

Management of energy air transport and tourism in the Mediterranean



TEC, Plan Bleu
Final report

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Contents

Introduction.....	5
Context and issue	5
Organisation of the study	5
I. Carbon dependence: a new challenge for tourism	7
1. World level challenges	7
1.1. One transport mode dominates emissions figures	7
1.2. A rapidly growing contribution to emissions	8
1.3. What is at stake in the Mediterranean?	9
2. The situation in the Mediterranean	9
2.1. Strong economic weight but uneven development	9
2.2. Fairly close proximity tourism	11
2.3. Air transport increasing strongly and superseding personal vehicles	15
2.4. Already high GHG emissions	18
3. A prospective study to highlight future policies	22
II. Potential changes in tourism transport in the Mediterranean	24
1. Setting targets	24
1.1. 2 °C target in international negotiations	24
1.2. Relating the “2 °C” target to carbon.....	24
1.3. “Common but differentiated responsibilities” for countries	25
1.4. What objectives for air transport?	26
2. Three scenarios for aligning Mediterranean tourism with climate policy	27
2.1. Scenario S1: Real Politik	28
2.2. Scenario S2: Bali.....	29
2.3. Scenario S3: Hansen.....	31
2.4. Variant of the Hansen Scenario: S4	32
3. Lessons from models	33
3.1. Difficult to control CO ₂ emissions.....	33
3.2. ... mainly due to economic development in the Mediterranean.....	35
3.3. Domestic tourism increasing to the detriment of international travel	37
3.4. Shorter distances travelled	38
3.5. Difficulty in restricting the use of air transport.....	39
III. How to adapt	42
1. Possible levers	42
1.1. Transport policy	42
1.2. Tourism policy	48
1.3. Tourist demand and lifestyles	53
2. Means of action	56
2.1. Improving awareness of the issues	56
2.2. Diverse situations	57
2.3. Mobilisation of the actors	58
2.4. The need for Mediterranean cooperation	61
Conclusion: the need to adapt.....	62
Mediterranean tourism and climate change: representative of the global debate.....	62
The specificities of tourism... requiring specific regulations	63
Appendices	66
1. UNWTO forecasts double the GHG emissions from tourism by 2035	66
2. Modelling principles	67
Objectives and principles of the model.....	67
The MEDTOUR database.....	68

Policy projections and impacts	69
Design of the scenarios.....	71
Bibliography.....	73
Table of illustrations	75

Introduction

This document is the final report for the prospective study on “Air Transport and Tourism in the Mediterranean”. It sets out to inform decision-makers and operators, as well as both inbound and outbound countries, on the potential options for reducing of greenhouse gas (GHG) emissions from tourism-related air travel without financially negating the opportunities for development stemming from the tourism sector. This study has been carried out thanks to funding from the European Investment Bank and it is based on findings from Plan Bleu.

This study was conducted jointly by Plan Bleu: Philippe Vallouis (‘Transport’ Programme officer for Plan Bleu), Jean-Pierre Giraud, Elisabeth Coudert, Laura Martinez Roubio and TEC Consulting; Ghislain Dubois, Marie Lootvoet and Jean-Paul Ceron, under the coordination of Pierre Icard, Head of Plan Bleu’s Thematic Unit. The modelling work was carried out by Paul Peeters, Associate Professor on “Sustainable Tourism and Transport” at NHTV Breda University of Applied Sciences.

Context and issue

Tourism is one of the most important economic activities for the Mediterranean sea bordering countries. Thanks to their location at the crossroads of three continents, these countries attract 30% of international tourist arrivals, creating jobs and receipts which contribute to their economic development.

Despite the problems in analysing such a broad sector, tourism was recently estimated to account for 5% of worldwide CO₂ emissions, 40%¹ of which is from air transport. In terms of radiative forcing, air transport is the largest contributor as it generates roughly 73% of the contribution of tourism transport as a whole to climate change. While the trend in other sectors is for stabilising or reducing levels of emissions, tourism accounts for a growing share in a category (transportation) which in itself is seeing an increase in greenhouse emissions. There has been a constant increase in tourism since the seventies and this will undoubtedly continue, particularly in the Mediterranean basin, creating even more GHG emissions from transport.

This new challenge for tourism has only recently been taken into account in research. Estimations of the contribution of the tourism sector were first put forward during the second International Conference on Climate Change and Tourism held in Davos, in September 2007. Following this initial work, it became clear that energy management in the transportation sector, and particularly air transport needed to become a focus.

This study therefore aims to **provide a prospective vision for potential changes concerning the issue of air transport / tourism activity within the international context of reducing CO₂ emissions and to explore adaptive measures available to countries in the context of stricter climate policy constraints.**

Organisation of the study

The study was based around an Excel model called MEDTOUR which characterises tourism flows in Mediterranean countries, for inbound, outbound and domestic tourism, in terms of volume, modes of transport, revenue and greenhouse gas emissions.

¹ JP Céron, G. Dubois, *Climate change and tourism: responding to a global issue. Sustainable Development and Environment Economy Seminar*, IDDRI / Ecole Polytechnique, 29 January 2008.

The study was carried out in three phases:

- The current situation was revealed, based on information already existing and available from international institutions, in each of the countries and within the scientific community (statistics and indicators, case studies, results from previous studies and evaluations, existing planning documents, expert reports, etc.). This provided a retrospective analysis of trends in tourism arrivals by mode of transport, to be related to outbound countries, and shed light on the relationship between air transport and tourism development in inbound countries. The results of the model for existing flows were used to evaluate the current situation in terms of GHG emissions.
- The second phase of the study consisted in building several prospective scenarios in terms of national and regional climate policies. The aim was to assess the potential consequences for Mediterranean destinations of energy price changes and increasingly strict carbon emissions regulations for the air transport sector. The consequences in terms of tourism flow and related GHG emissions were calculated with the model.
- Finally, the study examines the adaptation possibilities of the Mediterranean countries for taking into account these changes. The levers available in these countries were analysed in order to identify measures that can be put in place at national and regional levels to reduce negative effects on tourism from international climate change regulations.

I. Carbon dependence: a new challenge for tourism

1. World level challenges

Until quite recently, tourism has received little attention when it comes to climate change research and policy. Many economic sectors have an underlying role in tourism, however for most of these sectors, tourism represents only a part of their business (restaurants, transportation). In the past it was assumed that the basic information required to assess the relationship between tourism and climate change could be taken from analyses of these sectors, and the significance of this relationship was not even evaluated. Tourism is never specifically identified in emissions inventories and it is never explicitly targeted under emissions reducing measures. In particular, air transport, with 80% of its volume resulting from leisure travel (DG Enterprise European Commission 2004)², is not included in the application scope of the Kyoto protocol.

Several studies have played a precursor role in analysing tourism-related greenhouse gas emissions. These include IFEN 2000; Gössling 2002; Ceron and Dubois 2003; Peeters, van Egmond et al. 2004. The second International Conference on Climate Change and Tourism in Davos in September 2007 was the first attempt to estimate CO₂ emissions and radiative forcing from tourism on an international level (estimates for 2005). This evaluation included emissions for one-day round trips and took into account emissions from transportation, accommodation and tourism-related activities.

1.1. One transport mode dominates emissions figures

If international tourism, domestic tourism, day trips and each mode of transport are all taken into account, the total emissions from tourism transport are estimated at approximately 985 million tonnes of CO₂, with air transport accounting for 52 % of this total (UNWTO, UNEP et al. 2008).

When broken down by mode of transport, there are substantial differences between international and domestic tourism. **For international tourism, air travel causes 86% of CO₂ emissions.** In terms of radiative forcing, air transport is the largest contributor on both a national and international level, as it causes roughly 73% of the total contribution to climate change from tourist transport.

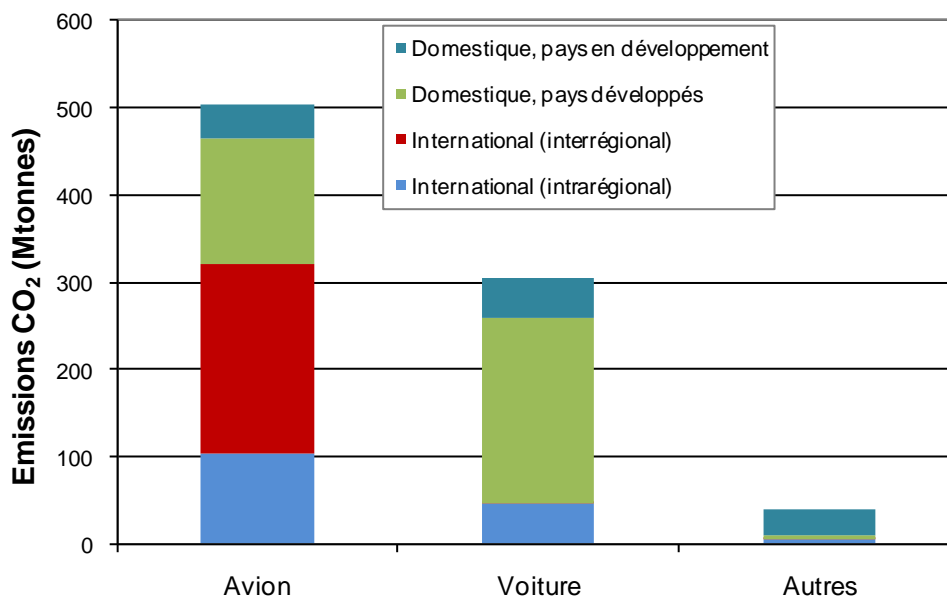
Table 1 - Total emissions from global tourism in 2005

	CO ₂ (Mt)	Radiative forcing (W/m ²)	
		Without impact on cirrus clouds	With maximum impact on cirrus clouds
Air transport	515	0.0395	0.0979
Car transport	420	0.0176	0.0197
Other transport	45	0.0021	0.0021
Accommodation	274	0.0116	0.0116
Activities	48	0.0020	0.0020
TOTAL Tourism	1,302	0.0734	0.1318
TOTAL World	26,400	1.6	1.7
Tourism share	4.93 %	4.59 %	7.75 %

The colours show the degree of uncertainty on numbers: green shows uncertainty of +/-10 %, blue +/-25 % and orange +100 %/-50 %
Source: (UNWTO, UNEP et al. 2008)

² Source: UNWTO, UNEP, and al. (2008). *Climate change and tourism. Responding to global challenges*. Madrid, UNWTO.

Figure 1 - CO₂ emissions from global tourism transport (excluding day trips)
classified by transport mode and region



Source: (UNWTO, UNEP et al. 2008)

1.2. A rapidly growing contribution to emissions

While the trend in other sectors is to see stabilising or reducing levels of emissions, tourism accounts for a growing share in a category (transportation) which is itself seeing an increase in greenhouse gas emissions.

The technical report that came out of the 2007 Davos Conference on Tourism and Climate Change³ makes projections for 2035 (see details in Appendix). In these projections, the future of tourism depends on increasing numbers of tourists, an increasing share of long-distance tourism and an increasing average travel distance, as well as the tendency for more frequent and shorter holidays. Based on these perspectives, the study built a business-as-usual scenario for 2035 based on current trends for travel and distances for the various modes of transport, all the while taking into account maturing markets. The outcome shows a 161% increase in emissions from tourist transport emissions, with the share of emissions from aviation increasing by 12 points between 2005 and 2035. As far as radiative forcing is concerned, the impact of tourism on global warming would be even greater, with an increase in radiative forcing of up to 209% (estimate with maximum contribution of cirrus clouds). Air transport is therefore responsible for the majority of CO₂ emissions (52%) and the bulk of radiative forcing (roughly 80 %). The Davos Declaration⁴ calls for the sector to “mitigate its Greenhouse Gas emissions” which, given the current trends, is a real challenge.

However, due to climate concerns and the need to reduce greenhouse gas emissions, there is a sword of Damocles hanging over the air transport sector. Carbon taxes, offset schemes and increasing oil prices are all factors that will contribute to rising airfares and reduced mobility.

³ UNWTO, UNEP, and al. (2008). *Climate change and tourism. Responding to global challenges*. Madrid, UNWTO.

⁴ See the declaration at <http://www.unwto.org/pdf/pr071046.pdf>

1.3. What is at stake in the Mediterranean?

Tourism is one of the most important economic activities for Mediterranean rim countries. Thanks to their location at the crossroads of three continents, these countries attract 30% of international inbound tourism. In 2007, they were visited by 274 million international tourists. In 2007, spending from international tourism throughout this region totalled US\$ 237 billion. International tourism also creates employment and generates revenue, thus contributing to the economic development of these countries.

Mediterranean countries will be affected differently by the constraints faced by the air transport sector, firstly due to their dependence on tourism, as mentioned above, and secondly, due to the characteristics of their tourism industry. Where do their visitors come from? Is it a form of tourism that relies heavily on air transport?

In the hypothesis of increased costs for air transport, to combat global warming for instance, dependence on air transport would heighten the vulnerability of the economies of Mediterranean countries. It is therefore logical to examine research addressing the relationship between the future of aviation and climate change.

2. The situation in the Mediterranean

2.1. Strong economic weight but uneven development

Uneven development of Mediterranean tourism

The long history of tourism in the Mediterranean can be characterised by periods of development spread out over time. In the late nineteenth century, the Italian and French Rivas were the winter tourist destinations for the aristocracy. During the twentieth century, these became the summer destinations for the middle class, especially after WWII, as living standards gradually increased, resulting in more increased mobility. A second and third wave of tourism development then took place throughout the entire Mediterranean, with the exception of a few countries such as Albania, Algeria and Libya, where there is still relatively little international tourism.

This very brief summary does not allude to the specific conditions in which tourism has developed in some countries. However it is important that these be addressed in order to understand the changes in the past and the current situation:

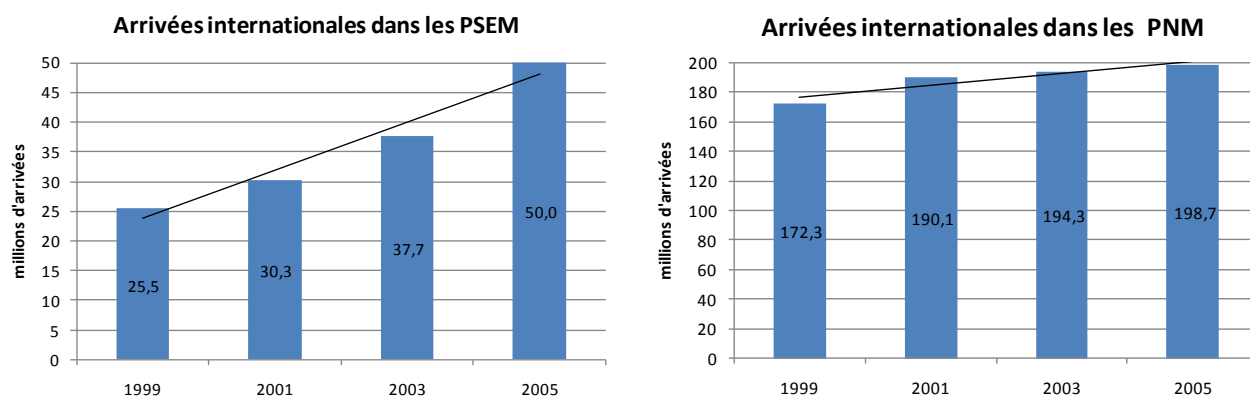
- the close proximity of outbound countries at the end of post-war years reconstruction enabled tourism to grow at an exceptional pace in Spain. This contributed to development throughout the country and it is now considered as a paradigm for tourism development in many developing Mediterranean countries;
- the break-up of the former Yugoslavia and the ensuing conflicts disrupted tourism in Eastern Adriatic countries for more than a decade;
- the Middle Eastern countries along the Mediterranean coast was and continue to be deeply impacted by the Arab-Israeli conflict. This has delayed and even prevented tourism in the area from developing to its full potential.

Furthermore, **the time lag between the development of international tourism in different Mediterranean countries has resulted in significant disparities in the distribution of tourism in the Mediterranean area.** Even today, the three North-western countries still play host to two-thirds of the international tourists travelling to Mediterranean countries. This also results in the coexistence of tourist destinations at varying stages of maturity within the Mediterranean region and these destinations are consequently confronted with different issues, often stemming from the rate at which tourism has grown. For instance, destinations currently being developed in Morocco and Turkey have little in common with mature destinations such as the Balearic Islands or the French Riviera.

Inbound visitors still concentrated in Spain, France and Italy

In 1970, 58 million international tourists travelled to Mediterranean countries. These numbers reached more than 220 million in 2000 (multiplied by 3.8) and 249 million in 2005. Over the same period, global inbound visitors increased from 165 to more than 687 million in 2000 (multiplied by 4.1) and to 801 million in 2005⁵.

Figure 2 - Change in international inbound visitor numbers to Mediterranean countries between 1999 and 2005

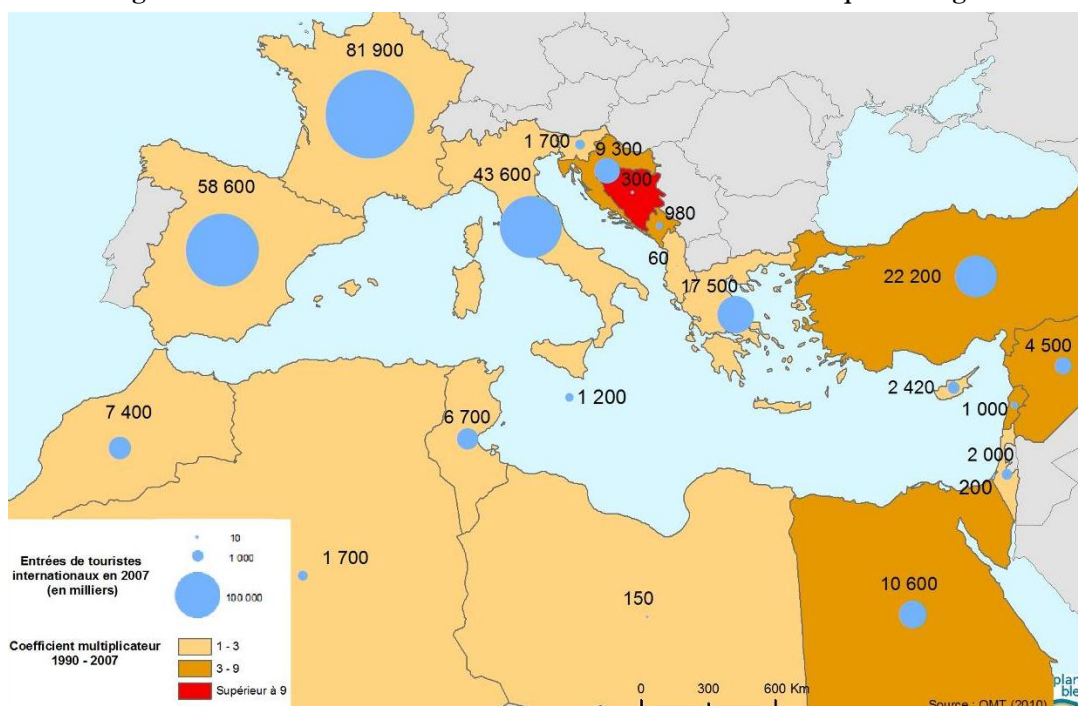


Source: UNWTO, Plan Bleu

In thirty years, average annual growth was 4.8% globally and 4.5% for countries in the Mediterranean basin, with a 35% share of global tourism in 1970 and 32% in 2005.

Nonetheless, **inbound tourism to Southern and Eastern Mediterranean destinations has grown much more rapidly**, with the number of arrivals doubling between 1999 and 2005 compared to around 15% growth for Northern Mediterranean Countries (NMCs).

Figure 3 - Numbers of inbound international tourists in 2007 and subsequent changes



Source: Plan Bleu, from UNWTO

However within the Mediterranean region there are major disparities. Spain, France and Italy are the primary beneficiaries of these tourism flows, even though their numbers have decreased in favour of new destinations. After capturing 82 % of the tourists in 1970 and 79 % in 1980, these three countries attracted 168 million tourists in 2005, just 68 % of all tourists.

⁵ 2005 was selected as a baseline year for the study and the model as it is the last year for which all the necessary data is available.

Three types of situations can subsequently be distinguished depending on the country:

- those in which tourism began developing in the 1970's such as Tunisia, Egypt and Morocco;
- those in which tourism is recovering, such as the Balkans;
- those in which tourism has not yet developed, such as Libya and Algeria.

Dependence of countries on tourist economy

The tourism industry represents different realities in different Mediterranean countries, particularly in terms of the revenue generated, jobs created or proportion of the GDP. **Mediterranean countries therefore have varying degrees of dependence on this industry.**

In 2000, revenue from international tourism was equivalent to 20.2% of the GNP in Cyprus, 17.2% in Malta, 13.6% in Croatia, but just 2.4 and 2.1% in Italy and France. This indicator shows to what extent tourism is essential in certain Mediterranean economies.

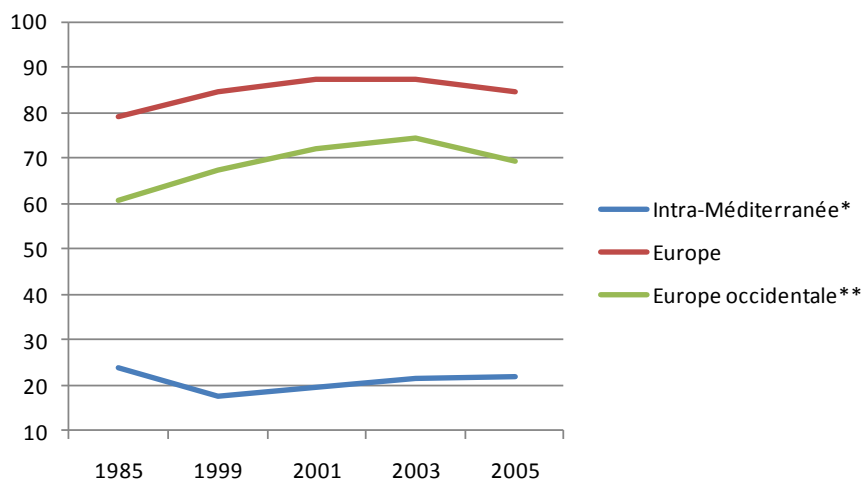
Over the last forty years, revenue from international tourism has shown an overall growth trend. However, since the early 1980s the receipts per tourism arrivals in the Mediterranean remain slightly lower than the world level, which means that **Mediterranean tourism is cheaper, suggesting it contains hidden margins for growth in terms of added value or wealth and foreign currency.**

2.2. Fairly close proximity tourism

Outbound countries concentrated in Western Europe

The vast majority of tourism to the Mediterranean comes from European countries. The share of European tourists has never dropped below 80% over the last 20 years and increases even more during times of global crisis due to health or security issues.

Figure 4 - Origin of visitors to the Mediterranean, by share of international inbound tourists (%)



Source: UNWTO, Plan Bleu

* As not all data is available, the percentage is less than the reality.

** France, Germany, United Kingdom, Ireland, Spain, Italy, Portugal, Benelux, Norway, Sweden, Denmark, Switzerland

In general, Western and Northern European countries generate the largest international tourist flows to the Mediterranean (all Mediterranean destinations included). This can be explained by the aging populations in these countries, where the over 60's age demographic could account for approximately 30% of their populations by 2025⁶. Due to changes to pension schemes, this phenomenon could have significant effects which still remain difficult to assess.

⁶ According to the United Nations Population Division

During the period from 1985 to 2005, growth in the share of European tourist flows is partially due to the emergence of Central and Eastern Europe⁷ as an outbound region (1.4 % in 1985, 6.6 % in 2005), where the number of tourists increased from 1.7 to more than 16 million. Over the coming years, the development of these countries could contribute significantly to the development of international tourism in the Mediterranean. This could particularly affect the inbound countries that are closest in terms of geography, history, or culture, or those that are best placed to attract these new tourists, just as Spain attracted tourists from Western and Northern Europe in the 1950s and 1960s. In 2006, tourist flows from Central and Eastern Europe made up 32 % of tourists in Montenegro, 30% in Turkey, 20% in Croatia, 16% in Egypt, and 12% in Israel.

Though Europeans make up the main client base for the Mediterranean in general, the distribution of tourists by country of origin shows that there are disparities between inbound countries. **Europeans account for more than 85% of visitors to all Northern Mediterranean countries (NMCs), as well as to Turkey. However, this is not the case for Southern and Eastern Mediterranean countries.**

The share of European inbound visitors remained relatively stable between 1999 and 2005. However, the share of Western European tourists dropped slightly. In NMCs destinations, there has been an increase in visitors from Northern Europe while the number of visitors travelling from Central and Eastern Europe to SEMCs has significantly increased (17% in 1999 to 24% in 2005).

The share of intra-Mediterranean tourists is lower in the NMCs (between 16 % and 20 %, increasing slightly) than in the SEMCs (between 29 % and 35 %, a relatively stable share for the period). It is interesting to note that **tourist flows from SEMCs to NMCs are very low**: less than 2 million visitors in 2005 compared to nearly 40 million visitors travelling between NMCs. For the period between 1999 and 2005, there are no substantial changes in trends with respect to the distribution of the various tourist origins.

Mainly proximity tourism

The distance between the origin and destination is an essential factor in determining the carbon intensity from tourism, through the number of kilometres travelled for a given trip, and through the influence on the chosen transport mode.

International tourism in the Mediterranean has a strong sub-regional character that draws on proximity. In 2006, Libyans and Algerians accounted for 37% of tourists in Tunisia; in Turkey 30% of visitors come from Central and Eastern Europe, particularly Bulgaria, Georgia, Romania and Russia; 40% of tourists visiting Italy come from Germany, France and Austria; in Slovenia, 43% of tourists originate from Hungary, Austria, Italy and Croatia.

⁷ Region according to the UNWTO definition

Figure 5 - Distribution of inbound visitors to Mediterranean countries by distance category in 2005



Source: Plan Bleu, TEC

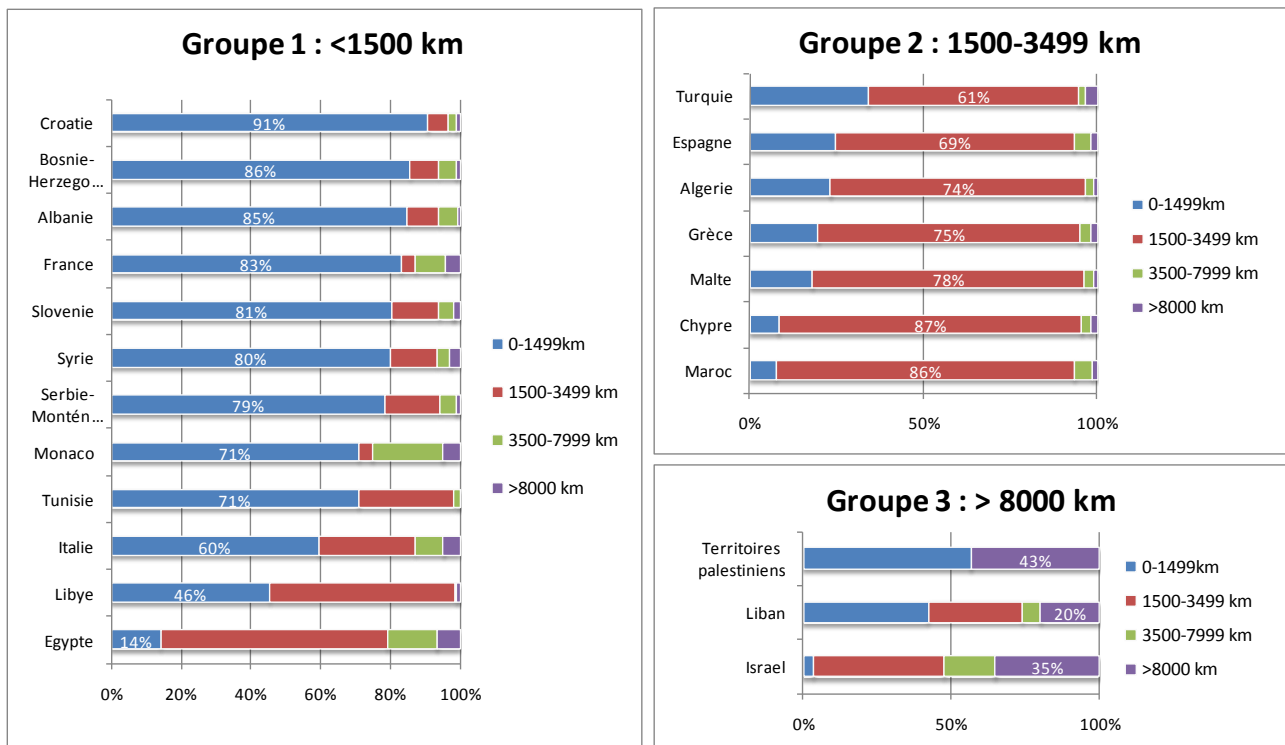
On average, for the entire Mediterranean region, the two distance categories with the highest relative share of trips are 0-999 km (34%) and 1500-3499 km (39%). Only 15% of inbound travel falls within the 1000-1499 km distance class.

90% of all arrivals into the Mediterranean region originate from trips of less than 3,500 km.

A typology of three sub-groups of inbound countries can be identified:

- 1) inbound countries where **the majority of visitor arrivals (> 50%) stemmed from trips of less than 1,500 km** (Albania, Bosnia-Herzegovina, Croatia, Egypt, France, Italy, Libya, Monaco, Serbia & Montenegro, Slovenia, Syria, Tunisia);
- 2) inbound countries where **the majority of visitor arrivals (> 50 %) stemmed from trips of between 1,500 and 3,499 km** (Algeria, Cyprus, Greece, Malta, Morocco, Spain, Turkey) ;
- 3) atypical countries where **a high relative share of arrivals stem from trips of more than 8,000 km**: these include Israel (35%), which has a substantial number of tourists from the USA, Lebanon (20 %) with a large number of Asian tourists and the Palestinian Territories (43 %).

Figure 6 - Distribution of inbound visitors to Mediterranean countries by distance class in 2005



Source: Plan Bleu, TEC

NMCs seem to fit best into group 1, but not systematically (8 in group 1 and 4 in group 2). SEMCs fit best into group 2 (5 countries), however there are also SEMCs in group 1 (2 countries) and they make up group 3 (3 countries).

