More mobility means more impact on climate change: prospects for household leisure mobility in France(1)

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ABSTRACT
Given the growing dependence of tourism on transport and the contribution of tourism mobility to global warming, this activity might be seriously questioned by mitigation policies.
This paper explores prospects for household tourism and leisure mobility and their associated impacts on climate change. Household mobility patterns associating various forms of tourism trips and proximity leisure outings are developed. Their comparison shows that less conventional tourism does not necessarily implies less mobility, also the critical impact of long haul travel on climate change, and that fundamentally the future impacts are strongly associated with the individual choices between tourism and the other uses of spare time.

KEY WORDS: tourism, leisure, mobility, climate change, uses of time, France

RÉSUMÉ
L'ACCROISSEMENT DE LA MOBILITÉ ET SON IMPACT SUR LE CHANGEMENT CLIMATIQUE: PERSPECTIVES POUR LA MOBILITÉ TOURISTIQUE DES MÉNAGES EN FRANCE
En raison de la dépendance croissante du tourisme vis à vis du transport, mais aussi de la contribution de la mobilité touristique au changement climatique, le développement de cette activité pourrait être sérieusement remis en question par les politiques de lutte contre le changement climatique. Cet article explore les évolutions possibles de la mobilité de tourisme et de loisirs, et ses impacts associés sur le changement climatique. Des profils de mobilité associent différentes formes de mobilité touristique et de mobilité de loisirs. La comparaison de ces profils montre d'abord que moins de tourisme – au sens classique du terme – n'impliquerait pas nécessairement moins de mobilité, ensuite le rôle déterminant des voyages à longue distance en avion, enfin que les arbitrages individuels entre tourisme et autres usages du temps libre sont un facteur déterminant des impacts à venir.

MOTS-CLÉS: tourisme, loisirs, mobilité, changement climatique, usages du temps, France

INTRODUCTION

The access to leisure, to tourism, and thus to the mobility they imply are now accepted as an important dimension of welfare. This has not always been the case in western societies. During the 19th century, uses of time such as leisure or even more tourism were not considered as legitimate except for upper social classes: this was clearly expressed by Napoleon saying that a workman can work every day since he eats daily... In 1883, Lafargue's book «le droit à la paresse» («the right to laziness») was considered as extremely provocative (Lafargue, 1970)... Nearer to us it can be recalled that one of the first tasks of WTO has been to obtain a recognition of the right to tourism, a point which is stressed from the Manila declaration on world tourism (1980) to the Global code of ethics for tourism (1999) (Dubois and Ceron, 2000).

Today, in most of OECD countries, holidays are usually considered as a right and should be accessible to all. Staying at home is largely admitted by public opinion as an indicator of poverty and exclusion: not going on holiday when the majority have the means of financing their leisure and departure is tantamount to being put aside from one of the important times of collective life. The current growth of domestic tourism in developing countries also shows there is a true desire for taking holidays as soon as economic conditions allow to do so.

Within the same period, as these trends develop, the impacts of human activities on the environment are increasingly questioned. Throughout these last thirty years, it became gradually admitted that there are global environmental limits to human activities (Meadows, 1972) and that environmental problems cannot be solved by relying only on technology but might imply changes in lifestyles (WCED, 1987). One of the major issues to be tackled is global warming. Transportation is one of the major sources of greenhouse gas and also, owing to the dramatic increase of all forms of human mobility, the most difficult to curb. Its share in French total $C0_2$ emissions rose from 8% to 34,3% between 1960 and 1999. The emissions of ground transports increased by 16,5% between 1990 and 1999, those of aviation by 59,6% (Fontelle, Chang, Allemand and al., 1999, 2000).

The impacts of human mobility on global warming will certainly have to be addressed and this can be a major threat to tourism, all the more if tourism globally goes on expanding on an annual rate of 4% as WTO prospects suggest (WTO, 2001). Given the growing dependence of tourism on transport (transport intensity is growing (Ceron and Dubois, 2002)) and its contribution to global warming, mitigation policies should seriously question tourism. Will there be in a more or less foreseeable future restraints of some kind or another on travelling? If so, what are the patterns of leisure time use that are questioned? Ultimately, to what extent do potential restrictions on tourism question welfare: tourism is after all only one of the uses of leisure time. Are there any elements tending to show that tourism is not bound to expand indefinitely and that people might be willing to substitute it partly by other uses of their leisure time which request less mobility, or have to do so? To what extent can leisure-time policies influence the current trends?

