
Comparison of Urban Trip Policy in Europe France, Italy, Norway, Spain, and Switzerland

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Abstract

To varying degrees, every European country faces the same problems as far as urban travel management is concerned. These problems are congestion, pollution, and public deficits. Overall, the effects of these problems are tending to increase. To tackle these problems, European countries have developed different strategies with varying degrees of success, but none have really lived up to the inhabitants' expectations.

To get a better idea of these policies and their effects, we have chosen a number of cities in Europe. These cities are either representative of the type of policy that is carried out in the country, or they may be leaders in that field. The countries chosen have relatively contrasting policies that can be described more or less as follows:

- France (Lyons, Grenoble, Montpellier) the user has free choice of his mode of transport,
- Italy (Bologna, Milan) car access to city-center forbidden,
- Norway (Oslo) urban toll,
- Switzerland (Bern, Zurich) use of private cars somewhat restrained and public transport promoted,
- Spain (Barcelona) unusual situation due to the Olympic Games.

For each city, we have gathered data on its urban travel management policy (public transportation, car parking). This data is analyzed with respect to supply and demand as well as with reference to economic, demographic, and institutional contexts. The article presented here will introduce the methodology used for this investigation, as well as the main results of the comparison for each transport mode. Finally, we will develop some of the main conclusions in terms of urban travel policies.

Introduction

To varying degrees, every European country faces the same problems as far as urban travel management is concerned. These problems are: congestion, pollution, and public deficit. These problems are well known, and it is apparent that the effects of these problems are going to increase in the years to come. Their main causes have also been identified: firstly, the increase in urban travel, which has grown steadily over the past years. The growth in congestion has spiralled with negative consequences on pollution, lost time, and city dwelling in general. Public finance has gone far into the red when we add the level of debt of the organizing authorities and/or public transport companies, the necessity to continue investment, and a demand for public transport, which is not high enough to enable companies to break even.

The perspectives for the years to come do not seem liable to change this trend - quite the contrary. Many factors would seem to prolong them:

- demography: the ageing of the population decreases the relative number of young people who are heavy users of public transport. This also leads to the replacement of elderly populations by others which are massively used to the automobile;

- urbanism: the spreading out of urbanization is continuing and thus decreasing the amount of travel where public transportation can offer a quality alternative;
- economy: more and more people are motorized, specially as revenues rise;
- life-styles: the generalization of women going to work; relative decrease of commuting (which calls on public transportation more than other forms of travel do); development of leisure time...

These difficulties are common to all European countries. It is, therefore, interesting to see how they face up to them. The aim of this article is to present these different policies through the analysis of one or two conurbations - often leaders - that are representative of the country's policy. We do not try to give an exhaustive description of each of the cities under study; we do, however, try to present the main lines of the policies carried out along with their effects or, to be more specific, the state of urban travel.

Before coming on to the data for each city, we feel it is necessary to present the methodology used. (Section 1) Then rather than going on to give our analysis for each of these cities, we have preferred to present the conurbations in parallel to compare the cities studied.

We begin by giving a number of figures for the cities (section 2), and then give a brief idea of the institutional context of urban travel management (section 3). We then present then main lines of urban travel policy (section 4) before going on to more sectorial approaches: private cars (section 5), car parking (section 6), and public transport (section 7). Finally, we deal with the main lessons to be learned from this work in terms of urban travel policies (synthesis).

1 Methodology of Analysis

Since we only had a limited amount of time in which to carry out this study, we decided to limit our analysis to one or two cities per country chosen to illustrate contrasting policies. In these countries, we chose cities whose size is as near as possible to that of the French cities studied, so that a truly European comparison could be made. We highlighted cities that are leaders as far as the dominant national policy is concerned. It was, therefore, possible to point out the differences between these urban entities and show a certain number of "impacts" of the policies carried out.

Once again because time was limited, we decided not to give a full and exhaustive description of each city. We preferred to analyze the present situation through data from local organizations and thanks to the general objectives of the policy carried out such as it was presented by the local actors. We have not then been able to go into a historical analysis. Our paper reflects the state of things at the present moment and of certain elements of the policy carried out over the past years by the locally elected officials. It would therefore be wrong to interpret the data presented here as "effects" of the policies carried out. The local state of transport also reflects certain factors of an historical, social, economic, and political nature. This does not mean that present local policies have no "effect" on the state of travel today, but that those policies take part in it, along with other factors. It is from this point of view that it seems interesting to us to point out certain elements about the policies carried out and on urban travel.

It also seems important to deal with the problems of comparability that are raised by this type of analysis. We have tried to obtain simple and, generally speaking, currently used indicators, but their definition and method of measurement may, in certain cases, vary slightly from one country to another. On the other hand, local geographical, urban, demographic and economic contexts can vary considerably. This is specially true when we compare a Northern European city such as Oslo, two-thirds of whose surface area consists of forests, with a Southern European city which has conserved its historic urban texture.

Finally, we have to use existing administrative wards or precincts. These again vary from one country to another. We have therefore chosen the following four perimeters, even if we most commonly use the two intermediate ones:

- city-center: the heart of the city and the place where urban functions are concentrated. This space, however, is ill-defined, since it does not tally with any specific administrative zone. The data is, therefore, often unavailable;
- central city: the city which is at the center of the conurbation;
- the conurbation, which often tallies with a co-ordination perimeter for actions of transport or urbanism (or for some of them);
- the metropolitan area which more or less tallies with the area of attraction of the conurbation.

We felt it necessary to make these few remarks in order to avoid the reader's falling into the trap of interpreting the results too mechanically.

