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SCATTER

Sprawling Cities And Transport: from Evaluation to Recommendations

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Summary Report

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FOREWORD

SCATTER is a research project within the Fifth Framework Programme of the European Commission. It makes part of the Thematic Programme "Energy, Environment and Sustainable Development" and of the Key Action "City of Tomorrow and Cultural Heritage". It has been co-funded by DG Research and national organisations from Belgium, Finland, United-Kingdom, Germany, France and Italy. The project started in January 2001 and finished in September 2004.

This Summary Report contains two chapters: first, a project summary, which covers all the themes dealt with and tasks carried out during the project, and, secondly, a set of recommendations to local authorities based on the results obtained in the various tasks. These recommendations are the final outcome of the project.

SCATTER tackles the issue of urban sprawl, in particular in the context of cities implementing new suburban public transport services. Urban sprawl is one of the major challenges that European metropolitan areas are facing and will have to face in the next decades, together with congestion, emissions, and preserving or enhancing the quality of life of their inhabitants. It lies at the crossing of highly topical issues: urban governance, environmental concerns (emissions, biodiversity, etc), and quality of life of the inhabitants of the urban areas.

The starting point of SCATTER is that, in order to reduce the harmful effects due to a first wave of urban sprawl (congestion on radial roads, CO₂ and pollutant emissions due to transport), authorities of many urban regions are implementing new high quality public transport services linking the suburban areas and the urban centre. But by improving the accessibility, the authorities simultaneously create an incentive for a new wave of urban sprawl. There is therefore a need to design and implement accompanying measures to these new public transport services, in order to counter-balance their negative effects on the spatial pattern.

The objectives of SCATTER were therefore to analyse the mechanisms and effects of urban sprawl, to evaluate measures aiming to control or reduce sprawl, and to provide policy recommendations to cities, in particular in the context of cities implementing new suburban public transport services.

SCATTER is thus in line with various EU policies and topical reflections, like the Sixth Environmental Action Programme and the Thematic Strategy on Urban Environment.

To reach its objectives, SCATTER has achieved various tasks: statistical analysis with original indicators, interviews of local authorities, interviews of US experts, review of policies in a dozen of cities, analysis of mechanisms of inter-institutional cooperation, simulations of policies and impact assessment.

The message of SCATTER is that one cannot implement new transport services between suburban areas and urban centre without being aware that this will encourage the out-migration of the households and that therefore this requires an accompanying strategy. The package of policies recommended by SCATTER combines fiscal measures on suburban residential developments and offices choosing inadequate locations (i.e. locations poorly served by public transport), and transport pricing: increase of car use cost and reduction of the fare of public transport, but in the urban centres only. SCATTER also recommends to have more recourse to innovative housing design (intermediate between collective and individual housing) in order to meet simultaneously the individual household aspirations and the collective density criteria.

Finally, SCATTER also recommends soft measures. Further to the technical policy recommendations, the key success factors to tackle urban sprawl are: integrated strategies, coordination, and cooperation, between municipalities and between institutions and players in general. In this clearly multi-dimensional, multi-disciplinary issue, each player holds a part of the solution. Soft measures like symbolic measures should contribute to create a common culture at a supra-municipal level, to enable consensus building, a consensus about the objectives and the ways to reach them. These points are key elements to achieve a more sustainable urban development.

The SCATTER consortium wants to express his special gratitude to all the local and national authorities involved for their help and guidance, and to Dr. Eric Ponthieu, Scientific Officer of DG Research, for his constructive attitude and actions which have always encouraged them in their work.

The SCATTER consortium

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1. PROJECT SUMMARY

1.1. Starting point and objectives of SCATTER

SCATTER tackles the issue of urban sprawl, in particular in the context of cities implementing new suburban public transport services.

Urban sprawl is a common problem encountered in Europe. It is usually defined using three key concepts: low density, uncoordinated urban growth, spatially segregated land uses¹. Sprawl is positioned against the concept of compact city, with high density, centralized development and a spatial mixture of functions. Generally speaking, the spatial pattern which results from sprawl is unfavourable to the development of public transport and other sustainable transport modes. On the contrary, urban sprawl induces high level of private car use. The negative effects of urban sprawl on transport are therefore an increase of trip lengths, congestion on the radial roads giving access to city centres, increase in fuel consumption and in air pollution.

Other negative effects are due to urbanisation and land consumption themselves: loss of high quality agricultural land and open space, destruction of biotopes and fragmentation of eco-systems², change of the water streaming coefficient. Urban sprawl also generates higher costs of new neighbourhood equipments, infrastructures and public services.

Now, in order to reduce the congestion and the CO₂ and pollutant emissions due to a first wave of urban sprawl (mostly due to networks of motorways), authorities of many urban regions are implementing new high quality public transport services linking the suburban areas and the urban centre (like the future RER in Brussels). But by improving the accessibility, the authorities simultaneously create an incentive for a new wave of urban sprawl. Therefore *there is a need to design and implement accompanying measures to these new public transport investments*, in order to counter-balance the negative effects of these new public transport services on the spatial pattern (and to reinforce their positive effects, e.g. modal shift). The SCATTER project tackles this issue.

In this context, the objectives of SCATTER were to analyse the mechanisms and effects of urban sprawl, to evaluate measures aiming to control or reduce sprawl, and provide policy recommendations to cities facing that phenomenon.

1.2. Overall methodology

The approach followed consists of three stages:

- first stage: improving the understanding of the mechanisms of sprawl and its effects. This first stage includes:
 - (i) a state-of-the-art review of urban sprawl effects
 - (ii) a systemic analysis of urban sprawl on the basis of interviews of experts and local/regional authorities in 6 case cities (Bristol, Brussels, Helsinki, Milan, Rennes, Stuttgart)
 - and (iii) a statistical analysis of time series data in these 6 cities;

¹ E.g. homogenous single family residential development; shopping centres, retail and services; freestanding industrial areas.

² See the programme CORINE Land Cover of the European Environment Agency which highlights the evolution of the territorial fragmentation between 1990 and 2000, in 31 countries.

- second stage: reviewing and assessing policy measures aiming to tackle urban sprawl or its negative effects. This second stage includes:
 - (i) a review of policies, including policies experienced in the USA
 - (ii) a critical analysis of institutional barriers and solutions
 - (iii) a quantitative assessment of the efficiency of policies (as regards the control of urban sprawl), on the basis of simulations carried out with land-use/transport integrated models, in 3 case cities (Brussels, Helsinki, Stuttgart);
- third stage : setting up recommendations for local and regional authorities. Three tasks were carried out in this third stage:
 - (i) providing general recommendations to European cities
 - (ii) design of an “urban sprawl monitoring tool” intended for local/regional authorities
 - (iii) setting up a practical programme of policy measures for the 6 case cities.

1.3. What is urban sprawl ?

A comprehensive review of the existing literature has been performed in SCATTER covering the recent debate on the topics of urban growth and urban sprawl. Maybe for the first time, a review about sprawl in both United States and Europe was achieved.

Urban sprawl is usually defined using three key concepts: low density, uncoordinated urban growth, spatially segregated land uses (e.g. homogenous single family residential development ; shopping centres, retail and services ; freestanding industrial areas). Sprawl is positioned against the ideal of the compact city, with high density, centralized development and a spatial mixture of functions. In terms of urban forms, a variety of forms are covered by the term “urban sprawl”, ranging along a continuum of more compact to completely dispersed development: contiguous suburban growth (i.e. a contiguous expansion of existing development from a central core – this was identified as sprawl earlier but is no more classified as sprawl now), compact growth around a number of smaller centres, linear patterns of strip development, leapfrog and scattered development. “Urban sprawl” must clearly be distinguished from “urban growth”: the latter may and should be sustainable, while the first is considered as being not.

1.4. Perceptions by local authorities

Interviews of local authorities and experts were performed in the 6 case cities (26 interviews in all). A synthesis has been drawn from these interviews, based on a recursive process of contents analysis. Common factors emerged in the 6 cities, related to the perception of the causes of urban sprawl, the level of awareness regarding sprawl, and the awareness of institutional barriers to the implementation of policies. Using the contents of the interviews, four different types of sprawl were identified that are frequently referred to and identified with urban sprawl.

Some perceptions shared by most of the interviewees are as follows:

- the need for an improved coordination between land-use and transport planning as well as for a more effective control of the production of the built environment are perceived as crucial steps in the struggle against urban sprawl ;
- urban sprawl is mainly originating in situations when new demands arising for the increase in households' incomes are met mainly by the private sector. The housing

and land market and the lack of measures to control the increasing use of private means of transport are the main causes ;

- sprawl is also perceived as relating mainly to housing rather than to an 'ill' structure of land-use distribution and planning ;
- there is a call for mixed land-use planning as a possible solution in particular to the mobility problems induced by sprawl, but the attention to the possibility offered by economic and fiscal measures is still scarce. (Costs and benefits have been since long investigated by the American literature but planning practice in Europe has focused mainly on the possibility to control sprawl by means of land-use and transport planning.)

1.5. Indicators and statistical methods to measure urban sprawl

How to measure urban sprawl ? In SCATTER, an original framework of statistical analysis has been developed in order to identify and quantify urban sprawl. This framework has been applied to the six case cities and highlighted the fact that they had different de-concentration patterns.

The statistical framework consists of :

- a specially designed generalized shift-share analysis ;
- a new measure of spatial de-concentration, called *H*- indicator ;
- local spatial autocorrelation statistics (e.g. Moran's I) ;
- as well as more traditional indicators like densities, shown on maps.

The variables investigated were :

- total population and total employment, for all the cities
- income per capita, number of commuters, commuter trip length, house prices, number of dwellings, residential buildings, and number of jobs directly induced by the population, in some cities.

The analysis was applied on time-series data, covering a 20-years period or more, for most of the cities (10 years period for one city).

This statistical framework allowed to show that the 6 case cities could in fact be clustered into three groups having three different de-concentration patterns:

- Milan, Bristol: continuing and rather strong spatial de-concentration of activities (activities include population and employment), with local specificities such as:
 - Milan: population and employment are out-migrating to areas which are more and more distant from the centre;
 - Bristol: it exhibits a more polycentric pattern, with 2 other urban poles included in the hinterland;
- Stuttgart, Brussels: moderate spatial de-concentration of activities, tending towards a stagnation of the pattern;
 - in the case of Brussels: it seems that the sprawl, as regards population, has slowed down these last years, and even stopped very recently;
 - in the case of Stuttgart: sprawl can be stated for population on a low level but in case of employment sprawling seems to stagnate;
- Rennes, Helsinki: continuing spatial concentration of activities: these two metropolitan areas do not exhibit all conditions of urban sprawl, but the growth of the population

and of the employment is nevertheless scattered to a certain extent. In both areas, there is in the same time an out-migration of the rural population towards the urban centre and especially the outer urban ring, and a scattered growth pattern, but at a lower level than in the 4 other cities.

1.6. Qualitative evaluation of policies aiming to reduce urban sprawl or its negative effects

A literature review and a qualitative analysis of 11 European case studies (including the 6 case cities of the project) have been performed, to get insights into the theoretical and practical implications of the design and implementation of policy measures to control urban sprawl. The literature review on innovative methods and practices was combined with an analysis of case studies in order to overcome the sectoral approach of the former with the more integrated and operational approach of the latter.

In the review, policies have been classified according to issues, namely environmental policy, land consumption, mobility, adaptability of physical infrastructure and social segregation.

The case studies have shown that policies targeting sprawl are inseparable from policies which deal with the problems of modern urban growth. There is a strong emphasis on integrated policies which tackle a series of related issues, and a focus on a regional approach. The other overarching concept is the promotion of the compact city or a form of decentralized concentration.

All the case studies show some degree of policy (e.g. land use/transport) or institutional integration and coordination. Integration in these cases is the response to the acknowledgment that interactions between policies and between the different effects of policies must be dealt with. Integration is therefore recognised as a key success factor.

The analysis also highlighted that new forms of planning practice are emerging which represent an adaptive response of local and regional authorities to the challenges posed by the changes in the scale and type of urban growth, demographic migration and economic activities relocation. Besides innovating the contents of planning policies, public institution and organisations are also changing the practice, the “how to” of planning (e.g. more entrepreneurial approaches ; regional planning strategies coupled with local regulations and detailed plans ; bottom-up approaches ; institutions building coalitions).

An essential challenge for cities, which are undergoing processes of significant urban growth or change, is the necessity to balance the promotion of economic competitiveness (both against other cities in the metropolitan area or region and at the national or international level) with the control of spatial growth and its impacts (land and natural resources consumption, social segregation). In this field EU regulatory framework can play a key role.

Finally, in order to highlight ways of identifying sprawl on the ground in a context like the US where sprawl and anti-sprawl measures have a longer history than in Europe, interviews were conducted with academic experts from United States (Portland, Oregon and New Jersey). These interviews bring insights among others on successful instruments implemented in Portland, the concepts of growth management and Smart Growth, the costs and benefits of sprawl as they are perceived in United-States

1.7. Quantitative evaluation of policies aiming to reduce urban sprawl, through simulations with integrated land use/transport models

To perform policy impact assessment, scenarios of policy measures have been simulated in 3 case cities (Brussels, Helsinki and Stuttgart), using integrated land use/transport models. Besides, a common evaluation framework was set up. The indicators of this evaluation framework mainly tackle concentration/de-concentration of population and employment, mobility pattern, and CO₂ emissions.

The common policies simulated in all 3 cities are fiscal measures applied to suburban residential developments, regulatory and fiscal measures applied to offices, increase of car use cost, cordon pricing, reduction of fare of public transport, and combinations of these measures.

First, the simulation results confirm that public transport investments indeed generate urban sprawl if they extend to the suburban or rural areas.

Moreover, the simulations have shown that new radial rail services cause a significant lengthening of the home-work trips (increase by 8% due to the implementation of the RER in Brussels ; increase by 12 % in the scenario of local investment plan + speeding up the rail services by 25 %, in Helsinki). On the other hand, the rail investments lead to an improvement of the indicators related to the modal share: decrease of the car mileage and increase of the public transport share. In the two scenarios mentioned above, the decrease in CO₂ emissions is by 8 % (Brussels) and 2 % (Helsinki). However, the potential total “short-term” improvement (i.e. the improvement which would have occurred if there was no change in activity location, neither lengthening of the trip distances) would have been even higher. In other words, one negative effect of sprawl is to “consume” a part of the potential benefits of the public transport investments, with regard to the reduction of car mileage and emissions.

Secondly, the simulation results led to select the following package of measures, to be recommended as accompanying measures to new public transport services linking the urban centre and suburban areas:

- increase of car use cost
- reduction of the fare of public transport only on the territory of the central agglomeration
- fiscal measure (“impact fee”) on new suburban residential developments

fiscal measure to incite offices to locate in areas well served by public transport (e.g. rail stations). The policies were assessed with indicators reflecting two main criteria: on one side, urban concentration and land consumption, and on the other side, CO₂ emissions and air pollution.

