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# *SCATTER*

***Sprawling Cities And TransporT: from Evaluation to Recommendations***

**Annex to D2 and D3 (Work packages 2 and 3)**

# Monographic report
# Case city Brussels

Contract number: EVK4-CT-2001-00063

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**Author:** STRATEC S.A. (BE): Françoise Boon, Sylvie Gayda, Nathalie Schaillée

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# 1. OVERALL PRESENTATION OF THE CITY

This first section presents the study area and its main evolutions in terms of urbanisation and socio-economic variables during the last 15 years. It also presents the variables used in the following statistical analysis (WP3) of the Brussels area.

## 1.1. Presentation of the study area

As for the other case cities, the study area has been divided in 3 zones: the urban centre has been defined as the Brussels-Capital Region, it is surrounded by a first outer urban ring, and then by a wide hinterland. The whole area is covering a zone with a 30km radius around Brussels, is composed by 135 communes (study unit), and contains the Brussels-Capital Region (centre) and territories of Flemish (North) and of Walloon Regions (South). The first periphery (outer urban ring presented on Figure 1) is composed by 33 communes, and the hinterland is composed by 83 communes.

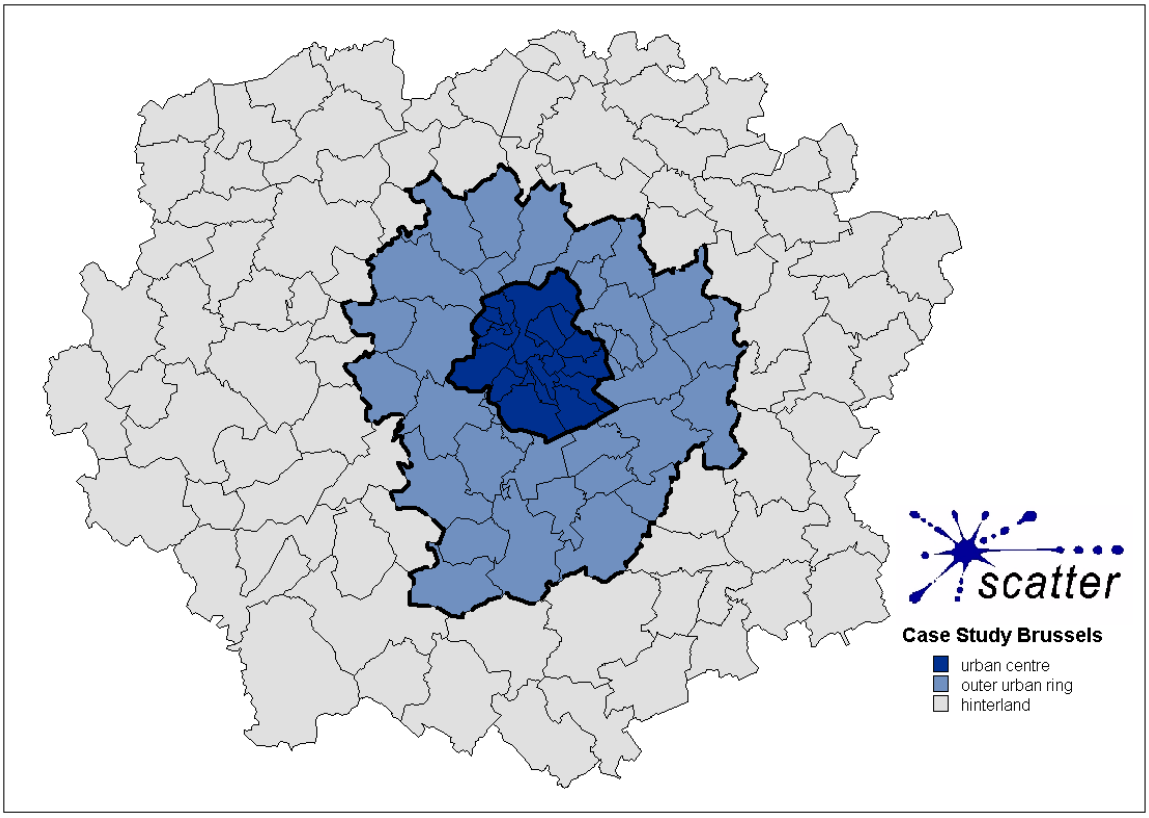


**Figure 1: Urban definition of case study Brussels**

This study area comprises the Brussels-Capital Region and its suburbs, but also (in the hinterland) a further belt with secondary cities (Aalst, Leuven, Mechelen, Louvain-la-Neuve for example), which are more autonomous from Brussels. One also has to keep in mind that several important cities, with strong economic functions, are located close to the study area, such as Antwerp or Liège (economic poles), generating strong exchanges with some parts of the study area.

The Brussels-Capital Region has been created in 1989 and has been autonomous since then. The Region is an agglomeration of 19 communes, constituting one of the three Regions of the federal state of Belgium. It is the capital of Belgium, the siege of the French and Flemish communities, and the siege of European institutions officially since 1992. Brussels-

Capital Region contained 964.405 inhabitants in 2001, and covers a territory of 162 km². However, this regional area is smaller than the continuous built up agglomeration ("*agglomération morphologique*").

Regarding these specific functions and the study area as a whole, the urban morphology has changed: the urbanisation of the area has been modified, and its socio-economic characteristics as well. The following sections will study in particular the evolution of the study area between 1991 and 2001.

## 1.2. Evolution of urbanisation between 1991 and 2001

In 2001, the study area, with a total area of 4331 km², comprises 2.945.000 inhabitants, of which 40.5% are active and resident. Since 1991, population and jobs have globally increased (respectively + 3.7% and +12.1%).

This study area has a strategic position at the European scale: close to two important European harbours (Antwerp and Rotterdam), on the Paris-Amsterdam axis which concentrates ¾ of the European logistic activities, it is also the administrative capital of Europe.

The increase of population and activities generates an increasing consumption of space: the total built area has increased of 18.1% from 1991 to 2001, with a yearly growth of 1304 ha. This growth is essentially due to a growth of residential areas and heavy activity areas.

However, the population density, regarding the residential areas, has decreased during that period: from 60.7 inhabitants/ha, it has come to 52.9 inhabitants/ha. In parallel, the land consumption per inhabitant has increased, from 1.65 ares to 1.89 ares. The growth is not homogeneous in space. The central urban area is nearly totally saturated; on the other hand, new development axes can be identified, some secondary poles appear, and a general phenomenon of sprawl seems to have occurred. A competition for space is taking place, between jobs and households, which involves their needs, preferences, and costs, regarding localisation and transport. A filtering process of households and jobs occurs, leading to a specialisation of locations.

## 1.3. Evolution of the population and the socio-economic variables between 1991 and 2001

When the three defined zones (urban centre, outer urban ring and hinterland) are compared in terms of population, it appears that the central urban region has gained 1.1% inhabitants between 1991 and 2001, when it was loosing population since 1967. But the suburbs grew more: the hinterland has grown the most, by 5.1%, whereas the outer urban ring has grown by 4.7%.

The jobs have grown by 12.1% from 1991 to 2001, but differently for different types of jobs having different location needs. Three different types can be distinguished:

- Jobs consuming much space per employee: they have decreased in the study area by 10.2%. They include industrial, logistic, wholesale, transport and construction activities. They need large and cheap spaces, and a location with great car accessibility, but not necessarily close to the city. They have decreased in number in the urban centre, but slightly increased in periphery;

- Jobs in the decision centres of companies or administrations: they have increased by 22.6%. They include national and international administrations and private services to companies. They need a location with good accessibility by car and public transport, take benefit from being near the airport, and generally search for prestigious locations or locations with aesthetic quality. They have increased in all three of the defined zones;

- Jobs in the induced tertiary sector: they have increased by 19.8%. They include retail trade, local private and public services. Their location is a response to the population's demand, so that they are very sensitive to demographic variations. They are located in space according to a fine grid with commercial and services nodes. They have increased in all three zones.

The jobs have globally increased in each of the three defined zones, but not equally: the central area has had the lowest increase (4%), meanwhile the first outer urban ring has had the greatest increase (30.3%). The hinterland has had a considerable increase of jobs as well (16.3%). The first urban ring appears thus has having been the most attractive in this period.

The principal statement coming out of these observations is that sprawl has occurred during this period, in terms of jobs and population. Is this consumption of space (2% of increase per year) acceptable? The following statistical analysis will analyse this sprawl phenomenon, giving details on its dynamics and characteristics. The analysis is temporal and spatial, and smoothes the phenomenon in time. It emphasizes the spatial differentiation within the study area, confirming that the three macrozones defined for the analysis (urban centre, first outer urban ring and the hinterland) are well relevant and it highlights that three periods of urban functioning, with specific characteristics, have succeeded one another on 20 years. This analysis provides a renewed insight in the mechanisms and features of sprawl, compared to a more traditional statistical analysis.

## 1.4. Variables used for statistical analysis of Brussels

The spatial unit is the commune. The following four variables are studied in this statistical analysis:

- Population: total population by commune;

- Total jobs: total jobs counted at the place of work, by commune. Those data don't include self-employment, neither jobs from the European institutions, which means that the number of jobs in the urban centre is under-estimated (the number of jobs in the European institution amounted to 15.000 jobs1991 and to 16.400 in 1994);

- Directly induced jobs: this category of jobs, which are accounted in the total jobs, represents the jobs which are induced by the population: retail trade and services to persons. These jobs should logically follow the population relocation in case of sprawl;

- Yearly income per inhabitant: yearly income per inhabitant, in constant prices (BEF1990).

The following Figure 2 resumes the time dates and the time steps of the used data.

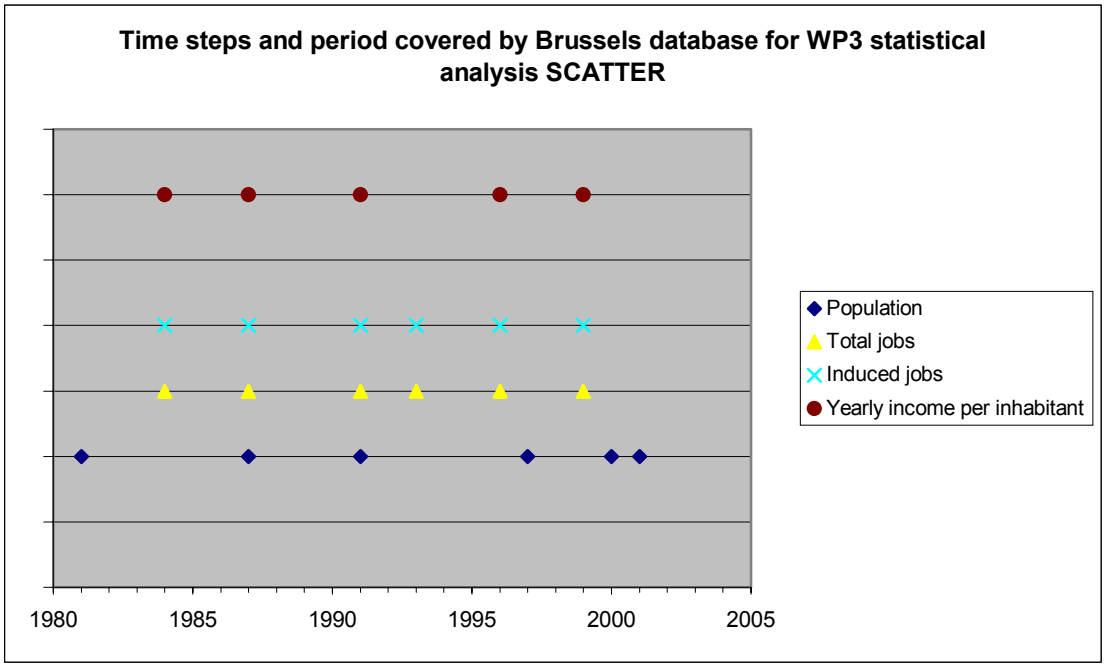


**Figure 2: Time points and steps of data used in Brussels statistical analysis.**

# 2. STATISTICAL ANALYSIS

This section presents the results and the conclusions of the statistical analysis. The overall methodology of the analysis and the precise definition of the indicators are presented in the Deliverable 3 main report.

## 2.1. Development of the average growth rates

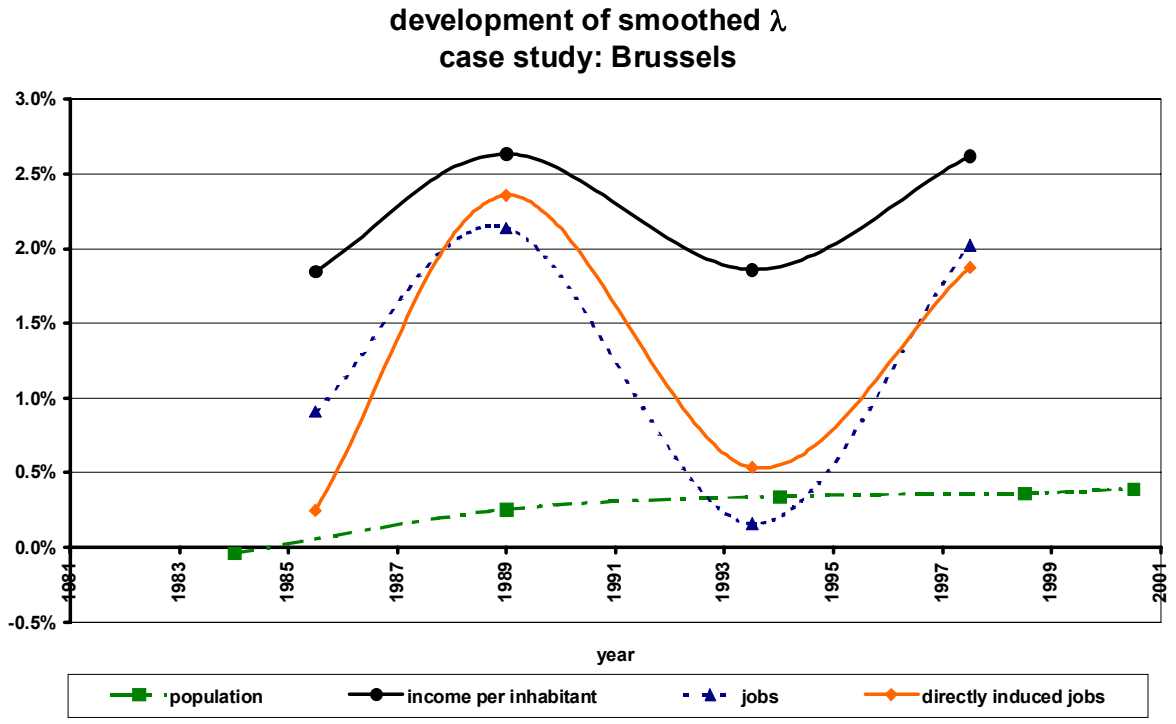


**Figure 3: Average annual growth rate of $\tilde{\lambda}^{population}(t)$, $\tilde{\lambda}^{income\ /\ inhabitant}(t)$, $\tilde{\lambda}^{jobs}(t)$ and $\tilde{\lambda}^{induced\ \ jobs}(t)$**

From the evolution of the average annual growth rates of the four studied variables in the whole study area, several conclusions can be drawn.

