

and temporal resolution, development of preparedness/response strategies based on community needs and priorities and development of public communication strategies to ensure that warning information and recommended response strategies are conveyed to the populations at risk.

4.9 VULNERABILITY AND ADAPTATION OF THE TOURISM SECTOR

A close linkage exists between climate and tourism since climate defines the length and quality of tourism season and plays a major role in destination choice and tourist spending. Climate also affects a wide range of environmental resources that are critical attractions for tourism, such as snow conditions, biodiversity, water levels and quality. Moreover, climate has an important influence over environmental conditions that can deter tourists including disease spread, and extreme events such as heat waves, floods and extreme storms (UNWTO et al., 2008).

Tourism in Lebanon mainly consists of recreational tourism that includes beach holidays, winter sports, summer holidays in the mountains, cultural, religious, and adventure tourism, in addition to business tourism and health and education tourism (MoE, 2001). Related activities and infrastructure are concentrated in three areas: The high mountains where ski resorts and winter chalets are located; the hills overlooking Beirut and the coast where "country clubs" are found; and the coastline where beach resorts, public beaches and marinas are located, mainly on the northern coast (MoE, 2005). In recent years, alternative types of tourism and recreational activities have grown in Lebanon among which is ecotourism which has registered a significant increase in the number of ecotourism providers throughout the years since 1991 (MoE, 2001).

4.9.1 METHODOLOGY

Scope assessment

The assessment covers all the touristic areas of Lebanon with focus on the sites and activities that are likely to be vulnerable or "hotspots" such as coastal archaeological sites (e.g. world heritage sites of Tyre and the Fortress of Saida) and coastal touristic infrastructure, such as beach resorts, public beaches and marinas that may be damaged by sea-level rise, high mountains that may be affected by and shortening of the winter season and a

reduction in snow cover and mountainous summer resort areas that may be affected by increase in temperatures. The assessment covers the whole year to tackle summer and winter climate changes. The baseline year is 2004, and projections are made until 2030 by forecasting the impacts of future variation in the demographic, socio-economic and technological driving forces as well as climate change on the tourism sector.

Development of the sector under socio-economic scenarios

In Lebanon, tourism growth and its sensitivity to climatic change are influenced by three main factors: 1) economic stability, whereby high prosperity levels in the country result in growth of the tourism sector; 2) security and political stability, whereby the absence of conflict and strife dispel uncertainties regarding investment in tourism; and 3) resources' availability, especially forests and the availability of water supplies that could become a major constraint.

Taking these factors into account, under scenario A, tourism will probably be among the main active economic sectors, having an important contribution to GDP. Both mass tourism and ecotourism will be growing with greater emphasis on ecotourism due to better understanding of the recreational value of natural assets, participation of civil society in its protection and law enforcement on forest management. This would create alternative livelihoods, especially for populations in remote areas, which would in turn influence internal migration and local sustainable economic development. However, the low resources availability under this scenario might limit ecotourism growth.

Under scenario B, a moderate growth in the tourism sector and mainly in mass tourism on one hand and a low growth of ecotourism on the other hand due to lack of awareness and degradation of available natural resources will entail a massive burden on environmental resources, leadingly to an unsustainable growth.

4.9.2 VULNERABILITY ASSESSMENT

The relationship between tourism and climate is very complex and remains difficult to define. Tourism is sensitive to changes in temperature, rainfall, snowfall and extreme weather events that could lead to shifts in a variety of outdoor tourism and recreation opportunities in Lebanon, such as skiing in winter and beach activities in summer. The added effect of sea level rise may lead to coastal

erosion, loss of beach area, and higher costs to protect and maintain seafront resorts and thus affect summer activities (UNWTO et al., 2008).

In terms of adaptive capacity, tourism sector has a relatively high adaptive capacity with ability to respond to changing demographic and economic conditions as well as to new demands and technologies. Tourists have the greatest adaptive capacity (depending on three key resources: money, knowledge and time) with relative freedom to avoid destinations impacted by climate change or shifting the timing of travel to avoid unfavorable weather conditions. Suppliers of tourism services and tour operators at specific destinations have less adaptive capacity while destination communities and tour operators with large investment in immobile capital assets (e.g., hotel, resort complex, marina or casino) have the least adaptive capacity (UNWTO et al., 2008). Figure 4-43 illustrates the relative adaptive capacity of major sub-sectors.