1.8. Institutional issues: from barriers to cooperation

Institutional barriers and new ways of cooperation between institutions have been tackled through the analysis of 6 structures of inter-institutional cooperation existing in the 6 case cities. The analysis was carried out through the framework of the “institutional square” and showed that there is in practice a great variety of institutional solutions. It highlighted the issues of balance and consistency, between the features of an institution and its objectives. The institutional obstacles occurring in the context of management of urban sprawl were identified and different types of response to such obstacles were described and analyzed. As a conclusion, it is obvious that a strong metropolitan institution, with strong democratic legitimacy and strong action instruments, will be more efficient. However, the creation of a

strong metropolitan institution, depriving partly other authorities of their powers, can be very difficult in practice because of historical and/or political reasons. In such cases, a less formal structure of cooperation between existing institutions is the only feasible solution. This type of solution should not be neglected for that all, because it can generate a permanent dialogue between municipalities or other institutional levels, contribute to raise awareness among decision-makers (awareness of the need of cooperation on at least some matters), and can be the first step on which progressively a stronger structure could build on. Stabilisation of political arrangement needs time and non formal cooperation helps to define collectively rules, identities, references or values which make possible a political integration in a later stage.

Besides, the range of appropriate responses to any situation can vary greatly from one urban situation to another, because of local specificities, as mentioned above. Each territory has its own resources. Configurations of political leadership (collegial, individual) represent opportunities, or constraints, for the feasibility of the settlement of a new political institution. Mobilisation of private interests organisations on institutional aspects depend also from the locality. Presence of social values shared by inhabitants, like consensus or collective action capacity, is a specific resource which can make possible the creation of a new political institution.

1.9. An Urban Sprawl Exploratory Tool available on Internet

An Urban Sprawl Exploratory Tool (USET) has been developed in Scatter. The Urban Sprawl Exploratory Tool is an interactive tool implemented on Internet, intended for local authorities and planning actors involved in decision making. Its objectives are to inform and raise awareness about urban sprawl (especially among authorities of small and medium-size cities), and to explore and monitor variables related to sprawl. The final objective is to provide some help in making a diagnosis about sprawl and building a strategy.

The USET is the perspective of SCATTER on: local governments information needs, what is essential to know about urban sprawl (indicators), what local governments should do to act strategically on urban sprawl.

Practically, USET gives:

- definitions of concepts related to urban sprawl
- a set of relevant indicators, and the possibility to calculate some of them, if input data are provided by the user
- values for these indicators, calculated in the 6 SCATTER case cities
- a policy database referring to the policies evaluated by simulations or by case studies in the project.

USET is available on www.casa.ucl.ac.uk/monitor.

1.10. Recommendations to local and regional authorities

Finally, recommendations to local and regional authorities have been elaborated on the basis of the outcomes of the whole project. Some policy recommendations are directly derived from the policy simulations: those policies were therefore quantitatively evaluated. Some other policies recommended are derived from the case studies ; they were not quantitatively evaluated and look rather like “best practices”. They were selected because they contain innovative aspects or should become more generalised. Finally, some recommendations related to the institutional matters derive from the analysis on inter-institutional cooperation.

The recommended policies are as follows:

- tax on the suburban residential developments (“impact fee”), possibly combined with a tax reduction for housings in urban areas
- tax on all offices located in zones not served or poorly served by public transport
- increase of the cost of car use, through congestion pricing
- reduction of the fare of public transport *only* in the urban centres
- land use and land rent regulation by the public authorities, through negotiations, exchanges and public-private partnerships
- alternative housing forms, intermediate between collective housing and individual single-family housing, and innovative urban design
- setting up mechanisms for inter-institutional cooperation
- symbolic and cognitive actions, to build a consensus on the objectives and the ways to reach them.

Some of these recommendations can be implemented at the local, municipal level ; some others require coordination at a supra-municipal level.

These recommendations are intended for any small, medium-size or large cities implementing new public transport which will improve the accessibility with suburban areas, for cities simply facing sprawl, for suburban municipalities involved in a sprawl process, or any cities concerned by sustainable urban development, like those which committed in the Aalborg process³.

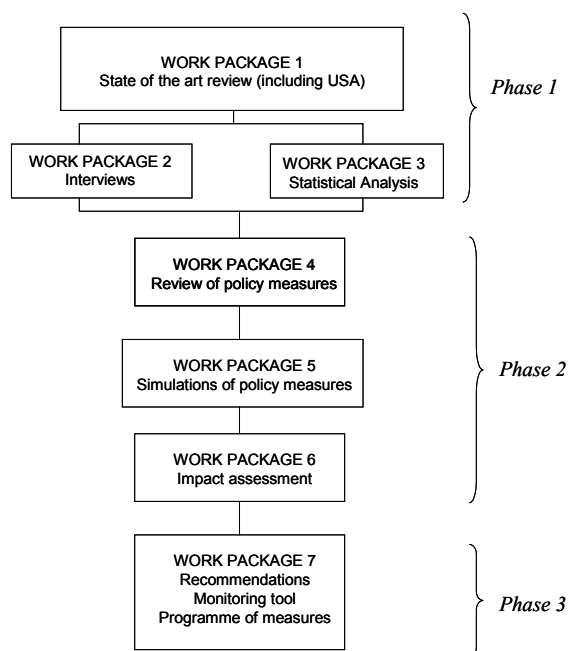


Figure 1.1 Project flowchart

³ The Aalborg Charter is a Charter about sustainable urban development and was adopted at the First European Conference on Sustainable Cities and Towns, that took place in Aalborg, Denmark, in 1994. The 4th European Sustainable Cities and Towns Conference, which took place in 2004 (“Aalborg +10”), adopted the “Aalborg + 10 Commitments”, which are seen as an important step from theory to real actions. Cities having signed the Commitments agree to make an environmental review of their city, identify targets and monitor progress.

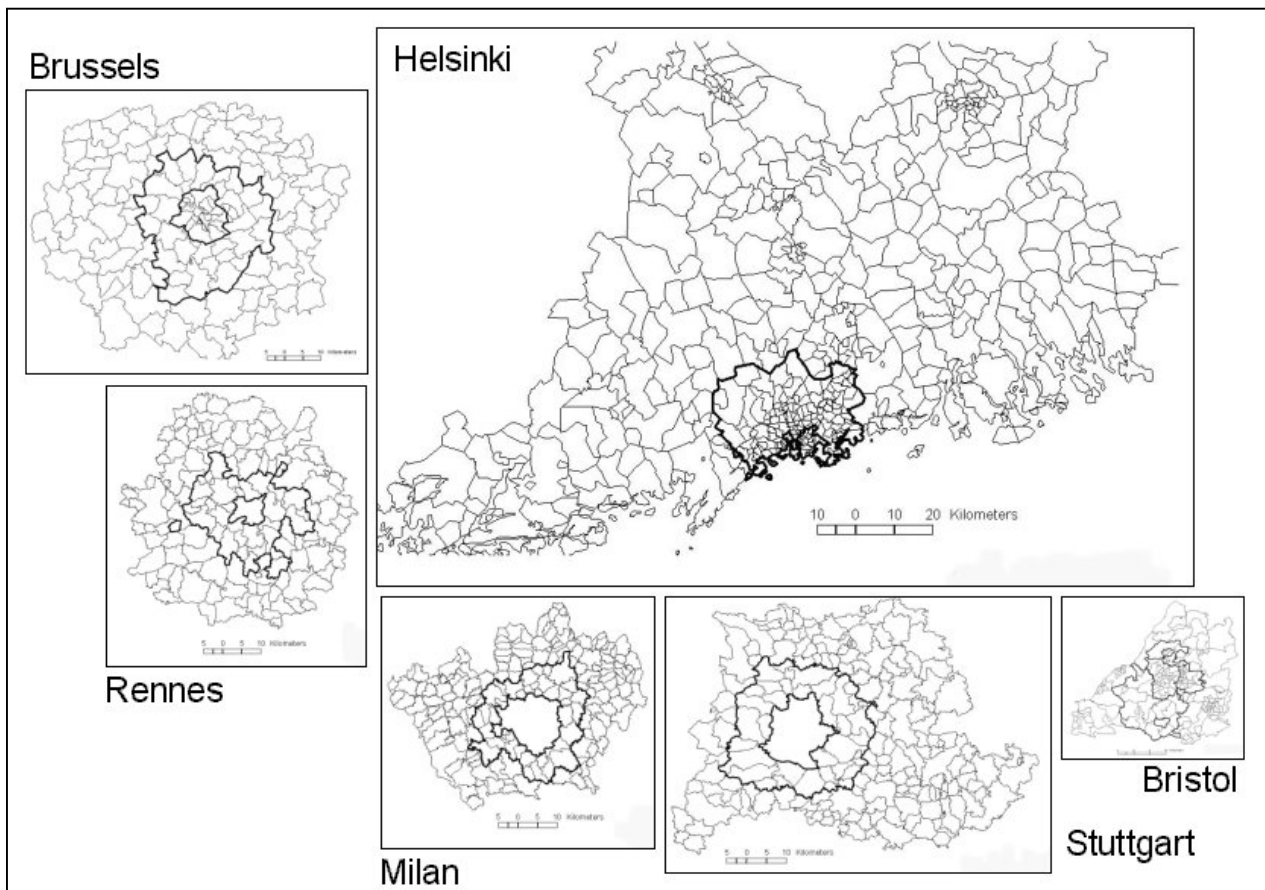


Figure 1.2 The six SCATTER case cities presented at the same scale

2. RECOMMENDATIONS TO LOCAL AUTHORITIES

This chapter presents the final recommendations to local and regional authorities which can be formulated on the basis of the outcomes of the whole project. Some policy recommendations are directly derived from the policy simulations: those policies were therefore quantitatively evaluated. Some other policies recommended are derived from the SCATTER case cities ; they were not quantitatively evaluated and look rather like “best practices”. They are mentioned here because they contain innovative aspects or should become more generalised. Finally, some recommendations related to the institutional aspects derive from the analysis on inter-institutional cooperation.

These recommendations are intended for any small, medium-size or large cities implementing new public transport which will improve the accessibility with suburban areas, for cities simply facing sprawl, for suburban municipalities involved in a sprawl process, or any cities concerned by sustainable urban development, like those which committed in the Aalborg process⁴. Some of these recommendations can be implemented at the local, municipal level ; some others require coordination at a supra-municipal level.

At the begin of this chapter, some key concepts related to urban sprawl are resumed. Then, each policy recommendation is described and justified, and then illustrated by results drawn from the SCATTER project.

2.1. What is urban sprawl ?

Urban sprawl is a common issue encountered in Europe. It is usually defined using three key concepts: low density, uncoordinated urban growth, spatially segregated land uses (e.g. homogenous single family residential development ; shopping centres, retail and services ; freestanding industrial areas). Sprawl is positioned against the ideal of the compact city, with high density, centralized development and a spatial mixture of functions. In terms of urban forms, a variety of forms are covered by the term “urban sprawl”, ranging along a continuum of more compact to completely dispersed development: contiguous suburban growth (i.e. a contiguous expansion of existing development from a central core – this was identified as sprawl earlier but is no more classified as sprawl now), compact growth around a number of smaller centres (which is different from a poly-nucleated city⁵), linear patterns of strip development, leapfrog and scattered development.

⁴ The Aalborg Charter is a Charter about sustainable urban development and was adopted at the First European Conference on Sustainable Cities and Towns, that took place in Aalborg, Denmark, in 1994. The 4th European Sustainable Cities and Towns Conference, which took place in 2004 (“Aalborg +10”), adopted the “Aalborg + 10 Commitments”, which are seen as an important step from theory to real actions. Cities having signed the Commitments agree to make an environmental review of their city, identify targets and monitor progress.

⁵ The distinction between the two lies among others in the density and in the functional autonomy of the secondary centres, their interactions with the main centre.

“Urban sprawl” must clearly be distinguished from “urban growth”: the latter may and should be sustainable, while the first is considered as being not⁶. Finally, it is worthwhile noting that urban sprawl is not only an issue for big cities: medium-size cities also are facing sprawl (see for example Rennes and Bristol among the 6 SCATTER case cities, whose population of the urban regions are respectively 521 000 inhabitants and 933 000 inhabitants).

Lastly, one should keep in mind that strong demographic or sociological trends may influence the evolution of sprawl, in one direction or in another, such as the ageing of the population, or the generalisation of tele-working.

For more details on the concepts related to urban sprawl: see Deliverable 1 of SCATTER (state of the art review) and the Urban Sprawl Exploratory Tool (www.casa.ucl.ac.uk/monitor).

⁶ In the United States, where the debate on urban sprawl is on-going since several decades, the established expression for meaning a sustainable urban growth is “smart growth”.

Historically, the urban sprawl phenomenon was first a peculiarly British and American phenomenon, due probably to the relatively lower density of cities in both Britain and America and to the notion that home-ownership with a garden are core values of the Anglo-Saxon heritage. In continental Europe, the conditions for urban growth have more recently begun to mirror those in Britain and North America. Towns in continental Europe have tended to remain more compact with higher and more uniform densities. Between the 70s and 80s, ‘growth management’ legislation started in several American States leading to an attempt to control the spread of urbanisation. In the same time, in European countries, there was the first important wave of uncontrolled sprawl.