The population growth starts in 1985 and is continuous until the end of the studied period, with a slightly increasing growth rate.

The evolution of jobs and income has to be compared with the evolution of Added Value (AV) on the same period (see Figure 4).

Jobs and income per habitant seem to follow the economic cycle of the Added Value: the maximum in the evolution of the AV growth rate in 1989 is reflected in the regional evolution of the jobs and income. In 1993, the fulgurous decrease of Added Value is reflected in a decrease of jobs and income. After 1993, all three variables seem to enter a new cycle again (increase again).

In fact, all these variables are inter-related: in case of economic growth (high added value), the number of jobs increase, followed by a rise of income per habitant, which induces induced jobs (services to persons and retail trade). In case of economic recession, the same phenomenon is observed the other way round. The data show that a second wave of

economic growth seems to be starting from 1993, with the same impacts on jobs and income than previously.

These average growth rates give thus information on the regional trends. However, a sprawl phenomenon cannot be identified at this stage yet.

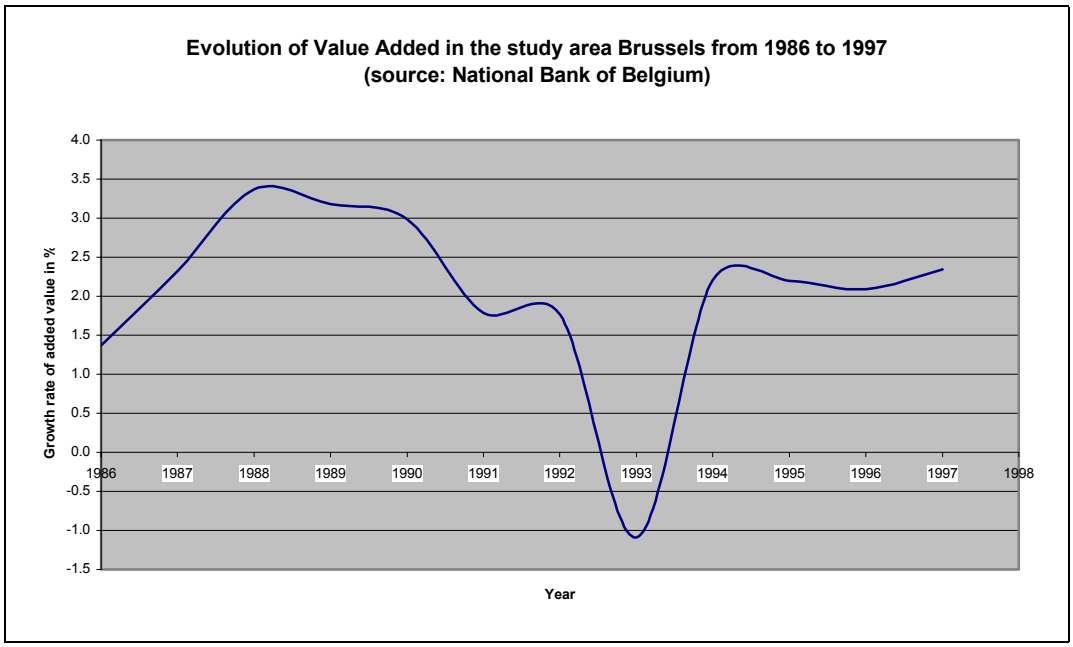


**Figure 4: Evolution of value added in the study area between 1986 and 1997. (source: Comptes régionaux, Croissance économique des régions, provinces et arrondissements - période 1985-1997 - Institut des Comptes Nationaux, Banque Nationale de Belgique)**

## 2.2. Development of the deviations from the average growth rates

The development of the deviations from the average growth rates for the urban centre, the outer urban ring and the hinterland are given in Figure 5. These figures show the temporal evolutions of the different variables in the three macro-zones, comparatively to the regional trend analysed before.

Maps of temporal mean growth rates (Figures 6 and 7) highlight the spatial structure of the study area, regarding the evolution of population and jobs.

### 2.2.1. Development of the deviations from the average growth rates: temporal analysis

The graphs lead to the identification of three phases of spatial development in Brussels, on the study period covering 1985 to 2001, which are detailed in the following sections.

#### 2.2.1.1. Phase 1: from 1985 to 1989, sprawl of population and jobs following economic growth

In this first phase, characterised by a high economic growth (roughly more than 2% per year) as shown by the added value evolution, a general sprawl phenomenon occurs and is even accelerating.

High economic growth induces growth of jobs in the whole area. This increase of jobs is essentially located in the outer urban ring, and more slightly in the hinterland; the growth in the urban centre is very low, often close to 0%. The evolution of $\gamma^{jobs}$ in the outer urban ring strictly follows the average growth rate.

This positive evolution of jobs is followed by a general increase of income per habitant, such as identified previously in the regional trend (average growth rate). The increase of income occurs more in the hinterland and in the outer urban ring compared to the urban centre: it is likely to be due to the out-migration of high income households, whereas the low income population stays in the urban centre. People who have higher income can afford to live further away from the city centre to have more living space and/or to be near nice green natural sites.

The movement of population is confirmed by the evolution of the development of smoothed $\gamma^{population}$: $\gamma^{population}$ is negative and still decreases for the urban centre, while it highly increases in the outer urban ring, and more softly in hinterland, with a maximum of this trend in 1989: a population sprawl clearly takes place here, and the sprawl is accelerated between 1985 and 1989. As an additional illustration, the following Table gives the population evolution for the urban centre, which decreases from 1981 until 1994.

| Population of Brussels-Capital Region | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1981** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** |
| 1.000.221 | 954.045 | 951.217 | 950.339 | 949.070 | 951.580 | 948.122 | 950.597 | 953.175 | 954.460 | 959.318 | 964.405 |

**Table 1: Population of Brussels-Capital Region from 1981 until 2001. (source: Institut National de Statistique, Registre National)**

It has to be noted that the population increase in the hinterland includes the evolution of population of secondary cities such as Leuven or Mechelen, having a certain level of functional independency with regard to the capital, such as it has been notified in interviews of the work package 2. Therefore, the increase in the hinterland is not exclusively due to Brussels' evolutions.

The move of population induces a relocation of induced jobs (retail trade and services to persons): their growth is essentially observed in the outer urban ring, and less in the hinterland, but surely less in the urban centre (negative values of deviations). They follow quite well the relocation of people.

In summary, this first phase (1985-1989) is characterized by a sprawl of population and of jobs, essentially towards outer urban ring, which seems to be at least partly due to the economic growth. Higher income are more frequent out of the city, induced jobs are created essentially in the outer urban ring. This sprawl phase is in some way confirmed by the following data table giving the number of active people living in zones of different urban hierarchical level, and working in Brussels, in 1981 and in 1991, as well as the variation. (Table 2 ). The total absolute variation of people working in Brussels is negative, due to the decrease of people living and working in Brussels (- 13,07%). But the number of people living out of Brussels and working in the city has mainly increased (11,17%), confirming in a way the sprawl of population. This growth of commuters is essentially composed by commuters coming from the 4 level I cities (Antwerp, Gent, Liège and Charleroi). Links between Brussels and these cities are reinforced, such as with cities of level II.

| | 1981 | 1991 | Absolute variation | Relative variation (%) | % of the growth of commuters entering Brussels |
|---|---|---|---|---|---|
| **TOTAL** | 559 286 | 554 744 | -4 542 | -0.81 | |
| **BCR** | 276 479 | 240 346 | -36 133 | -13.07 | |
| **TOTAL less BCR** | 282 807 | 314 398 | 31 591 | 11.17 | 100 |
| **Arrondissements containing a city of level I** | 24 676 | 35 342 | 10 666 | 43.22 | 33.76 |
| **Arrondissements containing a city of level II** | 99 568 | 110622 | 11 054 | 11.10 | 34.99 |
| **Arrondissements containing a city of level III** | 142640 | 149246 | 6 606 | 4.63 | 20.91 |
| **Other arrondissements** | 15923 | 19188 | 3 265 | 20.50 | 10.34 |

**Table 2: : Active people working in the Brussels-Capital Region, as a function of the urban hierarchical level of the residence zone, in 1981 and 1991 (1981 and 1991 Census – Geographic mobility of manpower – National Institute of Statistics – INS)**

2.2.1.2. Phase 2: from 1989 to 1993: slow down of the sprawl phenomenon

This second short phase is characterized by a low economic growth or even economic recession, and in the same time, by a slow down of the sprawl observed before.
The growth of jobs is very much reduced in the outer urban ring, and is increasing slightly in the urban centre: the sprawl of jobs seems to reduce. An additional increase of jobs in the urban centre is to be mentioned, which is not apparent in these data: the European institutions locate in Brussels in this period, providing 15.000 jobs in 1991. This likely induces an increase of population, of attractiveness and of induced jobs in the urban centre.
This might explain the slow down phenomenon of sprawl: $\gamma^{population}$ of the urban centre increases, the decrease of population in urban centre is lower (with a lower increase in the outer urban ring); and with regard to the jobs, $\gamma^{jobs}$ of the urban centre does no more decrease, while $\gamma^{jobs}$ of the outer urban ring is well decreasing.

2.2.1.3. Phase 3: after 1993: re-centralization of population

The last phase, starting from 1993 until 2001, presents a totally reversed trend compared to the sprawl of the first phase, except for jobs location.

Again, the higher economic growth starting from 1993, induces an increase of jobs, mostly in the outer urban ring. But this time, the income is not only rising in the periphery, but also in the centre. This can be a consequence of a change in the type of jobs offered in the centre, but also of the development of the European Commission in Brussels offering high-income jobs (those incomes are not included in this income data, nor in the jobs data – it represents 16.400 jobs in 1994), inducing more consumption and a certain increase of income. The variation of income in the urban centre is much more dynamic compared to the outer rings.

The centre is gaining in jobs, in income and in population. Starting from 1997, inhabitants start to increase in the urban centre, meanwhile its growth is attenuated in the outer urban area: it seems that, from 1999, the sprawl of population is stopped and that a reverse trend is starting. Induced jobs follow clearly this trend.

In conclusion, this statistical analysis confirms that a sprawl phenomenon of jobs and population has appeared, but has been reduced by some event. These evolutions of the sprawl phenomenon seem to be strongly linked to economic cycles.

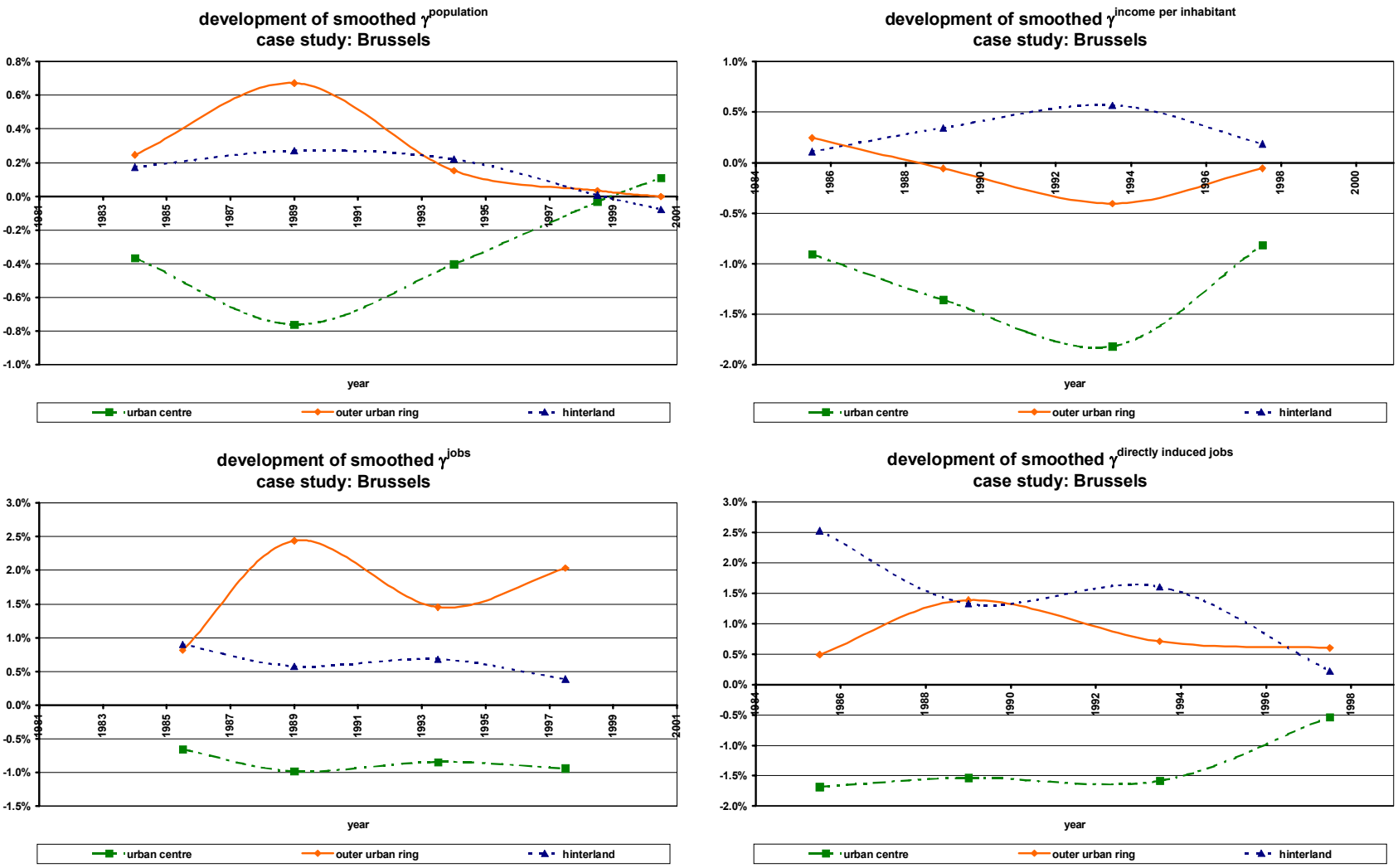


**Figure 5: Annual deviations from the average growth rate $\tilde{\gamma}^{\text{population}}(t)$, $\tilde{\gamma}^{\text{jobs}}(t)$, $\tilde{\gamma}^{\text{income / inhabitant}}(t)$ and $\tilde{\gamma}^{\text{induced jobs}}(t)$**

