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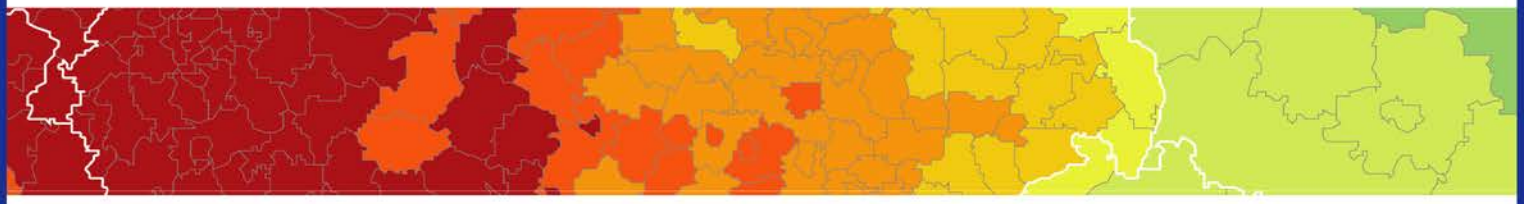

SPIMA – Spatial dynamics and strategic planning in metropolitan areas

Targeted Analysis

Annex 3 to Final Report
Figures, Maps and Tables
Version 5 March, 2018

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Authors

Vanya Simeonova, Michiel van Eupen, Jan Clement, Andrea Baraggia, Wageningen Environmental Research-Alterra (the Netherlands), Lead partner

Gro Sandkjær Hanssen, Hege Hofstad, Norwegian Institute for Urban Research (Norway)

Ivan Tosics, Eva Gerohazi, Metropolitan Research Institute (Hungary)

Advisory Group

ESPON EGTC: Peter Billing

Lead Stakeholder: Peter Austin (city of Oslo, Norway)

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Contact: info@espon.eu

SPIMA - Spatial dynamics and strategic planning in metropolitan areas

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Abbreviations

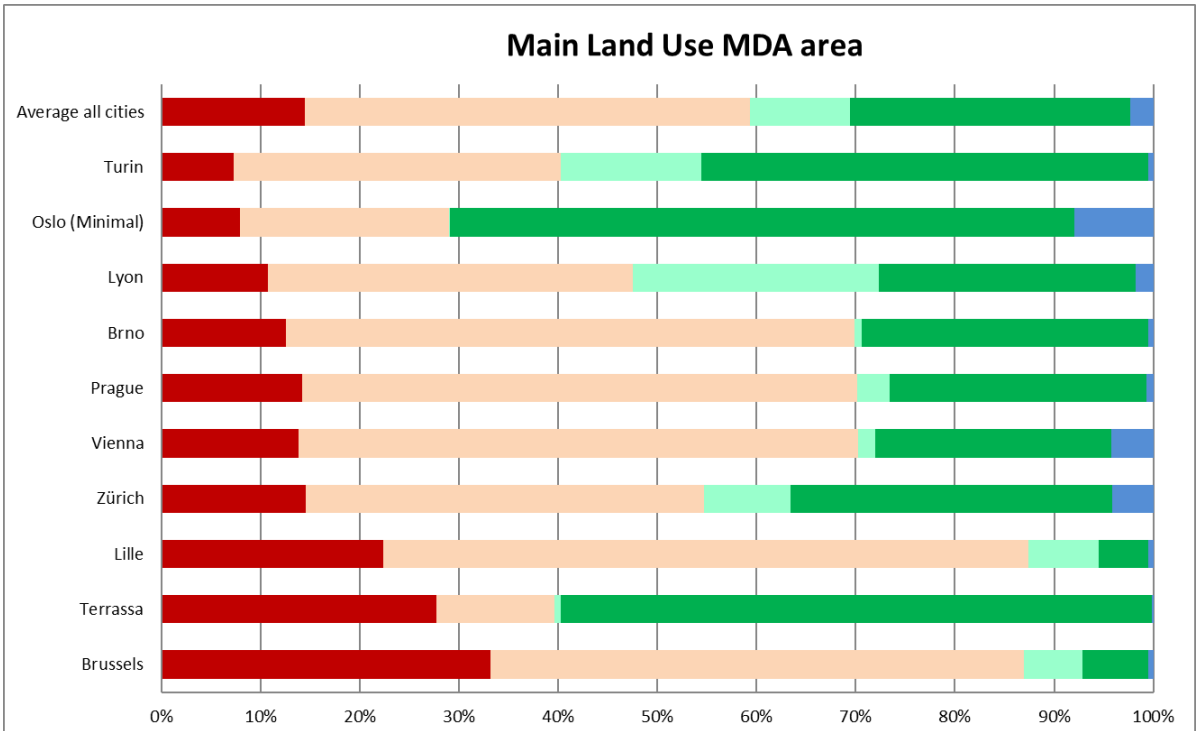
EC	European Commission
ESPON	European Territorial Observatory Network
EU	European Union
FUA	Functional Urban Area
MUA	Morphological Urban Area
LAU	Local Administrative Unit
MDA	Metropolitan Development Area
LUZ	Large Urban Zone
MA	Metropolitan Area

1 Key trends in socio-economic development

1.1 Land use trends

1.1.1 Metropolitan Development area

Figure 1.1 Overview of the land use in the MDAs of the stakeholders' areas

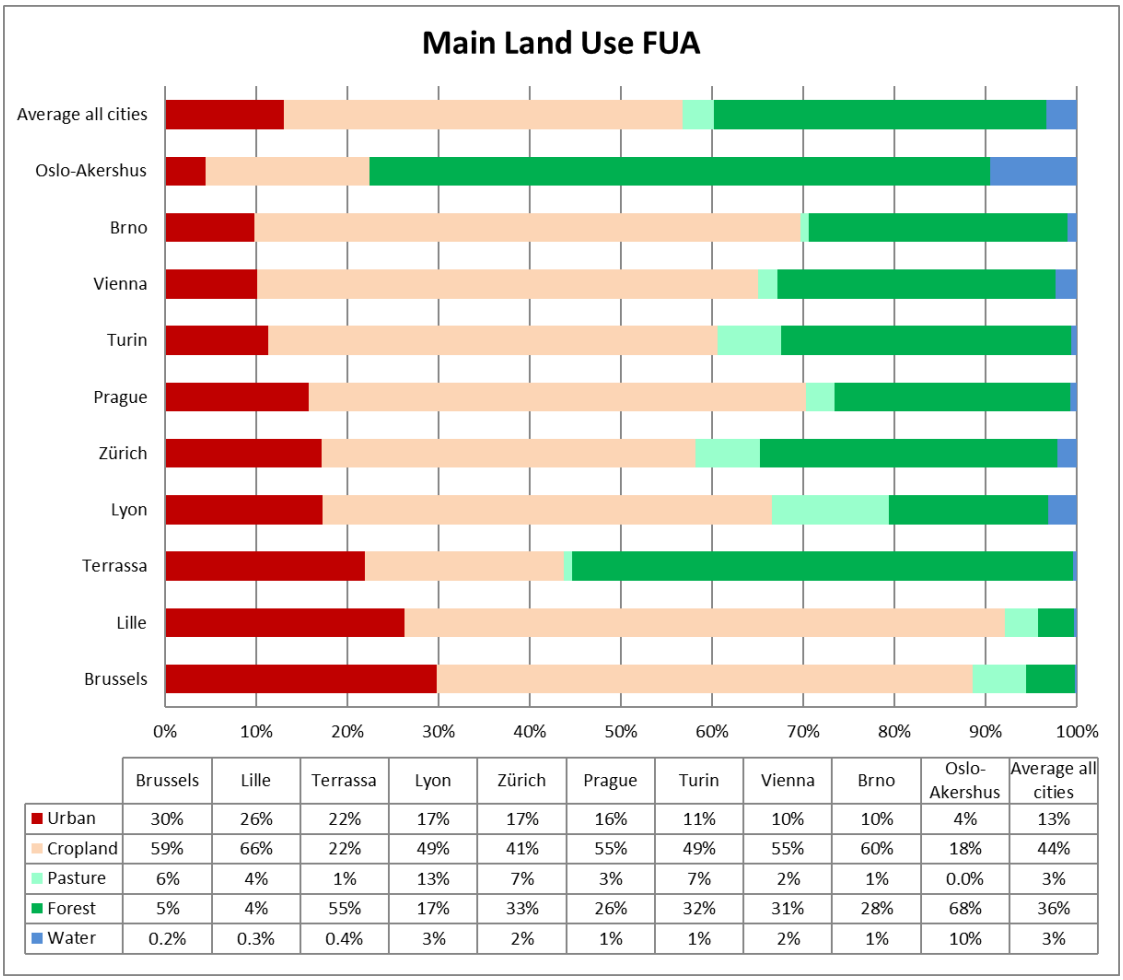


	Brussels	Terrassa	Lille	Zürich	Vienna	Prague	Brno	Lyon	Oslo (Minimal)	Turin	Average all cities
Urban	33%	28%	22%	15%	14%	14%	13%	11%	8%	7%	14%
Cropland	54%	12%	65%	40%	56%	56%	57%	37%	21%	33%	45%
Pasture	6%	1%	7%	9%	2%	3%	1%	25%	0.02%	14%	10%
Forest	7%	60%	5%	32%	24%	26%	29%	26%	63%	45%	28%
Water	0.5%	0.1%	0.5%	4%	4%	1%	0.5%	2%	8%	0.5%	2%

Source: EUROSTAT (2011), Urban OLAP Cube (2009)

1.1.2 Functional urban area

Figure 1.2 Overview of land use in the FUA of the stakeholders' areas

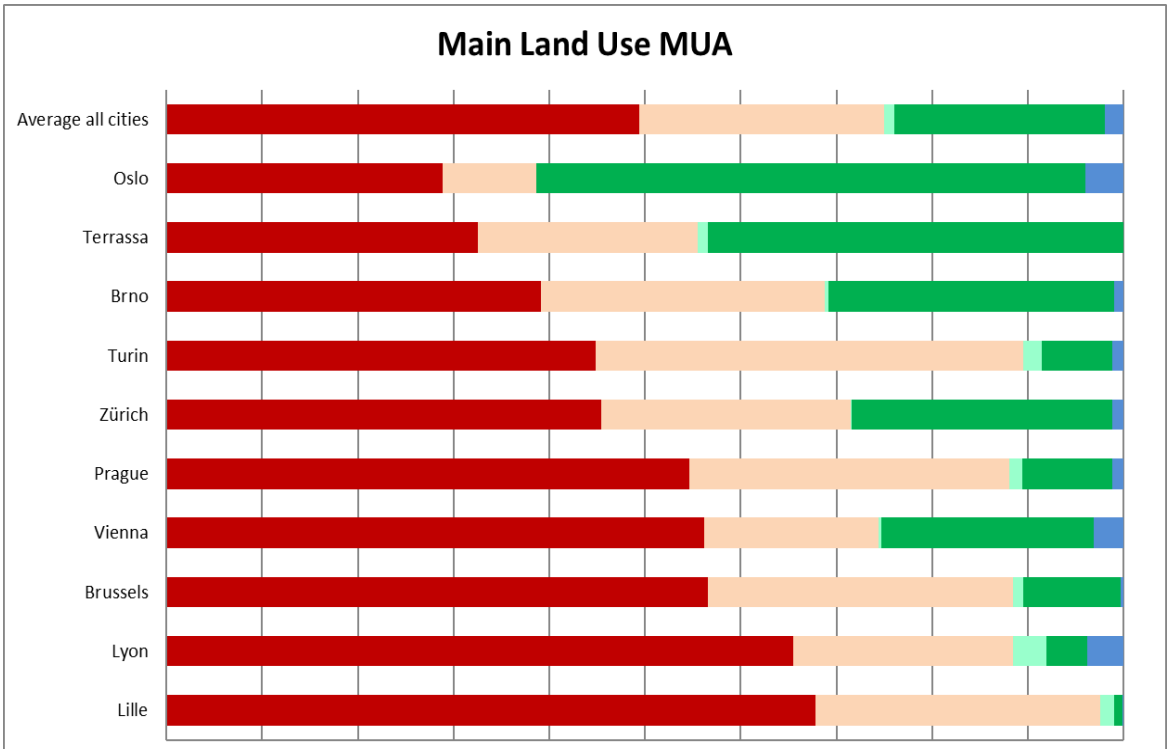


	Brussels	Lille	Terrassa	Lyon	Zürich	Prague	Turin	Vienna	Brno	Oslo-Akershus	Average all cities
Urban	30%	26%	22%	17%	17%	16%	11%	10%	10%	4%	13%
Cropland	59%	66%	22%	49%	41%	55%	49%	55%	60%	18%	44%
Pasture	6%	4%	1%	13%	7%	3%	7%	2%	1%	0.0%	3%
Forest	5%	4%	55%	17%	33%	26%	32%	31%	28%	68%	36%
Water	0.2%	0.3%	0.4%	3%	2%	1%	1%	2%	1%	10%	3%

Source: EUROSTAT (2011), Urban OLAP Cube (2009)

1.1.3 Morphological Urban Area

Figure 1.3 Overview of land use in the MUAs of the stakeholders' areas



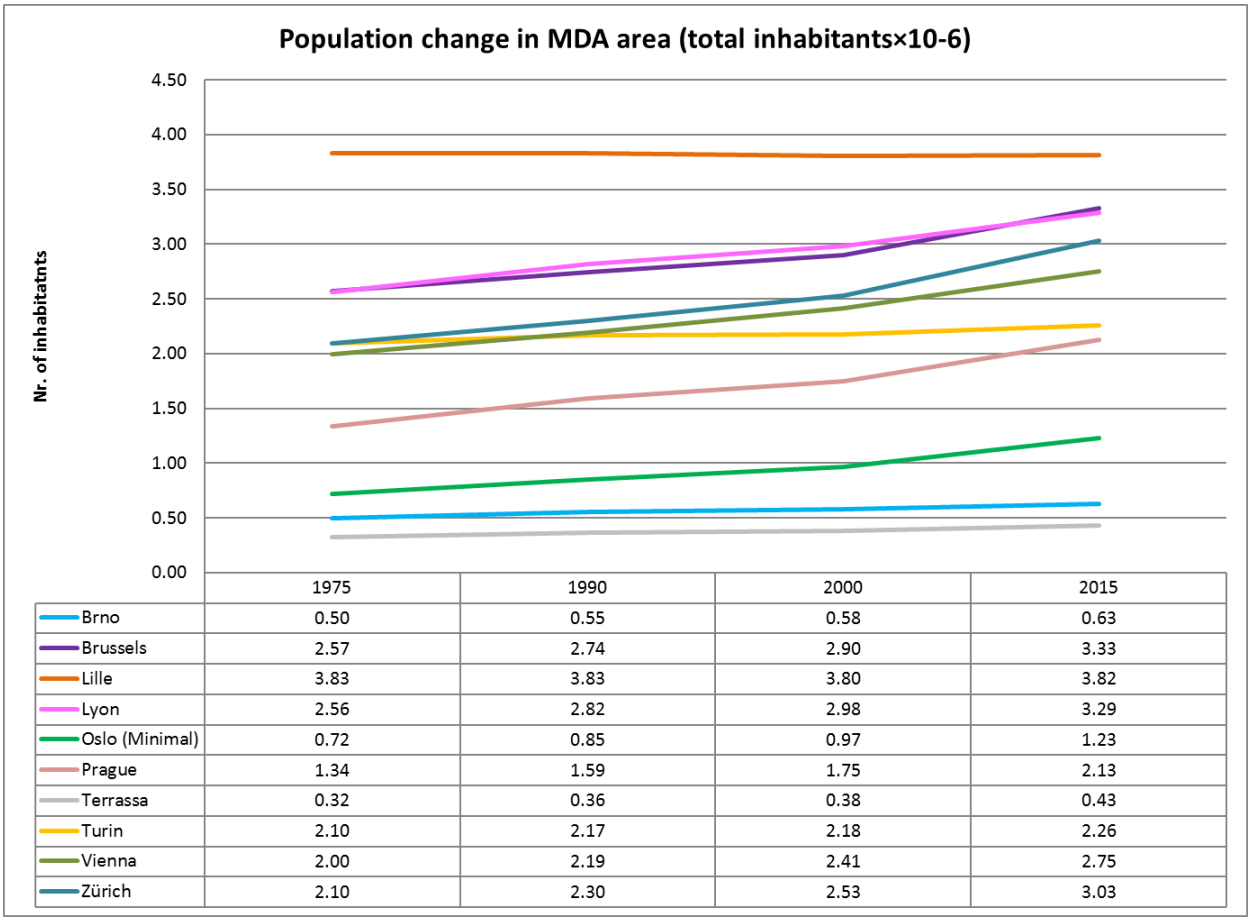
	Lille	Lyon	Brussels	Vienna	Prague	Zürich	Turin	Brno	Terrassa	Oslo	Average all cities
Urban	68%	65%	57%	56%	55%	45%	45%	39%	33%	29%	49%
Cropland	30%	23%	32%	18%	33%	26%	45%	30%	23%	10%	26%
Pasture	1%	3%	1%	0.3%	1%	0.1%	2%	0.4%	1%	0%	1%
Forest	1%	4%	10%	22%	9%	27%	7%	30%	43%	57%	22%
Water	0.1%	4%	0.3%	3%	1%	1%	1%	1%	0.0%	4%	2%

Source: EUROSTAT (2011), Urban OLAP Cube (2009)

1.2 Population growth and density trends

1.2.1 Metropolitan Development Area (MDA)

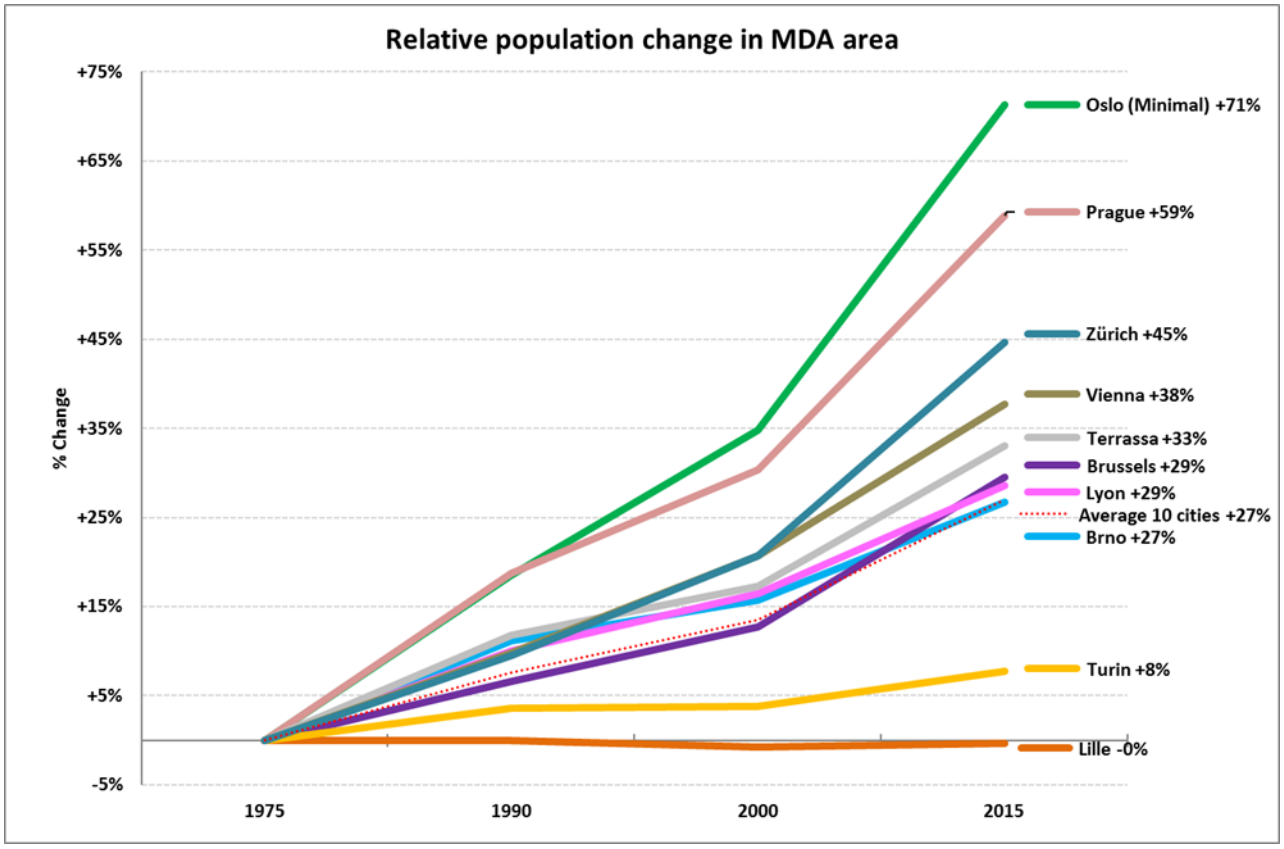
Figure 1.4 Overview of population change in the MDAs of the stakeholders' areas



	1975	1990	2000	2015
Brno	0.50	0.55	0.58	0.63
Brussels	2.57	2.74	2.90	3.33
Lille	3.83	3.83	3.80	3.82
Lyon	2.56	2.82	2.98	3.29
Oslo (Minimal)	0.72	0.85	0.97	1.23
Prague	1.34	1.59	1.75	2.13
Terrassa	0.32	0.36	0.38	0.43
Turin	2.10	2.17	2.18	2.26
Vienna	2.00	2.19	2.41	2.75
Zürich	2.10	2.30	2.53	3.03

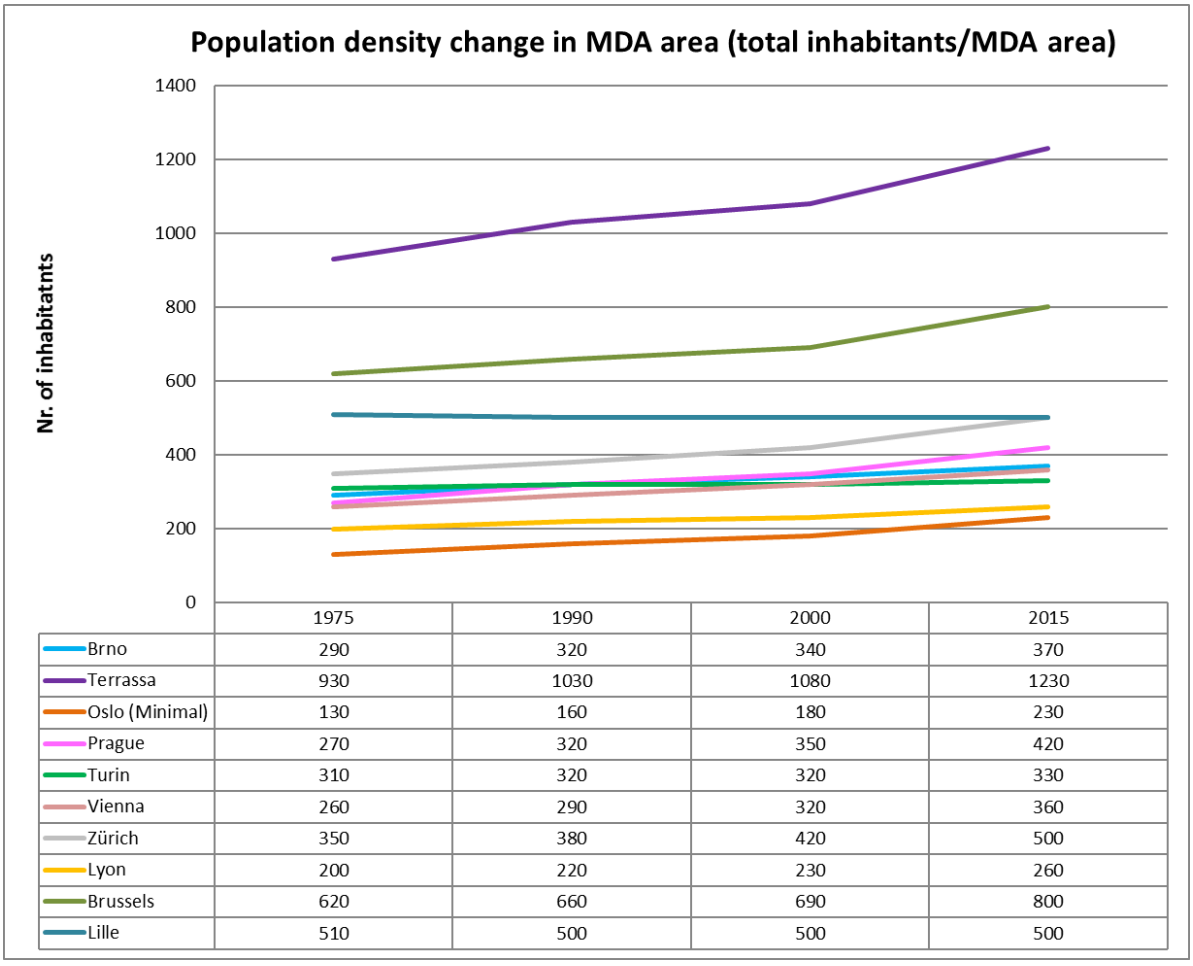
Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

Figure 1.5 Relative population change in the MDAs of the stakeholders' areas (%)



Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

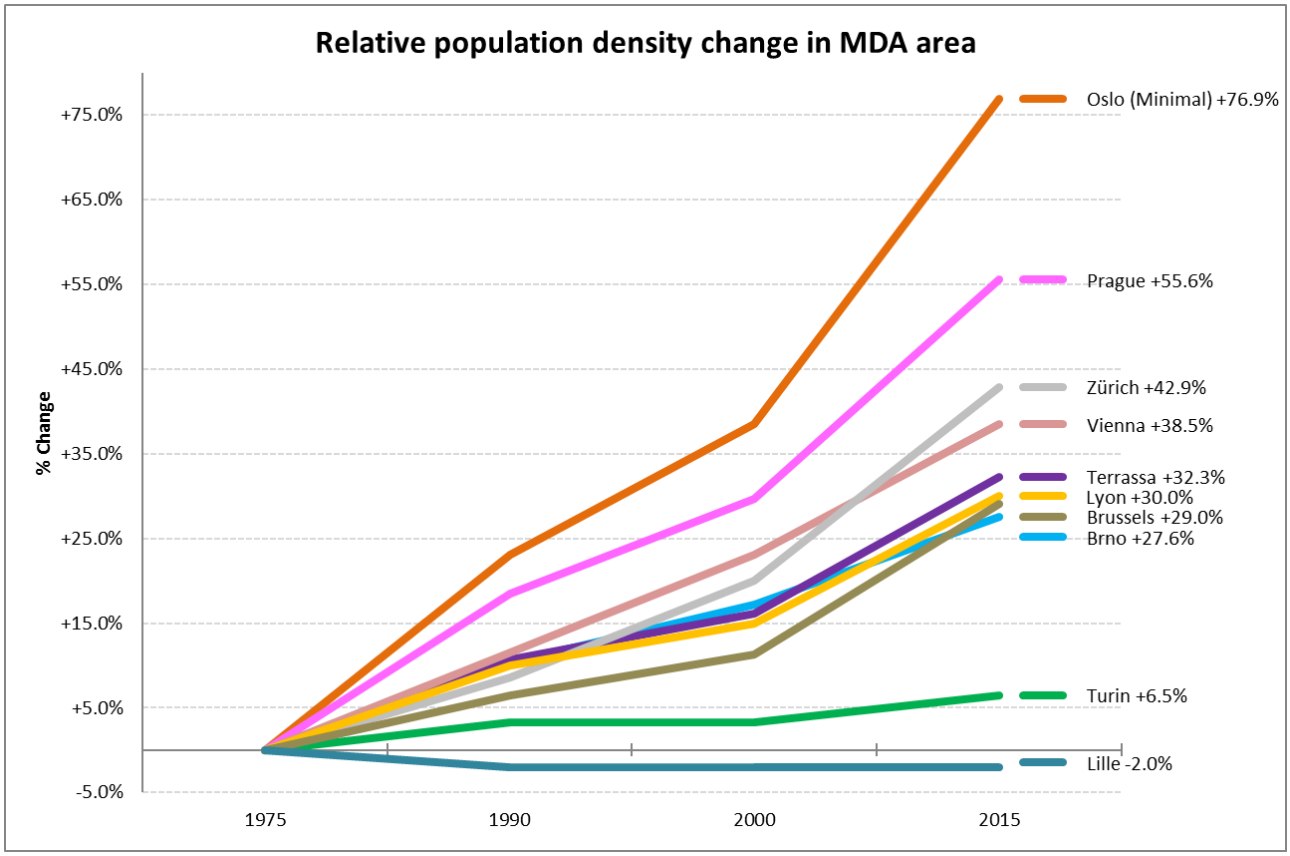
Figure 1.6 Overview of population density change in the MDAs of the stakeholders' areas



	1975	1990	2000	2015
Brno	290	320	340	370
Terrassa	930	1030	1080	1230
Oslo (Minimal)	130	160	180	230
Prague	270	320	350	420
Turin	310	320	320	330
Vienna	260	290	320	360
Zürich	350	380	420	500
Lyon	200	220	230	260
Brussels	620	660	690	800
Lille	510	500	500	500

Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

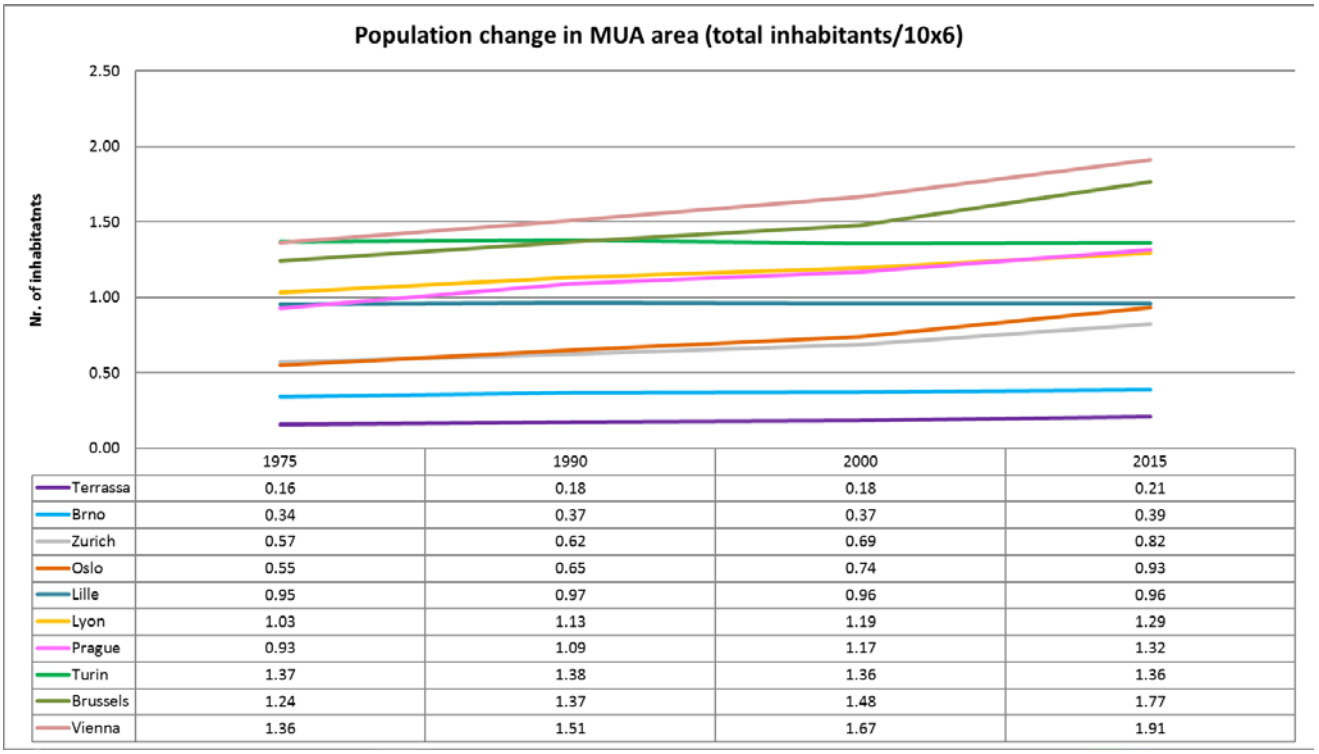
Figure 1.7 Relative population density in the MDA of the stakeholder areas



Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

1.2.2 Morphological Urban Area (MUA)

Figure 1.8 Overview of population change in the MUAs of the stakeholders' areas



	1975	1990	2000	2015
Terrassa	0.16	0.18	0.18	0.21
Brno	0.34	0.37	0.37	0.39
Zurich	0.57	0.62	0.69	0.82
Oslo	0.55	0.65	0.74	0.93
Lille	0.95	0.97	0.96	0.96
Lyon	1.03	1.13	1.19	1.29
Prague	0.93	1.09	1.17	1.32
Turin	1.37	1.38	1.36	1.36
Brussels	1.24	1.37	1.48	1.77
Vienna	1.36	1.51	1.67	1.91

Figure 1.9 Relative population change in the MUAs of the stakeholders'' areas

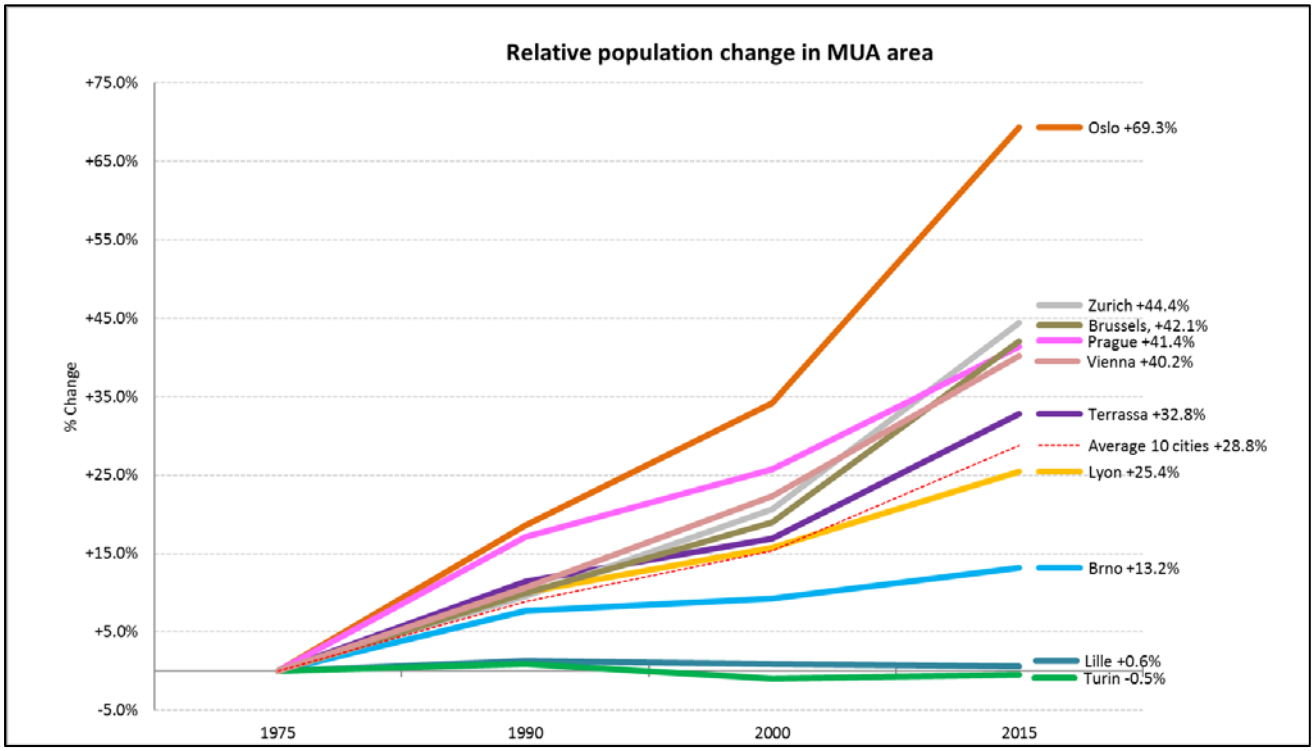
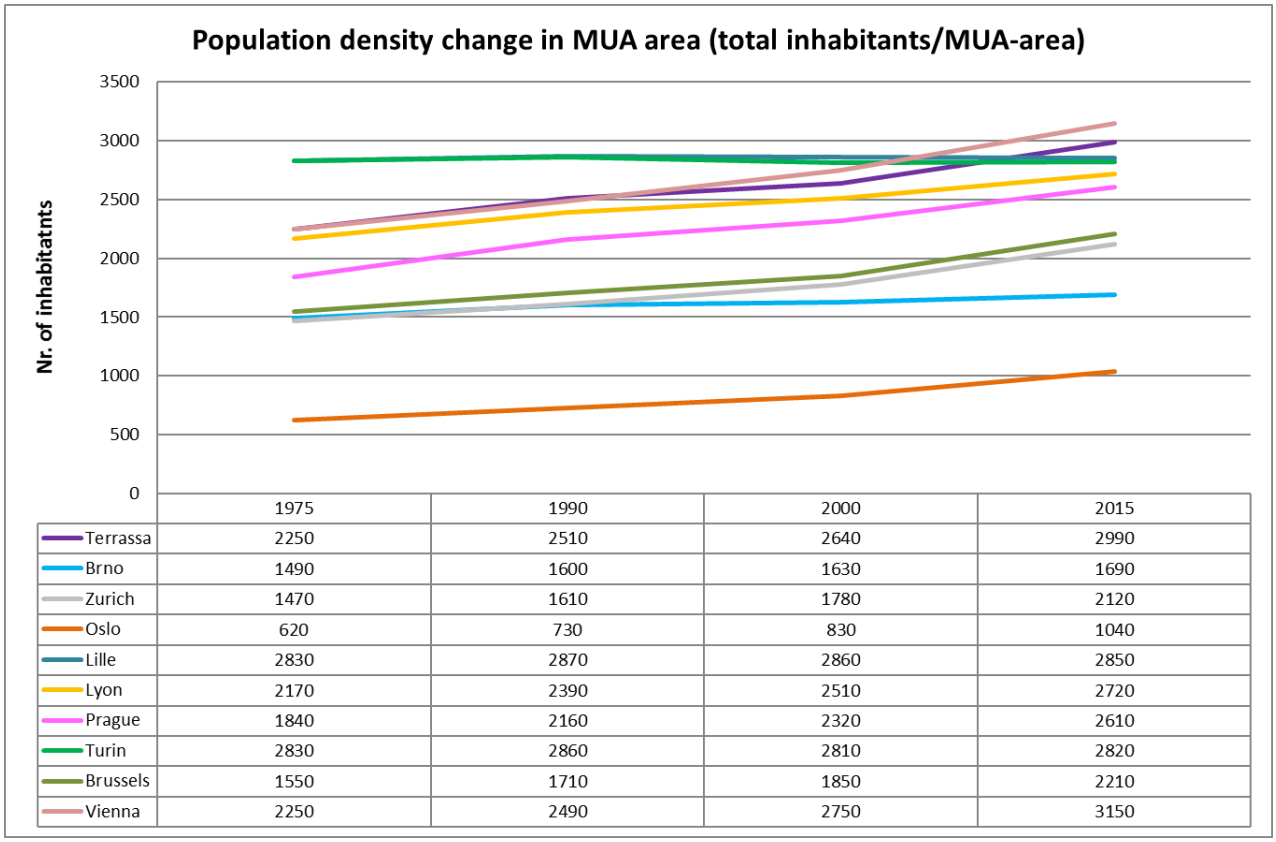


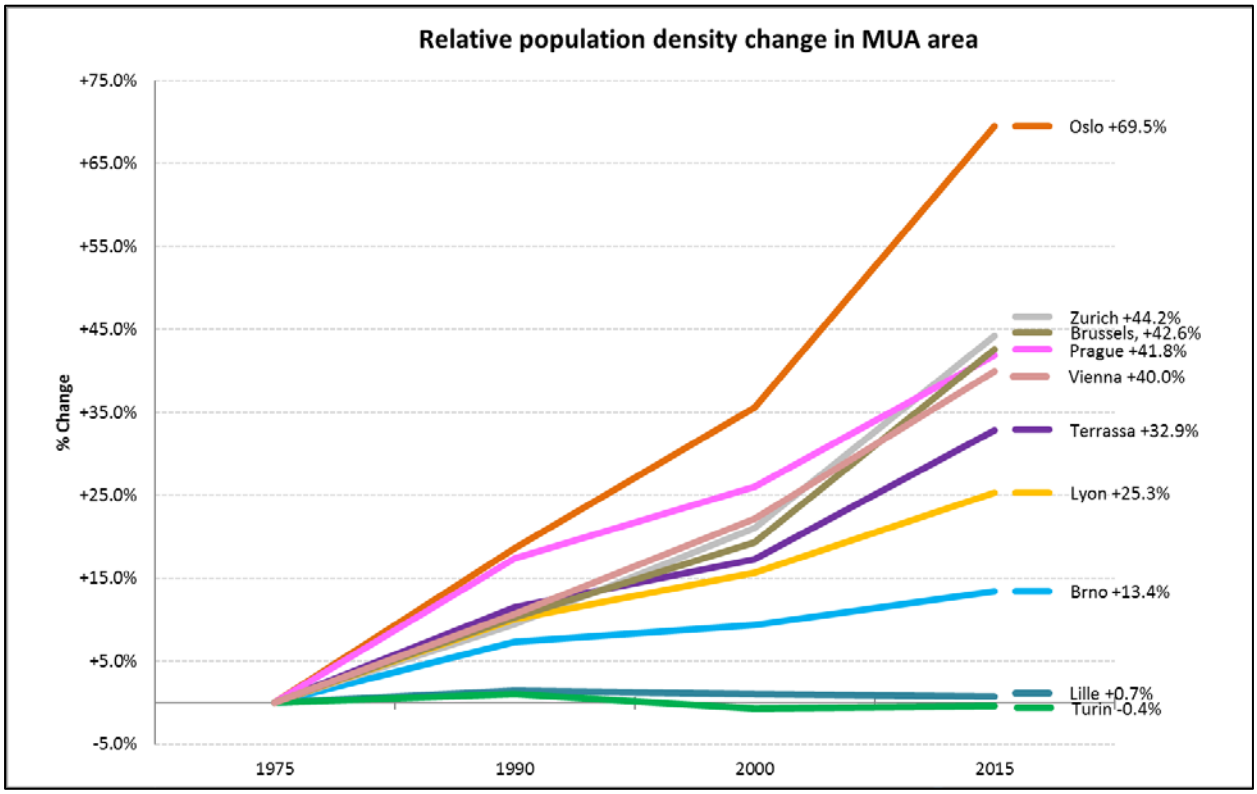
Figure 1.10 Overview of population density in the MUAs of the stakeholders' areas



	1975	1990	2000	2015
Terrassa	2250	2510	2640	2990
Brno	1490	1600	1630	1690
Zurich	1470	1610	1780	2120
Oslo	620	730	830	1040
Lille	2830	2870	2860	2850
Lyon	2170	2390	2510	2720
Prague	1840	2160	2320	2610
Turin	2830	2860	2810	2820
Brussels	1550	1710	1850	2210
Vienna	2250	2490	2750	3150

Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

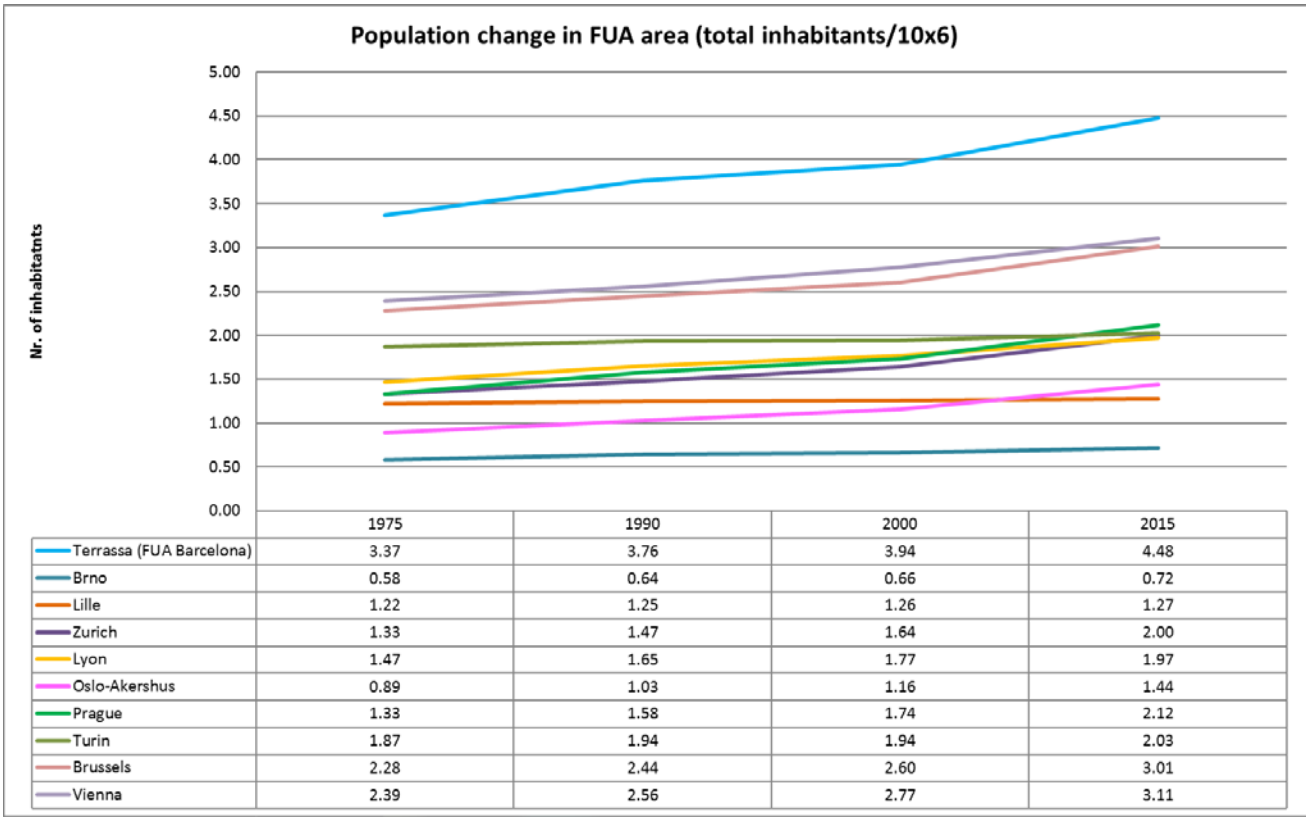
Figure 1.11 Relative of population density in the MUAs of the stakeholders' areas



Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

1.2.3 Functional Urban Area (FUA)

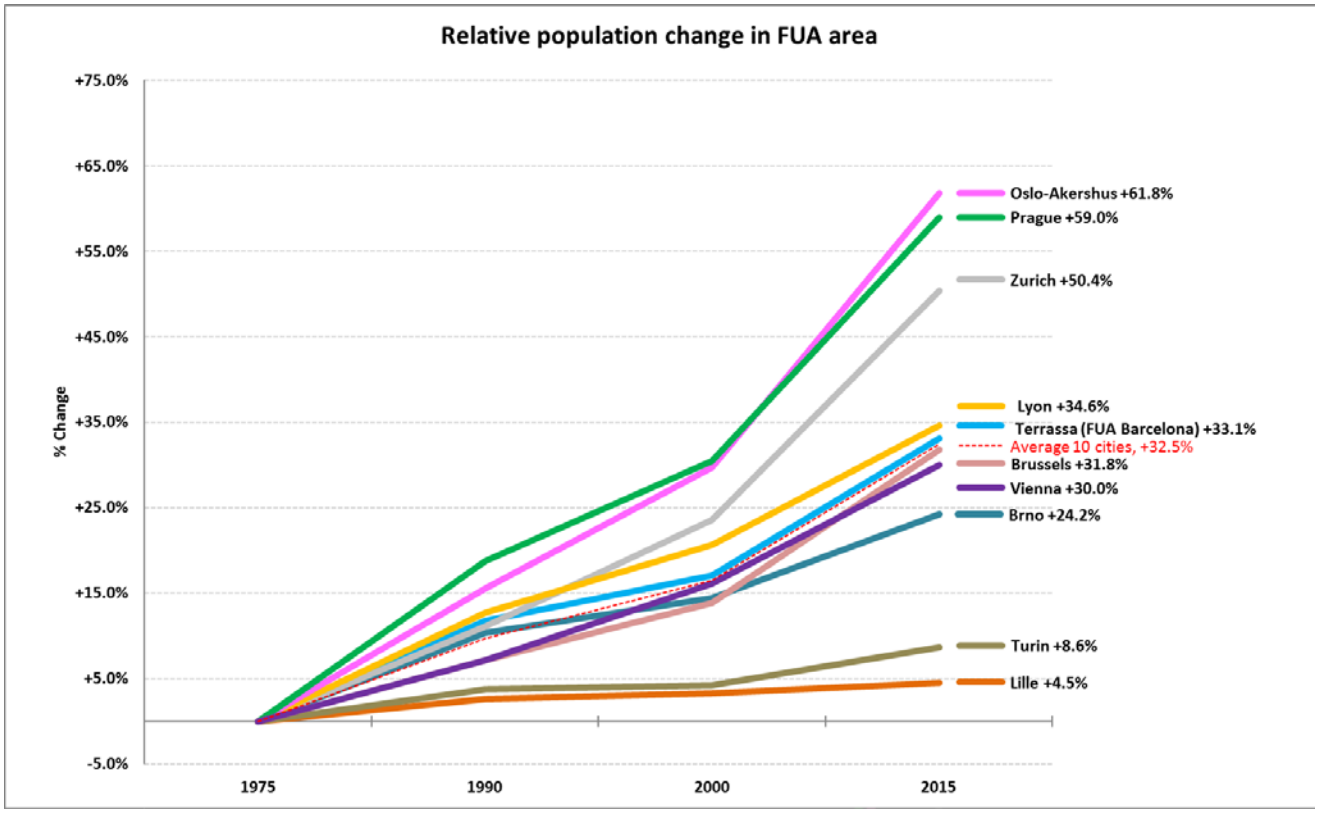
Figure 1.12 Overview of population change in the FUAs of the stakeholder areas



	1975	1990	2000	2015
Terrassa (FUA Barcelona)	3.37	3.76	3.94	4.48
Brno	0.58	0.64	0.66	0.72
Lille	1.22	1.25	1.26	1.27
Zurich	1.33	1.47	1.64	2.00
Lyon	1.47	1.65	1.77	1.97
Oslo-Akershus	0.89	1.03	1.16	1.44
Prague	1.33	1.58	1.74	2.12
Turin	1.87	1.94	1.94	2.03
Brussels	2.28	2.44	2.60	3.01
Vienna	2.39	2.56	2.77	3.11

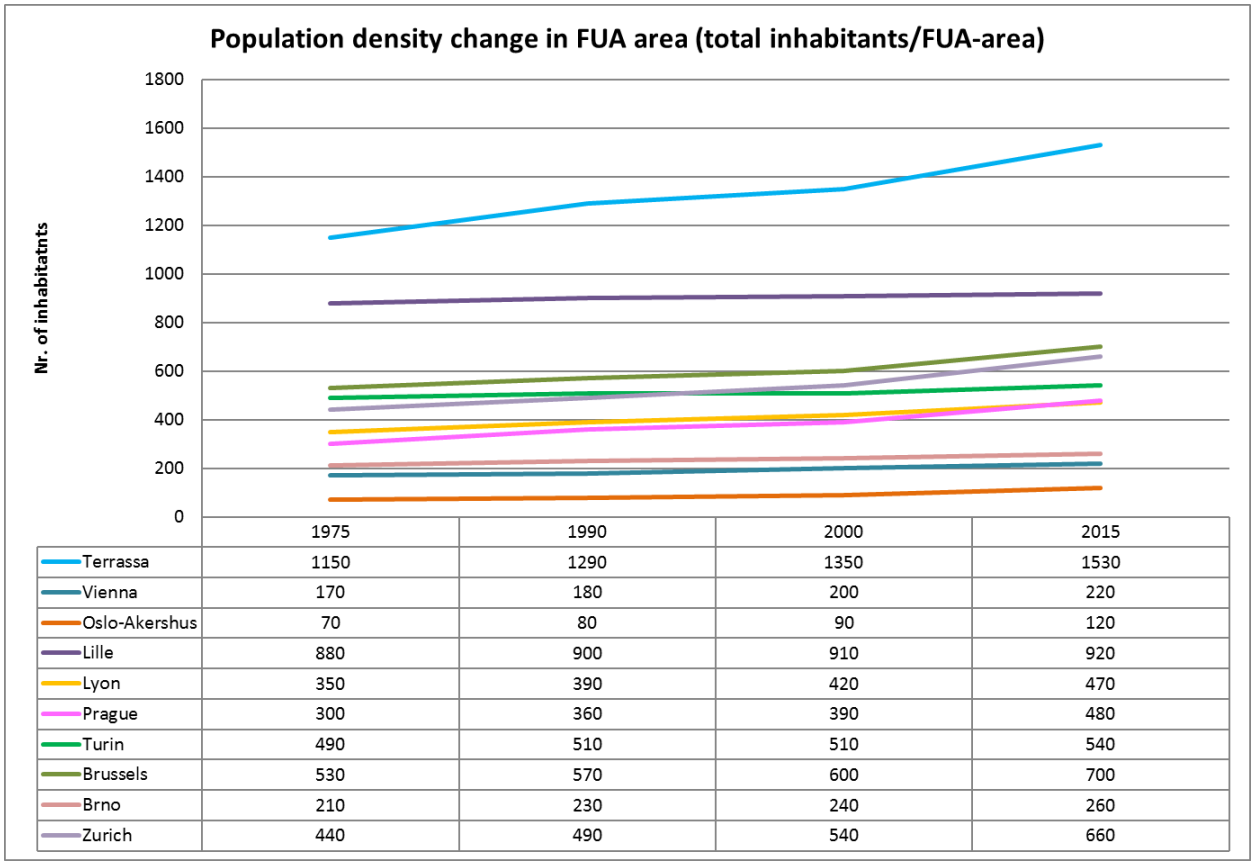
Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

Figure 1.13 Relative population change in the FUAs of the stakeholder cities



Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

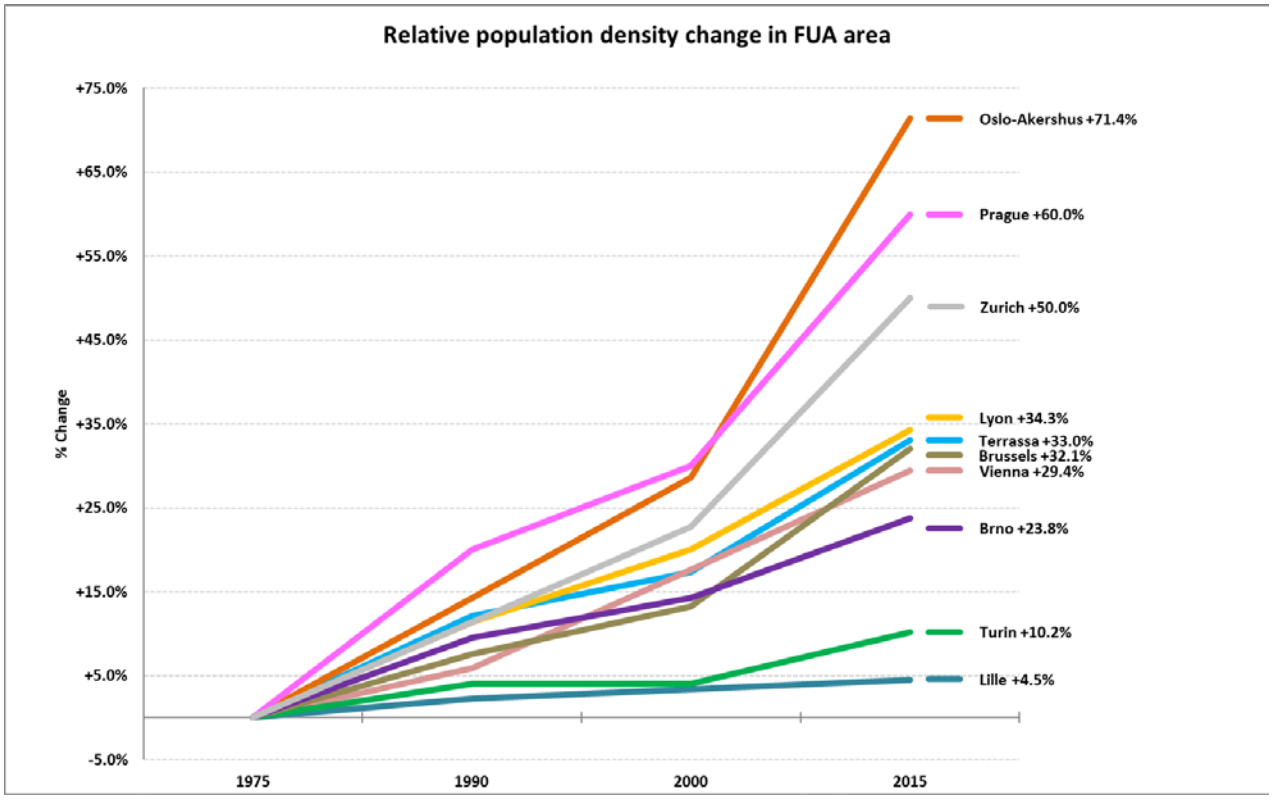
Figure 1.14 Population density change in the FUAs of the stakeholder areas



	1975	1990	2000	2015
Terrassa	1150	1290	1350	1530
Vienna	170	180	200	220
Oslo-Akershus	70	80	90	120
Lille	880	900	910	920
Lyon	350	390	420	470
Prague	300	360	390	480
Turin	490	510	510	540
Brussels	530	570	600	700
Brno	210	230	240	260
Zurich	440	490	540	660

Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

Figure 1.15 Relative population density change in the FUAs of the stakeholder areas