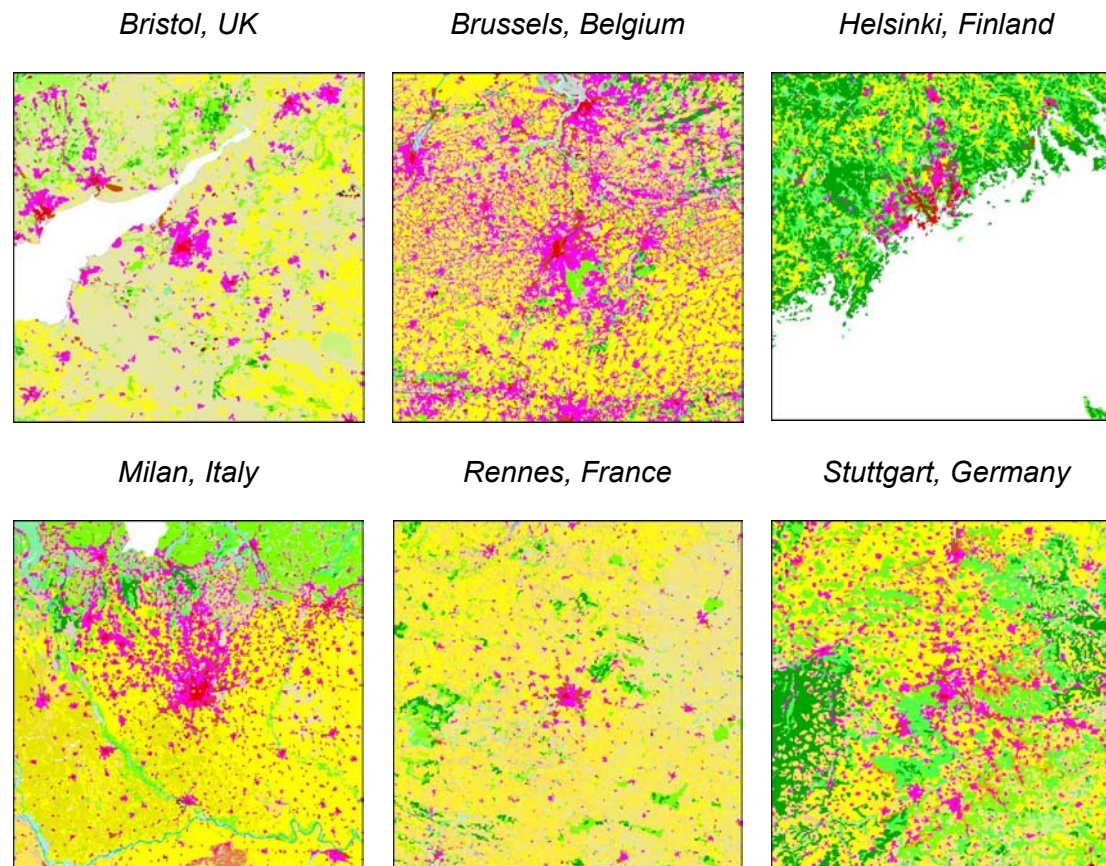


Figure 2.1 : Urban Land Use (Purple) from Remotely Sensed Data (Corine 1990) in the Six SCATTER City Regions

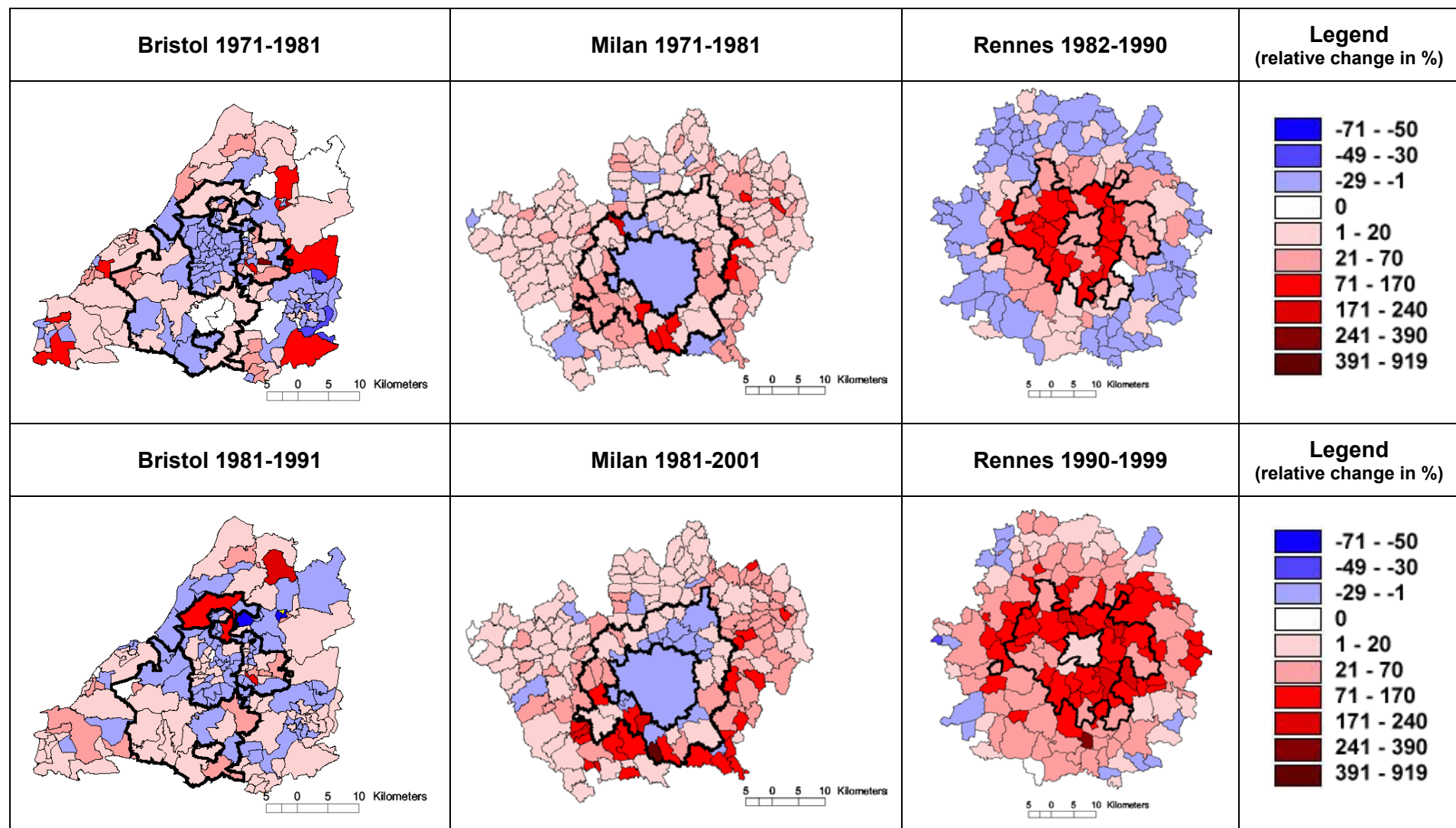


Figure 2.2 : Change in density of population by small zone in the 6 SCATTER case cities

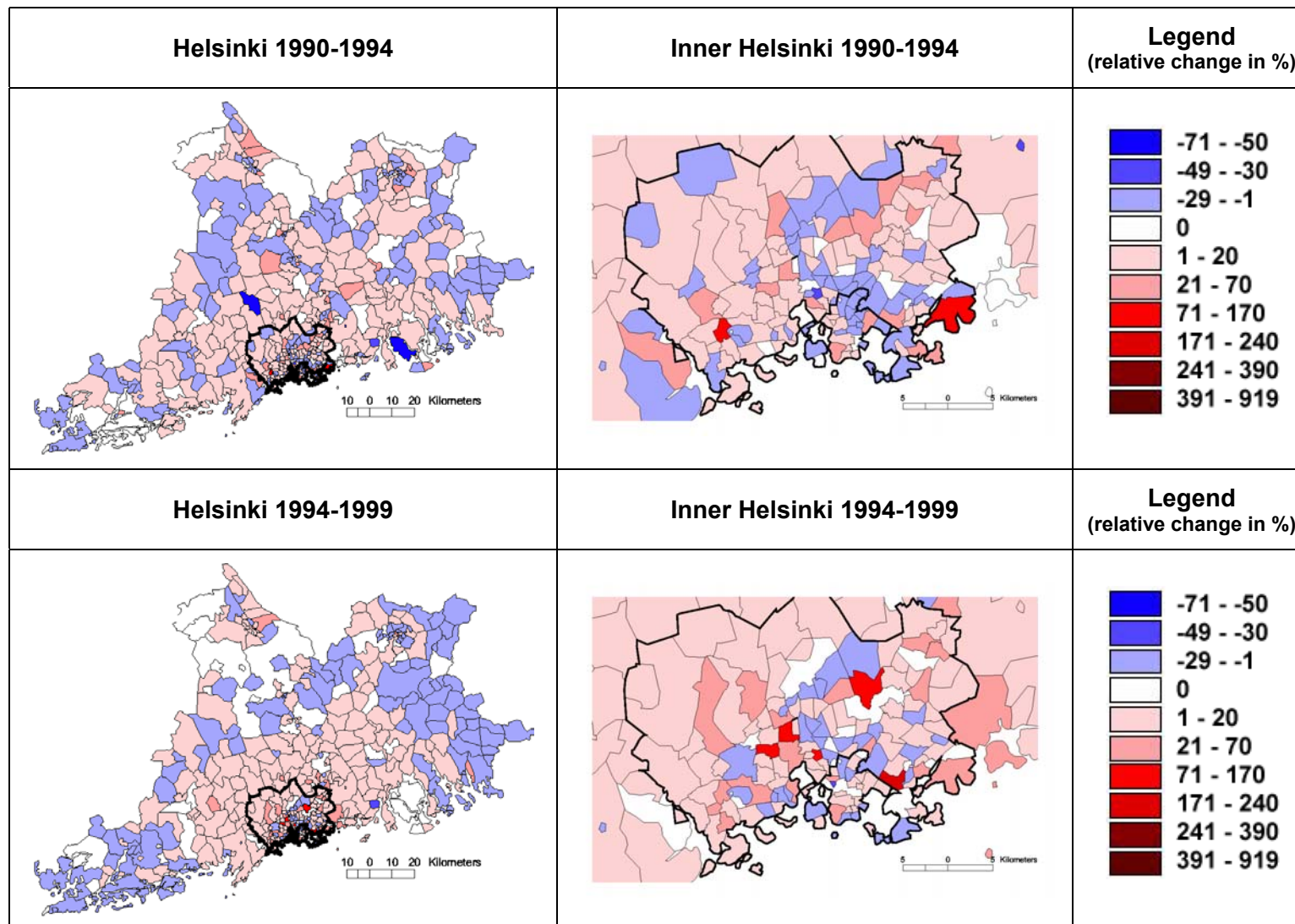


Figure 2.3 : Change in density of population by small zone in the 6 SCATTER case cities (cont.)

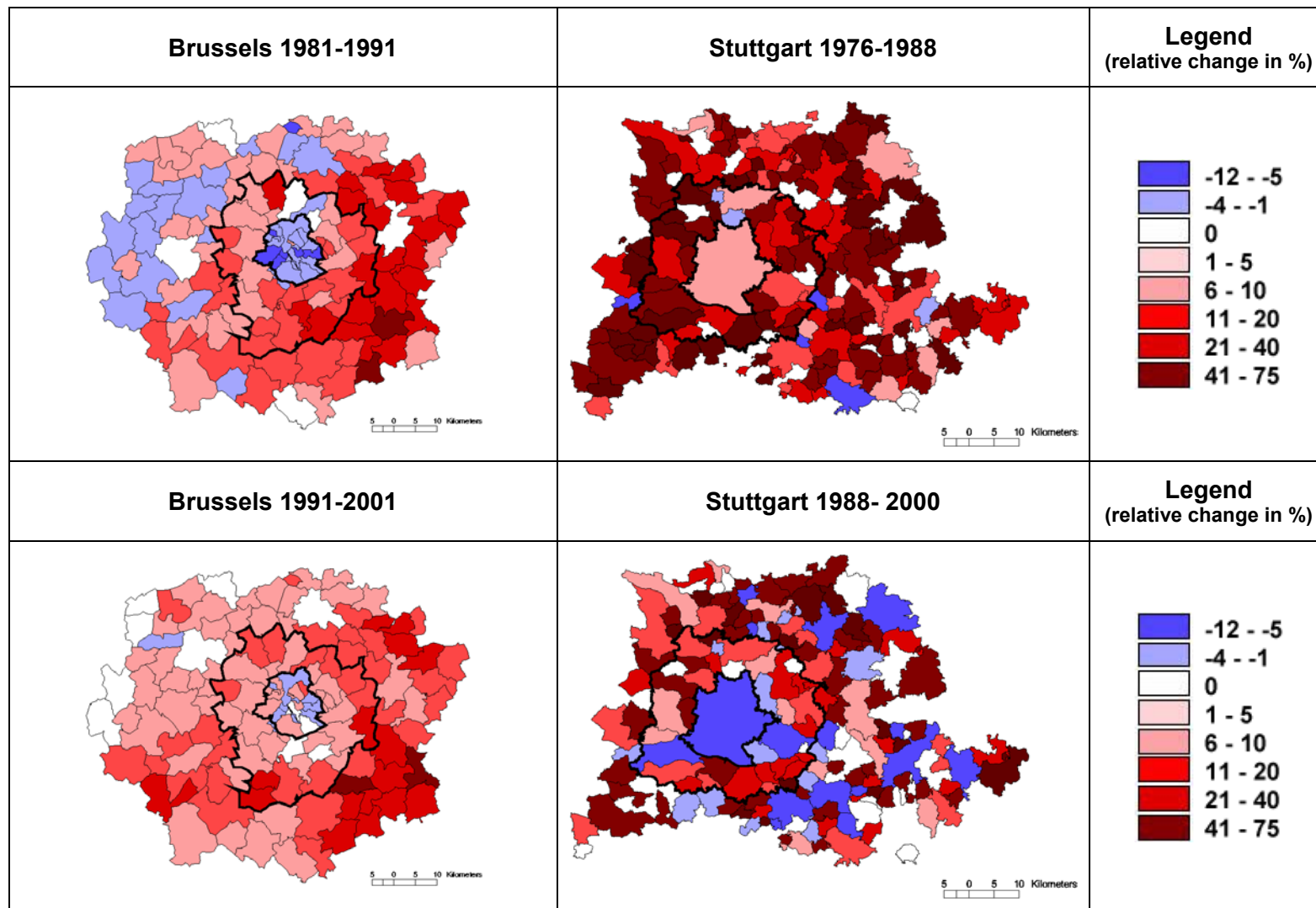


Figure 2.4 : Change in density of population by small zone in the 6 SCATTER case cities (cont.)

2.2. Why is urban sprawl a problem ?

It is now commonly admitted in Europe that urban sprawl has negative effects in many aspects. The urbanisation of agricultural or open land through the development of new settlements has negative effects by itself: loss of high quality agricultural land and open space, destruction of biotopes and fragmentation of eco-systems⁷, change of the water streaming coefficient. Urban sprawl also generates higher costs of new neighbourhood equipments and infrastructures and public services. The marginal cost generated by a new household or a new economic activity in terms of equipments, infrastructures and public services is higher in a low-density suburban context than in a dense urban environment, and this cost is not covered by the household or activity who generates it, but is often supported collectively (external cost). This situation even leads to an issue of equity, when the external costs are shared by urban lower-income households and suburban higher-income households. Besides, the spatial pattern which results from sprawl, characterised by low population density and spatially segregated land uses, is unfavourable to the development of public transport and other sustainable transport modes. On the contrary, urban sprawl induces high level of private car use, together with an increase of trip lengths, congestion on the radial roads giving access to city centres, increase in fuel consumption, CO₂ emissions and air pollution⁸.