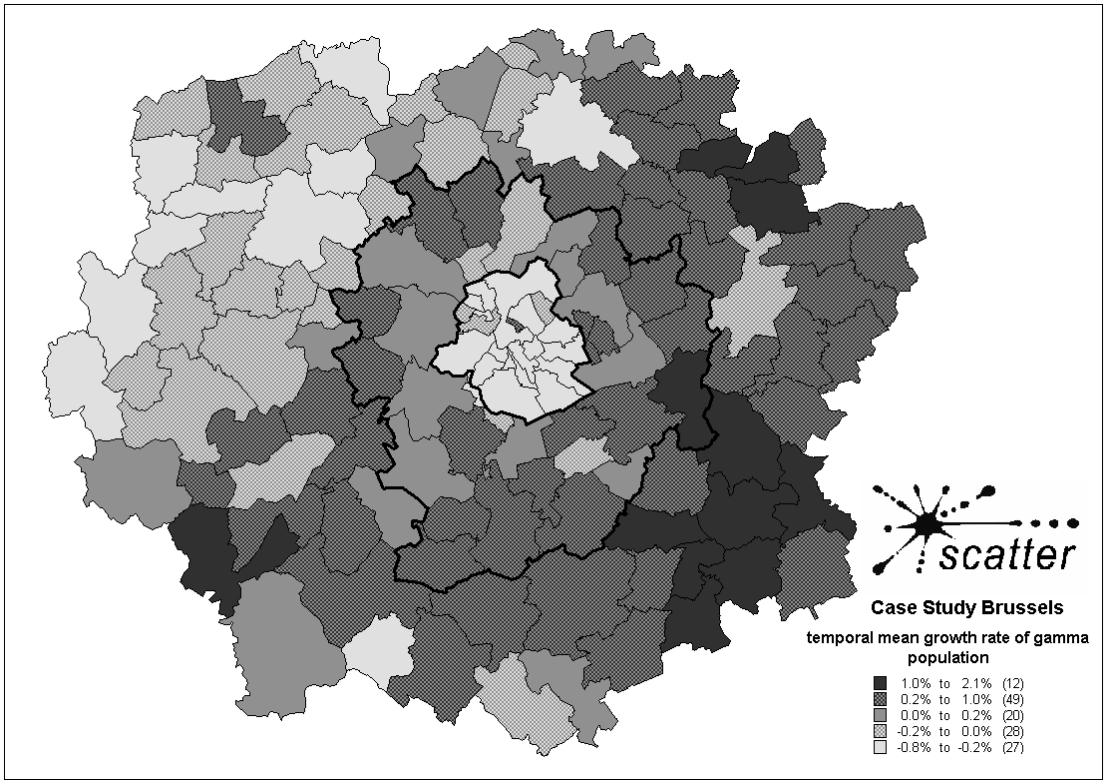


**Figure 6: Spatial distribution of the temporal mean growth rate of $\tilde{\gamma}^{\text{population}}$ over the period 1984-2001**

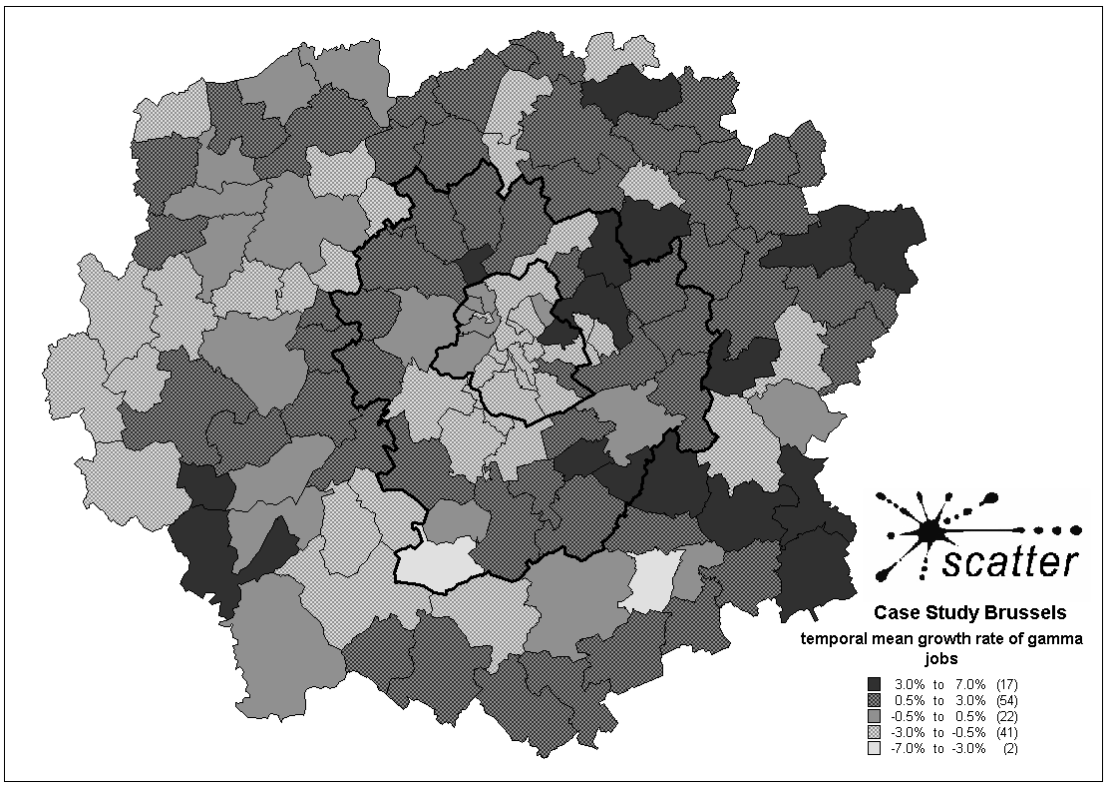


**Figure 7: Spatial distribution of the temporal mean growth rate of $\tilde{\gamma}^{\text{jobs}}$ over the period 1984-1999**

## 2.2.2. Temporal mean growth rates: spatial analysis

The maps showing the spatial distribution of the temporal mean growth rates of $\widetilde{\gamma}^{\text{jobs}}$ and $\widetilde{\gamma}^{\text{population}}$ by zone, on the total study period (Figures 6 and 7), allow to get a finer spatial view of the temporal phenomenon identified in the previous section.

On both maps, a general spatial structure appears clearly: it is mainly concentric, with lower growth rates in the centre, quite high rates in the outer urban ring and various rates in the hinterland. The market share of car seems to follow this structure. The limits of the macro-zones, as they were defined for this analysis, are in a way justified by these maps. This concentric structure is accompanied by a positive dissymmetry towards the East part of the study area.

An additional information is given in Figures 8 and 9, showing the market share of private car (driver and passenger), for the home-work trips, in 1981 and in 1991, i.e. in the first phase of sprawl identified. The four maps considered together illustrate a strong link between sprawl and the increase of the car market share. As it has been mentioned in the interviews of work package 2, the public transport services are generally not very efficient in the periphery. A high proportion of the people migrating towards the periphery still work in the centre, and choose their car to go to work, so the market share of car increases strongly in these zones.

More people and jobs are migrating towards the Eastern part, compared to the West part, and in parallel, the market share of car is also higher in the Eastern area. Beside the general increase of car use in the whole area, a dissymmetric structure appears, which highlights the areas with high attractiveness and with high market shares of car.

The following general conclusions can be drawn on the three macrozones defined in the study area and on the overall spatial structure, during the first phase of sprawl :

- the urban centre is characterised by a general loss of population and jobs. The decrease trend of jobs is less strong. The market share of car is very low in this zone, but increases slightly;

- the outer urban ring is quite homogeneous as well, with an increase of population and jobs: the market share of car is high and increasing in this zone. For jobs, some clear well-known poles appear: Zaventem (airport), La Hulpe and their surroundings;

- the hinterland: the dissymmetry East-West is clear for both variables (more development in the East), and inside the hinterland, poles characterised by a strong growth appear:

    - in population: some zones (the darkest ones) are clearly attractive: Walloon Brabant, Rotselaar and Silly, which confirms other well known observations. The surrounding zones of the secondary cities are growing as well (around Leuven, Mechelen, Wavre). These households induce higher car use in these zones;

    - in jobs: mainly a South East axis and the axis of the airport (Zaventem), which are also characterized by high market share of car.

In conclusion, these maps highlight the existence of poles inside the macrozones (hinterland, outer ring or centre) and of particular phenomena. Sprawl has accelerated the growth of the market share of car, and the car use in general.

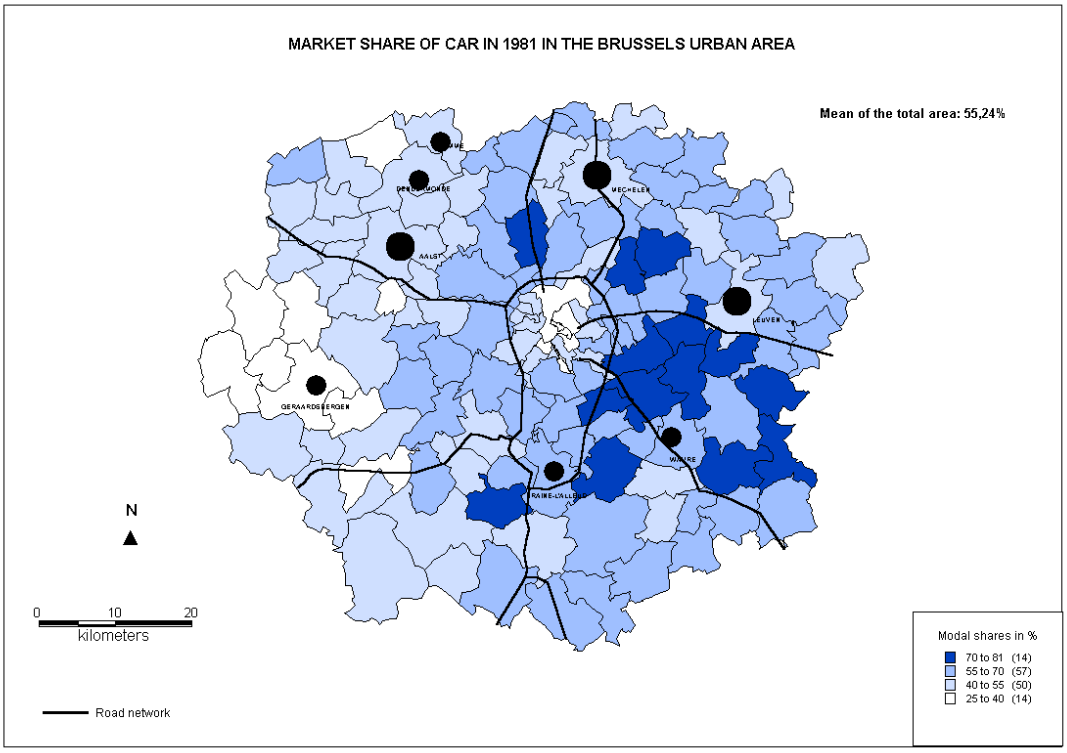


**Figure 8: Market share of car (driver and passenger) for the home-work trips, in 1981 in the study area (source: National Institute of Statistics – 1981 census)**

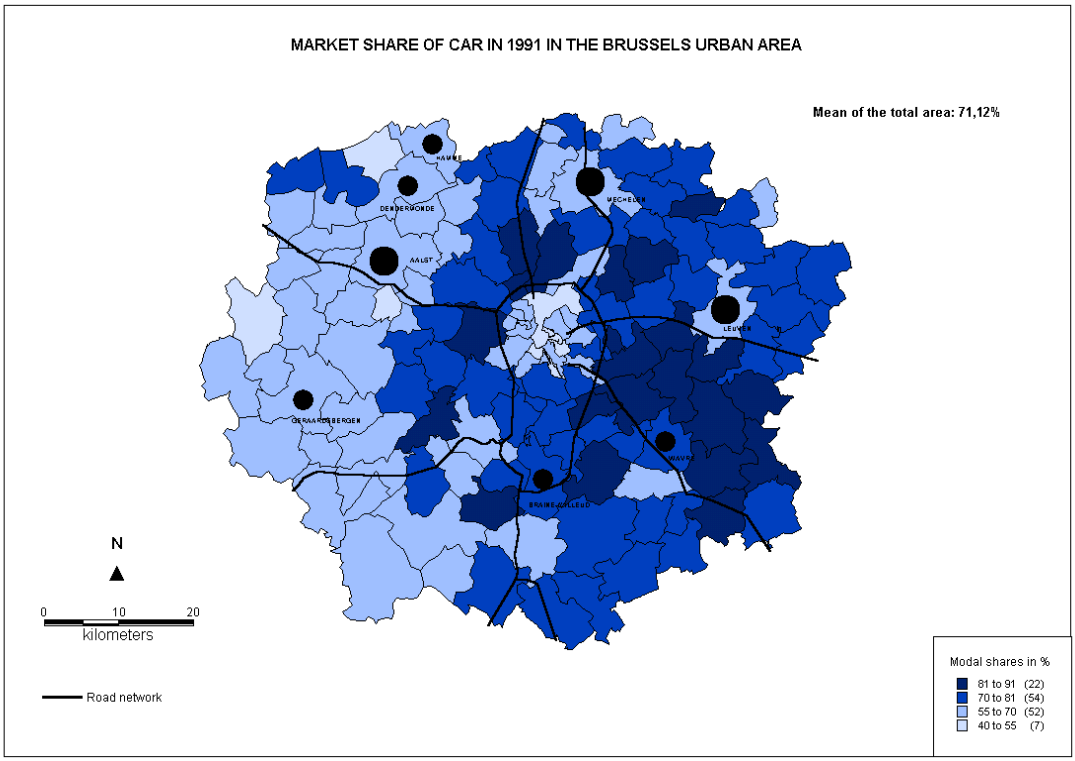


**Figure 9: Market share of car (driver and passenger) for the home-work trips in 1991 in the study area (source: National Institute of Statistics – 1991 census)**

## 2.3. Development of the H-measure

The analysis is focussed on the $H_{relative}$ indicator, which gives a direct measure of decentralisation or sprawl. For a particular variable, when $H_{relative}$ increases, this variable is growing faster in the outer urban ring or the hinterland than in the urban centre. When $H_{relative}$ remains constant, the evolution in space is homogeneous. Decreasing measures of $H_{relative}$ reflect a spatial concentration.

