Freshwater and Tourism in the Mediterranean

Author
Lucia De Stefano (luciads@wwf.es)

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For further information contact
WWF Mediterranean Programme
Via Po 25/C
00198 Rome, Italy
Phone: +39 06 84497227
Fax: +39 06 8413866
www.panda.org/mediterranean

Front cover photos
Lac Tonga, Ramsar site in the El Kala National Park, Algeria

New construction along the Mediterranean coast, Turkey

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Summary

The Mediterranean is the main tourist destination in the world. Every year millions of people flock to the Mediterranean coasts, with the number likely to reach between 235 and 355 million people per year by 2025. Tourism activity peaks in summer, coinciding with the time when natural water availability is at its lowest. Storing water in dams and extracting groundwater have, until now, been the solutions to satisfying the ever-increasing thirst for water by ever-increasing numbers of tourists. As a consequence, tourism is making a major contribution to the degradation and destruction of water ecosystems as rivers are being fragmented, groundwater levels are sinking and wetlands are drying out. Lower groundwater levels are not only causing habitats to disappear but are having a negative impact on human communities as the groundwater that is used for drinking water and irrigation is becoming saltier and requires treatment or the total abandonment of the resource.

Every tourist consumes between 300 and 850 litres of water per day. This rate could be reduced by 50%, a daily total of 273.000.000 cubic meters of water basically compensating for the forecasted increase in tourist numbers and associated water consumption by 2025.

Hosting, entertaining and supplying the increasing number of tourists along the limited space of the Mediterranean coast will push urban boundaries further inland, most likely destroying in the process the few remaining coastal wetlands and lagoons.

Reducing water consumption and preventing encroachment into wetlands can only be achieved if the tourism industry, the government and individual tourists take concrete measures, such as installing water saving devices, reusing water, enacting water saving policies and adopting a land use plan that respects environmental considerations. Saving water does not have to incur additional costs but can be economically advantageous as hotels save on their water bills. In addition, protecting wetlands means maintaining one of the attractions that people come to see.

The present report gives an overview of the current impact of tourism on freshwater resources and freshwater ecosystems and the underlying causes in the Mediterranean. Recommendations for reducing water consumption are given for the tourism industry, governments and the individual tourist. A case study presents a positive example of municipal water saving. Finally, facts, data and examples are given for tourism and water consumption in selected countries.

1 Overview of impacts of tourism on freshwater sources in the Mediterranean

1.1 Impacts

Tourism in the Mediterranean has the following impacts on freshwater resources:

Over-exploitation of groundwater. Groundwater overexploitation occurs when the volume of abstracted groundwater exceeds the average annual renewal of the groundwater body. According to Plan Bleu (1999), aquifer overexploitation is considerable in many Mediterranean countries: 13 % in Cyprus, 24 % in Malta (in 1990), 29 % in Gaza, 32 % in Israel (in 1994) and 20 % in Spain (25 % in the Júcar basin, 4 % in the Balearic Islands). Aquifer overexploitation was registered also in Egypt, Greece, Libya, Morocco, Turkey, and Tunisia (Plan Bleu, 2004, figure 1). Its main consequence is the decrease in the groundwater table, which negatively affects wetlands whose hydrological dynamics are directly linked to aquifers.

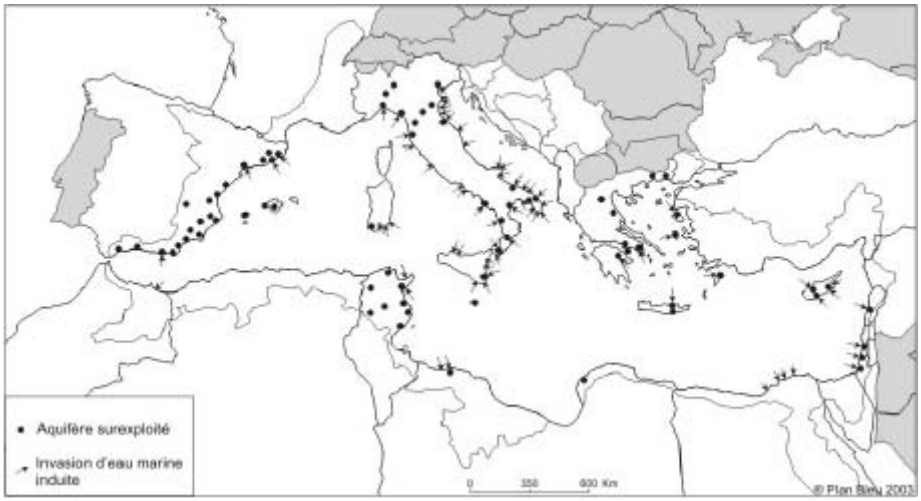


Figure 1. Areas where overexploitation of groundwater was registered in the Mediterranean region. Extracted from Plan Bleu (2004), who highlights that this map was elaborated using national sources and that the criteria used to identify an aquifer as over-exploited are not homogeneous throughout the countries.

Moreover, over-exploitation in coastal aquifers alters the equilibrium of the interface between freshwater and sea water in the groundwater body[1], which provokes saline water intrusion. Once the salt level of groundwater has increased, drinking water quality is reduced and might require pre-use treatment or the search for alternative sources. Higher levels of salt in irrigation water also increases the salinity of agricultural land leading to reduced productivity and in the worst cases to the complete loss of land.

Most Mediterranean coastal aquifers suffer from over-exploitation due to the concentration of agriculture and tourism in coastal areas where the mild climate

[1] In coastal aquifers, freshwater in the ground and sea water are in contact but do not mix together due to the different density of water (salt water is heavier, so it partially intrudes under the freshwater body as a wedge). If there is an excessive abstraction of freshwater, the size of the salt wedge increases and occupies parts of the aquifers where there was freshwater.

favours both economic activities. Coastal groundwater has been reduced to below sea level by excessive pumping in Cyprus, Greece, Israel, Italy, Libya, Spain (Plan Bleu, 1999) and Turkey (EEA, 2003, figure 2).

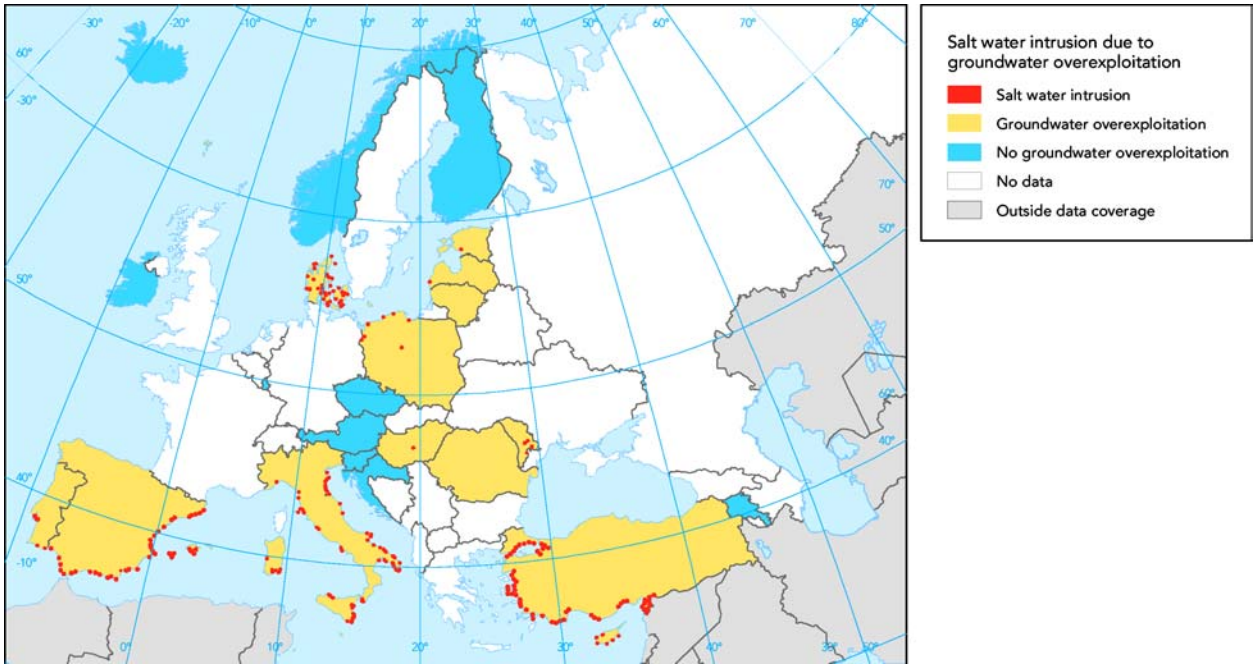


Figure 2: Salt water intrusion due to groundwater overexploitation. Source: European Environment Agency (2003): Europe's water: An indicator-based assessment. Topic report No 1/2003, p. 93 and p. 97.