Urban sprawl also contributes to the decay of downtown areas. Although authors are not quite unanimous on this point, it also generates in many cases social segregation. Finally, it leads to poor access to services for those with limited mobility such as the young and elderly.

Moreover, the pattern of spatially segregated land uses raises the issue of possible spatial mismatches within intra-urban poly-centricity: mismatch between population and jobs location ; spatial mismatch of professional skills, where jobs and unemployment lie side by side ; and finally, the hypothesis that job decentralisation harms low-income residents of central cities because of barriers that limit their access to suburban labour markets.

The evolution which derives from the urban sprawl process is therefore wholly in conflict with the objectives of many of the EU's policies in the domains of environment protection, transport, energy and sustainable urban development.

On the other hand, the positive effects are mostly situated at the individual level: access to cheaper private residential developments (middle-class households have the possibility to become owners of single family housing, with enhanced personal and public open space); access to cheaper private non-residential developments (young SME and companies have more pleasant work environment than what they could have afforded in the urban centre).

The European Union has pronounced itself in favour of the compact city model (European Commission, 1990) and of the polycentric regional systems (European Commission, 1997). In this sense the EU has embraced a successful approach adopted in some European countries where policies of urban containment have been balanced by strategies of "concentrated de-concentration".

For more details on the effects of urban sprawl: see Deliverable 1 and Deliverable 3 (statistical analysis) of SCATTER .

⁷ See the programme CORINE Land Cover of the European Environment Agency which highlights the evolution of the territorial fragmentation between 1990 and 2000, in 31 countries.

⁸ An essential US reference on the costs of urban sprawl: *The Costs of Sprawl – Revisited* (1998), and *Costs of Sprawl 2000* (2002), Transportation Research Board and the National Research Council, National Academy Press, Washington DC.

Evolution of the urbanisation in the Brussels metropolitan area (135 communes)			
	1991	2000	Variation (%)
Urbanised land (1)	64 828 hectares	76 565 hectares	+ 18.1 %
Population	2 840 680 inhabitants	2 933 089 inhabitants	+ 3.3 %
	1 201 931 households	1 254 169 households	+ 4.3 %
Employment	1 206 889 jobs	1 353 426 jobs	+ 12.1 %

Figure 2.5. : Evolution of the urbanisation in the Brussels metropolitan area. The urbanised land is calculated from the national land register, as the sum of built parcels, except of transport infrastructures. Other sources: National Institute of Statistics, population register, national surveys, various Belgian national public services: ONSS, INASTI, national railway company SNCB.

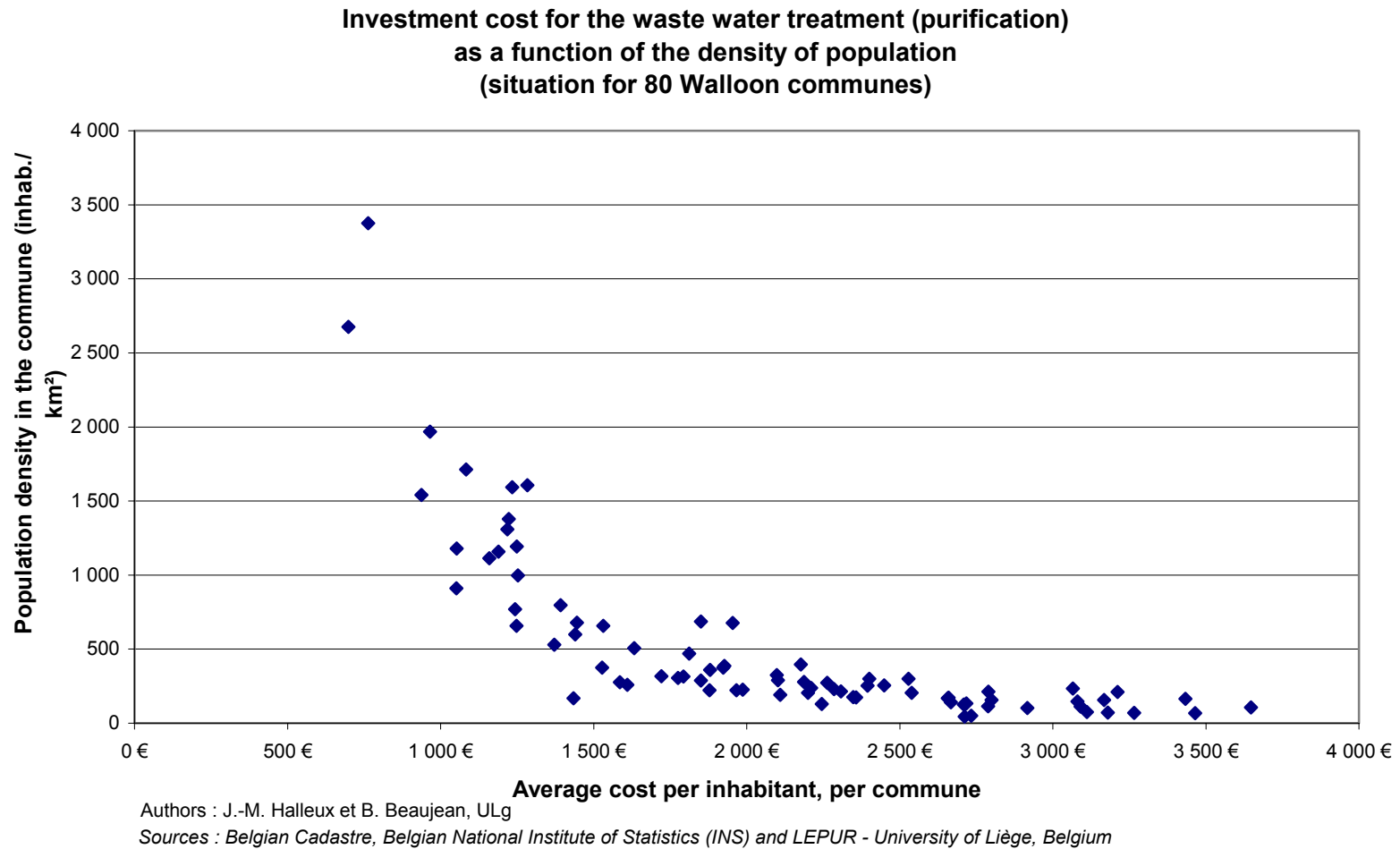


Figure 2.6. : Example of the relation between equipment cost and population density: investment cost for the waste water treatment as a function of population density, in Wallonia (Belgium). Source: J.-M. Halleux and B. Beaujean, University of Liège, Belgium. - The investment costs have been calculated on the basis of the inventory of the equipments and standard unit costs.

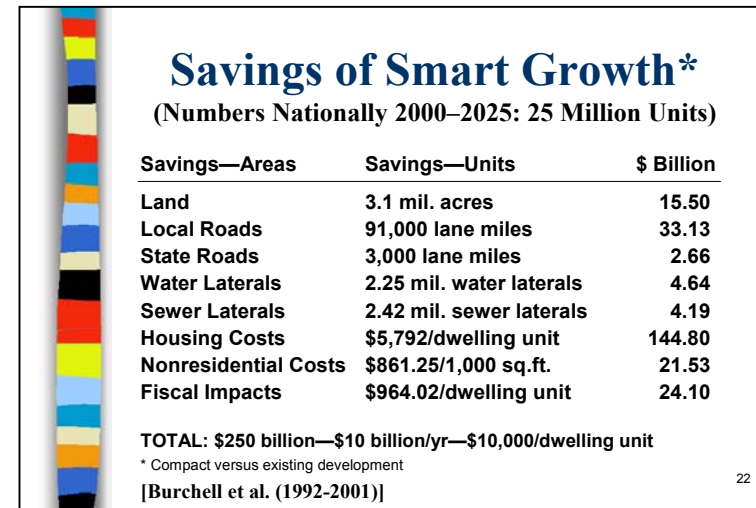
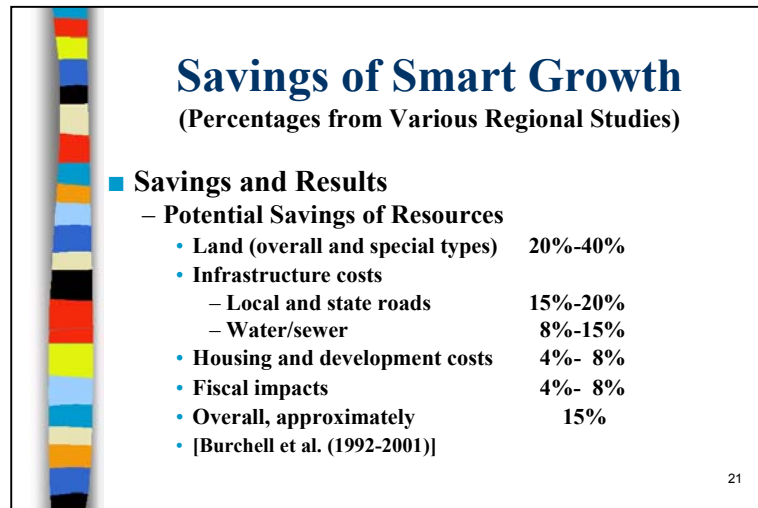


Figure 2.7 : US example of calculation of the costs of urban sprawl: estimates of the savings that could be achieved (in terms of land, infrastructures and fiscal impacts), on the period 2000-2025, if smart growth occurred instead of sprawl, in the United States. This is just given as an example of the overall approach which consists in quantifying costs of sprawl. Indeed, sprawl in the US is in many aspects extremely different from sprawl in Europe (e.g. differences in the planning, fiscal, value and life-style systems). Also, these estimates do not take into account the cost of the policies to be implemented to control sprawl and reach a more compact development. – Source : Robert W. Burchell, “The costs of alternative forms of development – What has the evidence shown ?”, Conference at the UCLA Conference Centre, California, October 2003.

2.3. The starting point and the objective of SCATTER

SCATTER tackles the issue of urban sprawl, in particular in the context of cities implementing new suburban public transport services.

Indeed, in order to reduce the congestion and the CO₂ and pollutant emissions due to a first wave of urban sprawl (mostly due to networks of motorways), authorities of many urban regions are implementing new high quality public transport services linking the suburban areas and the urban centre (like the future RER in Brussels). But by improving the accessibility, the authorities simultaneously create an incentive for a new wave of urban sprawl. Therefore there is a need to design and implement accompanying measures to these new public transport investments, in order to counter-balance the negative effects of sprawl. The SCATTER project tackles this issue.

In this context, the objectives of SCATTER were to evaluate measures aiming to control or reduce sprawl (and reinforce the positive effects of the new public transport services), and propose recommendations to cities facing that phenomenon.

2.4. The specific case of urban sprawl due to public transport investments

The simulations in Brussels and Helsinki have shown that new radial rail services providing a significant improvement in the accessibility between the suburban areas and the urban centre generate indeed sprawl of population and concentration of employment. A consequent change in the home-to-work mobility pattern is the lengthening of the home-work trips (e.g. increase by 8% due to the implementation of the RER in Brussels ; increase by 12 % in the scenario of local investment plan + speeding up the rail services by 25 %, in Helsinki). It is worthwhile noting that households decide to out-migrate towards suburban areas not only because of the improved accessibility by public transport, but also because of the consequent better accessibility by road (the modal shift due to the rail investments alleviates to some extent the congestion on the roads)⁹.

On the other hand, the rail investments lead to an improvement of the indicators related to the modal share: decrease of the car mileage and increase of the public transport share. In the 2 scenarios mentioned above, the decrease in CO₂ emissions is by 8 % (Brussels) and 2 % (Helsinki). However, the potential total “short-term” improvement (i.e. the improvement which would have occurred if there was no change in activity location, neither lengthening of the trip distances) would have been even higher. In other words, one negative effect of sprawl is to “consume” a part of the potential benefits of the public transport investments, with regard to the reduction of car mileage and emissions.

For more details on the simulations: see Deliverable D5-D6 of SCATTER, chapter 7.

⁹ It is well known that generally, in congested areas, at short term (i.e. without change in location), the users who benefit the most from public transport investments, in terms of travel time savings, are the car drivers, rather than the public transport users. This was quantified for example for the case of the RER within the study area of Brussels, in a previous study by Stratec, on behalf of the Brussels-Capital Region (study IRIS 1, 1991-1996).

Effects Scenarios	Variation in the number of households in the urban centre (%)	Variation in the number of households in the urban zones (%)	Variation in the number of jobs in the urban centre (%)	Variation in the number of jobs in the urban zones (%)	Variation in the average home-work trip distance (%)	Variation in the total car mileage (%)	Variation in the public transport modal share (points)	Variation in the total CO ₂ emission (%)
Brussels – implementation of the Regional Express Railway Network (REN)	-3.6	-1.4	0.7	0.3	8.1	-6.2	8.8	-8.1
Brussels – alternative operating scheme of the REN with more orbital connections	-5.5	-2.8	0.8	0.3	12.4	-9.2	11.5	-11.5
Helsinki – Helsinki Metropolitan Area transport investment plan + speeding up the rail services by 25 %	-1.6	-0.5	1.7	0.5	12.2	-0.8	5.3	-1.5

Figure 2.8 : Simulation results of 3 scenarios of public transport investments. The savings in car mileage and CO₂ emissions would have been higher without the trip lengthening: sprawl “consumes” a part of the potential benefits of the public transport investments. Source : SCATTER, Deliverable D5-D6.

2.5. Mono-centric versus polycentric approach

As a foreword to the policy recommendations, it is worth noting that the approach adopted in SCATTER, with regard to the identification and measurement of sprawl, was a poly-centric approach rather than a mono-centric approach. This means that when evaluating the effects of policies in the work package dedicated to simulations, two types of indicators were calculated: the first ones were related to the “urban centre” (as opposed to all the peripheral areas), while the second ones were related to “all the urban zones”, i.e. all zones urbanised, including small or medium-size urban centres in the periphery. In this view, “increasing the urban concentration” meant “increasing the share of population and activities located in all the urban zones taken together”, and not necessarily “increasing the share of population and activities located in the urban centre”. This more comprehensive approach is essential, in particular in connection with the necessary inter-institutional cooperation, which is tackled later below in this chapter. To give a more precise idea, here are the definitions of the “urban centres” and “urban zones” which were adopted in the 3 case cities for which simulations were carried out: respectively in Brussels, Helsinki and Stuttgart, the “urban centre” was defined as the Brussels-Capital Region, the city centre of Helsinki, the city of Stuttgart ; the “urban zones” were defined, in Brussels: as the total set of communes defined as urban in the regional land use plans (i.e. 60 communes in all), in Helsinki: as the whole metropolitan area and its suburbs, in Stuttgart: as the city of Stuttgart and the outer urban ring (i.e. 37 communes in all). Finally, it is worth noting that secondary urban centres (small or medium-size cities) may themselves also face sprawl.

