

Improving European mega-regions towards sustainability Case study: Barcelona-Lyon

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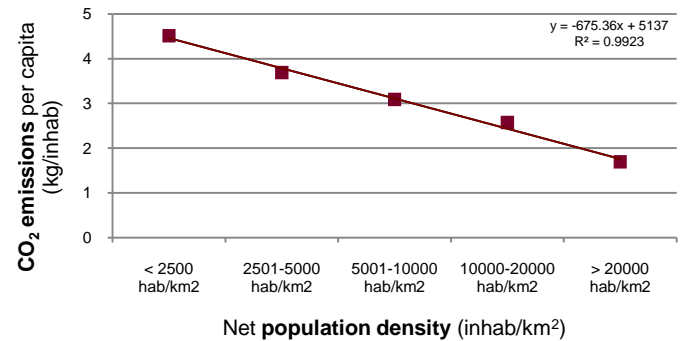
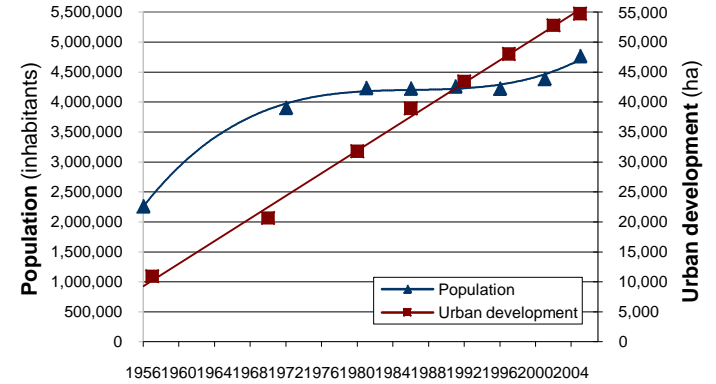
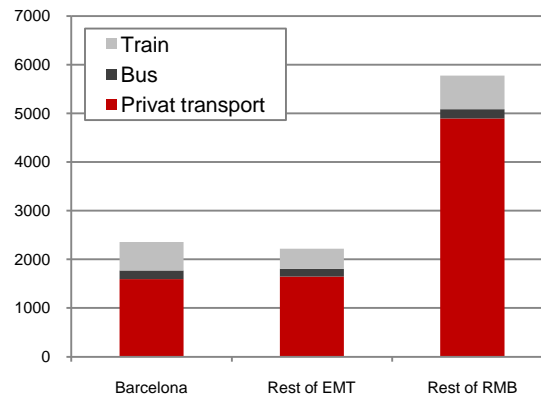


Source: ESA/NASA, 2011

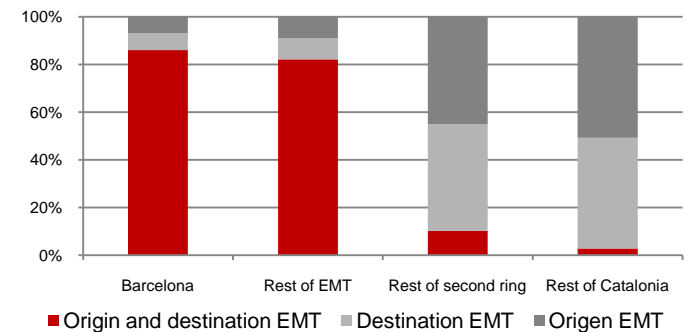


Source: IERMB

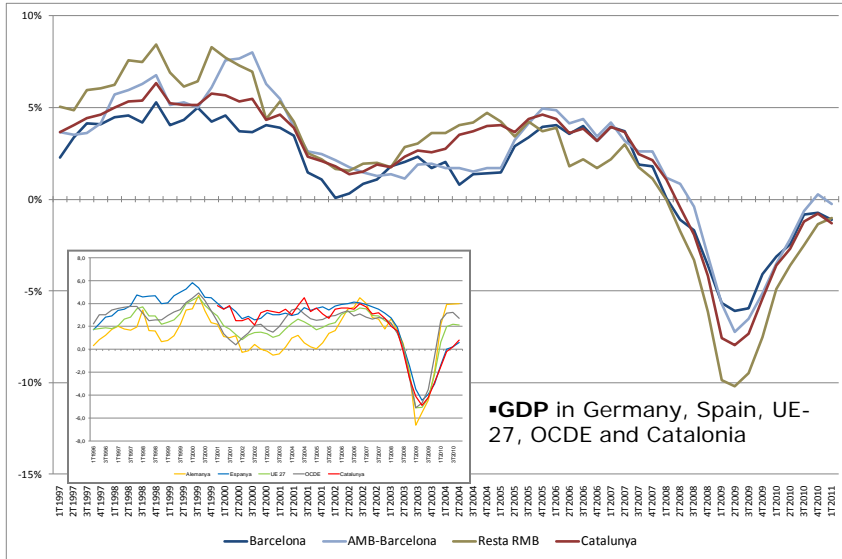
■ **GHG emissions (tn CO₂/day) in relation to residential area and transport mode**



■ **Territorial contribution of the population mobility to the NO_x emissions (%) in the city of Barcelona**

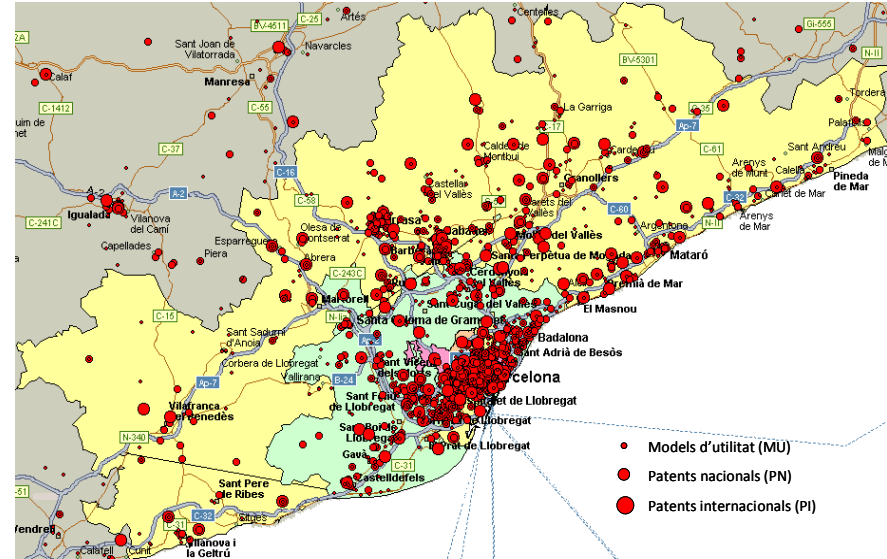


■ **Employment growth.** Year quarterly rate. 1997 – 2011 (1st trimester)