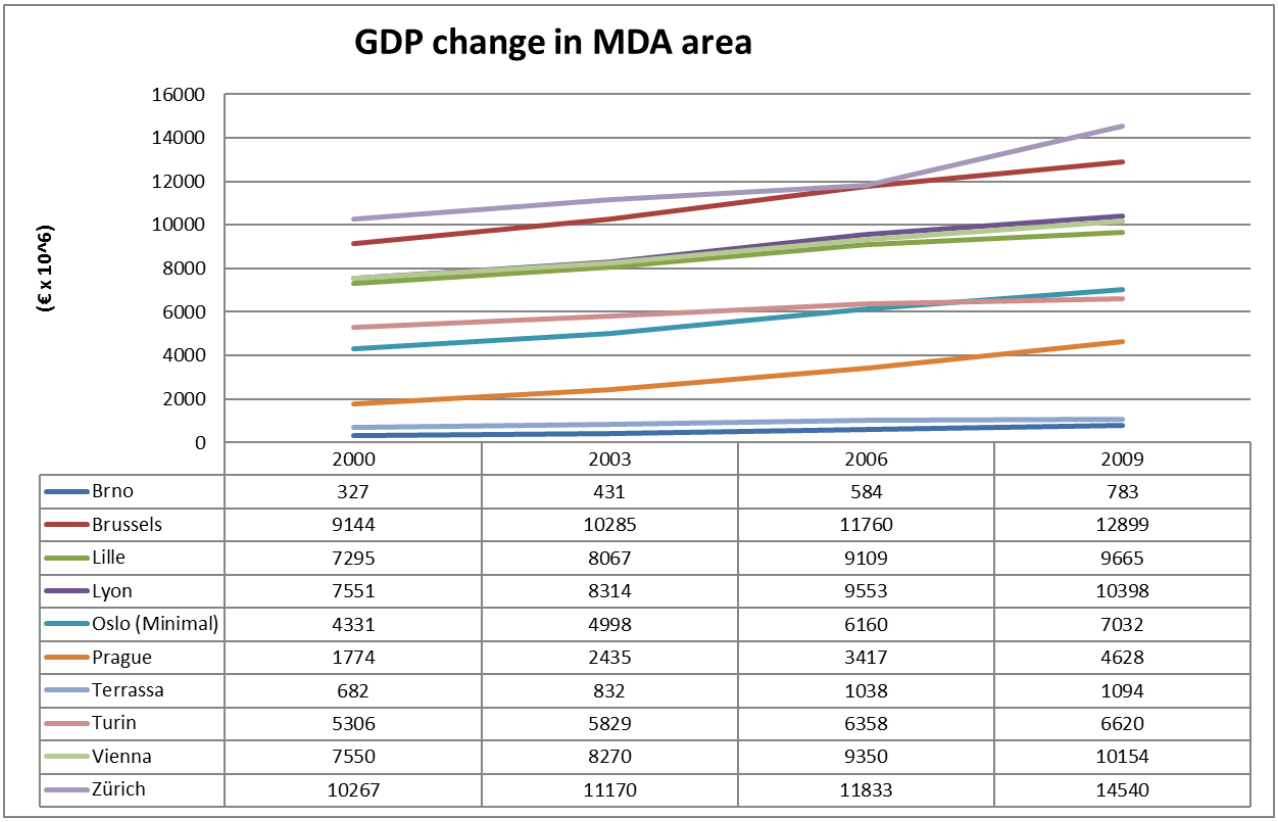


Source: European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

1.3 GDP trends

1.3.1 Metropolitan Development Area (MDA)

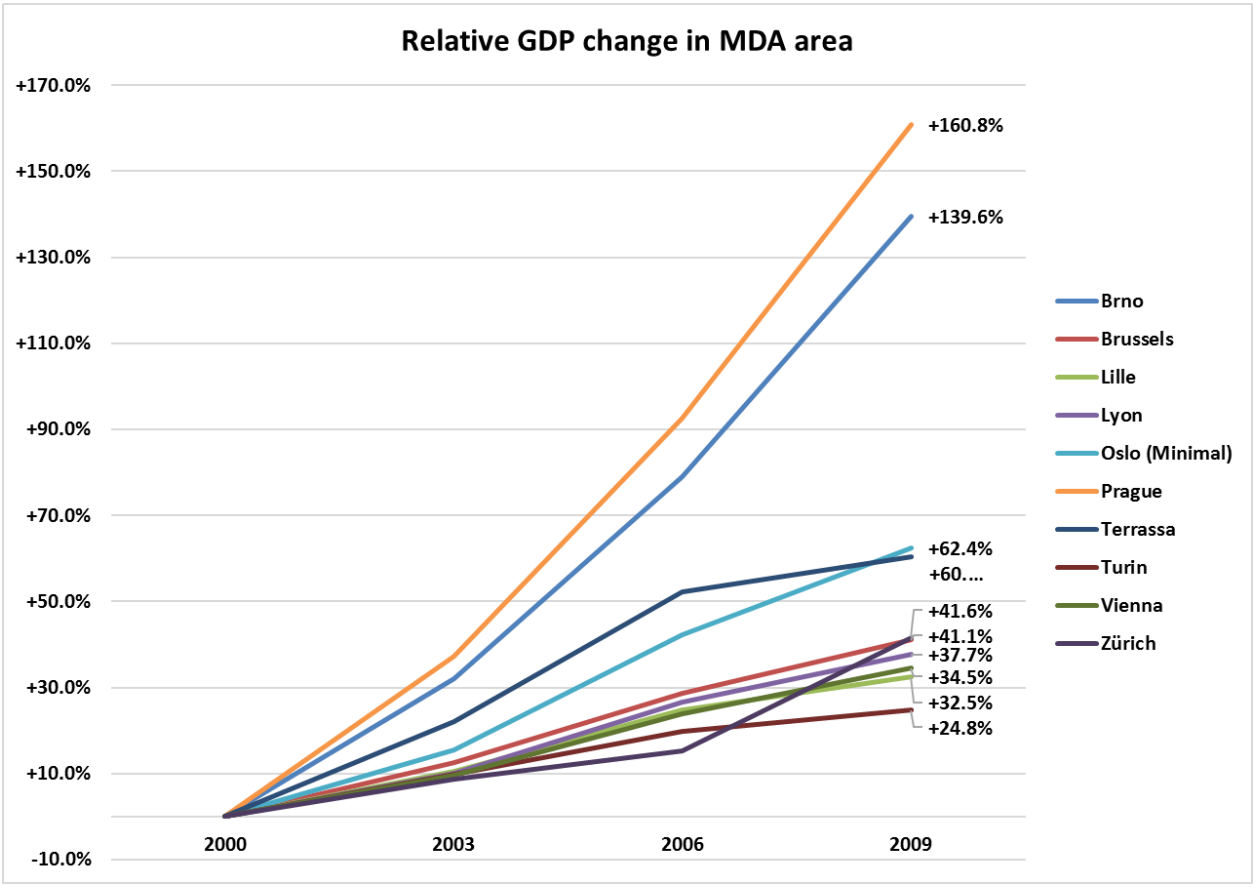
Figure 1.16 Overview of GDP change in the MDAs of the stakeholders' areas



	2000	2003	2006	2009
Brno	327	431	584	783
Brussels	9144	10285	11760	12899
Lille	7295	8067	9109	9665
Lyon	7551	8314	9553	10398
Oslo (Minimal)	4331	4998	6160	7032
Prague	1774	2435	3417	4628
Terrassa	682	832	1038	1094
Turin	5306	5829	6358	6620
Vienna	7550	8270	9350	10154
Zürich	10267	11170	11833	14540

Source: EUROSTAT (2011), Urban OLAP Cube (2009)

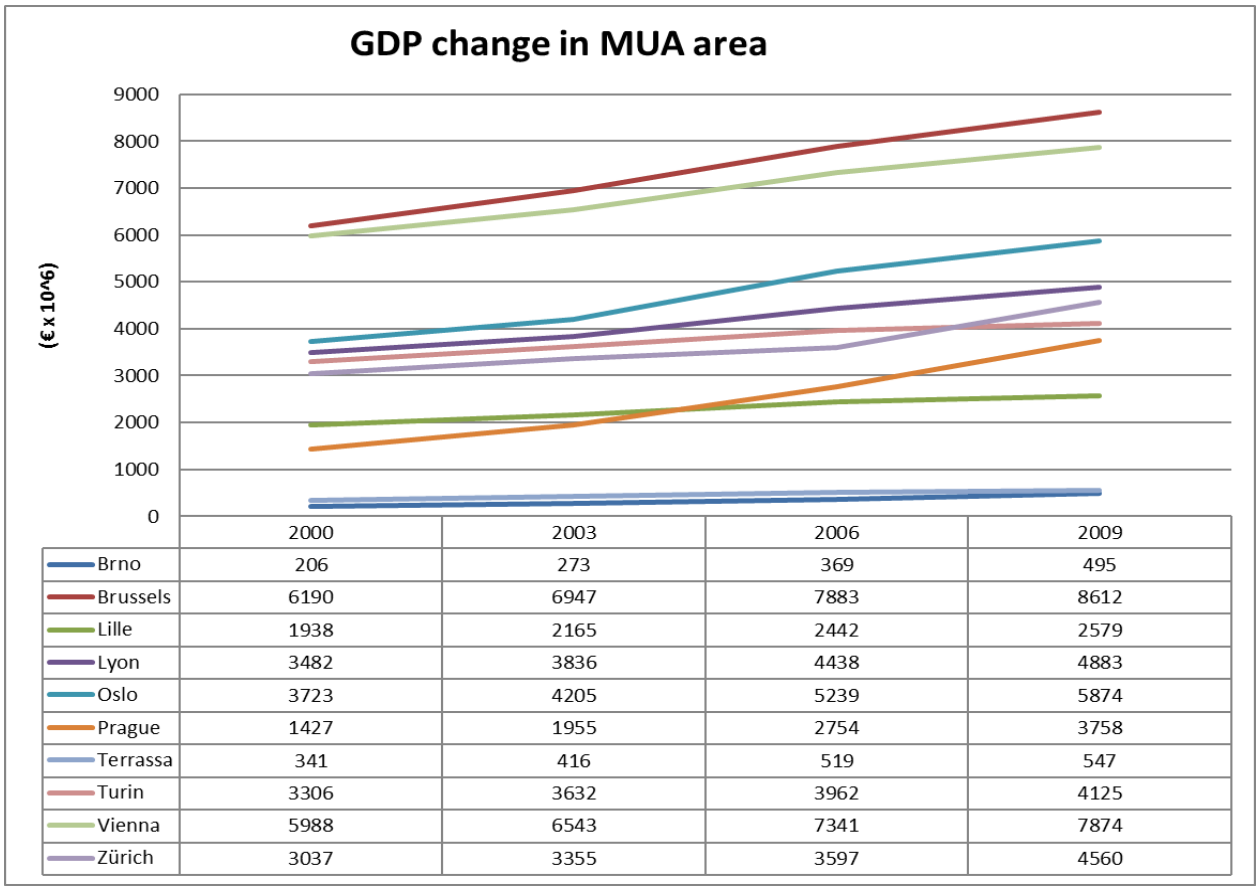
Figure 1.17 Relative GDP change in the MDAs of the stakeholders' areas



Source: EUROSTAT (2011), Urban OLAP Cube (2009)

1.3.2 Morphological Urban Area (MUA)

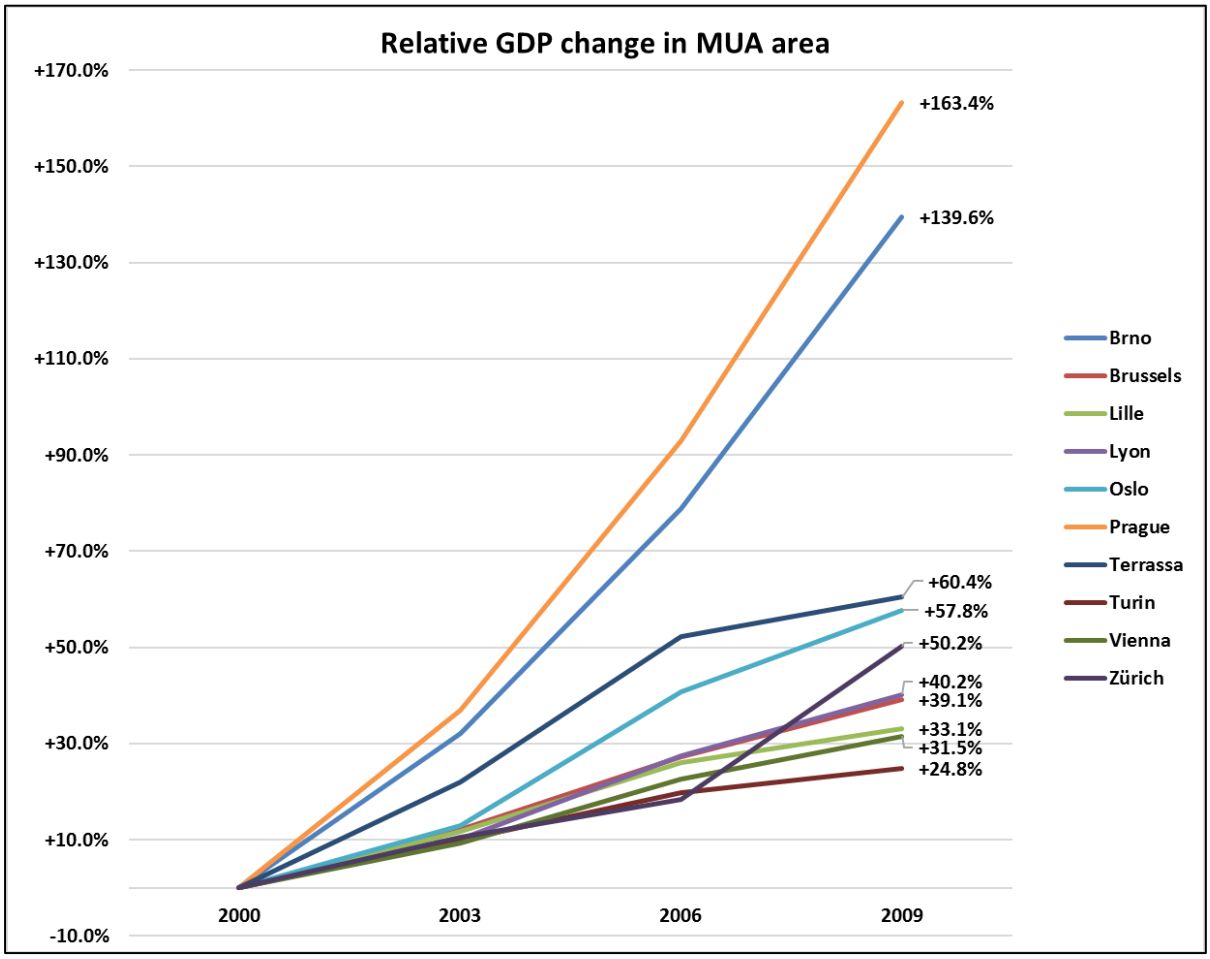
Figure 1.18 Overview of GDP change in the MUAs of the stakeholders' areas



	2000	2003	2006	2009
Brno	206	273	369	495
Brussels	6190	6947	7883	8612
Lille	1938	2165	2442	2579
Lyon	3482	3836	4438	4883
Oslo	3723	4205	5239	5874
Prague	1427	1955	2754	3758
Terrassa	341	416	519	547
Turin	3306	3632	3962	4125
Vienna	5988	6543	7341	7874
Zürich	3037	3355	3597	4560

Source: EUROSTAT (2011), Urban OLAP Cube (2009)

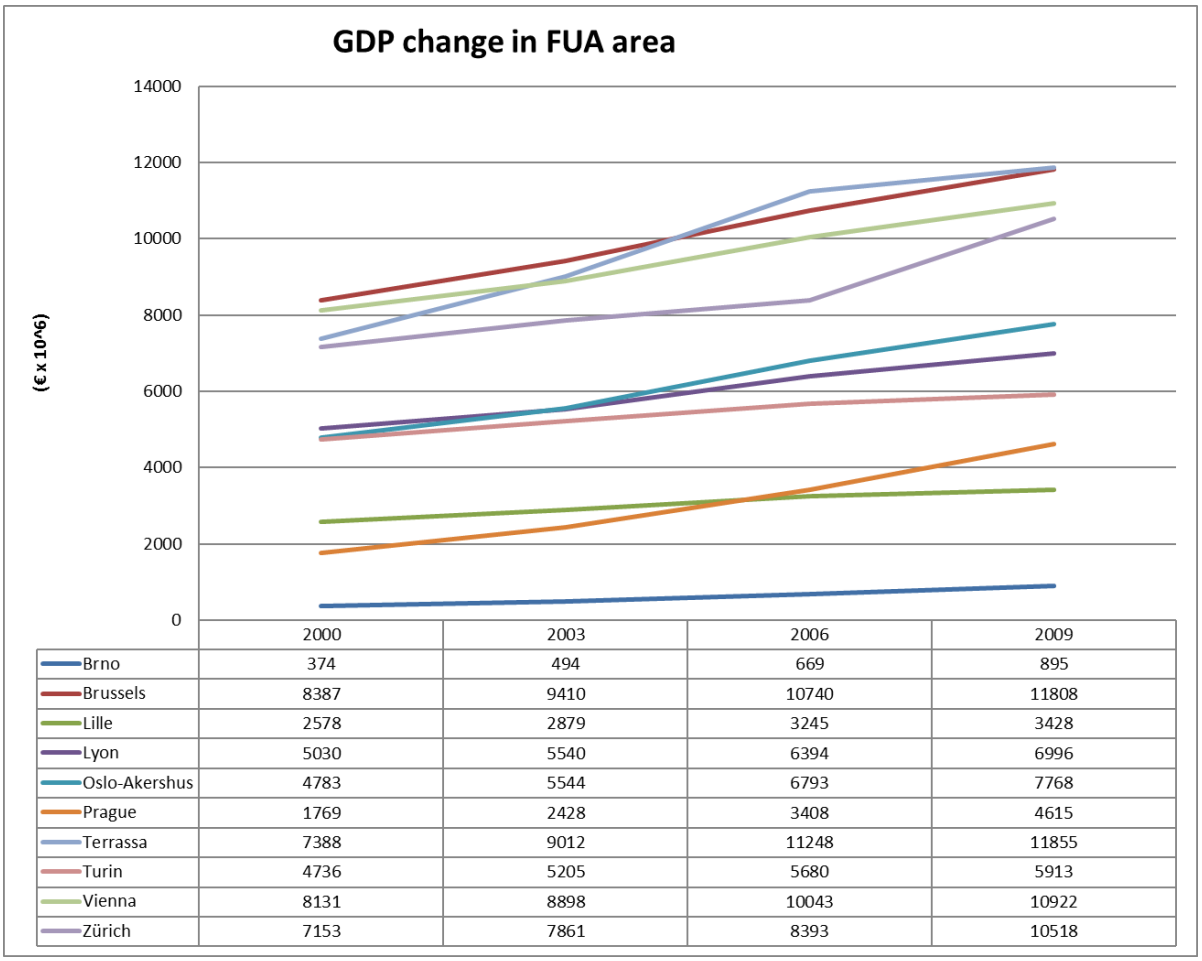
Figure 1.19 Relative GDP change in the MUAs of the stakeholders' areas



Source: EUROSTAT (2011), Urban OLAP Cube (2009)

1.3.3 Functional Urban Area (FUA)

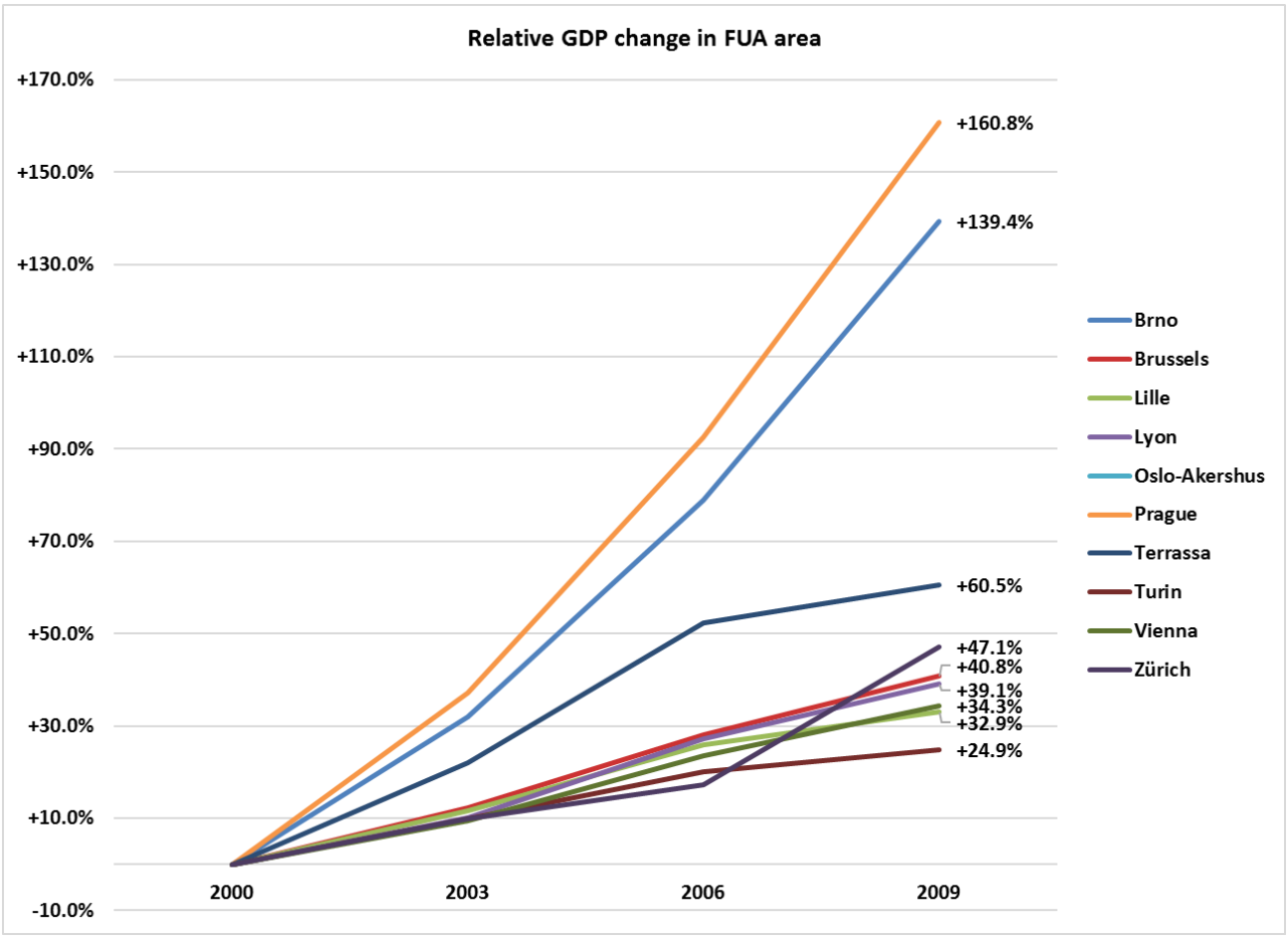
Figure 1.20 Overview of GDP change in the FUAs of the stakeholders' areas



	2000	2003	2006	2009
Brno	374	494	669	895
Brussels	8387	9410	10740	11808
Lille	2578	2879	3245	3428
Lyon	5030	5540	6394	6996
Oslo-Akershus	4783	5544	6793	7768
Prague	1769	2428	3408	4615
Terrassa	7388	9012	11248	11855
Turin	4736	5205	5680	5913
Vienna	8131	8898	10043	10922
Zürich	7153	7861	8393	10518

Source: EUROSTAT (2011), Urban OLAP Cube (2009)

Figure 1.21 Relative GDP change in the FUAs of the stakeholders' areas

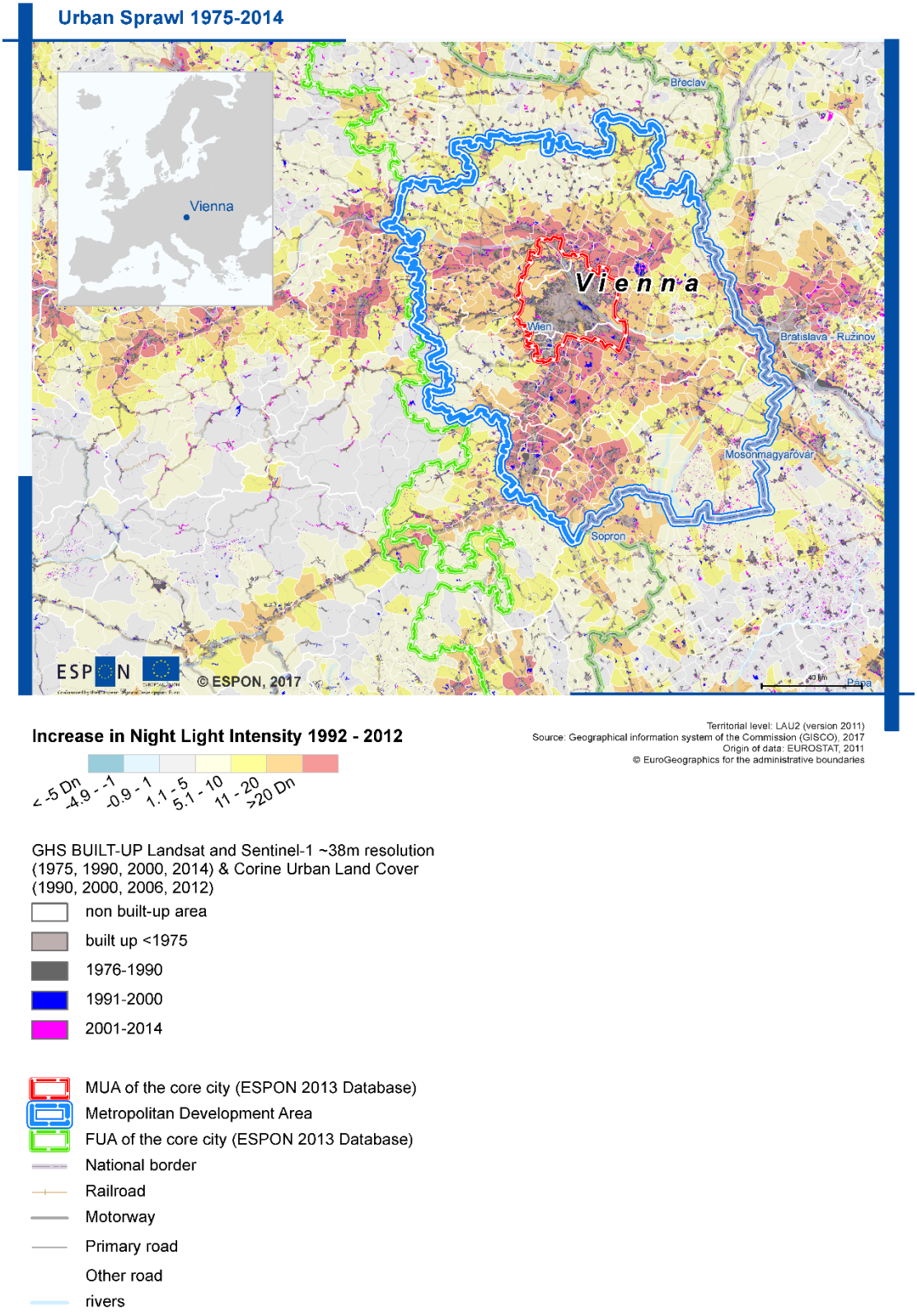


Source: EUROSTAT (2011), Urban OLAP Cube (2009)

2 Urban sprawl

2.1 Vienna

Map 2.1Urban sprawl in Vienna MA (1990-2012)



Source: Copernicus CORINE Land Cover (CLC 1990-2012); GHS built-up grid, European Commission, Joint Research Centre (JRC) Pesaresi et al. (2015)

Due to the high prices of the land and the intense urbanization in the past in and around Vienna, there is a moderate, but steadily growing population number in the last decade. There are no large differences in the population growth within the MDA, MUA and FUA (Fig. 1.4, 1.9, and 1.13). Yet, during the coming 20 years, it is expected that this growth trend will increase and bring about 170,000-200,000 new dwellers in the metropolitan area.

The real sprawl is visible just outside the MUA, in the north-west border, with some recent urban expansion in the southern border, and around development of infrastructure. The sprawl is limited by the presence of the mountains in the south-west and by the lake in the southeast.

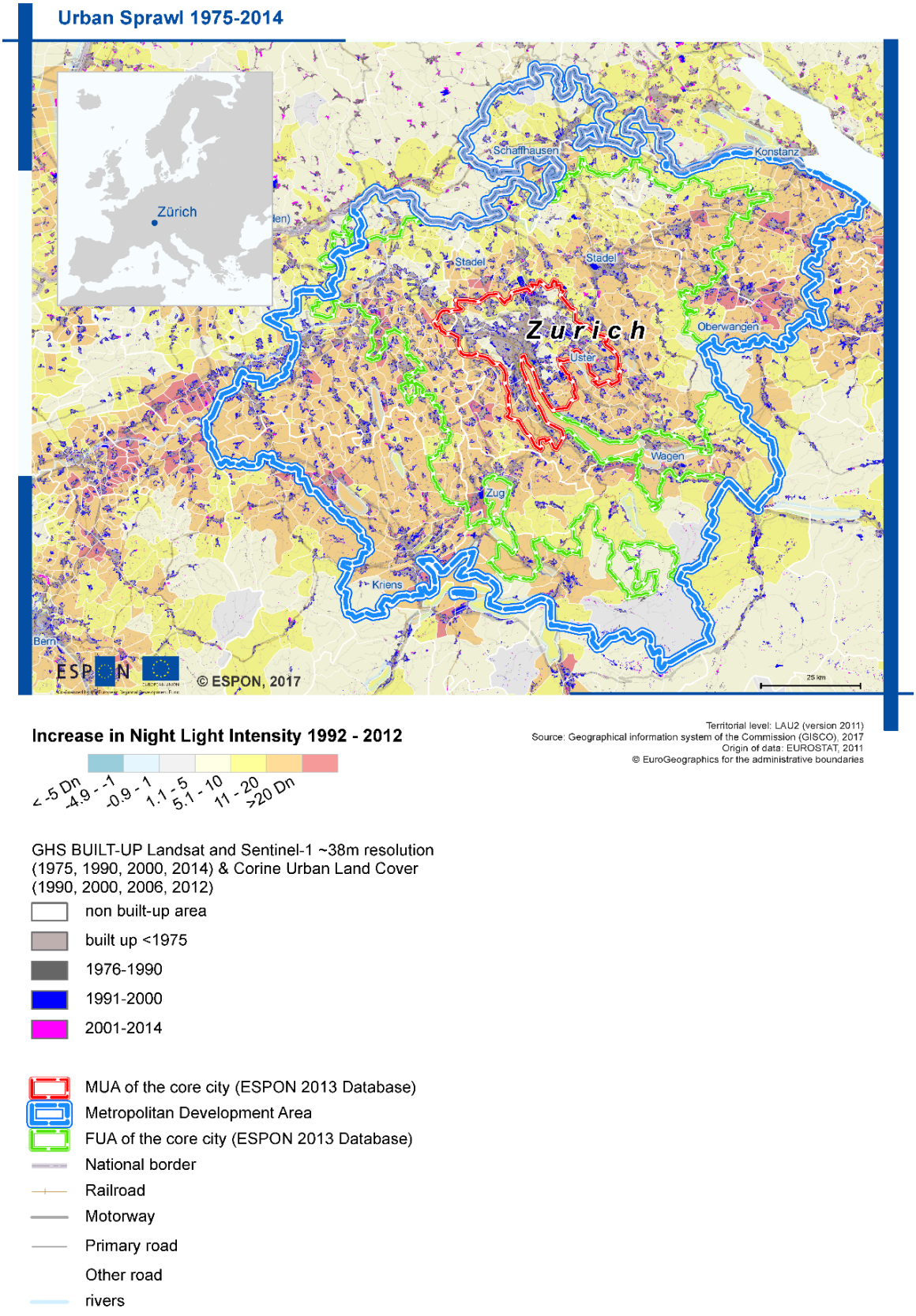
On the East side, instead, the urban expansion continues due to the proximity of Bratislava. In particular, it concentrates on the trans-border corridor connecting the two countries along the Danube.