The Balkans and France are geographically well-placed, less than 1,000 km away from their client base. The countries furthest from their visitors are those in the eastern area of the Mediterranean basin, such as Turkey, Cyprus and Egypt, which mainly attract tourists from Western Europe. All in all, the market is principally for short and medium-haul tourism.

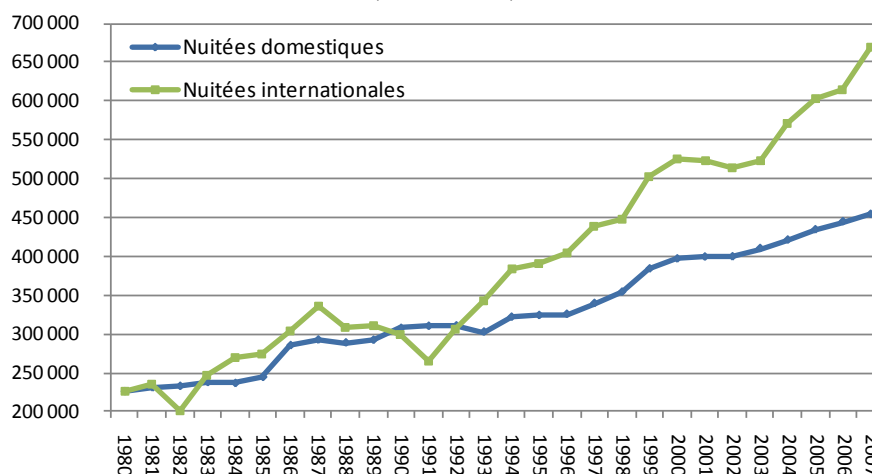
Domestic tourism: much more than an adjustment variable

As in previous studies, there is still a significant lack of data on domestic tourism. The only reference that can be used comes from estimations made in 2000 by Plan Bleu⁸. Numbers from these relatively outdated estimations should probably be revised upwards, but nevertheless show **considerable growth in domestic tourism in Southern and Eastern Mediterranean rim countries, when economic growth permits. This proves that there is a real aspiration for holidays in these countries.**

This tendency is illustrated in Figure 7, which shows the share of domestic overnight stays in the total number of overnight stays. In 2007, there were 1,122 million overnight stays from tourism in the Mediterranean basin. International tourism accounted for 60% of overnight stays and domestic tourism accounted for 40% of the total.

⁸Based on holiday departure rates

Figure 7 - Changes in international and domestic overnight stays in hotels and similar establishments in the Mediterranean (in thousands)



Source: UNWTO, Plan Bleu

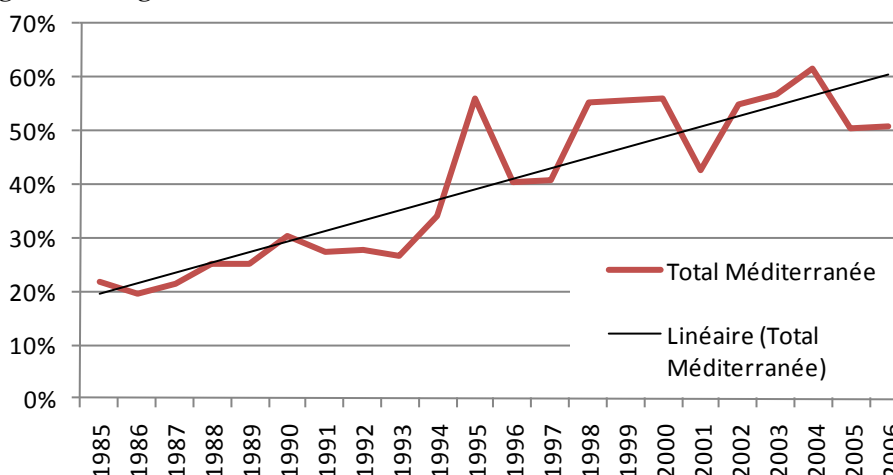
It can be observed that domestic tourism is prominent in the wealthiest countries (France, Italy, Israel) as well as those countries where tourism is still relatively poorly developed (Algeria, Serbia-Montenegro, etc.). In these latter countries (Algeria, Albania), domestic overnight stays can even account for up to 95% of the total. This situation clearly highlights the weakness of international tourism in these countries.

Domestic tourism is a significant component in the tourism sector. It is even more important in the event of international crises when, as seen before, it has shown that it can play a role as a substitute for international tourism and thus mitigate negative economic impacts on the hotel industry. This has worked so well that in many Southern and Eastern countries (particularly Morocco) the increase in domestic tourism demand is no longer considered as a way of offsetting the decrease in international tourists but rather as a clientele group in its own right.

2.3. Air transport increasing strongly and superseding personal vehicles

In 2006, **air travel represented a total of nearly 51% of international arrivals** in the Mediterranean while road travel accounted for 39%. Rail travel is lagging far behind when it comes to international tourism transport in the Mediterranean.

Figure 8 - Changes in the share of air travel in international visitor arrivals in the Mediterranean



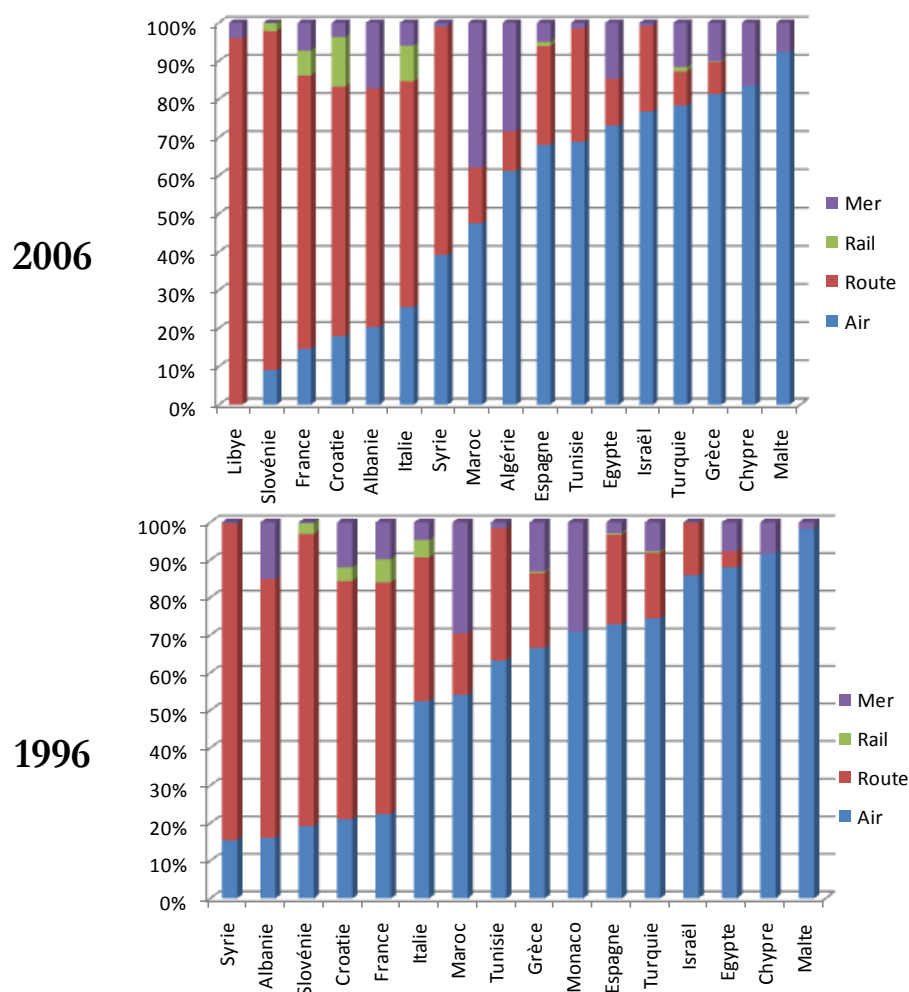
Source: World Tourism Organization

Over the last twenty years, air transport has experienced the most significant growth. In the late eighties it only made up one quarter of tourist arrivals and now accounts for more than half, while arrivals

by sea only increased by 2% over the same period. However, many international tourists still arrive by road (roughly 60% in the late eighties compared to one third today). Tourist arrivals by train decreased by a factor of 3 between 1988 and 2006. This is a reflection of greater individual mobility and the role of air transport in Northern countries, as well as the development of international tourism in Southern and Eastern Mediterranean countries, which are the furthest away from the main outbound countries of Northern and Western Europe. These are also the countries where rail networks are the least developed or even almost nonexistent, and South-South tourism exchange is limited.

Although air transport is now the preferred transport mode for international tourists in the Mediterranean, the average distribution by mode of transport hides significant differences between outbound countries.

Figure 9 - Modal distribution of international tourist arrivals in Mediterranean destinations in 2006 and 1996



Source: World Tourism Organization

The islands, Malta and Cyprus, are evidently the most dependent on air transport. For Egypt, Turkey, Israel and Spain, this mode of transport accounts for more than 70% of tourist arrivals, whereas in France, Croatia, Slovenia, Albania and Syria, air tourist arrivals represent less than 20%. There are no significant characteristics that differentiate NMCs from SEMCs.

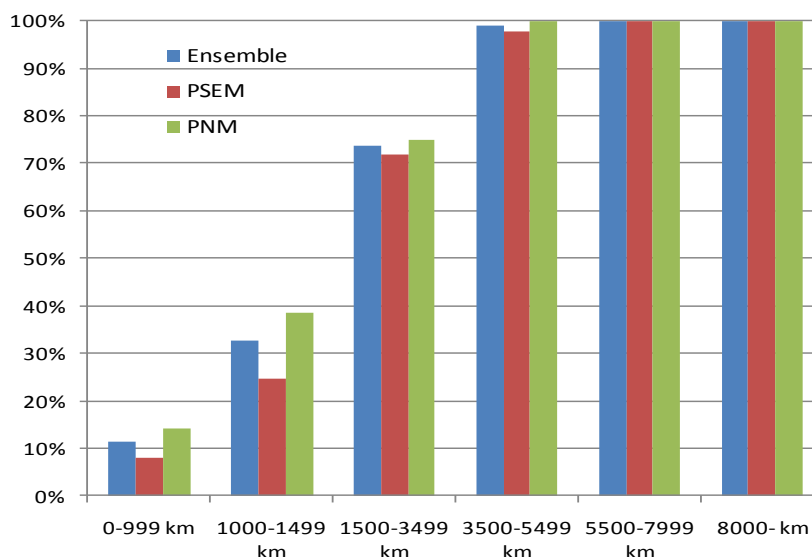
International tourists, mainly from the Northern countries, island territories and SEMCs, are ever-increasingly dependent on air transport.

More than ten years ago, in 1996, air travel already accounted for 40% of international tourist arrivals in the Mediterranean, however the distribution for each country has changed.

Just like the island territories, **SEMCs depend increasingly on air transport, with relatively few exceptions.** For instance, the majority of tourists travelling to Syria use road transport and are from neighbouring countries such as Turkey, Lebanon, Jordan, and Iraq.

The model developed for this study can be used to calculate the share of each mode of transport by distance category, as shown in Figure 10.

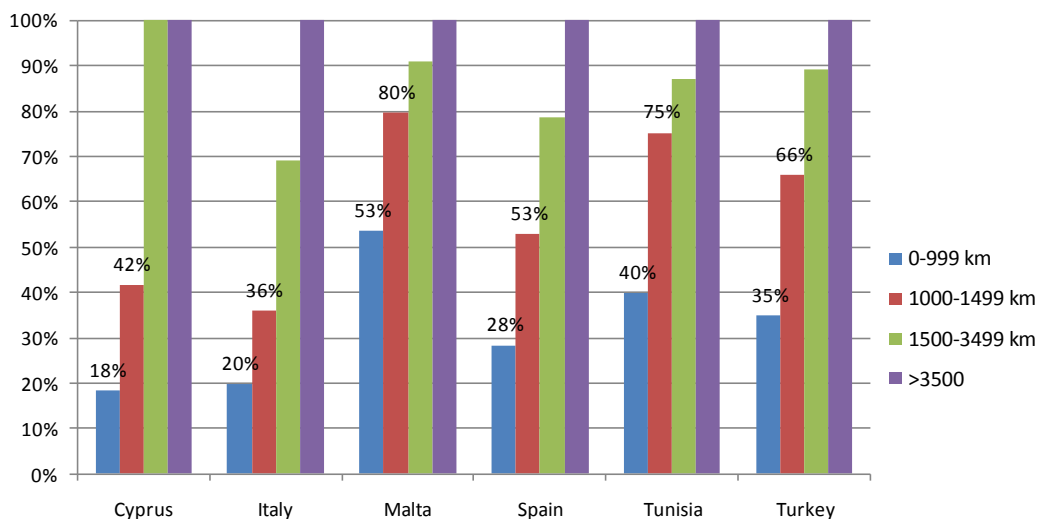
Figure 10 - Average share of air transport by distance category (Round trip) in 2005



Source: Plan Bleu, TEC

There is strong correlation between the distance travelled and the mode of transport. **Over 3,500 km, air transport is always used.**

Figure 11 - Share of air transport by distance category: specific cases



Source: Plan Bleu, TEC

For now, land transport is favoured when it comes to proximity tourism, particularly road transport, since rail travel does not currently meet the needs of tourism (not well enough developed or poorly adapted to current lifestyles). However, European mobility has been widely facilitated by the development of air travel, especially low-cost airlines. The shift towards greater use of air transport and cars has contributed to the increase in atmospheric pollution and greenhouse gas emissions in the region. **Distance is therefore a key factor, particularly given the potential for reduced mobility and tax on CO₂ emissions in the future.** The origin/destination structure of tourism in the Mediterranean and the prevalence of proximity

tourism could mean that tailored rail and bus alternatives become foreseeable ways of reducing air transport.

2.4. Already high GHG emissions

In 2000 (last available year), GHG emissions for Mediterranean countries were 2,698 million tonnes of CO₂ equivalent with 941 million tonnes of CO₂ equivalent for SEMCs (34.9%) and 1,757 million tonnes of CO₂ equivalent for NMCs (65.1%).

Table 2 - Distribution of GHG emissions by sector in Mediterranean countries in 2000 (% of total emissions)

Sector	SEMC	NMC
Energy use	71.1%	75.2%
Electricity and heating	26.3%	24.2%
Industry and construction	13.5%	13.6%
Transportation	12.8%	21.6%
Other fuel combustion	10.4%	15%
Fugitive emissions	8.9%	0.9%
Other GHG emissions	28.8%	24.8%

Source: TEC adapted from Plan Bleu 2008, Climate Change and Energy in the Mediterranean

For 2005, only CO₂ emissions linked to energy use are available. Emissions were 2,211 million tonnes for Mediterranean countries, with 1,454 million tonnes for NMCs (65.8%) and 757 million tonnes for SEMCs (34.2%).

By extrapolating the distribution for 2000 with numbers for 2005, total GHG emissions for 2005 can be estimated at 2,998 million MTCDE for Mediterranean countries, with 1,933 million tonnes for NMCs and 1,064 million tonnes for SEMCs.

GHG emissions from tourism largely due to air transport

Total CO₂ emissions from international tourism to Mediterranean countries in 2005 (excluding domestic transport) were 130 million MTCDE for roughly 248 million tourist arrivals. Domestic transport was estimated in the model at 56.4 million MTCDE.

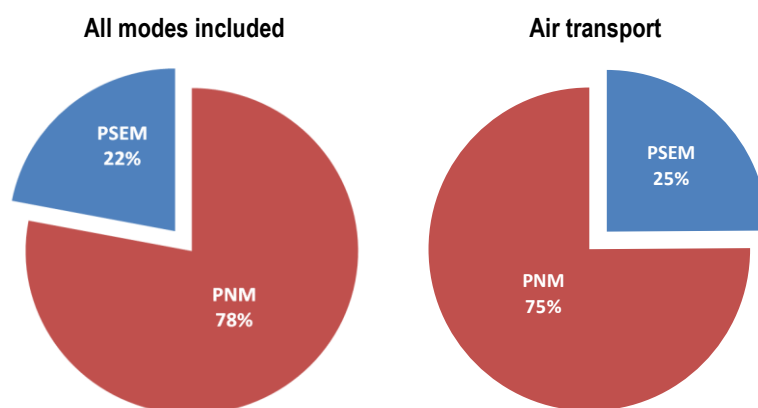
Air transport alone accounts for 96.5 million tonnes of CO₂ equivalent, or 74% of these emissions. This reflects the order of magnitude observed at the international level for the impact of air transport (UNWTO, UNEP et al. 2008).

These GHG emissions from international tourism transport account for 4.3% of all emissions according to the above estimates. Tourism-related air transport alone represents 3.2% of emissions.

Very unequal distribution of emissions from country to country

This overall number masks a considerably variable relative impact for each country. In general, there is a major imbalance between North and South.

Figure 12 - Distribution of CO₂ emissions from international tourism transport (by group of inbound country)



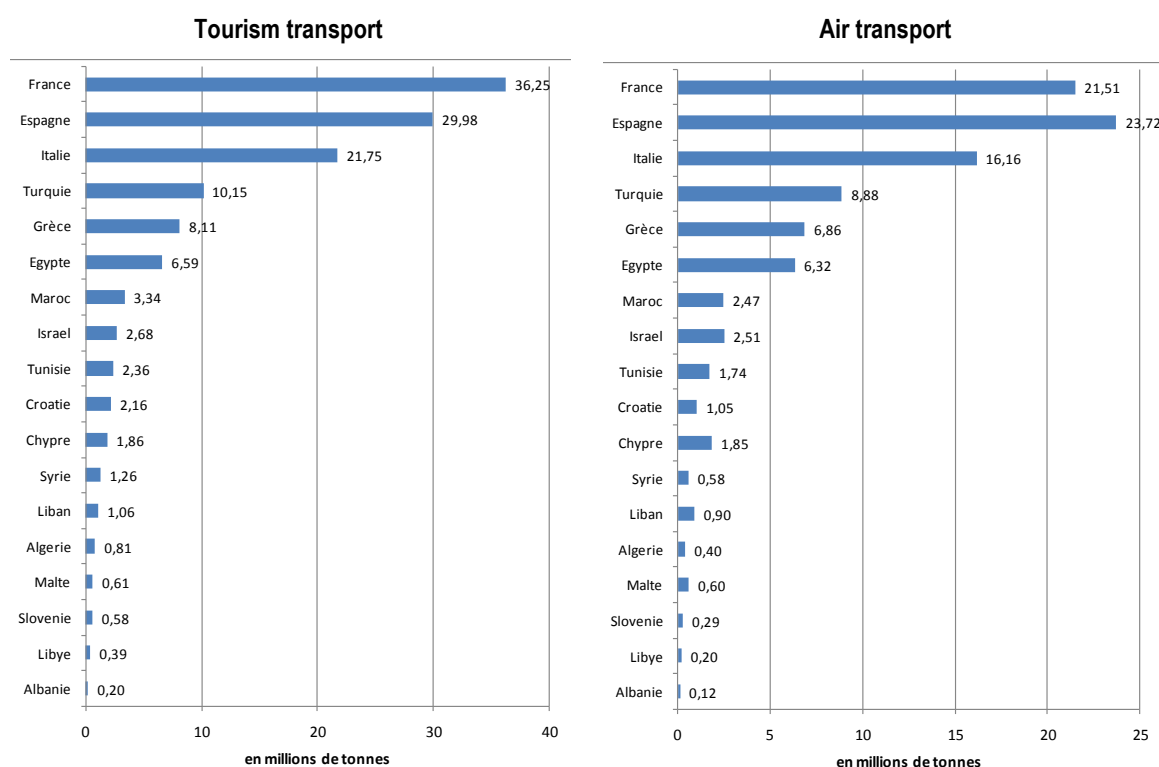
Source: Plan Bleu, TEC

Northern, Southern and Eastern Mediterranean countries are both inbound and outbound countries (although Northern countries account for the bulk of outbound travel). **As inbound tourism countries, NMCs account for 78% of all emissions from international tourism transport to the entire Mediterranean basin, and 75% of emissions from air transport for 80% of visitor arrivals.**

The imbalance between the two areas of the Mediterranean is even more significant in tourism transport than in other sectors. For Northern Mediterranean countries, inbound tourism transport accounts for 5.2% of all emissions, with air transport alone representing 3.7% of emissions. As far as Southern and Eastern Mediterranean countries are concerned, inbound tourism transport generates 2.7% of all emissions and air transport 2.3%.

Northern Mediterranean tourist destinations not only generate the vast majority of tourism-related GHG emissions in the region, but tourism also has a much greater impact on total carbon intensity in these countries than the rest of the Mediterranean. Emission reduction strategies are therefore likely to target these countries.

Figure 13 - CO₂ emissions from transport to Mediterranean countries (2005)



Source: Plan Bleu, TEC -

Note: no data is available for Bosnia-Herzegovina, Monaco, the Palestinian Territories and Serbia-Montenegro.

Inbound countries which generate the most emissions from tourism transport are France (36.3 Mt), Spain (30 Mt) and Italy (21.8 Mt). The three of them account for two-thirds of emissions from international tourism transport in the Mediterranean.

If air transport is examined more specifically, the trends remain the same but the influence of each country varies. In this case, Spain is the inbound country that contributes the most to these emissions (23.7 Mt), followed by France (21.5 Mt) and Italy (16.2 Mt). The three of them account for just under two-thirds of air transport emissions.

A variable emissions-per-trip ratio

To truly compare the carbon intensity of tourism in the various groups of countries, ratios showing the quantity of CO₂ per trip can be calculated.

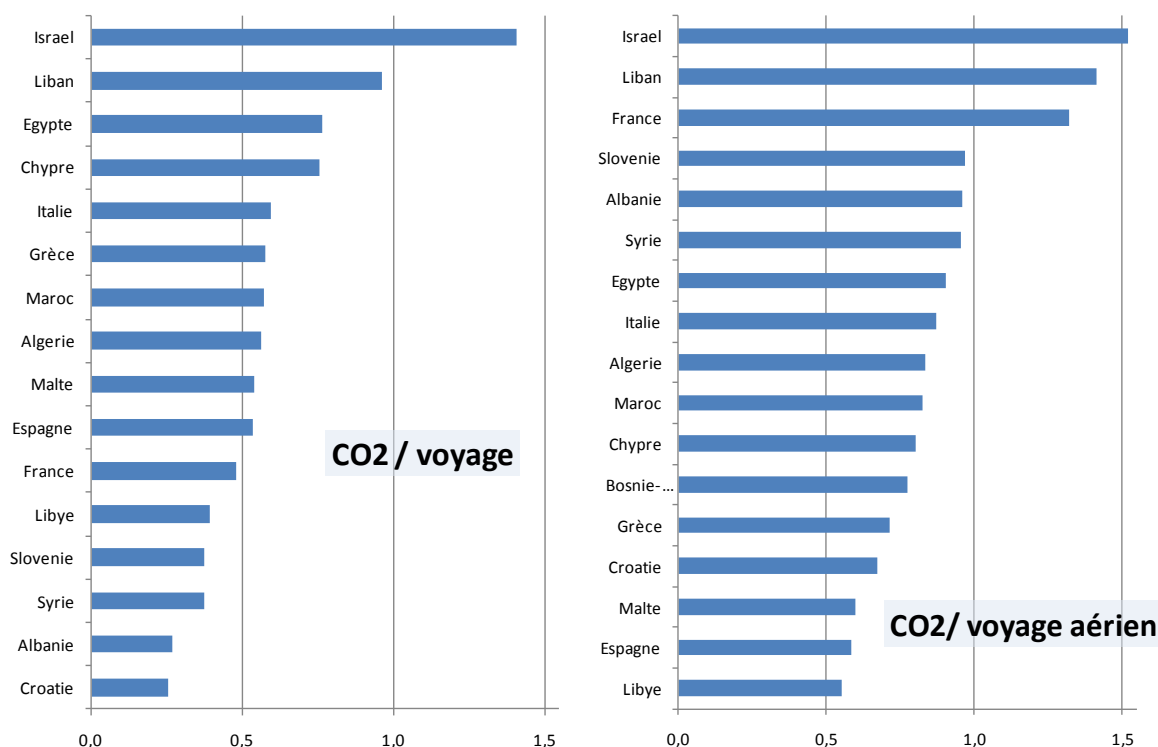
Table 3 - Ratio of GHG emissions per trip (2005)

	GHG emissions (t eq. CO ₂) per international tourist arrival	GHG emissions (teq. CO ₂) per international tourist arrival via air transport
Mediterranean	0.52	0.78
SEMC	0.57	0.73
NMC	0.52	0.80
NMC excluding FR, IT, ES	0.48	0.72

Source: Plan Bleu, TEC

In the Mediterranean, 130 million tonnes of CO₂ equivalent for 248 million tourist arrivals gives a ratio of 0.53 teq. CO₂ per tourist arrival, all transport modes included, whereas air travel gives a ratio of 0.78 teq. CO₂ per tourist arrival. NMCs, excluding France, Italy and Spain have the lowest ratios.

Figure 14 - Ratio of GHG emissions per trip for each inbound country, all modes of transport (2005)



Source: Plan Bleu, TEC

If the ratio per trip for all transport modes is examined, the countries with a ratio lower than the Mediterranean average are Croatia, Albania, Tunisia, Syria, Slovenia, Libya, France and Turkey. If the ratio per trip is examined, the country rankings change. Those with a ratio less than the Mediterranean average are Tunisia, Libya, Spain, Turkey, Malta, Croatia and Greece.

This dual approach makes it possible to **assess the relative influence of distance and modal distribution factors on the carbon intensity of tourism for each country**.

In both cases, Israel generates by far the greatest quantities of CO₂ per tourist arrival due to the substantial amount of affinity tourism from the United States. This tourism relies heavily on air transport, and tourists travelling long distances. Lebanon is also visited by a high proportion of tourists travelling from far away (Asia), which explains the country's high ratios.

In the case of France, if the two graphs are compared, it can be observed that although the destination receives visitors travelling by air from relatively far away (France is ranked third in the second graph), the modal distribution of tourism transport mitigates the CO₂ impact with a ratio of just 0.48 for all tourist arrivals.

For countries such as Tunisia, the second graph highlights the short distances travelled by tourists, even in the case of air travel.

Eco-efficiency: carbon intensity per overnight stay or \$ spent

Eco-efficiency is **a concept that aims to relate wealth creation with the associated ecological damage**. Eco-efficiency uses this approach to compare various economic activities, development choices and the products, supply chains and techniques used within a given activity. In the tourism sector, use of the eco-efficiency concept resulted in a ground-breaking article in the journal Ecological Economics. The article focused on just one aspect of ecological damage: greenhouse gas (GHG) emissions.

Eco-efficiency is therefore expressed in ratios. To demonstrate the relationship between carbon intensity and the economic impact of an activity in the country, it is not enough to use the ratio of GHG emissions per trip as it does not take into account spending during the holiday, which depends on the length of stay and the added value of products consumed. Other ratios can be calculated from available data to come up with a more precise analysis.

The available data can be used to calculate two other ratios:

- **GHG emissions per overnight stay:** total GHG emissions from international tourism transport to each Mediterranean destination (inbound tourism only) can be expressed as a ratio of the number of overnight stays in tourist accommodation (source: UNWTO, Compendium of Tourism Statistics 2002-2006);
- **GHG emissions per dollar spent:** total GHG emissions from international tourism transport to each Mediterranean destination (inbound tourism only) can be expressed as a ratio of tourist spending (USD) in inbound countries (source: UNWTO Tourism Highlights, 2008 edition; Plan Bleu).

These ratios must nevertheless be considered with a degree of caution as the data is particularly unreliable for most countries, especially in terms of tourism spending.

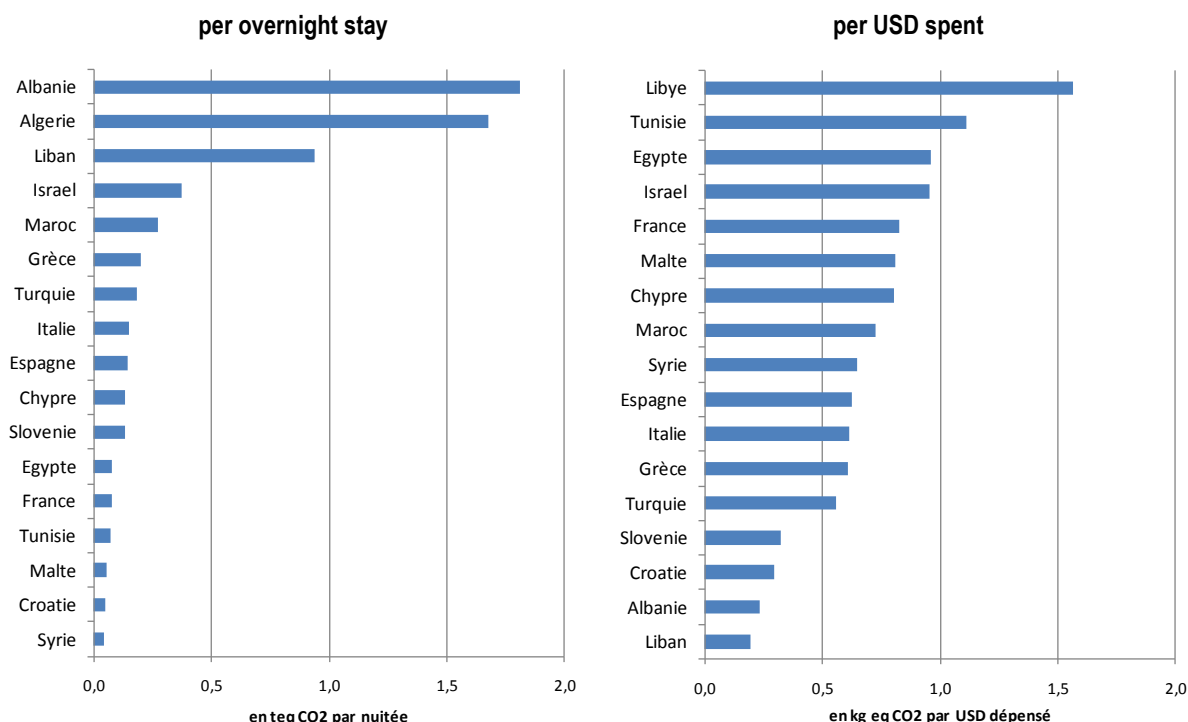
Table 4 - Ratio of emissions per overnight stay and per USD spent (2005)

	GHG Emissions (teq. CO₂) per overnight stay	GHG Emissions (kg eq. CO₂) per USD spent
Mediterranean	0.11	0.66
SEMCs	0.13	0.67
NMCs	0.11	0.66
NMCs excluding FR, IT, ES	0.12	0.51

While NMCs excluding France, Spain, and Italy have lower-emissions-per trip ratios, they also seem to show lower eco-efficiency performance in comparison to their neighbours. In contrast, according to these results, **SEMCs seem to be more eco-efficient than other countries in the Mediterranean basin**.