The $H_{relative}$ measures (Figure 10) confirm the previous observations and the temporal phases identified :

- Sprawl of jobs occurs and slows down from 1998, as well as income on a lower level. The income per habitant figure shows a later sprawl phenomenon from 1986 until 1997: this confirms previous observations on the income.

- Sprawl of population is observed, until 1997. This is reflected in the induced jobs, confirming the link between population and these jobs.

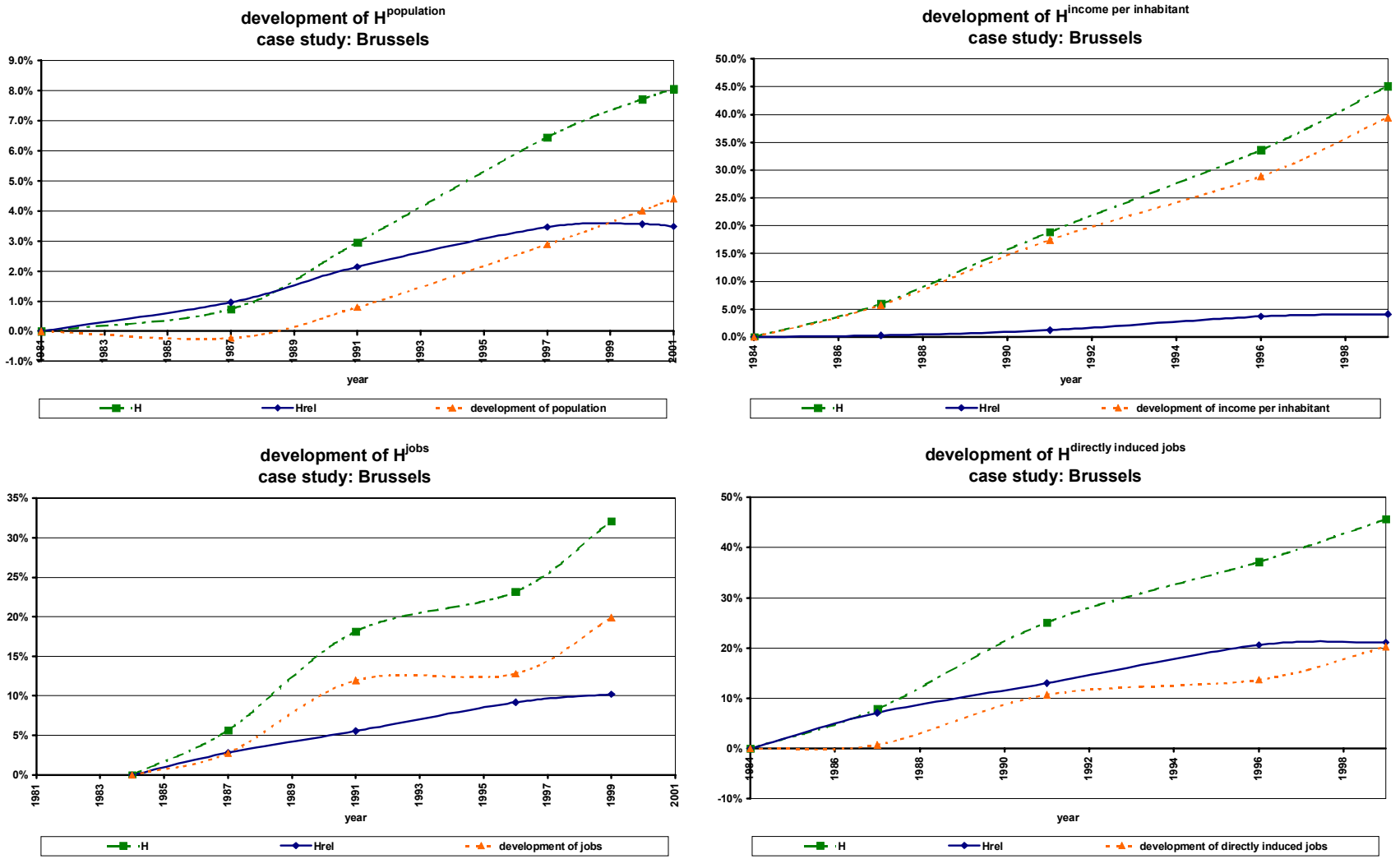


**Figure 10: Development of $H^{\text{population}}(t)$, $H^{\text{jobs}}(t)$, $H^{\text{income / inhabitant}}(t)$ and $H^{\text{induced jobs}}(t)$**

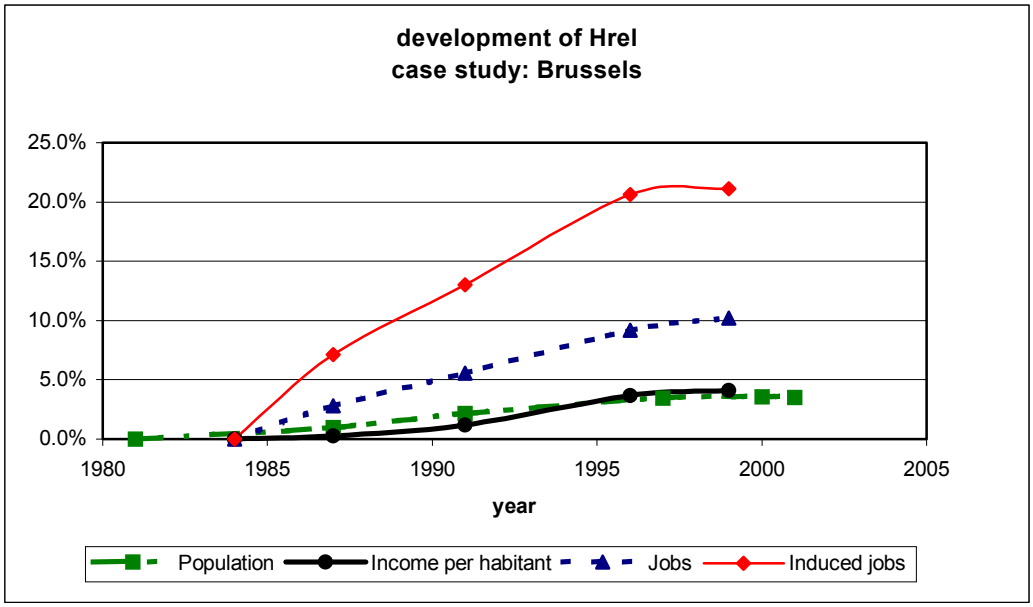


**Figure 11: Development of $H^{\text{relative}}(t)$ for all variables**

The above figure shows the evolution of the $H_{relative}$ indicators for the four variables. The sprawl of induced jobs appears to be stronger than the sprawl of the other variables: these activities have the highest spatial dynamics and follow actively the population location. All variables do show a sprawl phenomenon, which seems to stop starting from 1996, except for jobs for which it slows down starting from that date.

In conclusion, the H indicator seems to be relevant to give an overall indication of the level of sprawl.

## 2.4. Development of global and local Moran I

Global and local Moran I indicators are calculated on population and job densities. They give an idea of the spatial autocorrelation of the variables. When the Moran I indicators increase, the level of homogeneity between the zones and their neighbourhood (i.e the surrounding zones) increases, sometimes leading to homogeneous clusters. When the local Moran I indicators decrease, there is more heterogeneity between the zones and their neighbourhood. When they remain constant, the level of homogeneity remains unchanged.

### 2.4.1. Global Moran I

The global Moran I (Figure 12) gives an idea on the spatial autocorrelation of the variables when considering the whole study area. It is the sum of the local Moran I indicators of all the zones.

On the period 1984 - 1999, the global Moran I does not change significantly for the density of population ad induced jobs. It increases slightly for the density of total jobs and has a globally decreasing trend for the income per inhabitant.

Regarding the income, the three phases described above can be found approximately again here. In parallel with the global Moran I, maps showing the income per habitant in 1984, 1991 and 1999, all in constant BEF 1990, are presented in Figures 13, 14 and 15.

- From 1984 to 1990-91: the incomes are rising, and evolving towards a more heterogeneous spatial structure (decreasing Moran I), as, with sprawl, middle class or high income households migrate towards peripheral communes, initially inhabited by lower income households. The maps 1984 and 1991 show that this sprawl of income is essentially happening towards the South East zones, known as attractive, and more slightly towards a North-West axis, orientated to the North East, just above the urban centre (Gooik, Dilbeek and Grimbergen). These zones are also characterised with high market shares of car (see previous Figures 8 and 9). It might be that the evolution of the Walloon Brabant will be copied by the North East axis in a more or less near future;

- From 1991 to 1996, the phenomenon seems to slow down;

- Starting from 1996, the homogeneity of zones regarding income trends to increase. This could maybe be explained by the previous statement, that in this period, the income not only rises in periphery but also slightly in the urban centre. The maps of income of 1991 and 1999 confirm this global rise and continuing of sprawl. The main impact on market share of car and car use in general can be estimated: those have risen, between 1991 and 1999, most probably dramatically.

This analysis highlights some mechanisms of the sprawl of population, where the income, as one of the drivers of sprawl, and the high level of car use, as an impact of sprawl, are closely inter-related.

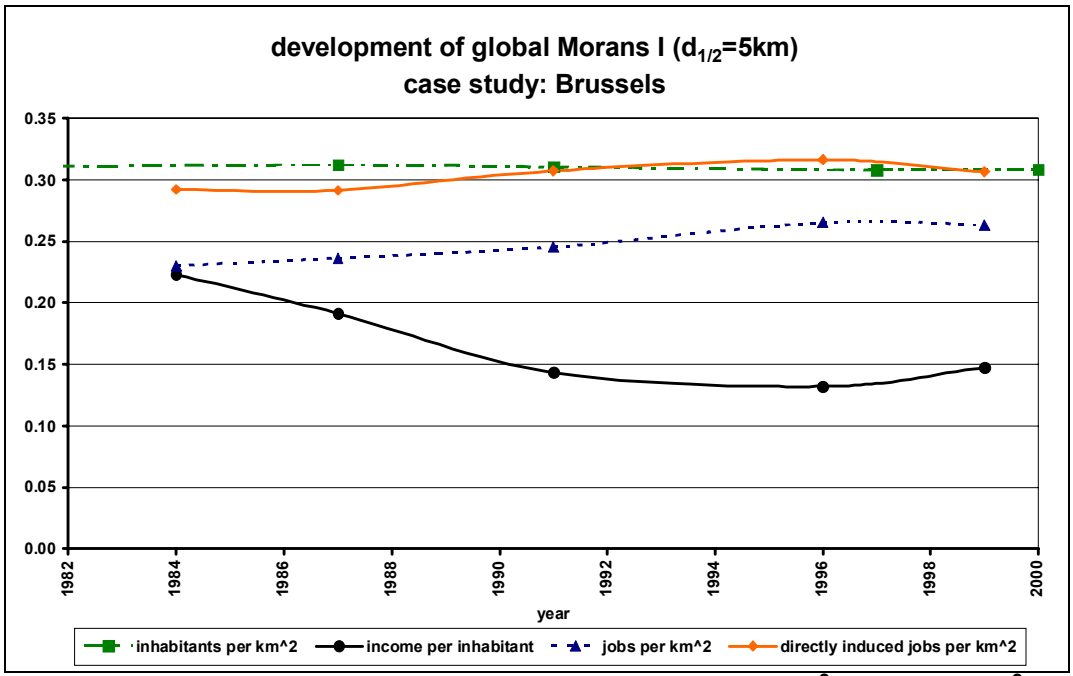


**Figure 12: Development of global Moran I of inhabitants per km$^2$, jobs per km$^2$, income per inhabitant and directly induced jobs per km$^2$**