In the North of Vienna, urban sprawl is limited within the MDA scale and it is characterized by smaller recent sprawls in the neighbouring municipalities, which creates satellite-municipalities.

In conclusion, despite the statistical evidence, showing that relative population density trends are similar in MUA and MDA, the MUA has consolidated its shape, while the MDA presents multidirectional urban development and beyond. Future planning will densify the metropolitan development alongside the main infrastructure.

2.2 Zurich

Map 2.2 Urban sprawl in Zurich MA (1992-2012). CLC 1990 does not exist for Zürich



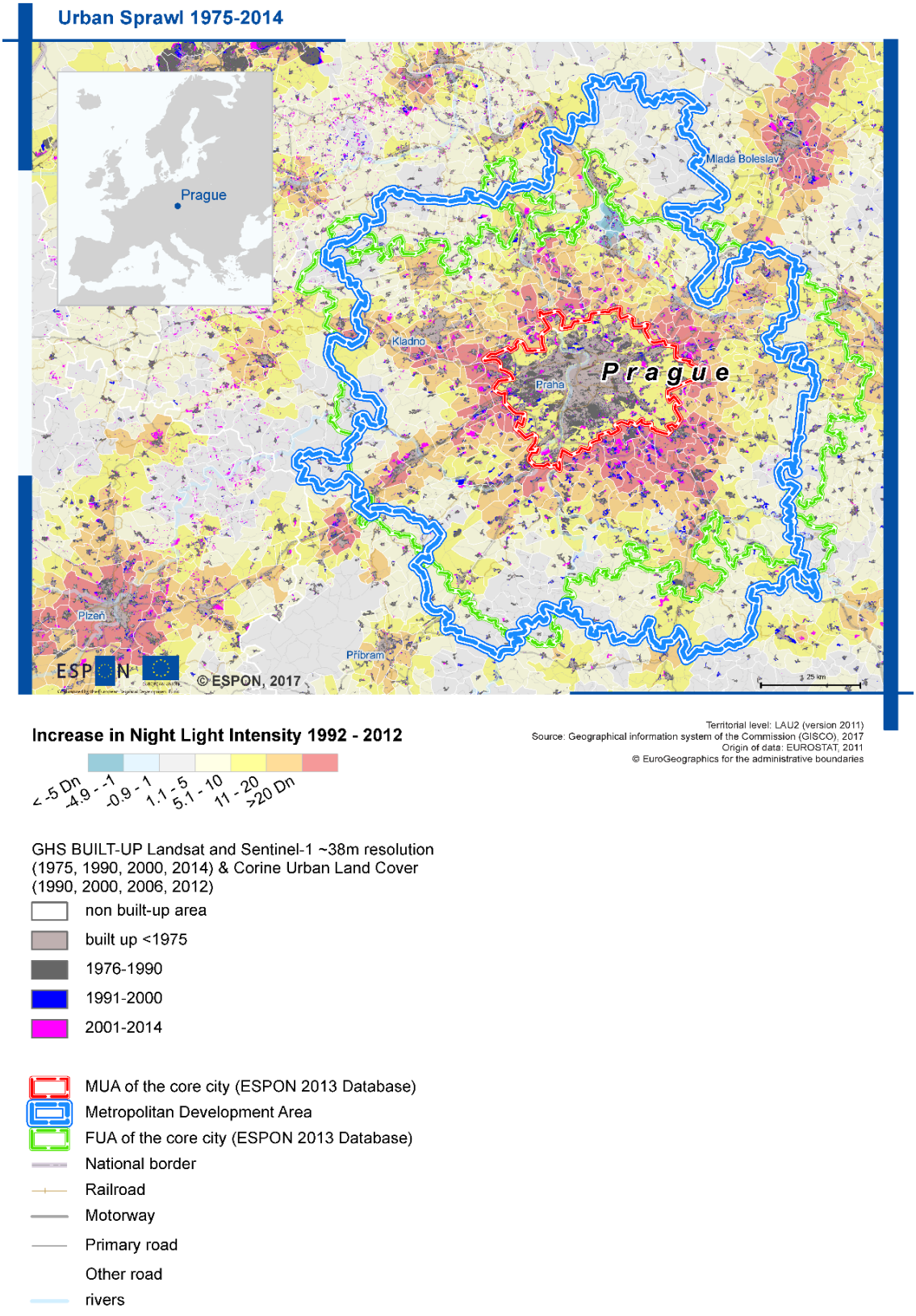
Source: Copernicus CORINE Land Cover (CLC 1990-2012); GHS built-up grid, European Commission, Joint Research Centre (JRC) Pesaresi et al. (2015)

The map of Zurich MA clearly illustrates the spatial consequences of the rapid population growth: urban sprawl is taking place around the territory of the MDA. This also reflects the population growth trend, which is increasing uniformly during the last decade (Fig. 1.4-1.15). Similar trends are observed in the change of population number and density in the MUA and MDA while within the FUA the increase is slightly higher (Fig. 1.5, 1.9 and 1.13).

Urban growth is mostly present within the MDA border, focusing on the municipalities surrounding Zurich (FUA is one of the most urbanized between the analysed cities). The core city is increasing its urban density, especially along the lake of Zurich. In particular, future intentions in the spatial planning strategy foresee 80% of population growth. The past sub-urban sprawl in the municipalities surrounding Zurich has been generated by the implementation of the public transport structure that connects the periphery to the core urban area. This consequently intensified the growth of population density and urban sprawl around the transportation hubs. While the urban sprawl is homogenous in all the areas of the MA, the GDP growth has a concentric configuration because it decreases when moving away from the MUA, the FUA going to the MDA.

2.3 Prague

Map 2.3 Urban sprawl in Prague MA (1990-2012)



Source: Copernicus CORINE Land Cover (CLC 1990-2012); GHS built-up grid, European Commission, Joint Research Centre (JRC) Pesaresi et al. (2015)

Prague urban development has a clear radial structure moving uniformly from its central and older core to the surrounding territory. The expansion of the urban area is taking place around multi-directional rays of the main road infrastructure, connecting the city centre with the other key municipalities of the hinterland and towards other bigger cities outside the MDA.

The FUA area embraces the urban sprawl of Prague MA except for two zones, one in the south and one in the southeast, which are characterised by natural areas and wetlands.

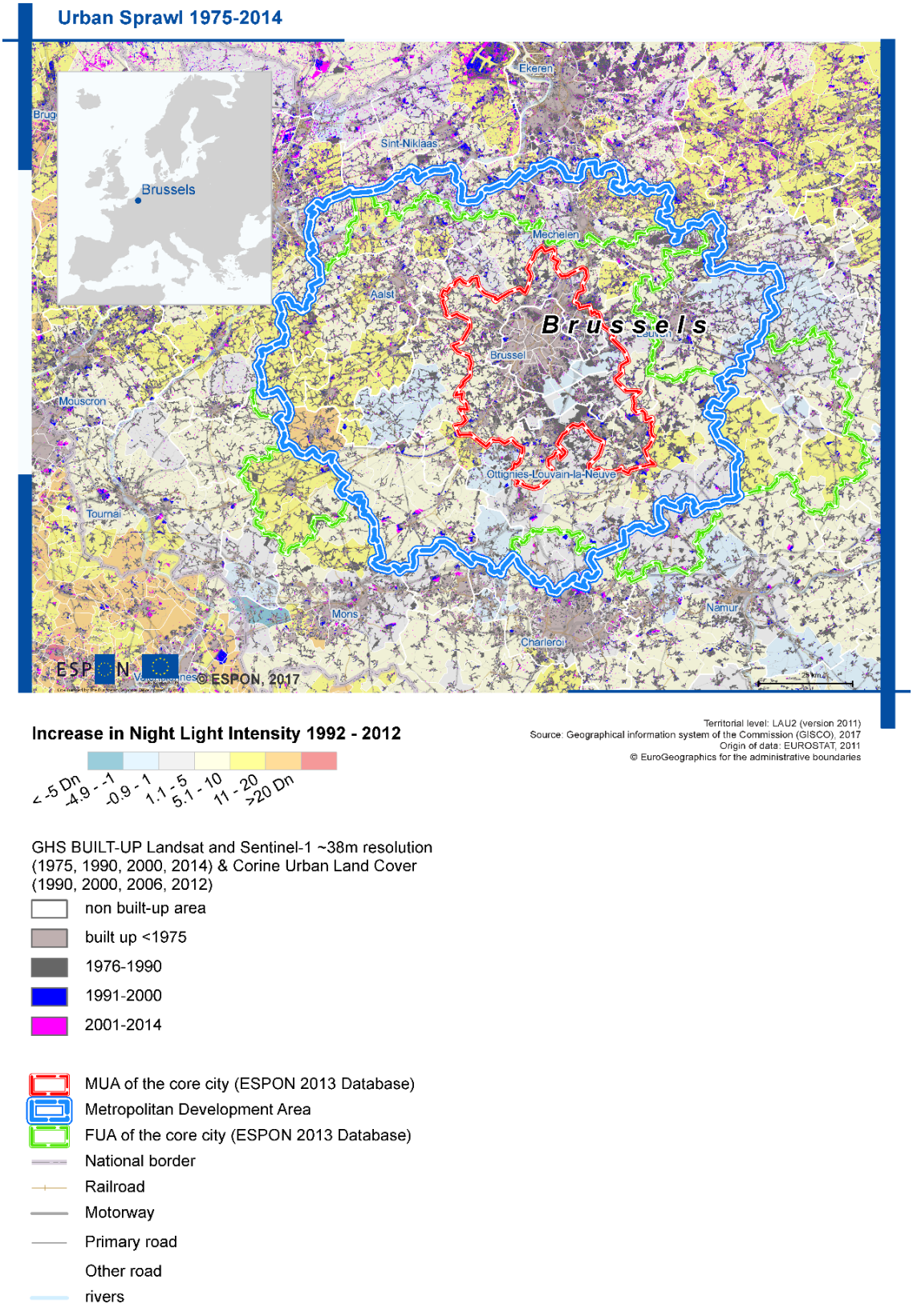
Since 55 % of the MUA – core urban area of Prague is already urbanized (Fig. 1.3), the most intense new urban growth is taking place around and beyond the edges of the MUA (similar to Vienna). This corresponds to the increasing suburbanization around Prague and the rising land values, particularly in the southeast zone.

Meanwhile, current urban growth trends indicate that population numbers and densification steadily increase. More intensive growth is observed the FUA and in the MDA, while the MUA has more gradual increase in population due to already rather densified urban environment in the past (Fig. 1.4-1.15). While suburbanization peaked in the mid-2000s, urban sprawl is continuing at a slower pace. Despite the fact that recent legislation promotes compact urban development, developments are taking place outside Prague, increasing land, and housing prices. Urban sprawl is continuing even beyond the currently delineated MDA of Prague (ITI).

The relative growth within the MDA based on GDP indicator is >160%, which is the highest among other cities. Meanwhile, population growth increased after 2006, highlighting economic and demographic growth in and beyond Prague.

2.4 Brussels

Map 2.4 Urban sprawl in Brussels MA (1990-2012)



Source: Copernicus CORINE Land Cover (CLC 1990-2012); GHS built-up grid, European Commission, Joint Research Centre (JRC) Pesaresi et al. (2015)

Brussels MA is characterised by an intense web of earlier urban developments, along the road infrastructure. Although intensification of urban functions is continuing within the area, the more recent urban sprawl is taking place between the remaining open areas. As Brussels is already heavily urbanised during the previous years the MDA area does not visibly illustrate an intense sub-urbanization trend beyond its borders. More recent urban sprawl is visible in the northern zone (Flemish area) outside the MDA.

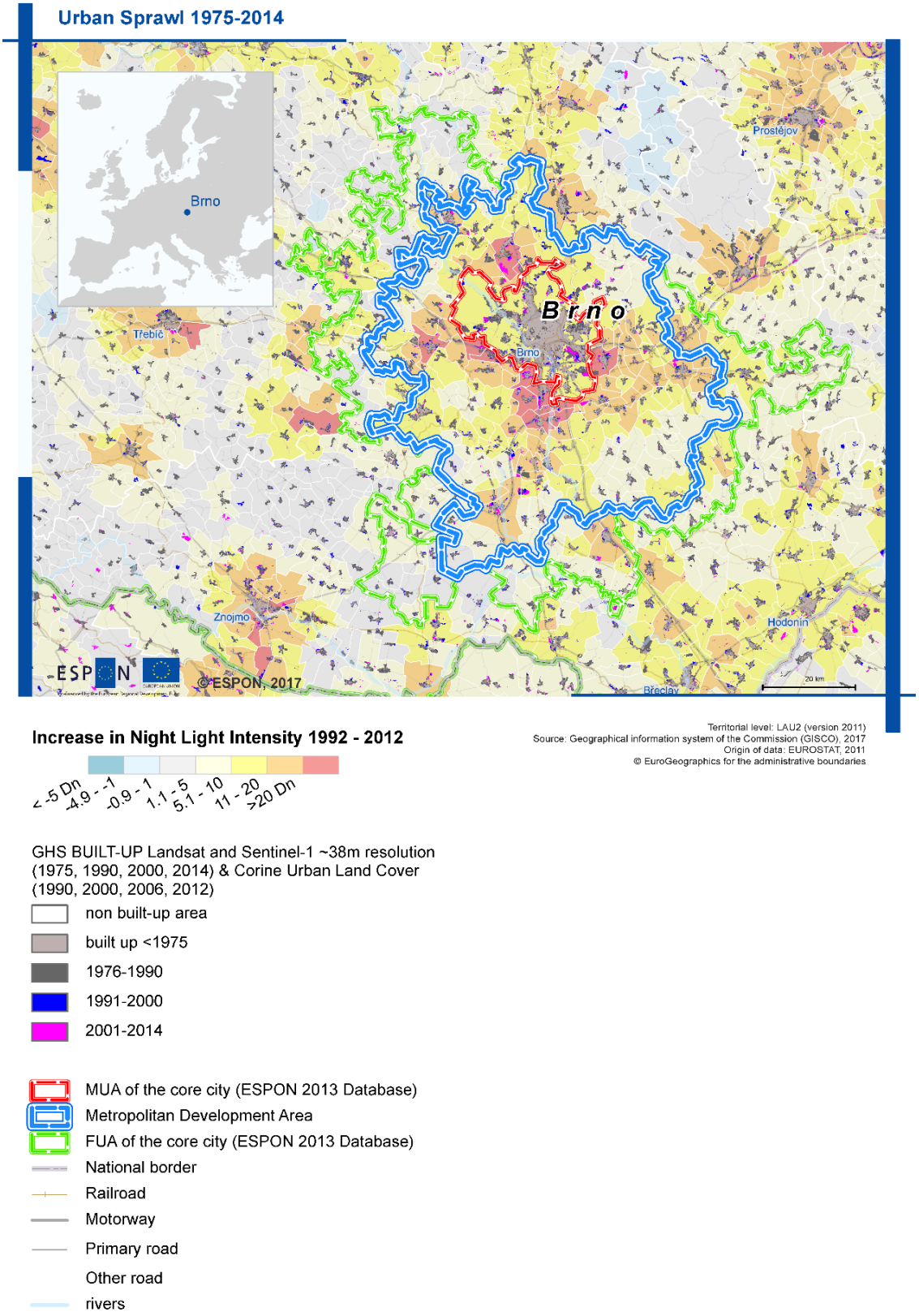
The MUA crosses the densest and consolidated urban structure of Brussels city, while the FUA and the MDA borders are dividing the key urban agglomeration from the other adjacent agglomerations. The adjacent secondary urban cores are showing higher urban development than Brussels.

Brussels is one of the most urbanized metropolitan areas among other cities in this study. About 33 % of the MDA territory is urbanized. Due to the intense urban development, between1975-1990, in the recent period Brussels' population has been increasing and being regulated by the policy of the Brussels- Capital region. There is a steady population growth observed between the years 2000 and 2015 in and around Brussels. While within the MDA and FUA similar growth patterns are observed, within the MUA the population growth and densification is slightly higher (Fig. 1.4-1.15). The MUA of Brussels' has one of the fasted increasing population density trend compare to other European cities.

Current trends show that Brussels may face an uneven spatial distribution of the increasing population, which will densify the MUA zone and develop the metropolitan area in the North West. The relation between the core city and its sub-urban area is becoming stronger as the demands for new jobs and more attractive living environment increases as well.

2.5 Brno

Map 2.5 Urban sprawl in Brno MA (1990-2012)



Source: Copernicus CORINE Land Cover (CLC 1990-2012); GHS built-up grid, European Commission, Joint Research Centre (JRC) Pesaresi et al. (2015)

The most intense urban sprawl in Brno MA is taking place immediately outside the MUA perimeter, due to the facts that the city core. This is a result of an intensive urbanization during the past decades and from the new masterplan, limiting further expansion. The MUA, includes the old development of the city and a part of more recent one, in its surrounding, especially in the west zone. Within the MDA and FUA borders urban growth takes place both towards the neighbouring cities (such as Prostějov and Vyškov), and towards the core city of Brno.

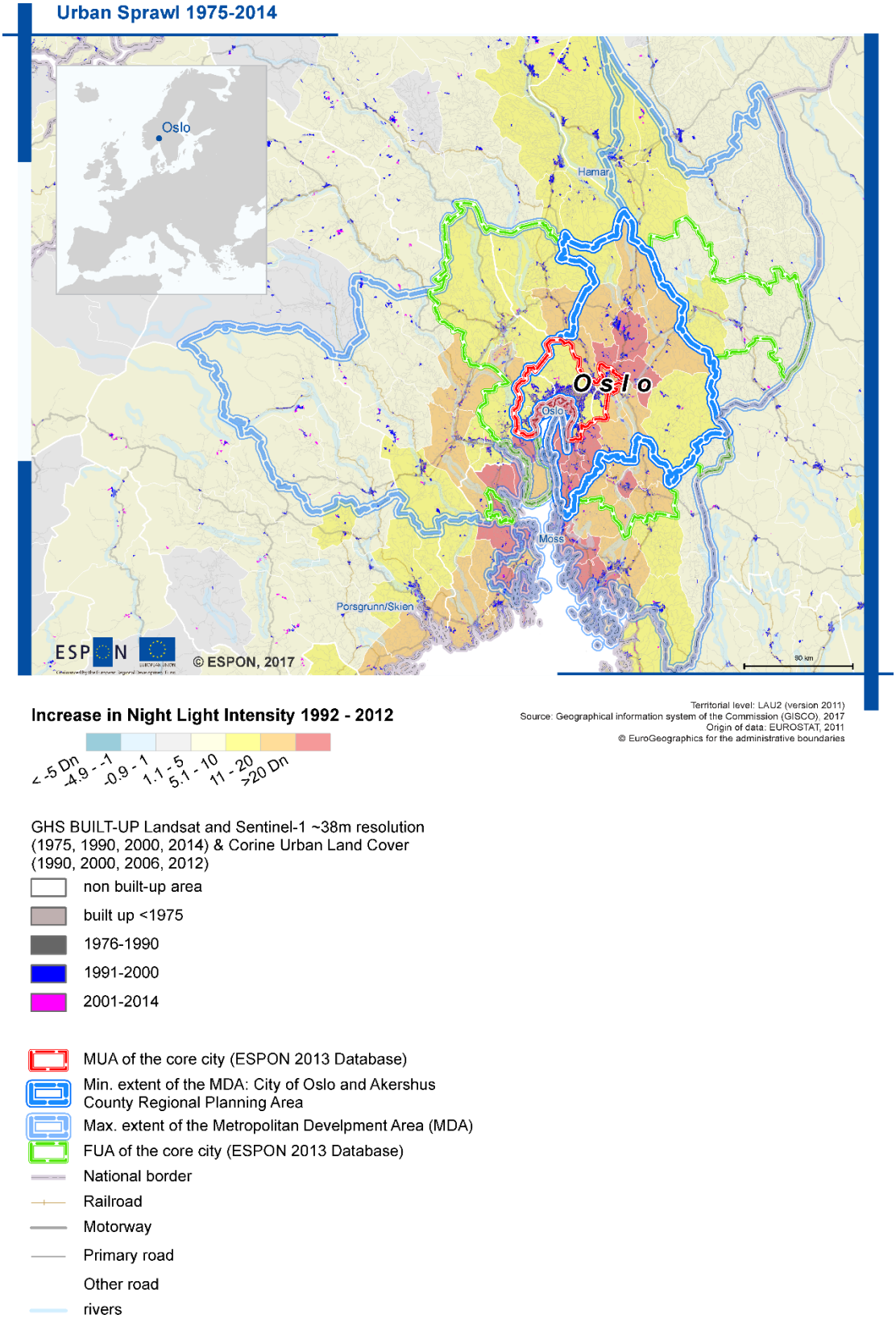
Current trends show that the MDA and FUA, if compared to the MUA, have been less urbanized in the past and are currently accommodating the recent population growth. In the beginning of the 2000s, Brno faced some stagnation of population growth (Fig. 1.5). After this period and until 2015 and currently, the population growth is a gradual population growth in the MUA, FUA and the MA of Brno (Fig. 1.4-1.15). Population density increases fastest in the MDA area.
The GDP has a similar increasing trend for all delineated areas.

The density of the built environment is higher in correspondence to the available infrastructure. They connect Brno to other satellite cities and demonstrate the close relation between the development of infrastructure and the consequent urban sprawl. Moreover, in the municipalities surrounding Brno, where land use planning is left to the single municipalities, urbanization is more uncontrolled due to available residential land.

The urban development based on the land use, population and GDP trends, shows both economic and population growth taking place within and beyond Brno. Both urban intensification and sub-urbanization are taking place with densification particularly in the MUA and a noticeable urban sprawl along infrastructures and outside the MUA and towards the MDA.

2.6 Oslo & Akershus

Map 2.6 Urban sprawl in Oslo & Akershus MA (1992-2012).



Source: Copernicus CORINE Land Cover (CLC 1990-2012); European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015) (Note: CLC 1990 does not exist for Norway)

Oslo & Akershus urban development is influenced by the morphology of its territory, which is characterised by mountains in the east and west side, and the sea in the south. If compared to other metropolitan cities in this study, Oslo has rather low percentage of urbanization within the MUA, FUA and MDA, and forest is always the most prevalent land use (Tables 1.1, 1.2, 1.3). In particular, Oslo's MDA includes a large low urbanized natural area, which is not a typical structure for a metropolis.

Meanwhile, Oslo & Akershus metropolis has one of the highest index of population growth and density in the MUA and MDA (minimum) (Fig. 1.4-1.11). Due to its low urbanization, the area can easily accommodate future population growth, but the presence of the mountains limits the urban development mainly around the core of the city and along the coastal area. For this reason, differently from other metropolises, Oslo presents densification pattern within the MUA border. In particular, the most recent urban expansion is irregularly distributed along the coast in the southern zone of the area. It also extends in in northern valley before slowing down close to the mountains.

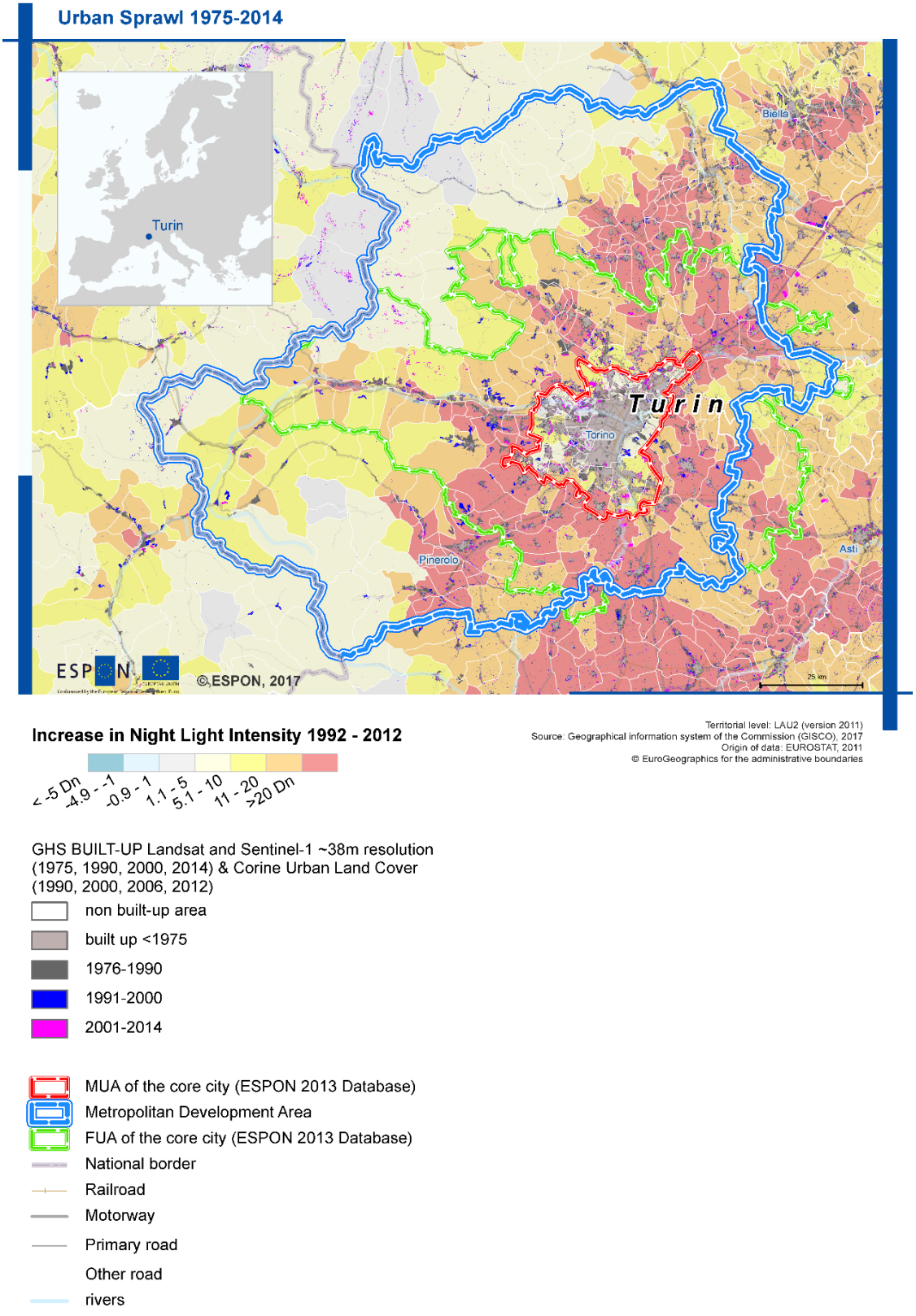
The night light intensity index for urban activity, shows a gradual V-shaped sprawl around Oslo, where the morphology of the territory allows growth.

The map above describes the actual situation in Oslo, where small municipalities are pursuing individual urbanization due to the lack of a coordinated planning at metropolitan scale. This shows the need for a more polycentric development of the area in order to mitigate future mobility problems arising from locally and regionally commuting population.

The urban sprawl of Oslo is strongly dependant on its physical characteristics. The delineation of the MDA corresponds well to these patterns and can be considered in the future strategic and spatial planning of the Metropolitan area of Oslo.

2.7 Turin

Map 2.7 Urban sprawl in Turin MA (1990-2012)



Source: Copernicus CORINE Land Cover (CLC 1990-2012); European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

The map above clearly illustrates that, due to the presence of the Alps in the north-west of Turin, the urbanization is mostly oriented to the southwest region towards Moncalieri, Chieri, until Asti, and to the northeast towards Settimo Torinese, in the direction of Milan.

An exception concerns the expansion of the MA in northwest direction; it is the recent case of Susa Valley, which connects the Pindemont region to France, where a new infrastructure corridor is under construction. Currently only 7 % of the MDA territory and 45% of the MUA is urbanized (Tables 1.1-1.3). Urbanization is clearly distinguishing the core area from the urban sprawl outside the MDA's border.

