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Sprawling Cities And Transport: from Evaluation to Recommendations

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

Monographic report Case city Rennes

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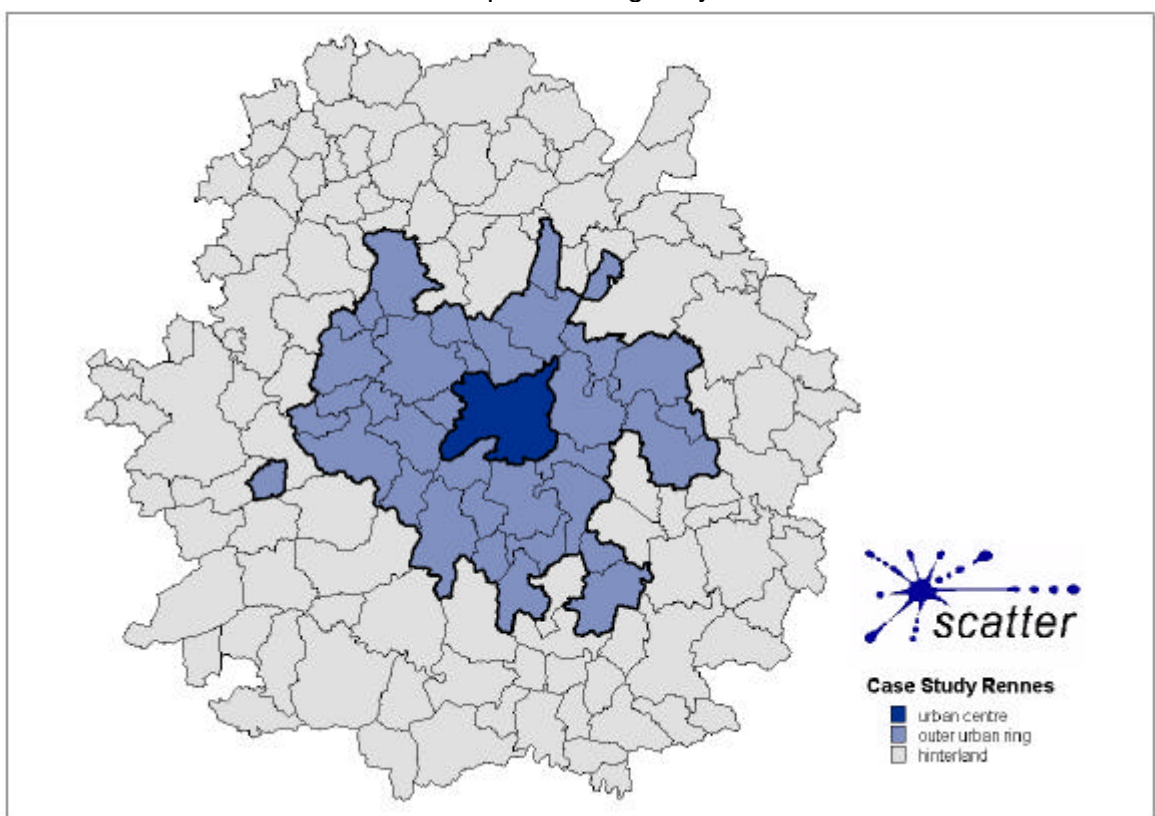
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1 CASE STUDY RENNES

1.1 Study Area

The case city Rennes is located in the north-west of France (Brittany region). It covers 140 “communes” and represents a demographic weight of 521,000 inhabitants. Area’s definition is based on a statistical level called in France *aire urbaine*. It is defined by the French national statistics institute (INSEE) as a *functional urban area* delimited from analyses of commuters trips after each census. In this study, the limits are coming from the results of the analyses of the commuters trips in 1999. An *aire urbaine* comprises several local-authority areas (communes) whose 40% of their inhabitants work in the city centre. Rennes *aire urbaine* concerns 140 communes with an area of 2542 km² and represents a demographic weight of 521,000 inhabitants.

The Region of Rennes has no geomorphologic constraints. That’s why urban development is almost uniformly spread over the whole area. Historically, Rennes has always been a roads cross and a front door of Brittany region. A good accessibility by roads to suburban cities must be underlined with a developed free highways network.



Source : INSEE, “aire urbaine”, limits of 1999

Figure 1: Definition of the urban centre, outer urban ring and hinterland of the case study Rennes.

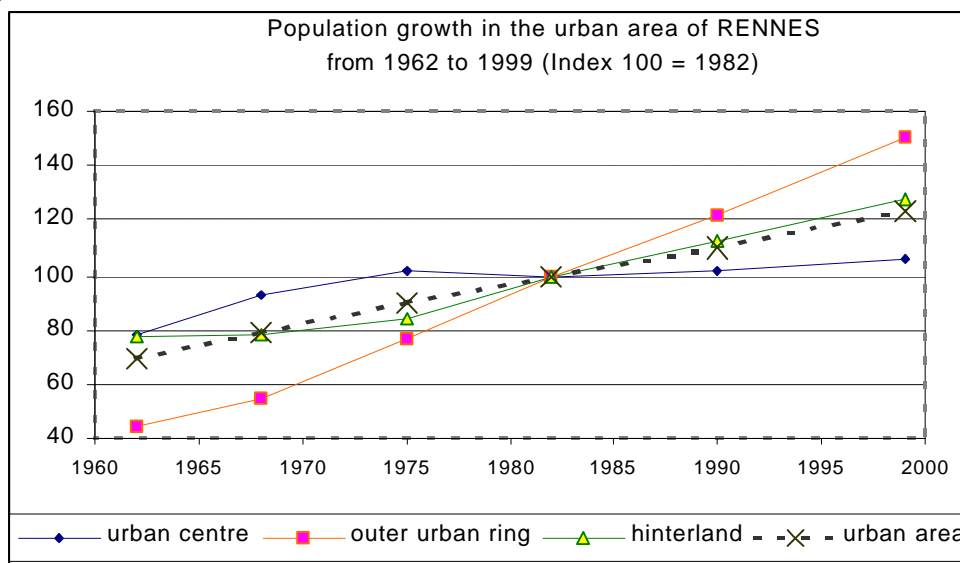
For the SCATTER project, we used a typology of zones which needs to be explained in the Rennes case study (Figure 1).

- The “urban centre” corresponds to the commune of Rennes, the central city.
- The “outer urban ring” includes the local authorities which compose with the commune of Rennes a political institution of cooperation called *Rennes Métropole*. This institution has been created in 1974 and has implemented several politics about urban planning, transport, environment, housing.
- The “hinterland” includes all other the communes of Rennes “*aire urbaine*” but outside *Rennes métropole*. It an outer suburbs defined from the daily commuters trips.

1.2 Population

Since two decades, Rennes is with Toulouse and Montpellier among the more dynamic of the great French urban areas in terms of growth of population and jobs.

The whole urban area has known a yearly growth of population of 1.6% per year between 1962 and 1999. On a long trend, one can see that Rennes has known a population growth that concerns all the parts of the urban area, but more the suburbs than the core since 1982. This year can be considered like the starting point of the scattered development (Figure 2).



source : census, INSEE

Figure 2: Population growth in the urban area of Rennes between 1962 and 1999 (Index : 1982 = 100).

To sum up spatial structure of the case city Rennes and its evolution in the recent period, four characteristics can be underlined.

- The city core is still concentrating most of the population, dwellings and jobs (figure 3). Except the central city, densely populated (206,000 habitants), the biggest communes of Rennes area have only 10,000 inhabitants. The urban centre represents around 40% of the population of Rennes urban area. The urban centre and the outer urban ring represent 70%. The number of inhabitants in the central area has still known an increase all along this period.
- The recent period is still a context of strong growth for the urban area of Rennes (1.3% per year for population between 1990 and 1999, Table 1). In this context, studying the scattered evolutions become of a great interest. Furthermore, one could underline that the number of inhabitants in the central City of Rennes is still increasing all along this period, even if the scattered urban developments are stronger. And that is a big difference with the other cases study, for example Stuttgart or Brussels.

Figure 3 : Evolution of population, jobs and housings (1990/1999)

Area	Main figures						average annual growth from 1990 to 1999		
	population		dwellings		jobs		population	dwellings	jobs
	1990	1999	1990	1999	1990	1999			
Studied area of RENNES (urban area defined by INSEE in 1999)	463,366	521,188	190,052	231,978	202,477	228,445	1.3%	2.2%	1.3%
city of Rennes	197,536	206,229	91,478	108,053	103,915	110,351	0.5%	1.9%	0.7%
Rennes métropole except RENNES	129,075	158,423	43,763	60,616	64,590	78,555	2.3%	3.7%	2.2%
hinterland (urban area except Rennes Metropole)	137,055	156,536	54,811	63,309	33,972	39,539	1.5%	1.6%	1.7%

Source : census, INSEE

1.3 Land use

A good analyse of the figures requires a knowledge of some morphological elements. Firstly, it is important to keep in mind the fact that there is a very important difference in the level of density between the central city and its suburbs (Figure 4).

The map about land use (Figure 5) shows that most of the built-up area is located in the central city of Rennes. So, one can say that the commune of Rennes includes most of its inner suburbs ; it means that possibilities for urban sprawling are high even in the inner suburbs but also that the political decisions in term of planning are very important for the sprawling issue even in the core of the urban area.

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Urban growth has concerned all the «communes» of the Rennes urban area. But preservation of natural zones has always been a priority leading to an absence of a dense inner suburbs. In particular, the city centre is separated of its neighbouring «communes» by a green belt. Land allocation plans aims at fighting against the development of a contiguous suburban growth.

Figure 4 : Density in inhabitants in the urban area of Rennes in 1999

	Population in 1999	Surface of the area (km ²)	Density (inhabitants/km ²)
• Urban centre	206,229	50	4,125
Outer urban ring	158,423	559	283
Hinterland	156,536	1,933	81
Urban area of Rennes	521,188	2,542	205

source : census, INSEE

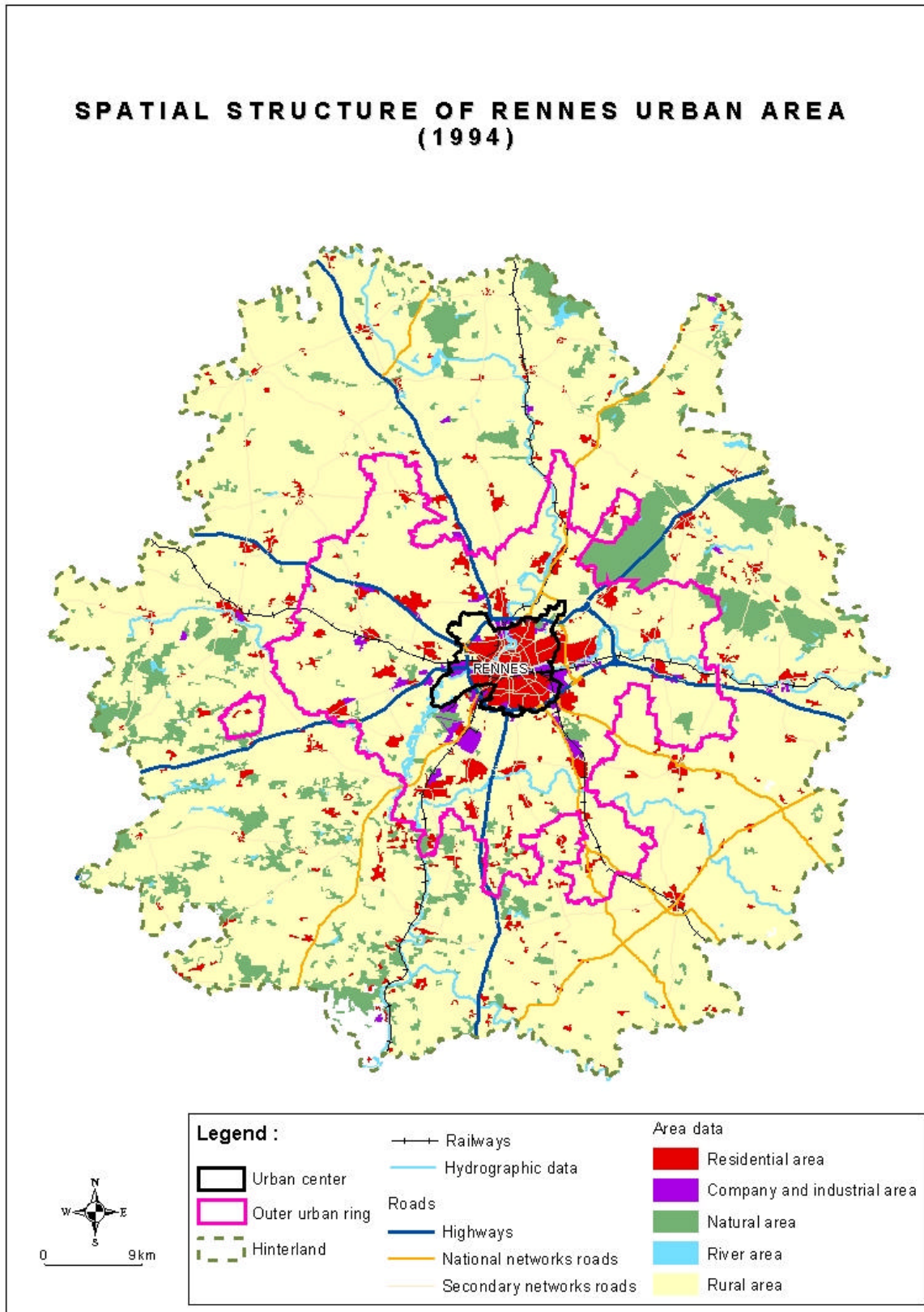


Figure 5: Land use in the urban area of Rennes (1994)

