Tourism and climate change in the Mediterranean region

Paper presented at the 12th MCSD meeting

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Plan Bleu
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2007

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1. Introduction: a dual issue

Both domestic and international tourism are major activities for many of the 21 Mediterranean countries. They attract over 30% of international tourism[2] and this makes up their first source of currency. Since the beginning of the decade growth in this sector of activity has fluctuated between 3 and 4% per annum.

Although the relationship between tourism and climate has been studied for a long time, it remains complex and somewhat hard to grasp. Besides this, interest in climate change has only been an issue since the end of the 1980s and more especially since the turn of this century[3]. However, it is now obvious that tourism needs to be focussed on in the context of climate change to the extent that it is one of the few activities that is extremely vulnerable and at the same time a major cause of greenhouse gases emissions.

With this in view, the issue to be dealt with is necessarily a dual one: it involves the impact of tourism on climate change, which relates to reducing greenhouse gases emissions, and the impact of climate change on tourism, which relates to vulnerability and adaptation. We will see, however, that both aspects of the « tourism and climate change » issue are partly linked together.

2. Impact of tourism on climate change

2.1. Contribution of tourism to greenhouse gases emissions

Greenhouse gases emissions from tourism are significant. The historical contribution to global radiative forcing from the tourist industry was 4 to 10% in 2000[4]. By 2050 this share could be between 10 and 20% if the temperature rises between +3 and +5°C (unsustainable future), and could reach 50 to 100% in a scenario of +2°C (i.e. if the other sectors of activity make considerable efforts to reduce their emissions). Indeed, the carbon efficiency of the tourist industry (contribution to GDP/greenhouse gases emissions) is only half of the world average: its share of emissions is between 4 and 10% while its share in GDP is only 3.6%. This carbon efficiency is quickly decreasing with the lengthening of the distances to the destinations and the shortening of the duration of the trips.

Greenhouse gases emissions from tourism are largely caused by transport (see Figure 1). Air transport is the major preoccupation for several reasons: it emits more greenhouse gases per tourist and per trip than any other means of transport; its impact on global warming per unit of fuel burnt is higher; it is experiencing a spectacular growth rate[5]. Hence, the increase in its greenhouse gases emissions is much faster than that of all other sectors of activity. In addition, it should be noted that the ageing of the European population, still in an early stage, has brought

[1] This note has been inspired by several existing works that have not all been cited here, in order to make reading easier. It refers especially to the work of the experts of the E-CLAT network (*Experts in climate change and tourism*). A version containing more precise references is available from the author of this exposé.

[2] 135 million visitors in 1990, 147 million in 2003 and between 235 and 350 million forecasted for 2025.

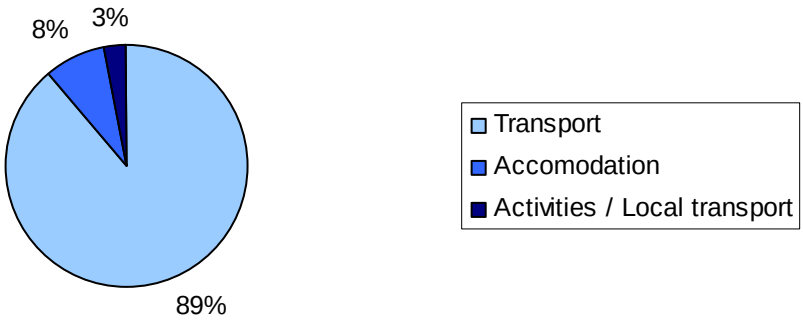
[3] The event that laid the foundations for reflection on « tourism and climate change » was the Djerba Conference organised by the World Tourism Organisation (WTO) in 2003.

[4] Peeters, 2007.

[5] It is progressing by 8% per annum in an extremely inequitable way, since only between 1 and 2% of the world's population fly occasionally.

about a boom in demand for holiday homes, necessitating a search in ever more distant places such as in Morocco or the south of Spain for senior citizens from Germany and France. This trend will only lead to more frequent and more distant return trips.

