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Transport research innovation

Eco-mobility :
Non-motorised transport : walking, cycling, rollerblading..., key elements for an alternative in urban mobility

May 2003

Results of research carried out
in the PREDIT II framework (1996-2002)

Bilingual summary (French-English) of research carried out between 1996 and 2002 for the PREDIT action programme n° 17 *"Non-motorised travel" ("Strategic research" thematic group)*

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13 Summary

Concerning the subject of « non motorized » mobility, France was somehow late (both for studies and achievements) as compared to neighbour countries, especially the North of Europe. If this gap is not filled yet, it has been reduced through the work undertaken by the PREDIT National Programme. This work took advantage of what was done abroad, and put forward the specificities of the French situation and the originality of some of the solutions adopted in France.

However, the results of the five years research achieved by the PREDIT programme, on the theme of non motorized mobility, were totally unknown abroad and must be promoted beyond our borders.

This bilingual publication should help initiating new and fruitful exchanges between the specialists, the concerned representatives and associations, not only at the national level, but at the international level and especially at the European level.

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Forward the “Non-motorised” theme in the PREDIT programme

Presentation of PREDIT

PREDIT, the National Land Transport Research and Innovation Programme was initiated by the Ministries responsible for research, transport, industry and the environment, ADEME (Agency for the Environment and Energy Management) and ANVAR (Agency for Innovation).

PREDIT seeks to fulfil objectives targeting user expectations, the protection of the environment and the economic competitiveness of the sector concerned. In order to achieve these goals, it finances five year research programmes and supports innovative projects and experiments.

The second PREDIT programme, from 1996 to 2000, was organised into four major fields: strategic research, science and technology, technological objects and transport systems. It covers socio-economic research and transport forecasting, energy and environment issues, safety in transport, research into new materials for transport, the development of new user systems and services, using new communication technologies, and experiments in urban travel management.

A third PREDIT programme was launched in 2002 and covers the same fields organised around slightly different themes.

Strategic research in the PREDIT II Programme

The Strategic Research group, a socio-economic research programme on transport, constitutes one of the four major areas covered by PREDIT II. The group aims to improve the global understanding of the transport system, by providing information, decision support tools and an overview of future prospects.

The Strategic Research group has set up a system of thematic sub-groups, in order to open up new fields of research and develop the more traditional areas requiring further in-depth study. Through this mechanism, a good number of subjects bridging several fields have been able to be addressed, ranging from inter-modality to parking, and more generally to questions of changing lifestyles, especially in towns where most of the population is now concentrated and where a large proportion of the transport of people and goods now occurs.

The group launched almost two hundred research projects over the 1996-2000 period, stressing the particular importance of exploiting this major body of knowledge, which could be considered to be “strategic” only if it was widely disseminated amongst all potential users of the research.

The "Urban mobility and non-motorised travel" thematic group

The introduction in 1996 of a specific research theme on non-motorised travel in the land transport research and innovation programme was a new development, supported by the Ministry of the Environment (now the Ministry of Ecology), which was responsible for the secretariat. The pilot committee on this theme was chaired by Michel Gilbert (then deputy mayor of Grenoble and Chairman of the "Club des Villes Cyclables"- Club of Cycling Towns). The scientific co-ordination was assured by Jean-René Carré, researcher at INRETS.

In order to stimulate research on this theme, which had been neglected until then, the committee based its work on the following findings:-

The world population is now essentially urban, and the part of this population living in big metropolises continues to grow.

This urban development is linked to the rise of the motor car and to a spread towards the outskirts, resulting in a dispersion (dilution) of urban functions. These two trends reinforce each other mutually.

In this context, the promotion of modes of "locomotion based on the metabolic energy of man" – walking, cycling, rollerblading… and even public transport, can seem to go against what appears to some as "heavy" tendencies (i.e. those considered to be irrepressible).

The idea that these proximity modes can constitute a key element in constructing a veritable alternative to the system of "facilitated mobility", based on the motor car, has still not really been sensed by transport specialists and public decision-makers.

Although the development of the urban fringe and the predominant position of the motor car in urban travel are responsible for numerous social problems and serious environmental effects, the tendency is to try to reduce the number of motor car trips by various means … but without great success until now.

In this context, the first objective decided upon by the committee was to provide precise, well-founded answers to questions on the past development, the present role and future prospects of non-motorised modes (walking, bicycling, rollerblading…) in the process of urban development, and to contribute to developing another approach to urban mobility, which would be more sustainable, more equitable and better able to preserve social links and fulfil the social aspirations of city dwellers than those currently in force. As the work inspired by the committee progressed, the question of urban shape and its links with travel systems appeared well and truly as the central issue for the future.

The bilingual summary or the research on non-motorised mobility

This document lies within the framework of PREDIT's general policy to promote research. The public for whom this work is intended includes the researchers themselves, transport operators, government officials, elected representatives (local representatives in particular), and associations (very active in this field). It is also intended for all those people who could help to give publicity to the results of the research, such as journalists, teaching and training institutions.

It is true that France has lagged somewhat behind its neighbours, especially in Northern Europe, in matters of "non-motorised" mobility (in terms of both research and the implementation of measures). If this gap has not yet been totally closed, it has now been very much reduced, thanks, notably, to the research carried out within the PREDIT framework. This research has benefited from work done in other countries, and has also revealed the special nature of the French situation and the originality of certain solutions adopted in France.

However, it has become clear that the results of the five-year PREDIT research programme on the theme of non-motorised mobility are totally unknown outside our country. It was therefore important to publicise these results beyond our own borders.

The evidence - unfortunately increasingly patent - of the lost influence of the French language made it essential to produce an English version of the results of this research. We hope that this bilingual publication will encourage new, fruitful exchange amongst specialists, elected representatives and associations concerned with the issue, not only on a national level, but also on an international, and particularly a European level.

Introduction

Over the past few decades, everyday mobility in French cities has been marked by a major increase in motor vehicle traffic. This is now the dominant mode of transport: people use the car for more than two-thirds of their daily travel. The predominant role currently played by the motor car in the mobility of city dwellers should not, however, conceal the fact that almost one journey out of four is made without a motor vehicle and that travel sequences on foot - and to a lesser extent, by bicycle - play an often determining role in daily exchange in urban areas.

Furthermore, the fact that people travel primarily by car has environmental consequences, causes problems and costs for the community. An increasing number of city residents are attracted by the convenience and comfort of the private car, and the new infrastructures which are built to absorb the increasing flow of vehicles generate even more traffic, by creating situations which encourage people to use their cars.

The constant rise in the number of vehicles on the roads creates a vicious circle, in which "the growth of traffic causes increased space consumption, direct environmental nuisances for residents and leads to a greater tolerance of distance. This is a factor in shops, services, work places and recreational facilities becoming increasingly scattered and widespread, which in turn, leads to an increased need for travel and a rise in motor traffic".[1]

Changes in mobility patterns have been a crucial factor in the development of urban sprawl, due to the spatial dispersion of settlements, with the ensuing problems of organising services and managing these new forms of urbanisation, as well as the increasing impact of the motor car: air pollution, noise, accidents, the monopolisation of public space and the prohibitive cost of infrastructures.

Faced with the physical impasse resulting from policies promoting the motor car to the exclusion of most other forms of transport, public authorities have looked into ways of limiting its use. As a reaction, priority has been given ostensibly to public transport, which has led to a rather excessive public debate in which the private car and public transport are seen to be in opposition. However, the share of public transport in city-residents' everyday mobility has remained almost stable (around 10% on average, except in the Paris region), despite considerable investment by municipalities into developing or improving bus, metro and tram networks.

Moreover, the importance given to public transport has meant that the so-called "non-motorised" modes have been overlooked. As the share of public transport has remained stable, the rise in the motor car has been essentially to the detriment of the bicycle and, above all, of walking, whose modal share has dropped by more than 30% in 15 years.

However, these modes are an integral part of the transport chain. Any journey is composed of sequences, some of which are necessarily carried out on foot. In addition, every pedestrian is a potential public transport client, which is not so for motorists. For a very low facilities development cost, compared with the large sums

[1] P. Gout: quotation from the proceedings of the Séminaire Villes et Transports, Plan Urbain, 1991-1994 (Seminar on Towns and Transport, Urban Plan 1991-1994)-Paris, Plan Urbain, Direction de l'Architecture et de l'Urbanisme, 1995.

allocated to motor vehicles, these modes constitute an alternative to the motor car, but without causing the same environmental and social problems.

If a certain number of the trips now made by car were to be made on foot or by bicycle, it would be possible to slow down the increase in motor traffic. The bicycle, which is particularly efficient for local journeys between 1 and 5 kilometres long, can contribute to extending the range of public transport networks and make long journeys possible without a motor vehicle. Modal exchange with public transport or train is common practice in many neighbouring European countries, but rare in France.

The enforcement of the Law on Air through Urban Travel Plans makes room for non-motorised modes in urban travel policies and requires local authorities to adopt measures to encourage their use and development. More recently, the Law on Town Planning-Habitat-Transport provides for measures to achieve a greater coherence in transport and planning policies.

In this context, it was essential to look closely at the existing links between urban design and travel systems. It is important to have a clear understanding of everyday mobility, and in particular the reasons underlying modal choice, as decisions regarding the mode of travel are both key factors in shaping daily life and of strategic importance for the future of the urban environment. PREDIT 1996-2000, through its Strategic Research programme, made a special effort to gain a broad understanding of the transport system as a whole.

The aim of this work is to present a summary of the research financed by the PREDIT Strategic Research Action Programme n° 17, "Urban mobility and non-motorised travel", between 1996 and 2002. The goal of the programme steering committee, in organising a seminar in December 1999, was to open up possible avenues for developing more balanced, sustainable urban structures in the future, taking non-motorised mobility into account.

The rise of non-motorised modes over the past thirty years is one of the aspects of the gradual, but deep transformation of mobility which has greatly affected the way of life of people in France. It can not therefore be dissociated from the travel system as a whole. The aim of the research undertaken by the committee was to analyse this development, the wide range of consequences of the increasing dependence on the private car for travel as well as the associated transformations of space - physical space, space as it is experienced and people's representations of it.

The research carried out under the auspices of the "Non-Motorised" committee and presented in this work had a number of objectives:

- to organise a corpus of reliable information on non-motorised mobility;
- to analyse the developing forms of urban structure from the point of view of travel;
- to outline the potential role of non-motorised modes in urban areas;
- to examine possible scenarios for re-integrating these modes in urban mobility and to recommend ways of encouraging their use.

N.B. : These research projects are referred to in the text of this document by the surname of the person responsible for the research, followed by a number to identify the document, and the e-mail address of the research team , in Part I of the Bibliography.
The other research quoted is referred to by the surname of the author and the date of publication, in Part II of the Bibliography.

Chapter 1

Non-motorised modes : a review

1.1 Pedestrian and bicycle mobility in France at the present day : a framework

When we talk of urban transport, what almost inevitably comes to mind is an image of complex technical systems and motor vehicles, and of course... the ubiquitous motor car. Yet this is also very much of a stereotype: it tends to be overlooked that almost a quarter of the journeys in urban areas are made without a motor vehicle. In modern cities walking, and to a lesser extent cycling, are important means of travel for our contemporaries.

In France, walking now represents 23% of weekday travel, cycling between 2% and 3% (1994 figures). However, the great majority of two-wheelers in towns are now bicycles (a fact which is all too often unknown)[2], representing a modal share far greater than that of motorised two-wheelers.

It is true that over the past few decades, travel in French towns has been marked by a considerable increase in the use of motor vehicles, which are now the dominant mode of transport: almost two-thirds of everyday journeys are made by car.

On the other hand, the share of public transport in the everyday mobility of city residents, (a little less than 10%) has remained almost stable, despite major investment by municipalities into developing and/or improving metro, tram and bus networks. The spread of the motor car has therefore been essentially to the detriment of non-motorised modes, cycling and especially walking, whose modal share has decreased by more than 30% over the past fifteen years.

Global mobility, expressed in terms of the number of journeys made per person per day, has remained stable. On the other hand, the market share of non-motorised modes diminished by approximately one third between 1982 and 1994. This can be seen by comparing the results of the 1993-1994 INRETS-INSEE survey on transport with those of the previous 1981-1982 survey.

T1 Everyday mobility in France: trends in modal share between 1982 and 1994[3]

N.T.S	Private motor vehicle		Eco-mobile chain		
	Car	Motorised 2-wheeler	Public Transport	Bicycle	Walking
1994	63.5 %	1.4 %	9.0 %	2.8 %	23.2 %
1982	48.6 %	4.2 %	8.6 %	4.5 %	34.1 %
% evolution	*+ 32 %*	*- 67 %*	*+ 5 %*	*-37 %*	*- 31 %*

Source : National Transport Survey INSEE-INRETS (data on local trips less than 80 kilometres from the home made by people of six

[2] Carré, J-R.-La bicyclette, un mode de déplacement méconnu dans ses risques comme dans son usage, *in* RTS n° 49, 1995

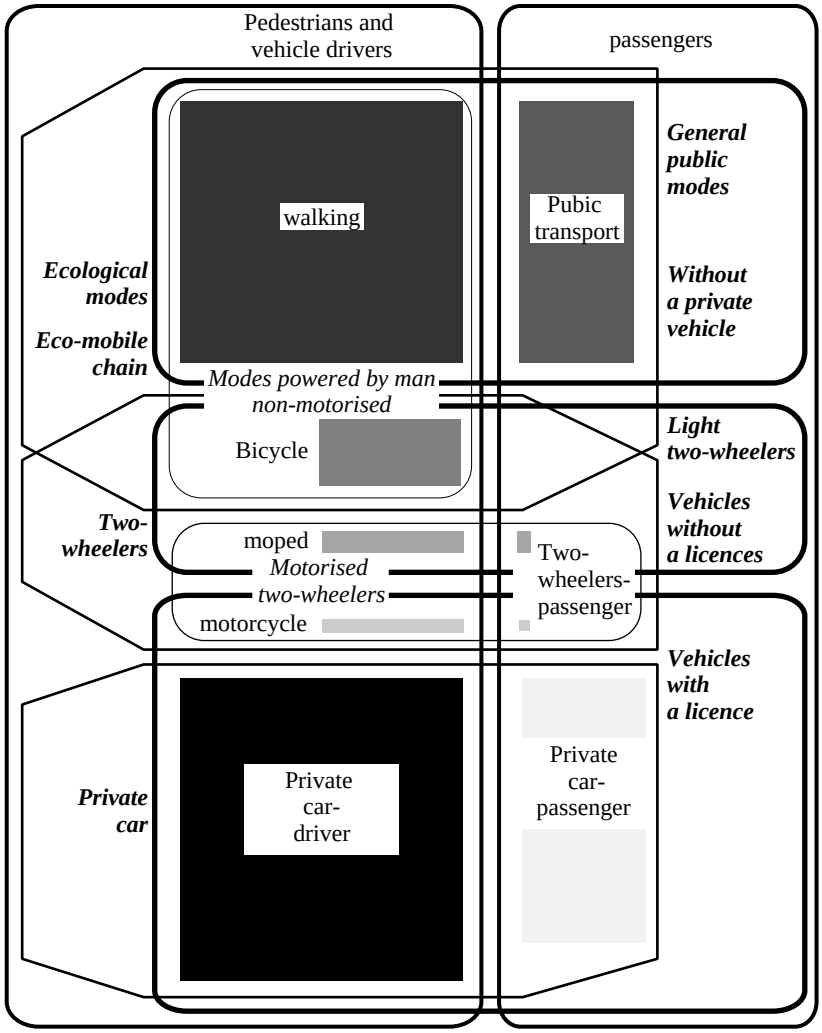
[3] See F. Papon, in list of research projects, n° 28

The modal distribution we have considered here is composed of two major categories: private motor vehicles (cars and motorised two-wheelers: 65%), and the "eco-mobile chain" (public transport + bicycle + walking: 35%).