2 The Situation of the Conurbation

In accordance with the remarks made above, we chose cities which are representative of contrasting policies and which we can caricature as follows:

FRANCE: the user can choose his mode of transport freely
cities studied: GRENOBLE, LYON, MONTPELLIER

ITALY: cars forbidden downtown
cities studied: BOLOGNA; MILAN

NORWAY: urban toll system
city studied: OSLO

SWITZERLAND: use of private cars somewhat restrained and public transport promoted
cities studied: BERN, ZURICH

Finally, we added SPAIN with BARCELONA because of projects connected with the Summer Olympics.

To situate these conurbations from a comparative point of view, we furnish population and employment density data for each of the urban centers in Table 2 (at the conclusion of this article). Surface area analysis shows that the definition of the central city varies between France and the other European countries. This definition is much more limitative in France than elsewhere. On the other hand, as far as the conurbation is concerned, urban hierarchy is more or less respected.

The population data enables us to distinguish two groups of cities:

- BARCELONA, MILAN, LYON, OSLO and ZURICH are central cities of conurbations of more than a million inhabitants and are the capital or the second city in the country. We could subdivide this group to isolate the first two cities whose size is much greater than the others;
- BERN, BOLOGNA, GRENOBLE, and MONTPELLIER are much smaller.

The densities reflect very different urban structures:

- the Latin cities have a high population density which increases with the size of the city, this is specially true of BARCELONA;
- the Northern European cities in Switzerland and Norway have a much lower population density, specially OSLO, two-thirds of which is taken up by forests.

Even if the population density differences are considerable, the evolution of all these cities is comparable with the number of inhabitants in the heart of the city decreasing and an increase of an ever-outward-moving peri-urbanization.

Employment data also shows highly varied inhabitant/employment ratios for the central-cities. Switzerland and Grenoble have very low rates, which means that there is a high concentration of employment in the center city whereas the opposite is true of Barcelona and, to a lesser extent, of Milan and Montpellier.

3 The Institutional Context

A rapid glance at Table 3 shows how close the institutional structures are in all the conurbations:

- private cars: separation and complementarity of competence as far as investment and maintenance are concerned, bringing local and regional or state authorities together, specially for the construction of new freeways. As far as policing and traffic management are concerned, the city is responsible in all the countries studied;
- parking: the city is responsible in all the cities studied, but there are differences as far as the management of pay parking is concerned. It may be determined by the city itself as in Switzerland; semi-public companies or private companies as in Barcelona, Lyon, Grenoble and Oslo; or by public transport companies as in Italy and Montpellier. On the other hand, park and ride, when it exists, is planned and managed by the public transport organizing authority in conjunction with the city concerned;
- public transport: except for Oslo and Bern, a supra-city administrative entity is responsible for organizing public transport - usually created specially for this purpose and most of time based on the existing administrative zones. Competence is usually for the metropolitan area, except in France. Other than in Switzerland, the network is run by a company which the organizing authority has contracted out to;
- urbanism: what is particular in France is the responsibility of a group of cities which is, however, shared with the central-city. On the other hand, power rests with the central-city.

The differences from one conurbation to another from the institutional point of view would therefore appear to be few, even if the competence of the central city seems to be farther-reaching in Switzerland or in Oslo. Generally speaking, what is striking is the splitting up of power. There is no example of an authority managing the overall problems of urban travel. Therefore, any co-operation between different transport modes or between fields of competence with a view to introducing a coherent overall policy for the conurbation relies on local political will and close co-operation between the technical services of the various authorities. In this way, Switzerland is unique thanks to an overall policy and coherent management of urban travel, which integrates connected fields of competence.

4 Urban Travel Policies

Table 4 enables us to learn a number of lessons. If the fundamental aims of the conurbations are more or less the same, the policies carried out are different. All the conurbations want to fight congestion and pollution and improve the living environment. Thus, they want to maintain the city so that it is possible to provide the main urban functions and so that life is enjoyable. But there are differences in the real importance assigned to these aims. All also want to promote and develop public transport. On the other hand, the ways in which they try to attain these general objectives, or to be more specific, to answer these challenges, differ considerably from one conurbation to another:

- Oslo and France: develop the individual and public transport supply. These two countries have a non-restrictive policy with regard to cars, even if they try to maintain a certain free-flow of traffic thanks to highways investment, specially by diverting through-traffic away from the central-city. No ban or strong dissuasion is envisaged. Those in charge would appear to believe that the system can regulate itself as a result of these investments and as a result of real-time traffic management and the improvement of public transport. Oslo found the necessary financial means to accompany this policy, thanks to an urban-toll system.
- Italy: protection of historical city-centers. Italy has adopted a policy that bans private cars from city centers. No non-resident can drive in the city-center. This measure is accompanied by a ban on half the possible car traffic for the whole conurbation when pollution risk is high. This is carried out by allowing only those cars with a number plate with an even number to be on the road on even dates and vice versa. This policy is accompanied by an abundant public transport supply at attractive prices. The people's elected representatives thus hope to protect historic monuments in the city centers and reduce atmospheric pollution.
- Switzerland: urban travel control to reduce the level of pollution and improve living environment. To do so, Swiss cities go about things differently from what we have seen so far; they adopt a very restrictive policy with regard to private cars but without there being any actual driving ban. However, as a result of the measures taken, it becomes so difficult to drive around, that many Swiss prefer public transport, all the more so as considerable efforts have been made to guarantee a high quality supply. The dissuasive measures introduced concern the control of both public and private parking, the reduction of the capacity of the highways, the redistribution of traffic lanes for the various transport modes, the protection of residential areas, and the diversion of through traffic. The most important point in the Swiss policy, perhaps even more than the measures taken, is the overall coherence of the measures since they associate all the local actors towards the same objective.
- Finally, Barcelona is in an intermediary position between the first two groups. It employs both bans on private cars at certain times of year and measures that encourage public transport use. Every year at Christmas, the city-center is partially prohibited for private cars. The city also used the Summer Olympics period to try out driving bans and stricter parking regulations.