Figure 1. Global GHG emissions per tourism element in 2002 (Peeters, 2007)



2.2. Perspectives for the reducing of greenhouse gases emissions by the tourist industry

Most of the initiatives to reduce greenhouse gases emissions caused by the tourist industry concern « on site » emissions, especially in hotels. "Environmental management" is the most intuitive way to take both for operators and for the general public. It involves mainly developing the use of renewable energies and promoting energy saving by using low consumption light bulbs or by means of appropriate architectural designs for the tourist facilities. This is clearly a direction to take that requires the least challenge and reorganisation and only minor changes in behaviour. However, Figure 1 demonstrates that only 10% of the problem can be dealt with in this way. It can therefore only (1) supplement a more ambitious mechanism for transport; (2) accelerate awareness-raising among operators and tourists in order to introduce greater measures in other respects.

Concerning air transport – the main source of worry with regard to greenhouse gases emissions, as we have seen – at least three sets of options can be considered, should be studied, and where possible implemented, in the coming years.

Option A: Reducing air traffic

As tourism is a prime-mover for growth and development in the Mediterranean, it is unquestionably difficult to contemplate reducing tourist air transport *all things being equal*. Nevertheless, it is possible to reorganise the tourist sector in many ways: by making tourist stays longer, nearer, less frequent, etc. Typically, one hypothesis would be to induce offer and demand to change from the model of annual one-week trips to tri-annual 3-week trips. This type of reorganisation would theoretically reduce air traffic without affecting local tourist businesses.

Option B: Reducing GHG emissions per passenger

Reducing greenhouse gases emissions per tourist transported is partially possible thanks to technological innovation. Many partial solutions exist but they are slow to be implemented (this is also true for road transport). It is proving difficult to introduce innovations of this sort in a very competitive market where airplanes have a life-cycle of about thirty years or so. Besides this, better fuel efficiency could also lead to a drop in prices and thus to an increase in traffic rather than to a decrease in gases emissions. Another marginal solution would be to fill up the planes better, but this could quickly reach a limit if it also were to bring about a drop in prices and in consequence an increase in traffic (the low cost company model).

Option C: Increasing emissions costs

Finally, a third set of options would consist in increasing the cost of greenhouse gases emissions. As tourism is intrinsically linked to travel, this direction would seem more appropriate rather than directly reducing mobility. Several means to envisage this solution could be looked at:

- Trading emissions permits: In Europe this would mean entering air transport in the emissions trading scheme (ETS). International air transport is not concerned by the Kyoto Protocol and emissions from this sector will only be included in national emissions inventories from 2011. The system of tradable emission permits will only progressively be put in place in 2011-2012. This means that no limits have been set for a rise in this sector until this date, while the cumulative effects would mean that with an equal climate objective, the more emissions there are in the next five years, the fewer there could be later.
- Taxing: As tourism has relatively little elasticity in its prices, taxation could be a solution (on fuel[1], on greenhouse gases emissions, on flight tickets, etc.) the main effect of which would be to raise compensatory funds, and the indirect effect to marginally limit traffic increase.
- Compensating for emissions: About fifty airline companies have already committed themselves to activities linked to compensation, although with widely different criteria and methods. If the real impact of such initiatives remains – and is likely to remain – small, they could be a good means to accelerate awareness-raising. However, compensation by forestry operations – the most widespread practice these days – has many major drawbacks, among which the fact that 28 000 Km^2/annum would have to be afforested to compensate for tourist air transport[2] – areas that should be left aside for ever[3]. Buying emission credits from the European Trading Scheme and keeping them off the market seems a more robust option.

2.3. Conclusion

These possible measures for reducing greenhouse gases emissions in the tourist sector should be examined globally: they are not exclusive and none of them alone could compensate for the rise in this sector of activity. They should also lead to a renewed look at the development policies underway at present and at the irreversibilities they generate[4].

[1] Air transport is for the moment exonerated from taxes on fuel, unlike e.g. car owners.
[2] Gössling, 2007.
[3] To this could be added the higher risks of forest fires linked to monoculture, etc.
[4] Here we have in mind, for instance, the development of « low cost airports » (Beauvais in France, Orio al Serio in Italy, etc.), a model which will produce the exact opposite of what was recommended above: it will stimulate new demand especially for weekend trips, increase air traffic, relocate airports even further away from cities, etc.

