below the table maps of the spatially explicit settings are provided delineating the areas where these settings apply.

Global Co-operation Entity	Models	Options	2010	2020	2030
EU-enlargement and trade arrangements (WTO)					
Countries in EU	GTAP/IMAGE/CLUE		EU25+Romenia + Bulgaria + Turkey	no further accession	-
Trade arrangements		**yes**			
EU - Turkey	GTAP	**yes**	Turkey enters EU	-	-
EU - Former Soviet Union	GTAP	**yes**	elimination of bilateral tariffs in manufacturing	no further arrangements	-
EU - USA	GTAP	**yes**	no specific arrangements	-	-
EU - Latin America and Carribean, Middle East, Africa	GTAP	**yes**	no specific arrangements	-	-
Trade / WTO		**yes**			
Export subsidies	GTAP	**yes**	25% reduction	50% reduction as compared to 2010	abolished for all sectors
Import tariffs	GTAP	**yes**	25% reduction	50% reduction as compared to 2010	abolished for all sectors
Non-tariff barriers for agricultural products (SPS, TBT…) between trade blocks (see footnote *)	GTAP	**yes**	situation 2001	global SPS and TBT leads to 1% cost price increase for agricultural products in developing countries	2,5% cost price increase (as compared to 2010) for agricultural products in developing countries
Domestic support in agriculture		**yes**			
Intervention prices	GTAP	**yes**	maintained at post MTR CAP reform levels	safety net just below average world market price levels	abolished
Production quota (milk)	GTAP	**yes**	level as decided for 2003 MTR CAP reform and agreed with Acceeding Countries	abolished	-
Production quota (sugar)	GTAP	**yes**	as decided in the 2003 reform	abolished	-
Coupled payments	GTAP	**yes**	full incorporation in decoupled single farm payment scheme	-	-
Decoupled payments (single farm payment scheme; partial, full, regional implementation)	GTAP	**yes**	EU: implementation of 2003 CAP reform, 2010: same decoupling in all scenarios	reduction by 25% as compared to 2010	reduction by 50% as compared to 2010
Rural development funds (2nd CAP pillar)	Downscaling		Downscaling and added to agricultural income	same as 2010	same as 2010
Compulsory set-aside of arable land (excl. organic farms)	GTAP/IMAGE/CLUE	**yes**	Never introduced in EU10; gradually abolished in EU15 from current level to 0% between 2018 and 2022 (equal change per year); 50% of area in set-aside is released as available area for arable land.	same as 2010	same as 2010
% of set-aside land used for biofuel cultivation			5%	15%	20%
Demography	GTAP/IMAGE				
Global population					
Population EU-25, including distribution within countries			Distribution based on EUROSTAT projections HIGH variant	Distribution based on EUROSTAT projections HIGH variant	Distribution based on EUROSTAT projections HIGH variant
Distribution of population within NUTS2 regions (increase/decrease)(dense: > 500 inh/km2; intermediate: 60-500 inh/km2; thin <60 inh/km2) (average of circle with radius 3 km)			Increase in population is spread in both the dense and intermediately populated areas. Decreases in population take place in the thinly populated areas.	Increase in population is spread in both the dense and intermediately populated areas. Decreases in population take place in the thinly populated areas.	Increase in population is spread in both the dense and intermediately populated areas. Decreases in population take place in the thinly populated areas.

Global Co-operation Entity	Models	Options	2010	2020	2030
Macro-economic growth	GTAP/IMAGE				
Global / global region			numbers from CPB study adjusted for individual EU25 countries based on EU-study (EPC projection of age-related expenditure)	same as 2010	same as 2010
EU-25: per country			numbers from CPB study adjusted for individual EU25 countries based on EU-study (EPC projection of age-related expenditure)	same as 2010	same as 2010
Agro-technology (including introduction of GMO's)					
Effects on productivity growth (irt FAO projection)**	GTAP/IMAGE				
EU25			0%	0%	0%
(CEEC)+baltic			5%	5%	5%
Turkey			0%	0%	0%
Consumer behaviour					
Preference for products from own IMAGE region	GTAP		no specific arrangements	-	-
Consumption of animal protein from meat	GTAP		endogenous GTAP outcome	5% lower than endogenous outcome	10% lower than endogenous outcome
Change in built-up area per person per year (including all built-up area: residential/services/recreation/industry/infrastructure)	CLUE		+0.5 m2 per person per year due to the effect of strong economic growth but restrictive spatial planning policies (compact urbanization; about half of the average value of the trend during 1990-2000 over all EU countries)	same as 2010	same as 2010

Global Co-operation Entity	Models	Options	2010	2020	2030
EU and national policies					
Nature development (EU)					
Area (EU)	GTAP/IMAGE/CLUE		Area nature is determined by interplay of change in agriculture/built-up area and natural succession, mimimal area determined by protected areas	same as 2010	same as 2010
Protected areas	CLUE		Forest, semi-natural, recently abandoned > all other uses not allowed in Natura 2000 locations (except succession); Other restrictions in Natura 2000 areas: Agricultural uses > urban: not allowed; Arable > grass: allowed; Grass > arable: not allowed; Arable & grass > permanent not allowed; Permanent > grass & arable: not allowed; Agriculture > recently abandoned: allowed, but incentives to prevent this by compensation to farmers (agri-env schemes)	same as 2010	same as 2010
Policy measures to control fragmentation	CLUE		Incentives aimed at limiting fragmentation of natural areas	same as 2010	same as 2010
Efforts to establish ecological corridors at national and international level			Yes: Farming conditions are not favourable in ecological corridor areas due to restrictions, so, all agricultural land use types in these corridors face a decrease in suitability	yes	yes
Agro-biodiversity	CLUE		Incentives (agri-env schemes) to prevent abandonment of agriculture within NATURA2000 area by compensation of farmers (see 8.1b)	agricultural areas within (proposed) Natura 2000 network either remain under extensive agriculture or are used for nature development. Main grassland areas in LFA's are incorporated in Natura 2000 network (extensive pastures).	same as 2020
Local patches of (semi-)natural areas	CLUE		Strong protection of local patches; but in case of strong competition and in main agricultural regions some patches may disappear	same as 2010	same as 2010
Less favoured areas		**yes**			
Area (classification criteria)	CLUE	yes	LFA maintained at current level; also implemented for EU10+2; Except for arable agriculture in locations with high erosion risk	-	-
Incentives/compensation for farmers	CLUE	yes	abolished	same as 2010	same as 2010

Global Co-operation Entity	Models	Options	2010	2020	2030
Land policies					
Shifts in permanent pasture area	CLUE		Incentives to prevent the conversion of permanent pasture to arable land. Implemented through a decrease in suitability for arable land on land currently assigned to pasture	same as 2010	same as 2010
Shifts in arable cropping patterns	CLUE		Tendency to concentrate pasture/arable crops preferably in most productive areas	same as 2010	same as 2010
Effects of active nature restoration on succession			Within NATURA2000 sites is, due to favourable management/reforestation the succession time of recently ab>seminat & semi-nat>forest reduced by 4 years		
Effect population on succession	CLUE		Moderate pressure in densely populated areas due to recreational uses/hobby farming etc. Conversion of recently abandoned to semi-natural takes longer (years added to 'natural' succession time per population pressure class 1: 100 years (no succession) 2: 20 years 3: 10 years 4: 2 years 5: 0 years Due to grazing it is assumed that succession is retarded by 5 to 10 years depending on livestock density in neighborhood. If the mean density of land-based systems in the neighborhood (circle radius 3 km) exceeds 75 LSU/km2 it is assumed that succession (both stages) is retarded by 10 years; if livestock density is between 30 LSU/km2 it is assumed that succession (both stages) is retarded by 5 years. Succession in Natura 2000 locations and the surrounding 2 km is not retarded.	same as 2010	same as 2010
Erosion risk	CLUE		Conversion to arable land is not allowed in erosion sensitive areas; incentives are provided to abandon arable land in erosion sensitive areas or convert to grassland/permanent crops.	same as 2010	same as 2010

Global Co-operation Entity	Models	Options	2010	2020	2030
Energy crops		**yes**			
Crops for biofuels (sugarbeet, potatoes, coleseed), coppice, firewood:	GTAP/IMAGE/CLUE	**yes**	output IMAGE	output IMAGE	output IMAGE
Crop residues / manure (ethanol, methane…)	?	**yes**	10%; reuse of crop residues and manure is stimulated by policy and government research.	30%	60%
Proportion of bio-energy in energy consumption	GTAP/IMAGE/CLUE	**yes**	52 Mton	52 Mton	52 Mton
Proportion of bio-fuels in transport fuel consumption	GTAP/IMAGE/CLUE	**yes**	5,75%	5,75%	5,75%
Import restrictions / tariffs for bio-fuels	GTAP/IMAGE	**yes**	no restrictions	same as 2010	same as 2010
Environmental legislation, public health, animal welfare etc. (incl. cross-compliance, good agricultural practices)	GTAP/IMAGE/CLUE		strong: minimization of environmental hazards	no further arrangements	-
Land conversion policy					
Large cities	CLUE		growth restricted to designated areas	same as 2010	same as 2010
Provincial towns	CLUE		designated areas adapted to demand	same as 2010	same as 2010
Small villages	CLUE		growth (if any) restricted to designated areas;	same as 2010	same as 2010
Focus of growth	CLUE		Restrictions in urban spatial planning resulting in compact urban growth; growth both in large cities and provincial towns	same as 2010	same as 2010
Nature and urbanization	CLUE		Semi-natural and forest may not change into residential uses	same as 2010	same as 2010

* Regional blocks:
1 Netherlands / Rest of EU15 / CEEC / Baltic countries / Rest of Europe;
2 Canada / USA / Central America / South America;
3 Oceania;
4 Japan;
5 East Asia / South-east Asia;
6 South Asia;
7 Former Soviet Union;
8 Middle Arfica / South Africa
9 Turkey / Middle East / North Africa;
10 Rest of World.

** Effects on productivity growth are the resultant of a combination of environmental constraints and technology development.

Notes on key assumptions

Policies measures to control fragmentation. These are various measures organized at different levels of administration with variations between Member States and land holders. In the current scenario implementation the effect of these measures is simulated in such a way that locations of agriculture that are considered to be fragmenting larger natural areas (i.e. locations with mainly natural areas in the neighbourhood) are given a relatively lower suitability as compared to locations that are not causing fragmentation of natural areas.

Permanent grassland areas. Policies assumed under this scenario aim at reducing the conversion of permanent grasslands. Such policies are currently only partially implemented in the macro-economic models that steer the overall grassland areas at national scale. Implementation of such issues in macro-economic models would require additional work. Given a certain area of grassland at the national level shifts in the spatial allocation of grassland are possible (e.g. as result of conversion to arable land). However, since policies to mitigate the conversion of permanent grassland are assumed a model implementation is chosen to limit this effect. This is done by a modified elasticity for conversion of permanent grasslands in the model specification (i.e. this implementation assumes that conversion costs are relatively high so that it makes it unattractive to use the land for another use). This implementation will limit shifts in grassland location. In more recent simulations for the project ' Land use modeling – implementation' a more detailed specification of these measures is implemented.

Erosion risk. It is assumed that under the scenarios policies are implemented to reduce erosion as a consequence of arable agriculture on steep slopes. Therefore the suitability of arable land on erosion sensitive locations (as shown on the map) is lower than for similar locations without erosion risk. This will provide an incentive/pressure to convert these areas towards grassland or forest. In addition, erosion sensitive locations currently not under arable land cannot be converted to arable land, within the model this conversion is not possible.

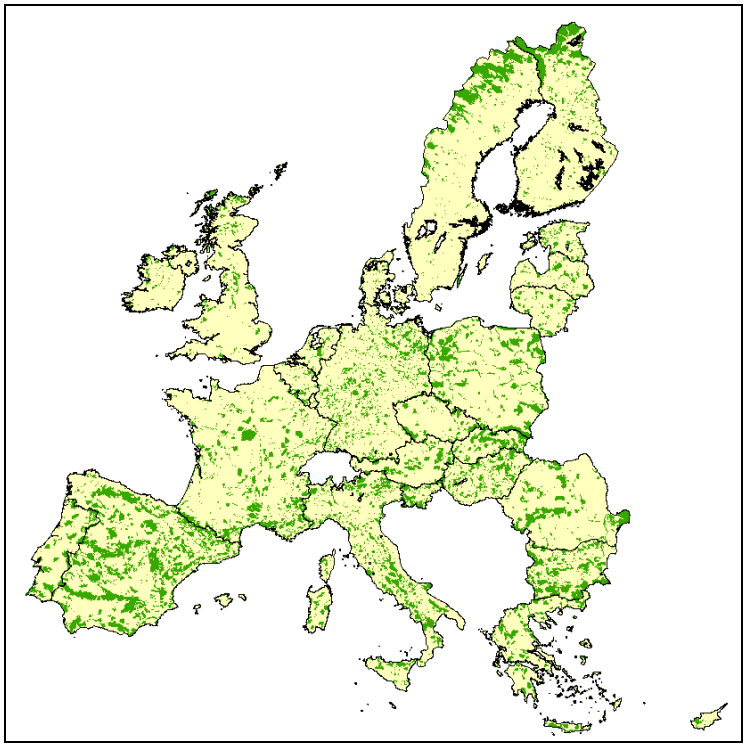


Figure 1. Natura 2000 areas

Natura 2000 areas

The GIS map for Natura 2000 is still an ongoing project, which has not yet been completed, but a preliminary version was used for this project. The European Natura 2000 database holds information about sites designated by EU Member States under the Birds Directive (79/409/EEC) and the Habitats Directive (92/43/EEC). It is Specially Protected Areas (SPAs) for birds and adopted Sites of Community Importance (SCIs) for habitats and other species.

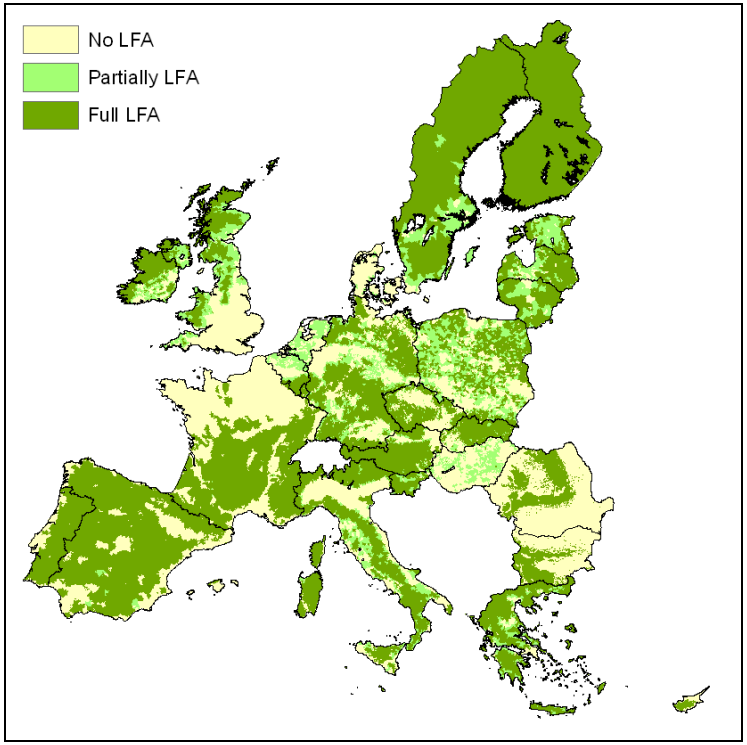


Figure 2. LFA areas

LFA areas

The LFA map is derived from the spatial dataset Less-Favoured Areas 2000-2006 based on GISCO Communes version 2.3. Areas that are fully eligible to one of the LFA articles are classified as 1, whereas areas that are only partially eligible to one LFA article are classified as 0.5. The non-LFA areas are classified as 0.

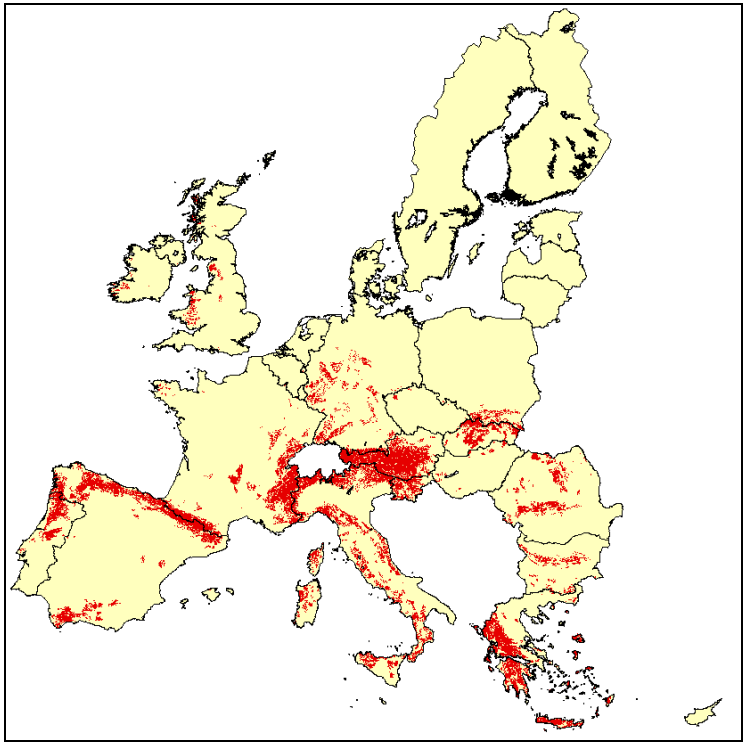


Figure 3. Erosion sensitive areas

Erosion sensitive areas

Delineation of areas with a high potential for soil erosion. Derived from a potential soil erosion map that was computed as the product of slope, soil erodibility and rain erosivity. A threshold was found by making an overlay with current arable, whereby it was aimed that approximately 8% of current arable would be eligible for receiving subsidies to prevent soil erosion.

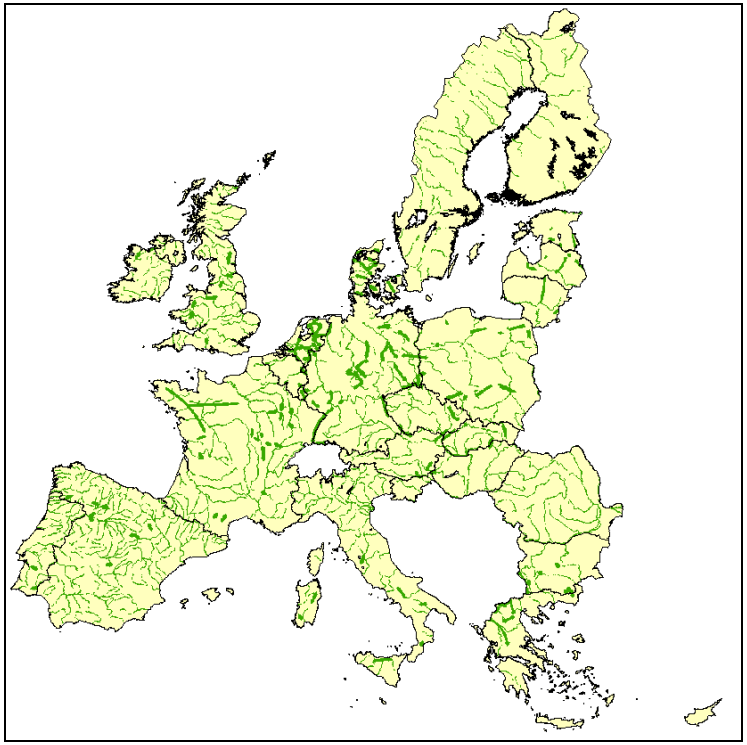


Figure 4. Ecological corridors

Ecological corridors

This map was created by combining three maps that indicate ecological corridors from different PEEN projects with the GISCO river map. The ecological corridors were derived from the PEEN project, and for Greece and Bulgaria the results of the PEEN South-East Europe project were used. Depending on their shapes, the corridors were directly converted to grids or a buffer function was used. Due to the different source data the width of the corridors is not everywhere the same, but on average it was set at 15 km. Along the large and medium sized rivers a buffer zone of 1 km at each side was used.

ANNEX 1.4. LAND COVER/USE CLASSIFICATION SCHEME USED

I: SHORT OVERVIEW OF THE LEGEND

Nr.:	Land cover class:
0	Built-up area
1	Arable land (non-irrigated)
2	Pasture
3***	(semi-) Natural vegetation (including natural grasslands, scrublands, regenerating forest below 2 m, and small forest patches within agricultural landscapes)
4*	Inland wetlands
5*	Glaciers and snow
6	Irrigated arable land
7	Recently abandoned arable land (i.e. "long fallow"; includes very extensive farmland not reported in agricultural statistics, herbaceous vegetation, grasses and shrubs below 30 cm)
8	Permanent crops
9**	Arable land devoted to the cultivation of (annual) biofuel crops
10	Forest
11*	Sparsely vegetated areas
12*	Beaches, dunes and sands
13*	Salines
14*	Water and coastal flats
15*	Heather and moorlands
16	Recently abandoned pasture land (includes very extensive pasture land not reported in agricultural statistics, grasses and shrubs below 30cm)

* These land use types are assumed to be constant during simulations with CLUE. These areas are assumed to be unsuitable for agriculture or urban expansion. This assumption is based on the adverse environmental conditions at these locations. Natural succession is also assumed to be hampered by adverse environmental conditions.

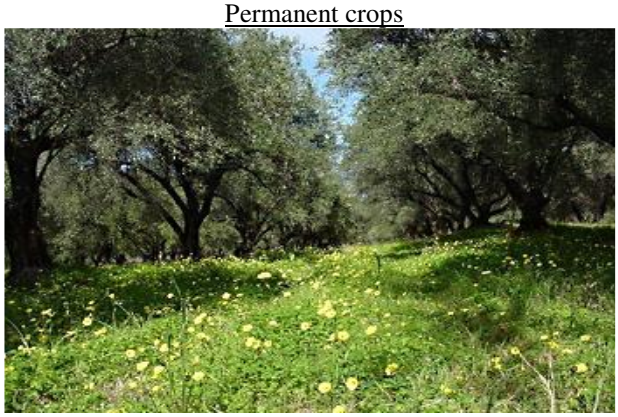
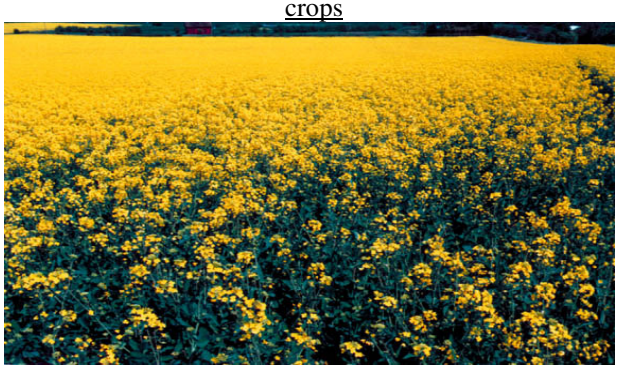
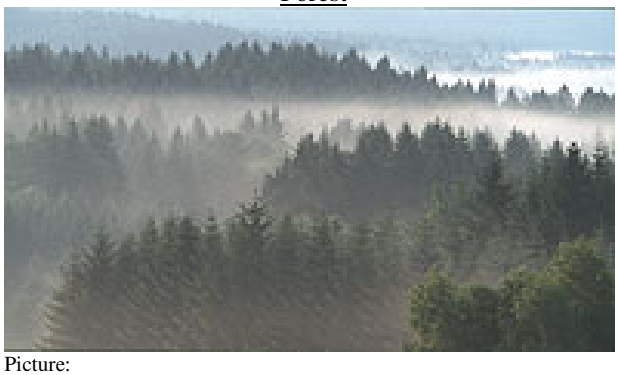
** In most cases, biofuel crops are part of (non-irrigated) arable land and therefore not shown on the map. Only in specific projects are biofuel crops explicitly mapped.

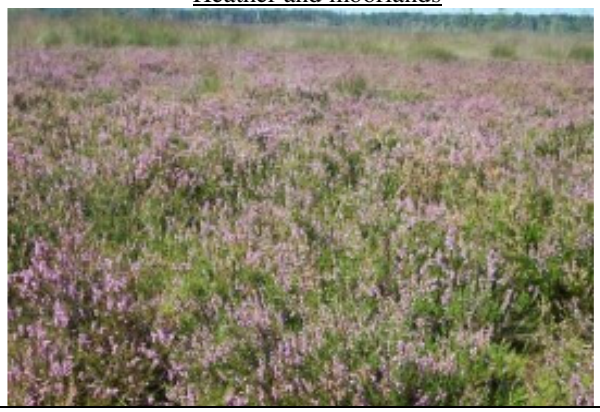
*** These classes are considered to be an intermediate stage in the natural succession from recently abandoned farmland to forest. Under certain conditions succession will be so slow that the vegetation will remain in the abandoned farmland class for a long period.

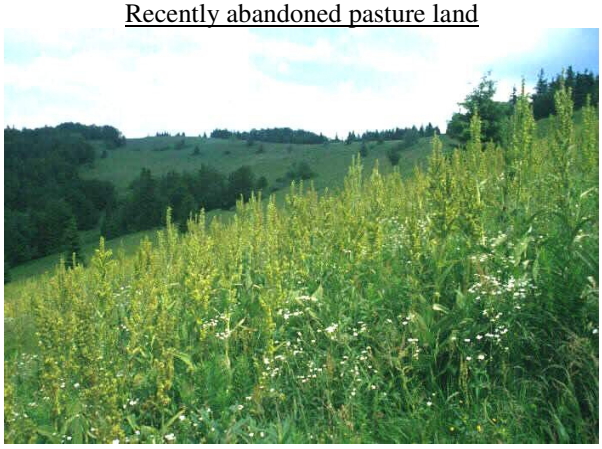
II: DETAILED LEGEND

Number:	Name:	Description:
0	Built-up area  Picture: http://terrestrial.eionet.europa.eu/CLC2000	This land cover class contains all built-up area (and other human fabric). It includes continuous urban fabric, discontinuous urban fabric, industrial areas, commercial areas, road and rail networks, (air)ports, mineral extraction sites, dump sites, construction sites, green urban areas, sports facilities, and leisure facilities.
1	Arable land (non-irrigated)  Picture: http://en.wikipedia.org/wiki/Arable_land	This land cover class contains all agricultural land that is not pasture or permanent crops. In case biofuels are separately shown on the map they are excluded from this class. In addition, this class does not include irrigated agricultural land uses (i.e. irrigated arable land) and permanent crops.
2	Pasture  Picture: http://www.birdlifecapcampaign.org/frameset.htm	This class contains all types of "pasture", including pastures used for the production of fodder. Included are also pastures with a lot of hedges (bocage). In principle it excludes grassland in rotation (< 5 years) which is part of arable land.
3	(semi-) Natural vegetation  Picture: http://www.corse-sud.net/maquis/maquis.html	This class includes all (semi-) natural vegetation types that are non-forest with the exception of small forest patches as occurring in agricultural landscapes. This class includes natural grasslands, scrublands and regenerating forest (below 2 meters). Inland wetlands and heather/moorland are not included in this class, as they are a separate class in the CLUE-map. This class includes rangeland.

4	Inland wetlands  Picture: http://www.natuurmonumenten.nl	This class covers all inland wetlands and peat bogs. Only standing waters are included in this land cover class. Flowing rivers and other water courses are included in a separate class.
5	Glaciers and snow  Picture: http://alps.virtualave.net/	This class covers all glaciers and permanent snow.
6	Irrigated arable land  Picture: http://www.parc-camargue.fr	This class contains all irrigated agriculture/arable land. It includes rice fields, but not greenhouses, and spray/rotary sprinklers.
7	Recently abandoned arable land 	This class contains recently abandoned arable land that is no longer used in a crop rotation. It consists of herbaceous vegetation, grasses and shrubs below 30 cm. This class naturally transgresses into the class "(semi-) natural vegetation". Most of this land cover type is still classified as arable land or permanent crops in the input data for the CLUE-map. Therefore, this class will only evolve during the simulations.

8	Permanent crops  Picture: http://www.lodestarfarms.com/	This class contains all land cover classes that are associated with permanent crops. This class includes all kinds of agro-forestry classes, such as dehesas and montanas.
9	Arable land devoted to the cultivation of (annual) biofuel crops  Picture: http://www.actionrenewables.org/RenewableImages/Bio/bf06.jpg	All (annual) crops that are grown with the aim to produce biofuel are include in this class. This land cover type is classified as (non-irrigated) arable land in the base map for 2000. Therefore, this class will only be indicated as a reclassification of arable land in simulations where biofuels are explicitly considered. This class does not consider perennial crops cultivated for biofuel production.
10	Forest  Picture: http://www.naturbilder.de/NBenglisch/html/bavarian%20forest.html	The forest class contains production forest, protected forest, and forest not currently harvested for other reasons. It does not include other types of natural vegetation, nor does it contain agro-forestry land cover types.
11	Sparsely vegetated areas 	This class contains all land cover types that are extremely sparsely vegetated. It includes bare rock, badlands, etc.

12	Beaches, dunes and sands  Picture: www.natuurmonumenten.nl	This class includes land cover types such as beaches, dunes and sands in general.
13	Salines  Picture: http://www.parc-camargue.fr	This class contains salt pans, but excludes salt marshes.
14	Water and coastal flats  Picture: http://www.werkgroep-vlieland.nl/tesnatura/index.html.	All water surfaces and coastal flats
15	Heather and moorlands 	Vegetation with low and closed cover, dominated by bushes, shrub and herbaceous plants (heather, briars, broom, gorse, laburnum). Most often succession into forest vegetation is constraint by climate or soil conditions.

16	Recently abandoned pasture land 	This class contains recently abandoned pasture land. It consists of herbaceous vegetation, grasses and shrubs below 30 cm. This land cover class contains vegetation that is no longer production grassland but can not yet be considered natural grassland. It may be under very extensive grazing regime not being respected in agricultural statistics. This may include horse keeping. This class naturally transgresses into the land cover class "(semi-) natural vegetation". Most of this land cover type is still classified as pasture land in the 2000 map. Therefore, this class will only evolve during the simulations.

III: DETAILED DESCRIPTION OF MAP AND LINK TO CORINE

CLUE-map	CORINE-classes that are included:	equivalent CORINE-group/class	Added (compared with equivalent CORINE-group/class):	Minus (compared with equivalent CORINE-group/class) :
0 Built-up area	1 Continuous urban fabric 2 Discontinuous urban fabric 10 Green urban areas 11 Sport and leisure facilities 3 Industrial or commercial units 4 Road and rail networks and associated land 5 Port areas 6 Airports 9 Construction sites 7 Mineral extraction sites 8 Dump sites	Artificial surfaces	-	-
1Arable land (non-irrigated)	12 (parts of) Non-irrigated arable land 21 (parts of) Land principally occupied by agriculture, with significant areas of natural vegetation 20 (parts of) Complex cultivation patterns	Arable land (non-irrigated)	- parts of "Land principally occupied by agriculture, with significant areas of natural vegetation" - parts of "Complex cultivation patterns "	- Biofuel crops
2 Pasture	18 Pastures 21 (parts of) Land principally occupied by agriculture, with significant areas of natural vegetation	Pasture	- parts of "Land principally occupied by agriculture, with significant areas of natural vegetation"	
3 Nature	26 Natural grasslands 28 Sclerophyllous vegetation 29 Transitional woodland-shrub 21 (parts of) Land principally occupied by agriculture, with significant areas of natural vegetation	Nature	- parts of "Land principally occupied by agriculture, with significant areas of natural vegetation"	- Forests - Moors and heathland - Beaches, dunes, sands - Sparcely vegetated areas - Burnt areas - Glaciers and perpetual snow

CLUE-map	CORINE-classes that are included:	equivalent CORINE-group/class	Added (compared with equivalent CORINE-group/class):	Minus (compared with equivalent CORINE-group/class) :
4 Inland wetlands	35 Inland marshes 36 Peat bogs	Inland wetlands	-	-
5 Glaciers and snow	34 Glaciers and perpetual snow	Glaciers and perpetual snow	-	-
6 Arable land (irrigated)	13 Permanently irrigated land 14 Rice fields	Permanently irrigated land Rice fields	-	-
7 Recently abandoned arable land		NOTE: There is no equivalent CORINE-class for "recently abandoned arable land". Most of it is likely still classified as arable land or permanent crops.		
8 Permanent crops	15 Vineyards 17 Olive groves 16 Fruit trees and berry plantations 19 Annual crops associated with permanent crops 22 Agro-forestry areas	Permanent crops	19 Annual crops associated with permanent crops 22 Agro-forestry areas	
9 Arable land devoted to the cultivation of (annual) biofuel crops		NOTE: There is no equivalent CORINE-class for "biofuel crops". Instead, it is contained within the CORINE land cover class "Non-irrigated arable land".		
10 Forest	23 Broad-leaved forest 24 Coniferous forest 25 Mixed forest	Forest	-	-
11 Sparcely vegetated areas	33 Burnt areas 31 Bare rocks 32 Sparsely vegetated areas	Sparsely vegetated areas	33 Burnt areas 31 Bare rocks	-

CLUE-map	CORINE-classes that are included:	equivalent CORINE-group/class	Added (compared with equivalent CORINE-group/class):	Minus (compared with equivalent CORINE-group/class):
12 Beaches, dunes and sands	30 Beaches, dunes, sands	Beaches, dunes, sands	-	-
13 Salines	38 Salines	Salines	-	-
14 Water and coastal flats	40 Water courses 41 Water bodies 44, 50 Sea and ocean 37 Salt marshes 39 Intertidal flats 42 Coastal lagoons 43 Estuaries	Water bodies	37 Salt marshes 39 Intertidal flats	-
15 Heather and moorlands	27 Moors and heathland	Moors and heathland	-	-
16 Recently abandoned pasture land		NOTE: There is no equivalent CORINE-class for "recently abandoned pasture land". Most of it is likely still classified as pasture.		

The European land cover map used for CLUE contains the following classes:

Built up area (number in CLUE-map = 0):

This land cover class contains all built-up area (and other human fabric). It includes the following classes from the CORINE land cover map:

1 Continuous urban fabric:

Most of the land is covered by structures and the transport network. Buildings, roads and artificially surfaced areas cover more than 80 % of the total surface. Non-linear areas of vegetation and bare soils are exceptional. Extension:

- *80 % of the total surface at least should be impermeable.*

This heading includes:

- *urban centre types and dense ancient suburbs where buildings form a continuous and homogeneous fabric*
- *public services or local governments and commercial/industrial activities with their connected areas inside continuous urban fabric when their surface is less than 25 ha*
- *interstices of mineral areas, un-vegetated cemeteries and cemeteries less than 25 ha located inside continuous urban fabric.*

2 Discontinuous urban fabric

Most of the land is covered by structures. Buildings, roads and artificially surfaced areas are associated with vegetated areas and bare soils, which occupy discontinuous but significant surfaces.
The continuous urban fabric class is assigned when the urban structures and transport network (i.e. impermeable surfaces) occupies more than 80 % of the surface area. This coverage percentage pertains to real ground surface. Therefore, localization of this cut-off-point requires particular attention to avoid confusion with the apparent vegetation (e.g. visible crown of trees) and permeable surfaces under trees. For example, in the streets bordered with trees, the real ground surface under the trees is mostly covered with asphalt or concrete. So, the vegetation percentage has to be estimated taking into account the shape structure and context visible on the satellite image. In particular, vegetation impact has to be underestimated in case of linear structure of vegetation.
The discrimination between continuous and discontinuous urban fabric is set from the presence of vegetation visible in the satellite image illustrating either single houses with gardens or scattered apartment blocks with green areas between them.
The density of houses is the main criteria to attribute a land cover class to the built-up areas or to the agricultural areas. In case of patchwork of small agricultural parcels and scattered houses, the cut-off-point to be applied for discontinuous urban fabric is 30 % at least of urban fabric within the patchwork area. This heading includes:

- *private housing estates, residential suburbs made of individual houses with privative gardens and/or small squares,*
- *scattered blocks of residential flats, hamlets, small villages where numerous un-mineralized intersticial spaces : gardens, lawns can be distinguished,*
- *large blocks of flats where green spaces, parking areas and adventure playgrounds cover significant surface area,*
- *un-vegetated or smaller than 25 ha cemeteries included within discontinuous fabric,*
- *public utilities/communities surfaced areas less than 25 ha,*
- *holiday cottage houses are included in 112 if infrastructures like road network is visible in the satellite images. They must also be connected to built-up areas.*
- *troglodyte villages along streets and subterranean housings visible from the satellite image.*

3 Industrial or commercial units

Artificially surfaced areas (cement, asphalt, tarmacadam or stabilized e.g. beaten earth) without vegetation occupy most of the area, which also contains building and/or vegetation. This heading includes:

- research and development establishments,
- security, law and order services (fire stations, penal establishments),

- company benefit schemes (old people's home, convalescent homes, orphanages, etc.),
- stud farms, agricultural facilities (cooperatives, state farm centres, livestock farms, living and exploitation buildings),
- exposition sites, fair sites,
- nuclear power plants, military barracks, testing pistes, test fields, biological waste water treatment plants, water houses, transformers),
- large shopping centres,
- abandoned industrial sites and by-products of industrial activities where buildings are still present.
- water retention and hydro-electric stations
- telecommunication networks (relay stations for TV, telescopes, radars.)

4 Road and rail networks and associated land

Motorways and railways, including associated installations (stations, platforms, embankments). Minimum width for inclusion: 100m. This heading includes :

- *motorway rest areas, service stations, parking lot areas, haulage depots connected on motorway networks, services and maintenance activities for roads, toll-boothes,"*
- *marshalling yards, perimeter of stations, services and maintenance activities for trains,*
- *tramways networks,*
- *cableway networks.*

5 Port areas

Infrastructure of port areas, including quays, dockyards and marinas. This heading includes :

- *commercial and military ports,*
- *shipyards,*
- *fishing ports,*
- *yachts ports, sport and recreation ports,*
- *shipping and infrastructure port facilities,*
- *sea, river and lake ports,*
- *harbour stations, dock houses,*
- *oil terminals.*

6 Airports

Airport installations: runways, buildings and associating lands.
Extension:

- Associating lands (mainly grassland).

This heading includes :

- military airports.

7 Mineral extraction sites

Areas with open-pit-extraction of construction material (sand pit, quarries) or other mineral (open-cast mines). Includes flooded gravel pits, except for river-bed extraction. This heading includes :

- *ballast, sand, clay, kaolin, gravel, hard stones quarries,*
- *extraction and conglomeration areas of solid fuels (coal, lignite),*
- *rock salt pits,*
- *sand extraction site inside coastal dune areas.*
- *inland salines in north African countries.*

8 Dump sites

Public, industrial or mine dump sites.Extension : Dump sites of raw materials or liquid wastes. This heading includes :

- *dump sites areas within industrial units areas,*
- *liquid wastes originating in mainly chemical industry,*
- *sewage farms connected to sewage plants.*
- *slag heaps which are un-vegetated.*

9 Construction sites

Spaces under construction development, soil or bed rock excavations, earthworks. This heading includes

- *Public and industrial fabric structures, road and rail networks, etc under constructions.*

10 Green urban areas

Areas with vegetation within the urban fabric, including parks, cemeteries with vegetation, and mansions and their grounds. This heading includes :

- *park woodlots,*
- *park lawns,*
- *park basins,*
- *park flower bed, harbor and shrub berry,*
- *park and city squares,*
- *ornemental gardens,*
- *city blocks inner spaces*
- *botanical and zoological gardens.*
- *vegetated areas which can be used for recreation purpose even it is not their main utilisation such as woods in urban fabric,*

11 Sport and leisure facilities

Camping ground, sport ground, leasure parks, golf courses, race courses, etc. Includes formal parks not surrounded by urban areas. This heading includes :

- *camping and caravaning parking organized for recreational purpose (excluding commercial activities),*
- *small airfields with grass runways and small buildings,*
- *important archeological ruins,*
- *indoor sport facilities,*
- *cottage areas used for recreation and leasure activities outside the settlements only for temporary sejourns,*
- *zoological/botanical gardens outside urban fabric,*
- *forest parks outside built up areas,*
- *vegetated and military cemeteries outside settlements, hoby/city gardens,*
- *motor-racing circuit.*
- *ski resorts (except the ski pistes)*

Arable land (non-irrigated) (number in CLUE-map = 1):

This land cover class contains all agricultural land that is not pasture or permanent crops. For a number of applications of this map in the simulation model this class does not include biofuel crops; this is in contrast to the CORINE class "arable land (non-irrigated)" that does contain biofuel crops. In addition, this class does not include irrigated agricultural land uses (i.e. irrigated arable land). Another important remark is that the land use classes "complex cultivation patterns" and "land principally occupied by agriculture with significant areas of natural vegetation" have been disaggregated and the arable areas within these classes have been included here.
Land cover class "complex cultivation patterns" was split equally between the classes "arable land (non-irrigated)" and "pasture". The land cover class "land principally occupied by agriculture with significant areas of natural vegetation" was split into the classes "arable land (non-irrigated)", "nature" and "pasture" based on a division key of respectively 25%, 30% and 45%. Therefore, parts of these CORINE classes have been classified as "arable land (non-irrigated)".
Thus, this class includes the following classes from the CORINE land cover map:
12 (parts of) Non-irrigated arable land

Cereals, legumes, fodder crops, root crops and fallow land. Includes flowers and tree (nurseries cultivation) and vegetables, whether open field or under plastic or glass (includes market gardening). Includes aromatic, medicinal and culinary plants. Does not include permanent pasture.
Extension :

- *Includes flower, tree (nurseries) and vegetable cultivations.*
- *Includes other annually harvested plants with more than 75 % of area under rotation system.*

This heading includes :

- *leguminous permanent plants as asparagus,*
- *flooded crops as water cross beds,*
- *semi-permanent crops as strawberries,*
- *temporary fallow lands (lands under three years' rotation system),*
- *drained arable land should be mapped as 211 instead of 212,*
- *fragmented agricultural land use resulting in juxtaposition of different annual crops,*
- *weeded crops,*
- *non-permanent industrial crops as textile plants, oleaginous plants,*
- *tobacco,*
- *chicory plants,*
- *condiment plants,*
- *sugar cane,*
- *flowers under rotation system,*
- *industrial flower crops as lavender species,*
- *nurseries-garden (non-forestry nurseries),*
- *garaats in Mediterranean region.*

20 (parts of) Complex cultivation patterns

Juxtaposition of small parcels of diverse annual crops, pasture and/or permanent crops.
Extension :

- *Juxtaposition of small parcels of, annual crops, city gardens pastures, fallow lands and/or permanent crops somewhere with scattered houses.*

This heading includes :

- *mixed parcels of permanent crops (fruit trees, berry plantations, vineyards and olive groves),*
- *interstices of non-mineralized free spaces in discontinuous urban fabric > 25 ha,*
- *complex cultivation patterns areas with scattered house inserted within a patchwork structure when built-up parcels cover less than 30 % of the patchwork area,*
- *hobby/city gardens*

21 (parts of) Land principally occupied by agriculture, with significant areas of natural vegetation

Areas principally occupied by agriculture, interspersed with significant natural areas.
Extension :

- *Land occupied by agriculture with areas of natural or semi-natural areas (including wetlands and water bodies, outcrops)*

This heading includes

- *linear structures of trees organized for truffle producing*
- *hortillonage (vegetable crops and canals),*
- *agriculture and scattered heaps of stones,*

Pasture (number in CLUE-map = 2):

This class contains not only the CORINE land cover class “pasture”, but also consists of parts of the CORINE classes “complex cultivation patterns” and “land principally occupied by agriculture with significant areas of natural vegetation”. This is because land cover class “complex cultivation patterns” was split equally between the classes

"arable land (non-irrigated)" and "pasture". Land cover class "land principally occupied by agriculture with significant areas of natural vegetation" was randomly split into the classes "arable land (non-irrigated)", "nature" and "pasture" based on a division key of respectively 25%, 30% and 45%. Therefore, parts of these CORINE classes have been classified as "pasture".