Construction of new reservoirs or water transfer schemes. The growth of tourism is often associated with the search for complementary water sources to satisfy the great demands on water for this economic sector. The combination of water needs for agriculture and tourism has lead to the construction of a significant number of dams. At present, in the Mediterranean basin there are at least 500 big dams, with a combined storage capacity of 230 km^3. Countries having the most highly developed dam systems – the highest number of dams, with the highest total stored volume and having come closest to reaching the maximum number of dams the country can hold – are Spain, Italy, France and Egypt (Plan Bleu, 2004). Dams are certainly necessary for water supply, energy production and flood control, but they have negative effects on the environment and on people. The indiscriminate construction of dams is to be avoided.

A recent study of the World Resources Institute, (WRI, 2004) highlights that dams alter the dynamics of rivers in terms of water flow regimes and transportation of sediments. Dams reduce the speed of the rivers' flow and provoke water stagnation, which decreases the capacity of the river to break down organic pollutants and therefore to combat water pollution. This leads to changes in the chemical and physical characteristics of rivers that adversely affect fish species, which also suffer from the alteration of their migratory patterns.

Another adverse effect of dams is related to altered water regimes in rivers. The artificial time and volume of water released by dams impacts on waterfalls, rapids and riverbanks and wetlands, which are essential feeding and breeding areas for many aquatic and terrestrial species.

Dams hamper the movement of sediments to deltas, estuaries, flood forests, wetlands and lagoons, affecting the composition and productivity of species. Coastal fisheries depend on the rivers' input of nutrients to ensure good fish productivity. After the construction of the Aswan High Dam on the Nile River, the decline of nutrients transported by the Nile to the sea (by 4% for phosphate and 18% for silicate), combined with the increased salinity of the delta due to the reduction in the river outflow and over fishing, reduced the productivity of the coastal fisheries significantly (FAO, 1995, cited in WRI, 2004).

Dams have an extremely detrimental effect on people, with displacement of the local population and deterioration in the condition of freshwater ecosystems, necessary for their livelihoods (e.g. fisheries), both close to the water infrastructure and downstream, where the effects of the dam on the river dynamics are heavier.

According to Plan Bleu (2004), the concentration of water use along Mediterranean coasts has also led to the construction of water transfer schemes to the Mediterranean coast in several countries (e.g. Egypt, France, Greece, Israel, Libya, Morocco, Spain). The main water infrastructure of the Spanish Hydrological Plan approved in 2001 (and recently revoked due to social pressure) was a 900 km-long transfer of 1050 hm^3/year of water from the Northeast to the Southeast of Spain, where the tourist sector has grown 50% in the last five years (WWF, 2003), increasing its competing role for water with intensive agriculture.

The exploitation of non-renewable groundwater resources. According to Plan Bleu (1999) this is a serious problem for the Saharan aquifers in Libya (which provide 87 % of the amount of water used), but also in Egypt, Tunisia and Algeria. These resources may last at best fifty years because of the depletion of exploitable stocks. Moreover, the quality of extracted water can deteriorate by mixing with saline water even before reserves are depleted, thus reducing their 'useful' life.

Pollution of surface and groundwater. Insufficient, inefficient or non-existent waste water treatment systems have a direct negative impact on the quality of water and therefore on the ecosystems associated with them. According to a study of Ramsar sites (Frazier, 1999), pollution, water regulation, and urbanization and settlement impacts are among the five most frequently recorded change factors in Ramsar wetlands over the world. Of these, pollution is the most important one in Eastern and Western Europe.

In Greece, for example, hotels located near the coast are often not connected to any sewage system. For this reason, local authorities require hotels to build their own treatment plants, usually designed as pre-fabricated units. However, the lack of staff training and the seasonal aspect of wastewater production is causing operational problems, which reduce the effectiveness of treatment (EC, 2000).

Another source of water pollution is leakage from solid waste. In isolated areas or where the normal solid waste disposal system is not able to absorb peaks in waste production caused by the seasonal influx of tourists, the quality of freshwater can be affected by leakages from uncontrolled or inadequate disposal of solid waste.

Although Plan Bleu (2004) highlights that it is difficult to give any overview of water pollution due to the high variety of causes and processes (point or diffuse pollution, accidents or chronic pollution) as well as of the variety of temporal and spatial effects of pollution processes, it is clear that the pollution of water has a negative impact both on natural ecosystems and on economic activities directly related to tourism. The pollution of ground or surface water makes it necessary to increase the treatment processes to produce drinkable water and, in some cases, makes it impossible to use water for human supply (e.g. for its high salinity). The contamination of rivers, lakes, wetlands and other aquatic ecosystems, causes the decrease or even the disappearance of many terrestrial and aquatic species, and also prevents local people and tourists enjoying bathing and other leisure activities.

Finally, polluted rivers and lakes, together with direct discharges of poorly treated or untreated wastewater also affect the quality of the sea water into which freshwater drains. EEA (2000) estimated that tourism contributes to 7% of all pollution in the Mediterranean Sea (industrial and urban wastes, including sewage, polluted rivers draining into the sea, crude oil dumped by all activities, detergents, mercury, phosphates, euthrophication). Health problems such as infections of the ear, nose and throat, hepatitis and dysentery can result from swimming in polluted sea waters.

Occupation of wetlands areas. Coastal areas often host unique ecosystems in deltas estuaries and lagoons, where birds, fish and other aquatic and terrestrial species dwell and breed. More than 50% of the 25,000 plant species in the Mediterranean are endemic to the region (UNDP, 1999). Mediterranean wetlands are also critical areas for migratory birds: it is estimated that about 2 billion migratory birds of 150 species use the Mediterranean wetlands as seasonal sites or as a stopover before crossing the sea or the Sahara desert in their Africa-Palearctic flyway (UNDP, 1999).

Over-development of the coast means that attention is directed increasingly towards Mediterranean wetlands for accommodation and recreational facilities. In the Moroccan region of Saïdia Ras El Ma, the planned construction of a tourist resort on the estuary of the Moulouya estuary might severely affect a very important resting site for migratory birds[2].

All the reports on tourism and the environment stress that several coastal areas around the Mediterranean are under extreme pressure from the high number of tourists they receive every year, but there is little detailed information of the impacts on the coastal and marine environments. One study cited by EEA (2001), however, suggests that three quarters of the sand dunes between Spain and Sicily have disappeared as a result of urbanisation linked to tourism development. According to Plan Bleu (2001), in Tunisia, the development of international and domestic seaside

[2] www.eeh.ouvaton.org

tourism has contributed to a significant occupation of flat shorelines and beaches. Hotel infrastructure, at first concentrated near seaside towns and villages (e.g. Sousse, Monastir, Jerba, Hammamet), has proliferated everywhere on the coast. At this present rate, in one or two decades, hotel complexes will occupy the entire Gulf of Hammamet. According to estimates, the urbanised coastal areas cover 140 km and tourist areas occupied by hotels and second homes cover 80 km. This adds up to a total of 220 km of artificial coastline (18 % of the total Tunisian coastline). With ongoing projects, about 150 km of the shoreline will be occupied by tourist activities (e.g. hotels, leisure installations, and holiday villas). Building tourist infrastructures too close to the shore and especially on the shore dunes is accelerating the process of beach erosion, the occupation of *sebkhas* areas and the alteration of water dynamics that, for example in case of flash floods, causes significant damage.

Hence, urbanised areas and other economic activities are moving to wetlands, especially in coastal areas. Wetland disappearance or degradation contributes to the decline of species that depend on them to survive: the number of water birds has decreased by 46% during the last 15-20 years and twenty globally threatened bird species live in the region (UNDP, 1999).

