Greenhouse gas emissions from tourism under the light of equity issues

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Tourism is affected by global warming, but it is also a major contributor to greenhouse gas emissions, by emitting CO2, and other gas (mainly CH4, N20), and through specific phenomena (contribution to the formation of cirrus clouds by airplanes for example). This second aspect is less studied. Moreover research up to now mainly focused on the impacts of energy consumption, of transports etc. without assessing the specific contribution of tourism.

The methodological and practical difficulties of such an assessment are discussed at first. This is followed by results for France: they show in particular that tourism is increasingly dependent on transport.

Given the overwhelming importance of the stakes linked to global warming and a contribution by tourism which is far from negligible, this activity is bound to be concerned by mitigation policies. This is a broad issue which is largely ignored but needs to be explored, probably under various and contrasted hypotheses. The second part of the paper points out to the importance of the problems which will have to be dealt with and the equity issues that stem from them.

An assessment of the contribution of French tourism to global change

Within an environmental assessment of the tourism sector at a national scale, we conducted for the French Institute for the Environment (Ifen) an evaluation of the contribution of tourism transport to global warming.

1)Hypothesis and methodological choices

In order to simplify the evaluation, and taking into account the reliability of data, it was decided :

- to take as a starting point the tourist himself rather than the economic activities related to tourism (i.e. to privilege a consumption approach rather than a production approach). Therefore, the impacts of sub-sectors, such as travel agencies, or the operating of air companies (independently of the air trip itself), are not included in this assessment ;

- not to get involved in a life-cycle approach. In such an approach the impacts of the construction and dismantling of airplanes, hotels, equipment or energy plants should be added, as well as the impacts of implementing «clean» energy production processes, with insurmountable practical

difficulties. This is why only direct contributions to global warming were considered, and indirect ones left aside;

- to evaluate, tourism impacts at a national level rather than at the destination level. Research on environmental indicators for tourism is essentially destination-oriented (Ceron & Dubois 2001), whereas most international discussions and the Kyoto protocol on the reduction of greenhouse gas emissions refer to a national basis. Therefore, a national evaluation was considered as necessary to define the priorities ;

- to calculate a *total* contribution rather than a *net* contribution to greenhouse gas emissions. If a tourist stays at home instead of spending vacations, he consumes water, and energy, produces wastes and greenhouse gas which should be subtracted from the total tourism impacts in order to calculate the net emissions due to tourism. On the one hand, *total* estimates are most appropriate to establish benchmarks, or to facilitate regional or place-based analysis (EPA, 2000). They do not depend on the variability of alternative activities, which may change over time and places. On the other hand, *net* estimates are useful to point out what is environmentally friendly in a tourist's way of life, compared to everyday life (staying in a camp site for instance), and what is not and leads to an over consumption of resources (using air planes, ski lifts…). At home, households also contribute to greenhouse gas emissions, through personal or professional movements; however, in the case of transport, net emissions seem very close to total emissions, since the distances travelled are much more important during vacations owing to the travel between home and the destination.

- to focus only the contribution of tourism transportation to global warming. The main components of the tourism product/experience are transport, lodging and catering, the use of equipments (ski lifts, swimming pools, etc.), and activities (i.e. walking, swimming, etc.). More generally speaking, the impacts of tourism on the environment can be parted between on-site impacts (including on-site transports) and transportation (to the destination) impacts. Each step of this consumption pattern contributes to global warming and, legitimately, should be evaluated, though it is not the case here.

Calculating the total contribution of the tourism sector remains uncertain because of the lack of required data. The methodology for accommodation and equipment would require a knowledge of the number of overnight stays/visitors for each type of accommodation/ equipment, allowing to multiply by ratios, such as the average use of energy per overnight stay/visitor. The breaking down between the different energy sources used (electricity, fuel, gas….) should be known to calculate greenhouse gas emissions. As far as electricity is concerned, it is possible to convert energy consumption into

greenhouse gas emissions thanks to national data on electricity production and its splitting between sources : coal, nuclear, renewable, etc.

- for accommodation, these ratios depend on the standard of comfort, the age of accommodation, the climate of the location (implying air conditioning, heaters…). This is why data based on local surveys are not very helpful. Only a few surveys provide such ratios for hotels, camp sites, secondary homes on a national basis…Current research on eco-labelling and its forthcoming monitoring will provide more ratios in a nearby future;

- there is also a great lack of data concerning equipment: very few data are available for theme parks, water parks… *Ifen* estimated from 571 to 734 GWh the energy consumption of 4000 lifts during a casual winter season, e.g. from 1/4 to 1/3 of the annual energy production of a nuclear plant ;

- further, when lodging, catering and equipment are included in an overall evaluation, it really seems necessary to consider both *total* and *net* impacts on climate change. It would not be fair to the tourism sector to just consider the *total* estimate. One should rather focus on the incremental emissions caused by tourism, and on the way of reducing them.