Thus, this class includes the following classes from the CORINE land cover map:

11 PASTURES

Dense grass cover, of floral composition, dominated by graminaceae, not under a rotation system. Mainly for grazing, but the folder may be harvested mechanically. Includes areas with hedges (bocage).
Extension:

- *Grazing used by cattle.*

Pastures can be described as extensively used grass lands with presence of farm structure such as: fences, shelters, enclosures, watering places, drinking trough, or regular agricultural works: mowing, drainage, hay making, agricultural practices, manuring.
This heading includes :

- *temporary and artificial pastures not under rotation system which become permanent grasslands five years after ploughing. Significant number of natural vegetation species are present (as Taraxacum Officinale, Ranunculus sp. Chrisanthemum Leucantemum, Knautia Arvensis Achillea Millefolium, Salvia sp., etc.),*
- *abandoned arable land not under rotation system used as pastures (after 3 years),*
- *pastures may includes patches of arable land which do not cover 25 % of the total surface,*
- *humid meadows with dominating grass cover. Sedges, rushes, thistles, nettles, cover less than 25 % of the parcel surface.*

20 (parts of) Complex cultivation patterns

Juxtaposition of small parcels of diverse annual crops, pasture and/or permanent crops.
Extension :

- *Juxtaposition of small parcels of, annual crops, city gardens pastures, fallow lands and/or permanent crops somewhere with scattered houses.*

This heading includes :

- *mixed parcels of permanent crops (fruit trees, berry plantations, vineyards and olive groves),*
- *interstices of non-mineralized free spaces in discontinuous urban fabric > 25 ha,*
- *complex cultivation patterns areas with scattered house inserted within a patchwork structure when built-up parcels cover less than 30 % of the patchwork area,*
- *hobby/city gardens*

21 (parts of) Land principally occupied by agriculture, with significant areas of natural vegetation

Areas principally occupied by agriculture, interspersed with significant natural areas.
Extension :

- *Land occupied by agriculture with areas of natural or semi-natural areas (including wetlands and water bodies, outcrops)*

This heading includes

- *linear structures of trees organized for truffle producing*
- *hortillonage (vegetable crops and canals),*
- *agriculture and scattered heaps of stones,*

(semi-) Natural vegetation (number in CLUE-map = 3):

This class includes all (semi-) natural vegetation types that are non-forest. In this respect, forest is defined as vegetation higher than 2 meter. This class includes natural grasslands, scrublands and regenerating forest (as long as they are below 2 meters). As already described above, the CORINE land cover class "land principally occupied by agriculture with significant areas of natural vegetation" was split into the classes "arable land (non-irrigated)", "nature" and "pasture" (based on a division key of respectively 25%, 30% and 45%). Therefore, parts of this CORINE class have been classified as "nature". This can potentially include small forest patches within the agricultural landscape.

Inland wetlands and heaths/moors are not included in this class, as they are a separate class in the CLUE-map.

Thus, this class includes the following classes from the CORINE land cover map:

26 Natural grasslands

Low productivity grassland. Often situated in areas of rough, uneven ground. Frequently includes rocky areas, briars and heatland.

Extension :

- *Natural grasslands are areas, where herbaceous vegetation (maximum height is 150 cm and gramineous species are prevailing) which cover at least 75 % of the surface covered by vegetation.*

This heading includes :

- *saline grasslands grown on temporally wet areas of saline soils,*
- *humid meadows where sedges, rushes, thistles, nettles cover more than 25 % of the parcel,*
- *natural grasslands with trees and shrubs if they do not cover more than 25 % of the surface to be considered,*
- *high-productive Alpine grasslands far from houses, crops and farming activities,*
- *herbaceous military training areas,*
- *grasslands which can be grazed, never sown and not otherwise managed by way of application of fertilizers, pesticides, drainage or reseeding except by burning,*
- *grasslands with a yearly productivity less than 1 500 units of fodder/ha,*
- *herbaceous grass covered composed of non-palatable gramineous species such as Molinia spp. and Brachypodium spp.,*
- *derelicted natural grass land where ligneous vegetation cover less than 75 % of the area,*
- *grasslands found on calcareous soils with a high proportion of calcicole species of limestone, chalk Machair or Karst,*
- *grasslands dotted with bare rock areas which represent less than 25 % of the surface.*

28 Sclerophyllous vegetation

Bushy sclerophyllous vegetation, including maquis and garrigue.

Extension :

- *Evergreen sclerophyllous bushes and scrubs, which compose maquis, garrigue, mattoral and phrygana.*

This heading includes :

- *mattoral of arid zone with pre-desert brushes and tall Ziziphus lotus,*
- *laurrel mattoral with Laurus nobilis,*
- *cypress mattoral with native or planted cupressus,*
- *tree-spurge formation with dense stands of Euphorbia dendroides in thermo-Mediterranean area,*
- *palmetto brush formations with dominating Chamaerops-humilis,*

- *pre-desert scrub with halo-nitrophyllous scrubs and gypsum scrubs : jujube brush (Ziziphus lotus), shrubs of African affinities (spiny brush formation of accacia),*
- *abandoned olive groves.*

29 Transitional woodland-shrub

Bushy or herbaceous vegetation with scattered trees. Can represent either woodland degradation or forest regeneration / recolonization.
This heading includes :

- *arborescent mattorals which are pre- or post-formation of broad-lived evergreen forest with a usually thick evergreen shrub stratum composed of evergreen oaks (Quercus suber, ilex, rotundifolia), olive trees, carob trees or pines the crown cover density of which is less than 30 % of the surface,*
- *agricultural lands (classes 2xx) under recolonizing process with occurrence of forest trees which cover more than 30 % of the surface (scattered trees or small plots of forests),*
- *abandoned fruit trees plantations and orchards,*
- *clear cuts in forest areas,*
- *young plantations,*
- *forest nurseries inside forest areas,*
- *natural grass land areas with small forests < 25 ha and/or with trees intermixed which cover more than 30 % of the surface,*
- *open cleared-felled or regeneration areas with regrowing during transition stage which last for maximum 5-8 years,*
- *forest burning areas which do not show black tone any more in the satellite image but are still visible.*
- *heavily damaged forests by wind, snow-brake or acid rains with more than 50 % dead trees,*
- *margin zones of bogs with a vegetation composed of shrubs and pine bogs which cover more than 50 % of the surface.*
- *bare rocks with scattered trees that cover more than 10% of the surface.*

21 Land principally occupied by agriculture, with significant areas of natural vegetation (partly)

Areas principally occupied by agriculture, interspersed with significant natural areas.
Extension :

- *Land occupied by agriculture with areas of natural or semi-natural areas (including wetlands and water bodies, outcrops)*

This heading includes

- *linear structures of trees organized for truffle producing*
- *hortillonage (vegetable crops and canals),*
- *agriculture and scattered heaps of stones,*

Inland wetlands (number in CLUE-map = 4):

The class covers all inland wetlands and peat bogs. Only standing waters are included in this land cover class. Flowing rivers and other water courses are included in a separate class.
This class includes the following CORINE land cover classes:

35 Inland marshes

Low-lying land usually flooded in winter and more or less saturated by water all year round.
Extension :

- Non-forested areas of low-lying land flooded or floodable by fresh, stagnant or circulating water. Covered by a specific low ligneous, semi-ligneous or herbaceous vegetation.

This heading includes :

- Fens and transitional bogs without peat deposition or on peaty ground (peat layer is less than 30 cm thick) with specific vegetation composed of reeds, bulrushes, rushes, willows, sedges and tall herbs, sphagnum hummocks, often with alder or willows and other water plants,

- marsh vegetation located in margin zones of raised bogs,
- water-fringe vegetation of reed beds, sedge communities, fen-sedge beds, tall rush swamps, riparian cane formations,
- high floating vegetation,
- sebkhas in north-african area,
- inland saline (alkali) marshes (prevailing arheic).

36 Peat bogs

Peatland consisting mainly of decomposed moss and vegetable matter. May or may not be exploited.
This heading includes :

- minerotrophic peat bogs fed by ground water or streams with mosses (Drepanocladus spp.) and Carex spp. or schoenus in alcaline bogs with occurence of Salix spp., Betula spp. and Alnus spp.,
- ombrotrophic peat bogs fed only by direct precipitation with sphagnum species which are abondant and dominant with other acido philous plants such as Eriophorum vaginatum, Scirpus spp., Carex spp., Vaccinium oxicoccos, Andromeda spp., Drosera spp. and lichens,
- blanket bogs with sphagnum species and Narthecium spp., Molinia spp., Scirpus spp., Shoenus spp., Erophiorum spp.,
- boreal peat bogs with reticulated structure (aapa) with Sphagnum spp., Empetrum spp., Vaccinium spp., Betula nana, Salix nana, Carex spp. Erophorium spp., Utriculara spp., Drosera spp.,
- peat extracting areas,
- fossil artic peat bogs (palsa) with Vaccinium spp., Betula nana, Salix lapponum and Salix glauca, lichens and Carex spp.

Glaciers and snow (number in CLUE-map = 5):

This class covers all glaciers and permanent snow. It includes the following CORINE land cover class:

34 Glaciers and perpetual snow.

Land covered by glaciers or permanent snow fields.

Irrigated arable land (number in CLUE-map = 6):

This class contains all irrigated agriculture/arable land. It includes the CORINE classes permanently irrigated land and rice fields (see below). It is possible that some irrigated land, occurring within the classes "complex cultivation patterns" and "land principally occupied by agriculture, with significant areas of natural vegetation".

13 Permanently irrigated land

Crops irrigated permanently or periodically, using a permanent infrastructure (irrigation channels, drainage network). Most of these crops could not be cultivated without an artificial water supply. Does not include sporadically irrigated land.
Extension :

- Excludes drainage network areas, which are assigned to 211, 231 or 242, applied for pumping infrastructure and irrigation system from superficial water supplying.

This heading includes :

- recently abandoned irrigation systems,
- sown grassland (as part of crop rotation) if the irrigation infrastructure is permanently present.

14 Rice fields

Land prepared for rice cultivation. Flat surfaces with irrigation channels. Surfaces periodically flooded.
Extension :

- *Abandoned rice field are not included.*

A one or two years rotation is applied for rice fields, therefore the land cover is mapped according to the presence at the time of satellite data acquisition

Recently abandoned arable land (number in CLUE-map = 7):

This class contains recently abandoned arable land that is no longer used in a crop rotation. It consists of herbaceous vegetation, grasses and shrubs below 30 cm. This class naturally transgresses into the CLUE-land cover class "(semi-) natural vegetation". There is no separate CORINE-class that covers this land cover type. Most of it is likely still classified as arable land or permanent crops. Therefore, this class only evolves during the simulations.

Permanent crops (number in CLUE-map = 8):

This class contains all land cover classes that are associated with permanent crops. This class includes all kinds of agro-forestry classes, such as dehesas and montanas. This class includes the following classes from the CORINE land cover map:

15 Vineyards

Areas planted with vines.
Extension :

- *Vineyard areas are classified as 221 if the vineyard parcels exceed 50 % of the area and/or they determine the land use of the area.*

This heading includes :

- *vine-growing nurseries inside vineyards areas,*
- *vineyards for wine production,*
- *vineyards for eating grapes and raisins,*
- *complex cultivation pattern areas where vineyards parcels cover at least 50 % of the area.*

17 Olive groves

Areas planted with olive trees, including mixed occurrence of olives trees and vines on the same parcel.
Extension :

- *Mediterranean plantations of Olea europaea. ssp europaea.*

This heading includes :

- *olive groves shading herbaceous layer.*

16 Fruit trees and berry plantations

Parcels planted with fruit trees or shrubs: single or mixed fruit species, fruit trees associated with permanently grassed surfaces. Includes chestnut and walnut groves.
Extension :

- *Ligneous crops.*
- *Includes chestnut and walnut trees orchards, intended for fruit production.*

This heading includes :

- *hop plantations,*
- *plantations of berry shrubs, black and/or red currants, raspberries, gooseberries, blackberry crops,*
- *willow plantation for wicker production,*
- *fruit trees under greenhouses,*
- *abandoned orchards which still preserve characteristic alignments,*
- *fruit, orchards of apples, pears, plums, apricots, peaches, cherries, figs, quinces and other rosaceae,*
- *ligneous crops : chestnut, walnut, almond, hazel, pistachio groves,*
- *permanent florist plantations of roses,*
- *plantation of vines associated to fruit trees within the same parcel, where vines cover less than 40 % of the surface,*
- *tropical fruit trees : avocados, bananas, guavas, mangos, kiwis, passion fruits, papayas, pineapples, pomegranates, brazil nuts, cashew nuts, coconuts, nut megs,*
- *citrus fruit trees : oranges, lemons, mandarins, tangerines, grape fruits, pomelos,*
- *permanent industrial plants: coffee, cacao, mulberry, tea,*

- *recently abandoned orchards where characteristic plantation structures (espaliers and climbers) are still visible.*

19 Annual crops associated with permanent crops

Non-permanent crops (arable land or pastures) associated with permanent crop on the same parcel.
Extension :

- *Permanent crops are either in juxtaposition with arable lands/pastures or located along the border of the parcels. The occupying rate of non-permanent crops is more than 50 %.*

This heading includes :

- *non-permanent crops areas in which they are shaded by a fairly closed canopy of fruit trees or olive trees or vines.*
- *non-permanent crops areas which are bordered by a reticulated structure of fruit tree lines, vine lines,*
- *some parcels of permanent crops more or less irregular with annual crops/pastures less than 25 ha and inserted into a dominating non-permanent crop whole where none of these crops is represented more than 75 %.*

22 Agro-forestry areas

Annual crops or grazing land under the wooded cover of forestry species.
Extension :

- *Annual crops or grazing land and fallow land do cover less than 50 % of the surface.*

This heading includes :

- *areas of forest trees imbricated with fruit trees/olive trees when both kind of trees are not dominating,*
- *carob trees shading agricultural lands,*
- *agricultural land shaded by palm trees in Mediterranean context*

Arable land devoted to the cultivation of (annual) biofuel crops (number in CLUE-map = 9):

All annual crops that are grown with the aim to produce biofuel are include in this class. In most cases, biofuels are part of (non-irrigated) arable land and therefore not shown on the map. Only in specific projects the biofuels are explicitly mapped.
There is no separate CORINE-class that covers this land cover type. Instead, it is contained within the land cover class “12 Non-irrigated arable land”.

Forest (number in CLUE-map = 10):

The forest class contains production forest, protected forest, and forest not currently harvested for other reasons. It does not include other types of natural vegetation, nor does it contain agro-forestry land cover types.
This class includes the following classes from the CORINE land cover map:

23 Broad-leaved forest

Vegetation formation composed principally of trees, including shrub and bush under storeys, where broad-lived species predominate.
Extension :

- *With a crown cover of more than 30 % or a 500 subjects/ha density for plantation structure, broad-lived trees represent more than 75 % of the planting formation. Three heights under normal climatic conditions are higher than 5 m.*

This heading includes :

- *plantations of e.g. eucalyptus, polars,*
- *walnut trees and chestnut trees used for wood production included into forest area context,*
- *sparse broad-lived forests with a 30 - 60 % bracket of crown cover,*
- *evergreen broad-lived woodlands composed of sclerophyllous trees (mainly Quercus Ilex, Quercus Suber, Quercus Rotondifolia),*

- *arborescent mattoral with sclerophyllous species,*
- *olive-carob forests dominated by Olea europaea sylvestris, Ceratonia siliqua,*
- *palm groves woodlands,*
- *holly woods dominated by Ilex aquifolium,*
- *tamarix woodlands,*
- *broad-lived wooded dunes,*
- *transitional woodland areas when the canopy closure of trees cover more than 50 % of the area and if their average breast diameter is at least 10 cm,*
- *sub-arctic broadleaved forests, not reaching the 5 m height.*

24 Coniferous forest

Vegetation formation composed principally of trees, including shrub and bush under storey, where coniferous species predominate.
Extension :

- *Coniferous trees represent more than 75 % of the formation. Three heights under normal climatic conditions are higher than 5 m.*

This heading includes :

- *non-evergreen coniferous trees woodland composed of larix species,*
- *coniferous wooded dunes,*
- *arborescent mattoral with dominating juniperus oxycedrus/phoenica,*
- *coniferous wooded land,*
- *Christmas trees plantations,*
- *sub-arctic coniferous forests, not reaching the 5 m height.*

25 Mixed forest

Vegetation formation composed principally of trees, including shrub and bush under storeys, where neither broad-lived nor coniferous species predominate.
Extension :

- *With a crown cover of more than 30 % or a 500 subjects/ha density for plantation structure. The share of coniferous or broad-lived species does not exceed 25 % in the canopy closure. Three heights under normal climatic conditions are higher than 5 m.*

This heading includes :

- *mixed-forest wooded dunes,*
- *sub-arctic coniferous forests, not reaching the 5 m height.*

Sparsely vegetated areas (number in CLUE-map = 11):

This class contains all land cover types that are extremely sparcely vegetated. It includes bare rock, badlands, etc.
This class includes the following classes from the CORINE land cover map:

33 Burnt areas

Areas affected by recent fires, still mainly black.
This heading includes :

- burns which are younger than three years and when they are still visible in the satellite images,
- all natural and semi-natural vegetated areas.

31 Bare rocks

Scree, cliffs, rock outcrops, including active erosion, rocks and reef flats situated above the high-water mark.
This heading includes :

- unvegetated abandoned extraction sites,
- regs and hamadas in north-African area,
- sparsely vegetated areas where 75 % of the land surface is covered by rocks,
- stable rocks with limestone pavements, block litter and mountain-top-debris,
- unvegetated lapiaz,

- sites and products of recent volcanic activities, volcanic ash and lapilli fields, barren lava fields,
- un-vegetated supra-littoral rocky zones.

32 Sparsely vegetated areas

Includes steppes, tundra and bad lands. Scattered high-altitude vegetation.
Extension :

- Scattered vegetation is composed of gramineous and/or ligneous and semi-ligneous species for determining the ground cover percentage, excluding cryptogams.

This heading includes :

- sparsely vegetated and instable areas of stones, boulders, or rubble on steep slopes where vegetated layer covers between 15 % and 50 % of the surface,
- sub-desertic steppes with gramineous species (Artemisia spp.) mixed with alfa (Stipa spp.) when they cover between 15 % and 50 % of the surface,
- vegetation of "lapie" areas or limestone paving
- bare soils inside military training areas,
- karstic areas of gramineous, ligneous and semi-ligneous vegetation

Beaches, dunes and sands (number in CLUE-map = 12):

This class includes land cover types such as beaches, dunes and sands in general. This class in the CLUE-map is identical to the equivalent CORINE land cover class:

30 Beaches, dunes, sands

Beaches, dunes and expanses of sand or pebble in coastal or continental locations, including beds of stream channels with torrential regime.
Extension :

- *Supra-littoral beaches and dune developed at the back of the beach from high water mark toward lands.*

This heading includes :

- *river dune formation in the immediate vicinity of great rivers,*
- *inland and lacustrine dunes*
- *shifting dunes with mobile, un-vegetated or open grass lands (white dune),*
- *grey dunes fixed, stabilized or colonized by more or less closed perennial grass lands,*
- *machair formations (nature coastal sand-plane with more or less surface and grass land vegetation),*
- *ergs (continental dune field located in desert),*
- *accumulation of gravels along lower section of alpine rivers.*

Salines (number in CLUE-map = 13):

This class in the CLUE-map is identical to the equivalent CORINE land cover class:

38 Salines

Salt pans, active or in process of abandonment. Sections of salt marsh exploited for the production of salt by evaporation. They are clearly distinguishable from the rest of the marsh by their parcellation and embankment systems.
This heading includes :

- *salines organized for breeding shellfish, fishes.*

Water and coastal flats (number in CLUE-map = 14):

This class contains all major waterbodies, and all saline ecosystems. This class includes the following classes from the CORINE land cover map:

40 Water courses

Natural or artificial water courses serving as water drainage channels. Includes canals. Minimum width for inclusion: 100 m.
This heading includes :

- *sand or gravel accumulations along streams < 25 ha,*

- *rivers which have been canalized.*

41 Water bodies

Natural or artificial stretches of water.
This heading includes :

- low floating aquatic vegetation with species such as Nuphar spp., Nymphaea spp., Potamageton spp. and Lemna spp.,
- archipelago of lakes inside land areas,
- water surfaces used for fresh-water fish-breeding activities.

44, 50 Sea and ocean

Zones seaward of the lowest tide limit.

37 Salt marshes

Vegetated low-lying areas, above the high-tide line, susceptible to flooding by sea water. Often in the process of filling in gradually being colonized by halophytic plants.
This heading includes :

- Intertidal sand, silt or mud-based habitats colonized by halophytic grasses such as: Puccinelia spp., Spartina spp, rushes such as Juncus spp. and Blismus rufus and herbs such as Limonium spp., Aster tripolium, Salicornia spp. Includes all flowering plant communities which are submerged by high tides and some stage of the annual cycle,
- salt meadow shep areas.

39 Intertidal flats

Generally un-vegetated expenses of mud, sand or rock lying between high and low water mark.
Extension :
0 m marine contour on maps.
This heading includes :

- *intertidal seaweed-covered boulders, un-vegetated shores, covered by shattered rocks or boulders, cliffs and out cropping base-rocks.*

42 Coastal lagoons

Stretches of salt or brackish water in coastal areas, which are separated from the sea by a tongue of land or other similar topography. These water bodies can be connected to the sea at limited points, either permanently or for parts of the year only.
This heading includes :

- *only water surface, vegetation fringe should be separated,*
- *estuarine lagoon,*
- *salt or brackish water surface remaining at low tide.*
- *lagoons organized for breeding shell fishes*

43 Estuaries

The mouth of a river, within which the tide ebbs and flows.
This heading includes :

- *the water and the channel bed with the fringing vegetation zone > 25 ha*

Heather and moorlands (number in CLUE-map = 15):

This class in the CLUE-map is identical to the equivalent CORINE land cover class:

27 Moors and heathland

Vegetation with low and closed cover, dominated by bushes, shrub and herbaceous plants (heather, briars, broom, gorse, laburnum).
Extension :

- Temperate shrubby area vegetation: includes dwarf forest trees with a 3 m maximum height in climax stage.

This heading includes :

- wet heath distributed on humid or semi-peaty soils (peat depth < 30 cm) with Erica tetralix/ciliaris, Sphagnum spp. and Molinia spp.,
- Pinus mugo coverage above the upper tree limit in alpine zone or in the bottom of large depression with temperature inversion,
- maritime, prostrate, wind-swept and cushiony heaths with maritime ecotypes,

- heath and scrub formation in Atlantic, sub-Atlantic and sub-continental areas with gorse (Ulex spp.), vaccinium heaths (Calluna vulgaris, Vaccinium spp.), heather (Erica spp.), bracken or gorse (Genista spp.), Bilberry heaths (Vaccinium myrtillus), briar patch (Rubus spp.),
- moors in supra-mediterranean area with box trees and gorse, hedgehog-heaths (Buxus spp., Astragalus app., Bupleurum spp., etc.),
- subalpine tall herbs with dominating bushy facies (Calluna spp., Vaccinium spp., Rubus spp., Juniperus nana, etc.),
- artic moors areas with moss, lichen, gramineous coverage and small dwarf or prostrate shrub formations (Betula nana, Salix lapponum, Salix glauca, Juniperus alpina, Dryas spp.),
- thickets and brush woods in temperate climate areas (box, bramble thickets, broom fields, gorse thickets, bracken fields, common juniper-scrubs),
- brush woods and bush-like forest in alpine area with dwarf mountain pine scrub or green alder scrub (Pinus mugo spp., mughus and alnus spp.), alpine willow brush, etc, accompanied by Rhododendron spp.,
- thickets and bush-like forest in artic area with Betula nana and Salix lapponum/glauca spp.,
- abandoned crops where ligneous/semi-ligneous species cover more of 25 % of the surface,
- coastal dunes (so-called brown dunes) covered and fixed with shrubs (Hippophae spp., Empetrum spp., Salix spp.),
- herbaceous coverage formations mainly composed of non-palatable gramineous species such as Molinia spp., Brachypodium spp., etc.

Recently abandoned pasture land (number in CLUE-map = 16):

This class contains recently abandoned pasture land. It consists of herbaceous vegetation, grasses and shrubs below 30 cm. This land cover class contains vegetation that is no longer production grassland but can not yet be considered natural grassland. It may be under very extensive grazing regime not being respected in agricultural statistics. This may include horse keeping. This class naturally transgresses into the CLUE-land cover class "(semi-) natural vegetation". There is no separate CORINE-class that covers this land cover type. Most of it is likely still classified as pasture. Therefore, this class only evolves during the simulations.

SOURCE: http://terrestrial.eionet.europa.eu/CLC2000/classes/

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III: Coding tables and display legend

Dyna_CLUE code reflects the coding within the Dyna-CLUE simulations
Nr. Code reflects the 'base-map' coding
Visualisation code reflects the reclassification code for display and the RGB color code

Dyna_CLUE	Nr.:	Visualisation:	Land cover class:
0	0	0 (219/0/0)	Built-up area
1	1	1 (254/250/194)	Arable land (non-irrigated)
2	2	2 (163/222/133)	Pasture
3	3***	3 (114/137/68)	(semi-) Natural vegetation (including natural grasslands, scrublands, regenerating forest below 2 m, and small forest patches within agricultural landscapes)
9	4*	4 (173/164/254)	Inland wetlands
9	5*	5 (160/160/160)	Glaciers and snow
4	6	6 (254/172/0)	Irrigated arable land
5	7	7 (205/205/102)	Recently abandoned arable land (i.e. "long fallow"; includes very extensive farmland not reported in agricultural statistics, herbaceous vegetation, grasses and shrubs below 30 cm)
6	8	8 (207/152/107)	Permanent crops
	9**	1 (254/250/194)	Arable land devoted to the cultivation of (annual) biofuel crops
7	10	9 (1/99/0)	Forest
9	11*	5 (160/160/160)	Sparsely vegetated areas
9	12*	5 (160/160/160)	Beaches, dunes and sands
9	13*	-9999	Salines
9	14*	-9999	Water and coastal flats
9	15*	3 (114/137/68)	Heather and moorlands
8	16	7 (205/205/102)	Recently abandoned pasture land (includes very extensive pasture land not reported in agricultural statistics, grasses and shrubs below 30cm)

Visualization table and short description for display legend:

0	Built-up area
1	Arable land (non-irrigated)
2	Pasture
3	(semi-) Natural vegetation
4	Inland wetlands
5	Glaciers, Snow, Sands and sparsely vegetated areas
6	Irrigated arable land
7	Recently abandoned farmland
8	Permanent crops
9	Forest

ANNEX 1.5. DESCRIPTION OF THE LAND USE MODEL CLUE (VERSION DYNA-CLUE 2)

The model is an adapted version of the CLUE-s model (Castella and Verburg, 2007; Verburg *et al*, 2003) which is based on the spatial allocation of demands (from an external model) for different land use types to individual grid cells. The version implemented (Dynamic Conversion of Land Use and its Effects model: Dyna-CLUE version 2.0) combines the top-down allocation of land use change to grid cells with a bottom-up determination of conversions for specific land use transitions. The analysis starts by grouping the land use types into two groups: those that are driven by demand at the regional level and those for which no aggregate demand at the regional level can be determined. In many applications, the demands can be specified for urban and agricultural land uses (including production forest) while no specific demand can be determined for the (semi-) natural land cover. The land cover types for which no demand can be specified are grouped into a new category for which the aggregate change in area results from the dynamics of the other land use types, i.e., the overall change in area of this new category corresponds to the net change in the demand-driven land use types (Figure 1).

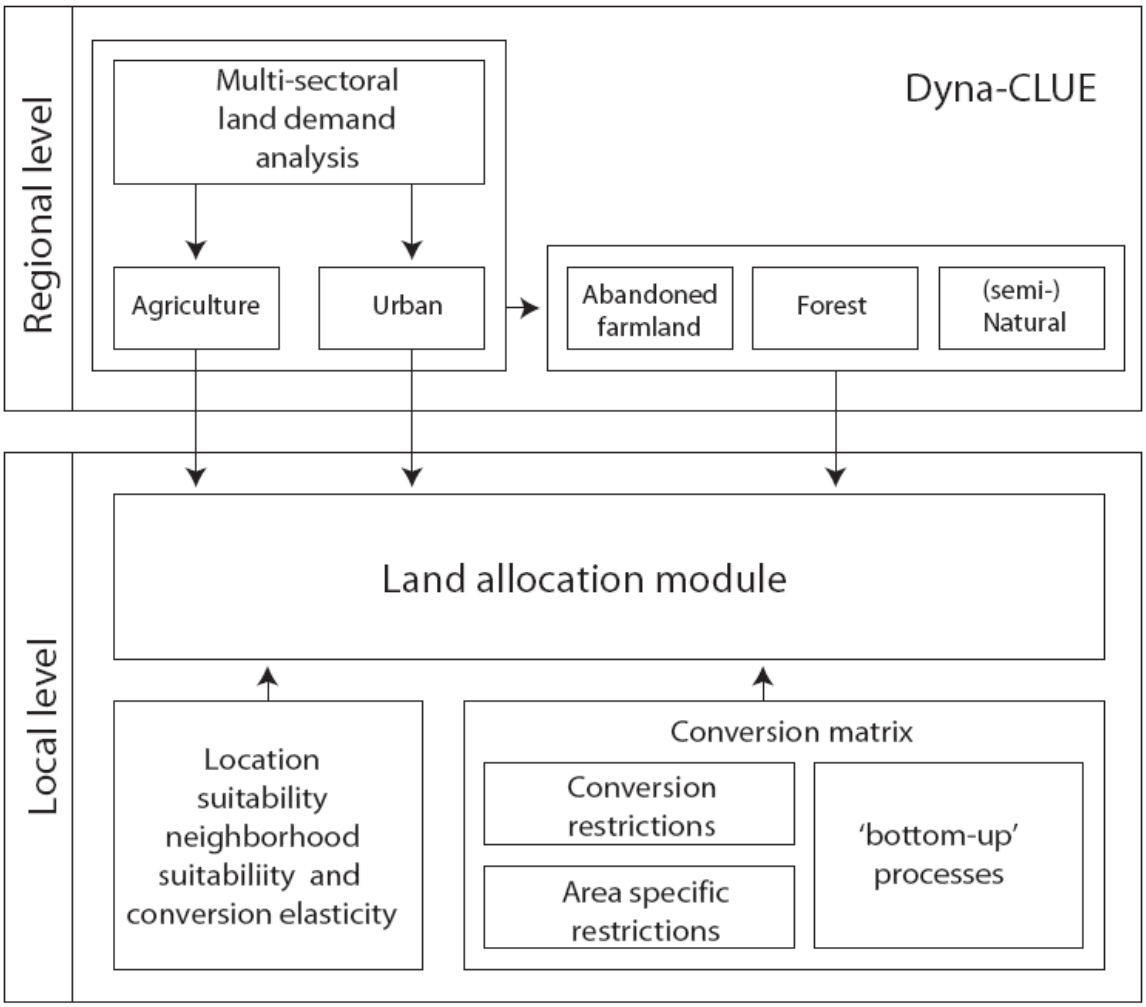

Figure 1 Overview of the Dyna-CLUE model

The spatial allocation module allocates the regional level (often national level) demands to individual grid cells until the demand has been satisfied by iteratively comparing the allocated area of the individual land use types with the area demanded. Land cover types that are grouped in a new category are allocated individually but only the sum of the allocated area of the grouped land cover types is compared with the demand. The allocation procedure allocates at time (t) for each location (i) the land use/cover type (lu) with the highest total probability ($Ptot_{i,t,lu}$). The total probability is defined as the sum of the location suitability ($Ploc_{i,t,lu}$), neighborhood suitability ($Pnbh_{i,t,lu}$), conversion elasticity ($elas_{lu}$) and competitive advantage ($comp_{t,lu}$) following:

$$Ptot_{i,t,lu} = Ploc_{i,t,lu} + Pnbh_{i,t,lu} + elas_{lu} + comp_{t,lu} \quad (1)$$

The conversion elasticity is a measure of the cost of conversion of one land use type to another land use type and applied only to those locations where the land use type is found at time t. High values indicate high conversion cost (either monetary or institutional (e.g. in terms of legislative procedures) and thus a higher total probability for the location to remain under the current land use type. Low values for $Elas_{lu}$ may apply to annual crops, grassland and similar land use types while high values apply to forest, urban areas and permanent crops for which high costs of establishment have been made.

The competitive advantage is iteratively determined for all land use types during an iterative procedure. Values are increased during the iteration when allocated area is smaller than area demanded while values are decreased when allocated area exceeds the demand. In the case of increasing demand, the value of the competitive advantage is likely to increase while lower values are obtained when the demand for a certain land use type decreases. For the grouped land use types, only a value for the competitive advantage for the group as a whole is determined, as demands are not specified for the individual land use types within this group.

Location suitability and neighborhood suitability can be determined by either empirical methods (Aguiar *et al*, 2007; Verburg *et al*, 2004b), process and expert knowledge (Overmars *et al*, 2007) and the (dynamic) analysis of neighborhood interactions similar to constrained cellular automata models (Verburg *et al*, 2004a). In case of (semi-)natural land use types suitabilities are only defined when specific location requirements are known and relevant. Otherwise a uniform suitability is assigned to all locations.

The maximization of the total probability is checked against a set of conversion rules as specified in a conversion matrix (Figure 2). This conversion matrix indicates which conversions are possible for each land use type, e.g., the conversion from agriculture to forest is not possible during one (yearly) time step as a consequence of the time it takes to grow a forest. Conversions that are excluded by the conversion matrix overrule the maximization of total probability. Instead, the land use type with the highest total probability for which the conversion is allowed will be selected. In addition it is possible to specify that certain conversions are only possible within delineated areas, such as outside nature reserves. In this case a reference to a map indicating these zones is made in the conversion matrix. The dynamics of the land use types governed by local processes ('bottom-up processes' in Figure 1) are also

specified in the conversion matrix. Instead of restricting a specific conversion it is also possible to enforce a conversion between land use types. When a specific conversion is expected within a specific number of years the conversion will be enforced as soon as the number of years is exceeded. Figure 2 illustrates this for the conversion of shrubland to forest which takes place after a number of years depending on the growth conditions at the location. Such locally determined conversions are the result of specific management practices or vegetation dynamics. Due to the spatial variation in local conditions, these time periods are represented in a map (Figure 2).

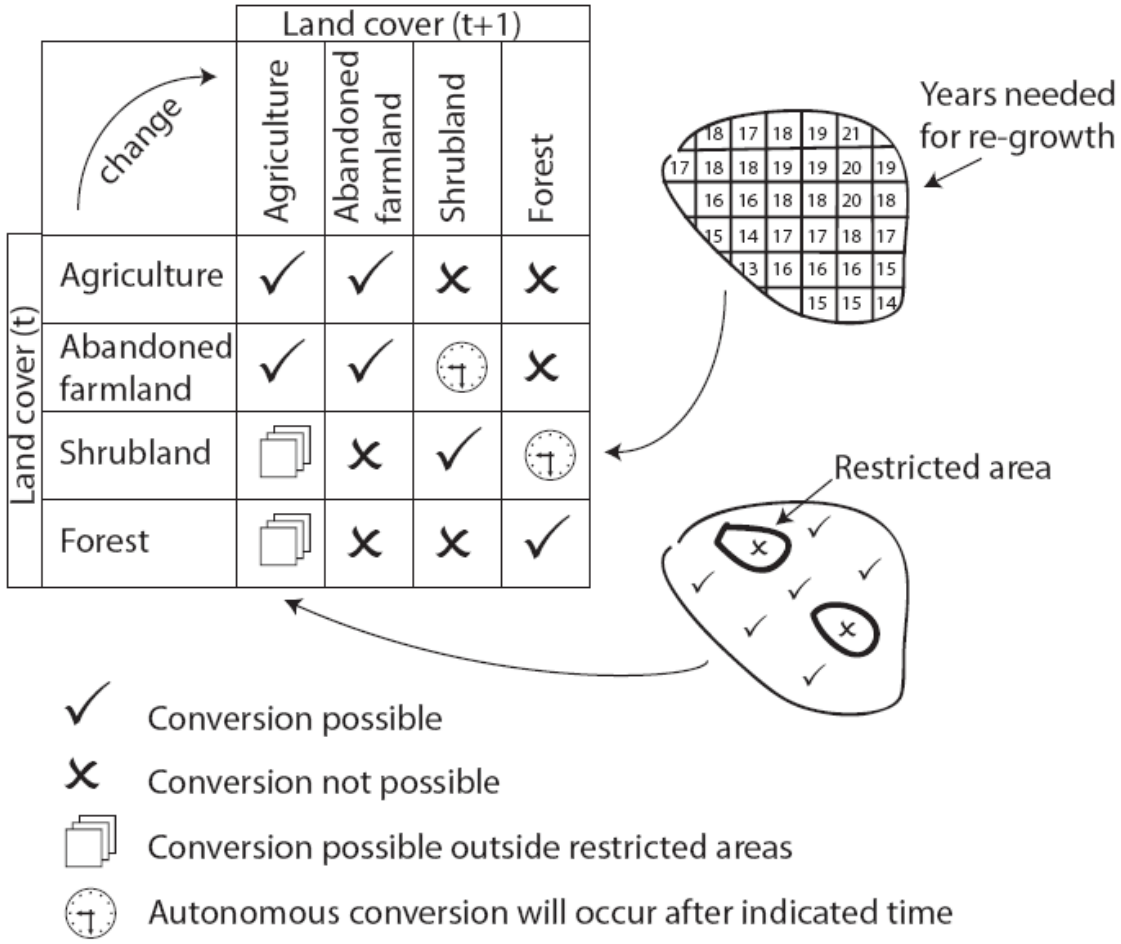

Figure 2. *Simplified land cover conversion matrix indicating the possible conversions during one time step (one year) of the simulation*

Locally determined conversions will, to some extent, interfere with the allocation of the other land use types that are driven by the regional demands due to changes in conversion elasticity upon locally determined conversions, i.e., the conversion to agriculture is less difficult for recently abandoned agricultural land than for shrubland. The resulting conversion trajectories will cause intricate interactions between the spatial and temporal dynamics of the simulation.

The specification of the model for different land use types, location suitability, conversion elasticity and conversion matrix is dependent on the specific case study area, spatial and temporal scale and the purpose of the model. The following section illustrates the functioning of the model by a specification of the model for the

simulation of land use for the 27 countries of the European Union at a spatial resolution of 1 km2 for the time period 2000-2030.

Implementation of the Dyna-CLUE model for EU27

The application of the model for Europe includes 16 different land use types (Annex 2). Although the land use types area derived from a land cover map (CLC/CORINE, (EEA, 2005)), they also represent, to some extent, the use of the land cover. Therefore, we refer to 'land use types' in the following. The land use types are subdivided into three categories:

- The first category includes land use types for which a demand is calculated at the level of individual member states by a macro-economic, multi-sector model accounting for global trade and agricultural policy (Meijl *et al*, 2006; Verburg *et al*, 2008) in combination with a simple projection model for urbanization;
- The second category contains land use types for which the area is expected to be more or less constant in time due to the inability to use these lands for agricultural or urban purposes, or strict protection to avoid conversion;
- The third category contains land use types the conversions of which are determined by local conditions, especially the regeneration of natural vegetation. Land use types in this group are recently abandoned arable land, recently abandoned grassland, (semi-)natural vegetation and forest. The land use types in this category are grouped into one single group, which area results from the dynamics of the agricultural and urban land use types. Agricultural decline will increase the area of this group while agricultural expansion and urbanization will occur at the cost of this group. The protected areas for nature conservation determine the minimum area allocated to these (semi-) natural land uses. The conceptual transitions between the land use types in this group are shown in Figure 3. Upon abandonment of agricultural land regeneration/succession of (semi-)natural vegetation takes place depending on the local conditions that favor or retard the establishment and growth of natural vegetation.

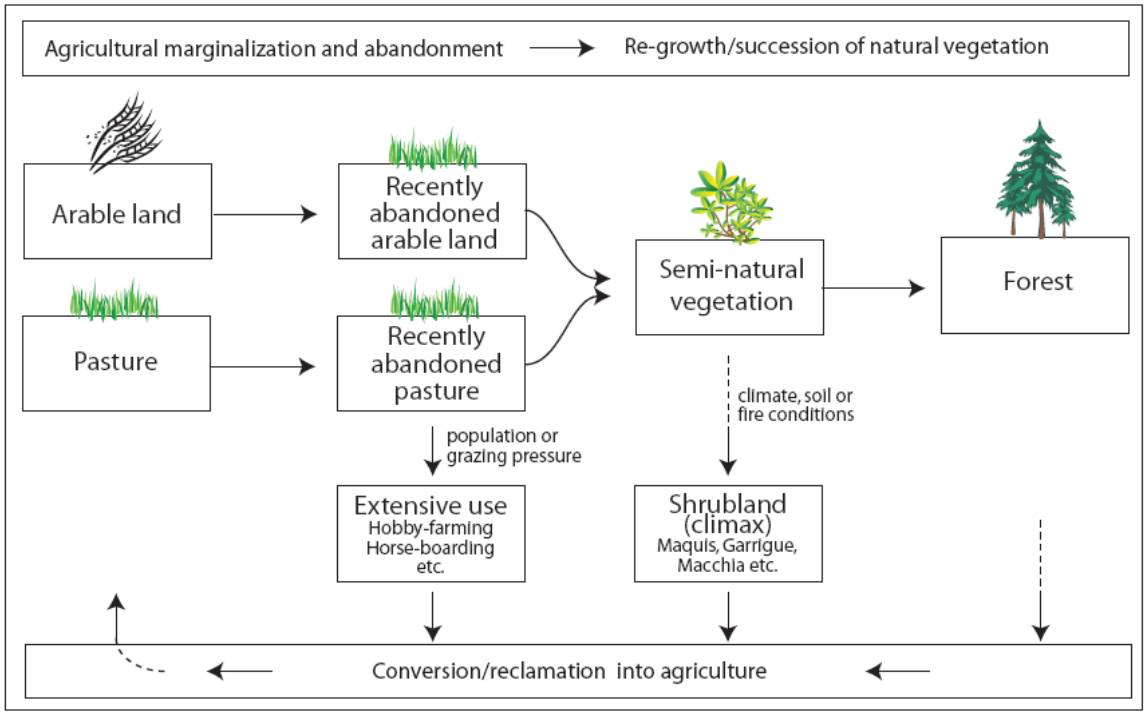

Figure 3 *Schematization of the land use/cover transitions upon abandonment of agricultural land*

The subdivision of the regrowth of natural vegetation into three stages of succession is arbitrary since succession is a continuous process. However, the three stages were chosen because of their clear morphological and functional differences and frequent use in studies of succession on abandoned farmland (Pueyo and Beguería, 2007). Occasional grazing on abandoned farmlands, which is common practice in many parts of Europe, may retard the transition to shrubs and trees (González-Martínez and Bravo, 2001; Tasser *et al*, 2007; Tzanopoulos *et al*, 2007). Also, in densely populated areas alternative uses may occupy former farmland areas, e.g., hobby farming and horse-boarding (Gellrich *et al*, 2008). In this case the land use remains similar to agricultural land but does not contribute to agricultural production. Therefore these areas are disregarded in the demand calculations for agricultural land. Under these circumstances the classification of the land will remain 'recently abandoned agricultural area'. Besides the effects of grazing and population pressure, the re-growth of shrub vegetation on recently abandoned land depends on local growth conditions for vegetation including soil constraints (Prach, 1993; Tasser *et al*, 2007). Recently abandoned agricultural land is subdivided into recently abandoned grassland and recently abandoned arable land depending on the previous use. This subdivision is necessary because succession on grassland takes, under similar conditions, longer due to the closer vegetation structure that makes the establishment of new species including shrubs and trees more difficult (Benjamin *et al*, 2005; Flinn and Vellend, 2005; Myster and Pickett, 1994). Also the subsequent conversion of shrubland to forest depends on local biophysical conditions (Kräuchi *et al*, 2000; Pan *et al*, 1999; Poyatos *et al*, 2003; Pueyo and Beguería, 2007). In dry or cold climates or on very shallow soils the succession of shrubland to forest is extremely slow and may not occur at all (del Barrio *et al*, 1997; Lesschen *et al*). In these locations shrubland is the climax vegetation including typical vegetations such as Maquis, Garrigue and Macchia as found in southern Europe, the Tundra of northern Europe and mountain areas above the treeline. Besides climatic and soil conditions the time needed for

succession into forest is also determined by the dispersal of seeds (Prévosto *et al*, 2003; Pugnaire *et al*, 2006; Tasser *et al*, 2007) which is approximated by the presence of forest in the neighborhood.