The first step to cope with these questions is to explore the future of tourism and leisure mobility. Tourism research often concentrates on the demand for tourism itself (motivations, expectations, purchasing power...), leaving aside the fact that, in developed countries, preliminary individual trade offs between tourism and other

uses of time are a key factor to explain the volume of tourism demand and its evolution, as well as the impact of tourism / leisure mobility on climate change.
Indeed, tourism is not, «by nature», bound to expand indefinitely. It can be reminded that only a small part of days off work is devoted to tourism. French employees have 145-150 days off, but the French on average spend 15 to 17 nights on vacation (or 24 to 28 nights if one only takes into account the 62% who left home in 1999) (Insee: holidays survey/ «enquête vacances», SDT survey). Quite roughly, even though leisure time has increased over the last twenty years (Chenu, Herpin, 2002; Dumontier, Pan Ké Shon, 1999; Dumontier, Guillemot, Méda, 2002), the French do not spend more time on holidays. French domestic tourism annual demand lost 57 millions of nights between 1983 and 1999. Life cycles are not a new phenomenon for destinations, as historic studies on French tourism underline (Boyer, 1982, 1996), but facts now show that not only the places but also the volume of the activity are shaped by long term trends and phenomena. The French yet tend to stay in France and steadily refuse to see their holidays organised by professionals: the two thirds of the nights they spend in France are taken in the non merchant sector (second homes, friends and family). Travel agencies and tour operators only manage 19% of the domestic demand (including French travelling abroad: SDT survey). Thus, French tourism is quite specific compared to other European countries, and French mobility patterns developed in this paper should not be extended to other contexts.
The paper tries to explain how, in the case of France, the combination of time uses could produce various mobility patterns, which are suggested by current observed trends and would impact differently on climate change: less conventional tourism does not necessarily mean less impact.

METHODOLOGY AND OBJECTIVES

TOURISM AND LEISURE: OFFICIAL BORDERS, POROUS REALITIES

Tourism is traditionally strictly defined by the World tourism organization as «the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes». Thus, a combination of distance and duration defines tourism, rather than the purpose of the activity (Figure 1).
On the contrary, the field of leisure is defined by its purpose: all activities mainly motivated by personal hedonist reasons, without any criteria of distance and duration.
The following points must be stressed owing to their importance for the future of mobility patterns.

- The field of tourism is not completely included in that of leisure, because of the existence of convention tourism, motivated by professional reasons. However, this paper only deals with non-professional tourism. Thus, as understood in this paper tourism can be considered here as a particular form of leisure activity.
- The term «leisure» refers to a wide range of activities, part of which (reading, gardening, watching TV), can take place during a tourist trip. To a certain extent, a tourist trip is a sum of leisure activities.
- The strict definition of tourism quoted above leaves aside a major part of leisure related mobility: excursions, excluding an overnight stay but distant from home, neighbouring and home-centered leisure (gardening), and «para-tourism», such as bi-residential mobility between a first home and a second home, of which it is often difficult to say which is the main one. Moreover, the borders between the different categories of time are increasingly blurred and porous. More people work at home,

Figure 1. The field of tourism and leisure.

sometimes during the week-end (40% of employees say they do) or while on holiday (20%) (Potier, 2002, p. 26). Reciprocally some people include leisure within their working hours: surfing on the internet, shopping between two meetings… Portable computers, e-mails, cellular phones have within the length of one decade permitted leisure and working time to penetrate each other and the same can be said of places previously devoted to work or to leisure.

- The elaboration of tourism statistics is based upon administrative and political borders (the states, the regions) that tend to disseminate misleading figures on tourism flows, and do not describe the reality of the tourist experience and motivations. For instance, in Europe, the fragmentation in numerous states artificially increases the figures of international tourism: trips from Nice to northern Italy, of from North of France to Belgium or Germany are accounted as «international tourism», whereas a trip from New York to San Francisco is accounted as domestic tourism (though it is equivalent to a trip from France to Senegal). Thus, the categories of mobility we use here do not fit with official categories, but have been designed so as to reflect different attitudes to tourism and travel: the need of exotics (very long distance trips), of sun and sea (long distance trips), of short breaks (outings), the attachment to places (bi-residential mobility), the daily proximity leisure (short distance leisure mobility). Average distances and modal splits for each category are assumed taking into account data on French tourism and transport surveys. However, as the categories are often a mix of two «official» categories («long distance mobility», for instance combines domestic tourism and international tourism to neighbouring countries), it was necessary to make some assumptions and estimates.

FORECASTING TOURISM & LEISURE MOBILITY DEMAND

This paper is linked to a research in progress for the French ministry of spatial planning, the objective of which is to build scenarios on tourism and leisure mobility demand for the 30 coming years.
Rather than taking as a starting point the average consumption patterns of French households and examining their future under contrasted socio-economic scenarios (and thus forecasting the trends averages might follow), the first step of the research is to develop some contrasted tourism/ leisure mobility patterns, elaborated having in mind recent sociological trends observed in France and in Europe (Urbain, 2003; Viard, 2002; Potier, 2002; Boulin, Dommergues, Godard, 2002;

Asher, Godard, 2003). Indeed, the tourism demand is so diverse and heterogeneous that this method, based upon a typology of household behaviours, should be more relevant. The patterns result from the summing of a number of trips for five types of mobility (leisure near the home, outings, long distance trips, very long distance trips, bi-residential mobility), each of them bestowed with a respective average distance derived from national tourism and transport surveys, and associated with a modal repartition for each type of trip, which enables to calculate associated greenhouse gas emissions. The patterns insist on emerging trends in the current tourism demand, which could take in the future a more important share of the tourism/ leisure mobility demand. Moreover, they are not the results of a statistical typology of the current tourism demand, but have been designed so as to enable a modelling of this demand (as a basis to build future scenarios).