However, the most frequently adopted forms of modal distribution do not generally take non-motorised modes into consideration, and are "traditionally" divided into four categories (private car/public transport/two-wheelers/walking), without any distinction being made between different types of two-wheeler (motorised/non-motorised). Walking is sometimes omitted, in which case only "motorised" travel is considered (or sometimes so-called "mechanical" modes, with the bicycle being included in the "motorised" modes category). However, this way of presenting the different modes tends to give a distorted view of what everyday mobility really is.

There are many ways of presenting and classifying the different modes of everyday travel, as shown in the diagram below, developed by Francis Papon :

Different groupings of travel modes (F. Papon)



It should be recalled that in Transport surveys, walking is considered to be a mode of transport only if the whole journey, from beginning to end, is made on foot. This means that a great number of walking sequences occurring in the course of trips by public transport or by car are excluded, which tends to minimise the share of walking

in everyday mobility and to gloss over its determining role in the organisation and sequencing of travel by city residents.

However, variations in this general trend can be observed in different towns, as is shown in the following table concerning provincial towns.

T2 – Modal share in 10 provincial towns (2 periods)

	Private motor vehicle		**Eco-mobile Chain**		
	Car	Motorised 2-wheeler	Public Transport	Bicycle	Walking
89-96	**54.1 – 66.7 %** Lyons / Valence	**0.5 – 2.6 %** Lyons / Nantes	**5.4 – 13.8 %** Valence / Grenoble/ Lyons	**0.7 – 5.4 %** Lyons / Valence	**19.9 – 30.8 %** Bordeaux / Amiens Lyons
76-83	36.2 – 50.9 % Nancy / Belfort	2.9 – 6.4 % Belfort / Nantes	9.2 – 14.5 % Amiens / Nantes	1.5 – 6.1 % Nancy / Bordeaux / Grenoble	27.8 – 45.7 % Bordeaux / Nancy

F. .Papon, INRETS, 1998, data: CERTU-CETE
The Paris region has been deliberately omitted from this table

1.2. Trends in non-motorised mobility in France

It is not an easy task to construct a table representing trends in modes of travel. If walking and cycling now tend to have a minority modal share, they are not negligible or residual. On the contrary, their role in the transport chain appears decisive: they often constitute a critical link which determines the way people organise their travel, in conjunction with other modes, or for local travel.

From the historical point of view, mobility in France has been characterised by a marked drop in the utilitarian role of walking and cycling. There are a number of reasons for this. We can mention:

- lifestyle trends and urban transformation: changing spatial and temporal mobility patterns have had an extremely negative influence on non-motorised modes. An increasing number of people live, work, shop, seek entertainment, and therefore travel, on the outskirts of towns. The distances which people need to travel have become too great for walking.

There has been a slow but constant progression in French towns from a fairly balanced situation in 1976 (40% to 50% non-motorised journeys) to a situation in which motor vehicles have become dominant (25% to 30% non-motorised journeys, compared with 60% to 75% motorised journeys), with the notable exception of Strasbourg.

T3 – Trends in pedestrian mobility in France from 1959 to 1994[4]

	1959 i	1967 ii	1973-76 ii	1981-82 ii	1986 ii	1993-94 ii
Population of 6 years and over in millions			46	49		53
Share of walking home- work travel %	32	25	22	19	15	14
Journeys on foot per person and per day		*2.23*	1.63	1.03	*0.79*	0.73
Distance journeys on foot in km per person and per year		*569*	415	261	*233*	226
Distance journeys on foot in km per person and per year		*680*	*530*	*380*	*360*	*360*

i) survey on commuter travel
ii) INRETS-INSEE household surveys on transport
In normal typeset : calculations according to other tables. In italics : estimations

T4 – Share of the different travel modes in everyday mobility in French cities (urban areas) from 1976 to 1998

Urban area of:	Year	Population	No. trips/ pers/ day	1 walking	2 cycle	3 public transport	4 motorised 2-wh.	5 PC Drivers	6 PC Passengers	1+2+3 ecological modes	1+2 no motorised modes
Lille	1976	889 000	2,68	38%	**6%**	7%	**6%**	31%	11%	**51%**	**44%**
Lyon	1976	1 029 000	3,45	**46%**	3%	**11%**	3%	29%	9%	**59%**	**48%**
Marseille	1976	930 000	3,43	**52%**	1%	9%	5%	23%	10%	**62%**	**53%**
Nancy	1976	230 000	3,13	**46%**	2%	10%	**6%**	27%	9%	**57%**	**47%**
Orléans	1976	201 000	3,46	35%	**7%**	6%	**8%**	31%	12%	48%	**42%**
Bordeaux	1978	604 000	2,83	28%	**6%**	10%	5%	**39%**	11%	44%	**34%**
Grenoble	1978	371 000	**4,04**	**41%**	**6%**	9%	5%	28%	10%	**56%**	**47%**
Toulouse	1978	542 000	3,00	31%	4%	10%	**6%**	**36%**	12%	46%	**36%**
Amiens	1979	145 000	3,41	**40%**	3%	8%	5%	30%	12%	**52%**	**44%**
Avignon	1980	131 000	3,36	35%	**10%**	4%	**7%**	32%	10%	**50%**	**46%**
Nantes	1980	466 000	2,80	28%	**6%**	**14%**	**6%**	34%	11%	48%	**34%**
Valence	1981	130 000	3,72	35%	5%	8%	5%	34%	11%	49%	**40%**
Lorient	1982	171 000	2,27	29%	4%	**13%**	3%	**37%**	**13%**	46%	**34%**
Belfort	1983	106 000	3,57	32%	4%	9%	3%	**37%**	**14%**	45%	**37%**
Perpignan	1984	117 000	3,25	37%	2%	**11%**	3%	34%	12%	**50%**	**39%**
Grenoble	1985	380 000	3,74	36%	3%	10%	1%	**36%**	12%	49%	**39%**
Lyon	1985	1 088 000	3,26	35%	1%	**14%**	1%	**37%**	11%	**50%**	**36%**
Toulon	1985	289 000	2,79	30%	1%	**13%**	4%	**38%**	**13%**	44%	**31%**
Valenciennes	1985	329 000	3,37	33%	**6%**	8%	2%	32%	**16%**	47%	**39%**
Average	**1980**	**428 842**	**3,08**	**36%**	**4%**	**10%**	**4%**	**33%**	**12%**	**50%**	**41%**

[4] Diagram from the report by F. Papon, see list of research projects, n° 28.

Urban area of:	Year	Population	No. trips/ pers/ day	1 wal-king	2 cycle	3 public trans-port	4 moto-rised 2-wh.	5 PC Dri-vers	6 PC Passe ngers	1+2+3 ecolo-gical modes	1+2 no moto-rised modes
Orléans	1986	230 000	2,62	28%	**4%**	2%	2%	44%	10%	34%	**32%**
Lille	1987	1 093 000	3,46	32%	3%	7%	1%	39%	**16%**	43%	**36%**
Reims	1987	200 000	**4,14**	**36%**	1%	10%	1%	38%	13%	**47%**	**37%**
Dijon	1988	221 000	**3,98**	**34%**	2%	**13%**	1%	37%	11%	**49%**	**36%**
Marseille	1988	1 137 000	2,91	**35%**	0%	11%	2%	37%	13%	**47%**	**35%**
Strasbourg	1988	386 000	**3,80**	32%	**8%**	7%	2%	37%	12%	**48%**	**40%**
Aix	1989	227 000	2,92	25%	1%	8%	2%	**48%**	**16%**	33%	**26%**
Angers	1989	199 000	3,22	26%	**4%**	**12%**	2%	43%	13%	42%	**30%**
Bordeaux	1990	762 000	3,11	20%	**4%**	10%	2%	**49%**	15%	33%	**24%**
Etang de Berre	1990	326 000	3,30	24%	1%	6%	2%	**49%**	**18%**	32%	**25%**
Nantes	1990	518 000	3,28	22%	2%	**13%**	**3%**	46%	14%	37%	**24%**
Toulouse	1990	681 000	2,91	20%	3%	10%	2%	**49%**	14%	33%	**23%**
Amiens	1991	153 000	3,05	31%	1%	10%	1%	42%	14%	42%	**32%**
Dunkerque	1991	202 000	3,60	29%	**4%**	8%	1%	40%	**16%**	41%	**33%**
Nancy	1991	295 000	3,70	30%	1%	10%	1%	44%	14%	40%	**30%**
Rennes	1991	309 000	3,44	28%	3%	**12%**	1%	42%	13%	43%	**31%**
Saint Etienne	1991	435 000	3,42	31%	1%	**13%**	1%	40%	13%	**45%**	**31%**
Valence	1991	228 000	3,72	20%	**5%**	5%	2%	**49%**	**16%**	31%	**26%**
Belfort	1992	127 000	3,39	22%	3%	10%	1%	46%	**16%**	35%	**25%**
Clermont Fd	1992	323 000	3,39	24%	2%	9%	2%	**48%**	15%	34%	**26%**
Grenoble	1992	349 000	3,58	27%	**4%**	**14%**	1%	41%	13%	**45%**	**31%**
Le Havre	1992	238 000	3,52	31%	1%	9%	2%	41%	**16%**	41%	**32%**
Metz	1992	177 000	3,32	30%	1%	9%	1%	43%	14%	41%	**31%**
Mulhouse	1992	214 000	3,36	26%	**4%**	11%	1%	43%	13%	41%	**30%**
Average	**1990**	**376 250**	**3,38**	**28%**	**3%**	**10%**	**2%**	**43%**	**14%**	**40%**	**30%**
Cherbourg	1994	87 000	3,76	29%	3%	2%	2%	43%	**21%**	34%	**32%**
Lyon	1995	1 220 000	3,63	**31%**	1%	**14%**	1%	41%	12%	**46%**	**32%**
Douai	1996	174 000	3,51	28%	**4%**	7%	1%	41%	**19%**	38%	**32%**
Reims	1996	221 000	3,76	27%	1%	**11%**	1%	46%	14%	39%	**28%**
Rouen	1996	382 000	3,40	**30%**	1%	9%	1%	44%	14%	**40%**	**30%**
St-Nazaire	1996	187 000	3,58	17%	**4%**	6%	2%	**52%**	**18%**	27%	**21%**
Toulouse	1996	723 000	3,52	22%	3%	**10%**	1%	**49%**	14%	34%	**25%**
Aix	1997	290 000	**3,83**	27%	0%	6%	2%	**49%**	15%	34%	**28%**
Elbeuf	1997	53 000	3,48	28%	2%	6%	1%	45%	17%	36%	**30%**
Etang de Berre	1997	329 000	3,60	25%	1%	5%	1%	**51%**	17%	31%	**26%**
Marseille	1997	1 068 000	3,25	**32%**	0%	**11%**	2%	42%	13%	**43%**	**33%**
Strasbourg	1997	508 000	**4,19**	**30%**	**6%**	8%	1%	42%	12%	**44%**	**36%**
Valenciennes	1997	334 000	3,55	27%	**4%**	6%	1%	42%	**18%**	38%	**31%**
Lille	1998	1 177 000	**3,99**	29%	2%	7%	1%	45%	17%	37%	**30%**
Nice	1998	1 030 000	3,75	**31%**	1%	6%	**4%**	43%	14%	38%	**32%**
Toulon	1998	357 000	3,52	29%	1%	7%	2%	44%	16%	38%	**30%**
Troyes	1998	120 000	3,78	23%	3%	6%	2%	**49%**	16%	32%	**26%**
Average	**1997**	**485 882**	**3,45**	**27%**	**2%**	**7%**	**1%**	**45%**	**16%**	**37%**	**30%**

Source : (household survey) CERTU.
Data base processing: F. Héran. The data in bold are the most noteworthy figures.
MS = market share compared with all the journeys put together.
PC = private car.

1.3 Trends in pedestrian mobility

1.3.1. The decline of walking

The distances people travel on foot have diminished. This is due less to a loss of interest in walking than to the fact that fewer journeys are made on foot, and above all because these journeys have become shorter. The fact that walking and travel by public transport are complementary is another important factor. Walking remains competitive, as it is still the major form of travel for journeys of less than one kilometre. However, the development of urban sprawl means that people now make fewer journeys of this kind, which are being replaced by longer trips for which the car or public transport are more suitable.

Trends in walking vary greatly according to the urban context and the population groups concerned. In towns, walking is stable for trips within the centre itself. People living on housing estates and travelling in the city centre are those who walk most frequently. This is particularly true in Paris, where half the trips are made on foot.

1.3.2 Who walks?

The biggest walkers are traditionally people not in active employment, viz. the elderly and minors. This too has been affected by changes in mobility patterns: the increasing access to motor vehicles by women, young people (as passengers) and senior citizens (with the gradual disappearance of generations of retired people without a licence) has contributed to a drop in the number of walkers. For children, various parental fears mean that they are often escorted to their activities by car.

People walk a great deal for sport, recreation, going to school and shopping. These last two reasons, which were still very important only a few years ago, are now being whittled away by changes in the way commercial activities are organised (the increasing scarcity of local shops) and the fact that many people now escort their children by car, as mentioned above. People did not and still do not often walk to work. According to F. Papon[5] (1997), the proportion of people who do not travel on foot one day a week has risen from 65% to 75% of the population.

Walking is still a vital and indispensable activity. However, there is an increasing tendency for it to be confined to special enclosures - shopping centres, pedestrian streets, historical inner city centres, recreation parks, greenways - which underlines just how sensitive the pedestrian is to the environment in which s/he travels as well as the importance of the design of urban roadways and shopping areas for preserving walking.