This is why the idea of an evaluation of the contribution to climate change of the overall tourism activity was abandoned.

Concerning transports, in spite of a considerable amount of research devoted to the environmental impacts of day-to-day household travel, until recently only little work, specifically focused on the environmental impacts of household *tourism* travel. According to OECD, «*One source of tourism-related environmental impacts – travel - remains consistently and conspicuously absent from the general discourse on sustainable tourism.*» (OECD, 2001). With regards to global warming, the evaluation of transportation impacts should be considered as a priority: the Environment Protection Agency (EPA, 2000), estimated that for the United States, 76,5% of greenhouse gas emissions of the tourism and recreation sector are caused by transportation (against 15% for lodging, 2,7% for restaurants, 1% for retail, and 4,8% which are activity-specific). On-site travels usually have a lower impact than the travels from home to destination. In Calvia (Balearic Islands) on-site tourist movements represented 73 000 tons of CO_2 in 1995, when air transport to the destination contributed eight times more to greenhouse gas emissions (534 000 tons).

2) Detailed methodology

1. Estimation of the total contribution of tourism transport

The first step was to calculate emissions of greenhouse gas related to domestic tourism by road transport, for which very precise data were available. Then, the results were extended to the whole of tourism transport, taking into account the modal distribution of domestic and adding international tourism to France.

Evaluating the contribution of domestic tourism road transport to global warming required very precise data concerning tourist movements (kilometers), and emission factors for various pollutants. Some very consistent data are available for road transport, thanks to the National Transport Survey, for 1994. Households were asked to part their annual road trips (in kilometers) into five categories: home to work; professional trips; *week-ends; holidays*; others private trips. The selected categories do not exactly match with a definition of tourism, since some week-end trips can be undertaken without an overnight stay. They do not match either with recreation, since the category «other private trip» (including daily leisure trips) has not been taken into account. The survey enabled to determine which type of vehicles were used for the different types of trip (petrol or diesel, age and capacity of vehicles), which is important since holidays and week-ends trips appear to use more frequently diesel engines, more recent and higher capacity vehicles. In a policy-making approach, these very detailed results will help pointing out the main factors (technical, socio-economic, load factors of cars….) influencing the current emission profile of tourism and leisure.

The emission factors per kilometer were provided by the Copert III program (Computer program to calculate emissions from road transports), for an average speed of 100 km/h, which correspond to the highway or national road trips linked to tourism transportation. Copert III provided results for energy consumption and for nine pollutants: CO2, CH4, N20 (all greenhouse gas), CO, NOx, COV (light organic compounds), PM (particles), NH3, as well as the global warming potential for the 100 coming years (GWP100) which is an aggregated index of the three main gas contributing to greenhouse effect (GWP100 (in kg carbon-equivalent)= 12/44.(CO_2 emissions (kg) + 21.CH_4 emissions (kg) + 310.N_20 emissions (kg)).

2. Estimation of greenhouse gas emissions for a specific travel

The indicators provided by the previous evaluation are quite technical and hard to communicate with on a large scale, towards the general public. They do not insist enough on individual responsibilities towards the greenhouse effect, and do not provide satisfactory information about the implication of the modal choice on greenhouse gas emissions. To present these results in a more attractive way, it was decided to calculate a specific indicator: a comparison of price, energy consumption and greenhouse gas emissions of a Paris to Nice trip, according to the mode of transport (see Figure 3). The indicator was calculated both for a family trip (4 persons), and for an individual trip, during a peak period (influencing prices and load factor). The indicator provides a range (min/max) between the most and the least polluting vehicle for each mode of transport, or between the most and least polluting kind of travel (in the case of airplanes, a charter flight pollutes less per person, because of better load factor, for instance).

- The Copert III methodology, as explained before, was used for road transport, with a distinction between diesel and petrol vehicles, and precise data about the characteristics of travel (different types of roads, and their respective speed).

- For air transport, data were provided by Airbus industries (Airbus Aircraft performance program) and completed by the Emep/ Corinair (European Environment Agency 1996) simplified methodology for other airplanes. Emissions were calculated for a load of factor of 100%.

- For rail transport, the Jorgensen and Sorenson (1997) methodology was used. Emissions depend on the weight of the train, slope, average speed). French railways provided data for TGV (high speed trains). Average emissions factors for diesel train were collected in Zinger and Hecker (1979). These ancient data are compatible with Jorgensen and Sorenson's results from a sample of European trains. Emissions were calculated for a load of factor of 100%

3) Results

1. Estimation of the total contribution of tourism transport

The first result is the important contribution of tourism to the emission of air pollutants: the contribution of tourism to the single road transport emissions (Figure 2) varies from 6% for COV, to 26% for Nox.

Compared to the French overall emissions in 1994, the contribution of domestic tourism transports is negligible for methane (CH4: 0,1%), which mainly comes from agricultural sources, or ammoniac (NH3), but is still important for air pollutants such as carbon monoxide (CO: 41%), nitrogen oxides (Nox: 11,8%), light organic compounds (COV: 2,4%) and carbon dioxide (CO2: 5,5%).