The detailed analysis of the measures taken, which we will present farther on, will throw light on the differences between the cities.

5 The Private Car

Policies vary considerably among conurbations. We can create five groups for each country, and the same is true for their "effects" or the state of modal distribution, in as far as many other elements influence this indicator, and this leads to the creation of three groups: Switzerland, Italy, and the other countries.

Bern and Zurich: Dissuasion and Popular Agreement

Amongst the cities studied, the Swiss have the lowest rate of private car use. If we consider only trips by car or public transport, one of every two trips is taken by car. This rate goes down for city-center travel (1/4 to 1/3), specially at peak hours (1/5 to 1/6).

They remain low for trip to the center, going from 1/3 at peak hours in Bern to a daily mean of 2/3 in Zurich. The car comes into its own as in the other conurbations on the outskirts.

This low use of the private car use is not linked to the petrol pricing. Quite to the contrary, Swiss petrol is the cheapest of any of the countries studied as is the very low ratio of price per liter of petrol against public transport fares. On the other hand, car control measures have probably a considerable influence. These have been introduced progressively over the last twenty years with the agreement or even the request of the people living in the zones concerned. This is no doubt an important advantage for those in charge who can also refer to a Federal law for the protection of the environment voted in 1985 and whose aim is to reduce all forms of pollution their 1955/60 level - specially in the area of noise and air-pollution. These measures are highly diversified and go to make up a coherent whole including:

- the dividing-up of highways

Little by little, highways are being divided up for their various uses: private car traffic, public transport, cycling, pedestrians. This distribution is usually carried out to the detriment of the private car and can go as far as to reduce the capacity of certain junctions - which can reach 30 percent in certain areas in Zurich. These traffic regulations also deal with turning at crossroads which can be forbidden if it disrupts public transport flow. The aim is to enable other modes of transport to have priority over the private car;

- channelling of traffic : "traffic mazes", "traffic cells"

The aim here is to channel internal traffic flowing through the conurbation along dedicated roads. A traffic plan is drawn up, and it bans vehicles from crossing through certain areas. It is possible to enter these zones, but the one-way system brings the motorist back to his point of departure;

- the protection of residential zones or traffic "calming"

In these zones, speed is restricted to 20 or 30 k.p.h. To make sure that these restrictions are observed, and without requiring repressive measures, the highway is treated under a different angle. Special surfacing is used. Urban amenities are modified and used to form physical obstacles which slow the motorist down. "Traffic collars" are constructed and other natural obstacles are used. This system helps to inverse the order of priorities - pedestrians and cyclists have priority over motorists. In certain cases, sidewalks are done away with. In this manner, the highway belongs to every user;

- diverting of through traffic

The aim is to divert through traffic from the conurbation by providing bypasses or ring roads.

Even if all these measures are highly constraining for motorists, it would appear that it is thanks to their overall introduction and to their coherence with other sectorial policies that the agreement of the population has been obtained and therefore that the share private car trip is of so small.

Bologna - Milan: Traffic Bans

Italy has adopted a different approach to reduce the use of the private car. We are no longer dealing with people's being incited to act, but rather being coerced as the result of a series of bans. On the one hand, the bans come from the desire to preserve historic city-centers, and on the other hand to limit pollution when it approaches critical threshold level. There are two types of measures:

- "bans" on driving in the city-center

The ban was set in 1986 in Bologna and in 1987 in Milan. It has been well accepted by the population, which was consulted by referendum, and 50 percent approved of this proposal made by ecologists.

Access to the center of the city-center is prohibited at certain times of day (from 7.30 a.m. to 6 p.m. in Milan, from 7 a.m. to 8 p.m. in Bologna) except for those with a special parking permit. The categories which have been granted such a permit are:

- residents,
- trades people,
- cars with number-plates from other regions (Lombardy for Milan, Emilia-Romagna for Bologna),
- public transport,
- professions with special access needs.

Most of the population respects this measure well and it has had positive effects on automobile traffic in the "ban" zones. In Bologna, the number of vehicles entering the prohibited area has been reduced, and it has been stabilized in Milan. There is, however, a certain amount of negative fall-out in nearby areas - especially as far as parking is concerned.

- odd/even license plate scheme

Cars with number plates with an even number are authorized to be driven on even days of the month and vice versa. This traffic management measure would appear to be becoming less and less efficient as a result of the non-respect of the new ministerial instructions for anti-pollution published in 1992, and as the result of certain acts of vandalism. Furthermore, the number of households with two cars has increased considerably since the introduction of this measure in the cities concerned. Both cities have the highest rate of car ownership per inhabitant among the cities studied.

These bans are accompanied by very high taxes on petrol, whose price is the highest of all the countries under consideration. The difference is even more significant if we compare the price of a liter of high-grade petrol with public transport fares.

These measures have not enabled the Swiss level of results to be achieved as far as modal split is concerned. However, the share of trips made by car is smaller than in other countries.

