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Land change typology in the context of
the case studies

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Introduction

The present report shows an analysis of land use typology in each of the case study regions, identifying the factors and drivers of land use change according to type of land in each case, also analyzing land use changes according to type of land

It also analyses the case studies in the context of the Land change hotspots and finalizes with an identification of the key challenges of land use change in the investigated regions

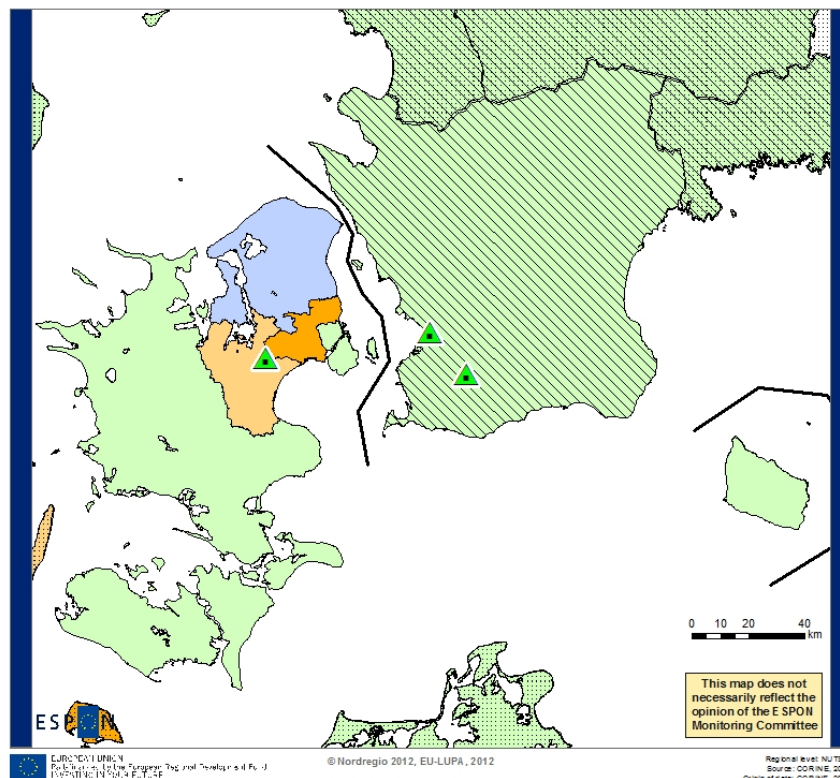
1. Land Change Typology

1.1 Øresund Region

Moderate intensification – rural conversions combined with notable land take

Moderate intensification – mainly rural conversions with low levels of land take

Land Use Change Typology 1990 – 2006 Øresund Region



Land Use Change Types

- Very high intensification – land take, often from natural areas
 - High intensification – continued urban land take from rural land
 - Moderate/high intensification – urbanizing areas while maintaining rural functions
 - Moderate intensification – rural conversions combined with notable land take
 - Moderate/low intensification – mainly rural conversions with low levels of land take
 - Low intensification – rural conversions with negligible land take. Some agricultural withdrawal
 - Extensification – rural conversions with significant levels of farm withdrawal
- Points of investigation
 - National boundary
 - Regional boundary
 - Only 2000-2006 data
 - Areas outside the case study region

Oresund Region consists of two different parts. The core of the region is intensifying in medium intensity, due to some urban sprawl combined with forest conversions in the nearest Copenhagen neighborhood and relying on the agricultural and forest changes mainly further west.

Changes in urban core and urban and economic sprawl are strictly connected to the economy transformation from traditional spatially concentrated urban activities to more dispersed activities of high-tech and R&D sectors. Urban and economic sprawl is quite controlled according to “finger plan”, which indicates major development axis of “Hovestad” along sea coast and main routes. A parallel processes occurred on Swedish side, which accelerated after constructing Oresund Bridge. On peri-urban and rural areas increase of different forms of leisure activities function instead of intensive agriculture is significant. Intensive agriculture is gradually shifted to Jutland Peninsula and, finally, to new member states. However this process is much elder than since beginning of 1990s’.

In the prevailing part of Zealand Island low intensification is taking place, which also relying on the agricultural and forest changes and limited urban sprawl. This spatial pattern of land use changes has been proved by case studies, however along seacoast slightly different situation is observed. There are traditionally second houses areas and recreation sites there, thus the changes of land use are different than in the prevailing part of relevant NUTS3 regions. The basic barrier of uncontrolled more rapid changes in the internal part of the island is the strict spatial planning focusing on the preservation of rural landscape.

Table 1 Identification of the factors and drivers of land use change according to type of land in Oresund region

Type of land	Change <i>E- ekstensification; S – stabilization; I - intensification</i>	Dynamics <i>+++ - high ++ - medium + - small</i>	Factors <i>++ - most important; + - less important</i>	Identified processes
Arable land	E	++	+ From 1972 – zoning system in Denmark (agriculture, leisure, urban) protected agriculture area (one compromise: communication network) + EU support big farms	Moving animals' farms to less develop countries. Transform agriculture to ecological, organic. On Danish side arable land decreases, in Sweden side it's stable because Skane is the only agricultural region in whole country.
Pastures with annual/permanent crops	E	+	+ trend to transform land from agriculture to sport and recreation functions	Decrease area in Capital Region of Denmark and Skane, but increase in other part of Zealand
Forests	S	+	+ forest is more and more popular for recreation services	Internal changes
Natural Grassland				
Transitional woodland – shrub areas				
Sparsely vegetated areas				
Marshes, coastal areas and inland waters	S	+	++ in the case of coastal areas strongly developed residential function in the past, now protection of access to coast for recreational purposes	Strongly developed zone of summer houses along sea coast during many decades. Now landscape conflict with needs of wind power plant on the sea and spatial conflict about needs of access to sea coast and recreation, which is a barrier for further residential zone enlarging and intensifying.
	E	+	+ in the case of inland waters environmental protection	Environmental protection of water reservoirs and their surroundings and recreational purposes are the often reasons of economic activities abandon. Now function of environmental protection and recreation dominates in these cases.
Core urban areas	S	+	+ migration of young people into city centers and older (with families) to suburbs	Internal changes
Urban areas in transition	I	++	++ suburbanization, improving quality of life, ++ transformation of regional economy appearing as dispersion of industry, warehouses and research activities	Urban sprawl according spatial plans (controlled by law). Transformation of regional industry and economy appearing in deconcentration of high-tech economy and R&D sector activities connected with demanding of clean environment, improving conditions of work and spatial accessibility, lowering costs and decreasing role of agglomeration profits.
Urban areas in intensive transition				
Urban areas in arable land	I	+	++ suburbanization, improving quality of life	Urban sprawl according spatial plans (controlled by law)
Urban areas in pastures with annual	I	++	+ investment in sport and recreation areas	Investment in golf clubs, leisure areas, horseback riding paths, etc,

and permanent crops				
Urban areas in forested areas	I	+	+ investment in recreation areas, horse path,	Investment in leisure areas, horseback riding paths, etc,
Urban areas in transitional woodland areas				
Urban in marshes, coastal areas and inland waters	I	++	++ nice landscape, high land value	Business centers, wind power plant