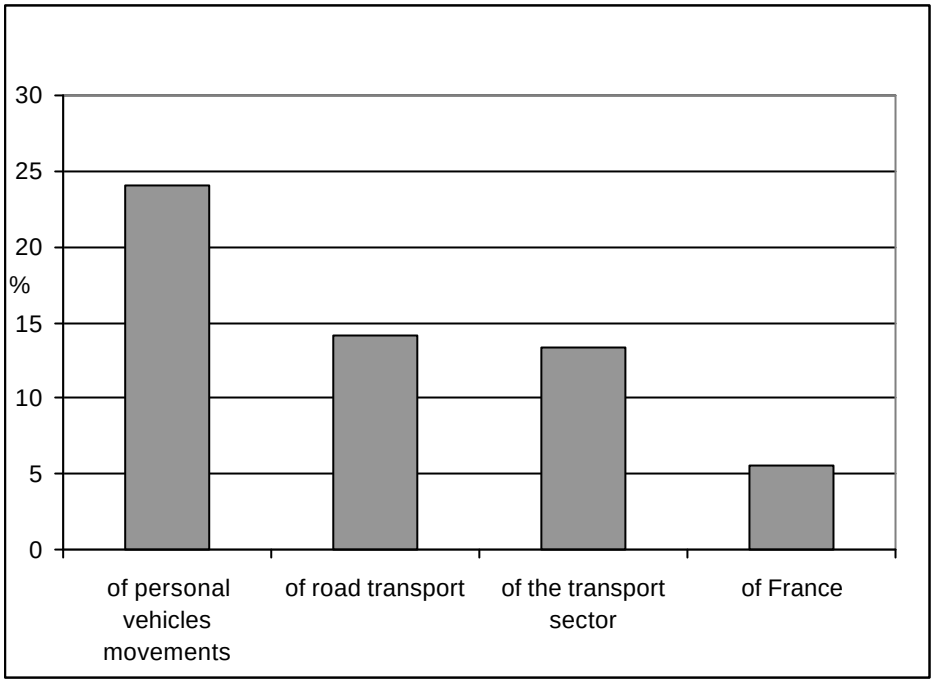
Domestic tourism road transport represents (Figure 1) 24% of personal vehicles emissions of CO2, 14,7% of road transport, 12% of the overall transport sector, and 5,5% of French emissions. It reaches annually 105 billions of km and emits 17 millions of tons of CO2. *The potential of global warming (GWP100) of domestic tourism road transportation accounts for 3,8% of French total emissions (4,8 million tones carbon-equivalent).*

The total contribution of tourism transport (domestic and international tourism, all modes of transports included) implies adding:

- air transport for domestic (within France and abroad) tourism reaches 15% of the distance traveled by road for tourism purposes, with emission per passenger.km from 2 to 4 times more important. This leads to a rough estimate of 45% of domestic road tourism transport.
- rail transport for domestic tourism represents 20% of the distance traveled by road, with emissions per passenger.km 3 times less important (*National Transport Survey*)., thus about 7% of domestic tourism road transport emissions.
- international tourism travel to France represents 30% of domestic tourism travel, with more air travel than domestic tourism. This comes up to, at least 45% of domestic tourism road transport emissions. This figure is surely underestimated, owing to far distance travel.

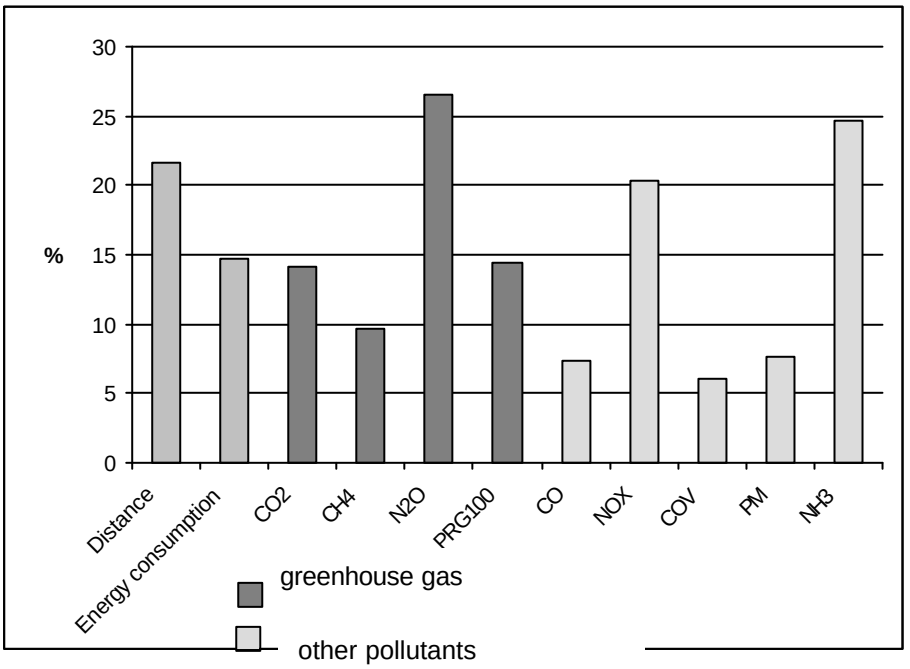
The total contribution of tourism transport to French greenhouse gas emissions is thus roughly about twice more important, from 7 to 8%.