Barcelona- Momentary Bans

Barcelona occupies an intermediary position in as far as it used general traffic management methods and, in parallel calls upon more intransigent strategies in the case of important events. Barcelona then introduces short-lasting regulations which restrain private car trips in city-center. They thus test the reactions of the population on the one hand and try to create an effect of surprise obliging motorists to learn to adapt rapidly to fluctuations in traffic environment, on the other hand. Barcelona restricts private

car access to well-defined urban areas following the same logic as Bologna and Milan. Thus, for four years now, Barcelona has limited private car access to the heart of the city-center for one month (mid-December to mid-January) i.e. during the period of Christmas. During the Summer Olympics, from 25 July to 10 August 1992, a project called GAUDI made daily visitors' travel easier by banning private car traffic from the Montjuic site (where more than 80 percent of the Olympic events were taking place) only people with special permits were allowed in (people from the Olympic Village, civil servants, public transport, residents). The results would appear to have been beneficial.

Grenoble, Lyon, Montpellier: Free Choice

Basing their action on the LOTI ("*Loi d'Orientation des Transports Intérieurs*" <Internal Transport Orientation Act>), Grenoble, Lyon and Montpellier wish to guarantee "transport right" ("*droit au transport*"). They use much more flexible automobile traffic management methods, such as the introduction of specific traffic plans, the use of automobile traffic regulation plans in real time (the CORALY system for the Lyon conurbation and PETRARQUE for the district of Montpellier). They try to divert through traffic thanks to new ring-roads, and have either decided to introduce or are thinking of introducing infrastructure tolls by franchising the new freeways in order to get the necessary funding.

Oslo: Urban Tolls

Oslo wishes to develop its road network considerably (by increasing its capacity by 35 percent). It must be pointed out that it had a low level of investment over the past decades. The objective is to improve roads, whether it be in the city-center or in the outskirts to channel the flow of through traffic to specific routes. To do so, Oslo introduced a ring toll in 1990, 70 percent to 80 percent of whose resources go to investment in roads.

The Oslo urban toll is the second in Norway after Bergen and before Trondheim. There are not regulation toll-booths as in Singapore, but the toll that is levied collects funds for investments in road and public transportation included in the "Oslo Package" program. Local elected representatives preferred this system to an infrastructure toll on new highways and thus encourage people to use the new roads, especially in the city-center, to channel through traffic. The specific geography of Oslo has made it possible to create a ring around the city with the installation of eighteen toll-booths on roads into the city. The toll is 11 kronen (approximately US\$1.80). It is only levied on those entering the city, 24 hours a day, without any price change according to the time of day. The tariffs encourage people to purchase season tickets, which are more and more commonly paid for by employers (approximately 30 percent in 1992). Tolls were collected manually to begin with, but there is now an evolution towards electronic systems enabling vehicles to avoid queuing up at toll gates. The available data would seem to show that there has been no reduction in traffic on the highways concerned (but, in any case, this was not the aim).

Oslo also calls on specific city-center actions: channelling of traffic; creation of "30 k.p.h. areas"; dividing up of the highway as in Switzerland, but to a lesser extent and limited to the city-center. Furthermore, these measures are not accompanied by parking and public transport policies as they are in Switzerland.

6 Parking

The ratio of public parking supply to the number of inhabitants + the number of jobs is an interesting indicator for situating the level of parking supply. It gives an indication of the weight of pressure on parking. The data indicates that France has the highest supply despite the fact that it is the only country that has undertaken a program of construction of private car-parks. It is too soon to know if these investments are going to lead to a high progression of the supply or if the declarations of persons in

Table 1

Characteristics of the Oslo Urban Toll		
Private Car Tariffs in FFR (in 1992, 1 kronen = 0,86 FFR = 0,14 US\$)	- Single ticket	FFR 9,50
	- Subscriptions	
	monthly	FFR 215
	6-monthly	FFR 1.16
	yearly	FFR 2.150
	- Season tickets	
	25 tolls	FFR 200
	175 tolls	FFR 1.250
	350 tolls	FFR 2.336
Distribution by type of tariff	- manual payment	19 %
	- automatic coin payment	23 %
	- subscription or season ticket	58 %
Distribution of subscription	- monthly	11 %
	- six-monthly	15 %
	- yearly	74 %
Annual traffic	63 million, viz. 210K/day	
Receipt	520 million kronen	
Exploitation costs	60 million kronen	
Acceptability	At the beginning, 1/3 of the inhabitants considered the measure as positive. After two years, this is the opinion of 40%. A majority of the inhabitants therefore remains hostile to the toll.	

charge announcing the corresponding removal of on-street parking will be effective. If the first hypothesis were to be confirmed, French cities would be in opposition to the others and we would have to ask ourselves a number of questions about the consequences of this policy on automobile traffic.

There are many lessons to be learned from the Swiss example. Both Swiss cities are trying to stabilize, if not to reduce, public and private car parking facilities by making urban standards stricter. Zurich has gone as far as to forbid the providing of parking spaces in new buildings in certain parts of the city-center. Bern has also managed to do away with 10,000 parking places over the last ten years. This restrictive policy is accompanied by very high parking tariffs and strict limits on parking time to dissuade the population from driving into the city-center. As we have already seen, this policy would seem to have borne its fruit in term of modal split. Contrary to fears expressed, no damage seems to have been done to the economic, commercial, or entertainment vitality of the city-center.

For the other countries, parking does not seem to be a major preoccupation in urban travel management policies. Oslo is trying to stabilize public supply while generalizing pay parking and limiting parking time. Both Italian cities have to face a large supply deficit both for residents and other users. When this is put together with a total lack of respect of parking regulations, the result is chaos where unauthorized parking is a major cause of congestion, specially around the perimeter of the zone in which motoring is banned.

There is one point on which all the cities agree. They all try to provide peripheral park and ride where motorists can park before switching to public transport.

7 Public Transport

Once again, analysis of the table shows that the Swiss cities stand out. They have an abundant supply, which is greatly used by the population. Other cities such as Oslo and Milan may well have a high level of supply, but demand, especially in Oslo, is far less. A more detailed analysis of the ratios will enable us to refine this characterization. It is important to underline the fact that for Bern, Oslo, and Zurich, the data concerns central-city and not the conurbation, which limits the possibilities for comparison.

