



ANALYSING LAND USE AND LAND USE CHANGE DYNAMICS FOR POLICY DEVELOPMENT: IDENTIFICATION OF HOT-SPOTS OF CHANGE

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Contribution to
The second ESPON 2013 Scientific Report



Introduction

Understanding land use change dynamics and monitoring these changes are becoming more critical as the activities in the landscape include a multitude of interacting and conflicting purposes.

Some of these are directly related to available ecosystems and landscape services while others are related to the territory due to other constraints.

All together these uses obtain a diverse set of functions:

- economic,
- environmental,
- social and
- cultural

They are constituting “a key part of territorial capital and therefore an important asset in the endogenous development of regions and cities”

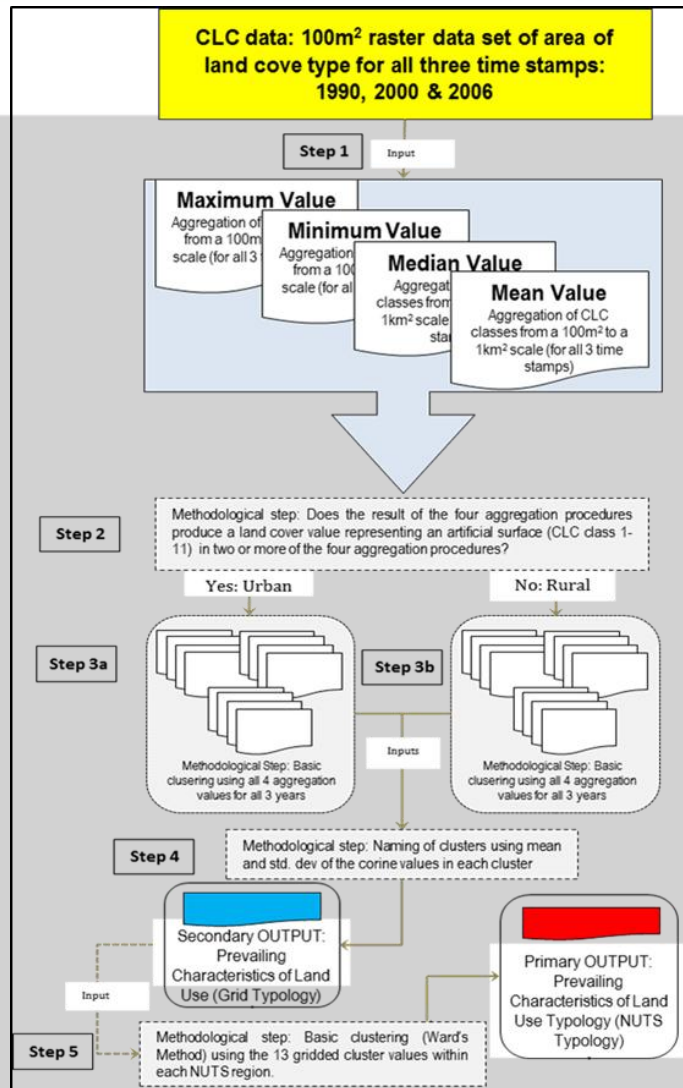
Introduction

There is a need to be able to identify areas where such changes take place whether it is in relation to increases or decreases in competing demands in multifunctional land use systems. And maximizing land use efficiency is seen as a direct mean of improving the sustainability of land use in general.