Degradation of sensitive wetlands. Tourism intensity contributes to the degradation of certain sensitive wetlands near tourist hotspots. Recreation and tourism is listed as the second major use of Ramsar site wetlands both in Western Europe, Eastern Europe and in Africa (Frazier, 1999). This means that wetlands - especially the protected ones - are a tourist attraction and when their recreational use is not strictly regulated and monitored it can cause negative impacts on species dwelling in the area. Indeed, except for very specific and local cases (e.g. the degradation of small protected wetlands on the dunes of Doñana, Spain for the decrease of groundwater levels due to water supply for the tourist Matalascañas village), wetland degradation is due to a combination of causes (e.g. agriculture, tourist, industrial development). EEA (2003) reports a loss of habitats in transitional and coastal waters related to intense pressures due to "high human population densities", without specifying how much was lost and due to what.

A study on wetland loss by Wetlands International (1996) concludes that it is not possible to draw an overview at a regional level due to the diversity of methodologies used to measure wetland loss, and the lack of coordination between studies in different countries or for different wetland types. According to the same study, in Africa, the only quantitative information arises from the wetland inventory of Tunisia, which reports an overall loss of 15% of wetland area, and 84% loss in the Medjerdah catchment[3].

OECD/IUCN (1996) states that "some estimates show that the world may have lost 50% of the wetlands that existed since 1900; whilst much of this occurred in the northern countries during the first 50 years of the century, increasing pressure for conversion to alternative land use has been put on tropical and sub-tropical wetlands

3 Hollis, G.E. 1992. The causes of wetland loss and degradation in the Mediterranean. In Finlayson, C.M., cited in Wetlands International (1996)

since the 1950s". According to a pan-European study by Jones and Hughes (1993) and data from the European Commission (1995) overall wetland losses exceeding 50% of original area have been reported by France, Greece, Italy and Spain. Stuip et al. (2002) state that in 1999 84% of Ramsar-listed wetlands had undergone or were threatened by ecological change loss or degradation, mainly due to drainage for agriculture, settlements and urbanisation, pollution and hunting.

1.2 Causes

The main causes of the impacts on freshwater ecosystems described in the previous section are:

High water consumption due to population increase. Tourist areas suffer from significant fluctuations in the number of local dwellers that have to be supplied with freshwater and consumption peaks normally occur in the dry season, when tourist demand overlaps with high water demand by agriculture.

In the 1990s, it was estimated that nearly 135 million tourists (international and domestic) visit the Mediterranean coast every year, doubling the local population (EEA, 2000). In certain areas and at certain times of the year the population can increase two, three or even ten or more fold. Plan Bleu (1999) states that the population of 27 municipalities on the Costa Brava (Spain) swells from 150,000 in winter to 1.1 million in mid-August. This increase in population brings about a peak in water demand for domestic use. In France, the Provence-Côte d'Azur region receives 1.7 million tourists every summer. This implies an increase of 50% of the total population, which can reach peaks of 2.5 millions people during the 'hottest' summer vacation periods and which leads to double the normal water demand. In some Greek islands (Cyclades), water demand in summer can be from 5 to 10 times higher than in winter (Plan Bleu, 2004). In the Balearic islands (Spain), water consumption during the peak tourism month in 1999 (July) was equivalent to 20% of that by local population in a whole year, having increased by about 80% since 1994 (EEA, 2000).

Higher consumption of water for associated facilities and leisure. Tourists require constant access to water. A tourist staying in a hotel uses on average one third more water per day than a local inhabitant (EEA, 2000). Moreover, extensive landscaping, water parks, swimming pools and golf courses are typical tourist facilities that require water during the dry season. In Cyprus, where water resources are very limited, eight golf courses are under construction[4]. On average, a golf course needs between 10,000 and 15,000 m^3 of water per hectare and year (similar to the water requirements of a rice pond!). The surface of a golf course lies between 50 and 150 hectares, which means that the annual consumption of a golf course is around 1 million cubic metres per year or the equivalent of the water consumption of a city of 12,000 inhabitants (WWF Spain, 2003).

[4] Green paper on Water in the Mediterranean Basin, EFGP, Mediterranean Network, Narbonne, 21 and 22 November 1998, www.europeangreens.org

Peaks in wastewater volumes, inefficient or non-existent wastewater treatment facilities. According to EEA (2000), tourists consume up to 300 litres (up to 880 litres for luxury tourism) and generate around 180 litres of waste water per day. In the Rimini province (Italy) the production of wastes and wastewater in summer is three times higher than in winter. Indeed, the largest proportion of water is not consumed but used and disposed of as waste. The result is large volumes of sewage discharged to sewage treatment plants, or to the sea and rivers, because many tourist facilities are in isolated areas and are not connected to the water treatment network. In all cases, if water is not treated, recycled or disposed of properly, it will cause pollution.

Urban development associated with tourism. Tourism leads to urban development because it needs facilities not only to host, feed and entertain tourists, but also to transport them, care for them (e.g. hospitals), treat their wastes etc. Moreover, economic growth is normally associated with growth of the local population that provides services to tourists. All these facilities occupy land and transform the landscape and the natural dynamics of wetlands located near tourist resorts.

Accommodation (80% of all tourism and leisure construction) has a major impact on water resources, land use and ecosystems. The growth of the number of second homes during the 1990s created more intense pressures on land and the environment, especially in coastal and mountain zones. In France almost 335,000 second homes have been built during the past two decades, covering more than 22 million m^3 of land (EEA, 2000).

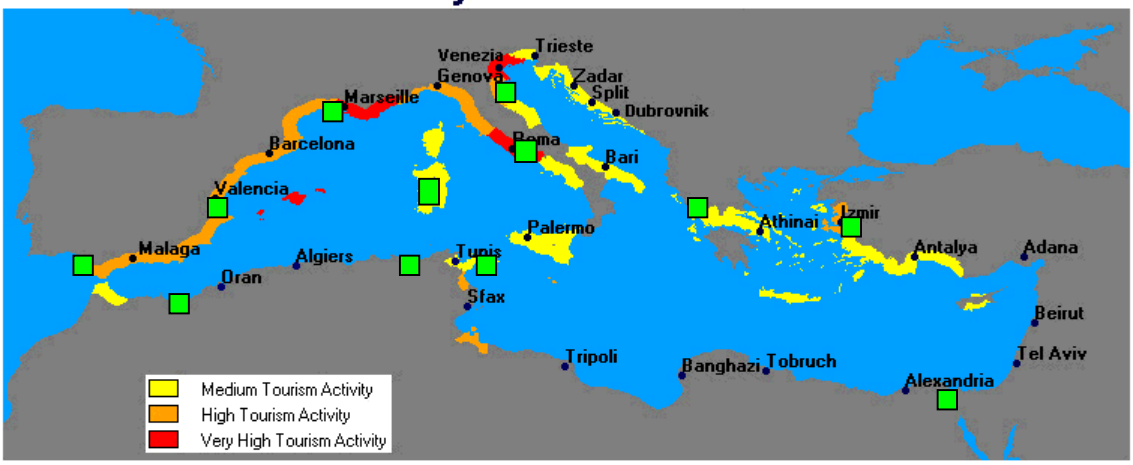
The Ravenna coastline (Italy) is suffering from significant subsidence and alteration in sedimentation dynamics due to human activities such as beach tourism, the regulation of rivers, - leading to a decrease in transported sediments - and the progressive extending of Ravenna Port jetties. The existence of more than 100 bathhouses on the 10.5 km of beaches of the area have damaged and destroyed the dune bar and are having a heavy impact on the existing residual dune bars and on the pinewood[5].

Transport infrastructures associated with tourism. The tourist industry requires efficient facilities to transport huge amounts of goods (food and all type of goods that can be sold to tourists) to tourist resorts and, of course, to bring tourists to their destination. The construction of transport infrastructures often negatively affect the environment. In Portugal, the construction of the Vasco da Gama suspended bridge on the estuary of the Tagus River was planned to improve the mobility of commuters working in Lisbon, but also to favour the flow of tourists from the Portuguese capital to the beach during the summer. The bridge was built next to the EXPO-98 site and, on the bank furthest from Lisbon, it crosses a nesting area of bird species protected under the Bern Convention and a nursery for fish in the adjoining wetlands[6].