These ratios show much more significant variation when examined by inbound country.

Figure 15 - Ratio of emissions per overnight stay and per USD spent for each country (2005)



Source: Plan Bleu, TEC

This eco-efficiency approach helps identify the countries which appear to need to improve the economic performance of each trip, with an aim of mitigating emissions. The problems vary, as do the strategies for making the improvements.

For instance, in Tunisia, the ratios per trip and per overnight stay are relatively low. It therefore seems that more emphasis needs to be placed on the added value of the product.

In the case of Lebanon, which receives visitors from far away and therefore has high GHG emissions per trip and overnight stay, it appears that the tourist product has high added value and it is actually the distance from visitors that is the problem.

3. A prospective study to highlight future policies

The aim of this study is to shed light on the issue of carbon and Mediterranean tourism by analysing the future of tourism flows under the constraint of national and international climate policies.

Current knowledge on tourism in the Mediterranean is lacking due to a highly varying level of tourism development from one country to the next, and because of the problems in observing this diverse and multifaceted economic sector. In some countries, databases are incomplete, available data is inconsistent (e.g. nationals residing abroad are not fully taken into account in some countries), and some areas of the economy are ignored or poorly processed (e.g. domestic tourism). The sophistication of the tools used depends on the country, and in particular there is not always specific research or compiled data on the transport issue.

Therefore, for the purposes of this study, a specific model called MEDTOUR (see Appendix) needed to be built and used. Based on the available data and a certain number of assumptions, this model was used to fulfil two objectives:

- characterise tourism flows in the Mediterranean and calculate associated GHG emissions;
- observe the potential changes in these flows in the future according to different political-economic hypotheses.

The model can calculate tourism growth projections based on specific models for each country and can project trends for each market (domestic market and international markets by distance category). In a given economic and demographic context (growth profiles defined by the IPCC in scenarios A1F and A2 in the SRES⁹) modelling and forecasting can be used to play with the modal distribution of tourism travel or the distance travelled.

Various climate policy hypotheses (price of CO₂, national taxes and subsidies, as well as infrastructure and technology investments reflected in the changes in average journey times) affect transport costs and the travel length for the various transport modes for each country, resulting in transfers between markets and transport modes.

This prospective study is based on the modelling of tourist flows in the Mediterranean over the next century, according to different scenarios. Specific scenarios were therefore created for this study reflecting potential trends in terms of climate and energy policy at a national, regional and international level.

⁹ SRES: Special report on emission scenarios.

II. Potential changes in tourism transport in the Mediterranean

1. Setting targets

1.1. 2°C target in international negotiations

In late 2009, the Copenhagen Summit ratified an agreement in principle based on restricting the increase in global temperature to less than 2°C above pre-industrial levels in order to keep the effects of climate change within manageable limits.

The target of 2°C, which appeared for the first time in the IPCC Second Assessment Report, had substantial media and political repercussions despite the fact that no references were made to it at the Kyoto Climate Summit, in the Kyoto Protocol or at any Conference of the Parties (COP). In Bali, a debate on the need to make reference to this target pitted Russia and the United States against the rest of the states. The Copenhagen Declaration therefore offers something genuinely new in the area of climate change.

However, the IPCC did not recommend limiting the global temperature increase to 2°C. The table correlating the impact of climate change and temperature increases in the Fourth Assessment Report simply shows that above 2°C, the impacts worsen. However, **the negative impacts resulting from a 2°C increase are far from insignificant**. For example, a 50% reduction in emissions results in a 50% probability that in 2050, roughly one billion people will experience water shortage. This number would double by 2100. It can also be shown that even if efforts continue to be made at the same intensity after 2050, this level of reduction will still lead to a more than 50% probability that the 2°C target will be surpassed by 2100 (Parry, Palutikof et al. 2008).

1.2. Relating the “2 °C” target to carbon

How it relates to atmospheric concentration

Over the years, the 2°C target has been associated with varying concentrations of greenhouse gases in the atmosphere. Although the IPCC associates the 2°C figure with a concentration of 550 ppm of CDE¹⁰ in its second report, in its fourth report it considers that stabilisation at 450 ppm corresponds to the best estimate for a temperature increase of 2.1°C and 54% chance of not exceeding 2°C (IPCC 2007) p.826).

Within the scientific community, an increasing number of people are pushing for toughened objectives. Recent research shows that current climate change trends are currently towards the higher end of the IPCC estimates and that societies are more sensitive to climate change impacts than previously thought, (Richardson, Steffen et al. 2009). Furthermore, some researchers argue that claims estimating the danger at 2°C are based on outdated models (including those that are currently used) that do not take into account feedback effect from soil elements or the atmosphere, such as the melting of glaciers and the ice shelf, the release of greenhouse gases from the ground (tundra) or oceans, or that widely underestimate their significance. These assessments lead some authors (Hansen, Sato et al. 2008) to argue for stabilisation at 350 ppm (a target that has already been surpassed) rather than 450 ppm.

How it relates to carbon budget

A new approach in the movement to intensify the climate alert is based on **an estimation of the carbon budget that is sustainable for the atmosphere** (Schmidt and Archer 2009; WBGU 2009). If the carbon that has already been emitted is deducted, the remaining budget can be determined. This approach is nice and clear and lays down in stark terms the basis for sharing future emissions. To limit the global temperature increase to 2°C (with a probability of two-thirds), calculations converge towards a budget of

¹⁰ Carbon Dioxide Equivalent

756 gigatonnes for the 2010-2050 period. To reach a probability of three-quarters, emissions must be reduced to 600 gigatonnes.

Whether the issue is framed in terms of carbon budget or atmospheric concentrations, the calls for the necessity of long term reduction are converging. For instance, according to the association 350.org, an 80% reduction in emissions by 2050 corresponds to a temperature increase of approximately 1.5°C above pre-industrial temperatures. The authors from the IPCC Fourth Assessment Report Working Group 2 come to similar conclusions (Parry, Palutikof et al. 2008). **This is a far cry from Factor 4, which is still the focus of developed countries** (Radanne 2004).

High pace of policy implementation

With the level of the objective and taking inertia into account, the date at which emissions levels start to fall is also crucial. The commitments made by governments for reducing emissions cannot be applied to policies and measures right away. Modelling the possibilities for limiting the increase to 2°C in 2050 and maintaining this target beyond, based on the date on which emissions reach their peak and the average rate at which they diminish, show that **the only way of reaching this target is if emissions peak in 2015 (and no later) and the average rate of reduction is 4 to 6% between 2015 and 2050.**

Table 5: Rate of annual reduction after emissions peak and resulting temperature increases in 2100

Peak	1%	2%	3%	4%	5%	6%
2015	2.6°C	2.1°C	1.8°C	1.6°C	1.5°C	1.4°C
2025	3.0°C	2.6°C	2.3°C	2.1°C	1.9°C	1.8°C
2035	3.4°C	3.0°C	2.8°C	2.6°C	2.5°C	2.4°C

Source: (Parry, Lowe et al. 2008)

From a time perspective, the window for taking action is very small (Stern Review 2006): delaying the peak to 2025 increases the average temperature in 2100 by 0.5°C and by 1°C if it is delayed to 2035 (Parry, Lowe et al. 2008). This would entail additional ensuing risks and catastrophes.

1.3. “Common but differentiated responsibilities” for countries

Incidentally, if it is accepted that each person on the planet has the right to create an equal amount of emissions and that this right is applied over the long term, beginning with industrialisation, it does not take much imagination to come to the conclusion that those living in the Northern hemisphere have emitted much more than their share and are therefore owe a ‘climate debt’ to those in the South. In other words, they would no longer have any right to generate emissions and would have to immediately begin “paying back” their debt.

Based on new scientific data, global emissions should be reduced by 80% and not 60% as previously thought. Within this new context, **the principle of common yet differentiated responsibilities between Northern and Southern countries creates a certain degree of margin for developing countries to increase emissions, which then means that Northern countries must achieve almost full carbon neutrality by 2050.**

If immediate efforts are made to work towards an average emissions reduction rate of 80% for developed countries while maintaining a degree of flexibility for other countries, as was the case for a 50% target, European countries would each have to achieve almost full carbon neutrality (-100%) by 2050. Scenario research has begun based on these targets, such as the work of the Wuppertal Institute for Climate, Environment, and Energy in the Alps region on behalf of the German government and the Alpine Convention.

Considerable effort would need to be made by developed countries that generate outbound tourist flows through the use of emissions trading mechanisms or offset schemes (CDM) with less developed countries.

1.4. What objectives for air transport?

Based on the national objective, the next logical step is to set subsidiary-objectives for each economic sector: energy production, housing and construction, transport, agriculture etc.

Lifestyles in question

A certain amount of research has been carried out in France to examine the feasibility of achieving Factor 4, which is compatible with earlier targets (e.g. the Conseil Général des Ponts and Chaussées 2006; De Boissieu 2006). In broad outlines, they came to the conclusion of a foreseeable reduction by a factor ranging between 2 and 3 C, and that achieving a factor 4 would be impossible within the framework of realistic scenarios. Although it is easy to understand why futuristic technological hypotheses are not considered, hypotheses involving more drastic lifestyle changes by 2050 than originally thought should perhaps be examined. **In fact, if carbon neutrality is set as an objective right now, lifestyle changes will be the adjustment variable. It is therefore important to remain realistic. All economic sectors and all social practices (including tourism) will be affected, and none will be exempt from making a sizeable effort.** Under pressure, compensation or flexibility mechanisms (emissions trading, CDM) can only play a marginal role in a context of increased compensation, which will only end up increasing prices to levels far beyond the current price of carbon.

What are the consequences for the aviation sector?

The main actors are currently extremely reluctant to accept such an outlook as it would have a catastrophic impact on their business. The example of civil aviation is without a doubt the most difficult transport sub-sector to address. The sector is experiencing strong growth (Airbus 2006; Boeing 2006) boosted by a high demand for mobility driven by lifestyle changes (Gössling 2003; Gössling, Ceron et al. 2009). This probably contributes to global warming well beyond simply generating CO₂ emissions (Penner, Lister D.H. et al. 1999; Peeters, Gössling et al. 2006; Lee, Fahey et al. 2009). There are limited options for reducing emissions due to the fact that the various methods all involve mature technology (Peeters, Middel et al. 2005) and that there are no viable substitutions for kerosene that could meet high demands (Akerman 2005). Within the context of emissions reduction targets for 2050, it can be ascertained that **if the aviation sector continues to grow as its stakeholders would like, it will have used up the full emissions budget for a country such as Great Britain by 2050** (Bows, Anderson et al. 2007). **It therefore seems inevitable that the model of air transport will be challenged.** Even by taking into account improved energy efficiency (e.g. 60 % by 2050), partial replacement of kerosene with biofuels (Ceron and Dubois 2006), the implementation of flexibility and offsetting mechanisms (Ceron and Dubois 2008), the aviation industry can expect a very difficult future if climate becomes a priority in international policy.

Post-Kyoto and perspectives for air transport

The current emissions reduction commitments made by governments still fall within the Kyoto Protocol. This agreement sets differentiated emissions reduction targets – depending on the country - based on 1990 emissions figures. Only some industrialised countries (Annex I parties) made commitments (with the notable exclusion of the USA, among others). Emerging countries (India, China, Brazil, etc.) and developing countries did not make any reduction commitments. The process of negotiating a successor to the Kyoto Protocol envisaged a global cap-and-trade system to widen the circle of committed countries. However, the Copenhagen Conference in late 2009 failed to achieve results in line with the objectives defined above.

International aviation (unlike domestic air transport) was not taken into account in the Kyoto Protocol. The issue of assigning emissions (to the origin, destination or both, or the airline company host) and the complexity of re-examining the countless bilateral agreements governing air traffic were the reasons given to justify the exclusion. Nevertheless, certain groups of countries, including the European Union, decided to implement economic measures aimed at cutting emissions (carbon trading) to the best of their ability on an international scale.

Box 1 - IATA commitments... a look beyond the numbers

In September 2009, the CEO of British Airways outlined the following actions that could be taken by the IATA:

- a 50% net reduction of emissions from 2005 by 2050;
- a 1.5% cut in emissions per year over the next ten years;
- carbon-neutral growth from 2020;
- Submitting propositions for joining a global carbon trading scheme to the United Nations by the end of 2010.

He highlighted that these commitments go further than the British Government's target of reducing emissions by 50% by 2050 (Milmo 2009).

The following responses could be made to these proposals:

- 50% is not 80%...
- the reduction is proposed with respect to 2005 levels and not 1990 levels, which is quite significant given the increase in aviation emissions within this timeframe;
- only CO₂ is addressed, meaning that the other contributions of aviation towards global warming are ignored (total radiative forcing);
- the 50 % cut concerns net emissions. For gross CO₂ emissions, the commitment is for a 1.5% reduction per year over the next ten years. However,
 - this seems like a difficult goal to reach if aviation continues to grow as before (4-5 % per year), which is obviously desired;
 - the possibility of maintaining such a rhythm in the future is highly doubtful (decreasing yield of mature technology) (Peeters, Middel et al. 2005; Air Transport Department 2008) ;
- there is obviously an intent to count on the use of flexibility schemes (carbon trading, clean development mechanisms) with a considerable burden to the detriment of other sectors (see above). Offsetting or trading emissions is not the same as reducing emissions!

Future developments are uncertain and after initially being in denial, representatives from the sector have changed their stance. **Airlines now accept the principle of their inclusion in the carbon market.** They are now counting on flexibility and offsetting mechanisms to maintain their outlook for growth (UNWTO 2009). They could therefore purchase emissions credits from other sectors, use emissions offsetting schemes set out in the Kyoto Protocol (Clean Development Mechanism) and based on the principal of “common but differentiated responsibilities” apply different schemes to routes (exemptions or transitional measures) if they concern developing or even emerging countries. **They anticipate that such mechanisms would not prevent them from growing given their flexibility in transferring costs to the consumer (low elasticity).** Such an outlook is not realistic. Although the airline industry, more than other sectors, could purchase carbon permits and pass on the cost to consumers, massive purchases of carbon credits would deprive other sectors of access to flexibility mechanisms, despite today's societies still needing cement, steel, heat, etc. (Godard 2006).

However, they are firmly opposed to a quota system and an internal credit market for aviation (UNWTO 2009).

2. Three scenarios for aligning Mediterranean tourism with climate policy

This study makes the assumption that tough climate policies may be implemented by countries at a regional or international level. It therefore attempted to assess the impact of various scenarios on Mediterranean tourism in terms of the following:

- the price of carbon;
- technological progress;
- changes in infrastructures;
- regulatory measures concerning tourism transport and particularly specific carbon markets for the sector.

Three scenarios were defined to demonstrate the directions that national and international climate policies could take over the course of this century. These scenarios are increasingly restrictive for the airline sector. Each scenario is outlined according to three axes:

- directions in terms of overall climate policy (setting emissions reduction targets, etc.) and how tourism and air transport are addressed within these policies;
- changes in the air transport sector beyond environmental concerns, as well as policies for investing in infrastructures and projected technological advances for the sector;
- the pace of progress through the scenario, as the concept of time is essential to the exercise.

Figure 16 - Schematic description of scenarios

	S1 Real Politik	S2 Bali	S3 Hansen	S4 (variant)
Overall policy Objectives	Fragmented Copenhagen 2050 price of CO ₂ €72	Strong EU effort Obj. 2050/1990: -50 to 60% NMC: Climate and Energy Package SEMC: 10-15 year deferral €200	Global policy, USA leadership Obj. 2050/1990: -80% Major impact on lifestyles €595	€1000
Tourism and air transport in climate change	EUTS system for NMCs	Global carbon price, no special stipulations for air transport	Specific system for air transport, individual targets, sector-specific market	
Changes in the sector	Current trends (open-sky, low-cost airlines, etc.)	Current trends curbed in the medium term	Current trends reversed in the short term	
Infrastructures	Partial/delayed Euromed transport planning	Modal integration, Euromed transport planning followed	Modal integration, TGV a priority, Euromed transport planning completed	
Technological developments	No special stipulations	Introduction of turboprop aircraft	Turboprop aircraft, slower travel time	
Pace	Slow progress	In stages, in line with international negotiations	Begun immediately	

Source: TEC/Plan Bleu

2.1. Scenario S1: Real Politik

This scenario follows on from the Copenhagen Summit in December 2009 and depicts the consequences of the current commitments made by governments, hence the name “Real Politik”. It generally continues with current trends, with some marginal inflection through unambitious emissions reduction policies and is mainly driven by market mechanisms. It is a strong economic growth scenario; the aim of this scenario is to show the consequences of current policies.

Overall climate policy

Climate policy is broken down into blocs of countries. There is no overall policy. Nevertheless, the EU is aiming to become a leader in terms of climate policy and has been somewhat more ambitious than other regions.

On a global scale, reduction targets correspond to those made by the USA in Copenhagen, i.e. a 17% reduction against 2005 levels by 2020 (33 % in 2035, 83 % by 2050, etc.). EU policy, which applies to all NMCs, is a little more proactive with a reduction target of 20 % by 2020. Emerging countries (SEMCs) will probably become involved in the period 2020-2025 with the first reduction targets being in 2030. For these nations, targets are equivalent to international targets, but with a 15 year time lag, i.e. 17% reduction against 2015 emissions levels by 2030.

Reduction policies do not fundamentally change household income levels or their ability to travel in the short-term. The Stern Review estimates that a business-as-usual (BAU) scenario would reduce available income by 5 to 20% in the long term if all risks and impacts are taken into account according to risk economy principles. Given the higher level of awareness following recent research, disaster-aversion and a broader approach to impacts than a merely

production-focused approach, the upper end of this 5 to 20% range is probably more realistic. (Stern review 2006 p 10.)

Tourism and air transport within climate policy

As a consequence of overall climate policy, the sectorial approach of climate policies is inevitably extremely fragmented. Carbon pricing exists only for NMCs and not SEMCs. The European emissions trading system, EUTS, will apply to aviation from 2012, when airline emissions exceed 97% of 2005 levels.

The system in place relies on a trade-only market mechanism where there are enough quotas to prevent the price of carbon from increasing by too much (roughly EUR 70 per tonne). Aviation is gradually introduced into the carbon trading system, first in the EU, then in the USA, followed by the other regions. The price of carbon will remain low early on, but could see a rapid jump as the airline sector will be quick to purchase available credits in bulk, thus increasing prices.

Changes in the industry unrelated to climate policy

Current trends are maintained, with open-sky agreements, increased competition, low-cost airlines and the development of regional airports. These changes will lead to record-low airfares in just a few years. Lower airfares mainly benefit the South, with a reduction in price differential between NMCs and SEMCs (since SEMCs will fully benefit from these trends while they are relatively mature in the North) and prices to Southern destinations that will fall faster than prices on routes within NMCs. This situation will continue until prices rise again with the price of fuel. The low-cost model is more vulnerable to fuel prices and is therefore affected by such rises.

Transport infrastructure investment policy

Investment policy is always dictated by competition between rail and air travel, and in this scenario the Euromed transport planning process is only partially completed or delayed. The development of already launched air infrastructure projects will continue, however new projects are not encouraged.

Technological progress

Technological progress corresponds to the baseline scenario.

Pace of the scenario unfolding

This scenario relies on little policy and therefore moves forward fairly slowly. The price of carbon will probably not see a linear progression but is instead rather erratic variation with successive rises and falls (economic climate and market phenomena). The price message is unstable.

2.2. Scenario S2: Bali

The Bali Conference, which lends its name to the scenario, was held in December 2007. It was the 13th Conference of the Parties (COP13) to the United Nations Framework Convention on Climate Change and the 3rd Meeting of the Parties to the Kyoto Protocol. The aim of the conference was to launch a new global agreement on reducing greenhouse gas emissions.

This scenario is based on the strong ambitions expressed in Bali but which led to no commitments on the part of nations attending the conference. It aims to demonstrate that the air transport sector poses a real problem if it is treated like other sectors, even with a high carbon price. An open market is inefficient in reducing emissions and puts too much pressure on other sectors.

Overall climate policy

This is a relatively integrated scenario. Climate policy is still fragmented, but less than in the previous scenario, and distinguishes between developed and emerging countries, with strong resolution on the part of the EU.

The global targets set in Bali correspond to the low end of the scale with respect to IPCC research, with a 50 to 60% reduction against 1990 levels by 2050. The EU (NMC) targets are based on the on the Climate and Energy Package with a 30% reduction from 1990 levels by 2020. SEMC targets are the same, but with a 10 to 15-year time lag.

With this scenario there are no significant impacts on the economy because if problems are dealt with in time, the resulting effects can be limited, as evoked in the Stern Review. This therefore means a situation of relative economic neutrality: policies are implemented to avoid certain negative effects from climate change and more or less compensate the falls in household income. People's ability to travel is not significantly affected.

Tourism and air transport within climate policy

The price of carbon is a global price, perhaps with a few regional variations. The carbon trading system is a global system based on a high carbon price (roughly EUR 200 per tonne) with no specific framework for the aviation industry. However, to limit flights (discourage travellers) either as part of climate policy or investments, taxes are imposed on short-haul flights.

Changes in the industry unrelated to climate policy

Current trends (open-sky agreements, increased competition, low-cost airlines and development of regional airports) must be curbed or reversed in the medium term if there is to be any chance of reducing emissions.

Airfares reach their lowest level in just a few years. There is a reduction in price differential between NMCs and SEMCs with prices to Southern destinations falling faster than prices on routes within NMCs. The situation will not last and prices will quickly start to increase again with the combined effect of fuel and carbon prices. The low-cost model is affected more quickly. It is also more difficult for airlines to enter the market (high entry costs), which results in a relative concentration of the market and consequently higher tickets prices.

Transport infrastructure investment policy

There is real progress in integration between the various modes of transport. Policy concerning the development of high-speed rail around the Mediterranean is in line with Euromed transport planning. Alternative solutions are added to transportation networks for relatively short distances, mainly to cross the Mediterranean or fill in where high-speed trains do not operate: a combination of air transport with turboprop aircraft and ferries.

Air infrastructure planning is rationalised and focused mainly on Mediterranean hubs that can accommodate turboprop aircraft crossing the Mediterranean Sea. Government incentives for regional airports are abolished.

Technological progress

In addition to taking advantage of the full potential of technological progresses, there is a push to renew fleets with the introduction of turboprop aircraft, which are much more energy-efficient (Akerman 2005).

Pace of progress of the scenario

The scenario progresses in stages according to negotiating periods: 2012-2020 post-Kyoto, after 2020 a more ambitious period.

Box 2 - Turboprop aircraft: more economical for short-haul travel and more environmentally friendly

The difference between a jet aircraft and a turboprop is that a jet only uses air drawn into the engine nozzle to generate the thrust that makes the aircraft move, while a turboprop reuses the energy produced by the turbines to drive the propeller at the front of the engine.

Currently used on the ATR and other aircraft, turbo propulsion is more energy-efficient and emits less CO₂.



Research programmes such as Clean Sky focus on solutions aimed at significantly reducing the environmental impact of air transport, reducing noise by 5 decibels, CO₂ emissions by 30% and nitrogen oxides by 50%.

In 2011, trials will be run on an engine that should reduce fuel consumption and emissions into the environment by an additional 10% compared to the current fleet.

2.3. Scenario S3: Hansen

American climatologist James Hansen heads the NASA Goddard Institute for Space Studies and his work is at the origin of the international "350"¹¹ campaign. He supports an ambitious vision of national and international climate policy and particularly, the implementation of a global carbon tax.

This third scenario is in line with Hansen's work and takes the warnings of scientists fully into account. The fight against climate change becomes the deciding criteria for all countries and economic and political means, etc are geared towards this objective. The aim of this scenario is to show the consequences of specific action targeting aviation, which is inevitable within such a context.

Overall climate policy

Climate policy is managed on a global level with strong leadership from the United Nations. The objective is an 80% global reduction against 1990 levels by 2050, which means almost full carbon neutrality for developed countries. There must be an all-round approach and the role of regulatory tools is essential. There is a high carbon price that is common for all countries.

This will create a shock: lifestyles and consumption practices are called into question and the propensity to travel is highly impacted as climate policy measures affect the income available for travel in the immediate short term. In the long term, some adaption should partially attenuate the phenomenon, as other modes of transport emerge.

Tourism and air transport within climate policy

Aviation is governed by a specific system based on emissions caps, setting individual targets for airlines. It also includes a carbon trading mechanism within the industry itself.

¹¹ 350 ppm refers to the total amount of CO₂ in the atmosphere that should not be exceeded. According to research by Mr Hansen and the IPCC, beyond this level, ocean acidification, the deterioration of coral reefs, melting of the polar ice cap and disturbance to major river systems as well as the modification of climate zones will continue and lead to a point of no return. Mr Hansen believes that the maintenance of civilisation depends on this 350 ppm limit

A statutory ban on short-haul air transport is also implemented when a viable rail transport alternative is available.

Changes in the industry unrelated to climate policy

Current trends (open-sky agreements, increased competition, low-cost airlines and development of regional airports) are quickly reversed. This is a disruptive scenario. The result is an elitist system for medium and long-haul travel where just a few essential and short routes (e.g. crossing the Mediterranean) remain mass-marketed products for air travel.

It is also a scenario that will lead to innovation in transport services, involving the integration of travel operators that would begin selling a travel service rather than just a specific transport mode.

Transport infrastructure investment policy

The scenario involves modal integration between the various transport modes within a context of very high prices. There is strong and quick high-speed rail development around the Mediterranean. Current Euromed transport planning is implemented quickly and is improved for the Southern and Eastern shores of the Mediterranean.

New solutions are added to transportation networks for short distances (e.g. crossing the Mediterranean): a combination of air transport with turboprop aircraft and ferries.

Air infrastructure development is stopped, except for a few exceptions in Mediterranean hubs able to accommodate turboprops. Regional airports are gradually closed along with some runways at major airports.

Technological progress

Substantial funding is made available in order to improve technologies and there is high market pressure due to the high carbon price.

There is an even greater push to renew aircraft fleets. The main progress lies in a more rapid introduction of turboprop aircraft.

However, longer travel times ("slow travel") can be expected with this scenario.

Pace of progress of the scenario

Strict targets mean that the scenario is put in place immediately and progresses at a rapid pace, therefore creating disruptive changes. For instance, high tax measures are implemented in the immediate short term and rail infrastructure investments are put in place in parallel.

2.4. Variant of the Hansen Scenario: S4

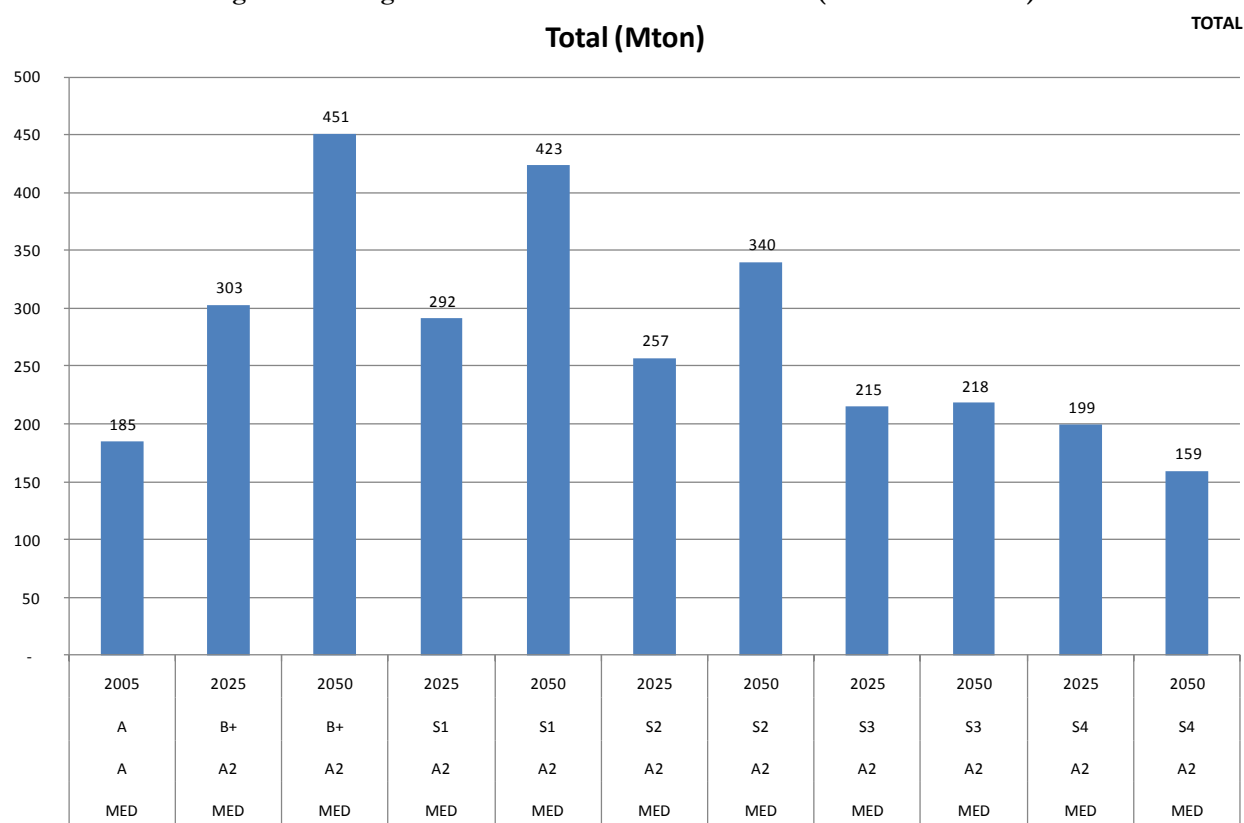
The aim of this scenario is to achieve stabilisation of emissions by 2050 at 2005 levels. In order to do so, characteristics are similar to those for Hansen S3, however the global price of carbon is much higher.