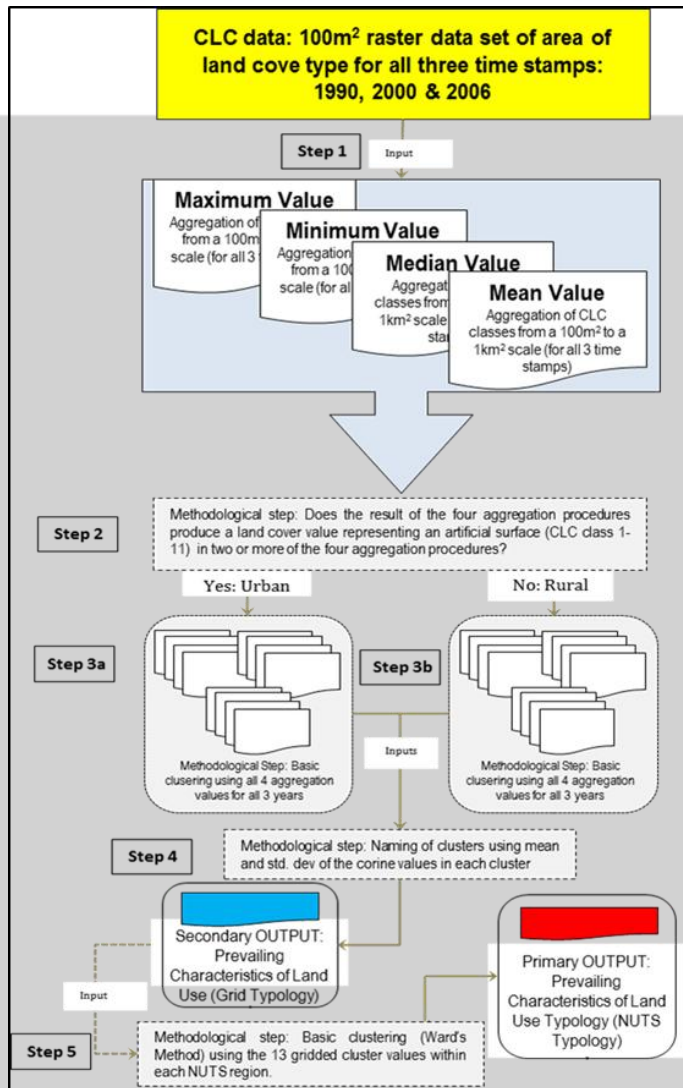
It is important to consider how increased human landscape intervention is among the strongest pressures on biodiversity, but also that protecting the environment and promoting resource efficiency generate a potential for ecosystem goods and services which may “contribute to efficient resource use, regional economic growth and territorial cohesion”

EU-LUPA proposes a novel methodology for an optimal characterization of land cover status and changes, by means of CORINE Land Cover (CLC 1990, 2000, 2006) that can be analysed vis-à-vis socio-economic dimensions. EU-LUPA defines regional typologies (regionalized information at NUTS2/3) as an analytical tool for the development of policy messages and recommendations for the ESPON territory

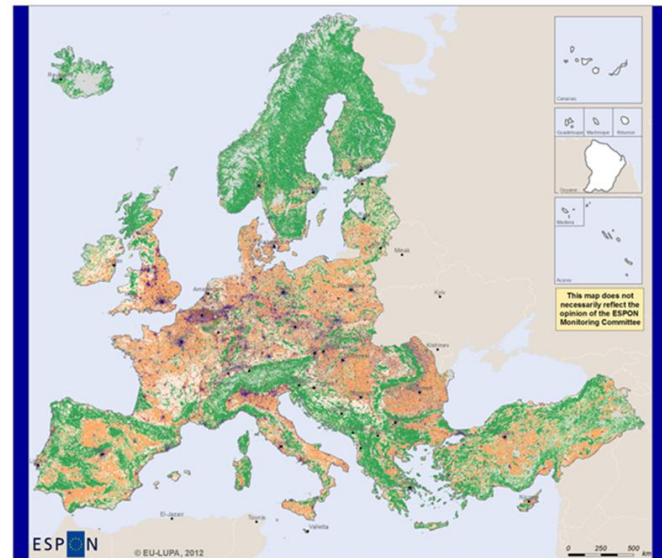
Generating an adequate typology



Generating an adequate typology



Prevailing Characteristics of Land Use 1990 - 2006



ESPON
Part-financed by the European Regional Development Fund
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Regional level: NUTS 20
Source: Bordegats, 2012
Date of issue: EEA, 2011
© EuroGeographics Association for administrative boundaries