[5] http://www.eurosion.org/shoreline/28marinadiravenna.html
[6] Beatriz Chito (no date). Environment as a Frame of Social and Economic Integration of Cultural Heritage: the Portuguese Case. http://www.arcchip.cz/w01/w01_chito.pdf

2 Tourism activity and trends in water consumption

Tourism Activity in the Mediterranean in 1995



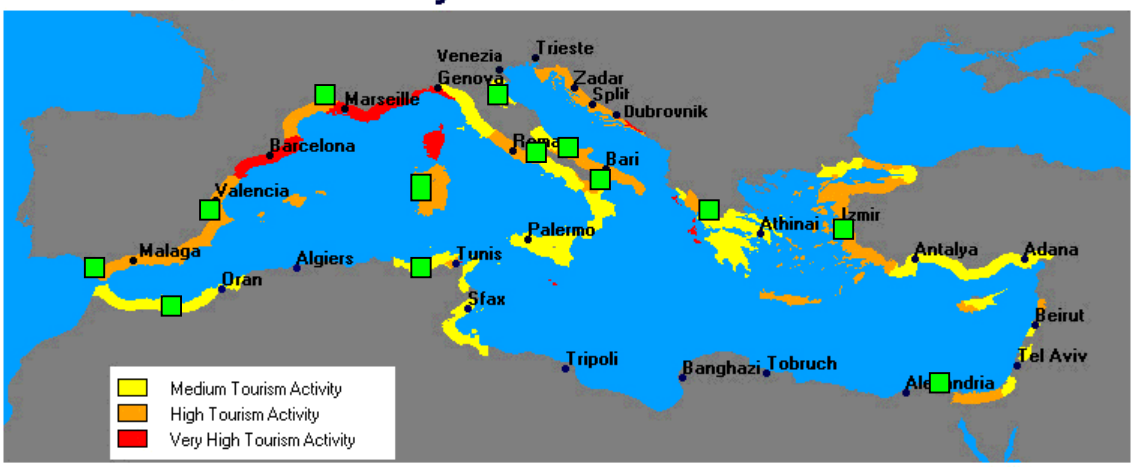
Kilometers

2,500.00

North

Notes:
Data based on number of tourists during peak period in the Mediterranean region. Blue Plan 1995.

Tourism Activity in the Mediterranean in 2005



Kilometers

2,500.00

North

Notes:
Data based on light intensity differential between winter and summer 1993-2000. National Geographic Data Center-USA.
Bosnia-Herzegovina and Montenegro results are due to increased light intensity following the war in the former Yugoslavia and are not associated with very high tourism activity.

Selected wetlands of international importance according to Ramsar (2001)

The Mediterranean is the world's leading holiday destination, accounting for 30% of international arrivals and 25 % of receipts from international tourism. As the above maps demonstrate, tourism activity along the Mediterranean coast has increased dramatically over the last decade. The number of tourists in Mediterranean countries is expected to reach between 440 and 655 million in 2025 (with 235 to 355 million on the coastal region), almost double the 1990 numbers (260 million, with 135 million on the coastal region). There has been and will be increased tourism activity in coastal areas where important wetlands are located (see above maps), as well as an expansion of tourism into wetland areas previously unvisited by tourists on a large scale.

In southern western Europe (France Greece, Italy, Portugal and Spain) tourist arrivals increased by 91% between 1985 and 2000 (EEA, 2000).

Over the last 40 years mass tourism has developed into an important source of income. At present, income through tourism accounts for about 1.2% of the total GDP in OECD countries (EEA, 1999) and, in countries with a strong tourist sector this share may rise to over 4% (Greece, Portugal, Spain). France has the largest number of arrivals with 77 million per year, followed by Spain with 52 million and Italy 32 million (WTO, 2002).

In most countries there are no specific figures on water consumption by the tourist sector, which is normally included in the urban supply statistics. Even figures referring to urban supplies are estimates of consumption and not direct measurements (Plan Bleu 2002) and to get an overall picture of water consumption trends in tourism, we can only observe trends in water consumption for urban supply.

According to Plan Bleu estimates (Plan Bleu, 2002; Plan Bleu, 2004) water demand for urban supply seems to be stabilising in European Mediterranean countries, after a strong growth in the 1970s and 80s. In France there is even a decreasing trend starting from 1989, due to the improvement of the distribution network and maybe due to the increase in water prices. In Greece freshwater production for Athens decreased by 14% between 1990 and 1996. On the contrary, increases are clearer and more regular in the southern part of the Mediterranean. It is expected that water demands will double in 20 years in Turkey, Syria, Libya, Algeria, Morocco. Growth has been slower and tending to stabilisation in countries with a high water scarcity, like Israel, Cyprus and Malta (Plan Bleu, 2002).

Where there is data on water consumption for tourism, a clear increase has been detected. In Tunisia water demand for tourism more than doubled between 1977 and 1996; the Balearic Islands (Spain) used 15 times more water between 1980 and 1995 (Plan Bleu, 2004).

It is important to notice that tourism is not the main water consumer: water demand for human supply is 13% of the water demand in the Mediterranean, while for agriculture it is 63% (Plan Bleu, 2004); although in Tunisia water for tourists amounts to just 6% of national water consumption (Plan Bleu, 2001) tourism exacerbates water supply problems by concentrating water demand in very short periods of time (Easter, Summer, Christmas, New Year) and in limited areas.

Moreover, tourism has demanding standards in terms of quality and guarantee of supply. This means that facilities and water availability must be ensured with water infrastructures (reservoirs, water transfer schemes) that are "oversized" during most of the year.

A quite common trend in Mediterranean countries is the decrease of the share of water consumption by agriculture – which is still the main water consumer – and, in parallel, the increase of the percentage of water consumed by urban areas and tourism. In the Balearic Islands, agricultural water demand decreased from 81.7% in 1980 to 63.2% in 1995, while water demand by the tourist sector has increased (Plan Bleu, 2004).

Tourism demand in some cases can cause problems for the local population. During the last period of drought (1994-1996), the town of Tangier (Morocco) suffered from a severe freshwater shortage and water supply to tourist facilities had priority over the water needs of the local population (Plan Bleu, 1998).

In general, Water Authorities answer water demands for economic sectors like tourism by applying a supply-oriented approach. This means that the Authorities work only on increasing water availability and, in this way, contribute to creating the false belief that water consumption can be endless. On the contrary, they should question (and increase) the efficiency of current water use and discuss the compatibility of economic growth based on the available water resources.

This short–sighted approach has increased the pressure on conventional resources and has favoured exploitation practices (groundwater over-exploitation, exploitation of non-renewable resources, construction of a high number of dams) that are unsustainable in the medium-long term because they are not able to ensure the present water supply levels. According to Plan Bleu estimates (Plan Bleu, 1999), several dams in the Mediterranean area will have serious operational problems in the long term due to silting up of reservoirs. Indeed, heavy sediment loads in floods in Mediterranean countries, especially in Southern ones, result in active silting-up of dams and decrease the dams' water regulatory functions. Usual losses of effective capacity are 0.5 to 1 % per year, sometimes more: 2 to 3 % in Algeria where the useful life of dams of medium capacity is 30 to 50 years; 2 % in Morocco; 1 to 2.5 % in Tunisia. Algerian reservoirs had lost, before 1990, 11 % of their initial total capacity, and the Moroccan ones 8 % in 1990. In Morocco the capacity of reservoirs built before 1988 will be reduced by half by 2050. The reduction in the water storage capacity is an unsolved problem so far (International Hydropower Association et al., 2000 cited in WRI, 2004) and will make looking for other water sources obligatory to sustain an economic development that, in many cases, is not compatible with the available natural resources.

On the other hand there is an emerging trend to reuse water which is particularly under development in Mediterranean countries where resources that are still available are becoming scarce. According to Plan Bleu (1999):

- The reuse of drainage water is intensive in Egypt and already represents more than 12 km^3/year. Along with pumping of groundwater oversupplied by irrigation water (4 km^3/year) and with slight re-use of urban waste water (0.7 km^3/year), it raises the water taken from primary resources and used twice, up to 36 %.
- The reuse of urban waste water is significant in Israel where 65 % of discharged waste water is already treated and re-used – mainly in agriculture – and should reach 87 % in 2020. In 1997, reused waste water represented 14 % of all sources of supply.
- The reuse of waste water has also started in Cyprus, Syria, Libya, Malta, Tunisia, Spain

However, it is important to notice that reused water in urban areas is suitable only for specific uses like landscaping irrigation and that to be employed in golf course irrigation, for instance, it often needs to be mixed with good quality water in proportions sometimes up to 50% (WWF Spain, 2003). In addition, bulk quantities of water produced during summer peaks are difficult to manage for reuse, especially as a lot of this water is used in coastal areas where it cannot be used to feed aquifers or rivers and is often rejected directly into the sea.