All possible conversions indicated in Figure 3 are represented in the land use conversion matrix (Figure 2). The matrix indicates that certain conversions are not possible, e.g. the conversions from agricultural land to shrubland and forest because upon agricultural abandonment the land use is first classified as recently abandoned land. Conversion of recently abandoned arable land into shrubland is scheduled after a number of years indicated in a map depending on the local conditions and the processes mentioned above (Figure 4). The parameterization of the time between the different succession stages is based on a combination of expert rules and biophysical data. The influence of climate and soil conditions is quantified by calculating an index that combines potential evapotranspiration during the growing season and constraints based on the water holding capacity of the soil available to plants, water deficit, temperature restrictions and water logging occurrence. Spatial information for these variables is derived from the WorldClim database (Hijmans *et al*, 2005), the Climate Research Units database (Mitchell *et al*, 2002) and the European Soil Database (ESDB). This index is translated into succession periods by calibration on an expert table of observed and reported succession speed in different environmental and altitude zones across Europe (R.H.G. Bunce, pers. communication). The expert table is based on observations of forest re-growth on abandoned land and review of literature for various case studies (a.o., (Bonet, 2004; Debussche *et al*, 1996; Didier, 2001; González-Martínez and Bravo, 2001; MacDonald *et al*, 2000; Osbornova *et al*, 1990; Poyatos *et al*, 2003; Pugnaire *et al*, 2006; Tasser and Tappeiner, 2002; Tasser *et al*, 2007). In the calibration, it was accounted for that the observed succession times often correspond with plots that are marginal for agriculture, showing lower succession speed for natural vegetation as compared to locations on prime agricultural land. This calibration resulted in three maps indicating (i) succession time for recently abandoned grassland to (semi-)natural vegetation, (ii) recently abandoned arable land to (semi-)natural vegetation and (iii) for (semi-)natural vegetation to forest (Figure 4). Based on current grazing intensities (high-resolution livestock data; Neumann *et al*, 2009) and population densities (LandScanTM Global Population Database; Oak Ridge National Laboratory) the transition of recently abandoned agricultural land to shrubland was retarded to represent the effects of grazing and alternative uses under conditions of high population pressure. Grazing in areas with more than 30 livestock units/km^2 was assumed to retard succession by 5 years while in zones with more than 75 livestock units/km^2 succession was retarded by 10 years. In areas with high population pressure (identified by calculating a population potential map) the succession was assumed to be retarded by between 5 and 100 years dependent on the population pressure. Retarding the succession by a long period indicates that succession is unlikely to happen, at least not during the simulation period (2000-2030). In scenarios where active management of natural areas designated under the NATURA2000 scheme was envisioned, the succession time was expected to be two years shorter than elsewhere under similar conditions due to favorable management conditions that enhance the establishment of natural vegetation.

Other model settings include the definition of the suitability of locations for agricultural and urban land use types, conversion elasticities and region-specific constraints representing spatial policies and planning. Suitabilities where estimated by

logit models using the spatial association of current land use with a wide range of biophysical and socio-economic variables to represent location factors (Verburg *et al*, 2004b; Verburg *et al*, 2006b). Conversion elasticities were estimated based on expert knowledge of the conversion costs for different land uses and spatial restrictions included NATURA2000 nature reserves, erosion sensitive locations and 'less favoured areas' following the spatial policies included in the scenario description (Westhoek *et al*, 2006). More specific details on the configuration of the model are provided in Verburg *et al*, 2008) and (WUR/MNP, 2008).

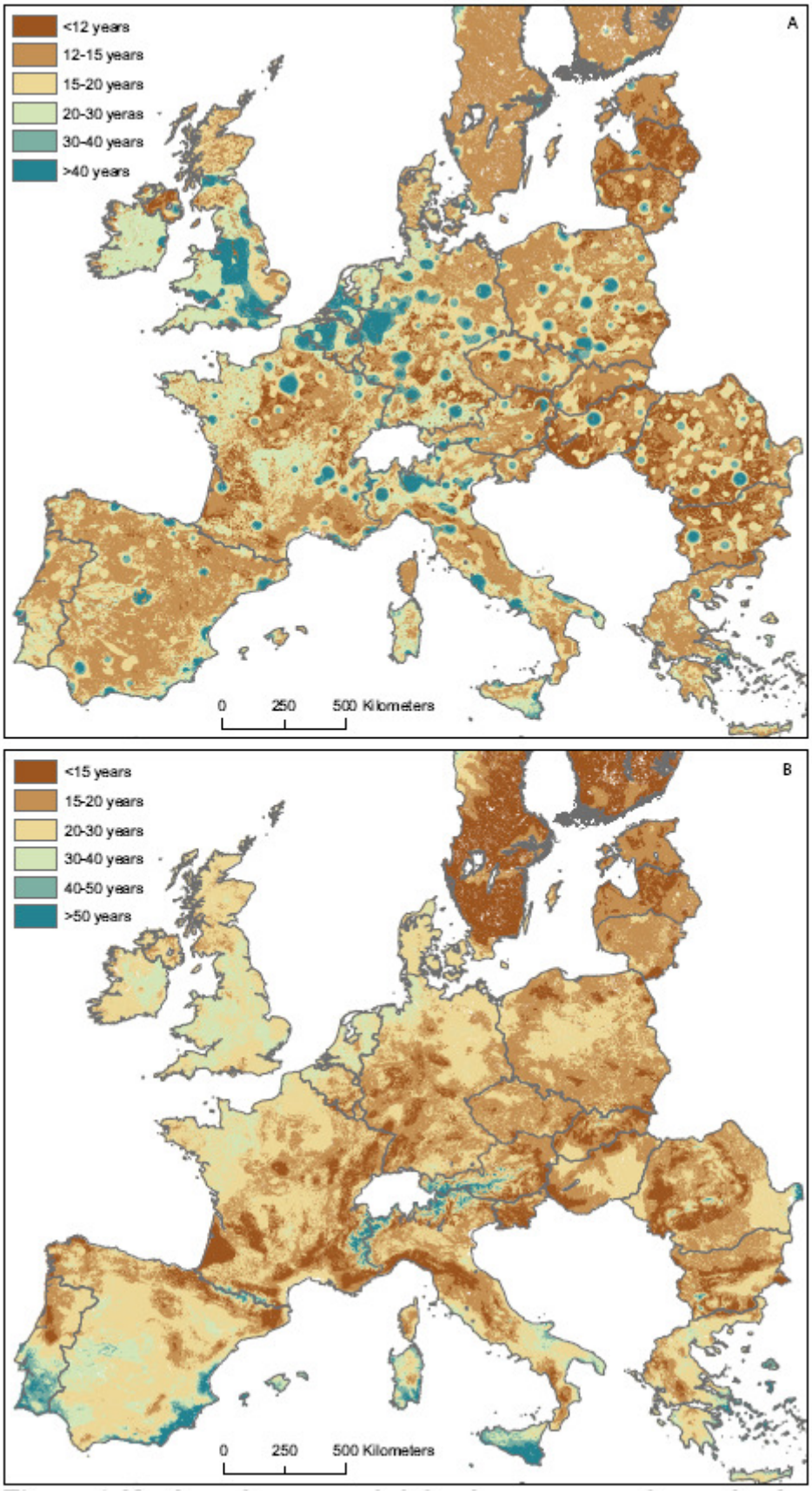

Figure 4 *Number of years needed for the transition of recently abandoned arable land into (semi-) natural vegetation (A) and for the transition of (semi-) natural vegetation into forest (B)*

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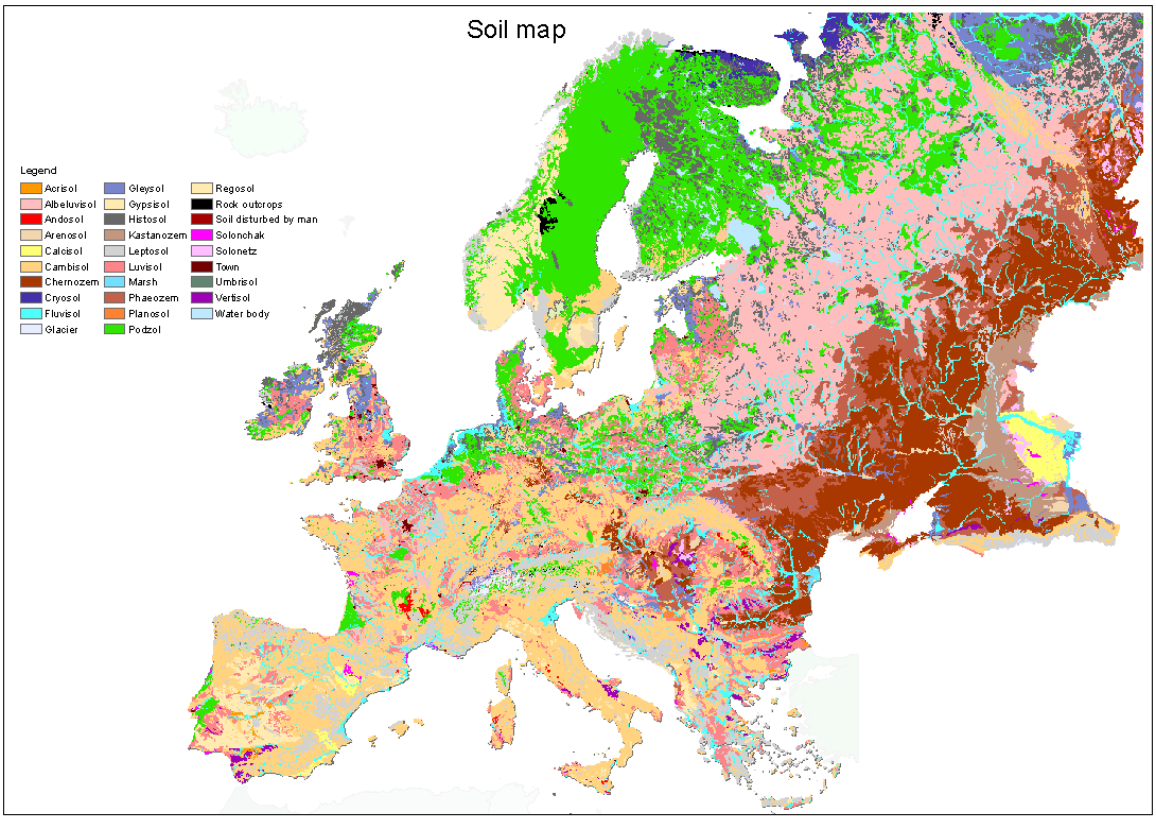
ANNEX 2. SOIL SEALING DATA AND DETAILED RESULTS

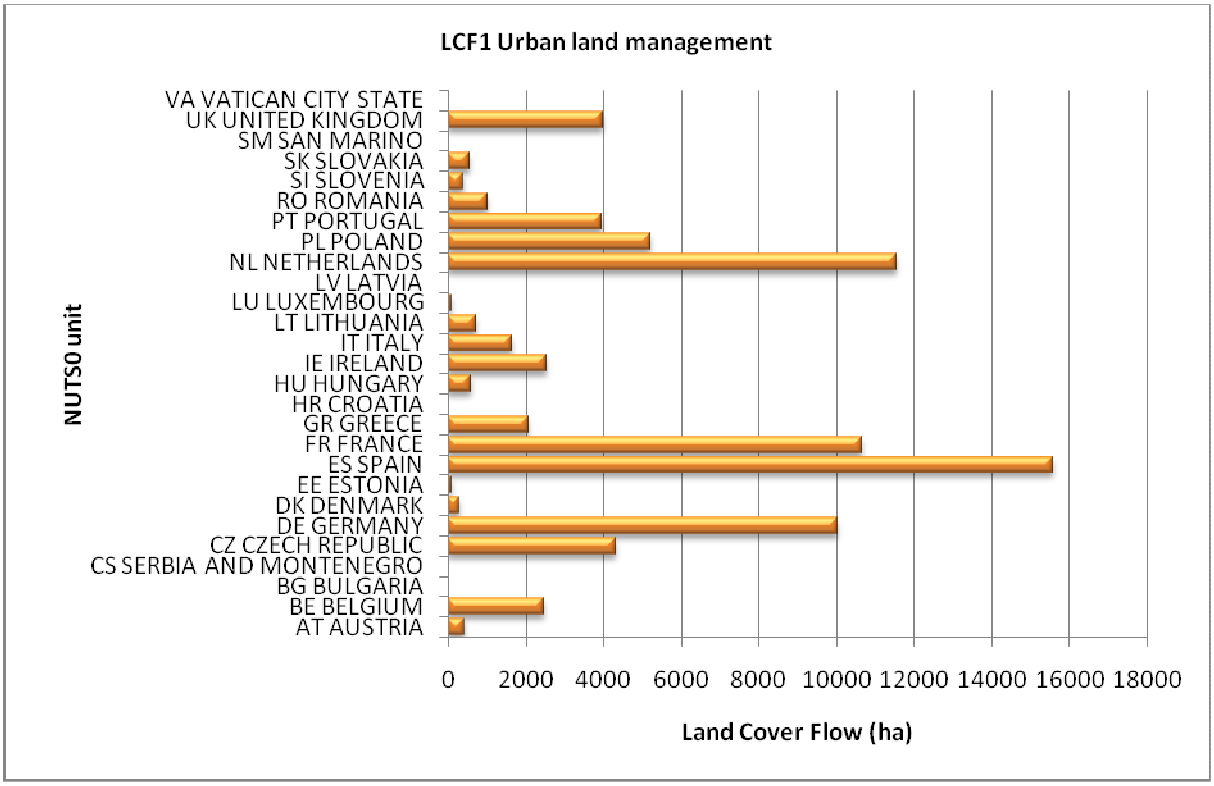
ANNEX 2.1. REFERENCE SOIL GROUPS IN THE EUROPEAN SOIL MAP



Source: European Soil Database v2.0.

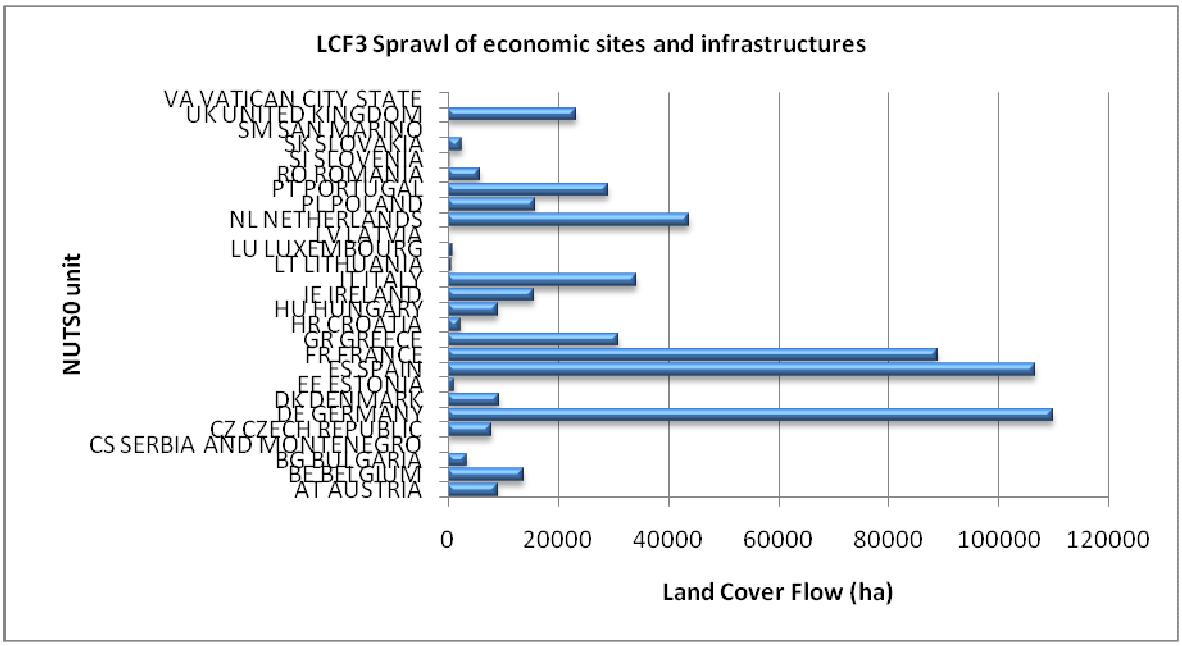
ANNEX 2.2. LAND COVER FLOWS AFFECTING SOIL SEALING AT NUTS0 LEVEL BETWEEN 1990 AND 2000 (LCF1).

Annex 2.2a. Internal transformation of urban areas in European countries at NUTS0 level between 1990 and 2000 (LCF1).



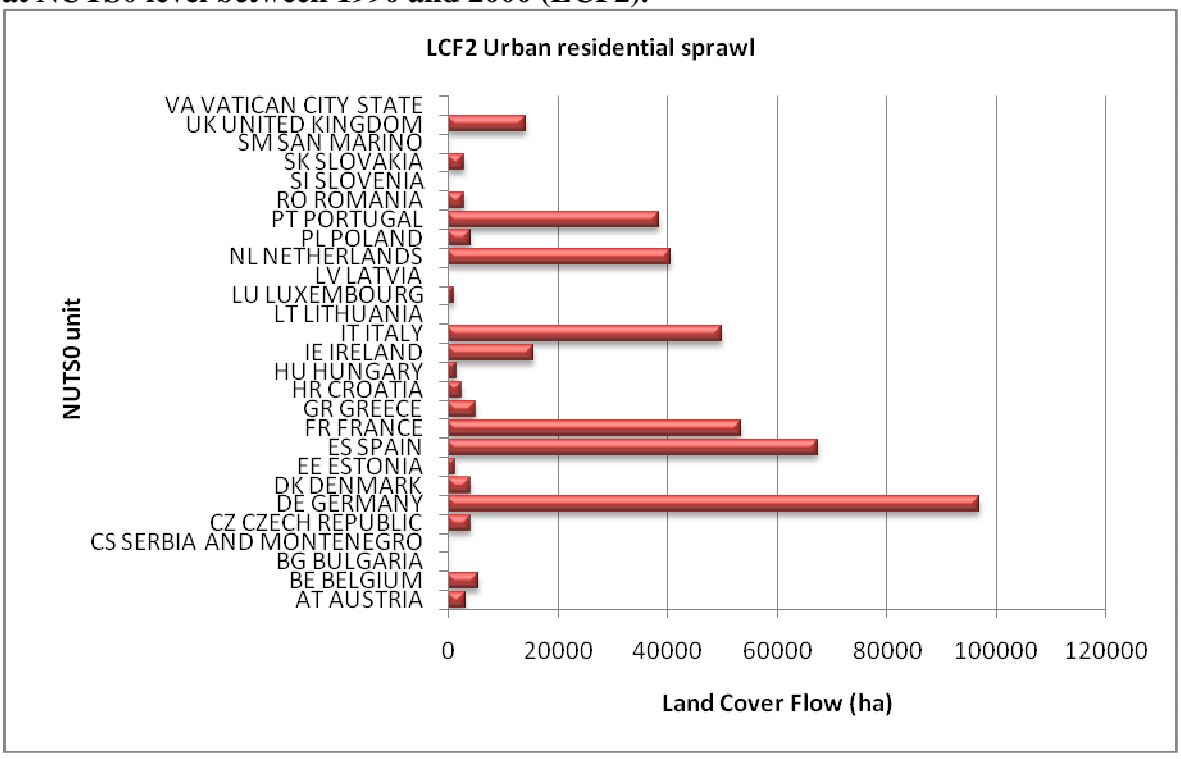
Source data: LEAC 1990-2000 and Task 1.

Annex 2.2b. Urban residential sprawl in European countries at NUTS0 level between 1990 and 2000 (LCF2)



Source data: LEAC 1990-2000 and Task 1.

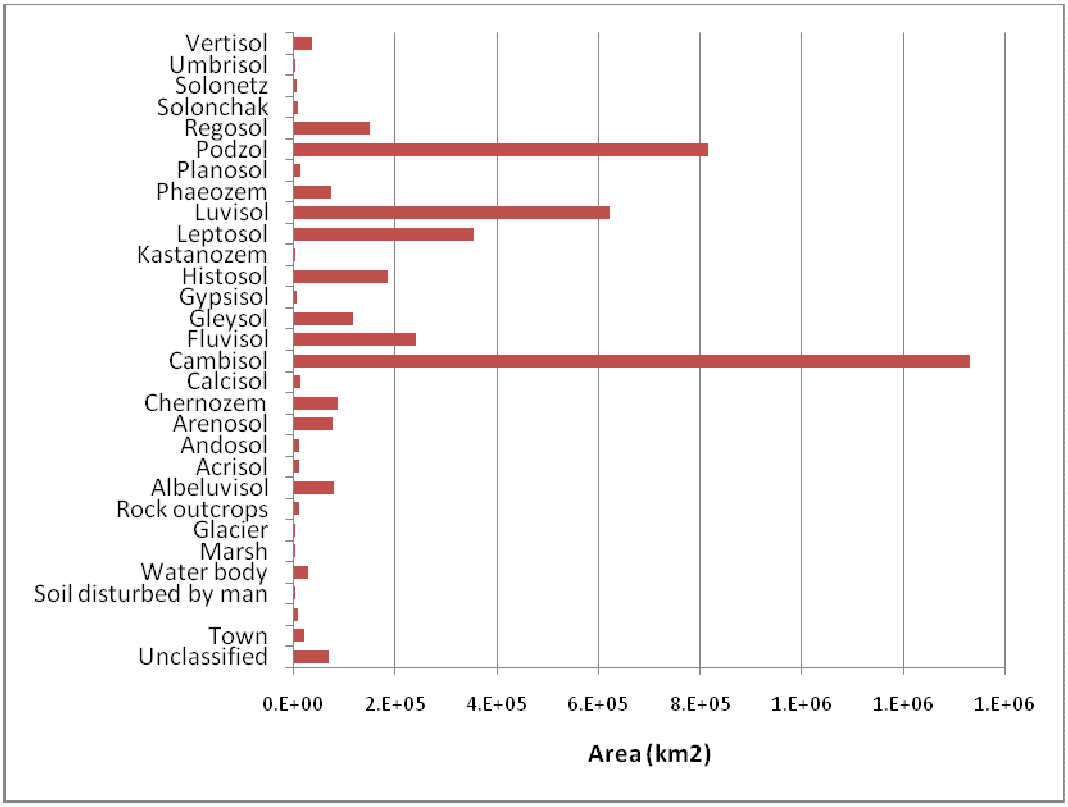
Annex 2.2c. Sprawl of economic sites and infrastructures in European countries at NUTS0 level between 1990 and 2000 (LCF2).



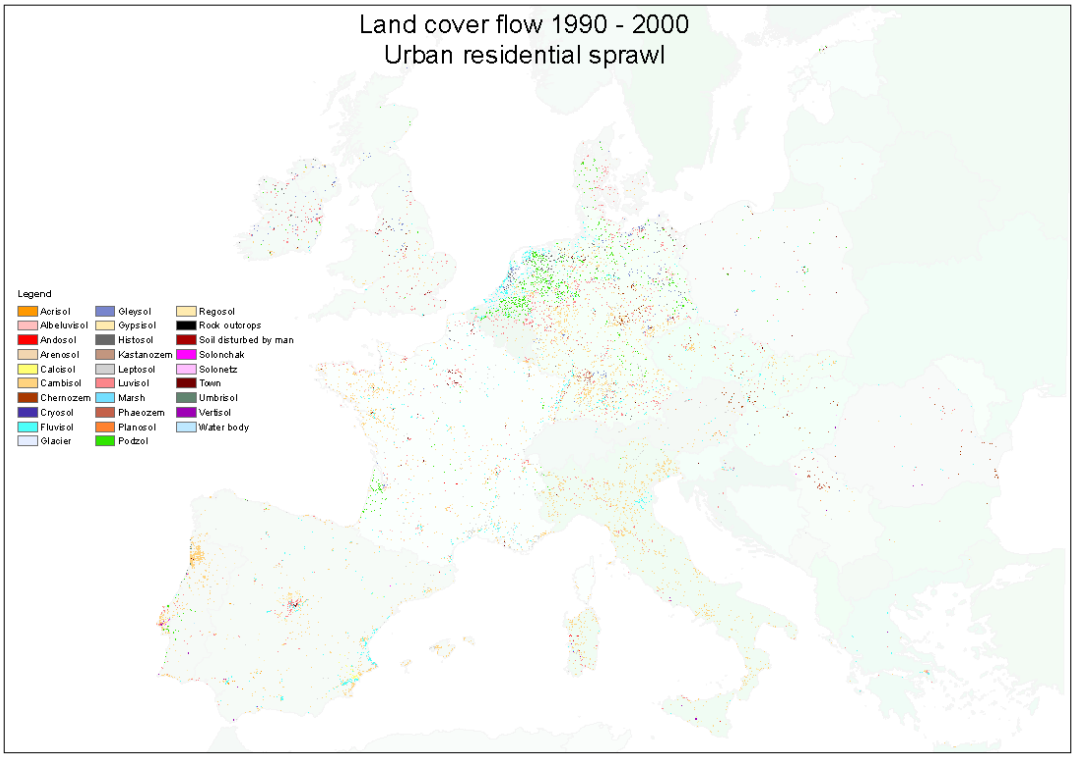
Source data: LEAC 1990-2000 and Task 1.

ANNEX 2.3. EXTENT AND UPTAKE OF REFERENCE SOIL GROUPS

Annex 2.3a. Areal extent of Reference Soil Groups (WRB 2006) in EU27.

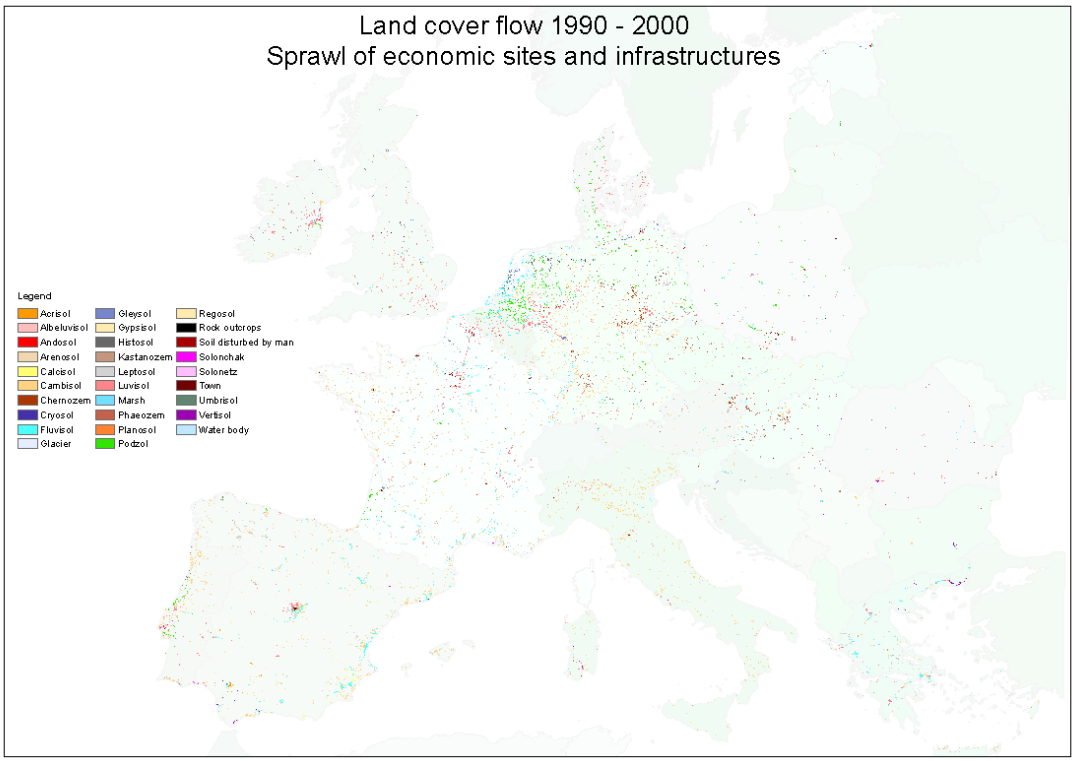


ANNEX 2.3b. Uptake of Reference Soil Groups by urban residential sprawl between 1990 and 2000.



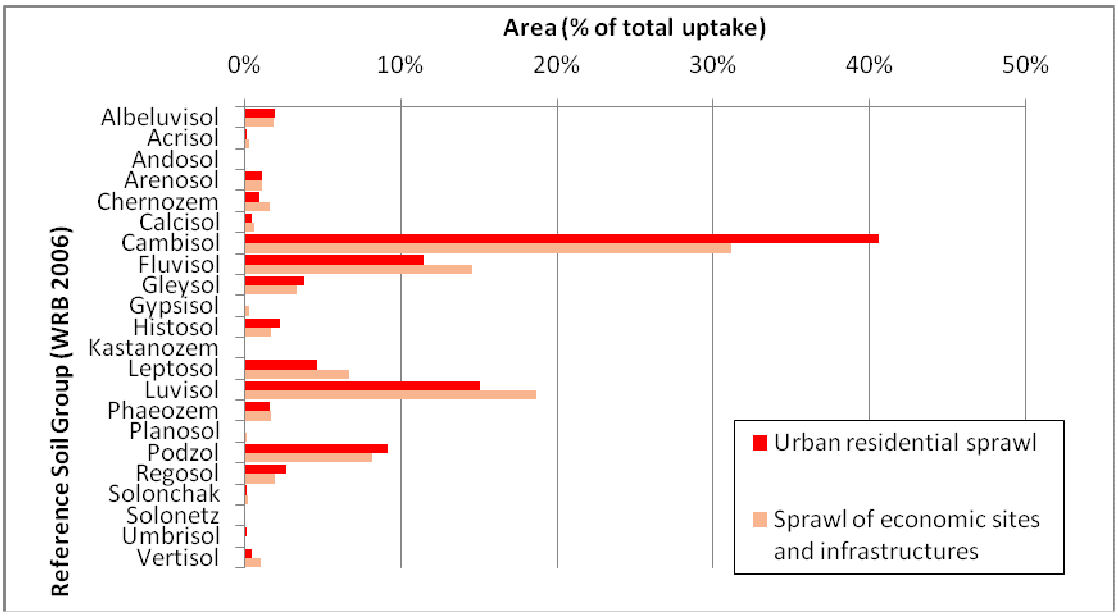
Source data: CLC 1990 and 2000, LEAC Database, ESDB v2.0.

ANNEX 2.3c. Uptake of Reference Soil Groups by the sprawl of economic sites and infrastructures between 1990 and 2000



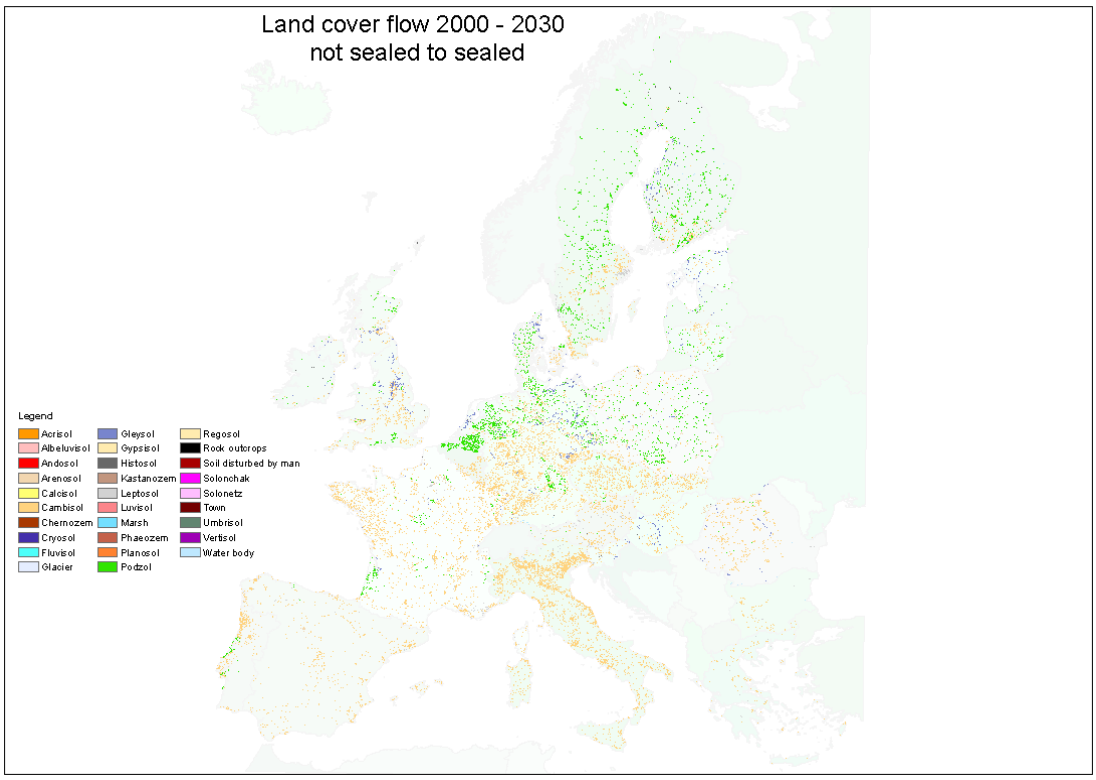
Source data: CLC 1990 and 2000, LEAC Database, ESDB v2.0.

ANNEX 2.3d. Uptake of Reference Soil Groups by urban residential sprawl and the sprawl of economic sites and infrastructures between 1990 and 2000.



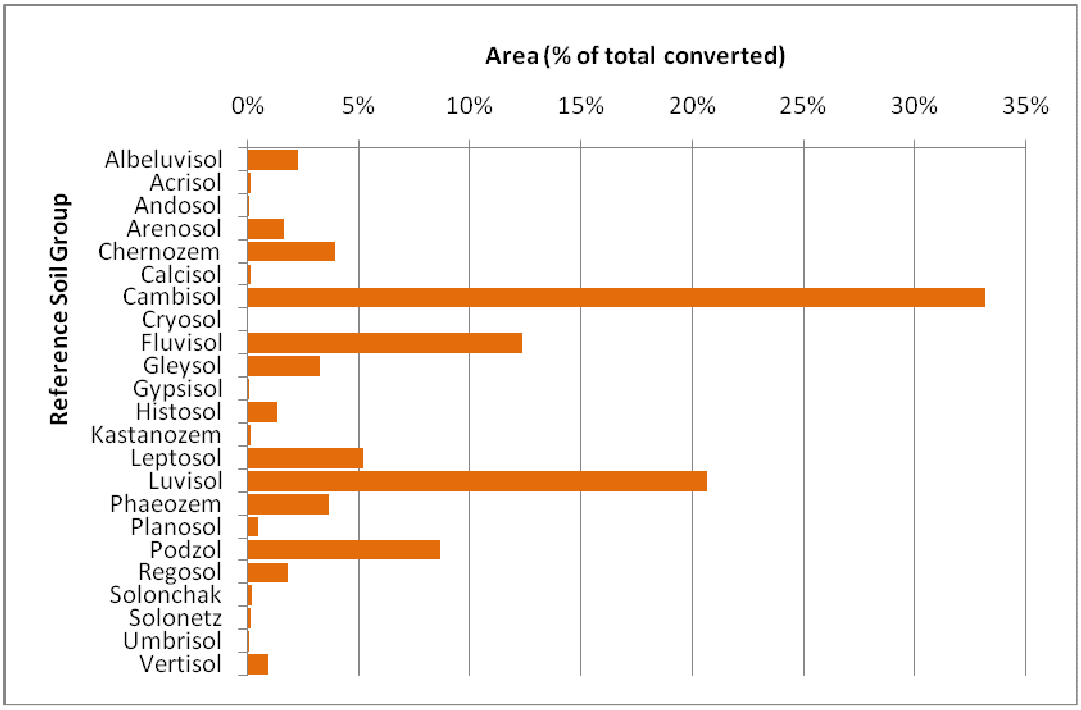
Source data: CLC 1990 and 2000, LEAC Database, ESDB v2.0.

ANNEX 2.4. UPTAKE OF REFERENCE SOIL GROUPS BY BUILT-UP AREA BETWEEN 2000 AND 2030. SOURCE DATA: CLC 2000, AND SIMULATIONS WITH THE GTAP, IMAGE AND CLUE MODEL CHAIN FOR GLOBAL CHANGE SCENARIO B1.



Source: report from Peter Verburg for Task 1, this volume, ESDB v2.0.

ANNEX 2.5. UPTAKE OF REFERENCE SOIL GROUPS BY BUILT-UP LAND BETWEEN 2000 AND 2030



Source data: CLC 2000 (reclassified to CLUE legend), CLUE-2030, ESDB v2.0.

ANNEX 2.6. DESCRIPTION OF THE MEAN SPECIES ABUNDANCE (MSA) AND ITS CALCULATION

This information sheet was produced for the Eururalis 2 tool, in order to:

- implement indicator calculations;
- automate validation of input parameter and calculation result range;
- visualise indicator map;
- collect uniform indicator fact sheet content;
- allow back tracing of calculation (transparency).

Indicator name	Biodiversity / ecosystem quality
Short description (max. 3 lines)	This indicator is constructed to show the impact on biodiversity. The value used to describe the biodiversity is the Mean Species Abundance (MSA) and the approach used is derived from the GLOBIO3 concept. Biodiversity is responds to land use change and is affected by fragmentation, N deposition, infrastructure development and land-use intensity. These factors are driven by the (global) driving forces but also by specific nature policies which are spatially explicit.
Contact person and organization	Jana Verboom Alterra – jana.verboom@wur.nl Rob Alkemade MNP – rob.alkemade@mnp.nl Willem Rienks Alterra – willem.rienks@wur.nl Igor Staritsky – igor.staritsky@wur.nl

Indicator data type

Units	Biodiversity index (MSA)
Valid range	0-100

Qualitative or ordinal : index indicating risk

Legend (for map display)

Name	Value or range	Colour indication
0-5	0-5	Brown yellow
5-10	5-10	
10-20	10-20	
20-30	20-30	
30-40	30-40	
40-50 50-75 75-100	40-50 50-75 75-100	Dark green

Level of map presentation (e.g. 1x1km gird, nuts2, HARM, etc)
1*1 km grid, Nuts2 (upscale)

Description of causality in calculation method (max. 10 lines)
The biodiversity index or MSA is derived from land-use, land use intensity (agriculture and forestry), the N-deposition, fragmentation, infrastructure developments and policy assumptions on high nature value (HNV) farmland protection and organic agriculture. The methodology used is the GLOBIO3 approach.

Calculation input

Name	Quantity	Source	Description
Land cover	Clue classes	Clue modeling	Clue AsciiGrid grid 1x1 km (For all scenarios; for all timesteps)
Livestock density map	0-100 100-9999	Result of Eururalis livestock density metamodel Livestock density indicator	AsciiGrid grid 1x1 km (For all scenarios; for all timesteps)
Forest age map	Years	WUR-SIL	nuts3 level forest age map from WUR-SIL (1)
MSA Landuse conversion table per landuse category		Expert judgement table MNP table Rob Alkemade / Jana Verboom	A table (1) with a MSA Landuse conversion factor per CLUE land-use category (1)
Forest use intensity table per scenario & per time slice		Scenario assumption by experts (Jana Verboom, Rob Alkemade, Willem Rienks)	We will provide a table (1) with forest use intensity per scenario (1)
HNV Map	Yes/no	JRC via Michiel van Eupen/Berien Elbersen Alterra	AsciiGrid 1x1 km map with areas under HNV designation (1)
Organic agriculture table		Own data source/table Pytrik Reidsma et al	Table with the 4 scenarios and the % of organic agriculture over time (1)
Road map 2000 grid	Yes/no	TEN-Stack project via NEA (mr Marco Duijnisveld – 070-3988416)	AsciiGrid grid 1x1 km Road map of 2000 (1)
Road map 2010 grid	Yes/no	TEN-Stack project via NEA (mr Marco Duijnisveld – 070-3988416)	AsciiGrid grid 1x1 km Road map of 2000 (1)
Road map 2020 grid	Yes/no	TEN-Stack project via NEA (mr Marco Duijnisveld – 070-3988416)	AsciiGrid grid 1x1 km Road map of 2020 (1)
Road map 2030 grid	Yes/no	TEN-Stack project via NEA (mr Marco Duijnisveld – 070-3988416)	AsciiGrid grid 1x1 km Road map of 2020 (1)
Table road buffer		Expert judgement table (Jana Verboom en Rien Reijnen of Alterra Wageningen)	Table with the buffer distances and correction factor
Natura 2000 map	Yes/no		AsciiGrid grid 1x1 km (1)
Fragmentation table		Table of Fleur Smout en Rob Alkemade of MNP Bilthoven.	A table with the relation between area of nature and the MSA correction factor
N-deposition maps Image	Kg N/ha	IMAGE modeling via Bas Eickhout	AsciiGrid 1x1 km (For the four baseline scenarios; for all timesteps)
Critical load map	Kg N/ha	Rob Alkemade MNP	AsciiGrid 1x1 km (1)
Critical load formulas		3 formulas for critical loads for 3 categories.	A table of formulas per CLUE legend class.