Land use types - 1 000m grid

- Urban cores and metropolitan areas
- Suburban residential and economic areas
- Special urban areas with relationships to the marine environment
- Pastures and agricultural mosaics in peri-urban or rural community areas
- Forested areas and agricultural mosaics in peri-urban areas
- Arable land in predominantly rural areas
- Pastures, agricultural mosaics and mixed forest in predominantly rural areas
- Rural forest
- Transitional woodland or sparsely vegetated areas
- Lands primarily associated with water courses
- Sparse vegetation, wetlands, water bodies and snow or arctic conditions
- No Data

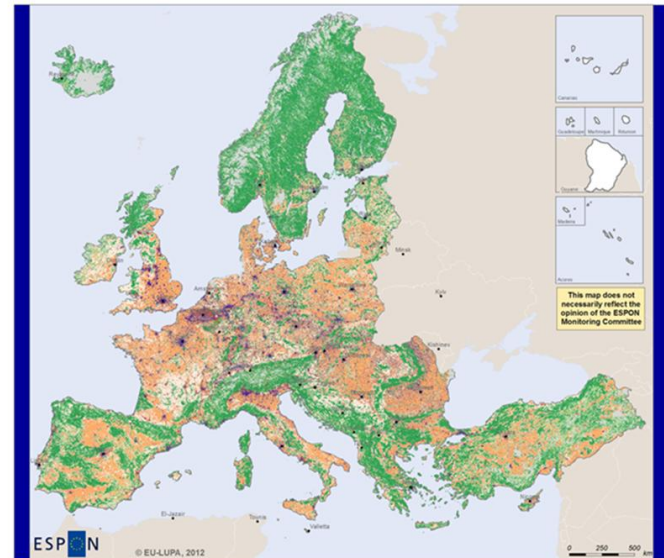
This grid representation is the result of a four-step method of forming land use types from the 200 m² CLC classification Values for all available data in each of the years available (1990, 2000 & 2006). This began with a multi-criteria aggregation procedure in GIS, a clustering procedure and a Naming process (See EU LUPA Scientific Report Volume 1 pp. 23-33 for additional details).

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


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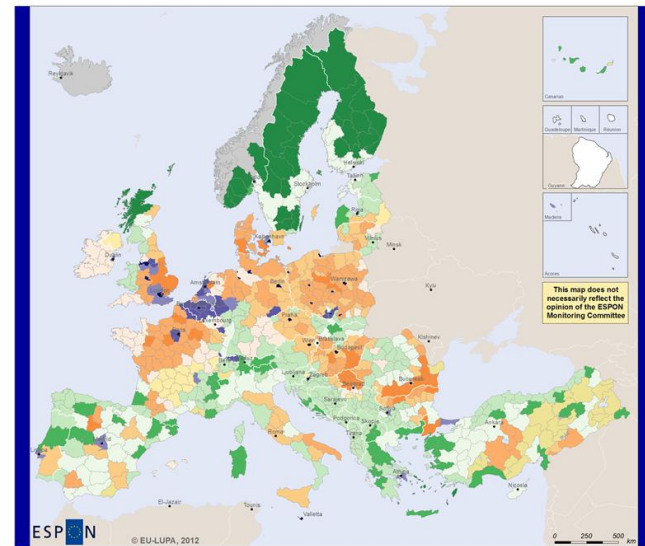


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











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Prevailing Characteristics of Land Use 1990 - 2006



Regional land use types

-  Urban cores and metropolitan areas
-  Suburban areas
-  Suburban or peri-urban areas
-  Arable land in peri-urban and rural areas
-  Arable land and pastures in predominantly rural areas
-  Rural arable land with permanent crops and some forest
-  Rural mix dominated by pastures with some arable land
-  Rural pastures and complex cultivation patterns
-  Diverse land use in rural areas
-  Diverse rural forest coverage with dispersed areas of permanent crops, pastures and arable land
-  Arid mixed forest
-  Rural forest
-  Sparse vegetation with some forest and pasture
-  Sparsely vegetated areas
-  No Data

The concept of Intensity

The concept of land use intensity is introduced to acknowledge that while socio-economic growth is less and less attributed to land-based production it is an ever-increasing driver of land changes. It is not only important to know how much land is changing, but it is crucial to know if land changes reflect minor changes which usually relates to on-going socio-economic processes, or if they reflect major shifts in land cover as part and parcel with structural socio-economic changes.