The goal of the research on pedestrian sequences in the course of everyday travel, carried out by A. Julien and J.R. Carré[6] (2000), was to analyse the role of walking sequences in different types of journey (multimodal in particular) and to determine the conditions in which they took place (safety, comfort, type and quality of the space).

The total distances walked daily by city-dwellers which emerged from this survey are greater than the values indicated in transport surveys. The number of journeys per

[5] See list of research projects n° 28
[6] See list of research projects, n° 7, 8.

subject (3.4) is comparable with the findings of the Global Survey on Transport in the Ile-de-France region (3.49). This survey arrived at a modal share for walking of 33.6% in 1998. However, the G.S.T. survey considers as pedestrian journeys only those which are made entirely on foot. This explains why daily walking times obtained in the Julien/Carré survey (33 min 30 daily, of which 6 min 30 are spent in transport areas) are higher than those in the G.S.T. (16 minutes daily), thanks to more sophisticated techniques for recording pedestrian travel. This new method of calculation therefore shows that walking is greatly underestimated in the statistics.

The average distance travelled daily on foot is 1,800 metres. The shortest distance recorded was 30 metres (a 43 year-old woman who made all her trips by car), the longest 5,900 metres (a 23 year-old student who walked to a volunteer activity). These results reveal major disparities in the population, in function of age and activity, but also in function of personal tastes: the person mentioned above said he enjoys walking. The distance walked daily in public transport networks is 498 metres.

People who travel only by foot (27 in the survey) spend less time travelling daily (30 minutes on average) than those who use a motor vehicle and whose daily travel times range from one to two hours.

Serious thought should be given to the quality of public space and to pedestrian accessibility to all points of the urban environment, as has been done in cities in other countries which have developed specific policies to cater for the needs of pedestrians, such as Geneva, in Switzerland, and York, in the United Kingdom.1.4 L'accompagnement des enfants en voiture

1.4 Escorting children by car

Children naturally walk for home-school travel. Nevertheless, over the past few years, there has been a marked tendency for parents to escort their children to school by car, even if the school is within walking distance.

Research by ADETEC[7] (2000) has attempted to quantify the proportion of home-school travel for which children are escorted by car, on the basis of a sample of 19 schools (from kindergarten through to secondary school), and to determine the main underlying factors. There is a strong correlation between the travel habits of the parents themselves and their escorting their children. This is related to the broader issue of the increasing complexity of travel loops. Many parents drop their children off on their way to work, which explains why children are more often taken to school in the morning than picked up by car from school in the afternoon.

Furthermore, a child may also sometimes serve as a justification for using a private car for journeys which adults could sometimes accomplish by other means.

Modal distribution for home-school travel in the morning is as follows:

- 42% for walking
- 35% for the car
- 21% for public transport
- 1% for motorised two-wheelers
- 1% for the bicycle

[7] See list of research projects, n° 2.

Walking is still the most frequent mode of travel for all school levels globally, but 20% of the journeys less than 500 metres long and 42% of the journeys between 500 metres and 1 kilometre are made by car. The car is used in the majority of cases for journeys over one kilometre long. The main criteria for choosing a particular mode are:

- the distance between home and school
- safety (road safety and/or fear of attack)
- the availability of an adult to take the child to school
- the quality of the public transport service

Three quarters of the journeys made to escort a child are part of a home-school-work loop. The bicycle is used practically at secondary school level only, and for only 2% of the journeys.

ADETEC estimates that the potential for modal shift on these bases, considering the length of the journeys concerned, is from 5% to 10% for the bicycle, of which only a proportion would replace the car, and from 10% to 15% for walking. It should be noted that this research concerns small and middle-sized towns, Brioude and Clermont-Ferrand, in urban and urban fringe areas.

Half of children's extracurricular activities take place more than 5 kilometres from the home, which means that they need to be escorted by car in most cases. Furthermore, dispensation from school zoning almost systematically leads to a child going by car to a school which is much further away from the home than the local school.

1.5 Trends in bicycle mobility

Francis Papon[8] shows that the main variable explaining the use of the bicycle is ownership. If the total number of bicycles today is broadly comparable with the number of motor cars, they are much less well distributed: 50% of the households do not own a bicycle, whereas only 25% of households do not have a car.

Statistical surveys reveal a marked drop in the use of the bicycle in France since the end of the Second World War. People continue to cycle for recreation (contrary to walking, which has shifted to other modes), but utilitarian uses of the bicycle have declined greatly.

This is the result of a long process in which the private car has been very much encouraged[9]... Furthermore, since the beginning of the 1950s, mopeds (Vélosolex, Mobylettes...) have contributed to an increasingly rapid use of motor vehicles, with the rise of an individual model of mobility, as the motorised two-wheeler became a step (for everyone in the 1950s, essentially for young people today) towards owning a motor car, which first became a symbol of social promotion then a veritable social

[8] See list of research projects, n° 27 and A.

[9] A far from spontaneous development, as from the very beginning, the motor car was promoted by the authorities. See, for example, the circular published by the minister of Public Works, the 10th April 1899, which recommended that the mining engineers, who at that period issued driving licences: "reconcile the legitimate demands for public safety with the equitable requirements of a highly worthwhile industry which merits being encouraged all the more as it is just beginning". This choice, moreover, has continued to be associated with various measures taken in favour of the motor car the most discreet not being the least efficient, as, for example, the order by the Prefect of Paris in 1949 who, by cancelling the obligation for cars to turn on their side lights, which had been compulsory for night parking until then, gave the authorisation to keep one's car in the street.

norm. In France, the bicycle therefore had to co-exist with two motorised competitors: the moped and the motor car.

Over the past 15 years, however, there has been a renewed interest in the bicycle, particularly amongst people living in the centre of major cities.

1.5.1 Cycling today

The bicycle is used more and more often for recreation (visits, leisure activities, sport) and less and less for utilitarian purposes (study, work, shopping). It is associated with nature, health, family, friends and Sunday outings. The development of cycling as a sport means that the car and the bicycle (especially the mountain bike) are often used in combination for getting to where an excursion is to take place.

This explains why, in France, bicycles are not used very much in combination with public transport, which is one of the most common uses in other countries (Germany, Netherlands, Japan). In the same way, whether for everyday travel or recreational trips (cyclo-touring, in particular), bicycles are not very often used in conjunction with the train, given the limited number of trains in which it is authorised to transport them.

However, researchers stress that the bicycle complements rather than competes with public transport.[10] For instance, in an urban sprawl context, in small towns and rural areas, the bicycle provides autonomous mobility for certain population groups, in particular teenagers, women between 50 and 64, and retired people, for whom it constitutes a way of escaping having to be taken places by car.

Thus, modal share for the bicycle is small in big cities, whereas it can be big in small and middle-sized towns (Dunkerque, Douai, Saint-Nazaire, Valence...).

T5 – Share of the different modes in weekday travel according to the departure point, in 1993/1994, in %[11]

Departure point	Private car	Walking	Public transport	Bicycle	Moped	Motor cycle-	Total
Central commune	59.6	**27.3**	**12.4**	1.9	0.8	**0.7**	100
Inner suburbs	61.4	**23.9**	**10.6**	2.7	0.7	**0.6**	100
Outer suburbs	**64.8**	22.9	7.9	**2.9**	**1.2**	0.3	100
Another town	**67.8**	21.4	5.6	**4.0**	**1.0**	0.2	100
Rural	**74.0**	16.3	4.5	**3.9**	**1.1**	0.2	100

Source : INRETS-INSEE Transport and communications survey 1993-1994, DEPLQUOT File
Another town = outer area towns in the first, second or third circle or urban fringe
Rural =urban fringe rural of the first, second and third circles and rural outside Z.P.I.U.

[10] Theoretically competition is valid for short distances in urban areas. In reality, most towns in which a large proportion of journeys are made by public transport also have a large share of journeys by bicycle. In the urban fringe, the bicycle is complementary to means of public transport as a mode for getting to these. L. Bonanomi, 2000)

[11] Diagrams from the report by F. Papon, see list of research projects, n° 28

1.5.2 Why choose the bicycle?

It is difficult to come to a definite conclusion regarding the paradoxical situation of the bicycle, since it is perceived above all as a leisure tool, but in reality, appears to be a vector of mobility for certain population groups. It is now developing very rapidly as a mode of transport, its use for utilitarian purposes is growing, as its particular social marking disappears.

F. Héran (1997), on the basis of a survey carried out in Lille, underlines the fact that the age, social milieu and motivation of urban cyclists are much more diverse than in the past. It is possible to distinguish:

- the practical person, for whom the flexibility and rapidity of the bicycle is important,
- the thrifty person, who wants to keep transport costs down,
- the ecologist, who denounces the environmental impact of the motor car,
- the health enthusiast, who wants to get exercise when travelling.

Two thirds of these people are still men.

The reasons for choosing the bicycle are also complex. If cities with a well-defined cycling policy can boast a rather high modal share for the bicycle, there are also those in which the bicycle has remained a normal mode of travel, without any particular policy ever having been put into practice, in France (Valence, Dunkerque), as in Italy (Ferrara).

However, more people will be persuaded to use the bicycle only if a deliberate policy is implemented, in order to create a modal shift from the motor car to the bicycle, and including the development of cycling facilities, for which French local authorities do not have the technical background.

1.6 Rollerblades and emerging forms of use

In addition to the "traditional" alternative modes of walking and cycling, new modes of travel are emerging - rollerblades, scooters... - generally associated with sport and recreational activities, but which affect urban space, particularly as they challenge the distinction between space reserved for wheeled vehicles and space for pedestrians. The PREDIT "non-motorised" research programme has given consideration to these types of activity, by devoting two research projects to the rollerblade. E. Adamkiewicz[12] (2003) considers that if the rollerblade appears more as a tool for recreational and sporting activities than as a veritable mode of travel, it nevertheless opens up serious prospects, in the light of transformations already in progress in certain urban areas (in North America and Europe essentially) and of the relative interest expressed in non-polluting transport systems. It is suitable for short trips (3 to 5 km). The light-weight equipment necessary, which assimilates rollerblading to a pedestrian trip, although at much greater speed, and the pleasure of being in the open air are its major assets. These are counterbalanced by the risk of accident both with cars and pedestrians, by problems caused by physical obstacles, by being prohibited access to certain zones, a limited capacity for transporting objects and the compulsory wearing of protective gear.

If only a small number of people use rollerblades for travel, essentially in the Paris area, the growing movement throughout the country, which has been taken in

[12] See list of research projects n° 0

hand by grass roots initiatives (organisation of excursions and other events) seems to indicate that a social phenomenon, which cannot be considered as a fleeting fashion, is now coming of age. H. Ollivier[13] (2001) estimates that 10% of the people who use rollerblades do so for travel purposes.

Nevertheless, very little information, and even fewer statistics, exist on the subject and rollerblading and its potential development are not mentioned in Urban Travel Plans. The many different uses of rollerblades are not well known, nor are they taken into account in urban planning. This lack of knowledge, due to an absence of consideration of these activities in urban design, results in either nothing being done, or in the setting up of special "Rollerpark" facilities, which satisfy the needs of only a small proportion of skaters.

In addition to measures limiting space consumption by cars and their speed, which are advantageous to all non-motorised modes, thought should be given to the way public space can be organised, on a temporary or permanent basis, and to new ways of organising the use of certain zones of the roadway so the rollerblade can become one of the new tools for urban design and culture.

[13] See list of research projects n° 26

Chapter 2

Non-motorised modes in traffic: behaviour, risk and the influence of the environment

2.1 Risk, accidents and the health effects of walking and cycling

An important change is occurring in the way the question of risk in transport is being addressed. The central issue, which has concentrated until now on traffic accidents, is changing:

- with respect to transport networks (road, air and rail), intentional risks related to conflicts and attacks[14], as well as technological risks and environmental effects (air pollution and greenhouse effect) are now becoming major considerations,
- for non-motorised modes, the prevailing, and negatively perceived notion of "vulnerability" (see below) is now being replaced by a more general approach which takes into account the fact that these modes are beneficial for public health. The importance of this development can be seen in the decision taken by the WHO in 2001 to launch a research programme aimed at improving the assessment of the advantages of walking and cycling in terms of public health.

The beneficial effects of walking and cycling for health have been studied in many surveys. F. Papon[15] makes reference to these in a series of articles published in the review *Transports*, in 2002. This summary concludes, for instance, that the global effect of cycling is very positive, as the beneficial individual effect for the cardiovascular system exceeds the negative effect of road hazard. With respect to the community as a whole, if pedestrians and cyclists suffer from air pollution and noise, these effects are relatively slight compared with road hazard. On the contrary, walking and cycling have only a very small environmental impact, and even improve the urban environment.

On the international level, there is a fairly extensive body of accident research (in the classical sense of the term). A number of statistical surveys carried out in France have complemented and clarified this. This research is a tool for guiding practical decisions designed to promote these modes.

As in many other countries, the number of accidents involving non-motorised modes has been diminishing constantly for several years: over a period of twenty years, the number of bicycle accidents has been halved, which is a much more

[14] Thus in air transport, acts of violence are responsible for an increasing share of the risk, even if the international organisations (IATA, for example) refuse to incorporate these losses in their statistics.
[15] Papon, F.- La marche et le vélo, quels bilans économiques pour l'individu et la collectivité? *in* : Transports n° 412-414, 2002

marked reduction than for other road users. The number of pedestrians killed in France dropped from 3,202 in 1970 to 987 in 1996. However, this is due essentially to the relative decrease in the number of pedestrians compared with the total number of journeys, rather than improved safety conditions.

When one analyses bicycle accidents in France since the beginning of the last century, it can be seen that the number of deaths (the most reliable indicator) diminished rapidly in the early years, which demonstrates that people were becoming familiar this mode of transport. A similar phenomenon was also observed for the motor car. However, as of the 1930s, the number of deaths in proportion to the total number of bicycles rose yet again, due to increasing motor traffic, as can be seen in the number of bicycles/number of cars ratio. Safety for cyclists is very much linked to the numerical balance between bicycles and motor cars, as can be seen in the table below.

T6 - Trends in risk for cyclists over one century in France :

	Number of bicycles for ONE motor vehicle	Number of cyclists killed	Cyclists KILLED per 100,000 bicycles
1900	**336**	**70**	**7**
1913	**35**	**120**	**3**
1928	15	200	3
1938	5	380	4
1957	**2**	**1046**	**13**
1967	1	837	8
1979	0,7	589	4
1993	**1**	**328**	**1**

JR Carré, RTS 1995

The turning point for the bicycle occurred around 1955: competition from both the motor car and the moped caused the use of the bicycle to decline more quickly than in neighbouring countries. In addition, the rapid growth of badly regulated motor traffic generated such road hazards that, between the mid-1950s and the end of the 1960s, the physical elimination of cyclists was such that they almost disappeared.