Figure 1 : contribution of domestic tourism road transport to CO2 emissions of…



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

Figure 2 : contribution of domestic tourism travel to emissions of road transport

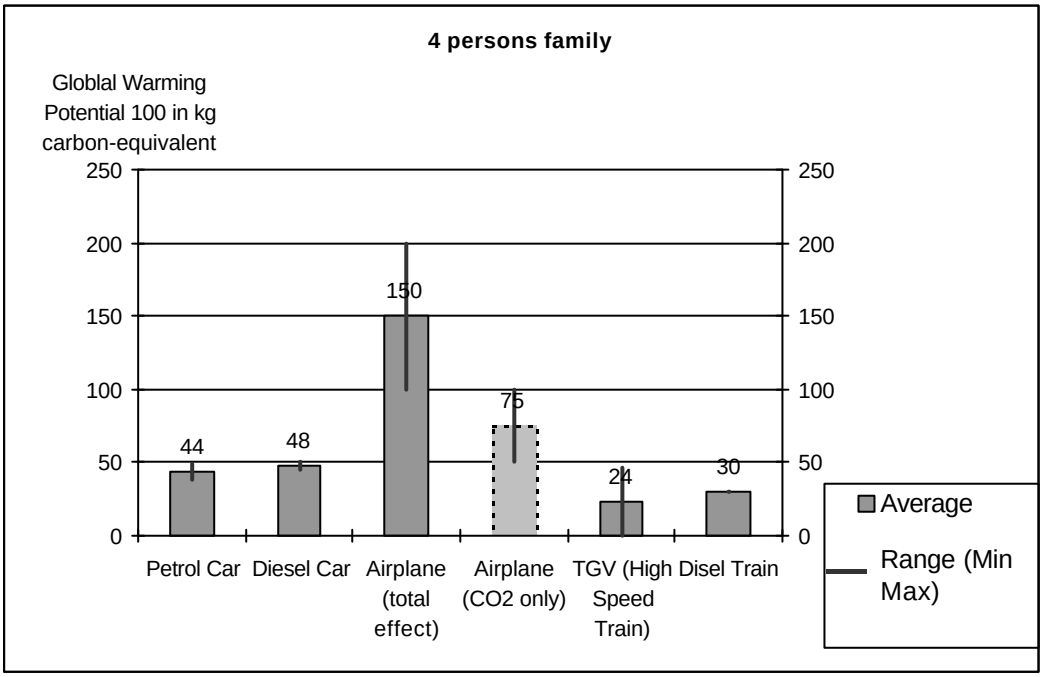


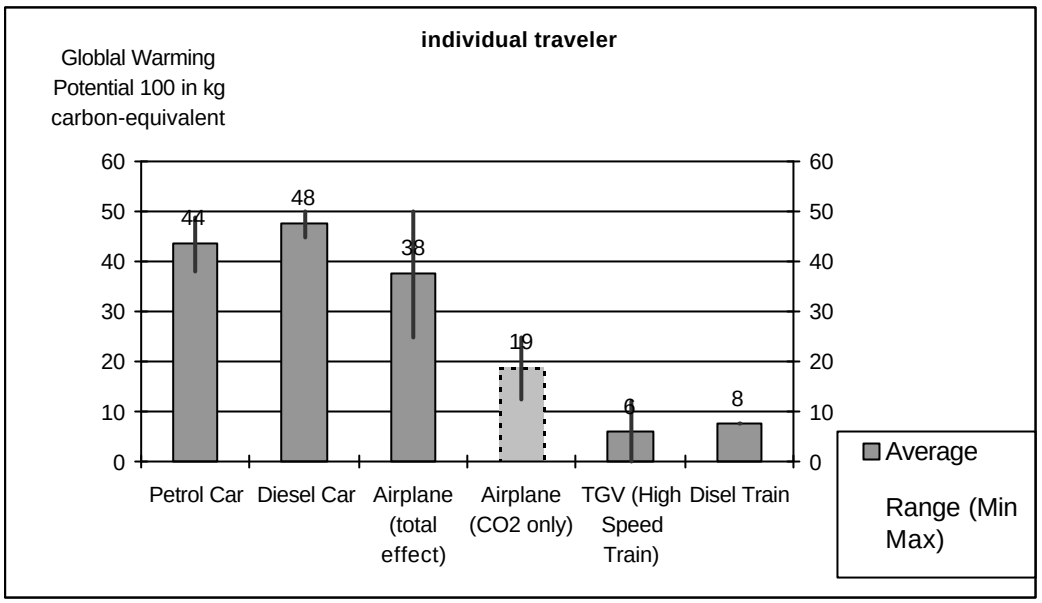
Source : IFEN based on SNCF, European Environment Agency (Copert III and MEET programs), IPCC, Airbus Industries, EDF