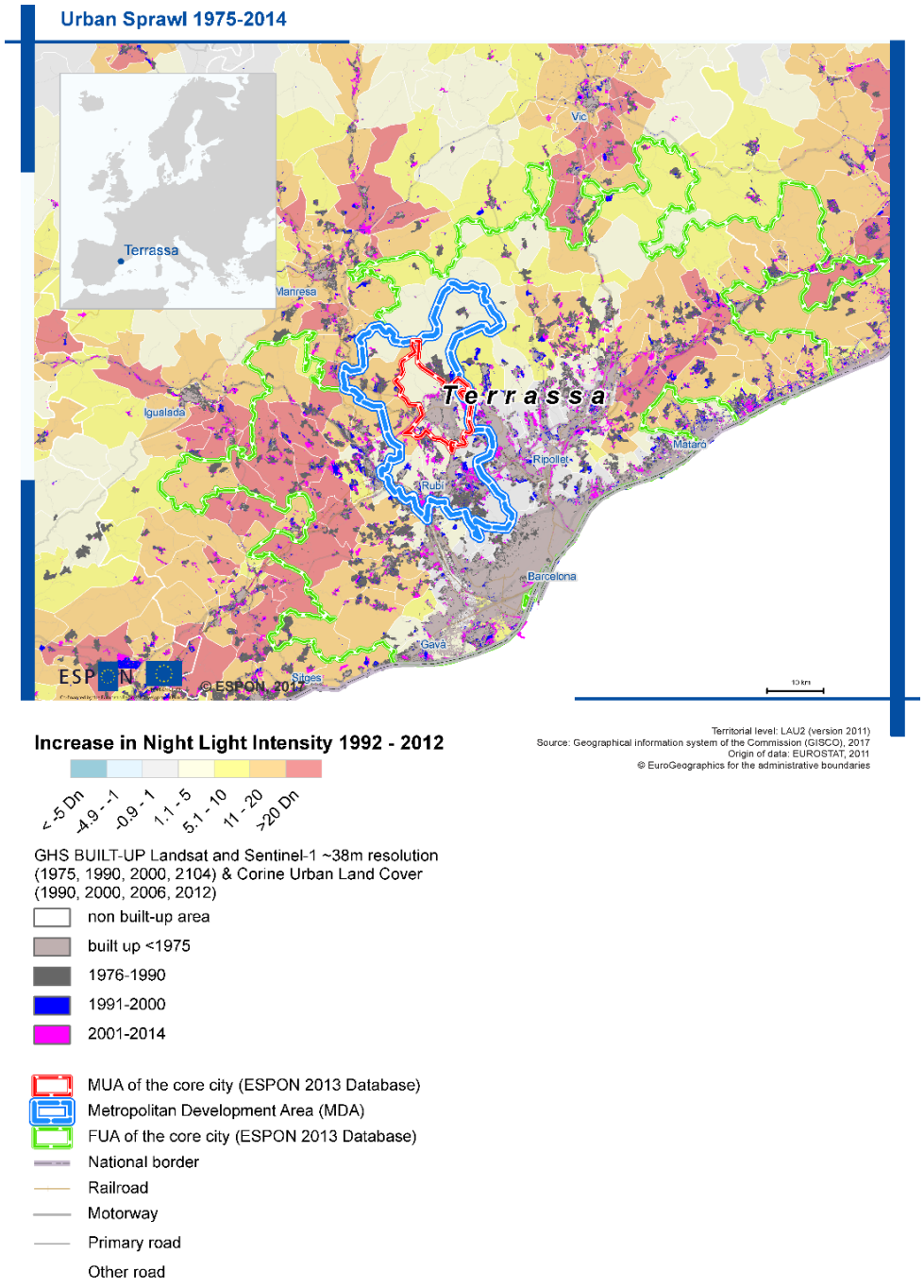
MDA and the FUA borders are delimiting the urban sprawl of the MDA in the south and northeast direction. At the same time, other cities near the MDA are growing towards Turin (e.g. Chiavasso). The MDA is divided in urban and natural area (incl. rural areas), showing fragmented natural landscape and large sized areas. In terms of land use, the MDA delineation corresponds to the administrative territory of the Metropolitan city of Turin.

Population growth trends indicate a stagnating population numbers and density within the MDA and particularly within the MUA (Fig. 1.4-1.8). This evidences that urban sprawl is taking place mostly outside and around the MUA border. The recent demographic trend relates to the economic recession of the past years (MCT has the lowest relative growth of GDP comparing to other SPIMA cities).

The resulted in increase of migration of population between Turin and its suburbs. This has been causing urban sprawl and mobility and accessibility issues, related to inefficiency of transport and public infrastructure in the suburban and in more remote areas in the periphery.

2.8 Terrassa

Map 2.8 Urban sprawl in Terrassa MA (1990-2012)



Source: Copernicus CORINE Land Cover (CLC 1990-2012); European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

Terrassa MA has an irregular and uncontrolled urban sprawl, which is due to the rapid population growth, influenced by its proximity to the Barcelona MA. Due to the close relation between the two metropolitan poles, the urban development should be analysed at the level of Barcelona's FUA, which includes both Terrassa, the coastal area and the zones in between.

The MDA border includes the oldest core of Terrassa and its neighbour satellite municipalities, especially in the south, such as Rubi' and Sabadell, but it dissects the Barcelona area, ignoring its strong influence. The MDA of Terrassa is focussed on the 11 municipalities included in the area's collaborative initiative and does not address larger spatial development of the entire metropolis of Barcelona and its FUA.

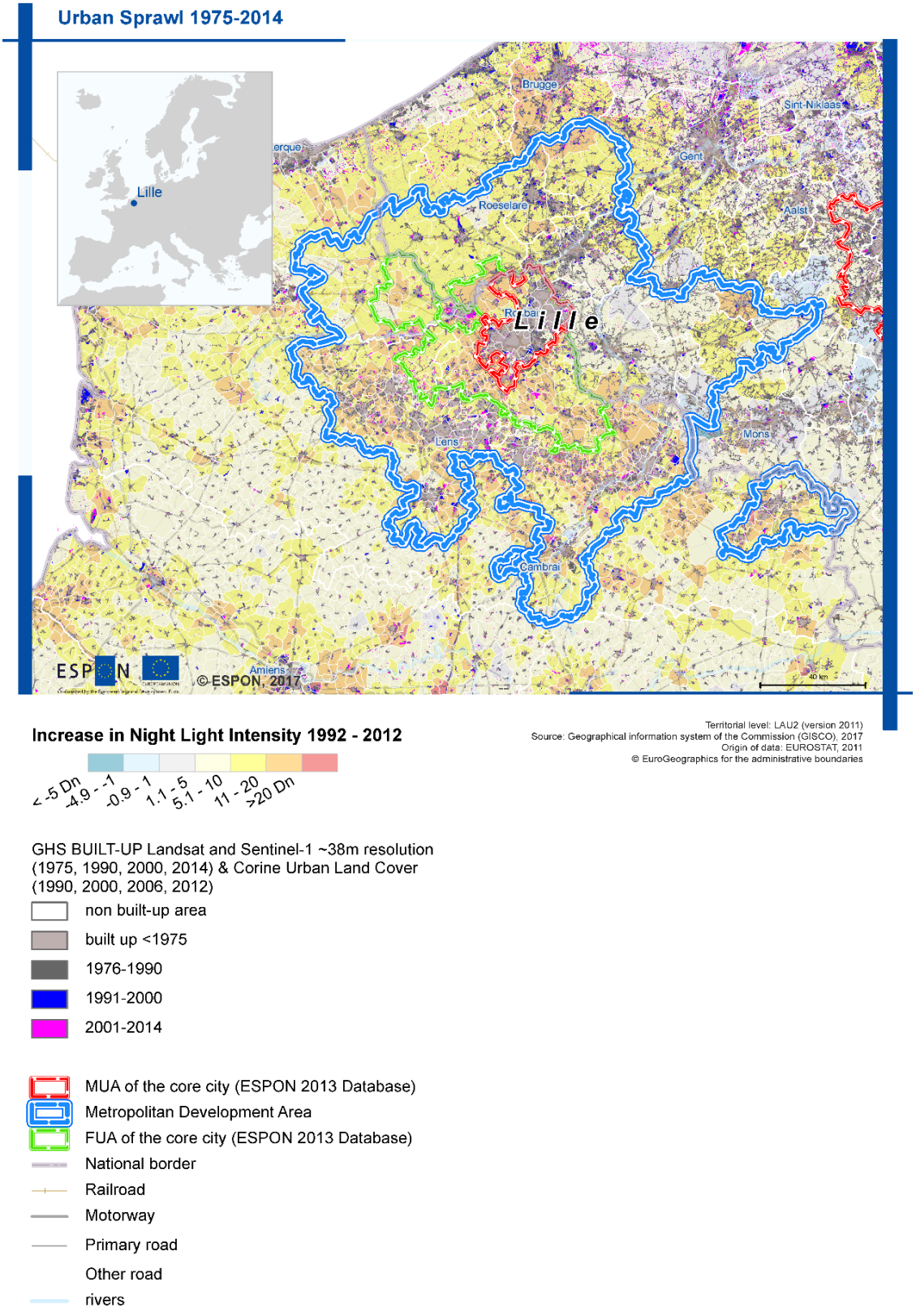
The highest intensity of urbanization is seen in irregular areas in the marginal zones of the FUA, which are creating a belt surrounding the MDA until it reaches the coast. The lack of a physical centre of development and the complicated legislation regulating the spatial planning results to uncontrolled urban sprawl.

Terrassa is characterised by rather high population number and density, spreading uniformly between MUA, FUA, and MDA (Fig. 1.4-1.15).

In conclusion, different factors such as lack of cooperation between municipalities, the lack of coordination of spatial plans, the influence of the nearby Barcelona Metropolitan Area and the economic recession are among some of the key factors influencing the development of Terrassa MA and its eleven municipalities. In the case of Terrassa MA the Barcelona's FUA should be considered as inclusive border to describe the urban growth in and around Terrassa.

2.9 Lille

Map 2.9 Urban sprawl in Lille MA (1990-2012)



Source: Copernicus CORINE Land Cover (CLC 1990-2012); European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

Due to the favourable morphology of its territory, the Lille Metropolitan Area (LMA) is characterized by high values of built land in the MDA and MUA. The map above, illustrates the relative low and sporadic urban sprawl as consequence of the already dense urbanization of the past decades. On the other side, Lille is characterised by the lowest relative population growth and density among the other SPIMA cities (Fig. 1.4-1.15). This is as well a consequence of the cross-border influence of Brussels and the Belgian border.

The map of LMA, shows an uniform and urban growth around the consolidated urban core within the MUA border and the surrounding agglomerations included in its borders, such as Lens. In particular, most of the recent expansion occurred after the 1990 is an extension of the older urban cores. The delineated MDA has a cross-border character and stretches across the Belgian border.

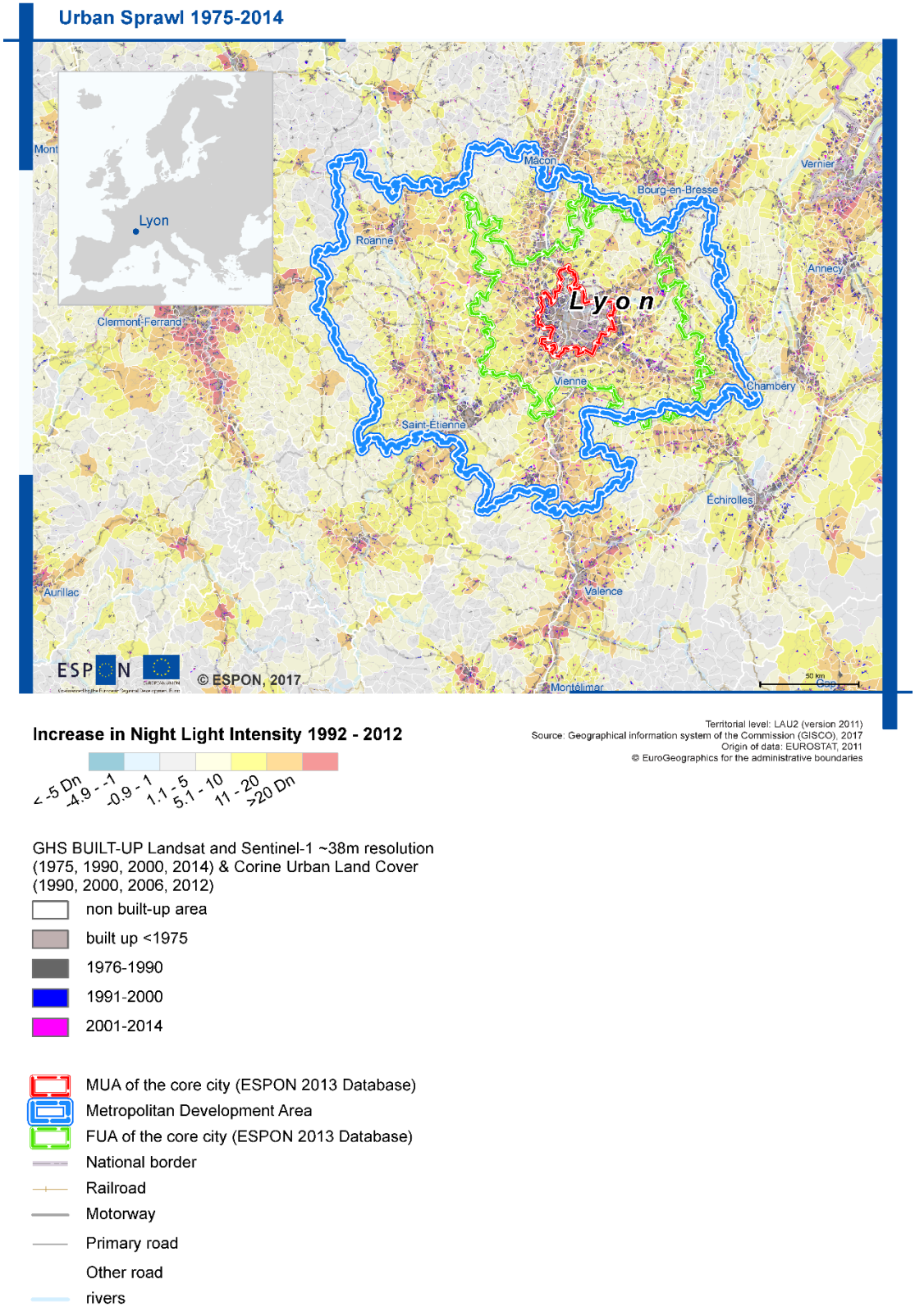
In the north and in the east of Lille, the FUA border shows ongoing urban sprawl. In the south, new urban extension is taking place, related to existing infrastructure. The FUA is embedded in the borders of the MDA being smaller than the MDA. The MDA delineation is based on a larger cross-border metropolis that streches beyond the conventional FUA.

Despite the close relation and exchange with France, urbanization is less evident in the east of Lille, while it shows higher indexes towards Brugge and Gent, in the north. In conclusion, it can be considered that the slow and limited urban sprawl affecting Lille might be a consequence of the combination of different factors including:

- Past intense urbanization
- Slow GDP growth
- Migration to the Belgian border.

2.10 Lyon

Map 2.10 Urban sprawl in Lyon MA (1990-2012)



Source: Copernicus CORINE Land Cover (CLC 1990-2012); European Commission, Joint Research Centre (JRC); Columbia University, Center for International Earth Science Information Network - CIESIN (2015)

The wide metropolitan area of Lyon, which occupies 12867km^2 of the French territory, is characterized by a polycentric development around the main core. Each centre, then, acts as a starter of its own urban sprawl until different cities and municipalities merge their influence areas, for instance, the municipalities along the Rhone River in the south of Lyon.

Lyon MDA includes the radial development of its oldest core and the increase of urban density around the rays. This is determined by the infrastructure connecting Lyon's city centre to its satellite-agglomerations. The delineated MDA fully embeds the core area of Lyon and its satellites under a unique metropolitan agglomeration as addressed in the strategic plan for Lyon metropolitan area.

Due to its large area, Lyon's MDA shows relatively low urbanization of its territory, about 11% (Fig. 1.1). At the scale of the FUA and MUA urbanization s much higher (Fig. 1.2 and 1.3). This matches with the consolidated built up area of the core city, which limits new urban sprawl.

Instead, new urban expansion is particularly concentrated in more empty areas, such as in the south east of the MDA border, following the direction of the main motorways.

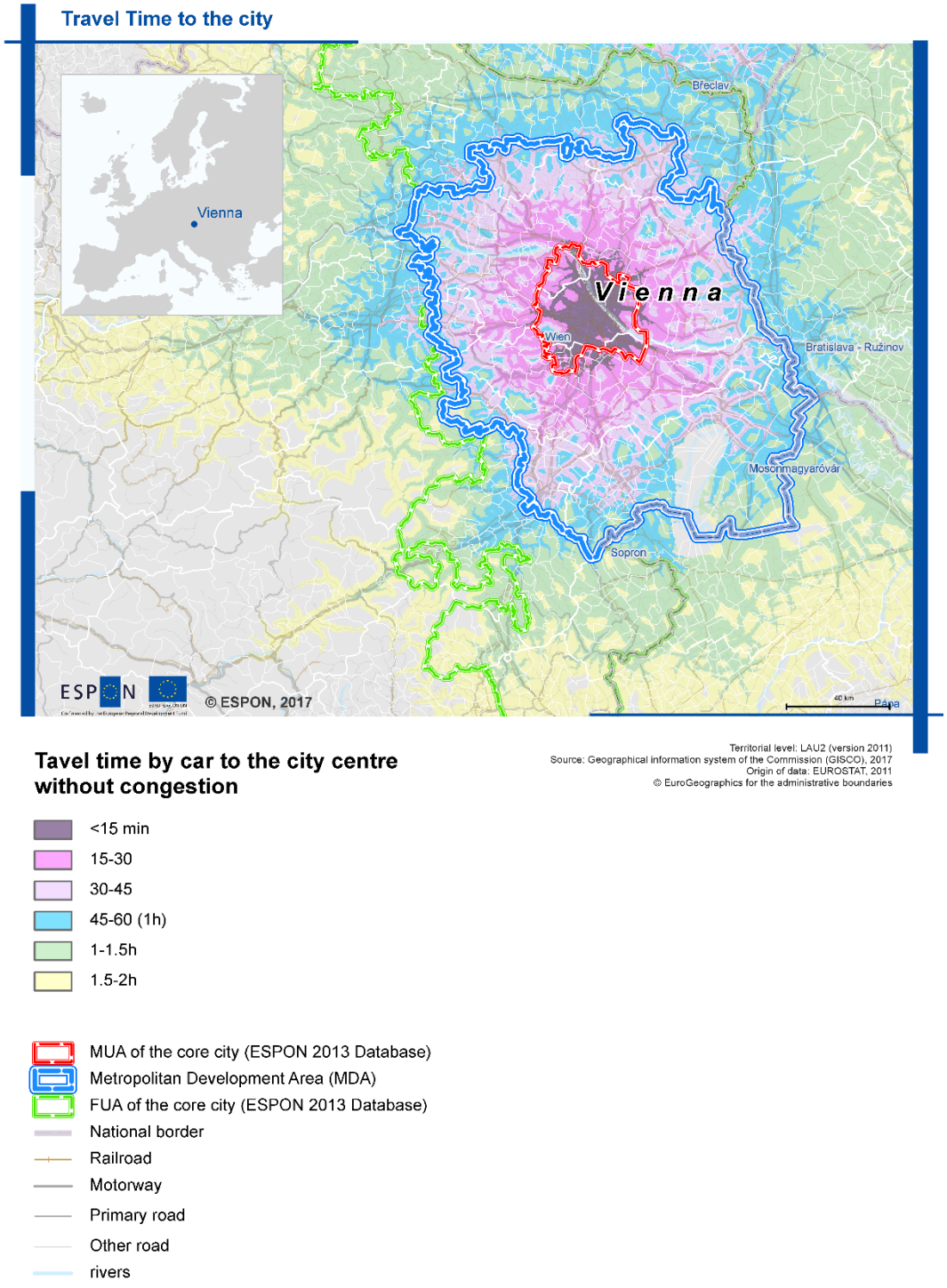
The same type of development takes place in the west side of Lyon, between the FUA and MDA perimeters: infrastructure-linking Roanne to Saint-Étienne and Saint-Étienne to Lyon gave impetus to new urban development along its own centres and along the infrastructure interconnecting them.

The population and GDP trends are growing uniformly and moderately at the scales of MDA, FUA and MUA, corresponding to the ongoing urban sprawl from Lyon city centre to the hinterland because of available land.

3 Accessibility

3.1 Vienna

Map 3.1 Travel time by car to the city centre in Vienna MA



Source: authors' elaboration on ESPON Database (2013)

Due to the radial distribution of the motorways, the car accessibility in Vienna MA decreases radially while moving away from the city centre. The presence of large infrastructure in the south, but also in the other rays moving from the city centre to all the directions provides high accessibility to the city (Map 3.1).

Within the MDA borders, there is a high accessibility and it is possible to reach the city centre within 30-45 minutes from every point within its border.

The presence of the mountains in the southwest and of the Neusiedler lake in the southeast rapidly reduces accessibility and increases the travel time to the city.

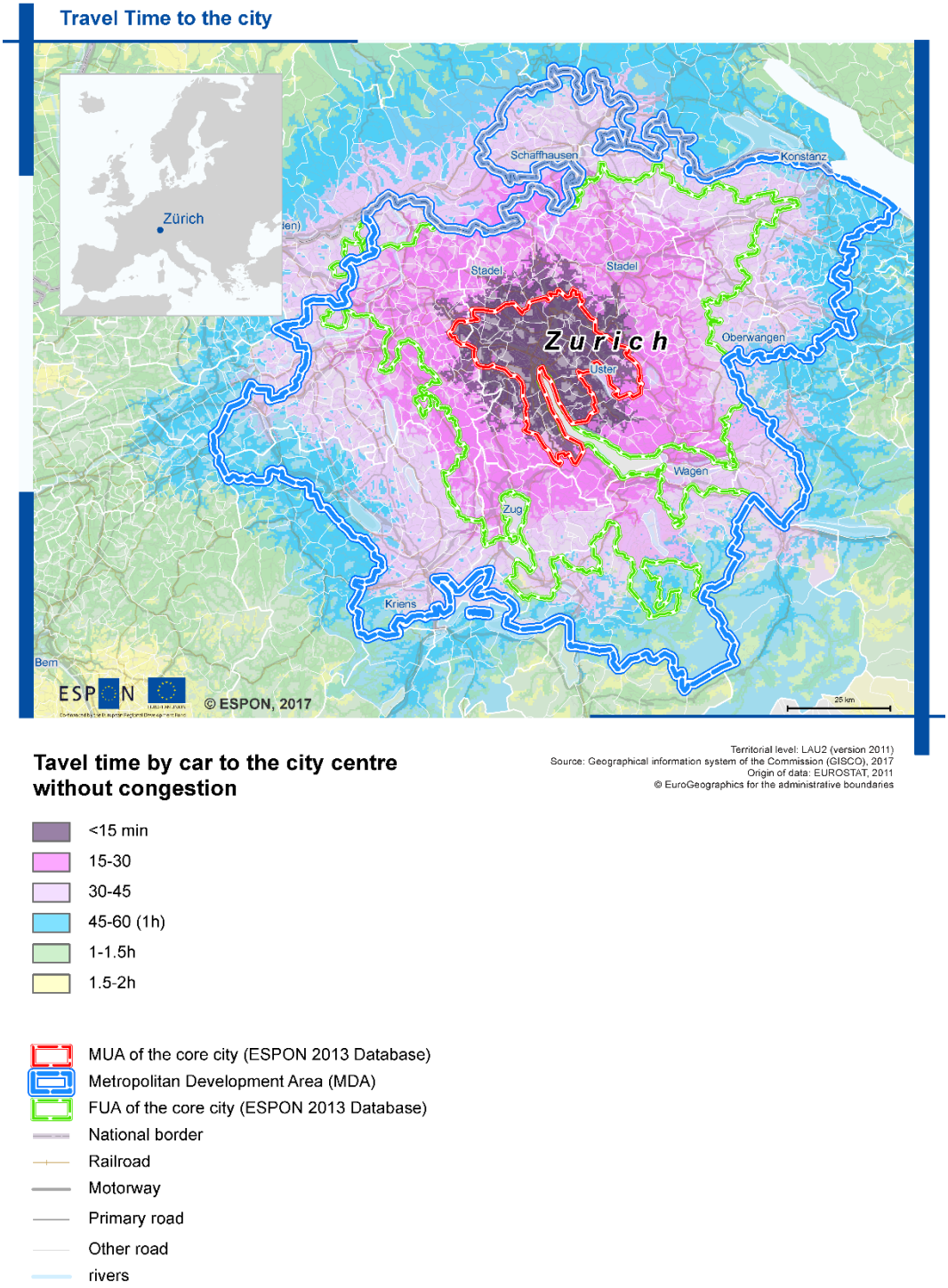
While the MDA has a rather good, spatial fit with the current accessibility patterns. The borders of the much larger FUA extend to the north and the south of Vienna, which can be reached within 1 to 2 hours from the city centre.

Finally, moving outside the FUA border, the quality of the accessibility is strictly related to the proximity to the main road, increasing the travel time to reach the city centre.

The near presence of Bratislava on the east of Vienna had a beneficial effect on the development of road connection, improving the accessibility but, at the same time, this is just limited to the single corridor along the Danubeconnecting the two cities; the nearby territories remains remote because of the national border.

3.2 Zurich

Map 3.2 Travel time by car to the city centre in Zurich MA



Source: authors' elaboration on ESPON Database (2013)

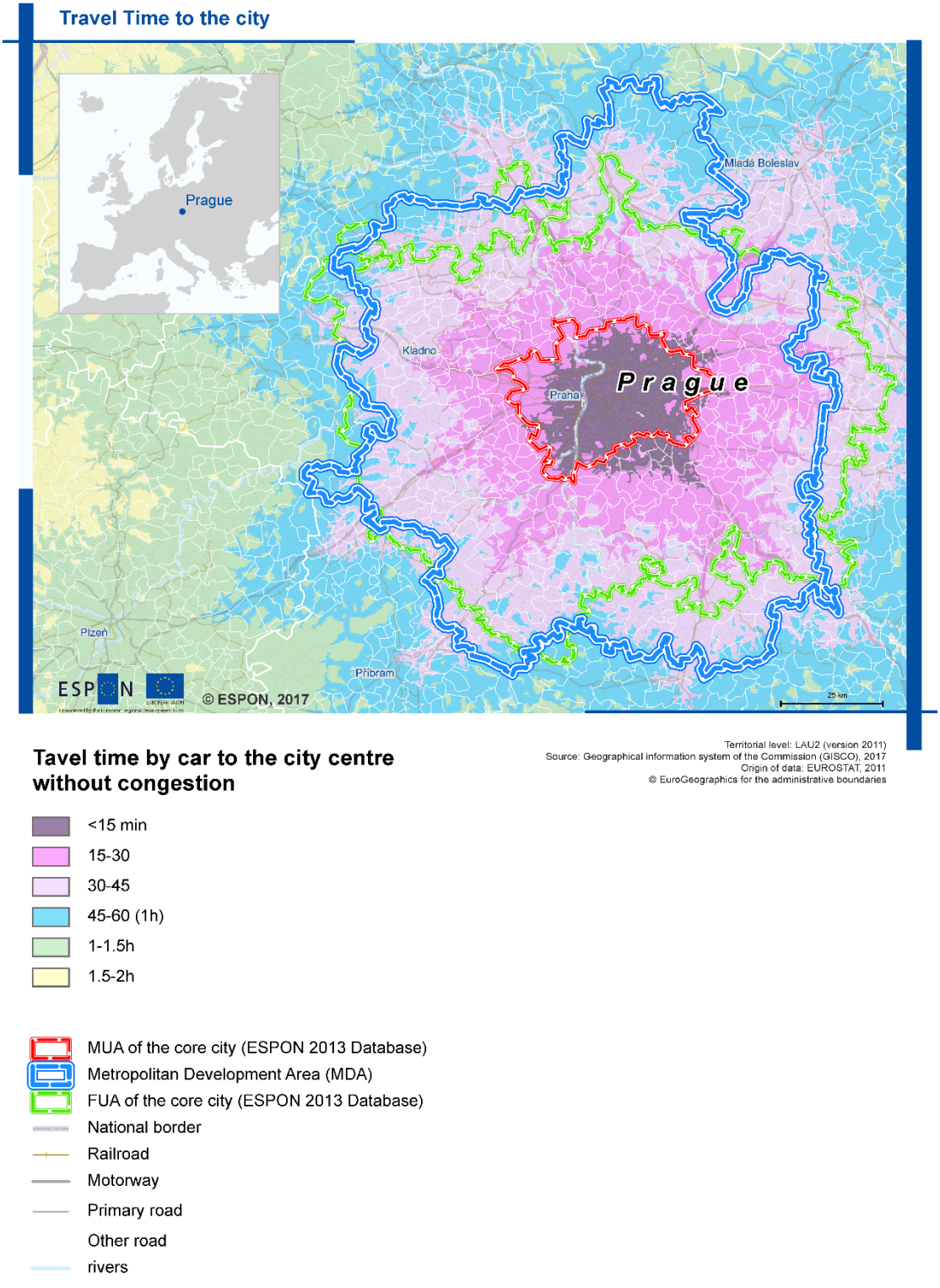
The MDA of Zurich has well developed transport network. This includes as well the S-Bahn transport system. The accessibility to the core city is within 15 to 30 minutes travel time by car. Within the MUA borders, the maximum travel time to the city centre is 15 minutes (Map 3.2).

The southwest parts of the FUA and MDA borders present slightly lower accessibility of 30-45 minutes travel time. This relates to the morphology of the territory and to the lower density of infrastructure. The northwest zone of the MDA is most accessible. Generally, a maximum travel distance of 30 min is possible within almost the entire FUA territory and nearly for the MDA territory.

The accessibility in Zurich metropolitan area is uniformly distributed and is not entirely dependent on the proximity to the main motorways.