The accident rate for cyclists reached its maximum in the mid-1950s, when the number of bicycles dropped to two for one motor car. This was particularly effective in dissuading people from cycling until the end of the 1970s, when the bicycle/motor car ratio fell to its lowest point. The most recent figures show a more favourable tendency, corresponding to the development of the bicycle as a leisure vehicle (and in particular the “boom“ of the mountain bike), which has led to a more satisfactory bicycle/motor car ratio.

Traffic restraint policies, such as those implemented in 30 kph zones, contribute to making journeys more comfortable, more pleasant and safer for pedestrians. However, these measures are limited to only some specific sites (city centres, near schools...) and are too few for one to be able to talk of a general improvement for pedestrians. In effect, the areas reserved for them are too often of mediocre quality and the motor car tends increasingly to take over public space, including that which, in principle, is reserved for pedestrians (c.f. 3.2.1 below).

2.1.1 Characteristics of risk for pedestrian and cyclists

Accidents involving pedestrians occur essentially in built-up areas (93% in 1991), but accidents occurring in the open country (7% of the total) are much more serious: 31% of the deaths on the network occur outside a built-up area. The same situation prevails for the bicycle: only 17% of the accidents occur in the open country, but these represent 50% of the fatal accidents (O.N.I.S.R., 1993). Speed on little used roads, shorter reaction times, the lack of night lighting, the absence of footpaths, all explain this difference between urban and rural areas.

The study by A. Julien and J.R. Carré[16] (2000) on pedestrian risk exposure reveals the very small proportion of journeys during which pedestrians are directly exposed to the risk of an accident, whether the indicator employed is duration, distance or the number of crossings. If the average time spent walking daily is 33 min 30 seconds, the average duration of exposure to road hazard is 3 min 34 seconds, including the time spent crossing or walking on the road. Risk, calculated on the basis of this fraction of total walking time, during which the pedestrian is exposed to motor traffic, is therefore very much higher than the estimations based on data in the Ile-de-France global transport survey. This new data shows that for pedestrians, the risk of being injured or killed is much higher than for motorists, while the risk of coming out of an accident unscathed is very much lower.

T7 – Comparative risk for pedestrians and motorists

Risk ($x10^9$) Of being …	**MOTORISTS**	**PEDESTRIANS**	
	Basis : duration of motor car journeys (GTS)	Basis : duration of total pedestrian trips (GTS)	Basis : duration walking on the road and crossing (INRETS)
KILLED	3	3	29
Seriously injured	11	23	240
Slightly injured	122	125	1335
Uninjured	214	1	15

Sources : GTS, ONISR, INRETS 'pedestrian survey'

Research by Jean-René Carré[17] on cycling accidents demonstrates that the most common accident is a non-serious fall. Although it is difficult to count these, in surveys involving cyclists they have been calculated to be more than half the total number of accidents. People who cycle daily in urban areas are the most exposed (injury accident police reports). When the number of fatal accidents is compared with the number of motor vehicles, it can be seen that the bicycle is less dangerous than other two-wheelers: 2 accidents per 100,000 bicycles, compared with 25 for mopeds and 86 for motorbikes.

The most common cycling accidents in France are rear-end collisions or collisions occurring when a car overtakes a bicycle (38% of the collisions). In Northern Europe, most accidents occur at intersections, because there are extensive facilities

[16] c.f. List of research projects n° 7 and 8

[17] These data concerning cycling accidents have been worked out by cross-referencing different sources: INRETS-DERA file on 1/50° of the injury accident police reports, SETRA-ONISR file, medical information on trauma carried out on a temporary basis in hospitals, surveys, quoted in: Carré, Jean-René.-La bicyclette, un mode de déplacement méconnu dans ses risques comme dans son usage *in*: RTS, n° 49, 1995.

mid-block which reduce the number of accidents but increase the risk at intersections, as cyclists are no longer protected. It can not be excluded that, in these countries, there is excess risk at intersections, as cyclists are used to specially designed infrastructures which isolate them from motor traffic.

2.1.2 The cause of accidents

Accidents involving non-motorised modes are very much linked to the lack of visibility and/or lighting. Pedestrian accident rates are higher during the winter months, when the light is low and bad weather more frequent. Most cycling accidents occur at the end of the afternoon and the beginning of the evening, when motor traffic is heaviest. The most serious accidents, and fatal accidents in particular, generally occur in the open country, especially at night (almost one fatal accident out of 3), despite the fact that very few cyclists travel at night.

Certain pedestrians are more vulnerable than others in traffic: children concealed by parked cars, mobility-impaired elderly people. One of the problems of the bicycle is that it is difficult to see, on account of its small size. This factor is compounded by the weak lighting at night or the carelessness of cyclists who ride in town without lights. The lack of visibility of cyclists is aggravated by "the illusion of visibility" (B. Ferguson and N.B. Blampied, 1991)[18]: cyclists think that they are seen by other users because they see them. But motorists, in their peripheral vision, both at night and in the daytime pay attention only to masses equivalent to that of their own vehicle.

Children and elderly people are the categories which encounter the greatest difficulties when crossing, and who are over-represented in pedestrian accidents. A number of surveys indicate that a significant proportion of pedestrian accidents in urban areas occur on roadways on which a range of functions are combined, including transit, shopping and housing, and where cars travel at high speed, where crossings are frequent and irregular and where many vulnerable users (children, elderly people) are present. The sensitive zones are arterial and collector roads, busy shopping streets and roads leading out of towns where speeds, long crossings, an ambiguous status of infrastructures and the lack of facilities are all factors of risk.

2.2 Analysis of behaviour

Cycling and pedestrian facilities are often designed in such a way as to segregate the different user categories which, in the mind of the designers, provides the highest level of safety . By analysing in detail how subjects behave when travelling, it is possible to establish more precisely what they do in reality, and the different types of behaviour amongst users of a same mode. This research could thus constitute a basis for a more global approach to the behaviour of cyclists and pedestrians, for the measures implemented by people working in the field to be better suited to the needs and expectations of these user categories.

2.2.1 Pedestrian behaviour

Interviews of people participating in the Julien & Carré survey[19] (2000) after they had completed walking sequences provide information on the way they perceived their trips. During the interviews, more than a quarter of the subjects expressed a

[18] See the general bibliography.
[19] See the list of research projects, n° 7 and 8

feeling of insecurity, with respect to the risk of an attack in public transport, the dangers of motor traffic, and "social" dangers in certain places (stations). Unlawful parking by cars on footpaths is also a frequently observed problem. Insecurity, real or perceived, can sometimes lead to people changing their mode of travel, and is a factor in the spread of chauffeuring.

Frequent disruptions in public transport are considered to be a source of discomfort by 21% of the subjects who use this mode, as are long and complex connections and crowds. The advantages mentioned are the rapidity, the possibility of using one's time to do something other than driving, if travelling by public transport in dedicated lanes, the RER or the train, conviviality and comfort in buses. Discomfort is mentioned essentially by elderly people and children, and sequences are explicitly mentioned as being unpleasant because noisy, busy with heavy traffic, polluted, or with difficult crossings.

2.2.2. An analysis of the behaviour of cyclists

The behaviour of cyclists was analysed in the course of the RESBI experiment (experimental research on cycling strategies in traffic)[20] (JR Carré, 2001), using a bicycle equipped with video cameras for filming both the road scene and the movements made by cyclists to seek information. The aim was to obtain comprehensive data on the behaviour of cyclists in traffic, which could help planners and engineers take their needs better into account.

[20] See the list of research projects, n° 6

The behaviour of cyclists is different from that of pedestrians, in that they are interested more in efficiency when choosing a route than in riding through pleasant surroundings, at least when the journey has a utilitarian purpose. A cyclist is motivated above all by the desire to move easily with the traffic, to make the necessary manoeuvres to keep a constant speed and, above all, to avoid having to stop. The small size and the manoeuvrability of his vehicle are an advantage in this respect. When he comes across an obstacle, or if traffic is too dense, a cyclist can change position and use the footpath.

The behaviour of a cyclist in traffic appears not to change: he spends more than three quarters of the time riding straight ahead, on the right hand side of the roadway. However, because of the great number intersections and obstacles (vehicles parked on the edge of the road), he needs constantly to anticipate ways of avoiding these obstacles and to plan his position at intersections in function of the movement of cars.

For these reasons, a cyclist tends not always to respect the road code to the letter. These deviations are generally deliberate, and are the result of a better understanding of the situation than a motorist could have (wider field of vision, higher position, slower speed). Thus, cyclists often overtake on the right (an offence in France, but authorised in Switzerland), do not stop at red lights when turning right, place themselves in front of cars stopped at a red light, in order to start off again ahead of the traffic.

Behaviour also varies with the experience of the cyclist. This is why specialists such as Oskar Balsiger (1990) recommend that facilities be designed so as to cater for both fast, experienced cyclists, who move with the traffic, and slower or less experienced cyclists, as well as those who are carrying a heavy load, who need to be kept away from the traffic.

2.3 Obstacles to non-motorised modes

Researchers working on the subject agree that the serious obstacles to walking and bicycling in towns are sufficient to discourage people from using these modes of transport in certain cases. The rise in motor traffic deters those categories who would be the most likely to use these modes, children in particular, from using public space[21].

These obstacles are often due to the fact that not enough attention is paid to the needs of non-motorised users, either because technical references are lacking, or because their particular requirements are insufficiently taken into account. Pedestrians and cyclists are penalised by detours and environmental nuisances, because they are not protected, as is a motorist, by a passenger compartment and because they depend on muscle power, which makes any lengthening of a route synonymous with extra effort.

[21] Mayer Hillman, John Adams and John Whitteleg demonstrated in their work in 1990: “One false move: a study of children’s independent mobility” (see bibliography) that limits put on children’s mobility as a result of road hazard have definite consequences for their development: retarded autonomy, more restricted socialisation, less varied and less frequent group games.

2.3.1 Obstacles in the urban environment

Psychological obstacles (the feeling of insecurity) can not be separated from the physical conditions of travel which foster a negative climate: barriers which lengthen journeys, restrictive facilities, discomfort and badly maintained roadways, zones designed solely for motor vehicles (many urban ring roads, for instance), without any markings for crossings or footpaths. For certain researchers, this is the result of society's bias in favour of technical options, promoting motor travel to the detriment of all others.

A great deal of discomfort

During traffic sequences, pedestrians and cyclists are subjected to many forms of discomfort:

- noise and air pollution, a degraded urban environment and landscape
- the narrowness of the special areas available to them (footpaths, tracks, lanes)
- the lack of maintenance (subways, footpaths, cycling facilities)
- unlawful parking, the cluttering up of footpaths by urban furniture

The feeling of discomfort and insecurity is particularly acute on the fringes or the outskirts of towns, which are much less well equipped than the centre, where there are sometimes no footpaths and where fast traffic makes crossing difficult.

Facilities which afford physical protection (barriers, chicanes) put severe restrictions on people, obliging them to wait or take a route which is not convenient for them. These obligations, which not all pedestrians respect, create situations in which accidents are more likely to occur. CERTU envisages, for example, abolishing pedestrian crossings in local service streets where there is a 30 kph limit. Protruding footpaths are preferable in such cases, for four reasons: they reduce the length of the crossing, slow traffic down, improve mutual visibility and simplify pedestrian itineraries. This single example does not, however, account for the many possible ways of improving pedestrian safety and comfort during crossings.

Severance effect

The Anglo-Saxon approach to severance effect has established the notion of *Traffic Barrier* as the framework for analysing barriers as obstacles and objective and subjective factors of risk for pedestrians. In this same line of thought, the work carried out in San Francisco by D. Appleyard (1981)[22] demonstrates that motor traffic has a negative impact on social relations between neighbours in a same street, and is a factor which generates divisions between communities.

The aim of the research undertaken on this issue by F. Héran (1999, 2000) in the PREDIT[23] framework, was to arrive at a better evaluation of the impact of severance effect on mobility of pedestrians and cyclists in urban areas. The approach is based on the principle that severance effect exists whenever an obstacle obliges a user to make a major detour. Thus, a natural obstacle (river, relief), a large, closed surface (factory, railway yards), temporary obstacles (park, cemetery closed at night) all cause severance effect.

[22] See general bibliography
[23] See the list of research projects, n° 14, 16

Severance effects have severe consequences for travel by non-motorised users, as the length of the routes they are obliged to take often acts as a deterrent. In addition, they are also at the centre of a process which contributes to breaking up a town into mono-functional zones, which leads to an increase in motor traffic and provides a justification for using the motor car. These consequences can be divided into three categories:

- the immediate effects on travel: longer crossing times, longer trips, more dangerous crossings and increased motor traffic
- the indirect effects for the neighbourhood: fewer social contacts, isolation of difficult areas;
- the long term effects on the urban fabric: a mono-functional use of space, the loss of territorial legibility and urban development adapted solely to motor vehicles.

A solution to severance effect has been sought in the construction of underground or overhead crossings. These are often of mediocre quality, as they are badly maintained, or lead to an increase in the length of journeys comparable to that caused by the barrier itself (ramp, detour to reach the crossing). Crossings can be improved, but the problem must also be addressed in terms of town planning, by increasing the permeability of space. Alleys, passageways, paths crossing through parks, blocks or various land takes must be preserved when they do exist, planned in new constructions and renovated to improve their quality and their attractiveness.

2.3.2 Psychological obstacles

Amongst the psychological obstacles, those which are most frequently mentioned are:

- the risk of theft, greatly underestimated by non-cyclists,
- the negative image of the bicycle, once a popular mode but considered today as eccentric, and of walking, considered as a second-class mode,
- insecurity, perceived by users or their entourage, which leads them to give up these modes of travel in favour of others, and resulting in the development of chauffeuring by car.

However, opinions on non-motorised modes and traffic restraint in general seem more contrasted than one might imagine. Many people deplore the lost autonomy of their children, the fact that they are restricted in their mobility by the absence of alternatives, or subjected to the nuisances caused by traffic. Thus, an opinion poll carried out by GART in 1993 showed that 71% of city dwellers were rather in agreement with pursuing the development of public transport, even if this meant discontenting motorists, and that it was necessary to limit the use of the car in order to improve traffic conditions in town.

2.3.3 Obstacles related to planning and regulations

The bicycle is considered by the French Road Code as a full-fledged vehicle, and is therefore subject to the same rules as motor vehicles, such as respecting one-way streets. It has been seen above that these are a considerable handicap to cyclists, on account of detours, and therefore the extra effort necessary. The detours which pedestrians are obliged to make, or the lack of specific facilities, can cause them considerable inconvenience too.