3. Impact of climate change on tourism

3.1. The connection between tourism and climate

Climate is an essential characteristic of a tourist destination. It is a factor that plays a large role in motivation and satisfaction. Yet, the relationship between climate and tourism is extremely complex: « good weather » depends on the destination, on the type of activity planned, on the tourist himself (age, health, etc.), his representations, his culture, etc. Several more or less successful attempts have been made to model this relationship, the Tourism Comfort Index (TCI) being the most widely known[1]. It combines information about the average temperature, maximum temperature, humidity, precipitations, sunshine and wind to allocate a rating to a site, from the local to the global scale, that reflects the level of comfort tourists will enjoy.

In any case, it is expected that tourists will alter their current habits to face the expected climate changes, with variable consequences depending on destinations.

3.2. Four types of impact of climate change on tourism

The impact of climate change on tourism can be classified into four major categories[2]:

- Direct impact caused by an alteration in the climate (see 3.1.). Increased variability of the climate causing complications to carry on the activity; alteration in conditions for comfort, health and safety; extreme events such as storms and flash floods, and so on. Local "improvements" cannot be excluded here: lowering of rainfall, longer summer season.
- Indirect impact of climate change through environmental changes. For instance, a decrease in water availability, especially in summer, is expected in several Mediterranean regions and this could have several effects on tourism *via* access to drinking water, water sports, modifications in attractive natural and agricultural landscapes. The expected sea level rise, together with other natural or man-made phenomena, threatens many coastal tourist resources, from resorts and infrastructures to beaches.
- Indirect impact of emissions reduction policies, especially on costs and characteristics of transport (see 2.2). This impact could be much greater for tourism than the impact caused by climate change itself, depending on the objectives that our societies set and the measures that they undertake in the coming years,
- Consequences of the global impact of climate change for our societies: way of life, economic growth, political stability, and so on. Here lie the greatest uncertainties and the most complex inter-relationships, tourism being dependant on many other sectors of activity.

Combined together, these four types of impact contribute to calling into question the relative competitivity of destinations. In the Mediterranean region where the major flow of tourists is currently from northern Europe down to the Mediterranean, there could be many possible effects on the destinations (see Table 1).

[1] See work by B. Amelung et D. Viner.
[2] Adapted from Céron and Scott, 2007.

Table 1: Expected effects of climate change on the Mediterranean tourist destinations[1]

Climate change in the place of origin	Climate change at the destination region	Implications for the destination region	Possible market reactions
-Much warmer, wetter winters -Warmer, drier summers -More "reliable" summers	-Warmer, wetter winters -Much warmer, drier summers -Changes more marked in Eastern Mediterranean -Increased heat index -More days above 40°C -More arid landscape -Small tidal range means greater sea level rise impact	-Greater drought and fire risk -Increased water shortages -Greater personal heat stress -Beach degradation and habitat loss due to sea level rises -Vulnerability to more tropical diseases (e.g. malaria) -More flash floods -Poor urban air quality in cities	-Improvement of Northern European summers triggers more domestic holidays -Decreased incentive for Mediterranean summer holidays -Increased incentive for shoulder month Mediterranean holidays -Increased incentive for southerners to go north

3.3. Vulnerability of the tourist sector

For each of these four types of impact there are several corresponding forms of vulnerability that are variable depending on the region and the tourist practices. Here we provide food for thought especially concerning the first two categories of impact.

Concerning the direct impact of climate change, the identification of « tourism and climate change hotspots[2] » throughout the world combines WTO figures for tourism flows and IPCC[3] analyses on climate changes. The North and East Mediterranean regions stand out as "hotspots[4]" mainly because of the forecasted rise in droughts and heat waves: these hotspots are particularly vulnerable to direct climate impacts.

Vulnerability to indirect impact caused by climate change is multi-dimensional but it is obvious that the low coastal areas are particularly exposed. In Tunisia for example, where 90% of tourist facilities are on the coast, the Gulf of Gabes seems to be very vulnerable. The same can be said for Egypt's Mediterranean coast where domestic tourism is rapidly developing.

Finally, it should be pointed out that the average tourist uses up a lot of resources : he consumes a lot of water (food, baths and showers, swimming pools, housework, gardens, golf courses, etc.), during seasons of low resources availability. Tourism thus competes with local uses (domestic, agricultural and industrial consumption, etc.), increasing the vulnerability of the territory where it settles – and in consequence its own vulnerability.