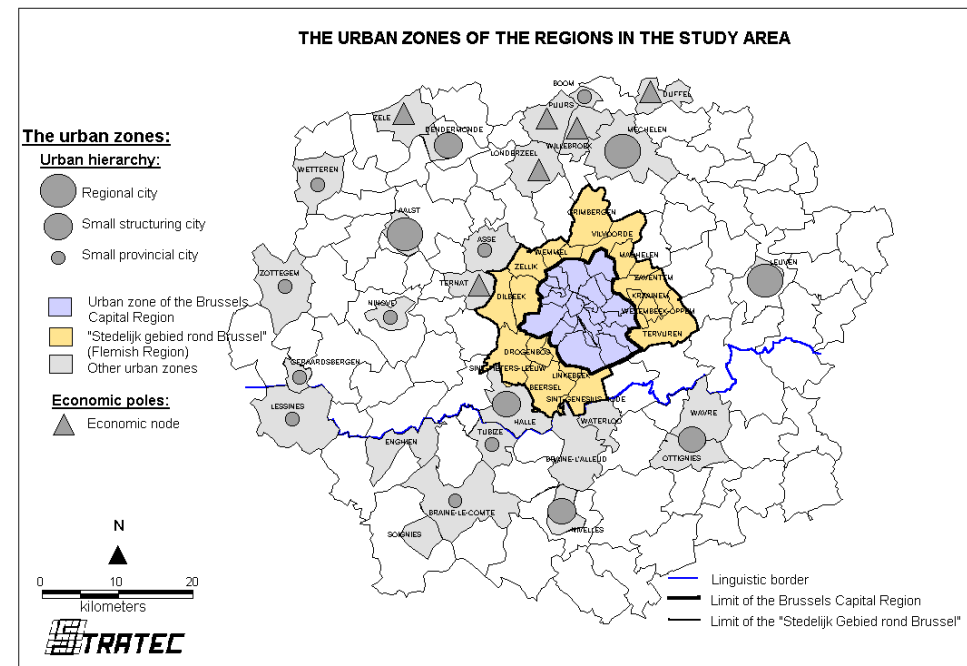
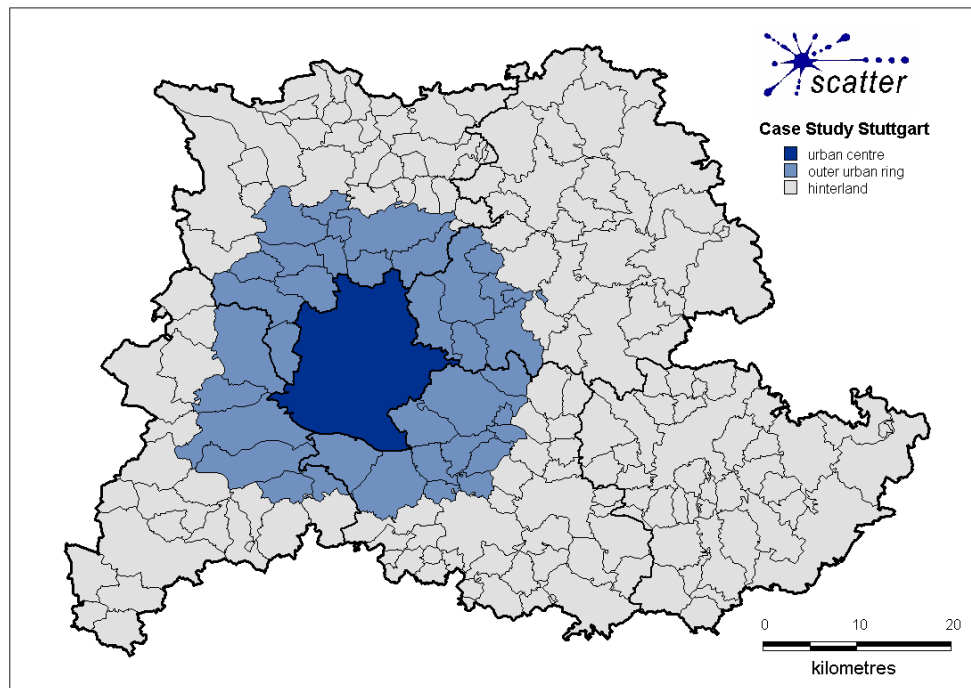


Figure 2.9 : Stuttgart and Brussels study areas. The zones considered as urban are: in the case of Stuttgart, the outer urban ring (medium blue zones) ; in the case of Brussels : the Brussels-Capital Region (light blue), the surrounding ring of urban Flemish communes (yellow), the other communes defined as urban in the regional land use plans (grey).

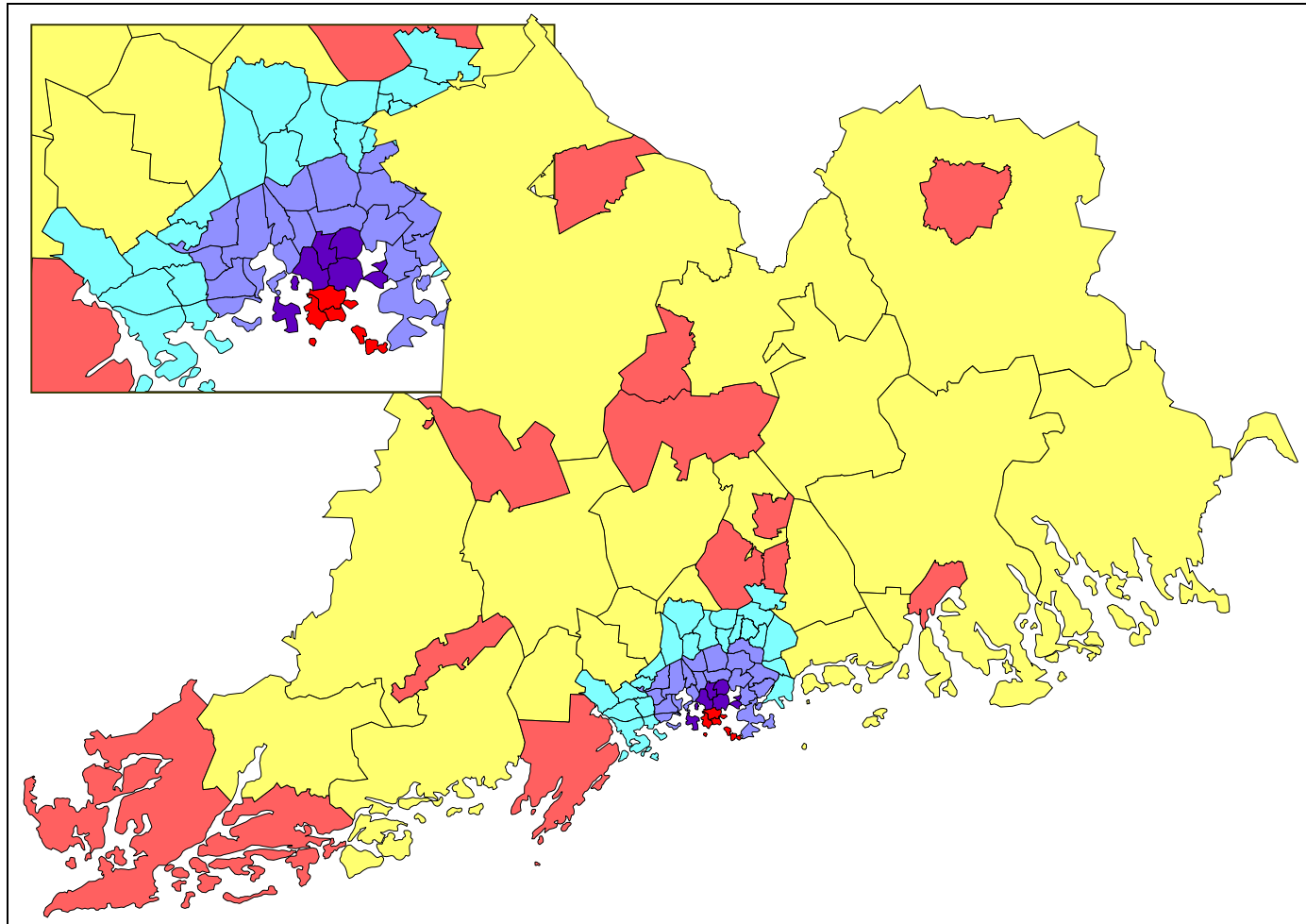


Figure 2.10 : Helsinki study area: Helsinki centre (red), Inner Helsinki Metropolitan Area (HMA) (dark blue), outer HMA (mid-blue), HMA suburbs (light-blue), other urban conurbations outside HMA (orange) and rural municipalities (yellow). All zones are considered as urban except the rural municipalities.

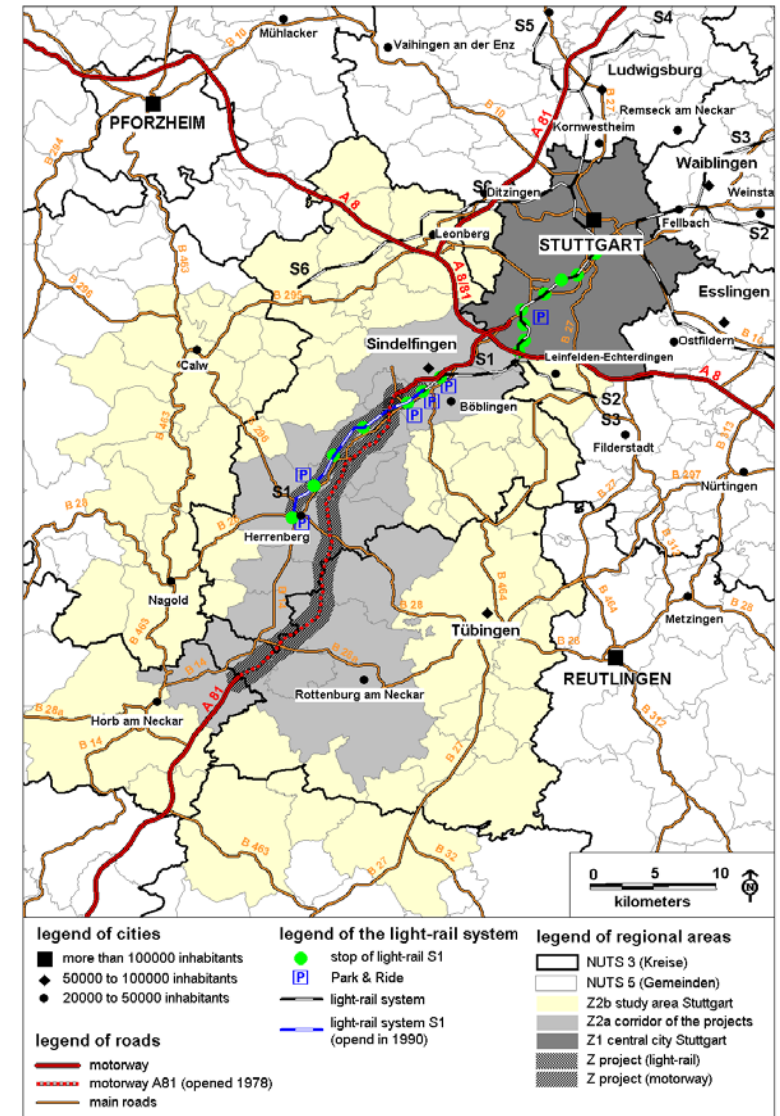
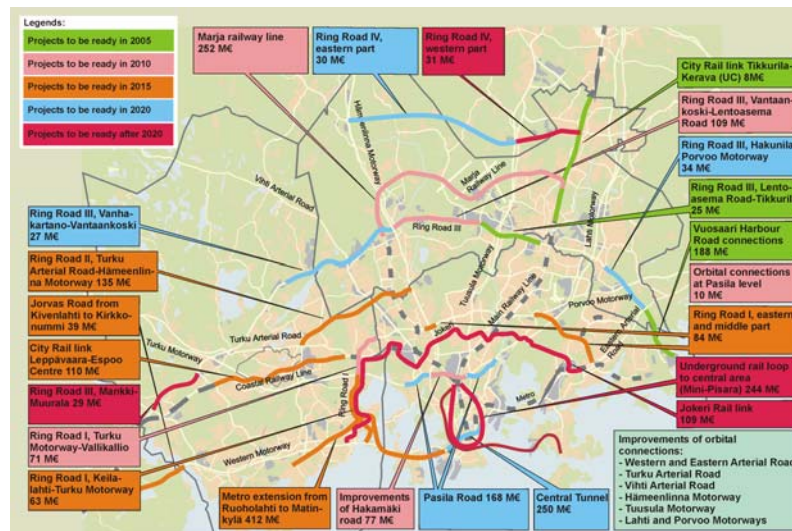
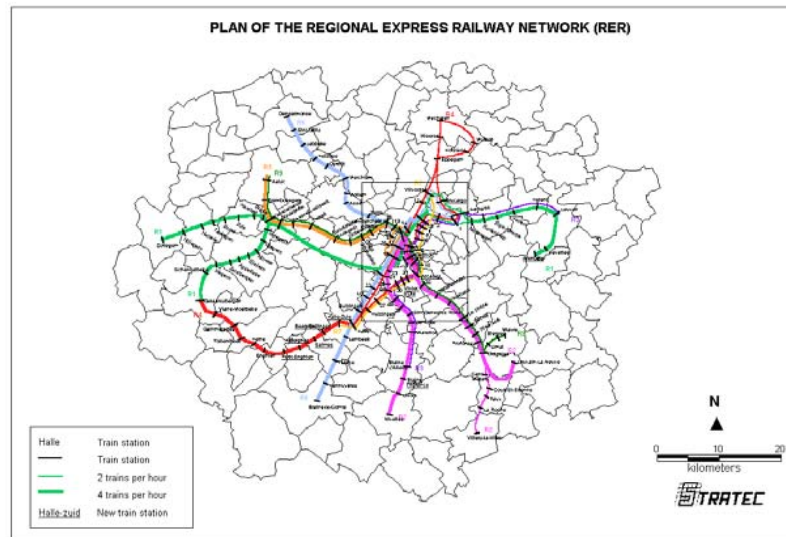


Figure 2.11 : Brussels, Helsinki, Stuttgart: the new public transport services whose influence on activity location was investigated

2.6. Policy recommendation 1: Tax on suburban residential development (“impact fee”)

This policy means applying a tax on suburban residential developments, in order to internalise a part of the external costs generated by these new housings in terms of equipments and infrastructures. It is an application of the “polluter pays” principle. The recommendation is derived from the results of the simulations performed for Brussels, Helsinki and Stuttgart. The scenario simulated was indeed the application of such a tax on the housings locating in non-urban areas, combined with a fiscal incentive (i.e. a tax reduction) for the housings located in the urban areas. In the scenario, the tax in the suburban areas amounted, in all 3 cities, to 670€/housing/year, which correspond to a one-shot tax of 13 400 € distributed on 20 years. In the case of Helsinki only, two other tax levels were also simulated, namely 340 € and 1 000 €/housing/year. The tax reduction in urban zones was in each case calculated so that globally, the total policy had no cost for the authority. The conclusion of the simulations was that this measure was efficient to concentrate the population in the urban zones (at least as efficient as better known policies based on car use pricing) and also tended to concentrate the induced employment¹⁰ in urban areas. However this scenario had no or poor effect on the car mileage and the CO₂ and pollutant emissions, on the contrary of car use pricing policies.