The road system has been transformed in order to improve traffic flow by increasing capacity and speeds. Slip roads, viaducts, giant roundabouts, road bridges and tunnels have been constructed right into the centre of towns. For pedestrians, these facilities are synonymous with long and dangerous, or even impossible crossings. Cyclists can be pushed onto an expressway, or forced to cross extra intersections in fast traffic. The study on severance effect analyses several specific cases, in the Paris suburbs in particular.

The lack of reliable parking facilities where people study or work is one of the factors limiting the use of the bicycle. Well-equipped, aesthetic parking facilities (arch-shaped cycle stands enabling bicycles to be attached in two places, with a roof for protection from bad weather) are elements which would serve to promote the bicycle. In urban areas, cyclists can be discouraged from using their bicycles on a daily basis because they often do not have practical parking facilities at home, in particular in dense urban zones.

The study of the circumstances in which thefts occur, carried out in the context of the work by F. Héran (IFRESI-CNRS) and N. Mercat (Altermodal)[24], reveals that half of the bicycle thefts occur on private property. Cyclists appear particularly negligent, since in almost one quarter of the cases, the bicycles were not attached at all, and in 95% of the cases, theft protection was inadequate. The main victims are inexperienced cyclists who have just bought a new bicycle. Furthermore, the return of stolen bicycles to their owners is almost impossible, since the police has no means of identifying them.

The survey by S. Barles[25] on cycling in the new towns in Paris region also shows that there is no guarantee that facilities will be used when they do exist. The Val-Maubuée cycling track networks in the new town of Marne-la-Vallée, which have been badly maintained since they were built and which are not equipped with signals, are not used by the cyclists who participated in this survey, either because they did not know that they existed, or because there are numerous obstacles to cycling and they consider that it is more practical to use ordinary roads. The situation is often the same for pedestrian pathways, which are supposed to enable the inhabitants of new towns to travel away from the main highways.

2.4 Integration and segregation of traffic: the pitfalls

The comparative survey carried out by Arantxa Julien[26] on the basis of the major European manuals on cycling facilities highlights the fact that the crucial point is that of the choice between two opposing principles:

- integrating the cyclist in the general road network,
- developing a segregated cycling network by means of cycling tracks.

Some experts (c.f. Oskar Balsiger (1990), Jean-René Carré (1995)), consider that the construction of a complete network superimposed on the road network is not appropriate in existing urban centres, where available space is rare. It is longer and more difficult to realise.

[24] See list of research projects, n° 17
[25] See list of research projects, n° 4
[26] See the list of research projects n° 19

Accident surveys conclude, moreover, that cycle track networks are globally negative, from a safety point of view[27]. Nevertheless, such considerations are counterbalanced by the fact that the cycling track provides better protection once a certain level of traffic has been reached, when speeds are high, and when there are no intersections with other roads (along a waterway or a railway, for example)[28].

THE CYCLING LANE	**THE CYCLING TRACK**
On a road with several lanes, designates the lanes reserved for cyclists, delimited by a broken white line.	Designates a road reserved for cyclists, physically separated from the roadway on which motor vehicles travel.

In Europe, the prevailing trend is to integrate cyclists in road traffic: apart from the fact that the technical constraints of using a bicycle are better known, and that the facilities are therefore designed accordingly, the advantages represented by the cyclist for moderating traffic are now also known. Cycling facilities also make it possible to mark the place of the cyclist on the roadway as a full road user.

The analysis of cycling facility manuals by A. Julien shows that the criteria for choice between integration and segregation are essentially the same (related to the speed and volume of motor traffic) in different countries, whereas thresholds and technical solutions adopted can be different.

One of the approaches in these manuals is a behaviourist approach, which is based on the specific characteristics of the cyclist and his or her vehicle, and therefore proposes solutions to the problems encountered by users on this basis. The Swiss manual is the most representative of this.

Nevertheless, the dominant approach is a normative, technical one, as in the Dutch and Quebec manuals. This last, which is a carbon copy of road manuals, insists on specific equipment for a specific user category: cyclists. This approach has the disadvantage of making only a very marginal link between cycling facilities and the road network or the urban environment.

[27] A survey by Gaarder and Leden, which summarises the various monographs on cycling track networks is very pessimistic about their effectiveness in terms of safety: they are said to increase the number of accidents by 40%. See the general bibliography.

[28] See in this issue Goodefroij, T.-Criteria for integration or segregation of different modes of transport (bicycle and motor traffic).-Vélo Québec, *in* Perspectives Mondiales sur le Vélo, Montréal 13-17 September 1992, pages 162-164.

Chapitre 3

Observations and porposals for a city with fewer cars

The development of motorised mobility has brought about many changes in people's lifestyles. Spatial repercussions are growing even today, in terms of urban sprawl and the impact on the landscape. In addition to the monographic approach to non-motorised modes, it was therefore necessary to undertake more general investigations into urban development and the ways in which it interacts with mobility.

The research presented in this chapter highlights the changes in cities due to the motor car, and in particular the emergence of the urban fringe lifestyle, made possible by the widespread use of the car and currently the most preoccupying consequence of this, from the point of view of the urban, ecological and societal choices which are currently in vogue.

The growth of the urban fringe seems largely responsible for this development. Between 1982 and 1994, the average distance between the centre of urban agglomerations and residential areas increased by 12%, the number of jobs in the outer suburbs increased by 24%, and travel between the suburbs and the city outskirts increased by 79%, amounting to millions of kilometres daily[29].

The notion of modal choice, based on the postulate that the user chooses his/her mode of transport for every journey, is less evident when one considers the social context which influences a person, the location of housing which can be the result of a choice, but also of necessity, and transport chains, the mode chosen at the beginning conditioning the mode used during subsequent trips. In the same way, the relationship between the different types of mobility and subsequent adjustments show that the system does not hinge on the place of residence, but that this is a dynamic element of it.

As is underlined by M. Wiel [30](1998), it is no longer acceptable to reduce mobility to a category of services consumed by households and enterprises, as this has the disadvantage of confirming a vision of mobility as the sole outcome of the lifestyles of private persons and of the needs of the productive system. For the town-planner, desirable conditions of mobility are therefore much more the result of the way in which urban forms are assembled, than of a need to evacuate traffic flow induced by this layout. Urban design takes precedence over traffic-centred considerations.

[29] See general bibliography: J.P. Orfeuil (1994)
[30] See general bibliography

3.1 Changes in urban space

3.1.1. The gradual congestion of the older centres

The arrival of the motor car has progressively transformed the pedestrian town, from one fully occupied by its inhabitants and their activities, to a town dominated by streets, in which most of the undeveloped space is allocated to traffic. The footpath, which appeared in the 19th century, constituted progress with respect to hygiene and safety, but it also meant that the principle of traffic separation was to become established doctrine. Faced with the rise of motor traffic, non-motorised modes were given support, but this was too limited to halt their decline. In the 1970s, the car tended to rule the street, in terms of traffic and parking.

As traffic jams became increasingly widespread, managers were concerned with removing non-motorised users from the roadway. Traffic relief was achieved by reducing footpaths, and by an initial spatial segregation, excluding pedestrians from the roadway, except at authorised crossings. In Paris, footpaths, which represented 40% of the roads in 1900, represented only 30% in 1940 and 25% in 1960[31].

The rue du Gros Horloge, in Rouen, was the first pedestrian street to be opened in 1970. At the time, this corresponded rather to a policy aimed at bringing back life to town centres, which had to compete with shopping centres set up on the outskirts than to a travel policy. If the measures taken to prohibit and limit traffic, with a view to creating zones reserved for pedestrians and public transport have been a real success, they are spatially very limited and have not, for this reason, deterred people from using a private car.

Increasing urban traffic generates a certain number of environmental problems and contributes to the spread of a fearsome image of city centres: increasing traffic jams, noise and air pollution, with consequences researchers are in agreement about (V. Kaufmann[32], 1997; F. Héran[33], 1997, 2000):

- access is more difficult: traffic congestion and parking problems make access more difficult to many central areas and facilities, which people gradually abandon for facilities on the outskirts;
- the street loses its multifunctional nature, as well as its status as a place for informal communication: "living in a street is replaced by travelling through it".
- the acoustic environment and air quality deteriorate, people retreat to inner courtyards, resulting in a loss of control over the street. A gradual selection occurs in the urban area, tending to leave the zones exposed to environmental damage to the more modest social categories.
- the number of accidents increases, affecting motorcyclists, cyclists and pedestrians.
- travelling conditions for non-motorists deteriorate: public transport vehicles are caught in traffic jams, pedestrian routes are chopped up by main roads, those built to cater for fast traffic become dangerous, the mono-functional use of land is encouraged, increasing the distances people must travel, to which should be added the development of barriers which force detours on non-motorised users.

[31] Guillerme, A (1990), see general bibliography
[32] See list of research projects, n° 21, 22
[33] See list of research projects, n° 15, 16

3.1.2 Monopolisation of space by the motor car

In addition to the occupation of almost all the available traffic space by motor vehicles, which in certain cases leave pedestrians only minimal left-over space, parked cars frequently invade space reserved for pedestrians.

In order to assess the discomfort thus caused to pedestrians, B. Cordier of ADETEC[34] carried out a survey on unauthorised parking on footpaths. In Clermont-Ferrand (137,000 inhabitants), where the survey was organised, 8,000 vehicles were found to be unlawfully parked every 70 metres along the footpath. In two cases out of three (i.e. every 100 metres), a car left less than 90 cm for pedestrians to pass, making it impossible for people to cross, or for wheelchairs and pushchairs to pass. The inconvenience caused in the course of a 500 metre trip on foot can be summarised as follows:

T8 – difficulties during a walking trip of 500 metres :

	Necessary width	**Number of vehicles blocking passage**	**Number of vehicles preventing a valid pedestrian from crossing**	**Number of vehicles preventing a mobility handicapped person crossing**
Able-bodied adult pedestrian	0.60 m	**3 - 4**	**5 - 6**	**6**
Pedestrian with load	0.90 m	**5**	**6**	**6**
2 able-bodied adult pedestrians side by side	1.10 m	**5 - 6**	**6**	**6**
Mobility handicapped person	0.90 m	**5**	**6**	**6**
Adult with 2 children	1.40 m	**6**	**6 - 7**	**6 - 7**

In 40% of the cases, one or several free parking places were available within 500 metres. Disciplinary action is not often taken against offenders, which no doubt explains why this phenomenon is so widespread: in Clermont-Ferrand - only 750 vehicles are impounded and 6000 reports issued annually.

However, it is possible to take effective action on the local level, as can be seen with the example of Sotteville-lès-Rouen, which has succeeded in reducing unauthorised parking in quite a spectacular manner.

[34] See list of research projects, n° 1

T 9 - Results of a campaign against unlawful parking

	Sotteville-lès-Rouen	**Clermont-Fd and Chamalières**
A car every… metres along the footpath	600 m	70 m
A car leaving less than 90 cm for pedestrians every … metres of footpath	3 000 m	100 m

3.1.3 The second step: urban sprawl

The corollary to motorised mobility is urban sprawl: with a car, it is possible to live further from the town centre and from the workplace, while preserving an urban way of life. This is what M. Wiel calls “facilitated mobility", which develops opposition between multi-territoriality on the one hand and enclosure on the other. For example, widespread housing is associated with a dispersion of activities, which makes access difficult to a growing number of jobs for people without a car.

Commercial activities are characteristically set up according to a strategy of intensive growth, which requires being within reach of all available markets, both city centres, and shopping centres on the outskirts. However, for daily provisions, supply continues to be concentrated on a limited number of sites, to the detriment of local centres[35]. But the notion of proximity has it applications in France today, thanks to new policies for setting up public services, such as ASSEDIC (unemployment benefits) and ANPE (employment agency) offices, post offices, in the framework of urban development plans.

There results a dichotomy between the historical town, where traditional activities, such as walking, can be preserved, and the so-called “emerging town”, according to the expression of G. Dubois-Taine, which operates around major transport infrastructures and is characterised more by an urban lifestyle and mobility than by clearly defined spatial limits. Contrary to the traditional town, whose density was due essentially to restricted mobility, this new urban entity is characterised by a change of scale, brought about by the motor car, which makes it possible to travel further at a modest cost.

In debates on the future of the city, these two models are seen to be opposites. It is clear that the low-density city turns its back to the dense, multifunctional city which most town-planners find desirable. In urban development plans, it is stated that a choice has been made in favour of the high-density city, whereas, in reality, a space is developing which guarantees access to the resources of the city in an area without continuity or density, functionally divided to the extreme.

3.1.4 The failure of planning?

Must one come to the conclusion that, in the field of town planning, control of urban development and therefore of travel has been a failure? The results of spatial planning are ambiguous: if the urban perimeters laid down in urban development plans have been respected, space consumption, on the contrary, has been very high,

[35] See the research financed by the PREDIT Groupe-Programme n° 4: Mobilité, développement économique et aménagement.

as the zones of urban development, intended for a population growth far greater than there has been in reality, have been totally consumed[36].

According to V. Kaufmann[37] (2000), the introduction of the motor car has led to a division between urban development and urban transport policies, which had been quite logically linked. From the moment the car comes into widespread use, the regional planning authorities seem unable to contain it or to control urban sprawl .

Space consumption caused by urban sprawl can be translated into figures: according to D. Apel[38] (1999), urbanised space (including the part occupied by traffic) amounts to 226m^2 in the town centre and 824m^2 in the suburban outskirts (figures for Germany).

It is clear that the measures implemented to curb the use of the motor car in urban areas have their limits: policies to combine housing and employment come up against residential mobility, which is rarely motivated by the desire to live closer to the workplace. In the same way, improvements in public transport encourage new clients amongst former pedestrians more than they convince motorists to abandon their vehicles. The same situation arises with Park & Ride: fewer vehicles enter the city centre, but more travel to the railway station.

F. Beaucire[39] (1998) notes that expressions used in planning documents of the 1960s/1970s, such as "fighting" or "avoiding" urban sprawl, were being replaced by terms like "channelling urban sprawl" as we approached the year 2000. This author also underlines the fact that road infrastructures which have already been programmed are proceeding without deviating very much from the initial projects, despite the fact that the control of urban sprawl has been a stated objective of all urban development plans since the 1970s. The new infrastructures attract new inhabitants, and therefore traffic, to the zones they serve.

In the end, despite more sophisticated planning tools, procedures do not always correspond to real goals, and there is a lack of consideration of the links between the various projects planned for the different sectors.

M. Wiel[40] (1998) notes that the relevant local institutions seem to be waiting desperately for local powers to be defined which correspond to their level of authority. He proposes a method in which a project would delimit the geographical contour of associated regions, thus leading to the emergence of new levels of authority, in particular the zone of employment and daily life for urban sectors.

