Regional Climate Change Initiative Republic of Cyprus

The Cyprus Institute
RESEARCH·TECHNOLOGY·INNOVATION

Report of the Task Force on

Tourism

Eastern Mediterranean and Middle East Climate Change Initiative

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Task Force Coordinators

Harry Coccossis, Professor Emeritus, University of Thessaly, Volos, Greece. E-mail: hkok@uth.gr

Anna Farmaki, Assistant Professor, Cyprus University of Technology, Limassol, Cyprus. E-mail: anna.farmaki@cut.ac.cy

Task Force Members

Nikolaos Boukas, Professor, European University Cyprus, Nicosia, Cyprus. E-mail: n.boukas@euc.ac.cy

O. Cenk Demiroglu, Associate Professor, Umeå University, Umeå, Sweden. E-mail: cenk.demiroglu@umu.se

Esraa A. El-Masry, Assistant Professor, University of Alexandria, Alexandria, Egypt. E-mail: esraaelmasry@alexu.edu.eg

Dimitri Ioanides, Professor, Mid Sweden University, Östersund, Sweden. E-mail: dimitri.ioannides@miun.se

Hossein Olya, Professor, University of Sheffield, Sheffield, UK. E-mail: h.olya@sheffield.ac.uk

Daniel Scott, Professor and University Research Chair, University of Waterloo, Waterloo, Ontario, Canada. E-mail: daniel.scott@uwaterloo.ca

Dimitrios Stylidis, Associate Professor, University of Crete, Crete, Greece. Email: d.stylidis@uoc.gr

EMME-CCI Liaison Coordinator

Marco Neira, Associate Research Scientist, Climate and Atmosphere Research Center (CARE-C), The Cyprus Institute, Nicosia, Cyprus. E-mail: m.neira@cyi.ac.cy

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Preface

In the Eastern Mediterranean and Middle East (EMME), tourism is a phenomenon influenced by environmental, economic, sociocultural and political factors, among many others. In this region of the world, considered a climate change hotspot, tourism simultaneously influences and is affected by climate change. Therefore, it is imperative to explore the potential for climate change adaptation and mitigation actions which are suitable for the region, and exchange relevant practices and best examples.

This chapter is prepared in the context of the EMME-CCI Tourism Task Force exchange of ideas. In this respect, it is important to thank all members and participants.

EMME-CCI Task Force on Tourism

Introduction & Scope

The continuous increase in greenhouse gas emissions in addition to other anthropogenic pressures on the environment related to the territory (e.g. extensive deforestation and urbanization) have led to important changes in climatic parameters, such as the increase in global surface temperature and fluctuations in precipitation levels. The response to climate change manifestations as well as the severity of the phenomena vary among different regions, leading to the creation of climate change hotspots. The Eastern Mediterranean and Middle East (EMME) region is considered among these hotspots due to increasing trends in mean temperature and temporal variability of its meteorological features as well as dependency on the tourism sector (Scott et al., 2019). According to relative projections, the temperature trends (mean temperature and summer peaks) in the region will continue to intensify throughout the 21st century leading to extreme weather events, such as heatwaves and severe prolonged droughts. The frequency, duration and magnitude of these events are expected to increase with severe impacts on society, the environment and economic activity in the region. In addition, increasing population growth and urbanization rates are expected to intensify competition over the local natural resources, thus leading to expansion and worsening of environmental issues and social inequalities. Additional risks are expected for tourism from potential sea level rise impacts due to climate change, affecting the majority of typical regional tourist assets, the beaches, but also coastal tourism related development, as well as natural risks, such as flooding and forest fires (Olya & Alipour, 2015).

This document presents an overview of key issues related to tourism and tourism development in the region, highlighting that tourism as a multi-sectoral activity, is affected by and affects climate change in multiple ways. Therefore, there is a need for a complex approach to climate change adaptation and mitigation from supporting basic resources (water, energy, soil) to key tourism assets (beaches, natural and cultural heritage) and tourist destinations (in terms of spatial planning and management) (Jopp et al., 2010; Scott et al., 2012).

The purpose of the report is to provide a scientifically based set of recommendations for regional action. Furthermore, we aim at identifying particularities in the region, and create opportunities to showcase experiences and good practices in the context of EMME-CCI.