Technical implementation of calculation method (Incl aggregation method)

The main approach is the following (example 2000):

MSA_{2000} = $MSA\text{-}landuse_{2000}$ * MSA $infrabuffer_{2000}$ * $MSA\text{-}fragmentation_{2000}$* $MSA\text{-}Ndeposition_{2000}$ * $MSA\text{-}climate_{2000}$ * 100

MSA-landuse

1. select CLUE Land-use map
2. Split up Land-use class Pasture into Intensive pasture and Extensive pasture with the Livestock density map; Extensive pasture is pasture with less than 100 LSU/km2
3. Split up land-use category Forest into Forest plantation and natural forest with the Forest age map. Age classes are younger than 10, 20, 30, 40 50-80 years, and older than 80 years.
4. Join the Landuse map with the Landuse conversion table with a MSAlanduse value per Landuse class
5. Multiply all agricultural classes with 1.25 when within boundaries of HNV map
6. Multiply all agricultural classes with Organic agriculture table; times 3 for very intensive agriculture, times 2 for intensive agriculture and times 1.4 for extensive agriculture
7. Multiply all forest with Forest use intensity table for the right scenario

MSA-infrabuffer

1. Select the road map
2. Buffer road map with Table road buffer

MSA-fragmentation

1. Select the Clue landuse map
2. Select all the nature categories and make map Yes/no nature
3. Select the Road map and the Natura 2000 map; when B1 or B2 scenario and 2020 or 2030 erase road grids within Natura 2000 boundaries (we assume that Nature 2000 areas will be linked when fragmented in the B scenarios).
4. Subtract the Yes-nature with the Road map resulting in smaller patch sizes
5. Calculate patch sizes
6. Join the patch size with the Fragmentation table calculating the MSA-fragmentation
7. When landuse is agriculture, then MSAfrag = 1.

MSA-Ndeposition

1. Select the IMAGE Ndeposition map and the Critical load map
2. Subtract both maps: Nexc = N-dep - CL
3. When Nexc > 0 than calculate the per landuse categorie the MSA-ndeposition
4. Calculate the impact of N-exceedance on the MSA-Ndeposition with 3 different formulas applicable for different clue classes. When no exceedance or when clue landuse class is not sensitive to ndeposition than MSA-ndeposition = 1.

MSA-Climate

- not taken into account in Eururalis 2.0

<u>Present aggregated results:</u>

- per nuts region resulting in average MSA
- by smoothing the results with 10 km circle

MSA-land-use table

LU-class	MSA-value	Description	
0	: 5	0	Built-up area
1	: 10	1a**	Arable land (non-irrigated) Intensive
		1b **	Arable land (non-irrigated) Low-input (extensive)
2	: 10	2**	Pasture intensive (>50 LSU/km2)
3	: 70	3*	(semi-) Natural vegetation (including natural grasslands, scrublands, regenerating forest below 2 m, and small forest patches within agricultural landscapes)
4	: 100	4*	Inland wetlands
5	: 100	5*	Glaciers and snow
6	: 5	6**	Irrigated arable land
7	: 30	7 **	Recently abandoned arable land (i.e. "long fallow"; includes very extensive farmland not reported in agricultural statistics, herbaceous vegetation, grasses and shrubs below 30 cm)
8	: 20	8 **	Permanent crops
9	: 10	9**	Biofuel crops (Intensive)
10	: 70	10*	Forest (natural/plantation – average forest age in region between 50 and 80 years)
11	: 100	11 *	Sparsely vegetated areas
12	: 100	12*	Beaches, dunes and sands
13	: 100	13*	Salines
14	: 100	14*	Water and coastal flats
15	: 100	15*	Heather and moorlands
16	: 30	16*	Recently abandoned pasture land (includes very extensive pasture land not reported in agricultural statistics, grasses and shrubs below 30cm)
17	: 30	17**	Woody Biofuel crops
18	: 40	18**	Pasture extensive(<50 LSU/km2)
19	: 60	19*	Forest (plantation when average forest age in region is under 50 years)
20	: 45	20*	Forest (plantation when average forest age in region is under 40 years)
21	: 35	21*	Forest (plantation when average forest age in region is under 30 years)
22	: 25	22*	Forest (plantation when average forest age in region is under 20 years)
23	: 15	23*	Forest (plantation when average forest age in region is under 10 years)
24	: 100	24*	Forest (natural – average forest age in region older than 80 years)

*. These classes are al in the 'Nature' category;
**. These classes are all in the 'Agriculture'category;

Organic table 1
Conversion of conventional into organic farming in relation to 2000

	2000	2010	2020	2030
A1	1	1.05	1.05	1.05
B1	1	1.05	1.10	1.15
A2	1	1.05	1.08	1.10
B2	1	1.05	1.10	1.20

In the B scenario's will be more emphasis on organic farming than in the A scenario's. Area under organic farming increase in time.

Organic table 2

LU class	Organic correction	Description	
0	0	0	Built-up area
1	200	1a**	Arable land (non-irrigated) Intensive
		1b **	Arable land (non-irrigated) Low-input (extensive)
2	100	2**	Pasture intensive (>50 LSU/km2)
		3*	(semi-) Natural vegetation (including natural grasslands, scrublands, regenerating forest below 2 m, and small forest patches within agricultural landscapes)
3	100		
4	100	4*	Inland wetlands
5	100	5*	Glaciers and snow
6	300	6**	Irrigated arable land
		7 **	Recently abandoned arable land (i.e. "long fallow"; includes very extensive farmland not reported in agricultural statistics, herbaceous vegetation, grasses and shrubs below 30 cm)
7	100		
8	140	8 **	Permanent crops
9	200	9**	Biofuel crops (Intensive)
		10*	Forest (natural/plantation – average forest age in region between 50 and 80 years)
10	100		
11	100	11 *	Sparsely vegetated areas
12	100	12*	Beaches, dunes and sands
13	100	13*	Salines
14	100	14*	Water and coastal flats
15	100	15*	Heather and moorlands
		16*	Recently abandoned pasture land (includes very extensive pasture land not reported in agricultural statistics, grasses and shrubs below 30cm)
16	100		
17	140	17**	Woody Biofuel crops
18	140	18**	Pasture extensive(<50 LSU/km2)
		19*	Forest (plantation when average forest age in region is under 50 years)
19	100		
		20*	Forest (plantation when average forest age in region is under 40 years)
20	100		
		21*	Forest (plantation when average forest age in region is under 30 years)
21	100		
		22*	Forest (plantation when average forest age in region is under 20 years)
22	100		
		23*	Forest (plantation when average forest age in region is under 10 years)
23	100		
24	100	24*	Forest (natural – average forest age in region older than 80 years)

According to Bentsson (2005) the mean species abundance will increase with 50% when transforming conventional farming to organic farming. The conversion of more extensive land use categories will result logically in a decreasing gain. In Reidsma et al (2006) this is elaborated for the Eururalis approach. They use a tripling of the MSA for very intensive systems, a doubling for intensive agriculture and a 1.4 times gain for extensieve agriculture. These figures have been put in the table.

Forestry intensity table

	2000	2010	2020	2030
A1	1	1	1.1	1.1
B1	1	1	1.1	1.1
A2	1	1	0.9	0.9
B2	1	1	0.9	0.9

In the 2 scenarios there is more emphasis on self-sufficiency. This leads to a more intensified forest management in the 2-scenarios. In the 1-scenarios more wood is bought on the international market.

Road buffer table

Way of calculation: Roads that do not split up natural areas (<10000), will reduce biodiversity with 0.13 and 0.29 in the cell itself. Roads that do split up nature areas will reduce biodiversity with 100% in the road cell itself and will reduce biodiversity in neighbouring cells as follows:

Totale zone	cel	<5000	5000-<25000	25000-<50000	50000-<100000	>100000
1000 m	wegcel	0.1344	0.2878	0.3641	0.3903	0.3903
1500 m	1e cel ernaast	0.0000	0.0115	0.0401	0.0776	0.1081
2500 m	2e cel ernaast	0.0000	0.0000	0.0000	0.0229	0.0229
3500 m	3e cel ernaast	0.0000	0.0000	0.0000	0.0115	0.0115

This for Eururalis has been translated as follows:

Used to derive 'verstoringsgrid' – road buffer grid			
WEGCAT	DISTCAT	VALUE	VERSTORING
0	0	0	0.1344
0	1	1	0.0000
0	2	2	0.0000
0	3	3	0.0000
1	0	10	0.2878
1	1	11	0.0115
1	2	12	0.0000
1	3	13	0.0000
2	0	20	0.3641
2	1	21	0.0401
2	2	22	0.0000
2	3	23	0.0000
3	0	30	0.3903
3	1	31	0.0776
3	2	32	0.0229
3	3	33	0.0115
4	0	40	0.3903
4	1	41	0.1081
4	2	42	0.0229
4	3	43	0.0115

Values derived on the basis of expert judgement by Jana Verboom & Rien Reijnen both of Alterra;

Fragmentation table

area (km^2)	reduction (%)
0 1	45
1 10	25
10 100	15
100 1000	5
1000 9999999	0

Source: Floor Smout & Rob Alkemade of MNP Bilthoven The Netherlands:.

Critical loads table

LU class		**Form Nr.**	**form_nr**	**Formula**
0	Built-up area	0		
1	Arable land (non-irrigated) Intensive	0	0	1
2	Pasture intensive (>50 LSU/km2)	0	1	0.8 - 0.08 * ln(NE)
3	(semi-) Natural vegetation (including natural grasslands, scrublands, regenerating forest below 2 m, and small forest patches within agricultural landscapes)	1	2	0.9 - 0.05 * ln(NE)
4	Inland wetlands	1	3	0.8 - 0.14 * ln(NE)
5	Glaciers and snow	2		
6	Irrigated arable land	0		
7	Recently abandoned arable land (i.e. “long fallow”; includes very extensive farmland not reported in agricultural statistics, herbaceous vegetation, grasses and shrubs below 30 cm)	0		NE = nitrogen exceedence in grammen
8	Permanent crops	0		
9	Biofuel crops (Intensive)	0		
10	Forest	3		
11	Sparsely vegetated areas	2		
12	Beaches, dunes and sands	2		
13	Salines	2		
14	Water and coastal flats	2		
15	Heather and moorlands	2		
16	Recently abandoned pasture land (includes very extensive pasture land not reported in agricultural statistics, grasses and shrubs below 30cm)	0		
17	Woody Biofuel crops	0		
18	Pasture extensive(<50 LSU/km2)	0		
19	Forest (plantation when average forest age in region is under 50 years)	3		
20	Forest (plantation when average forest age in region is under 40 years)	3		

ANNEX 3. HABITAT FRAGMENTATION ASSESSMENT METHODS

ANNEX 3.1. INCORPORATION OF THE BARRIER EFFECT OF ROADS

A known pressure on biodiversity resulting from socio-economic development is the increase of the number of roads and traffic intensity, which is often used in pressure indicators (e.g. Schenk, 2001; CBD 2003). We incorporated this pressure factor through the use of the TEN-STAC (TEN-STAC 2004) road map which is the only available one including includes a 'present' (2000) state of the network of main roads and traffic densities as well as the changes predicted for 2025 (which we used for 2030). We incorporated the relationship between traffic densities and barrier effect according to Van Langevelde & Jaarsma (2004), with settings for species of intermediate size (see Figure A3.1.1 below). For terrain heights over 300m, where the increased relief will cause a higher number of safe road crossing opportunities (stream underpasses etc.), we assumed the barrier effect to decrease by half.

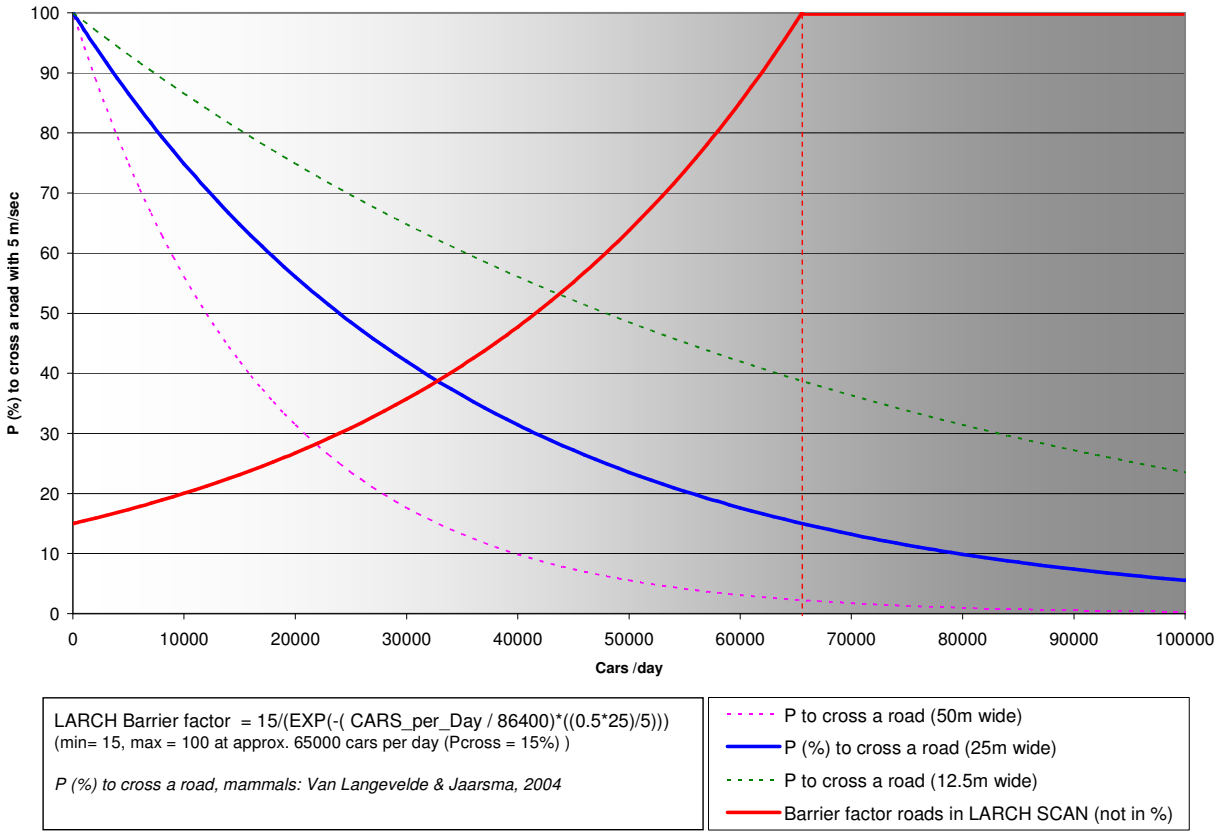


Figure A3.1.1. The relationship between road crossing probability dependency on traffic density according to Van Langevelde & Jaarsma (2004) and the barrier factor for roads used in LARCH modeling

ANNEX 3.2. PRODUCING A MAP WITH RELEVANT HABITAT TYPES

All habitat types were basically extracted from the Task 1 map of land cover classes (See Annex 1.4 above), as repeated in Table A3.2.1 below.

Table A3.2.1. Land cover classes in the task 1 map.

Nr.:	Land cover class:
0	Built-up area
1	Arable land (non-irrigated)
2	Pasture
3***	(semi-) Natural vegetation (including natural grasslands, scrublands, regenerating forest below 2 m, and small forest patches within agricultural landscapes)
4*	Inland wetlands
5*	Glaciers and snow
6	Irrigated arable land
7	Recently abandoned arable land (i.e. "long fallow"; includes very extensive farmland not reported in agricultural statistics, herbaceous vegetation, grasses and shrubs below 30 cm)
8	Permanent crops
9**	Arable land devoted to the cultivation of (annual) biofuel crops
10	Forest
11*	Sparsely vegetated areas
12*	Beaches, dunes and sands
13*	Salines
14*	Water and coastal flats
15*	Heather and moorlands
16	Recently abandoned pasture land (includes very extensive pasture land not reported in agricultural statistics, grasses and shrubs below 30cm)
17**	Perennial biofuel crop cultivation

The legend units that are relevant for defining natural habitats are '(semi)-natural vegetation', 'inland wetlands', 'forest' and 'heather and moorlands'. Apart from those, there are two classes of 'abandoned' (arable land and pastures) that define newly forming nature. The 'pasture' class is unusable for nature since there is no data available that would allow the separation of permanent (high nature value) grasslands from non-permanent grass production ones.

Taking the limitations of the Task 1 map and the available extra GIS maps into consideration, three general habitat types could be identified with reasonably good accuracy:

a. Forest, which is taken straight from the Task 1 maps for the present as well as the business as usual (BAU) 2030 scenario. For 2030 the 'new nature' classes 7 and 16 were included as marginal forest.
b. Wet nature. In the Task 1 map, 'inland wetlands' is the only category representing wet nature areas. In CLUE modelling this category is left 'as is' so does not change between present and 2030. Since the CORINE land cover map class 'inland marshes and peat bogs' also represent wet nature, we made

an overlay of this category with the task 1 map categories 'semi-natural vegetation' and 'heather and moorlands' The result was added to the task 1 category 'inland wetlands' to form our 'wet nature' habitat map for the present situation. For 2030 the same overlay was made, but now potentially wet areas resulting from an overlay of the potential 'new nature' categories 7 and 16 with the map of the potential vegetation Europe were included.

c. Semi-natural non-wet nature. For the present situation, this category consists of the combination of the 'semi natural vegetation' and 'heather and moorlands' classes minus the areas indentified as wet in the previous step. For 2030 the non-wet parts of the 'new nature' categories 7 and 16 were added.

Norway and Switzerland are absent from the Task 1 maps. To prevent confounding effects of the missing data in these countries on our modelling analysis and to be able to incorporate Norway and Switzerland in our basic analysis as far as possible, we used land cover data for these countries that was acquired for a Pan European Ecological Network (PEEN) study (Jongman *et al,* 2006). Since there was no information available on land use changes, the data for these countries is the same for the present and 2030 scenarios.

ANNEX 3.3. CONNECTIVITY ANALYSIS

The LARCH connectivity model

To asses the changes in fragmentation between the present situation and 2030, we used connectivity modeling. By comparing the results fragmentation state changes were assessed by comparing the results of the LARCH connectivity modeling for the present situation and 2030. Explanation of the use of the LARCH model adapted from Groot Bruinderink *et al*, (2003):

LARCH assesses the spatial connectivity of the network on the basis of the connectivity index developed by Verboom *et al,* (1991), Hanski (1994), and Ter Braak *et al,* (1998). The basic principle is that for each unit in the network, connectivity is a function of the potential immigration from surrounding patches within the dispersal range. In this calculation it is assumed that the smaller a patch is and the further away it is in the landscape the less it contributes to the inflow of dispersing individuals. It is also assumed that potential key populations in poorly connected landscapes are not part of a sustainable habitat network. The barrier effect of major roads and urban zones is also taken into account. The distance limit for exchange between patches therefore depends on patch population sizes (area x density, which depends on habitat quality) and ease of movement through the landscape in between.

LARCH uses a grid base and therefore calculates the connectivity per grid cell. For each grid cell *j*, the area of the dominant type of land use is converted into a potential carrying capacity for red deer, expressed in the number of reproductive units RU*j*. Therefore, each grid cell is surrounded by other grid cells, each of which has an RU related to the potential contribution to the stream of immigrants reaching cell *i*. To determine which cells could potentially contribute, it is necessary to know the dispersal range of red deer and the effect of the landscape on the dispersal distance. The number of migrants, *Si*, reaching a patch of habitat from other patches at a

$$S_I = \sum_{j=1}^{n} Y_j A_j^b B_{ij} \cdot e^{-\alpha \cdot d_{ij}} \quad (j \neq 1)$$

distance *dij* away is estimated as (Vos *et al,* 2000), where *Yj*_1 for occupied patches and 0 for unoccupied ones, *Aj* is the area of patch *j*, and *Bij* is an indicator of the presence of a barrier between *i* and *j*. In this equation, α is a constant, setting the survival rate of migrants over the distance between the contributing patch *j* and the receiving patch *i*. We transformed the product of *Yj* and *Aj* to an ecologically scaled measure, the carrying capacity of a grid cell *j*. On the basis of expert knowledge, we assumed that average major roads in our research area reduced the contribution of a grid cell *j* to the connectivity of cell *I* by 10%, but we took no account of the variation in traffic frequency between the regions. Vos *et al,* (2000) explain how they transferred empirical data on dispersal distance to an estimate of α, and we used the same approach for the red deer. A conservative estimate of dispersal distances for red deer in northwestern Europe is 50 km (Darling 1937; Carranza *et al,* 1991). This coincides with α values of 0.05, assuming a landscape with no barriers. As yet, we have been unable to validate this assumption.

LARCH determines the connectivity, SC*i*, of a habitat grid cell *i* by weighting the carrying capacity of all grid cells within the potential dispersal distance according to the distance and barrier effect of intervening major roads: where *dij* is the distance between the contributing grid cell *j* and cell *i*, measured as the shortest distance between *j* and *i*, avoiding built-up areas; RU*j* is the maximum number of reproductive units in cell *j* (taking into account differences in carrying capacity between habitat types and the effect of barriers); and *pn* is the coefficient of the "permeability," or ease of crossing, of all roads that are crossed (*p*1 * *p*2 * *p*3). If no roads are present, *pn* _ 1. If no barriers are encountered, the Euclidian distance (as the crow flies) is calculated. If a barrier is encountered (built-up area, major road), the permeability of the barrier is accounted for in the algorithm by the parameter *p,* or the barrier is avoided by a detour. This detour increases the distance (*dij*) in the algorithm. The choice is based on the least costs.

Ecoprofiles and model settings

The three habitat categories indentified from the task 1 map are so general they do not correspond to the habitat used by more than a few existing species and the geographic range of the habitats is larger than the distribution areas of most European species. Connectivity modelling based on the characteristics of real species will therefore not produce realistic results. As the objective of this task is to give an overview of the extent and impact of fragmentation changes and their effect on corridor function, this can better be accomplished by using generalised species characteristics to analyze connectivity in a standardised and uniform way. For every region, results can then be seen as representing connectivity for the local species with the same mobility characteristics. This approach has already been widely used by Alterra in previous projects (a.o. van Rooij *et al,* 2007; Mücher *et al,* 2009). We established generalised species profiles called 'ecoprofiles' for two mobility classes across the three habitats (Table A3.3.1).

Table A3.3.1. Species group settings for LARCH model runs.

Species group characteristics					Habitattype			# LARCH runs
Barriers	Dispersal range		Density/1km2	LARCH Alpha used	Forest	Dry	Wet	
Terrestrial	Small	5km	100	0.50	P,F	P,F	X	4
	Medium to large	25km	10	0.10	P,F	P,F	X	4
Flying	Small	5km	100	0.50	P,F	P,F	P,F	6
	Medium	25km	10	0.10	P,F	P,F	P,F	6
								20

P = present
F = future

For the modelling, habitat quality (to determine carrying capacity) and barrier effects (roads, urban zones) must be set for all cover types in the map. The used settings are given in Table A3.3.2.

Table A3.3.2. Habitat quality and barrier settings for LARCH model runs

	Flying						Terrestrial				
	Forest		***Dry***		***Wet***		***Forest***		***Dry***		
Task 1 legend units	*Hab*	*Bar*	*Hab*	*Bar*	*Hab*	*Bar*	*Hab*	*Bar*	*Hab*	*Bar*	*Task 1 map units*
Habitat units											
Present											
10	1	1	0	1	0	1	1	1	0	1	Forest
4, wet parts of 3 and 15	0	1	0	1	1	1	0	10	0	10	Semi- natural + heather and moorlands masked with Corinne inkand marshes and peat
rest of 3 + 15	0.1	1	1	1	0	1	0.1	1	1	1	All remaining semi- natural + heather and moorlands
7 + 16	0	1	0	1	0	1	0	1.5	0	1.5	Recently abandoned pasture and arable land
Change 2030											
7 + 16	0.1	1	1	1	0.1	1	0.1	1	1	1	Recently abandoned pasture and arable land
Barriers and indifferent units											
0	0	1	0	1	0	1	0	100	0	100	Built-up area
5	0	1	0	1	0	1	0	100	0	100	Glaciers and snow
1,2,5,6,8,9,11,12,13,14,17	0	1	0	1	0	1	0	2	0	2	Remaining task1 map units
Roads from roadmap	0	1	0	1	0	1	0	var	0	var	Roads (depending on altitude and traffic density)

Hab = habitat quality: 1: normal, 0.1: marginal (10% of carrying capacity)
Bar = barrier effect: 1=indifferent, 10, 50 etc.=resistance 10, 50 times as high, var= variable resistance

To keep the number of runs for the LARCH model within manageable limits we used only two mobility categories, corresponding to species with dispersal ranges of 5 km and 25 km. Each mobility class has two ecotypes of which the first one is barrier insensitive (corresponding to flying species) and the second one barrier sensitive

(corresponding to terrestrial species). For wet nature we omitted the barrier sensitive category because the generalised ecoprofiles would only represent very few if any real species (the specific landscape elements used for dispersal by mid-range species like beaver or otter are for instance not distinguishable in the presently available map, making it impossible to define even a generalised profile for them).

Due to the 1km scale of the base map, modelling results for species with dispersal ranges under 5km would be unrealistic because the small landscape elements these species will use are not represented in the map, while similar modelling exercises in previous projects (o.a. the SENSOR project; van Eupen *et al*, in prep.) have shown that results for larger dispersal ranges become very insensitive to fragmentation effects and are therefore not useful.

ANNEX 3.4. PRODUCTION OF PREDICTED FRAGMENTATION IMPACT MAPS

Technical Calculation: Impact assessment of land use change scenarios on corridors

1. LARCH-SCAN runs produce 20 connectivity maps (Table A3.4.1). The present and 2030 maps for each species group are subtracted from each other, resulting in 4 connectivity change maps for forest, 4 for non-wet semi-natural and 2 for wet habitat. Change is calculated per 1km^2 pixel, Present habitat/reachable to unreachable = -1, vice versa = +1.
2. Total connectivity change is calculated per NUTSx area. Corridor change for all species groups (terrestrial, flying large or small) is considered of equal importance. Number of positive and negative changes is simply added up and relative change in % of NUTS surface area is calculated. Change in under 2% of area, or less habitat than 2% in unit = no change, rest is scaled to 5 classes using natural breaks in the distribution of results across the NUTSx regions.

Table A3.4.1. overview of LARCH modelling runs

Scenario	***Ecoprofile***				
	Terrestrial y/n	***disperser***	***Forest***	***Non-wet***	***Wet***
T = 0 years	Terrestrial	Small	1a	2a	
		Large	1b	2b	
	Flying	Small	1c	2c	3c
		Large	1d	2d	3d
T = 30 years	Terrestrial	Small	1e	2e	
		Large	1f	2f	
	Flying	Small	1g	2g	3g
		Large	1h	2h	3h

Figure A3.4.1 shows the ArcMap calculation scheme:
a) Calculation of the corridor change per 1 km2 raster cell for terrestrial habitat networks (eg. For forest habitats in Table z3: 1e minus1a & 1f minus 1b)
b) Calculation of the corridor change per 1 km2 raster cell for terrestrial habitat networks (eg. For forest habitats in Table z3: 1g minus1c & 1h minus 1d)
c) Combination calculation in step a) and b), see Figure A3.4.2.

d) Calculation of the minimum amount of habitat valid for aggregation to NUTS (>2% habitat)
e) Calculation and classification of the amount of change per NUTS region with a minimum threshold of 2% habitat per NUTS region, see Figure A3.4.3.

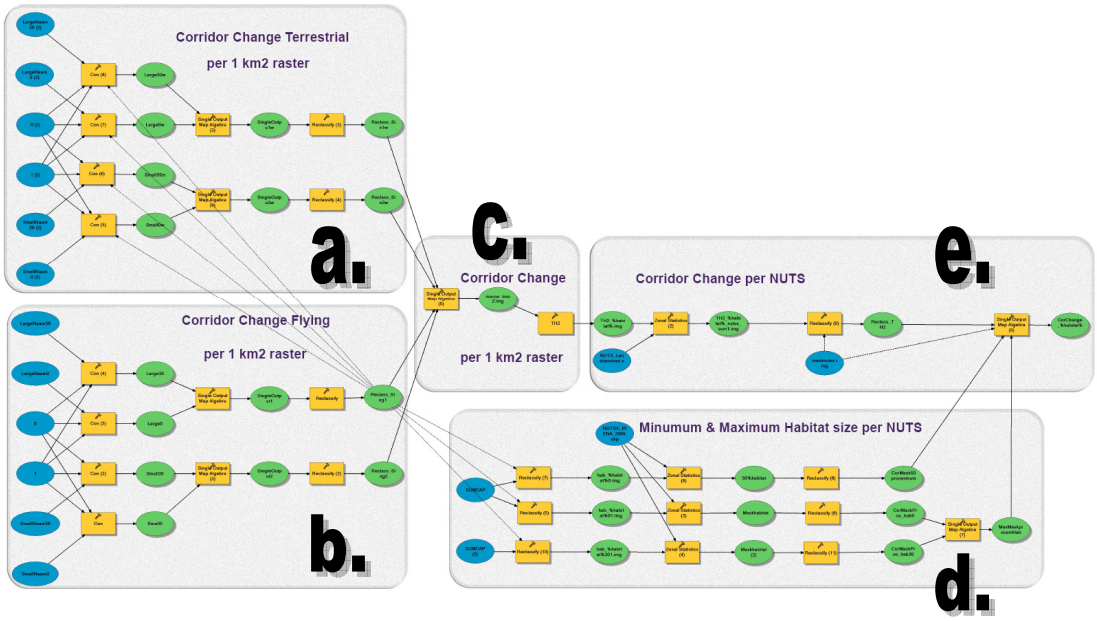


Figure A3.4.1. ArcMap calculation scheme of the corridor change per NUTS-region

The resulting maps for the semi-natural non-wet and wet habitats are represented in Figures A3.4.4 and A3.4.5.

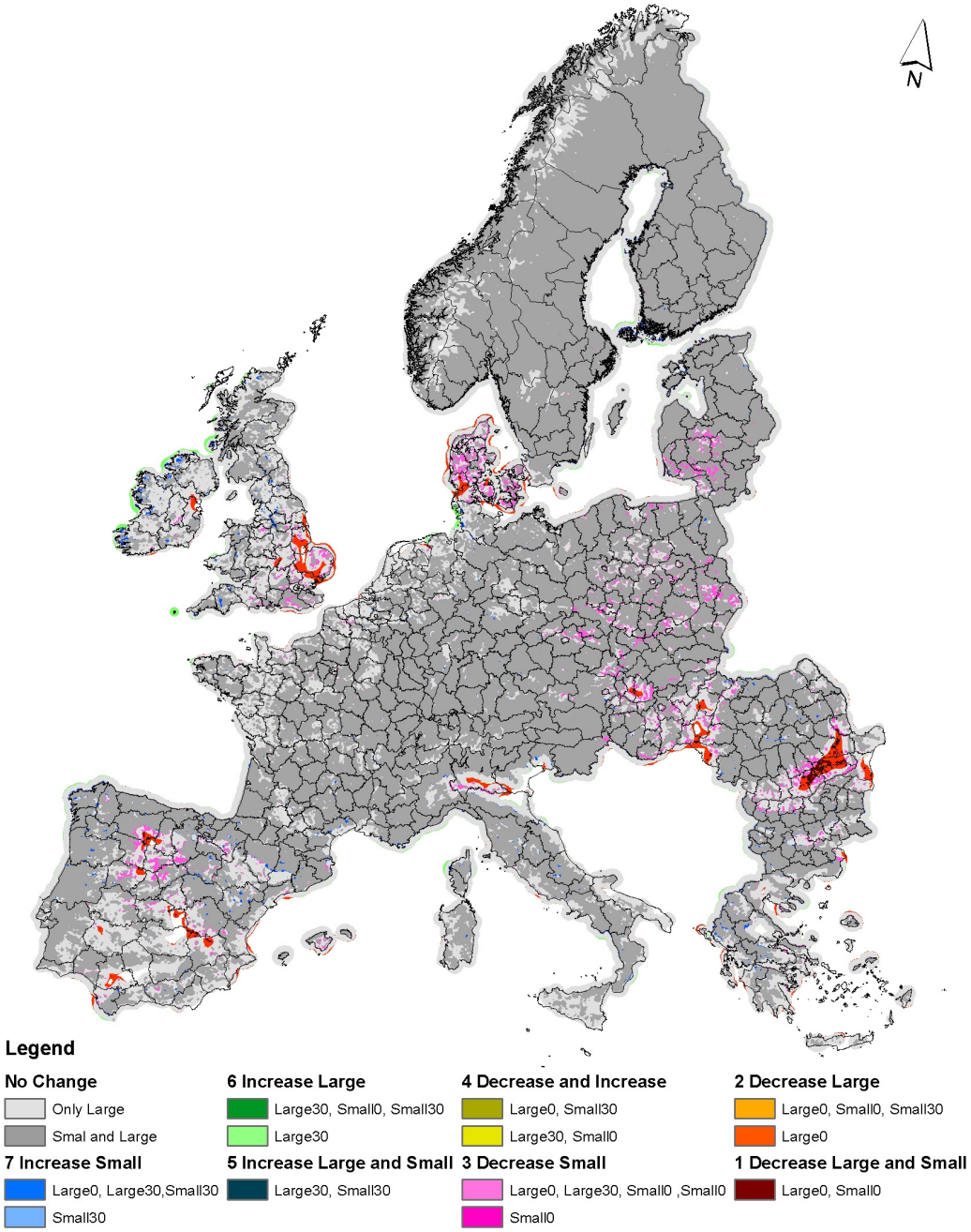


Figure A3.4.2. Corridor change per 1 km2 raster cell for forest

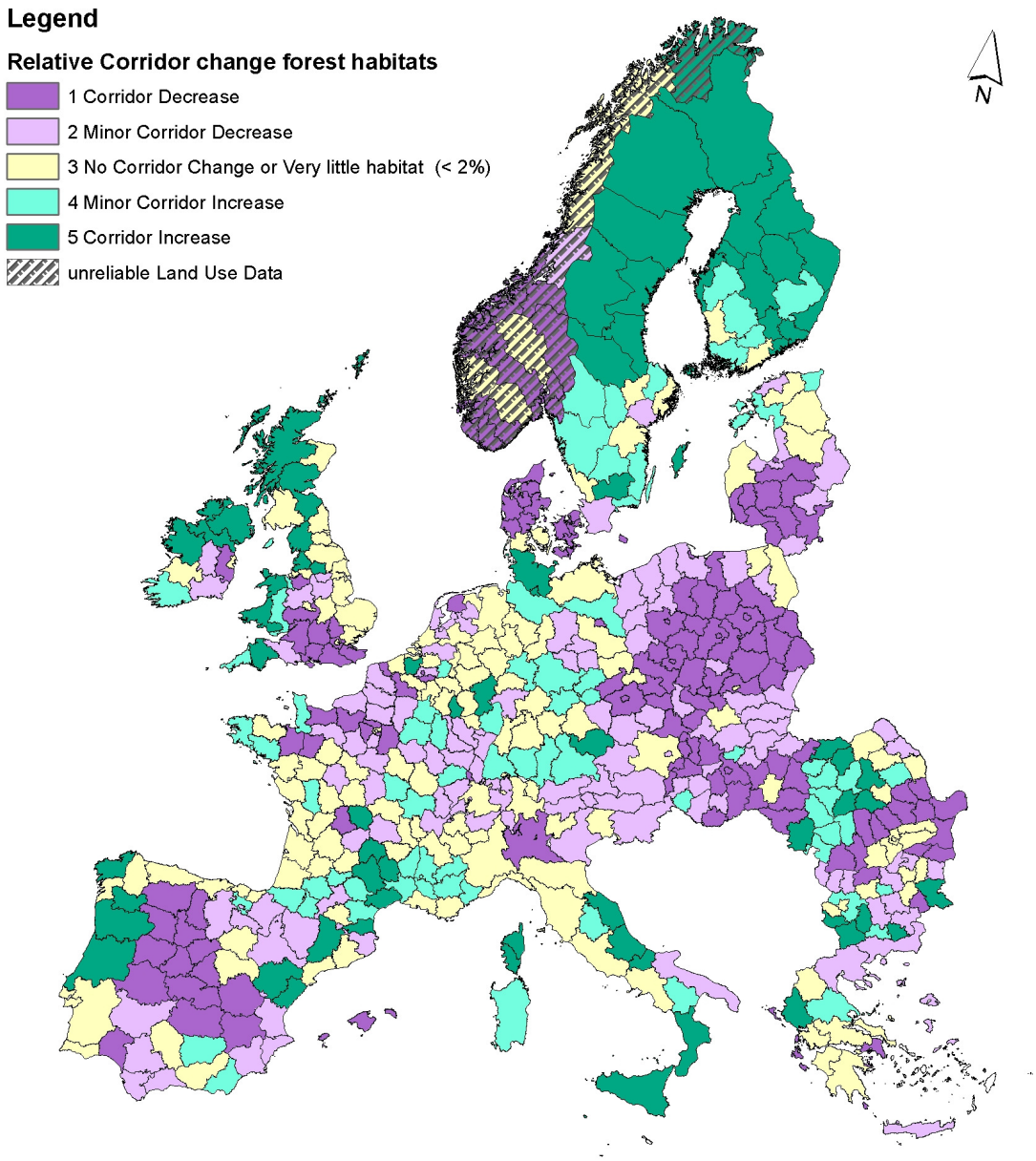


Figure A3.4.3. Relative corridor change per NUTSx-region for forest

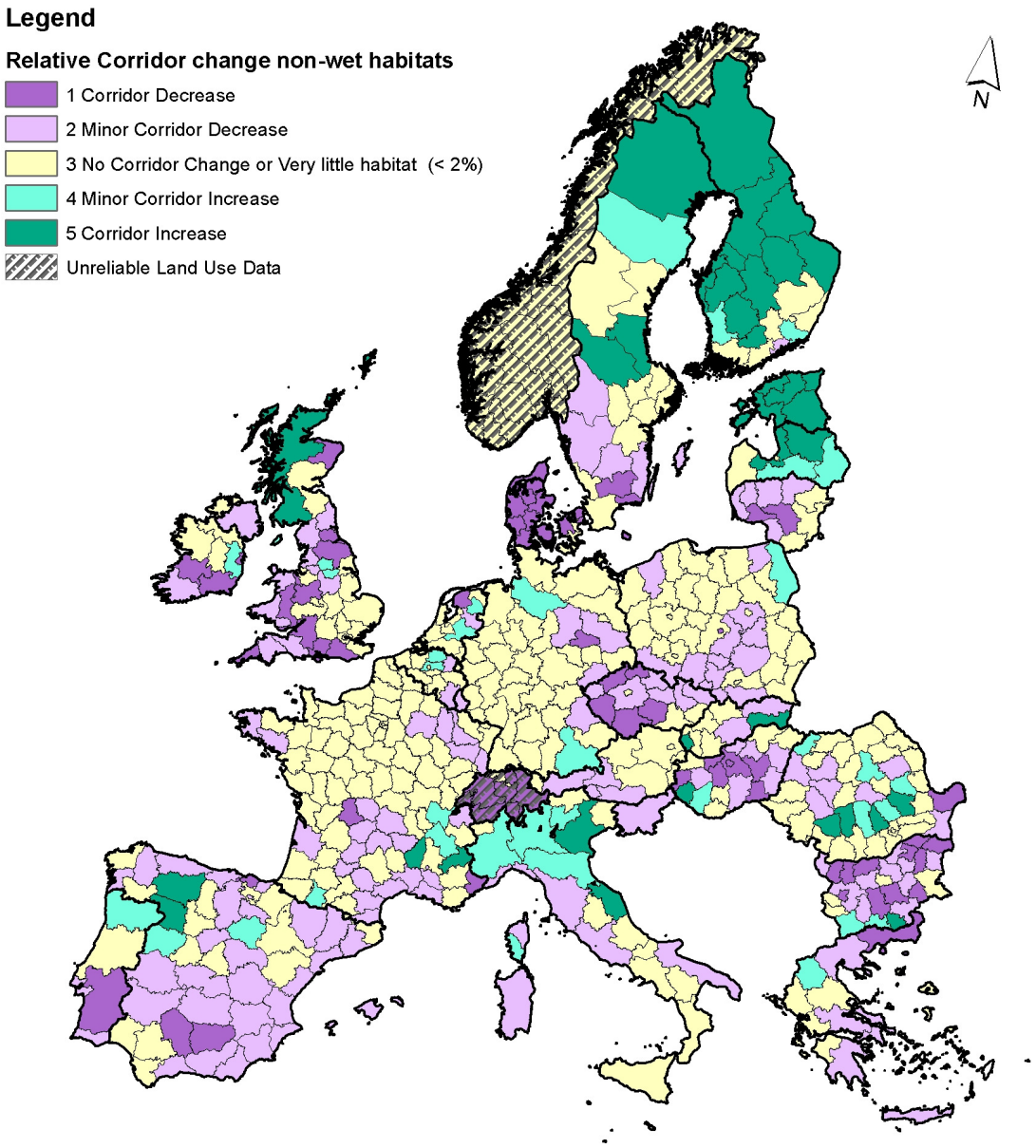


Figure A3.4.4. Relative corridor change per NUTSx region for semi-natural non-wet habitat

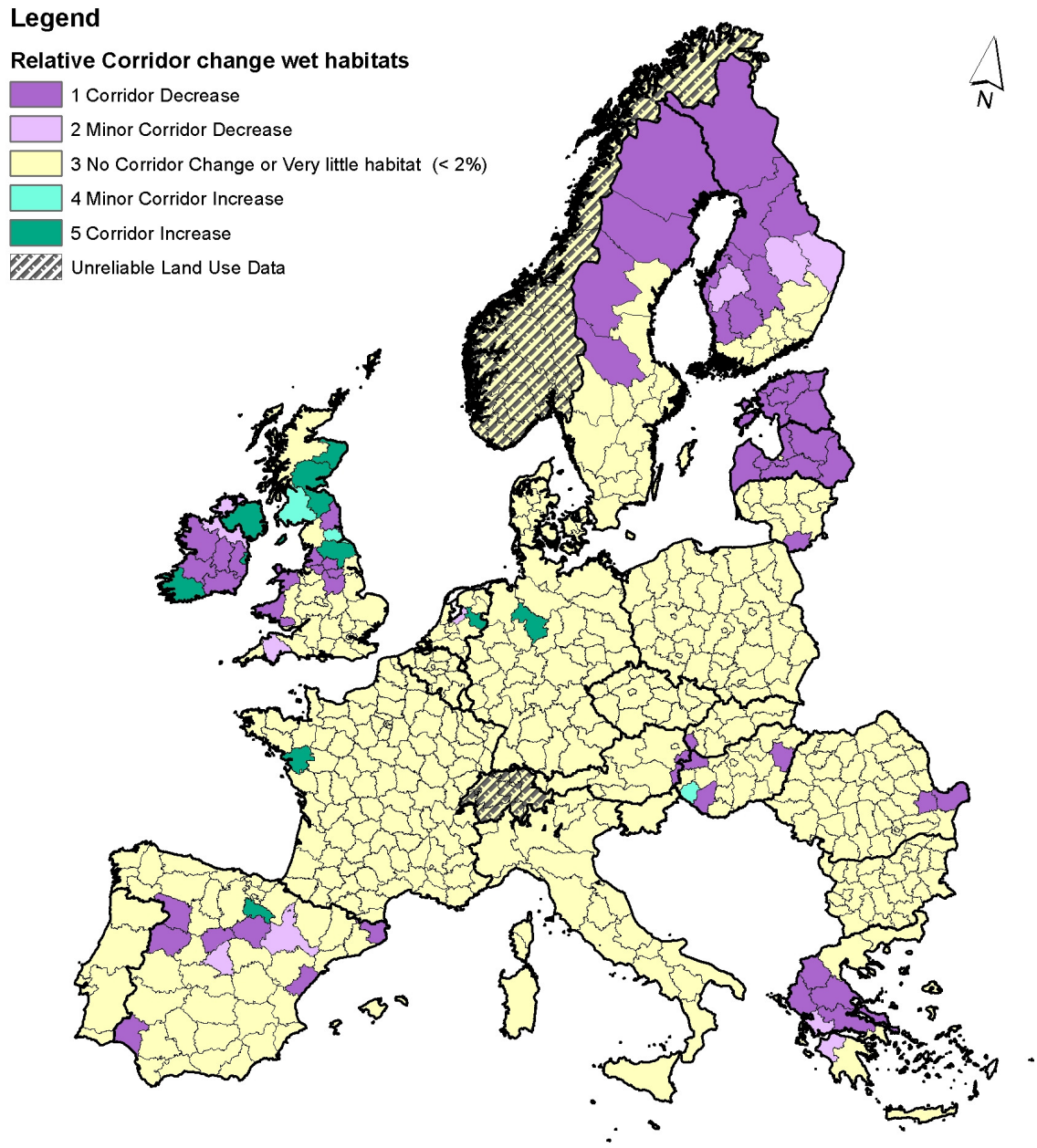


Figure A3.4.5. Relative corridor change per NUTSx region for wet habitat

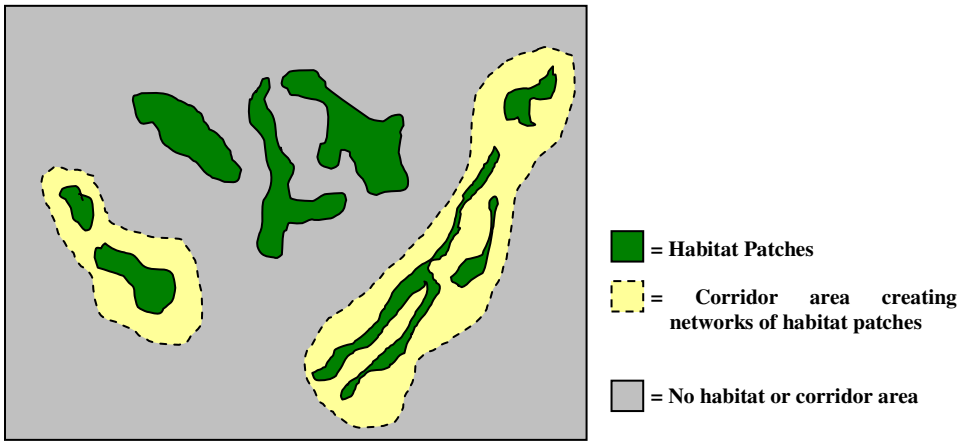


Figure A3.4.6. Corridors forming habitat networks

The importance of each NUTSX area for corridor function is established. To realise this map the following assumptions had to be made:

- A NUTSx area has high importance for corridor functioning when relatively low amounts of habitat are responsible for a relatively high level of connectivity. This is the case when a high amount of the NUTSx unit's surface area is reachable from habitat, but is no habitat itself (i.e. is covered by the LARCH connectivity contour, see Figure A.3.4.6). Connectivity in the area is considered to be at a turning point when this amount is at the maximum, because at this point a habitat increase will mean a replacement of 'reachable' by habitat (safer situation) but a habitat decrease in an increase of the unreachable area (less safe situation).
- NUTS areas with more than 50% habitat area are considered as unimportant (safe) areas considering corridor function.
- NUTS areas with less than 2% habitat area are considered as unimportant (too little habitat) considering corridor function.