Zurich, Bern

The Swiss cities have chosen to keep their tram networks whereas France didn't. There is no doubt that they are less modern than the new network in Grenoble, but it serves the conurbation much better and goes right out into the outskirts of the city. In Zurich, express commuter trains network using existing rail lines reinforces the supply in situ proprio. Bern intends to create a like network.

This structuring network is added to by bus lines. Both Swiss cities thus have an abundant supply with a good quality of service, even if they do not have the most modern technology which French networks are so set on developing. The different indicators illustrate this point. Both cities have the highest seat kilometer offered per inhabitant ratio. Journey speed is one of the best, and frequency is very high. Even in off-peak hours and at night, the Swiss public transport passenger knows that he will never have to wait too long. This is probably one of the most important aspects of the quality of service in Switzerland and is to be found on no other network. On the other hand, fares are rather higher than in the other countries. It has been designed to attract and keep the public transport user thanks to very good subscription and season ticket tariffs, specially per year.

When abundant public transport supply and the restrictive policies against the use of private cars are put together, the result is satisfactory with regard to the number of trip per annum and per inhabitant ratio. Once again, Swiss cities are by far in the lead. Modal split between car and public transport shows this contrast even more.

The Other Conurbations

We will group the other conurbations together in one paragraph. This is not really because they all have the same policy, since a certain number of differences can be pointed out, but rather to show what separates them from the Swiss cities. Milan comes first from this group with the best supply measured in SKS/inh (seat kilometer supply per inhabitant), close to Bern, but the use of public transport is much less than in Switzerland. Furthermore, the size effect is to the advantage of the larger conurbations. The difference is even more marked for Oslo which has the same SKS/inh as Bern, but use is virtually three times less. The high seat kilometer supply in Oslo would appear to be due to the lay-out of the city, which creates long distance travel. Moreover, high tariffs and low frequencies contribute to this low use.

The SKS/inh ratios are relatively similar for the other conurbations. The cities with more than one million inhabitants all have a network in situ proprio with an underground and a tramway in Milan and Oslo. The journey speeds are close. The lowest fare rates are to be found in Italy and Spain.

The cities are close in terms of use, except for Italy, which has a higher user rate for public transport with 280 trips per year per capita in Bologna, and 350 in Milan, whereas for the other cities the ratio varies from 115 to 190. These results probably stem from Italy's dissuasive policies against private car users.

To finish the presentation of the state of public transport network, the institutional dimension has to be

referred to again. In Italy, Barcelona, and Zurich, the public transport organizing authority's influence covers the whole metropolitan area. This situation has contributed to or facilitated the introduction of an express commuter rail network in the three cities with more than one million inhabitants and surely counts for the tariff integration on a metropolitan scale. This structure is missing in Oslo and in Lyon, which do not have a commuter train network (Lyon would seem to be thinking of introducing such a network thanks to the creation of a fourth underground line). It would appear to be advisable, then, to have the attraction area for the central city tally with the perimeter of competence of the organizing authority.

Synthesis

This comparison of the policies used with the state of urban travel in nine European metropolitan areas in five countries enables us to learn a certain number of lessons.

A: The Development of Public Transport Supply: Necessary but Insufficient

The comparison between the levels of supply and use of public transport seems to show that use is not dependent upon supply. It is true that the cities with the highest SKS/inhabitant use public transport more. But we can also see a link between dissuasive policies used against motorists, whether it be in Switzerland or in Italy, and a lesser use of this mode. On the other hand, those countries that have policies that are the most favorable to motorists, such as France, are also those where this mode dominates, including in the city-center. Even if this affirmation is worth validating in other cities by going into the comparisons in greater depth, it appears that promotion and an effort in favor of public transport is of course necessary but not enough to guarantee an intensive use of this mode. A policy of promotion for public transport must be accompanied by actions on the other modes of transport.

B: The Use of Private Cars Can Be Reduced without the Use of Bans

Zurich and Bern have introduced a whole series of measures to "moderate" or "channel" the use of the private car in the city. These measures include the dividing up of the highway, the channelling of traffic, diversions for through traffic, reduction and management of the parking supply, and traffic "calming". These measures try to reduce the importance of the use of private cars. They incite or dissuade potential users rather than ban car traffic as in Italy. The modal distribution for travel in or into the city-center, which is aimed at by these policies, would seem to show that this policy can be efficient in the limiting of the use of the private car and the redistribution of the use of the urban space.

C: Necessity for Public Agreement?

Once again, Switzerland is an interesting field for the study of this question. Is it necessary to have public agreement to introduce and succeed in a policy for the reduction of the use of the private car. In both cities studied, the action undertaken to discourage the use of the private car usually led to public consultation. Those referenda are requested by residents from the involved areas. The motivations put forward are linked to an improvement in the quality of living standards and the protection of the environment both of which have progressively become important considerations in Switzerland.

In Bern, the change in urban travel management policy came about at the beginning of the seventies. At the end of the sixties, those in charge in Bern worked out a road investment policy with the aim of reducing automobile congestion. This plan was rejected by referendum in July 1970. This public refusal led the city council to modify its policy. The change came later in Zurich, but there, also, the population played its role. Furthermore, these policies were introduced gradually. They did not, therefore, cause any real upheaval in travel habits, but rather caused people to modify their behavior over a period of time,

baring fruits in the middle or long term as the modal distribution data would seem to show.