1.4 Economy

Employment is mainly located in the city centre and some of its neighbouring «communes» (figure 3). Five local authorities of the central area (that includes 36 communes) represent 80% of the jobs. Whereas residential function is scattered, there's a spatial polarisation of jobs. Hypermarkets are also located around the city centre.

Industrial manufacturing has been existing in the Rennes area only since the sixties with the implantation of CITROEN. That's why industrial manufacturing were located immediately in industrial zones around the city core and along the main roads. The fact that Rennes isn't an old manufacturing city has consequences on urban sprawl. Indeed, it's difficult for the local government to find old industrial zones in the city centre in the aim to build new housings.

Research and development are well-represented activities in the Rennes area (communication, data processing). Important centres of research and engineer schools are located in the Rennes area. University is one of the most important in french west region.

The number of workplaces in administrations and public sector is also important. It can explain why local economic activities isn't really affected by economic cycles. It depends a lot of public subsidies.

About local tax, it's important to note that a one tax rate exists between the 36 communes of Rennes Métropole about location of firms since 1994. It has permitted to limit the concurrence for the location of new economic activities and then to rationalize industrial and business zones planning.

1.5 Transport

Rennes area and Brittany region aren't concerned by the mean relations within the Trans-European Network (TEN). But Rennes area appears as the entrance from the rest of french territory in Brittany region. Historically Rennes area was always a roads cross (Paris, Brest, Nantes, Rouen). The absence of physical barriers has permitted to realize infrastructures without difficulties. Main roads were transformed in a highways network while a ring was built around the city core between 1965 and 1995. Due to urban and regional traffic, the motorway network around the City of Rennes is highly overcharged. There are a bundle of well constructed secondary roads connecting the City of Rennes with the peripheral zones.

Public transport network is composed of city buses, metro (one line and a new one in project) and regional rail systems. All modes are present: pedestrian, bicycle, bus, metro, suburban rail, car, as well as intermodal transport opportunities like P&R (park-and-ride). The railway lines connect Rennes to the other cities of Brittany region (Brest, Lorient, Saint-Brieuc, Vannes) and to Paris (high-speed trains, TGV).

The Rennes area is served by an national airport located in the south-west.

2 STATISTICAL ANALYSIS

2.1 Development of the average growth rates

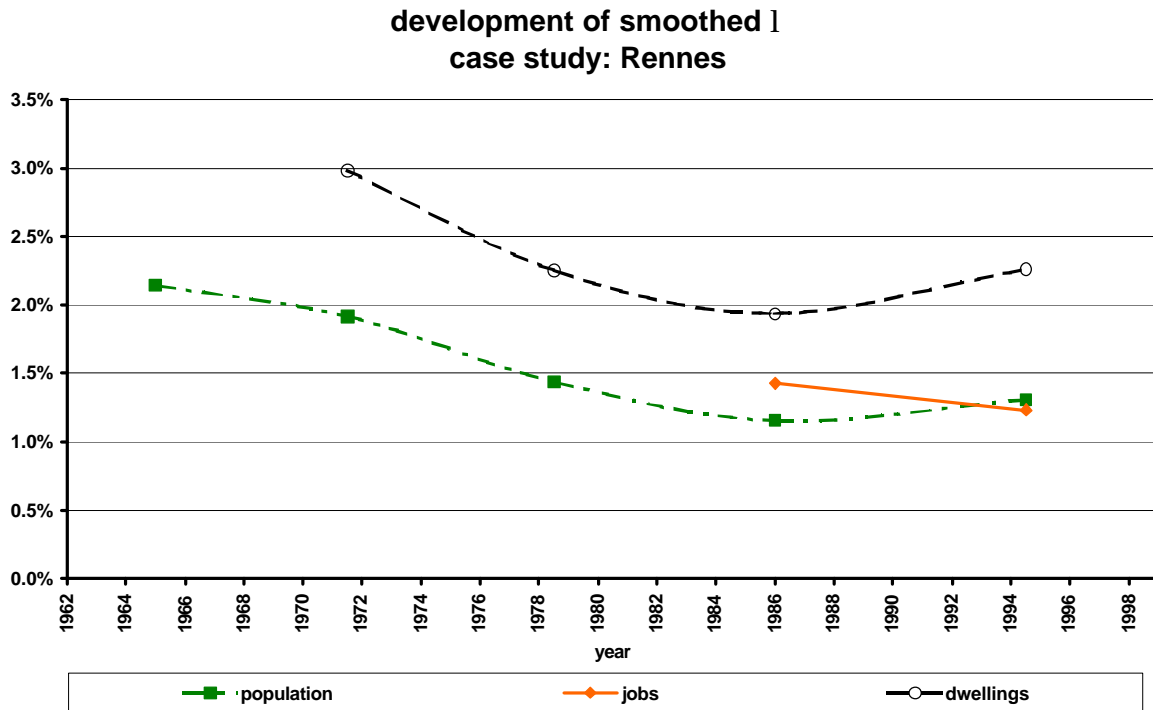
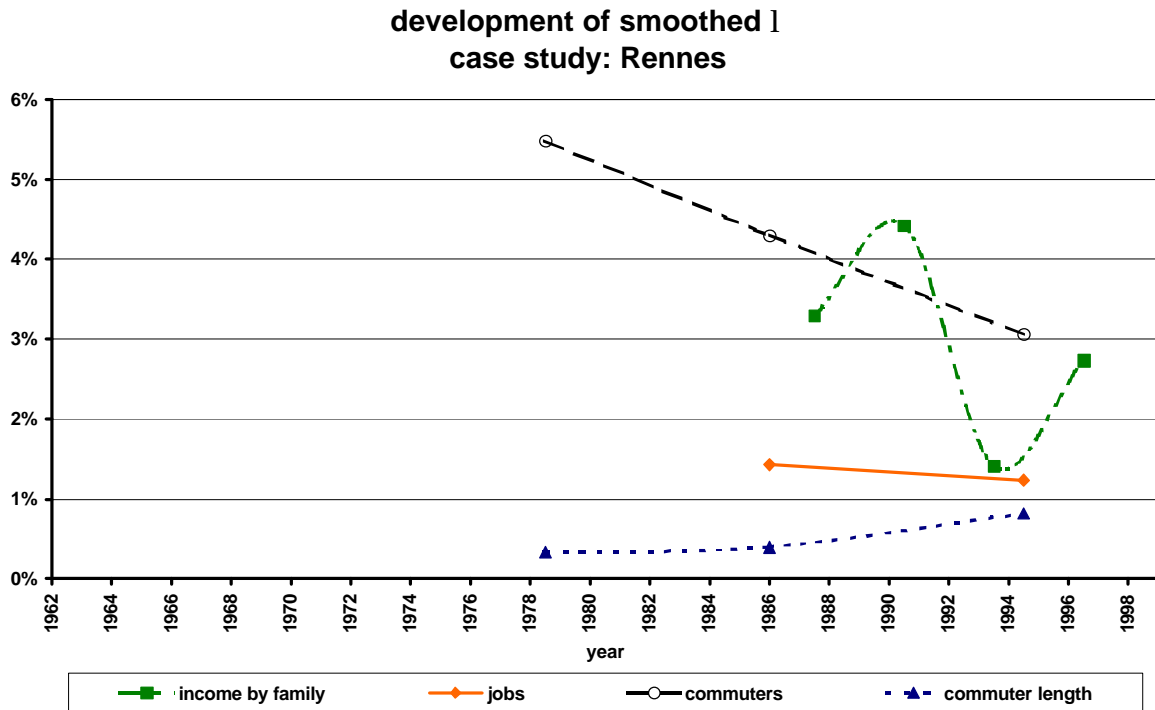


Figure 6: Average annual growth rate of $\tilde{I}^{population}(t)$, $\tilde{I}^{jobs}(t)$ and $\tilde{I}^{dwellings}(t)$

Figure 6 provides the development of the (smoothed) average annual growth rates of population, the jobs and number of dwellings while in Figure 7 the average annual growth rate of income per family, jobs, commuters and commuter length are depicted. Rennes is well known in France as a dynamic urban area. All indicators have had over the last decades a positive growth rate.

In Figure 6, the average annual growth rates of population and dwellings have the same development. They decline in the 70s and 80s and increase again in the late 80s and 90s. The absence of delays between population development and dwellings evolution, could be a consequence of urban planning tradition by elected politicians. The annual growth rate of dwellings are always bigger than the annual growth rates of inhabitants (it is not specific to Rennes case study because even if there's no growth of population it is necessary to built new dwellings so the growth rate of dwellings is generally positive). For the recent years the difference of the annual growth rate is increasing. This difference of growth between dwellings and population is due to the decrease of the number of persons per household.

The annual average growth rate of jobs is slowly declining in the second part of eighties, but is still positive and greater than 1%. It seems difficult to explain it because of data serie limited we dispose.



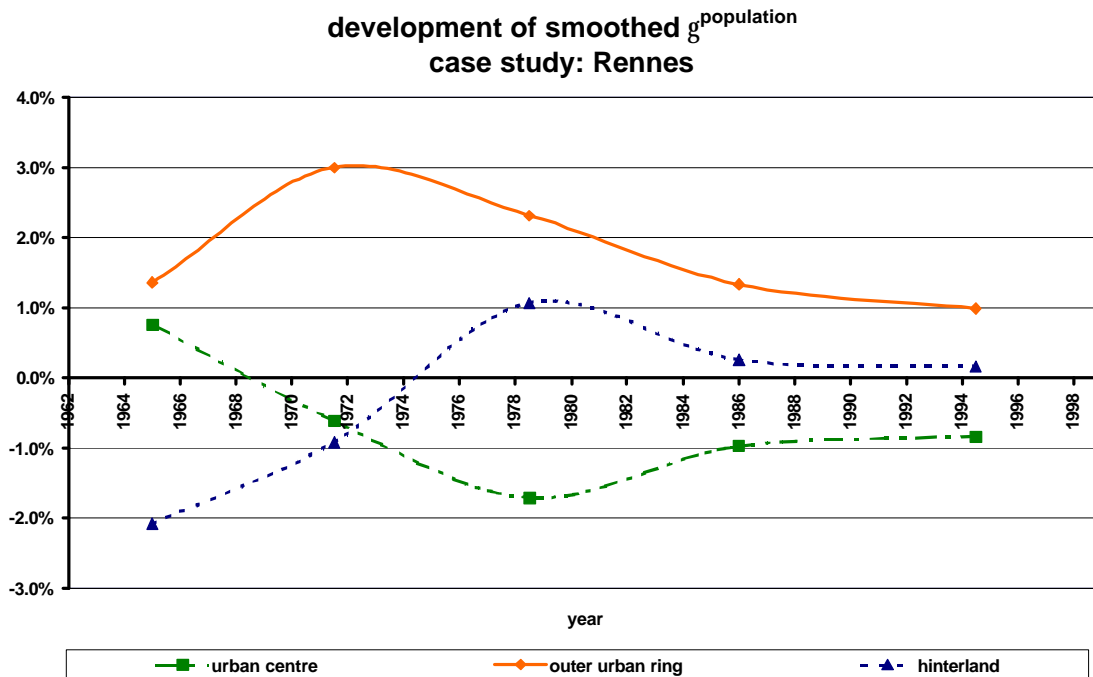
source : from census, INSEE and fiscal sources

Figure 7: Average annual growth rate of $\tilde{I}^{income\ by\ family}(t)$, $\tilde{I}^{jobs}(t)$, $\tilde{I}^{commuters}(t)$ and $\tilde{I}^{commuter\ length}(t)$

Figure 7 shows the average annual growth rates of income by family, jobs, commuters, and commuter length. All growth rates are positive over the last decades. The annual growth rate of the commuters decline from 5.5% to 3% during the last two decades. Indeed, local authorities are faced to migration of households from the city centre. People live in these communes but were still working in the city centre. Therefore the growth rate of the commuter length increased (commuters length represents the average length of the journey between the home place and the work place. Only people who live in a commune and work in an other are taken into account).