2. Estimation of greenhouse gas emissions for a specific travel

In this example of a Paris to Nice trip, a family will have contributed three times more to global warming with an airplane than with a car, five times more than with a train. In the case of an individual traveler –responsible for the total of the car emissions, but only responsible for one fourth of the airplane and train emissions calculated for a family – airplane and car emissions are almost equal. In all cases, the train is the winner of this competition, with very low emissions when the electricity comes from nuclear or renewable sources. For that range of travel distance, air transport represents 2% of personal trips taken in France, the train 18%, cars 80% (*Insee, National Transports Survey*).

Figure 3 : 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 programs), 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 airplane. 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 vapor, sulfur oxides and jet trails are all taken into account and sum up by applying a factor 2 to the CO2 emissions; this is relatively low and some will consider multiplying by 2,7 (Hoyer 2001 p. 457)

Trains. Variables :type of energy used to produce electricity for a TGV , from hydraulic power (0 or near 0) to coal (47)

Transport has a growing responsibility in greenhouse effect : the contribution of transport in French CO2 emissions climbed from 8% to 39% between 1960 and 1990 (*Citepa*). The modal choices (and consequently the infrastructure choices) have a strong impact on this contribution. This issue is all the more important for tourism as it is highly dependent on transport.

The dependence of French tourism on transports

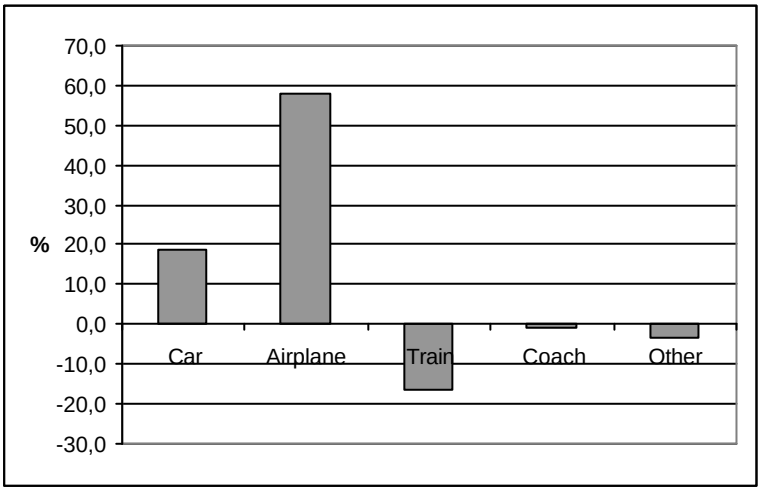
1) The growing transport intensity of French tourism

By nature, tourism relies on transport but it also does more and more. Rather than the growth of overnight stays, the changes in households travel behaviors are the main reason for the growth of tourism mobility in France. Current trends show that greenhouse gas emissions follow the increase in mobility. Moreover, it can be expected that they will grow even faster because of the evolution of the modal partition of tourism departures.

Tourism and transport surveys show more frequent departures, for shorter stays and longer distances. The recent French law on the reduction of working time (« 35 heures »), adopted in 1999, certainly reinforces this trend, since it enables more departures and shorter stays. In short, the same activity for hotels, restaurants… requires more transport than it used to:

- from 1979 to 1999, the number of overnight stays in France by French tourists staggered from 733 millions to 709 millions (-3%), whereas the number of tourist trips increased from 43,8 millions to 62,1 millions (+ 41%) (Insee, «Vacances » Survey).
- The average length of stay for a French tourist dropped from 18 to 12 days between 1975 and 1999 (Insee, « Vacances » survey)
- the number of personal annual departures rose from 3,1 to 4,8 between 1982 and 1994 (Insee, Transports Survey), and is staggering around 4,5 in 2000 (SDT Survey).
- The average annual distance traveled for personal long-distance trips (>100 km), is 5230 km per person, whereas the average length of one personal trip is 1430 km (SES, 2002)

Figure 4 : Evolution of the modal repartition of holiday departures (> 4 nights), 1986-1999



Source: Insee, «Vacances» survey

In the future, the contribution of French tourism to greenhouse effect should increase even faster than the number of departures, since, as Figure 4 shows, the most polluting modes of transport (airplane and cars) take a more and more important share in departures. French tourism seems structurally dependent on road and air transport. The attitude of tourists to transports, the spatial distribution of resorts within France, past infrastructure choices (highways rather than train service), and current trends of the tourism demand (the attraction of French tourists for remote areas, etc.) lead to this high-impact situation.