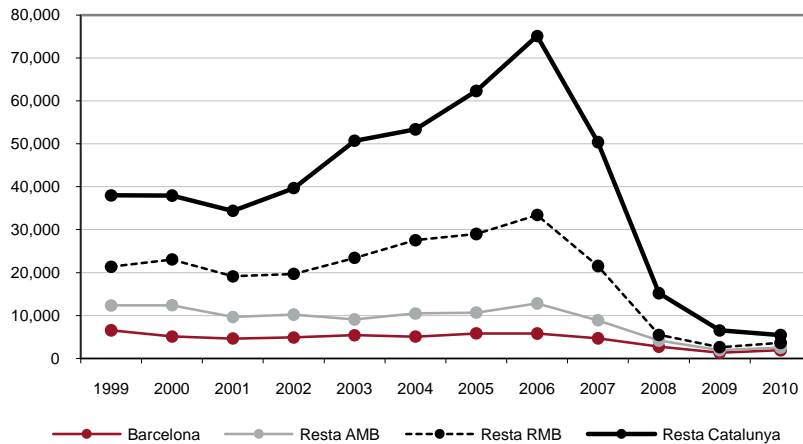
Source: OCDE, Idescat

■ **Innovation:** Patents and utility models. Accumulated years 2001-2006



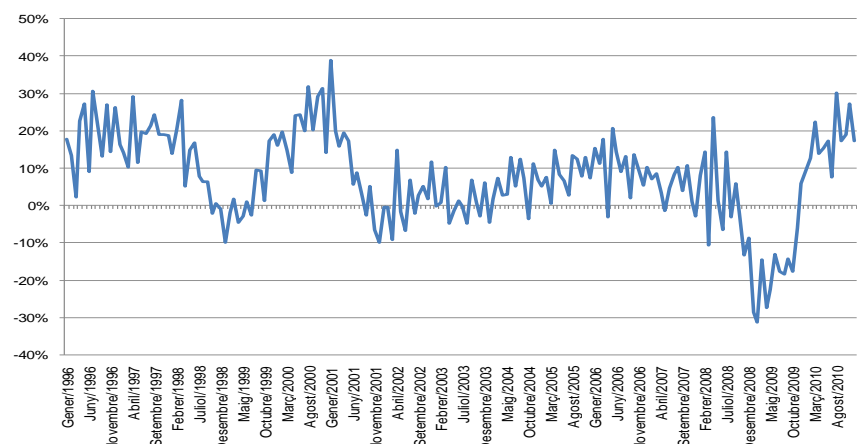
Source: OEPM, EPO, PCT, WIPO

■ **Housing development** (units started). 1999-2010



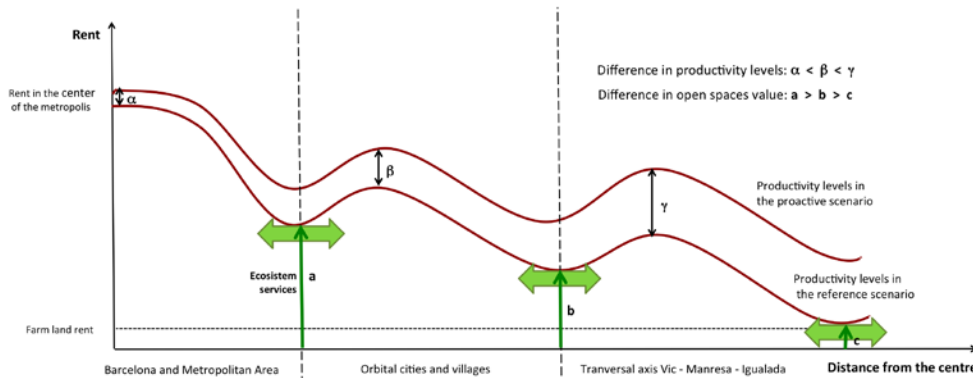
Source: IERMB

■ **Catalonia exportations,** inter-annual variation (%). 1996-2010



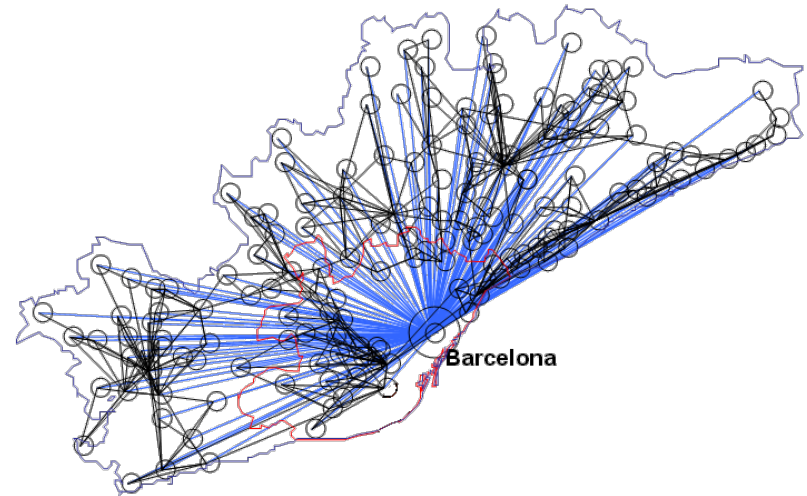
Source: Idescat, AEAT

▪ Theoretical Bid Rent Model proposal

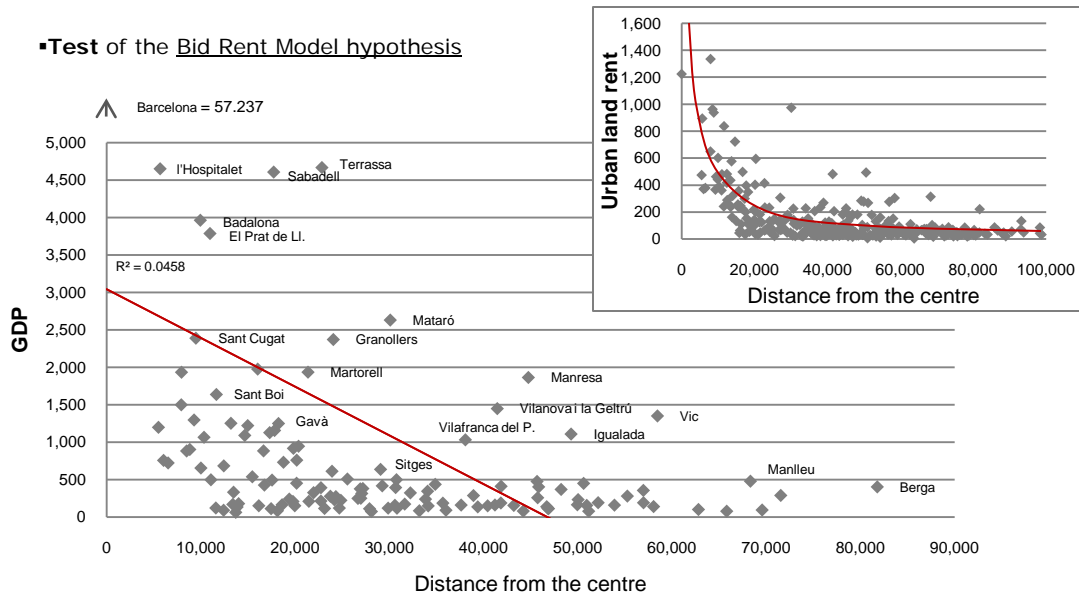


Source: Trullén, 2011

▪ Network of cities. Barcelona Metropolitan Region. Commuting fluxes. 2001

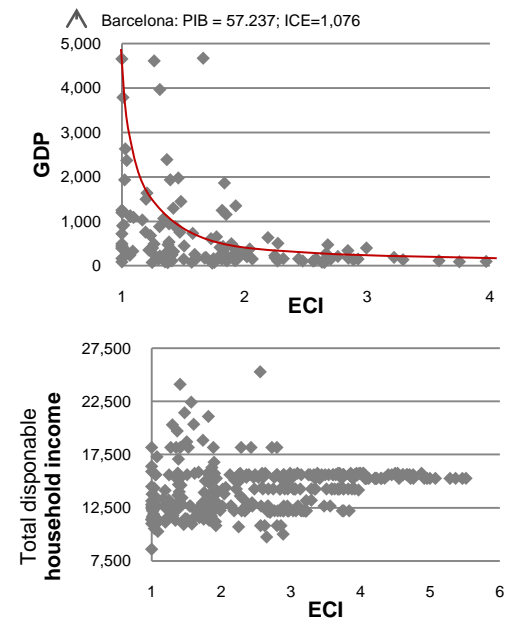