However, the time factor must also be taken into account when assessing an urban policy, and the disappointing results of sector-based evaluations must not make us forget that it is necessary to combine the various means of action to arrive at tangible results. Operational efficiency could be conceived only if there were shared objectives between the legislature (Law on Air, Law on Solidarity and Urban Renewal) and the local decision-making level.

[36] On this subject, see in the general bibliography: Beaucire, F et al. (1999)
[37] See list of research projects n° 21 and 22
[38] Presentation at the seminar: “Formes urbaines du futur et mobilité non motorisée” c.f. list of research projects Ref. A.
[39] c.f. reference above
[40] See general bibliography

3.2 Town, place of residence and travel habits

The research presented in this report looks above all into mobility in an urban fringe environment and attempts to assess the potential modal shift in this context, sometimes by making comparisons with suburban or central urban fabrics.

3.2.1 A restrictive housing market

According to V. Kaufmann, C. Jemelin and J-M. Guidez[41] (1996), the predisposition to using a motor vehicle, although dominant, does not appear to be a general phenomenon. The rapid growth of urban sprawl is said to be incorrectly interpreted as the result of its conformity with the dominant values of the period: the desire for ownership, to live in a private house, to travel by car in order to "privatise" mobility and space-time, made possible by the car...

To test this hypothesis, these researchers made a survey[42] (2000) in different types of district in French towns: central and pericentral districts, in new towns and in urban fringe fabric in four French cities (Paris, Lyons, Aix-en-Provence, Strasbourg), in order to gather data on people's travel habits, as well as their opinions regarding the environment they live in.

The basic hypothesis was confirmed: the way in which the housing market operates, and in particular the lack of suitable supply in the centre, often obliges families who want to own a big house or apartment to migrate towards the urban fringe. However residents say that they are particularly attached to the central areas of towns and that they would like to be able to continue to live there. If, in effect, a dominant model to which people aspire does exist, associating the motor car, social integration through contacts and private housing, other models were highlighted, although the people concerned often experienced difficulties when they attempted to turn these models into reality, because of the demands of their programme of activities and the restrictions imposed on them by urban structure.

Another survey carried out by the CREPAH[43] (1998) came to a similar conclusion: of 72 young households in the Rouen area who had acquired a house in the urban fringe, 40% to 50% underlined that property costs were the determining factor in their decision. It is important for them to be able to go into town regularly and they consider themselves to be "in transit" in the urban fringe, and intend to return to an area closer to the centre when they have enough income.

A study on zero interest loan schemes in the Ile-de-France region between 1996 and 1998[44] also demonstrates that the conditions for obtaining such loans contribute to urban sprawl, as almost 70% of them were granted in the outer Paris suburbs, whereas the system hardly exists in Paris itself or on a south-west axis running through the Hauts-de-Seine, Essone and Yvelines departments. Moreover, the profile of the households who do have a private house built in zones away from the centre shows that people choose to acquire a house in the urban fringe essentially because of limited resources and market conditions, the personal contribution acting as an adjustment variable used to select buyers in the various geographical zones.

[41] See list of research projects n° 21
[42] See list of research projects n° 22
[43] See general bibliography
[44] See in the general bibliography: Grimal, R (2001), p. 10-15

The control of the housing market, characterised by financial effort thresholds in function of the income of the household, engenders social selection which directs the least well-off families towards the least expensive (and generally the most distant) areas of a city. But the savings made on housing are lost in extra expenses on transport: an INRETS survey in Ile-de-France[45] (1998) shows that travel-related expenses represent only 6% of the budget in the central zone but rise to 26% in the zones furthest away from the centre, and that global expenses for housing and transport represent one third of the revenue in the most central zones, and rise to 52% in the most distant zone (59% for new property-owners).

The rules are difficult to modify in town centres which are no longer changing, or which change little, and in the urban fringe, which has developed because of the automobile system. It is, on the other hand, possible to modify the urban dynamic in the suburbs, which are too often degraded, but which can combine a dense urban fabric, lower housing prices than in the centre, local facilities and a good public transport coverage. The most suitable urban fabric, according to V. Kaufmann (2000) seems to be that of the inner suburbs, whose prestige is currently at a low ebb, but which constitute an already partially densified fabric, where real estate options linked to the disengagement of industrial activities allow for the development of a dense, sustainable city.

In his research on the inner Paris suburbs[46], E. Charmes (2001) also pursues this line of thought. He has studied the dynamics underlying the property market. He demonstrates that people do not look for the densest town for its own sake, but for the urban qualities associated with the concentration of human beings. Thus public transport services occupy a predominant place in the development of the Paris inner suburbs. But this is not the only factor: quick pedestrian accessibility to facilities, services and shops is also a powerful force of attraction. For the inner suburbs to be upgraded, it is essential for these qualities, which are often threatened, to be actively encouraged.

3.2.2 Dependence on the motor car in question

People living in the urban fringe are very much dependent on the motor car, which is essential if they are to develop a complex programme of activities, contrary to those living in dense, multifunctional areas. Furthermore, people commonly use the car as a reflex, because it is considered to be an expression of social standing and because of prejudice against public transport.

However, as is stressed by M. Wiel, it would seem that the use of a car for all travel corresponds above all to an ideal form of behaviour of well-off people, who associate it with urban fringe housing and related social integration. On the contrary, according to research by V. Kaufmann, residents appropriate the environment in which they live in various ways, which are not greatly related to the nature of the area in which their home is located. But, as they demonstrate, if not all the people want to own a motor car and a house in the urban fringe, a series of constraints linked to urban dynamics push people who have other aspirations, to adopt the dominant model: the spatial organisation of urban areas, unsuitability of public transport supply.

[45] See in the general bibliography: Polacchini A.R., Orfeuil, J.P., (1998)
[46] See list of research projects n° 9

J.M. Beauvais[47] (1999) has studied the mobility and lifestyles of families with and without a motor vehicle living on the outskirts of Tours, whose situation and layout is typically that associated with urban fringe housing. The district concerned is serviced by a bus line which goes into the centre. The study shows that, despite a feeling of strangeness, which means that they call themselves "curious beasts", the non-motorised families manage to be sufficiently mobile, although they must select their destinations and organise their timetables more carefully than others.

The fact of not owning a motor vehicle has a great effect on modal distribution. The members of non-motorised households travel by car for only 14% of their journeys, compared with 76% for a person from a household with two vehicles. The extra time spent by the non-motorised person in trips and waiting for public transport is only 8 minutes daily on average. On the other hand, these people do not travel as far as the others: 10km per day, compared with 19km for people with one car, and 26 km for people with two cars.

Owning a car means a great deal of expense, and not having one means that these expenses do not exist: non-motorised families can transfer the 13% of their expenses not used for the motor car to other households (gifts, assistance, maintenance), as well as to food, housing, public transport, telecommunications and clothing.

A survey organised by the European Conference of Ministers of Transport (ECMT)[48] stresses the fundamental problem of free parking on the work site, which has a major influence on the choice of transport mode for everyday mobility. According to this study, free parking conceals one of the most important elements in the cost of using a private car, which is parking. However, workers who prefer to use public transport are not at all recompensed for it. This type of parking generates other trips by car, in addition to commuting, since the employee is very much encouraged to make a loop when leaving home or work (escorting children, various errands...). The report recommends implementing a "cash-out" policy, i.e. giving a certain sum of money to employees who give up their parking space.

3.2.3 Do without a car?

When the possibility of doing without a car is mentioned, the practical and psychological obstacles are numerous. The spread of the motor car has led to an almost uniform spread of favourable representations of this mode of travel: each person tends to consider his/her own habits to be preferable to alternatives, and as the motor car is the dominant means of transport, the use of other modes is gradually excluded as a possible solution. V. Kaufmann (2000) has observed that there is a great difference between the various modal practices, according to the different types of urban fabric. In the central districts, there is a broad choice, ranging from walking, which is generally approved for moving within one's own district, to public transport and the motor car, used for more distant travel, whereas in the urban fringe, the motor car is used both for local travel and for travelling over wider areas.

Research by A. Julien[49] (2002) on everyday mobility in small towns of 20,000 to 100,000 inhabitants corroborates this fact. The widespread use of the motor car in these built-up areas is made easy: roads are created or their purpose is modified in

[47] See list of research projects n° 5
[48] See general bibliography
[49] See list of research projects n° 18

order to cope with increased traffic, parking in town centres is easy and often free of charge. In addition, none of the other modes, in particular the bus, designed for school pupils, represents a credible alternative. The growing dispersion of enterprise zones and housing has made the problem even worse by making the use of the motor car unavoidable. Measures to restrict cars can not be easily justified in these urban centres, in which there are no real problems of congestion. Yet, without restricting the use of the car, measures to encourage use of the other modes of transport will not suffice to bring about a significant modal shift.

In the families which own a motor vehicle interviewed by J.M. Beauvais, the purchase and use of a car is often justified by the need to escort the children to and from their activities. When the interviewees were asked to imagine, on the basis of the description of their regular travel movements, how they would do without a car, solutions were found for almost all their journeys:

- walking, cycling or bus for going to work
- a change of destination or of frequency for shopping (not travelling so far but more often)
- walking, bus or cycling for recreation, but with limitations on space and time, on certain activities (outings in the evening), in particular for children who would need to choose activities closer to the home.

However, these people say that the comfort of the car (free choice of timetable, transporting parcels, the possibility of doing a series of activities in sequence) is such that they would not give it up because alternatives can be envisaged. These results should be compared with assessments made of the "Day without a car"[50] (1998), which showed that the event brought about very few changes in the modal habits of the people travelling to the zones in which traffic was prohibited (only 23% changed mode).

3.2.4 Measures to promote local shopping

Shopping is a major reason for people to travel, amounting to one fifth of the journeys made by people in the week and to one quarter on a Saturday. At the same time, the choice between local shops and suburban shopping centres constitutes a real environmental issue. J.M. Beauvais[51] (1996) has demonstrated that, because of a different modal distribution in travel by clients, supermarkets in the city centre caused energy consumption almost three times less than the big superstores on the outskirts. Lastly, journeys made for shopping are amongst the easiest to change: it is easier to go to a different supermarket than to change one's job.

Promoting local shops seems a lost cause. Suffocated by the development of superstores, they continue to survive only in dense city centres. However, if it is improbable that there will be a return to earlier commercial structures, the decline of the local shop is not irreversible. A number of more or less recent developments even play in their favour[52]:

[50] See list of research projects n° 25, 30
[51] See in the general bibliography: Beauvais, J-M.-(1996)
[52] See in the general bibliography: Deese, (2001) and Péron, R.-(2001). See also the internet site of the Groupe Chronos (study group on time and mobility in the town): www.atcm.org

Regarding supply:

- Progress in logistics and stock control make it possible to lower costs and supply a wide range of products in a small area.
- Groupings of shop keepers (via franchises, for instance) give small shops greater purchasing power with respect to wholesalers and help them to keep prices down.

Regarding demand:

- Consumption is less exclusively determined by the price; consumers are more concerned with the quality of the service associated with the product sold (including personal contact).
- growing rejection of "consumer factories" - the big superstores – from the point of view of daily practice and on the political level. The major players in distribution, moreover, consider the local supermarket as a new commercial frontier.
- The ageing of the population, which has the double effect of accentuating the movement in favour of dense centres (the choice of the private suburban house is very much linked to the presence of children in the household) and alternative mobility.

Numerous measures can be envisaged to reinforce these trends. It is particularly important for there to be co-ordination and co-operation between the different parties. The experiments in town centre management developed in the United Kingdom are worthy of consideration[53]. These are partnerships between the authorities and private parties whose aim is to revitalise urban shopping complexes.

These joint actions constitute an indispensable basis for setting up the services which could both improve the competitiveness of shops and facilitate access by users of alternative modes of transport. Grouped together and supported by local communities, small shopkeepers can, for instance, set up a home delivery service.

With respect to developing shopping areas, there is reason to be sceptical about making these into pedestrian zones. Firstly, this type of development is really justified only in big old centres or major shopping complexes. Furthermore, associated with the construction of parking buildings, the creation of pedestrian zones simply reproduces, in the city centre, the structures set up in suburban shopping centres. It therefore seems preferable to work for a harmonious co-existence between pedestrians, cyclists and motorists. According to L. Bonanomi[54] (1996), this could best be achieved by reducing the speed limit to 30 kph or even to 20 kph, as in the Swiss "strolling streets".

With respect to parking, research indicate that parking spaces should be maintained on shopping streets, but that the time allowed should be drastically limited, according to the "stop-off" model, so as to make it easier to stop and do the shopping when passing by. This represents a significant share of the turnover of a number of shops (bakers, tobacconists, dry-cleaners, florists...).

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[53] See the following internet sites: Association of Town Centre Management: www.mainst.org. an English association of which the American equivalent in National Main Street Center: www.mainst.org. In Quebec, a similar organisation can be found at : www.foundationruesprincipales.qc.ca

[54] See the revue *Rue de l'avenir* (revue of the Groupe-conseil roman devoted to eco-mobility, travel safety and proximity town planning): www.rue-avenir.ch and the general bibliography.

These measures may seem paradoxical in that they appear to encourage the use of the private car, but E. Charmes[55] (2001) considers that for local shops, the promotion of non-motorised modes will be achieved less through the spatial segregation of the different modes of travel than by their integration.

3.2.5 Proposals for a less motorised town

Firstly, it is important to emphasise other forms of reasoning in urban transport planning than those which have been employed for decades, without their effects ever having been correctly analysed. Thus Richard Gilbert, of the Centre for Sustainable Transportation of Toronto (Entretiens Jacques Cartier, 1998) puts forward other guiding principles, in particular a principle he calls " Equal Advantage for Non-Ownership", which stipulates that "every part of every urban region should be developed and organised so that the advantages of not owning a car are at least equal to the advantages of owning a car".

Reducing the number and length of journeys as much as possible seems to be the only way of fulfilling this condition. The concept of the compact city, imported from the Nordic and Germanic cities is the most suitable one for reaching this objective, even if it can only be adapted more or less completely to different situations. Local urban planning initiatives can not suffice alone; they must be supported by national legislation.

According to M. Wiel (1998), the increase in motor traffic can currently be explained mainly by the lengthening of everyday journeys due to the development of the urban fringe, rather than by an increase in the number of cars or in mobility. For him, the key to controlling travel lies therefore much more in the way towns are organised than in travel policies strictly speaking.

In his work, *La Transition Urbaine* (The Urban Transition), he makes recommendations for town planning, which consist of channelling the growth of the urban fringe, creating suburban centres on the basis of existing intermediary hubs. This restructuring must be based on public transport lines servicing the main hubs of employment. Moreover, in order to reinforce the position of the main city, it is important to recycle any vacant land, to restructure the big complexes and strengthen the commercial dynamics of the centre.