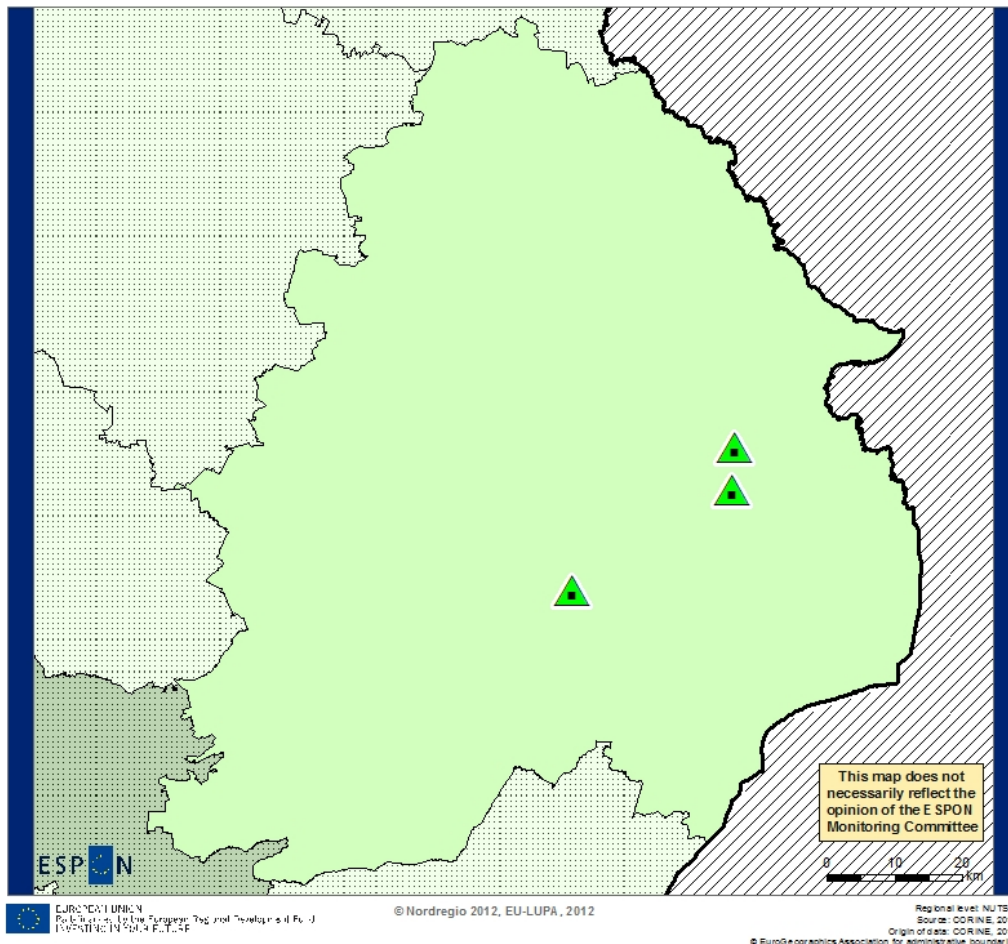
Table 2 Analysis of land use changes in the Oresund Region investigated area according to type of land

Name of investigated area	Type of land	Change <i>E- ekstensification; S – stabilization; I - intensification</i>	Dynamics <i>+++ - high ++ - medium + - small</i>	Land Cover Flows	Factors <i>++ - most important; + - less important</i>	Remarks
1. Hedeland - Sprawl of economic sites and infrastructures	Urban areas in intensive transition	I	+++	Sprawl of economic sites and infrastructures	++ very good localization close to the city with specified spatial plan	Old grave and clay mine, which was transformed into big very diverse recreation zone
2. Lomma – Natural Grassland	Natural Grassland	E	+++	Agricultural internal conversions	+ high value of nature + protection because of threat from motorway and new investment	Nature reserve protecting wildlife of small pond. A couple of new economic investments in the surrounding.
3. Forest near Svedala	Forest	S	+	Forest creation and management	+ cut down because of trees disease	Horseback riding paths and old golf club in the area. Transformation of forest slightly east from indicated point.

1.2 Chełmsko-Zamojski Region

Low intensification – rural conversions with negligible land take. Some agricultural withdrawal

Land Use Change Typology 1990 – 2006 Chełmsko-Zamojski



Land Use Change Types

	Very high intensification – land take, often from natural areas		Points of investigation
	High intensification – continued urban land take from rural land		Regional boundary
	Moderate/high intensification – urbanizing areas while maintaining rural functions		National boundary
	Moderate intensification – rural conversions combined with notable land take		Areas outside the case study region
	Moderate/low intensification – mainly rural conversions with low levels of land take		No data
	Low intensification – rural conversions with negligible land take. Some agricultural withdrawal		
	Extensification – rural conversions with significant levels of farm withdrawal		

The whole chełmsko-zamojski region is classified as an area of low intensification mainly due to agriculture and forest changes. This category of land use changes typology has been partly proved in case study investigation. In the sense of land cover the region is gradually extensifying, especially in the field of dominating agricultural land use. The more intensive industrial croplands has been substituted by more extensive cereals cultivation. More other some of the less favourable areas has

been converted into untilled meadows or forests. Especially in the 2000s' in spite of EU payments some unfavourable arable lands became fallow land, and after that, due to forest succession, were converted into forests.

On the other hand, in the sense of the land ownership structure is concentrating and the best performing farms are becoming modernized, more specialized. The intensification of agriculture is taking place mainly in the framework of animal production. More over, there are also some spots of investments in the framework of tourism and recreation. In the vicinity of two the most important towns of the region (Chełm and Zamość) there is also linear transformation of agricultural land into housing and services areas, due to urban sprawl. This process is accelerating since 1990. and due to some lacks in spatial planning is causing the most of spatial conflicts in the region. This process seems to be the most rapid in land use changes last years. In aerial sense, due to monofunctional character of the region, changes in agricultural land are the most significant. However the most dynamic and the most influential for the regional multifunctionality and economic development seems to be urban sprawl connected to the entrepreneurship in market-oriented services dispersion on rural areas.

Table 3 Identification of factors and drivers of land use change according to type of land in the Chelmsko-Zamojski Region

Type of land	Change <i>E- ekstensification; S – stabilization; I - intensification</i>	Dynamics <i>+++ - high ++ - medium + - small</i>	Factors <i>++ - most important; + - less important</i>	Identified processes
Arable land	E	++	++ Collapsing of food processing industry + Macroeconomic circumstances for agriculture + Needs of energy production	Shifting of cultivation area structure from industrial plants, like sugar beetroots, potatoes, flax or tobacco, to cereals and some energy willow on weaker soils. Forestation of steep slopes and plots with weaker soils.
Pastures with annual/permanent crops	E	+	++ Cattle breeding concentration and intensification + Drainage systems in river valleys abandon	Forestation of wetlands and wildlife growth. Pastures not fully utilized due to cattle breeding concentration.
Forests	S	+	+ Market circumstances of wood supply for building and furniture production + Environmental protection	Maintaining activity of sawmills and small furniture factories. Environmental protection in some areas. Gradual enlarging of forest areas on worse conditioning agricultural land. Gradual leisure function growth in forests and in their neighborhood in some areas, especially in Roztocze Hills.
Natural Grassland	S	+	+ Environmental protection	Wildlife growth, forest succession and drainage systems abandon in some areas.
Transitional woodland – shrub areas	S	+	+ Environmental protection	Wildlife growth.
Sparse vegetated areas				
Marshes, coastal areas and inland waters	I	+	+ Flood protection + Leisure function role growth	Some new artificial water reservoirs appearing. Predominance of their recreational function with second houses zone appearing in neighborhood. Some small ponds for recreational fishing appeared as well.
Core urban areas	E	++	++ Emigration of young people to bigger educational centers and bigger labor markets ++ Collapsing of industry in the region + Decreasing of administrative role of Chełm and Zamość + Revitalization of Zamość oldtown	Stagnation of towns development. Ageing of population due to emigration of young people due to educational and labor market purposes and suburbanization. Shifting of their functions from administrative-industrial to trade-educational. Strong increase of relatively big moles wining competition with small enterprises in the town center. Revitalization of historical Zamość old town is going to strengthen tourist and cultural function in it.
Urban areas in transition	I	+	++ Suburbanization with predominance of housing and services functions, improving quality of live	New housing areas along main roads from Chełm and Zamość with small entrepreneurship. Lack of spatial planning in suburbs in some cases, especially further from main roads, causing spatial conflicts regarding housing areas and infrastructure networks development.