4.9.3 IMPACT ASSESSMENT

In general, warmer temperatures may cause heat stress and health risks for tourists and entail additional cooling costs, and expected lower precipitation and increased evaporation may lead to potential water scarcity, leading to competition for water between different sectors (e.g., agriculture and tourism), or between different forms of use in tourism establishments. Extreme weather events such as extreme storms may threaten tourism facilities which may require increased insurance costs due to loss of insurability and business interruption costs (UNWTO et al., 2008).

The main potential impacts of climate change and its implications on vulnerable tourism destinations in Lebanon are:

Implications on high-altitude Mountains: Warmer temperatures and precipitation reduction are expected to lead to a decrease in the intensity, residence time and thickness of the snow cover in the mountains of Lebanon as well as change in the altitude of regions covered by snow and thus shorten the skiing season, which is the key attraction for tourism during winter. Before the 1990s, dense snow often covered more than 2,000 km² of the Lebanese mountains and averaged about 2,280 km². Lately, it declined to less than 2,000 km² with an average area of about 1,925 km². In addition, the average time that dense snow remains on mountains before melting has also decreased from 110 days to less than 90 days (Shaban, 2009), and it is expected to further decrease to 45 days with a warming of 2°C (Najem, 2007). Furthermore, the mountainous ecosystems have been depleted of their vegetation cover by several degradation factors, thus altering the potential for self regeneration and reconstitution of the vegetation cover in these areas.

Implications on mountainous summer resort areas: Higher temperatures may affect the mountainous summer resort areas as they offer a cooler climate compared to urban coastal cities. Given that this can be rather easily mitigated by increasing cooling intensity in areas with hotter temperatures or by the gradual and autonomous shift of mountainous summer resort to higher altitudes, the vulnerability of those areas are deemed to be relatively low. The adaptive capacity of residents and seasonal tourists in the mountainous summer resort areas is considered to be high, especially that many of the residences are second-homes.

Implications on coastline areas: Mediterranean Sea Surface Temperatures (SST) is expected to gradually increase due to climate change. The greatest benefit of a 2-3°C rise in SST would be the extension of the swimming season beyond May and October to the spring and autumn seasons. However, the coastline where



Figure 4-43 Relative adaptive capacity of major tourism sub-sectors

Source: Scott, D. and Jones, B. (2006)

archaeological sites, beach resorts, marinas and public beaches (e.g. Ramlet el Bayda, Tyre etc.) are located could be exposed to sea-level rise that may predictably attain a 12 to 25 cm rise by 2030 in the Mediterranean Sea. Such a rise may inflict damage on the touristic attractions due to their proximity to the shore if protective structures are not built. Sea-level rise may also affect the attractiveness of public beaches that are used by a significant proportion of the population, and cause coastal erosion and structural damage to the national archaeological heritage, inflicting higher costs to protect and maintain waterfronts.

Implications on natural areas of national interest:

Higher temperatures and lower precipitation resulting in longer drought periods may impact protected areas and natural reserves by increasing the risk of forest fires and endangering some forest species. The expected increased frequency of fire events, the shift in forest lines and the risk of forest pest infestation are likely to provoke the loss of natural attractions, afflict potential damage to tourism infrastructure and natural assets and impinge on the livelihoods of the communities there (guesthouses, restaurants, souvenirs shops, etc.). In addition, some natural areas are at risk due to their coastal location, therefore might be affected by the expected sea level rise (e.g., the Palm Islands and Tyre Coastal Nature Reserve).

Indirect socio-economic impacts: The entire social fabric and infrastructure of certain communities in the region are based on tourists' flows attracted by the recreational opportunities of the vulnerable systems already identified. Changes in the availability of those recreational opportunities could have wide-reaching impacts on attracting tourists, and thus on the livelihoods of permanent residents that rely on the region's multi-faceted outdoor recreation industry. This in turn could lead to the migration of the affected groups that include hotels, restaurants, shops and other entities benefiting from the tourism sector. In terms of receipts from the tourism activities and the number of eco-tourists in the most vulnerable systems, they are likely to remain stable or slightly increase under scenario A due to the growth in the sector which, given stable political and security conditions, might overshadow any climate-induced negative impacts. Under scenario B, receipts are likely to range from a moderate decrease to stable returns, which, relative to scenario A, is a worse-off situation. This is mainly due to the expected, unsustainable growth trend in the ecotourism sector leading to a decrease in returns and the growth in mass tourism which might offset any losses due to climatic changes.