Land use intensity is defined as ***the degree of human intervention caused by activities taking place on a given parcel of land*** - activities that, in most cases, do not have a direct and one-to-one implication on the characteristics of land cover.

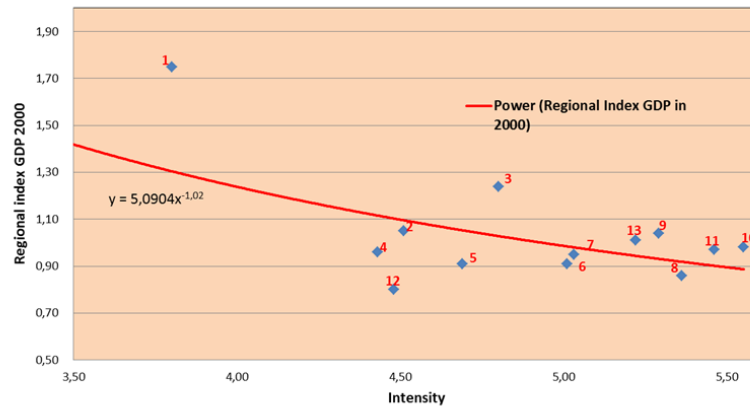


The concept of Intensity

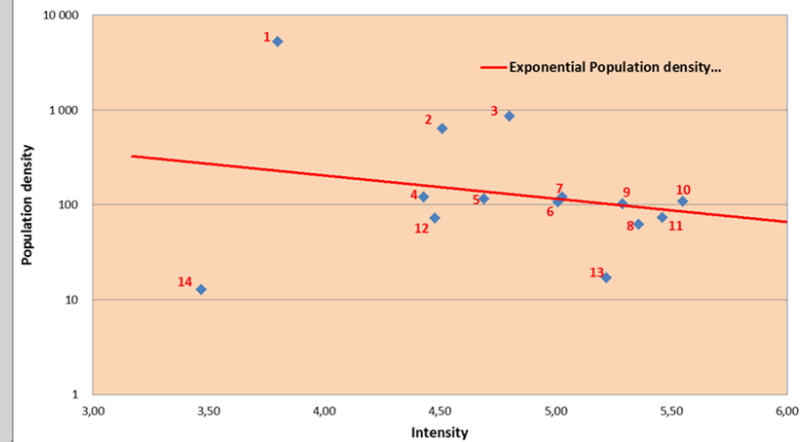
GRID CODE	CLC CODE	LABEL1	LABEL2	LABEL3	Intensity Code
1	111	Artificial surfaces	Urban fabric	Continuous urban fabric	1
2	112	Artificial surfaces	Urban fabric	Discontinuous urban fabric	3
3	121	Artificial surfaces	Industrial, commercial and transport units	Industrial or commercial units	2
4	122	Artificial surfaces	Industrial, commercial and transport units	Road and rail networks and associated land	2
5	123	Artificial surfaces	Industrial, commercial and transport units	Port areas	2
6	124	Artificial surfaces	Industrial, commercial and transport units	Airports	2
7	125	Artificial surfaces	Mine, dump and construction sites	Mineral extraction sites	2
8	126	Artificial surfaces	Mine, dump and construction sites	Dump sites	2
9	127	Artificial surfaces	Mine, dump and construction sites	Construction sites	2
10	141	Artificial surfaces	Artificial, non-agricultural vegetated areas	Green urban areas	3
11	142	Artificial surfaces	Artificial, non-agricultural vegetated areas	Sport and leisure facilities	3
12	211	Agricultural areas	Arable land	Non-irrigated arable land	4
13	212	Agricultural areas	Arable land	Permanently irrigated land	4
14	213	Agricultural areas	Arable land	Rice fields	4
15	221	Agricultural areas	Permanent crops	Vineyards	4
16	222	Agricultural areas	Permanent crops	Fruit trees and berry plantations	4
17	223	Agricultural areas	Permanent crops	Olive groves	4
18	231	Agricultural areas	Pastures	Pastures	5
19	241	Agricultural areas	Heterogeneous agricultural areas	Annual crops associated with permanent crops	5
20	242	Agricultural areas	Heterogeneous agricultural areas	Complex cultivation patterns	5