2) The dependence on air transport

French tourism is a healthy economic sector. However, its growth relies on inbound and outbound (international) tourism. Outbound overnight stays increased by 32% while international departures increased by 76% between 1979 and 1999. Meanwhile, inbound overnight stays increased by 104% (Survey «Enquête aux frontières»).

Contrary to remote areas (such as islands), France benefits from the proximity of other European countries (main international markets). This is why 57% of Foreign tourists used their car to reach France in 1996. However, international tourism remains strongly dependent on air transport: 44% of French departures to international destinations (including French territories) use planes (SDT Survey, 1997), so do 15% of international arrivals to France («Enquête aux frontières» Survey, 1996)

3) The dependence on road transport

For various reasons, French domestic tourism also relies on road transport :

- the French tend to organize their holidays themselves more than their neighbors do, and Tour Operators (which are more likely to use collective means of transportation, be it coach, train or plane) only hold a low market share;

- rural tourism accounts for one third of domestic tourism. It is obviously more difficult to provide a coach or rail service in rural areas than in waterside or urban resorts (87% of stays in rural areas use car, against 73% in urban destinations).

- especially on the coastline, tourist lodgings are spread over the territory rather than concentrated in center cities

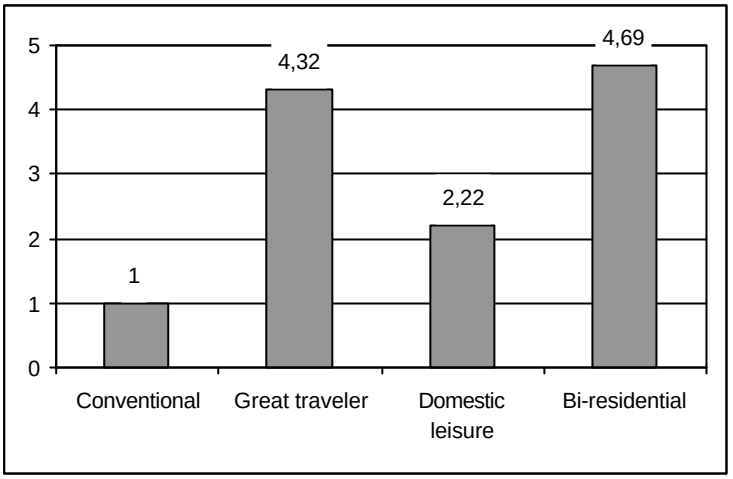
4) Prospects of future emissions

What are the prospects if demand is allowed to develop freely. Is the demand for holiday travel going to stagger in a predictable future (just as the demand for cars or for domestic appliances in some countries) or to expand significantly with the associated environmental impacts. To assess this we defined four types of tourism/leisure patterns corresponding to the present trends of tourism and leisure in France (Ceron, Dubois 2003a,b):

- a conventional pattern, maintaining the present situation,
- a "great traveler pattern" with frequent and varied departures (partly for long distances, frequently for short stays etc.)
- a "domestic leisure" pattern associating more home leisure with occasional departures for exotic destinations
- a "bi-residential" pattern in which leisure mobility is essentially due to the travel between two homes.

These patterns link the characteristics of mobility (frequency, distance, means of transport) with the emissions impacts. The methodology is described in (Ceron, Dubois 2003a,b) and the results summarized in the figure below.

Figure 5 : Impacts on climatic change for different mobility patterns



Source : Ceron et Dubois, 2003a, b

These results show that, compared to present mobility reflected in the conventional pattern, none of the alternative patterns permit a reduction of the emissions of GHGs from tourism transport: these are multiplied by a factor from 2 to 5. Air travel is the most powerful variable leading to these results but tourism depending less on a merchant organization and more on self-organization does not necessarily imply less mobility : weekly migrations to a second home can lead to high impact situations.

The dependence of tourism on future transport policies

Tourism contributes significantly to the greenhouse effect, and relies more and more on transport: these two statements show the sensitivity of tourism to future transport policies in the context of a reduction of greenhouse gas emissions under the Kyoto protocol, and furthermore in the context of more restrictive transport policies which might emerge in the future.

For tourism, the level of impact will strongly depend on the mode of distribution of the constraints between miscellaneous stakeholders (economic sectors and countries). Referring to sustainable development implies that the distribution should be fair. The difficulty is that there is no unique criterion by which fairness or equity could be judged. Any judgment on equity depends on the system of values which is mobilized. Boltanski and Thevenot (1991) show that, within a society, different systems of values coexist regarding to which choices can be justified: civic, industrial, merchant, domestic justification contexts, "cités" as they call them.