We decided to not comment the curses of the figure 7 concerning average annual growth of income by family and jobs.

2.2 Development of the deviations from the average growth rates



source : from census, INSEE

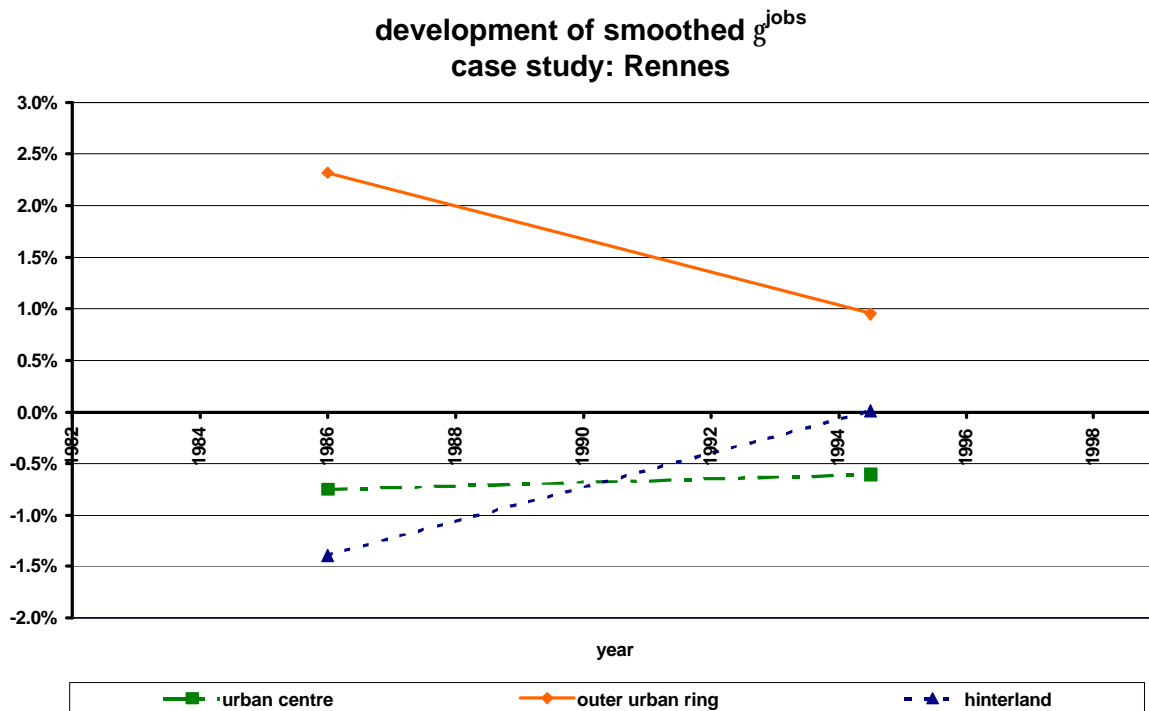
Figure 8: Annual deviations from the average growth rate $\tilde{g}^{\text{population}}(t)$

The annual deviations from the average growth rate for population are shown in Figure 8. It indicates that the annual population growth rate of the outer urban ring and hinterland are mainly above the average growth path while the deviation of the urban centre are below the average growth path. This can be also verified in Figure 3. Rennes keeps a green belt around the city where the urban area has a very low density. Any more, an effort about new dwellings has been accomplished since twenty years in this area. Several housing plans have been implemented to increase production of new buildings in the city centre neighbouring communes.

Since the late 80s the deviations of the hinterland from the average growth path are nearly zero. This means, that the annual population growth of the hinterland behaves like the average growth rate of the whole region. In the Rennes case study, must we keep speaking about urban sprawl or an urban growth generalised in the urban area?

Indeed, since 1975 the population of the urban centre is nearly constant while the outer urban ring and hinterland increased steadily.

All this confirms that in Rennes case study, the core city doesn't loose population to periphery. All areas had to support a demographic development. New migrants are coming from the rest of Brittany region but also from other french regions.



source : from census, INSEE

Figure 9: Annual deviations from the average growth rate $\tilde{g}^{\text{jobs}}(t)$

With respect to employment (Figure 9), one can observe the same dynamic in the outer urban ring but the trend of growth in this case begin to change in a context of suburban development we can notice that:

- City of Rennes wasn't affected by an economic recession and the number of jobs is growing. Of course its dynamic is just under-side the general growth rate of area study. But it's stable.
- More and more employments seem to be located in hinterland areas. For example, several firms working in link with Citroën settled around outer urban ring areas because level of taxes was more attractive. Netherless, urban centre and outer urban ring still represent the most of jobs in Rennes urban area and most of the growth of the number of jobs.
- Annual deviation from the Annual deviation from the annual deviations are always above the average growth rate of jobs has decreased for outer urban ring areas. Period of new industries localizations is finishing.

The outer urban ring becomes more and more less importance while the hinterland becomes more importance in the annual growth of jobs.

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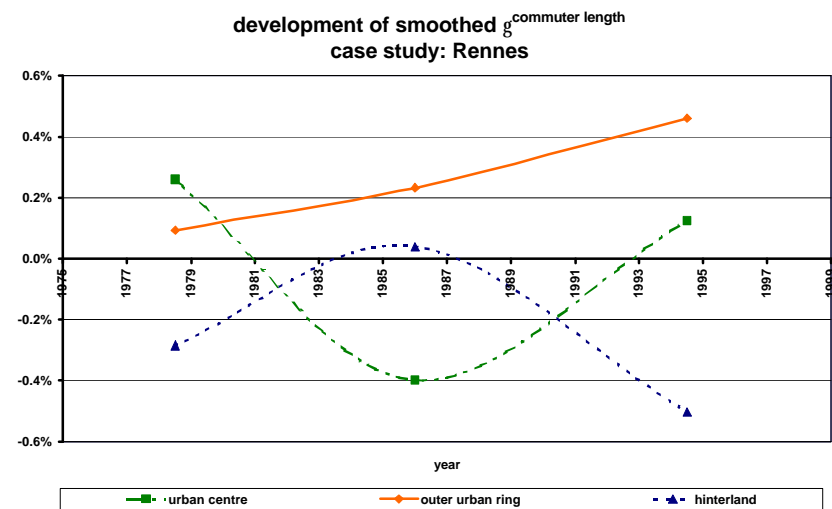
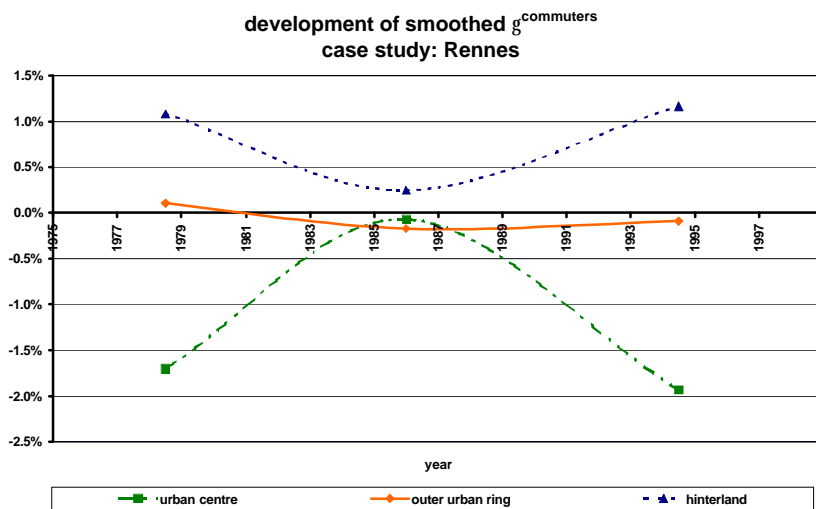
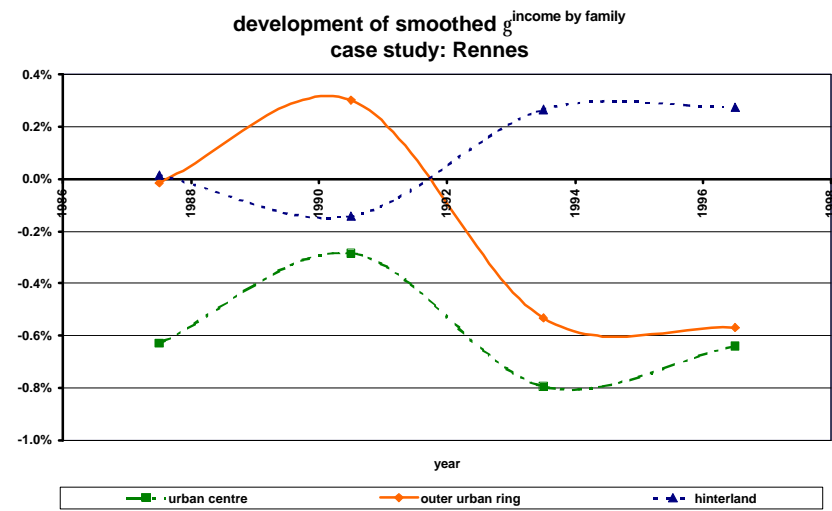
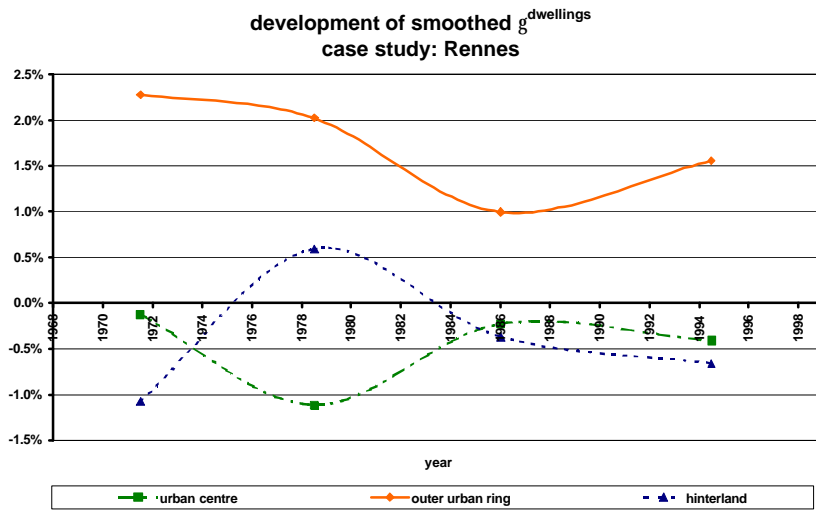


Figure 10: Annual deviations from the average growth rate $\tilde{g}^{\text{dwellings}}(t)$, $\tilde{g}^{\text{income by family}}(t)$, $\tilde{g}^{\text{commuters}}(t)$, and $\tilde{g}^{\text{commuter length}}(t)$

Observation of deviations of the average growth rate of the **number of buildings** (figure 10 a) is quite similar with the population average growth rate. If we let out of the analyse the very high level of growth in the late sixties and seventies, explained by the low level of the stock of dwellings, the residential building activities of the outer urban rings are during the whole period above average annual growth. The deviations increase since the middle of eighties. Residential building activities of the urban centre is below average during all the period. Deviation has been reducing since 1980. For hinterland areas, residential building activities was above average during the period 1975/1982 and below after.