3 Opportunities to reduce water consumption and its impacts on the environment

Applying existing technology to save water in Mediterranean hotels could bring about a significant reduction in water demand and could possibly accommodate a further increase in tourism without more dams being constructed. According to the EEA (2001) water saving devices can save up to 50% of water. Assuming a doubling of the number of tourists in the Mediterranean by 2025, a savings potential of 50 % would amount to a total of 273.000.000 cubic meters of water[7] per year. Many effective water-saving devices can be purchased at a reasonable price with some of the devices not requiring any structural modifications. The following table presents some examples of water-saving devices and their costs[8]

Type of water savings device	Expected water savings (%)	Cost (Euro)
Temporised taps	30-40	22.84 – 124 (average: 84)
Water-saving devices for traditional taps	40	6
Water saver for toilets	50	3-24

Source: http://agua-dulce.org

3.1 By the tourism industry

The tourism industry should be directly concerned with the impact of its activities on freshwater because[9]:

- Decreasing overall water use can lead to cost savings. Restrict water use especially during periods of drought.
- Reducing water use can conserve and protect the local water resources upon which a hotel and the local community depend. This is even more relevant if overexploitation or water pollution is causing deterioration to the freshwater ecosystems that symbolise a tourist destination.
- Preserving the quality of local water resources can reduce the need for costly drinking water treatment processes.

[7] under the assumption of 260 Mio tourists in coastal areas of the Mediterranean, using 300 litres per day and staying an average of 7 days

[8] based on data from: http.//www.agua-dulce.org

[9] Adapted from A Practical Guide to Good Practice Managing Environmental and Social Issues in the Accommodations Sector. The Centre for environment leadership in Business. Tour Operator's initiative for sustainable tourism development.

- Water conservation can enhance reputation among guests and others who are concerned about reducing water consumption and protecting local resources.

When considering impact on the environment, it is useful to distinguish between mass tourism, nature-based tourism and ecotourism (see below) and to identify the most common direct impacts associated with each:
Mass tourism is usually confined to relatively small urban areas where the highest water demand occurs. Due to the high density of land and water uses, if mass tourism is not properly managed and its growth is not carefully planned, its consequences on the environment can be severe. The most common negative impacts on freshwater ecosystems are: high demand on water, due to high density of accommodations and due to existence of leisure facilities[10]; high production of wastewater, with significant peaks that sometimes cannot be accommodated by water treatment plants; land occupation by accommodation facilities and leisure areas; and developed transportation network to transport tourists and goods.

Nature-based tourism includes low-density rural tourism in small towns and communities and so-called sport-tourism which needs natural areas (lakes, rivers, mountains) to develop. This kind of tourism often visits or uses areas with a high ecological value. The main threats of this type of tourism are linked to urban development to accommodate tourists, the transport network to ensure tourists' mobility and the disturbance of wildlife due to the presence of tourists in sensitive areas.

Eco-tourism is characteristically low density and is normally less demanding in terms of water-consumption facilities. The main problems of this type of tourism are linked to wastewater treatment (isolated resorts are not usually connected to the water treatment network), waste disposals (illegal waste disposals often occur in wetland areas; inadequate waste disposal can pollute groundwater) and to the transport network to access relatively remote places.

UNEP (2001) identified, some 250 voluntary initiatives to raise awareness and set standards of 'sustainable tourism' within the tourism industry around the world. These include codes of conduct, awards, benchmarking, best practices, ecolabelling and certification programmes and most of them include a small section on water use and wastewater. It is interesting to note however, that the internet search carried out when drafting this report showed that in the Mediterranean there are very few examples of initiatives that publicise measurable achievements related to freshwater.

The following section outlines two of the more effective means of influencing the sustainability of tourism. These are the establishment of certification programmes and the elaboration of best practices manuals.

[10] tourist destination in urban areas normally complement their offer with water-consuming facilities such as swimming pools, water parks, golf courses…

3.1.1 Certification systems[11]

According to UNEP (2001), around the world there are some 70 ecolabelling and certification programmes offering logos or seals of approval. These programmes focus on sustainable tourism in general, and wise use of freshwater in particular.

Green certification programmes involve a combination of stakeholders – industry, consumers, NGOs, host governments and local communities – and cover a variety of geographical areas. They range from global programmes such as Green Globe 21, ECOTEL, and the International Hotels Environment Initiative (IHEI), to regional national or even provincial efforts. Most certification programmes target the easiest component, accommodations. Europe alone has about 30 programmes for accommodation services. Today the most popular EMS certification programme is ISO 14001, which is being used, for example, by Green Globe, IHEI, Green Flag for Green Hotels in Europe, and a number of individual hotels and chains around the world.

Existing certification is divided into three types of programme:

Tourism certification programmes: Most often used by the mass tourism industry, particularly large accommodations or hotel chains, these programmes focus on the physical plant or the internal business, not wider conservation and community impacts. They issue logos based on setting up environmental management systems that emphasize environmentally friendly and usually cost-saving procedures and renovations, compliance with existing legislation, and best practices that go beyond compliance. Often these certification programmes are created and run by industry trade associations without wider stakeholder involvement. According to UNEP (2001), while tourism certification programmes can lead to some "green" innovations, they are insufficient to generate sustainable tourism practices.

Sustainable tourism certification programmes: These are primarily or totally performance-based programmes, using independent auditors and multifaceted questionnaires drawn up in consultation with a variety of stakeholders. Questionnaires include criteria on environmental, sociocultural and economic impacts both within the business and on the surrounding community.

Ecotourism certification: This type covers companies that describe themselves (through brochures, websites, etc.) as involved in ecotourism. They are normally located in or near protected areas or other fragile and pristine ecosystems and emphasize a business's impact on the local community and the ecosystem in which it operates. While "green" innovations for mainstream tourism reduce energy consumption and waste, ecotourism standards go beyond questions of ecoefficiency and are more responsive to national and local stakeholder concerns. While sustainable tourism certification strives to reduce negative impacts, ecotourism

11 The main source of information for this section was Certification programmes in the tourism industry. Martha Honey. UNEP Industry and Environment July – December 2001.

certification gauges whether companies contribute positively to conservation of protected areas and ensure benefits reach local people.

Due to the variety of certification systems, it is difficult enough to evaluate the effectiveness of certification in reducing the impact of tourism on the environment, let alone on freshwater ecosystems. In Europe the EEA (2001) reported that there was a five-fold increase between 1990 and 2001 in the use of ecolabels for accommodation, but there is no evaluation of this data.

3.1.2 Best practices manuals

On the Internet there are a number of manuals and educational programmes aimed at the tourism industry (tour operators, hoteliers) to raise awareness about the advantages of saving water and preventing freshwater pollution. The vast majority of the advice focuses on accommodation facilities and the content of these information tools is quite similar in all these initiatives. A summary of the advice is presented below[12].

Setting Targets

- Set a feasible target for reducing water use (e.g. 5% reduction per year, over 3 years). It is very helpful for hotels to measure reductions in water bills or pumping times and showcase successes to staff and guests, to capitalize on water saving efforts.
- Check the relationship between the number of tourists that the accommodation facility can host and the volume of water used by setting a benchmark (e.g. 350 litres per bed night) and monitoring how the figure changes.
- Identify the main areas of water consumption in the accommodation facility where significant water savings may be achieved.
- Regularly monitor water consumption for each area of the hotel/ accommodation facility (kitchen, laundry, rooms, etc.). Daily or weekly monitoring helps to identify leaks and to quantify water savings when efficient equipment is installed or a good practice is implemented.

Design and Planning

- Design water systems e.g. roof-fed water tanks to collect storm water for use in cleaning or landscaping.
- Install low-flow or dual-flush toilets and waterless urinals.
- Install smart pressure valves to regulate flow, solenoid valves to release water only when required and level controllers to avoid overflow.
- Install tap aerators and low-flow showerheads which use 60% less water than conventional equipment. Low-flow fixtures in showers can reduce the flow of water by 50% without affecting the comfort level of the user.

[12] Adapted from: "Responsible tourism handbook: a guide to good practice for tourism operators Practical guidelines for tour operators on implementing responsible tourism". Greening the WSSD initiative / Eldis Document Store, 2003; and "A Practical Guide to Good Practice Managing Environmental and Social Issues
in the Accommodations Sector". The Centre for environment leadership in Business. Tour Operators initiative for sustainable tourism development (no date).

- Acquire water-efficient washing machines and dishwashers which use as little as 15 litres of water per cycle.