21	243	Agricultural areas	Heterogeneous agricultural areas	Land principally occupied by agriculture, with significant areas of natural vegetation	5
22	244	Agricultural areas	Heterogeneous agricultural areas	Agro-forestry areas	5
23	311	Forest and semi natural areas	Forests	Broad-leaved forest	6
24	312	Forest and semi natural areas	Forests	Coniferous forest	6
25	313	Forest and semi natural areas	Forests	Mixed forest	6
26	321	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Natural grasslands	7
27	322	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Moors and heathland	7
28	323	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Sclerophyllous vegetation	7
29	324	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Transitional woodland-shrub	6
30	331	Forest and semi natural areas	Open spaces with little or no vegetation	Beaches, dunes, sands	7
31	332	Forest and semi natural areas	Open spaces with little or no vegetation	Bare rocks	7
32	333	Forest and semi natural areas	Open spaces with little or no vegetation	Sparsely vegetated areas	7
33	334	Forest and semi natural areas	Open spaces with little or no vegetation	Burnt areas	7
34	335	Forest and semi natural areas	Open spaces with little or no vegetation	Glaciers and perpetual snow	7
35	411	Wetlands	Inland wetlands	Inland marshes	N/A
36	412	Wetlands	Inland wetlands	Peat bogs	N/A
37	421	Wetlands	Maritime wetlands	Salt marshes	N/A
38	422	Wetlands	Maritime wetlands	Salines	N/A
39	423	Wetlands	Maritime wetlands	Intertidal flats	N/A
40	511	Water bodies	Inland waters	Water courses	N/A
41	512	Water bodies	Inland waters	Water bodies	N/A
42	521	Water bodies	Marine waters	Coastal lagoons	N/A
43	522	Water bodies	Marine waters	Estuaries	N/A
44	523	Water bodies	Marine waters	Sea and ocean	N/A

GDP and Population density in relation to intensity

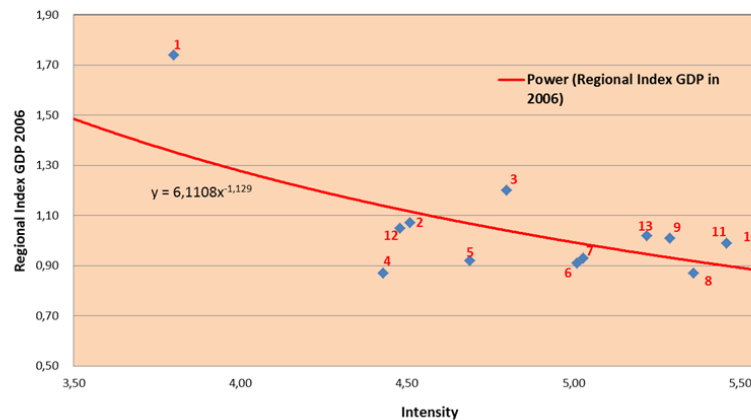
Regional Index GDP in 2000 vs. Intensity