3. Lessons from models

3.1. Difficult to control CO₂ emissions...

Figure 17 shows the CO₂ emissions generated by tourism flows, all types of tourism included: the arrival of international tourists in Mediterranean destinations, outgoing Mediterranean tourists taking holidays abroad and domestic tourism in all Mediterranean countries.

Figure 17 - Changes in CO₂ emissions under each scenario (Mediterranean total)

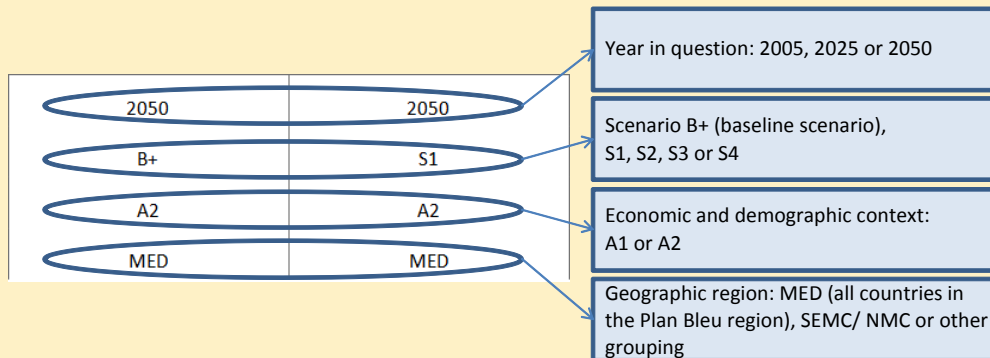


Source: Plan Bleu, TEC

Unfortunately, **even the most extreme scenario does not generate the desired emissions reductions**, which is quite alarming. Tourism growth (i.e. increasing travel volumes) will mean an increase in CO₂ emissions generated by tourism transport, regardless of which policies are put in place. Climate policies nevertheless make a real difference with almost complete stabilisation of emissions in the case of Scenario S3. Only an incredibly high carbon price would lead to real reductions in emissions by 2050.

Box 3 - How to read the graphs

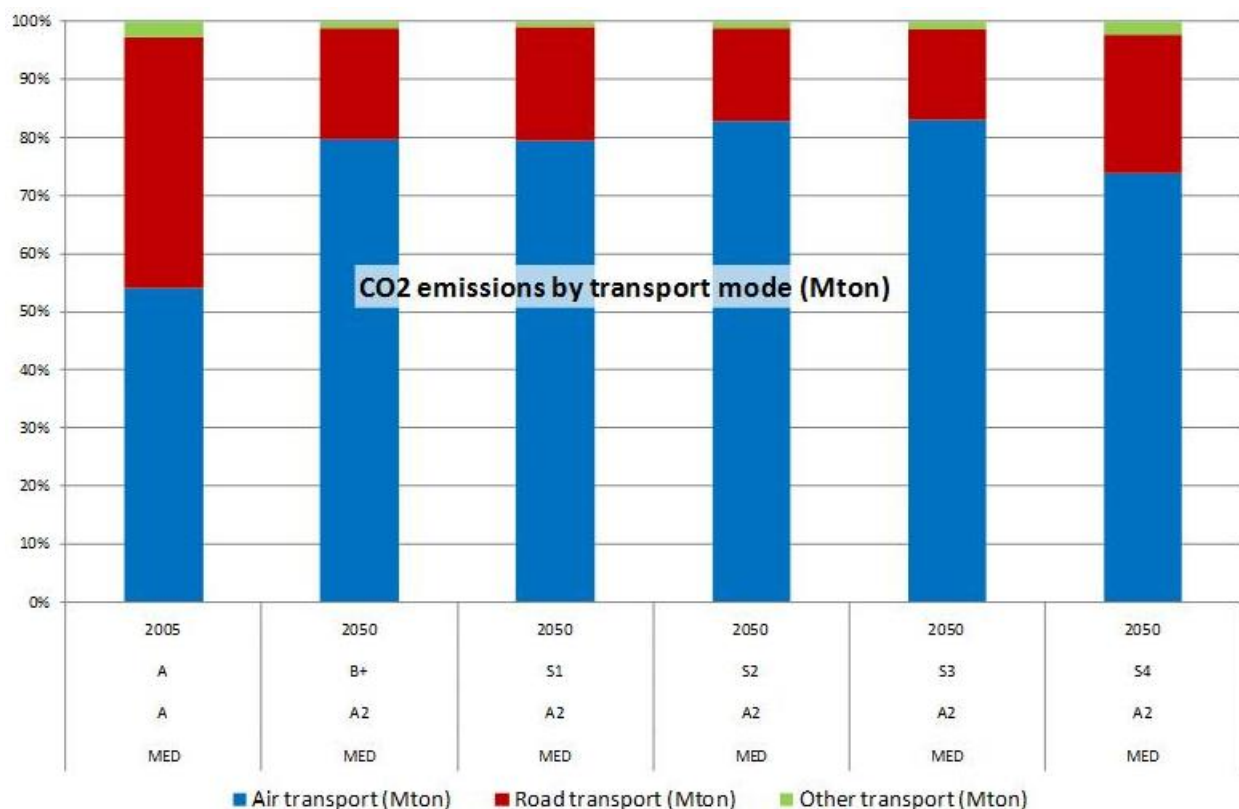
The graphs given in this section show the results from the MEDTOUR model, organised according to several parameters. The horizontal axis gives details about the content of the graph as follows:



Air transport generates the most emissions

Air transport, in the form of tourism transport that generates the most CO₂ emissions, is leading the way in transport emissions in the Mediterranean and continues to increase its share, rising from 53 % of emissions in 2005 to 80 % in baseline forecasts (B+) by 2050.

Figure 18 - Changes in CO₂ emissions per transport mode under each scenario (Mediterranean total)



Source: Plan Bleu, TEC

None of the climate policy scenarios reduce aeroplane emissions from the current situation and only an extremely high carbon price is cable of curbing the trend.

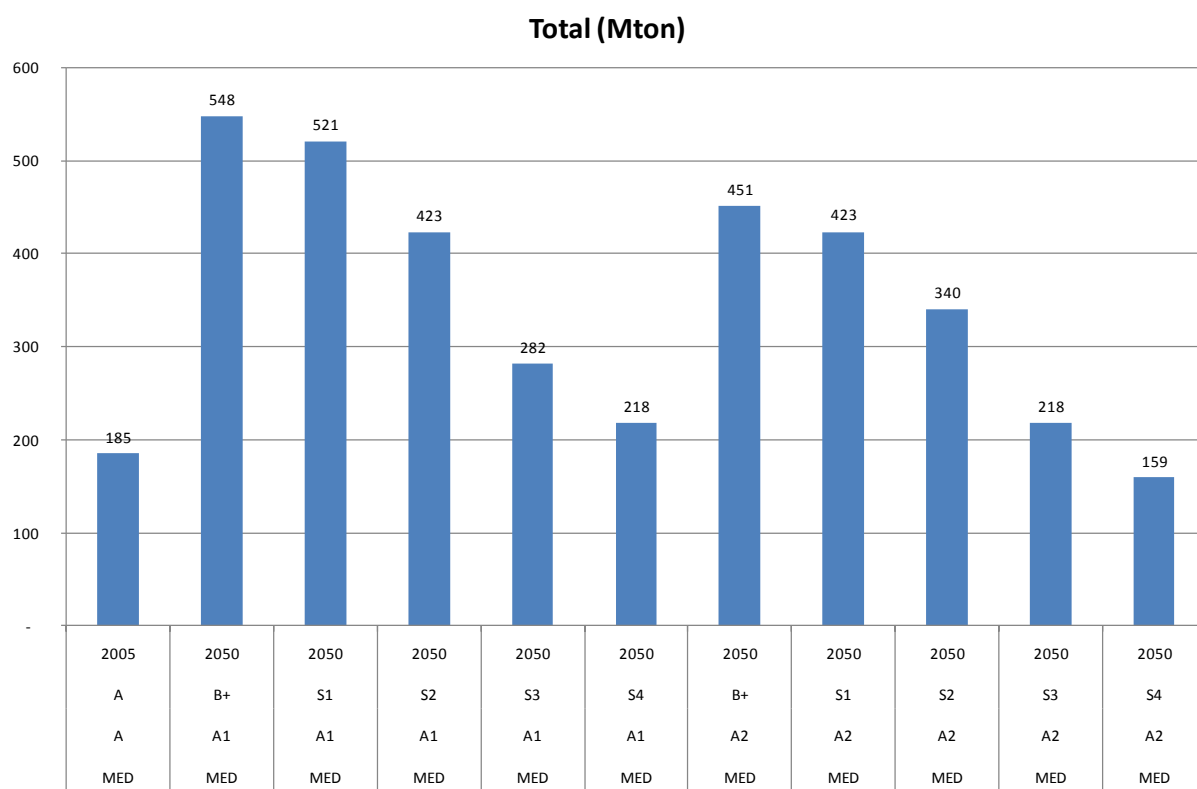
3.2. ... mainly due to economic development in the Mediterranean

Economic conditions play an influential role on the number of trips and emissions

By comparing scenarios for the two models with two different demographic and economic growth contexts the influence of the context on tourism flows can be assessed.

The results of the two models, show a 30% difference in the number of trips between the context of strong economic growth (IPCC scenario A1F), and thus an assumption that households are able to spend a significant portion of their budget on holidays, and a much more moderate economic context (scenario A2) in which there seems to be a reduced propensity to travel.

Figure 19 - Changes in emissions levels based on different scenarios and economic contexts (Mediterranean total)



Source: Plan Bleu, TEC

With sustained economic growth in the Mediterranean, even the toughest scenario does not reduce emissions from tourism by 2050. Only with a moderate growth outlook, in line with the 2010 economic crisis is a reduction in tourism transport emissions foreseeable. There is a difference of roughly 20% between the two types of economic contexts.

This trend is less distinct with respect to changes in the distances travelled. For the least restrictive climate policy scenarios, tourists travel distances that are 16% to 17% shorter in a tense economic context. If climate policies are toughened, the distances travelled are 19% to 25% shorter. The trend is even more surprising as far as modal distribution is concerned. Air travel retains just as high a share in a context of moderate economic growth. However, in all cases, this share is decreasing.

These results seem to show that when economic pressure increases, consumers prefer to travel less but to maintain the ability to travel long distances. Certain motives, particularly reasons of affinity, might explain this trend. It would be interesting to conduct a more qualitative (sociological, anthropological) analysis by country of travel choices under tighter financial constraints.

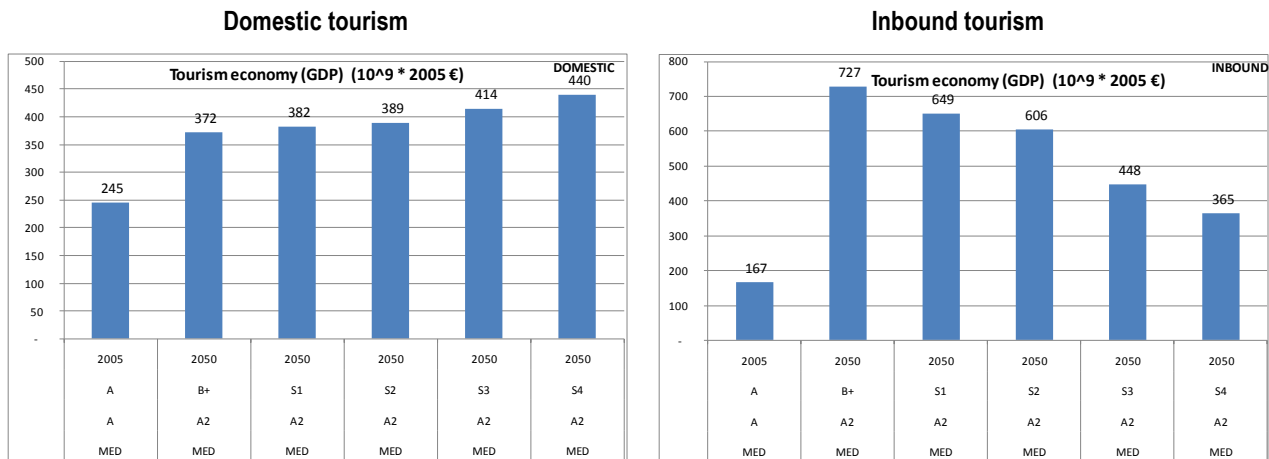
If the trend is confirmed, it can be imagined that economic constraints would probably have less impact on the distribution of tourist flows between destinations than on total travel volumes.

For the next part of the analysis, the model based on IPCC scenario A2 was used. This scenario assumes moderate economic growth over the next few years as a result of the current financial crisis.

A growing economy in the Mediterranean

Even in a moderate economic context, the tourist economy continues to grow. However, restrictive climate policies weigh heavily on GDP from tourism.

Figure 20 - GDP generated by domestic / inbound tourism under each scenario (Mediterranean total)

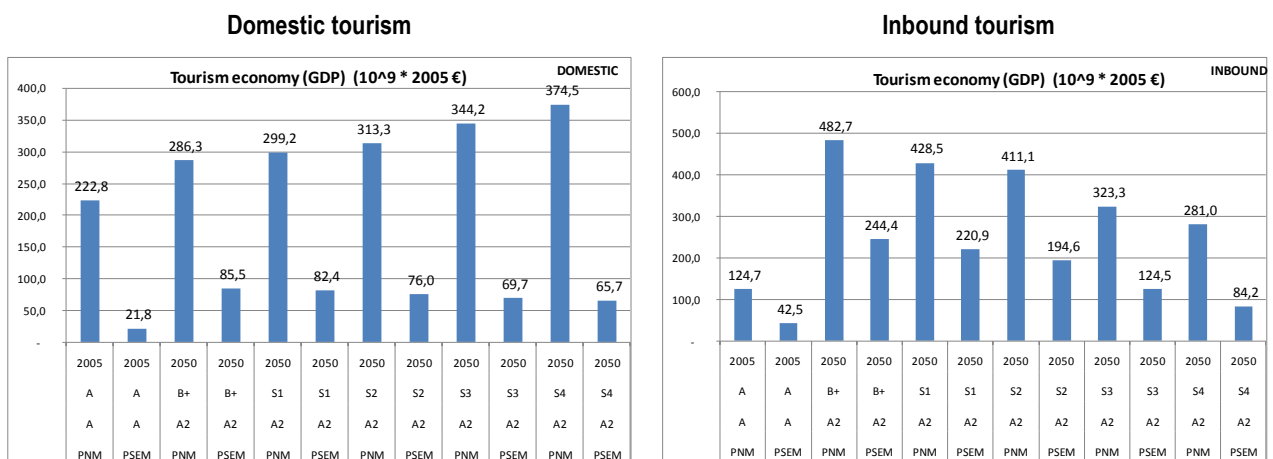


Source: Plan Bleu, TEC

Although **inbound tourism continues to be a growing resource for Mediterranean destinations**, climate policies weigh heavily on the income that it generates. On the other hand, the economic activity generated by domestic tourism gains from a context that is tougher in terms of carbon.

However, **SEMCs appear to be somewhat disadvantaged by air transport constraints**.

Figure 21 - GDP generated by domestic / inbound tourism in SEMCs



Source: Plan Bleu, TEC

The geographical distribution of GDP growth coming from domestic tourism in climate policy context is unevenly spread between NMCs and SEMCs. Thus, when it comes to the NMCs, the more climate policies tend to favour gas emissions reduction, the more GDP growth generated by domestic tourism can be noticed. As for the SEMCs, the situation is reversed: the more the climate policies tend to favour gas emissions reduction, the more GDP coming from domestic tourism decreases. Moreover, this uneven growth distribution from domestic tourism between NMCs and SEMCs is even more emphasized that even if the decrease of GDP coming from international tourism is balanced by domestic tourism for the NMCs, the loss of economic wealth generated by international tourism is not balanced by the growth of domestic

tourism in the SEMCs. Consequently, climate policies are – from an economic point of view – clearly unfavourable to the SEMCs. Indeed, the more there is a difference between SEMCs and NMCs on domestic GDP on one hand and international GDP on the other hand, the more climate policies tend to favour emissions reduction. Beyond the capital carbon proposition, these results point towards time shifted emissions reduction between NMCs and SEMCs.

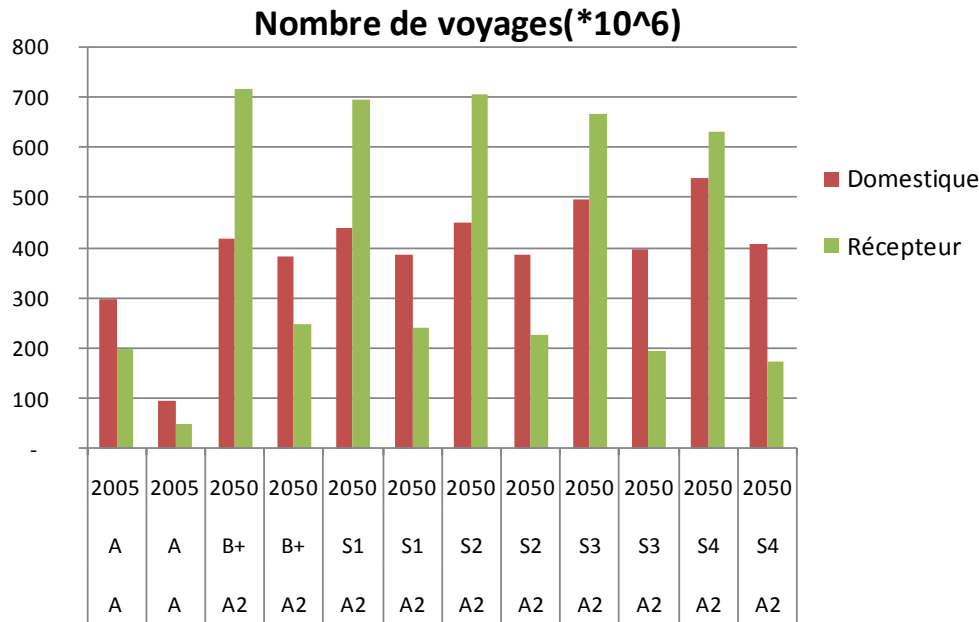
Will taxes finance the transition towards more sustainable mobility?

The increase in global taxes becomes quite significant in the most “virtuous” scenarios. These scenarios involve a halt to investments in airport infrastructures and massive investments in rail transport. Although it is impossible to give precise figures at this point, taxes in general represent substantial amounts in the scenarios. This suggests that it may be possible to finance regional transport policies and investments in more environmentally-friendly modes of transport, in particular rail infrastructures. Local taxes should also see significant rises but be curbed by shortened distances and fewer trips.

3.3. Domestic tourism increasing to the detriment of international travel

In this modelling exercise, the total number of trips (one of the input variables in the model) is restricted by the economic and demographic changes described in the SRES scenarios. The focus should be on the distribution of flows between domestic tourism and outbound tourism rather the changes in total volume.

Figure 22 - Changes in number of trips for domestic tourism and inbound tourism (Mediterranean total)



Source: Plan Bleu, TEC

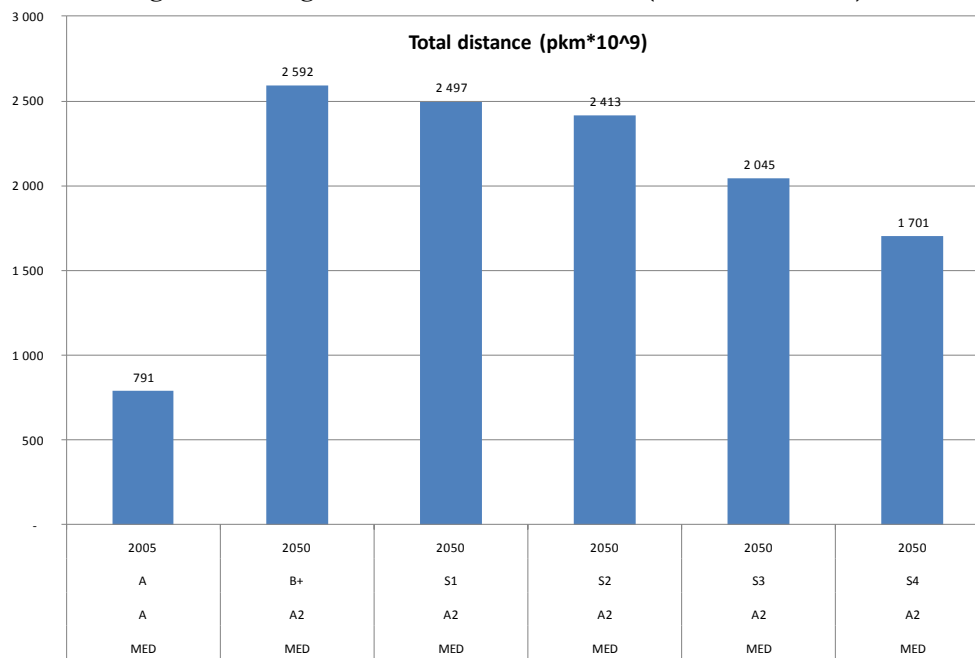
The trend shows **a switch from domestic travel to international travel for Mediterranean inbound arrivals**. The introduction of climate policy encourages the growth of domestic tourism and limits inbound tourism. However, only the most restrictive air transport policies reverse the dominance of international tourist arrivals in Mediterranean inbound tourism. These findings apply for both NMCs and SEMCs.

The development of domestic tourism is definitely an avenue that could help limit greenhouse gas emissions from tourism. However this would require that governments and business sectors change their strategic view of tourism (what it contributes to countries, economic role, social role, etc.). On an individual and social level, this raises questions on acceptability and the function of travel. Is one form of travel more valuable than another? Is domestic tourism an acceptable substitute for international travel?

3.4. Shorter distances travelled

As mentioned earlier, Mediterranean tourism is a tourism of relative proximity and distance is a crucial factor affecting the quantities of CO₂ emitted by tourism.

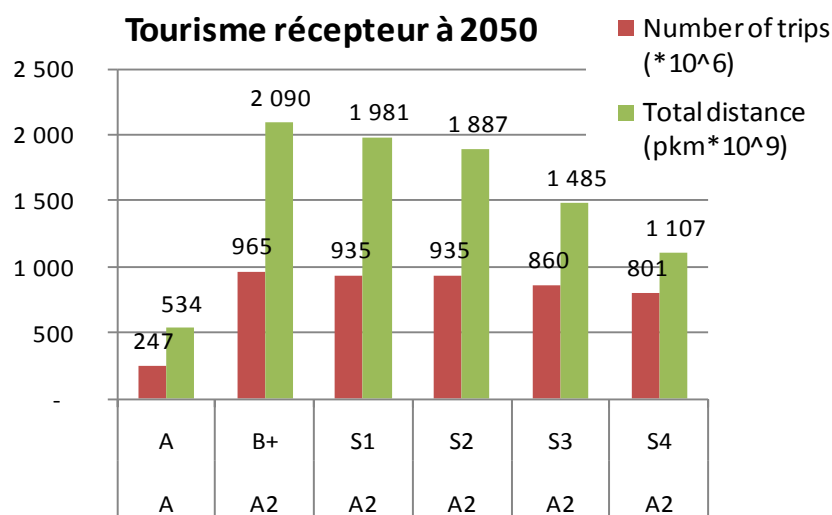
Figure 23 - Changes in distances travelled for 2050 (Mediterranean total)



Source: Plan Bleu, TEC

Given the increase in tourism volumes in the Mediterranean, the total distances travelled in kilometres per passenger logically follow a strong growth curb. However the **implementation of restrictive policies has a significant impact on distances**. For instance, in Scenario S3, the total distance is more than 20% less than the baseline scenario.

Figure 24 - Changes in distances travelled and inbound tourism volumes for 2050 (Mediterranean total)



Source: Plan Bleu, TEC

For inbound tourism, if the total number of trips and the total distance travelled are taken into consideration, the mean distance travelled by international tourists to the Mediterranean can be estimated. The distance (currently approximately 2,160 km, one way) remains stable in a baseline scenario. However, with the climate policy scenarios, the distance is shortened to 1,727 km in Scenario S3, i.e. a 20% reduction compared to the baseline scenario.

Table 6 - Changes in average inbound tourism distances in NMCs and SEMCs

	2005	Baseline in 2050	S3 in 2050
NMC	2,080 km	2,081 km	1,681 km
SEMC	2,449 km	2,421 km	1,886 km

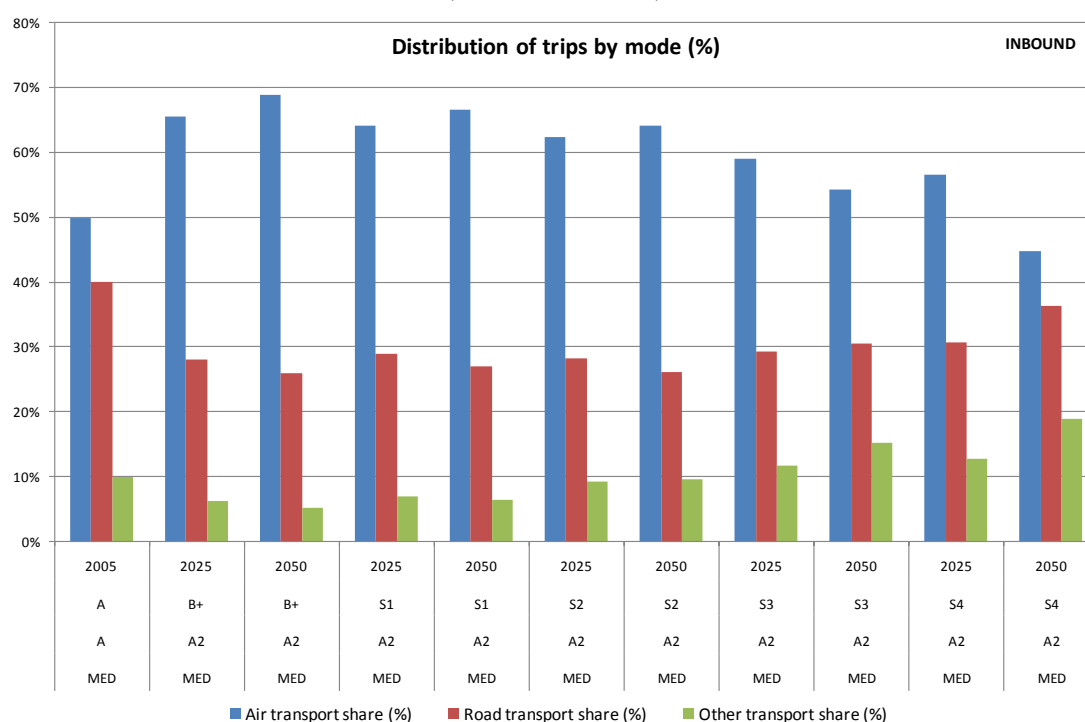
Source: Plan Bleu, TEC

There is a slightly greater a reduction in the SEMCs (22 % lower with Scenario S3 than for the baseline scenario), because these destinations receive international tourists come from further away.

3.5. Difficulty in restricting the use of air transport

One of the solutions for reducing CO₂ emissions within the context of increasing tourist travel involves limiting the use of air transport. In this case, the distribution of flows between the various transport modes (air, road and other modes, particularly rail) must be examined.

Figure 25 - Distribution of the number of international tourist arrivals (inbound) and transport modes under each scenario (Mediterranean total)



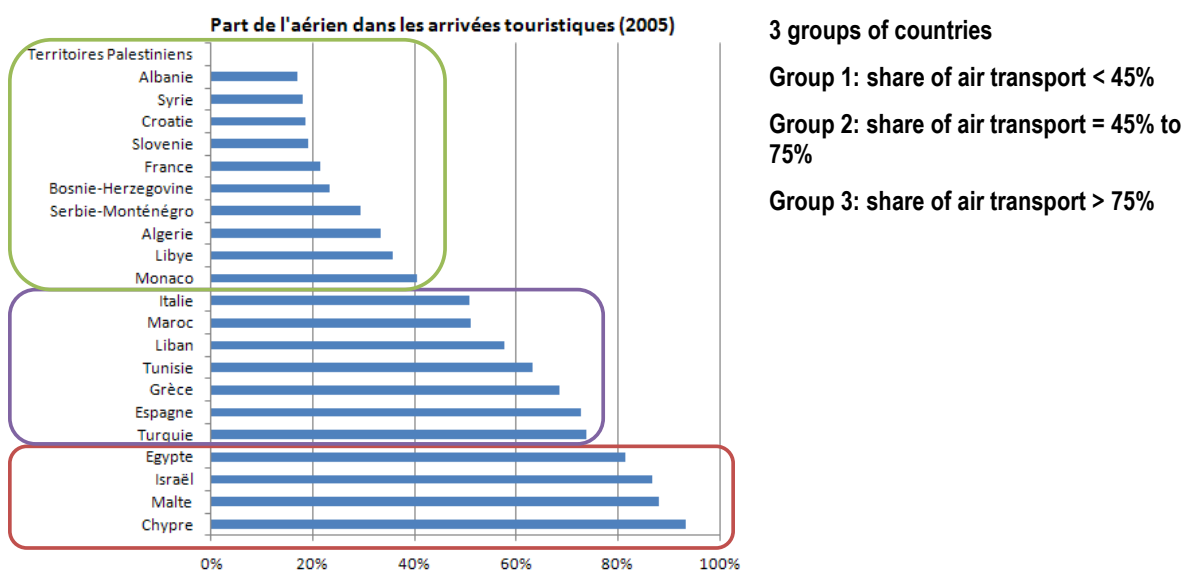
Source: Plan Bleu, TEC

The share of air transport, is already the most frequently-used mode of transport (50%) for international inbound arrivals, and will continue to increase. Scenarios S1 and S2 are unable to reverse this trend or even reduce it. Only an extremely tough policy scenario (S3-S4) is capable of reversing the current trend between 2025 and 2050. Still in a 2050 projection, it is only in this scenario that alternatives transport can see their share increase compared to nowadays, up to reach 45% for train and 19% for the other transportation modes in this scenario.