The second step of the research – *which is not presented here* – will consist in an elaboration of overall tourism/ leisure mobility demand scenarios with a description of their associated impacts. The previous patterns will be associated in different proportions derived from diverging hypotheses on the importance socio economic factors and emerging trends could take. The central hypothesis is that these mobility patterns, existing or emerging in the current tourism demand, are elements that can be used to describe the futures of tourists behaviour: their general characteristics are supposed not to evolve with the socio-economic conditions, whereas their share in the tourism mobility demand will. Thus, different scenarios of evolution progressively diverging from the conventional pattern, which is likely to keep the most important share of the mobility within the next 20-30 years will be tested. Assembling the patterns into contrasted scenarios of overall tourism/ leisure mobility demand implies to cope with serious difficulties, like determining what are the most interesting hypotheses to be made on the share of each pattern according to the various socio-economic and demographic contexts, introducing the size of households (the load factor of cars highly impacts on effective emissions) and the possibility of various mobility patterns within the same household (two cars for a household, or a working person with a bi-residential pattern whose family has a more home-centred life).

FORECASTING TOURISM & LEISURE MOBILITY IMPACTS ON CLIMATE CHANGE

The impacts of tourism on climate change, through the emissions of CO_2, other greenhouse gases and indirect effects, concern the different stages of a tourist trip: transport, accommodation and activities. Transport includes travel to and from the destination, as well as travel while staying at the destination. For tourism, transport contributes overwhelmingly to the total emissions of air pollutants: i.e. between 60-95%, depending on the country and the type of tourism (EPA, 2000; Becken, 2002; Becken and Simmons, 2003).

The factors influencing the emissions of a tourist trip are: the distance, speed, modal split, the load factor of vehicles, and the state of technology. Three means of transport have been considered in this research with greenhouse gas (GHG) intensities reflecting the impacts (Figure 2).

The mobility patterns are based upon a 4 persons household. This choice seriously impacts on GHG emissions: the emissions of the household will be 3 or 4 times more important for an airplane trip than in the case of an individual traveller, whereas they would be the same for a road trip. In that perspective, air transport is roughly 3 times more polluting than road, and rail 0,5 times less polluting than road. The «GHG intensity» coefficients (see Table 1) synthesize the impacts of different modes of transports and the modal repartition of each kind of mobility (a 0,75 coefficient for bi-residential mobility for instance, since the trips are supposed to be taken by train and by car in an equal proportion).

Finally, this approach allowed to calculate a «Climate Change Index», which reflects the impacts associated with each pattern.

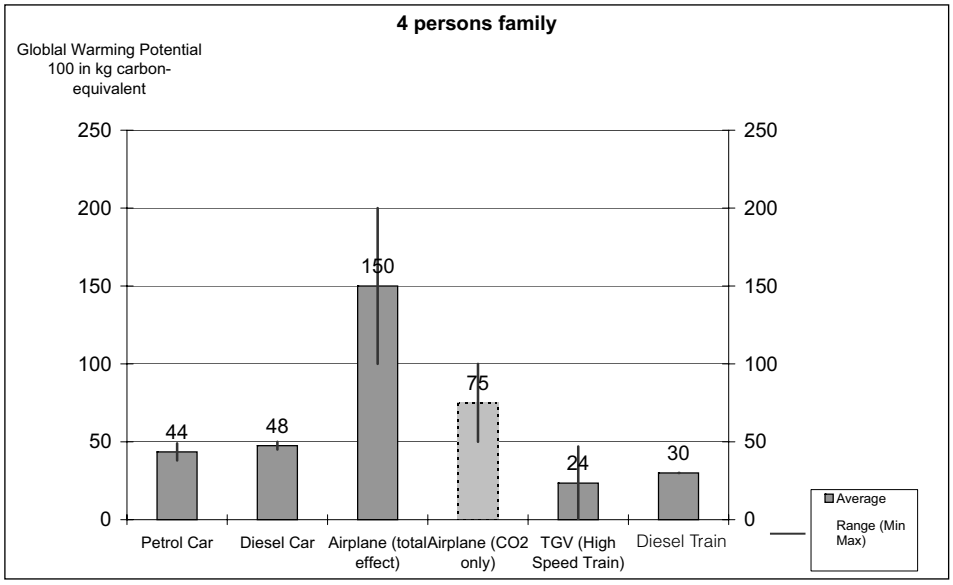

Figure 2. Impact on the greenhouse effect of a journey from Paris to Nice, depending on the mode of transport.

Source: IFEN based on SNCF, European Environment Agency (Copert III and MEET programmes), IPCC, Airbus Industries, EDF

Remarks. Range: from the most to the least polluting vehicle in each category.
Cars. Variables: age, horsepower, type of journey (motorway or main road)
Planes. variables: type of aeroplane. Two estimations are given: one for the effects of carbon dioxide (CO2), which are well known, and the other for the impact on the greenhouse effect of all pollutants emitted during the flight. In this case, the effects of nitrogen oxides, water vapour, sulphur oxides and jet trails are all taken into account.
Trains. Variables:type of energy used to produce electricity for a TGV , from hydraulic power (0 or near 0) to coal (47).