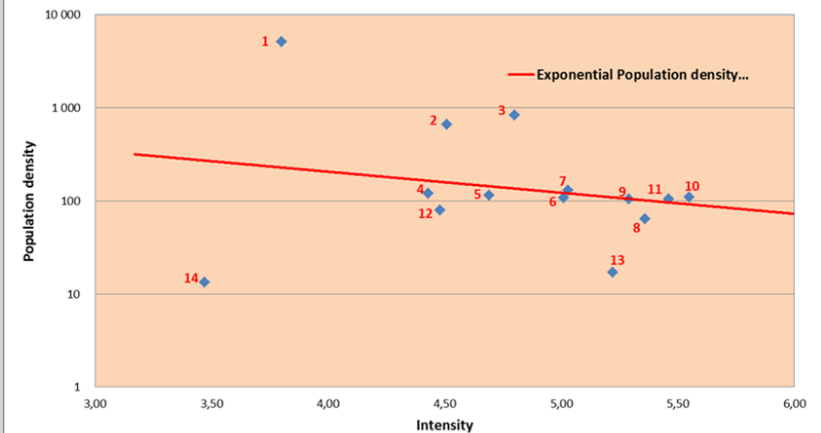
Population density 2000



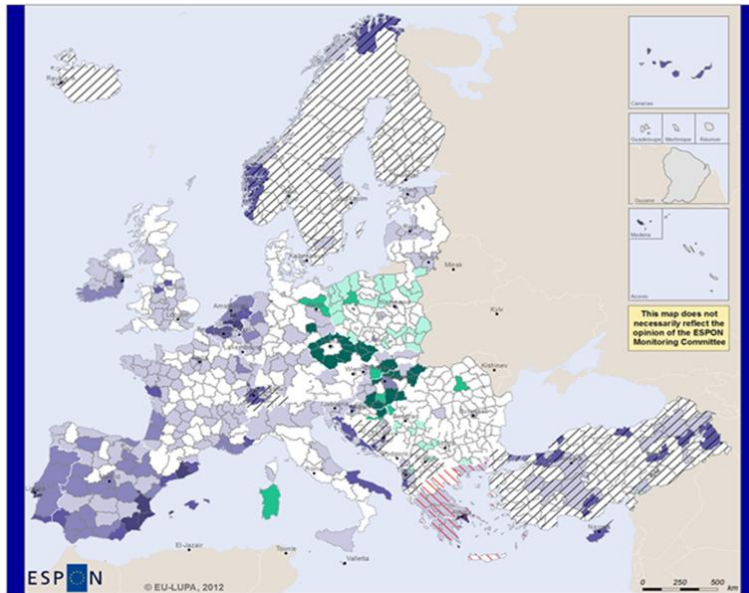
Regional Index GDP in 2006 vs. Intensity



Population density 2006



1990 - 2006 Land Change Hotspots



Matrix of land change hotspots

The x-axis shows the amount of land that has undergone change between the given years (in percent) while the y-axis indicates the change in intensity as a result of those changes. Therefore, regions in white represent those with relatively stable land cover characteristics while increasingly darker shades of green or purple identify "hotspots" of change where high intensifications or extensifications are coupled with increasing levels of overall land change are evident.