This graph helps explain the significant reductions in CO₂ emissions through a transfer to more environmentally-friendly alternative modes of transport, even despite an increase in the use of air transport.

To get a closer analysis of the change in the use of air transport for international inbound travel, it is interesting to observe the behaviour of different groups of countries. A typology for Mediterranean countries was created based on the current dependence on air transport (share of air transport in 2005 international inbound arrivals). This typology breaks countries into three groups, as shown in the figure below.

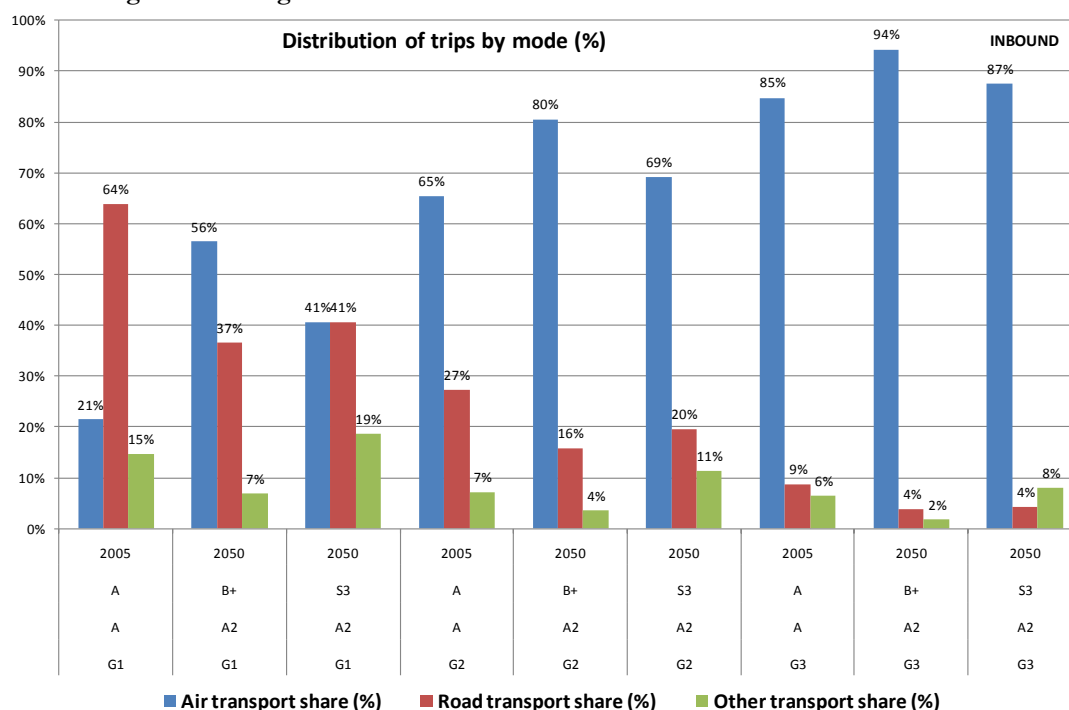
Figure 26 - Typology of countries according to dependence on air transport



Source: Plan Bleu, TEC

The groups are divided based on the share of air transport in tourist arrivals (inbound tourism), highlighting the vulnerability of export activity to this transport mode. The following results therefore only take into account inbound tourism.

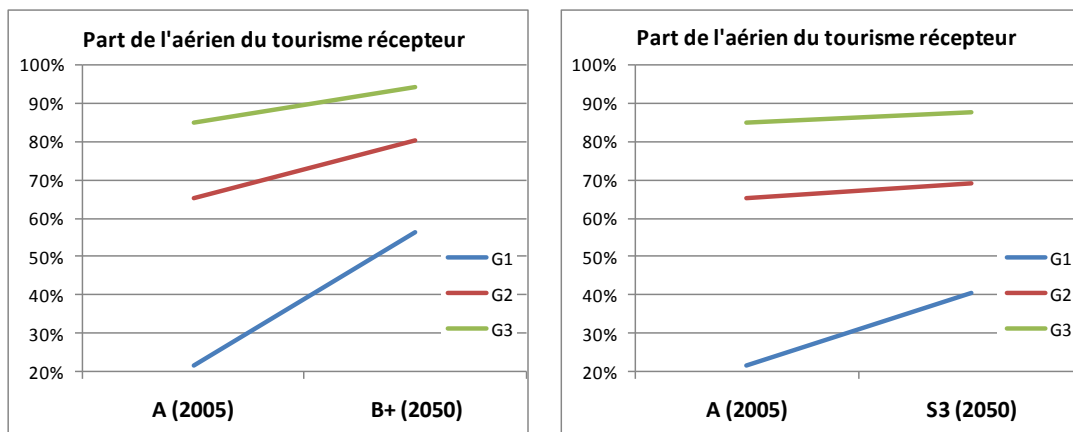
Figure 27 - Changes in the modal distribution of inbound tourism under each scenario



Source: Plan Bleu, TEC

For all three groups, the curves showing changes in the air transport share between now and 2050 are similar for the baseline scenario and 2050 for the restrictive Scenario S3. **However the more countries are dependent on air transport, the less the influence of policy factors.**

Figure 28 - Changes in the share of air transport depending on the group of countries



Source: Plan Bleu, TEC

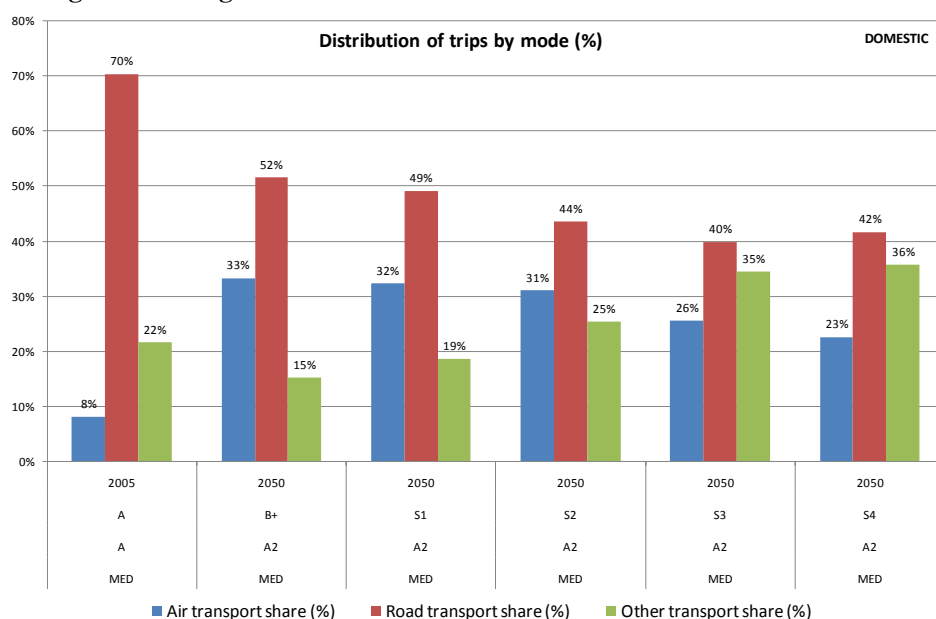
The less countries are dependent on air transport for their inbound tourism now, the more the share of this transport mode changes. The smaller the current share, the more it increases. For Group 1, which relies on road transport as the main mode for transporting foreign tourists, air travel increases from 21 to 58% between 2005 and 2050. In this case, the only scenario that curbs the growth of this transport mode is the Hansen scenario with its tough policy measures, leaving air and road travel with equal shares in 2050.

In Scenario S3 and above, the distribution sees an increasing share for other modes. In S4, the share of alternative modes of transport is multiplied by 1.5 to 2 between 2005 and 2050.

For domestic tourism, cars remain dominant but are losing ground

For domestic tourism, air transport is still in the minority, while personal vehicles are by far the dominant travel mode. This trend persists in all the scenarios, but will be less pronounced as the pressure from climate policy increases, creating space in the market for air transport and especially other transport modes such as rail and coach.

Figure 29 - Changes in modal distribution for domestic tourism under each scenario



Source: Plan Bleu, TEC

These findings are quite alarming in that only extremely tough policies promote more environmentally friendly transport modes. However, even for short distances involved in domestic tourism, air travel continues to gain market share in all cases.

III. How to adapt

1. Possible levers

This study has shown that under the assumption that climate change is taken seriously, countries would face a drastic change in the way tourism is approached, with air transport especially being challenged. They must therefore prepare for such an eventuality by looking for ways to accompany the transition and limit any negative impacts on their economies. There are various technical, marketing and organisational levers that could help optimise the carbon footprint from tourism and reduce dependence on air transport.

Three main levers stand out which, if put to use at a national or international level, could influence the way Mediterranean tourism evolves within the context described in the previous chapter. The first is transport policy which directly impacts the mobility of travellers. This must be examined with respect to the Mediterranean region as a whole. Secondly, the tourism policies of each country will obviously play a fundamental role. Thirdly, the transformation of travel culture and lifestyles is a powerful lever for change although this is often unrecognised and lacks specific action planning (ways to influence, but not only on this level, the propensity to travel etc.).

1.1. Transport policy

In a situation where climate policies are toughened at all levels, we have seen that tourism would mainly be affected in terms of transport. An in-depth reflection on transport policy in each country and especially on an EU and Mediterranean scale would bring a different perspective to the travel industry so that tourism in the Mediterranean could be sustained and even developed.

Current policy of liberalisation and organisation of air transport...

The share and pace of change in tourism-related air traffic in Mediterranean countries varies for each country, but the total increase in traffic is likely to increase at a rate of 4.4% per year according to UNWTO estimates.

Air transport in the Mediterranean has been marked over the last few years by the liberalisation of the market, resulting in lower prices. This change particularly enabled the expansion of mass tourism in the Mediterranean with the development of high-traffic airports. The sector has also been structured around a hub configuration. However, according to OECD, this type of arrangement is not the most environmentally suitable as it increases distances and the number of takeoffs and landings (OECD 2010, Globalisation, Transport and the Environment).

Current regional transport policy is structured by the Regional Transport Action Plan for the Mediterranean Region 2007-2013 (RTAP), adopted in October 2007 by the various Mediterranean partners of the Euromed Transport Project. The purpose of the plan is to facilitate exchanges between Mediterranean countries. In terms of civil aviation, it recommends that markets continue to open up, that safety and security should be improved and air traffic managed better.

Faced with the major changes taking place in air transport, the European Community aims to adopt policy for creating a common aviation area that includes countries covered by European neighbourhood policy, in line with the principle of regulatory convergence and improved access to the market. Morocco has already signed an open-sky agreement with the EU and other agreements with Tunisia and Libya.

In terms of security, Mediterranean countries are encouraged to align with the expertise of the European Aviation Safety Agency (EASA) concerning regulation functions and control mechanisms and to improve the control capacity of their authorities.

Finally, as far as management is concerned, coordination between the initiatives of areas neighbouring the EU should be put in place. These initiatives include the Europe-Middle East Air Traffic Management Coordination protocol (EMAC), signed by Cyprus, Lebanon, Syria, Jordan and Egypt, AEFMP (Algeria, Spain, France, Morocco, Portugal) and the recent *Meda Bleu* initiative (Italy, Malta, Tunisia, Cyprus).

Box 4 - Effects of the crisis on passenger air transport

The players in the aviation sector estimate that 2009 saw the most significant decline in demand since the end of World War II. The effects of the recession were worse than the combined effects of the Gulf War and 11 September.

The IATA announced a 3.5% fall in international passenger demand, with a 75.6% seat-occupancy rate. The Airports Council International CACI reports a 2.7% drop in passenger traffic in international airports in 2009 against 2008 figures, with numbers falling to 4.4 billion travellers. International traffic (-4.2% to 1.8 billion passengers) was hit harder by the financial crisis than domestic traffic.

European and North American carriers were especially affected with a 5% drop in international demand between 2008 and 2009. The European Regions Airline Association (ERA), which represents 65 intra-European airlines, saw a 4.2% decrease in passenger traffic for 2009. Middle-Eastern carriers came through the crisis unscathed with 11.2% growth for the entire year thanks to an increase in market share on long-haul flights transiting through hub airports.

In December 2009, global demand began to improve and was confirmed in the first quarter of 2010. European and North American carriers were the only ones that did not see a pick-up in demand by the end of 2009. Other regions saw positive growth in December, which mitigated the poor results for the rest of the year.

Sources: IATA, ACI, ERA

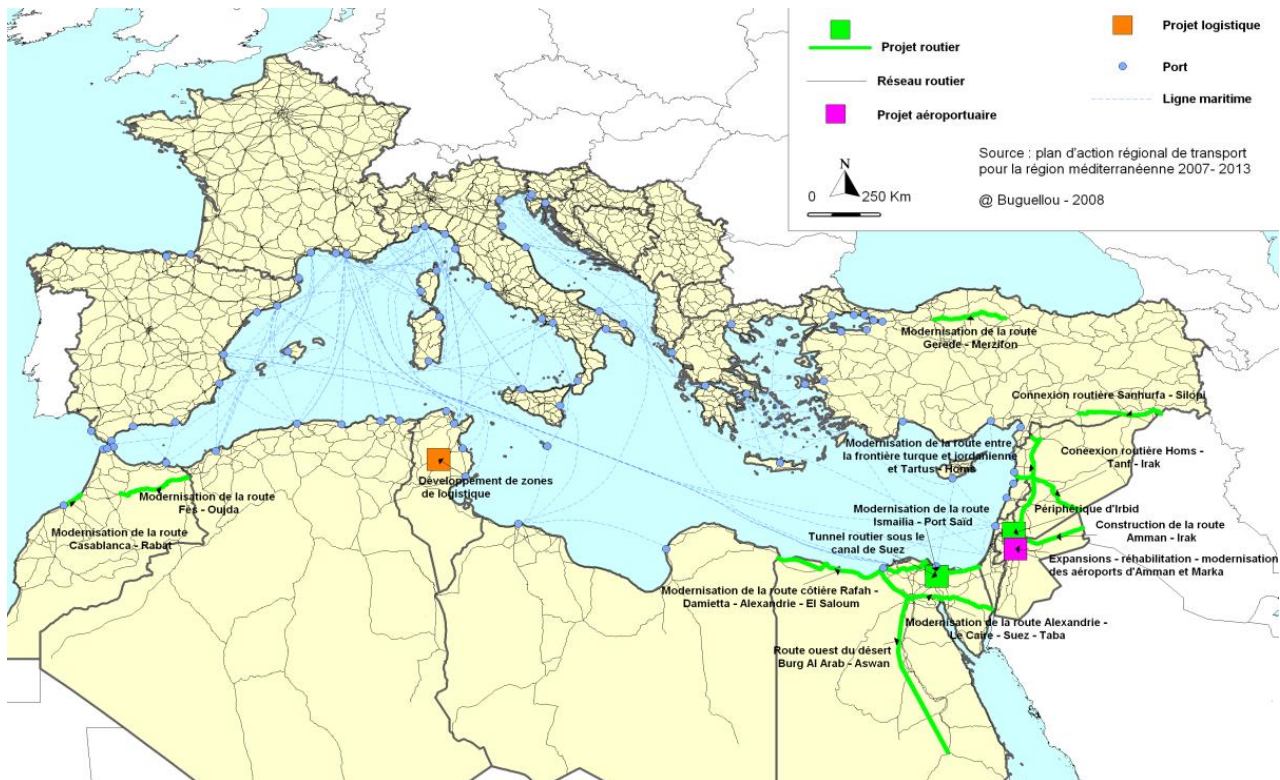
... and an improved land transport network around the Mediterranean basin

The EU needs to play a key role in creating an integrated land transport network, by developing high-speed rail across the entire territory of the EU to transport Northern European tourists to the Mediterranean coast.

The RTAP currently recommends that greater effort be put into investing in rail rather than airport infrastructures in order to compete against air transport, especially for travel between adjacent countries.

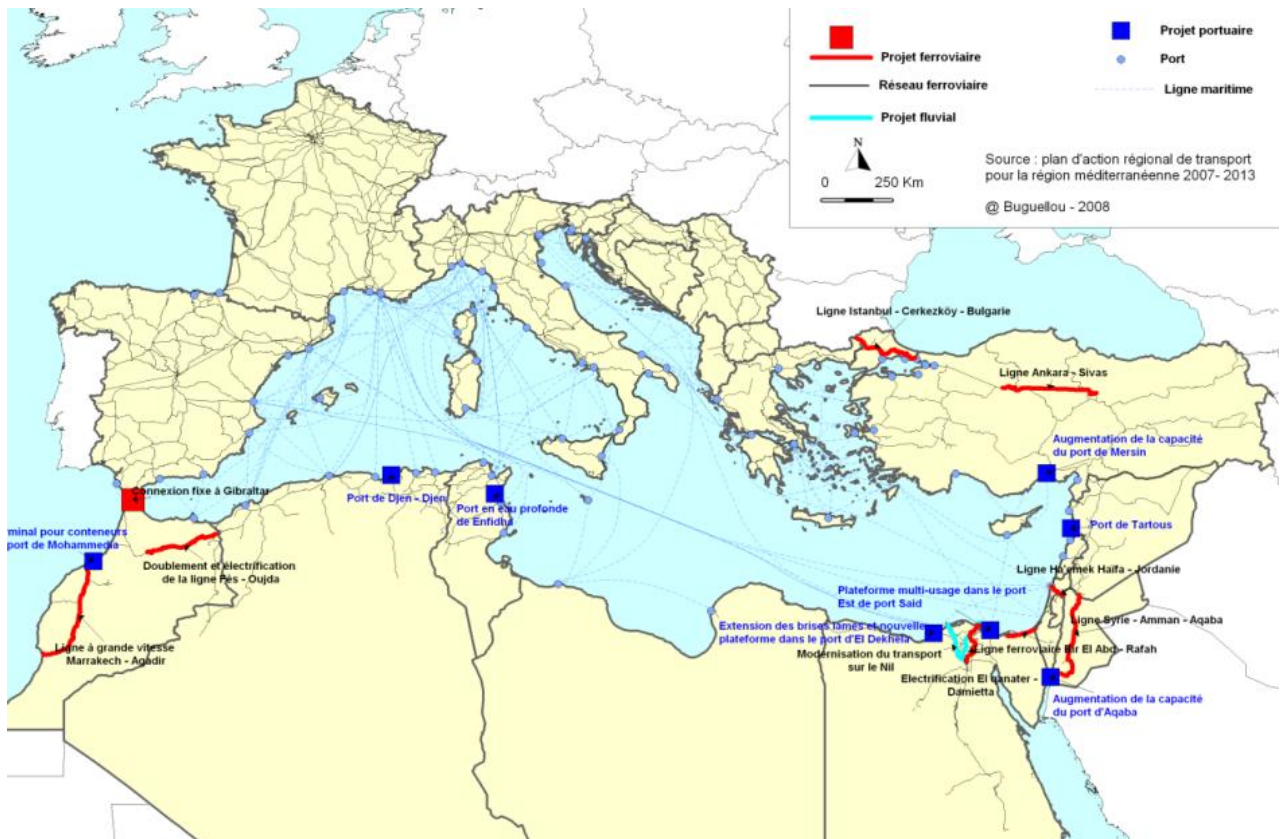
The maps below show projects included in the RTAP for the various transport modes and outline the routes providing continuous service between countries. These reveal that land transport between adjacent countries is developing and will create an alternative to air transport.

Figure 30 - Location of RTAP road and airport infrastructures



Source: Regional Transport Action Plan for the Mediterranean Region 2007-2013

Figure 31 - Location of RTAP rail, seaport and river infrastructures



Source: Regional Transport Action Plan for the Mediterranean Region 2007-2013

Figure 32 - Entire road network and airport facilities

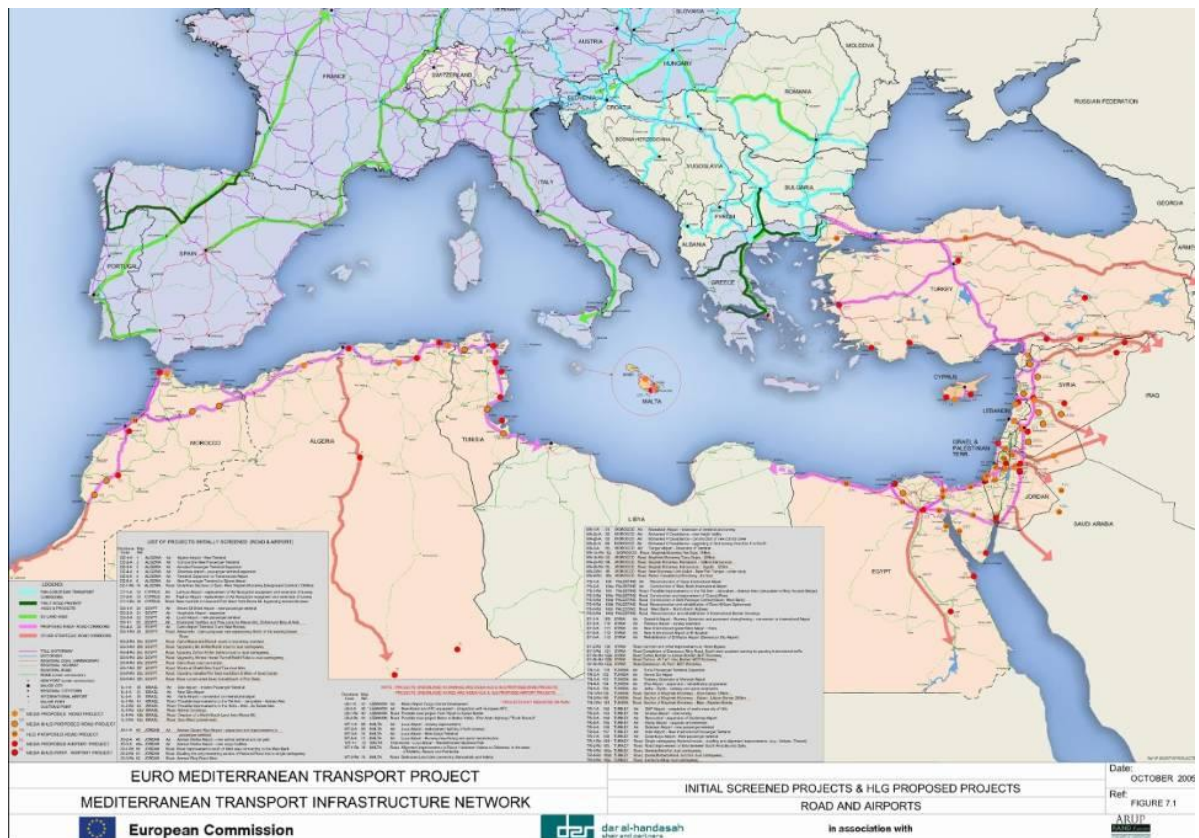
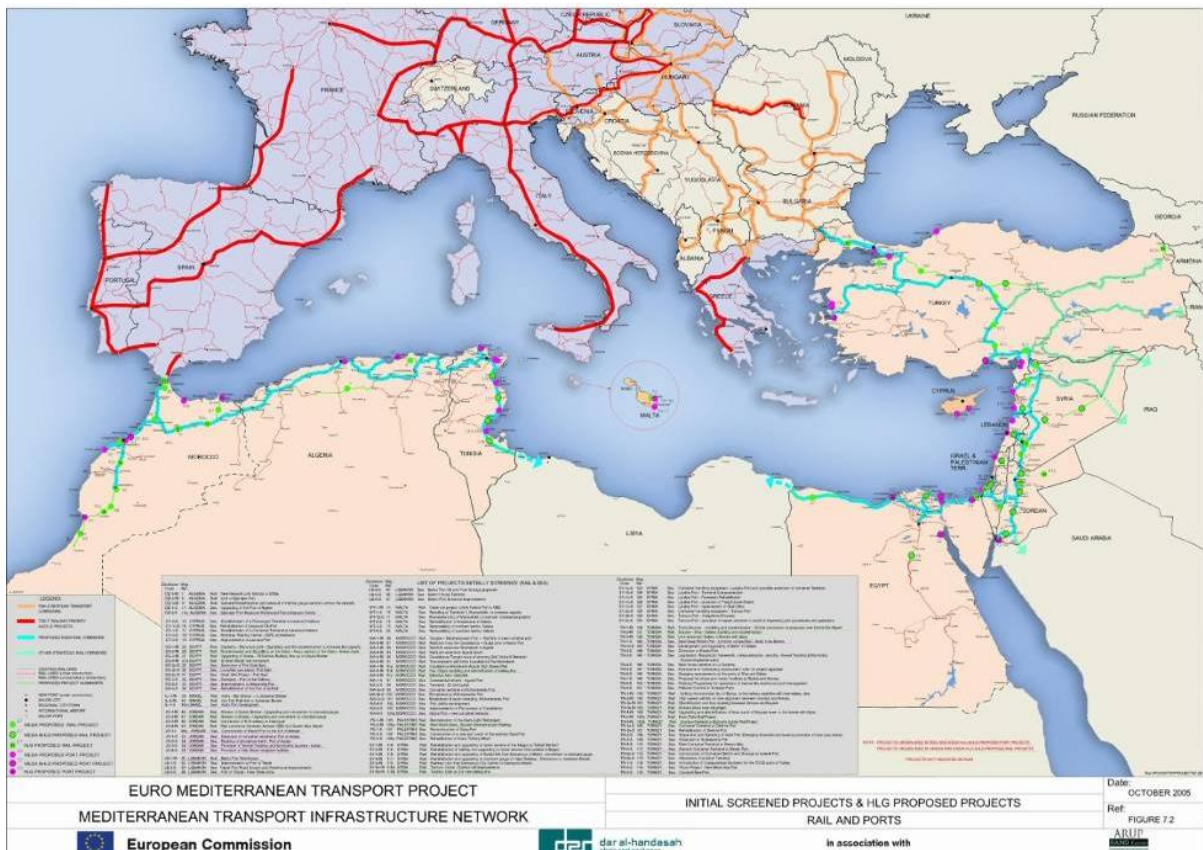


Figure 33 - All rail transit routes and ports



Source: Regional Transport Action Plan for the Mediterranean Region 2007-2013

Limiting competition between transport modes

In the current situation, competition between air and other transport modes (especially rail) on certain routes leads to transport “dumping”. If the aim is to expand tourism transport modes that generate lower emissions, the existing competitive situation must be rectified in order to avoid the systematic use of air transport when another mode is available. For certain origin/destinations air travel should be limited to emergencies only if a less-polluting rail alternative exists. This policy could especially apply to routes of less than 800 km that have high-speed rail service.

In an ambitious emissions-reduction scenario, public authorities would grant limited slots to air transport.

Box 5 - Interactions between train and plane: What are the effects of the “TGV Sud-Est” service since 2001?

The last stretch of the LGV Sud-Est (or LGV Méditerranée) high speed rail line was put into service in June 2001 between Saint-Marcel-les-Valence and Marseille. It cut travel times between Marseille and Paris by an hour and fifteen minutes, generated more round trips per day and, according to general consensus, turned the tables in terms of competition between air and rail for the route.

An analysis of travel between the Paris region and the “Var, Vaucluse, Bouches-du-Rhône” *départements*, which could have been assumed to be impacted by the TGV high-speed train, shows the effect on modal distribution. Rail transport increased from 33.1% of trips in 2000 to 40.3% in 2007 while air travel for the route dropped from 14.3% to 7.9%. The rail share is very high (the figure 10.5% for travel to all destinations in France), likely due to the first stretch of the TGV Sud-Est high-speed rail service (Paris-Valence) gradually put in service between 1981 and 1993.

Furthermore, the train line does not seem to have increased the number of holidays or overnight stays, in other words, it did not create any additional demand. The “Mediterranean” line seems more to have had an effect on a modal transfer rather than a clear demand for travel.

These results show that the dominance of cars for personal transport and the exponential growth in air travel are not inevitable trends as long as appropriate infrastructure is developed.

Finally, in terms of greenhouse gas emissions per stay, a 25% drop was seen between 2000 and 2007 for the route in question, compared to a 7% drop for France as a whole.

Dubois G. and Ceron J.P., Le monde est à nous ? Analyse socio-économique des émissions de gaz à effet de serre dues aux déplacements de tourisme and de loisirs, programme de recherche GICC, June 2009

In addition, it is possible to make the appropriate investments that anticipate and encourage change, particularly through fuel taxes and a transfer of investments in airports to rail transport. Stopping the fuel subsidies that still exist in some countries is one of the first measures that would enable money to be reallocated to more environmentally-friendly modes.

Finally, the low-cost model should perhaps be re-examined. It is not so much the low-cost model that is problematic, rather the fact (as even its most vocal proponents claim) that it generates traffic that would not otherwise exist (through the pricing policy and creation of new routes), and this makes it a direct competitor for transport modes that pollute less. Price is therefore the key factor in this system. If the market and the cost of energy do not raise the cost enough, governments should raise it themselves by taxing external aspects of the business. Distances are not taken much into account by costs. Taxing energy increases the impact on prices, however slot authorisations, especially for short distance routes (<800 km) must be used to promote rail transport and discourage or even prohibit air transport.

Box 6 - “All air” policy in Tunisia

In Tunisia, several major policy decisions will impact tourism development and increasingly air transport: the steady expansion of air service with the opening in late 2009 of the new Enfidha Airport, one of the largest hubs in the African continent that will notably provide service to the tourist areas on the eastern coast of Tunisia. Other decisions include the opening of routes to Libya and in general, the open-sky policy that is being put in place.

Maximising land transport for the land pre-carriage

A process involving rail or coach solutions could be studied for pre-carriage transport where air travel is not strictly necessary; on each side of the Mediterranean and even eventually around the entire basin. By reducing flights, layovers and connections, CO₂ emissions for any given journey could be reduced. A multi-leg flight combining a long-haul and short-haul leg creates more pollution than a direct flight¹².

This lever relies mainly on the transport policy of individual countries as well as regional transport policies, as they alone can create the efficient international travel network that is needed for developing a rail transport offer for tourism. This requires strong investment in rail transport that takes tourist use into account right from the design stage (choice of routes, stops, connections with urban transport and other modes such as air and boat, etc.). In the short term, development concerns mainly Northern countries where high-speed rail lines already exist or are planned. More work needs to be done on the southern side of the Mediterranean where road and air infrastructures are currently prioritised.