Referring to a "civic city" context leads to attributing an equal share of emission rights for each inhabitant of the planet. Referring to an industrial context would privilege sharing the emission rights proportionately to GDP so as to minimize the negative impacts on activities. Referring to a domestic context would promote an approach taking into account the rights acquired by previous generations ("grandfarthering"): the inhabitants of the North can claim rights on the atmosphere they have been innocently using these last centuries, not knowing that they were compromising mankind's future environment; using the emissions in 1990 for a benchmark as the Kyoto Protocol suggests in fact refers to this last frame.

These examples are just here to show that calling upon equity to share the burden the GHGs linked to tourism or to determine emission rights for tourism can lead to dramatically different results.

It nevertheless seems interesting to dwell on the first reference to an interpretation of equity attributing an equal share of emission rights for each inhabitant of the planet. First because this equity criterion is often put forward as self evident, or at least as a criterion superior to all others. Though nobody really suggests it could be applied immediately, it is more frequently considered that in the long term a worldwide convergence of emissions rates could be a legitimate goal. Secondly because it appears that the consequences of such a criterion for tourism would be absolutely devastating.

1. An equalitarian perspective

At present, the use of energy generates roughly 6 billion tones carbon-equivalent for some 6 billion people: one tone per head. Such a rate of emissions leads to a warming of the earth which might induce severe consequences for mankind. Some argue that reducing the pace of warming to an acceptable level, in the context of a moderate demographic growth would imply diminishing emissions per head by a factor 2, that is to 0,5Tc (see for instance http:/www.manicore.com/documentation/serre/reduction.html). Since the global warming potential of domestic tourism is somewhat over 5% of the global French contribution, the question is : what could each of us do with the quota of 25kg carbon (5% of 500 kg) equivalent it could devote to his traveling for tourist purposes. Figure 5 shows that this quantity would not even allow a family to travel by car from Paris to Nice; using a train fed by nuclear or other renewable energy would be the only alternative.

Such an approach might be considered as extremist. The theme of an equalitarian access to resources is nevertheless supported by groups of intellectuals both in the North and in the South (Agarwal 1991); one can also recall that radical discourses might be listened to (see, for instance the maximalist

interpretations of the precautionary principle), especially when they meet the frustrations, the lack of perspectives large groups of population are confronted with.

Such drastic implications for tourism are difficult to accept, let alone to cope with. Some might say that this leads to question the criterion on the grounds of realism though it remains a valid equity principle. In fact this opinion itself can also be questioned. The main reason for this is that the equalitarian principle does not really allow to determine the level of emissions the present generation could afford. The burden should be shared not only by the all individuals of the present generation, but also fairly between the present and the forthcoming generations. If, as he IPPC scenarios suggest, the world population could range from 6 to 17 billion when the concentration in the atmosphere reaches a level of 450 to 650 ppm (corresponding to 630 to 1080 billion tones of carbon equivalent), abiding by the equalitarian principle would allow for an individual belonging to the present generation to emit from 0,5 to 1,6 Tc. This first means that under such premises, the quantity of emissions we can afford now is largely undetermined (Godard 2003); in other words that this manner of posing the problem does not help much. It secondly shows that in the most permitting scenario (low population combined to high emissions), the rate of emission is not very far from the French reality in 1990 (1,8Tc), but somewhat more for other developed countries : 7 Tc per head in the US, (0,9 Tc in China) according to UNFCCC in 1998. The nuclear origin of electricity in France (which poses other environmental and ethical problems) explains much of the gap with other European countries. From this, one could conclude that the changes in our present way of life should not be as dramatic as the first figures above suggested. A reasonable tourism activity could survive, though at a level lower than the present one and unquestionably this would not avoid breaking with the present trend of a growing transport intensity of the activity.

Finally an equalitarian view of the share of emission rights essentially contributes to show strikingly that the present situation and the present trends are not sustainable, it does not really lead to solutions which must be sought in other directions.

2. The prospects of international negotiations

An alternative approach to tackling the problem is to look at "what can be done" at the expense of taking some distance with "what should be done". What can we expect from the negotiation processes within the international community and, taking into account the way they suggest to share the efforts, what could be their effects on tourism?

On the one hand, the Brundtland report refers to *"common but differentiated responsibilities"* which clearly shows a will to introduce an principle of equity into the negotiation process.

On the other hand the characteristics of the international negotiations on climate change do not fundamentally differ from those on other topics such as trade etc. There is no world government that could enforce measures reflecting superior interests of mankind, and equity principles which can stand within a constitutional democratic State cannot be applied in this context. Instead we deal with an assembly of independent states, each of them being lead by its own interests. In such a context any pro-active stakeholder (a State for instance) that would consider itself as a victim of climatic change or whish to counteract the negative effects on climatic change of an activity such as tourism would have to convince its partners to implement measures they are not interested in and thus to compensate them for doing so (Godard 2003). This means that in a context where no superior institution can enforce measures and make the polluter pay as it is the case in a country, the only alternative left is for the victim to pay. This is contradictory with the common sense of equity and anyway not very appealing for any stakeholder conscious of climatic issues.