These proposals, particularly the priority use of what already exists, have points in common with the concept of sustainable town planning, for instance, which is defined in the Ruhr[56] as follows:

- preserve land, reduce urban growth trends, contain the extension of the outskirts, recycle vacant land;
- combat the decline of city centres;
- concentrate efforts on land already developed, and on transforming this, avoid too many new buildings;
- use existing infrastructures, in particular renovate railway stations and lines, link town planning and public transport;
- save energy, treat water pollution, reduce the use of plastic;
- plan for energy balance in new buildings.

[55] See list of research projects n° 9

[56] D. Blase, economist and deputy manager of the Société d'aménagement et de reconversion des friches urbaines de Sarrebrück, interviewed in the September 2000 issue of the revue Projet Urbain n° 21, published by the Plan Urban, Ministry of Country Planning

Also in Germany, D. Apel[57] advocates reducing both motor traffic and space consumption, using a number of tools, including taxes. Along with other town planners, he proposes a land tax reform, which would involve adapting normal property tax in such a way as to increase density where desired and to make building away from existing urban areas less advantageous.

The Arch'Urba[58] team, composed of A. Faure, F. Garnier and A. Compagnon, working in the PREDIT framework, has made an inventory of the means used to combat urban sprawl in five European countries - Switzerland, the Netherlands, Germany, Denmark and the United Kingdom - in order to identify those which appear most easily adapted to the French situation. After listing the negative effects of urban sprawl and analysing the context and the means of implementation in each country, a thematic summary of the measures was carried out, along the lines defined by the DIFU (German Town Planning Institute).

Strategies to increase density

The "compact city", a concept conceived in the Netherlands in 1985, is the key word in the model of urban structure towards which the five countries studied are working. The strategies to be implemented involve increasing the density of urban hubs and encouraging urban development around major public transport routes. Everything must be done for land to be used economically in the central zone and to limit travel: polyvalent facilities, the creation of urban parks inside towns. Accompanying measures must encourage residents to walk, cycle and use public transport for their everyday travel.

Regulatory and institutional tools

The authors of the reference documents recommend investing more power in the urban agglomeration, which is an appropriate level for implementing such a policy. The generalisation of urban development schemes and plans and the setting up of urban development observatories, feature amongst the means employed. Town planning documents must be valid for only a limited period, in order for them to be revised regularly.

Tools for economic intervention

These are tax incentive tools: subsidies to help owners renovate and build in developed areas, aid to communities for them to modify the purpose of town centres and develop local hubs. Taxes relating to the use of the motor car: tax on fuel or on the purchase of a motorcar (in Denmark), tax on land surpluses in cases of urban development of rural land in Switzerland, a heavy tax on undeveloped land in the central zone, property tax based on land value and not on the value of the buildings.

Policy on infrastructures

This involves stopping, or at least limiting the construction of new roads, a restrictive parking policy (parking norms revised downwards), combined with an improved supply of public transport, and measures encouraging sustainable modes and inter-modality.

In addition to these proposals, the authors of the report insist that objectives and the corresponding budgets most be maintained over a period of time, on account of

[57] Town planner, researcher at the Deutsches Institut für Urbanistik (DIFU) in Berlin; see the list of research projects: Ref. A

[58] See list of research projects n° 12

the slow pace at which urban structure changes. Even in the countries most committed to high-density urban development, such as Denmark, public opinion must support these projects if they are to be pursued over the long term, and constant educational measures are necessary.

Chapter 4

What lessons can be drawn from overseas experiences ?[59]

Measures to encourage non-motorised modes have been developing for a long time in certain countries. In Copenhagen, for example, a network of cycling tracks between the carriageway and the footpath was begun as early as 1884, and has formed the basis for a social travel policy, as there is now an average of 2.5 bicycles per family. In the 1970s, cities like Bern, in Switzerland, became aware that increasing travel by car would cause problems in the future and started to take measures to limit it, as well as to maintain and revive public transport, cycling and walking.

Two surveys of experiments in other countries were carried out successively in the PREDIT framework. They report on experiments to boost non-motorised modes in towns which have managed either to maintain, or to increase the share of non-motorised modes. The first survey, carried out in 1997 by the association 4D[60], concerned Freiburg in Germany, Ferrara in Italy, Seattle in the United States, Toronto and Vancouver in Canada. The aim of the second survey by 4D[61], in collaboration with Altermodal, was to understand how it had been possible, in a certain number of European towns, to maintain or increase favourable modal shares for "alternative" modes (bicycle, walking, public transport). Field studies were made in six European towns: Heidelberg and Freiburg (Germany), Graz (Austria), Livourne, Ferrara and Bologna (Italy).

Finally, the research directed by A. Faure of Arch'urba, already quoted above, endeavoured to make an inventory of the means used to combat urban sprawl in five European countries (Switzerland, Netherlands, Germany, Denmark, United Kingdom) and gives accounts of many original experiments.

4.1 The main characteristics of the towns studied

The detailed monographs produced by 4D draw attention to various dynamics which present a certain number of points in common. One of the major lessons to be drawn from this research is that the towns which undertake to limit travel by private car are subjected to a veritable initiation.

Despite being at different stages of advancement, it can be seen that all the towns studied have acquired a certain know-how, a public image and achieved a change in mentalities and behaviour, a concern for quality, all assets which are now almost impossible to go back on. At the very most, in the course of the planning process, the pace with which measures in favour of eco-mobility are implemented in these towns

[59] This chapter is largely based on the result of the comparative research carried out in 2000 by the Arch'Urba team (see list of research projects n° 12)
[60] See list of research projects n° 11
[61] See list of research projects n° 10

may sometimes slow down. This was the case, for instance, during the recent changes in the political majority in Bologna, Heidelberg and Graz. But the survey has nevertheless identified a number of institutional or legislative difficulties which these towns have been confronted with, often beginning on an administrative or political level, which local decision-makers have no control over.

4.1.1 Local motivations

The specific historical, social and cultural past of each town studied seems to be an important factor when answering the question "How did we get to where we are?". The geographical situation (topographical and meteorological conditions) is also factor which influences the range of dynamics observed, particularly in Italy.

An environmental “trigger” has often marked the history of the town, resulting in the town council and town inhabitants developing a particular ecological awareness. Pollution is eating away the architectural heritage in cities in the North of Italy, which is the main reason for the authorities deciding to close the historical centres to cars.

The installation of a chemical factory in Ferrara in the 1970s and of a nuclear power plant in Freiburg also acted as triggers. In Copenhagen, which also counts amongst the pilot towns in terms of promoting the bicycle, a high-speed road was built close to the centre, generating renewed interest in the bicycle, which has continued to progress ever since.

At the end of the 1980s, a certain number of global environmental problems were thrust into the public arena, such as greenhouse effect and questions on the limits of the planet's energy resources. The Bruntland Report (1987) and the Earth Summit in Rio de Janeiro (1992) were important in bringing the major problems to the attention of the general public. Today, we are moving towards approaches in which transport policies are an integral part of a series of measures aimed at achieving sustainable urban development and addressed on the local level.

For example, in 1990, the town of Seattle launched an environmental action plan making measures to protect the environment a priority in the municipal budget. A committee of experts has identified air pollution from traffic as one of the major problems. A number of measures are being implemented progressively, in order to improve public transport supply, to promote modal shift, car pooling, and to enlarge the network of cycling facilities. One of the most remarkable decisions is that which implements a strict programme of transport in municipal services, including an annual subscription for public transport or subsidies for car pooling, and objectives for reducing the number of kilometres travelled for professional reasons.

There is increasing co-operation in exchanging experiences on the European level, the "initiatory pathway” in the field of environmental protection. Thus there is a will to achieve a global approach and policies bridging a broad range of issues have been observed in most cases, since five out of the six towns studied during the 4D/Altermodal research have adopted a local Agenda 21 (programme of sustainable development for the 21st century).

4.1.2 Political and administrative modes of operation

The way institutions function and the distribution of responsibilities over the different levels sometimes play an important role in determining the types of reasoning underpinning transport policies, particularly when it comes to granting elected representatives, the administration, the police or citizens a greater or a lessor margin of manoeuvre. Popular referendums can be organised in Switzerland, for example, if a sufficient number of citizens sign a petition on a specific issue.

In addition to the regulatory and institutional framework, an informal network (overseas contacts, for example), and action on the local level have a major influence on the measures taken. Political decisions on the national level can be translated into reality only if there are relays on the local level, either communes or associations. The fact that key people in towns - the mayor, local representatives or civil servants - take on the question of non-motorised travel, also acts as a driving force.

In these experiments, the exchange of ideas between town councils and inhabitants, stimulating consultation and action by associations, play a major role in defining transport policies. In Italy, a constructive dialogue was established amongst environmental, heritage and cycling associations, (Legambiente, Italia Nostra, Amici della Bicicletta). In Germany, associations for the promotion of ecological mobility are very much present at the different levels of the Federal administration. In Toronto, the cycling group network stimulates actions, according to an agenda set in function of needs and resources.

4.1.3 Obstacles to be overcome

The major difficulties which all the towns in the sample seemed to be confronted with are:

- the limited leeway for districts to take long-term action on travel modes, beyond their zone of influence, (major urban fringe development, little co-ordination between districts),
- progress hindered by inadequate or contradictory laws, directives and national or European financial plans,
- limited social acceptance of the idea that the use of the private motor car should be restricted, especially amongst those active in the economic and political arena. In effect, all the municipalities consulted stressed the importance of their role as an economic centre, which they seek to reinforce,
- contradictions resulting from the conflict of interest mentioned in the preceding point, characterised primarily by major investments in new roadways and parking buildings, and even shops on the outskirts.

Research undertaken by Arch'Urba refers more specifically to obstacles of the "received ideas" type, common in France, and which need to be refuted by a widely publicised information campaign on what renewed urban concentration really implies. For instance, the dream of “life in the country" on the outskirts of the city becomes less attractive when people are made aware that a bungalow will become progressively less charming as urban development encroaches on natural sites, in addition to the constraints of travel and the spread of pollution and other environmental problems over an increasingly wide area. Density also remains a vague term for the general public, associated with big complexes and social problems. In fact, the highest densities allow optimal use to be made of urban

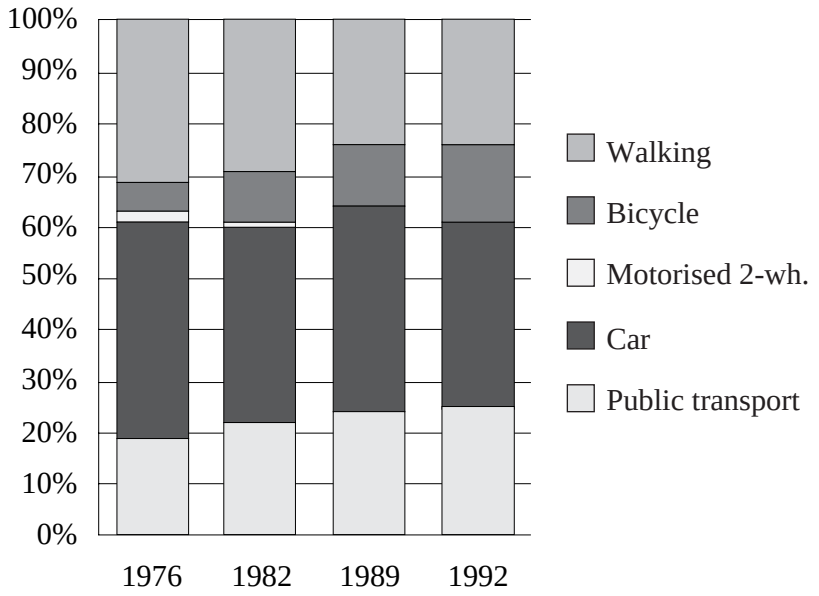
infrastructures and equipment (energy and water supply in particular), reduces distances people need to travel, increases the attraction of the city, brings the rate of motor vehicle ownership down. Lastly, the research mentions the competition between regions to attract companies and employment as an obstacle to reconstructing the urban fabric, since the desire to attract enterprises often means that urban control and sustainable development objectives are relegated to a secondary position.

4.2 The tools of eco-mobility

"Push and Pull"[62] transport policies have been typical of North European towns over the past thirty years. They are based on the idea that it is possible to reduce motor traffic in towns, in order to make them safer and more pleasant, on the condition that at the same time there is a deliberate policy to promote alternative modes.

The experiences of Berlin, Freiburg, Bern and Munich are based on this approach and have succeeded in bringing about significant changes in modal share, limiting the effects of the increased use of motor vehicles by preserving or even increasing the share of alternative modes.

Modal share in Munich 1976 -1992



Source : Socialdata

These policies hinge on a combination of various measures:

- the encouragement of walking and cycling by means of specific facilities and an energetic communication policy,
- the promotion of public transport and the way in which it complements alternative modes (comfort, speed, extension of the network, integration in public space, tariff incentives);
- restrictive parking policies, to select journeys,

[62] Policies involving “pushing” the car out of public space and “pulling” eco-mobile modes in, by implementing measures giving them priority (note by the author)

- relief of transit traffic in the city centre and its concentration on a few arteries, possible halt in the construction of new infrastructures,
- traffic restraint in a large proportion of residential areas,
- pedestrian zones and a modification of the purpose of the city centre.

Having arrived at a certain level of "maturity", or in other words of general acceptance of these new policies, German and Austrian towns have been able to take more radical measures and to change the general direction of their travel policies, for example, by setting the speed limit at 30 kph on the secondary network in Graz. They are now on the verge of providing a "bicycle system" (as there now exists an "automobile system"), in which a full range of efficient services available to the user, including a continuous network of pathways and tracks, specially guarded parking areas, and a complete system of information.

The concept of the short-distance city is a next step, integrating the needs for transformation of the city itself and involving a form of urban development which encourages walking and cycling. This method is based on various means of action which all aim at limiting the spatial range of journeys, providing, for example, big apartments in the town centre, or nearby, to encourage families to stay in the city, increasing the density of the zone which has already been developed, by exploiting its property and real estate possibilities to their maximum, offering local services and employment by developing a wide range of activities, stimulating commercial supply in the town centre, ensuring quality design of public space, supplying recreational equipment and green open spaces near housing districts. Graz (Austria) and Groningen (Netherlands) are amongst the towns which apply this principle.

Nevertheless, it takes time establish a system such as this and to get results. Thus, when they first started, the German and Austrian towns studied by 4D all began with sector-based measures addressing each mode independently. The Italian cities went through this stage at the beginning of the 1990s, but have gradually caught up, benefiting from the experience of their Northern partners.