3.3 Prague

Map 3.3 Travel time by car to the city centre in Prague MA



Source: authors' elaboration on ESPON Database (2013)

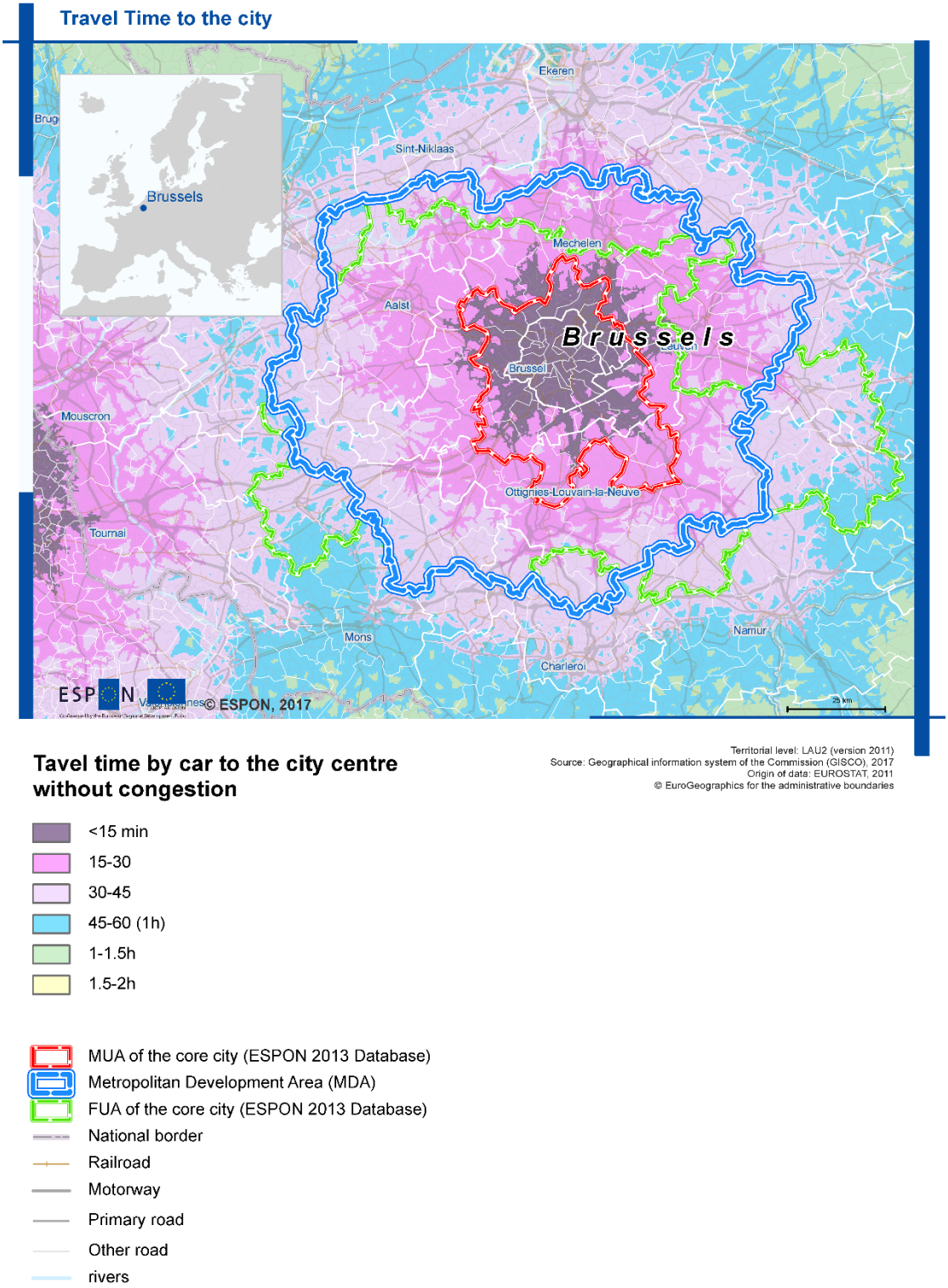
Prague MA has a strongly concentrated accessibility around the MUA (core urban rea). With accessibility, to the city centre for less than 15 minutes (Map 3.3). An exception is the western zone of the MUA where accessibility is lower, due to insufficient transport infrastructure. At the contrary, the southeast area outside the MUA shows high accessibility.

Due to the presence of big motorways, the accessibility to Prague radially distributes around the city centre and reaches the borders of the delineated MDA. Most distant vertexes are located on the main infrastructure nearby the FUA border. From the FUA borders, the city centre can be reached within 45 minutes travel time by car.

The development of infrastructure stimulates further urban sprawl as indicated by the development of Mladá Boleslav in the northeast and in the eastern territory of Prague outside the MDA border (Map 3.3). The MDA delineation filly embeds the current accessibility patterns and transportation network of motorways.

3.4 Brussels

Map 3.4 Travel time by car to the city centre in Brussels MA



Source: authors' elaboration on ESPON Database (2013)

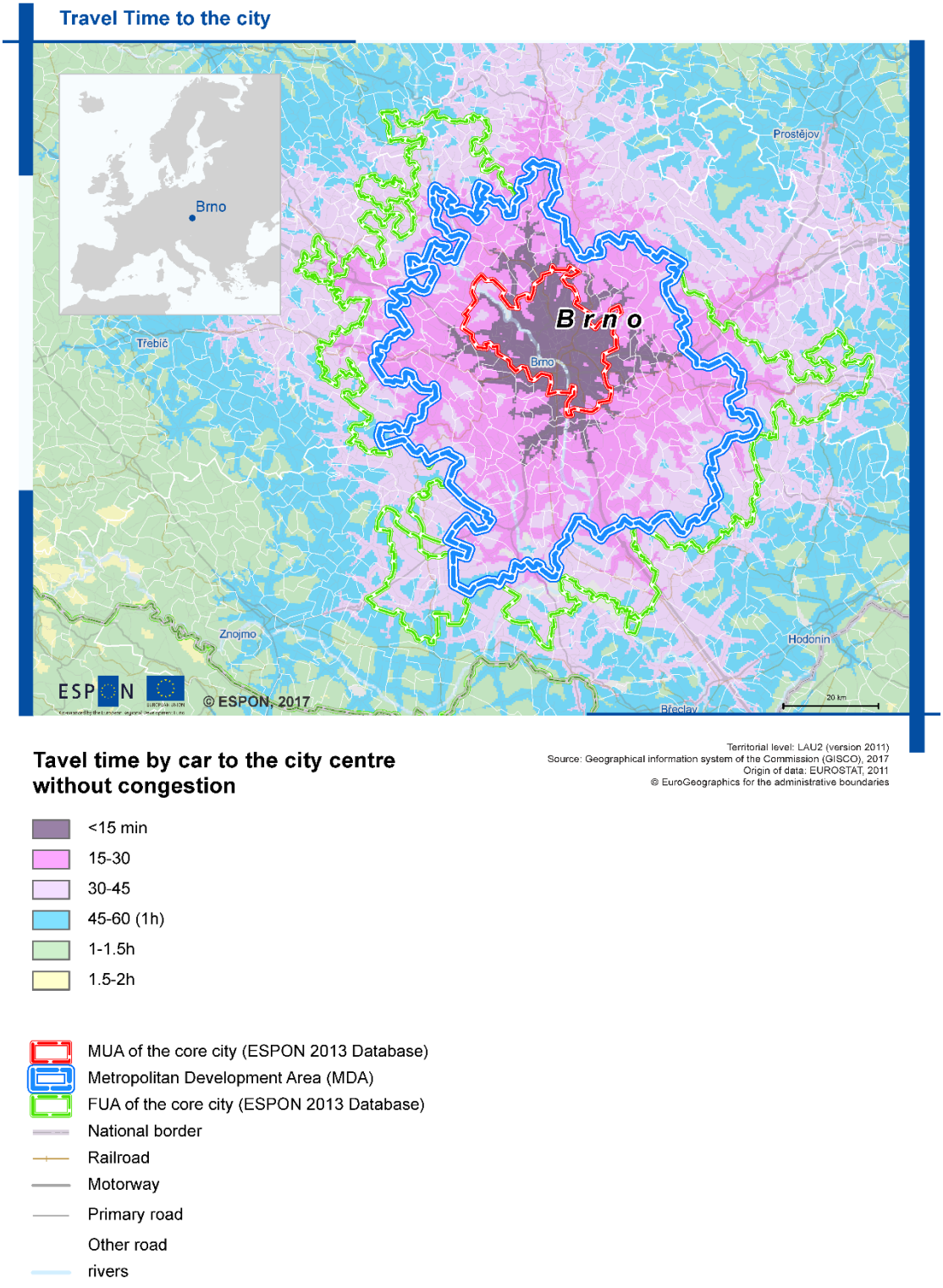
The polycentric structure of Brussels has favoured the accessibility to the city on a large scale. The intensively developed road infrastructure between connects different urban centres around Brussels with the core city (Map 3.4). This is particularly visible in the north of the area, because of the presence of Antwerp. Brussels city centre can be principally reached within 45 minutes of car travel within the MDA. Nevertheless, this time spam of travel by car is often longer due to regular traffic congestions and lack of alternative routes.

Accessibility is lower in the southwest of the FUA. Compared to the FUA, the MDA (based on the RER) spatially embeds the current accessibility patterns and covers the zone of 45 minutes of travel time by car to the city centre.

Concerning the MUA, which is mildly decentralized in terms of accessibility from the city centre, the southwest part is accessible from the city centre within 15-30 minutes comparing to the less than 15 minutes in the north.

3.5 Brno

Map 3.5 Travel time by car to the city centre in Brno MA



Source: authors' elaboration on ESPON Database (2013)

Brno infrastructure and accessibility pattern is strongly influenced the ongoing urban sprawl. The extension of the main motorways aim to connect remote and developing areas.

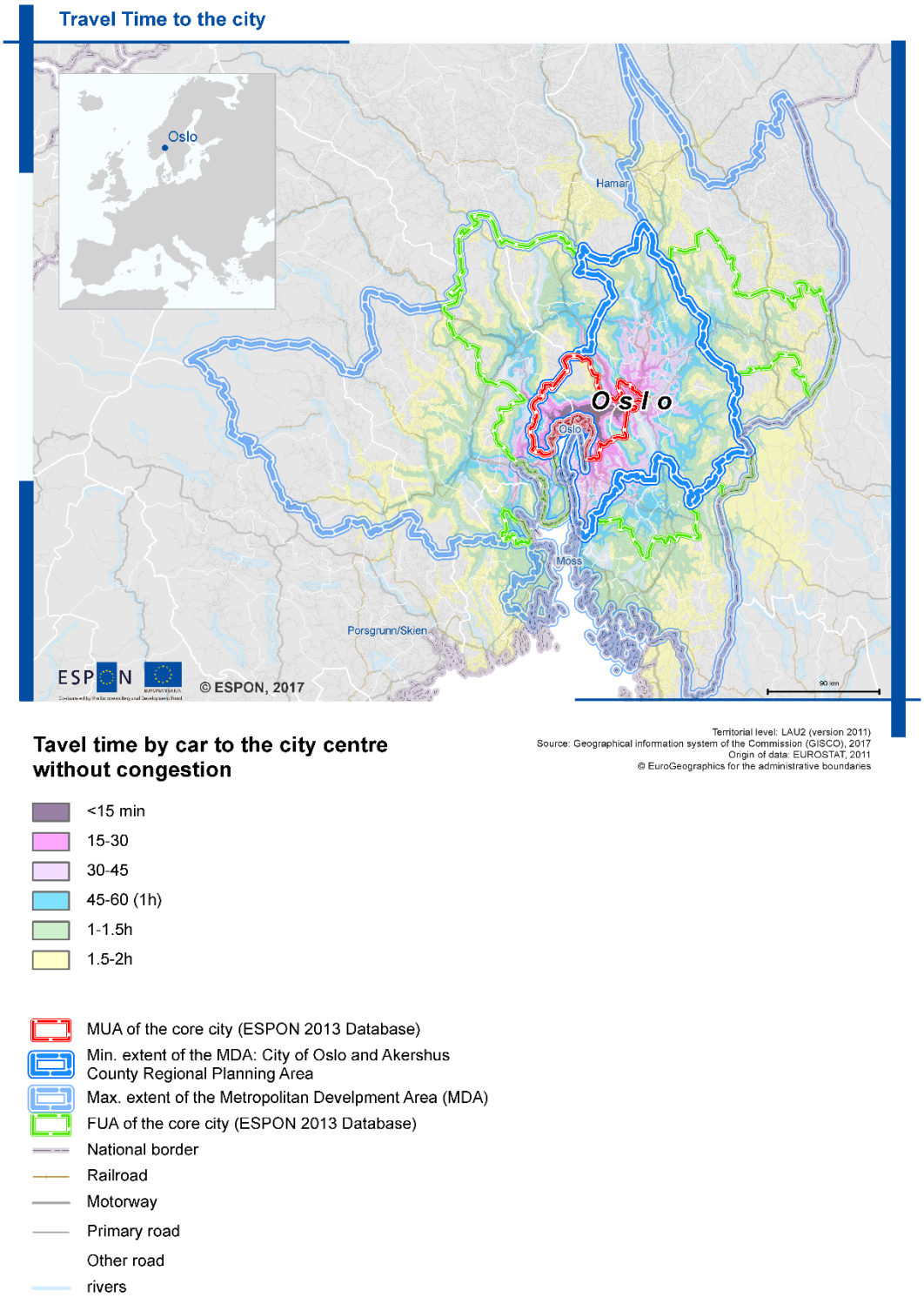
The MDA perimeter of Brno has a good spatial fit with the accessibility/commuting patterns and ensures 30 minutes travel time to the city centre (Map 3.5). This is a relative high accessibility.

While the zone covered by 15 minutes of travel distance is mainly depending and related to the five biggest roads around Brno, the 30-45 minutes zone is well embedded in the MDA area.

The FUA is as well spatially relevant and embeds accessibility patterns surrounding Brno slightly beyond the MDA and within 45 min travel time by car to the city centre. However, the urban development along the northeast axis of Brno is outside the MDA and FUA.

3.6 Oslo & Akershus

Map 3.6 Travel time by car to the city centre in Oslo & Akershus MA



Source: authors' elaboration on ESPON Database (2013)

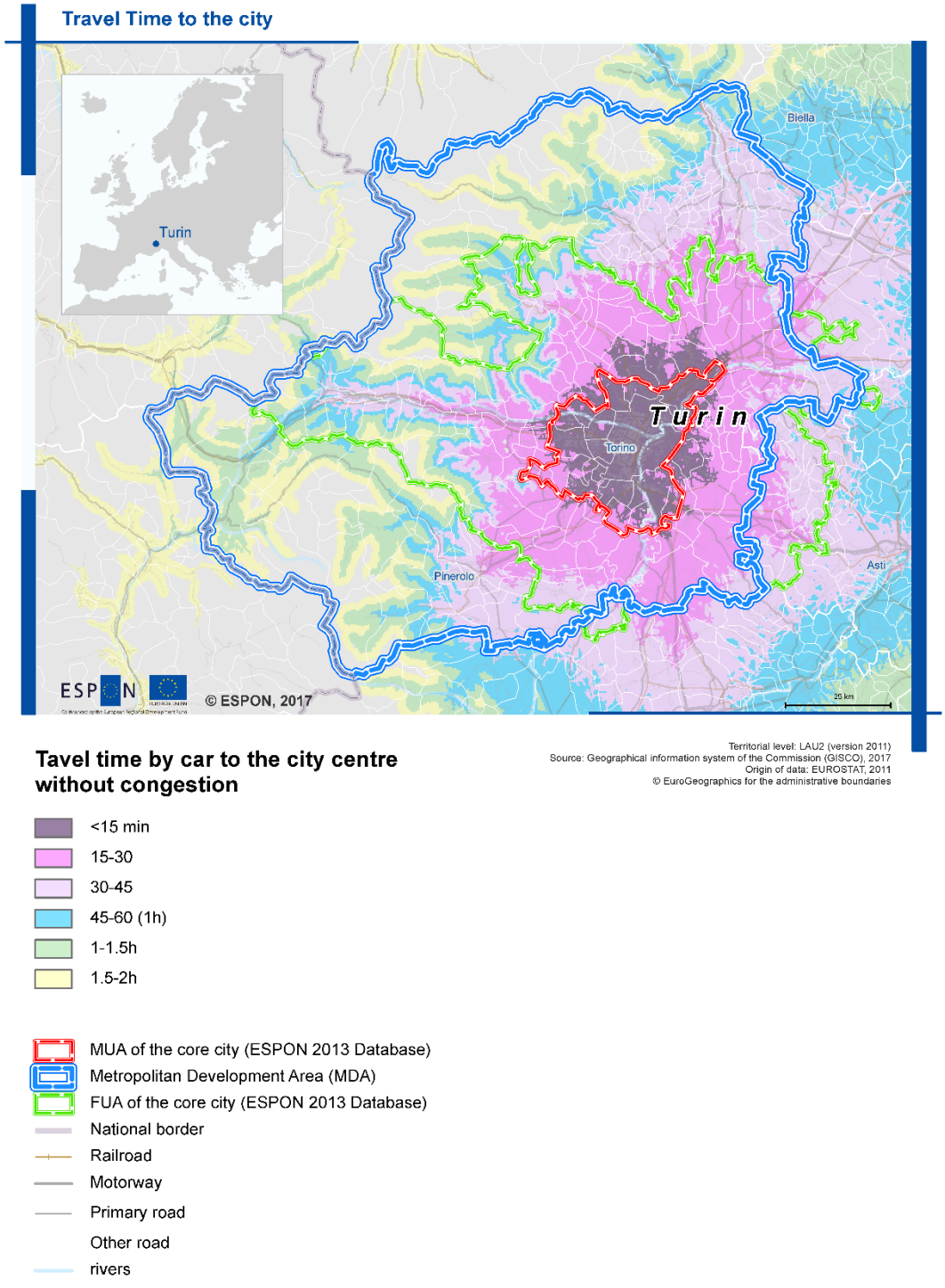
Oslo & Akershus MA shows an accessibility pattern that is particularly concentrated within the MUA and it decreases towards the MDA and the FUA due to the mountainous morphology of the territory (Map 3.6). The most recent urban sprawl around the city centre increased the accessibility in the northeast area.

The minimum scenario of the MDA almost fully embeds the current most accessible zones around Oslo & Akershus. Yet even within the minimum MDA scenario, accessibility is not evenly distributed and is particularly lower to the north and northeast.

The FUA and the maximum extension of the MDA borders places Oslo in a central position and stretch far beyond the current accessibility pattern. In particular, the FUA includes areas, which are not easily accessible, such as the mountains in the northeast and northwest zone.

3.7 Turin

Map 3.7 Travel time by car to the city centre in Turin MA



Source: authors' elaboration on ESPON Database (2013)

The morphology of the Turin's MDA (MCT) is shaped by the Alps in the North West and has an unbalanced accessibility, mostly oriented towards the southeast (Map 3.7).

Despite the recent sprawl towards the mountain area during the winter Olympic Games in 2006, the accessibility of that zone is still low, due to the morphological issues and lack of further investments. The only exception is represented by the corridor in Susa valley connecting Turin with the French and, consequently with Lyon.

The FUA illustrates the accessibility of Turin, which is uniformly distributed around the city centre (even when distant from motorways), except for the alpine area.

In the south and north east of the MDA, accessibility shows good values because of the nearby cities such as Chiavasso and Carmagnola acting as urban nodes towards Turin.

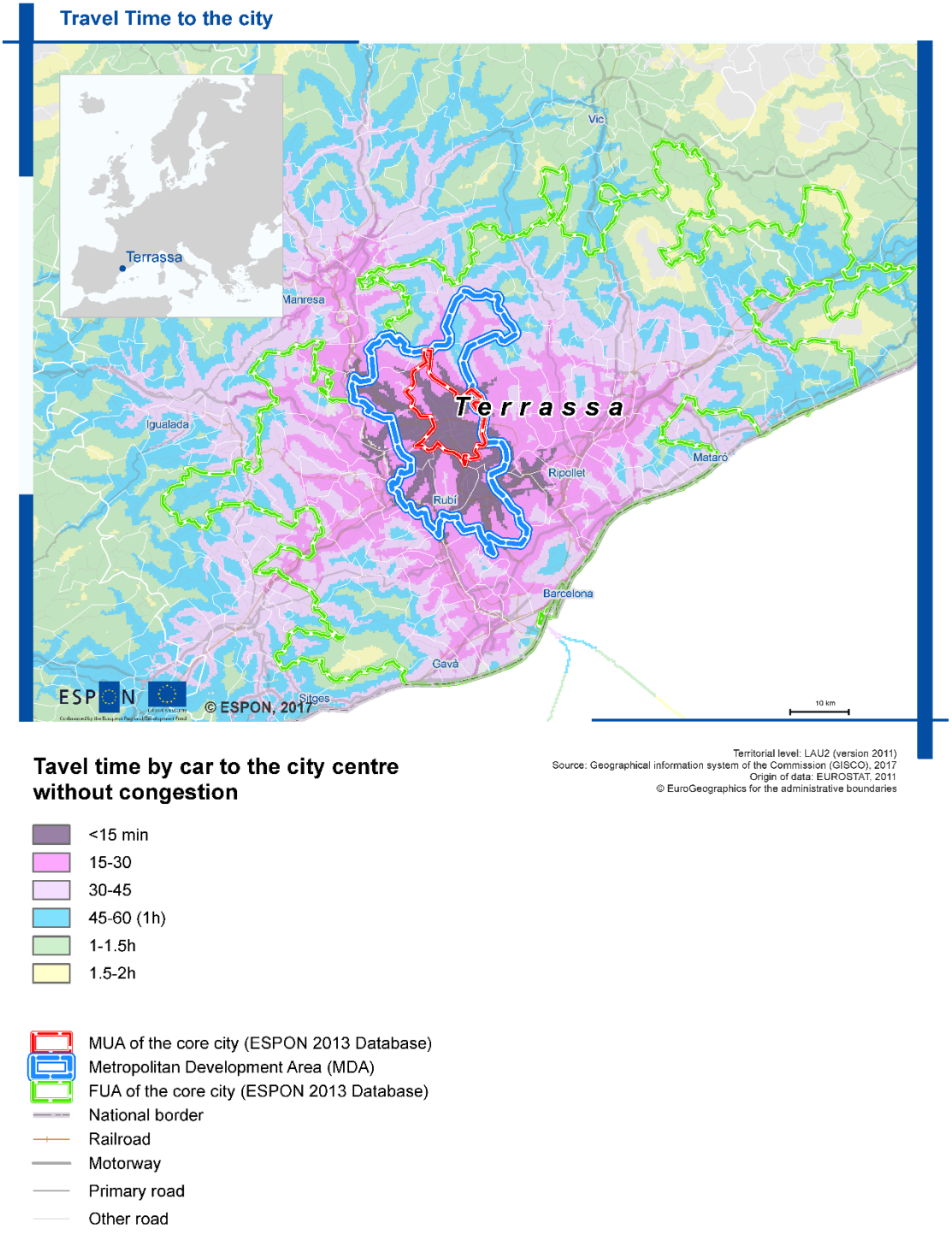
The MDA of Turin is oriented towards the Alpine zone and the eastern border is particularly close to the MUA border where accessibility is sufficient. The west and the southwest of the MDA show much scarce accessibility patterns due to the extension of the MDA into the rural areas and the mountains.

Turin city centre is accessible from the MUA borders within 15 minutes of travel time by car. Outside the MUA accessibility quickly decreases in correspondence of the most recent urban sprawl. Instead, in the north of the MUA, accessibility is high.

The delineation of the MDA of Turin to fit the current administrative structure of the Metropolitan area of the city of Turin presents somehow fragmented patterns in terms of accessibility. There is yet insufficient transport infrastructure that ensures the connectivity between the different parts of the area.

3.8 Terrassa

Map 3.8 Travel time by car to the city centre in Terrassa MA



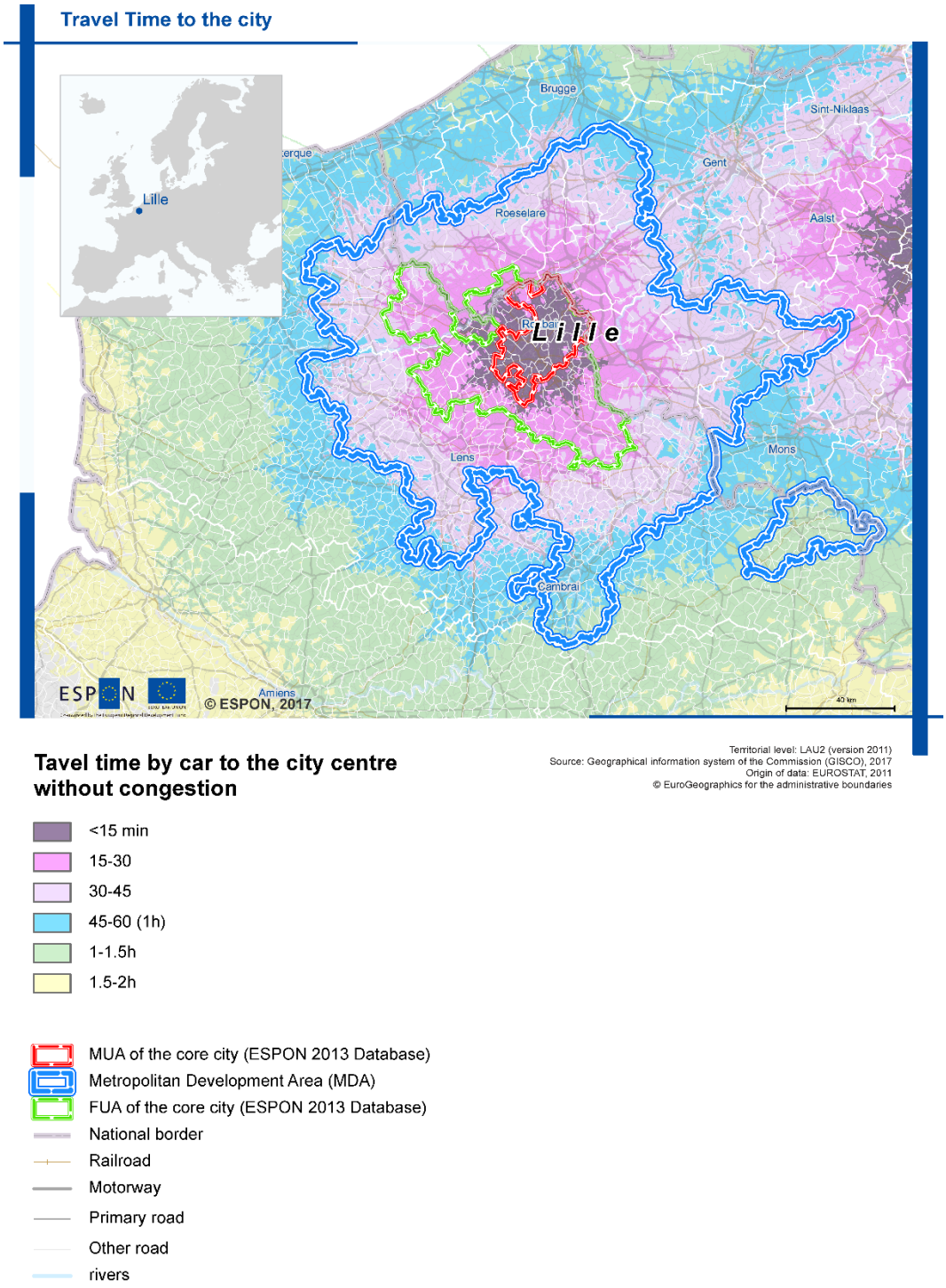
Source: authors' elaboration on ESPON Database (2013)

The infrastructure system of Terrassa MA has sensibly influenced its urban sprawl. The accessibility of the urbanized area is highly dependent on the principal motorways connecting the surrounding nearby cities (Map 3.8).

Barcelona and the coastal area, has a strong influence on Terrassa and it affects its accessibility through the infrastructure across the entire FUA. Due to its high relevance for Terrassa, the FUA border of the Metropolitan region of Barcelona addresses the accessibility pattern between Terrassa and Barcelona. Both the MDA and the FUA follow the accessibility patterns within 30-45 minutes.

3.9 Lille

Map 3.9 Travel time by car to the city centre in Lille MA



Source: authors' elaboration on ESPON Database (2013)

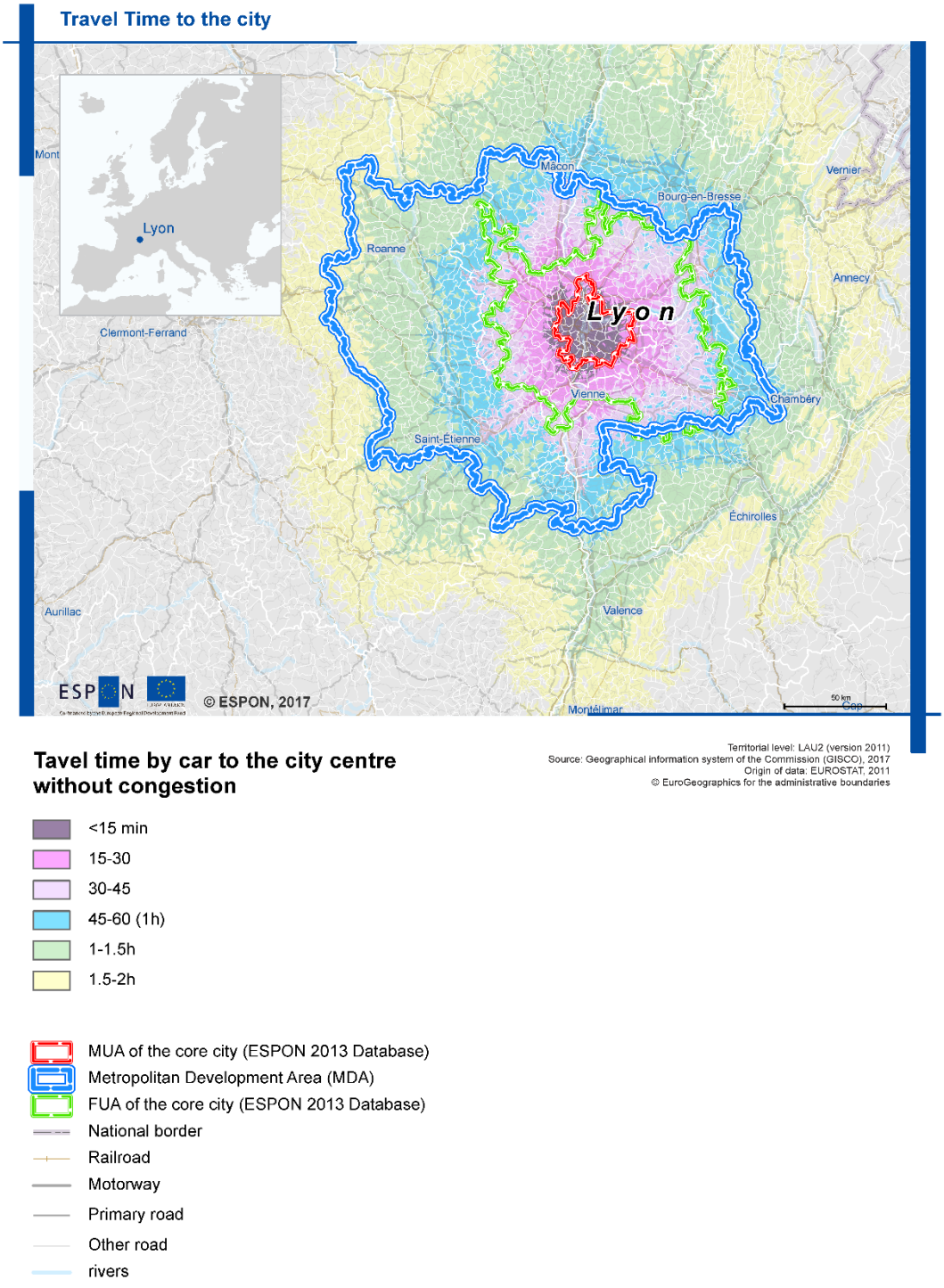
The MDA of Lille (LMA) is a cross-border area that is strongly influenced by the international border with Belgium and the metropolitan area of Brussels on the East side.