This divide explains why those who get involved in the discussions on climatic change with the ethical background of the Brundtland report and who whish to progress towards a more sustainable development are rapidly led to look for measures that are acceptable by all major stakeholders, simply because an action that the US, Europe, China etc. have the means to offset the benefits of is of little interest. An acceptable measure can be defined as one to which each stakeholder feels free to agree since he is better off with it than without. Practically, since, as we have seen there is no single vision of equity, the art of the negotiation process consists in combining the different visions and establishing compromises and acceptable trade offs between them. Thus ethics and equity remain present and paid lip service to throughout the negotiation process and if, finally, an acceptable measure can be agreed upon it will be declared equitable... (Godard 2003).

It was legitimate to consider the Kyoto Protocol as the successful outcome of such a process, as long as the USA did not reject it. Notwithstanding this last event, nor the fact that on the contrary the protocol is considered as not sufficient by some important stakeholders (the UK already adopted a 20% reduction target by 2010 beyond the Kyoto protocol and is working towards a 60% cut of carbon dioxide by 2050 (British Secretary of State for Trade and Industry, 2003), it remains interesting to examine its potential implications for tourism

By signing the Kyoto Protocol, France has committed itself to bring back its emissions to the 1990 level. This can be seen as the first step towards reducing emissions in the long run, at a moderate

rhythm. In this case also, it is worth while looking at how an expanding tourism activity can cope with such prospects. Naturally this issue concerns France and Europe where growth prospects are moderate, but also other regions of the world where tourism is expanding at a much higher rate. According to WTO forecasts international tourist arrivals should almost treble within the two next decades and by 2020, 1.6 billion tourists should travel to foreign destinations. The growth should be more moderate in Europe with a rate of 3% and 717 million visitors (WTO 2002). France is not in the worst position to maintain its greenhouse gas emissions at a constant level, nevertheless tourist mobility follows an upward trend. How can this problem be dealt with ?

The latest assessment of greenhouse gas emissions shows that for the moment France complies with the Kyoto objective, releasing 2,1% less (in terms of Global Warming potential) than in 1990. As long as this situation goes on, why should tourism be questioned, and it seems hardly relevant to discuss how to mitigate its impacts. This could go on for some years. But the context appears to change completely if one looks at the long term. If the most ambitious national strategies (UK) are to be extended on an international basis, then it is obvious that tourism will have to diminish seriously its impact.

Calling for technology to rollback ultimate environmental constraints is by no means new (Sachs et al 1973). To what extent can productivity gains, which diminish the quantity of energy used per kilometer, help ?

- As far as cars are concerned , for a given category of vehicle, gains around 25% in energy consumption are expected in the next decade. This gain will be partially offset by safety requirements which increase the weight of cars, and by the consumption of more frequent air cooling equipment. This figure can also be compared to the 31% and 38% increase in holiday and week end distances between 1982 and 1994 (Insee, transport survey).

- As far as planes are concerned, the decrease of energy consumption per passenger.km is roughly 25% from one generation of planes to the next (every 25 years). Before the next technological leap occurs (use of liquid hydrogen), the gains are likely to be less important than previously. OECD believes that during the next twenty years, the contribution of air transport to total greenhouse gas emissions due to energy use will increase from 3% to more than 7%. At world level it could, somewhere between 2010 and 2030, catch up with that of road transport. One can remind that the number of holidays taken by the French in a Foreign country increased from 3.8 to 11 million between 1964 and 1994 (Insee “Vacances” Survey)

and that the figure of personal trips of the French, using air transport increased by 16% from 1996 to 2000 (Direction du tourisme, SDT Survey). French tourists cross the border far less frequently than their neighbors of north-western Europe, but nothing indicates that it will continue.

For air and road transport, technical progress does not permit to offset the effect of the increase of tourist movements and it seems it will be even less the case in future decades.

The nearest reaction to come to this problem concerns air transport. Both the White paper of the European Commission on transports and the Royal Commission on pollution in the UK recommend to tax kerosene which since Washington Convention in 1937 escapes any form of tax. This preferential treatment should not hold indefinitely and, if one considers the suggestion on the Royal Commission i.e. a tax of a hundred euros on each European departure, one can imagine the consequences on low cost companies , on short stays, though long distance flights should be less affected.

Such measures should no suffice to curb in the long run the emissions of tourism ad it will be inevitably concerned by the debates on tradable permits. This type of mechanism allowing the more and the less environmentally efficient industries to exchange emission rights is to be set up for the European industry. One can imagine to see tour operators buying extra emission quotas from other sectors so as to maintain their activity.

Another possibility 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 and the fact that obviously the pace of change is not slowing down. Take for instance time watching TV: who in 1950 would have expected that 50 years later the French would spend on average 2 hours a day doing so (Dumontier , Pan Ké Shon 1999) ? 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. In a globalized world sustainable mobility is one of the major challenges that has to be faced and tourism mobility is, not alone though, part of the problem.

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