Quality changes within habitat are not considered and the map is based on the present habitat situation. For each habitat type all NUTS regions are classified into five importance classes using natural breaks in the distribution of the amount of 'reachable' area across all NUTSx units (3d.), and comparing results with the manual classification of a sub-sample of NUTS units.

Figure A3.4.7 gives an overview of the ArcMap calculation scheme.

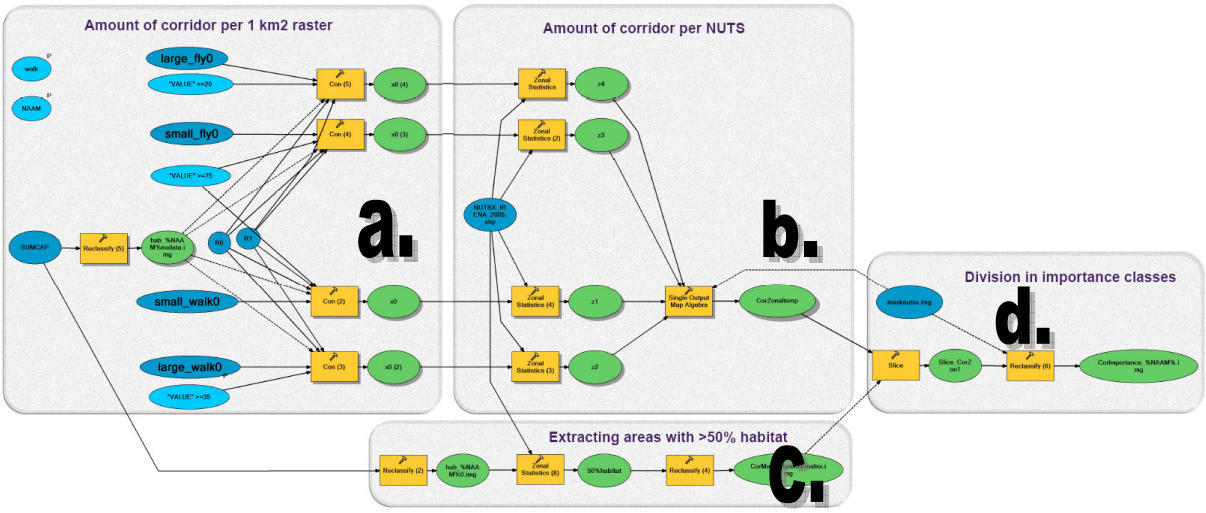


Figure A3.4.7. ArcMap calculation scheme for corridor importance

The resulting map for forest is given in Figure 5.11 in the main Final Report. The maps for non-wet and wet are given in Figures A3.4.8 and A3.4.9 below.

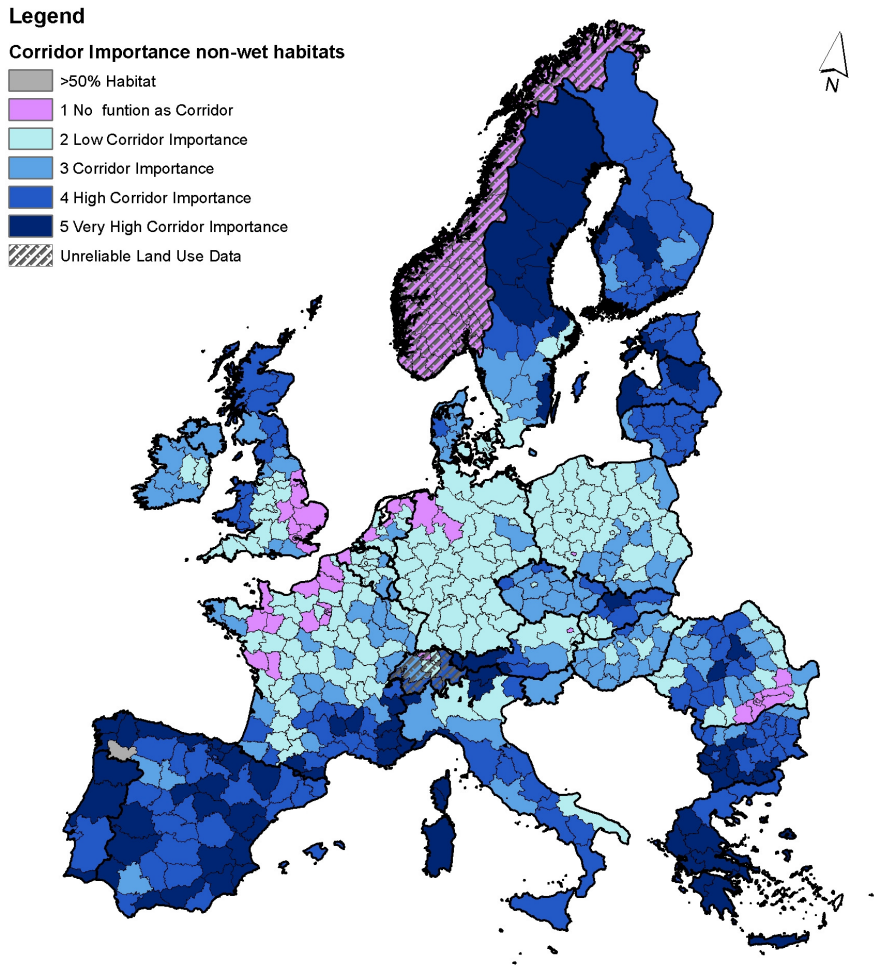


Figure A3.4.8. Relative importance of corridor function per NUTSx region for semi-natural non-wet habitat

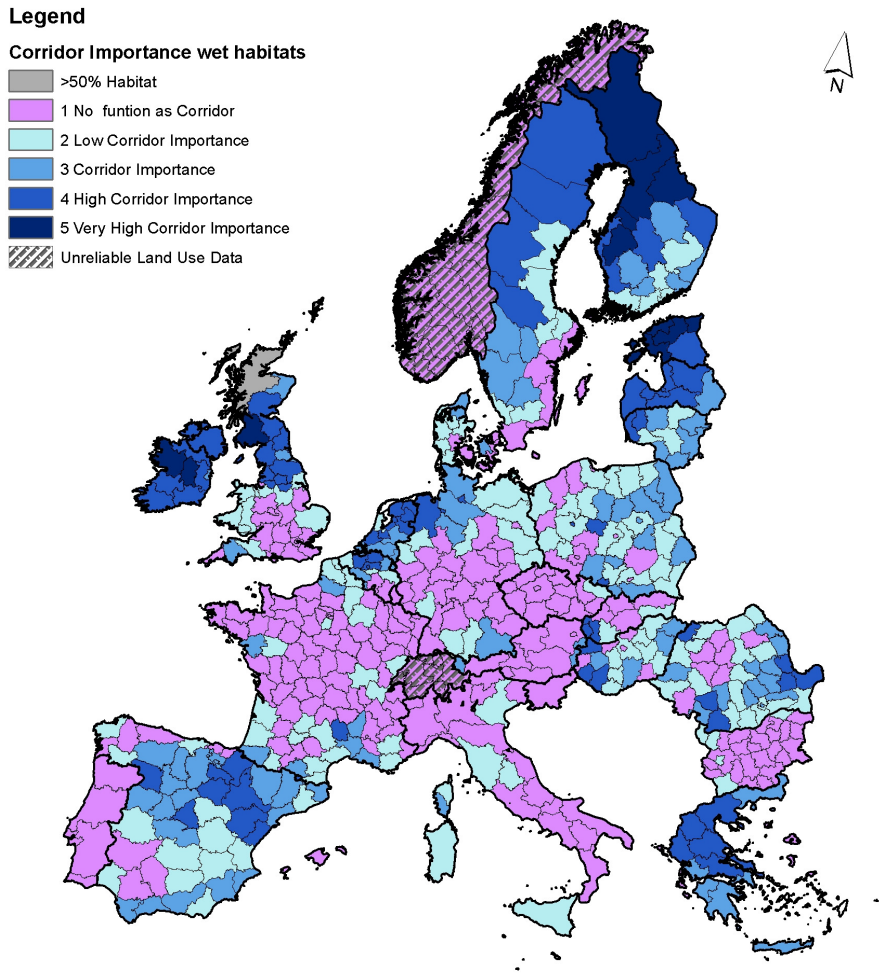


Figure A3.4.9. Relative importance of corridor function per NUTSx region for semi-natural non-wet habitat

The change and corridor functioning maps are combined to an impact map using the calculation scheme in Figure A3.4.10 and reclassification Table A3.4.2 below.

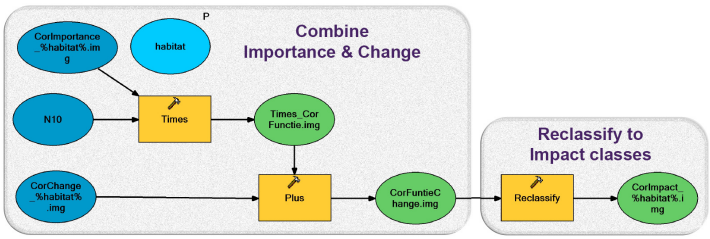


Figure A3.4.10. ArcMap calculation scheme for impact on corridor functioning

Table A3.4.2. Reclassification table for the conversion of connectivity change and corridor importance to impact on corridor functioning

Change	Corridor Importance					
	0 > 50% habitat	1 no corridor	2 low importance	3 important	4 High importance	5 Very High Importance
1 Decrease	-1	0	-1	-2	-2	-3
2 Minor Decrease	999	0	-1	-1	-2	-2
3 No Change	999	0	0	0	0	0
4 Minor Increase	999	0	1	1	2	2
5 Increase	999	1	1	2	2	3

Legend:

-3 = Very Negative Impact
-2 = Negative Impact
-1 = Possible negative impact
0 = No Impact
1 = Possible positive impact
2 = Positive impact
3 = Very positive impact
999 = > 50% habitat

The resulting maps for the three habitat categories can be found in Figures 5.12-5.14 in the main Final Report.

ANNEX 3.5. OVERVIEW MAP OF EXISTING PLANS

We choose to undertake a visual comparison between the maps of national ecological networks and the outcomes of the LARCH modeling for the following two reasons:

- *Differences in cartographic presentation*

The presentation of the various national and international networks shows large differences (see figure A3.5.1). Comparing maps with different lay-outs in a GIS-analysis would give inconsistent results. Also, not all maps distinguish corridors and even if corridors are distinguished there are large differences in map representation, for instance as arrows, lines or indicative zones (see figure A3.5.1). ECNC recently compiled all national networks in Europe in one overview map (Bonnin, 2007), but the aim of that exercise was just visualization and it therefore did not produce a consistent GIS map.

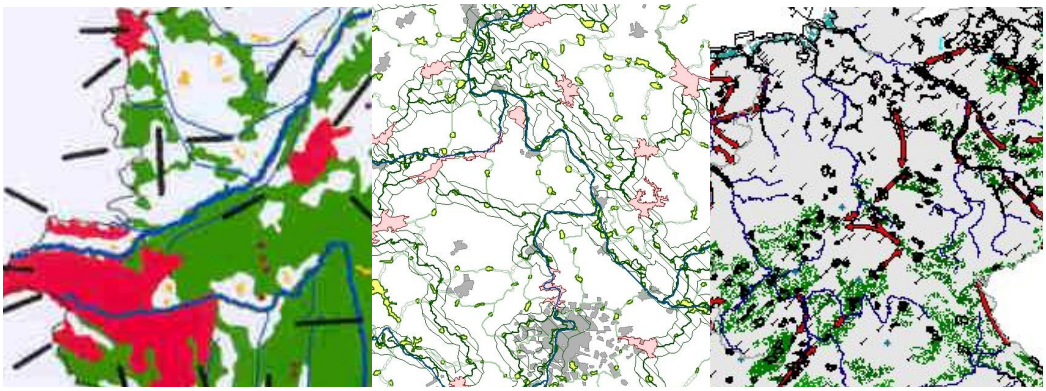


Figure A3.5.1. Differences in cartographic presentation of national network designs.
Left : Map of Hungarian ecological network: corridors are indicated as lines.
Middle: Slovak ecological network: corridors are indicated as broad zones
Right: Indicative map of Western Europe: corridors are indicates as arrows representing search areas

- *Cartographic inaccuracies*

National maps were developed in different projections systems and on different scales and converting them all to a projection system required for a European wide analysis would result in cartographic inaccuracies. If for instance planned corridors would then show in slightly the wrong place, a GIS-analysis could easily conclude insufficient similarity between plans and actual situation, while a visual comparison will easily deliver the right conclusion.

In the visual comparison we assessed if there was a 'good', 'medium' or 'poor' correspondence between the habitat configuration in the NUTS region and the national ecological network plans. The result for the forest habitat category is shown in figure A3.4.3.

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ANNEX 4. LESSONS FROM EUROPEAN CASE STUDIES OF ECOLOGICAL CORRIDORS

ANNEX 4.1. CASE STUDY QUESTIONNAIRES ON BIODIVERSITY CORRIDOR INITIATIVES

Annex 4.1.1 Territorial System Of Ecological Stability, Czech Republic

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	Územní Systém Ekologické Stability
1.2 Current name of the initiative (English translation)	Territorial System of Ecological Stability
1.3 Lead organisation	Ministry of Environment (main responsibility) in cooperation with former Ministry of Economy (today Ministry for Regional Development)
1.4 Other partner organisations	Agency for Nature Conservation and Landscape Protection of the Czech Republic (expert budgetary organisation of MoE)
1.5 Overall nature conservation aims of the initiative	maintenance and reproduction of natural heritage, favourable impact on surrounding, less stable parts of the landscape; fro studying its theoretical foundations one may derived that the original aim was to reinforce the ecosystem resilience within degraded landscape + maintain it in its healthy parts
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	Originally, no other aims were envisaged; however, especially municipalities do not understand the ecological base but promote recreational and sometimes anti-flood function of particular elements
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	delimitation and gradual implementation of TSES on the entire territory of the country
1.8 Key dates:	
• **Start of initiative (study)**	June 1, 1992 (coming into force of the Act No. 114/1992 Coll.)
• **Agreed corridor / network map**	1996 – supraregional and regional level; before 2000 – local level (78 county "generels", followed in several cases by further elaboration into more detailed documentation
• **Latest update of the network map**	at the local level continuously during preparation of spatial plans; in very limited scale, adjustment of some previous "generels"
1.9 Brief description / definitions of network components (e.g. see table below)	see the separate table
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological	in cooperation of both Ministries and the Chamber of Architects, recommended methodology was developed in 1990´. It is highly schematic, purely technical, but also taking into account the results of "landscape mapping"

models, expert judgement)	undertaken for this purpose during the preparatory phase of each local SES (TSES were drafted for basic units which were counties – altogether 78 counties in the country that time. As the Czech Republic covers about 78,000 km2, on average one county equals to 1,000 km2).
1.11 If ecological models were used, which were they?:	Theory of "ecological stability" from 1980s
1.12 If the network is based on the ecological requirements of certain species, which are they?	not taken into account
1.13 Does the network link to other local, regional or transboundary networks?	they are no other networks – our more than 2,200 protected areas and about 900 Natura 2000 sites we do not call "network" but "set"– but if protected areas physically overlapped with SES they were included, usually as biocenters
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	no, because the concept is much older than PEEN and was put into the law far before the idea of PEEN originated. In fact, the idea of PEEN was developed on three existing models in Europe, one of them being Czech – Slovak (then Dutch and Polish).
1.15 Consultations with stakeholders:	
• **Who were consulted?**	In experimental (pilot) SES, landowners were agreed to provide their land and to being subsidized to carry out the SES. In several later implementation cases, especially within land consolidation, landowners (often municipalities) were sometimes omitted which causes negative response after they had revealed it
• **At what stages of the initiative were they consulted, and on what?**	
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	Different means – from face-to-face consultation to official public hearings during preparation of spatial plans (obligatory by law)
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	As in 1.14: some of the other initiatives rather followed our example, at least in theoretical level

2. Areas of network components

Component	Area in proposed network (ha)	Area currently legally protected (ha)	Area legally protected as a result of the initiative (ha)	Target for restoration, if any (ha)	Area of habitat restored since start of initiative (ha)
Core area	"minimum standards" established – for supraregional TSES 1,000 ha, for regional and esp. local much less				Originally the whole SES was aimed at restoration of damaged landscape; in reality, very little new biocentres and corridors were established –rather

					the existing natural elements were amended or maintained
Corridors (total)	Standards in terms of width of corridors established – supraregional up to 100 m, local often 6 – 8 m only				
• Linear corridors	Only linear corridors considered				
• Steeping stones					
Buffer areas for core areas	No				
Buffer areas for corridors					
Restoration areas					
Other (please describe in notes below)					

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.
Within the first planning phase, the so-called "generels" for the entire territory of the country include proposals for 50,000 biocentres and 85,000 biocorridors. Estimated delivery up to now is less than 200 implementations (of both centres and corridors). The main aim – to restore and reinforce the "landscape skeleton" – has never been reached; even if there was a drive to do it, this aim is not realistic due to enormous demand for funds and absolutely unclear future of SES – as SES is not defined for concrete ecological groups or taxa, it is impossible to define "due management" – as management always refers to concrete organisms or habitats.

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	the only "protection" lies at the level of spatial plans: once included into the spatial plan, TSES became "untouchable" in terms of development or conversion into other landuse. In the field, however, no real protection exists.
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	One of the biggest gaps of the concept. The law says that management of SES is the joint task of the State, municipalities and landowners. This is a purely political proclamation; in fact, nobody cares for SES at all. There has never been developed any concepts of their management – on my view the most important cause has been that the purpose of individual TSES has never been stated (e.g. that certain biocorridor should enable movement of certain species) – and subsequently, it has never been possible to specific a suitable management.

3.3 Area and percentage of corridors under nature conservation management:	
• **at start of initiative**	Only protected areas, if they (randomly) fell under SES
• **currently**	The same
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	
3.5 Is any monitoring of ecological impacts carried out, and if so what?	Definitely not
3.6 Use of EU agri-env funds:	Agri-envi funds not used for this purpose; however, Sectoral Operation Fund Environment theoretically enables co-financing of establishing of some elements of SES as well as planting trees in the open landscape within the framework of land consolidation and SES implementation. Exact data on use of this fund are missing; however, as co-financing by the applicant is needed, and there is no benefit from SES for the landowners, the interest for these subsidies is negligible.
• **Which types of measures were used?**	
• **Are agri-env funds targeted towards the corridors?**	No, agri-envi has nothing in common with SES
• **How much was spent on the initiative?**	
• **What was the funding used for?**	
• **Were there any constraints on using potentially available EU funds?**	
3.7 Use of other EU funds (e.g. LIFE):	0
• **Which funds were used (e.g. LIFE)?**	
• **How much was spent on the initiative?**	
• **What was the funding used for?**	
• **Were there any constraints on using potentially available EU funds?**	
3.8 Other sources of funds (type, amount and use)	Exact figures are missing; about € 10 million have been spent for various kinds of SES plans, about € 4 million for practical delivery – all funds came from Czech national sources – above all, the subsidy schemes of the MoE
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	See 3.8
3.10 Costs to date of managing and protecting the corridors (if known).	No data – mostly due to zero expenditure

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	Due to the obsolete concept of "ecological stability" it is very difficult to assess the achievements of SES: due to lack of implementation, it is difficult to speak about any "success" in terms of creating something new in the field; and the existing, natural biocorridors exist regardless the fact that they are delineated on maps. Perhaps the most important is that once introduced into spatial plans, TSES has been protected from any development – which is important especially in the close surroundings of urban areas.
4.2 Specific objectives / targets achieved	Due to lack of implementation, probably not
4.3 Evidence of ecological impacts	Never envisaged
4.4 Specific objectives and targets not achieved and principal reasons	See 4.1
4.5 Overall summary of key constraints on progress and actions that did not work	SES has been a theoretical concept, not underpinned by real scientific justification, due to coincidence in politically very hectic period of early 1990s put into the law and forced until 1996 by a committed group of people with close links to landscape architects. Those people also secured resources for accomplishing the 1st stage – i.e., mapping of SES, which had been a good job for several dozens of architects working on those maps. Once the mapping exercise was over, there was any real attempt made to implement the SES in the field. However, due to unintentional substitution of theory and practice, and due to the fact that SES remains as obligation according to the Czech Nature Protection Act, the whole concept has not yet been challenged officially even if it is obvious that it has never fulfilled its goals..
4.6 Overall summary of actions that worked effectively and efficiently	The only thing which worked was planning – i.e., making maps – as its authors knew that they would never be responsible for implementation and as there were special funds available for that purpose.
4.7 Future plans	For political grounds, and also because a considerably lot of money has been spent and the payment orders were signed by decision makers that are still in power, nobody touches the issue of SES
4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	If any theoretical corridor concept should really be implemented in the field, it would be very costly and time-consuming. It should therefore be perfectly justified scientifically, and also all possible options should be assessed prior the final decision is made. In some particular cases, such justification can be found (e.g. as regards overcoming of linear barriers as highways, speedways and train corridors). As a general concept, however, the "corridor" concept is doubtful. It should be rather followed the more ecologically sound concept of "patchwork" of variable habitats in the broader landscape and management of tiny but ecologically very important features. Remember also that very frequently, even within the conservation community, corridors are meant not for autochthonous species but for game as red deer – in biodiversity poor, highly developed countries perhaps also game is important for some educational purposes but from ecological perspective there is no justification for enabling game to migrate through the landscape – in Western and Central Europe, game species are as unnatural as the wolves and bears with that difference that wolves and bears were exterminated centuries ago while game is artificially spread. – When thinking about viable concept, one

	should also take into account the implementation capacities of the country: even if the concept was realistic and justified, there would never been enough companies to implement it in a real time (e.g., 20 years) at the whole countries´ territory.

Annex 4.1.2 Estonian green network

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	Eesti Roheline Võrgustik
1.2 Current name of the initiative (English translation)	Estonian Green Network
1.3 Lead organisation	Ministry of Interior, Methodology was developed by Estonian University of Life Sciences and Regio Ltd
1.4 Other partner organisations	The Ministry of Environment, County Governments, IUCN
1.5 Overall nature conservation aims of the initiative	– to complete functionally the network of protected areas, connecting them into a complete system with natural areas; – to protect valuable natural habitats and preserve the migration routes of wild animals, and valuable landscapes; – to promote nature conservation outside protected areas.
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	– to shape the spatial structure of natural areas in the most reasonable way considering the ecological, environmental protection, economical and social aspects; – to soften, compensate, and forestall the anthropogenic impact on nature, to contribute to sustainable development strategy; – to offer the possibility of nature-friendly management, living styles and recreation by ensuring spatial accessibility to natural areas; – to minimise future conflicts of interest incorporating different sectors (forestry, agriculture, transport, recreation) through spatial planning; – to guide settlement and land use; – to preserve the natural self-regulation ability of the environment; – to support international and transboundary co-operation.
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	Not set
1.8 Key dates:	
• **Start of initiative (study)**	At the national level 1997-1998, At county level in 1999

• **Agreed corridor / network map**	At county level first county defined in 2003, latest 2007
• **Latest update of the network map**	At national level 1998
1.9 Brief description / definitions of network components (e.g. see table below)	Core areas (4 levels), corridors (4 levels)
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	Criteria: In Estonian methodology the following criteria were considered during the pre--selection of corridors: the location of core areas; – the morphometry of natural areas (Table 10); – corridors created by the implementation of legal Acts (for instance the *Coastal protection Act*, 1995 defines buffer zones for the water network) – the location of settlements and other infrastructures (transport etc.); – relief (location of primeval valleys, river valleys, etc.); – the landscape characteristics of the area; – the location of valued areas from the natural, environmental and heritage point of view; – the actual or historical presence of species dispersal and migration ways ("dispersal and migration corridors") – chains of singular and small nature objects which are under the protection or valuable. Expert judgment
1.11 If ecological models were used, which were they?:	No
1.12 If the network is based on the ecological requirements of certain species, which are they?	Not really
1.13 Does the network link to other local, regional or transboundary networks?	Yes
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	Yes
1.15 Consultations with stakeholders:	
• **Who were consulted?**	Representatives from all main sectors of stakeholders: nature conservation, transport, forestry, agriculture, mining, private sector, NGOs, local people
• **At what stages of the initiative were they consulted, and on what?**	During the designation, a draft version of spatial plan,
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	Workshop, spatial plans was open for comments at least during the 4 weeks, internet sites
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	No

2. Areas of network components

Table 10. Hierarchical levels and planning the ecological network in Estonia

Human centred and administrative levels	Level	Range of area (km)	Central areas of green network	The diameter of core areas (km)	The diameter of corridors (km)	Distance between the elements of network, 'size of the loops' (km)
Districts, small group of counties, group system of settlement	G_6	100…150	National-large	30… 50	10… 20	min 10… 15 max 30… 50
County, big group of parishes	G_7	30…50	National-small	10… 20	3… 5	min 3… 5 max 10… 15
Small group of parishes, large town	G_8	10…15	District (county) large	3… 5	1… 2	min 1… 2 max 3… 5
Parish, town, a part of large town, big group of villages	G_9	3 … 5	District (county) small	1… 2	0.3 0.5	min 0.3–0.5 max 1… 2

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	Method of protection of green network (biodiversity corridors), including stepping stones **Main instruments**: Planning guidance Advisory guidance Legal acts (Law on planning) Legal protected areas Agri-environmental schemes (restoration)
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	Mainly: Land use conditions set by spatial plans, regulations, state and municipal control
3.3 Area and percentage of corridors under nature conservation management:	Not defined or calculated (ca 19% Estonian territory is under the nature protection), green networks covers ca 30-40% of the

	territory
• **at start of initiative**	
• **currently**	
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	Semi-natural meadows are
3.5 Is any monitoring of ecological impacts carried out, and if so what?	No
3.6 Use of EU agri-env funds:	
• **Which types of measures were used?**	Restoration of semi-natural meadows
• **Are agri-env funds targeted towards the corridors?**	Not set
• **How much was spent on the initiative?**	???
• **What was the funding used for?**	Restoration of semi-natural meadows
• **Were there any constraints on using potentially available EU funds?**	Yes
3.7 Use of other EU funds (e.g. LIFE):	
• **Which funds were used (e.g. LIFE)?**	LIFE-NATURE,
• **How much was spent on the initiative?**	???
• **What was the funding used for?**	Restoration some habitats (polders, pools)
• **Were there any constraints on using potentially available EU funds?**	Yes
3.8 Other sources of funds (type, amount and use)	This project has been carried out with support from the Dutch Ministry of Agriculture, Nature Management and Fisheries and the Dutch Ministry of Foreign Affairs (MATRA Fund/Programme International Nature Management) ca 12 000 EUR
3.9 Costs to date of development of network map / proposal, protection and management, restoration (please break-down if possible).	Data not available
3.10 Costs to date of managing and protecting the corridors (if known).	Data not available

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	Green network is designated at the National and County level, partly also at municipal level
4.2 Specific objectives / targets achieved	Network is defined, missing links are defined, land-use conditions are set
4.3 Evidence of ecological impacts	Unfortunately monitoring programs are not linked to
4.4 Specific objectives and targets not achieved and principal reasons	Implementation of set land-use conditions do work well
4.5 Overall summary of key constraints on progress and actions that did not work	List of recommended species for designating core areas and corridors was not used – not enough data!

4.6 Overall summary of actions that worked effectively and efficiently	Spatial planning as a tool for designating green network worked well (public hearing, stakeholders involvement, SEA etc)
4.7 Future plans	To continue to designate green network at municipal level. To harmonize different existing environmental spatial ,measures
4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	We should talk always about the network, where biodiversity corridor is part. Set land use conditions, which were part of spatial plans, are not reliable! Maybe we need a category "Natura corridor" or even better "landscape corridor", which could be

Sources of information and supporting references

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Sepp K. 2002. Country approaches for developing ecological corridors. In – Jongman, R. and Kamphost, D (Eds). Ecological corridors in land use planning and development policies. Nature and Environment, 125, 17–20.

Sepp, K, Jagomägi, J., Kaasik, A., Kuusik, M. (2001). Main principles for defining green networks in spatial planning in Estonia. IALE European Conference 2001 "Development of European Landscapes" : Conference proceedings. 2, 574 - 578.

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Sepp, K., Kaasik, A. (Eds) 2002. Development of National Ecological Networks in the Baltic Countries in the framework of the Pan-European Ecological Network. IUCN Office for Central Europe, 185 p.

Sepp, K.; Jagomägi, J.; Kaasik, A.; Gulbinas, Z. (2001). Development of National Ecological Networks in Baltic Countries. Hedegaard, Lars and Lindström, Bjarne (Eds.). North European and Baltic Sea Integration Yearbook 2001/2002 (NEBI) (103 - 121).Springer-Verlag.

Annex 4.1.3 Nature Frame, Lithuania

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	Gamtinis karkasas
1.2 Current name of the initiative (English translation)	Nature Frame
1.3 Lead organisation	Ministry of Environment
1.4 Other partner organisations	Ministry of Agriculture, State Institute of Land Management, State Protected Areas Service
1.5 Overall nature conservation aims of the initiative	To create geo-ecological compensation areas and network in Lithuania
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	To protect stability of landscape To create geoecosystem stabilisation centres To create geodynamic and bioinformation migration corridors To optimise land use through development activities and protection
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	Specific target could be to include protected areas in nature frame and form migration corridors. The total area should include protected areas, buffer zone and corridors, but not quantifiable targets. There are no special defined targets, which could be measured. Afforestation of abandoned agricultural land could be among specific targets, but it is not only for Nature frame.
1.8 Key dates:	
• **Start of initiative (study)**	Idea to develop nature frame rise in 1983. Initiative was supported group of scientists and environment specialists and started to develop.
• **Agreed corridor / network map**	In 1989 the schemes of nature frame were developed as follow: - at national level, scale 1 : 300 000 - at regional (district) level, scale 1 : 50 000 In 1991 State Land Management Institute started to develop Nature frame at local level, scale 1 : 10 000.
• **Latest update of the network map**	In 2002 Lithuanian Parliament (Seimas) adopted Comprehensive (Master) Plan of the territory of the Republic of Lithuania (Decision No IX-1154, October 29, 2002). The Comprehensive Plan includes Nature frame at scale 1 : 400 000. Following the Parliament decision county and municipality administrations endorsed development of comprehensive plans, including nature frames in each plan. Some administrations have already adopted plans, some are under development.
1.9 Brief description / definitions of network components (e.g. see table below)	
1.10 Brief description of the corridor /	**There are any specific adopted methodology, but**

network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	**mapping is based the following legal documents:** Regulation on Nature Frame. Order of the Minister of Environment (Nr. D1-96, 14-02-2007); Typical Regulation on Protected Areas Protection. Government Decision (Nr. 996, 19-08-2004). **Methodological guidelines** "Applied Land Management", State Land Management Institute, 1998 (not legally adopted); **CORINE Biotopes methodology** (typical used in Europe)
1.11 If ecological models were used, which were they?:	Not used
1.12 If the network is based on the ecological requirements of certain species, which are they?	Designation and mapping of Nature frame is not based on ecological requirements (certain habitats, species), but theoretically a legal background exist for that.
1.13 Does the network link to other local, regional or transboundary networks?	There is only one type of networks in Lithuania. Do to specific character and requirements it can not be comparable with other neighbouring countries. Nature frame has 3 levels: national, regional and local. Local nature frame schemes should be regularized with regional, regional with national.
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	Partly. Recent legal documents are focus on designation of nature frame based on mainly on ecogeophysical parameters, but there are legal space to develop ecological criteria in the Nature frame (Baskyte, 2003, see attachment).
1.15 Consultations with stakeholders:	
• **Who were consulted?**	Consultations on Nature frame are performed on the base of spatial planning legislation. Each interested group, organisations and citizens are able to have information on spatial plans.
• **At what stages of the initiative were they consulted, and on what?**	According the Law on Territory (spatial) Planning (1995, with amendments) all interested parties have possibilities to learn on territorial planning documents when are prepared draft of planning decisions. After consultation with public it could be corrected.
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	Decisions of spatial (territorial) planning documents (text and maps) are available to public: during public hearings, exhibiting in authorities administrations (it depend on document levels), it is made announcement in newspapers where are possibilities to acquaint with planning documents.
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	Nature frame is specific network and typical for Lithuania. The aim is to ensure stability of landscapes and protect them. There are not defined designation criteria. Ecological criteria are not or partly used, but protected areas (including Natura 2000) are as part inside of nature frame. It is difficult to compare Nature frame with other ecological corridors, but some ideas of other corridors are used. Nature frame components are different than typical ecological networks and difficult to compare, but some attempts are made (see attachment: Baskyte. 2003).

2. Areas of network components*

Component	Area in proposed network (ha) *****	Area currently legally protected (ha)	Area legally protected as a result of the initiative (ha)	Target for restoration, if any (ha)	Area of habitat restored since start of initiative (ha)
Core area**	1.489.586 ha (37,2 % of total Nature frame area)	*No data or need special studies*	*No data or need special studies*	*No data or need special studies*	*No data or need special studies*
Corridors (total) ***	943.637 ha (23,5 % of total Nature frame area)				
• Linear corridors	*No data or need special studies*				
• Steeping stones	*No data or need special studies*				
Buffer areas for core areas****	1.576.464 ha (39,3 % of total Nature frame area)				
Buffer areas for corridors	*No data or need special studies*				
Restoration areas	*No data or need special studies*				
A total Nature frame area	4.006.989 ha (61,4 % of total Lithuanian territory)				

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.

See attachment, Baskyte, 2003.

* **- Nature Frame** zones do not directly correspond with zones of Ecological networks
** **- Core area** could be as analogue to Geo-ecological watersheds of Nature frame
*** **- Corridors** could be as analogue to Migration corridors of Nature frame
**** **- Buffer zones** could be as analogue to Geoecosystem stabilisation centres.
***** **- Proposed area is area included in Comprehensive Plan and adopted by Parliament (2002)**

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	Legal protected area status, planning guidance
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	State land control Restrictions for development Agri-environment schemes
3.3 Area and percentage of corridors under nature conservation management:	*No data or need special studies*
• **at start of initiative**	
• **currently**	
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	*No data or need special studies*
3.5 Is any monitoring of ecological impacts carried out, and if so what?	*No data or need special studies*
3.6 Use of EU agri-env funds:	
• **Which types of measures were used?**	Under the **Rural Development Programme for the period 2004 – 2006** approved by the Decision of the European Commission No. C(2004)2949 on August 3th, 2004, support is being provided for the implementation of the following measures: Measure 2: Less favoured areas and areas with environmental restrictions Measure 3 Agri-environment - Protection shore belts of surface water bodies in meadows and arable land and prevention of soil erosion; - Landscape Stewardship Scheme; - Organic Farming Scheme; Measure 4: Afforestation of agricultural land Under the **Rural Development Programme for the period 2007 – 2013** (approved by the Decision of the European Commission No. C(2007)5076 on October 19th, 2007) by implementing: Agri-environment payments measures: • Landscape Stewardship Scheme • Protection shore belts of surface water bodies in meadows and arable land and prevention of soil erosion • Rare Breeds Scheme • Programme for improving the status of water bodies at risk • Organic Farming Scheme Less favourable area measure; Natura 2000 measures; Measures for improving the landscape's and water quality.
• **Are agri-env funds targeted towards the corridors?**	Agro – environment funds are targeted to entire territory, including Nature frame, but no specific measure.
• **How much was spent on the initiative?**	*No data or need special studies*
• **What was the funding used for?**	See above section
• **Were there any constraints on using**	Main constraints were high state institution bureaucracy and law activities of land owners.

potentially available EU funds?	
3.7 Use of other EU funds (e.g. LIFE):	
• **Which funds were used (e.g. LIFE)?**	LIFE Nature in some areas
• **How much was spent on the initiative?**	There are no data which were used for the initiative. The fund was used for more wider conservation issues
• **What was the funding used for?**	In general for nature conservation and management in Natura 2000 sites
• **Were there any constraints on using potentially available EU funds?**	Main constraint to use LIFE Nature funds was that they can be used for Natura 2000 sites, but Nature frame is much more wider than Natura 2000 sites.
3.8 Other sources of funds (type, amount and use)	State budget, Structural Funds, regional municipalities funds.
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	No data for the Nature frame, it is costs for landscape and biodiversity conservation in general for Lithuania.
3.10 Costs to date of managing and protecting the corridors (if known).	*No data or need special studies*

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	61,4 % of total Lithuanian territory is under some kind of protection. This area is included in Comprehensive plan of Lithuania. Protected areas cover 15,3 % of total territory.
4.2 Specific objectives / targets achieved	Since specific measurable targets were not defined, it is difficult to estimate specific achievements.
4.3 Evidence of ecological impacts	Not monitored in Nature frame.
4.4 Specific objectives and targets not achieved and principal reasons	As in 4.2
4.5 Overall summary of key constraints on progress and actions that did not work	The main constraint to implement Nature frame could be encompassing very large areas of total Lithuanian territory (61,4%). It demands a huge amount of financial, human and technical resources. A lack of specific objectives/targets and prioritisation of certain zones inside of Nature frame unable to relocate of existing resources.
4.6 Overall summary of actions that worked effectively and efficiently	It is difficult to define which actions worked effectively. Probably only territorial planning activities were performed efficiently.
4.7 Future plans	No special funds are allocated for implementation of Nature frame. In 2007 it is adopted program "Biodiversity and Landscape Protection, 2007 – 2013". Minister of Environment issued Order (Nr. D1-214, 23-04-2009) under the Program where is allocated 3 789 120 Litas (1 097 400 Euro) for preparation of planning documents. There are allocated financial resources to finalise comprehensive plans of regional municipality territories. Each plan should develop local nature frame schemes.
4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	To develop Lithuanian protected areas strategy; To establish criteria for designation biodiversity important zones inside Nature frame; To prioritised areas for biodiversity conservation inside Nature

	frame; To set priority measures for biodiversity conservation and management; To allocate more resources for conservation and management in spite to preparation of planning documents.

Notes:

Please add any additional notes to clarify answers above, and cross refer to question number.
[e.g. 3.6 Figures refer to the allocated budget for 2007-2013]

Sources of information and supporting references

Please add full reference details for any references or sources of information listed above (cross refer to reference number).

Attachment

Table. Comparison of the main features of Nature frame and ECONET

Nature Frame	**Ecological Network (ECONET)**
Universal (geo-ecological) approach	Specialised (ecological) approach
Overall goal – ecological compensation	**Overall goal** – biodiversity protection
Concept based on: • Catchment area and biostructure • Analyses of migration processes in natural landscape • Evaluation of gravigenuous structure of natural complexes • Conservation and enrichment of bio- and geo-ecological stabilisers in geosystems	**Concept based on:** • Biostructure • Analyses of biodiversity • Evaluation of the most important ecosystems • Minimum areas required to sustain them • Conservation of biodiversity
Consist of: • Geo-ecological watersheds • Geoecosystem stabilisation centres • Migration corridors	**Consist of:** • Core areas • Nature development areas • Ecological corridors
All natural and seminatural areas included	Areas of national and international significance included
Covers 60% Lithuania	Covers 17% of the Netherlands

Sources:
Baskyte R. 2003. System of Protected Areas of Lithuania. State Protected Areas Service. 47 p.