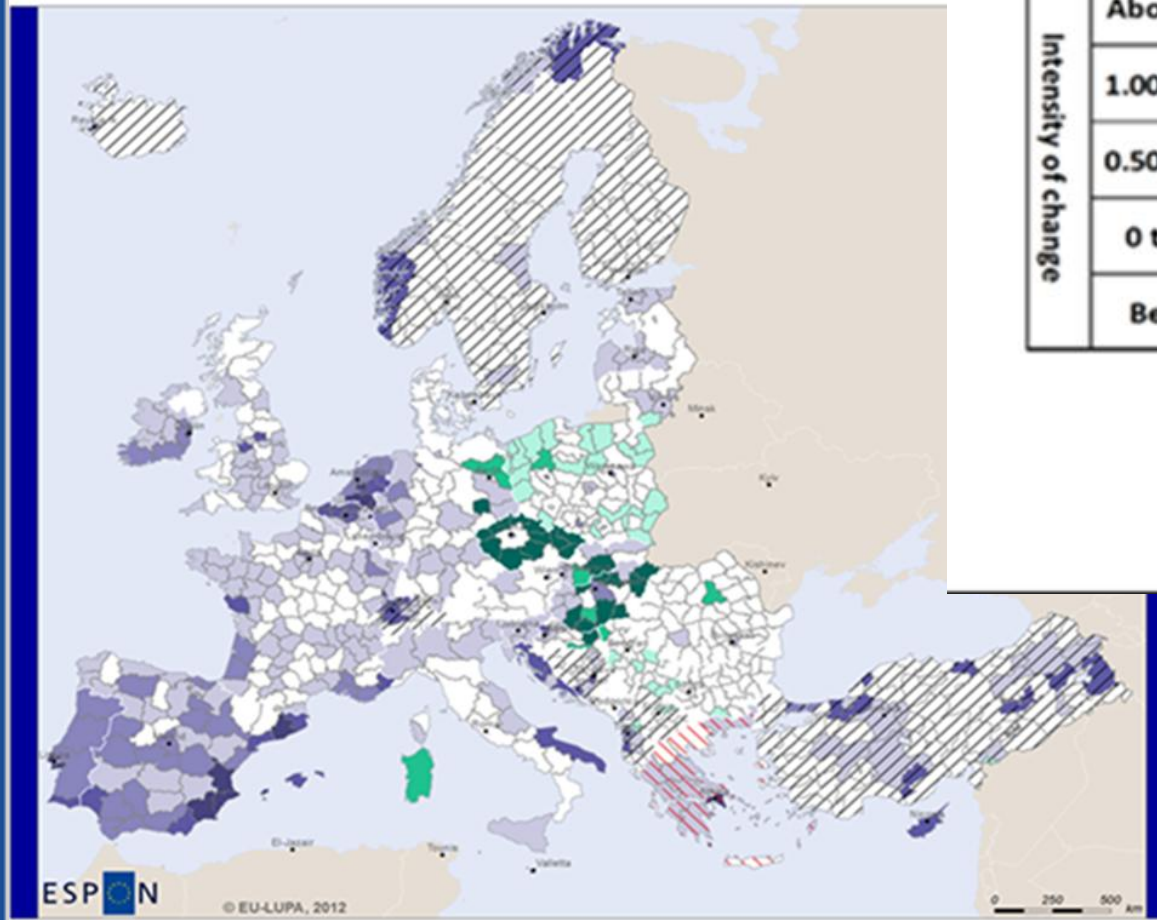
- only 1990-2000 data
- only 2000-2006 data
- No Data

Intensity of change	Above 1.50	1.00 to 1.49	0.50 to 0.99	0 to 0.49	Below 0
Amount of change					
	Below 2.5%	2.5-5%	5-10%	10-20%	Above 20%

LAND CHANGE HOTSPOTS



1990 - 2006 Land Change Hotspots



Intensity of change	Above 1.50					
	1.00 to 1.49					
	0.50 to 0.99					
	0 to 0.49					
	Below 0					
		Below 2.5%	2.5-5%	5-10%	10-20%	Above 20%
		Amount of change				

Policy aspects

The examples are just a few observations that can be made based on the hotspot analysis, and to some extent ascribed to the intensification or extensification of land use with land as the major production factor.

Yet all things considered, the most dramatic land change processes taking place in Europe are predominantly driven by Europe's path of socio-economic development, which is taking place due to the effects of globalization and its effect on the future division of labour and ***demand for land not only as a production factor but as locus standii for different dimensions of human life and environmental, economic, social and cultural activity.***

This is an issue reflected through the concept of intensity and therefore also essential in relation to the future focus on territory and related policy development as multi-functional entities that requires new and innovative approaches to land use related analyses.