BUILDING MOBILITY PATTERNS: STEP BY STEP

A SEGMENTATION OF TOURISM LEISURE MOBILITY DEMAND

The growth of tourism cannot be considered as simply coupled with economic growth or with the spreading of the «*société de consommation*» («Consumption society», Fourastié, 2004) or of the «société des loisirs» («Leisure society», Dumazedier, 1997), should these be considered as valid concepts. The following factors influencing the tourism demand can be recalled: economic growth and inequalities, demography (including family patterns), conditions of travel (safety...), transport infrastructure development, tourism and leisure supply (how far will liberalisation go and the market sector penetrate the activity), marketing strategies, technologies, the way society values amenities linked to tourism (sunshine, sport, etc.) and of course two fundamental variables: time resources and disposable income...
The followings insist on one particular factor: in a historical period where both

income and leisure time increase, how are the uses of leisure time – other than tourism – evolving, what are the prospects of their competition with tourism and the impact of this on mobility? For instance, on a scale leading from working time to tourism time, some intermediary categories of time enable leisure; their share in responding to the demand for leisure could be a key factor explaining the further developments of household mobility.
Five categories of tourism/ leisure mobility are distinguished; they combine in different quantities to build each of the patterns above.

Very long distance trips

Very long distance trips have for main motivations, visiting a distant country, discovering a culture, exotism, benefiting from a tropical environment... It generally means travelling to another continent or to the southern and eastern shores of the Mediterranean, using of course a plane. Very long distance trips last from one to three weeks. International tourism from France is partly included in the national statistics of long distance trips (which comprises some domestic tourism as well) and very long distance trips.
We assume their average distance is 6000 km, which is the average between a trip to the Caribbean and one to North Africa. The average distance per trip for international tourism is around 4 000 km (SDT survey, 2002). Given that trips to neighbouring countries are accounted here in the next category (long distance trips), 6 000 km should be considered as a minimum. Indeed, trips to the French overseas territories have a strong impact on this category. In 2000, the Caribbean French territories (accounted as «domestic tourism») represented 1,1 million of stays from the mainland, French Pacific territories (roughly 15 000 km from Paris, that is 30 000 km per trip) more than 100 000 stays (direction du tourisme, 2001), figures which are not negligible compared to the 5 million transcontinental trips of French residents to foreign countries.
Two factors influence the development of this very long distance mobility: a generational effect, and disposable income. The French, as well as the Spanish, have been traditionally reluctant to travel abroad: their countries have many tourist resources (sea, mountain…), and the elderly have not been used to travel abroad, and all the more in remote countries (the barrier of language…). Long run statistics show that at the same age, departure rates have increased by 15-20% as the result of higher incomes and travel experience. International tourism from France increases annually at a 5-10% rate.

Long distance trips

Long distance mobility corresponds to the conventional vacation patterns of the Europeans: a trip to a seaside or a ski resort, taken within the country or in a neighbouring one (mainly on the northern shore of the Mediterranean). Long distance domestic trips overwhelmingly use the car (more than 80%). The two marginal uses of train and plane neutralise each other which is tantamount, with regards to the impact on climate change, to all these trips using cars. We assume an average distance of 1500 km per trip.
In 2001, on average, 22 days away from home were taken by the French, with 0,2 stays taken abroad, 2.2 stays over 4 nights taken within France, and 1,5 short stays (SDT survey). The average distance of a personal trip which includes outings (next category) and international tourism (previous one) was 1 440 km. This average distance per trip tends to increase. Its evolution depends, for the short term, on disposable income and the safety of international travel, for the long term, on transport prices, infrastructure improvement and attractiveness of remote destinations.
This category of mobility has the lowest rhythm of growth: The long stays (more than 4 nights) of French domestic tourists have been staggering for more than twenty years. With the diminution of the length of stay, though (two stays of 6 days a year rather than one lasting 15 days), the number of trips increased by 19% within the last decade (Insee, «Vacances» survey).

Outings

Two subcategories are included under the term of outings:

- daily trips at some distance from home, excluding the immediate neighbourhood, but remaining for the majority of them under 200 km (return included). In 2002, the French took 153 millions of daily trips (more than 100 km from home), 75% had a distance below 200 km, 21% between 200 and 500 km, 4% beyond 500 km. More than 75% used the car, 10% the train and 6% the plane (coach and unknown: 8%). We do as if they all used the car, since the impacts of other modes tend to compensate each another (SES 2004, from SDT Survey). Although the monitoring of these daily trips has only started recently, the improvement of the accessibility of the territory, and the diminution of working time on a weekly basis suggest a rapid growth.
- short stays (i.e. up to three nights spent away from home) close to the place of residence (between 100 and 500 km). Short stays represented in 2001 more than 80 millions of trips.

Bi-residential mobility

Bi-residential mobility is a frequent and regular mobility between the main home and a secondary home, or, in an extreme scenario, between two homes of equal importance. We assume an average of 500 km per trip, half of which are taken by car, and half by train or other public means of transportation.