Urban areas in intensive transition				
Urban areas in arable land	I	+	+ Local fresh food market	Some cases of vegetable production and greenhouses investments for local market.
Urban areas in pastures with annual and permanent crops	E	+	+ Macroeconomic circumstances of agriculture + Local fresh food market	Abandon of cattle breeding in suburbs. Some orchards supplying local market with fruits.
Urban areas in forested areas				
Urban areas in transitional woodland areas				
Urban in marshes, coastal areas and inland waters				

Table 4 Analysis of land use changes in the Chelmsko- Zamojski Region investigated area according to type of land

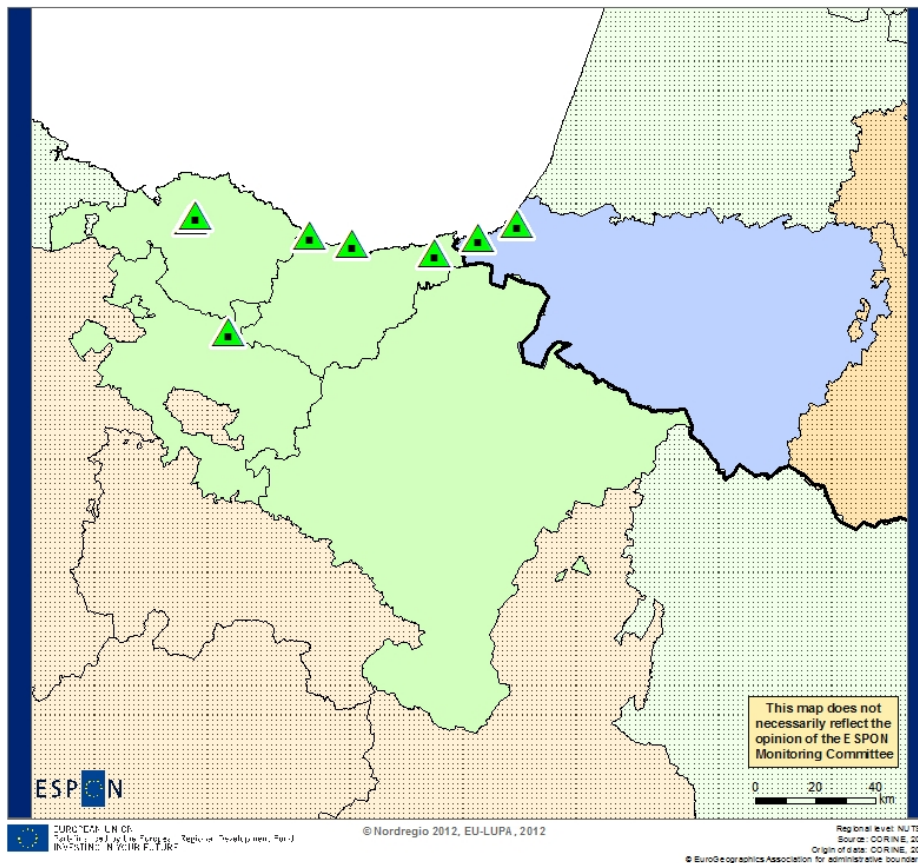
Name of investigated area	Type of land	Change <i>E- ekstensification; S – stabilization; I - intensification</i>	Dynamics <i>+++ - high ++ - medium + - small</i>	Land Cover Flows	Factors <i>++ - most important; + - less important</i>	Remarks
1. Huczwa river near Malice village – Agriculture internal conversions	Pastures with annual/permanent crops	E	++	Agricultural internal conversions	++ macroeconomic circumstances for agriculture + non maintaining drainage system	Conversion arable land with cereals and maize cultivation to pastures for cattle breeding during 1990s'. Wildlife growth.
2. Werbkowice – Urban residential sprawl	Urban areas in transition	I	++	Urban residential sprawl	++ life quality improvement + potential accessibility + macroeconomic circumstances of agriculture	Majority of houses is from 2000s', arable land with very good quality of soils were transformed into housing area on outskirts of little town. Neighborhood of main road, but underdeveloped local road infrastructure.
3. Polanówka – Forest creation and management	Forests	S	+	Forest creation and management	++ macroeconomic circumstances of agriculture + macroeconomic circumstances of wood production + ownership of forest	Natural succession of forest on fallow private agricultural lands on slopes. Wood production inside state forest area.

1.3 Eurocity Basque – San Sebastian

Low intensification – rural conversions with negligible land take. Some agricultural withdrawal

Moderate/high intensification – urbanizing areas while maintaining rural functions

Land Use Change Typology 1990 – 2006 Eurocity Basque Bayonne - San Sebastian



Land Use Change Types

- Very high intensification – land take, often from natural areas
 - High intensification – continued urban land take from rural land
 - Moderate/high intensification – urbanizing areas while maintaining rural functions
 - Moderate intensification – rural conversions combined with notable land take
 - Moderate/low intensification – mainly rural conversions with low levels of land take
 - Low intensification – rural conversions with negligible land take. Some agricultural withdrawal
 - Extensification – rural conversions with significant levels of farm withdrawal
- Points of investigation
 - National boundary
 - Regional boundary
 - Areas outside the case study region

The Basque Country is very diverse region: in French part we observe moderate-high intensification due to urbanizing process. Around big cities on the coast we observe intensive changes in terms of new infrastructure, new build-up areas, development of industrial and logistic activities. The rest of region is mostly rural, arable region with some touristic functions. Navarra and Alava are characterized by low intensification, dynamic mix between agricultural/forest changes and limited urban sprawl, which occur mostly around the biggest city like Vitoria. The terrain prevents the widespread use of land - wide variety of land, difficult accessibility. Biscay and Gipuzkoa in land change typology are referred to as “low intensification mainly due to agriculture and forest changes”,

which is correctly, but we should notice also changes in urban sprawl. In this area are many difficulties due to terrain (agriculture and settlements can be established only in the bottom of valleys). Low intensification due to forest is causes long analyses period (between 16 years a lot of wood plantation could be cut down and new plantation can be established).