Awareness raising

- Encourage guests to use their towels or bed linen for more than one day. Provide guests with tips about water-saving measures such as turning off the taps in the sink when shaving or brushing their teeth.
- Work with employees to identify water-saving practices, such as avoiding leaving water running, or operating washing machines and dishwashers only when full.
- Engage the housekeeping and engineering departments in an active campaign to detect and repair leaking toilets, faucets and showerheads.

Saving Water

- Check service water pipes, valves, joints, pump seals, hoses, boilers and appliances regularly to prevent problems before they occur. The absence of preventive maintenance generates small but regular leaks, which can correspond to an important loss of water.
- Install data loggers on meters for constant monitoring.
- Look for fluctuations in pressure, flow and water use patterns to detect problems.
- Fix leaking pipes and dripping taps immediately.
- Use storm or grey water for irrigation or put timers on sprinklers to ensure you control water usage.
- Water gardens at cooler times of the day when there is less evaporation.
- Use drip irrigation systems and choose drought-resistant native plant species for landscaping. Water saving irrigation technologies can increase water use efficiency by 60 – 90%.

Treating Effluent

- Connect to the sewage system or install an individual wastewater treatment plant. It is important to ensure the good functioning and the maintenance of the plant.
- Separate effluent water into reusable and non-reusable streams. Use grey water from baths, showers and basins for landscaping and in toilets.
- Use biodegradable, phosphorous-free detergents, which lower the nutrients in effluent, and reduce consumption of washing powder.
- Avoid toilet ducks, odour neutralisers and aggressive toilet and drain cleaners
- Avoid getting solids such as food waste into effluent.
- Regularly maintain and clean kitchen grease traps.

Septic Tanks

- Undertake tests to determine soil infiltration rates and groundwater levels.
- Locate septic tank away from domestic water supplies, groundwater, rivers or lagoons.
- Treat septic tank effluent at a central point to remove nitrogen and allow bacteria and pathogens to die off.
- Use dry composting toilets to reduce the load on septic tanks and other waste systems.

3.2 By individuals[13]

Individuals can contribute to minimising the impact of tourism on water resources mainly by improving their behaviour as water users. Equally important, they can put pressure on the tourist industry and decision-makers to be more aware and careful of freshwater ecosystems. In both cases, it is very important for individuals to have information on how to improve their environmental behaviour, which situations and practices harm the environment and how to minimise the negative impacts of tourism on freshwater ecosystems.

Personal habits

- Install water saving systems in second houses
- Ensure that taps are always turned off completely and promptly inform the reception/landlord of any leakage in the room: 10 drops in a minute are 20,000 litres in a year.
- Turn off water while shaving: fill a glass of warm water instead of leaving the tap running. A running tap consumes 25 litres, while with careful use one can consume less than 3 litres.
- Keep showers short. Turn off the water while soaping and shampooing. Turn water back on to rinse quickly. A typical shower lasts about 8 minutes and consumes 80-120 litres. An efficient shower last 3-4 minutes and uses 40-60 litres.
- Turn off the water while brushing one's teeth. Use a glass of water instead of leaving the tap running. A running tap consumes 10-20 litres, while with careful use less than two litres are used.
- Flush the toilet only when necessary. The largest quantity of water used per person every day goes down the toilet – each flush uses about 12 litres of water.

Influence on the tourist sector and decision makers

- Do not request high-water-consuming facilities such as golf courses or individual swimming pools in highly water-stressed areas.
- Request water-saving measures and point out wasteful practices to the management (e.g. inadequate irrigation systems or schedule for changing towels and bed linen everyday).
- Favour accommodation facilities with water-saving initiatives.
- Favour tourist areas that are known for their efforts to improve their environmental performance. This is the best way to push local authorities to start initiatives like the definition and implementation of Local Agenda 21.

[13] Part of these advices are taken from the leaflet 'Every drop counts" produced by WWF Greece, May 2002.

3.3 By Governments[14]

Local and national authorities
Traditionally speaking, tourism development depends to a great extent on initiatives taken by the private sector (i.e. all companies operating in the tourism sector), but now authorities – especially the local ones - are increasingly involved in developing and managing tourism activities. National authorities also have an important role to play in creating conditions for more sustainable development of domestic tourism. In the list below, the administrative level at which each action should be undertaken has not been specified, as the competencies for the recommended actions widely vary depending on the country.

To reduce the negative impact of tourism on freshwater ecosystems, competent authorities should:

- Prepare overall strategies for tourist destinations based on dialogue with the private sector, local authorities and NGOs: a kind of 'vision' of what kind of future each tourist resort aims at.
- Participate in the enhancement and management of tourist destinations, balancing the interests of the environment with those of residents, tourists, operators.
- Generate partnerships between public and private actors to foster the achievement of environmental objectives.
- Promote the re-investment of part of the profits of tour operators in local development projects.
- Launch campaigns to inform the tourist communities (tourists and providers of services and goods to tourists) about the advantages of embarking on strategies and action plans for sustainable tourism, and support them in their efforts.
- Strengthen capacity building in local communities and encourage networking, particularly between communities in the same major tourist region.
- Strictly regulate tourist growth taking into account its impact on freshwater ecosystems.
- Protect wetlands and areas with an high ecological value from pollution and construction.
- Increase the efficiency of the water distribution system.
- Apply water use and sewage charges according to water consumption and including not only the total costs of capital, operation and maintenance of water infrastructures, but also associated environmental cost of supply and wastewater treatment.
- Improve water treatment network and plants.
- Oblige isolated tourist resorts to treat their wastewater and control the effectiveness of wastewater treatment systems.
- Install water saving systems in new or renovated buildings.

14 The main sources of recommendations were "Tourism and Local Agenda 21s" Anne Vourc'h, UNEP Industry and Environment. July – December 2001 and Tourism and Biodiversity: Tools for Good Global Governance. Tourism and biodiversity. Environment in a Global Information Society. Symposiums. Les entretiens de Port-Cros. Peter Dogsé (2000).

- Strictly enforce rules and regulations related to tourism (land use planning, water use and treatment); if the risk of being found guilty is low or the penalties are small compared to the profits, there is little incentive to abide by rules.

The international level

Organizations working at an international level (e.g. United Nations Environment Programme, United Nations Development Programme, UNESCO, World Travel Tourism Council, International Council for Local Environmental Initiatives, and World Tourism Organisation) play an important role in raising awareness of tourism's impacts on sustainable water use.

These organizations should:

- Identify and disseminate good examples from tourist destinations throughout the world that have embarked on initiatives for the sustainable use of water. Tourist communities face specific problems concerning sustainability, and there is need for information exchange.
- Prepare and circulate documents concerning methods and guidelines, tailored to the particularities of tourist destinations.
- Acquire more knowledge about public demand for sustainable tourism and circulate it among tourist communities. Indeed, the reality of market demand and visitors' willingness to pay for environmentally friendly tourism is still questioned by many tourist communities.
- Develop international public opinion and make tourists aware of sustainable tourism, and support and increase awareness of codes of behaviour relating to tourism.
- Identify, broadcast and promote labelling for sustainable destinations, based on reliable and transparent criteria.

4 Water saving in a tourist resort: Calvía, Balearic Islands (Spain)[15]

Calvià, is the most important tourist municipality of the Balearic Islands (Spain) and is a paradigmatic example of a tourist destination on the Mediterranean coast. Calvià's territory extends over143 km^2 and has a 60 km coastline. It hosts a stable population of 50,000 inhabitants and receives more than 1.2 million tourists every year. The development of Calvià as an international tourist resort started in the 1960s and, since then, the municipality has experienced chaotic urban development and the unsustainable use of its natural resources. In the 1990s, after 25 years of uncoordinated development, Calvià started suffering the consequences of such a short-sighted and chaotic growth: environmental and landscape degradation, uncontrolled mass tourism, loss of quality in the services provided to tourists and loss of its positive image as a pleasant tourist destination. In 1995, the municipality of Calvià decided to start the implementation of the Local Agenda 21 to stop the deterioration of the area and give a new orientation to the tourist sector, which represents the main economic activity of the municipality.

Local Agenda 21 defines a number of objectives to aim towards in seeking the sustainability of the municipality and targets the wise use of freshwater. The Calvià municipality set itself a target - to consume, by 2007, the same amount of water as was consumed in 1997 (10 hm^3). An increase of 70% in water consumption (17 hm^3) for the period 1995-2007 had been predicted, due to the increase in the population and the construction of new buildings.