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Annex 4.1.4 Ecological Habitat Network Schleswig-Holstein

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	Schutzgebiets- und Biotopverbundsystem Schleswig-Holstein (SBVS-SH)
1.2 Current name of the initiative (English translation)	Ecological habitat network SH
1.3 Lead organisation	Ministerium für Landwirtschaft, Umwelt und ländliche Räume des Landes Schleswig-Holstein
1.4 Other partner organisations	Concept: Landesamt für Natur und Umwelt, Realization: Ministry, Nature Protection Authorities of all levels, Stiftung Naturschutz, other foundations, Nature protection NGOs,
1.5 Overall nature conservation aims of the initiative	Identifying and connecting areas of high nature value Conservation and Restoration of natural habitats in a coherent system with an area of at least 10% of land surface.
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	• Climate protection by restoring bogs, by establishing new forests • Restoring rivers and floodplains • Flood protection by water retention • Endorsement of environmentally compatible settlement development by establishing areas with priority to nature protection
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	At least 10% of land surface of Schleswig-Holstein (1.570.000 ha → 157.000 ha). On a regional level (5 regions within 1.570.000 ha) every main habitat complex with natural or nature-like character shall have an area of at least 400 ha. On a higher level (Schleswig-Holstein as a whole) focus lies on conservation of typical examples of cultural landscape (man-made landscape) of at least 7000 ha connected by e.g. rivers.
1.8 Key dates:	
• **Start of initiative (study)**	1988
• **Agreed corridor / network map**	1992 ready on a scale 1:250.000 (draft) 1995 ready on a scale 1:50.000 (draft) Confirmed by several government decisions between 1998 and 2005
• **Latest update of the network map**	Regional level December 2004 (1:50.000); on a level of Schleswig-Holstein as a whole October 2008 (1:250.000)
1.9 Brief description / definitions of network components (e.g. see table below)	Core areas: Nature reserves, protected areas under the Habitats as well as under the Birds Directive (except agricultural area, which may have certain importance for e.g. geese, but is not a core area for nature protection), legally protected habitats (directly protected by law, e.g.: heaths, bogs, swamps, dunes, small ponds, reeds), for nature protection purposes purchased land. Connected by linear close-to-nature structures: e.g. water courses, hedges
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	Choice of suitable areas: Size, quality and distribution of existing protected areas; Occurrence of endangered species (also occurrence in the past); results of field mapping of endangered habitats; potential for positive development. Result of an examination of field survey, historical maps, actual CIR

	air photographs, expert judgement
1.11 If ecological models were used, which were they?:	Model of differentiated land use (HABER 1972) Model der differenzierten Bodennutzung nach HABER 1972
1.12 If the network is based on the ecological requirements of certain species, which are they?	At the time of main work only few data were available (e.g. reptiles, amphibians, otter)
1.13 Does the network link to other local, regional or transboundary networks?	There are connections to Denmark (Süderau and Jardelunder Moor). South border is the river Elbe as a main link but also a cut of land connections; in the southeast the sites of the Green Belt form the connection to the east.
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	No, because work started in 1990 and finished (first draft) in 1995. An adaptation to Natura 2000 network will be finished at end of 2009
1.15 Consultations with stakeholders:	
• **Who were consulted?**	Regional level: a) regional nature protection authorities b) other public stakeholders and NGOs state level: only between Ministry and state agency for nature protection
• **At what stages of the initiative were they consulted, and on what?**	At an early stage/first draft
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	by providing the draft and followed by meetings and discussions
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	No, in 1990 there were no other corridor initiatives (Biotopverbundplanungen) in Germany

2. Areas of network components

Component	Area in proposed network (ha)	Area currently legally protected (ha)	Area legally protected as a result of the initiative (ha)	Target for restoration, if any (ha)	Area of habitat restored since start of initiative (ha)
Core area	219351 ha about14% of total land surface	Core areas + Corridors: 124295 ha (12/2003) Not actualized since then.	Cannot be enumerated, because the „Corridor Initiative“ (Biotopverbundplanung) is only the frame for activity not the cause/the result (a frame for a painting is not the cause for the painting) The „Biotopverbund-planung“ channels e.g. land purchase and installing nature reserves.	Restoration of natural conditions as far as possible. Often limited by existing infra-structure	Not exactly known. More than 30.000 ha within corridors and core areas were purchased by nature protection foundations. SPA and SCI (SAC) lie predominantly within this „spider web“
Corridors (total)	120237 ha about 7,7 % of total	Cannot be enumerated,	See above	See above	See above

	land surface	because not distinguished			
• Linear corridors	Are not mentioned seperately				
• Steeping stones	Are not intended, a connection is always aspired				
Buffer areas for core areas	Are not mentioned seperately. To be decided when a concrete project is to be realized. In general buffer zones are included in the system.				
Buffer areas for corridors	See above				
Restoration areas	In the beginning of the work in 1990 6,5% of the total land surface was natural or semi-natural. Another 15% are in principal suitable for restoring close to nature. Nature protection law of Schleswig-Holstein demands 10% of land surface for a "Biotopverbund" of core areas and corridors. The target was to close the gap between 6,5% and 10%. Meanwhile this is accomplished.				
Other (please describe in notes below)					

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	Land purchase by nature protection foundations Legally protected as nature reserves; by law; as SPA or SAC Declaration of areas with priority for nature protection by the state development authority (important for areas which are not yet protected by other law).
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	Areas protected by any legal regulation are managed a) on a legal base of land purchase, b) in reality by measures (if necessary) to maintain a good conservation status, ba) on the basis of a contract with the landowner (agri-environment payments according to European Agricultural Fund for Rural Development (EAFRD))
3.3 Area and percentage of corridors under nature conservation management:	Unknown because not recorded, approx. 75%
• **at start of initiative**	
• **currently**	
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	Unknown because not recorded
3.5 Is any monitoring of ecological impacts carried out, and if so what?	Monitoring for Art. 17 report (Hab.- and Birds Directive) with full coverage of all sites + monitoring in all nature reserves as well as in the National Park
3.6 Use of EU agri-env funds:	
• **Which types of measures were used?**	Agri-environment payments according to Art. 39 CR (EC) 1698/2005
• **Are agri-env funds targeted towards the corridors?**	Yes: The intersection of covered areas is large.
• **How much was spent on the initiative?**	The Plan of the Land Schleswig-Holstein for the development of rural areas 2007-2013 indicates a budget to the amount of 35,2 Mio € for agri-environment payments who are supporting biodiversity corridors particularly.
• **What was the funding used for?**	The payments cover additional costs and income foregone resulting from the commitment made in the permanent grassland programme, Halligprogramme and contract-based nature conservation.
• **Were there any constraints on using potentially available EU funds?**	Art. 39 CR (EG) 1698/2005 says commitments shall be undertaken as a general rule for a period between five and seven years. The beneficiaries may be selected on the basis of calls for tender, applying criteria of economic an environmental efficiency. The support is limited to the maximum amount laid down in the Annex of regulation 1698/2005.
3.7 Use of other EU funds (e.g. LIFE):	
• **Which funds were used (e.g. LIFE)?**	LIFE
• **How much was spent on the initiative?**	8,65 Mio € total budget from 2001 to 2011, thereof 4,8 Mio € EU budget
• **What was the funding used for?**	Between 2001 and 2011 three LIFE-projects approved by the Commission. Their objectives are dry-grassland, fire-bellied toads and exchange of expertise according to sustainable long term

	management of project sites in five countries. Look e.g. at http://www.life-baltcoast.eu/index.php?id=207. The cost are spend or will be spend on personnel, travel, external assistance, durable goods, land purchase, consumables, overheads and other costs.
• **Were there any constraints on using potentially available EU funds?**	The application for funding by LIFE Nature under LIFE III is quite complicate and extensive (under LIFE+ even more). This procedure selects only beneficiaries who will later be capable to apply to the strict and even stricter rules changing during the project duration. Also a certain level of pre-financing for the project application as writing and answering questions +adopting changes proposed by the Commission is necessary. Some potential applicants are not capable and therefore some project ideas will never be submitted. This consequently can not contribute to the improvement of nature.
3.8 Other sources of funds (type, amount and use)	Private und public nature protection foundations Compensation measures or (in general) payments for private or public infrastructure measures: new roads, deepening of shipping channels, new power supply lines
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	The estimated need per hectare per year is about 125 €. There are about 158.000 hectare.
3.10 Costs to date of managing and protecting the corridors (if known).	Is included in 3.9

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	Increase of close-to-nature habitats of about 2% of total land surface especially by land purchase. Increase of another 6% because of implementation of Natura 2000 Establishing a network of coherent areas close to nature to enable the remains of the natural biocoenosis of our landscape to survive and to react on stress on a long term basis.
4.2 Specific objectives / targets achieved	
4.3 Evidence of ecological impacts	
4.4 Specific objectives and targets not achieved and principal reasons	Spatial connection between core areas is still not satisfying. Reason: increasing competition with agriculture, especially with renewable primary products. Fragmentation of landscape is still increasing because of new roads and motorways. Although improving, there is still a tension between nature conservationists and land-owners and users as a result of different interests concerning land use. These tensions avoid good cooperation.
4.5 Overall summary of key constraints on progress and actions that did not work	See above
4.6 Overall summary of actions that worked effectively and efficiently	„Local Alliances“ or „Local Actions“ (Alliance of Landowners and –users, local nature protection organisation and nature protection authorities) in connection with well financed agri-env-measures and land purchase and professional management
4.7 Future plans	
4.8 What recommendations would you make to help implement biodiversity	Implementation of a plan of close-to-nature core areas and corridors on a legal level as high as possible. This plan has to be

corridor initiatives?	taken into account when new infrastructure planning is going on. Nature protection measures of all kind are to be concentrated in this biotope net. On the other hand this means a focus of nature protection on small remain areas. Comparing the financial volume of agriculture and nature protection on the other hand, perhaps this is a realistic way.

Annex 4.1.5 Lanscape Ecological Planning, Metsähallitus (Finland)

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	Alue-ekologinen suunnittelu
1.2 Current name of the initiative (English translation)	Lanscape Ecological Planning, Metsähallitus (Finland)
1.3 Lead organisation	Metsähallitus, Forestry Unit
1.4 Other partner organisations	Finnish Environment Centre (development of the method)
1.5 Overall nature conservation aims of the initiative	Conservation of native species as viable populations while running active forestry business
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	Improve the recreational value of the forests. The requirements of nature-based livelihoods such as reindeer herding, hunting and berry picking were to be safeguarded.
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	No quantitative targets.
1.8 Key dates:	
• Start of initiative (study)	Development of the method was started in 1994
• Agreed corridor / network map	1996 – 2000 (the project) – present (Continuous updating)
• Latest update of the network map	Continuous updating
1.9 Brief description / definitions of network components (e.g. see table below)	Nature protection areas, valuable habitats in commercial forests, corridors, stepping stones and biodiversity enhancement areas.
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	Mapping of valuable habitats in the commercial forests. Connectivity was defined mostly as a map exercise.
1.11 If ecological models were used, which were they?:	Valuable habitats (key biotopes) – corridor –model.
1.12 If the network is based on the ecological requirements of certain species, which are they?	General valuable habitat approach was applied, non-specific by species.
1.13 Does the network link to other local, regional or transboundary networks?	No.
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	No but it does, of course
1.15 Consultations with stakeholders:	From 1995 to 2000 in total 716 various interest group

	meetings with altogether 1275 interest groups + public hearings of 12 960 persons. The activity is continuous by nature.
• Who were consulted?	Trade unions, ENGO's, forest industry, recreational users, hunting societies, village committees, research organisations, reindeer herders, Sámi people, authorities, etc.
• At what stages of the initiative were they consulted, and on what?	In the beginning of each individual project (112 projects altogether) for communication of the project objectives and to survey the expectations of the various parties.
• How were they consulted (e.g. workshop, distribution of plans, exhibition)?	Interest group meetings, public hearings, open houses
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	No

2. Areas of network components

Component	Area in proposed network (ha)	Area currently legally protected (ha)	Area legally protected as a result of the initiative (ha)	Target for restoration, if any (ha)	Area of habitat restored since start of initiative (ha)
Core area	190 000	1 108 000	-	-	-
Corridors (total)	115 000	-	-	-	-
• Linear corridors	115 000	-	-	-	-
• Steeping stones	-	-	-	-	-
Buffer areas for core areas	-	-	-	-	-
Buffer areas for corridors	-	-	-	-	-
Restoration areas	-	-	-	-	-
Other (please describe in notes below)					

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.
The figures above concern productive forest land, only (annual increment > 1 m^3/ha). Stepping stones were defined, too but the area is negligible. Spruce dominated corridors are regarded as set aside areas in forestry. Pine dominated corridors can be subject to limited forestry operations with certain preconditions. The concept of buffer area is applied along all the water courses (no go areas), as well as around smaller protection areas (< 1000 ha) in southern Finland. Higher amounts of retention trees are left in the buffer areas and forestry operations are planned together with people responsible for management of the protected areas.

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	Valuable habitats and eco-connections are protected by decision of Metsähallitus.
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	The sole responsibility of conservation management is with Metsähallitus
3.3 Area and percentage of corridors under nature conservation management:	None
• **at start of initiative**	
• **currently**	
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	All corridors are primarily boreal forests of different age classes (weighted to the older forests) on various soil types (fertility classes).
3.5 Is any monitoring of ecological impacts carried out, and if so what?	No
3.6 Use of EU agri-env funds:	No
• **Which types of measures were used?**	
• **Are agri-env funds targeted towards the corridors?**	
• **How much was spent on the initiative?**	
• **What was the funding used for?**	
• **Were there any constraints on using potentially available EU funds?**	
3.7 Use of other EU funds (e.g. LIFE):	No
• **Which funds were used (e.g. LIFE)?**	
• **How much was spent on the initiative?**	
• **What was the funding used for?**	
• **Were there any constraints on using potentially available EU funds?**	
3.8 Other sources of funds (type, amount and use)	The project was implemented with funding from Metsähallitus forestry business unit, i.e. business funding.
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	Total costs of the planning process was 7,6 mill. €. The cost (alternative cost) of the realisation as reduced logging volumes is 46,7 mill. € in 2008 as reduced profit of Metsähallitus of which 3,2 mill. € is due to the increased labour costs in management.
3.10 Costs to date of managing and protecting the corridors (if known).	Not separately analysed.

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	Significant contribution to protection of various forest species, enhancement and reinforcement of protected area network in Finland.
4.2 Specific objectives / targets achieved	-
4.3 Evidence of ecological impacts	Impacts will realise in longer term, no immediate impacts
4.4 Specific objectives and targets not achieved and principal reasons	-
4.5 Overall summary of key constraints on progress and actions that did not work	
4.6 Overall summary of actions that worked effectively and efficiently	
4.7 Future plans	The network will be maintained and its value will increase in time.
4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	These exercises are country specific. A consideration must be given to the target species and methods applied should be chosen by habitat requirements of those species.

Annex 4.1.6 National Ecological Structure, The Netherlands

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	
1.2 Current name of the initiative (English translation)	
1.3 Lead organisation	
1.4 Other partner organisations	
1.5 Overall nature conservation aims of the initiative	Enlarge, connect, strengthen nature area's in the National Ecological Structure (EHS) In addition agricultural area's for conservation of geese and meadow birds Improvement of environmental and hydrological conditions
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	Protection of existing and new developed nature areas and values by Nature Laws and general spatial planning instruments. Including the EU Bird-directive and Habitat-Directive areas Fixed targets for total area and quality of different ecosystems Improving environmental conditions for nature areas (less eutrophication, acid deposition, groundwater depletion) Stimulate public accessibility and other ecosystem services Not only nature professionals, also private owners and farmers

	Improve public awareness and responsibility Improve knowledge and education Adaptation to Climate Change International dimensions
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	In 2020 more than 730,000 ha nature
1.8 Key dates:	
• **Start of initiative (study)**	
• **Agreed corridor / network map**	
• **Latest update of the network map**	
1.9 Brief description / definitions of network components (e.g. see table below)	**Core Areas**: protect and strengthen existing nature values. **Nature Reserves**: preserve existing nature values in combination with existing (mostly agricultural) management. **Nature Development Areas**: restore or create certain habitats to strenghten nature areas. **Ecological Links or Corridors**: improve the possibilities for migration of certain species. **Buffer Areas**: take measures to protect nature areas from external influences, limitations to the agricultural development of potential.
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	**2000-2001: national survey, building a knowlegde base:** - policy-plan: "Nature for Men, Men for Nature": 8 corridors. - identifying national priorities, indicative routes,
1.12 If the network is based on the ecological requirements of certain species, which are they?	
1.13 Does the network link to other local, regional or transboundary networks?	
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	
1.15 Consultations with stakeholders:	
• **Who were consulted?**	
• **At what stages of the initiative were they consulted, and on what?**	
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	

2. Areas of network components

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.
• Robust Ecological Corridors: connect core areas of the EHS on a (supra-) regional scale. • What do they look like: - dimensions: length 1- to 30 km, width in average about 0,5 to 1 km; sometimes linked to longer migration-routes. - a chain of habitat-areas ('stepping-stones") and smaller corridors; - may contain different kinds of ecosystems (woods, brook valleys, (semi-) natural pastures, moors, etc.) - dimensioned for exchange and migration of a set of target species, providing also migrating possibilities for other animals and plants; - may consist of existing nature area's, cemented together with new developed nature area's (mostly former farmland); - human activities often allowed or even encouraged (agriculture, recreation); - measures to be taken for beneficiary habitats, - often combined with measures to overcome infrastructural and urban barriers (ecoducts, animal bridges).

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	land acquisition, legal protection?, implemented into spatial plans,
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	land improvement for nature, improvement of environmental and water conditions, and countering fragmentation (such as constructing crossings of infrastructural barriers)
3.3 Area and percentage of corridors under nature conservation management:	
• **at start of initiative**	Corridors: ? Total network: 435,500 ha in 1990
• **currently**	Corridors: ? Total network: 593,000ha in 2007.
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	
3.5 Is any monitoring of ecological impacts carried out, and if so what?	
3.6 Use of EU agri-env funds:	
• **Which types of measures were used?**	
• **Are agri-env funds targeted towards the corridors?**	
• **How much was spent on the**	

initiative?	
• **What was the funding used for?**	
• **Were there any constraints on using potentially available EU funds?**	
3.7 Use of other EU funds (e.g. LIFE):	
• **Which funds were used (e.g. LIFE)?**	
• **How much was spent on the initiative?**	
• **What was the funding used for?**	
• **Were there any constraints on using potentially available EU funds?**	
3.8 Other sources of funds (type, amount and use)	National annual funding of about €0.4 billion was made available for management, land acquistion, land improvement for nature, improvement of environmental and water conditions, and countering fragmentation (such as constructing crossings of infrastructural barriers)
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	Funding is a problem – currently costs €1 billion per year (including provincial, NGO, and private spending: €0.4bn of this is from national funds) but it is unsure that it can continue this way.
3.10 Costs to date of managing and protecting the corridors (if known).	

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	The EHS (730.000 ha) almost totally (95%) delineated; translated in national and provincial environmental and spatial strategy plans, existing and future nature area's protected by law. Natura 2000 sites, National Parks and other special protected area's integrated in the EHS.
4.2 Specific objectives / targets achieved	the network has expanded from 450,000 ha to 593,000ha
4.3 Evidence of ecological impacts	
4.4 Specific objectives and targets not achieved and principal reasons	The network is still very much fragmented. favourable conditions are impossible to realise in time
4.5 Overall summary of key constraints on progress and actions that did not work	There has been a significant difficulty in improving the areas due to the difficulty in communicating the issues to landowners and stakeholders, and because of the high cost of maintaining the network. Little awareness of necessity (and willingness to coöperate) on local level. Confusion about ambition, specific targets, interaction between target-species and local interests, and the use of guidance tools (knowledge). Sometimes fragmented approach of different parts of supra-regional corridors, lack of coöperation of different stakeholders. Resistance of local stakeholders (and their representatives) caused by fear for effects of migrating animals (wild pigs, dear, wild cattle), damage to crops, spreading of diseases, safety on roads, etc.), fear for new constraints on farming practices, and fear of loss of net value of agricultural property Approach based on voluntary coöperation.

	Constraints on budgets, especially for acquisition of agricultural lands and crossing of infrastructural barriers.
4.6 Overall summary of actions that worked effectively and efficiently	
4.7 Future plans	
4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	• dedicated regional authorities, sufficient professional and creative professional mediators to draw and promote plans and to invest in relations with local stakeholders, to take time to connect nature targets with other societal targets and find solutions for their problems. • A good knowledge base and good communication is essential: be clear and specific about the problems and possible solutions: what ecosystems and species are endangered and need help, analyse measures and interactions. • Be also clear about your ambition, connectivity of nature area;s. Use as much as possible excisting nature ares. • A bold director to start and direct the processes is essential. Sometimes also some kind of intervention is necessary from higher levels, dispite the decentralisation. Don't hesitate to act. • Look for involvement of local stakeholders in an early stage. Take problems of stakeholders serious and try to create multi-benefits, i.e.: mutifunctional use of corridors, pure nature is not always necessary • But be flexible about methods and measures, let local experts decide on that. • Look for synergy with other local and regional processes, investments and dynamic pocesses; opportunities for faster and more cost-effective solutions. • enough budget and fair compensations for damage.

Annex 4.1.7 Networking For Biodiversity, Flanders

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	
1.2 Current name of the initiative (English translation)	Networking for Biodiversity, Flanders
1.3 Lead organisation	Agency for Nature and Forests
1.4 Other partner organisations	
1.5 Overall nature conservation aims of the initiative	Enhancing and creation of a durable ecological network in Flanders. Aims to connect important Natura 2000 areas.
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	Landscape protection and creating recreation opportunities will be consequences of the installation of such a network, but where not the intended by the initiative. Achieving areas for agriculture, biodiversity and recreation.
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	125,000ha Ecological Network where nature is given priority, but no specifications were given regarding the area of habitat to be restored. Main aim was conservation.
1.8 Key dates:	
• **Start of initiative (study)**	1997 Decree for Nature Conservation called for the

	designation and protection of 125,000ha Ecological Network.
• **Agreed corridor / network map**	
• **Latest update of the network map**	The network is still updated (enlarged) along with spatial planning in Flanders
1.9 Brief description / definitions of network components (e.g. see table below)	The network is in fact a combination of core areas + actual corridors. Linear stepping stones are intended but in some regions only steeping stones have been marked out. There is significant overlap between ecological network and Natura, which form many of the core areas.
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	The marking out of the network was mainly an expert judgement exercise. Obviously different criteria where implicit to the delineating exercise: land use, ecological quality, the aim of connecting core ecological sites. Clearly, no ecological models where used. Involved many ecological professionals and NGOs.
1.11 If ecological models were used, which were they?:	/
1.12 If the network is based on the ecological requirements of certain species, which are they?	Few criteria set in advance. Looked at areas that were not protected at the time but were important and already functioning as corridors between the core areas.
1.13 Does the network link to other local, regional or transboundary networks?	Yes, it was intended to link areas which where delineated under the European habitat and bird directive.
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	See above.
1.15 Consultations with stakeholders:	
• **Who were consulted?**	In fact, almost people with profound ecological knowledge where consulted. Landowners and farmers were not aware of the process of designation at the time. Professionals assumed they knew best.
• **At what stages of the initiative were they consulted, and on what?**	
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	

2. Areas of network components

Component	Area in proposed network (ha)	Area currently legally protected (ha)	Area legally protected as a result of the initiative (ha)	Target for restoration, if any (ha)	Area of habitat restored since start of initiative (ha)
Core area				/	
Corridors (total)					
• **Linear corridors**					
• **Steeping stones**					
Buffer areas for core areas					
Buffer areas for corridors					
Restoration areas					
Other (please describe in notes below)	Overall 125,000ha. No distinction was made in this target between core areas and corridors. 150,000 supporting areas with mixed use.		87,000ha 1,500ha Because farmers don't know what this will imply. Low trust between stakeholders. Intention to have different functions from the same area: nature, agriculture, recreation. Not clear what this means in practice -		

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.
There is to be 125,000ha designated and protected with nature as priority function. In addition, there is to be 150,000ha of interweaving and supporting areas with mixed function. Of the 87,000ha most part was already protected as a result of spatial planning). An important part of this is already is Natura 2000. This designation relatively easy, therefore it is not sure how much this designation adds to nature

protection.

The protection afforded by the Decree is even more strict than Natura protection. It disallows any development that will have a significant effect on any nature values or harm nature irreversibly. In practice, conservationists concentrate on Natura 2000 sites. It follows the Natura principle of finding alternative sites, mitigating/reducing the damage through design and compensating any unavoidable damage. The focus has been core areas and not on corridors.

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	• Legal protection under the legislation from development • Protection and development of small landscape structures, such as hedges, ponds and natural buffer zones along rivers and roads; • Land purchase by NGO's and the government (Agency for Nature and Forests)
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	• Agri-environment agreements; different instruments. E.g. hedges protection, grasslands, margins for birds. Works well to a certain degree. Instruments for meadow birds work less well: few farmers will agree to it – and effectiveness is quite low. • Restoration (which is costly) is mainly within Natura 2000 – due to specific aims and pressure from Europe – or being undertaken in any case by NGOs.
3.3 Area and percentage of corridors under nature conservation management:	
• **at start of initiative**	???
• **currently**	???
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	???
3.5 Is any monitoring of ecological impacts carried out, and if so what?	Not on a structural basis
3.6 Use of EU agri-env funds:	
• **Which types of measures were used?**	Pillar II. "PDPO". At village level there are additional instruments.
• **Are agri-env funds targeted towards the corridors?**	The agri-environment schemes don't start from a clear vision of what they would like to reach in the end. Any farmer can restore a pool and hedge and want money for it. Doesn't necessarily mean specific corridors that are performing the task of linking core areas.
• **How much was spent on the initiative?**	
• **What was the funding used for?**	
• **Were there any constraints on using potentially available EU funds?**	
3.7 Use of other EU funds (e.g. LIFE):	
• **Which funds were used (e.g. LIFE)?**	
• **How much was spent on the**	

initiative?	
• **What was the funding used for?**	
• **Were there any constraints on using potentially available EU funds?**	
3.8 Other sources of funds (type, amount and use)	
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	
3.10 Costs to date of managing and protecting the corridors (if known).	

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	
4.2 Specific objectives / targets achieved	Protection of existing nature values has been achieved, habitat restoration within the network has also been achieved but it is questionable whether this is actually the consequence of de delineating of the ecological network. Where there is overlap with the NATURA2000 habitat restoration did occur most but the driving force here is clearly NATURA2000.
4.3 Evidence of ecological impacts	
4.4 Specific objectives and targets not achieved and principal reasons	The spatial planning process for the sites of the ecological network and for the corridor areas has been very slow. Especially the delineating of the remaining 38.000 ha is problematic as the actual land use here is mainly agriculture. It was also intended to write out detailed ecological aims for more than hundred distinguished areas within the network. Especially due to long and numerous consultations with all relevant administrations and stakeholder groups, this has only lead to 5 pilot plans.
4.5 Overall summary of key constraints on progress and actions that did not work	Achieving buy-in from local stakeholders has been very difficult as they were not consulted at the beginning which has resulted in a break down of trust. This has meant that achieving co-operation in any areas outside of already protected sites has been extremely difficult.
4.6 Overall summary of actions that worked effectively and efficiently	
4.7 Future plans	At the moment Flanders concentrates on the development of ecological aims for the NATURA2000 network. Here we try to involve pressure groups earlier than before still attempting to keep this process as rational and efficient as possible. Aim to remain on speaking terms with stakeholders – by setting aims for Natura 2000 network. After this it may be possible to move onto the res of the network, after having rebuilt trust by managing this process well. Discussions ongoing at a governmental level to attempt to find agri-environment instruments appropriate for specific areas – thus allowing for greater flexibility.

4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	Make clear objectives. Try to keep close contact to the local stake holders and continue this efforts. Prevent the process to come to a stop. Try to find win-win situations.

Annex 4.1.8 Sandstone Ridge ECOnet Partnership, Cheshire (UK)

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	Sandstone Ridge ECOnet Partnership (SREP)
1.2 Current name of the initiative (English translation)	Sandstone Ridge ECOnet Partnership (SREP)
1.3 Lead organisation	Cheshire West and Chester Council
1.4 Other partner organisations	Cheshire Community Action National Farmers Union Country and Landowners Business Association Tarmac plc Natural England Outdoor Education Service Vale Royal Borough Council Bolesworth Estate National Trust
1.5 Overall nature conservation aims of the initiative	To create an interconnected network of woodlands, heathlands, peatlands and meadows along the mid Cheshire Sandstone Ridge for the benefit of people and wildlife (ref.1) This is the first phase of an ecological network for Cheshire. Project area is 20,000ha.
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	• Sustaining the natural heritage • Improving access and awareness • Supporting education and rural skills • Promoting the built and cultural heritage
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	Conservation and enhancement of 1,100 ha of new and enhanced habitat. Minimum targets for restoration/creation: • Lowland heath 320ha • Meres & mosses 530ha • Woodland 220ha • Meadows 30ha
1.8 Key dates:	
• **Start of initiative (study)**	Life ECOnet Project 1999-2003 (ref.2)
• **Agreed corridor / network map**	2003
• **Latest update of the network map**	2003
1.9 Brief description / definitions of	Initial GIS spatial analysis of existing priority habitats

network components (e.g. see table below)	identified 'core areas'; 'buffer areas' based on hydrological catchments; and development areas based on soil type. Subsequent work (see 1.11) identified three priority landscape zones across the whole of the county of Cheshire.
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	Initial GIS spatial analysis of existing priority habitats followed by land use and species modelling (see 1.11) indicated that the Sandstone ridge deserved the highest ecological priority (refs. 3, 4).
1.11 If ecological models were used, which were they?:	LARCH provided information on the metapopulation structure and population viability in relation to habitat distribution and carrying capacity. LARCH SCAN assessed the spatial cohesion of potential habitat and provides information on the best ecological corridor.
1.12 If the network is based on the ecological requirements of certain species, which are they?	Species representative of priority habitats. 'Ecoprofiles' were used for the sensitivity to habitat fragmentation with the spatial and qualitative requirements of a surrogate species representing a range of species with similar demands.
1.13 Does the network link to other local, regional or transboundary networks?	Not directly but forms part of the Biodiversity Resource and Opportunity Diagram in the North West England Regional Spatial Strategy.
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	
1.15 Consultations with stakeholders:	
• **Who were consulted?**	Landowners, policy makers, NGOs, politicians, Government agencies, local communities
• **At what stages of the initiative were they consulted, and on what?**	Stakeholder consultation was undertaken from the very start of the development of a network planning and continued through to the implementation phase.
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	Workshops, 1:1 meetings; practical initiatives; exhibitions
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	Dutch National Network – to learn from experiences in planning and stakeholder involvement in the Netherlands

2. Areas of network components

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.
The Sandstone Ridge is the first phase of the development of an ecological network for Cheshire. Minimum required areas for various habitats in key areas were generated for the whole of the county (ref 4) – see extract attachment.

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	• Statutory protection of Natura 2000 and Sites of Special Scientific Interest (SSSI). • Protection of local wildlife sites and Biodiversity Action Plan (BAP) habitats through the UK land use planning system. • Limited land purchase of existing woodland patches by community groups and environmental NGOs. • Small scale land purchase of farmland (5ha) for heathland creation
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	• Provision of SREP grant aid (capital) with long term management agreements to maintain restored/created areas • State owned forest park (Forestry Commission) • Some land owned and managed by environmental NGOs (National Trust, Woodland Trust, Cheshire Wildlife Trust). • Ad-hoc take up of agri-environment management schemes by farmers and landowners. • Planning agreements - habitat creation through the restoration of mineral extraction sites
3.3 Area and percentage of corridors under nature conservation management:	
• **at start of initiative**	620.73ha - based solely on statutory sites and National Trust, Woodland Trust, Cheshire Wildlife Trust land.
• **currently**	635.73ha - based solely on statutory sites and National Trust, Woodland Trust, Cheshire Wildlife Trust land.
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	• Created or restored over 90ha of BAP habitat • Agreement to create 28ha heath/acid grassland through quarry restoration • Restored 20km+ of hedgerow • 40ha of unimproved grassland managed through agri-environment scheme (Higher Level Scheme)
3.5 Is any monitoring of ecological impacts carried out, and if so what?	No overall monitoring of area.
3.6 Use of EU agri-env funds:	
• **Which types of measures were used?**	Countryside Stewardship, Environmental Stewardship Schemes, England Woodland Grant Schemes
• **Are agri-env funds targeted towards the corridors?**	In part
• **How much was spent on the initiative?**	Unknown – there has been a reasonable take up by farmers of the various schemes in the area.
• **What was the funding used for?**	Primary objectives: wildlife conservation; landscape conservation; protection of the historic environment; promotion of public access;

	natural resource protection
• **Were there any constraints on using potentially available EU funds?**	Agri-enviroment schemes are multi-functional and not targeted for the support and creation of ecological networks/biodiversity corridors. Take up is voluntary.
3.7 Use of other EU funds (e.g. LIFE):	
• **Which funds were used (e.g. LIFE)?**	LIFE Environment Programme
• **How much was spent on the initiative?**	Total budget: 4.8m euros, 2.3m euros EC contribution
• **What was the funding used for?**	The *Life* ECOnet project - a demonstration model which integrates environmental considerations in sustainable land use planning and management through the use of ecological networks. A demonstration project with partners in Italy and the Netherlands which included scientific analysis to create provincial/county network maps.
• **Were there any constraints on using potentially available EU funds?**	LIFE Environment funds were not available to be used on practical implementation.
3.8 Other sources of funds (type, amount and use)	(a) Local authority (Cheshire County Council) £800,000 capital funds - provision of a conservation grant scheme for landowners, farmers, NGOs and community groups in line with project aims (1.3,1.4) (b) Cheshire Rural Enterprise £67,000 – provision of grant aid for habitat, access and historic feature improvements. (c) Aggregates Levy Sustainability Fund - £40,000 for habitat creation and restoration (d) Landowners and other grant recipients own funds/time/ labour for (a)+(b)+(c) £355,000 (e) Heritage Lottery Fund - £44,500 for development work to lead to submission of Landscape Partnership Scheme application (f) Heritage Lottery Fund Landscape Partnership Scheme - £1.3m for a 3 year multi-programme scheme (Conservation of habitats and Hillforts, access and interpretation improvements and training programme). Project team (3 posts) also funded. (g) Landowners and volunteer 'in kind' time contribution to (f) £568,000
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	Detailed costs not available.
3.10 Costs to date of managing and protecting the corridors (if known).	Not known.

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	• Defined a scientifically justified ecological network • Raised awareness and acceptance of ecological network concept • Created or restored over 90ha of BAP habitat • Agreement to create 28ha heath/acid grassland through quarry restoration • Restored 20km+ of hedgerow

	• 40ha of unimproved grassland now managed through agri-environment scheme (Higher Level Scheme) • Over 65 landowners have enhanced areas for wildlife
4.2 Specific objectives / targets achieved	Key outputs for the 4 main aims outlined in Progress Report (ref 5).
4.3 Evidence of ecological impacts	
4.4 Specific objectives and targets not achieved and principal reasons	Large scale habitat creation and restoration – see 4.5
4.5 Overall summary of key constraints on progress and actions that did not work	• No national ecological network/national government funds • High land value (£7-20k/acre) of productive farmland prevents large scale land purchase for habitat creation/restoration • Limited staff resource (1 full time officer until late 2008) • Lack of fit with regional & sub regional economic strategies
4.6 Overall summary of actions that worked effectively and efficiently	Working in partnership with local partners and delivery of capital grant aid programme
4.7 Future plans	Delivery of Heritage Lottery Fund supported Habitats and Hillforts Landscape Partnership Scheme 2008-11
4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	• Engagement of local stakeholders • Creation of a formal, discrete steering group/delivery board • Innovative use of funds and practical actions focussed on the network. • Creation of a project team • Working with all land use sectors • Consideration of long term management/exit strategy

Notes:

Please add any additional notes to clarify answers above, and cross refer to question number.
[e.g. 3.6 Figures refer to the allocated budget for 2007-2013]

Sources of information and supporting references

Please add full reference details for any references or sources of information listed above (cross refer to reference number).

Ref.1 Cheshire County Council (2005). Sandstone Ridge ECOnet Partnership Vision – Action to improve the landscape for people and wildlife 2005-10.

Ref.2 Cheshire County Council (2004). LIFE ECOnet Project. Final Report. LIFE 99 ENV/UK/000177. 1 September 1999-31 August 2003.

Ref.3 Sluis, T. van der , R.G.H. Bunce, H. Kuipers, J. Dirksen (2003). *Corridors for Life: Ecological Network Analysis for Cheshire County (UK)*. Wageningen, Alterra, Green World Research. Alterra-rapport 698.

Ref.4 Rooij, S.A.M. van, E.G. Steingrover & P.F.M. Opdam (2003). *Networks for Life: Scenario development of an ecological network Cheshire County (UK)*. Wageningen, Alterra, Green World Research. Alterra-rapport 699.

Ref.5 Cheshire West and Chester Council (2009). The Sandstone Ridge ECOnet Partnership – Mid Cheshire Sandstone Ridge. Progress Report April 2005 – March 2009.

Annex 4.1.9 National Ecological Network, Hungary

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	Nemzeti Ökológiai Hálózat
1.2 Current name of the initiative (English translation)	National Ecological Network
1.3 Lead organisation	Ministry of Environment and Water
1.4 Other partner organisations	Main Competent Authorities: National Park Directorates (10), regional organisations handling all nature conservation issues Municipalities Regional Inspectorates for Environment, Nature and Water (10), (1.st instance authorities) Chief Inspectorate for Environment, Nature and Water (2.nd instance authority) Other main Institutes: Ministry for National Development and Economy Ministry of Agriculture and Rural Development ECNC (European Centre for Nature Conservation), Tilburg and former office in Budapest The Institute of Botany of the Hungarian Academy of Sciences ÖKO Co. Ltd. Vácrátót VATI Hungarian Public Nonprofit Company for Region, Budapest Ecological Institute for Sustainable Development, Miskolc IUCN (International Union for Conservation of Nature), Brussels Green Belt Office, Belgrade, former office in Sarród
1.5 Overall nature conservation aims of the initiative	The overall nature conservation aims of the National Ecological Network specified as follows: - to maintain the biological diversity by conserving diversity of species, their habitats and ecosystems; - to maintain the natural and near-natural habitats, and providing hosting sites for species or populations of national, European or Pan-European importance; - to protect all natural, semi-natural habitats, that are endemic in Europe, or characteristic for Europe, or threatened in Europe; - to maintain, conserve, restore and manage **connections** between the areas of the ecological network in Hungary; - to aid species conservation through **improved connectivity and reduced fragmentation;**

1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	- **Recreation and restoration of habitats of ecological corridors** (e.g. wetlands, mires, alkaline lakes, grasslands, hedgerows, forests, oxbows, forests etc.) - conservation and improvement of the status of protected areas; - achieve additional conservation benefits outside of protected areas; - conservation and improvement of biodiversity outside protected areas; - conservation and restoration of landscape; - integration of the principles of nature conservation and landscape protection into the operation of other sectors utilising natural resources - integration of conservation considerations into other sectoral policies and plans; - participation in the development of agri-environmental initiatives trough the National Agri-environmental Programme and through the National Rural Development Plan; - Harmonisation of nature protection and management on Environmentally Sensitive Areas (ESA) overlapping with the ecological network.
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	- to contribute to the conservation and restoration of the Natura 2000 sites overlapping with the National Ecological Network (1,882,760 ha); - To contribute to the conservation of protected species and protected areas.
1.8 Key dates:	
• **Start of initiative (study)**	o Prephase: IUCN co-ordinated surveys in the mid 90's (1992) o Act No. LIII. on Nature Conservation (including ecological network), 1996. o General planning –Meeting point: National Physical Plan (draft plan: 1:500 000), 1997. o *Planning according to the categories of the PEEN Guidelines of the PEEN, 1999-2000 o Designation of the network (1999-2001) o Act on National Spatial Plan (including ecological network), 2003 o Guidelines of revising for National Ecological Network o Revising process involving Natura 2000, 2007 o Act on National Spatial Plan (after amendment), 2008
• **Agreed corridor / network map**	2002 (indicative map, scale 1:50 000)
• **Latest update of the network map**	2007
1.9 Brief description / definitions of network components (e.g. see table	The ecological network is a unified definition for the biological connections of natural and semi-natural sites,

* ref: Nature and Environment No. 107. General guidelines for the development of the Pan-European Ecological Network (2000)

below)	moreover the protected zones and their buffer zones provided by ecological corridors. In Hungary the network elements – core areas, ecological (green) corridors and buffer zones – have as appropriate been designated, but restoration areas in the revised national ecological network (2006) have not been distinguished separately at this national scale, since this type of site may be present in any of other land-use categories and ecological interpretation of this network. Core areas: sites of various sizes that support a maximum number of populations and the ecosystems consisting of these populations. Most core areas of the National Ecological Network are "protected" in some way: e.g., national park, protected natural area, Natura 2000 area or environmentally sensitive area. Corridors: Links between core areas that are strip-like, continuous habitats or larger habitat patches. Corridors can be "Linear corridors" or patch-like "Stepping stones" Buffer areas: buffer zones are to be designated around core areas, where the ratio of natural areas is relatively high and the land use of the landscape does not pose a threat to the core areas. Restoration area: rehabilitation sites can be situated in core areas, ecological corridors or buffer zones as well and primarily characterise those areas that are ecologically damaged and their rehabilitation concerning their size is feasible. Ecosystems had priority at the designation of the Network : Every rivers, streams and their floodplain, Wetlands, Grasslands (steppes) Peats, bogs and marches, Forests (deciduous) Potential components of the ecological network by the Hungarian system: • Protected areas (national parks, landscape protection areas, nature conservation area, ex lege protected mires, sodic, lakes) • Buffer zones of the protected areas • Natural areas • Ecological corridors • Environmentally sensitive areas (ESA) • Sites of community interest (SCI).
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	The planning of the National Ecological Network was based on available maps and databases related to nature conservation and ecological corridors. The digital and printed versions of various databases of national parks or nature reserves were also taken into account. The experience and expertise of national park directorates and non-governmental organisations was a very important source of information. Databases used for designation:

	• Database of protected areas • Databases of active floodplains, • Databases of the forestry service, • Corine Land Cover 1:100 000 • 1:50 000 digital land cover maps, • Geocoded, vectorised photos of SPOT 4 satellite images, • 1:25 000 and 1:50 000 scales Gauss-Krüger topographical maps, • Results of the Corine Biotopes Programme, • Database of the Environmentally Sensitive Areas • Databases of ex lege mires and sodic lakes Nine regional ecological networks have been established under the leadership and with the participation of the experts of nine national park directorates in accordance with the Pan-European considerations and the natural characteristics of the regions. Upon compilation of these networks, the 1:50,000 digital database of the National Ecological Network of Hungary was established in 2002. Nevertheless, Hungary also participated in the so-called "Indicative map programme of the Council of Europe, co-ordinated by the ECNC," since most ecological networks of each countries in this region were prepared their ecological networks that time. Components of the ecological network, and criteria for their identification were determined (core area, ecological corridor, buffer zone, restoration area) by the PEBLDS (PEEN) categories and guideline. The designation began after the guidelines of the Council of Europe (1999). A digital database (Arc GIS, scale 1:50 000) has been prepared. During the compilation, all available maps, documentation, databases, research results and filed experience was effectively utilised. <u>Mapping data:</u> GIS layer(s): Arc GIS file Mapping scale: 1:50 000 Projection: EOV national projection
1.11 If ecological models were used, which were they?	Other networks of Central and Eastern European countries (Slovakia, Poland, etc.)
1.12 If the network is based on the ecological requirements of certain species, which are they?	The network was designated mainly from the point of habitats Ecosystems had priority at the designation: • Every rivers, streams and their floodplain, • Wetlands, • Grasslands (steppes) • Peats, bogs and marches, • Forests (deciduous)
1.13 Does the network link to other local, regional or transboundary networks?	• <u>Natura 2000 Network</u> Comprising Special Protection Areas (SPA) under Birds Directive and Special Areas of Conservation under the Habitats Directive (SCI), the Natura 2000 Network makes (made) a crucial contribution to the protection of the

	National Ecological Network, helping it with being legally protected. In Hungary there are 55 SPA, and 467 SCI areas. • Ramsar sites The Ramsar sites (28 in Hungary) play important role in protecting waterfowl migration routes and the progress management of ecological processes and services provided by wetlands. • World Heritage sites The exceptional heritage sites (4 in Hungary for conservation) with high ecological value contribute to better conservation of natural habitats. Biosphere reserves (UNESCO-MAB: The World Network of Biosphere Reserves) The biosphere reserves (5 in Hungary) fit in well with ecological networks since they combine conservation of resources with sustainable development (Seville Strategy, 1995.) Nationally protected sites The area of nationally protected areas are increasing steadily: - national park: 10 - landscape protection area: 37 - nature conservation area: 163 - natural monument: 1 - Ex lege protected natural areas a.) qualified as nature conservation area (bog, saline lake) b.) qualified as natural monument (tumulus, earth fortification, spring, sinkhole) c.) ex lege protected natural assets (caves) National designations support the ecological network. Ex lege protected mires and alkaline/saline lakes are special small areas, and as stepping stones also contribute the ecological network. ~ 10% of Hungary's territory is legally protected • The European Green Belt Inititative, • Carpathian Convention's protected area network • „Indicative map of the Pan-European Ecological Network for Central and Eastern Europe" (2003. ECNC) Contribution with neighbouring countries on ecological networks: Contribution of "Visegrad 4 Group" countries (Poland, Slovakia, Czech Republic, Hungary) + Ukraine and Croatia: Programme for making a common map about ecological networks (2002, Kiev) Hungary has sub-regional cooperation with the other three countries of the Visegrád group field of cooperation include the followings: biodiversity conservation, the Pan-European Ecological Network, cooperation about the Natura 2000 network and the Carpathian Convention. Under the Carpathian Convention Hungary actively participated in the development of the Protocol on Conservation of Biological and Landscape Diversity. In the field of biodiversity conservation, bilateral cooperation exists with several countries. High-level

	bilateral memoranda of understanding are signed and other on-going cooperation exist for nature conservation on regional level through neighbouring national park directorates and other nature conservation agencies. Hungary cooperates with neighbouring countries concerning protected sites for instance through the transfer of experience on the establishment and management of the Ramsar protected sites, World Heritage sites, transboundary ecological network, protected caves, Natura 2000 network or other activities in relation to the transboundary ecotourism, wetland restoration, integrated international EU projects and other co-partnership programmes. Concrete cooperation activities include the following: - with Austria – cooperation between the transboundary national parks (Fertő-Hanság National Park – Neusiedler See-Seewinckel National Park); common grassland management system; establishment of visitors centre; wetland reconstructions; - with Romania – activities related to the Natura 2000 network, harmonized monitoring activity regarding some protected bird species, joint projects (e.g.: Conservation of Falco vespertinus in the Pannonian region) - with Slovakia – common map of ecological network (2003); cooperation regarding Natura 2000 sites and certain species conservation action plans; establishment of transboundary Ramsar site; joint conservation actions at the World Heritage Site at the Aggtelek National Park – Slovak Karst; several joint publications, films and exhibitions, nature conservation dictionary in Hungarian-Slovak-English - with Slovenia – cooperation between transboundary protected areas (Őrség-Raab-Goricko naturpark) - with Croatia : - Duna-Drava National Park – Kopacki Rit Nature Park cooperation - Pilot project for the implementation of European ecological network between the the Duna-Drava National Park and Kopacki Rit National Park area on the border of Croatia and Hungary (common project on nature conservation (1999, 2005 ECNC, Interreg). See more details in “Notes”. - Planned joint designation of Mura-Drava-Danube Transboundary Biosphere Reserve (UNESCO-MAB, 2007-2009). Nomination of the Hungarian part has been ongoing (deadline 30.09.2009)
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	Establishment of the national ecological network, in relation with the Pan-European Ecological Network (PEEN)- as part of the Pan-European Biological and Landscape Diversity Strategy (PEBLDS)., commenced in 1999 in accordance with pan European categories. The designation of the network began after the guidelines (Nature and Environment No. 107. General guidelines for the development of the Pan-European Ecological Network) of the Council of Europe (2000).
1.15 Consultations with stakeholders:	

• **Who were consulted?**	- experts of national park directorates - experts of NGO-s - experts of The Institute of Botany of the Hungarian Academy of Sciences - experts of CEEWEB Hungary - experts of other institutes (ÖKO Co. Ltd., VATI, Ecological Institute for Sustainable Development etc.)
• **At what stages of the initiative were they consulted, and on what?**	1997. Committee of experts In the planning phase at both national and local levels, permanent and constructive means of co-operation were built between the national park directorates and the civil society.
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	- inter-ministerial consultation - workshops, consultations - alliance of municipalities - committee of experts -establishing of database by using Arc GIS Mapping System
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	Regarding international commitments, relevant global, Pan-European, European or related EU agreements and conventions and other legal instruments are taken into account that have any direct or indirect influence on the establishment of the ecological network. Two of them had significant influence: the Natura 2000 network of the European Union and the PEEN (Pan-European Ecological Network) programme of the Pan-European Biological and Landscape Diversity Strategy. There is a large overlap between the criteria (and areas) of PEEN, and the criteria behind the list of species and habitats to be protected under Natura 2000 (former part of Emerald Network). All areas are designated under these international instruments and national legal procedures together form the National Ecological Network as a part of PEEN.