Table 5 Identification of the factors and drivers of land use change according to type of land in the Eurocity Basque San Sebastian Region

Type of land	Change <i>E- ekstensification; S – stabilization; I - intensification</i>	Dynamics <i>+++ - high ++ - medium + - small</i>	Factors <i>++ - most important; + - less important</i>	Identified processes
Arable land	E	++	+ urbanization process, ageing of population, style of life	Urbanization, withdrawal of farming, transformation of agriculture to more ecological
Pastures with annual/permanent crops	S	+	++ terrain (hills and mountain areas)	Stable area of pastures, but just in mountain region
Forests	E	++	+ forest are mostly private areas	A lot of plantations of trees, which can be cut down in every moment – destroy of environment (soil, water, landscape).
Natural Grassland				
Transitional woodland – shrub areas				
Sparsely vegetated areas				
Marshes, coastal areas and inland waters				
Core urban areas	I	+	+ Depopulation, style of life + transition from heavy industry to high-tech	old industrial buildings, the port disappeared – there appeared high-tech companies
Urban areas in transition	I	++	++Suburbanization, improving quality of life +Style of life +Research and business activities	Urban sprawl controlled by spatial plans.
Urban areas in intensive transition				
Urban areas in arable land	I	++	+ Improve quality of life, ++Good localization, near cities and transport corridors, + Specific day schedule of Spanish people (They have a long lunch break in the middle of the day, so they want to live near their work)	Urban sprawl, transport corridors, rural tourism
Urban areas in pastures with annual and permanent crops				
Urban areas in forested areas				
Urban areas in transitional woodland areas				
Urban in marshes, coastal areas and inland waters	I	++	++ Natural process of suburbanization +Nice landscape, good infrastructure	New investments: second houses, urban sprawl,

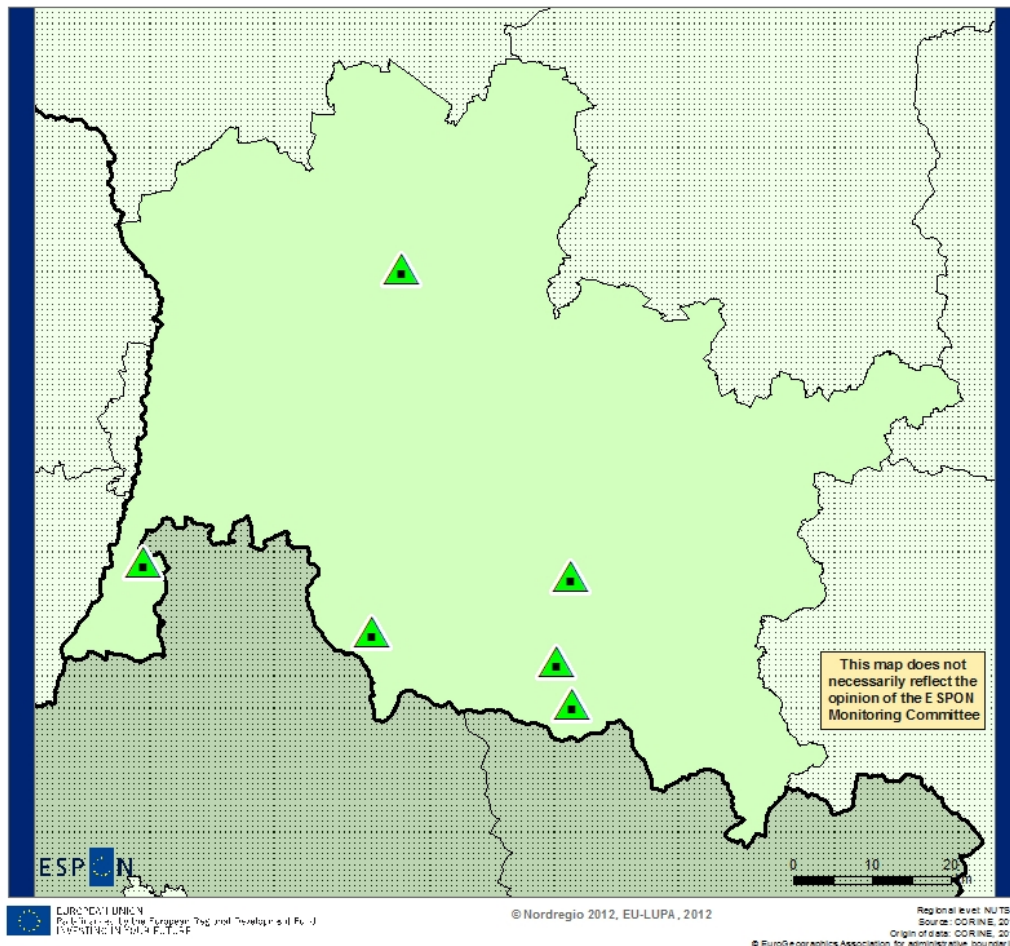
Table 6 Analysis of land use changes in the Eurocity Basque- San Sebastian Region investigated areas according to type of land

Name of investigated area	Type of land	Change <i>E- ekstensification; S – stabilization; I - intensification</i>	Dynamics <i>+++ - high ++ - medium + - small</i>	Land Cover Flows	Factors <i>++ - most important; + - less important</i>	Remarks
1. Lanbarren Industrial Zone	Urban areas in arable land	I	+++	Sprawl of economic sites and infrastructures	++ very good location – near the motorway and harbour, increase of international exchange	Very good location of that new logistic park.
2. Urban sprawl In Kalitxo	Urban areas in arable land	I	++	Urban residential sprawl	++ location in a very favourable place – close to the city and the ocean. + development of the accompanying infrastructure (eg. shops).	Complex development of the new settlement – there was one investor.
3. Derio – technological park	Urban areas in arable land	I	++	Sprawl of economic sites and infrastructures	++ close location to Bilbao city, + nice location in terms of landscape and close to the airport	Complex development of new research and technological park – totally new investment outside of the city
4. Geldo – forest changes	Forests	S	+	Forest creation and management	+ poor quality of land for other activities, extensive land use, plantations cultivated in terms of economic profits	No visible Corine changes – due to a fact, that there is big rotation in the coverage of the woodlands
5. Bidart – sprawl of economic sites and infrastructure	Urban areas in arable land	I (in LCT - E)	++	Sprawl of economic sites and infrastructures	+ good localization – close to the city and motorway	Urban residential sprawl
6. Mutriku – old city	Urban areas in transition	S	+	No changes ?	+ city located in valley- there are not more land for urbanization – just on the slopes	No visible Corine changes
7. Getaria - port city and agricultural land	Arable land	S	+	Agricultural Internal Conversions	+ region located on the coast, without good connection to big cities	Internal changes in town and agriculture
8. Legutio – Urban residential sprawl	Urban areas in arable land	I	++	Urban residential sprawl	++ access to social infrastructure: schools, health care, kindergarten, shops. ++ good localization: close to big city, in nice landscape, near good road	New investment based on old part of town with services.