3.3. Adapting to climate change

The adaptation issue in the tourism sector is more relevant for operators and investors than for tourists, who will most likely adapt their habits to changes in their environment by themselves (even if a few seasons behind). It should be noted, however, that the tourism business has a wide range of contrasted interests and ways of thinking, from small local operators (who represent a majority) to multinational companies. Some of them, for instance, are strongly attached to a specific place, while others are more mobile. Their possibilities to adapt to climate change are very varied, and are at several levels (technical, behavioural, economic, political, etc.).

[1] Source : G. Vereczi, WTO, 2007.
[2] Becken, 2007.
[3] Intergovernmental Panel on Climate Change.
[4] On the contrary, the South Mediterranean region does not appear to be a « hotspot » because of the relatively low tourism there. This parameter could of course change in the coming decades and exceptions already exist, as is the case for Tunisia.

The first option, when possible, is to move the activity. Whether this move is spontaneous or imposed, it matches – theoretically at least – the need to adapt but it obviously encounters many obstacles in practice. The most realistic and most efficient option is to anticipate future impacts on current investments: such an option however implies access to climate information, vulnerability maps, etc., that are not always available.

A less drastic option resides in the environmental management of tourist facilities, with the involvement of the tourists (e.g. water and energy saving, rainwater collectors, waste water recycling, adapted designs and architecture). Such adaptation measures are particularly welcomed by tourism operators when they imply savings, although it should be remembered that water and energy costs only account for between 5 and 10% of the overall costs for the running of a medium-sized hotel[1] – thus financial incentives are not to be neglected but not overestimated either.

Diversifying the offer as well as decreasing seasonality also provide good opportunities for the Mediterranean in the context of climate change. On the whole, seaside tourism (the "3-s model": sea, sun and sand) still dominates in the Mediterranean, while it is especially vulnerable because of alterations to beaches and coastlines. Adaptation in that case could be about developing less climate-sensitive activities, or at least activities that have varied sensitivities, as well as less resource-intensive activities. However, if mass seaside tourism still dominates in the Mediterranean, it is because it meets the expectations of a large majority of tourists: diversification of both offer and demand must go hand in hand or be trapped in a chicken-and-egg dilemma.

Finally, it should be noted that many adaptation options, often among the most intuitive, simple and inexpensive ones, tend to increase the problem to which they are supposed to bring solutions: this is clearly the case e.g. for air-conditioning, but also in some areas for hard coastal defence (dykes, groins, beach nourishment, etc.).

3.4. Conclusion

If there is no longer a shadow of a doubt that tourism in the Mediterranean will be affected by climate change, the magnitude, the nature and the locality of impacts remain uncertain. The historical weakness of research on adaptation in the tourist sector leads experts to communicate mostly on risks while offering few solutions. Such a risk-oriented rhetoric is useful but is often badly accepted by those directly concerned.

Moreover, even when describing risks, there is a need for local models and information while they often remain regional or global. To sum up, it could be argued that stakeholders involved want to know « what the weather will be like » where they are settled, rather than what the future climate throughout the Mediterranean region.

4. General conclusion: great changes to be introduced into a sensitive context

Climate change is about to become one of the most important issues in the medium and long term for tourism in the Mediterranean. What is at stake is both to reduce GHG emissions and to adapt to the changes underway, in order to reduce the vulnerability of a key sector of activity that risks being severely disrupted in the next few decades.

As for the whole society, the question is raised of the balance – and thus the division of costs – between mitigation of greenhouse gases emissions and adaptation to climate change. Focussed on mitigation until recently, research and action lately moved to adaptation – long considered as a

[1] But up to 15% for water in Tunisia for example.

defeatist attitude – as we were becoming aware of the irreversible nature of the changes that are already underway. Authorities in charge of tourism, together with the private sector, should now make better use of climate information, i.e. they should better integrate it in their policies, development strategies and business plans, etc. Attention should logically be focussed first on no-regret and no-cost options and measures: many could have positive impact in terms of mitigation, adaptation and return on investment.

Consideration of this matter should be carried out quickly, without losing sight of the fact that for many stakeholders we are speaking of hypothetical problems that could materialise in 20, 30 or more years, while their actions are focussed on the real problems they are confronted with at present. It should not be forgotten either that tourism remains one of the main development opportunities for many Mediterranean countries. Any restriction could therefore negatively affect millions of current and future jobs, and the development of entire regions: proposals of this nature thus tend to be badly accepted by stakeholders. This is all the more true as mobility, discovery of other people(s), cultures and places have become values in themselves for many of our fellow-citizens.