The annual deviations from the average growth path of the **number of commuters** (figure 10 c) follow the trend in the outer urban ring during the whole period. Development of commuters in the hinterland areas during all the period is above average annual growth. It shows residential specialisation of this zones, jobs are polarised on urban centre and outer urban ring areas. Concentration of employment on the city centre explains why deviation of commuters between the urban centre and other areas is so important. People who live in Rennes can work on the same place. Nethertheless even if deviations of the average growth rate of commuters is below the average growth path - the number of commuters could have increased as this indicator aims to show a difference not an absolute value.

Concerning Annual deviations from the average growth rate $\tilde{g}^{\text{commuter length}}(t)$ (Figure 10 d), it's difficult to analyse these curves because it requires a knowledge of the absolute value.

The deviations of the income per family in real prices show, that the urban centre and outer urban ring will be very strong influenced by the economic cycle (figure 10). When the annual growth decline (increase) of the income per family, the deviations are negative (positive) in the communes in the outer urban ring and the centre. The hinterland seems not to be so strong influence on the economic cycle. The deviations are above the average annual growth when the annual growth decline and vice versa. Nethertheless, it's necessary to keep a prudence with data of income by family because the source used rests on incomes which are concerned by national tax.

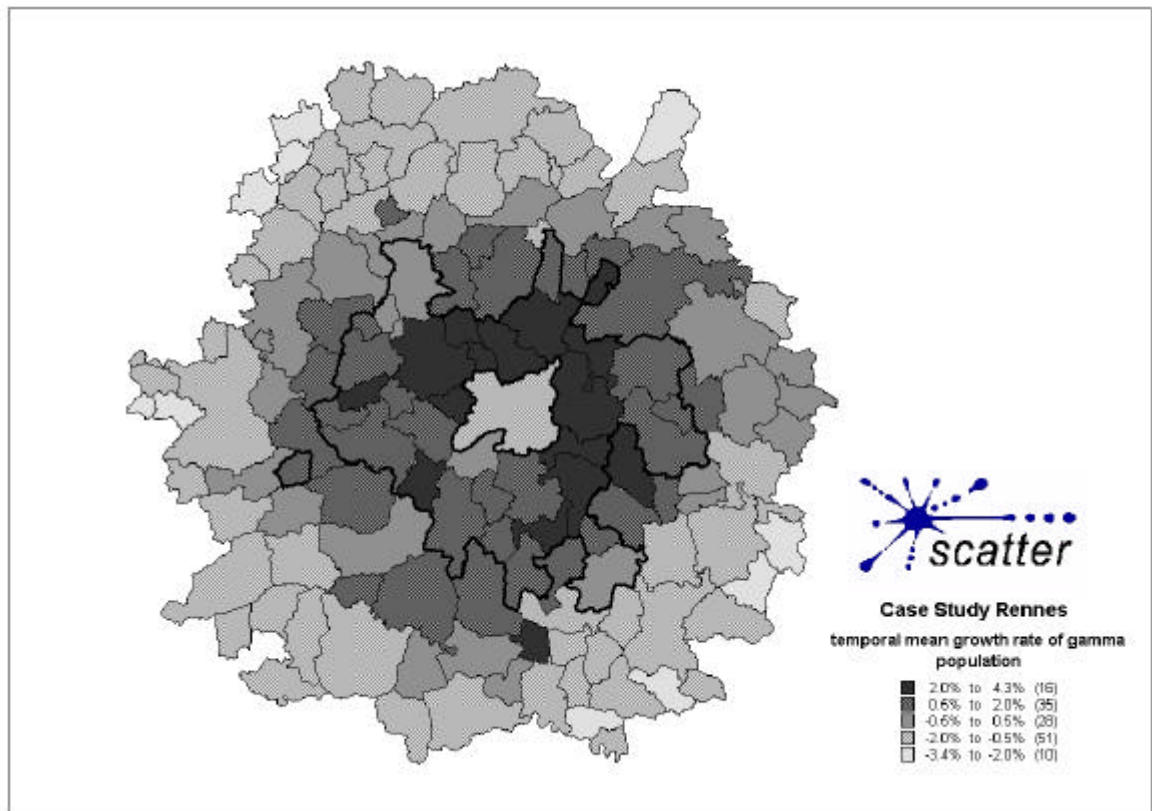


Figure 11: Spatial distribution of the temporal mean growth rate of \tilde{g} population

The average annual deviations from the mean growth rate of population between 1962 and 1999 on the level of «communes» is depicted in figure 11. The spatial pattern indicates that the above average growing zones (communities) are scattered mainly over the outer urban ring and near the border between outer urban ring and hinterland. «Communes» of the first ring around the city centre appear with a development of population more important than the other areas. In particular «communes» located in the Eastern and Northern part of this inner suburbs. This observation has been confirmed by the interviewed experts. This municipalities are really attractive because of the quality of life (no industrial zones) and a new highway has been created which increases their accessibility.

More generally «communes» member of *Rennes Métropole* have known a very strong development. It can be seen as a consequence of a politic will of building new dwellings.

The average annual deviations from the mean growth rate of jobs on the level of «communes» (figure 12) indicates that the communes with an above average growth are less numerous than in the case of the growth rates of population and more scattered (even if «communes» concerned are mainly in the *Rennes Métropole* area). Exhaustive data about evolution of jobs would show how urban centre keeps concentrating them.

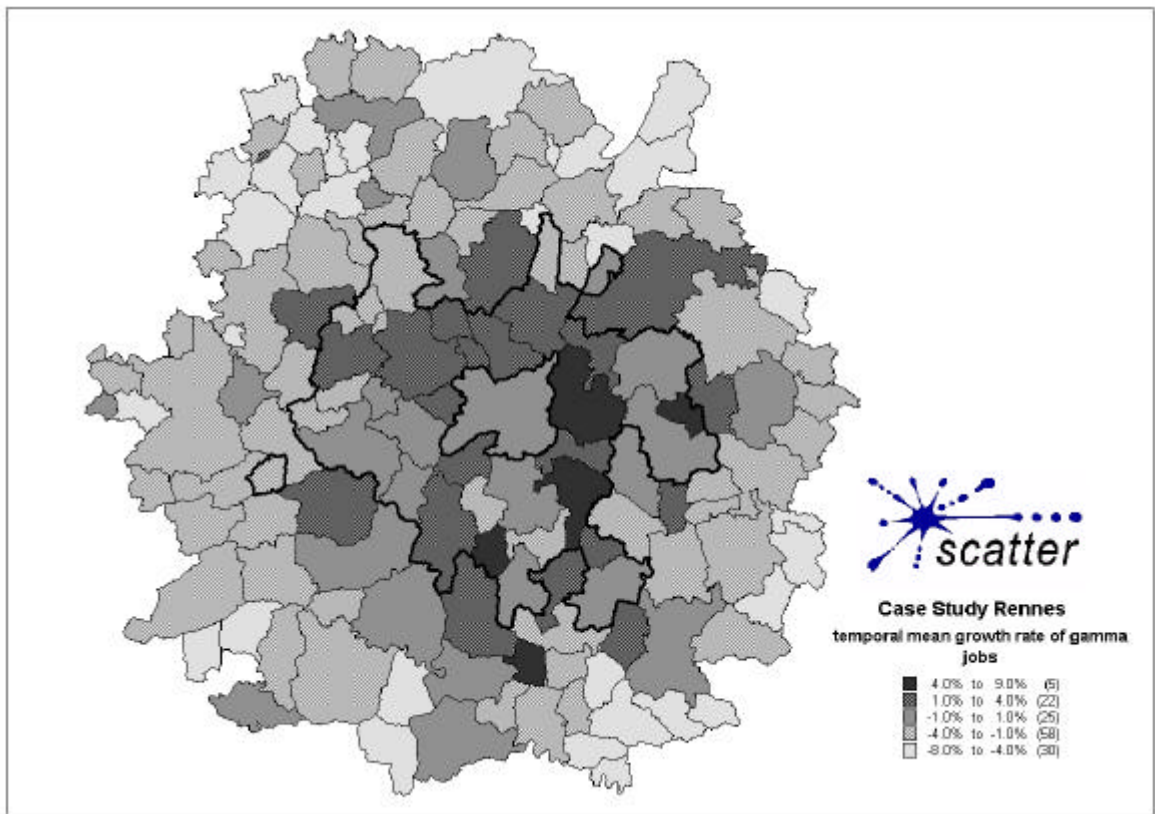


Figure 12: Spatial distribution of the temporal mean growth rate of \tilde{g}^{jobs}

2.3 Development of the H-measure

In the figures 13, 14 and 15 the concentration-measure H^{el} for the investigated variables population, jobs, number of dwellings, commuter, commuter length and income per family are shown. All data are scaled to the first year of the data set.

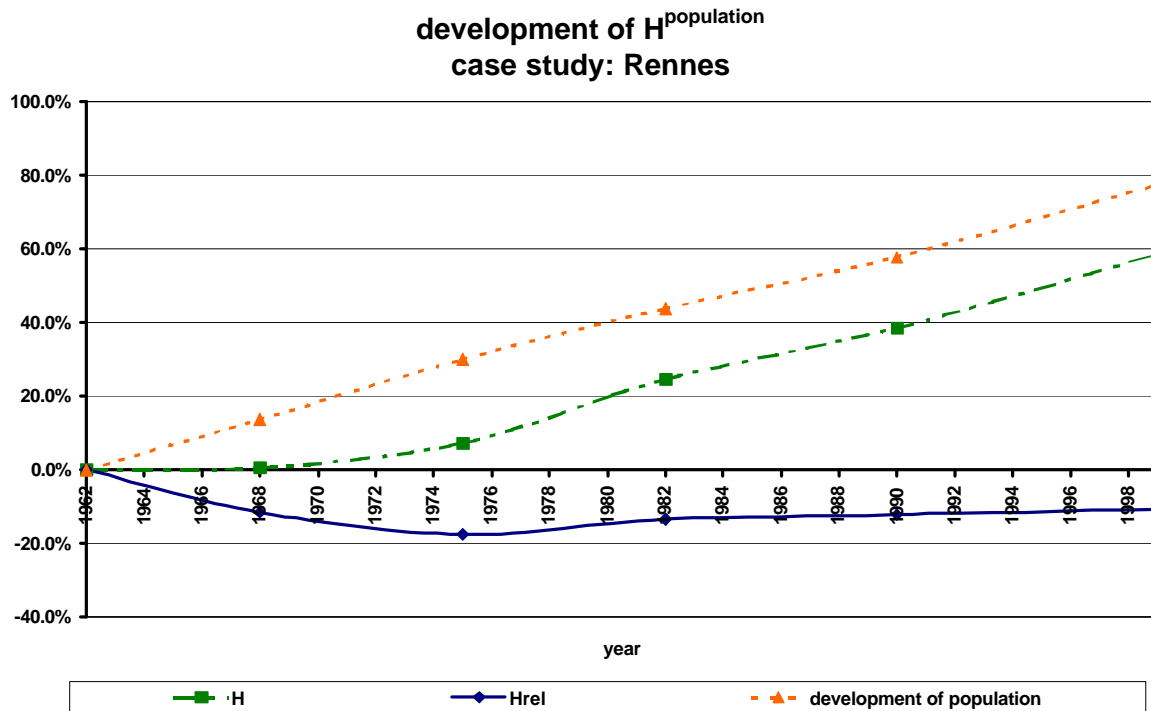


Figure 13: Development of $H^{population}(t)$

In the case of Rennes the temporal development of the relative H -measure of population $H^{population}(t)$ indicates an increasing concentration in the 60s and early 70s and since the late 70s a de-concentration. During a large part of the periode, the city centre has concentrated new housing projects. But things are changing. The city centre hasn't enough land to realize new urban developments. In the next years, the trend should lead to a location of new urban developments (mainly buildings) in the outer urban ring area.