In addition to national and regional transport policies, the whole chain of operators involved in creating tourism travel packages has a part to play. These packages offered by tour operators and travel agents currently use air transport exclusively, but modal substitution could be envisaged. Transport operators could offer a service tailored towards intermodality, with simplified connections, coordinated timetables and reservation sites for booking international travel.

Maximising technical progress

In addition to policy concerning infrastructures and the organisation of traffic, transport policy could also support technological progress for all transport modes, as technical progress is and must be synonymous with improved energy efficiency. This type of policy will involve encouraging R&D programmes in aeronautics and other economic policies affecting the sector.

However, as evoked in the scenarios, it should be noted that technical solutions considered as ‘outdated’ must not be overlooked as they could end up being better suited to the future transportation landscape around the Mediterranean basin. This is notably the case with turboprop aircraft, which are more efficient in terms of emissions per passenger and could provide short-haul transport for crossing the Mediterranean.

Improving aircraft passenger load factor and the number of economy class seats

By optimising the passenger load factor (PLF) of each aircraft, the coefficient of GHG emissions per kilometre can be reduced. There are two ways of filling up aircraft: by decreasing the supply or increasing demand. If traffic is to be maintained in order to avoid penalising the tourism industry of a country, current passenger load factors must be improved.

When a country offers funding to a national airline, it must be able to impose passenger load conditions:

- Tax empty seats, thus encouraging airlines to fill seats “whatever the cost”. To do so, reservations must be opened long in advance and offer better prices for early booking. Unsold seats during the low season can be sold off with a degressive pricing structure.
- Give tickets away if they are unsold at the last minute. This type of measure would have the advantage of responding to the search for greater equality in the distribution of travel by targeting specific population groups according to specific criteria (income conditions, family ties, etc.).

¹² Takeoffs generate high GHG emissions. It should be noted that we are specifically referring to multi-leg transport combining a long-haul and short-haul leg. If the same trip can be made by combining two medium-haul flights; emissions may be lower than what would be produced by one direct long-haul flight: Emissions from an additional landing and takeoff can sometimes be lower than those generated by transporting fuel over a long distance, as done for a long-haul flight. Direct flights are not always the best solution.

Flights within the Mediterranean region are also relatively short and business or first class seating is not always justified. For a two-hour flight, issues of comfort are less important than for a fifteen-hour long-haul flight. Economy classes are more advantageous in terms of CO₂ emissions per passenger in that they allow aircraft to be filled with more passengers. Once again, systems taxing or regulating the proportion of business or first class seating could be considered.

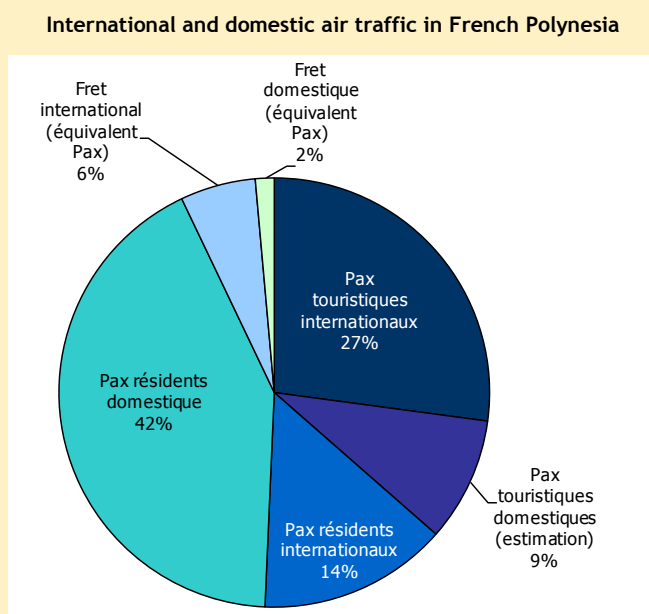
Shifting the air transport paradigm

Air transport is currently a sector that focuses on a free competition and pure market economy approach (which nevertheless does not prevent hidden subsidies and favouritism).

In the future, air transport must be considered as a business that, granted, provides a society with considerable services, but must be limited in terms of volume due to the substantial impacts on environment that it creates.

Consequently, air transport policy must focus on arbitrating between the reasons for travelling (business, holidays, affinity) and markets (the most economically or socially beneficial).

Box 7 - Issues in air transport above and beyond international commercial tourism



Source: TEC, 2009. Study on French overseas tourism growth and carbon dependency for the French Development Agency (l'Agence Française de Développement)

Traditional international tourism is by no means responsible for all air traffic. Air transport for reasons of affinity, health (obtaining care in a country where healthcare is better or less expensive), cargo, etc. must also be taken into consideration.

The same type of arbitration can apply to Mediterranean countries and especially the island countries of Cyprus and Malta, where there are no alternatives (e.g. road or rail for cargo). Returning to visit one's country of origin is also a very common phenomenon in the Mediterranean region. Finally, arbitrating between outbound tourism and inbound tourism must also be considered ...

1.2. Tourism policy

Each country makes its own choices with regard to tourism policy. In the Mediterranean, price is the main factor when it comes to attempting to be competitive. As a result, the tourism that is offered is conventional and centred simply on seaside activities. New destinations look to the model used by their predecessors and hope to experience the same success.

However new challenges tied to carbon constraints and climate change make it all the more important to find additional and complementary development ideas. Many of these strategies have long been known to create just as many opportunities. However they have certainly not received as much attention or effort from tourist destinations and professionals as other development strategies that are considered more profitable in the short term: focusing on visitors with the most purchasing power (Northern and Western Europeans, Americans, Japanese) or with high potential (Chinese, Eastern Europeans), the appeal of doing high volume business at the expense of quality, banking on current trends and acceleration in travel modes (short stays). Yet the tourism development policies that countries put in place can significantly influence the 'carbon content' of this sector but also interestingly enough, its quality and profitability. To create a tourism sector that is less carbon-dependent means working on which markets are targeted and the type of offering that is supported by governments.

Box 8 - The Tunisian experience: counting on climate change as an additional incentive to begin fundamental changes that should have come long ago

Adapting a tourism offering involves addressing the vulnerability of the offer. In Tunisia, mainly seaside, summertime vacation packages are offered based on all-inclusive resort holidays that are all basically very similar. Tourism is especially vulnerable to rising sea levels, higher summer temperatures and the increased risk of heat waves, as well as issues around air transport, which is one key pillar of the model. It could become less vulnerable by offering more diversified products and increased added value (e.g. ecotourism, spas, cultural tourism), by achieving a better seasonal spread of tourism, and more generally, through a change in the tourism image of Tunisia within European mindsets.

These strategies are beneficial in many respects and were identified years ago in several different studies as conditions for creating sustainable tourism in Tunisia. However as tourism keeps growing, apart from a few isolated initiatives, they have remained on paper while the prevailing model continues to be the focus of investors and politicians.

The forecasts of climate change increase the need to implement these changes in practices. The same messages must be repeated with more urgency and these avenues must not be set aside under the pretext that they have not been successfully implemented over the last 20 years. Within today's changing context, stakeholders may finally see the interest of taking a new approach.

Focusing on domestic markets

The domestic market has significant potential for real growth in the tourism industry with the advantage of being able to use more environmentally-friendly land transport modes (train, coach) over shorter distances.

Destinations often target international tourists with the highest purchasing power, as a source of hard currency and a route to a balance of payments surplus. Yet the development of domestic tourism can enable a destination to create a solid base that is less sensitive to the economic climate, drawing on a local fabric of entrepreneurs as a source of sustainable economic development. It can also help restrain nationals from travelling abroad (outbound tourism) by offering them a suitable alternative and thus also contribute to a balance of payments.. Moreover, the share of European tourists in the international tourists composition cannot be stretched indefinitely. The alternate solution would be to redirect one part of this market towards domestic tourism. For SEMCs, diversifying the customer base towards the domestic market and neighbouring countries is not just a way to widen the potential of the tourism sector. It is above all necessary in order to renew their clientele and prepare for demographic changes. Developing domestic tourism also acts as an insurance against stagnating numbers of traditional tourists.

In France, during the summer, the Var department is mainly visited by tourists from the Provence region who come to spend their holidays, whether for a weekend break or for a longer stay. This tourist base enables the department to withstand the financial crisis and mitigate the effects of seasonality.

The development of domestic tourism depends mainly on two factors.

First, it correlates with population and especially concerns highly populated countries and/or those with high population growth such as Turkey, Egypt and Algeria. However, even when the demographic context is favourable, purchasing power must still be high enough for people to consider the idea of leisure and holidays.

Secondly, there must be a tourism offer that can meet domestic demand. There must be natural or cultural resources, leisure facilities and activities that correspond to domestic practices and not just to foreign tourists. The tourism offer must also be based on pricing policies that are adapted to the country. This is the challenge for policies aimed at promoting access to holidays that could be developed in SEMCs in the future.

In Tunisia, luxury hotels make up the bulk of accommodation offered and foreign tourists are sold low-priced package holidays by international tour operators. When Tunisians wish to access this accommodation without a holiday package deal, “individual” rates are much higher and often inaccessible to the country’s middle class.

Facilitate proximity markets

Just as for domestic markets, proximity markets combine short distances and the possibility of using transport modes that are more carbon-efficient.

The development of proximity markets depends on several factors.

The first is strictly physical. Outbound markets must exist within a reasonable distance without any major geographic barriers that would hinder accessibility. From this standpoint, North-Western countries are at a clear advantage.

Next, natural or cultural resources must exist that can be promoted for tourism and that distinguish them from their neighbours. For instance, this is the case of Croatia and its coast that attracts nearby mountain-dwelling populations. If exploited in a reasonable manner, this factor constitutes a long-term lever for attracting proximity markets.

Finally, policies can influence the flow of tourists, through conditions that are accommodating in terms of visas, limiting geopolitical posturing and improving transport service.

Many Algerians meet up with their families living in France on the north-west coast of Tunisia. This is a result of a combination of the domestic political climate in Algeria, where foreign residents cannot always come for holidays, the country’s relations with neighbouring countries and the lack of an accessible route to Morocco. Improved living standards for Algerians and a more relaxed political climate could divert these tourists from travelling to Tunisia.

For Mediterranean countries, the potential for close proximity varies from region to region. For Northern countries, this kind of tourism is significant because of diverse and well-promoted tourism resources, a relatively stable geopolitical climate and well-organised travel circulation. For countries in the Eastern Mediterranean, development could be geared towards the market of Persian Gulf countries, visitors seeking a cooler climate and seaside tourism, as well as greater freedom of lifestyle choice. Northern African countries generally have fewer options as neighbouring countries still have relatively lower standards of living and there is a climate of geopolitical tensions. However, beyond direct neighbours, the market of Mediterraneans in the Mediterranean remains an absolute priority ahead of distant markets such as North America or the emerging Chinese market. This applies even though there is great temptation for many destinations to attract the Chinese and studies released to tourism stakeholders increase the appeal.

Box 9 - Specific between countries

In most destinations, the major attraction is leisure tourism. However Italy stands out with a major business tourism segment. Israel also receives a substantial number of visitors who come for “other” reasons, often for religious or affinity tourism.

In addition to leisure tourism, historical and/or cultural ties (e.g. earlier patterns of migration, common language, etc.) are a source of specific international tourism flows in the Mediterranean:

- in 2006, 57% of tourists in Cyprus and 38 % in Malta were from the United Kingdom;
- French tourists make up 23% of tourists in Morocco, 20% in Tunisia;
- Tourists from the Middle East account for 78% of tourism in Syria, 46% in Libya, 41% in Lebanon;
- Significant numbers of African tourists are only seen in Libya (48% in 2005), in Tunisia (16%) and Algeria (11%);

There are very few visitors from countries that are furthest away (Asia, North America), making up 8.3% of tourists. They are mainly represented in Lebanon (31.1 %), with visitors from South Asia and North and South America. The USA generated 27% of tourism in Israel in 2005. This relatively small share stems mainly from emigration processes and cultural and historical ties.

In the years to come, current migrants could strengthen the ties with their countries of origin and thus expand these flows even more (Germans travelling to Turkey, French to North Africa, etc.).

Developing new tourism products, especially long stays

The shorter the holiday, the greater the impact of transport, whether it be on the price or carbon footprint of the holiday. For the same quantity of CO₂ emissions, lengthening the stay reduces the ratio of CO₂ per overnight stay. The type of product offered to tourists therefore has direct implications for transport and especially the eco-efficiency of transportation.

The average length of stay has seen a slight decrease in the Mediterranean, dropping from 5.4 nights in 1980 to 5 in 2002, with a significant dip in the early nineties. The changes in each country are extremely varied, with fluctuations tied to sociological and lifestyle changes taking place in developed countries. However the drop in average length of stay combined with an increase in the number of inbound tourists and number of overnight stays also means an increase in the number of short stays and a need for more travel.

One of the most promising strategies therefore involves developing long stays or very long stays.

The first target would be retirees, with an offer that has begun to develop in North Africa, for instance (e.g. three months in the Tunisian sun in mid-season). Young people could also be targeted with the development of long-term volunteer experiences, designed more as life experiences rather than tourism.

Another avenue is combined tours with multiple stays that offer a variety of locations and activities over a longer stay. In Morocco for instance, the idea would be to combine a week by the sea in Essaouira with a week in a riad near Fes and a one-week tour in the south (desert and oasis), or combined tours between two neighbouring countries. Achieving a three-week average length of stay of three weeks could be a first step.

Several conditions are required to develop these types of tourism products:

- the development of holiday rentals to limit the price of the stay: tourists who currently come for one week would not necessarily be able to pay for three weeks in a hotel. There is a risk, however, that the demand for rentals could generate conflicts with local populations for access to housing;
- the creation of various types of incentives resulting from ambitious national policy: airfare reductions for tickets booked in advance, airfare reductions for visitors staying for at least one month, buy one week in hotel, get one free, etc.
- the development of activities offered to prevent tourists from getting bored (important criteria in choosing stays). This requires imagination and quality on the part of tour operators, as well as work on planning and coordination between destinations, with local authorities playing an active role;
- the development of tourism that is much more integrated with local life by drawing on local businesses and craftspeople, with once again, local authorities and business associations (federations, chambers of commerce, etc.) taking an active role in territorial planning and coordination;

- an inland rail service for travelling and more generally, a suitable tourism transportation network. Should the length of stays increase, it is of course important to promote more environmentally-friendly forms of tourism. Therefore additional air travel, ferry boat rides or long off-road adventures should be limited. Once again, this comes back to transport policy issues;
- the adaptation of national legislation concerning lengths of stay and tourist visas.

Finally, potential negative ‘rebound’ effects must not go unheeded. If retirees spend the winter in the sun, their children would perhaps use the opportunity to visit them on weekends. New markets must be developed in conjunction with deterrents targeting the most carbon-intensive holiday patterns.

Increasing spending and benefits for the local economy (improving eco-efficiency)

Further to the points made above, the idea is to increase tourist spending for any given holiday and therefore for the same amount of CO₂ emissions from air transport. This strategy goes completely against the current situation and trends which see Mediterranean destinations competing over a mediocre product with low added value engaging in price wars. Today travellers head south to enjoy luxury at a low price thanks to the much lower local standard of living.

The type of tourism offering has a great influence on the profitability of the tourist activity. The offer is a key factor in whether the tourist economy can remain stable in the event of stagnation or reduced inbound flows.

A fundamental characteristic of international tourism development in the Mediterranean is the reliance on the Sea/Sun/Sand paradigm. The ‘lowest common denominator’ nature of the Mediterranean tourist product leads to fierce competition between destinations that eventually results in decreasing quality. The heightened competition between inbound countries under pressure from tour operators and the desire of these operators to standardise tourism products for greater short-term profitability has contributed to a downward price spiral. There is no longer any differentiation in terms of added value or unique selling points. As a result, this increasingly less diversified offer compromises the ability of the Mediterranean to be competitive in the global market. This in turn leads to cost-cutting on services that are offered, with the risk that these services no longer meet the expectations of tourists.

Box 10 - Adaptation can challenge the overall development model of the destination

Several potential strategies, adaptation levers in numerous areas, have been identified for Tunisia through the design of more efficient accommodation, diversification of tourist products and the development of domestic and proximity markets. However in order to truly limit the vulnerability of Tunisian tourism to the potential impacts of climate change, a list of successive measures is not enough. The development models used until now must also be challenged in order to make profound changes to the tourism culture being driven by the market players. The role of tourism in the country (from an economic sector whose role is to improve the balance of payments to a tool for regional planning and improvements in the standards of living?), the overall image of the destination (from a sunny, sandy beach to a rich history and tradition of hospitality?) and the dominant product (from grand resort complexes to reinvented traditional North African architecture?) must all be re-evaluated to open up a new outlook.

Reversing the tendency of mediocrity and striving for more added value will require determination on the part of tourist destinations and a radical image change. To do so, the specific traits of each country must be optimised. For instance, if no other countries have pyramids, people are willing to pay more to see them.

However, while there is nothing wrong with destinations seeing tourism as a dynamic economic sector, it must not be forgotten that the development of sustainable tourism does not necessarily imply focusing on luxury products aimed at the wealthiest visitors. It is just as essential to improve the overall benefit to the local economy from tourism. Of course it is important to increase spending, but it is more important to develop locally-managed businesses and strengthen the connection with all economic sectors by developing local guest houses or accommodation complexes, and using local suppliers for decorating, services, food, etc.

1.3. Tourist demand and lifestyles

The levers associated with transport and tourism policy can especially be used to act on technical, economical and organisational aspects at different levels. Beyond this, nothing can be done without a profound cultural change when it comes to travel. To make tourism that generates less greenhouse gas emissions possible and acceptable, the mechanisms promoting hypermobility must be broken down, as must the tourist mindset that goes along with it. This will undoubtedly involve several factors, from the standard of living of Mediterraneans, the organisation of their cities and towns, to their outlook on daily activities and their lives as a whole, their reasons for travelling and the place of leisure activities within social systems.

Working on the propensity to travel

As explained earlier, the local market – that is Mediterraneans in the Mediterranean – is essential to the majority of destinations in the Mediterranean region. However, there are deep inequalities between countries and individuals in each country in terms of their propensity to travel.

This propensity to travel is mainly based on economic conditions. One must have a high enough standard of living in order to allot part of the household income to travel. This is not all. The importance of the cultural lever must not be overlooked. Being a “traveller” is practically a social status on its own. The ability to travel abroad is often perceived as a status symbol.

The development of a country and the increased purchasing power of its residents tends to lead to an increase in the total number of trips. Given the current imbalance in flows between EU countries and the rest of the Mediterranean region, this lever mainly concerns SEMCs.

In countries where there is a higher standard of living (mainly the NMCs), strategies must be aimed at reducing the propensity to travel. These could target living environments, the distribution of free time throughout the year, city planning and leisure activities available within close proximity.

In general, a change is necessary in terms of the ‘image’ of travelling and travellers. This can be achieved through numerous channels and particularly the media, with mindsets changed through advertising or television shows, for instance.

Viewing travel differently

Today, the journey itself is often just a prelude to the actual trip. In a high-speed society, travellers look for the solution that will allow them to ‘waste’ the least amount of time in transport and spend as much time as possible at their destination. With this in mind, air transport generally appears to be the best solution as it is the fastest, which in some cases is not an accurate reflection of reality, if the total door-to-door travel time is considered.

More and more voices are being raised to demand that the journey, the actual travel time be considered as an integral part of the trip. **The idea of Slow Travel in reference to Slow Food (movement founded in Italy by Carlo Petrini in 1989) is sometimes evoked. It is a movement that calls for each action in life to be experienced at its own pace without looking for speed and performance.** The pleasure of travelling should therefore be promoted in a move for personal wellbeing, environmental protection and respect for the communities that are encountered along the way. The slowing down of mindsets is currently an unfashionable concept that would nevertheless allow slower tourism to emerge. In the area of tourism mobility, dominant notions are sculpted by the idea of private jets and jet-setters and sometime in the future, space tourism (for example, the Virgin Galactic company has already accredited some travel agencies in space tourism). In such a context of fantasy, how can young people being trained as travel agents be convinced that trains will be the way of the future?

On the opposite end of the spectrum, some initiatives are being taken by hikers and cyclists, generally from Western Europe, where the entire holiday, including travel, is part of the adventure. This type of travelling requires prior organisation and a different form of time management (no race against time). Nonetheless, it

is the opportunity to rediscover the spirit of adventure not too far from home and gain a certain degree of freedom of movement where the travel time itself becomes part of the trip. This type of situation also forces travellers to get out and meet people rather than being cut off from the rest of the world in the confines of their car. This makes for a more enriching travel experience but it is also a source of worry for many people.

Box 11 - The “last kilometre” problem

In today’s world, only tourists with the most motivation are able to truly enjoy a ‘slow tourism’ experience. On a national scale, this means giving up the car for a combination of rail and other local public transportation. Around the Mediterranean it is still rare to find a suitable transportation network. On this level, it is often up to local governments, and transportation authorities to come up with practical solutions, and especially through close collaboration between transport operators and local tourist establishments (tourism offices as well as hotel establishments and other service providers). In the French Alps, for instance, the Mountain Wilderness association organised a competition called “*Changer d’approche*” (Changing approaches) in 2007 and 2008 to raise the awareness of mountain activity enthusiasts concerning slow mobility by inviting them to participate in mountain outings by using only French public transportation. The major problem lies generally in the ‘last kilometre’ that must be travelled to get to the final holiday destination from the last transportation station. It is often this last missing link that discourages visitors.

On an international scale, taking the time to travel and rediscovering regions means rediscovering long-haul train journeys, like in the days of the Orient Express. While some routes have begun to be put in place in the Northern Mediterranean, for many people this solution remains something out of science-fiction for the region. In this case practical solutions lie mainly in supranational transport policies and the removal of technical and organisational obstacles (school holiday calendar, the possibility of banking hours or taking unpaid holidays etc.).

Box 12 - Taking the time to travel: Nice - Saint-Petersburg

The Russian railway company, RDZ, is opening a Moscow-Nice rail line, with train services running once a week. The distance is covered in two days and crosses Europe with stops along the way in Minsk (Belarus), Warsaw (Poland), the Czech Republic, Vienna (Austria), the Brenner Pass between Austria and Italy, Milan, Genoa and finally, Nice.

The trip caters to travellers nostalgic for the days of the Orient Express and will cost € 1,200 for a private compartment with a double bed, shower, WC and mini-bar. Second class tickets, sold for € 306, will include a private compartment with one or two beds, with shower and toilet facilities available at the back of the car. Two restaurant cars will be available to passengers and thanks to an agreement between the SNCF and RZD, tickets will soon be available for purchase online.

Besides the charm and emblematic nature of this product, it is reminiscent of the golden era of Russian holiday-makers on the Côte d’Azur, and evokes powerful imagery.

From Michel Bovas, 21/09/10 at www.francesoir.fr

Beyond finding practical solutions that will provide more transport options, the question of mentalities and travel culture is what really needs to be raised. Those who shape popular opinion and mindsets, i.e. advertisers, the media (See “*Rendez-vous en terre inconnue*”, on France 2 television for a prime example of slow travel), educational institutions and public opinion leaders must take up the challenge. Some initiatives can already be identified, such as the tour operator *Vision du Monde*, which offers long-stay products (up to 29 days), the change in outlook with respect to certain forms of tourism, particularly desert tourism, which has gone from technological and adventure-oriented tourism (4x4) to a more personal experience (hiking, retreat/spiritual holidays).

Box 13 - The Swiss model of slow travel on a national level

Switzerland Mobility is a brand new concept in Switzerland that provides a way of travelling the country for non-motorised traffic. It relies on the following:

- a major network of routes throughout the entire country: 20,000 km of signposted routes (22 national and 147 regional routes) combined with various services, 500 different accommodation facilities, rental vehicles, baggage transport, 757 one-day stages and 560 info points;
- 5 disciplines: hiking, cycling, mountain biking, rollerblading and kayaking ;
- the possibility of purchasing an annual membership that allows members to use all public transportation, from cable cars to boats, trains and coaches, etc. and 18,000 public transportation stations with pedestrian signposting along the way;
- a standardised web tool in three languages with descriptions of the regions travelled and all available forms of public transportation with all connections;
- partnerships with the Swiss Alpine Club, various associations and federations concerned, as well as Swiss Federal Railways.

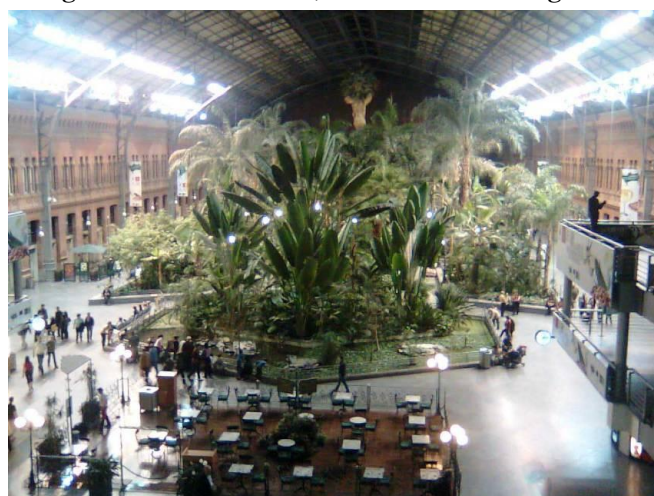
In terms of promotion, Switzerland Mobility has been integrated by Swiss Tourism into its tourism offering with international marketing and tourist regions are more than happy to integrate Switzerland Mobility into their offer.

Adaptation from Anne Babey, Suisse Rando

Working to improve travel conditions

In general, ease and comfort, or at least the idea of getting this experience, are among the reasons for taking a plane when travelling. It is a trip that is considered direct, without any change of transport, and hotels or local agents often handle the difficulties associated with transfers from outlying airports in the case of holiday packages. The image of comfort is probably the most important factor (onboard meals, flight attendant service, modern and well-organised airports, etc.), as opposed to noisy and cold trains and train stations with poor signage. Yet the trend is slowly starting to reverse. Though low-cost flights have extremely competitive rates, they offer less comfort and the aeroplanes increasingly feel like they have been converted into coaches. With inexistent service, greater restrictions for passengers and very basic airports, often far from urban or tourist centres, they are a far cry from quality service. On the flip side, rail transport is gaining in comfort as new trains are being developed along with high-speed rail and an effort is being made on train station layouts and the information given to passengers. This is particularly true in Europe with the development of the high-speed network. In Spain, Madrid-Atocha station resembles an exotic garden and trains offer comfort and high quality service. Some Southern countries are also beginning to offer a high-quality service. For instance, in Morocco, travelling to major cities by rail is simple, in modern trains with information on schedules and prices that can be easily accessed on the ONCF website¹³.

Figure 34 - Madrid-Atocha, train station or exotic garden?



Credits: G. Dubois, 2009

¹³ www.oncf.ma

The idea of a long journey crossing several countries can only be accepted by tourists if it is in comfortable travelling conditions. They must know they will be able to eat, rest and be given service adapted to their transfer needs, etc.

Better life at home and travel less?

Finally, the issue of living environments must also be taken into account. In an almost stereotypical fashion, people living in an urban environment, far from recreational areas like the sea, the countryside or the mountains tend to travel far away on the getaway trip they have been waiting for all year long. People living by the sea, in sunny regions feel less of a need to get away from their daily environments for their holidays.

The ability to gain easy access (i.e. quickly, cheaply with easily accessible information) to areas with nature, entertainment and cultural activities, different scenery and activities every day or on the weekend can satisfy some of the reasons for wanting to travel. The issues must be kept in mind, along with the fact that although tourism is unevenly distributed within populations, it only really represents a very small portion of people's free time. Several factors are involved here.

Firstly, urban policies in terms of living environments, urban landscaping (parks and gardens) and leisure activities within cities and the immediate vicinity. Other relevant issues are policies encouraging local and affordable leisure products (pricing policies, diverse products tailored to all budgets, etc.) and the organisation of public transportation networks and weekend service to such areas. The way time is organised, particularly the academic timetable (weekly and annually), which significantly influences the pattern of leisure activities, must perhaps evolve to make time for recreation at the expense of tourism. This lever should be used widely insofar as it can also contribute to evening out the flagrant inequalities that exist in access to tourism.

In the northern region of the Mediterranean, large Western European cities and their traditional end-of-the-week traffic jams that go hand in hand with weekend getaways to the countryside come especially to mind.

The leisure activities on offer are fairly extensive, and efforts must continue to be made in favour of the most disadvantaged people. However the proximity and accessibility of these activities are still far from meeting the needs of city dwellers. In Paris, someone wanting to go horseback riding in the forest at an affordable price must get up at 6 a.m. on a Sunday to take the only morning suburb train and negotiate with the riding club to come pick them up at the train station. For the same effort and not much more money, they could spend two days in Fes by taking a low-cost flight, because the airport is so easy to get to.

Cities in the South are beginning to experience similar "weekend getaway" phenomena. However, they generally have poorer public transportation networks and less leisure activities to offer to meet the growing demand. Population growth and the rural exodus have often led to rapid urban development (sprawl) without always taking into account concerns about living environment and leisure. Urban and social policy issues in SEMCs are certainly therefore where crucial efforts must be made to anticipate the getaway and recreation demands of these populations as they could represent substantial numbers of potential tourists.

2. Means of action

In a composite and fragmented market, the sector requires special governance. An in-depth reflection on the resources tools and ultimately on cooperation between stakeholders is needed in order to implement the abovementioned ambitious strategies.

2.1. Improving awareness of the issues

Current trends have been making air transport available to an ever-broader clientele. The accommodation and even the search at all cost to facilitate low-cost airlines, open-sky agreements in the South and the systematic development of routes with a profit potential all contribute to making air travel even easier by multiplying the number of destinations offered and lowering prices. Obviously all this is fundamentally opposed to a decrease in the carbon footprint from tourism.

A shift in transport policies and tourism products towards less air travel and more rail, for instance, is a topic that requires particular awareness-raising efforts because it goes against the prevailing trend. How can tour operators be convinced to offer rail travel for the initial leg of a trip or a region also be convinced to refuse construction of a low-cost terminal if it means giving up on potential short-term earnings?