The MDA delineation embeds the zone characterized by a maximum of 45 minutes of accessibility to the city centre (Map 3.9). Due to its close relation with Brussels and the common exchange of dwellers, the mobility is specifically oriented and developed in a cross-border perspective. As consequence, Brussels and Lille share the same 45 minutes accessibility area, respectively along the west and east sides of the cities.

The FUA extends its limits in the northeast and south-west directions, almost reaching the nearby agglomerations of Lens and Roubaix. Despite the strong attraction generated by these two poles, ensured by existing infrastructure, the accessibility of Lille is distributed uniformly around its centre.

3.10 Lyon

Map 3.10 Travel time by car to the city centre in Lyon MA



Source: authors' elaboration on ESPON Database (2013)

The radial infrastructure of Lyon generated urban sprawl along the main roads, where satellite cities have been created around the MDA border, including Roanne and Saint-Étienne (within the border) and Bourg-en-Bresse (outside the MDA). The MDA is wide and the accessibility to the city centre from the remote areas is particularly low (Map 3.10). In the west side of the MDA, radial infrastructure stimulates urban sprawl, enlarging its border in the west direction.
The accessibility has a radial structure around the core urban area of Lyon. The FUA embeds the accessibility pattern of 30-45 min travel time to the city.

The delineation of the MUA is well matching with the area accessible within 15 minutes of car travel time.

4 Tables interviews analysis

4.1 Key challenges

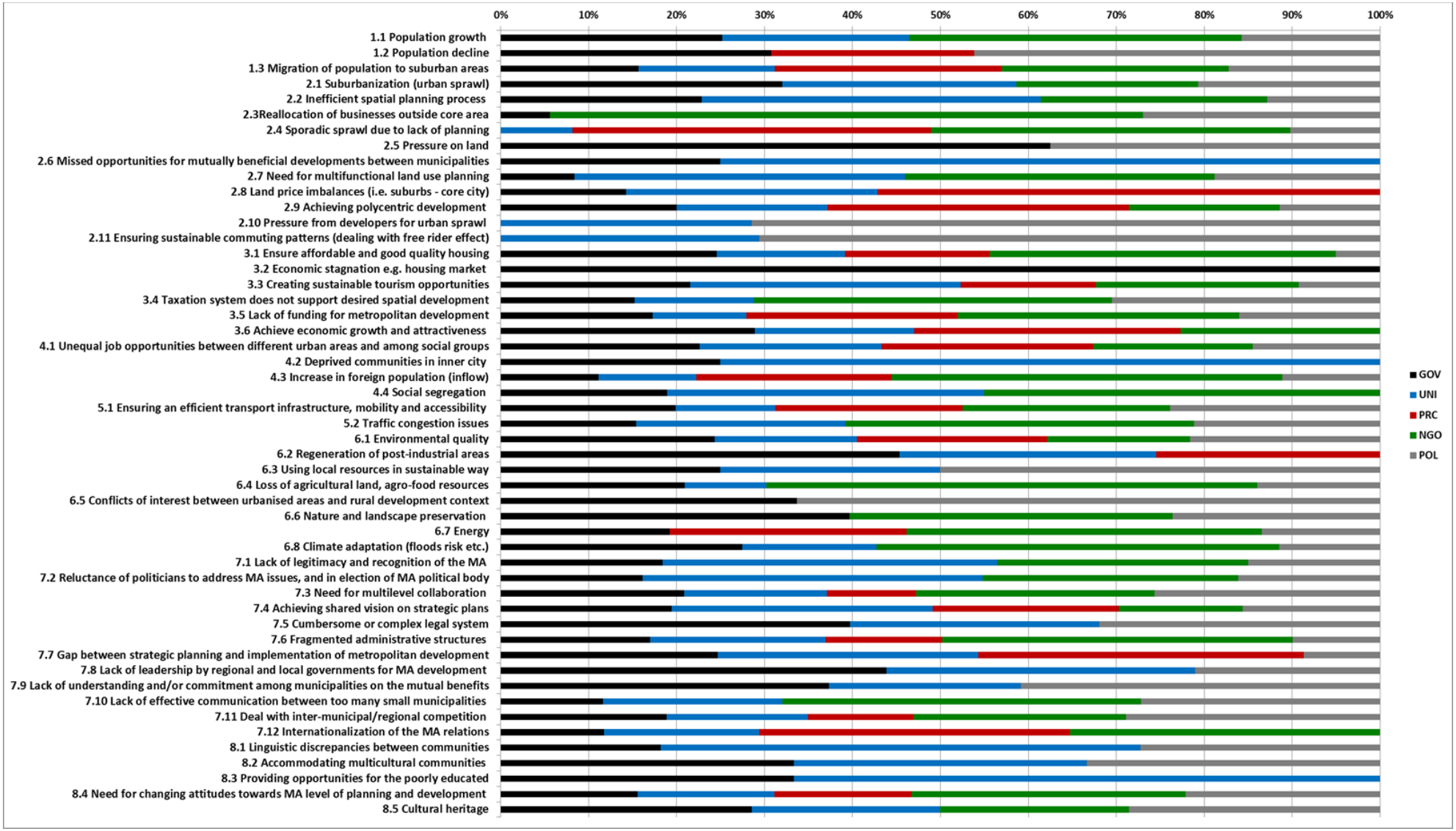
Table 4.1 Key challenges for metropolitan development identified by respondents per stakeholder area

Key challenges	Vienna	Zurich	Prague	Brussels	Brno	Oslo-Akershus	Turin	Terrassa	Lille	Lyon
Demographics										
Population growth	x	x	x	x	x	x		x		
Population decline							x			
Migration of population to suburban areas	x	x	x	x	x		x	x		
Spatial structure and development										
Suburbanization (urban sprawl)	x	x	x	x	x	x			x	x
Inefficient spatial planning process	x	x	x	x	x		x	x		x
Reallocation of businesses outside core area	x		x	x						
Sporadic sprawl due to lack of planning			x	x						
Pressure on land	x			x						
Missed opportunities for mutually beneficial developments between municipalities	x									
Need for multifunctional land use planning	x	x		x		x	x	x		x
Land price imbalances (i.e. suburbs - core city)	x		x		x					x
Achieving polycentric development		x				x	x			
Pressure from developers for urban sprawl			x		x					
Ensuring sustainable commuting patterns (dealing with free rider effect)	x		x		x					
Economy & finances										
Ensure affordable and good quality housing	x		x	x		x	x	x	x	x
Economic stagnation e.g. housing market							x		x	
Creating sustainable tourism opportunities		x					x	x	x	x
Taxation system does not support desired spatial development	x	x	x	x			x	x		x
Lack of funding for metropolitan development	x		x		x		x	x	x	x
Achieve economic growth and attractiveness	x			x			x	x	x	x
Social welfare										
Unequal job opportunities between different urban areas and among social groups			x	x			x		x	x
Deprived communities in inner city	x			x					x	
Increase in foreign population (inflow)	x			x			x			
Social segregation	x			x			x	x		x
Transport infrastructure										
Ensuring an efficient transport infrastructure, mobility and accessibility	x	x	x	x	x	x	x	x	x	x
Traffic congestion issues	x	x	x	x	x	x		x	x	x
Environment and quality of life										
Environmental quality				x			x	x	x	x
Regeneration of post-industrial areas			x				x	x		
Using local resources in sustainable way	x			x			x			x
Loss of agricultural land, agro-food resources			x		x			x	x	x
Conflicts of interest between urbanised areas and rural development context	x	x	x		x	x	x			
Nature and landscape preservation		x		x		x		x	x	x
Energy	x	x					x	x	x	x
Climate adaptation (floods risk etc.)	x		x		x		x	x	x	x
Institutional										
Lack of legitimacy and recognition of the MA	x	x	x	x	x	x	x			x
Reluctance of politicians to address MA issues, and constrains in election of MA political body	x	x	x	x	x		x	x	x	x
Need for multilevel collaboration	x	x	x	x	x	x	x	x	x	x

Key challenges	Vienna	Zurich	Prague	Brussels	Brno	Oslo-Akershus	Turin	Terrassa	Lille	Lyon
Achieving shared vision on strategic plans	x	x	x	x	x	x	x	x	x	x
Cumbersome or complex legal system		x	x	x				x		x
Fragmented administrative structures		x	x	x		x	x	x		x
Gap between strategic planning and implementation of metropolitan development	x	x		x	x	x	x			
Lack of leadership by regional and local governments for MA development	x		x		x					
Lack of understanding and/or commitment among municipalities on the mutual benefits of planning beyond their administrative borders.	x	x	x		x	x				
Lack of effective communication between too many small municipalities with administrative power	x	x	x		x					
Deal with inter-municipal/regional competition	x	x	x	x			x	x	x	
Internationalization of the MA relations							x		x	
Cultural										
Linguistic discrepancies between communities				x						
Accommodating multicultural communities	x			x			x			
Providing opportunities for the poorly educated				x			x			
Need for changing attitudes towards MA level of planning and development	x	x	x	x	x	x	x			
Cultural heritage	x	x					x	x	x	x
Total challenges identified										
Number of challenges per city	35	24	30	32	22	13	33	25	21	26
Percentage of total challenges per city	69	47	59	63	43	25	65	49	41	51

Source: Authors (2017)

Figure 4.1 Proportional distribution per challenge and actor group of the percentage of respondents that identified the challenge across all cities in which the challenge occurs



4.2 Changes needed in the spatial planning practices

Table 4.2 Changes needed in spatial planning practices in order to meet the challenges of metropolitan development, as identified by respondents in each stakeholder area

Changes needed	Vienna	Zurich	Prague	Brussels	Brno	Oslo-Akershus	Turin	Terrassa	Lille	Lyon
Changes in the legal framework for planning										
Improve national spatial planning legislation and tools in terms of land consolidation and conservation for green spaces, recreation and agriculture areas		x								x
Change the spatial planning law to accommodate MA development issues			x		x			x		
Introduce rules for compliance of municipal land use plans with regional/inter-regional plans				x		x	x			
Regional authorities have to have power to override spatial plans of the municipalities					x					
Move municipal spatial planning to regional level				x						
Developing spatial plans at MA level					x					
Changes in the cooperation mechanisms										
Coordinate plans and decisions on spatial developments between different scales (region, municipality)	x		x	x	x	x	x	x	x	x
Establish financial incentives to support the cooperation of municipalities in spatial planning	x		x		x		x			x
Provide clear mechanisms for implementation of spatial planning strategies at the inter-regional level	x			x				x	x	
Provide a mechanism for involving municipalities in spatial planning at the MA level in order to prevent resistance and conflicts over land uses	x					x	x			x
Shared spatial planning between regions/districts	x	x		x	x					
Develop new tools to support the MA level of spatial planning (land funds, subsidies for housing, tax sharing methods, land acquisition and compensation)	x		x		x			x		
Establish regular communication and coordination between spatial planning departments			x				x			x
Understanding of the spatial plans among regions and municipalities						x			x	
Create pilot bottom-up projects to prove the effects of integrated planning and mutual cooperation	x		x	x	x					
Establish metropolitan knowledge-based organization to guide MA decisions by evidence				x						
Changes in the spatial planning approaches and practices										
Spatial planning needs to support the understanding of the territory's spatial dynamics, including limitations on growth, designation of areas for different functions	x		x	x	x	x	x	x	x	x
Changing attitudes of planners and other actors	x		x		x		x			x
Consider socio-economic and environmental impacts of developments on other regions/areas and beyond the borders of the city master plans	x		x	x	x					x
Estbalihing stronger spatial planning process at regional scale				x			x	x		
Link strategic plans at regional/inter-regional or MA level with a spatial plan at the same level to ensure actual implementation			x		x	x	x			
Change planning culture from a blueprint process to a visionary one which sets opportunities			x	x	x					
Have an overview of detailed zoning plans of all municipalities						x				x
Strengthen the capacity of the planners			x		x		x			
Make decisions on the MA delineation and planning								x		
Change old spatial planning approach from prohibiting-permitting approach and segregation of functions to integration of functions				x			x	x		

Consider reducing number of municipalities (amalgamation of administrative units) to optimize services and administration	x		x							
Total changes identified										
Number of changes identified per city	11	2	13	12	14	7	11	8	4	9
Percentage of total number of changes per city	41	7	48	44	52	26	41	30	15	33

Source: Authors

4.3 Following steps

Table 4.3 Following steps identified by respondents for enhancing an integrated planning approach and collaboration for metropolitan development in each stakeholder area

Following steps	Vienna	Zurich	Prague	Brussels	Brno	Oslo-Akershus	Turin	Terrassa	Lille	Lyon
Policy frameworks and law										
Involvement of national authorities to support MA development		x				x	x	x		
Set measurable targets at the EU level for MA development							x			
Make laws about MA body/mayoral elections				x		x	x	x	x	x
Develop and coordinate inter-regional public policies						x	x		x	x
Strategic plans and identity of the MA										
Have a developed strategic plan for the MA				x			x	x	x	x
Municipalities have to contribute to the strategic plan							x			
Improve implementation of current strategic plans				x		x			x	
Enhance recognition of the MA level of planning				x			x	x		
Achieve shared vision and goals		x		x			x	x	x	x
Enhance the identity of the MA and its purpose	x	x		x		x	x	x		x
Finances and funding opportunities										
Combine federal and regional support in investments; make agreements on finances, creating common financial tools	x			x			x	x		
Introduce financial stimuli to reward MA cooperation	x			x		x	x			
Use ITIs potential to boost first steps in MA planning			x		x					
Changes in the tax system	x		x							
Provide resources at MA level		x					x		x	x
Receive national funding (housing market)							x			
Access to European funding			x		x		x			
Spatial planning tools and practices										
Monitor the growth potential and opportunities, to identify places for growth (growth management approach)	x						x			
Exchange of data and surveys on how people live and behave, create common (MA-level) dataset			x	x					x	
Apply best practices and evidence-based knowledge				x			x			
More detailed planning in the framework of already existing planning possibilities (territorial studies, urban concepts)	x		x		x				x	
Collaboration process										
Start with smaller steps and pilot projects (bottom-up & top-down)	x			x	x		x	x		
Identify areas with the highest cooperation potential (e.g. transport, marketing) and fix large-scale projects	x				x					
Enhance communication between agencies at different planning levels in order to increase capacities (time, knowledge, resources)		x	x	x	x		x	x		x
Establish consultation bodies (e.g. boards, committees)				x		x				
Find common language between core city administration and other municipalities	x			x	x		x			
Create a common arena for discussions in an informal setting		x		x		x		x		x
Enhance collaboration between regional and municipal bodies	x	x		x		x	x	x	x	x
Organizations and governmental structures										
Establishing joint institutions/agencies at the MA level	x		x	x			x	x	x	x
Capacity building			x				x	x		x
Strengthen the legitimacy of the MA authorities							x	x		x
Strengthen the cooperation of municipalities (to create aggregates of municipalities as partners for bigger entities)	x		x	x	x	x	x	x	x	x
Politics										
Establish political will and leadership	x	x	x	x			x	x	x	
Send clear messages to politicians				x		x	x	x		
Have an elected MA mayor							x	x		
Civil society and other actors										
Build awareness and involve citizens and NGOs				x			x	x	x	x
Involve private actors (businesses, trade unions, banks, industries)				x		x	x	x		x
Involve academics/universities							x	x		x
Total identified following steps										

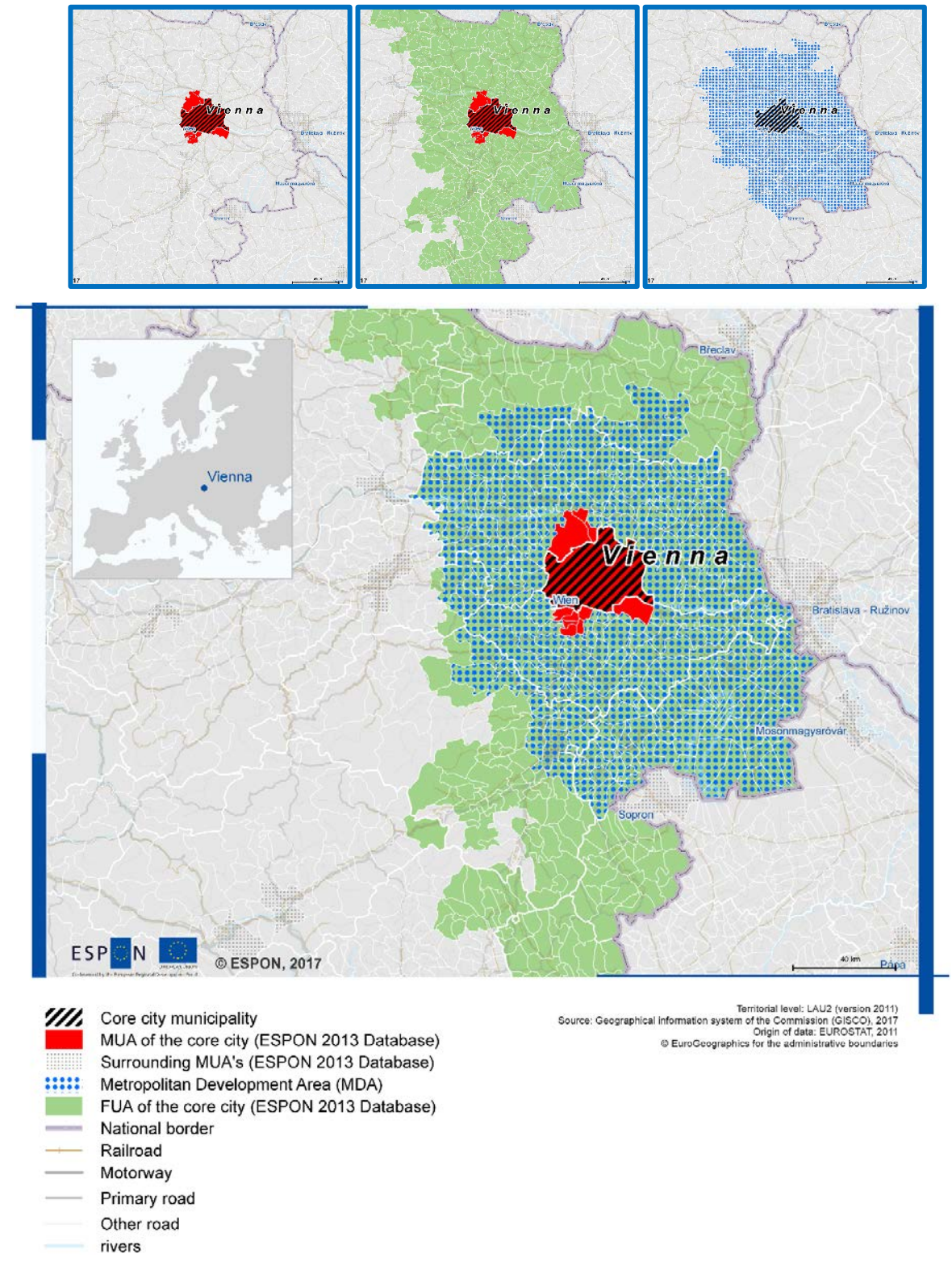
Number of following steps per city	13	8	10	22	8	12	30	21	13	16
Percentage of total steps identified per city	34	21	26	58	21	32	79	55	34	42

Source: Authors

5 Delineation of the stakeholders' MDAs, MUAs and FUAs

5.1 Vienna

Map 5.1 Viena MDA

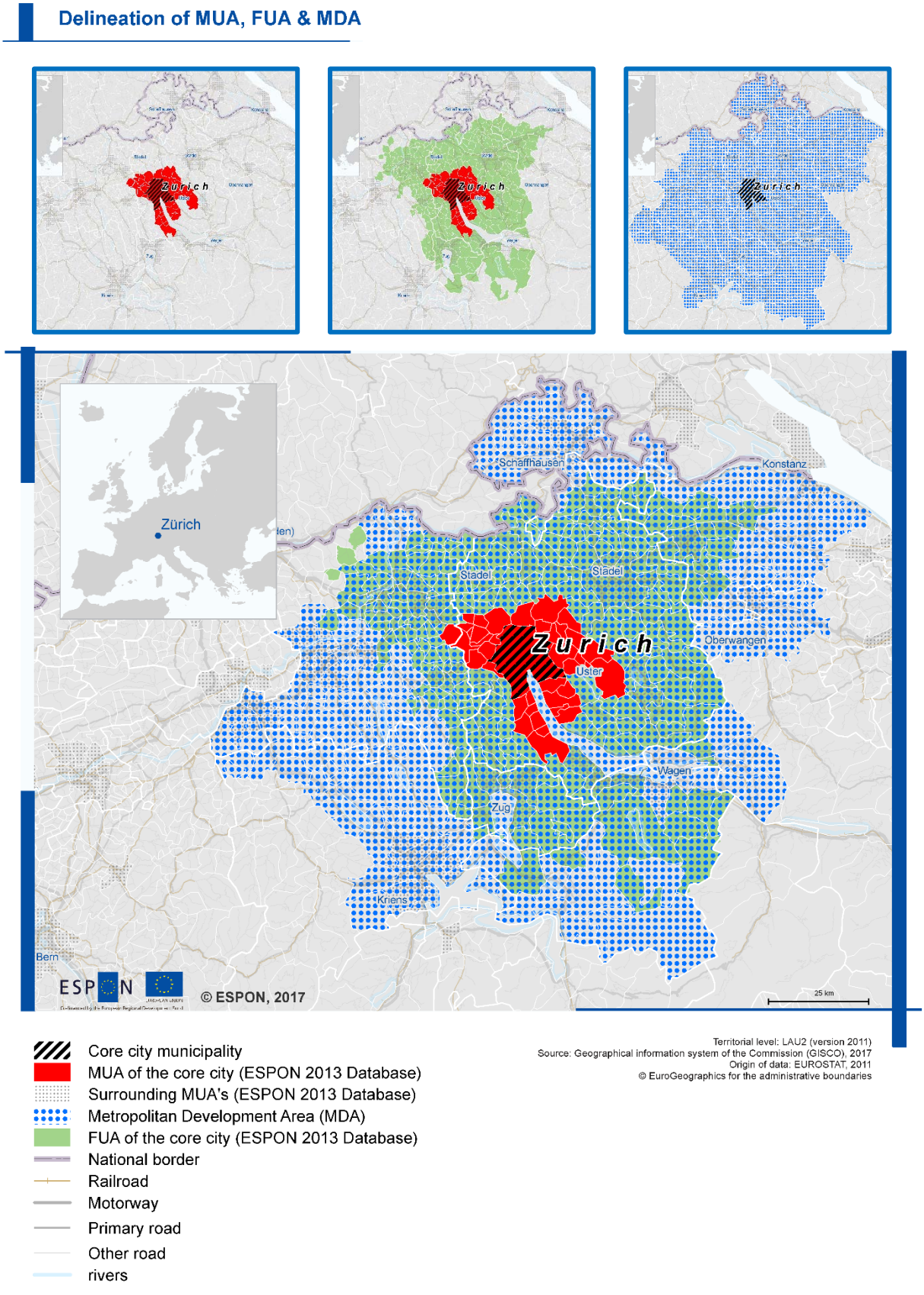


The delineation of Vienna MDA is based on the Stadtregion+ spatial concept. The MDA is smaller than the FUA. The borders of the MDA and FUA partly overlap in the west and in the east sides (reaching the border with Slovakia). In the north and in the south of Vienna, the FUA is extending far beyond the MDA.

The current urban development is not fully embraced by the MDA due to the presence of strategic cities in its proximity, such as Bratislava that serves as basis for suburban developments with a cross-border dimension.

5.2 Zurich

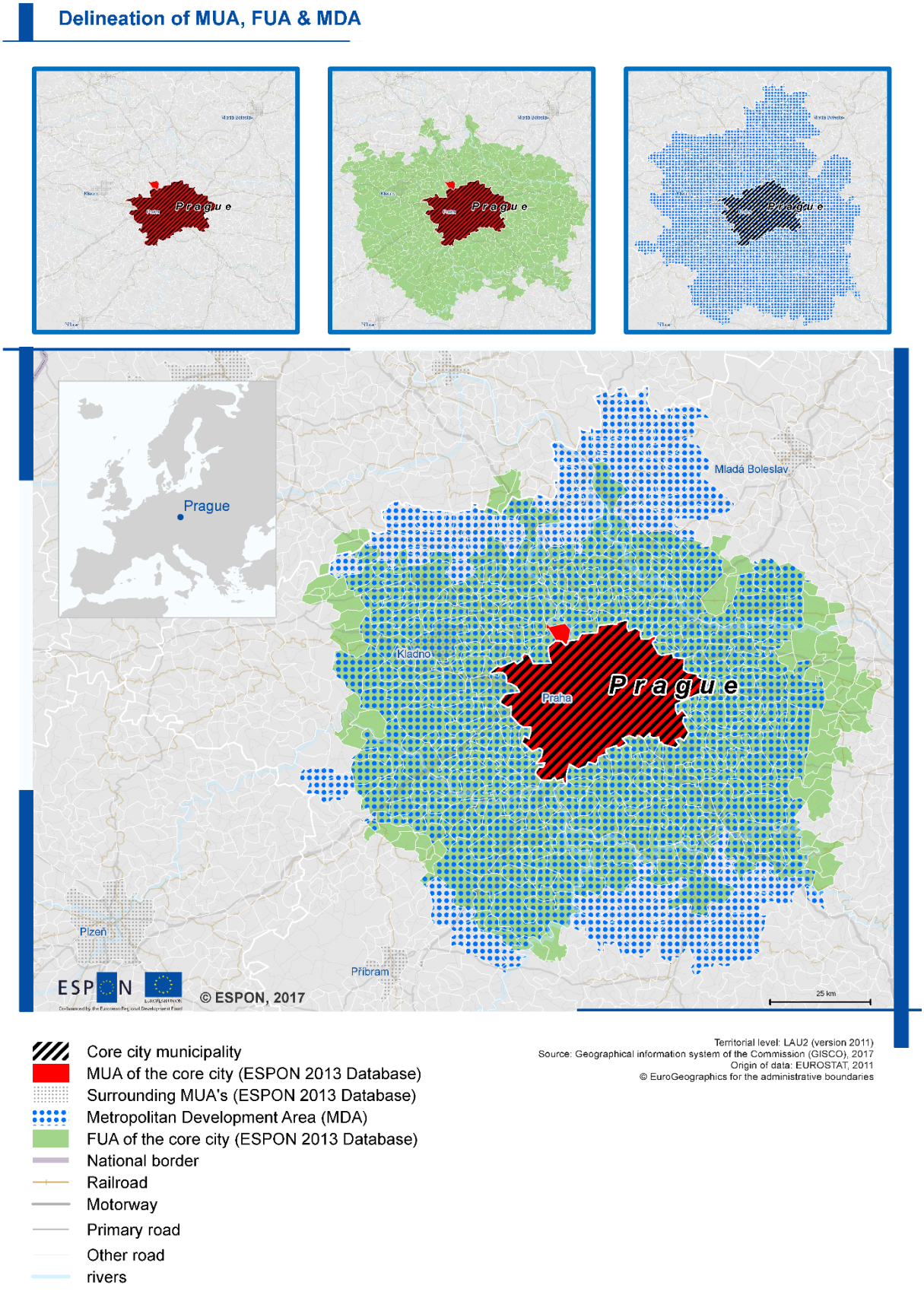
Map 5.2 Zurich MDA



Zurich MDA is defined according to a Spatial strategy and a concept. The MDA delineation goes beyond the FUA border until Germany and towards Luzern in the southwest. This delineation fits the current spatial developments in the metropolitan area. Due to the morphology of its territory, it does not fully match with the map describing the car accessibility to the core city.