The same conclusions can be done about development of H-measure for new dwellings.

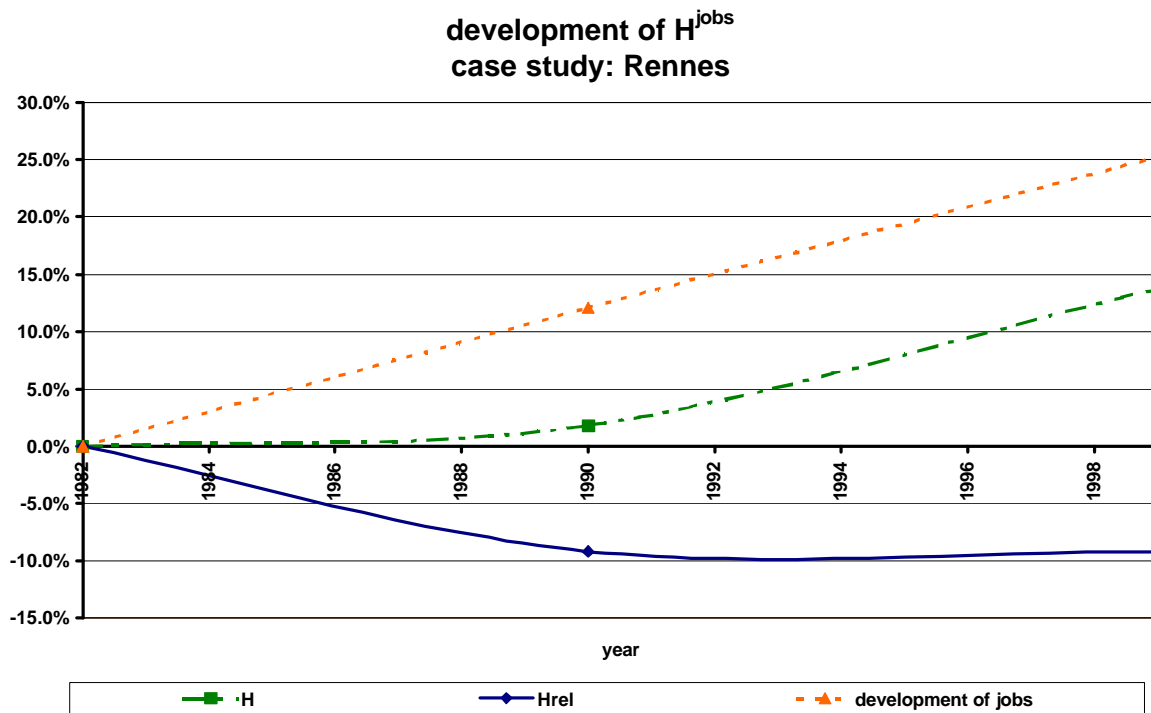


Figure 14: Development of $H^{jobs}(t)$

The relative H-measure of jobs decrease in the 80s and is nearly constant in the 90s. A spatial concentration of business activities to the urban centre can be observed in the 80s. This changes in the 90s, since the 90s the development of jobs in the urban area of Rennes is homogeneous. The main industrial zones were created in the city centre, administrations located also here. The growth of the localisations of population in the suburbs doesn't appear here about employment.

The relative concentration-measure H of commuters and income per family show a stable effect of de-concentration.

For the commuter length exhibit a period of increase in the 70s and 80s and a period of decrease in the 90s of the relative H-measure. This means that the travel distance of the commuters increases especially in the inner communes of the urban area of Rennes in the last decade.

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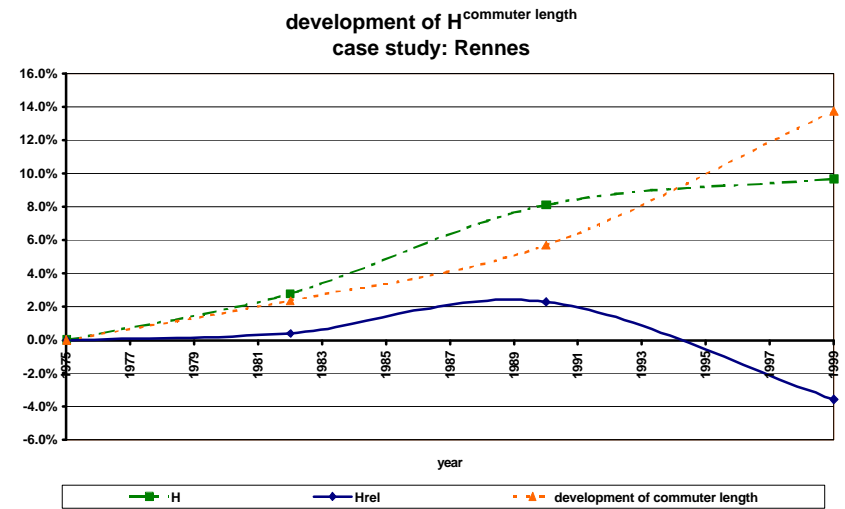
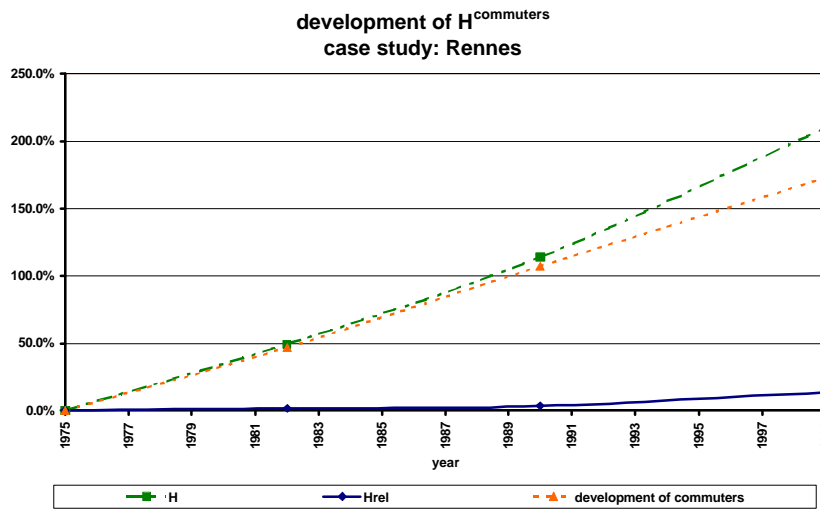
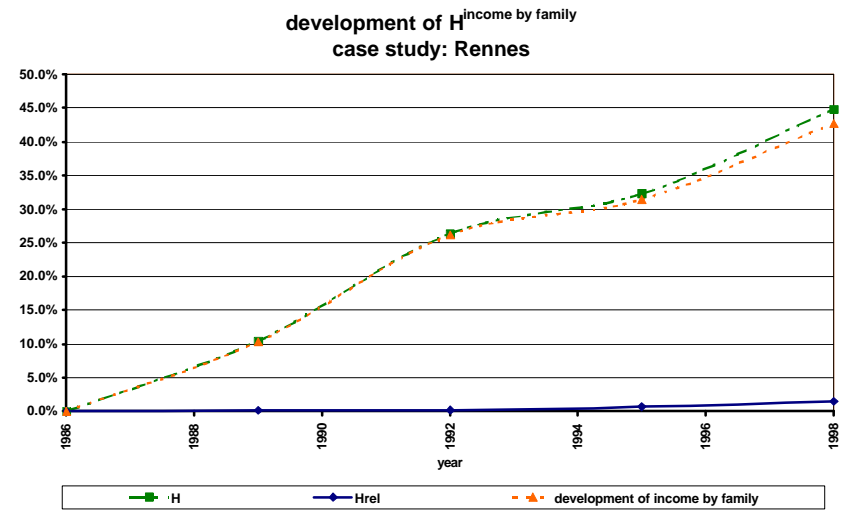
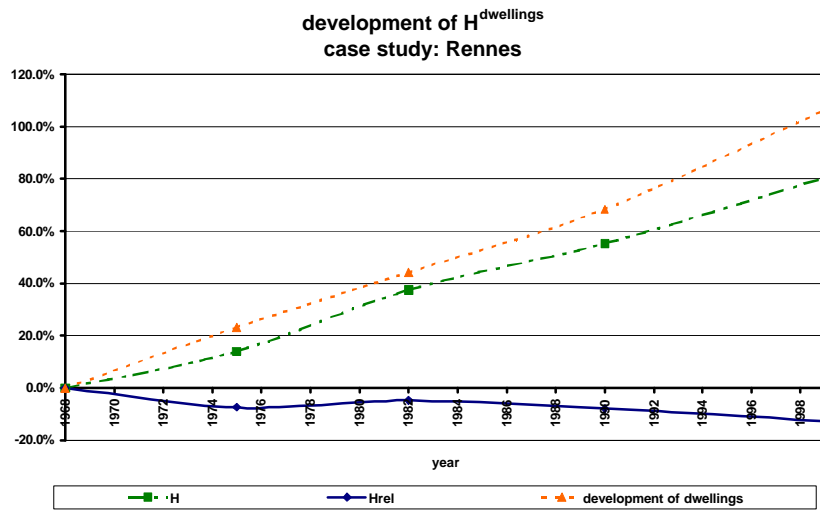


Figure 15: Development of $H^{dwellings}(t)$, $H^{income\ by\ family}(t)$, $H^{commuters}(t)$ and $H^{commuters\ length}(t)$

2.4 Development of global and local Moran I

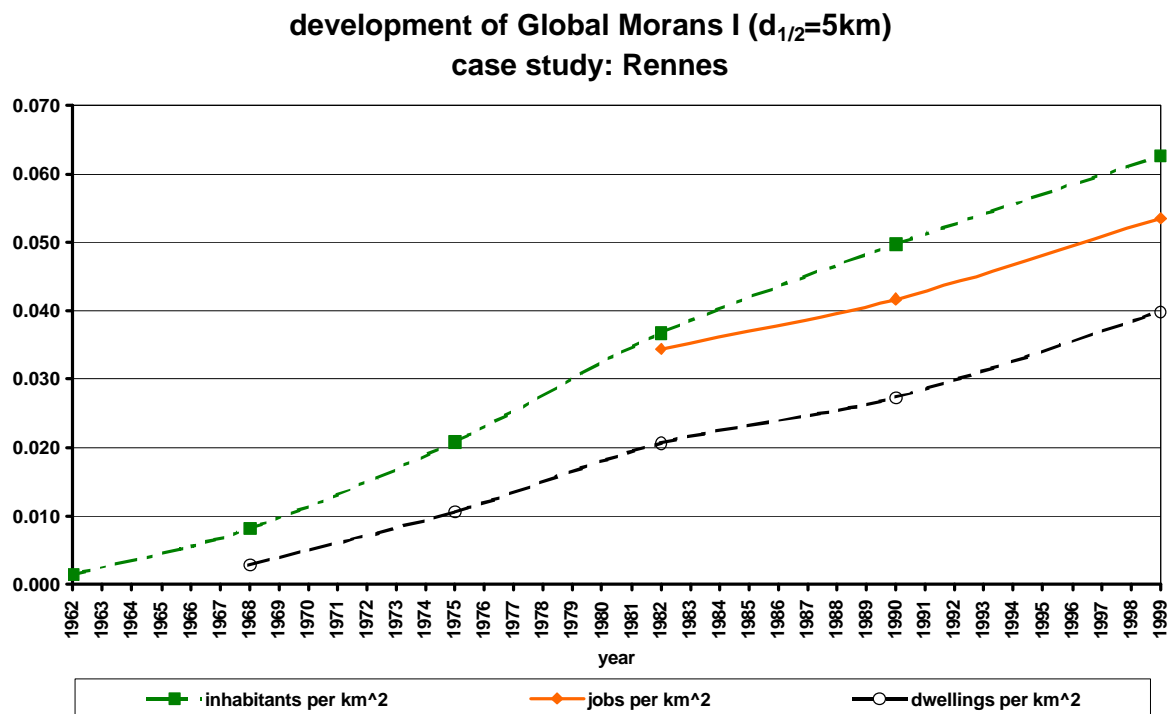


Figure 16: Development of global Moran's I of inhabitants per km², jobs per km² and dwellings per km²

The time development of global Moran's I of inhabitants per km² (population density), jobs per km² (workplace density) and dwellings per km² are shown in Figure 16 while in Figure 17 the global Moran's I of the other variables income by family, commuters and commuter length are depicted. A high level of global autocorrelation indicates that the characteristics of the areas situated close to one another are similar while a low level of global autocorrelation indicates that there are some clustering regions but the most areas are uncorrelated (unsimilar) in the Rennes area.