Box 14 - Raise awareness with travellers... without making them feel guilty

Surveys show that an increasing number of travellers are aware of the impact of transportation. Carbon offset schemes have contributed to this awareness. Beyond this, more innovative suggestions could be implemented for travellers and the tourist accommodation sector:

- □ ecolabelling for trips, just like appliances (A, B, C, D class, depending on the CO₂ emissions generated per overnight stay or per \$ spent at the destination) ;
- □ systematically showing rates per night rather than per trip, which would give an undeniable advantage to longer stays with customers.

In a business sector where decisions are mainly made in a short-term perspective, raising awareness is essential, especially with players in the field, investors, tour operators and tourist regions. In general, a much greater awareness-raising push is required regarding the causes and consequences of climate change, with explanation of the impacts related to tourism, including potential effects on the environment as well as national and international adaptation policies. To make this happen, progress needs to be made in research on the subject.

Box 15 - Building an adaptation strategy: raising awareness and explaining the issues to field actors

Tunisia has begun to discuss a climate adaptation strategy for its tourism sector with German technical support. The project has involved several phases of discussion with government and private sector stakeholders from around the country and has provided information that will be useful in organising similar debates in other Mediterranean destinations.

Certain expected climate change impacts are relevant to the concerns of tourism stakeholders because they involve an expansion of current phenomena. This is the case, for instance, with rising sea levels in coastal areas where coastal erosion is already a problem for waterfront hotels, or the increased risk of heat waves in hot regions (Sahara) that are already avoided by the most heat-sensitive tourists. Rising energy and water prices is also a topic of concern as accommodation operating costs are directly affected. In this case, it is easier to raise awareness and the messages warning against these worsening phenomena are well-received.

However some issues must be raised by consultants and scientists as they are completely unknown to players in the tourism field. This is particularly the case with increasing restrictions on air transport and the possibilities of changing transport modes. In Tunisia, almost all international visitors, besides those living within close proximity, arrive by plane, which involves large investments (inauguration of a new international airport in 2010, open-sky agreements, arrival of low-cost carriers). The threat of a drastic increase in airfares and fewer visitors arriving by plane goes completely against the current trend and is completely absent from most people's minds. The culture of train travel for tourism is also inexistent. If these notions are therefore to be introduced, intense work must be done to inform and convince tourism stakeholders, and the need to take them into account is still far from accepted.

2.2. Diverse situations

On a Mediterranean scale, the major differences in conditions at each tourist destination must be taken into account. Mediterranean destinations are in phases of development where investment, the environment and tourism regulation issues are viewed in a widely differing light. The economic, environmental and social issues differ, meaning that destinations cannot and should not act the same way or use the same levers.

France, Spain and Italy are mature destinations that still garner the majority of tourism business in the Mediterranean. The offer is complete and diversified and there are numerous organised and generally well-trained players in the market. There are limited possibilities for major investment in tourism and the images of these destinations are already well-entrenched in the minds of tourists. In this case, changes in the offering must be prepared in order to adapt to new challenges. This shift may need to go as far as

abandoning certain products or converting the offer to integrate issues tied to accessibility through other transport modes, extending lengths of stay, creating a more diverse customer base and advertising.

Emerging destinations such as Turkey and Egypt, for instance, are already well into the development phase and have come up with their own models driven by a search for quantity rather than quality. These countries have an existing offer that is relatively recent and strong tourism experience but are still in a growth phase. These destinations appear to have the right conditions for developing domestic and proximity tourism while using current tourism as a spring board. Their carrying capacity allows them to do so and their experience in tourism enables them to search out new markets. The economic development of both countries is also conducive to stronger internal demand. National tourism operators would be best suited to bring about this change, with strong political support favouring the development of recreation and tourism for local communities.

Upcoming destinations such as Libya and Algeria have much more leeway to prepare for changes in tourism and mobility. These destinations still have significant room for progress and now is the time for them to start integrating the carbon factor into their plans and programmes as they build up their tourism sectors. There are still many avenues for future investments and promotion efforts, however it is important to ensure that they take the 'low carbon' route rather than following the models of their predecessors. This requires ambitious political action on the part of tourism authorities to convince investors and tourism operators to make long-term choices. However international travel organisations that are involved in the opening up of these countries (particularly Western European tour operators) and international bodies guiding choices through technical incentives (technical and methodological support) and financial incentives (development and funding and investment financing) have a particular responsibility.

2.3. Mobilisation of the actors

As explained earlier, several levers will need to be used in order to adapt Mediterranean tourism to a situation where air transport is regulated, but above all, numerous stakeholders need to be involved, all of which have their part to play in the process.

Passenger transport operators are obviously the main stakeholders. It must be remembered that these include both those with potentially the most to lose (airlines) and those with the most to gain (land transport operators) from international regulation. Their future now depends on their ability to anticipate and move with future climate policies. Airlines could work harder on filling aircraft (give priority to routes with the highest passenger load factor, give away empty seats, etc), avoid promoting business and first class seats that take up a lot of room in aircraft, renew their fleets to improve performance, optimise transport passengers by rail and trips (avoid hubs, etc.). For rail and road transport operators, they must maintain and develop as strong and tight a network as possible, offer competitive pricing, ensure comfort and quality service for travellers and above all, ensure that tourist use is taken well into account. In some countries there are rail networks, however they are not planned out to accommodate tourist use. For this to happen, transport operators and tourism stakeholders must communicate to identify the routes and destinations that interest tourists, adapt schedules (according to season, plane arrivals, etc.) and especially keep tourists informed (user-friendly multi-language web sites, clear descriptions of lines, stops, schedules and rates, online ticket sales or bookings, info booth offering service in multiple languages in tourist stations, etc.). Transport operators from all transport modes can contribute to finding technical solutions to improve the environmental performance of the passenger transport industry.

Box 16 - Air Austral promotes trains

The airline company, Air Austral, has a partnership with the SNCF to transport its passengers to and from Roissy airport (Paris). A single combined “tgvair” train and plane ticket can be reserved on the airline’s website. The airline offers passengers services in the event of disruptions, allowing them to avoid missing connecting flights/trains, lost tickets and stressful situations due to delayed trains or planes.

Roughly twenty cities outside of the French capital and in Brussels are destinations for the service.



Source: www.air-austral.com

Tour operators and travel agencies are in the front line in terms of developing new products and influencing demand. They have a strong ability to adapt to the direct and indirect consequences of climate change. They are able to change the products and destinations offered in their catalogues from one year to the next. These decisions are generally based on financial profit criteria and a short term vision. However, they are increasingly attentive quality and customer satisfaction. Innovative products and carbon criteria can therefore afford them new opportunities and bring them into contact with customers who are increasingly careful of the impact of their consumption decisions. Finally, they have strong influence in the Mediterranean and the ability to impose a certain number of constraints on their products in their negotiations with destinations. It is therefore up to them to include long-stay products in their catalogues, leave customers the ability to choose the transport mode (flexible tourism packages) and even offer alternatives to air travel whenever possible. It is also undoubtedly pressure from tour operators and travel agencies that will lead to strategies such as carbon emissions labelling on trips or carbon-friendly accreditation on the most eco-efficient trips. They therefore also have a role in awareness-raising with their customers and influencing destinations and tourism service providers.

For **the restaurant, accommodation and leisure industry**, there are some similar characteristics in the short-term vision and the role of innovation in the product. However, these players are less well placed to adapt to the consequences of climate change due to the fact that they are dependent on the physical location of their investments. For instance, if the low-cost hub that connects them to North-western Europe were to close, the consequences could be disastrous. They are therefore potentially more motivated by long-term sustainable development objectives, but certainly less influential (except perhaps large chains) than the abovementioned stakeholders. They are mainly able to create conditions that encourage long-stay trips through the prices and activities that they offer. They can also promote the use of more environmentally friendly transportation, once again through pricing schemes (e.g. bonuses for those arriving by train), information (provided on their websites, in particular, giving travel information, transport schedules, etc.) and transport-related services (managing train bookings for individuals, transfers from stations, etc.). Finally, they can influence domestic tourists by adapting their offer (affordable pricing outside packages sold by international tour operators) and ensuring that they are promoted on the domestic market.

The role of **trade and labour organisations** (trade unions, chambers of commerce) is similar to the abovementioned two categories of private stakeholders, except that **they are able to take collective initiatives that bring the carbon constraint into the picture** and are an essential route for raising

awareness and bringing innovation to tourism. Chambers of commerce and industry in particular have a more global view of tourism than hotel or restaurant associations, which focus on a single sector, and can therefore provide a longer-term approach that is essential within the context of climate policy.

Marketing and promotion bodies at different levels (national, regional, local) depending on the country, have an important role to play in selecting target markets and the products offered by local stakeholders. They are less dependent on market forces and can act as a counterbalance to tour operators if they do not react to the carbon issue. In particular, they can redirect their marketing to target close proximity and domestic markets, disseminate information on the various transport alternatives and enter partnerships (promotions, special prices, etc.) with transport operators that generate the least emissions. However, these bodies' role is restricted to implementing tourism policies that are determined at a higher level.

Since market forces will not cause Mediterranean tourism to adapt to the restrictive climate policy context, ***governments and their administrations have a role that is essential on two levels. Firstly, regulations and public policies must drive the necessary changes in each country:*** domestic tourism policy (markets, products), transport planning, land development and local (depending on countries' level of decentralization), freedom of movement policy (visas, land borders, etc.), subsidising/taxing tickets depending on the mode of transport, arbitration on airplane use. In general, it is essential to break down the barriers that separate tourism and transport by creating or strengthening the systematic ties between transport and tourism administrations. ***Secondly, governments also have an influential role to play in international policies.*** As alluded to earlier, some decisions can only be made on an EU level, a Mediterranean level or a global level. This is particularly the case with regional transport planning, air transport regulation policies (prohibiting short-haul flights, taxation, etc.), and funding policies for investment in regional infrastructures, etc. Negotiations between governments and their degree of influence will determine whether policies that are truly efficient in changing Mediterranean tourism will be achieved.

Local governments also have a long term involvement in destinations through ties or economic interest. They do not represent a homogeneous category around the Mediterranean and do not have the same influence everywhere. However they sometimes have a part to play in implementing ***the relay between government tourism policies and can also play a key role in the development of transport infrastructures and services*** in their area (this can be seen in the struggle between various French local authorities to attract low-cost airport terminals).

International lending institutions, whether through bilateral cooperation, decentralised cooperation or other international bodies (EIB, WB, etc.), must redirect their investment choices, especially when it comes to major transport infrastructures. They must help develop a consistent land transport network in the Mediterranean and bring a critical perspective in the area of accessibility and markets to major tourism projects. Their involvement is essential in most SEMCs, where current rail and road infrastructures do not offer a viable alternative to air travel.

Development and environmental NGOs mainly have a role in raising awareness, offering technical and potentially financial support to the most exemplary initiatives and contributing to long-term reflection on future developments in tourism and air transport. Their influence on consumers can be quite significant and they could support and lend credibility to initiatives such as carbon labelling or 'low carbon' accreditation used by private sector stakeholders.

Last and not least is the individual responsibility of tourists who of course depend on the products offered by transport operators, travel agencies and tour providers, but can choose where they go, for how long (one month every two years rather than two weeks every year) and how they get there. Their level of satisfaction, loyalty and potential membership within consumer and/or activist associations (environmental protection, human rights, etc.) can have a major impact on the decisions of private tourism and transport stakeholders.

2.4. The need for Mediterranean cooperation

In all areas, regardless of the lever, one of the keys to working towards lower greenhouse gas emissions from tourism lies in Mediterranean cooperation. Of course each country will remain in control of its own tourism development but this does not mean acting completely unilaterally.

Develop a regional vision of Mediterranean tourism

Joint reflection involving the governments and operators from each destination aimed at adapting the type of tourism to the transport offer and to the realities of existing tourism resources, the cost of living in countries and emerging trends, could become a foreseeable reality. For instance, why not consider a more logical distribution of international markets between the following:

- short stays in the North, based on an already efficient high-speed train network and local transportation that is becoming better organised, greater proximity of the major customer base, relatively high prices for accommodation and activities, and
- long stays in the South to improve the eco-efficiency of air transport for tourists living the furthest away, based on a lower cost of living for European tourists, their increasing demand for long-term stays and milder weather from October to May.

In order for products to evolve, in addition to tourism development policies, they also require joint policies concerning freedom of movement and resident status (visas, etc.) that could especially facilitate South-South exchange.

Regional transport policy

Finally and most importantly, there is a particularly urgent need for a determined policy commitment and cooperation in the air transport sector. As stated earlier, it is crucial that countries come to an agreement concerning air transport regulations for the Euro-Mediterranean region. This requires not only dialogue between countries on a political and diplomatic level, but also the cross-industry involvement of all relevant institutional and private bodies (ICAO, UNWTO, etc.).

In this area, several topics can only be addressed through regional collaboration. **For infrastructure policies in particular, consistent and continuous routes can only be built through regional transport plans** such as the RTAP and through technical, political and financial cooperation throughout the entire Mediterranean region:

- the investments required to develop Euro-Mediterranean rail corridors make North-South cooperation essential in order to connect SEMCs to the European railway system;
- the efficiency of such a network requires in-depth reflection on global routes, technical consistency and coordination between operators;
- geopolitical issues play an essential role in certain regions.

A Coordinated approach to international negotiations

Due to competitiveness and competition, air transport will be regulated on a Euro-Mediterranean scale at the least, but especially on a global scale under the ICAO or the UNFCCC. Within this context, the methods chosen to regulate air transport are likely to modify competition conditions between the major global destinations.

It is well-known that as a major tourism region, the Mediterranean as a whole must face competition from regions such as the Caribbean or South-east Asia. Choices that may appear insignificant, such as establishing a carbon tax per trip or per kilometre, could favour or on the contrary, impede the Mediterranean with the global market. **It therefore appears urgent that joint positions be established.**

Conclusion: the need to adapt

The conclusions drawn from modelling highlight the need for Mediterranean tourism and destinations to adapt:

- obviously to significant climate change, with all the meteorological and environmental impacts that this entails;
- but especially and in the short-term, to increasing constraints restrictions imposed by national and international policies on emissions reduction.

Mediterranean tourism and climate change: representative of the global debate

As a region where countries of different cultures and phases of development meet, the Mediterranean could be considered as a miniature planet Earth, a laboratory in which the relevance and efficiency of climate policies can be tested. This study draws a number of conclusions that are useful in the context of the wider debate.

Differing positions in the climate policy cycle

While the scenarios were being built it was highlighted that none of the Mediterranean countries can really be considered as among the least developed on the planet. The countries in the South and East were recognised as emerging countries to varying degrees. Many of them are experiencing strong demographic growth as well as access to elite and middle-class consumption practices, while a large portion of the population remains in poverty. Demographics, the pursuit of better living standards, **the current low greenhouse gas emissions of countries, as well as low emissions levels per capita (except for elites), do little to encourage any discussion on limiting future emissions.** The call to give up on certain elements of “Northern” lifestyles that are mistakenly seen as synonymous with progress is unacceptable for a large majority of people. Limiting emissions growth in these countries will therefore be a herculean task. This state of affairs applies to whole range of lifestyle issues to access to tourism.

Of course the situation for Northern countries is radically different. It is characterised by stable demographics and high emissions. The EU countries as a bloc have taken a leading role in promoting the need for emissions reductions, although the targets set are nowhere tough enough considering what is at stake, the actual implications of these positions are not always properly thought through and public opinion is not ready for the drastic changes that they entail. **The fact remains that the potential for reducing emissions is however much more easily foreseeable in the North rather than the South.** This applies for all sectors and components of people’s lifestyles, including tourism.

Northern countries pressed to make greater efforts

For tourism, Northern countries will be affected very differently from countries in the South and the East as far as the perspectives for adapting to this new context are concerned.

The North is characterised by mature outbound and inbound tourism markets. There are good accommodations and transport infrastructures and the wealth of these societies mean that the necessary changes are possible, even in the crucial land transport sector. It must not be forgotten either that there are sunny destinations in the North including recent ones like Croatia, and the ability of their climates to attract tourists should improve in the coming decades. Other destinations of this type could also emerge a little further north (Amelung and Viner 2006). Furthermore, countries in the North-western Mediterranean are close to outbound markets that can be reached using land transport modes, therefore making it much easier to substitute air transport with sustainable modes. **Objectively, the conditions required for northern tourists to withdraw towards destinations of relatively close proximity** are therefore discernable. If prices to Southern destinations stop being so competitive (decisive factor in their past development) as a result of an increase in transport prices, this could be a tipping point.

In Southern and Eastern countries, there is strong potential for domestic tourism development, but the infrastructure is currently not tailored to this market. International tourism is a source of revenue but it is also impacted by competition between destinations which quickly downgrades amenities and leads to poor investment quality. Eventually the dependence on air transport will bring about problems of access that will initially have repercussions on costs.

This said, for tourists from the North seeking exoticism, **the Mediterranean region still will boast certain comparative advantages in the future. The distance to cross to the Southern Mediterranean is much shorter than for competing destinations** (Caribbean, Indian Ocean, etc.). The role of air transport can be significantly reduced (transport for the initial leg on the north side, network of public transportation in the south), however great foresight is needed to anticipate the major forthcoming changes and plan for the investments needed.

Integration or differentiation of tourism in the Mediterranean?

Mediterranean countries have diverging situations and philosophies concerning the issues addressed in this study. The question can be raised as to whether, within the framework of ambitious climate policies, tourism would be a factor for integration or divergence. Over the last two thousand years, the Mediterranean has been a region of exchange and cooperation, with high points and low points during this history. For nearly forty years, the environment and sustainable development have been seen as a new opportunity to strengthen ties (one shared sea, etc.) and bring Southern, Eastern and Northern countries together through improved cooperation. At one time, tourism development appeared to be in phase with these hopes and a tool to achieve them. With climate change, there is talk of long term emissions convergence and a closing of economic gaps. Nevertheless, it should be recalled that two of the four families of IPCC and SRES scenarios evoke the notion of a divided world. It would therefore be wise to examine the perspectives that, within a context of climate change, will encourage cooperation/convergence and those that push countries with extremely differing characteristics to become isolated. The question applies particularly in the case of tourism which, along with immigration, is one of the main driving forces behind human exchanges between the two shores of the Mediterranean. Incidentally, it should be noted that if the world were to fragment into large regional entities, it would not necessarily mean that the Mediterranean region would automatically break apart. In any case, **the call to reduce the distances travelled and develop proximity and domestic tourism will tend to lead towards increasing differentiation.**

The specificities of tourism... requiring specific regulations

It should be recalled that the scenarios were based on a set of hypotheses that go along with conclusions taken from discussions in legitimate international bodies (EU, Copenhagen and Bali COPs, the IPCC, etc.). They therefore do not stem from hypotheses invented by the researchers running the study. It is particularly interesting that what comes across from the results of the scenarios is a highly specific situation for the Mediterranean region and its tourism.

Reducing tourism emissions: an unrealistic goal?

The first thing to note is that **even with the toughest of the three scenarios (S3), emissions are not stabilised in 2050 in relation to 2005 levels.** This means that Mediterranean tourism as a whole is far from contributing to a more than 50% reduction in global emissions, the level that is supposed prevent temperatures from increasing by more than 2°C. Scenario S4 shows that emissions can only be stabilised with a carbon price that is so high that it is not even considered in current discussions. This goes along with findings from other work on global tourism (Dubois, Peeters et al. 2008). In this respect tourism is a very specific activity, in that moderate scenarios leading to reduced emissions in other economic sectors do not generate anything similar to the same results for tourism. **Tourism is thus a business and social practice that is completely unique and this applies all the more so in the Mediterranean region.**

Preserving the organic growth in the Mediterranean but selecting markets

It is noticeable that emissions increase at a relatively lower rate in NMCs than in SEMCs. However even in the toughest scenario, NMCs are unable to stabilise them in absolute terms. **As for SEMCs, this reflects the demographic trends and access to tourism already evoked. For NMCs, it means that action variables that were not included in the scenarios must be taken into account, with much more substantial changes in lifestyles and travel culture.** It can be shown that in this case, tourism emissions could be significantly reduced in the northern countries (Ceron and Dubois 2006). On the other hand, the effects of taking these variables into account for SEMCs have never been investigated.

Using such action variables to the extent that is required to reach the reduction targets cited by scientists is not included in the panel of actions envisaged by international organisations and governments for tourism to contribute to reducing emissions.

Carbon prices: promoting investment rather than curbing demand

International bodies (ICAO, UNWTO) mainly foresee the use of substitute fuels (biofuels), which is not a guaranteed solution, and the purchase of carbon credits from other sectors (UNWTO 2009). This strategy is appealing because the cost of currently low carbon prices can be transferred to consumers. However, it would create negative impacts for other economic activities by increasing the carbon price to high levels and consequently removing the flexibility that the mechanism is meant to provide (Godard 2006).

Furthermore, as previously mentioned, the scenario that envisages an extremely high carbon price (S4) in an attempt to simply stabilise emissions leads to such a high price that a separate emissions credit trading market just for aviation would have to be created. To a certain degree, the reliability of the result can be called into question. The way the scenario was built determines volumes based on price elasticity. This elasticity depends highly on the context and reflects preferences that can evolve over time. Nothing in particular guarantees that price elasticity will remain constant. The use of elasticities already creates problems in medium-term calculations, let alone for 2050.

It therefore appears that economic tools (carbon taxes, credit trading, etc.) are unable to sufficiently curb emissions. However, they generate significant sources of income that can be used for investing in infrastructures that themselves could cut demand. A reasonable carbon tax (S3) creates enough revenue to finance a high-speed train network in the Mediterranean region. It has already been proven that over a distance of one thousand kilometres, the existence of high-speed rail services leads to a significant decline in aeroplane travel (Paris- Marseille- Montpellier) (Dubois and Ceron 2009). With measures that improve rail services (night trains, etc.) and discourage air travel, much more could be achieved in this direction.

Reduce dependency on air transport through a specific regulation method

Mediterranean tourism of course cannot totally go without the use of air transport. The challenge is to strongly reduce its role, but decreasing greenhouse gas emissions is not the only motivation behind this. The aviation industry is well aware of future tensions concerning oil prices and availability (peak oil), even if it is one of the sectors the most easily able to pay high oil prices. Nevertheless, **the combination of these two constraints gives all the more reason to make tourism less vulnerable by reducing its dependency on air transport, which, as demonstrated, can only be done through a carbon tax.**

The ideology of full and free competition and the excessive focus on market mechanisms can lead to an underestimation of the importance of public and regulatory intervention. They are crucial when it comes to this issue. The idea of promoting alternative transport modes to air transport has already been evoked. New airport projects should be halted and there should be no further increase in the capacities of existing facilities. If reducing the role of air transport is seriously considered, investments that will eventually come to be seen as a waste of money should not be made. **Other strategies include regulatory measures prohibiting air travel for trips that are shorter than a certain distance (to be determined) and where there is a rail alternative.**

The previously highlighted vulnerability of international tourism, the real difficulty in putting in place alternative travel solutions, even if they already exist, and the uncertainty that lies in being able to use them in time, are arguments for **paying particular attention to the development of domestic tourism within SEMCs**, all the more so since underlying aspirations and demographic trends are pushing in this direction.

In general terms, the results from modelling raise the question of the extent of foreseeable growth in volumes, even for SEMCs. All else being equal, emissions are proportional to growth: there are no economies of scale. In addition to growth in volumes, the place of tourism in the use of free time and travel culture must also be considered (Ceron and Dubois 2006). The future travel culture in the coming decades is not known, whether it be in the NMCs or SEMCs. However, SEMCs cannot act in the same way as the North, even if they have the means to do so, which is not guaranteed.

Appendices

1. UNWTO forecasts double the GHG emissions from tourism by 2035

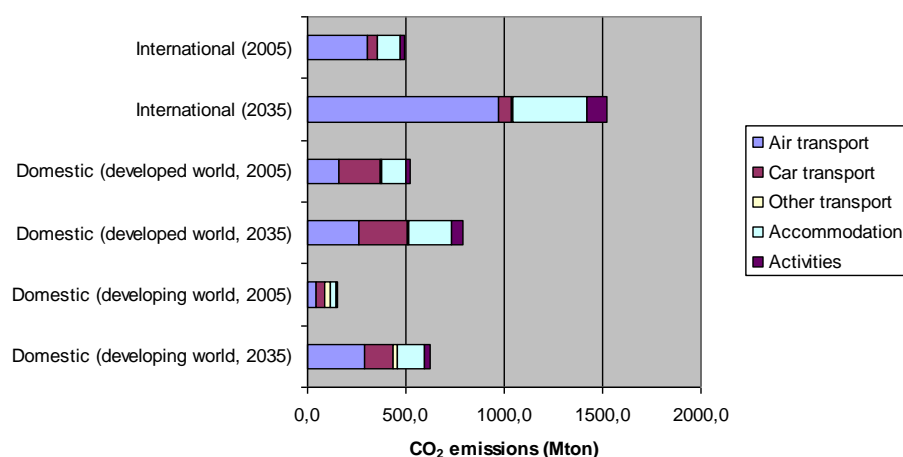
The study performed for the UNWTO makes forecasts for 2035. The future of tourism in these projections depends on four factors:

- An increase in numbers of tourists. UNWTO projections for international tourism up to 2020 show a 95% increase from 2005 levels (UNWTO 2007). It also forecasts significant growth in domestic tourism, especially in countries like India and China where current growth rates are at roughly 10% per annum.
- Secondly, it is expected that the share of long-distance tourism will increase from 18% of total tourism in 2000 to 24% in 2020 which, given the overall growth of the sector, would equate to the volume doubling or more.
- The average distance of trips is also increasing. In the European Union, the number of trips is estimated to grow by 57% between 2000 and 2020, while the distances travelled are likely to increase by 122%.
- Finally, the current trend is for shorter but more frequent holidays.

Based on these 2020 perspectives, the study came up with a “business as usual” scenario for 2035 by extending the trends for trips and distances for each of the different transport modes, while taking maturing markets into account.

Emissions also depend on changes in energy efficiency. The scenario is based on an optimistic hypothesis in terms of gains in air transport efficiency. For cars, the study assumes greater improvements in efficiency in developing countries (growing fleet of recent vehicles) than in developed countries. A 1% improvement per year in energy efficiency is assumed for other modes of transport. As far as accommodation is concerned, energy efficiency was assumed to remain constant due to improved comfort. For leisure activities, efficiency was not considered to improve as trends are moving to increasingly motorised activities. Figure 35 shows the results of the “business as usual” scenario.

Figure 35 - Projection of CO₂ emissions with a “business as usual” scenario (excluding day visitors)



Source: (UNWTO, UNEP et al. 2008)

The number of tourism trips thus increases by 179% while the number of overnight stays only increases by 156%. Kilometres per passenger, on the other hand, increase by 223% while emissions increase by 161% due to improvements in energy efficiency. The share of emissions from aviation increases by 12 points between 2005 and 2035. As for accommodation, emissions increase by 170% and for recreational activities, by 305% (UNWTO, UNEP et al. 2008) p.142.

Total CO₂ emissions from tourism would be 3,057 million tonnes in 2035 compared to 1,167 million tonnes in 2007. In terms of radiative forcing, tourism would contribute even more highly to global warming with a 192% to 209% increase in radiative forcing (depending on the assumptions regarding cirrus clouds). Air transport is therefore responsible for the majority of CO₂ emissions (52%) and radiative forcing (roughly 80%) (UNWTO, UNEP et al. 2008) p.143.

2. Modelling principles

Objectives and principles of the model

The MEDTOUR model was developed for the purpose of calculating projections (“scenarios”) for inbound and outbound tourism in and out of the 22 countries bordering the Mediterranean (“Plan Bleu countries”). For all international and domestic tourism flows (inbound and outbound), it is used to study the impact of economic growth and climate policies. The model provides the following output:

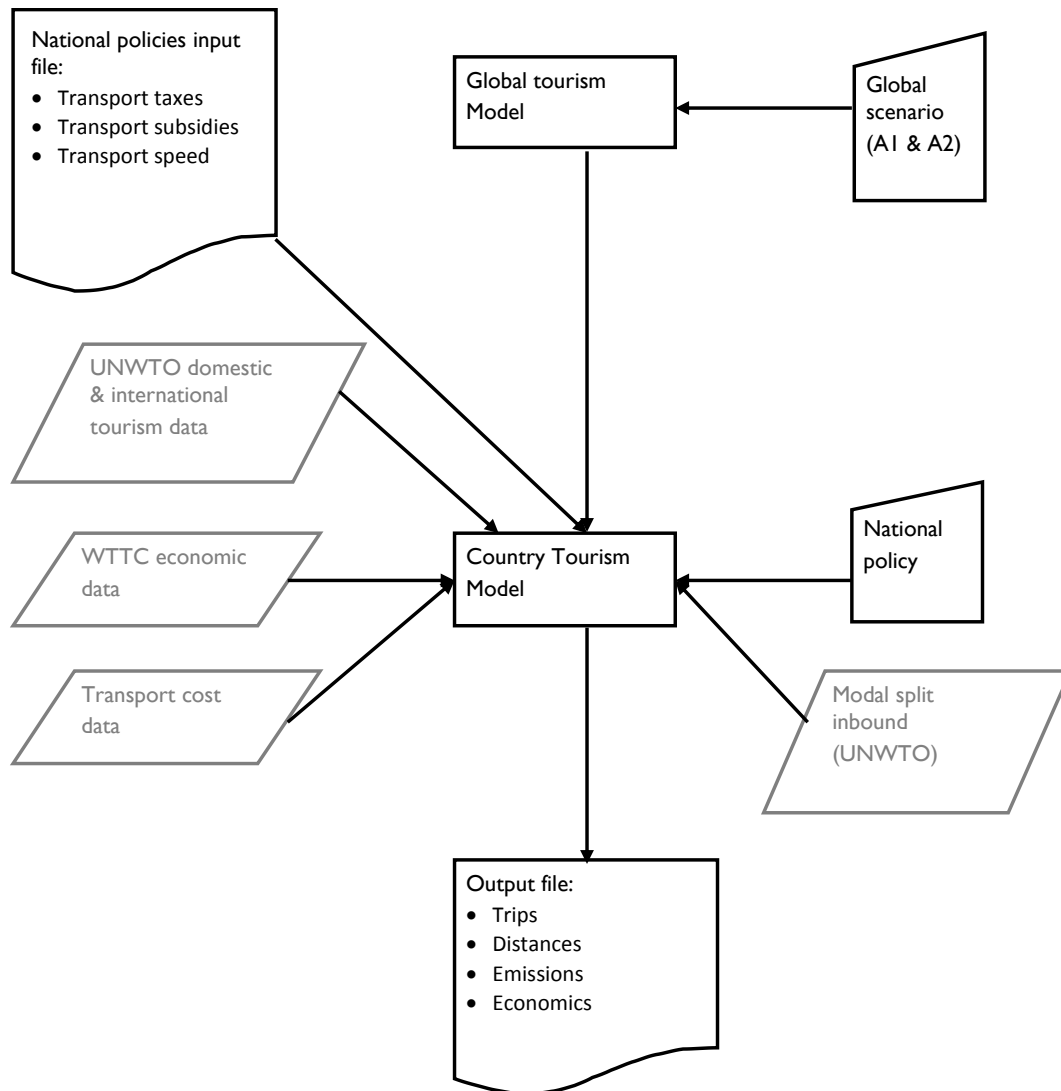
- It generates a consistent dataset for each country including the number of trips, distances travelled, contribution to GDP and CO₂ emissions, transport mode (air, rail, automobile, other) and the distribution by market (domestic market and six markets by distance category) for 2005.
- It generates a baseline scenario (called B+) for 2025 and 2050 based on population and economic growth curves given in scenarios A1F and A2 of the IPCC Special Report on Emissions Scenarios (SRES).
- It calculates scenarios that show the impacts of global and national reduction policies for 2025 and 2050 on tourism flow, GDP and CO₂ emissions. These policies affect transportation costs and the travel times on both global and national levels.