This process seems to lead to an increasingly integrated approach, with more global strategies, and takes into account:

- urban ecology,
- town and regional planning,
- the complementary nature of the different modes of travel,
- the regional and national dimensions of travel (rail in particular)

In Germany, further thoughts on the theme of the compact city take into account the situation of the town in urban regions with many centres, which makes it possible to integrate strategies on a larger scale, and in particular to increase the density of all existing hubs, to organise urban development around public transport arteries and to locate hubs close to interconnections. Urban development should be limited to areas which have already been developed in the town centre or in secondary centres, close to public transport junctions. Diffuse urban forms should be transformed into a network of big, middle-sized and small towns, based on a regional RER (regional express train system). If it is necessary to develop areas which have not yet been built-up, this should be done taking into account the structure of the urban region and its optimum size. A city centre of 300,000 inhabitants, for example, is an optimum size for reducing traffic and preserving land. For example, the people living there can reach the surrounding open space without a motor vehicle, as the city will stretch out over a radius of less than six kilometres, which can be covered by bicycle in less than 30 minutes.

4.2.1 Elements of a combined policy

Research carried out by Arch'Urba identifies a wide range of means of action, legislative measures, techniques and strategies which have been developed in the five countries studied, and which provides a good summary of the range of methods which can be employed to control urban sprawl, redirect mobility and increase the appeal of built-up sectors.

Strategic approaches:

- master plans whose structure is based on major public transport routes leading out from the city centre
- establishment of local hubs at interconnections
- definition of accessibility profiles on the basis of a typology of activities (ABC-type policy in the Netherlands)
- development of vacant land within the central or urban fringe fabric
- maximal use of existing buildings: fitting out of attics, construction in small spaces between buildings, new types of high-density settlements,
- traffic restraint and parking restrictions,
- better quality public space, integration of pedestrians and cyclists, comfort in public transport and at interconnection service areas.

Institutional and regulatory tools:

- framework laws and directives on the national level,
- reinforcement of the role of urban agglomerations (300,000 inhabitants approx.) which implement national guidelines,
- requirement of cohesion between the statutory documents corresponding to the different regional levels
- time limit on the validity of documents (4 years in Denmark), obligation to set up regional observatories
- organisation of public/private partnerships and of consultation between the various players
- strict methods of control for transferring land from a rural to an urban zone.

Tools for economic intervention:

- land tax based on the market value of the land (Denmark) rather than on the use value, to avoid land being withheld.
- tax on land surpluses and on changes of status (rural to urban)
- various taxes on the purchase of a private car (Denmark), taxes on fuel and - parking, reinvested in public transport
- state subsidies to revitalise centres and support local centres
- participation of developers in transport expenses.

Major policies on infrastructures:

- halt road building
- develop public transport, of the RER type in particular
- take measures to encourage cycling
- promote walking

Measures to limit the increase in the number of cars:

- improve coherence of town planning and traffic forecasting, so as to limit the distances people need to travel
- traffic control measures on the basis of mode priority

- inclusion of access on egress in local plans
- taxes on parking and on the purchase of motor cars
- parking norms according to the locality, the type of activity, the number of m^2 developed
- high parking fees, used for the construction of parking buildings.

The effectiveness of these strategies seems to depend in the long term on keeping to the agreed policy as well as on the coherence of sector-based policies. Moreover, financial means are required for a fundamental reform to be implemented, and public opinion and local representatives need to be made aware of the importance of the issue.

The Danish land tax

The Danish land tax is cited by Swiss and German authors as an example of a tax intended to optimise the use of available urban land and to minimise urban sprawl. This tax is evaluated according to the land value of all the developed and building land, based on regularly updated estimations. The value of the buildings is not taken into account. Given that only the land, without the buildings, is taxed, better use is made of the opportunity, granted by the right to build, as it encourages the construction of buildings which do not occupy large areas of land, and the densification of what is already in existence.
Withholding undeveloped or little developed land is not worthwhile. There is no longer reason to speculate. Building land therefore comes on the market more quickly and hardly any vacant areas or vacant buildings are left within the urban zone. As a result of the rapid resettlement of vacant areas, there is less pressure to build on undeveloped land on the outskirts.

4.2.2 Specific facilities

A number of examples demonstrate how creative towns can be and the number of fields in which it is possible for measures to be taken.

Countries such as Japan and the United Kingdom are experimenting with systems involving less restrictive crossings than the conventional pedestrian crossing with lights: actuator mechanisms for precision adjustment of light phases, integral pedestrian phases, which allow pedestrians to cross intersections diagonally. The 30 kph zones in Switzerland, urban courtyards in Germany and limited traffic zones in Italy are all good examples of traffic restraint. The town of Perouse, sited on a peak, has been equipped with an ingenious system of lifts and moving staircases, in order to facilitate walking in the town centre, which has been closed to traffic.

In North America, an increasing number of bicycle racks are being fitted on buses. Bicycle parking is encouraged and made secure in Germany, in the Netherlands and in Denmark thanks to guarded parks at stations. Parking systems are being installed in people's homes: bicycle garages in housing blocks or in the local vicinity, lock-up garages in the street. Belgium is currently attempting to set up a national file of registered bicycles, in order to combat theft.

Several countries, such as Belgium, Germany and Switzerland, have modified their Road Code so that cyclists can make certain manoeuvres – riding up on the right-hand side of a lane of cars, riding against the traffic in one-way streets – which enable them to be a competitive mode of travel. The French Road Code, drawn up in the 1960s, and which considers the bicycle to be a full-fledged vehicle, does not authorise such manoeuvres.

Certain types of facility, once very much in favour, are now being questioned by authors such as L. Bonanomi[63], who summarises the criticisms made of them in Belgium and in Switzerland:

- they occupy a great deal of space near stations (in areas where a multifunctional hub would be much more logical) for only a small modal shift,
- they concern only a small proportion of users, generally those who travel at peak hours,
- they encourage well-off city residents to live even further away on the outskirts
- it is essential for them to be associated with a restrictive parking policy in the town centre, which is not always the case.

An article published in 2001 by the Brussels town planner, P. Frenay[64], recommends that urban development still be encouraged around railway stations, to the detriment of Park & Ride terminals, and not the contrary, to locate these well upstream of daily congestion, away from the town, and to diversify user profile, by means of a general fee, combined with the railway ticket.

4.2.3 Innovations

Innovative measures have often been taken in the fields of services and communication. Firstly, mobility agencies, in Graz, Bologna and Frankfurt, provide information services on all types of urban transport. They use a combination of data bases from different transport services. A user can find full details for a trip which s/he wishes to make by public transport, including connections, in one same place, and reserve a final means of transport (such as a hired bicycle or car) if necessary.

Car-sharing is another innovation. This involves hiring a car for a year, coupled with a self-service system. Car-share companies provide a 24-hour reservation service for subscribers for whom a car is available, parked in one of the garages in the city, for a minimum hire period of one hour. This type of service already has 40,000 clients in Germany. For people who travel less than 15,000 kilometres annually, this system, all expenses included, costs less than car pooling.

A number of other services also exist: public transport on request (servicing the least dense parts of a town, mobility for the handicapped...), hire of bicycles or electric cars, bicycle taxis, bicycle delivery. Towns encourage inter-modality by setting up service stations in railway stations to repair and guard parked bicycles. Experiments of this type are underway in the Ile-de-France region, in collaboration with the RATP. The 16,000 bicycle parking spaces in RER stations in the Paris region have a 90% rate of occupation.

In Switzerland, the goal of the Geneva pedestrian plan is to promote walking in town. Established in 1995, this system is intended to be extended in the long term. Its goal is to have walking recognised as an independent means of travel, with a

[63] See general bibliography
[64] See general bibliography

particular role to play in the city. This concern has resulted not only in facilities for pedestrians, but also in a major long-term communication strategy.

In France, there are also self-service bicycle hire schemes, which L. Combet and B. Simon[65] have studied in three towns (Rennes, La Rochelle and Strasbourg). The combination of the bicycle and public transport encourages people to use both. Nevertheless, this research demonstrates that the mechanisms which have been implemented are often the result of a political agenda, too limited for their effectiveness to be really visible. Management constraints mean that the mechanism becomes rigid, limiting its user-friendliness, whereas the bicycle could bring about a veritable modal shift in town centres, where it is the most efficient. Hybrid systems, combining self-service and conventional hire techniques could help to improve the initial concept in the future.

Design contests have been organised for dense areas, leaving little room for the motor car, or even without motor cars, and in which residents commit themselves to not owning one. Several of these schemes exist in Germany, Austria, the Netherlands, and in the United Kingdom. The influence of the population groups concerned is far from negligible, as the percentage of households which do not own a car in the major urban centres can be as high as 40% or 50%. On the other hand, it is necessary to choose the location carefully, so that it is easy to live there without a car. It is therefore essential to live in an urban area, as this provides the best possible access by public transport, walking or bicycle. A car-share service, a private service for delivery of heavy goods, bicycle garages are also important criteria. The advantages are both financial (lower building costs and therefore of rents) and environmental (better quality of life, creation of quality public and private areas in the space not used for parking).

By encouraging employees to adopt “eco-mobile” modes and by promoting car-pooling, a company can effectively participate in a sustainable transport policy. In Switzerland, companies encourage their employees to travel to work by bicycle. In German cities, transport companies offer reduced-price transport cards to companies who propose to their employees to give up their parking spaces. Swiss companies encourage their employees to use the bicycle to travel to work and when on professional business.

Finally, towns such as Graz are also preparing the future by organising programmes in schools to teach children to ride a bicycle.

4.2.4 - Conclusions regarding examples in other countries

Measures to promote non-motorised modes in cities in other countries seem to be in keeping with a certain number of ecological criteria, to which the public is increasingly sensitive. They answer more effectively to certain social demands (autonomy and safety for children, for example) and are therefore very much highlighted when people speak about promoting non-motorised travel.

[65] See list of research projects n° 3

The conclusion of the 4D survey mentions various factors observed in the six cities studied, which the authors regard as worthy of careful consideration by French municipalities:

- forums for consultation, communication with the inhabitants – German, Austrian and Danish cities – and the nature of the relations between the participants – Italian cities -;
- decentralisation at the local district level
- numerous assessment tools and processes set up in German and Austrian cities;
- the contribution of national associations to urban environment policy (Germanic countries, but also in Italy)
- special facilities (e.g. bike office, mobility agencies) , 30 kph zones and ZTL.
- travel plans developed in the 1990s (in comparison with urban development plans)
- the participation of cities in international networks (undeniably greater in the Germanic countries than in France, but also, no doubt, in Italy)
- policies bridging various issues, leading to veritable global action plans (the local Agenda 21 process is beginning, although timidly, in France, but not the implementation of urban plans to combat greenhouse effect – as in Graz, Ferrara, Heidelberg, Bologna).

However, any comparison must be seen in context, on account of historical and cultural differences, different urban layouts and transport networks resulting from planning policies (or lack of policy), population density, differences between centralised and decentralised governments, the relative importance given to consultation, management and territorial decision levels.

For instance, the demand for children to have a certain degree of autonomy is logically stronger in Germany, as school hours do not coincide with adult working hours. The possibility of using direct democracy and the power of a well-developed organisation of transport users associations in Switzerland, the multi-hub urban layout and the short distances between towns in the Netherlands are also factors which need to be taken into account.

However, countries known for their eco-mobility (Germany, Netherlands, Switzerland) also question the results of certain experiments, such as Park & Ride in Switzerland, which are no longer considered as viable solutions, given that the development of the motor car currently concerns the urban fringe more than city centres.

The situation in the United States should also be mentioned, as a certain number of facts drawn from surveys give an account of a situation resulting from the almost total lack of town planning. From many points of view, changes in mobility resemble the European situation: urban sprawl, longer everyday travel, the regression of public transport. However, specific aspects, such as the growing empowerment of local communities with local urban management are typically American.

Chapter 5
Final remarks and prospects

It may have appeared to some as an impossible challenge to address the problems caused by the transformations which have affected the mobility of city residents over the past years from the point of view of walking, cycling and rollerblading. However, by drawing up a coherent view of the development and role in the life of city-dwellers of these "forgotten" modes of travel (but revealing just how great is the malfunction of transport systems) for the first time, the research programme on non-motorised travel has generated new knowledge of the transformations brought about by the rise of motor travel and provides a better understanding of the way in which this is linked to the issues of urban development.

The conclusions drawn from this research show that the development of towns, under pressure from the motor car, appears as a difficult process to reverse, without changing policy on town planning and transport. It has been demonstrated that the decline of non-motorised modes and the increase of the modal share of the motor car are indeed interdependent. The major increase in travel in the suburbs and on outskirts of cities over the past fifteen years (+79% between 1982 and 1994) shows that the growth of the urban fringe is one of the main phenomena involved in this development.

The study of obstacles to non-motorised modes has revealed, in particular, the significant role of an often neglected phenomenon, "urban severance effect" (viz. barriers created by major transport infrastructures). The analysis of this phenomenon and the assessment of its consequences have contributed to enriching the debate on urban development and to opening up new horizons for measures which should be taken by the authorities.

Generally, the research which has been carried out over the past four years on the theme of non-motorised travel has made it possible to identify corrective measures which could contribute to stopping non-motorised modes becoming only marginal. It also shows that a modal shift can be achieved for certain journeys, and that certain segments of the population would be disposed (or even desire) to modify their present habits. However, except in city centres perhaps, it is hardly likely that non-motorised modes will "spontaneously" recover their former market share. Nevertheless, alternative experiments and measures, taken by institutions and private persons, demonstrate that there is an aspiration and a capacity for choice.

Over and above the fundamental questioning they inspire, the results of this research can contribute to developing of a range of tools which could serve to create the conditions necessary for a more sustainable mobility: tools for diagnosis, follow-up, decision support, promotion leaflets, methodological guides. These "repercussions" of the "non-motorised" programme should be developed and supported in the future. In particular, an effort should be made to provide municipal teams with methods and tools which can be used to develop town planning and transport policy, in conformity with the objective of reducing motor traffic, stated in the Law on Air.

In a general manner, the research presented here gives a very precise view of the current role of non-motorised modes in the mobility of city dwellers and contributes to developing strategies for concrete measures in the field (supported by a majority of public opinion). But this research can provide only a partial idea of the forms which cities and urban travel systems will take in the future.

There is a strong demand amongst city dwellers for a better quality of life, even if this is only implicit in the research mentioned here. However, although this demand, which could be qualified as “ecological” is a serious one, it seems to come on top of more “materialistic” trends, which tend towards the “facilitated mobility” made possible by the motor car.

It is undeniable that we are faced with a certain contradiction here, which the current caution of politicians and public decision-makers makes it impossible to resolve, and which is matter for a broader public debate in view of achieving, finally, a new balance between the demand for individual liberties and for protection provided by the respect of common rules. Partial adjustments will certainly be made over the years to come, with the implementation of new legislative measures in this field. However, only more radical changes in urban policies would enable us to cope in the future with the crucial problems for the city posed by the explosion of motor traffic.

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