In the Rennes case study, we can observe that global Moran's I of population density, job density and dwelling density values are on a low level. It indicates an inhomogeneous neighbourhood of the zones in the urban area (sparsely clustered zones).

The trajectories of global Moran's I indicate also an increase in the spatial autocorrelation of population, jobs and dwellings. The increase of spatial autocorrelation of all considered variables during the last decades indicates, that within the Rennes region the economic and social interactions between the «communes» have increased. Socio-economic differences between rather rural and urban areas has decreased.

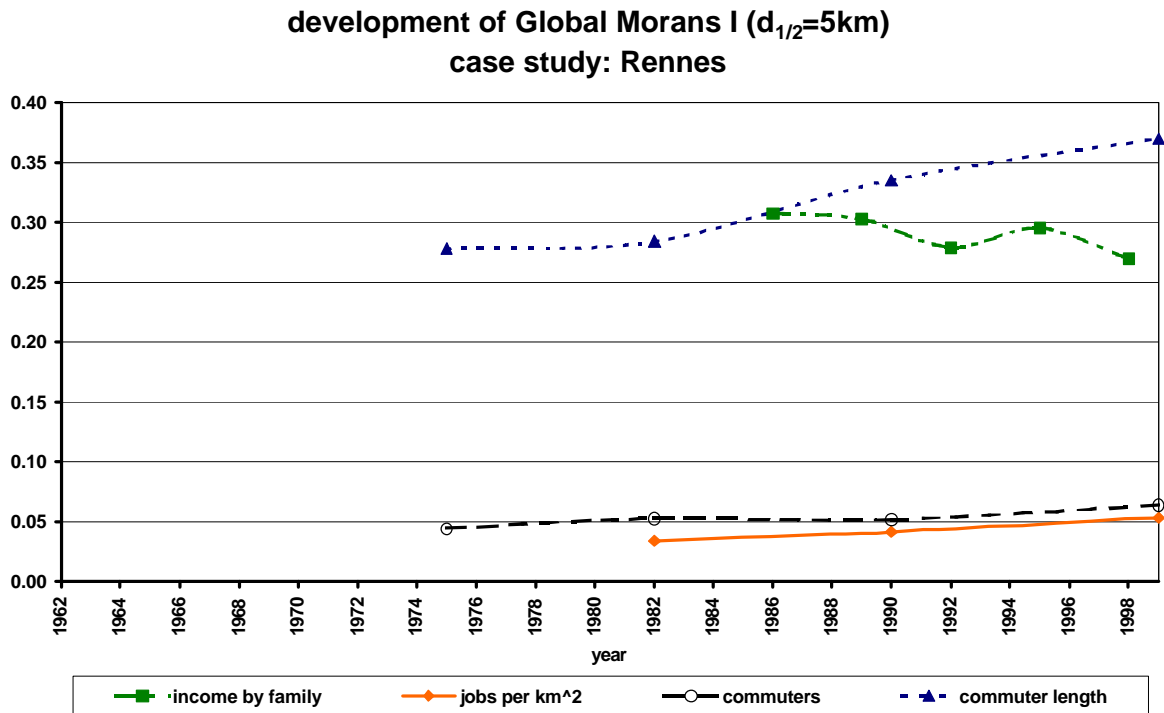


Figure 17: Development of global Moran I of income by family, jobs per km², commuters and commuter length

The global Moran I of commuter length and income by family have a medium positive level of spatial autocorrelation while in case of the commuter length it increases in time.

Concerning global Moran I of jobs and commuters, its value stays low indicating an inhomogeneous neighbourhood of the zones and its development show an increase of spatial autocorrelation.

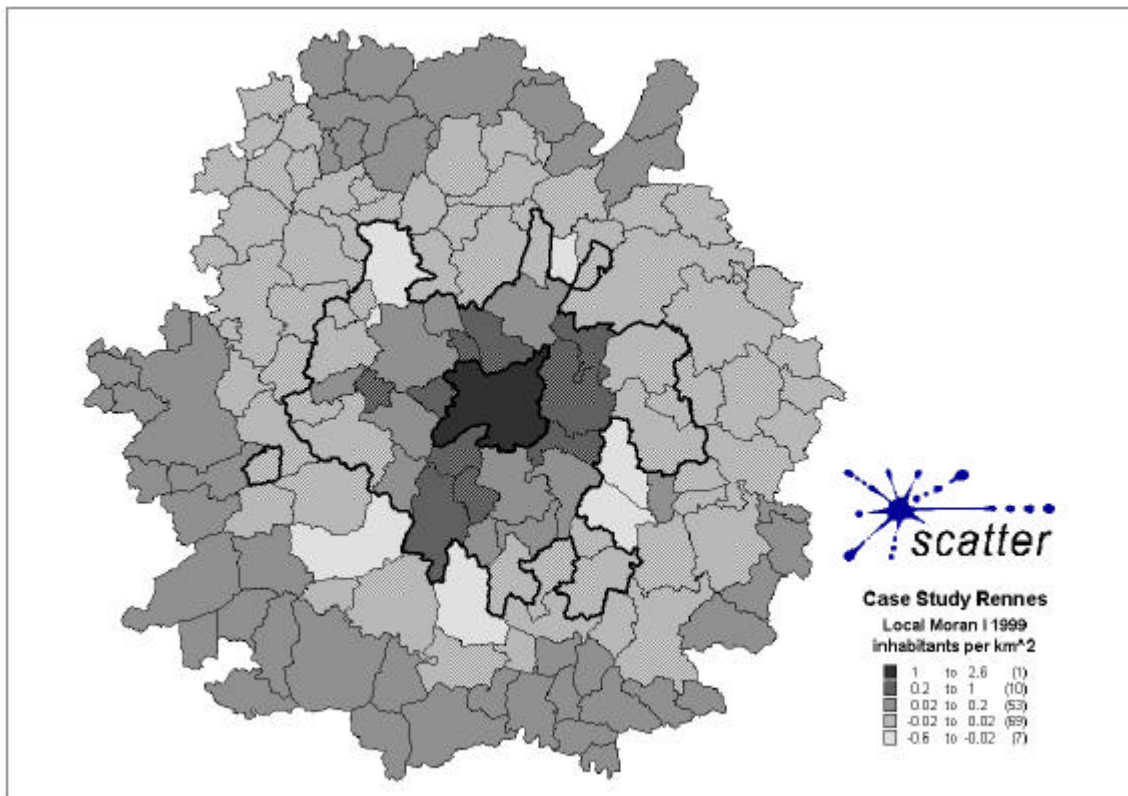


Figure 18: Spatial distribution of Local Moran I for inhabitants per km²

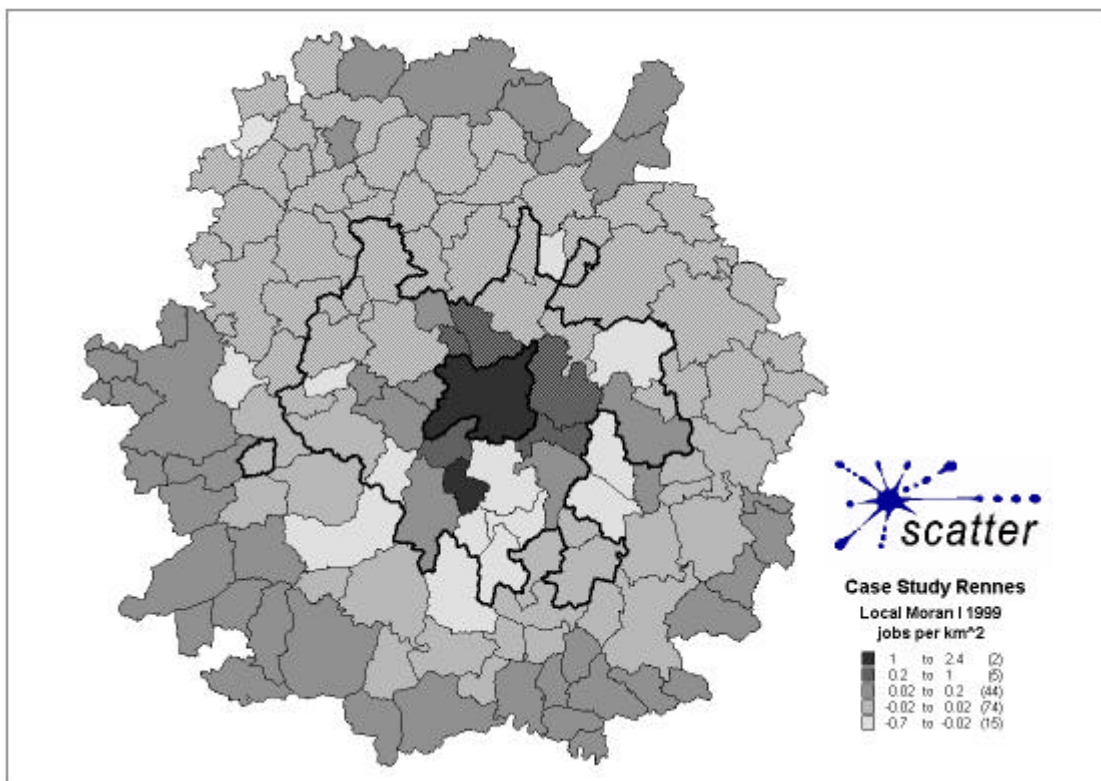


Figure 19: Spatial distribution of Local Moran I for jobs per km²

In the Figures 18 and 19 the spatial distribution of the local Moran's *I* of population and workplace density are depicted. The neighbouring areas (dark) that are relatively the same in terms of population and employment density and, on the other hand, those (light) that are relatively different.

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The city of Rennes indicates a high value of spatial autocorrelation between Rennes and its neighbourhood. Furthermore, it can be stated that a more or less scattered clustering of communities with high spatial autocorrelation around the city of Rennes exists. The local Moran's I of communes of the outer urban ring and near the border of the outer urban ring / hinterland are very low, because the differences of these communes with their neighbours are very high (heterogeneous neighbourhood of the zones). High values of local Moran's I in the hinterland can be found e.g. in case of rural areas.