1.4 Jeleniogórski Region

Low intensification – rural conversions with negligible land take. Some agricultural withdrawal

Land Use Change Typology 1990 – 2006 Jeleniogórski



Land Use Change Types

	Very high intensification – land take, often from natural areas		Points of investigation
	High intensification – continued urban land take from rural land		National boundary
	Moderate/high intensification – urbanizing areas while maintaining rural functions		Regional boundary
	Moderate intensification – rural conversions combined with notable land take		Areas outside the case study region
	Moderate/low intensification – mainly rural conversions with low levels of land take		
	Low intensification – rural conversions with negligible land take. Some agricultural withdrawal		
	Extensification – rural conversions with significant levels of farm withdrawal		

Jeleniogórski subregion is strongly diversified due to land use characteristics. In the mountainous part of the subregion there is domination of forests and meadows and large complex of forests in the north. Between these areas, there is a domination of agricultural areas. The settlement system in that subregion is a polycentric one – there is no a big centre with a dominant position (Jelenia Góra – 84,000 inhabitants), but there are also other towns that play an important role in the settlement system (Zgorzelec – 32,000; Jawor – 24,000; Lubań – 22,000; Kamienna Góra – 21,000; Złotoryja –

16,000). The settlement system is supplemented by many smaller towns and villages – most of them has a very linear character.

Generally we have observed very small changes of land use in the Jeleniogórski subregion for the last two decades. Less than 2% of land changed its classification in the period between 1990-2006. More significant changes took place in the period 1990-2000 than 2000-2006. We can identify some places that underwent the suburbanization processes (concentrated only near Jelenia Góra and Zgorzelec), some areas of agriculture internal conversions and very locally water bodies creation (including one artificial lake Sosnówka near Jelenia Góra – surface area of 1.5 km², opened in 2001). But the most considerable changes were identified in the category “Forests creation and management”. These changes take place in the mountain areas as well in the forest complex of Bory Dolnośląskie in the north of the subregion.

Table 7 Identification of the factors and drivers of land use change according to type of land in the Jeleniogórski Region

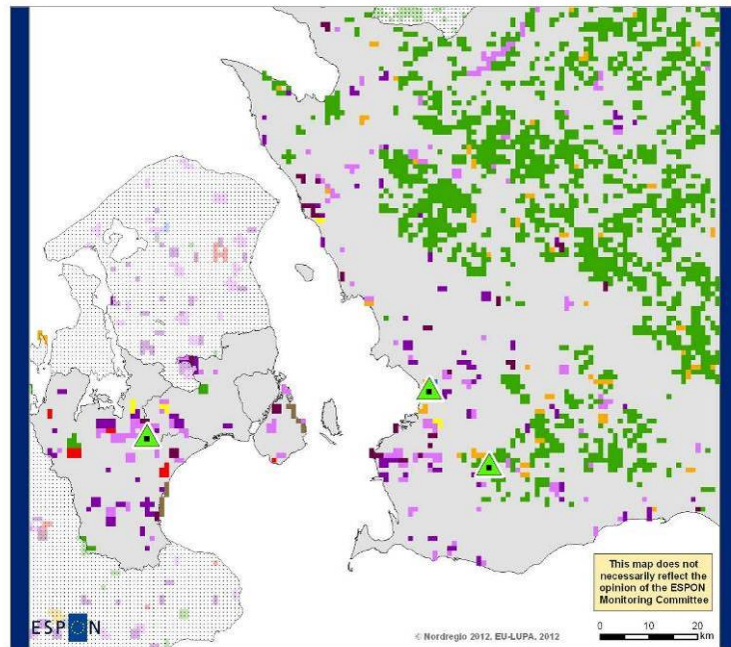
Type of land	Change <i>E- ekstensification;</i> <i>S – stabilization;</i> <i>I - intensification</i>	Dynamics <i>+++ - high</i> <i>++ - medium</i> <i>+ - small</i>	Factors <i>++ - most important;</i> <i>+ - less important</i>	Identified processes
Arable land	S	+	++ lack of other opportunities, European Union payments, good environmental conditions	Consolidation of land in big agricultural enterprises, agricultural production in the areas with the best environmental conditions, stimulation of agricultural production due to European Union payments
Pastures with annual/permanent crops	S	+	+ European Union payments	Most of the grasslands are not fully utilized – small amount of cattle and sheep breeding, some utilization is apparent and done due to European payments
Forests	I	++	++ renewal of destroyed environment	Big effort to renewal of destroyed forests after the ecological catastrophe
Natural Grassland				
Transitional woodland – shrub areas	I	++	+ activities of construction, industry, army	Forests and woodland are under the transformation processes due to construction of some infrastructure, industry plants, army activities or other human activities.
Sparsely vegetated areas				
Marshes, coastal areas and inland waters				
Core urban areas	S	+	+ depopulating processes, collapse of industry	Small revitalization processes.
Urban areas in transition	S	+	+ depopulating processes, development of some new entrepreneurships	Development of new industrial activities, construction plants not in the center part of towns (on ex-industrial zones) but outside of the centers or even outside of the town
Urban areas in intensive transition				
Urban areas in arable land	I	++	++ natural process of suburbanization – better quality of life	Development of individual housing, close to the city but in the open, rural space with high landscape values
Urban areas in pastures with annual and permanent crops				
Urban areas in forested areas				
Urban areas in transitional woodland areas				
Urban in marshes, coastal areas and inland waters				

Table 8 Analysis of land use changes in the Jeleniogórski Region investigated area according to type of land

Name of investigated area	Type of land	Change <i>E- ekstensification;</i> <i>S – stabilization;</i> <i>I - intensification</i>	Dynamics <i>+++ - high</i> <i>++ - medium</i> <i>+ - small</i>	Land Cover Flows	Factors <i>++ - most important;</i> <i>+ - less important</i>	Remarks
1. Hotel building in Karpacz	Pastures, agricultural mosaics and mixed forest in predominantly rural areas	I	+++	Sprawl of economic sites and infrastructures	++ big increase of popularity of skiing in Poland, lack of luxury hotels in that subregion	Big controversy according the spatial planning, according the typology there are not intensive changes – the building start after 2006.
2. Sosnówka Lake	Inland waters	I	+++	Water bodies creation	++ Anti-flood protection ++ Reservoir of drinking water	Creation of the lake on previously wetlands
3. Forest changes – Izerskie Mountains	Forests	S	+	Forest creation and management	++ reconstruction of forest after the ecological catastrophe in the 1980.	State Forest, Ecologist and National Park Policy
4. Jeżów Sudecki – suburban zone of Jelenia Góra	Urban areas in arable land	I	++	Urban residential sprawl	++ natural process of suburbanization – better quality of life	Undergrowth of social and technical infrastructure
5. Bogatynia – heaps	Forested areas and agricultural mosaics in peri-urban areas	E	++	Forest creation and management	++ intensive works in the brown coal mine near Bogatynia	Natural area to deposit the sand form open brown coal mine
6. Motorway A4	Rural forest	I	+++	Forest creation and management	++ development of transport network in Poland	Motorway was planned from many years.