That kind of fiscal measure has been among others recommended by the European Conference of Ministers of Transport¹¹. It is used for more than 3 decades in the United States, under the name “impact fee”, to control urban sprawl and to internalise the external costs of the suburbanisation¹². Already in the ‘50s, the municipalities were annoyed that the developers made only minimum works to equip the site, so that those minimum works had anyway to be improved by the municipalities on their own public resources. The tax was born in the years 70’ and has the form of a one-shot tax imposed to the developers for new suburban developments. At the begin, the tax was intended to finance the works to be done on the site itself. Then the tax was extended to cover also the works necessary to connect the new developments to existing networks (sewage, water provision, road network, ...) (“off-site tax”). Later, the Supreme Court of the US put some stricter rules on the way this tax had to be calculated. Currently, 23 States impose this tax to any new housing development to cover the long-term marginal cost of the improvements to be provided to infrastructures, equipments and services. The principles are as follows: the authority which imposes the tax must be the authority which is in charge of the land use regulation; the amount of the tax must be calculated to cover the supplementary public investments necessary to make the development work (they are not meant to finance existing deficiencies) ; the revenue of the tax must feed a fund dedicated to the equipments and infrastructures of the development. Generally speaking, further to the one-shot tax (on developers) covering the one-shot

¹⁰ *Induced* sectors (either households or economic activities) are sectors whose “production” is generated by a local demand, i.e. a demand coming from the study area; therefore their location is depending on the accessibilities (between “consumers” and “producers”) within the study area. Induced sectors are opposed to *basic* sectors: *basic* sectors do not respond to a local demand, but respond to an external demand; therefore their location is not or poorly depending on the accessibilities within the study area. Basic sectors are for example agriculture, industry, central public administration and, among the household categories, the retired people whose location is in principle not chosen in function of work places. In consequence of these definitions, the simulation tools used in SCATTER for Brussels, Helsinki and Stuttgart are well able to simulate the effect of changes in accessibility on the spatial pattern of the induced sectors, but do not determine the spatial pattern of the basic sectors.

¹¹ *Politiques spatiales et transports – Le rôle des incitations réglementaires et fiscales, Conclusions de la Table Ronde de la CEMT n° 124*, Paris, 7-8 November 2002.

¹² Source: Duncan associates and Cooper Consulting Company: Impact Fee Study – Policy Directions Memorandum – Fayetteville, Arkansas, April 2001.

investment costs, the recurrent costs could be covered by an annual tax applied to the households.

This type of fiscal measure raises the issue of the decision level authorised to levy the tax: in a context of spatial competition between municipalities, it is possible that most municipalities do not collect the tax, even if they may legally do it.

In the current French urban planning system for example, the concept of impact fees to offset the cost of local government provision of infrastructure (*taxe locale d'équipement*) exists. Since 2000, a legal procedure (*Participation pour le financement des voies nouvelles et de leurs réseaux*)¹³ authorizes municipalities to ask to land owners a financial participation to the building of new streets and technical networks when their land is recognized as a future residential space in the local spatial planning document. However, at least in some regions, the local authorities do not collect the tax, to remain competitive as a location, compared with the neighbouring municipalities.

In the same way, in the United States, out of 18 000 or so jurisdictions with the power to charge such impact fees, only 500 actually operate such instruments¹⁴. These both examples highlight the importance of raising awareness about the effects and costs of urban sprawl, among others by cognitive actions (see below).

Another difficulty is the acceptability of any fiscal measure, but this acceptability could be enhanced if the tax is implemented jointly with a tax reduction in the urban zones.

For more details on the simulations: see Deliverable D5-D6, scenarios 311-313.

¹³ This makes part of the framework of the law “*Solidarité et renouvellement urbain*”, 13 December 2000.

¹⁴ Source: interviews of US experts Richard Brail, Robert Burchell and Reid Ewing by Michaël Batty (CASA), in the work package 4 of SCATTER.

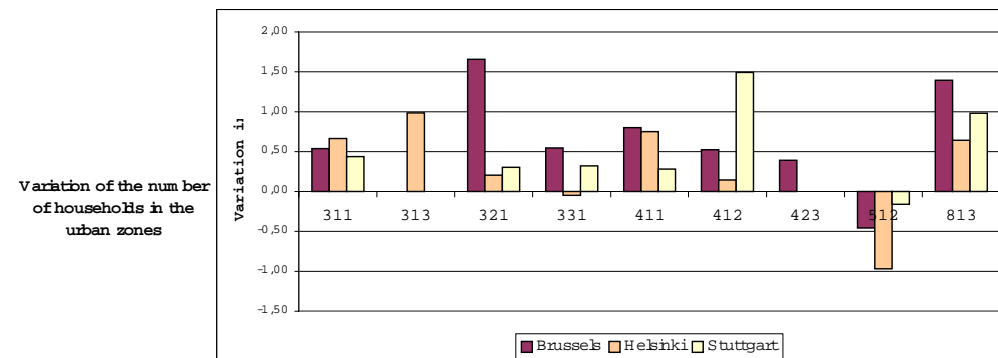
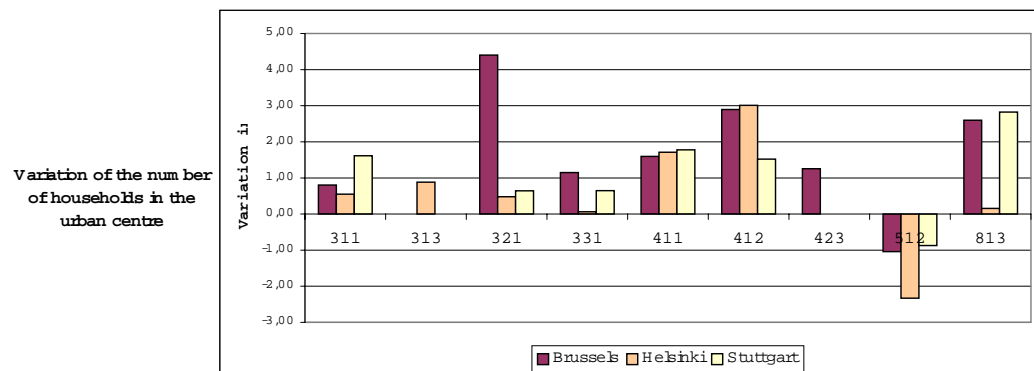


Figure 2.12 : Simulation results in Brussels, Helsinki and Stuttgart.

Effects of policies on the number of households in the urban centre and the urban zones. Scenarios 311-313: tax on residential suburban developments (respectively 670 €/year/housing and 1 000 €/year/housing) combined with tax reduction in urban areas – Compare with scenario 411 (increase of car use cost by 50 %) and 412 (cordon pricing).

Note: The overall level of the variations may seem low. It has to be reminded that some categories of households and economic activities (the so-called “basic” sectors) are assumed not to be affected by the policies simulated, and that they represent a significant percentage. In the Brussels case for example, the retired and old people represent about 25 % of the households (in 2001). Similarly, central administrations, universities, heavy industries do not respond to a local demand, but rather to an inter-regional or national demand; their location is assumed to be not influenced by the policies. To give a better idea, in terms of population, 1% change in the urban centre represents respectively a variation by 4 700 households in Brussels, 3 000 households in Helsinki, 5 900 inhabitants in Stuttgart ; 1% change in the total urban zones represents a variation by 9 000 households in Brussels, 7 700 households in Helsinki, 14 200 inhabitants in Stuttgart.

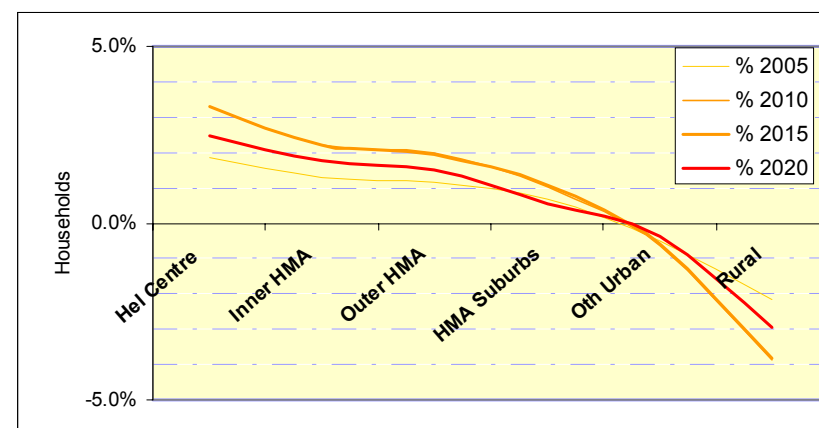
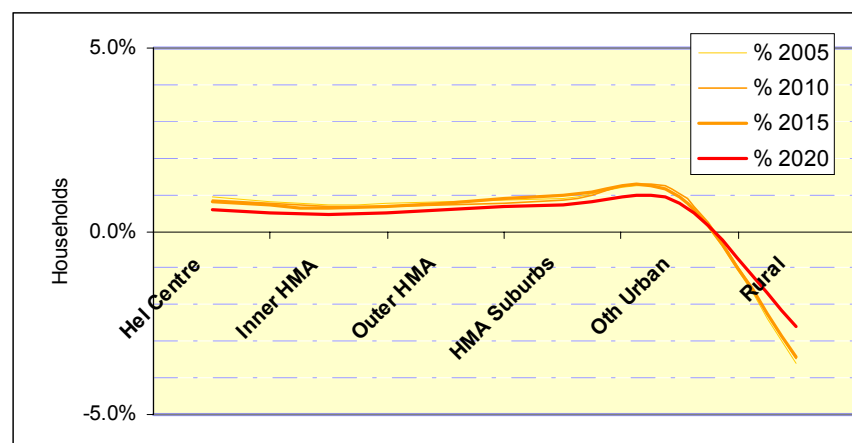


Figure 2.13 : Simulation results in Helsinki. Left: Effect of a tax (development impact fee 670 €/year/housing) in non-urban areas combined with a tax reduction in urban areas. Right: Effect of a increase of car use cost by 50 %.

2.7. Policy recommendation 2: Tax on offices located in zones not served or poorly served by public transport

This measure is inspired from the ABC approach¹⁵ which was developed in The Netherlands. The measure is based on the distinction between “A-type” zones and “non-A type” zones, the “A zones” being zones which are well served by high quality public transport at regional or even national level (e.g. areas surrounding railway stations served by inter-city rail services). The measure consists in putting an annual tax on the offices located in “non-A zones” and is of course intended to incite companies to locate in A-type zones. The tax is intended to cover the social marginal cost of transport generated by the location of economic activities outside A-zones. Again, it is an application of the “polluter pays” principle. The simulations performed in Brussels have shown that this measure was efficient to move jobs towards this type of zones, and that, as indirect effect, the measure also incites households to move towards urban areas, to follow employment. In fact, the potential effectiveness depends of the percentage of jobs already located in that kind of zones, in the reference scenario. For example, the percentage in the reference scenario was 37 % in Brussels, versus 70 % in Helsinki, which explains that the policy appeared to be much more effective in Brussels than in Helsinki. Besides, in Brussels and Stuttgart, this measure targeted to work places had a significant indirect effect on the household location. The simulation results in all the 3 cities show that, with regard to the concentration of the population in urban zones, this measure combined with the previous one would be roughly as effective than a drastic increase of car use cost (by 50 %).

In the scenarios simulated, the measure was applied to the sector “business services”. The amount of the tax was defined as the actual cost¹⁶ of a yearly public transport season ticket (the tax levels simulated were respectively 1 985 €/job/year in Brussels, 710 €/job/year in Helsinki, 975 €/job/year in Stuttgart). The underlying idea is that if a job locates in a non-A zone, the employer should pay the real cost of providing public transport to that location or, in other words, that the revenue from the tax should make up the operating loss of the public transport company. This approach is close to the tax called “*versement transport*” already enforced in France.

On the other side, like the previous one, this measure has no or poor effect on the transport indicators according to the simulation results. The only case where land-use targeted policies led to a significant decrease in the car mileage was a drastic regulatory measure forcing *all* jobs of the “business service” sector to locate in A-type zones.

In practice, the tax could be adjusted according to the type of location and the level of public transport service (i.e. according to a classification finer than a rough binary system A/non-A). The tax could also be combined with a fiscal incentive, i.e. a tax reduction for companies locating in A zones.

For more details on the simulations: see Deliverable D5-D6, scenario 331.

¹⁵ Roughly, the ABC theory states that there should be a good adequacy between the “mobility profiles” of the companies and the “accessibility profiles” of the locations (A, B, C profiles). A-type companies (i.e. with high concentration of employment, and/or large number of visitors, and whose activities are not very dependent on access by road) should be located in A-type sites (i.e. sites with high-quality access by public transport and poor access by car). On the opposite side, C-type companies (low concentration of jobs, small number of visitors, activities heavily dependent on access by road) should be located in C-type sites (with high-quality access by car or lorry).

¹⁶ Actual cost: i.e. cost including the state subsidies.