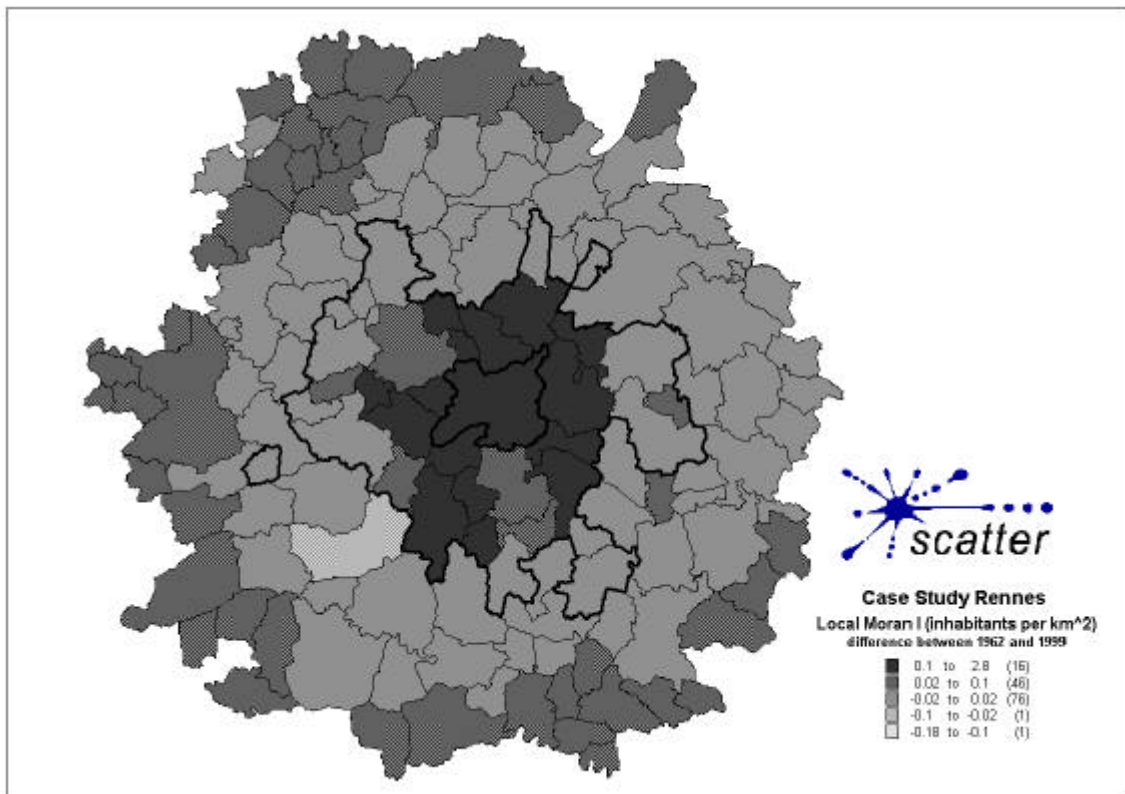


Figure 20: Changes of Local Moran I for inhabitants per km² between 1962 and 1999

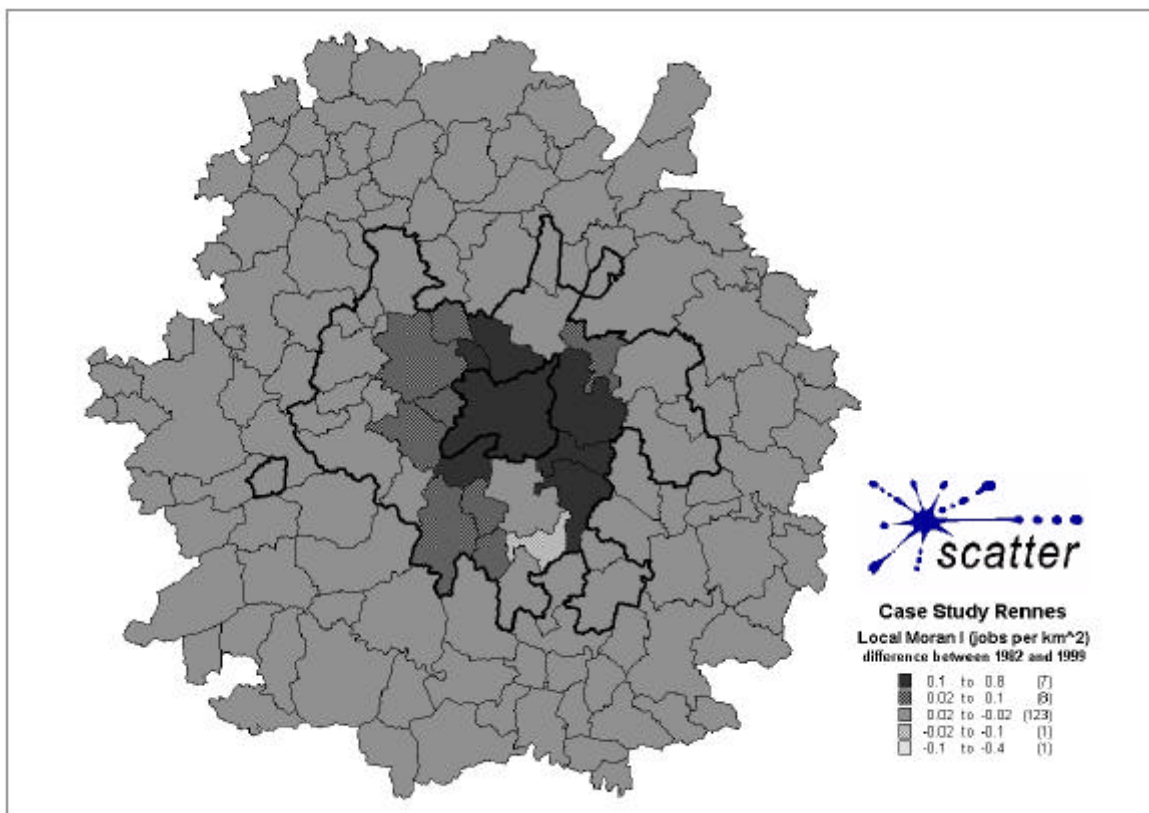


Figure 21: Changes of Local Moran I for jobs per km² between 1982 and 1999

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Changes in the Local Moran I of the population and workplace density are shown in figures 20 and 21. An increase of spatial autocorrelation indicates that regions becomes with its surroundings similar while a decrease indicates that regions becomes with its surrounding dissimilar. Especially in the capital region and also close to the boundary an increase of spatial autocorrelation can be seen. In the most regions of the case Rennes, especially for the jobs per km², nearly no changes or only very small changed can be indicated.

2.5 Summary of the Rennes Case Study

- The central city keeps on its development even in a context of urban sprawl.
- Political integration and policies about housing, land use allocation and more generally urban planning seems to have effects. Most of the outer urban ring communes included in Rennes Métropole have increased their population but in a context of development of spatial autocorrelation.
- Urban growth concerns principally inhabitants. Jobs are still concentrated in the central city, but some “communes” of the outer urban ring have known an important growth.
- It is also important to point out the fact tha a good accessibility in an urban area located in an open space has given large possibilities of development. But this development have been organized with a ring belt and new urbanization in the inner suburbs rather than in the hinterland.

3 PRESENTATION OF POLITICAL CONTEXT AND PLANNING SYSTEM OF RENNES

Study area for SCATTER project has been defined from a statistical level called *aire urbaine*. It built by french national statistics institute by analysing commuters. It represents area under urban influence of the city centre. An *aire urbaine* comprises several local-authority areas (communes) whose 40% of their inhabitants work in the city centre. As an example, the Rennes *aire urbaine* concerns 140 communes and represents a demographic weight of 521.000 inhabitants.

The central area, which corresponds to inner cities and outer in SCATTER typology, is covered by a political institution called *Rennes Métropole*. It's composed of the city of Rennes and 35 communes (365.000 inhabitants).

Whereas a large and integrated planning system exists on *Rennes Métropole*, the rest of *aire urbaine* isn't covered by efficient tools to fight against urban sprawl.

3.1 Rennes Métropole

At *Rennes Métropole* level, several orientation documents exist to precise orientations, objectives for the developpement of the politic community concerning business activities, transport system, natural zones, new buldings. The most general document is called urban area project (projet d'agglomération), it can be considered as a formalisation of the political project for *Rennes Métropole*. Concerning spatial dimension of this schemes, a land allocation plan has been continuously updated (1974, 1983, 1994, 2003). It has a regulation force. Other plans have a regulation force concerning public transport (plan des déplacements urbains), new buldings (programme local de l'habitat).

Rennes Métropole has financial ressources which allow the implementation of concrete actions about urban and transport planning. Public transport are managed by Rennes Metropole inside its bounderies. Municipalities can be helped by subsidies to build social housing or to buy land in order to organize urban development.

Concerning the municipalities of *Rennes Métropole*, each one has its own allocation plan which must respect coercitive measures inscribed in the regional land allocation plan and other plans with a regulation value. Also, local authorities have in charge the issuance of building permits.

An advice structure called AUDIAR (agence d'urbanisme et de développement de la région rennaise) has in charge the elaboration of the most of orientation and allocation plans at regional level.

Figure 22: Synthesis of the Rennes Métropole planning tools.

PLANNING POLICIES AND TOOLS			
	Orientation documents	Documents with a regulation value	Concrete actions
Rennes metropole level	Political project for urban area (Projet d'agglomération) Business development plan (Plan de développement économique) Shops development plan (Charte d'urbanisme commercial)	Land use plan (Schéma directeur) Transportation development plan (Plans des déplacements urbains) Housing development plan (Programme local de l'habitat)	Land action (Programme d'action foncière) Social Housing (Subsidies) Managing of transport network
Municipalities level		Land use plan (Plan local d'urbanisme)	Land action Permits

3.2 Peripheral crown around Rennes Métropole

Concerning areas comprised in the peripheral ring around *Rennes Métropole*, orientation or allocation plans don't exist at a regional level. Each local authorities (communes) has its own allocation plan and has in charge the issuance of building permits, leading to a lack of coherence in the implementation of measures against urban sprawl.

No advice structure exists for urban planning in this area.

4 SYNTHESIS OF THE INTERVIEWS OF EXPERTS AND LOCAL AUTHORITIES

This part of Rennes monography is a synthesis of the contents of the six interviews that have been carried out to investigate characteristics of urban sprawl phenomenon in Rennes area.

The synthesis of interviews is divided in five themes. Its presentation respects them.

- 1) The statement of urban sprawl and the level of awareness in local authorities.
- 2) The main causes of urban sprawl identified by interviewed people.
- 3) The main impacts of urban sprawl identified by interviewed people.
- 4) Existing but also suggested policies to limit, to fight against urban sprawl.
- 5) Thinking about why in Rennes case study has been existing a will to control urban development since fifty years?

Local authorities and experts who were interviewed in this study are:

- Mme DARD (Director of urban planning – Rennes Métropole)
- M. DARLOT (data expert - urban planning agency)
- M.DAVID (Responsible of land politics – Rennes Métropole)
- Mme JOLY (political leader – City of Rennes and Rennes Métropole)
- M. LEMONNIER (director of development – local rural interests organisation “Chambre d’agriculture d’Ille et Vilaine”)
- M. OLLIVIER (town planner – urban planning agency)

4.1 Statement of urban sprawl

Urban sprawl in the Rennes area started only after the second world war but with a very strong intensity. Between 1990 and 1999, Rennes *aire urbaine* had the third demographic growth rate in comparison with the other french *aires urbaines*. Three periods can be distinguished in the Rennes urban development history.

From 1950 to 1970, new buildings and activities were located in the city centre. Renewal projects and urban expansions (social housings and industrial areas) have permitted to concentrate this development on Rennes.

From 1970 to 1990, urban growth has still concerned the city centre but also peripheral cities for new buildings essentially. Local authorities around Rennes were villages, rural zones and not cities. Most of them were populated with less of a thousand of inhabitants. There was a scattered development between municipalities with a strong rhythm for the near suburbs and lower rhythm for the far suburbs (urban model of "villetes"). In the new residential spaces were built one-family housing by expansions of urban nucleus (allotments). Natural zones were protected between the city centre and municipalities of the first ring (coupures d'urbanisation). That's why, there wasn't a contiguous suburban growth nor linear patterns of strip development (except for activities).

From 1990 and 1999, efforts of the city centre and the communes of Rennes Métropole in new buildings weren't sufficient to localize new populations in the central area (even if the most of new buildings and new jobs are located in the central area). Municipalities located in the second ring around *Rennes Métropole* were concerned by urban growth. In the central area, local authorities located in the south and the east increased their population and their jobs at a strong rythm compared with other zones.