The Italian example confirms this hypothesis. Bologna and Milan principally use two measures against private cars: a ban on access to the city-center and alternating use of vehicles. The population would seem to respect the first measure reasonably well, but this is far from being true for the second. These two policies were not introduced in the same manner. The ban on access to the city-centers received public agreement through referenda in both cities. This is no doubt due to the desire to protect the historic centers of the cities. On the other hand, alternating traffic was decided upon by the people's elected representatives and led to the publishing of laws. This sort of measure is becoming more and more frequent and is seldom correctly explained to the population, which thus respects it less and less.

D: The Urban Toll as a Financing Instrument

Oslo introduced an entrance toll in 1990. Its aim was specifically financial to enable the city to carry out the "Oslo Package" investment program. Part of the money collected will go to public transport investment. The sums brought in will enable the city to implement the "Oslo Package" within 15 years instead of the 35 years, which would have been necessary if only public funds had been used. Approximately 75 million US\$ (equivalent) were collected in 1992 with a toll. This is a relatively low sum, since it is considerably less than public transport tariffs. The toll, therefore, can be considered a relatively efficient tool for the financing of urban travel.

Furthermore, it was possible to introduce it without hindering the mobility of the inhabitants of Oslo. Automobile traffic has evolved little since the introduction of the toll. It, therefore, corresponds to the aim of its designers, i.e. to collect funds and not to regulate travel. A regulation strategy with the use of a toll would probably have to call upon much higher tariffs to be efficacious.

E: Parking: An Efficient Tool for Urban Travel Management?

Parking is generally accepted as an urban travel management tool. However, the analysis of the policies in the various cities would seem to show that those in charge do not use it as such. France is an example in point. The peoples' elected representatives explain that they want to encourage the use of public transport and control the flow of cars, especially in the city-center. The parking policy, however, leads to an increase in supply, and this is liable to be counter-productive.

The Swiss example is quite the opposite. The two cities have undertaken a drastic reduction of public supply and control private supply strictly by means of planning permission. Once again, this policy is accompanied by other measures aimed at reducing the use of the private car and develop public transportation, and it would seem to be successful if evaluated from the modal distribution point of view.

F: Political Desires and Financial Engagement: A Necessity

All the policies require the development of public transport. If we want motorists to abandon their cars, public transport must provide an alternative. The analysis of the five countries shows that investments and the accepting of public transport exploitation deficits are necessary. Even in Switzerland, where the use of public transport is considerable, where commercial speed is high, and where fares are high as well, local authorities have to put up with exploitation deficits. Despite the fact that receipts cover a very considerable part of expenditure, Swiss local authorities spend more per capita than the other countries-specifically because use of public transport is high. Unless they find other revenue sources (such as the urban toll), local authorities are just going to have to put up with heavy financial support for public transport, all the more so as middle-term forecasts are not positive for the networks (Cf. *Prévision du*

modèle QUINQUIN, LET, Actes du Colloque "la mobilité urbaine: de la paralysie au péage?" < Cf. The QUINQUIN Forecast Model LET, Conference Proceedings : Urban Mobility: from paralysis to tolls?>).

This financial problem is not the only one for local authorities. If there is no modal transfer to public transport, in the long run this will lead to complete asphyxia in most conurbations as a result of congestion. However, it is not enough to promote public transport. The use of the private car has to be dealt with. Those in charge have a whole series of measures as used in Switzerland and Italy and these can be accompanied by the introduction of an urban regulation toll.

But there must be a real continuous political will behind all these measures which have to be accepted by the population and introduced gradually. Bern is interesting from this point of view, since the restriction policy on motoring was started 20 years ago, and its introduction is still going on today.

G: An Overall and Coherent Policy for all Transport Modes and for Parking

The problems which local authorities are confronted with are such that overall coordinated action is required. Measures concerning public transport although necessary are not sufficient. It is therefore necessary to take measures concerning private cars, either to ban certain uses, or to make certain uses so inadvisable in comparison with public transport performances. Parking supply and management are also important tools. The action must therefore also concern both public and private parking so that parking is in synch with the policy which has been decided upon.

This means that an overall policy has to be defined, and that it must be based upon all the sectorial actions concerning urban travel. If this policy is to be coherent, coordinating bodies to deal with all the partners must be created. Co-ordination between the various towns and cities that make up the conurbation is also essential. From this point of view, the perimeter of competence for the organizing authorities in France is too small with reference to the daily population travel catchment areas. Those cities that have been able to introduce an express commuter rail network, and an integrated fare system, all have a perimeter of competence that tallies with the metropolitan area.

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Table 2 Socio-economics characteristics