▪ Test of the Bid Rent Model hypothesis

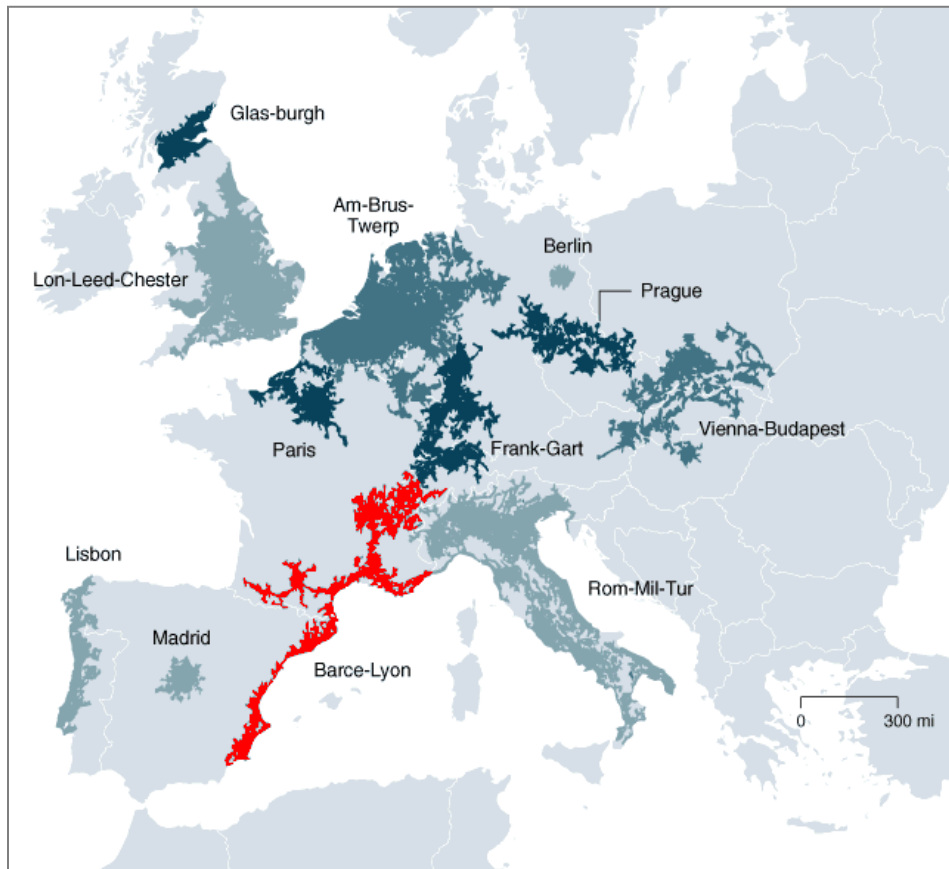


Source: IERMB

▪ Socioeconomic and environmental relationships



▪ Twelve **European mega-regions**



Source: Florida, 2008

▪ **Barcelona-Lyon mega-region** in the world context

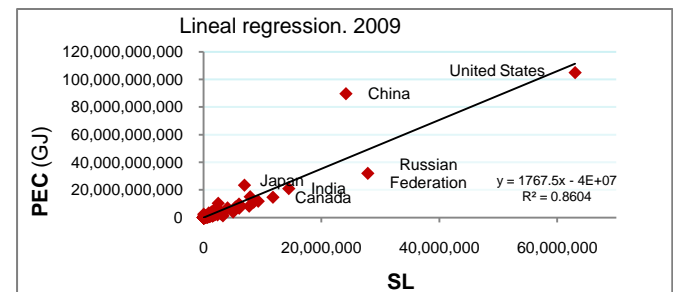
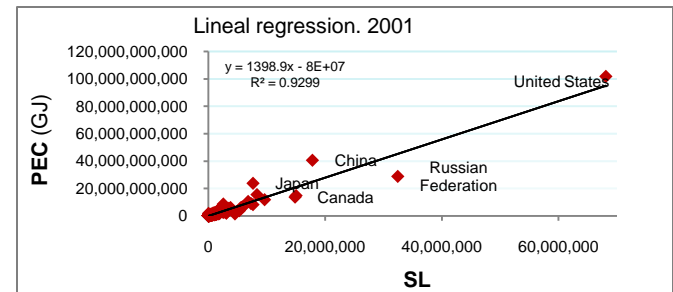
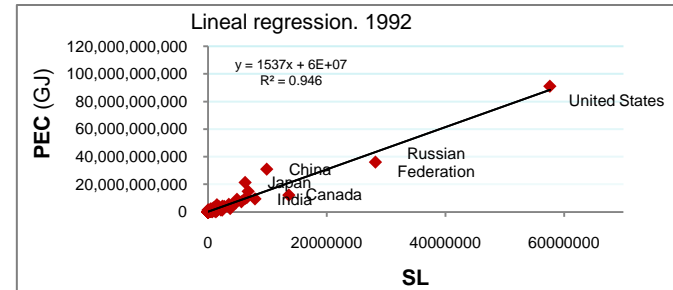
Position	Mega-region	Population (Millions)	LPR (\$ Billions)
1	Delhi-Lahore	121,6	110
2	Shanghai	66,4	130
3	Am-Brus-Twerp	59,3	1.500
4	Greater Tokyo	55,1	2.500
5	Bos-Wash	54,3	2.200
6	Lon-Leed-Chester	50,1	1,200
7	Rom-Mil-Tur	48,3	1.000
8	Seoul-San	46,1	500
9	Chi-Pitts	46,0	1.600
10	Mexico City	45,5	290
11	Hong-Zen	44,9	220