There are about 2.3 million secondary homes in France, they tend to accommodate over the years a larger proportion of holiday makers (Figure 3), which would

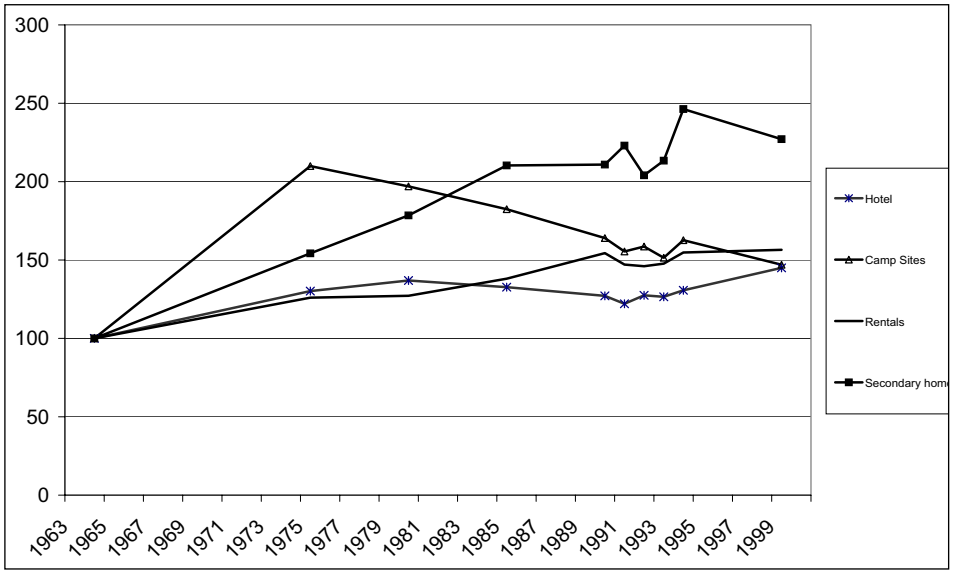

Figure 3. Evolution of overnight stays by type of accommodations, 1964-1999. Indices 100 in 1964.

Source: Insee, «Vacances Surveys» from 1964 to 1999

be even greater if mobile homes, caravans that no longer move, upgraded garden sheds etc. that play the role of second homes were included. It is felt that statistics at hand do not reflect correctly the importance of the bi residential life patterns of life that are emerging (Urbain, 2002, p. 173). The average time people spend in their second homes is 40 days (Credoc, «Conditions de vie et aspirations des Français» survey). Yet the internet and other communication technologies now allow for some professions to use a second home also for work, the more as the improvements in the transportation networks (motorways, high speed trains...) facilitate its access. Secondary homes are less inherited from the family, in less proportion located at a short distance from the main home (the Paris Basin) and more and more on the seashore and in the south (western Provence). The average distance taken, 500 km, is thus felt to be a conservative estimate.

Short distance leisure mobility

Short distance leisure mobility includes mobility within the city of residence or in the immediate neighbouring. The improvement in housing, adapting it to or permitting new leisure activities (meals with friends parents etc. seriously increase) can have important consequences for leisure activities out of the home and for French domestic and outbound tourism. In another contex, N. Curry has shown that the staggering of outings in the English countryside can be related to the changes in home ownership during the Thatcherian period (Curry, 2001).
The average distance of such mobility naturally depends on the different tourism and leisure patterns: for instance people with a hectic tourism mobility could not have much time to spare for leisure near the home.
We assume that short distance mobility is equally shared between the car on the one hand and public means of transportation (train and bus) on the other. Personal vehicles move on average 14 400 km a year, i.e. 270 km a week, of which 100 are related to professional purposes, 33 to vacations, 51 to week-ends trips, 6 to trips in a foreign country, and 82 to other private purposes («Transports et Communications» survey). The last category includes shopping and other constrained activities, but also short distance leisure mobility: with new trends such as «fun shopping», these two types of motivations can be mixed. We assume 30 km a week for a conventional household.

ASSEMBLING DIFFERENT FORMS OF MOBILITY IN HOUSEHOLD ANNUAL MOBILITY PATTERN

Time pattern models appear to be more and more differentiated. Some differences are traditional and well known (and nevertheless important), other partitions are more or less specific to France, some are just emerging.
The differences in time use patterns according to socio-professional categories are well known and documented, so as their trickling down from one social class to another (Packard, 1960; Bourdieu, 1979). One should notice here the gradual disappearance of the very specific time use pattern of farmers (which used to influence other inhabitants of rural areas) owing mainly to the dwindling of their number.
The leisure time patterns are not only increasingly split between social categories but also much more individualised (Cazes and Potier, 2002). Different factors push towards this: the flexibility of working hours which favours more individualistic uses of leisure time since working hours less coincide between the family members (Boulin & Du Tertre, 2001), the growing fragility of couples etc. As a whole, individuals want more and more to decide what they do with their free time, thus breaking with the mass models that were previously dominating.
In relation to this evolution within existing patterns of time use, new patterns of leisure and tourism mobility are emerging (Commissariat général au Plan, 1998), next to a conventional pattern, still but less prevailing, and which is itself subject

to changes (more mobility, and farther away).