Indicators	GRENOBLE 1992	LYON 1990	MONTPELLIER 1990	BARCELONA 1990	BOLOGNA 1992	MILAN 1990	OSLO 1989	BERN 1990	ZURICH 1990
<i>Urban Region</i>	Région urbaine	RUL : Région Urbaine de Lyon	Le Grand Montpellier	Région urbaine	Région urbaine	Aire métropolitaine	Comté d'Oslo	Canton de Berne	Canton de Zurich
. Number of towns		266	41	129	3 700	249		6 049	171
. Superficy (sq. km)		2 800	350 000	2 500	910 000	2 762		925 000	1 700
. Number of inhabitants		1 600 000		4 200 000	245	4 000 000		150	1 100 000
. Density (inhab/sq. km)		570		1 680		1 448			650
<i>Conurbation</i>	SIEPARG	Le Grand Lyon (COURLY)	District de Montpellier	Entité Métropolitaine de transport (EMT)	L'agglomération de Bologne	Compresorio		Région de Berne	RZU (Région de Zurich)
. Number of towns	23	55	15	18	230	98		250	70
. Superficy (sq. km)	212	500	194	330	485 000	1 200		300 000	450
. Number of inhabitants	371 000	1 200 000	282 000	2 900 000	2 100	3 200 000	700 000	1 200	800 000
. Density (inhab/sq. km)	1 750	2 400	1 450	8 700		2 700			1 770
<i>Central-city</i>	Ville de Grenoble	Ville de Lyon	Ville de Montpellier	Ville de Barcelone	Cité de Bologne	Commune de Milan	Ville d'Oslo	Ville de Berne	Ville de Zurich
. Superficy (sq. km)	19	50	57	100	140	182	453	52	90
. Number of inhabitants	160 000	400 000	208 000	1 800 000	417 000	1 430 000	(2/3 with forest) 450 000	134 000	360 000
. Density (inhab/sq. km)	8 800	8 000	3 650	18 000	3 000	7 900	1 000	2 500	4 000
. Number of jobs	170 000	270 000	104 000	700 000	260 000	800 000	300 000	135 000	380 000
. No inhabitants/No jobs	0,94	1,48	2,00	2,57	1,60	1,79	1,5	0,99	0,94
<i>City-center</i>									
. Number of inhabitants	20 000	50 000	25 000			30 000	1 500	5 000	6 500
. Number of jobs	40 000	67 000	26 000			120 000	70 000	30 000	63 000

Table 2: Institutional context

	GRENOBLE	LYON	MONTPELLIER	BARCELONA	BOLOGNA	MILAN	OSLO	BERN	ZURICH
Conurbations									
<i>Management of Private Cars</i> Running construction and maintenance Traffic									
<i>City-center Parking</i>	The "Grenoble Parking Company for constructed car parks	The "Lyon Parc Auto" Company for pay parking	No greater city organization but joint city SMTU responsibility	City responsibility + action by SMASSA (Co /c parking in Barcelona)	City responsibility + action by Azienda Trasporti Consorziati + action by AIP (Italian Car park association)	City responsibility + action by Azienda Trasporti Municipali + action by AIP	Public and private responsibility for constructed car parks	City responsibility	City responsibility
<i>Public transport in the Conurbation</i>									
Organizing Authority	SMTC (Syndicat Mixte des Transports Collectifs de l'agglomération grenobloise)	SYTRAL (Syndicat Mixte des Transports pour le Rhône et l'Agglomération Lyonnaise)	District de Montpellier	EMT (Entitat Metropolitana dels Transports)	Provincia de Bologna - Région Emilie-Romagna	Province de Milan - Région de Lombardie	Ville d'Oslo	Ville de Berne	ZVV (Zürcher Verkehrsverbund) canton + Ville de Zurich
Exploiting Company	SEMITAG (Société d'Economie Mixte des Transports de l'Agglomération Grenobloise)	SLTC (Société Lyonnaise des Transports en commun)	SMTU (Société Montpellieraine des Transports Urbains)	TMB (Transports Metropolitanans de Barcelona)	ATC (Azienda Trasporti Consorziati)	ATM (Azienda Trasporti Municipali)	Oslo Sporveier	SVB (Städtische Verkehrsbetriebe Bern)	VBZ (Verkehrsbetriebe der Stadt Zurich)
R & D Company	AURG (Agence d'Urbanisme de la Région Grenobloise)	SEMALY (Société d'Economie mixte du Métropolitain de l'Agglomération Lyonnaise)		CETRAMSA	CCC (Consorzio Cooperative Costruzioni)	MM (Metropolitana Milanese) + ATM (Azienda Trasporti Municipali)			
Urban Planning	AURG (Agence d'Urbanisme pour la Région Grenobloise)	AGURCO (Agence d'Urbanisme de la Communauté Urbaine de Lyon)	SERM (Société d'Equipement de la Région Montpelieraine)	- Generalitat - Mairie de Barcelone	- CCC (Consorzio Cooperative Costruzioni) - Comune di Bologna	Comune di Milano	Ville d'Oslo	Ville de Berne	Ville de Zurich

Table 4: The aims of urban travel policies

Aims	GRENOBLE	LYON	MONTPELLIER	BARCELONA	BOLOGNA	MILAN	OSLO	BERN	ZURICH
<i>Fight against congestion</i>	**	**	**	***	**	**	**	***	***
<i>Assure free choice of transport mode</i>	***	***	***				**	-	-
<i>Divert through traffic</i>	***	***	***	**	*	*	***	***	***
<i>Reduce private car traffic: city-center the whole city</i>	** *	** *	** *	** *	*** *	*** *	** *	*** ***	*** ***
<i>Develop the road network</i>	**	**	**				***	-	-
<i>Organize traffic in real time</i>		*	*	*		*			
<i>Increase the public supply for parking</i>	**	***	**	**	*	**			
<i>Limit public and private parking in the center</i>							*	***	***
<i>Develop public transport</i>	***	***	***	***	***	**	***	***	***
<i>Promote walking and cycling</i>	*	*	*	*	*	*	**	**	**
<i>Improve protection of the environment</i>	*	*	*	*	***	***	*	***	***
<i>Improve living environment</i>	**	**	**	**	**	**	**	***	***
<i>Conserve historic buildings and monuments</i>					***	***			

Legend:

- *** major aims
- ** important aims
- * secondary aims

Table 5: Private cars

Indicators	Conurbations	GRENOBLE 1990	LYON 1991	MONTPELLIER 1991	BARCELONA 1991	BOLOGNA 1991	MILAN 1991	OSLO 1990	BERN 1991	ZURICH 1991
Motorisation per 100 inhabitants		38	42	50	36	50	50	40	38	36
% of private cars (of private cars + public transport) Daily mean (in %)		81	76	86	76	63	61	75	52	50
- Center/center (in %)		75	56	71	45	55	50	75	25	35
- Center/periphery (in %)		75	70	71	70	65	72	75	45	65
- Periphery/periphery (in %)		90	80	91	85	80	86	85	85	85
Price per liter of high-grade petrol in L/FR (exchange rate at the date indicated)		5,20 (September 1992)	5,20 (September 1992)	5,20 (September 1992)	5,50 (May 1992)	7,50 (May 1992)	7,50 (May 1992)	7,00 (June 1992)	5,00 (April 1992)	5,00 (April 1992)
Price per liter/unit public transport fare		0,80	0,74	0,74	1,10	1,25	1,50	0,55	0,70	0,50
Strategies adopted vis a vis of private cars		- Construction of new road infrastructures - Traffic plan - Diversion of through traffic	- Construction of new road infrastructures - Traffic plan - Diversion of through traffic - Organization and management of traffic in real time with CORALY	- Construction of new ring-roads - Traffic plan - Traffic management with the technological system Pétarque	- Traffic Plan - Diversion of through traffic - Temporary ban on cars coming into certain urban areas	- Traffic plan - Odd/even licence plate scheme - Ban on private cars in city-center except for permit-holders	- Traffic Plan - Odd/even licence plate scheme - Ban on private cars in city-center except for permit-holders	- Introduction of peripheral toll in 1990 - "Oslo Package": construction of new roads thanks to toll (+35% private car capacity) - Diversion of through traffic - Project for "30 kph zones"	- Reduction of car traffic, specially concerning commuting - Diversion of through traffic - Protection of residential areas with channeling and traffic "calming" - Reduction of road space available for private cars: up to 30% for certain main roads reserved for other uses	- Aim to reduce car traffic by 10% by 1997 for all traffic - Diversion of through traffic - Protection of residential areas with channeling and traffic "calming" - Reduction of road space available for private cars for the benefit of other users

Table 6: Parking

Indicators	Conurbations	GRENOBLE 1992	LYON 1990	MONTPELLIER 1990	BARCELONA	BOLOGNA	MILAN 1992	OSLO 1992	BERN 1991	ZURICH 1991
<i>In city-centers</i>										
Public supply		12 000	24 000	14 300			19 500	6 000	2 500	4 000
- on street		9 500)) 24 000)	5 600			12 500	1 000	1 100	2 300
- off street		2 500		8 700			7 000	5 000	1 400	1 700
Constructions under way or to be built			10 000	8 700			2 500		0	0
<i>No of public car-parking spaces/no of inhabitants + no of jobs</i>		0,20	0,205	0,28			0,13	0,084	0,071	0,058
<i>Mains points in the policy</i>		- Extension of pay parking - Construction of car parks	- Construction of underground car parks in the city-center - Construction of park and ride	- Construction of underground car parks in the city-center - Construction of park and ride - Systematic pay on street parking with management of residential parking rates by smart cards	- Construction of surface park and ride	- Construction of car parks in the city to deal with the considerable lack of parking space for residents	- Generalization of limited-time pay parking - Stabilization of public supply: - construction of off-street car-parks - doing away with on-street parking for the benefit of other users (public transport, pedestrians, cyclists...) - Construction of park and ride	- Removal of 10,000 public parking places since 1980 for the whole of the city - Strict maximum norms for the construction of housing and offices: - One space per 150 sqm of housing, one space for 10 employees in the heart of the city-center - Dissuasion from parking for: - Work - Shopping - Entertainment - Construction of park and ride	- Stabilisation of number of parking places since 1980	

Public Transport (continued)

Indicators	CONRUBATIONS	GRENOBLE 1990	LYON 1991	MONTPELLIER 1991	BARCELONA 1991 (central-city)	BOLOGNA 1991 (central-city)	MILAN 1991 (central-city)	OSLO 1990 (central-city)	BERN 1991 (central-city)	ZURICH 1989 (central-city)
PT Demand										
<i>No of trips per annum (in millions)</i>	50	207	31	466	154	650	136	126	310	
<i>No of trips per annum per inhabitant</i>	140	182	115	190	278	350	172	505	470	
<i>Public transport % of PT + Private cars</i>										
Daily mean	19	24	14	25	37	39	25	48	50	
- Center/center	25	44	29	55	45	50	25	75	65	
- Center/periphery	25	30	29	30	35	28	25	55	35	
- Periphery/periphery	10	20	9	15	20	14	15	15	15	
<i>Dominant characteristics of PT policies</i>	- Development of tram network - Development of traffic lights priority - Continuation of development of SAE - Rail service to outskirts	- Development of SAE - Improvement of quality of service - Fully automated underground (Magaly) - Extension of underground network - Introduction of PTSP in the future international quarter - Project for intermediary structuring bus network	- Personalization of the service - Improvement of bus travel flow with Petrarque - Introduction of second priority bus route in 1992/3, usable later for a ground level PTSP - modern tram (year 2000)	- Improvement of communication with users - Creation of new lines - Urban transport using escalators - Extension of underground - Project for creation of tram network	- Improvement in quantity and quality of bus network - Multiplication of "policiono" - Construction of an underground in Bologna	- Extension of underground network - Passante ferroviario - Project for development of tramway network in the outskirts - Continued introduction of tariff integration	- Integration of underground network - Creation of a suburban ring line - Increase of suburban service - Improvements in center	- Introduction of suburban express commuter train network - Continuation of tariff integration with suburban network	- Continuation of cantonal tariff integration - No major projects but will to maintain the present high level of quality	

PTSP Public Transport in Situ Proprio (guided bus, trolley, tram, light rail, underground)

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