2 Land Cover Flows 1990-2006

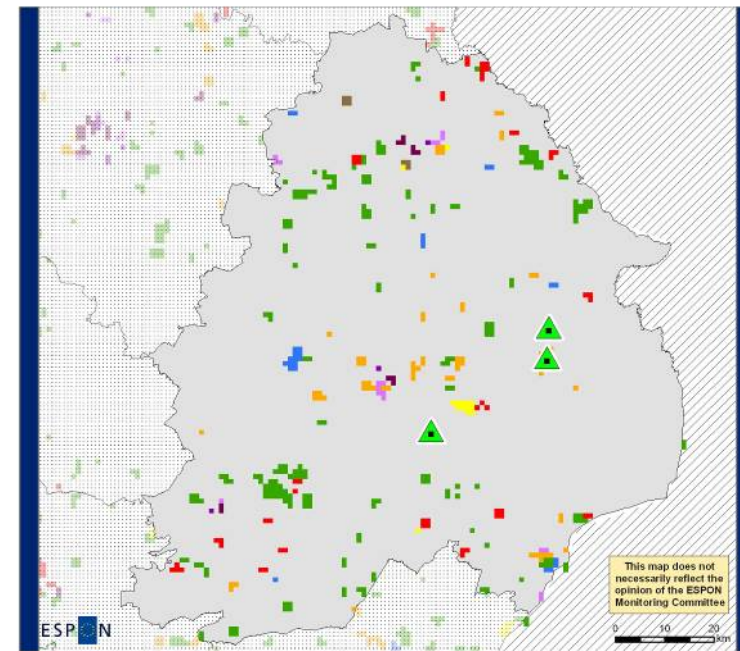
Land Cover Flows 1990-2006 Øresund Region



Areas Subject to Land-Use Change

- Urban land management
 - Urban residential sprawl
 - Sprawl of economic sites and infrastructures
 - Agriculture internal conversions
 - Conversion from other land cover to agriculture
 - Withdrawal of farming
 - Forests creation and management
 - Water bodies creation and management
 - Changes of Land Cover due to natural and multiple causes
- Points of investigation
 - Case study region
 - Areas outside the case study region

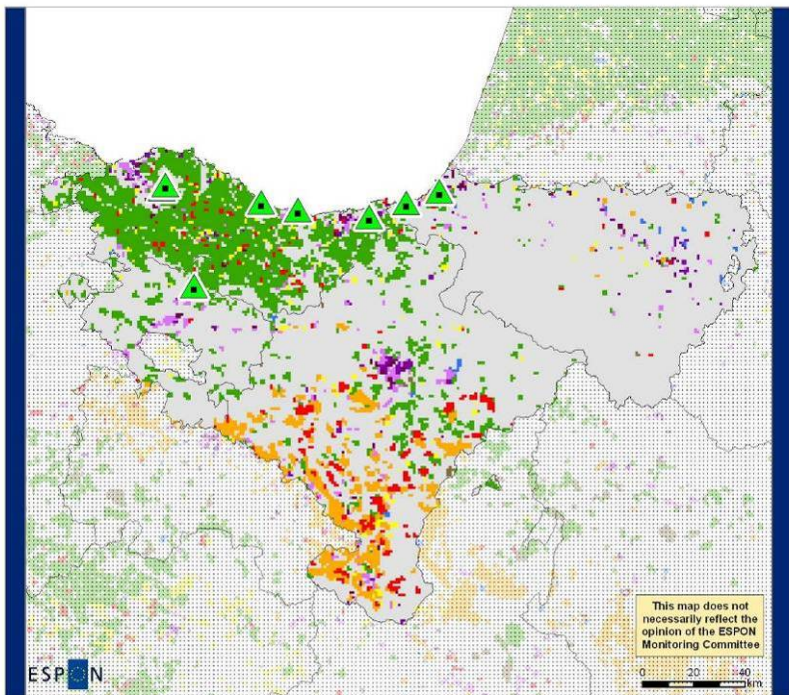
Land Change Typology 1990 – 2006 Chełmsko-Zamojski



Areas Subject to Land-Use Change

- Urban land management
 - Urban residential sprawl
 - Sprawl of economic sites and infrastructures
 - Agriculture internal conversions
 - Conversion from other land cover to agriculture
 - Withdrawal of farming
 - Forests creation and management
 - Water bodies creation and management
 - Changes of Land Cover due to natural and multiple causes
- Points of investigation
 - Case study region
 - Areas outside the case study region
 - No data

Land Cover Flows 1990-2006 Eurocity Basque Bayonne - San Sebastian

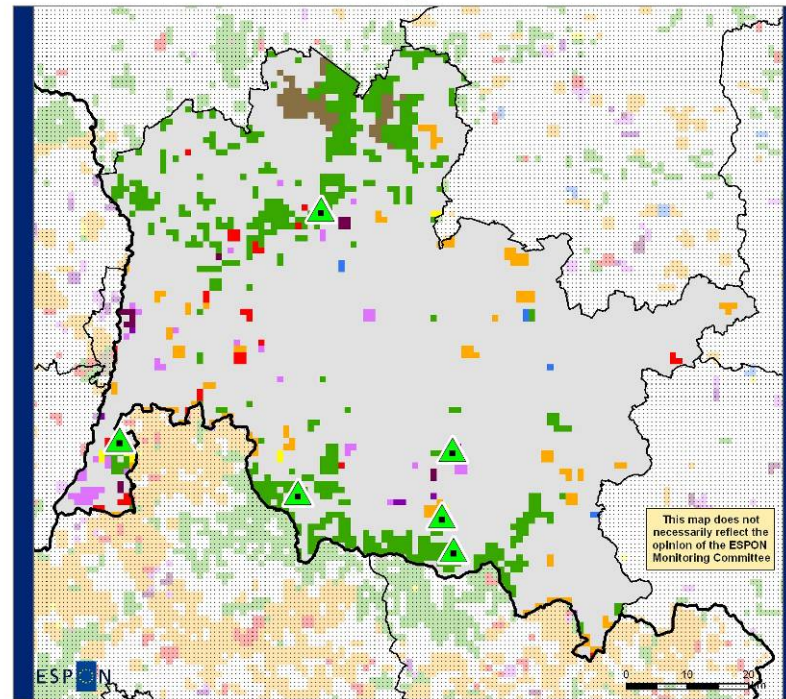


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Areas Subject to Land-Use Change

- | | |
|--|-------------------------------------|
| Urban land management | Points of investigation |
| Urban residential sprawl | Case study region |
| Sprawl of economic sites and infrastructures | Areas outside the case study region |
| Agriculture internal conversions | |
| Conversion from other land cover to agriculture | |
| Withdrawal of farming | |
| Forests creation and management | |
| Water bodies creation and management | |
| Changes of Land Cover due to natural and multiple causes | |

Land Cover Flows 1990-2006 Jeleniogórski



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 Regional level: NUTS 2
 Source: CORINE 2007
 Origin of data: CORINE, 2012
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Land Cover Flow Types