12	Rio-Paulo	43,4	230
13	Beijing	43,1	110
14	Osaka-Nagoya	36,0	1.400
15	Tel Aviv-Amman-Beirut	30,9	160
16	Barce-Lyon	25,0	610
17	Frank-Gart	23,1	630
18	Char-lanta	22,4	730
19	Tor-Buff-Chester	22,1	530
20	Vienna-pest	21,8	180
21	Taipei	21,8	130
22	So-Cal	21,4	710
23	Bangkok	19,2	100
24	Fuku-kyushu	18,5	430
25	So-Flo	15,1	430
26	Paris	14,7	380

▪ **Nightlight satellite** imagery to obtain economic and environmental indicators at mega-regional scale



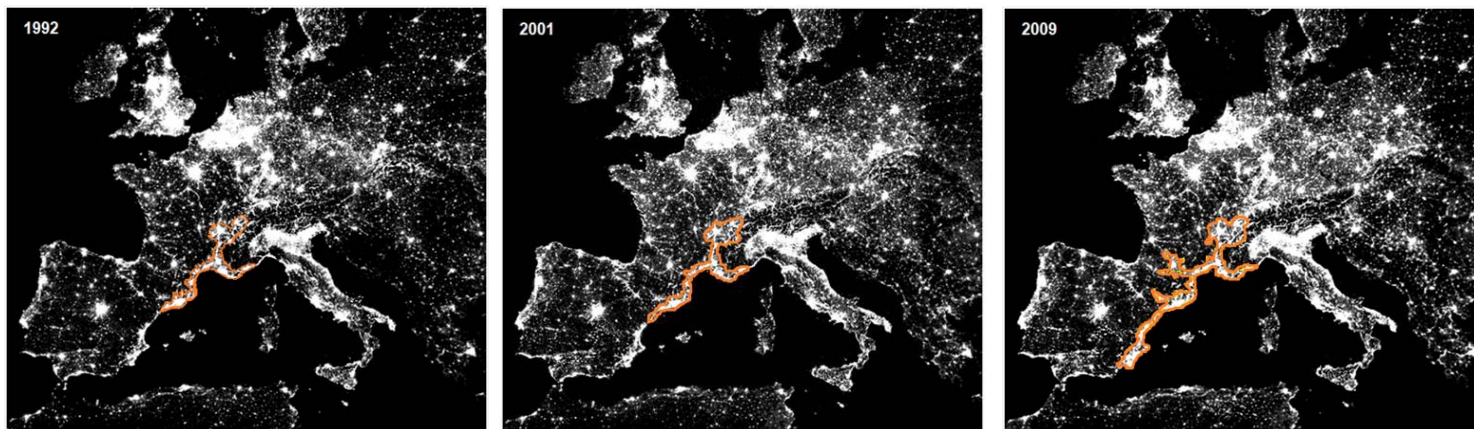
Source: NASA, 2009

▪ Sum of lights and **primary energy consumption**



Source: IERMB

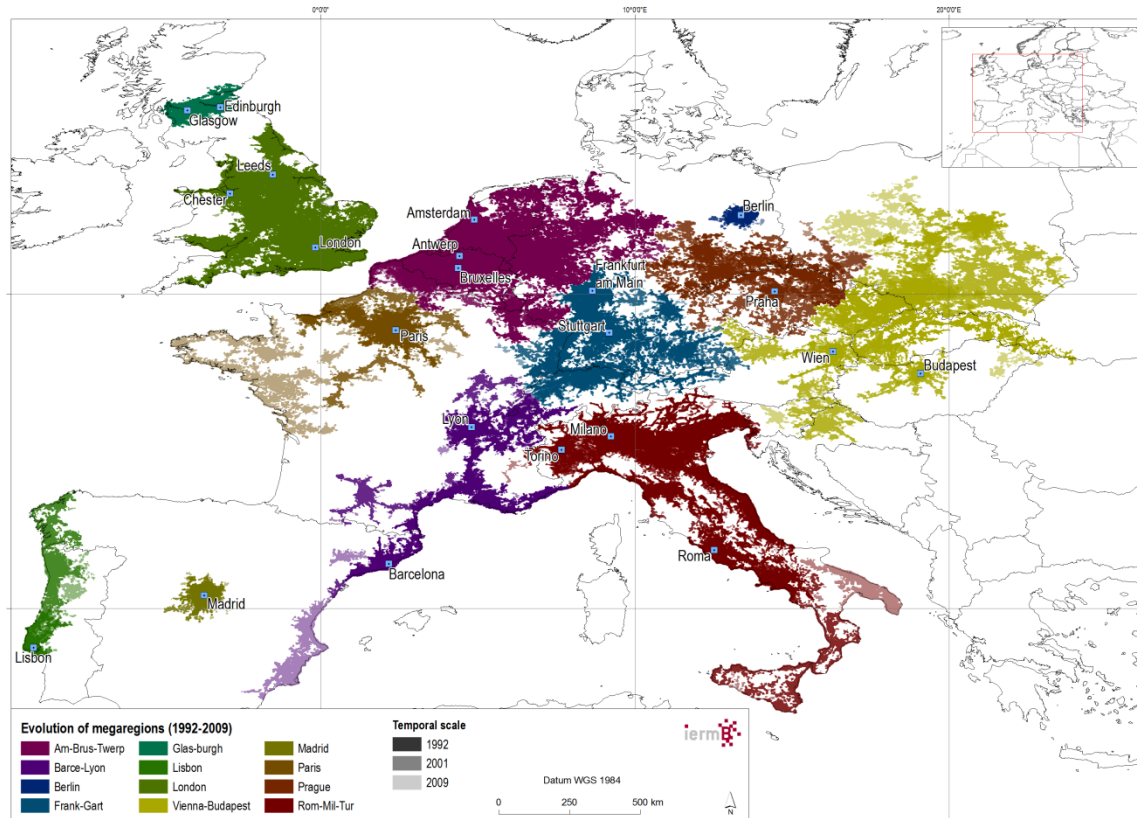
▪ Evolution of the **mega-region Barcelona-Lyon** (1992-2009)