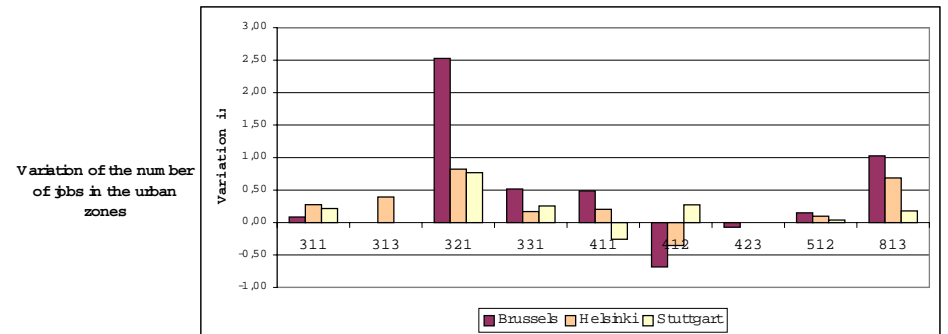
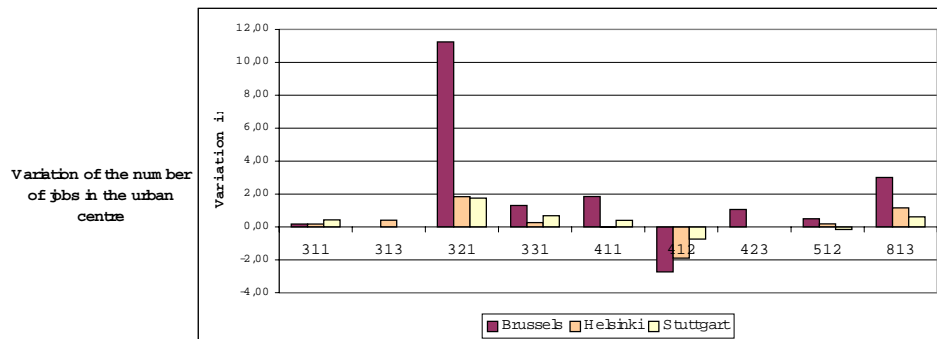


Figure 2.14 : Simulation results in Brussels, Helsinki and Stuttgart. Effects of policies on the number of jobs in the urban centre and the urban zones. Scenario 321: regulatory measure forcing the business services to locate in A-zones. – Scenario 331: fiscal measure inciting the business services to locate in A-zones. Compare with scenario 411 (increase of car use cost by 50 %) and 412 (cordon pricing). See the indirect effects of 321 and 331 on population on Figure 2.12 Compare the sum of the effects of 311 and 331 to the effects of 411, on Figure 2.12.

2.8. Policy recommendation 3: Congestion pricing

Congestion pricing means increasing the cost of car use during peak hours, in congested areas. The scenario simulated in Brussels, Helsinki and Stuttgart was an increase of the car use cost by 50 % for all drivers in the study area. The simulations have shown that this measure clearly leads to a concentration of the population in the urban zones. In Brussels and Helsinki, it also leads to a concentration of the employment in the urban zones. The effect of concentration of population is just an application of the following general principle: households tend to out-migrate towards suburban areas when the travel cost (or times) decreases, and on the contrary, tend to concentrate around the work places, when the travel cost (or times) increases. The second positive effect of the measure is a significant decrease in the total car mileage, and consequently, in the CO₂ emissions and pollutant emissions.

In practice, in some cases (like in Brussels), the increase in car use cost could be implemented through various measures, such as the suppression of the system of company cars which provides some categories of employees with cars whose costs are totally or partially covered by their employer.

This transport measure as well as the next one have been added to the two first fiscal measures focussed on land use, because land use measures alone have no or low impact on the total car mileage (this has been shown by the simulations). Transport measures have therefore been added to the package of recommendations, because they contribute to the urban concentration (counter-acting the negative effects of the public transport investments), and also because they reinforce the positive effect of the public transport investments which is to reduce the car mileage.

Finally, the three first policies recommended all consist in an internalisation of external costs, i.e. an application of the “polluter pays” principle. The principle is economically fair, but the acceptability of the practical measures is generally low. However, this type of measure provides the authorities with financial resources for new investments, and it can be made more acceptable by ear-marking, for example for public transport services or urban embellishment.

For more details on the simulations: see Deliverable D5-D6, scenario 411.

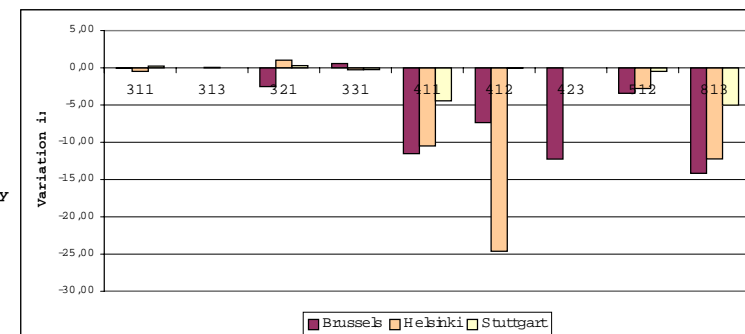
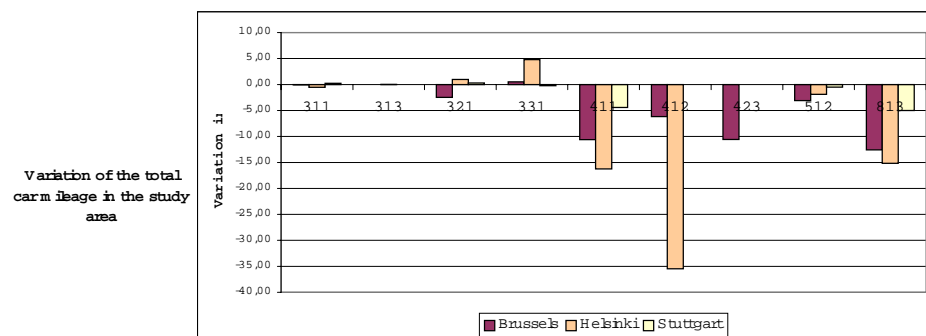


Figure 2.15 : Simulation results in Brussels, Helsinki and Stuttgart. Effects of policies on the total car mileage and the CO₂ emissions. Compare scenarios 311-313 (tax on residential suburban developments), 321 (regulatory measure forcing the business services to locate in A-zones), 331 (fiscal measure inciting the business services to locate in A-zones), 411 (increase of car use cost by 50 %) and 412 (cordon pricing). See the indirect effects of 411 and 412 on population on Figure 2.12.

2.9. Policy recommendation 4: Reduction of the fare of public transport only in the urban centre

In several countries and cities, the idea of a drastic reduction of the fare of public transport is quite topical, because it is expected to cause a significant modal shift and because of social reasons. However, the simulations performed for Brussels, Helsinki and Stuttgart have confirmed that a decrease of the fare of national-level or regional-level public transport services, linking the urban centre and the suburban areas (e.g. suburban railway), would generate urban sprawl. This result was clear in the 3 cities.

However, one simulation (performed in Brussels only) showed that when the accessibility is improved *only* within the urban centre, then the effect of the measure is to make the urban centre more attractive both for households and for economic activities. In fact, the measure simulated was an increase of the commercial speed of the surface public transport within the Brussels-Capital Region. Therefore, in the same way, a reduction of the fare *only* within the urban centre should improve the attractiveness of the urban centre.

The cost of this measure could be compensated by the revenue of the congestion pricing (previous measure), which would be a way to make the congestion pricing more acceptable for the users, through ear-marking for public transport.

For more details on the simulations: see Deliverable D5-D6, scenarios 511-512 and 517 (Brussels).

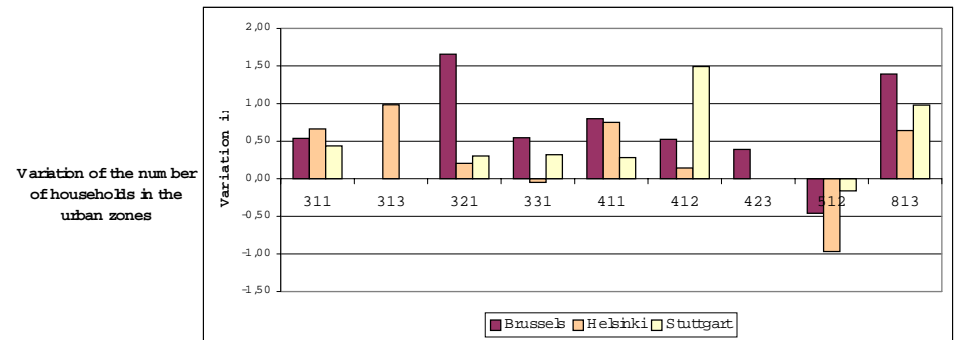
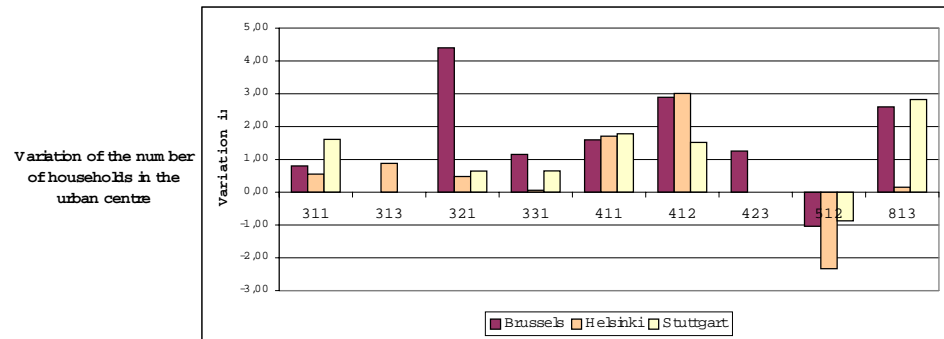


Figure 2.16 : Simulation results in Brussels, Helsinki and Stuttgart. Effects of policies on the number of households in the urban centre and the urban zones. Scenario 512: reduction of the fare of public transport by 20 %. Scenario 813: combination of 311 (tax on residential suburban developments), 331 (fiscal measure inciting the business services to locate in A-zones), 411 (increase of car use cost by 50 %) and 512 (reduction of public transport fare by 20 %).

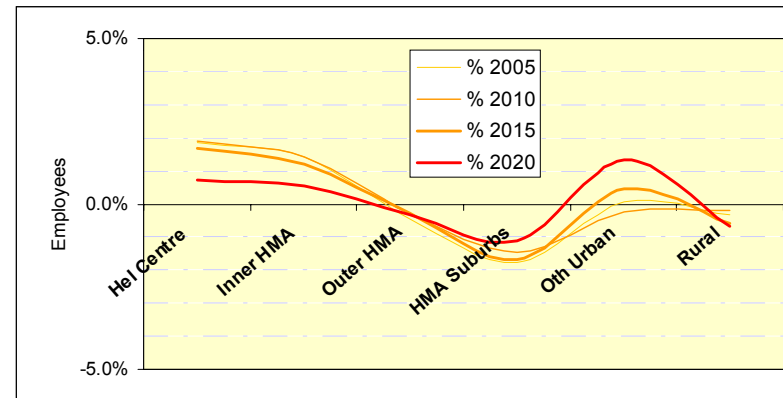
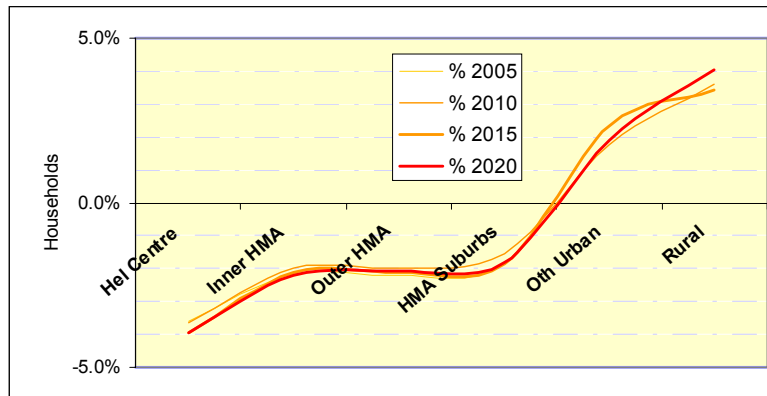
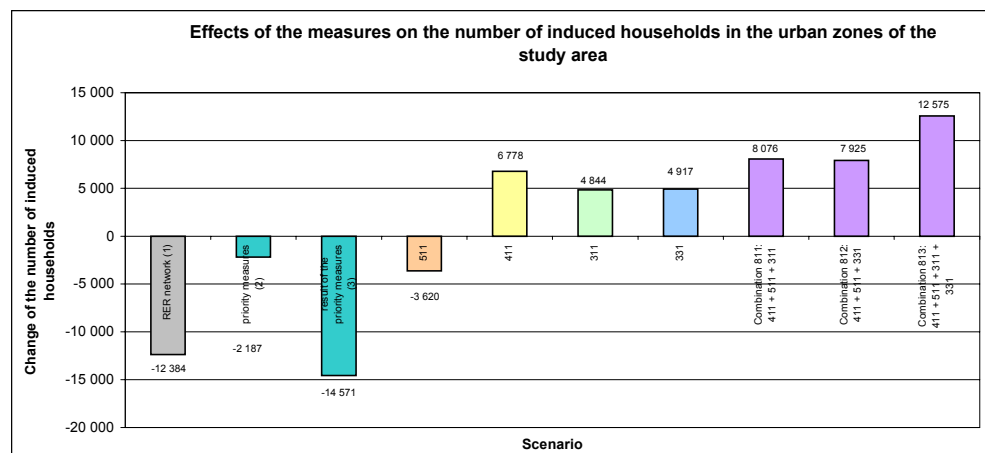
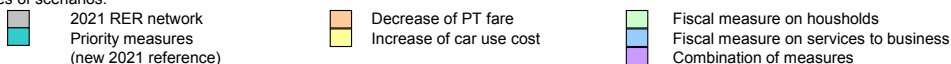


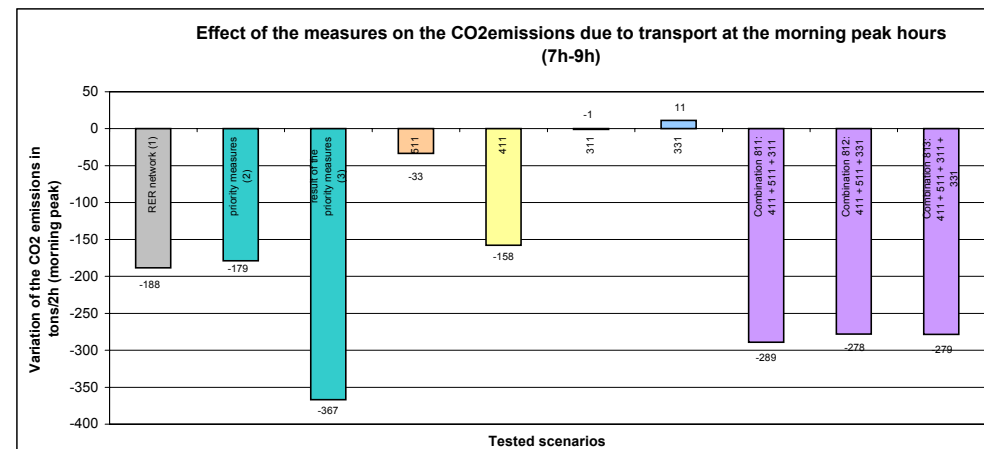
Figure 2.17 : Simulation result in Helsinki. Effect of a reduction of public transport fare by 20 %.