2. Areas of network components

Component	Area in proposed network (ha)	Area currently legally protected (ha)	Area legally protected as a result of the initiative (ha)	Target for restoration, if any (ha)	Area of habitat restored since start of initiative (ha)
Core area	1,781,843	756,310			
Corridors (total)	845,544	40,446			
• **Linear corridors**	N/A	N/A			
• **Steeping stones**	N/A	N/A			
Buffer areas	719,665	38,018			
Buffer areas	N/A	N/A			

for corridors					
Restoration areas					
Other (please describe in notes below)		1,882,760			

Data source: Ministry of Environment and Water, 20.09.2009

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.
There is overlap between National Ecological Network and Natura 2000 sites, at about 1,882,760 ha (current state: 20. 09. 2009.). On protected areas and on Natura 2000 sites habitat reconstructions are to be realized in the framework of KEOP (Environment and Energy Operational Programme - EEOP) projects, which also strengthen the connectivity of the National Ecological Network's areas. Habitat restoration also must be built in the development plans of the national parks.

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	The scientific and professional objective is that protected and non-protected areas should not be distinguished within the network, i.e. habitats should be assessed for inclusion on the basis of their true conservation value. An official national standard was prepared and published on ecological corridors arching through public roads in order to offer feasible technical solutions to mitigate habitat fragmentation effects of public roads intersecting natural habitats.
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	**State control :** Ministry for Environment and Water **Management:** National Park Directorates (10) **Regulations:** **Legal background:** **Act on Nature Conservation no. LIII of 1996.** The most important explanations of the ecological network (article 53, paragraph (2) sections a-b): „By the act the establishing, developing and supporting of the National Ecological Network must be an important task in the *National Environmental Action Plan*." Definition of the ecological network and the ecological corridor. „The ecological network is a network of protected areas, the buffer zones of the protected areas, the environmentally sensitive areas, natural areas and "Proposed sites of community interest" (PSci). "Ecological corridor means any ecological passage made up natural and semi-natural areas and strips which ensure or support the ecological connection between distant territories." "Ecological network means the biological connections of natural and semi-natural areas, protected natural areas and their buffer zones ensured by ecological corridors." By the Act. The National Environmental Programme shall contain the long term and medium term aspects of the establishment and maintenance of the ecological network and ecological corridors.

	National Nature Conservation Master Plan II (2003-2008) (Part of the National Environmental Programme, Parliament Resolution, *No. 132/2003 (XII.11.) OGY on the National Environmental Programme for 2003-2008)).* "The various natural and landscape assets of the country, outstanding in international comparison too, can be safeguarded by declaring protected areas in all planning-statistical regions, as well as through the ecological networks involving the protected areas too". **Act on National Spatial Plan No. XXVI. of 2003.** By the Act the National Ecological Network must be one of the national spatial zones in the spatial plans, and the network must be a stressed zone in regional spatial plans. Ecological networks, included in 14 regional plans, were approved. The amended Act on the National Spatial Plan came into force in July 2008. The National Ecological Network (core area, ecological corridors, buffer zones) are determined by this plan. Most of the Natura 2000 sites were also classified into the zones of the National Ecological Network, so the protection of these sites has been assured on planning level. The revision of the Act on National Spatial Plan in 2008 has led to the greater integration of biodiversity considerations into spatial planning. The revised NSP contains framework regulations regarding the land use of the zones of the updated and revised National Ecological Network. The restrictions of the National Spatial Plan (NSP) include the following: - Within the national ecological network, only special regional or county land use categories and zones may be established which do not damage the natural and semi-natural habitats of the ecological network and their relationships; - Within the zone, mining activities may be pursued in line with the provisions applicable to mining areas; - In the Special Regional Land Development Plan and County Land Development Plan, the zones of the national ecological network should be classified as core area, ecological corridor and buffer zone. The NSP defines further land use restrictions regarding the zones of the core area, ecological corridor and buffer zone as classified in the Special Regional Land Development Plan and County Land Development Plan. **46/1999. (III.18.) Governmental Decree on use and utilisation of active floodplains, bank zones, and areas threatened by water inundation** „The active floodplains are parts of the ecological network, and must be considered as natural areas…" **Act LIII of 1995 on the General Rules of Environmental Protection** and its **Government Decree No. 2/2005. (I. 11.) on the environmental assessment of certain plans and programmes** require a prior environmental assessment of all local, regional and national development plans. These plans must take account of the interests of nature conservation and in particular the coherence of the Natura 2000 network. **Balaton Act (Act No. CXII. of 2000.)** It was modified in 2008 in

	order to harmonize it with National Spatial Plan. This act also uses the categories of the ecological network. **Act. No LXIV. of 2005. on. Spatial Planning in the Agglomeration of Budapest** This act also uses the categories of the ecological network. **<u>Agri-Environmental schemes:</u>** **National Rural Development Plan (2004-2006) and "New Hungary" Development Plan (2007-2013)** In the framework of the agri-environmental measures of the National Rural Development Plan (2004-2006) a supplementary agri-environment scheme has been launched, which provide support for farmers to establish a 3 metre wide grass margins on their arable land parcels. The above mentioned supplementary agri-environment scheme could be applied only as a top-up measure next to certain agri-environment schemes. New Hungary Development Plan (NHDP) is the Strategic Reference Framework for the use of EU Cohesion Fund and Structural Funds (2007-2013). This plan integrates biodiversity conservation measures through its Environment and Energy Operational Programme. It provides financial assistance to non-productive investments, such as plantation of hedgerows at the edge of agricultural lots, or plantation of field-protecting trees.
3.3 Area and percentage of corridors under nature conservation management:	
• **at start of initiative**	Corridors: **687,370 ha** (source: KvVM, 2002) **~ 23%** The whole network: 2,997,840 ha (Continuous corridors: 414,980 ha, Stepping stones: 272, 390 ha)
• **currently**	Corridors: **845,544 ha** (source: KvVM, 2007) **~ 25%** The whole network: 3,347,052 ha
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	It is planning foreseen the end of 2009.
3.5 Is any monitoring of ecological impacts carried out, and if so what?	Common bird monitoring Water bird monitoring Monitoring of protected/strictly protected species: species monitoring (e.g wolf, Great-bustard, lynx, red-footed falcon, shaker falcon etc.) Habitat monitoring (National Biodiversity Monitoring System-NBmR) (where the project and sample area is overlapping) : In the design of the Hungarian Biodiversity Monitoring System the following key areas were given priority: • the monitoring of endangered and protected natural values, • the observation of elements with a diagnostic value in assessing the general state of the biota and communities, • the study of the direct and indirect effects of human-induced changes, and changes of the environment.
3.6 Use of EU agri-env funds:	

• **Which types of measures were used?**	till 2009: the agri-environmental measure; from 2009: agri-environmental measure, and the assistance provided to non-productive investments measure
• **Are agri-env funds targeted towards the corridors?**	In the framework of the agri-environmental measures of the National Rural Development Plan (2004-2006) a supplementary agri-environment scheme has been launched, which provides some support for farmers to establish a 3 metre wide grass margins on their arable land parcels. The above mentioned supplementary agri-environment scheme could be applied only as a top-up measure next to certain agri-environment schemes. In High Nature Value Areas (former: Environmentally Sensitive Areas=ESA) special payments were available for the conversation of arable land into grassland as well. The area covered by the above mentioned scheme was more than 2000 hectares. Besides these, from 2009 the New Hungary Rural Development Programme (2007-2013) provides financial assistance to non-productive investments, such as plantation of hedgerows at the edge of agricultural lots, or plantation of field-protecting trees.
• **How much was spent on the initiative?**	In case of supporting the establishment of grass margins 500 000 euro was spent during the five years of the program. (The amount of payment was 462 euro in the first year and 39 euro from the second year. The extent of the territory affected by this measure is approximately 800 hectares.
• **What was the funding used for?**	The funding was used for establishment of grass margins on arable lands.
• **Were there any constraints on using potentially available EU funds?**	o The exaggerated bureaucracy of the call for support. o The proper preparation and using permissions issued o The system of the agri-environmental measure is not complex and flexible enough for the aims of nature protection. o To exclude overlapping of different EU co-financed measures
3.7 Use of other EU funds (e.g. LIFE):	
• **Which funds were used (e.g. LIFE)?**	LIFE/LIFE+, Structural Funds (EEOP-Environment and Energy Operational Programme)
• **How much was spent on the initiative?**	In the Environment and Energy Operational Programme (EEOP), starting in 2007, a total of HUF 2.6 billion will be spent in the financial six-year period to attenuate the adverse effect of linear structures on Natura 2000 network in Hungary as well as for corridors to be built under or over public roads and railroads.
• **What was the funding used for?**	**LIFE +: Szabadság-Island - Béda-Karapancsa Project** (find more details in the final report enclosed) **Structural Funds: Accessible Sky project** for bird-friendly transformation of high, medium and low voltage power lines on a national scale (2008-2020). Aerial power lines pose a serious threat to wild bird populations due to electrocution and collision. In several endangered species, power lines are among the most important causes of mortality (for example, White Stork and raptors becuase of electrocution, Great Bustard and Northern Crane because of collision). To avoid further electrocution of thousands of birds, the Hungarian Ornithological and Nature Conservation Society (MME) signed a new "Accessible sky" agreement together with the Ministry of Environment and Water (MEW) and major electric companies in Hungary. The agreement is a voluntary commitment, forming the

	basis of a long-term solution until 2020 aiming to address the problem of bird electrocution in Hungary. The agreement was prepared and signed in February 2008 on collaboration among all distribution companies, governmental and non-governmental conservation organisations to minimise bird mortality along power lines. Funding is provided mainly through the Structural Funds (Environment and Energy Operational Programme) and LIFE Nature, but thanks to the improving co-operation, distribution companies also co-finance the projects. They have also prepared and constantly update BAT for the creation of bird-friendly power lines where new power lines are set up. Legislation was also amended in December 2008 to only allow bird-friendly technologies in new or fully renewed power lines. **Complex habitat reconstruction actions in the area of the Őrség National Park Directorates (Environment and Energy Operational Programme /EEOP/ = KEOP – 7.3.1.1. – 2008 – 0018)** Support:: 15 850 000 Ft The main role of the project is to support developing of a detailed plan for protecting the most valuable natural habitats, associations and species of the area. Main part of the project is the reconstruction of water habitats and establishing of "ecological passages" for amphibiants (for example the Common toad (Bufo bufo). **Development of management methods for natural values int he area of the Bükk National Park Directorates. (Environment and Energy Operational Programme /EEOP/ = KEOP 7.3.1.1-2008-0003)** Changing of aerial power lines to ground cables in the area of Hevesi Füves Puszták Landscape Protection Area and Borsodi Mezőség Landscape Protection area, to avoid serious threats of birds. Establishing of passages for ambhibiants int he region, to avioid running over them. Support: 46 542 000 Ft **Habitat reconstruction at the Kis-Konda-stream Walley Nature Protection Area to restore the ecological corridor function of the area (KEOP-7.3.1.2-2008-0022 Dombóvár Város Önkormányzata)** Support: 2 958 000 Ft
• **Were there any constraints on using potentially available EU funds?**	LIFE/LIFE+ regulation does not allow the financing of recurring activities LIFE/LIFE+ regulation does not allow the actions cannot be funded through other European funds
3.8 Other sources of funds (type, amount and use)	**ECNC:** pilot project (2005) for the implementation of European ecological network between the the Duna-Drava National Park and Kopacki Rit National Park area on the border of Croatia and Hungary. The projects have resulted in increased cooperation between stakeholders and consensus about priority actions. The pilot project was funded by the Dutch Ministry of Agriculture, Nature and Food Quality.

	ECNC: Development of a Carpathian ecological network (2006-2009): The development of an ecological network in the Carpathians as a constituent part of the Pan-European Ecological Network is one of the most important objectives of the Framework Convention on the Protection and Sustainable Development of the Carpathians. The project supports the implementation of the Convention by producing a Carpathian Biodiversity Information System as a base for the development of an ecological network for the Carpathians and by strengthening the capacities of the NGO network in the region. The project aims to support the implementation of the Carpathian Convention through the development and realization of a coherent transboundary ecological network as part of sustainable development in the Carpathians. The project is funded by the Netherlands Ministry of Agriculture, Nature and Food Quality under the auspices of the BBI-Matra Programme. **NGO Fund of the EEA/Norwegian Financial Mechanism:** CSEMETE Natural Conservation and Environmental Association: Civic initiative to survey and improve the nature conservation value of forest belts (2008-2010). Fund: 45,505 € The role of the project is to show positive sides and the versatility of the forest belt and planting them in areas where the people can be involved of the action. The project's first part contains the surveying of forest belts, standardization, and professional planning of the future encroachment and planting in 27 sample areas in the South Plain region of Hungary. The planned audience is people living around the 27 sample areas, the retractable civil groups, local governments, educational institutions. They would like to make professional aid, which would show that for one specific area what would be perfect structural and indigenous species for planting a forest belt.
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	-
3.10 Costs to date of managing and protecting the corridors (if known).	-

4. Achievements and lessons learnt
Please provide descriptions of:

4.1 Main overall achievements	- The National Ecological Network has been established, and main rules were built into the Hungarian legal planning structure; - The National Ecological Network has been integrated to the Act on National Spatial Plan No. XXVI. of 2003. By the Act the National Ecological Network must be one of the national spatial zones in the spatial plans, and the network must be a stressed zone in regional spatial plans. Ecological network is included in 14 regional plans approved. The amended Act on the National Spatial Plan (NSP) came into force in July 2008. The National Ecological Network (core area, ecological corridors, buffer zones) are determined by this plan. Most of the Natura 2000 sites were also classified into the zones of the National Ecological Network, so the protection of these

	sites has been assured on planning level. The revision of the Act on National Spatial Plan in 2008 has led to the greater integration of biodiversity considerations into spatial planning. The revised NSP contains framework regulations regarding the land use of the zones of the updated and revised National Ecological Network. The restrictions of the National Spatial Plan (NSP) include the following: - Within the national ecological network, only special regional or county land use categories and zones may be established which do not damage the natural and seminatural habitats of the ecological network and their relationships; - Within the zone, mining activities may be pursued in line with the provisions applicable to mining areas; - In the Special Regional Land Development Plan and County Land Development Plan, the zones of the national ecological network should be classified as core area, ecological corridor and buffer zone. The NSP defines further land use restrictions regarding the zones of the core area, ecological corridor and buffer zone as classified in the Special Regional Land Development Plan and County Land Development Plan.
4.2 Specific objectives / targets achieved	In Hungary many wetland habitats required restoration. The National Ecological Network gives a useful framework for the protection of ecological networks.
4.3 Evidence of ecological impacts	There was success in conserving to some extent (natural/near natural) per cent of the territory
4.4 Specific objectives and targets not achieved and principal reasons	In order to prevent the huge green investments on ecological corridors, we planned to integrate landscape ecological aspects more vigorously in spatial plans.
4.5 Overall summary of key constraints on progress and actions that did not work	The interests other stakeholders are often conflicting (green investments, windfarms, motorway building, housing estates etc.)
4.6 Overall summary of actions that worked effectively and efficiently	- integration the areas of National Ecological Network into the legal base of national spatial planning system
4.7 Future plans	Further protection and developing of ecological corridors - by the sources of the framework of the agri-environmental measures of the New Hungary Rural Development Programme (2007-2013): plantation of hedgerows at the edge of agricultural lots, plantation of field-protecting trees etc. - by other EU funds - by integrating the protection, restoration and establishing of corridors into the spatial plans of the settlements the more effective as it's possible.
4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	The protection, restoration and establishing of corridors should have been integrated into the regional spatial plans and other main regional plans.

Annex 4.1.10 Summary table of all questionnaires

1. Basic information, aims and network design methods

1.1 Current name of the initiative (national language)	
1.2 Current name of the initiative (English translation)	
1.3 Lead organisation	Government Ministry, Local Council, Forestry Unit, Regional government
1.4 Other partner organisations	
1.5 Overall nature conservation aims of the initiative	The aims of the projects vary from increasing connectivity, restoration of natural habitats, and achieving "ecological stability". Many, such as Hungary, include aims to achieve conservation benefits outside of protected areas.
1.6 Other multi-functional aims of the initiative (e.g. recreation, access, landscape protection)	Anthropogenic uses of the network are prevalent in most of the initiatives but not all. Schleswig-Holstein focuses on ecosystem regulating services (climate and water retention) while others mention optimising landuse development activities and recreational and awareness uses.
1.7 Specific objectives and quantifiable targets (e.g. xx ha habitat restoration)	Apart from Cheshire and Schleswig-Holstein, the initiatives do not have specified targets. Cheshire's targets relate to the enhancement of 1,100ha of new habitat while Schleswig-Holstein aims to have 10% of land surface covered by the network.
1.8 Key dates:	
• **Start of initiative (study)**	Start dates range from 1983 in Lithuania to the most recent of 1993 in Cheshire.
• **Agreed corridor / network map**	Start dates range from 1989 in Lithuania to 2003 in Cheshire.
• **Latest update of the network map**	In Metsahallitus the network is continuously updated; in other areas the last updates at an overall network level are between 5 and 10 years ago, with more recent updates at local levels.
1.9 Brief description / definitions of network components (e.g. see table below)	Core areas (in some cases Natura 2000) sites, with connected semi-natural areas/stepping stones or buffer zones was a quite common approach. E.g Hungary included all of above approaches, with restoration areas, which could be situated in core areas, corridors or buffer zones.
1.10 Brief description of the corridor / network mapping methodology (e.g. land use / habitat mapping, species distribution mapping, ecological models, expert judgement)	Cheshire used a GIS spatial analysis followed by land use and species modelling, while the others used various combinations of geographic analysis, looking at historic maps and field surveys. Hungary used Arc GIS, 1:50,000 digital database based on good quality existing databases, including CORINE, protected areas, floodplains & env. Sensitive areas. Finland also uses GIS.
1.11 If ecological models were used, which were they?:	Ecological models were used infrequently. Cheshire used LARCH to provide information on meta-population structure and viability in relation to habitat distribution and carrying capacity. Schleswig-Holstein used a model of differentiated land use (HABER 1972).

1.12 If the network is based on the ecological requirements of certain species, which are they?	Ecological requirements were seldomly considered. Cheshire was one network where species were used in deciding the networks. 'Ecoprofiles' were used to test the sensitivity to habitat fragmentation with the spatial and qualitative requirements of a surrogate species representing a range of species with similar demands. In Hungary, the network was designated with priority given to ecosystems such as river and their floodplains, wetlands, bogs, grasslands and forests.
1.13 Does the network link to other local, regional or transboundary networks?	In most cases the networks are not explicitly linked to other networks. The exceptions are Estonia (although no details are provided) and Schleswig-Holstein, which has links to Denmark to the North and connections to the Green Belt in the southeast. Hungary reported substantial involvement with other networks including 28 Ramsar sites, 4 World Heritage Sites for conservation, links to the European Green Belt Initiative and forms part of the "Visegrad 4" with Poland, Czech Rep. and Slovakia, as well as with Ukraine, Romania and Croatia.
1.14 Does the network explicitly aim to contribute to the Pan-European Ecological Network	Few of the networks aim to contribute to a Pan-European network. In some cases this is because they originated before the Habitats Directive, although efforts in Schleswig-Holstein are being made to take into account the Natura network. In the Czech Republic, where Natura sites happen to overlap with the ecological network, they are treated as core areas for biodiversity.
1.15 Consultations with stakeholders:	
• **Who were consulted?**	The degree of consultation varies between the initiatives. In the Czech Republic, landowners agreed to provide land in return for compensation but in later implementation phases were at times omitted, resulting in negative responses. Metsahallitus, Finland in contrast carried out a very comprehensive consultation of 1275 groups over 5 years and remains ongoing. Other initiatives also attempted to engage all the proper stakeholder although the level of success is not stated.
• **At what stages of the initiative were they consulted, and on what?**	Generally consultations occurred very early in the process , particularly Cheshire and Metsahallitus. In Estonia and Schleswig-Holstein, it occurred during designation and used a draft spatial plan.
• **How were they consulted (e.g. workshop, distribution of plans, exhibition)?**	Many of the consultations used initial drafts followed up by workshops, face-to-face meetings. In Metshallitus, in total 716 various interest group meetings and public hearings of 12,960 people were carried out. The consultation here is continuous by nature.
1.16 Did you follow the examples of any other corridor initiatives, if so which and why?	Cheshire was inspired by the Dutch network, but the other networks did not follow other networks.

2. Areas of network components

This section was less well completed with only three questionnaires providing detail on "Area in proposed network."

Component	Area in proposed network (ha)	Area currently legally protected (ha)	Area legally protected as a result of the initiative (ha)	Target for restoration, if any (ha)	Area of habitat restored since start of initiative (ha)

Core area	190,000 ha (Finland), 1,489,586 ha (Lithuania) 1,781,843 ha (Hungary)	756,310 (Hungary) Core areas + Corridors: 124295 ha (Schleswig-Holstein 12/2003) 1,108,000 (Finland)		In Schleswig-Holstein restoration of natural conditions as far as possible – but often limited by existing infra-structure	In Schleswig-Holstein, more than 30,000ha within corridors and core areas were purchased by nature protection foundations. SPA and SCI (SAC) lie predominantly within this network
Corridors (total)	115,000 ha (Finland) 943,637ha (Lithuania), 845,544 (Hungary)	40,446 (Hungary)			
• **Linear corridors**	Czech Republic inter-regional corridors up to 100 m in width, local often only 6 – 8 m. In Estonia, interregional corridors as wide as 20 km; local corridors 300m wide. Holland				
• **Steeping stones**	Little data available. In Schleswig-Holstein Czech Republic they are not planned.				
Buffer areas for core areas	These make up 1,576,464 ha (39,3 % of total Nature frame area) in Lithuania. 719,665 ha (Hungary)	38,018 (Hungary)			
Buffer areas for corridors					
Restoration areas	From 6.5% natural or semi-natural to 10% since 1990 in Schleswig-Holstein.				
Other (please describe in	In total there are 4.006.989 ha in	1,882,760 (Hungary)			

notes below)	the Nature Frame in Lithuania. (61,4 % of total Lithuanian territory)				

Comments on area of network components Please add below any explanatory text you wish to clarify answers to 2. Or describe and quantify in your own words the area of the main components of your corridor initiative if they do not match the table categories.
In the Czech Republic, of the planned 50,000 core areas and 85,000 corridors, a total of only 200 sites have been officially incorporated into the system.

Table 10. Hierarchical levels and planning the ecological network in Estonia

Human centred and administrative levels	Level	Range of area (km)	Central areas of green network	The diameter of core areas (km)	The diameter of corridors (km)	Distance between the elements of network, 'size of the loops' (km)
Districts, small group of counties, group system of settlement	G_6	100...150	National-large	30... 50	10... 20	min 10... 15 max 30... 50
County, big group of parishes	G_7	30...50	National-small	10... 20	3... 5	min 3... 5 max 10... 15
Small group of parishes, large town	G_8	10...15	District (county) large	3... 5	1... 2	min 1... 2 max 3... 5
Parish, town, a part of large town, big group of villages	G_9	3 ... 5	District (county) small	1... 2	0.3 0.5	min 0.3–0.5 max 1... 2

3. Methods of implementation and funding

3.1 Method of protection of biodiversity corridors (including stepping stone habitat patches) e.g. land purchase, legal protected area status, planning guidance, advisory guidance.	The networks utilise a range of instruments to protect the sites. The majority have some sort of legal protection for parts of the sites. Schleswig-Holstein has used land purchases, protected nature reserves and designated important areas (not yet protected by law). In Cheshire some protection is afforded through legally protected areas. The Czech republic protection doesn't happen in practice. Other networks rely on legally protected core areas. Estonia utilises stepping stones, but these are rarely considered in the other initiatives.
3.2 Method of conservation management of corridors (e.g. state control, land purchase, regulations, agri-environment schemes, other grants, advisory guidance, other, none)	Cheshire is more likely to show partnerships and incentives for landowners through agri-environment schemes. Other networks show a bias for legal protection through spatial plans, e.g Hungary, but may use a combination of the two.
3.3 Area and percentage of corridors under nature conservation	Not defined or calculated although some estimate (e.g. circa 19% Estonian territory is under the nature protection, green networks covers ca 30-40% of the territory)

management:	
• **at start of initiative**	In Hungary: corridors were 687,370 ha (2002) ~ 23%; the whole network was 2,997,840 ha; (Continuous corridors: 414,980 ha, Stepping stones: 272, 390 ha)
• **currently**	In Hungary, corridors were 845,544 ha (source: KvVM, 2007) ~ 25%. The whole network is now 3,347,052 ha
3.4 Area of corridor habitat restored/ created since start of initiative (breakdown by habitat type if possible)	This information is poorly recorded, except in Cheshire where 90ha of BAP habitat has been created or restored, 20km of hedgerow restore, and 40ha of unimproved grassland managed through agri-environment shcemes.
3.5 Is any monitoring of ecological impacts carried out, and if so what?	Schleswig-Holstein carries out monitoring of the network, with full coverage of its Natura 2000 sites, plus nature reserves and national parks. Hungary carries out monitoring of protected species, common and water bird species and the study of the direct and indirect impacts of human-induced changes to the environment.
3.6 Use of EU agri-env funds:	
• **Which types of measures were used?**	A combination of Countryside Stewardship, Environmental Stewardship Schemes, Landscape Stewardship Scheme Programme for improving the status of water bodies at risk, less favourable area measures have all been used.
• **Are agri-env funds targeted towards the corridors?**	Generally no, with Schleswig-Hostein an exception and in part in Cheshire. In Lithuania, the entire territory receives funds including the Nature Frame but it is not targeted.
• **How much was spent on the initiative?**	The Plan of the Land Schleswig-Holstein for the development of rural areas 2007-2013 indicates a budget to the amount of €35,2m for agri-environment payments who are supporting biodiversity corridors particularly. In Hungary, €500,000 was spent in 5 years on establishing grass margins, of approximately 800ha. For other networks this information is unknown.
• **What was the funding used for?**	Primary objectives of wildlife conservation, public access, restoration of habitats, protection of water bodies, permanent grassland protection.
• **Were there any constraints on using potentially available EU funds?**	LIFE-NATURE funds only eligible for Natura 2000 sites despite some networks being many times bigger than Natura 2000.
3.7 Use of other EU funds (e.g. LIFE):	
• **Which funds were used (e.g. LIFE)?**	LIFE was used by 4 out of 6 networks.
• **How much was spent on the initiative?**	4.8m euros, 2.3m euros EC contribution – Cheshire; 8,65 Mio € total budget from 2001 to 2011, thereof €4,8million EU budget – Schleswig-Holstein. Information not available for the other networks.
• **What was the funding used for?**	In general for nature conservation and management in Natura 2000 sites. Estonia spent it on restoration some habitats (polders, pools). In Cheshire a demonstration model which integrates environmental considerations in sustainable land use planning and management through the use of ecological networks. In Schleswig-Holstein, three LIFE-approved projects for dry-grassland, fire-bellied toads and exchange of expertise according to sustainable long term management of project sites in five countries.
• **Were there any constraints on using potentially available EU funds?**	LIFE Environment funds were not available to be used on practical implementation and can not be used for sites beyond Natura 2000. In addition, the application for funding by LIFE Nature under LIFE III is quite complicate, selecting only beneficiaries who will later be capable to apply to the strict and even stricter rules changing during the project duration. Also a certain level of pre-financing for the project application as writing and answering questions +adopting changes proposed by the Commission is necessary. Some potential

	applicants are not capable and therefore some project ideas will never be submitted.
3.8 Other sources of funds (type, amount and use)	Cheshire has been successful at attracting alternative sources of income though Lottery Funds, Rural Enterprise boards, local authorities, and various private funds. In the Czech Republic, about €10 million has been spent for various kinds of SES plans, about €4 million for practical delivery predominately subsidised by the Ministry of Environment. This project has been carried out with support from the Dutch Ministry of Agriculture, Nature Management and Fisheries and the Dutch Ministry of Foreign Affairs (MATRA Fund/Programme International Nature Management) ca 12 000 EUR. State budget, Structural Funds, regional municipalities funds. Private und public nature protection foundations. Compensation measures or (in general) payments for private or public infrastructure measures: new roads, deepening of shipping channels, new power supply lines
3.9 Costs to date of the whole initiative: proposal, protection and management, restoration (please break-down if possible).	The Schleswig-Holstein estimated the cost per hectare per year is about €125, giving a total of close to €20million. For the other networks this information was unknown.
3.10 Costs to date of managing and protecting the corridors (if known).	This information is not known by the networks. For Schleswig-Holstein, the sum of €125 includes costs of protecting the corridors.

4. Achievements and lessons learnt

Please provide descriptions of:

4.1 Main overall achievements	The most important achievement from a number of the initiatives, including the Czech SES, is protection from development. In Lithuania, 61,4% of total territory is legally recognised. Significant contribution to protection of various forest species, enhancement and reinforcement of protected area network in Finland. Natural or semi-natural habitats increased about 2% of total land surface especially by land purchase in Schleswig-Holstein. Cheshire included raised awareness amongst their achievements which included restoration of habitat. In Hungary, the network must be included in national and regional spatial plans which has led to greater integration of biodiversity into planning.
4.2 Specific objectives / targets achieved	Many of the initiatives did not set specific targets. For the Czech initiative, lack of implementation makes it unlikely that targets were met. Cheshire, however, reports key outputs related to the four aims of sustaining the natural heritage, improving access and awareness, supporting education and rural skills and promoting the built and cultural heritage.
4.3 Evidence of ecological impacts	There is no reported evidence of ecological impacts.
4.4 Specific objectives and targets not achieved and principal reasons	Large scale habitat creation and restoration in Cheshire has not yet happened. In Schleswig-Holstein, spatial connection between core areas is not satisfactory due to increasing competition with agriculture, especially with renewable primary products. Fragmentation of landscape is still increasing because of new roads and motorways. Although improving, there is still a tension between nature conservationists and land-owners and users as a result of different interests concerning land use, preventing good cooperation. Other initiatives do not have comprehensive targets.
4.5 Overall summary of key constraints on progress and actions	The constraints of the schemes expressed the shortage of funds and staff to implement the initiatives as planned. Lithuania commented that the enormous size of the network and the lack of clear targets made any progress difficult. In Cheshire,

that did not work	high value land and conflict with regional strategies also contributed, whereas in the Czech Republic there was a lack of follow through from planning to implementation. In Estonia the lack of data regarding the species for designating core areas meant that the sites are not necessarily based on scientific evidence. Schleswig-Holstein point to external pressures of continuing fragmentation and persistent (although diminishing) conflict between landowners and conservationists. Hungary had planned to integrate landscape ecological aspects more vigorously into spatial plans.
4.6 Overall summary of actions that worked effectively and efficiently	There is quite a dichotomy in responses on what has worked effectively. Cheshire and Schleswig-Holstein point to successful local partnerships and delivery of grants and agri-environment schemes. Estonia, Lithuania and Czech Republic suggest that only the planning stages were effectively carried out, but there was no method established on implementation.
4.7 Future plans	The initiatives intend to continue the work to date. Lithuania, for example has €1million for preparation of planning documents but has no funds allocated to implementation. In the Czech Republic, any fresh approach is unlikely given the considerable funds already invested in the current system. Estonia is planning to continue to designate green networks at the municipal level and harmonise different existing environmental spatial measures. In Hungary, to prevent the huge investments on ecological corridors, it is planned to integrate protection, restoration and establishing of corridors.
4.8 What recommendations would you make to help implement biodiversity corridor initiatives?	Each initiative proposes a different set of recommendations. Petr Roth emphasised that any work on the ground should be scientifically sound. There is more scientific support for the notion of "patchwork" of valuable habitats, including tiny micro-habitats. When thinking about viable concept, one should also take into account the implementation capacities of the country: even if the concept was realistic and justified, there would never been enough companies to implement it in a real time (e.g., 20 years) at the whole countries´ territory. Cheshire emphasises the importance of early engagement with all land use sectors, secure funds and the creation of a project team. Lithuania emphasises the setting of priorities for biodiversity management and conservation and ensuring resources are allocated to conservation management rather than simply planning documents. Schleswig-Holstein maintained the implementation of a plan of natural and semi-natural core areas and corridors on a legal level as high as possible. This plan has to be taken into account when new infrastructure planning is going on. Nature protection measures of all kind are to be concentrated in this biotope net. On the other hand this means a focus of nature protection on small remain areas. Comparing the financial volume of agriculture and nature protection on the other hand, perhaps this is a realistic way. Hungary recommends that protection, restoration and establishing of corridors be integrated into the regional spatial plans and other main regional plans.

ANNEX 4.2. RESULTS FROM THE WORKSHOP ON THE IMPLEMENTATION OF BIODIVERSITY CORRIDOR INITIATIVES

2nd of July 2009 DG Environment

1.1 ATTENDENCE

Anna Barnett, Boris Barov, Andreas Baumueller, Joop van Bodegraven, Dr Rob Bugter, Alun Evans, Paul Grigoriev, Petri Heinnonen, Dr. Lawrence Jones-Walters, Els Marten, A.J. McConville, Pranas Mierauskas, Pieter de Pous, Petr Roth, Reinhard Schmidt-Moser, Professor Kavel Sepp, Theo van der Sluis, Ana Suarez, Kerstin Sundseth, Aleksandra Sylwester, Dr. Graham Tucker, Eva Viestova and Professor Chris Walzer.

1.2 AIMS OF THE PROJECT AND THE WORKSHOP

The aim of this is workshop is to facilitate an in-depth and critical assessment of the corridor schemes. This intends to go beyond the publically available literature which often fails to document problems and failures. By applying Chatham House rules (whereby comments are not attributed to individuals) it was intended that the workshop could encourage participants to share experiences to obtain a deeper understanding of practical issues that hinder corridor implementation.
The workshop will contribute to a report describing the main approaches used to implement biodiversity corridors, with an assessment of their progress and summary of key factors influencing their success.

1.3 INTRODUCTION

Eva Viestova opened the workshop by welcoming the attendees and thanking them for their participation. She explained that the topic of discussion on Biodiversity Corridor Initiatives was part of a larger overall project on land services looking at the changes in land use over the past 25 years and at likely scenarios for land use in the future. The Commissions expects competition for land to increase in the near future through the need for food, biofuel, biomass, and biodiversity and it wanted to ensure the decision about budget allocation on the future of land was well-informed, in particular in relation to environmental and ecosystem services (such as water provision, climate regulation and erosion control). This workshop was called to help determine lesson learnt from countries within in the EU on preventing fragmentation through biological corridors which will help inform a policy position for the Commission.

Graham Tucker chaired the morning session and encouraged attendees to be open about what has and has not worked in the schemes in their countries.

1.4 MORNING SESSION

1.4.1 Territorial System of Ecological Stability, Czech Republic

Petr Roth

Description of the initiative

Petr explained that the current legislative framework regarding ecological networks in the Czech Republic originates from the philosophy of "climax ecology", dominant in the 1970s, that maintained ecosystems tend to reach a final stage of development. Ecological processes were thus assumed to require stability and connectivity was a means of ensuring that this stability was maintained. With the fall of the Soviet Union, this thinking was adopted by the new government, which employed many of the proponents of the philosophy. In the early 1990s, a law on nature conservation was passed which stated:

"*Territorial system of ecological stability of the landscape (SES) is a mutually interconnected set of natural as well as modified but close-to-nature ecosystems that preserve SES*." Art. 3 (1).

And:

"Protection of SES is an obligation of all land owners and users of plots representing its base; its implementation is public interest at which landowners, municipalities as well as state participate." Art. 4 (1).

As a consequence of the law, plans to protect "systems of ecological stability" were required at local, regional and national level that were to be incorporated into planning considerations. These plans attracted funds of around €10million, a very significant sum for biodiversity conservation at the time.

Problems emerged during the implementation of the scheme. Many of the people involved in defining the areas were architects and did not have an ecological background. Local planners saw the plans as principally having an anthropogenic focus and tended not to consider their biodiversity function. After completion of the 1st stage – delivering plans for the entire country (around the year 2000) – interest for SES significantly decreased. A major problem was the lack of explanation by those who formulated the policy and those who implemented it. As a consequence it has not been implemented widely. Despite a total of €3,381 million being spent between 1997 and 2008 in subsidies from the Ministry of Environment it is difficult to estimate the exact number of newly established SES areas as there is no record. The main theoretical purpose of SES – enforcement of ecosystem resilience – as not been achieved. If implemented in a wide scale, Petr argued, landscape and nature could doubtless benefit) – but in its current state it is unlikely to have any major significance for neither the landscape nor the nature

1.4.2 The Estonian Green Network

Kalev Sepp

Description of network

There has been a long history in Estonia though the 1970s and 1980s of connected areas. Since the 1970s the country has taken a multi-functional approach to ecological networks. In the early 1990s, the network initiative was taken up by experts on planning and in 1995 legislation was passed on ecological networks through the Building and Planning Act. The national long-term spatial plan, 'Estonia 2010', established basic principles of the Estonian ecological network by identifying corridors and 12 core areas of international importance. By 1998, the first network was identified. In 1999, the second phase of county planning (thematic planning) was initiated. It aims to define environmental conditions for the development of land use and settlement. The main tasks of this phase included the design of the Green Network that would guarantee its natural, environmental and socio-economic uses for the area.

The objective of planning the green network on the county level was not to define a large-scale 'green surface' and leave it out of use, but first and foremost, to guarantee the naturally, environmentally, socio-economically grounded space structure, based on the location of different infrastructures and needs analysis of society. It aimed to protect valuable natural habitats, the migration routes of wild animals, valuable landscapes and maintain nature conservation outside protected areas.

By 2007, all 15 counties had approved green networks. In addition to protected areas, circa 25 per cent of the land area of Estonia was designated as part of the Green Network. Flexibility is required in determining the criteria of the networks, such as area for core areas, wideness of corridor. At a county level, the detail is not always accurate and is often a rough vision rather than a prescription of the details.

Lessons learnt

The multi-functional approach involving different sectors (forestry, agriculture, transport, recreation) and interest groups (including local inhabitants) through the spatial planning was advantageous. However, the methodology was over complicated and sophisticated (relying on GIS) as at the time the methodology was developed, multiple layers did not exist (abandoned land etc.). The implementation between areas was very variable and many of the implementation measures were weak. Estonian legislation on spatial planning includes mechanisms for public involvement in Green Network planning. More specifically, at regional level the public should be involved in the final phases of the planning process. Public involvement includes a written consultation period in relation to draft planning documents for the Green Network, followed by a public discussion. The results indicated that the planning legislation, especially at municipal level, should be improved in order to enable the concept of the Green Network to be implemented more effectively. There is a need for practical advice on implementation and for involving stakeholders, supported by direct, open and flexible communication.