1992	2001	2009
55.901 km ²	81.532 km ²	111.816 km ²
17.969.067 inhab.	20.002.000 inhab.	29.067.891 inhab.
321 inhab./km ²	245 inhab./km ²	260 inhab./km ²
315.967 GDP MIOEUR	469.804 GDP MIOEUR	800.405 GDP MIOEUR
18.688 MIOEUR/inhab.	23.488 MIOEUR/inhab.	27.536 MIOEUR/inhab.
2.698.709.022 GJ	3.393.570.846 GJ	4.912.734.723 GJ
150 GJ/hab.	170 GJ/hab.	169 GJ/hab.
107.510.711 tn CO ₂	127.321.352 tn CO ₂	188.368.750 tn CO ₂
5,98 tones CO ₂ /inhab.	6,37 tones CO ₂ /inhab.	6,48 tones CO ₂ /inhab.

Source: IERMB

▪ Evolution of the twelve European mega-regions (1992-2009)



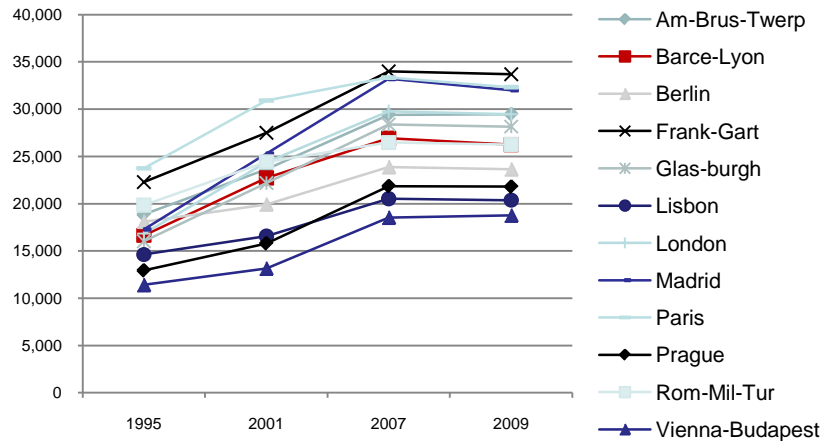
▪ Main characteristics of the European mega-regions (2009)

Mega-region	Population	km ²	inhab/km ²
Am-Brus-Twerp	62.331.069	166.218	375
Barce-Lyon	29.067.891	111.816	260
Berlin	4.540.513	5.566	816
Frank-Gart	34.753.485	114.870	303
Glas-burgh	3.863.299	11.852	326
Lisbon	10.459.976	40.974	255
London	51.846.094	111.972	463
Madrid	6.904.141	14.340	481
Paris	24.204.737	97.080	249
Prague	17.778.045	92.606	192
Rom-Mil-Tur	55.614.000	199.791	278
Vienna-Budapest	46.574.691	217.372	214
Total	347.937.941	1.184.456	294

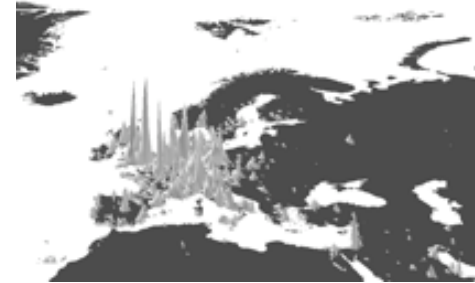
▪ Test of the mega-region economic benefit hypothesis (t-Student)

GDPGrowth	Inside 1995 (a)	Inside 2001 (b)	Oustide 2001 (c)
€/inhab. (1995-2001)	5.430,7 bc	3.899,1	3.865,2
€/inhab. (2001-2007)	5.439,1 c	4.979,9	4.545,6
€/inhab. (1995-2007)	10.869,3 bc	8,879.0	8.410,8

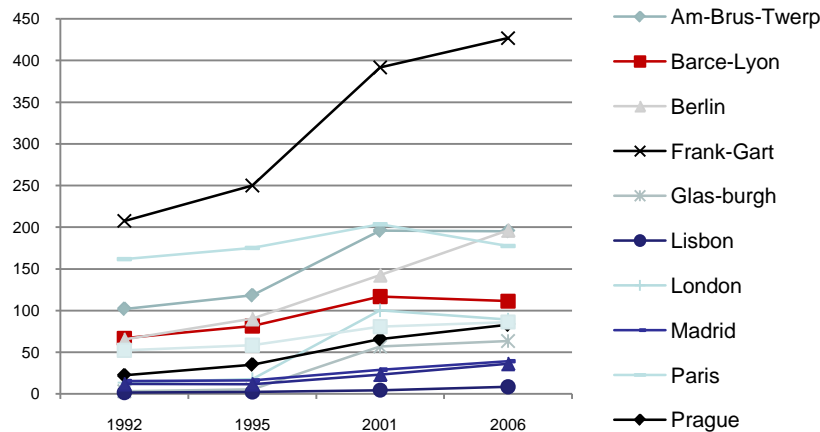
Evolution of the European mega-region **economic activity** (GDP/inhab.)



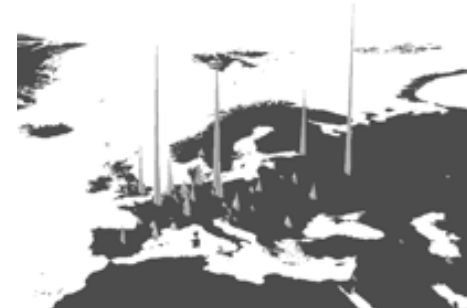
European distribution of economic activity (LRP)



Evolution of the European mega-region **innovation activity** (patents/million inhab.)