The achievement of the new water consumption goal required:

- A 7% reduction in water consumption per capita by 2001, reaching a consumption of 121 litres/inhabitant/day and a reduction of 10% (117 litres/inhabitant/day) by 2007.
- A reduction by 10% of the water consumed per tourist, achieving a consumption of 141 litres/tourist/day by 2001 and of 15% (134 litres/tourist/day) by 2007.
- Recycling of urban water to cover up to 8% of total water demand by 2001 and 11% by 2007.

The Municipality of Calvià is working towards the achievement of this objective through a number of measures - improvement of the distribution network, production and distribution for re-use of treated water, installation of individual water meters and, the most original, the creation of the "Blue Brigades" Programme.
The Blue Brigades are teams of two people (5 teams in 2001), normally students or trainees at the Calvià water company, that visit homes to inform citizens and tourists

[15] Main source: www.calvia.com. The web page is updated to September 2001 and these "green" activities have slowed down since then because in 2003 the rightwing Popular Party won the election in the municipality and also got the absolute majority in the Balearic Islands. Most of these initiatives were promoted by the previous municipal and regional government (a coalition of leftwing parties).

about the opportunities for saving water and installing free water saving systems in taps, showers and toilets. The Blue Brigades work only in summer, when there is the highest number of tourists, and, between 1999 and 2001, they installed 5,000 water-saving systems, all of them free.

5 Country –specific summaries

The following country-specific information does not claim to be comprehensive, but summarises some of the impacts of tourism on freshwater described in the previous pages.

5.1 Spain

Spain is the second world tourist destination (51,748 million tourists in 2002, WTO) and the annual income from the tourist industry in 2002 was 33,809 million USD (more than 7% of the world income for tourism).

The combination of intense tourist activity and agriculture, especially on the Spanish Mediterranean coast, has resulted in many problems related to freshwater ecosystems. The most important of these are aquifer overexploitation (20% in total, 25% in the Júcar river basin, 4% in the Balearic islands), salt intrusion in coastal aquifer and the construction of a very high number of water works. Spain has the highest number of dams per capita in the world and several water scheme transfers.

Seasonal peaks in water demand by tourism are extreme and their increase over the last few decades has been spectacular. Plan Bleu (1999) points out that the population of 27 municipalities on the Costa Brava (Spain) swells from 150,000 in winter to 1.1 million in mid-August. The EEA (2000) reports that water consumption during the peak tourism month in 1999 in the Balearic islands was equivalent to 20% of that used by the local population in a whole year. Tourist water consumption has increased by about 80% since 1994.

An area where tourism is having a great impact on freshwater ecosystems is the Southeast region of Spain (Alicante, Almería and Murcia provinces), where the tourist sector has grown 50% in the last five years and a further strong growth of the tourist market is foreseen. Murcia plans to double its tourist potential in the next ten years, to reach nearly one million hotel places and 100,000 new residences. This increase puts pressure on freshwater resources, especially during summer when the population in the southeast region is four times as big as during winter. With a corresponding quadrupling of water demand in the summer, water supply systems are forced to base their dimensions on these three months per year.

Second-house tourism has the greatest growth potential in the tourist industry of the Spanish southeast: of every 100 houses built in Alicante, 60 are for the second house market. Foreign tourists (80% from Germany and UK) own 240,000 houses in the province of Alicante, which is the province in Spain with the highest numbers of residents coming from other EU countries.

This residential tourism, normally characterised by high acquisition power, brings about water supply problems. Indeed, residential complexes with gardens and swimming pools need significantly more water than flats with terraces (according to a study by the public-owned water company, in Madrid the difference in water use between these types of dwellings can be up to 100%). Moreover, residential areas are often associated with the creation of high water consuming leisure activities like golf

courses. Indeed, it is expected that the number of golf courses in the Valencia province will multiply by three in the next 10–50 years and that the Murcia province will host 39 golf courses in the next ten years.

Main source: WWF (2003).

5.2 Italy

Italy is the third most popular tourist destination in the world (32,329 million tourists in 2002, corresponding to 5.66% of tourists in the world). Italian coasts and mountains play an important role in the tourism industry. For example, the Alps receive 60 million arrivals per year, mainly due to their skiing facilities. An EEA study (2000) points out that tourism in mountain areas is responsible for changes in the landscape and disappearance of biodiversity. Moreover, it causes water supply problems for the production of artificial snow or high seasonal peaks of population, and difficulties in sewage and waste disposal management.

These types of problems are even more severe on the coast. In the province of Rimini the production of wastes and wastewater in summer is three times higher than in winter causing serious problems for the waste management system (EEA, 2000). Again, the seasonal rise in population increases the pressures on water resources. According to the EEA[16], during 2000, 15% of Italian families suffered irregularities to their domestic water supply, a figure which was higher in regions with a strong tourist presence like Sardinia (47.3%) and Calabria (47,9%). Aquifer over-exploitation and salt intrusion are registered in many coastal aquifers in tourist areas.

Another problem linked to tourism development is uncontrolled or irrational urbanisation of coastal areas. According to a WWF analysis in Italy, over 43% of the 7,600-km-long coastline is completely urbanised mainly linked to tourism development, 28% is partially urbanised and less than 29% is still free of construction. In addition, there are only 6 stretches of coast over 20 km that have no construction and only 33 stretches between 10 and 20 km without construction.

5.3 Greece

In Greece, the income from the tourism sector in 2002 amounted to almost 10 million USD (WTO, 2002). It was estimated that in 2000, 12 million foreign tourists arrived in Greece (excluding domestic tourism). The majority arrive during the summer season and cluster in the areas that are already water stressed (e.g. Aegean islands).

Tourism has been increasing in Greece over the last decades: between 1987 and 1997, international tourist arrivals increased by 31.5% and the accommodation capacity in terms of number of beds increased by 49.5%. Tourism development puts considerable pressure on coastal and mountain land, on habitats, natural sites and cultural heritage, transport facilities, energy and water resources, waste water treatment facilities, on air and sea water quality due mainly to the concentration of tourist activities in specific areas.

[16] www.eea.eu.int.

Around 85% of total freshwater withdrawals are from surface water although the intensity of groundwater use has doubled in the last 20 years and many aquifers are overexploited, leading to salinity problems, especially in coastal cities. At the country level, domestic use (including households and tourism) is the second main use, consuming around 10% of the available resources. However, in many areas that additionally suffer from water stress, domestic use is the main, or even the only water use. The unequal distribution of activities and the population aggregation in the drier and more water-stressed parts of the country result in problems of water supply.

In the OECD Greek report (OECD, 2000), it is stated that parts of mainly the southern and central mainland, the Aegean islands and Crete are faced with serious water scarcity problems, and some are even in danger of desertification. Water supply and distribution systems in Greece are quite old and not very well maintained, resulting in leakages that occasionally reach more than 35% of the water handled.

Main source: http://www.un.org/esa/agenda21/natlinfo/countr/greece/tour and Weiler & Maragou (2003).

5.4 France

France receives over 77,000 million tourists a year, accounting for almost 11% of world tourism, making it the first tourist destination in the world and the country with the third highest income from tourism (after the U.S.A. and Spain). France presents many of the typical features of Mediterranean tourism, mainly seasonal fluctuations in water demand, especially in coastal areas, and strong urban development related to tourism. Plan Bleu (1999) reports that the Provence-Côte d'Azur region receives 1.7 million tourists every summer. This implies an increase of 50% of the total population, which can reach peaks of 2.5 million people during the hottest summer vacation periods leading to double the normal water demand.

As for urban development, the EEA (2000) points out that in France the number of second homes increased by 10% between 1990 and 1999, creating intensive pressures on the environment, especially in coastal and mountain zones. The results of the European programme "Lacoast" showed that in Côte d'Azur there is a sport harbour every 3 km and that most of these harbours are accompanied by urban development operations (Plan Bleu 1998).

According to EEA (2000) almost 335,000 new second homes have been built during the past two decades, occupying 22 million m^2 of land. The main disadvantage of second homes, which represent 73% of total tourist lodging capacity in France is that, to provide the same accommodation capacity, they require far more land area and are seldom used (often only two weeks a year compared to more than 20 weeks for hotels).