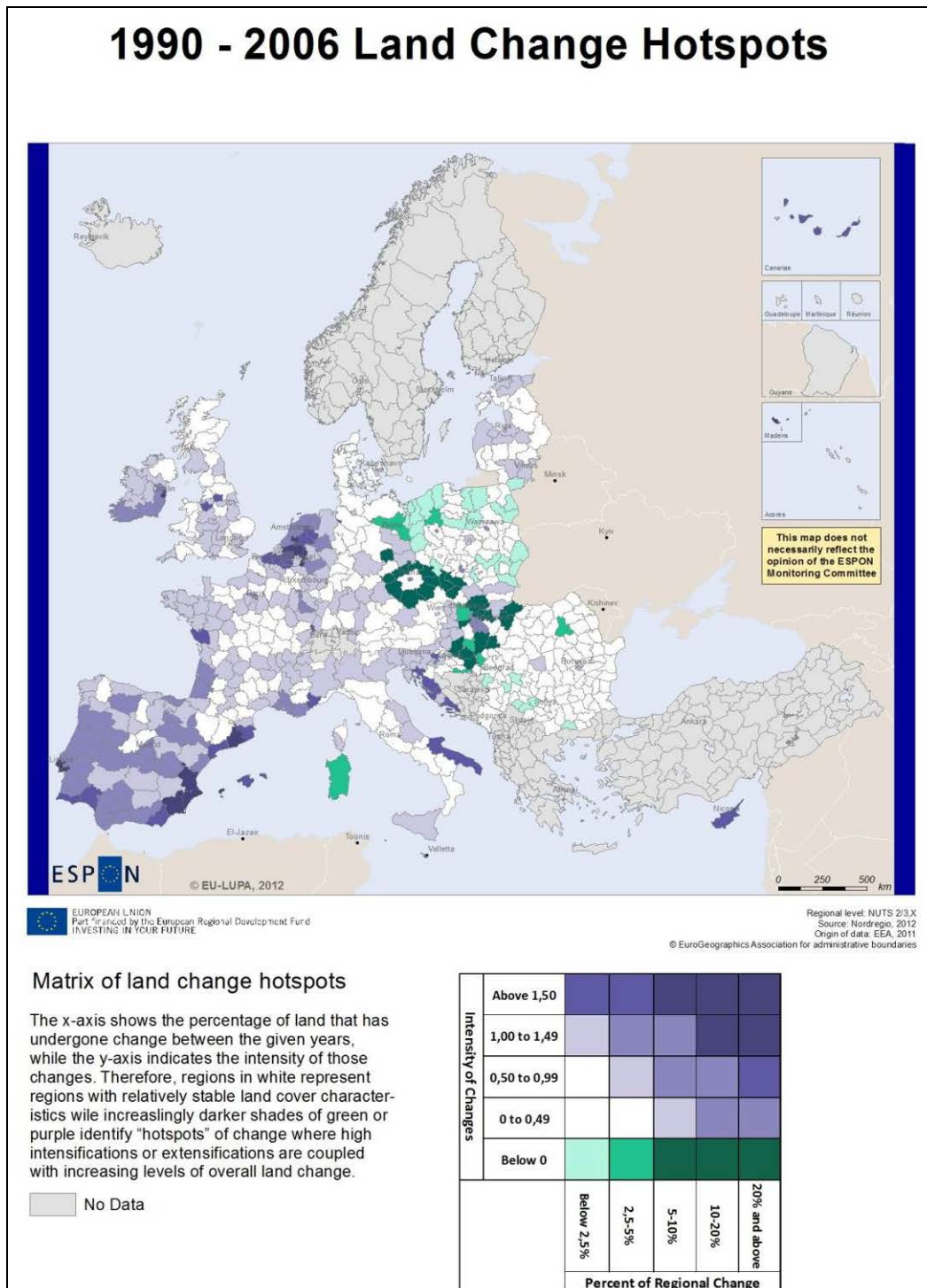
- | | |
|--|-------------------------------------|
| Urban land management | Points of investigation |
| Urban residential sprawl | National boundary |
| Sprawl of economic sites and infrastructures | Regional boundary |
| Agriculture internal conversions | Case study region |
| Conversion from other land cover to agriculture | Areas outside the case study region |
| Withdrawal of farming | |
| Forests creation and management | |
| Water bodies creation and management | |
| Changes of Land Cover due to natural and multiple causes | |

Table 9 Identification of the factors and processes in case study regions according to Land Cover Flows 1990-2006

Land Cover Flows Typology	Case study region and Name of investigated area	Identified processes	Factors ++ - most important; + - less important	Remarks
Urban land management				
Urban residential sprawl	<ol style="list-style-type: none"> 1. Jeleniogórski / Jeżów Sudecki 2. Basque Eurocity / Urban sprawl In Kalitxo 3. Legutio / Urban residential sprawl 4. Chelmsko-zamojski / Werbkowice 	Changes of agricultural land into the build-up areas. New houses are surrounded by the agricultural land – big mixture of land use. When the investors are private people - lack of development of technical and social infrastructure (eg. roads). When there is one investor - complex development of the new settlement.	<p>++ natural process of suburbanization – better quality of life</p> <p>++ location in a very favorable place</p> <p>++ access to social infrastructure: schools, health care, kindergarten, shops.</p>	
Sprawl of economic sites and infrastructures	<ol style="list-style-type: none"> 1. Jeleniogórski / Hotel building in Karpacz 2. Basque Eurocity / Lanbarren Industrial Zone 3. Basque Eurocity / Derio – technological park 4. Basque Eurocity / Bidart – sprawl of economic sites and infrastructure 5. Oresund / Hedeland <p>Jeleniogórski / Bogatynia – heaps</p>	<p>Intensive development of tourism infrastructure in the most attractive places. Very good location of new investments – close to the main transport corridors and close to the main cities.</p> <p>Transformation of industrial sites in direction of leisure activities functions development.</p>	<p>++ big increase of popularity of skiing in Poland, lack of luxury hotels in that subregion</p> <p>++ very good location – near the motorway and harbor, increase of international exchange</p> <p>++ increasing demand of leisure activities sites surrounding agglomeration</p> <p>+ transformation of industry in developed countries</p>	Some of the changes are not recognized by Corine typology
Agriculture internal conversions	<ol style="list-style-type: none"> 1. Basque Eurocity / Getaria - port city and agricultural land 2. Chelmsko-zamojski / Huczwa river near Malice village 3. Oresund / Lomma 	<p>Internal changes in town and agriculture. Conversion of wet arable land into meadows and pastures due to worse natural conditions for plant cultivation and collapsing of food processing industry.</p> <p>Environmental protection on small valuable areas in neighborhood of attractive investment areas</p>	<p>+ region located on the coast, without good connection to big cities</p> <p>+ worse environmental conditions for plant cultivation</p> <p>+ collapsing of food processing industry in the region</p> <p>+ pressure of investments and entrepreneurship in attractive localizations</p>	
Conversion from forested & natural land to agriculture				
Withdrawal of farming				
Forests creation and management	<ol style="list-style-type: none"> 1. Basque Country / Geldo – forest 	Forests are characterize by the very extensive land use. Some of the forests are	+ poor quality of land for other activities, extensive land use, plantations cultivated	No visible Corine

	<p>changes</p> <p>2. Chełmsko-zamojski / Polanówka</p> <p>3. Oresund / Forest near Svedala</p> <p>4. Jelenioński / Izerskie Mountain</p> <p>5. Jeleniogórski / Motorway A4</p>	<p>under of economic cultivations – they are plantations. Due to economic circumstances, the tree in forests are cut or not. In some places the forest is recultivated due to ecological reasons</p>	<p>in terms of economic profits</p> <p>+ enlarging demand for services connected to leisure activities</p> <p>++ reconstruction of forest after the ecological catastrophe</p>	<p>changes – due to a fact, that there is big rotation in the coverage of the woodlands</p>
Water bodies creation and management	<p>1. Jeleniogórski / Sosnówka Lake</p>	<p>The artificial lake was created at the beginning of XXI century. It is very intensive change of land use – the wetland were transformed into the anti-flood and reservoir of the drinking water for Jelenia Góra citizens.</p>	<p>++ Anti-flood protection</p> <p>++ Reservoir of drinking water</p>	
Changes of Land Cover due to natural and multiple causes				

3 Land Change Hotspots



The region of Oresund is diversified. Along belt west from Copenhagen, to Roskilde, the land use is intensifying medium or highly. The rest of Danish part of the region is intensifying lowly. In the case of intensification in the Copenhagen surroundings the major purpose is urban sprawl on well accessible areas and dispersion of high-tech industries and R&D sector, where profits of agglomeration are less important, but location in clean nature is more

valuable. The same process is having lower intensity along sea coast, where second houses zone and recreation function has longer tradition and has been forming during the decades. The internal part of Zealand Island have also relatively good access to core of development and labour market localized in Copenhagen, but strict spatial planning is focused on preserving of rural landscape there. That's why the major direction of land use changes relies on gradual transport and recreational function strenghtening, as a substitution of market oriented agriculture.