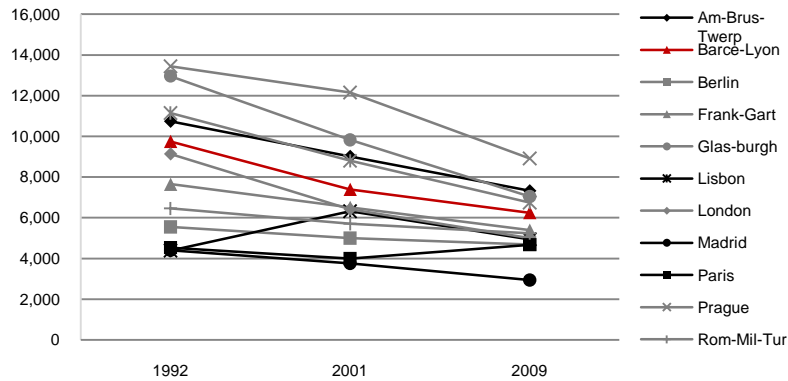


European distribution of patent activity (number)

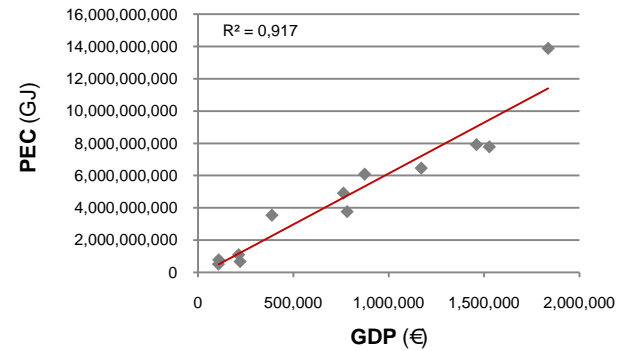


Source: Florida et al, 2007

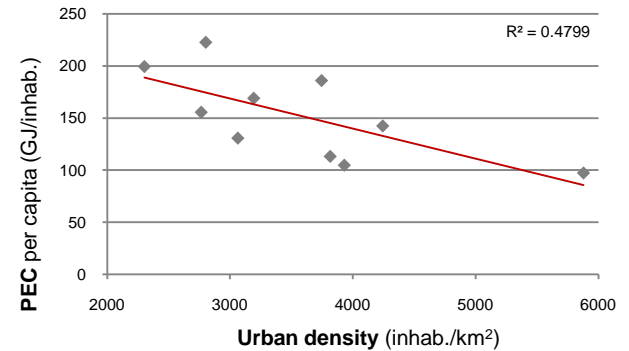
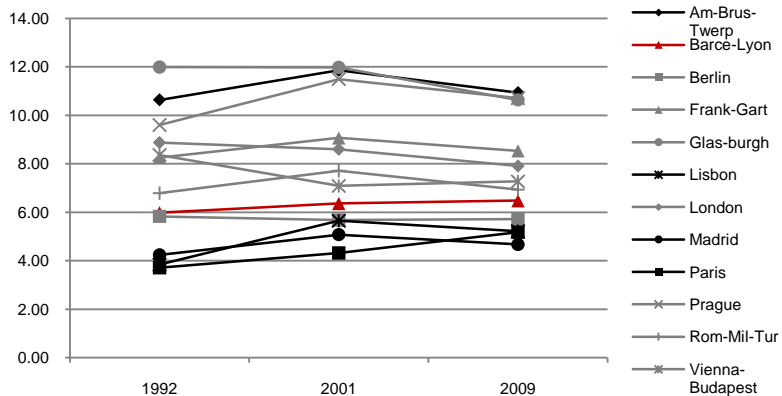
Evolution of the European mega-region **energy intensity** (GJ/GDP)



Energy consumption, economic activity and urban form

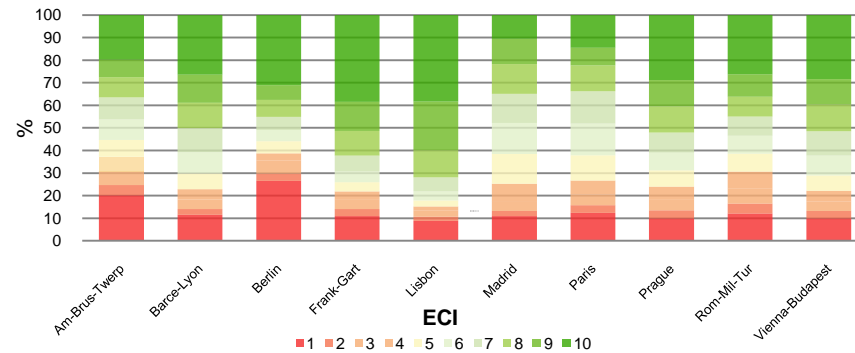
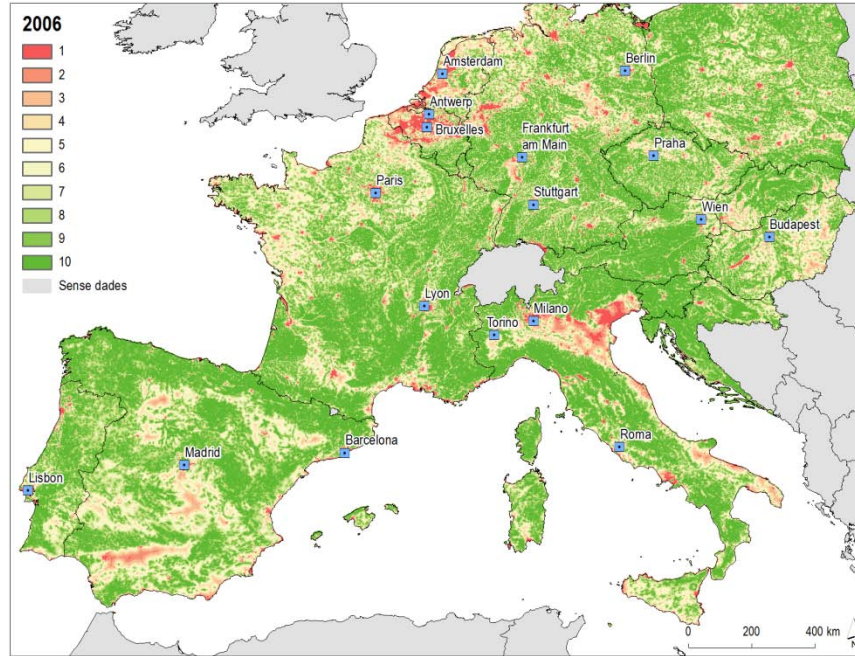
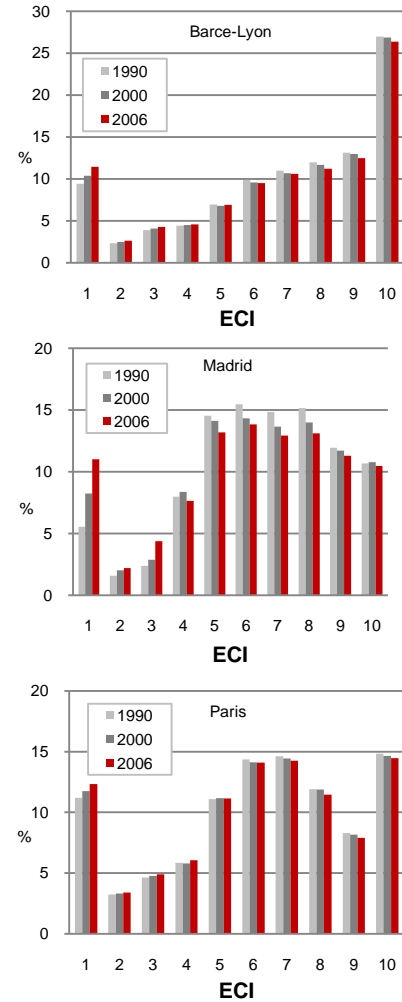