5.3 Prague

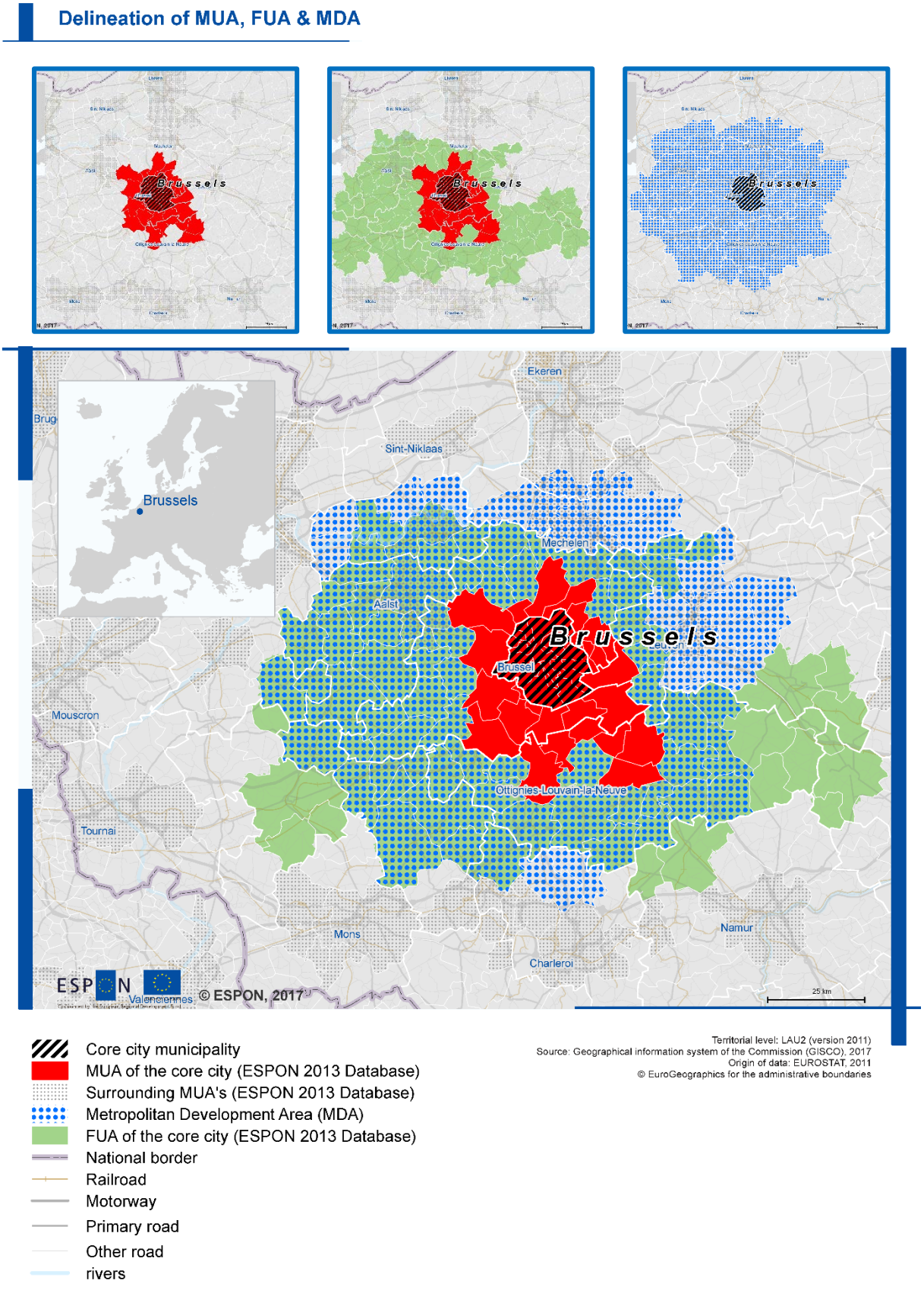
Map 5.3 Prague MDA



Prague MDA, being defined by the Integrated Territorial Investment (ITI), is similar to the FUA size. The MDA is slightly larger than the FUA and in many parts, their borders overlap. MDA fits the current ITI development. The MDA and the FUA embrace the accessibility patterns within the metropolitan area. Current urban sprawl is following infrastructure developments and expectedly might go beyond the MDA borders.

5.4 Brussels

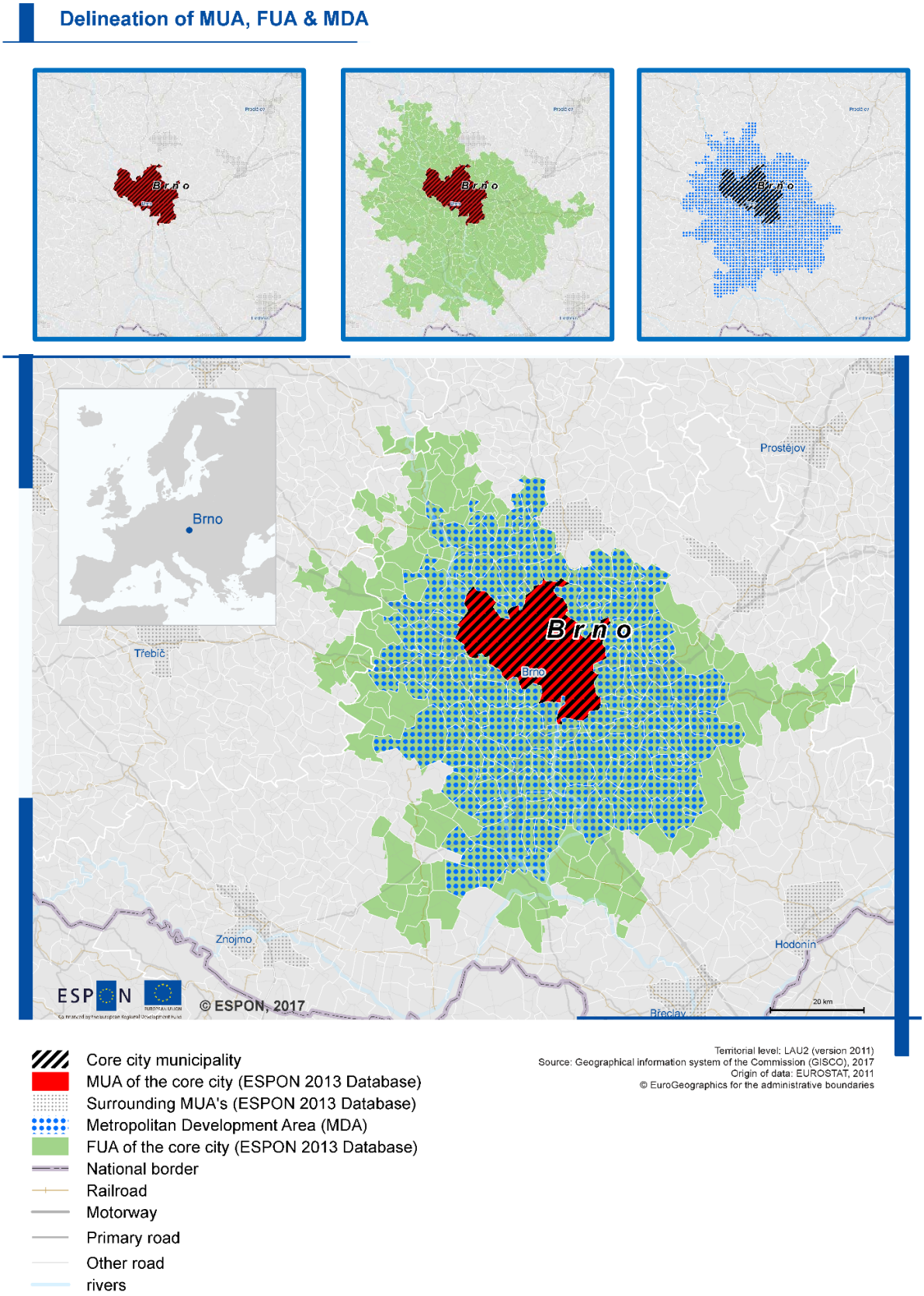
Map 5.4 Brussels MDA



The MDA of Brussels covers an an urban agglomeration of an inter-regional scale (across federal regions). The MDA and the FUA of Brussels have comparable dimensions around the city core, and their borders are in many parts overlapping. Brussels MDA is based on its mobility system. Despite this, the accessibility extends beyond the MDA border, because of the shared infrastructure with the neighbouring cities.

5.5 Brno

Map 5.5 Brno MDA

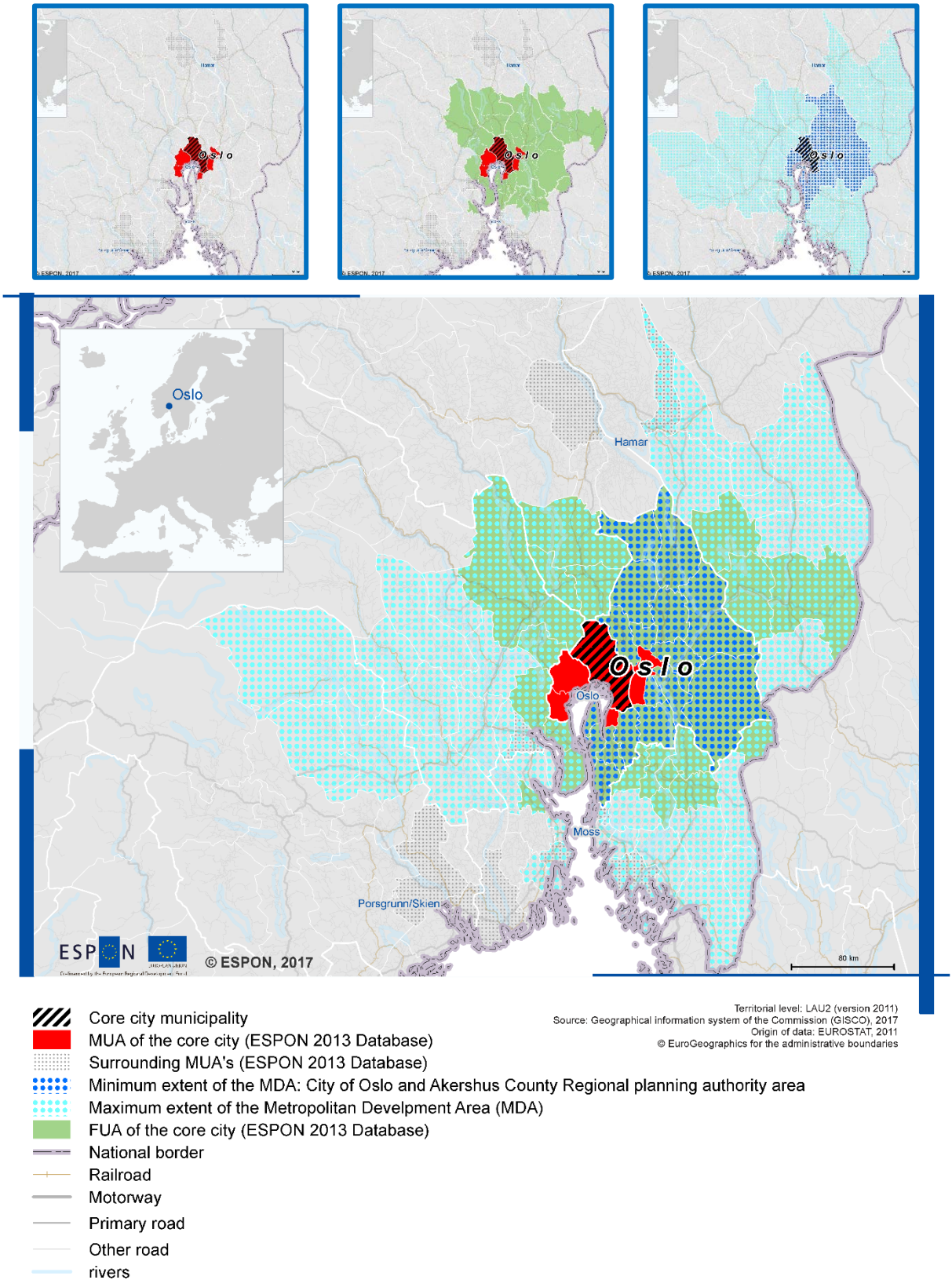


Brno MDA, as the case of Prague, is defined by the Integrated Territorial Investment (ITI). The MDA is almost fully embedded in the FUA. The FUA territory is slightly larger than the MDA. The MDA fits the current urban trends and embraces the efficiency of the car mobility to reach the city centre, including the zone characterized by 30 minutes of accessibility.

5.6 Oslo & Akershus

Map 5.6 Oslo & Akershus MDA

Delineation of MUA, FUA & MDA

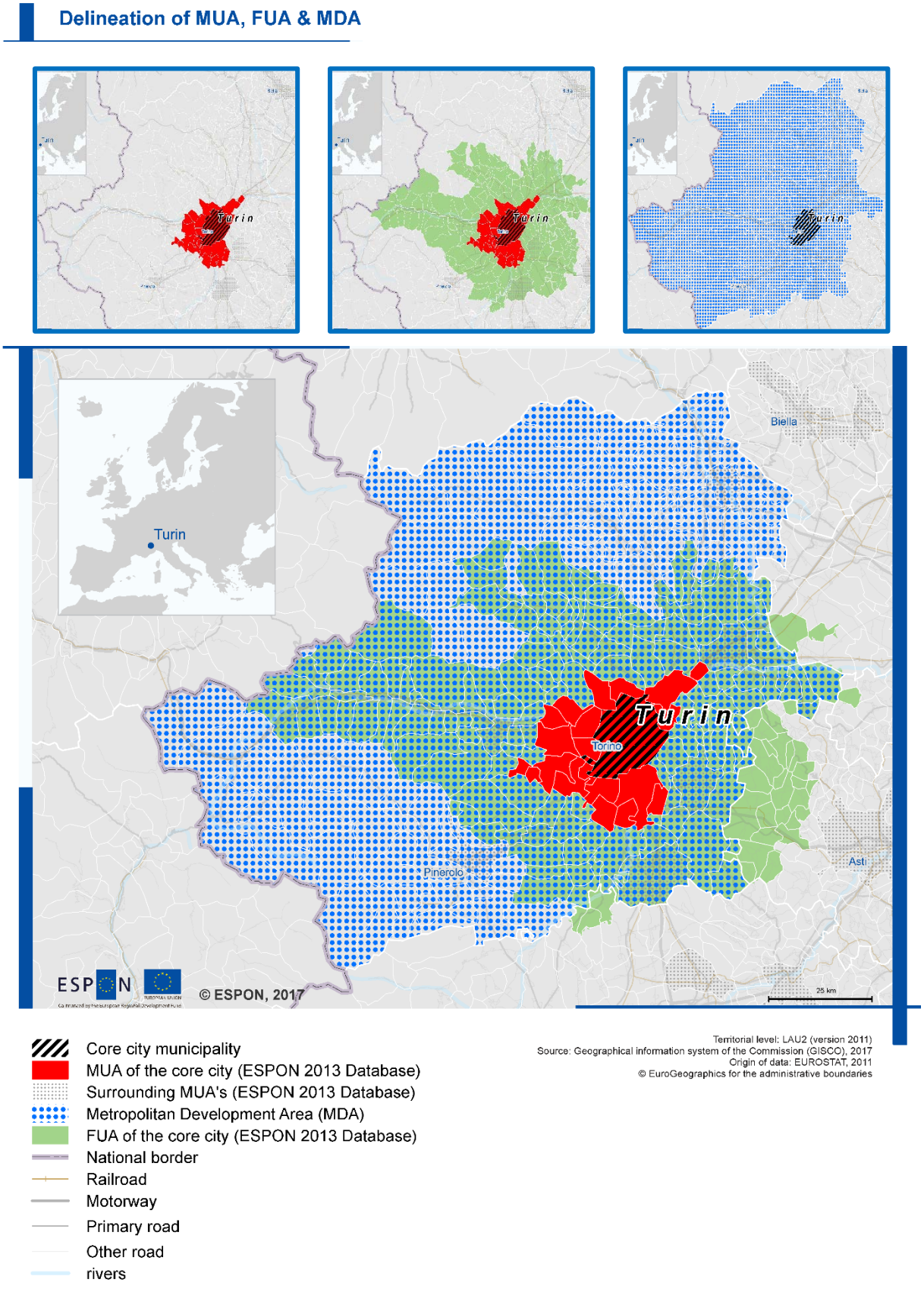


Oslo & Akershus MDA is based on an inter-regional collaboration between regional authorities.

The MDA is characterised by the specific natural morphology of the territory with lower urbanization towards the mountainous area. The minimum and maximum scenarios of the MDA needs further consideration based on the urban trends and the accessibility patterns between the two proposed MDAs and the FUA. The Minimum scenario based on the 22 municipalities of Oslo & Akershus is smaller and fully embedded in the FUA area.

5.7 Turin

Map 5.7 Turin MDA

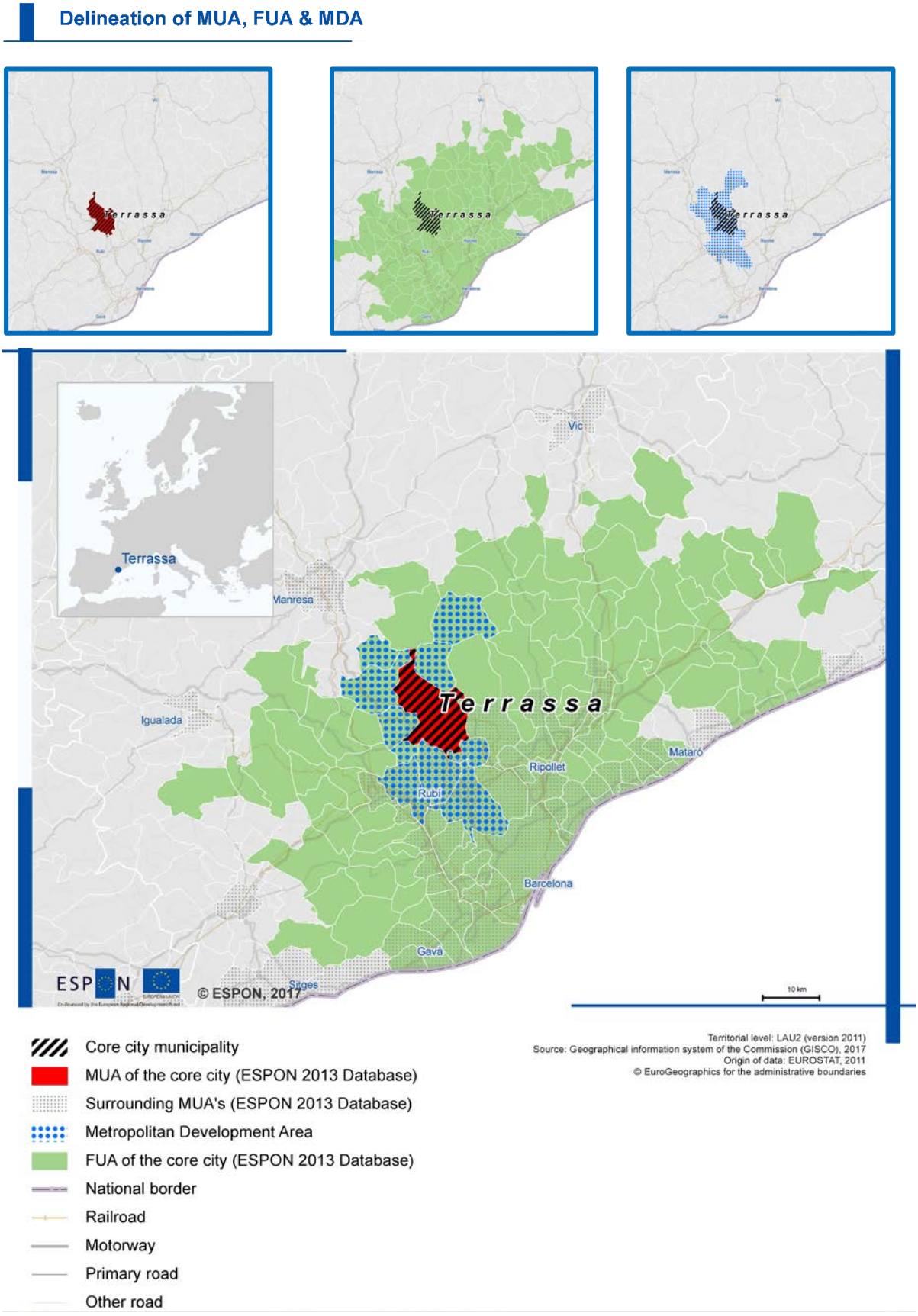


If looking at the morphology of the territory, the case of Turin is similar to the one of Oslo: there is a clear and strong polarization between the urbanized area and the mountainous/rural areas.

The MDA border of Turin is based on a formal delineation, based on the former province of Turin. The area has an unbalanced development towards the Alpine zone in the North West, where urban development is low. The accessibility and urban development shows fragmented patterns within the MDA. The area needs to have a better spatial fit with the future distribution of population and services. The MDA is much larger than the FUA, while in the East part of its border the FUA slightly extends beyond the MDA border.

5.8 Terrassa

Map 5.8 Terrassa MDA

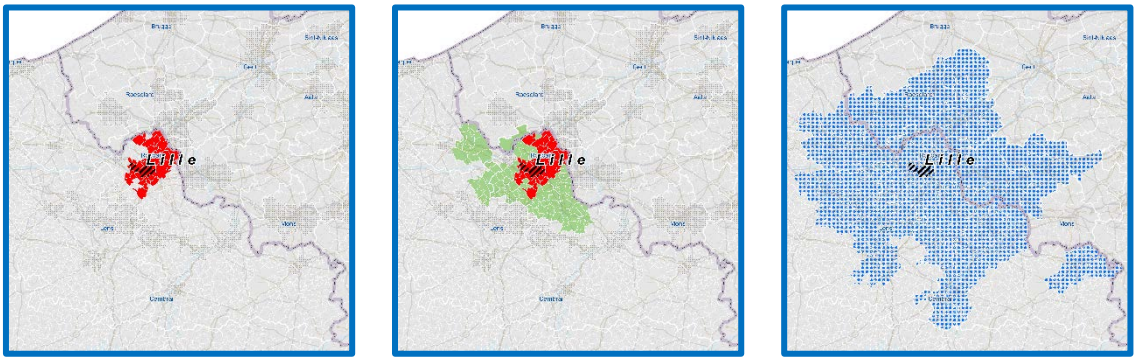


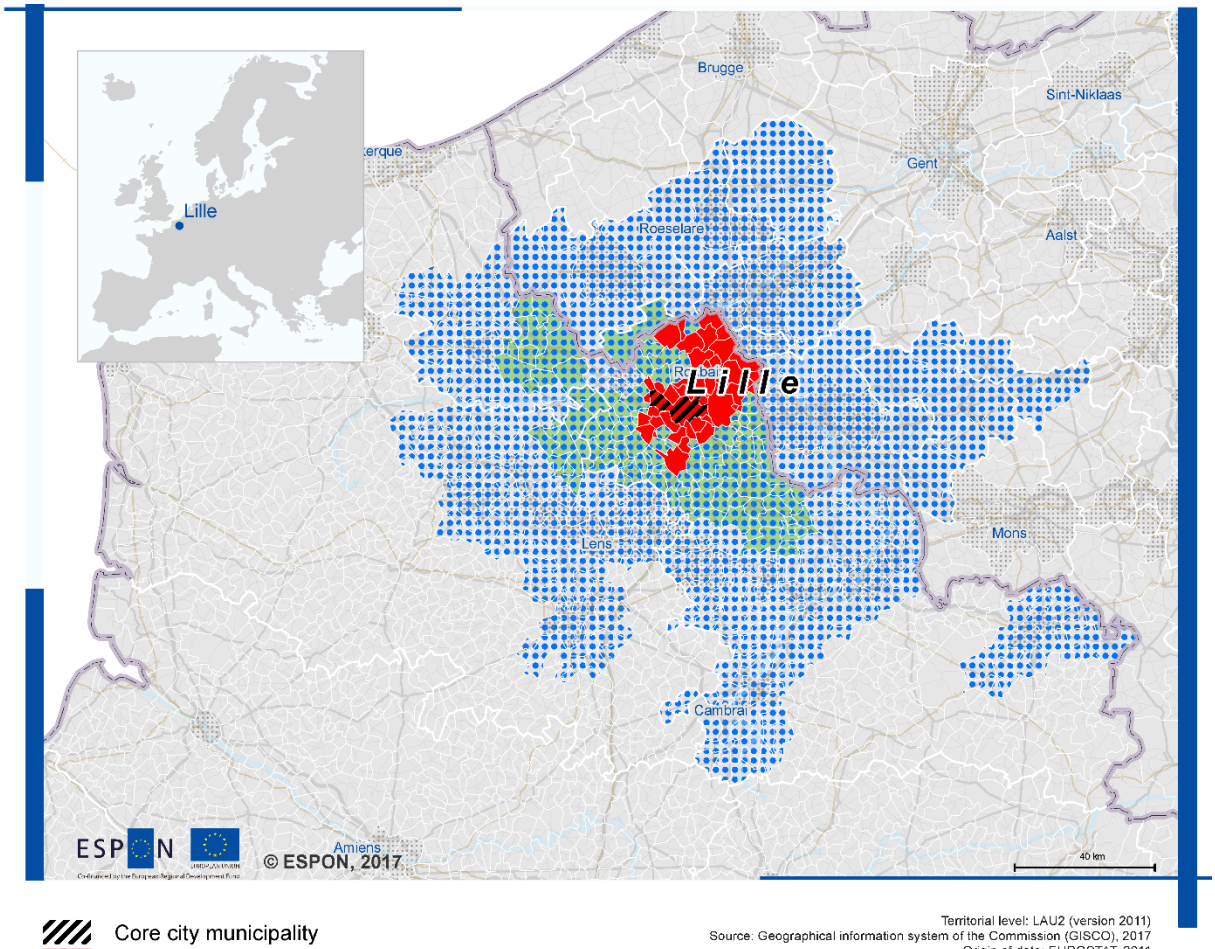
Terrassa MDA is much smaller and fully embedded in the FUA. It has been defined through a collaborative agreement and it is highly influenced by the metropolitan area of Barcelona, which shares part of the FUA with Terrassa. The MDA is not fully corresponding to the accessibility of Terrassa from the surrounding zone.

5.9 Lille

Map 5.9 Lille MDA

Delineation of MUA, FUA & MDA





Core city municipality
MUA of the core city (ESPON 2013 Database)
Surrounding MUA's (ESPON 2013 Database)
Metropolitan Development Area (MDA)
FUA of the core city (ESPON 2013 Database)
National border
Railroad
Motorway
Primary road
Other road
rivers

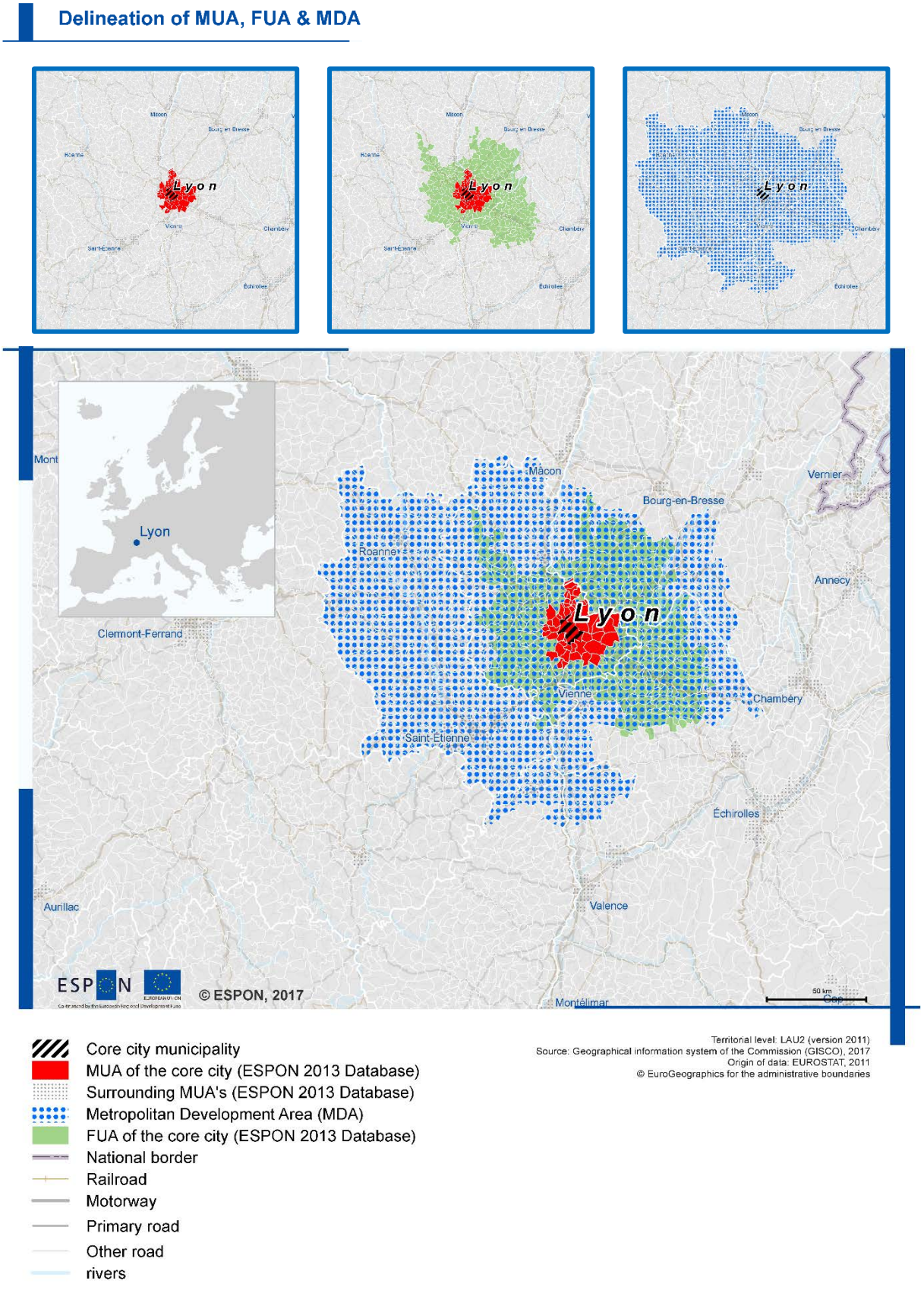
Territorial level: LAU2 (version 2011)
Source: Geographical information system of the Commission (GISCO), 2017
Origin of data: EUROSTAT, 2011
© EuroGeographics for the administrative boundaries

Lille is the second case of study next to Lille where the MDA has a cross-border perspective. Its territory is much larger than the FUA and it reaches the metropolitan areas of the surrounding Belgian and French cities such as Brugge, Gent and Lens.

The MDA has been defined through the strategic plan and the urban development of Lille is overcrossing it to reach the coastal area and other cities in the northeast. In the southwest region instead, the MDA embraces fully the current urban sprawl. Moreover, the MDA fits the 30-45 minutes car accessibility zone to Lille.

5.10 Lyon

Map 5.10 Lyon MDA



Lyon MDA, with its 12,867 km^2 is the largest metropolitan area among the stakeholder areas. Defined through the current strategic plan, it includes all the surrounding satellite cities of the polycentric.

However, due to its large surface, partially polarized in the west side, Lyon MDA delineation needs to more effectively consider the future accessibility patterns. The FUA covers the zone surrounding Lyon, characterized by 30-45 minutes of car accessibility.

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ESPON EGTC
4 rue Erasme, L-1468 Luxembourg - Grand Duchy of Luxembourg
Phone: +352 20 600 280
Email: **info@espon.eu**
www.espon.eu, **Twitter**, **LinkedIn**, **YouTube**

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