A conventional pattern

What is described here derives from the mass behaviour of the last two decades. In that model, the family takes 20 to 30 days off away from home including two long distance trips and 6 outings (week ends, short stays or excursions). This pattern includes a moderate use of leisure opportunities near the home. Very long distance trips are in this type of behaviour too occasional to be taken into account. All this sums up to 5 760 km (Table 1) per adult belonging to the household (children are not supposed to travel as much, but this is the case in each scenario). Such people mainly travel by car, as it is the case now (near 80%: Ifen, 2000, p. 39).
The modelised distance is quite consistent with the reality: on average, in 2000, a French individual who took at least one tourist stay (80% of the population) travelled 5 300 km for personal reasons (SES 2002, from SDT survey).

A great travellers, or «Parisian» pattern

Tourism is here pushed to some kind of extreme. The households still take 2 long distance trips but also one far abroad (6000 km per travel). They move frequently for outings but, as a consequence of all this, they tend to travel less for short distance leisure (15 km a week). This leads to the figure of 11 380 km.
On average, a Parisian who took at least one tourist trip travelled 8 000 km in the year (SES 2002, from SDT survey). As all Parisians are not «great travellers», the result of 11 380 km seems compatible.

A home-centred pattern

The home-centred pattern takes into account the facts that the home, its garden, its semi-urban surroundings constitute an increasingly attractive place for leisure. Thus people stay more at home. They are no longer tempted to go and live elsewhere for a couple of weeks or so: the garden needs watering, the house improving etc. They are of course still interested by visiting far away exotic destinations, every couple of years, since such trips are rather expensive, which leads to 0,5 trip a year. In the meantime they will still go away for outings (3 each year) and they move a lot for leisure near the home (60 km). This comes up to 6 720 km.

A bi-residential pattern

In this case, it is hard to guess which is the main home and which the second one, since those people spend during the major part of the years 3 days in one and 4 in the other. This roughly implies 40 trips from one home to the other, distant from an average of 250 km. This goes with a travel to exotic destinations every two years, a limited number of 3 short stays per year and a low travel intensity for leisure near the home (15 km). The total distance travelled is in this case 24 380 km.

A home-bound pattern

This pattern differs from the home-centred one in the sense that it does not usually stem from a voluntary choice. Staying at home reflects here economic conditions (poverty), living conditions (illness, old age), or reluctance to travel (fear, professional constraints...). It can be reminded that each year 40% of the French do not go on holiday (at least four nights out), and even more than 20% do not even go away on short stays; some of these, though, appear to take holidays every two years.
People concerned by this pattern will take two outings a year and do not move much for short distance leisure (owing to their physical and economic capacities).

Current repartition of patterns in French tourism/ leisure mobility demand

In order to model the current tourism/ leisure mobility demand, a reasonable current repartition of patterns can be estimated:

- in 2000, 27% of the French did not take any holidays, which means they did not even stay one night ouf of their permanent home. Though, some people who only take one short trip (Chrismas in the family) should be added to estimate the share of home-bound patterns. This leads to 32%;
- 50% left home but remained in France, which corresponds to the conventional pattern;
- 22% went abroad, of which only one third left Europe, to which trips to overseas French territories should be added: this leads to more or less 10% of great travellers;
- 10% of households own a secondary home, of which we assume that only 30% have a very intensive use of this residence, which leads to 3,5% for the bi-residential pattern;
- the remaining can be categorised as «home centred patterns», which is 4,5%.

RESULTS

The results presented in Table 1 can be analysed from the perspective of total kilometer travelled and impact on climate change of each mobility pattern. They can finally be used to combine these patterns so as to draw scenarios of French tourism / leisure mobility demand.
The approach in terms of kilometer is not the main objective of this research. However, it enables to address other environmental impacts of transports (figure 4). For instance, if «great travellers» and «bi-residential» patterns are quite equivalent with regards to climate change, the bi residential pattern might have serious impacts on road congestion (especially on Fridays and Mondays), noise, infrastructure development, while «great travellers» might cause airport saturation and question air traffic security.

A few lessons can be drawn from the «Climate change index» (figure 5).

- No current emerging trends seem to lead to a decrease of tourism/leisure impacts on climate change. The patterns show these impacts vary from 2,2 to 4,7 times more than the conventional (current) ones;
- Less tourism, as traditionally defined, does not necessarily mean less impacts on the atmosphere. A decline in conventional tourism can be easily offset by a development of bi-residential ways of life, and lead to a high-impact situation. Similarly, the advantage of more home centred leisure in terms of mobility can very easily be offset by the search for increasingly exotic tourism. This recommends to pay more attention in the future to «para-tourism» phenomena, such as outings, excursions, bi-residence....
- Air transport and very long distance mobility play a central role in «Great travellers» and «Home-centred» scenarios, with respectively 77% and 75% of the total impacts, while road transport plays a more important role in the «Conventional» and «Bi-residential» patterns (56% and 35%). Given the growing propensity of the French to travel abroad, the development or air transport is a serious concern for the future. This confirms the forecasted shift from road transport to air transport as the main contributor to climate change (OECD, 2001).
- The share of short distance mobility in the patterns varies from 2,3% (bi-residential) to 21% (conventional) and 59% (home bound). It is more important in the lowest emissions scenarios, which means its absolute value is quite low. If one adds the possibility, especially in centre cities, of a modal shift to less polluting modes of transportation (bicycles, tramways...), the substitution of tourism by leisure near from home could be a good opportunity for reducing impacts, all the more as this type of leisure occupies a good deal of time, and is quite important for the quality of life and well-being.