Evolution of the European mega-region **GHG emissions** (tn CO₂/inhab.)

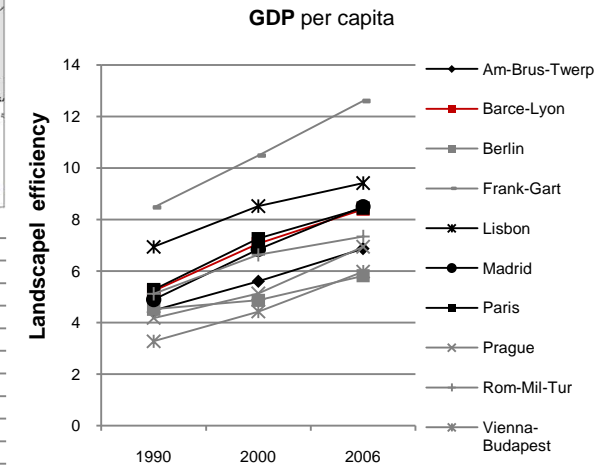
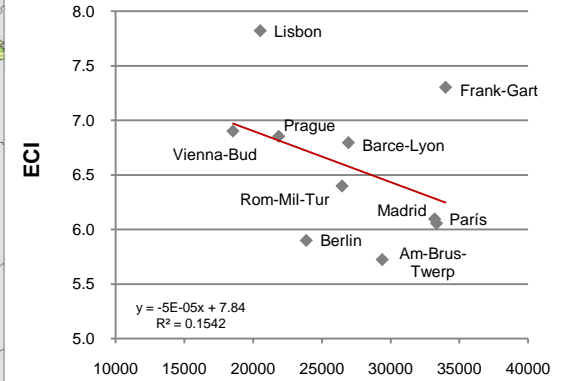


Source: IERMB

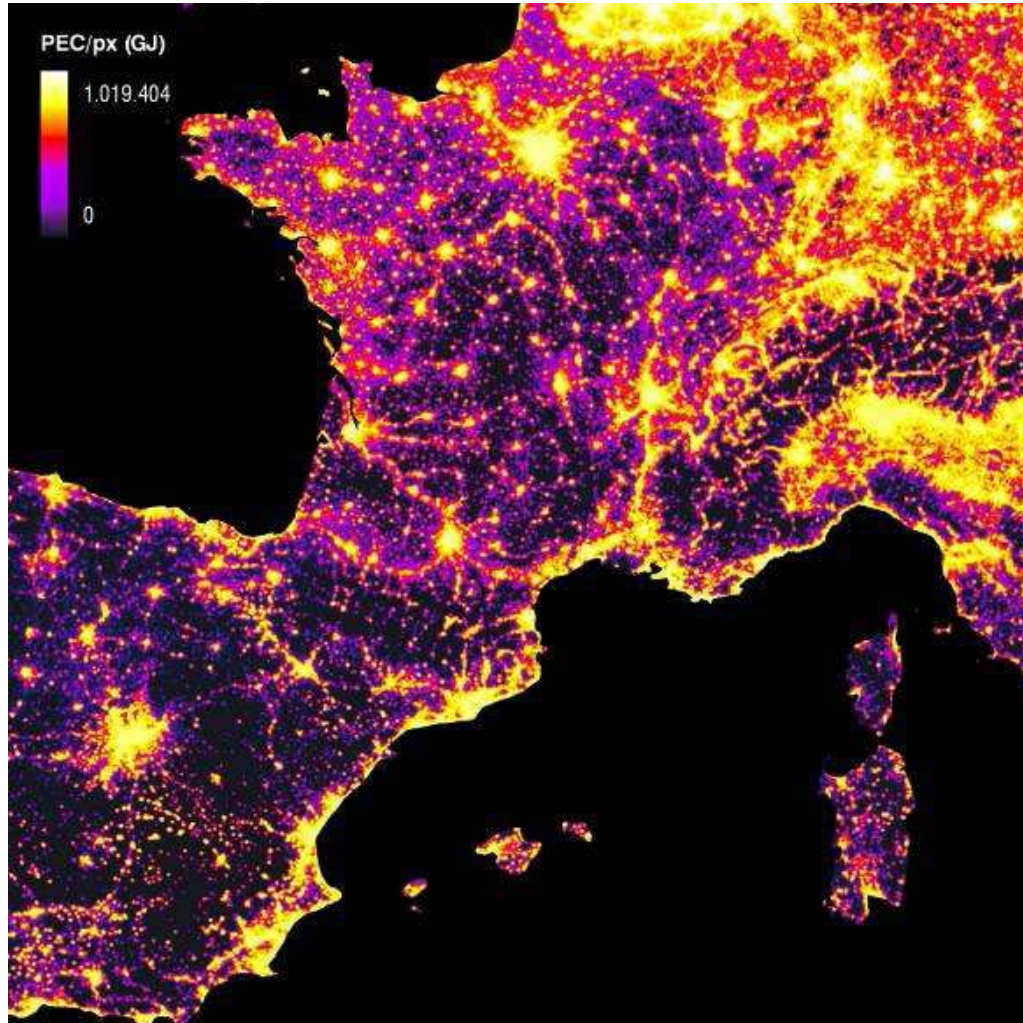
Comparative analysis of the ecological connectivity index (ECI) in European megaregions (2006)



Landscape efficiency (GDP/ECI)



▪ Primary energy consumption (GJ) in Western Europe (2009)