Types of scenarios:



- (1) The effect of the RER network is calculated in comparison with the 2021 reference scenario
 (2) The effect of the priority measures is calculated in comparison with the 2021 RER scenario
 (3) The effect of the priority measures is calculated in comparison with the 2021 reference scenario
 The effects of the other measures are calculated in comparison with the priority measures



- (1) The effect of the RER network is calculated in comparison with the 2021 reference scenario
 (2) The effect of the priority measures is calculated in comparison with the 2021 RER scenario
 (3) The effect of the priority measures is calculated in comparison with the 2021 reference scenario
 The effects of the other measures are calculated in comparison with the priority measures

Figure 2.18 : Simulation results in Brussels: Left: How the combination of the four policies mentioned so far (311, 331, 411, 511) together with the local investment plan (so-called “priority measures”) offset the out-migration of households due to the Regional Express Railway Network (REN). Right: The effect of this combination of four policies, together with the local investment plan, on the CO₂ emissions.

2.10. Policy recommendation 5: Land use and land rent regulation by the authorities (through negotiations, exchanges and public-private partnerships)¹⁷

The regulation of land use and land rent by the public authorities is a well known strategy. We however mention it here to emphasize that if the measures aiming to increase the concentration of population in urban areas reach their goal, it might be accompanied by an increase in the land rent in the urban centre. More generally, there are close interactions between the cost of transport and the land rent, as it was stressed by the European Conference of the Ministries of Transport (ECMT)¹⁸: measures increasing the travel cost (and in particular the car use cost) can have significant effects on the land market. The more costly the transport is, the more this contributes to reduce the urban sprawl, the more there will be a pressure to an increase of the urban land rent. This increase in land rent may in turn have effects on the social segregation¹⁹.

Therefore, beside the regulation of land use, at least a monitoring of the land rent should be set up and if possible, a policy of regulation of land rent should be implemented.

This policy is also mentioned here because the case studies have shown some original practices. Land banking, one way to achieve public land regulation, is a costly policy and not all cities can afford it. But the case studies (especially Rennes) have shown some less costly practices, based most often on negotiations, exchanges and private-public partnerships rather than on pure land banking. Rennes is a medium-size city (population of the urban region: 521 000 inhabitants), however it is facing urban sprawl just like larger cities. Examples of practices experimented in Rennes are as follows. (i) By controlling land (public land banking) or the use of land (land-use regulative plans), the city of Rennes influences the localisation of new urban developments and the type of this development (density, residential/economic activities). (ii) A land action to preserve agriculture has been designed and starts to be implemented. The *Communauté d'agglomération* builds land banking of agricultural zones and exchanges these plots of agricultural land with farmers owning grounds at the fringe of the urban agglomeration: the farmers transfer their plots of land to the city authority and receive in exchange larger plots situated further from the city (the objective here is also to keep agricultural activities). (iii) But to constitute public land banking represents a important cost for the public budget; that is why negotiation between the authorities and local property developers is developed, to control the building of new dwellings and the type of housing built in the city centre. For example, the authority transfers grounds to private developers provided that they develop housing types leading at least to some density threshold or provided that they include social housing in their projects. The authorities also use financial incentives: currently, Rennes Métropole gives a financial contribution to municipalities to buy lands if the municipality has the ability to build an integrated urban project (housing, services, transport). In the programme of measures proposed for Rennes (chapter 2), a further proposal is made: the *Communauté d'agglomération* could provide a financial help to municipalities that would agree to control their residential development (in a way, this can be seen as a funding for the maintenance of the natural landscapes).

¹⁷ As said in the introduction, this policy was not quantitatively evaluated.

¹⁸ *Politiques spatiales et transports – Le rôle des incitations réglementaires et fiscales, Conclusions de la Table Ronde de la CEMT n° 124*, Paris, 7-8 November 2002.

¹⁹ This effect is to some extent taken into consideration in the models. The Helsinki and Stuttgart models include a sub-model of land market or housing market.

More classically, the authority also aims to keep a certain rhythm of building to limit the increase in the price of housing and to avoid an increase in the social segregation.

For more details on the case city Rennes: see the monographic analysis on Rennes, the Deliverable D4.1, and the Deliverable D7, chapter 2, programme of measures for Rennes.

2.11. Policy recommendation 6: Intermediate housing/urban design, or how to combine household social aspiration and density

This is a “push” measure, aimed to make the urban centres more attractive for households. However clear the negative effects of sprawl may be, one has also to admit that for a proportion of the households, it corresponds to a social aspiration for a certain life style: a life style characterised by a single-family housing, in a low density environment, if possible surrounded by open spaces. In some cases, this aspiration is accompanied by a wish for social homogeneity. Among the households who leave the urban centres and migrate towards the suburban areas, some households really have an aspiration for a non-urban life style and environment; some others would prefer to stay in the urban centre, but do not find there a housing or neighbourhood fitting at the same time their needs and wishes (in terms of intimacy, floor space, open spaces, safety for children, etc), and their budget. This was confirmed by several surveys²⁰. The measure described here is addressing this second category: it is the development of alternative housing forms, intermediate between collective housing and individual single-family housing. These alternative forms could be intended to urban centres or to make suburban areas more dense.

The key question is: how make density attractive ? Examples of innovative urban forms exist in many, if not all, European countries (among others Germany, France²¹), but they should spread and become more generalised. Features of these housing/neighbourhood designs may be: a reflection on how to provide the inhabitants with more space while still meeting a minimum density constraint, a reflection on the concepts of privacy, private space and public space, a mix of private/collective/semi-collective gardens²², collective play grounds for children, a varied housing supply, allowing to different household types to live together in a same neighbourhood (young adults, families, retired people), careful design of paths for walk and cycle, mix of functions (residential and retail), proximity with nature, sometimes participative process involving the inhabitants, etc.²³

Of course, these intermediate-type housings should also be affordable for the households who are the target of the policy.

Last but not least, the diffusion of new forms of housings, in urbanised and in peripheral areas, can be successful only if local authorities are convinced. To obtain this active participation, a sort of collective pedagogy should be achieved, because politicians and technicians often have a negative perception about density. Hence, cognitive actions are essential: conferences, documents, etc, should be organised in order to change the shared

²⁰ A stated preference survey conducted in Brussels, in the framework of the European project ESTEEM (4th Framework Programme), has shown that middle-class families with children assigned a higher value to urban residential neighbourhoods, peaceful and green, protected from through-traffic, where children could safely play on street, than to “standard” urban neighbourhoods, and also a value higher than to a housing in rural environment. The value was expressed in terms of a percentage of their housing-budget, inside the affordable budget.

In Munster (Germany), a survey among households having moved towards suburban areas showed that about 70 % of them would have preferred to stay in the urban area but could not find a housing fitting their needs, wishes and budget. (Patricia Gout, Munster case study, Conference “*Architectures du transport: Territoires en mutation*”, IPRAUS-Ecole d’architecture de Paris-Belleville, Paris, May 2004).

²¹ In France, the PUCA, a research centre depending from the Ministry of Housing has financed between 2001 and 2004 several operations showing that a gain in density could be obtained by architectural innovations.

²² Example: 3 floors buildings, including 4 apartments, with a collective garden (usual in some German dense suburbs).

²³ One particular form of this urban design approach is the US concept “New Urbanism”.

opinion that there are just two opposed concepts (single-family and collective housing), and that there is no alternative, further to that.

The case study Rennes provides some examples of practices encouraging the development of these urban forms: regulatory measures about density included in spatial planning documents; public financial contribution to help innovation in housing developments ; negotiation between local authorities and developers to encourage the production of urban forms which use less space. It must be noted, to be complete, that an overall context of growth and demographic pressure, as it is the case in Rennes²⁴, makes easier for public authorities to negotiate with private property developers.

²⁴ Growth can occur simultaneously with sprawl: when the overall growth has a scattered pattern.

2.12. Policy recommendation 7: Setting up mechanisms for inter-institutional co-operation

When tackling urban sprawl, there are obviously institutional barriers to the implementation of efficient policies such as: too much territorial fragmentation, competition between institutions covering contiguous territories (e.g. municipalities, communes), and a lack of coordination between various services, while urban sprawl is a highly multi-dimensional issue and hence requires an integrated strategy (including urban planning, transport, housing, environment, fiscal matters, social matters, economy). As a result from the 12 case studies analysed in the project, integration appears as a key success factor. It is a necessary response to the fact that there are interactions between the policies and between the different effects of the policies.

To control urban sprawl, there is therefore a need for a more or less formal supra-municipal structure of cooperation between the concerned institutions, to achieve urban management at the scale of the metropolitan area.

On the other hand, the 4 main features of any institution are: the democratic legitimacy (political composition), the power (action instruments), the matters of competence, the territory on which the institution has authority: this is what is called the “institutional square”. And, for a supra-municipal institution just like for any other institution, a key condition for efficiency is balance and consistency between these 4 features and the objectives that the institution has to achieve. In the particular case of urban sprawl and urban management, examples of imbalances are: imbalance regarding the territory covered (too small with regard to the sprawl issue); imbalance in the matters covered, imbalance in the action instruments (ex.: shortcomings in the fiscal instruments), imbalance regarding the political composition (usual example: representatives elected locally, at municipality level, and delegated in a supra-municipal level, may tend to defend their local interests sometimes to the detriment of the interests of the supra-municipal institution ; besides, they know that they have to account to their local electorate ; another example is the possible mistrust towards representatives of the city centre; in the case of Rennes, the solution was to give to the central municipality, the Rennes District, a weight lighter than its actual demographic weight: in the supra-municipal structure *Pays de Rennes*, the District Rennes has 50 % of the votes while it represents 80 % of the population).

With regard to the competences, one competence to be addressed should be a permanent monitoring of the policy effects, against criteria in relation with sustainability.

In practice, the responses to the institutional barriers, to the territorial fragmentation, etc can be categorised in 3 types: (i) creation of a new institution, (ii) more or less deep transformation of the existing institutions (e.g. creating a common service between 2 or more institutions, transferring fiscal power from one level to another, designing a flexible revising mechanism for the territory over which the metropolitan institution acts, modifying the political composition of the metropolitan institution so that it holds the general interest as a priority, etc.), (iii) improvement of cooperation mechanisms between existing institutions (e.g. limited technical agreements, general cooperation, etc.).

There is therefore a broad variety of institutional responses. Which are the most effective ones to control sprawl ? It is obvious that, the strongest the institution, the most efficient it will be. Ideally, there should be strong supra-municipal institutions, with full democratic legitimacy, and strong power (including legal power and fiscal instruments). According to some experts, the municipal institutional level is just an heritage from the past which is no more adequate to the current cities and the problems they face.

However, two points have to be mentioned and moderate this principle. First, voluntary cooperation is needed. And the willingness to cooperate may be enhanced by symbolic actions (see the next sub-section). Secondly, when the ideal strong supra-municipal institution is not (or not yet) feasible for historical or political reasons, less formal structures, with low or medium power, are also useful: “institutional scene”, place for a dialogue, mechanisms for sector-specific cooperation, etc. They can be part of a step by step process, by which a stronger structure could progressively be built. They can generate a permanent dialogue between municipalities, contribute to raise awareness among decision-makers (awareness of the need of cooperation on at least some matters), etc. Stabilisation of political arrangement needs time and non formal cooperation helps to define collectively rules, identities, references or values which make possible a political integration in a later stage.

Another crucial point is to take into account locality, and the local specificities, in the definition of the new modalities of government. Each territory has its own resources (political resource, expertise, budget) whose stock and characteristics influence the choice of most appropriate modalities of political cooperation. Configurations of political leadership (collegial, individual) represent opportunities or constraints, for the feasibility of the settlement of a new political institution. Mobilisation of private interest organisations on institutional aspects depend also from the locality. Presence of social values shared by inhabitants, like consensus or collective action capacity, is a specific resource which can make possible the creation of a new political institution.

Finally, municipalities are often well informed about the potential revenues that they could get from new residential developments (through the income tax) or new economic activities. However they may be not as well aware about costs generated by these new developments. Some suburban municipalities discover sometimes that the migration of households represent a cost that they can no more afford, in terms of equipments and services to be provided (schools, etc) ; the problem is that they become aware of that too late, once the households have already moved²⁵.

For more details on the institutional issues, see the Deliverables D2 (interviews of local authorities) and D4.2. (institutional barriers and inter-institutional co-operation).

The "institutional square": a question of balance

<i>DEGREE OF AUTHORITY</i>	<i>SCOPE OF AUTHORITY</i>
<ul style="list-style-type: none"> ▪ Democratic legitimacy ▪ Power/action instruments 	<ul style="list-style-type: none"> ▪ Matters of competence ▪ Territory

Figure 2.19 : The 4 features of the “institutional square”

²⁵ A German researcher for example showed that in the case of Greater Hamburg and the German fiscal system, new housing developments in most of the suburban locations have no fiscal effect on the municipal revenues, as additional revenues and additional expenditures more or less match. Jens-Martin Gutsche, “The role of the municipal fiscal system in the traffic increase in conurbations”, Technical University of Hamburg-Harburg, paper presented at the European Transport Conference, Strasbourg, October 2003.

In the US, there are consultancies specialised in fiscal impact analysis. A fiscal impacts analysis projects the net cash flow to a jurisdiction resulting from new developments, taking into account the benefits and the expenses (ex. : analyses conducted by the experts Robert Burchell and Paul Tischler).

2.13. Policy recommendation 8: Symbolic and cognitive actions

At the current stage, an important part of the problem is no more technical (what to do ?) but cognitive (how to build a consensus on the objectives and the ways to reach them ?). Symbolic or cognitive measures are therefore crucial to increase the awareness among the various players: local and regional public authorities, players from the private sector (property developers, companies, ...), citizens. In this clearly multi-dimensional, multi-disciplinary issue, each player holds a part of the solution. The cognitive measures should among others inform about the effects and costs of urban sprawl and about the existing solutions, experiences in other cities, best practices, etc. The final objective is to create a common culture at a supra-municipal level, to enable consensus building, coordination and cooperation.

Compared to states and towns, metropolitan supra-municipal institutions have usually no high symbolic, historic or democratic legitimacy. They have generally low visibility and technocratic legitimacy: they acquire legitimacy mainly through actions and achievements ; but symbolic actions should contribute as well.

Examples of symbolic actions are: forums, workshops, community planning (involving inhabitants in an urban planning exercise), awareness campaigns intended to inhabitants, visits of local projects by local authorities, conferences intended for local authorities, conferences bringing together authorities, planners, architects, technicians, property developers, etc ...

See examples in the Deliverable D4.1: in Rennes (conferences about urban density, whose objective was to build a common urban culture among all the mayors of Rennes Métropole), and in Milan (actions from the North Milan Strategic Plan).