5.5 Turkey

With around 12 million visitors to Turkey each year, according to the OECD income from international tourism accounts for approximately 15% of total export incomes and 4% of the GDP. A WWF analysis points out that in 2005 Turkey will experience a massive surge of new tourism development and, by 2020, it will be a leading tourist destination in the Mediterranean together with Greece and Croatia. In Turkey tourism is concentrated mainly along the Aegean and Mediterranean coasts (in 1997 about 70% of tourism bed capacity was located in these areas), occurs between May and September and generates strong environmental pressures. A 1998 WWF survey on the Turkish Mediterranean coast found that 40% of the 2,456 km coastline was severely affected by tourism, and that about half of the beach areas used by nesting turtles had been destroyed by sand extraction.

Along the Aegean and Mediterranean coastlines there are many small and medium sized municipalities located very close to each other and their resident population doubles or even triples during the tourism season. In some areas deficiencies in infrastructure systems and mushroom-like development have created serious problems like aquifer overexploitation and water pollution due to discharges of large volumes of untreated wastewater into the sea.

Wastewater treatment is a big challenge for the tourist industry: in order to obtain approval for tourist facilities, operators are technically obliged to install independent waste facilities. Once the municipalities have installed their own infrastructure, holiday villages are then allowed to connect to the system. Nevertheless and despite existing regulations, around 90% of plants and 80% of tourist facilities have no water treatment facilities, only 20% of domestic wastewater is treated and only 6% of total annual solid wastes are disposed of.

Source: WWF Turkey (2002) and UK Trade & Investment web site[17].

5.6 Tunisia

The tourism sector occupies a major place in the national economy of Tunisia, accounting for about 5.5 % of the GDP. It is the second largest export sector after textiles, and employs around 70,000 people.

The Tunisian tourist sector has experienced significant growth: in 1960, Tunisia only received 0.2% of Mediterranean tourists; nowadays Tunisia hosts 5.5%. Accommodation has increased from 4,000 beds in 1962 to 200,000 in 2000, with capacity forecast at 300,000 beds for 2015.

The tourism industry has based its development on foreign, mainly European tourists, and it is concentrated along the coast, especially around the Nabeul-

[17] http://www.trade.uktradeinvest.gov.uk/environment/turkey/profile/overview.shtml

Hammamet, Sousse-Monastir and Jerba-Zarzis centres. National tourism is already well developed, and can only increase with the growth of holiday travels by Tunisians, Algerians and Libyans.

According to Plan Bleu (2001), uncontrolled tourism and other developments along the coast contribute to the degradation of a highly sensitive environment. The planning of residential zones for tourist personnel has been neglected, contributing to the multiplication of peri-urban areas of spontaneous dwellings. The erosion of beaches and pollution of bathing water are serious threats to a tourist destination which relies on the beauty of the sites and the cleanliness of the environment of seaside resorts.

The progressive growth of the tourist sector has brought about a significant increase in water demand by tourism, which multiplied by 2.5 in 20 years, between 1977 and 1996 (Plan Bleu, 2004). This, together with the increase in irrigated agriculture, has led to problems of aquifer over-exploitation, salt intrusion in coastal aquifers and the need to increase the storage capacity of dams. However, the biggest threat for the coastal area is the improper management of wastewater.

An example of tourism seriously threatening freshwater ecosystems can be found at Korba in Kelibia (Cap Bon). The eastern section of Cap Bon contains a string of lagoons extending 10 to 15 km in length and occupying the low-lying sections of the littoral plain over about fifty kilometres. This area hosts six globally threatened species and other species classified as "vulnerable" by IUCN. Moreover, this area of the coastline is potentially favourable as a nesting site for the sea turtle (*Caretta caretta)* and could serve as a migration refuge for the slender-billed curlew (*Numenius tenuirostris)*, a highly endangered species which has already been observed there.

The pressures on this zone are mainly due to the expansion of urban areas with backfilling of the lagoons, tourism development projects and illegal urban development. Added to this are various forms of pollution due to the disposal of liquid and solid waste from households or industries near the lagoons, where fresh water inputs and sediments are reduced as a result of the construction of several dams upstream. This is further aggravated by excessive withdrawals and salinisation of ground water.

Main sources: Plan Bleu (2001) and UNDP (1999b).

5.7 Morocco

Tourism is a vital economic sector of the Moroccan economy, both in terms of income and the creation of employment. According to WTO, in 2002 Morocco received about 4 million tourists, which generated an income of more than 2 million USD. However, this sector is still quite under-developed and has a high growth potential (Plan Bleu, 1998).

The Estuary of the Moulouya is an example of an important wetland area that is threatened by tourism development. At the estuary, the river has created relatively narrow gorges and after meandering within a rich riparian forest, reaches a wide alluvial plain. The marsh zone covers some 400 hectares and is complemented by the Chararba marshlands. Among the 67 globally threatened taxa dwelling on the Mediterranean coast of Morocco, 18 are present in the Moulouya estuary. Particularly noteworthy among the plants is one species endemic to Morocco, *Spergularia embergeri*, currently endangered. The monk seal (*Monachus monachus)*, also endangered, frequents this area. The slender-billed curlew (*Numenius tenuirostis)* and the Andalusian hemipode (*Turnix sylvatica sylvatica)* were observed recently and it may very well be that the estuary of the Moulouya river remains potentially favourable to these two birds amongst the rarest in Europe and probably in the world.

This area is still largely untouched by urban development but might be adversely affected by the recent expansion of the tourist industry. Indeed, local beach tourism is very important - the area of Saïdia is one of the favourite spots for the Moroccan population - and there are plans to increase the urban area to build a new tourist resort very close to the estuary[18]. Moreover, the area is experiencing problems due to the high number of visitors and the resulting degradation (improper waste disposal, disturbance of birds, etc.).

Main source: UNDP (1999c).

[18] www.hee.ouvaton.org

6 Conclusions

1 Tourism contributes to the overexploitation of water resources and the degradation and destruction of freshwater ecosystems in the Mediterranean.

2 In the tourism sector, there is still a high potential for water savings. Water consumption can be reduced by up to 50% if appropriate measures are taken by the tourism industry, the government and the individual tourist.

3 Available water resources could suffice to satisfy the water demand of the forecasted doubling in tourist numbers in the Mediterranean if appropriate water saving measures are taken.

4 Water saving devices are readily available for new installations as well as for retrofitting.

5 Installing water saving devices is an investment that can render long term economic as well as environmental benefits.

6 Governments should favour a legislative environment that creates incentives to save water and ensures the existence of freshwater ecosystems.

7 Tourism development in coastal areas should follow a land management plan that takes wetland conservation and environmental protection into consideration.

8 Good examples for reducing water consumption exist in the Mediterranean but it is time that a concerted effort is made to replicate them on a wider scale.

9 Preserving wetlands also means preserving one of the attractions that tourists come to see.

7 Annex

7.1 The Plan Bleu (Blue Plan)

The Blue Plan is a process of reflection on the Mediterranean as well as a non-profit organisation who leads this process and a research centre.

The objective of Blue Plan is to promote the sustainable socio-economic development of the Mediterranean region by providing countries with data, studies and proposals for action on the relationships between populations, the environment and development.

The Blue Plan research centre is located on the French Riviera and is a Regional Activity Centre of the Mediterranean Action Plan (MAP), which itself works under the auspices of the United Nations Environment Programme. The centre is run by a non-governmental, non-profit association called "*Plan Bleu pour l'environnement et le développement en Méditerranée*" (Blue Plan for the Environment and Development in the Mediterranean).

The Blue Plan's work is funded by MAP and specific allocations in cash and kind from France as well as through allocations granted by the European Commission and other international and regional organisations such as the World Bank.

Source: http://www.planbleu.org

7.2 The Ramsar Convention on Wetlands

The Convention on Wetlands is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Convention's member countries (Contracting Parties) commit themselves to:

- Designating at least one wetland that meets the criteria for inclusion in the *List of Wetlands of International Importance* (Ramsar List) and ensuring the maintenance of the ecological character of each of these Ramsar Sites. Parties are encouraged to include in the List as many wetlands that meet the criteria as possible. Listed sites do not necessarily require protected area legal status, provided their ecological character is maintained through a wise use approach;
- Promoting the wise use of all wetlands within their territory through their national land-use planning, including wetland conservation and management;
- Promoting training in wetland research, management and wise use;
- Consulting with other Parties about the implementation of the Convention, especially with regard to transfrontier wetlands, shared water systems, shared species, and development projects that may affect wetlands.

http://www.wetlands.org
http://www.ramsar.org

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