Table 1. Patterns of tourism / leisure mobility.

		Annual number of trips	Distance per trip	Total passenger.km travelled (4 persons)	*Share of car*	*Passenger.km (car)*	GHG intensity coefficient	Associated GHG emissions (index)	Climate Change Index
Conventional				**23040**		***16320***		**21480**	**1,00**
	Long dist	2	1500	12000	*80%*	*9600*	1	12000	
	Very long dist	0	6000	*0*	*0*		0		
	Outing	6	200	4800	*75%*	*3600*	1	4800	
	Bi-residential		500	0	*50%*	*0*		0	
	Short dist	52	30	6240	*50%*	*3120*	0,75	4680	
Great travellers				**45520**		***15960***		**92740**	**4,32**
	Long dist	2	1500	12000	*80%*	*9600*	1	12000	
	Very long dist	1	6000	24000	*0*	*0*	3	72000	
	Outing	8	200	6400	*75%*	*4800*	1	6400	
	Bi-residential		500	0	*50%*	*0*		0	
	Short dist	52	15	3120	*50%*	*1560*	0,75	2340	
Home centred				**26880**		***8040***		**47760**	**2,22**
	Long dist		1500	0	*80%*	*0*		0	
	Very long dist	0,5	6000	12000	*0*	*0*	3	36000	
	Outing	3	200	2400	*75%*	*1800*	1	2400	
	Bi-residential		500	0	*50%*	*0*		0	
	Short dist	52	60	12480	*50%*	*6240*	0,75	9360	
Bi-residential				**97520**		***43360***		**100740**	**4,69**
	Long dist		1500	0	*80%*	*0*		0	
	Very long dist	0,5	6000	12000	*0*	*0*	3	36000	
	Outing	3	200	2400	*75%*	*1800*	1	2400	
	Bi-residential	40	500	80000	*50%*	*40000*	0,75	60000	
	Short dist	52	15	3120	*50%*	*1560*	0,75	2340	
Home bound				**4720**		***2760***		**985**	**0,05**
	Long dist		1500	0	*80%*	*0*		0	
	Very long dist	0	6000	0	*0*	*0*	3	0	
	Outing	2	200	1600	*75%*	*1200*	1	400	
	Bi-residential	0	500	0	*50%*	*0*	0,75	0	
	Short dist	52	15	3120	*50%*	*1560*	0,75	585	
Coefficients									
Car	1								
Train	0,5								
Plane	3								

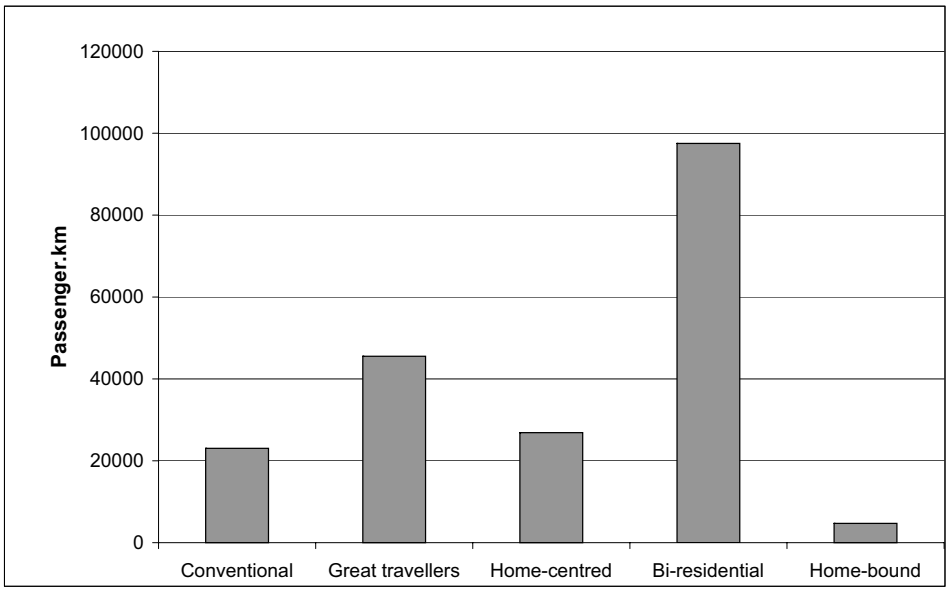

Figure 4. Total passenger.km travelled by pattern.