The main difficulties encountered in building the model were to extrapolate missing data for 2005, estimate the baseline changes in numbers of tourists for the 22 countries and develop algorithms that could be used to estimate the impact from the changes in cost and travel times due to climate policies.

Figure 36 outlines the model that was developed using Excel 2003 with VBA macros. It has two calculation blocs: the model of the global tourism market and the model by country. For each country, the model of the global tourism market is used to estimate trips for seven markets: six distance categories (one way) for international markets and the domestic market.

The grey parallelograms shows the 2005 data on which the model is based and calibrated (see Table 7 for data sources). **Users can enter the climate policy data for each country in order to influence the cost and travel times for the various modes of transport. They can also define a global policy by setting the rate of changes in carbon price between 2005 and 2050, a factor that determines the pace of technical progress for air transport.** Finally, once users have selected the policies to be applied at the global and national levels, the model can be run in one of two modes: (1) for a given country or (2) a complete scenario for all the countries. In both cases, the model generated a results file with detailed results for the country in question for mode 1 and exhaustive results for the Mediterranean in mode 2.

Figure 36 - MEDTOUR model



The MEDTOUR database

The main difficulty with this exercise is the lack of disaggregated data. The model requires data for trips for each country, each tourism market and each transport mode. However existing data generally reflects the total number of inbound tourists per mode and per country, the outbound tourists per country and gives little information on domestic markets. Consequently, a regression analysis had to be carried out using the average distances for each transport mode and the overall share of air travel in order to determine how transport modes are distributed for each market. The share of cars was determined using the relationship between GDP per capita and the use of cars for tourism (data obtained from the MuSTT project, Peeter et al. 2004). The remaining trips were attributed to other modes (coach, boat etc.).

For international tourism, the average distance between two countries is determined by the distance between the two countries' main airports. For domestic tourism, the average distance is based on the area of the country and once again, on the data from the MuSTT study. Emissions and transport costs are calculated using ratios of emissions and costs per passenger per kilometre. (See Table 7)

Table 7 - Data used and sources

Description of data	Source
2001 & 2005 inbound and outbound trips for each "Plan Bleu" country and for all countries of origin	UNWTO 2007a, UNWTO 2007b, 2001&2005 domestic and outbound trips and distances travelled for each "Plan Bleu" country
Estimations based on GDP per capita, population and area of the country according to Dubois et al. 2010, Peeters et al. 2010. Distances between all countries	Estimates based on UNWTO data according to Swartz 2010, WebFlyer 2003, Number of trips for 2010 and 2020 according to WTTC for each country, using long-term growth rates
WTTC 2010 Transport costs	Ebert et al. 2009, WRI 2007 for personal vehicles, statistics based on internet research for air and rail
Share of air, car, rail other transport modes internationally	Global data only UNWTO 2007b Share of air, car, rail, other transport modes in domestic travel
Estimates based on international shares and average distances travelled for domestic tourists	
2001&2005 Tourism Revenue per country	Plan Bleu and WTTC 2010 data, 2001&2005 GDP per country
World Bank, World Development Indicators database (WDI).	
Emissions factors for each transport mode	Peeters et al. 2007, UNWTO-UNEP-WMO 2008

Source: Plan Bleu, TEC

Box 17 - Quantifying the contribution of aviation to climate change

The UNWTO study reiterates that carbon dioxide is the main source of anthropogenic greenhouse gas (77% of total). Other gases are converted to a CO₂ equivalent that reflects their contribution to global warming over a period of 100 years. This means that CO₂ equivalents can only be calculated for gases with a minimum atmospheric lifetime of more than ten years. It is difficult to take into account certain emissions from aviation, such as nitrogen oxides responsible for the formation of ozone and methane, as well as high-altitude water vapour, which is visible in the form of vapour trails and cirrus clouds, due to their short lifetime and local manifestation in the atmosphere.

All these phenomena contribute to global warming and radiative forcing. The contribution of aviation is assessed using a radiative forcing index that is the relationship between total radiative forcing from aviation since 1945 and the radiative forcing from aviation CO₂ only over the same period. The index can only be calculated for total radiative forcing over a certain period of time and not just for one year. In 2000, the index was estimated at 1.9 (Penner, Lister D.H. et al. 1999). However, there are considerable uncertainties concerning the impact of vapour trails and cirrus clouds (Lee, Fahey et al. 2009), thus, 1.9 must be considered as a minimum, with the upper limit associated with these uncertainties being 5.1. This index also varies over time. It is influenced by technical advancements in aviation that can change the ratios of other gases to CO₂, as well as emission conditions (altitude, etc.). It depends on changes in air transport volumes: the higher the growth rate, the more short-lifetime emissions affect the calculation of the index, thereby increasing the value. Therefore, if work is done with scientific rigour, an index of 1.9 (reflecting a past situation) cannot be applied to an air transport volume in the future to calculate the future contribution of aviation to global warming (Peeters, Gossling et al. 2006).

However, as the alternative is to reduce the impact of aviation to just CO₂ emissions, which seriously minimises it, analysts often use a correction factor, even if this is not intellectually acceptable: the French Environment and Energy Management Agency (ADEME) therefore uses a multiplier coefficient of 2.

Policy projections and impacts

The model can be used to calculate growth projections up to 45 years in the future. These projections are based on (1) specific models for each country and (2) projections of trends for each market. The change in the number of trips per person in each country, including international and domestic travel, varies according to GDP per capita (Dubois et al. 2010, Peeters et al. 2010). The number of trips is therefore fixed: the model and scenario can act on the figures for distribution or distance, but not the rate of departure.

The trends for each market (domestic market and 6 distance categories) are initially calculated based on the increase in tourism flows per country given in the WTTC (WTTC 2010).

- For domestic and outbound tourism, the sum of all markets is adjusted to correspond to growth in the rate of departure per country according to the GDP given by IPCC SRES scenarios (A1 and A2).

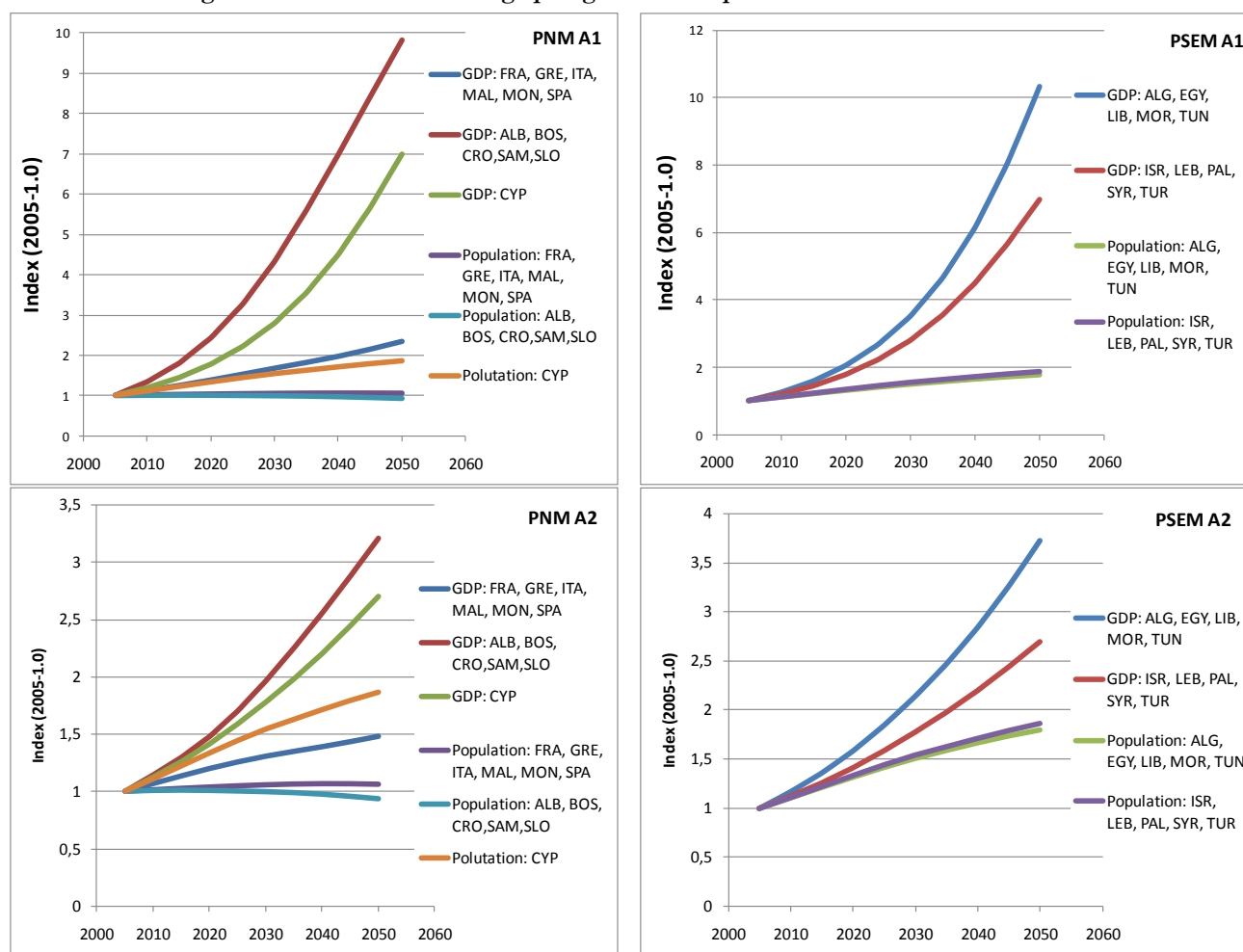
- For inbound tourism, growth is based on the global model for international tourism in MEDTOUR and operates on the same principles as the models for individual countries.
- The baseline scenario data for 2005, 2025 and 2050 imply the continuation of current climate policies (Business as usual) and population and GDP growth in line with IPCC scenarios A1 or A2.

Two distinct models according to two economic growth scenarios

Two models were created that differ only in the profile for economic and demographic growth:

- in the first, the growth profile from SRES scenario A1F (IPCC) is applied, i.e. very strong growth. It is the scenario that most resembles observations for the 2000-2009 period, in other words, the worst increase in emissions anticipated by the IPCC. The results of the model ended up being highly influenced by this growth. Yet in the current situation of crisis, it is not at all certain whether projected growth rates are accurate over the long-term;
- in the second, the growth profile from SRES scenario A2 (IPCC) is applied, i.e. much more limited growth that perhaps corresponds more with actual trends.

Figure 37 - Economic and demographic growth assumptions in SRES scenarios A1 and A2



Source: Plan Bleu, TEC

Climate policies

Emissions reduction policies include:

- changes in the price of CO₂ (€ per tonne);
- assumptions regarding the improvement of annual energy efficiency for aeroplanes, cars and other transport modes;

- for each country, changes in taxes and subsidies, as well as investments in infrastructures and technologies, reflected in the change in average travel times.

Influence of parameters

These various hypotheses influence transport costs and travel times of the various transport modes for each country, causing transfers between markets and transport modes.

- For domestic and outbound tourism in Mediterranean countries, the total number of trips is not modified as it varies according to the GDP per capita of the country.
- It is different for inbound tourism, since the total number of trips to a destination is the sum of the various outbound markets, where the distribution is affected by changes in price and travel time (e.g. more Germans in France but less in Tunisia and in the end, less foreign tourists in Tunisia).

All the changes in tourism flows between markets and transport modes are calculated using standard elasticities for price and travel time. The results are adjusted to correspond with the total number of trips, calculated according to the GDP per capita and the population growth. This adjustment is different every year between 2005 and 2050.

The following sources are used for economic data:

- UNWTO data consolidated by Plan Bleu for inbound tourism revenue;
- WTCC “import” data (WTTC 2010) for outbound tourism;
- WTCC “personal domestic” data (WTTC 2010) for domestic tourism.

The economic impact of tourism in a country is calculated by multiplying the number of trips by the revenue per stay consumed in a country, adjusted according to GDP growth.

Design of the scenarios

The principle of this prospective study is based on modelling Mediterranean tourism flows over a century according to different scenarios.

Specific scenarios were therefore built for the study to reflect the potential trends in climate and energy policy on a national, regional and international level. They are formulated using realistic and consistent hypotheses that are applied at various levels: global and national, developed countries (NMCs) and developing countries (SEMCs). The purpose of these scenarios is to shed light on a major problem; the consequences of highly contrasting political/economic choices concerning climate and energy policies and transport. There are four scenarios.

Each scenario coincides with a certain target for reducing greenhouse gas emissions, applied on a global, EU (including all NMCS) and SEMC level. These targets stem from targets set in various contexts (international conferences, scientific research, etc.) according to available sources (see following chapter).

In an effort to remain consistent with the outlooks of policies and international negotiations (long-term) and to address the concerns of policy-makers in each destination, investors (short-term) and lending institutions (medium-term), the impacts of climate change and regulation are evaluated over the medium and long term (2025 and 2050) using two approaches:

- a pragmatic approach for 2025, corresponding more to the vision of policy-makers (national and local politicians, investment);
- an ambitious approach for 2050, corresponding to international discussion on climate policies and the toughest IPCC targets.

Scenarios with a common setting, comparable to a baseline situation

In a scenario-based prospective study, a certain number of parameters vary according to a given situation (the baseline) in order to build contrasting scenarios that shed light on the effects of various tendencies. However, it is not advisable to vary every parameter and the elements that remain common to all scenarios must be defined beforehand in order to make results easier to interpret.

The baseline is not an actual scenario. It acts as a point of comparison for evaluating the scenarios. It contains a set of projections based on major socio-economic hypotheses (demographics, growth etc.) and does not include any new climate policies (mitigation).

The three scenarios share overall global trends that do not vary:

- demographics;
- regional security, geopolitics: there are always security crises and a degree of instability in the Mediterranean, but no major crises that affect the entire basin;
- the elasticity of tourism in relation to carbon prices and travel times.

For certain parameters, it is more difficult to formulate clear, realistic hypotheses that are easy to back up. This is particularly the case of the price of fuel which will be reflected in the carbon price in the model. The price of fuel will increase in each of the scenarios for different reasons. It is difficult to differentiate this increase for each scenario due to the complexity of the phenomena at stake (rate of economic growth, exploitation of oil reserves, policies, etc.). Therefore to take it into account, the carbon price used is the net price, i.e. which integrates the weighted change in the energy price and carbon taxes. It is also unlikely that the economy will remain the same depending to the scenario and the issue of how to handle the GDP per capita in each scenario. However, given the inherent difficulties in such a parameter, the relationship between GDP per capita and the propensity to travel remains the same for all scenarios.

Finally, for parameters that must be defined on a national level for each individual country, several principles were applied:

- These parameters are mainly set by region (SEMCs and NMCs). SEMCs are considered as emerging countries and there are no “less developed countries”. All the NMCs are considered as developed countries;
- Climate policies are differentiated by bloc of countries and/or NMC and SEMC regions, and not by individual country;
- The speed of transport modes is a sensitive parameter within the model which is taken into account on a national level where possible.

Precautions in interpreting results

The main limit to interpreting the output of the model concerns the results for each country. Due to the fact that country data is sometimes lacking and that the model has its limits, the results will not be presented by country but rather by group of countries, mainly based on the standard approach of Plan Bleu, which distinguishes between Northern Mediterranean Countries (NMCs) and Southern and Eastern Mediterranean Countries (SEMCs).

The second obvious limit of the model concerns the economic indicators, and mainly the GDP from tourism. This indicator can be highly influenced by the explosion of domestic tourism (e.g. Turkey, Croatia) and must be carefully interpreted. Only data concerning revenue from inbound tourism will be analysed.

Finally, a third limit concerns the integration of the oil price into the carbon price, which makes it impossible to determine whether impacts are due to the increase in oil prices or taxes within the framework of national or international policies.

Bibliography

- Akerman, J. (2005). Sustainable air transport: on track to 2050. *Transportation research D*, 10: 111-126.
- Anderson, K., A. Bows, et al. (2006). *Decarbonising modern societies: integrated scenarios process and workshops*. Norwich, UK, Tyndall centre: 142 p.
- Benoit, G., A. Comeau, Plan Bleu (2005). *A sustainable future for the Mediterranean*. Earthscan.
- Bows, A., S. Mander, et al. (2006). *Living with a carbon budget*. Manchester, Tyndall Centre: 175 p.
- Ceron, J.-P. and G. Dubois (2003). *Tourisme et changement climatique une relation à double sens. Le cas de la France*. 1st International Conference on Climate Change and Tourism., Djerba, Tunisia, WTO.
- Council of the European Union (1996). *Community strategy on climate change. Environment council meeting*. Brussels, Council of the European Union,.
- Dahan, A., S. Aykut, et al. (2010). *Les leçons politiques de Copenhague. Faut-il repenser le régime climatique*. Paris, Centre Alexandre Koyré: 45 p.
- Dubois, G., Ceron, J. P., Peeters, P. & Gössling, S. (2010). The future tourism mobility of the world population: emission growth versus climate policy. *Transportation Research - A*, in press, doi:10.1016/j.trra.2009.11.004.
- Ebert, S., Metschies, G. P., Schmid, D. & Wagner, A. (2009). *International Fuel Prices 2009*. 6th ed. Eschborn, Germany: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.
- European Commission. DG Enterprise (2004). *Feasibility and preparatory study regarding a multi-stakeholder European targeted action for sustainable tourism & transport. Final report*. The Hague: 160 p.
- GIEC (2000). *Scénarios d'émissions. Résumé à l'intention des décideurs*. Genève, PNUE, OMM. 22 p.
- Gossling S., Ceron J.P et Dubois G. (2008). Hypermobile travelers. In Gossling S. and Upham P. (Eds). *Climate Change and Aviation*. Earthscan
- Gössling, S. (2002). Global environmental consequences of tourism. *Global environmental change* (12): 283-302.
- Hansen, J., M. Sato, et al. (2008). *Target Atmospheric CO2: Where Should Humanity Aim?* eprint arXiv: 0804.1126.
- IFEN (2000). *Tourisme, environnement, territoires : les indicateurs*. Orléans, Ifen.
- IPCC (2000) *Special report. Emission scenarios*. Online document at URL: <http://www.ipcc.ch/ipccreports/sres/emission/index.php?idp=0>
- IPCC (2000). *Special report. Emission scenarios: Summary for policy makers*. 27 p
- IPCC, UNEP, WMO (1999). *Aviation and the Global Atmosphere*. A Special Report of IPCC Working Groups I and III in collaboration with the Scientific Assessment Panel to the Montreal Protocol on Substances that Deplete the Ozone, Cambridge University Press.
- Lee, D., D. Fahey, et al. (2009). Aviation and global climate change in the 21st century. *Atmospheric Environment*, vol. 43, issue 22-23. pp. 3520-3537
- Maddison, A. (2010). *Historical Statistics of the World Economy: 1-2008 AD*. University of Groningen.
- Parry M.L., O.F. Canziani, J.P. Palutikof, et al. (eds.), IPCC. (2007). *Climate change 2007: Impacts adaptation and vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the International Panel on Climate Change. Cambridge University Press.
- Parry, M., J. Palutikof, et al. (2008). Climate policy: squaring up to reality. *Nature Reviews: Climate Change*.
- Peeters, P. (2010). *Gestion de l'énergie, transport aérien et tourisme en Méditerranée. Modélisation: méthodologie et sources de données*. Marseille, TEC.
- Peeters, P. M. & Dubois, G. (2010). Exploring tourism travel under climate change mitigation constraints. *Journal of Transport Geography*, 18, 447-457.
- Peeters, P. M., van Egmond, T. & Visser, N. (2004). *European tourism, transport and environment. Final version*. Breda: NHTV CSTT.
- Peeters, P., S. Gössling, et al. (2006). *Air transport greenhouse gas emissions factors*. E-CLAT Climate change and tourism conference. Tourism and Climate Change Mitigation, Tilburg, The Netherlands.

- Peeters, P., Szimba, E. & Duijnisveld, M. (2007). Major environmental impacts of European tourist transport. *Journal of Transport Geography*, 15, 83-93.
- Penner, J. E., Lister D.H., et al., Eds. (1999). *Aviation and the Global Atmosphere*.
- Radanne, P. (2004). *La division par 4 des émissions de carbone en France d'ici 2050*. Paris, Mission interministérielle de l'effet de serre: 35 p.
- Richardson, K., W. Steffen, et al. (2009). *Climate change. Global risks, challenges & decisions. Synthesis report*. Copenhagen, University of Copenhagen: 39 p.
- Sahr, R. (2009). *Inflation Conversion Factors for Dollars 1774 to Estimated 2019*. Online documents at URL <http://oregonstate.edu/cla/polisci/faculty-research/sahr/sahr.htm> [17-09-2009].
- Schmidt, G. and D. Archer (2009). Too much of a bad thing. *Nature* (458): 1117-1118.
- Solomon S., D. Qin, M. Manning et al. (eds.), IPCC (2007). *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
- Stern, N. (2006). *Stern review: the economics: of climate change. Executive summary*. 27 p.
- Swartz, K. L. (2010). *Great Circle Mapper*. Online documents at URL <http://gc.kls2.com/> [22-01-2010].
- UNEP/MAP/Plan Bleu (2005). *Dossier on tourism and sustainable development in the Mediterranean*. Athens, MAP. (MAP Technical Report Series, 159)
- UNEP/MAP/Plan Bleu (2009). *State of the environment and development in the Mediterranean*. Athens, MAP.
- UNWTO (2002-2006). *Compendium of tourism statistics*. Madrid, UNWTO.
- UNWTO (2007). *Tourism 2020 vision*. Madrid, UNWTO.
- UNWTO (2007a). *Tourism factbook*. Online documents at URL: <http://www.wtoelibrary.org/content/v486k6/?v=search> [4th of July 2007].
- UNWTO (2007b). *Yearbook of tourism statistics*. Madrid, UNWTO.
- UNWTO (2008). *Faits saillants du tourisme*. Madrid, UNWTO.
- UNWTO (2008). *Tourism market trends. World overview*. Madrid, UNWTO.
- UNWTO, UNEP, WMO (2008) *Climate change and tourism: Responding to global challenges*. Madrid: UNWTO.
- WBGU (2009). *Solving the climate dilemma: the budget approach*. Berlin, WBGU. 58 p.
- WebFlyer (2003). *Milemarker mileage calculator*. Online documents at URL: <http://www.webflyer.com/travel/milemarker/>
- WRI (2007) *Earthtrends, the environmental information portal*. Online documents at URL: <http://earthtrends.wri.org/index.php> [30-12-2007]
- WTTC (2010) *Tourism Impact Data and Forecast Tool*. Online documents at URL www.wttc.org/eng/Tourism_Research/Tourism_Impact_Data_and_Forecast_Tool/ [22-01-2010].

Table of illustrations

Figures

Figure 1 - CO ₂ emissions from global tourism transport (excluding day trips) classified by transport mode and region.....	8
Figure 2 - Change in international inbound visitor numbers to Mediterranean countries between 1999 and 2005	10
Figure 3 - Numbers of inbound international tourists in 2007 and subsequent changes	10
Figure 4 - Origin of visitors to the Mediterranean, by share of international inbound tourists (%)...11	
Figure 5 - Distribution of inbound visitors to Mediterranean countries by distance category in 200513	
Figure 6 - Distribution of inbound visitors to Mediterranean countries by distance class in 2005.....	14
Figure 7 - Changes in international and domestic overnight stays in hotels and similar establishments in the Mediterranean (in thousands)	15
Figure 8 - Changes in the share of air travel in international visitor arrivals in the Mediterranean.....	15
Figure 9 - Modal distribution of international tourist arrivals in Mediterranean destinations in 2006 and 1996.....	16
Figure 10 - Average share of air transport by distance category (Round trip) in 2005	17
Figure 11 - Share of air transport by distance category: specific cases	17
Figure 12 - Distribution of CO ₂ emissions from international tourism transport (by group of inbound country)	19
Figure 13 - CO ₂ emissions from transport to Mediterranean countries (2005).....	19
Figure 14 - Ratio of GHG emissions per trip for each inbound country, all modes of transport (2005).....	20
Figure 15 - Ratio of emissions per overnight stay and per USD spent for each country (2005)	22
Figure 16 - Schematic description of scenarios.....	28
Figure 17 - Changes in CO ₂ emissions under each scenario (Mediterranean total)	33
Figure 18 - Changes in CO ₂ emissions per transport mode under each scenario (Mediterranean total).....	34
Figure 19 - Changes in emissions levels based on different scenarios and economic contexts (Mediterranean total)	35
Figure 20 - GDP generated by domestic / inbound tourism under each scenario (Mediterranean total).....	36
Figure 21 - GDP generated by domestic / inbound tourism in SEMCs	36
Figure 22 - Changes in number of trips for domestic tourism and inbound tourism (Mediterranean total).....	37
Figure 23 - Changes in distances travelled for 2050 (Mediterranean total).....	38
Figure 24 - Changes in distances travelled and inbound tourism volumes for 2050 (Mediterranean total).....	38
Figure 25 - Distribution of the number of international tourist arrivals (inbound) and transport modes under each scenario (Mediterranean total)	39
Figure 26 - Typology of countries according to dependence on air transport	40
Figure 27 - Changes in the modal distribution of inbound tourism under each scenario	40
Figure 28 - Changes in the share of air transport depending on the group of countries.....	41
Figure 29 - Changes in modal distribution for domestic tourism under each scenario	41
Figure 30 - Location of RTAP road and airport infrastructures	44
Figure 31 - Location of RTAP rail, seaport and river infrastructures.....	44

Figure 32 - Entire road network and airport facilities.....	45
Figure 33 - All rail transit routes and ports.....	45
Figure 34 - Madrid-Atocha, train station or exotic garden?	55
Figure 35 - Projection of CO ₂ emissions with a “business as usual” scenario (excluding day visitors).....	66
Figure 36 - MEDTOUR model.....	68
Figure 37 - Economic and demographic growth assumptions in SRES scenarios A1 and A2.....	70

Boxes

Box 1 - IATA commitments... a look beyond the numbers	27
Box 2 - Turboprop aircraft: more economical for short-haul travel and more environmentally friendly.....	31
Box 3 - How to read the graphs	34
Box 4 - Effects of the crisis on passenger air transport.....	43
Box 5 - Interactions between train and plane: What are the effects of the “TGV Sud-Est” service since 2001?.....	46
Box 6 - “All air” policy in Tunisia	46
Box 7 - Issues in air transport above and beyond international commercial tourism	48
Box 8 - The Tunisian experience: counting on climate change as an additional incentive to begin fundamental changes that should have come long ago.....	49
Box 9 - Specific between countries	51
Box 10 - Adaptation can challenge the overall development model of the destination.....	52
Box 11 - The “last kilometre” problem.....	54
Box 12 - Taking the time to travel: Nice - Saint-Petersburg.....	54
Box 13 - The Swiss model of slow travel on a national level.....	55
Box 14 - Raise awareness with travellers... without making them feel guilty	57
Box 15 - Building an adaptation strategy: raising awareness and explaining the issues to field actors.....	57
Box 16 - Air Austral promotes trains	59
Box 17 - Quantifying the contribution of aviation to climate change	69

Tables

Box 1 - IATA commitments... a look beyond the numbers	27
Box 2 - Turboprop aircraft: more economical for short-haul travel and more environmentally friendly.....	31
Box 3 - How to read the graphs	34
Box 4 - Effects of the crisis on passenger air transport.....	43
Box 5 - Interactions between train and plane: What are the effects of the “TGV Sud-Est” service since 2001?.....	46
Box 6 - “All air” policy in Tunisia	46
Box 7 - Issues in air transport above and beyond international commercial tourism	48
Box 8 - The Tunisian experience: counting on climate change as an additional incentive to begin fundamental changes that should have come long ago.....	49
Box 9 - Specific between countries	51
Box 10 - Adaptation can challenge the overall development model of the destination.....	52
Box 11 - The “last kilometre” problem.....	54
Box 12 - Taking the time to travel: Nice - Saint-Petersburg.....	54

Box 13 - The Swiss model of slow travel on a national level.....	55
Box 14 - Raise awareness with travellers... without making them feel guilty	57
Box 15 - Building an adaptation strategy: raising awareness and explaining the issues to field actors.....	57
Box 16 - Air Austral promotes trains	59
Box 17 - Quantifying the contribution of aviation to climate change	69
Table 1 - Total emissions from global tourism in 2005	7
Table 2 - Distribution of GHG emissions by sector in Mediterranean countries in 2000 (% of total emissions).....	18
Table 3 - Ratio of GHG emissions per trip (2005).....	20
Table 4 - Ratio of emissions per overnight stay and per USD spent (2005)	21
Table 5: Rate of annual reduction after emissions peak and resulting temperature increases in 2100.....	25
Table 6 - Changes in average inbound tourism distances in NMCs and SEMCs	39
Table 7 - Data used and sources.....	69