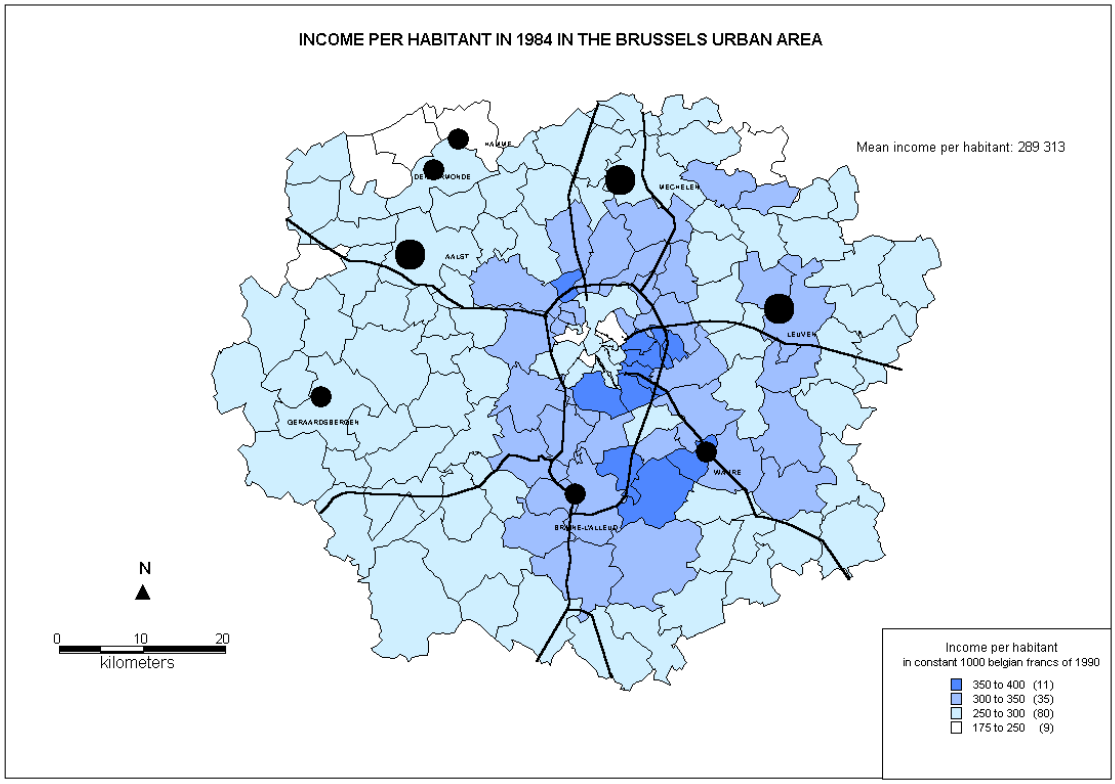


**Figure 13: Income per habitant, in constant BEF 1990, in the Brussels urban area, 1984**

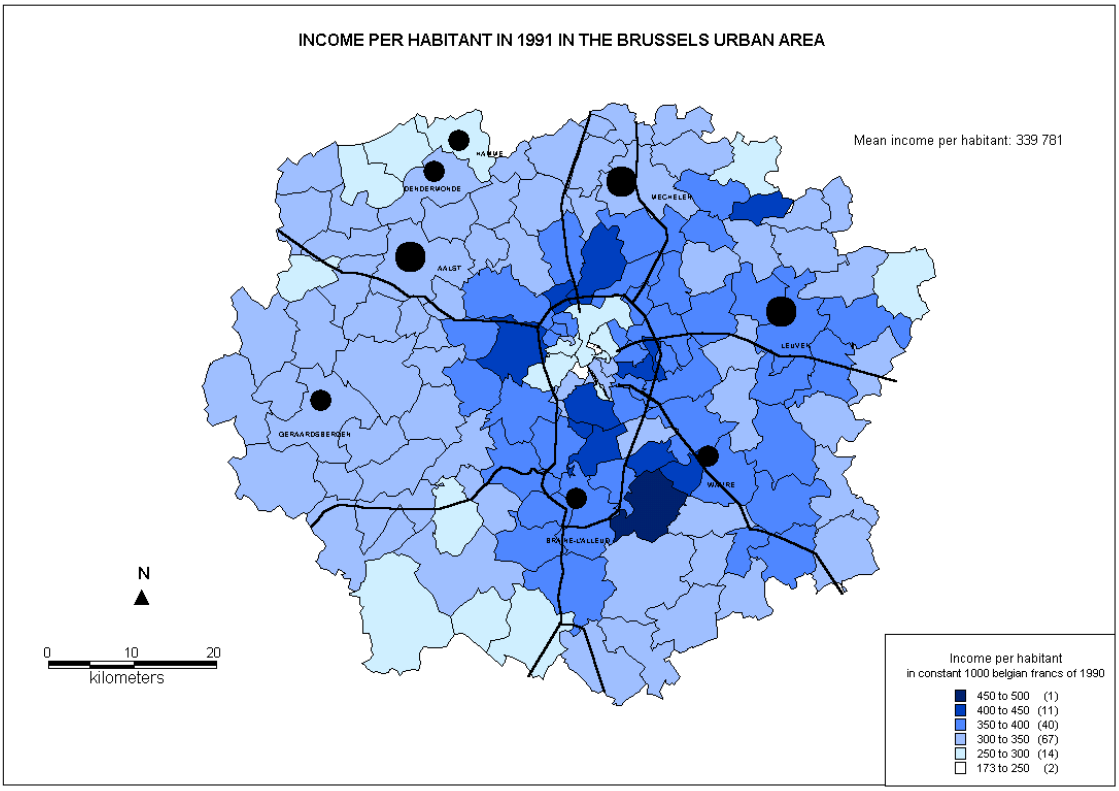


**Figure 14: Income per habitant, in constant BEF 1990, in the Brussels urban area, 1991**

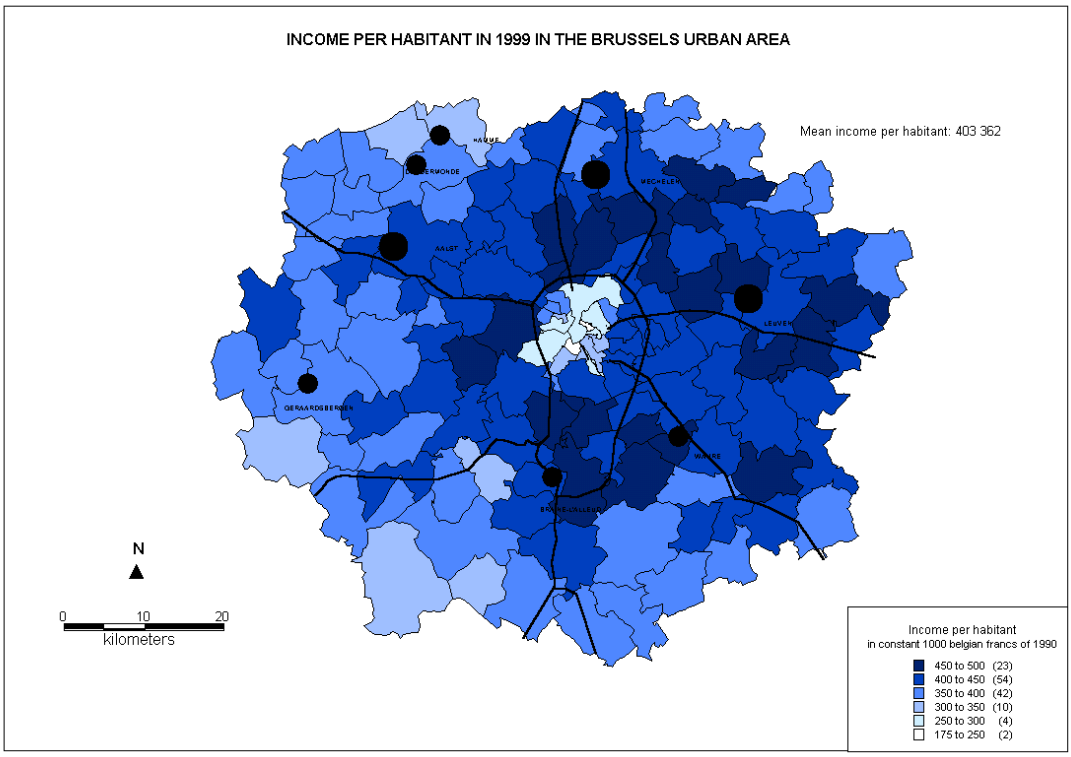


**Figure 15: Income per habitant, in constant BEF of 1990, in the Brussels urban area, 1999**

## 2.4.2. Local Moran I

The local Moran I indicators presented on the following maps (Figures 16 to 19) show several spatial structures.

In 2001, the structure of the Moran I for population is very clear. The urban centre and the hinterland are quite homogeneous: they represent the homogeneous dense urban area and the rural low-density hinterland. The first outer urban ring is more heterogeneous: secondary dense cities are present in a low-density rural area. Some secondary cities (Leuven, Mechelen) of the hinterland have low values of local Moran I because the population density in these urban centres is clearly very higher than the density in the surrounding zones.

The intermediate ring characterised by a high level of heterogeneity appears thus as the zone where urbanisation is currently being achieved, like a front line of urbanisation going ahead, the very specific mark of sprawl.

The evolution of this indicator from 1981 until 2001 shows that most of the study undergoes little change, except of the centre. The centre presents different patterns: some zones (Molenbeek-Saint-Jean, Saint-Josse-ten-Node) are becoming more homogeneous with the surrounding zones; they are probably becoming more dense in population, whereas other zones, the more central zones, are becoming more heterogeneous with the surrounding ones, probably because of a loss of population.

Regarding jobs, in 1999, the same clear concentric structure appears as for population. Again the poles Leuven and Mechelen appear. The evolution of these indicators on the 1984 - 1999 period shows globally that a large part of the study area kept more or less the same level of homogeneity. But the West area is distinguished, probably because of its high increase of jobs during this period. Some clustering poles appear, probably due to a development of jobs (Waterloo, Mechelen, etc.).