Chełmsko-zamojski region is classified as area of low extensification. However the pattern of the land use changes in that agricultural region is far more complicated, with divergence between land cover and land use function. On the one hand the extensification of plant cultivation structure can be observed, from cultivation of industrial plants connected to food processing industry network in the region to cereals cultivation as a consequence of macroeconomic changes in agriculture. Transforming of less convenient arable land into meadows and forest is the another form of land use extensification as a result. On the other hand investments in the best performing farms caused concentration of land ownership structure and more intensive agriculture, especially in the framework of animal production, what isn't so directly reflected in the land cover. It's also worth to say, that there are some local phenomenas of land use intensifying apart of agricultural function. As an example the investments in the framework of tourism infrastructure, like new artificial water reservoirs or ski lifts, can be indicated. There are also cases of urban sprawl of two regional centres, resulting pressure of housing areas on agricultural terrains of very good quality of soils in their surroundings.

The Basque Country is characterized by low or medium intensification process (low in French part, Comunidad Foral de Navarra and Alava. Medium in Biscay and Gipuzkoa). During the case studies we were analyzing just some part of French region (FR615), where the intensification was on very high level: the rest of region has greater influence on the complete indexes – there are rural and forest areas with low changes. Navarra and Alava are mostly forested and arable regions, where changes occurs mostly due to second houses development and agriculture internal conversions. In Biscay and Gipuzkoa we observe more intensive changes due to suburbanisation in Bilbao- San Sebastian region and also forest creation and management (but like we can see in Report from Basque Country – there are mostly plantations of trees than natural forest). Changes are more intensive in region with good transport connections and relatively close to cities and factories/harbors.

The Jeleniogórski subregion is characterized by both absolute and relative low level of intensity of changes. The processes of land use in this subregion are very differentiated. In general we can observe a stabilization in land utilization and land cover – the changes of land use do not show intensive changes. Due to peripheral location, an outmigration and a big share of agricultural lands and forests, such situation is natural. But in some parts of the subregion these changes are very intensive, even though they are not registered by the official statistics. Those changes are mainly concentrated in the suburban areas and touristic zones. Intensive development of houses (recreational or normal) and elements of tourism infrastructure are affecting the economical and functional structure of the area more than the land cover changes. This is so because the present-day settlements and production

plants are scattered and do not form a complex structures. So in some delimitations and statistics these areas are still registered and classified as an agricultural areas. And even if they are registered properly, their influence and importance in the social, economic and functional structures are much higher than in land use structures.

4 The challenges of land use change in investigated regions

Analysis of the challenges and recommendations concern land use changes from interviews

Case study region	Challenges	Recommendations
Oresund	<ul style="list-style-type: none"> green energy production, from wind power plants for bio-fuel cultivation. It is necessary challenge due to predicted future energy prices rising. 	<ul style="list-style-type: none"> concentration of urban sprawl in isochrones from railway stations. It helps to develop more effective railway transport and modal shifting among daily commuting people. Converting rural areas should be conducted dual. In the first direction relatively good connected with agglomeration parts of the region should be transformed into leisure activities for citizens or summer houses areas. In the case of rest of such areas should be introduced function of green energy production, from wind power plants or plant for bio-fuel cultivation.
Basque Eurocity	<ul style="list-style-type: none"> the challenges for the region is division of Basque Country into three provinces and the level of responsibilities that each of them have connection and cooperation between the three main cities is important – thanks to such situation there can be stronger functional specialization of each of the city and cooperation between them. Thanks to that level of development of each of the functions can be much higher and much more competitive on national and EU level the development of the Basque Country should be based on criteria of interconnection (spatial and sectoral) and fulfil the main objectives as: reinforce and rebalance urban system, improve urban areas and stimulate creation of medium cities network 	<ul style="list-style-type: none"> holistic development of the region needs a very good planning system which will be complex on the horizontal and vertical level – these means that sectoral plans should be created in cooperation with territorial ones (cohesion in spatial planning); very detailed planning on the municipality level – thanks to that there will not be many conflicts of functions; cooperation between different parts of the regions and division of functions within the territory – development of stronger functions of some particular towns has an important influence on the whole region. There should be regional competitiveness and not competitiveness within region.
Chelmsko-zamojski	<ul style="list-style-type: none"> co-existing agricultural activity and environmental and landscape values protection introducing of services sector on rural areas, which will help to limit young people outflow exploitation of the energy sources with co-existing regional 	<ul style="list-style-type: none"> key of financial support for farmers should stronger motivate to conducting really traditional agricultural activity, which could substitute potential profits from crops in intensive farming. Support for traditional farms for diversified forms of co-existing agricultural activities and services for agrotourism and leisure

	<p>unique character</p>	<p>activities based on regional heritage.</p> <ul style="list-style-type: none"> • different forms of support for selfemployment in rural areas in third sector. Dispersing of offices and regional institutions from the biggest towns to smaller ones and to rural areas. Special funds deducted from wind power plants owners dedicated for really local societies. Rules for investors exploiting slate gas resources regarding minimal share of employment in non-specialized professions among local societies. • On regional level strictly planned zones of the highest landscape values, which are excluded from energy production function, but especially supported in conducting of traditional agriculture and developing services connected to leisure activities and agro-tourism.
<p>Jeleniogórs ki</p>	<ul style="list-style-type: none"> • complex and holistic planning – connection of sectoral planning (socio-economic) with territorial one • conducted the permanent, annual monitoring of spatial organization in such spheres as: environment protection, industry investments, housing, cultural landscape and infrastructure • there should be obligatory in establish the local plans of spatial organization for each settlement • higher activity of local institutions – local self-government has to have the initiative. 	<ul style="list-style-type: none"> • holistic development of the region needs a very good planning system which will be complex on the horizontal and vertical level – these means that sectoral plans should be created in cooperation with territorial ones (cohesion in spatial planning); • equal importance of sectoral and territorial planning; • very detailed planning on the municipality level – thanks to that there will not be many conflicts of functions; • cooperation between different parts of the regions and division of functions within the territory – development of stronger functions of some particular towns has an important influence on the whole region. There should be regional competitiveness and not competitiveness within region; • permanent monitoring of socio-economic and spatial changes in the region and its communes; • coherent visions of development of communes, counties and region – there should be some hierarchical way of planning of strategies of development, because thanks to that will be “added value” of bigger scale of development; • engaging many institutions, local actors, representatives of main institutions important for spatial planning and creation of socio-economic development – thanks to that social consultancy the whole process of planning will be more coherent, transparent and complex; • good management – giving priority to public needs and public goods over the private benefit.

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