- Bi-residential patterns are very costly in terms of emissions (5 times the distance and the impact compared to the conventional one). They remain so even in the case of a reasonable use of the train between the two homes. Their impact is equivalent or slightly superior to that of the high tourism scenario.
- The «home bound» pattern appears to be the only sustainable one with regards to the climate change index if one admits that current emissions should be divided by four if climate change is to be seriously mitigated (Grassl and al., 2003; Thaler and al., 2000). Nevertheless a pattern founded on human misery or ageing population does not give an appealing image of sustainability. In terms of alternatives to the high transport patterns, other patterns than this one have yet to be found.

Assembling the patterns into contrasted scenarios of overall tourism/ leisure mobility demand is still a work in progress. At this step, only rough evaluations are possible. For instance, a society which would combine the home-centred and residential patterns in the respective proportions of 90% and 10% would obtain an average distance of 9 158 km, that is 60% more than the conventional scenario with 2,5 times more emissions.

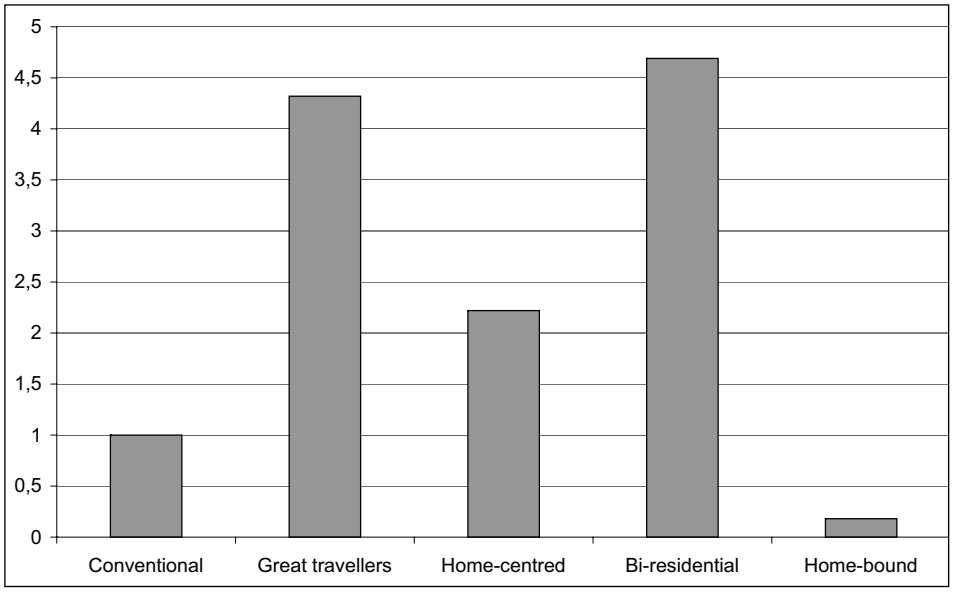

Figure 5. Climate change index by pattern.

CONCLUSION

Tourism necessarily implies mobility. Somehow the impacts of this mobility on the global environment will have to be addressed. Foreseeable technological improvements do not seem sufficient to cope with this issue: technological progress seems to improve much faster the conditions of virtual communications than those of physical travel (Ceron and Dubois, 2002; Boulin, Dommergues and Godard, 2002). The answer to this challenge can be sought in two types of directions.

The first is to try to maintain the possibility of travelling largely unrestricted. Meeting global constraints would then mean diminishing the other uses of GHG generating energies even more drastically than expected. When facing the cruel dilemmas this would imply, would people be willing to?

The second direction is to try to have a just as pleasant life with less long distance tourism (Peeters, 2003). We have great difficulties to imagine ways of life radically different from present ones, which is after all surprising if we consider how they have changed and what we have experienced through the last half century (for instance who in 1950 would have expected that 50 years later the French would spend on average 2 hours a day watching TV? (Dumontier, Pan Ké Shon, 1999)), and the fact that obviously the pace of change is not slowing down. The key point is the part tourism will take within leisure time. Forward thinking on that point implies that we should admit that leisure activities and the uses of leisure time will probably change considerably over the next decades. The important point is not so much to predict what

will change (what is the future of gardening, of reading, of watching TV, of home computer games etc.), but to know that the change will be considerable and might both upset the demand for tourism mobility (pressure towards growth or decline, no one knows...) and allow to rethink the place of tourism mobility within leisure time.

French public policies during the last twenty years (since the short-lived Ministère du temps libre in 1981) have focused essentially on tourism and left aside leisure. They appear to have been led mainly by the search of the economic benefits of tourism (notably the inflow of foreign currencies) and by the effects on employment of shorter working hours («les 35 heures»). Do they not somehow miss the point of more ambitious leisure / quality of life policies? The need for tourism is often linked to a bad quality of life, to a desire to escape, especially from urban areas (the Parisian syndrome…). Would a better quality of life (possibility of outdoor recreation, green belts, leisure activities) undermine the need for a tremendous mobility?

We are living times where technological, economic and social changes are opening new opportunities but also where global constraints must be now dealt with (Barnier, Beckett, Lepeltier, Straw, 2004). In a globalised world sustainable mobility is one of the major challenges that has to be faced and tourism mobility is part of the problem, not alone though.

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