Questions
A question was asked as to whether past corridors had been considered in the set up of the network. Kalev responded that very little information available on past corridors; there were only two counties where the information was known, through hunters who had knowledge about migration corridors. The specific measures to improve meta-populations have not worked either. However, the country doesn't have a problem with connectivity given its large area and small population.

1.4.3 Nature Frame in Lithuania

Pranus Mierauskas

Description of network
The Nature Frame attempts to stabilise and improve natural landscape, protected areas and other environmentally sensitive areas. In particular it attempts to:

- create a continuous network of the natural ecological compensation areas, ensuring the geo-ecological balance of the landscape and natural relations among the protected areas;
- create preconditions for the preservation of biological diversity, link habitats of the greatest ecological importance, and protect their environment and territories required for migration of animals and plants (valid from 2001);
- protect the natural landscape and natural recreational resources;
- increase the forest area of the country; and
- optimise the urban development of the landscape and the development of agricultural farming.

Although it is not legally protected, the Nature Frame is quite well incorporated and recognised by environmental law and contains elements that are protected. It consists of three zones:

- Geo-ecological watersheds;
- Geo-ecosystem stabilization centres; and
- Migration corridors.

Since joining the EU, the important areas inside Nature Frame were utilised. Main designation areas are forest, waterbodies, wetland complexes and connecting areas. Division of zones were defined as:

- 1st Zone: >80% of the area coverage;
- 2nd Zone: 50-80% coverage;
- 3rd Zone: <50% coverage

This information was mapped on a national, regional and local scale to give an overall map of the location of these Zones.

To date the main achievements include that it is well incorporated into legal documents and are part of comprehensive plans. There is legal recognition of the ecological network and the Nature Frame constitutes 61.4% of the territory.

However it lacks objectives, it is not always geared towards nature conservation and there is no clear methodology to designate zones of the Nature Frame. Very large areas can not be well managed as they need significant resources. 90 per cent of the resources are given to planning rather than implementation.

Lessons learnt

The integration of corridors into legal acts and spatial planning was found to be a useful step in ensuring the integrity of the network. Improvements could be made by:

- developing very clear criteria for inclusion to the network;
- prioritising areas for biodiversity conservation inside the network;
- ensuring very clear objectives for the land have been agreed; and
- allocating more resources for conservation and management.

Questions

It was enquired whether there have been any circumstances where development hasn't gone ahead as a result of the designation of the nature frame. Pranas responded that development may still go ahead in Nature Frame areas but compensation for lost habitat is required. Theoretically it could be used as an opportunity to expand biodiversity connectivity throughout the country. However, in practice, the Impact Assessments are often not well performed and do not take the Nature Frame into consideration.

Another question was asked about the future potential to divert funding from planning to implementation and monitoring. Pranas responded that there has been no monitoring of impact of the Nature Frame to date, not even for landscape impacts. There have been some very small projects on restoration of habitat. However, it is unlikely that progress will be made in the near future regarding increasing the funds available to implementation and monitoring.

1.4.4 Discussion on morning presentations

It was noted that all three examples have legal protection at a federal scale and as a consequence an ecological network exists and is recognized as such. Where planning is decentralised, for example as in Spain, there often is no network at all. Spain only has 3 regions in which networks have been established, despite having large areas designated as Natura 2000 sites. Therefore, it may be tentatively concluded that legal protection at the federal level may be a pre-requisite for the recognition of ecological networks.

A short debate ensued about the scale of network that is appropriate for species. One attendee did not understand the difference between local and regional zones, pointing out that animals really only function on a local level. The large scale is more of a planning terminology, as animals only move slowly. Birds from Africa is more to do with migration and therefore should be treated slightly differently on an international scale. Another talked about the movement of species as very species specific. With many initiatives in Europe, we need to harmonise the approaches and methodology of connectivity. Another attendee used the analogy of country roads for tractors who only want to travel short distances and lorries need motorways to get long distances. This is how we have to consider ecological networks. There needs to be a planning methodology for designing these networks which needs to integrate the specific biology of species.

Another attendee stressed the importance of scale and stakeholder involvement. If you locate special sites within networks they are more robust. For example, in the case of Natura 2000 it is important that the sites have a setting and infrastructure around them

so that they do not exist in isolation. This will require co-operation and involvement from stakeholders in the area adjacent to the sites.

1.5 MID-MORNING SESSION

1.5.1 Biodiversity corridors in Schleswig-Holstein

Reinhard Schmidt-Moser

Description of the network

Germany has 16 states which are highly devolved and autonomous. Most of the responsibilities for nature conservation in Germany rest with the regional authorities; as a result the federal department for nature conservation does not have much power in this area. Schleswig-Holstein, the state where Reinhard works, is the most northerly, and is located just below Denmark.

The establishment of a network in the region has its roots in the 1970s with the emergence of a new approach to nature protection. As conservation of separate protected areas on their own was deemed to be insufficient, an attempt was made to ensure that core areas became better connected to each other and to the broader landscape – the research suggests roughly 15-20% of land surface is required as habitat corridors to be effective. Legislation was developed in the 1980s to protect at least 15% land surface area as part of connectivity, some of which is now Natura 2000 and SPA but not all. The objective of the law was to preserve and where necessary restore typical ecosystems in the region. This was a significant challenge as 70 per cent of the land is used for agriculture, and only 10 per cent coverage of forestry. In the past 70-80 years, a highly sophisticated water system has been developed with very negative implications for nature; very few water systems and wetlands are now in their natural state. About 3 per cent of nature reserves in the region, as well as small habitats such as ponds which are protected by the law. Buying land is an important part of protection to avoid confrontations with landowners. About 30,000ha has been bought in the past 30 years, about 2% of the land area of the state. An important element of the system are the rivers and water courses which connect the areas.

There are different plans for the three different levels of state, regional and local level. 1 & 2 are not in law but are binding: e.g. new roads or harbour need approval from the competent authority that have to consider the plans at the 1 & 2 levels. They can deviate but require written permission stating overwhelming public interest.

Not all of the core elements have a large area are close to nature – some are cultural landscapes.

State level areas tend to be large, often cultural landscapes with a high density of mostly natural areas. At a regional level, sites are often semi-natural, and reasonably large (e.g. bogs and heaths); and at a local level the municipality have to designate small features that make up part of the network (ponds etc.).

Bought land has often been with financial support from the federal government. Many of these areas are designated as Natura 2000 sites. River courses make up much of the

linking corridors between the natural areas. The Autobahn development has to look at the ecological network; they managed to avoid the core areas but had to cross the ecological networks.

Lessons learnt

From the experiences in Schleswig-Holstein, it is recommended that at least 15% of land cover is given protection to act as, 10% offered by federal protection is not enough. Establishing legal protection at as high a level as possible is also crucial to the success of the corridors.

1.5.2 Landscape ecological planning through Metsähallitus, Finland

Petri Heinnonen

Description of the network

The ecological network of Metsähallitus has been entirely carried out on federal land rather than private land, on typically less fertile soils. Metsähallitus (Administration of Forests) is a state-owned enterprise in Finland which manages most of the protected areas of Finland and supplies wood to the country's forest industry. It administers some 120,000 square kilometres of state-owned land and water areas (about 35% of Finland's area), employing some 3,000 people. Its land consists of:

- forest land in managed forests (25%);
- poorly productive and non-productive land (12%);
- protected areas, wilderness reserves and other areas (32%);
- water areas (27%).

The aims of the network are to:

- ensure the survival of an area's natural species over the long term;
- ensure the multiple use of forests: game habitats, scenery, hiking routes, other recreational use and forestry;
- reinforce the area's protected area network through valuable nature habitats in production forests;
- harmonise ecological, economical and socio-cultural objectives.

Planning is based on a GIS system with 200 variables. Part of the planning is sub-sectional ecological analysis followed by site-specific plans for protected areas and forestry plans. Landscape ecological planning aims to ensure survival of an area's natural species over the long-term.

By the end of an extensive planning period, 112 plans were drawn up, requiring 160 person years of labour, with a significant emphasis on field work. Stakeholder consultation gathered an enormous amount of information (for example from hunters and other stakeholders); in total more than 6,000 people outside Metsähallitus participated in the planning process through stakeholder meetings, public hearings and other occasions. The total project cost came to €7.6 million.

Many of the corridors follow waterways which are important for connectivity, particularly as a result of buffer zones. The valuable habitats that were identified are not protected but are often set aside. The size of valuable areas included is increasing – and are being discovered. Natura 2000 sites don't all remain within the public areas and often on private areas. 162,000 ha is productive forest is included in valuable

areas which costs €32(mn) per year. However it is clear that the areas that are protected are definitely more valuable to biodiversity. The biggest factor for the survival of species is the quality of the habitat.

Lessons learnt
It is important to define the species for which the corridors are planned. The ecological requirements of the species should be well known. Otherwise it is most likely that there is no knowledge on the input-output ratio. The application of the habitat – corridor model calls for cooperation of the land owners.

Questions
It was asked what evidence exists of the historical quality of the networks for the presence of species, given the project's stated aims of focusing on which species you are trying to connect. Petri responded that the condition of the forest in the 1850s was so poor that people began to run out of fuel. The use of the forest was just exploitation with no regeneration, with slash and burn occurring on more fertile soils and tar production on pine dominating poorer soils. Very little natural forest was actually left south of the polar circle.

1.5.3 The National Ecological Network in the Netherlands

Joop van Bodegraven – Ministry of Agriculture, Nature and Food Quality

Description of the network
In Holland, many different type of ecosystems form the basis of nature conservation. There is a complicated governance system in Holland which makes multiple stakeholder engagement essential. Holland is a highly densely populated country. Much was of the existing nature remained fragmented, waters had high nutrient pollution levels, natural areas were severely degraded – all of which had to be taken into consideration in a new emerging policy on ecology. In the 1980s there was a major movement to change people's views on conservation – to enlarge nature areas, improve their quality and improve their connectivity. The government formulated fixed targets of the total area that they wanted as natural areas – from 8% to 17% by 2018. The establishment of a network of core areas with ecological links and corridors formed the basis of the approach. Efforts were made to protect areas outside protected areas from pollution through awareness and management practices. Today, the network has expanded from 450,000 ha to 600,000ha, including agricultural land with high biodiversity levels, but still has some way to go to meet the target of 730,000ha by 2018.

The network considers a range of scales – much like a body requiring different ways of transporting nutrients. Different responsibilities shared between national, regional and local authorities. The connectivity of the network functions through three main categories:

- Arteries: 13 Robust Ecological Corridors managed at a national level;
- Veins: 25,000ha of ecological corridors managed at a provincial level; and
- Capilliaries: 40,000ha of typical landscape elements (including verges, roads, railways, canals) managed at a local or private level.

Robust Ecological Corridors have to connect to the core areas of the network. The dimensions of the corridors are between 0.5 to 1km and up to about 30km long. They consist of a chain of habitat areas ('stepping stones') and smaller corridors, designed for the exchange and migration of a set of target species. Human activities are often allowed or even encouraged.

In total, 95 per cent of the target area that they would like to reach is covered by some plan (environmental or spatial plans), most of which have protection under the law. Despite progress, the original plan did not function particularly well as an ecological network. In recent times, they have been a few major changes in approach. The original approach consisted of buying land, but in the last 5 years the focus has shifted more to the contribution that landowners can make to the network. Since 2006, many of the responsibilities have been transferred from national to regional authorities, the outcomes of which are still are uncertain.

In many ways the project is still lagging. It has been a slow process to expand the network, improve the land and involve people and as a consequence it is unlikely that the 2018 target will be met to a high standard of protection. Funding is a problem – currently costs €1 billion per year but it is unsure that it can continue this way. The network is still very much fragmented.

Lessons learnt

Learning from the experiences of the Dutch, Joop set out a number of recommendations.

- A good knowledge base and good communication is essential: be clear and specific about the problems and possible solutions: what ecosystems and species are endangered and need help, analyse measures and interactions.
- Be also clear about your ambition, connectivity of nature areas. Use as much as possible existing nature ares.
- A bold director to start and direct the processes is essential. Sometimes also some kind of intervention is necessary from higher levels, despite the decentralisation. Do not hesitate to act.
- Look for involvement of local stakeholders at an early stage.
- Take problems of stakeholders seriously and try to create multi-benefits, i.e.: mutifunctional use of corridors; pure nature is not always necessary
- Be flexible about methods and measures, let local experts decide on the detail of implementation.
- Look for synergies with other local and regional processes, investments and dynamic processes and opportunities for faster and more cost-effective solutions.
- Arrange for sufficient budget and fair compensations for damage.
- Be patient!

Questions

A question was asked to what extent the decentralisation of responsibility of nature conservation to provinces is likely to affect the ecological network. Joop responded that agreements have been made at the devolved level but there is very little power to enforce agreements apart from more extreme measures. Therefore, the impact of decentralisation is mainly in the hands of the provinces, and the consequences are not yet known.

1.6 EARLY AFTERNOON SESSION

1.6.1 Networking for Biodiversity, Flanders

Els Martens – Agency for Nature and Forests

Description of the network

The Flemish area is one of the most densely populated and used areas in the EU, with considerable pressure on open areas. The 1997 Decree for Nature Conservation called for the designation and protection of 125,000 ha Flemish Ecological Network sites with nature as priority function, or ca. 8 % of Flemish region. To date only about 87,000 ha have been allocated. The Decree also provides for the designation of 150,000ha of interweaving and supporting areas with mixed functions, of which only 1,500ha has been allocated so far. Implementation has been included in spatial plans. The overall principle is to come up with a landscape mosaic taking into consideration land features. To prepare the maps delineating the areas, overall objectives for nature-forest-green spaces are developed and integrated into a spatial vision of the whole area under consideration, what kind of opportunities exist, and how to find a balance between nature and landscape conservation and other uses of the land. The network at the moment is made up of small, fragmented segments requiring linking up by various types of connecting elements which is a responsibility of the provincial administrations. The spatial planning process for the sites of the ecological network and for the corridor areas has been very slow especially due to long and numerous consultations with all relevant administrations and stakeholder groups, despite the planning work on paper already prepared.

There have been some successes concerning the planning and implementation of corridor sites. In Antwerp, a project has begun around the forts designated for bats as Natura 2000. However the surrounding area is not protected, although they are needed for the foraging of bats. So an attempt is being made to designate certain zones and corridors that need to be restored with subsidies from the province or EU funding. In the port of Antwerp, specific sites were identified for particular species, and a green belt has been designated to connect these sites. Extra habitat has been created, such as artificial ponds, or restored, for example for toads (*Bufo calamita*).

A proposal on the table is the interconnection of natural sites during road construction. Not all road developments have to compensate for direct nature loss, but even where not, opportunities to include measures to interconnect specific core areas are taken into account. A particular proposal relates to connecting two Natura 2000 sites with a variety of habitat alongside road development.

Overall, a range of measures related to connectivity and corridor systems are being implemented:

- Networking trans-boundary areas between Flanders and other regions;
- Protection and development of small landscape structures, such as hedges, ponds and natural buffer zones along rivers and roads;
- Agri-environment agreements;
- Defragmentation of rivers for fish migration;
- Peri-urban green spaces and forest; and
- Green infrastructure in industrial zones.

1.6.2 Lessons from developing an ecological network in Cheshire, UK

Alun Evans - Cheshire West and Chester Council

Description of the network

Much of Cheshire, approximately 70 per cent, is used for agriculture with only 4-5 per cent coverage of forest. Of the nature conservation resource that remains, only 1.34 per cent receives national protection (as Sites of Specific Scientific Interest). Natura 2000 sites make up about 500ha, and local protection (Sites of Biological Importance) make up about 5 per cent of land coverage, excluding marine and estuary habitats. In recent years, the Council has been inspired by the Dutch example of creating ecological networks and has thus adopted a mission statement:

"To create a sustainable network of habitats and species for people and wildlife by 2020."

The method for designing an ecological network included identifying the key habitats, then priority species, followed by looking at where habitat could be expanded. The process included a vegetation analysis by a national expert on what could potentially be created in certain parts of the county.

A key area for development with two interconnected areas of woodland, two interconnected areas of heathland and two isolated peatland networks was identified along the mid Cheshire sandstone ridge. The area was approximately 20,000ha in size, 20km in length and contained a mix of different habitats and land uses (woodland cover stood at 11 per cent, twice that of the county average).

After an initial feasibility study recognised that the science was available and public support existed, the issue turned to how to finance and implement the plan. The project started with the formation of a board from all the key stakeholders. The plan covered the ways in which the network could be improved for people and biodiversity, as well as developing understanding within politicians. A significant degree of work has been carried out on work improving traditional field boundaries (hedgerows and stone walls). Visitor attractions (gardens) in the area have started creating traditional meadows for tourists and much effort has focused on educational purposes. Key has been the support of a local politician who secured funding of £200,000 every year for 4 years, without which the project would not have been possible. Achievements include: creation/restoration of >90ha of biodiversity habitat; agreement to restore a local sand quarry to acid grassland/lowland heath rather than agriculture once extraction has been completed; 20km hedgerow creation/restoration; persuasion of farmers to join agri-environment schemes (40ha of meadow); and the restoration of nearly 1 km of sandstone dry walling.

The network faces a number of challenges.

- There is no national ecological network to link to, and thus the initiative remains isolated and with no access to national funds.
- There is also a lack of fit with regional and sub-regional economic strategies which emphasise economic growth.
- High land prices of 19,546 €/ha make purchasing land prohibitive.
- Arable land is very productive so it has been difficult to convert to large scale habitat restoration.

- Staff resource is limited.
- Long term funding has been difficult to secure.
- Local government re-organisation can be disruptive to long-term planning.

Lessons learnt

From the experiences of the initiative, Alun provided a number of recommendations.

- Have a strong vision for the network.
- Ensure strong science base to develop the spatial vision.
- Engage with local communities and stakeholders early in the process.
- Work in partnership with those in the area.
- Integrate different land use sectors (nature conservation, mineral extraction, forestry, agriculture).
- Find innovative uses of funding to multiply it.
- Have a long-term view for the initiative.

1.6.3 Discussion on all presentations

A debate followed the presentations of the case studies with attendees reacting to the conclusions made. These have been grouped below according to the general categories discussed and not necessarily the order in which points were made in. A separate paragraph delineates an intervention from an individual attendee, and therefore reflects an opinion rather than the consensus of the group.

Political and stakeholder buy-in

It is evident through the cases presented that there is a distinction between dedicated Natura 2000 sites, which had to be designated through EU law and broadly have been, and ecological corridors where there has been no legal obligation for protection. Member States have thus been working independently to establish what is necessary and what is possible. However many of these networks are more on paper than in practice and the implementation has been hampered by a weaker legislative framework.

It was pointed out that on an EU scale we need buy in from politicians. Around the EU, Member States have put together completely different packages on corridors. Often the projects finish at boundaries and therefore don't add up at a EU scale.

Another attendee noted that while political will is essential, stakeholder and community involvement is probably equally or more important, as it creates an image of the way they want their countryside to develop. This involvement facilitates action from politicians. Communication has been vital in all the projects mentioned in the workshop. Ecological networks need to be presented as a good deal for people overall.

In the Czech example, the lack of communication caused significant problems in the implementation of the initiative. The wording of the legislation was poor and not necessarily feasible and there was a lack of involvement of nature conservancy staff and foresters. In 1993, most foresters considered the legislation unnecessary as they believed a network was already in place. The key people behind the initiative never attempted to communicate it through out the staff and people who would implement it.

There has been some difficulty in communicating the issue of corridors as a concept, compared to protected areas. The Netherlands had difficulty in engaging people as many did not understand the concept of connectivity and people were concerned about the implications on humans. Scientific evidence can help to demonstrate trends in local biodiversity, which might help garner more local support.

At the EU level, when designating Natura 2000 were checked per country rather than between countries. Commission did not want to take the responsibility – Flanders attempted to join up sites that went over national boundaries – some sites were taken away on one side of a border while protected at the other side. An obvious example is the River Maas (Nl – Flanders) where Flanders designated the edges, NL protected up the middle.

Purpose of corridors

A debate ensued over the purpose of corridors and whether they perform as suggested. One attendee asked a number of questions which provided subject for discussion. The attendee noted that a lot of effort and money has gone into the corridors, which is commendable, but asked how is protection of the network ensured? Underlying issues for all examples have emerged: is the network enforced and do partnerships, mutual benefits and incentives to implement the schemes exist? Have specific management objectives been developed – what are the networks supposed to do in practice? Are they developed for specific habitats, and if so, what are their tolerances for patches? Who manages and monitors their effectiveness and who pays? They are a form of protected areas, but existing protecting areas are not adequately funded, so who can we judge that corridors are good value for money? In summary, it was asked what is the effectiveness of the corridors? There are huge corridors in Australian and the Yucon in America but there is little or no evidence that they are working. A lot of focus has been placed on biotopes and not enough on ecosystem function and. In a broad sense, corridors are intuitive response to the issue of fragmentation but where is the data to support them?

An attendee responded that a principal reason for corridors was to allow species to adapt for climate change. While we don't necessarily have the data on existing corridors, we know from a historical perspective that they did work at one time. Therefore we should be using the pre-cautionary principle and attempting to restore historical processes. The question is now to do the minimum – how little effort can we get away with to restore these processes?

It was pointed out that it is important to use climate change adaptation programmes and the Water Framework Directive as opportunities to demonstrate the importance of corridors and expand their application.

It has been demonstrated (by a German professor working in Poland) that for agricultural landscapes, many corridors don't connect areas, but are useful for acting as resource of species that populate into the fields, pointing towards a mosaic landscape. Therefore, they do not also work as they are intended but add conservation value nonetheless.

It was suggested that the UK are against the notion of corridors because they have exterminated many of the large species that would most benefit from them. But in Europe there are a large number of larger mammals that do use them. The idea is therefore of a patchwork landscape with multi functional use; for example, the brown bear uses the corridors to find its way into smaller habitat with fruit that provide it with energy requirements, thus making use of a mosaic of habitat types. We need to define what we mean when referring to corridors. When does a corridor become green veining, consisting of agricultural landscape and ditches, rather than a conduit for linking patches of habitat?

The amount of science involved in networks varies a lot between schemes. The Netherlands and Cheshire used sound, species-specific models to gauge the best response. Some species don't need it, others, for example large herbivores, certainly do. The types of corridors have different functions and are described in Alterra's reports.

Evidence for corridors is emerging which show that a random approach to extensifying land use such as set aside can be very useful. Also there is an international scale that also must be considered, such as flyways and areas important for migratory species.

Intrinsic value of biodiversity vs multi-functional uses

The Commission is very keen to develop green infrastructure, with the understanding that there should be multi-functionality between ecosystem services of water, erosion control and so on. But it was asked whether this approach was sensible. Biodiversity areas don't have to provide other purposes – they can just be for biodiversity. For example, zones for housing do not have to have a biodiversity element or vice versa. Biodiversity has an intrinsic value in its own right.

A representative from the Commission responded on the issue of multi-functionalilty, stating that the Commission does not have infinite resources to provide parallel systems, and pointed out that in many cases overlap exists between desired outcomes. For example, buffer zones are already protected under the Nitrate Directive, the Soil Framework Directive, the Water Framework Directive, regulations on pesticides and so on. This suggests that it makes sense in certain areas to achieve various functions all at once, such as water, soil, biodiversity protection. The problem is that it is often thought of in a Cartegian way – this is for biodiversity, this is for soil etc. Rather than producing atomised policies, we should be looking to be co-operative. That is not to say every area will have to be multi-functional and that of course there are certain areas that will have specific functional requirements.

1.7 LATE AFTERNOON SESSION

1.7.1 Towards a Green Infrastructure for Europe

Kerstin Sunsdeth – Ecosystem Ltd.

Description of the initiative

Kerstin described an ongoing project commissioned by DG Environment looking at integration of Natura 2000 into the countryside. The preliminary results of this

analysis work is now available on the website http://www.green-infrastructure-europe.org.

In March, the project team hosted a two-day workshop to review experiences on the creation of green infrastructures within the EU and to identify if there might be a role for the European Commission to assist in this process. The workshop illustrated that there were already many initiatives are underway to create ecological corridors within different parts of Europe. But it was equally clear that there the methodologies used are very wide ranging. The following 6 examples illustrate this diversity of approach:

1. Green belt: "corridors" approach to connectivity with a strong emphasis on engaging communities and deriving socio-economic benefits.
2. Wings over wetlands: "stepping stones" strategic approach to species conservation using the fly-ways concept; strong participatory approach with shared ownership and knowledge.
3. France – "ecological network" approach: this has not been presented as a nature tool, but rather packaged to politicians as an efficient land use planning tool (in order to obtain political buy-in). Involved engaging stakeholders very early on. The theory can come from national level but practice will be at municipality level.
4. Estonia – "multi-functional" areas: this approach identifies areas with several functions, based on societal needs. Involves working with people at municipality level to develop the maps that help zone various land use activities and developments; at a local level it is easier to engage people when they realise it is their own backyard.
5. Barcelona – "green matrix" approach: entire province treated as one system, which goes far beyond establishing biodiversity corridors between core protected areas. Land is zoned according to its ecological and ecosystems values. Resulted in local land use zoning maps which restrict further urban developments to just 6% of the province.
6. England – "agri-environment" schemes: embedding Natura 2000 into the agricultural landscape to ensure greater coherence of the network as a whole. Agri-environment schemes fund compatible land uses which help to make the landscape surrounding Natura 2000 sites less hostile to dispersing species and to increase the permeability of the landscape for biodiversity. Run by Natural England through by one-to-one negotiations. It is a voluntary scheme but that has high interest – currently 2/3rd of Farmland in England is included in the scheme.

Part of the workshop was dedicated to identifying lessons learnt and common problems encountered in the range of existing ecological network initiatives. Amongst those that stand out are the following:

- lack of clear objectives and messages – ecologists do not seem yet to have common understanding of what they want to achieve ;
- too narrow focus on corridors for species , causes difficulty to get buy from stakeholders, if they do not see any relevance for them;

- underestimation of how much work is involved resulting poor process management
- lack of integration into other policy sectors – v few attempts to find areas of common ground or potential win-win situations – eg through multifunctional zones – that could help to start gaining acceptance for green infrastructure concepts
- stakeholders are often not engaged early enough or at the right time;
- efforts are too piecemeal to be effective .

Lessons learnt

Kerstin outlined some of the key messages to be taken from the March workshop developing a common understanding from scientists on what they want.

- Adopting a broader approach: not focussing on one thing but looking at commonality between services; and broader than just as rare species conservation , but at same time don't lose the main purpose.
- Better integration with other policies/sectors and finding a common approach.
- Taking action at the correct spatial scale and ensuring that ecological networks are integrated into spatial land use plans at appropriate levels (national, regional, local)
- Adequate policy framework and funding: e.g. Holland place €1bn per year into their network.

1.7.2 Ecological networks: from spatial plan to implementation

Dr. Lawrence Jones-Walters

Description of the initiative

Lawrence described two projects funded by the Dutch government, namely Spatial Planning for Ecological Networks (SPEN) and Knowledge for Ecological Networks (KEN). SPEN looked at policy while KEN looked into implementation, with the overall purpose of the plans to raise awareness and make recommendations.

KEN looked at how to stimulate practical partnerships between stakeholders and to determine the best ways to disseminate knowledge. It found that while there isn't legislation enabling ecological corridors, many say that there is already too much regulation that means there are many hoops to jump through. There is also confusion about Natura 2000 which is talked about as a network. www.ecologicalnetworks.eu

SPEN is about interaction between spatial planning and the implementation of ecological networks. SPEN outcomes include the five country reports of Spain, Croatia, Denmark, Germany and UK which demonstrates the remarkable differences between them. A key factor was to only engage the stakeholders with the key people that you need, rather than bog down seeking a consensus on all decisions.

Lessons learnt

From the studies, Lawrence concluded a number of recommendations could be made.

1. Implementation needs to address many facets.
2. Scale matters: you need planning at different levels to deliver. The closer to ground level you get, the more explicit you have to be.
3. For implementation:

   a. Strong guidance, project planning for delivery. Often NGOs don't have the skills, and people get turned off if nothing happens.
   b. Stakeholder involvement should be selective.
   c. Clear communication based on well-founded knowledge and information.
   d. Identifying the additional benefits that the areas provide (ecosystem and recreational).
   e. Adaptation of strategy.
4. Flagship ships could really be used to sell ecological networks.
5. Conservationists should look at themselves and see what we can do for others.
6. In Holland, in the polders, if you didn't do your bit to complete and ensure the dykes function, you could be run out of the village.

1.7.3 Summary discussion

A final debate followed the last two presentations.

Caution required in applying ecological networks

An attendee pointed out it should be assumed that all of the benefits associated with corridors are positive. Many ungulates migration may increase move tuberculosis. There is also a lot of evidence about the movement of invasive species through ecological networks. Fisheries experts in particular, are worried about invasives moving along rivers.

An important issue is that countries often face completely different circumstances meaning that it is impossible to have a single approach. Therefore the Commission should be careful in being too specific on its approach to avoid its policies having an overall negative impact.

Climate change is an opportunity to improve our networks. There are so many initiatives in Europe that we need to bring them together to have a certain level of bottom down. But we need to be very careful on the wording to get buy in from the Member States.

There is too much focus on implementation without knowing if it is working without the research to back them up.

Securing funding for ecological corridors

It was recognised that by 2013 there could be a shake up in the funding.

Mention of connectivity in other initiatives such as the Cohesion directive would be helpful as well as targets.

Higher funding for these schemes must be backed up by support in legislation at a higher level, through policies such as job creation and so on.

Europe could act to link sites across borders although this might be too late as the designations have already gone ahead.

For funding we need co-financing from agri-cultural activity.

Message from Athens stated that more funding should go on research. We do not know how to implement corridor plans.

1.8 CONCLUSION

Graham Tucker concluded the workshop, drawing together much of the debate from the day and providing analysis of the discussions.

It is clear that one size fits all will not work in the context of ecological corridors. There is a very wide range of conditions and situations in each of the Member States and responses will have to be tailored to suit each circumstance. As a result, the design of corridors is very important as the case for action needs to be made to underpin political and public support. However, the specific justification for corridors and their objectives are often unclear. When it comes to connectivity we must acknowledge that what suits one species may be damaging for others. We should also be clear why we want connectivity: is it for facilitating migration, climate change adaptation or for supporting meta-populations?

Not much discussion was had about when corridors are not the answer: eminent scientists have pointed out that there is very little evidence to prove their usage (see for example case studies cited in van der Windt and Swart, 2008 in the main report). The debate in this workshop focussed more on linear corridors and has not referred much to the potential of stepping stones.

Where ecological corridors are important, we need to do two things:

- protect what we have;
- restore what we have lost.

The first is relatively more straightforward as it concerns maintaining the status quo. The second, however, requires detailed science and needs to be species specific. We need to consider models, but they need to be used by experts who understand their use and limitations.

This all costs time and money but it is small proportion of the implementation costs. Implementation requires a number of factors.

- Legislation: firstly to protect what we have. However it is often on paper.
- Money: connectivity is expensive and will compete for funding with core areas. Here there is the potential for habitat banking to make a contribution by offering a more cost effective way of restoring habitat.
- Political will: we don't perhaps have the communication in place to get through to politicians. Flagship species still have a role, and conservationists should perhaps try to simplify the message to attract attention and funding to their projects.

There are some cases where there are win-win scenarios. For example, by restoring upland peatlands we would increase connectivity, increase carbon capture and storage and improve water retention and quality. But in some cases decisions will have to be made between the two.

ANNEX 5. AGRICULTURAL POLICY MEASURES

ANNEX 5.1. RULES RELATING TO MAINTENANCE OF RATIO OF PERMANENT PASTURE RELATIVE TO UAA

Member State	Reference Year	Percentage reduction in area of PP relative to total agricultural area at which Member State takes action	Summary of rule
AT	2003	5%	Authorisation required for converting PP.
		10%	Re-establishment of previously converted PP necessary.
BE (F)	2003	No threshold is set.	Each farmer must maintain their 'individually assigned area' of PP.
BE (W)	2003	5% - 7.5%	Authorisation required for converting PP. By compensation another parcel must be converted to PP and maintained as such for 5 years.
		>7.5%	Prohibition of conversion of PP to another use. An equivalent area of PP must be maintained for 5 years if conversion does take place.
CY	--	--	No rules apply because there is no PP in Cyprus.
CZ	2005	10%	Rules are under discussion. A separate GAEC standard forbids the conversion of grassland into arable land.
DE	2003	5%	Authorisation required for converting PP.
		>8%	Länder may require farmers who have converted PP in the previous year to re-establish PP.
		>10%	Länder must force farmer to re-establish PP. The area converted in the past 24 months must be re-established.
DK	2003	5%	Authorisation required for converting PP.
		10%	Re-establishment of PP by farmers who have reduced their area of PP.
EL	2003	10%	Further examination takes place at level of individual farm.
EE	2005	5%	Authorisation required for converting PP.
		10%	Re-establishment of PP. Calculated for each farmer.
ES	2003	10%	Re-establishment of PP by farmers in the regions which have experienced a decline.
FI	2003	5%	Authorisation required for converting PP.
		10%	Re-establishment of PP converted in the last 2 years.
FR	2005	<10% (i.e. any decrease observed)	Individual or general management measures could be implemented.
		10%	Re-establishment of PP converted in the last 3 years may be required.
HU	2005	10%	Farmers are informed that if a 10% decrease occurs, they will have to re-establish PP which has been converted into arable land.
IE	2003	5%	Authorisation required for converting PP.
		10%	Re-establishment of PP.
IT	--	--	No rules have been established yet.

Member State	Reference Year	Percentage reduction in area of PP relative to total agricultural area at which Member State takes action	Summary of rule
LT	2005	5%	Authorisation required for converting PP.
		10%	Re-establishment of previously converted PP.
LU	2003	5%	Authorisation required for converting PP, so long as equivalent area put into PP. Newly created PP must be kept as such for 5 years.
		10%	Re-establishment of previously converted PP. Calculated for each farmer. Newly created PP must be kept as such for 5 years.
LV	2005	<5% (i.e. any decrease observed)	Area declared as PP in 2006 must be kept as PP in 2007.
		5%	Re-establishment of previously converted PP.
MT	--	--	No rules apply because there is no PP in Malta.
NL	2003	10%	Specific measures are not specified. 10% rule applies as stipulated in Art. 3 of Reg. 796/2004.
PL	2005	10%	In claims submitted in 2005 farmers undertook to retain an unchanged area of PP on their farms.
PT	2003		Authorisation required for converting PP. Conversion of PP only possible if the national reference ratio remains above 95%.
		10%	Re-establishment of previously converted PP in order to reach a level of 92% of the national reference.
SE	2003	5%	Authorisation required for converting PP.
		10%	Re-establishment of previously converted PP.
SI	--	8%	Re-establishment of PP.
SK	--	--	Farmers have been informed that they must apply for permission to plough up permanent pastures.
UK (E)	2003	5%	Unspecified actions to be taken.
		10%	Re-establishment of previously converted PP among those farmers who converted in the three previous years. Must be retained as PP for 5 years.
UK (NI)	2003	5%	Unspecified restrictions to be applied to ensure a 10% decrease avoided.
UK (S)	2003	5%	Authorisation required for converting PP.
		10%	Re-establishment of previously converted PP among those farmers who converted in the three previous years. Must be retained as PP for 5 years.
UK (W)	2003	5%	Farmers need to apply for permission to convert permanent pasture
		10%	Farmers need to apply for permission to convert permanent pasture

Source: Alliance Environnement (2007)

ANNEX 5.2. EXAMPLES OF MEMBER STATE PROPOSALS FOR DECOUPLING AND ART.68 IN 2010

Note: this information is incomplete, and does not cover all Member States' proposals

Member State	Decoupling	Use of Article 68 recoupling in 2010
BE - Flanders	Support for seeds and nuts decoupled from 2010. Calf slaughter premium and crop protein decoupled from 2012	No reduction
BE- Wallonia	Support for seeds and nuts decoupled from 2010. Protein crop decoupled from 2011	No use of Article 68 in 2010, but still under examination for further years
BG	All payments decoupled apart from the energy crop premium and the soft fruit payment	Not used, however will submit a request before August 2010 Request will be to support dairy secto in 2011
CZ	Already applies the decoupled SAPS, national top-ups tp follow the decoupling timetable. No deliberations at present to shift from the SAPS to the SFP before 2013	Reallocation of 3.5% of SAPS to provide extra support to vulnerable sectors from 2010 Current dairy market crisis
CY	Already applies SAPS and National Direct Payments will follow the decoupling timetable given. No deliberations yet to shift from the SAPS to the SFP before 2013	Does not intend to channel funds through this option at present
DE	All remaining coupled payments to be decoupled from 2012. mainly 25% hops, and 40% tobacco	No use of Article 68 as the German SFP already sees a certain redistribution of support from 2010 and the government wants to avoid any further SFP reductions
EE	Payments already decoupled	€1.238m To provide a headage payment to support small dairy farms (less than 100 cows)
FI	Male beef premium to be fully decoupled by 2010. Protein crops decoupled by 2011. Seed, flax and hemp, processing aid, dried fodder processing aid and potato and starch production and processing aid decoupled from 2012. Existing premiums from Article 69 to be abolished	€57m Beef cattle premium, dairy cow premium and small premiums for protein and oilseed crops, starch potato production and quality premium for slaughtered lambs
FR	Arable crops (25% coupled), sheep premium (50%), beef slaughter premium (40% and 100%) all to be fully decoupled by 2010. Suckler cow payments to be decoupled by 25%	€385m to be re-channelled by top-slicing 4.5% of direct payments national envelope. Total budget €410m Extra support to structurally fragile areas and for economically vulnerable types of farming - notably a coupled sheep and goat headage payment (€135m-33%) and a coupled payment for mountainous milk production (2c/litre up to a total of €45m- 11%). Other measures also include help for protein crops (€40m - 10%), organic production (€50m - 12%) and new risk management allocations (€140m - €40m -10% for sanitary risks and €100m - 24% for crop insurance.)
HU	N/A - Hungary already applies the fully	€1.3bn when fully phased in, or €910m in 2010

	decoupled SAPS scheme. Although National top ups will remain "as coupled as possible"	In 2010 €60-65m will be used as "coupled" support for milk. €15-20m will be used for restructuring programs for fruit and vegetables and for tobacco.
IT	To fully decouple support for drum wheat from 2010, remaining coupled aids for tomatoes, pears and peaches from 2011, nuts, seeds, rice, protein crops, the aid to processing dried fodder and flax & hemp will be fully decoupled from 2012. For plums, currently 100% coupled , there will be a 25% decoupling from 2011 with the remaining 75% amounts being decoupled from 2013	Worth €316m in 2010, €317m in 2011, and €322m in 2012 and subsequent years - roughly €145m of this will be from 'unspent amounts', and the rest will be from reducing direct payments 47% to be used on improving the quality of agricultural products, 31% agri-environment measures, 22%
IR	Ireland opted for full decoupling with effect from 2005. Protein crops will remain coupled until 2012	
M	Malta already committed to a fully decoupled system by the end of 2009	Will not be implemented in Malta as authorities deem total Pillar 1 funds to be "disproportionally' low for Article 68 to be used effectively
LT		
LV	CNDP for slaughtered cattle (40% currently) to be fully decoupled by 2012; CNDP for arable & feed crops fully decoupled from 2010; no decision on CNDP for suckler cows & ewes	€5.31m (3.5% of SAPS envelope) support in the dairy sector - probably based on production
LU	Decouple the two remaining aids for protein crops and nut aids ASAP - ie from 2010. After implementing a hybrid model in 2005 there will be no further move away from the historical model before 2014	Will not apply Article 68
NL	There will be no no coupled payments after 2012. Decoupling of the slaughter premium for calves and adult cattle will happen from from 2010 - resulting €102m shifted into the SFP envelope on the basis of a recent reference period. Nut and protein crops also to be decoupled. Coupled subsidies for dried fodder (€5m), starch potato processing (€10m) and flax and hemp (€1m) will all be decoupled from 2012 along with the additional starch/flax and hemp support for growers (worth €28m and €0.75m respectively).	No use of this, at least in 2010 and 2011 In early 2011 the government will reconsider whether to introduce any new Article 68 measures applicable from 2012
PL	In line with HC provisions	€89.8m Headage payments for cattle - €28.5 m (32%), ewes - €1.5m (1.7%), area payments for pulses and grain legumes - €10.8m (12%), decoupled tobacco payments to those switching to labour-intensive production in areas under restructuring - €49m (55%)
RO	No further decoupling or shift from the SAPS system	Will reallocate roughly €3m of the SFP envelope (3.5% of 2010 total)

		Additional aid for the milk sector in LFA (€66 per head) and for organic farming
ES	From 2010" sheep and goat premium (50%), drum wheat quality premium (40%), arable crops (25%) and olive oil production aid. From 2010 onwards, tobacco payments would be: 50% fo RD and 50%into SFP(from that 10% will be retained to support Article 68 measures). Remaining coupled payments will be integrated into the SFP from 2012 - namely specific payments such as: cattle slaughter, protein crops, rice, nuts, dried fodder, flax and hemp, seeds and potato starch. So all support in mainland Spain will be fully decoupled from 2012 except the suckler cow premium and aid to sugar beet/cane producers which will be extended to 2013/14	To maintain the existing "article 69" measures Dairy quality payment (€19.8m inc. €0.8m for differentiated/organic production), a suckler cow top-up payment (€47.96m), top-up fpr quality meat production (€7m), cotton and sugar support in certain intensive and irrigated areas (€9.63m). For tobacco, 10% of decoupled support will be retained to support improving quality and competitiveness in the sector - €5.8m a year for 5 years.
SK	Already applies SAPS and National Direct Payments will follow the decoupling timetable given. No deliberations yet to shift from the SAPS to the SFP before 2013	€9.813 m (3.5% of the national ceiling) To support the dairy sector in LFAs from 2010 onwards
SI	50% sheep and goats and 50% hops will be decoupled in 2010 and integrated into the SFP. Coupled payments for nuts, protein crops and the special premium for beef and veal shall be decoupled in 2012	10% of the national payment which is €14.42 (combined EU and NDPs) Additional payment for suckler cow production, area payment for dairy holdings in mountain areas and on steep slopes, grassland premium. Fund raised from unused funds as well as €1.43m from the abolition of the energy crop premium and amounts used under the previous Article 69
SW	Protein crops decoupled in 2010. Dried fodder and potato starch decoupled from 2012	Continue to use 0.45% of the national envelope for promotion and quality certification schemes as happened under Article 69 - it will not introduce new measures
UK - England	Already decoupled all optional coupled funds. Remaining coupled support (Area payment for Nuts and Protein Crop Premium) will be decoupled in 2012. Funds will be added to the flat rate SFP	No use of Article 68 in 2010, but still under examination for future years
UK - N Ireland	Protein crops to be decoupled in 2010 on a 2005-2008 reference period. Dried fodder and Flax and hemp to be decoupled from 2012 as required (both are minor in NI)	No scaling back of the SFP fund Current "static hybrid" model (80% historic, 20% area-based) to remain unchanged until end of 2012
UK - Scotland	Protein crop support to be decoupled. Everything else already decoupled	€20m funded from what was previously beef sector payments Coupled headage payment for beef breed calves. No further Article 68 measures
UK - Wales	Among less than 100 producers will be decoupled from 2010	Not in 2010 as government does not want to reduce pillar 1 payments N/A