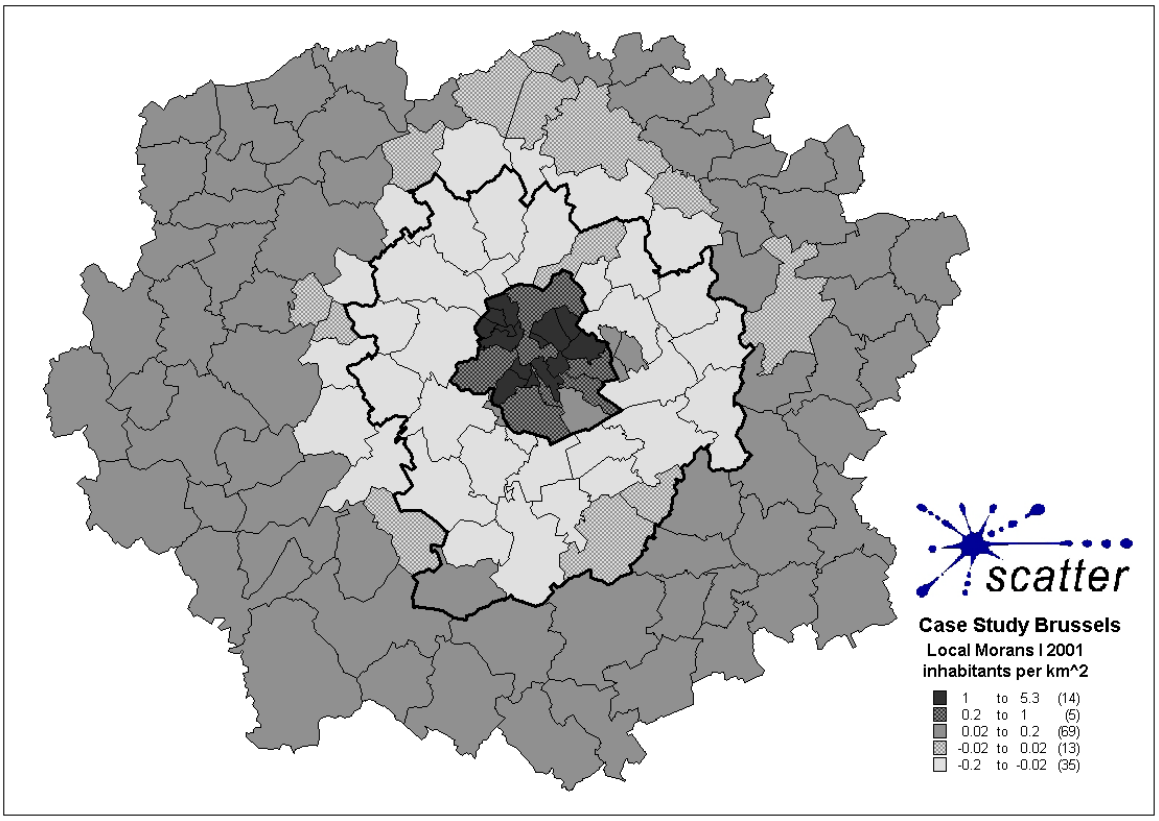


**Figure 16: Spatial distribution of Local Moran I for inhabitants per km$^2$ in 2001**

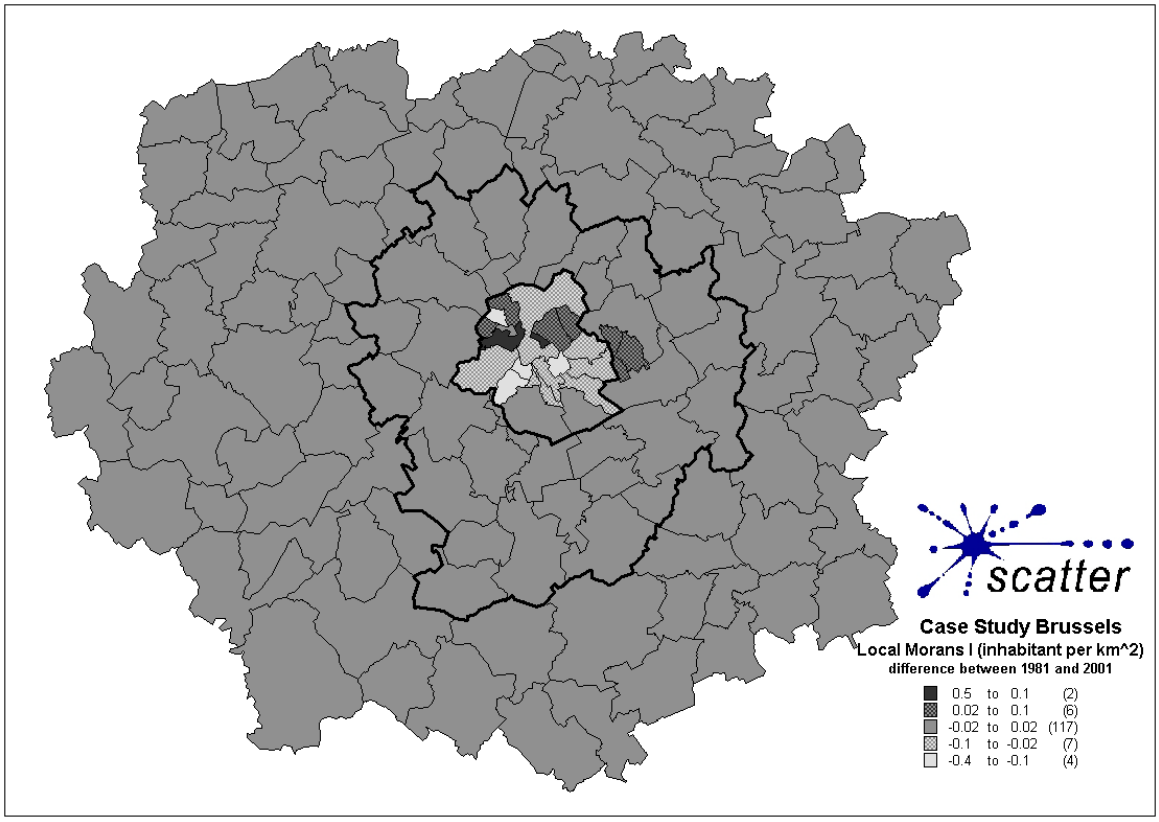


**Figure 17: Changes of Local Moran I for inhabitants per km$^2$ between 1981 and 2001**

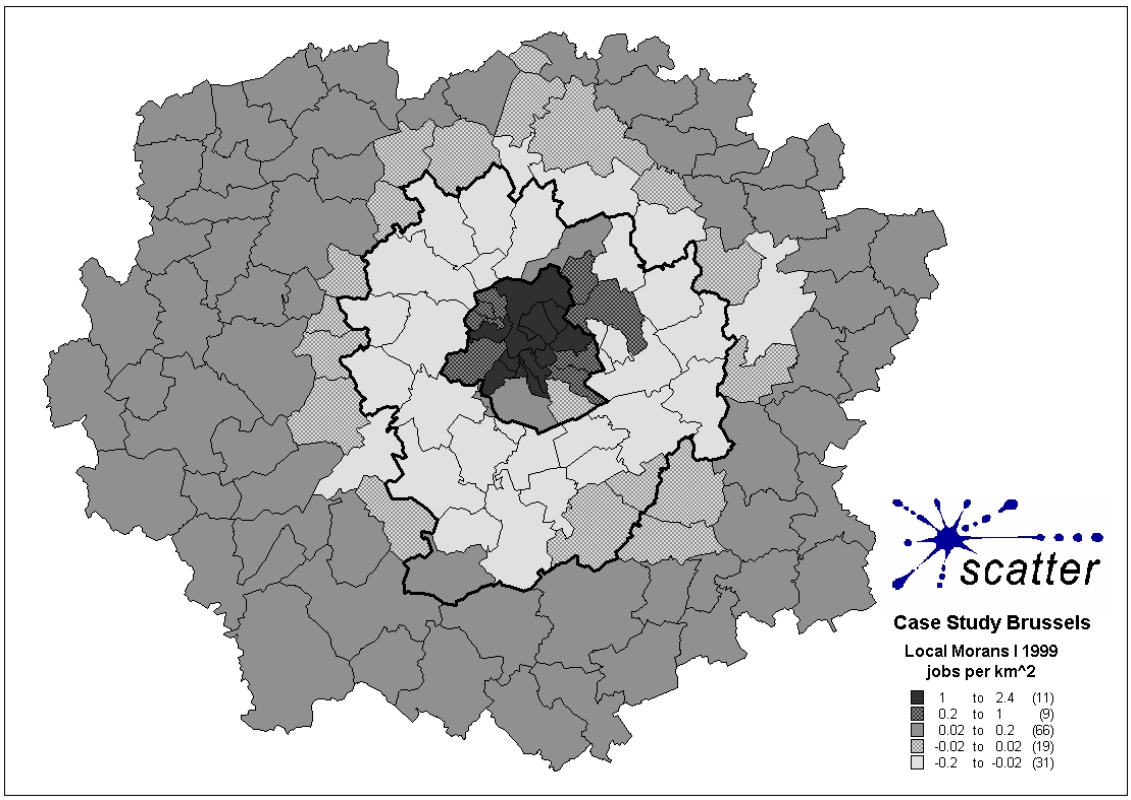


**Figure 18: Spatial distribution of Local Moran I for jobs per km$^2$ in 1991**

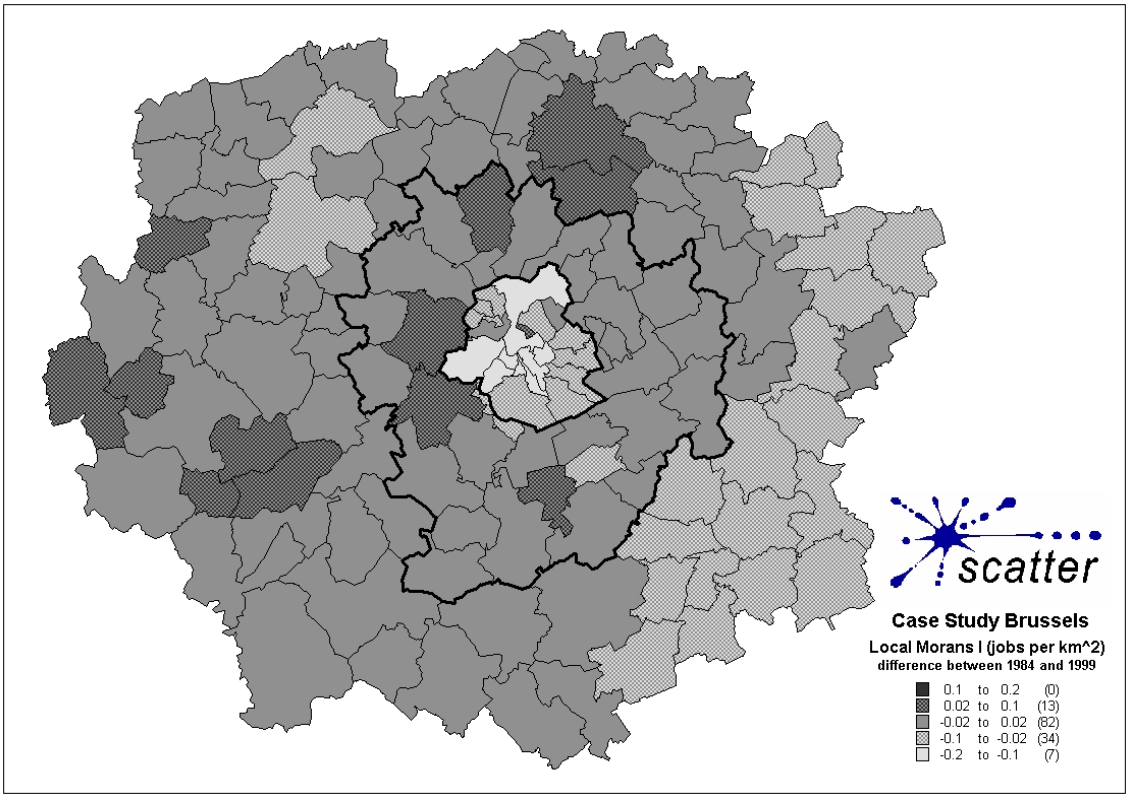


**Figure 19: Changes of Local Moran I for jobs per km$^2$ between 1984 and 1999**

## 2.5. Summary of the statistical analysis of the Brussels Case Study

The statistical analysis gave a possibility of recognising different temporal phases and spatial phenomena on the 1981 – 2001 period. The shift-and-share analysis of the growth rates, the H indicators, the Moran I indicators appeared to be adequate and relevant tools and indicators to measure urban sprawl. The evolution of the Brussels urban area is summarized below.

First of all, the sprawl phenomenon of population and jobs seems to be strongly linked with economic cycles: in a period of high economic growth, new jobs are created, income rises and the households, having gained confidence in the future, move towards the urban periphery probably to have more space and comfort, inducing there service jobs. On the contrary, in a period of low economic growth or economic recession, the sprawl of population tends to slow down or even stop. Measures to tackle urban sprawl should take into account this mechanism.

Three distinct phases were identified:

- 1985-1989: sprawl of population and of jobs, essentially towards the first outer urban ring, simultaneously with a high economic growth;

- 1989-1993: the sprawl is clearly reduced, in a period characterised by a lower economic growth and even a short recession;

- after 1993: there seems to be a slight relocation of population in the centre, starting from 1999. Jobs seem although to increase again in outer urban area and less in centre, except for jobs directly induced by the population (retail trade and services to the population).

In terms of impacts, the analysis highlighted that the sprawl of population induces an increase of the market share of car, presenting major negative environmental impacts.

The outer urban ring seems to be strongly linked to the city centre evolutions, whereas the hinterland is less linked: evolutions in the hinterland may also depend on distinct evolutions of secondary cities, or on the evolution of other surrounding cities not included in the study area, such as Antwerp or Charleroi.

The global spatial structure of the Brussels urban area is concentric in terms of the studied variables, with a East-West dissymmetry. Several poles exist in Brussels' periphery.

A sprawl phenomenon of jobs and population has thus occurred but has been reduced by some event(s), which seem(s) to have increased the attractiveness of the city centre. The development of the European Commission in Brussels, essentially since 1992 (Treaty of Maastricht) has to be kept in mind in this analysis: it has probably increased the attractiveness of the urban centre, has induced jobs and indirectly has probably increased the incomes in the centre. It could be one of the reasons – if not the most important one – of the reverse of trend observed since 1997. This illustrates thus that in some cases, like in the case of Brussels, an exogenous factor is able to increase the attractiveness of the urban centre and can contribute to reducing sprawl.

# 3. PRESENTATION OF THE PLANNING SYSTEM

The Brussels city case is very special because it is strongly influenced by its institutional context. It is consequently important to know this context before studying urban sprawl's mechanisms.

Before the regionalization of Belgium in the '80s, the country was covered by 48 sector plans made in the '70s and adopted under Royal Decree, stipulating the land allocation zones and governing the deliverance of the building permits. Belgium has maintained its public planning system but decentralized powers towards the three Regions (Brussels – Capital Region, Walloon Region and Flemish Region), and to the local municipalities.

In 1980, the Special Act on Institutional Reforms transferred 10 groups of national competences including town planning, to the Regional level. Two regions were created: Walloon Region and Flemish Region. The third region - Brussels Capital Region - was set up in 1989. In this context of Belgium, who was moving towards federalization, the three regions had and still have different conceptions of planning. These conceptions are presented below.

## 3.1. The Brussels - Capital Region

The Brussels – Capital Region covers only the central area of the Brussels agglomeration, i.e. 19 local-authority areas (communes). Three types of tools are used in this region, at two levels (region and communes – represented by the lines in Table 1), to coordinate its planning: plans, regulations and permits. The development of the Brussels – Capital Region is henceforth governed by a hierarchy of four plans, presented in table 3. The 2 types of development plans, made at two different scales, have an orientation role : they give the goals and priorities of the development. The 2 types of Allocation plans and the regulations have a legal force and give the necessary land allocation to implement the targets and the goals of the development plans. Two types of permits, delivered by the authorities, exist : urbanism permits and lots permits, which certify the respect of the allocation plans.

**Table 3: Synthesis of the Brussels – Capital Region planning tools.**

| PLANNING POLICIES AND TOOLS | | |
|---|---|---|
| **Orientation documents** | **Documents with a regulation value** | |
| **Development Plans** | **Allocation Plans** | **Regulations** |
| **PRD (Regional Development Plan)**<br>March 3rd 1995<br>6 year tenure<br>*Regional level*<br><br>Future developments and policies (development part and city project implementation part) | **PRAS (Regional Land-Allocation Plan)**<br>May 3rd 2001<br><br>*Regional level*<br><br>An updating of the original sector plan to incorporate the PRD directives | **RRU (Regional Urbanism Regulation)**<br><br>*Regional level*<br><br>Gives rules on the urban environment and constructions |
| **PCD (Local Authority Development Plan)**<br>*Communal level*<br><br>Give details at local level of the PRD outlines | **PPAS (Specific Land-Allocation Plan)**<br>*Communal level*<br><br>Gives detail at local level of the land-allocation | **Communal Rules**<br><br>*Communal level* |

## 3.2. The Flemish Region

In 1993, the Flemish Minister for Regional Development presented an ambitious regional structure plan incorporating every aspect under its jurisdiction. This document, “Regional Structure Plan” (RSV), was been approved by the Flemish government on September 23rd 1997. The content of this plan, such as all planning principles and tools of the Flemish Region, are integrated and defined in the new regional decree of planning approved on May 18th 1999.

The previous sector plans of the region and other planning tools are progressively replaced by the Structure Plans, which are being set up at regional, provincial and communal level (see Table 4). At these 3 considered planning levels of the Flemish Region (represented by the lines of Table 4), the “Implementation Plans” are also to be set up to implement the goals presented in the Structure Plans. These plans insist on the necessary processes to implement the desired spatial structure, and include a search of the right actors for the development of the considered zone (investors for example). The implementation plans represent a pro-active planning process. The principle of “subsidiarity” is applied in the making of these planning documents : every authority makes the Implementation Plan at its level on the matters under its jurisdiction, following the goals of its Structure Plan. The implementation plans have to be approved by the directly higher level of authority. They give the land allocation zones and govern the deliverance of building permits. The regulations governing the deliverance of building permits are detailed in the regional planning decree. Rules can be implemented at the three planning levels. Today, not all Structure Plans and Implementation Plans are finalized at each level. Advice structures also exist at the 3 planning levels, to give advice on the plans and planning principles.

**Table 4: Synthesis of the Flemish Region planning tools.**

| PLANNING POLICIES AND TOOLS | | | |
|---|---|---|---|
| **Orientation documents** | **Documents with a regulation value** | | |
| **Development Plans** | **Allocation Plans** | **Regulations** | **Commissions** |
| **RSV (Regional Structure Plan)**<br>*September 23rd 1997*<br>*May 18th 1999*<br><br>*Regional level*<br><br>Description of the present structure and of the wished structure and development | **Regional RUP (Regional Spatial Implementation Plan)**<br><br>*Regional level*<br><br>Plan to implement the objectives of the structure plans | **Regional Urbanism Regulation**<br><br>*Regional level* | **Advice instrument**<br><br>*Regional level* |
| **PSV (Provincial Structure Plans)**<br><br>*Provincial level* | **Provincial RUP (Provincial Spatial Implementation Plans)**<br>*Provincial level* | **Provincial Regulations**<br><br>*Provincial level* | **Advice instrument**<br><br>*Provincial level* |
| **GSP (Communal Structure Plan)**<br><br>*Communal level* | **Communal RUP (Communal Spatial Implementation Plan)**<br>*Communal level* | **Communal Regulations**<br><br>*Communal level* | **Advice instrument**<br><br>*Communal level* |

## 3.3. The Walloon Region

The 23 sector plans of the Walloon Region, covered for 45% by agriculture land and for 31% by forest, are still in application. Meanwhile some of them have been modified since the '70s. Besides, the CWATUP (Walloon Code for planning, urbanism and patrimony – 1984) defines the policies and the organisation of the Walloon planning system. It has been continuously updated and defines the different planning tools of the two considered planning levels, the region and the commune.