Climate change impacts and their implications on tourism are summarized in Table 4-16.

Table 4-16 Impacts of climate change and their implications for tourism

Impact	Implications for tourism
Warmer temperatures	Altered seasonality, heat stress for tourists, increase in cooling costs, changes in plant-wildlife-insect populations and distribution, infectious disease ranges
Decreasing snow cover due to lower precipitation	Lack of snow in winter sport destinations, increased snow-making costs, shorter winter sports seasons, aesthetics of landscape reduced
Reduced precipitation and increased evaporation	Water shortages, competition over water between tourism and other sectors, desertification, increased wildfires threatening infrastructure and affecting demand
Sea level rise	Coastal erosion, loss of beach area, higher costs to protect and maintain seafront resorts
Sea surface temperatures rise	Higher SST leading to an extension of the swimming season
Changes in terrestrial and marine biodiversity	Loss of natural attractions and species from destinations, losses in nature-based tourism
Increasing frequency and intensity of extreme storms	Risk for tourism facilities, increased insurance costs/loss of insurability, business interruption costs
More frequent and larger forest fires due to higher temperatures and less precipitations	Loss of natural attractions; increase of flooding risk; damage to tourism infrastructure

Source: UNWTO et al., 2008

4.9.4 ADAPTATION MEASURES

On the overall, despite the high vulnerability of some of the main tourism destinations in Lebanon to climate change, it is expected that in the tourism sector will adapt to the changes through increased investment in the tourism infrastructure. Specific adaptation measures can be implemented according to the different locations of the touristic areas:

High mountain areas and winter tourism destinations at risk

- Establish a plan to organize and assist ski resorts to move ski slopes to higher altitudes or to colder north mountains or to invest in snow production. It is essential to involve the MoPWT in the excavation of roads leading to new ski slopes and the restoration of already existing ones;
- Improve insurance coverage in the face of extreme events, natural disasters and unprofitable seasons due to climatic changes;
- Promote industry partnerships (integration within resorts, cooperation between resorts) to reduce economic vulnerability;
- Enforce laws on controlling grazing in rangelands in the mountainous areas that are being afforested and reforested to preserve green spaces and encourage summer outdoor activities;
- Restore the vegetation cover by making available seeds of adapted species which will improve the vegetation cover, reduce erosion, increase water infiltration, and contribute to reducing the speed of snow melt.

Coastal areas at risk

- Implement 'soft' coastal protection measures to prevent erosion such as conservation of shore-stabilizing vegetation that act as natural buffers;
- Enforce enhanced design and planning guidelines for tourism establishments in order to increase their resilience to the impacts of climate change;
- Integrate climate change factors into regulatory frameworks for tourism development, such as environmental impact assessment and strategic environmental assessments;

- Adoption of water conservation measures at the resort level;
- Re-organize the urban sprawl in coastal areas;
- Preserve existing public beaches and marine ecosystems.

Natural areas at risk

- Support protected area management in order to enhance their resilience;
- Enhance and restore the forest cover in order to promote sustainable tourism;
- Implement all adaptation measures proposed for the forestry sector and coastal zones.

Other general adaptation measures include:

- Strengthen the role of MoPWT in traffic management and in establishment of new roads to facilitate access to tourism destinations;
- Create financial incentives to encourage investment in more sustainable touristic activities such as ecotourism to be sponsored by MoT;
- Establish "information offices", to be managed jointly by MoIM, MoT, MoPWT, municipalities and the private sector, in regions of touristic importance to promote the shift to adaptable and sustainable activities;
- Seek funds from international organizations to support projects for the development of the proposed adaptation measures;
- Sponsor direct awareness of tourists, through MoT, towards cultural and sustainable tourism in order to promote diversification of tourism activities;
- Improve provision of climatic information to the tourism sector through cooperation with the national meteorological services;
- Increase studies on changes in snow conditions.