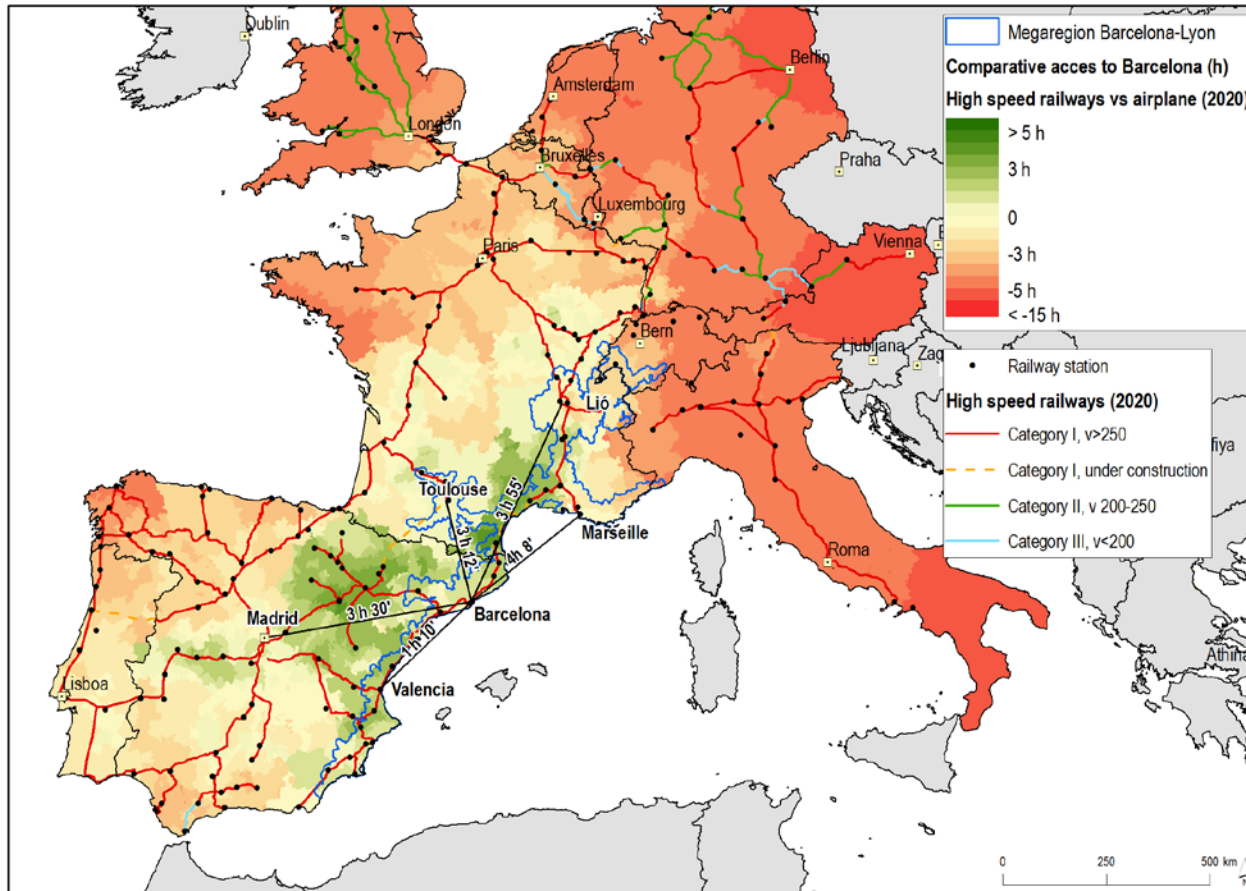


▪Comparative analysis: **Barcelona-Lyon vs Paris** mega-regions

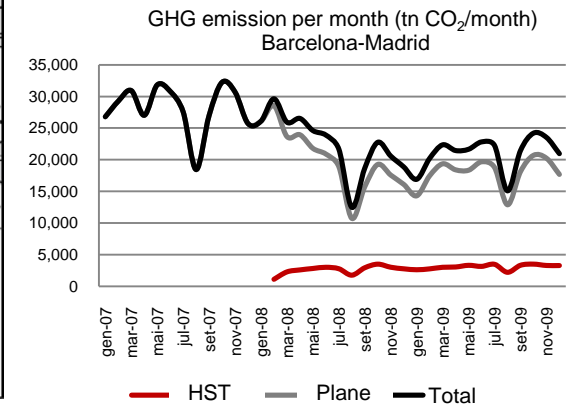
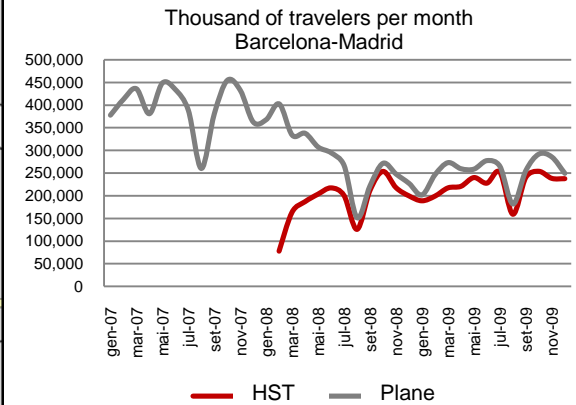
Parameters	Paris	Barcelona-Lyon
<i>Economic</i>		
GDP per capita in PPP (€/ inhab.)	32.314	26.250
Knowledge (patents/million inhab.)	103	71
<i>Metabolism</i>		
PEC(GJ / inhab.)	156	169
GHG emissions (tn CO ₂ / inhab.)	5,18	6,48
<i>Environment and land use</i>		
Population density (inhab./km ²)	249	260
City network efficiency (E _g)	0,0315	0,0122
Ecological fragmentation (M _{eff})	114,02	30,43
<i>Social</i>		
Population (Million inhab.)	24,2	29,1
Gini Index	33	32

Source: IERMB

- High Speed Train (HST) as **mega-regional transport mode**. Comparative HST railways vs plane (2020)



- Barcelona-Madrid transport corridor (2007-2009)**



▪Conclusions

- ✓ The analysis conducted on mega-regions confirmed that the gradual inclusion of different regions within the **European mega-regions** provides a significant **economic benefit** (per capita GDP) compared to other areas not included within these networks of cities.
- ✓ The development of mega-regions, supported by greater **energy efficiency** and **transportation systems**, enhance the appearance of significant socio-economic dynamics that, in turn, can cause profound changes in the landscape and accelerate change overall.
- ✓ The results on **landscape efficiency** encourage to propose solutions to many current conflicts, the environmental priorities that contrasted with economic development. Consequently, in the near future a **mega-regional scale approach** is needed in the development of economic, social and environmental policy and planning.

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