The following table (Table 5) summarizes the different planning tools of the Region (first line) and the communes (second line). The two levels of schemes are orientation documents. The SDER (Regional Spatial Development Scheme) gives the spatial potentialities and future planning options for the region, in the framework of the ESDP (European Spatial Development Perspective). It was adopted by the Walloon Government in May 1999 with a orientation role. The plans and regulations are documents with a legal value, and try to implement the options of the regional scheme, giving an allocation to the territories and rules to respect them.

**Table 5: Synthesis of the Walloon planning policies and tools (based on the table presented in "Echos de l'Aménagement du Territoire et de l'Urbanisme", no19, Printemps 1998)**

| PLANNING POLICIES AND TOOLS | | | |
|---|---|---|---|
| **Orientation documents** | **Documents with a regulation value** | | **Commissions** |
| **Schemes** | **Plans** | **Regulations** | |
| **SDER (Regional Spatial Development Perspective)**<br>*Walloon Region*<br>1/300.000 or 1/100.000 | **PS (Sector Plans)**<br>*Parts of the region (23)*<br>1/10.000 and 1/25.000 | **Regional Urban Regulation** | **Regional consultative Commission (CRAT)** |
| **Communal Structure Scheme (SSC)**<br>*Communal territory*<br>1/10.000 or 1/5.000 | **Communal Planning Plan (PCA)**<br>*Whole or part of commune*<br>1/2.500 or 1/1.000 | **Communal Urban Regulation (RCU)** | **Communal Consultative Commission (CCAT).** |

The Walloon planning system is more decentralized than the two others; it gives much more freedom to the communes. Indeed the Walloon Region, which includes 262 communes, intends to make peoples participation in decision-making legal, while maintaining regional control over the financial assets of such power through its decree of April 1989.
The Sector Plans and the CWATUP are to be revised in the near future.

# 4. SYNTHESIS OF THE INTERVIEWS OF EXPERTS AND LOCAL AUTHORITIES

This section presents the synthesis of the four interviews which were held in Brussels. One expert interview was held, such as three local authorities interviews: one interview was made of one representative of each of the three regions of Belgium. This synthesis of the interviews' results has the following structure:

- Spatial structure of Brussels and evidences of urban sprawl;
- Issues in the central urban area, perception of the situation and measures taken;
- Issues in the periphery, perception of the situation and measures taken:
  - Flemish Region;
  - Walloon Region;
- Conclusions.

## 4.1. Spatial structure of Brussels and EVIDENCE of urban sprawl

### 4.1.1. Spatial structure

The spatial structure of Brussels became, since the 1960s, quite representative of the American medium-size city :

Regarding the residential zones:

- a spatial structure of income in segments of tart : poor neighbourhoods along the old SW-NE industrial axis going through the city, flourishing during the 19th century but strongly declining now and only partially in renovation; around this axis alternation of middle class and high income neighbourhoods;
- a Belgian demographic spatial structure in concentric circles, as background : small households of old people in the centre, and families in the periphery;
- a nuclear structure on top of this made of poor ethnical neighbourhoods, in the centre near the train stations; these neighbourhoods issued from recent successive immigration waves designed first poor European areas in the '60s (Spanish, Portuguese and Greeks), Arabic-Muslim areas (Moroccan, Turkish, Algerian) and African areas later;
- this spatial structure takes place in a density envelop exponentially decreasing from the centre to the periphery, with a density crater in the centre leaving place to the CBD (central business district).

Regarding the activities:

- two strong central business districts : one built in the '60s (Quartier Léopold), essentially occupied by headquarters of banks, insurance companies and other big private companies which extension is now the European strategic area (Shuman roundabout). The other one (Quartier Nord), built in the '90s and now in its finishing phase, essentially occupied by regional administrations and public societies;

- between these two, in the old city (Pentagone), a commercial “hypercentre” and the old administrative city with the national ministries;

- an old SW-NE industrial axis which is being renewed in its peripheral segments;

- an airport (Brussels International Airport of Zaventem) in extension, representing a strong element of spatial structuring;

- a dissemination of shops and services of all sorts in the urban tissue.

### 4.1.2. Spatial dynamics

The role of European capital is, for Brussels, a considerable motor of spatial restructuring of activities:

- strong growth of the tertiary sector and of all accompanying services in the central parts of the city;

- strong out-migration of the activities consuming much land (industry and heavy tertiary activities), encouraged by the presence of the circular highway around Brussels (ring).

The population migrations are strong:

- strong in-migration of high income foreigners, in relation with the development of the European Union;

- migration of Belgian middle and high class families towards the periphery, encouraged by the presence of the ring highway;

- growth of a large poor income ring, around the city centre (“city in the city”), made of foreign neighbourhoods with a very dynamic demography;

- accentuation of the socio-economic contrasts inside the city, between the central dense parts and the periphery of richer neighbourhoods;

- good mixing of nationalities and cultures who live together in wealthy neighbourhoods. In the poor central areas the situation is more tensed between the aged Belgians still living there and the new young immigrant families from all horizons, who are in competition on the low cost and low quality housing market.

As a whole, the urban system of Brussels is growing, with strong centrifugal and centripetal spatial tensions producing a “filtering” process of activities and households. The resulting spatial structure of this zone is continuously and rapidly changing.

### 4.1.3. Urban sprawl

Urban sprawl is quite pronounced and rapid as the built up area has increased of 18% in the last 9 years. Several different aspects are to be mentioned :

- several development axis can be drawn between the city centre and the medium sized peripheral cities. They often follow the important transport axis (highways and rail ways);

- the near and far suburbs of Brussels have different rhythms of growth: strong rhythm for the near suburbs and lower rhythm for the far suburbs (see map of the growth rhythm of built area between 1991 and 2000);

- the peripheral cities of 50.000 to 100.000 inhabitants are growing strongly and present a proper urban sprawl.

It is clear that the observed urban sprawl is due simultaneously to the growth of the whole urban system, and to the relocation of activities and households towards the periphery.

**Figure 20: Growth rhythm of total built area between 1991 and 2000 – synthesis (based on cadastral data)**

### 4.1.4. Urban sprawl and transport network

Urban sprawl appeared clearly in Belgium in the '60s. The Belgian highway network was built during the same period. In 20 years, the major cities were linked to each other and opened to the car. In Brussels, the internal highways and tunnels, built first for the international exhibition in 1958, were followed by the building of the circular ring around the city along almost the entire regional boundary. Only 9 years were necessary for the Brussels' population to attain its maximum and to start decreasing alarmingly until 1999, while the surrounding suburbs were rapidly gaining in development.

The number of commuters constantly increasing as well as traffic congestion, the commercial speed of public transport was improved, by installing public transport lanes and a metro network inside the city. But this wasn't sufficient, even thought the metro is used by half of the public transport users in the city. Consequently, the idea of installing a Regional Express Railway (RER), in a zone of 40 km around the city, using the existing radial railway network, came out in order to try to decrease car use by commuters. This RER has been studied since quite a few years, especially the accompanying measures to be implemented, aiming to maintain its attractiveness without encouraging the relocation of households towards the periphery. A consensus has been reached between the three Belgian regions, but a lot of details are still to be discussed, specifically the financial part to be given by each region.

### 4.1.5. Main causes of urban sprawl, according to the responsible interviewed

Table 6 gives a synthesis of the causes of urban sprawl, mentioned by the interviewed people.

### 4.1.6. Boundary effects generated by the institutional framework

Besides the causes enumerated in the previous tables, others are to be found in the institutional organisation of Belgium. The study area is composed of different zones :

- a dense and continuously built urban area, of which only the central part is called "Région de Bruxelles-Capitale", institutionally independent and under bilingual regime;

- a first periphery made by the rest of the continuously built urban area, and the biggest part of the near suburbs;

- a second periphery, at further distance, with medium-size cities, existing for quite a long time, having their own influence zone and a quite autonomous economy for some of them (Leuven, Mechelen); some others are more dependant of Brussels (Aalst, Louvain-la-Neuve), as dormitory-towns. These cities are separated by rural areas;

- these two last zones overlap the Flemish Region and the Walloon Region, of different language and institutionally independent.

**Table 6 : Comparison of considered causes of urban sprawl by interviewed people for the case city of Brussels (Y:yes, N:no, NR: not relevant in the zone)**

| Possible cause | Planning Expert | Walloon Region and Waterloo | Flemish Region | Brussels-Capital Region |
|---|---|---|---|---|
| **1. Housing markets (housing prices lower in the periphery than in the core city)** | Y | Y before, caused a depopulation) | Y | Y |
| **2. Appeal of a rural ambiance** | Y | Y | Y | N |
| **3. Appeal of low density settlements** | Y | Y, still now | Y | Y |
| **4. Decrease of travel times and costs due to the extension of the highway network** | Y | Y before, but not today | Y | Y in the '60s, not anymore |
| **5. Decrease of travel times and costs due to the improvement of public transport services (heavy rail, light rail) serving the suburban area and linking it to the city centre** | N but planned RER project | N | Y in Flandres | N |
| **6. Rejection of the core city due to damaged buildings, dirtiness, car traffic, lack of safety due to traffic, noise, air pollution, …** | Y before but less today becauses a few central areas have been renovated | Y | Y but it is not a spatially homogeneous phenomenon | Y |
| **7. Rejection of the core city due to congestion** | N (decreasing congestion in the centre, increasing congestion at the entrances of the city) | N | Y is not a spatially homogeneous fact | N, rather the quality of life |
| **8. Rejection of the core city due to social problems** | Y (immigrants) | Y (immigrants) | All causes given here can be observed, but in different degrees for Brussels but also for the different cities surrounding Brussels: About 20 years ago, a demographic sprawl has taken place around Brussels, but the structure has totally changed nowadays. Brussels is rather situated in a polycentric spatial | N, except some central neighbourhoods |
| **9. Development of economic poles in the outer urban area or delocalisation of companies from the core city to the outer area** | Y | - | | - (does not make demographic delocalisation) |
| **10. Restructuring and relocation** | NR | Y but is a consequence | | NR |
| **11. Emergence of SME and decline of large enterprises** | - | Y for SME but for large firms it is more change than decline | | Y but large firms undergo an evolution in their production mode |
| **12. Development of an economic pole in the outer urban area** | Y (Zaventem) | N | | N (Zaventem is part of the city) |
| **13. The growth of employment in particular localised industries like mining, defence and tourism** | NR | NR | | NR |

| | | | | |
|---|---|---|---|---|
| **14. The restructuring of manufacturing industry and the associated growth of branch plants** | N | N | framework than centralised. | N |
| **15. The growth of employment in the public sector and personal services** | Y but is more a consequence than a cause | N | | - |
| **16. The effect of economic recession on rural-urban and return migration** | Y, when recession, less migration to periphery | N | | N, was the case before but not today |
| **17. The first round in a new cyclic pattern of capital investment in property and business?** | Y | Y | | - |
| **18. Increase of the total population of the city** | Y | N | | Y |
| **19. Inherent changing in structure population** | Y | Y | | Y |
| **20. The expansion of commuting fields around employment centres** | NR | Y | | NR |
| **21. The concentration of rural population into local urban centres** | NR | N | | NR |
| **22. The reduction of the stock of potential out-migrants living in rural areas** | NR | N | | Y but before |
| **23. The acceleration of retirement migration** | - | N rather a return to centre | | Rather the opposite |
| **24. Change in age structure and household size and composition** | Y | Y | | Y |
| **25. Increase of household income** | Y | Y | | Y |
| **26. The emergence of scale diseconomies and social problems in large cities** | Y | Y, social problems | | - |
| **27. The improvement of education, health and other infrastructure in rural areas** | N this is rather a consequence | Y | | N |
| **28. The change in residential preferences of working age people and entrepreneurs** | Y but the supply changes also | Y | | N |
| **29. The availability of government subsidies for rural activities** | N | N | | NR |
| **30. The success of explicitly spatial government policies; if yes, which one(s)** | - | Y (residential neighbourhoods made) | | NR |
| **31. The growth of state welfare payments, private pensions and other benefits** | N | N | | NR |
| **32. Improvements in transport technology** | Y | Y | | Y |
| **33. Improvement of sub-urban public transport service** | N | N | | N |

| | | | | |
|---|---|---|---|---|
| **34. Improvement of sub-urban road infrastructure** | Y | Y | | Y |
| **35. Application of specific transport measure; if yes, which one?** | - | N | | Y- employers pay the transport costs) |

The division of these territories by linguistic boundaries has created some important "boundary effects" :

- the migration balances are influenced by the linguistic regimes : the Brussels-Capital Region, which is for 85% French speaking, has stronger migratory links with the Walloon part, in comparison with the North of the Region which is rather Flemish speaking. These stronger links induce higher land and housing prices in the South periphery;

- the public transport lines managed by the regional Brussels public company stop at the boundary of the Region, whereas the real city continues further on. The difference in the quality of transport service is evident when crossing the boundary;

- the perception of urban problems and the planning systems being different from one Region to another, the planning measures are not homogeneous through the study zone, this is especially true with the system of deliverance of building permits: in the Northern part of the study zone, urban sprawl propagates in a linear way, along the roads; in the South urban sprawl is rather structured in development areas;

- the willing to fight against urban sprawl seems to be less pronounced in the Walloon Region because the high income immigration flow coming from the city induces high fiscal resources for this Region which is rather poor;

- the dialogue between the three Regions is difficult :

    - first because the perception of what should be the role of the federal and European capital is not the same for each Region; this is a permanent debate;

    - secondly because the spatial process is differently understood by the 3 Regions : the Brussels-Capital Region insists on the radial movements attracting a lot of commuters in the city; the Flemish Region insists on the growth of autonomous medium-size cities located in the periphery (polycentric system) and on the growing mobility along belt highways (ring) around Brussels; besides, the Walloon Region only recently admitted that the Southern part of the study zone is growing from a lot of residential relocations coming from Brussels, creating strong links between the two Regions;

    - finally, there is no institutional place for discussing planning problems of this area overlapping the 3 Regions : a Brussels minister cannot discuss concrete local problems with a provincial or communal responsible because the difference in the level of decision making is to high; if a discussion takes place with his Flemish or Walloon homologous, these can have very different orientations because their interests often diverge widely.