Figure 23: Evolution of population, jobs and housings (1990/1999)

	Population 1990	Population 1999	Housings 1990	Housings 1999	Jobs (1990)	Jobs (1999)	Population evolution (1990/1999)	Housings evolution (1990/1999)	Jobs evolution (1990/1999)
SCATTER project study area (Aire urbaine -1999)	463366	521188	190052	231978	202477	228445	+12,48%	+22,06%	+12,83%
Rennes Métropole (central area)	326311	364652	135241	168669	168505	188906	+11,75%	+24,72%	+12,11%
Rennes (city centre)	197536	206229	91478	108053	103915	110351	+4,40%	+18,12%	+6,19%
Hinterland (periphical crown of central area)	137055	156536	54811	63309	33972	39539	+14,21%	+15,50%	+16,39%

Whatever the period, evolution in the location of population between the city centre and first and second rings can be explained only in terms of spatial redistribution. Indeed residential attractiveness of Rennes area is national. As an example, new inhabitants came from Paris because their firm or laboratory has been located in Rennes. An other point to underline is that the city centre has still been more populated than other local communes. Large peripheral cities don't exist. If new buildings were located in all local authorities, activities development has been concentrated in the city core and some municipalities (Saint-Grégoire, Chantepie, Chartres de Bretagne, Vezin le Coquet, Cesson Sévigné) located on transport infrastructures.

Each year around 250/300 hectares of undeveloped zones are urbanized on the city core (Rennes Métropole). Evolution of land use on peripheral ring isn't known. However this land use consumption, interviewed people didn't underline urban sprawl as the main

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problem to resolve actually in Rennes. Which appears more important for them is the difficulty to produce enough new buildings for new populations (60.000 new habitants until 2010). Only rural interests underline difficulties and risks linked with the urban growth about environmental issues.

Explanation of this position can be found in a problem of definition of urban sprawl. Many local actors entended urban sprawl as urban expansions of the city center. In Rennes case, suburbs don't exist because of the preservation of natural zones. But Rennes area presents an urban development scattered around several local authorities. It's a different form of urban sprawl than contiguous suburban growth but isn't it urban sprawl?

Also, local actors are used to implement urban planning measures. Considering urban sprawl as a pregnant problem would lead to recognize a failure of their action.

4.2 Causes of urban sprawl

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Table 4 : Comparison of considered causes of urban sprawl by interviewed people for the case city of Rennes

Possible cause	B.DARD (Director of urban planning – Rennes Métropole)	J. DARLOT (expert)	M.DAVID (Responsable of land politics – Rennes Métropole)	Mme JOLY (political leader – City of Rennes)	M. LEMONNIER (director of development – rural interests organisation)	OLLIVIER (town planner – urban planning agency)
1. Housing markets (housing prices lower in the periphery than in the core city)	Y	Y	Y	Y	Y	Y
2. Appeal of a rural ambiance	Y	Y	Y	Y	Y	Y
3. Appeal of low density settlements	Y	Y	Y	Y	Y	Y
4. Decrease of travel times and costs due to the extension of the highway network	Y (but only decrease of travel times)	Y (but only decrease of travel times)	Y (but only decrease of travel times)	Y (but only decrease of travel times)	Y (but only decrease of travel times)	Y (but only decrease of travel times)
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	? (improvement of public transport services has just been implemented to serve the suburban area)	? (improvement of public transport services has just been implemented to serve the suburban area)		? (improvement of public transport services has just been implemented to serve the suburban area)		? (improvement of public transport services has just been implemented to serve the suburban area)

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6. Rejection of the core city due to damaged buildings, dirtiness, car traffic, lack of safety due to traffic, noise, air pollution, ...	N (municipality of Rennes has implemented voluntaristic urban politics to confort inner city attractiveness by architectural, quality of space public and green spaces)	N	N	N	N	N
7. Rejection of the core city due to congestion	N	N	N	N	N	N
8. Rejection of the core city due to social problems	N	N	N	N	N	N
9. Development of economic poles in the outer urban area or delocalisation of companies from the core city to the outer area	Economic activities stay located in the central area (city centre and firts crown)					
10. Restructuring and relocation	Economic activities recently settled up in Rennes (industrial 1965, new technological firms 1985), they completed traditionnal administration and universitary functions. That's why there wasn't a restructuration of industry.					
11. Emergence of SME and decline of large enterprises						
12. Development of an economic pole in the outer urban area	Economic activities stay located in the central area (city centre and firts crown)					
13. The growth of employment in particular localised industries like mining, defence and tourism	N	N	N	N	N	N
14. The restructuring of manufacturing industry and the associated growth of branch plants	N	N	N	N	N	N
15. The growth of employment in the public sector and personal services						
16. The effect of economic recession on rural-urban and return migration						

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17. The first round in a new cyclic pattern of capital investment in property and business?						
18. Increase of the total population of the city	Y	Y	Y	Y	Y	Y
19. Inherent changing in structure population	Y (continuous ageing)	Y (continuous ageing)				Y (continuous ageing)
20. The expansion of commuting fields around employment centres						
21. The concentration of rural population into local urban centres	Y	NR	NR	NR	Y	NR

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22. The reduction of the stock of potential out-migrants living in rural areas						
23. The acceleration of retirement migration						
24. Change in age structure and household size and composition	Y	Y	NR	NR	NR	NR
25. Increase of household income	Y/N (increase of difference between high and low household income)	Y	NR	NR	Y	Y
26. The emergence of scale diseconomies and social problems in large cities	N	N	N	N	N	N
27. The improvement of education, health and other infrastructure in rural areas	Y	NR	NR	NR	Y	NR
28. The change in residential preferences of working age people and entrepreneurs						
29. The availability of government subsidies for rural activities						
30. The success of explicitly spatial government policies; if yes, which one(s)	Y (will and politics to fight against urban sprawl)	Y	Y	Y	Y	Y
31. The growth of state welfare payments, private pensions and other benefits	NR					
32. Improvements in transport technology	NR					
33. Improvement of sub-urban public transport service	? (impletation is too recent to evaluate results)	? (impletation is too recent to evaluate results)	NR	? (impletation is too recent to evaluate results)	NR	? (impletation is too recent to evaluate results)
34. Improvement of sub-urban road infrastructure	Y	Y	Y	Y	Y	Y
35. Application of specific transport measure; if yes, which one?	Y (tarification integrated for public transport)				Y (tarification integrated for public transport)	Y (tarification integrated for public transport)

4.3 Impacts of urban sprawl

Urban growth has induced some negative effects which are:

- The increase of commuters living out Rennes Métropole and working in. Car use to enter in the central area leads to congestion and environmental negative effects (air pollution). Trips have increased of 15% between 1991 and 1999. Public transport don't represent a credible alternative in Rennes case. Indeed because of natural zones around the city centre, public transport lines must cross spaces with a very low density. Also large peripheral cities and urban continuity along roads don't exist.
- Land and housing prices have increased so rapidly that households who want to buy must check for low density settlements at 20 or 30 kilometres from the city centre. Private speculation strategies appear: some households send a flat in the first peripheral ring when prices level has increased to buy a new housing in the second or third peripheral ring.
- Land market represents a risk to preserve agricultural zones. Old farmers prefer sell their farm at new residents who want to transform it in housing. Some of them who want to pursue their activity must front of "stress land". It means that when rural zones are surrounded with residential spaces, it becomes more and more difficult for the farmer to pursue his activity (conflicts, no way to extend).
- New households coming from central area want to find a level of services comparable in peripheral local authorities. They ask for a public transport serve, amenities, schools... Financial communes health can be menaced. They can't afford to pay functioning costs. Several local authorities and *Rennes Métropole* front of public deficit.

4.4 Existing and suggested measures to fight against urban space fragmentation

To organize urban development in order to economize space consumption, the central area (*Rennes Métropole*) has implemented several tools: allocation plans with regulation value, public policies (land, public transport, social housing) and a urban culture building to convince politicians to change their position about urban sprawl.

Coercitive measures

An allocation land plan precise where the new buildings will be located and which type of activities (residential, business, rural or natural zones). This document has a regulation value: allocation plans implemented by communes (at local level) must respect it (in fact they precise it). According to interviewed people, the last allocation land plan implemented by *Rennes Métropole* in 1994 has been respected. The will to fight against space fragmentation was in the respect of the green belt around the city core, new urbanizations around urbanized zones, a well-balanced development between the 36 local authorities composing *Rennes Métropole*.

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Other plans have a regulation value concerning transportations, housing. Their dispositions improve a densification of housings by proposing a localization of new buildings and renewal projects in the city centre along public transport lines, by proposing new urban morphologies between single-family houses and multi-story buildings.

Incitative measures

By subsidies, *Rennes Métropole* helps local authorities to constitute land reserves. Then, if they want to build, property developers need to negotiate with public actors. It leads to build social housings (25% in each new project), to organize densifications in surrounding areas. Also, *Rennes Métropole* finances UNIPASS a public transport ticket which allows commuters to take train/metro-bus with the same ticket. The will is to improve using alternative means of transport.

Rennes Métropole has also implemented orientation plans with private actors (business interests) about new commercial projects (ex. hypermarkets, cinemas) in order to rationalize them (and then to decrease space consumption, car park capacities).

All local authorities of *Rennes Métropole* have the same rate tax for firms who are located inside its boundaries. Tax unification has permitted to stop concurrence between communes about industrial zone projects.

On the city centre, a **negotiation between public authorities and property developers** has been institutionalised. Their dialogue deals with how many new buildings will be commercialised during the next year, which type of buildings and where. For developers, negotiation is an obligation because the municipality of Rennes has already bought undeveloped lands. For the municipality of Rennes, public urban planning system guarantees a production of 2000 new buildings each year (this permits Rennes to keep 200.000 inhabitants). This public control on housing and on lands could be generalised at all the municipalities of *Rennes Métropole* but it's necessary to convince mayors. Indeed they don't agree with a substitution of their authority on commune development for a regional level institution.

Cognitive measures

Densification of housing isn't a popular idea for mayors of little municipalities. Used to the migration of the middle and high income families towards the periphery, they are afraid of social housings and decrease of the residential attractiveness associated. In order to fight against this mind of spirit, some politicians decided to organize meetings between town planners, urban planning professors and mayors. By visiting densification housing projects in Rennes area, they want to show that it doesn't mean necessarily large buildings. A place of discussion (atelier d'urbanisme) between mayors will be created to favourite exchanges about densification projects. Then the will is **to build an urban culture common** at regional level.

Urban planning agency (AUDIAR) plays a role in the fight against space fragmentation. It has been advised each mayor for allocation land plan modifications since 25 years. It can diffuse urban planning principles to control urban growth, to prevent from urban sprawl.

New measures

Actually, three types of new measures are envisaged.

- Interests rural organizations ask for large studies about rural spaces evolution: where maintain rural activities? How secure land rural zones from urban expansions? For them, similar studies than in urban areas must be implemented.

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- Urban planning agency should develop its activities at a larger level (advice, statistical analysis,...).
- Technicians of *Rennes Métropole* think to elaborate a global urban project for each commune of Rennes Métropole in order to increase land politics efficacy. Indeed they perceived a lack of anticipation from municipalities that led to a decrease of new buildings in a demographic growth context.

4.5 Reasons for measures taken to fight against space fragmentation

A share of culture urban of public control on urban planning even if difficulties stay

Most of politicians consider as legitimate for public authorities to control urban planning. Private interests, according to them, aren't able to produce an urban development with social housings, equilibrated between several local authorities. They look for projects with financial stakes. Also, they share an urban scheme separating urban and rural zones which is one of the component of Rennes area attractiveness. Creation of suburbs would mean a lack of public urban planning, that's why preservation of green belt around the city centre is a constant priority in the allocation land plans.

Because of shared ideas, political leaders accept to give financial, technical means to build a public and integrated urban planning system. But difficulties didn't disappear. Urban sprawl issues concern a spatial level which is larger than *Rennes Métropole* boundaries. The next land allocation plan will be implemented on an area comparable to SCATTER project area study. It will help to act on peripheral municipalities. But no political institution exists at this level and elected representatives of central and peripheral area aren't used to discuss about urban planning. Then would the next allocation plan be an orientation plan without prescriptive measures because of political agreement necessities? Any more to obtain political agreement about a large level, mayors of peripheral crown obtain to implement specific land allocation plans which will precise the general one. But what guarantee of a cohesive action in urban planning by multiplying documents?

Technical reasons

City centre area is limited (2500 hectares) and its urban development is constrained by circular highway, natural spaces belt. Then the will of keeping population growth led to organize urban expansions with peripheral cities. Cooperation in urban planning started early by the implementation of land allocation plans (1974), and the creation of a political institution at regional level (district urbain de Rennes 1971 transformed en communauté d'agglomération 2001).