  It is clear that the issues are different from one Region to the other.

## 4.2. Issues for the central urban region, perception of the situation and measures taken

The Brussels-Capital Region thinks that urban sprawl is “the” problem to be solved at the present time. It perceives urban sprawl quite negatively, as it induces a series of unpleasant problems, which become issues :

- the continuous and high decrease of its population between 1967 and 1999, with a strong aging of households;
- the decrease of the mean income level of the households, due to the migration of the middle and high income families towards the periphery;
- a consequence of this is a high decrease of fiscal resources for the Region;
- the decrease of some commercial nodes in the central part of the city, leading to a decrease of urban animation;
- the increase of commuters living out of the Region and working in the Region (55% of the total jobs in the Brussels-Capital Region);
- the increase of car use for the commuters trips, leading to traffic congestion inducing numerous environmental negative effects;
- the increase of functioning costs of the city due to the increase of distances travelled (increase of number of vehicles/km).

The competition of the Brussels-Capital Region with the periphery is high. Brussels finds itself unarmed regarding these negative impacts because of the impossibility to manage all migratory flows which go beyond its boundaries.

### 4.2.1. A strategy of seduction

Therefore, the Region can only try to seduce the households or companies which want to leave the Region. The philosophy of the Regional Development Plan (PRD) is principally based on that strategy :

- embellishment of the city and improvement of the quality of life by all means;
- measures to reinforce the residential attractiveness of the city, such as traffic calming measures (among which low thru-traffic zones), encouraging the families to come back with their children;
- creation of a contracted housing supply encouraging young for middle class families to locate in the city.

These policies trying to make families come back into the city, do have some success, as the population of the Region recently stabilized, as the negative migratory balance from the Region towards the other zones has decreased, and as the number of owners has increased from 30 to 40%.

Fiscal measures following the “polluting paying” principle, have been presented in the Regional Development Plan (PRD) in 1994 already. Ever since, they have never really been implemented. People don’t seem to be ready yet for these kinds of measures.

Nevertheless the measures implemented by the Brussels-Capital Region have less efficiency compared to coercive measures, such as densification of housing, which could be implemented in the periphery.

### 4.2.2. Coercive measures

There are only two fields where the Region implements coercive measures :

- transport:
  - car parking restrictions to discourage people from car use and to diminish the number of parked in the streets (efficient);
  - rotational car parking in commercial areas (efficient);
  - priority car parking cards for residents (not very efficient, creates other problems);
  - high decrease of car parking capacity in new offices buildings (not yet implemented for large scale areas).

- location of activities : the Region adopts the ABC theory ("the right business in the right place") and implements location restrictions in order to better manage transport demand :
  - location of big offices in a small number of areas located close to the train stations and well served by long distance public transports;
  - important compensations are asked to property developers, called "urban charges" (quotas of housing units built for free, or remodelling of public spaces);

The second business centre of Brussels (Quartier Nord) has been built under these regulations. It has been built very quickly, in a synchronized way with the remodelling of public spaces. The Region has demonstrated, with these new rules, its capacity to regenerate rapidly an urban area which had damaged its centre for more than twenty years. However, the initiative was essentially public. The Region is aware of the fact that for the moment the private sector takes very little part in important renewal projects in Brussels, unlike what happens is some other European cities (Lyon, Lille,…). The city is used by the private sector only as a functional place, essentially for the provision of services. This is shown by the architectural poverty of the new projects, nevertheless important in size and budget. Twenty years ago, everyone thought the poor neighbourhoods were going to be restructured but this didn't happen. The private sector should take part more intensively in important projects, having symbolic or cultural meaning. Creativity is present in this multicultural city, but promotion of ideas and projects is weak.

Globally, the interviewed person is admiring the more rigorous application of policies in the Flemish Region, which makes them more efficient. However, the person doesn't agree with the polycentric view of the urban network in the study area exposed by the Flemish Region (see next section) because the radial migration and trip flows of households and companies are still dominant in comparison with the belt flows.

## 4.3. Issues for the periphery, perception of the situation and measures taken

The issues for the periphery are different and complementary. It is more a question of protection of agriculture and natural zones which have to resist to the sprawl of big cities as well as smaller ones.

## 4.3.1. The Flemish Region

The perception of the spatial structure of the study area by the Flemish Region is quite different. For the authorities of this Region, the development of this part of the country is rather diffuse with concentration nodes. Brussels should be analysed in a much wider context and be considered as a part of an urban polycentric network, with other cities having their own development. This approach has been adopted in the Structure Plan of the Flemish Region.

Urban sprawl is a consequence of society's development; it is impossible to control it totally. The role of planning is to recognize the spatial phenomena which occur, and to try to coordinate and guide the underlying processes. Uncoordinated and disorganized developments may occur; this is the negative part of urban sprawl. The strong desire to manage development instead of letting the market regulate it, has existed in Flanders only for 5 years.

For the Flemish Region, the issues generate two strategies:

#### 4.3.1.1. Try to manage urban growth

The fight against space fragmentation generated a will to concentrate development in the polycentric urban network and to limit urban sprawl by :

- the choice of the urban nodes which constitute the polycentric network of cities, very much oriented by the existence of transport infrastructures which use should be optimised : the different levels of cities and the economic nodes are identified in the regional structure plan;

- the implementation of an urban perimeter for each chosen node, taking into account :
    - the future needs of housing distributed in space according to a planned proportion : 60% in urban areas, 40% in rural areas;
    - the future needs of activity zones distributed in space according to the following proportion : 80 to 85% in economic nodes and 15 to 20% out of these;
    - the spatial structure of the city and its specific needs in terms of new zones, zones to be restructured, types of housings, etc. with a willing to increase the density of the urban area;
    - the quality and the needs of public transport linking all the residential neighbourhoods to the service areas;
    - the nature of the surrounding rural area;
    - the Region's advice for the important cities, and the Province's advice for the smaller cities;
    - the participation of the private sector in the implementation of the plan.

Until now, only one urban boundary is defined (city of Aalst). Important difficulties remain because local authorities often do not realize the abuses in space consumption that are made, and the implementation of the process is quite long.
Around Brussels, several cities have been identified as being part of the Flemish polycentric urban network.

#### 4.3.1.2. In non urban zones, implement simultaneously policies aiming at conservation of natural areas and protection of productive agriculture areas

Many non urban zones have lost their agriculture function. In these cases the problem is to preserve open spaces rather than agriculture. Other non urban zones have still an agriculture function which is to be reinforced in terms of productivity. These two objectives are different. Around Brussels, the essential problem is to preserve open spaces. Residential zones are created for households who are planning to leave the dense urban areas anyway; these zones are surrounded by natural open spaces and are well linked to the city by public transport services.

## 4.3.2. The Walloon Region

The Walloon Region is very late in the process of implementing measures aiming at controlling urban sprawl.

#### 4.3.2.1. The content of the Sector Plans

The residential zones defined by the Sector Plans in the '70s and the '80s are much too large and encourage therefore urban dilution. On top of this, these zones may receive many different types of urban functions, among which office buildings. It means that office buildings which generate a lot of car traffic may locate anywhere. Furthermore the local public development councils which buy agriculture parcels, equip them into industrial parcels and sell them to private activities, behave like private property developers needing a continuous production of equipped parcels. Each time a piece of land is modified into an industrial parcel, a procedure of modification of the Sector Plan is started; after three years, the planning system has integrated these changes which are often inadequate. Many parcels have been equipped even though there was no real demand for it. Instead of leaving them empty, they were sold to activities which had nothing to do with industry (offices, supermarkets,…). In some cases, this process is clearly responsible for the important urban sprawl we can observe in the Walloon Region.

The Sector Plans are still in application but a revision of them has been planned since quite a long time. This revision process has not really started yet.

#### 4.3.2.2. A recent awareness of the necessity to do something

Recently, more restrictive measures have been taken to better manage the situation :

- The CWATUP (Walloon Code of planning) became more severe regarding the choice of activities to accept in the industrial zones;
- A list of selection criteria has been defined to evaluate in a better way the opportunity to realise new activity zones;
- A choice has been made among the projects of future activity zones, decreasing their total regional area to 50% of what was initially proposed.
- The zones of residential extensions, planned in the Sector Plans, are nearly totally frozen today;

#### 4.3.2.3. The particular case of the Walloon Brabant, South of the study area

The North of Walloon Brabant contains urban extensions of the central urban area and some suburbs having tied links with the main urban area, in terms of migratory flows and daily commuters for work and for social and commercial services. This connexion, probably

favoured by a dominant common language (French), is so strong that it has transformed the suburbs into a continuous built-up area and has incorporated several communes into the city.

The zone containing a university campus created about 30 years ago in a new town (Louvain-la-Neuve), has attracted numerous Brussels' French speaking middle class families first, followed by high income families (lots of these families are linked to the European Community or to multinational companies). The intellectual influence of the university got stronger in time, attracted important companies and generated good quality social equipment, surrounded by a nice and green environment. Today, the zone has become an essential element in the Walloon Region's economy, as it generates a considerable amount of financial resources. The urban sprawl is perceived by the Region as a positive phenomenon, even thought it generates quite important traffic congestion problems, on the South-North axis towards Brussels and East-West axis thru the Walloon Brabant. Public transport services are not adapted to the situation of that zone, even in terms of railway network; this induces a high rate of car use. This explains why the Region is very interested in the implementation of the RER, which will solve local congestion problems.

#### 4.3.2.4. Perception of urban sprawl by a rich commune recently incorporated in the city : Waterloo

The example of Waterloo (about 30.000 inhabitants) is quite typical of the dynamics generated by urban growth :

- in the '60s, the commune was one privileged site for second residences of the wealthy families of the Brussels' population; tourism and agriculture were flourishing;
- in the '80s, some of these people transformed their second residence into principal residence and the middle class people who were living in these residences became commuters working in Brussels; this was encouraged by the building of the circular highway around Brussels (ring); to live in Waterloo in a little farm with a nice dog and a red sport car was the symbol of success for quite a long time;
- today, the area has become a ghetto of rich Belgians and foreigners, thanks to a voluntary mechanism of selection of the arriving people;
- agriculture doesn't exist any more; it was transformed into golf courts, parks and very rich housing development areas;
- the former farmers became important property owners and lived a high increase of their social status; they are today the richest families of the area;
- induced effects of the rise of income on the commercial sector and the local services have been very important but are quite unstable because the former population of Waterloo overspends its money while rich foreigners buy luxury goods elsewhere anyway; the turnover rate of luxury shops is therefore very high;
- it is nevertheless obvious that the existence of luxury shops in the periphery decreases the need to go to the city centre of Brussels; Waterloo competes with the city centre of Brussels;
- all kinds of services to firms are attracted by the environment's quality of Waterloo; they recently appeared under the form of business parks; the prestige of the sites, the lower tax rates and the much higher supply of parking facilities are important attractive factors;
- today Waterloo is considered as a part of the urban area of Brussels but has local regulations imposing a high size of the residential parcels that maintain a low density and select only people who can afford buying big residential parcels.

The recent incorporation of Waterloo into the Brussels urban area is a functional fact which is not accepted on the political level. The inconvenient perceived by the authorities are the following :

- a high delinquency rate coming from outside is observed in Waterloo and is increasing, because of the strong presence of rich mansions : all forms of crime are present, from stealing to serious criminality, including car jacking and home jacking; the number of police officers has been largely increased;
- in terms of transport, Waterloo is a “western-city” crossed by important commuter flows on two main highway axis (North-South and East-West); it has to manage its own mobility problems but also the commuter problem; 20 years ago, the trip to Brussels used to take only 20 minutes; today it takes 1h10 in the morning peak hour; as these commuters generally have important functions, they are free to choose their time of departure and often leave home after the peak hour, or else they work aboard the car while the driver takes them to the city. It is obvious that people get more and more used to the congestion and adapt their behaviour to it;
- the RER project is rather badly accepted by Waterloo because it has a image of “popular” transport mode and will probably increase delinquency coming from outside;
- high standing business parks with nice accommodations (parks, ponds, gardens, etc.) and buildings of 10 to 15 meters high have been easily accepted in the first place, but are now less accepted because people feel they disturb the landscape which has nothing to do anymore with the countryside; people would rather prefer to let the land empty;
- the authorities are more and more aware of the lack of housing supply to rent for young households still in a phase of rather small income; for these less expensive apartments (built on communal properties given for free to the project) are now available; a convention between the parties limits le level of earning of the selected couple as well as the duration of the occupation (not more than 9 years); after this period a subsidy is given to the households who are willing to stay in houses located in the town of Waterloo;
- rich old people find easily a place to stay in private well equipped adequate housing for elderly under the condition to be in a good shape; as soon as they get health problems, they have to leave the place; the authorities have then decided to subsidy the building of a centre for ill old people close to their death.

But positive aspects are also perceived :

- the fiscal financial flows generated by this rich population are very important, and generate various social equipment (communal swimming pool, two sport centres, several schools) but there is no hospital (there is a very good hospital in the next town but this is perceived as too far);
- the few apartments which are located in the centre are luxurious and comparatively very expensive; house and land prices are higher compared to nice areas in Brussels; this encourages the young people to locate in Brussels for some time come back to Waterloo later with their entire family.

The objective of the authorities is to preserve the important fiscal financial flows generated by the residents; it is the reason why they maintain a very low density of housing : people have to build houses on parcels of minimum 1000 to 1500 sq. meters. Low densities will stay a very long time by the selection of rich people.
Urban sprawl is positively perceived by the Walloon Region and by Waterloo. But they are aware of the fact that it implies heavy investments in transport infrastructures.

## 4.4. Conclusions of the interviews in the case city of Brussels

If the causes of urban sprawl around Brussels seem to be quite standard, the impacts can be various and spatially differentiated. This is why the issues are different from one zone to another. The perceptions which are induced are also quite different and create some oppositions or even conflicts on the political level.

If the institutional framework reinforces the oppositions, as it is in the Brussels case, the situation becomes difficult to be solved.

In the case of Brussels, it is urgent to create a place where measures to be taken can be discussed, in a spirit of consensus between the institutional Regions. Other countries have tempted this adventure, such as France with its “communautés urbaines”.