1. Geography of the area

The Eastern Mediterranean and Middle East (EMME) region illustrates a variety of social, economic, cultural and political factors across its countries: Bahrain, Cyprus, Egypt, Greece, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, Türkiye, and United Arab Emirates (Figure 1). The region is a mosaic of states of various sizes and economic conditions with specific political, social and cultural characteristics.

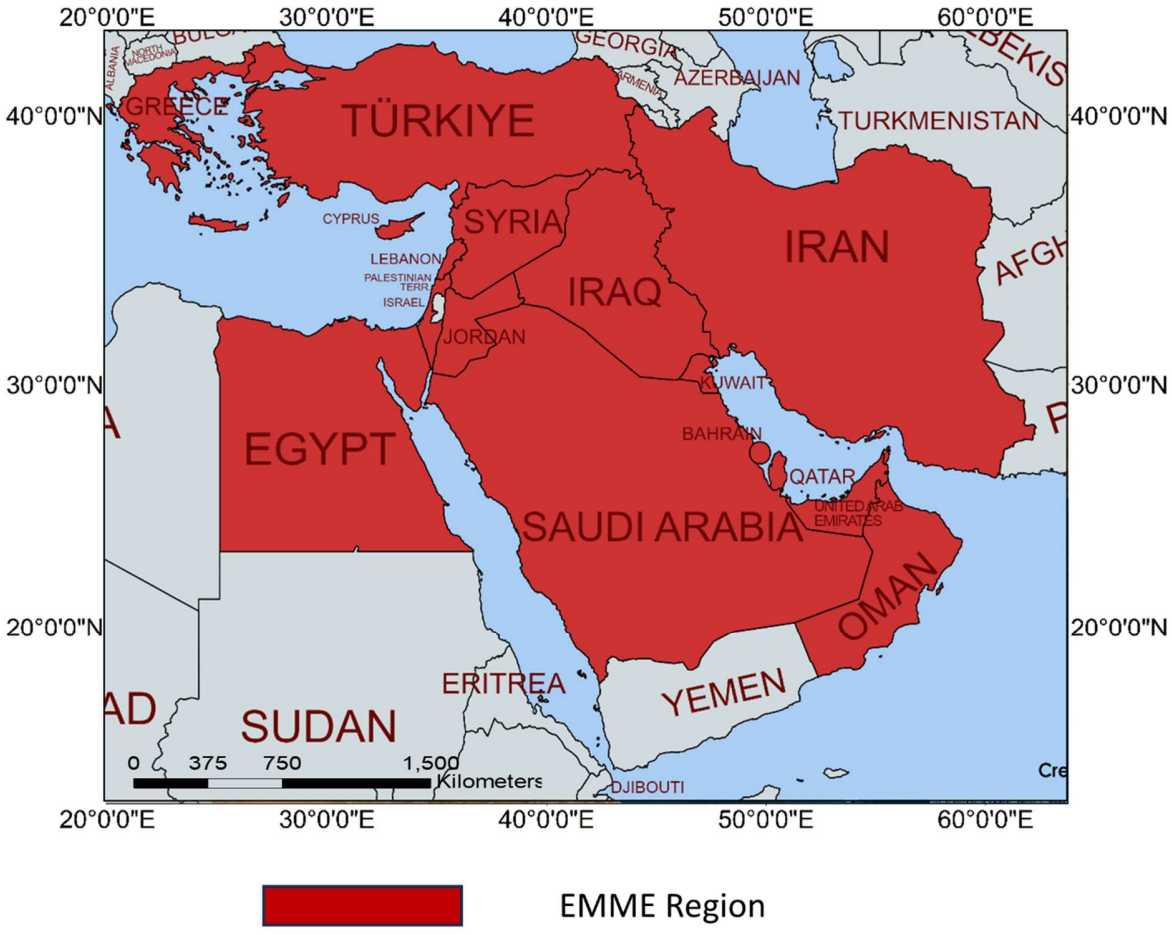

Figure 1: **Countries Included in the Tourism Task Force**

More specifically, in addition to an increase in per capita income in most countries, the region has known a rapid increase in population growth in recent decades. Moreover, the climate in the EMME has long been a key factor in attracting tourists to the region which has, in turn, become a key economic activity in the area (Eastern Mediterranean and Middle East Climate Change Initiative, 2021). The region is also known for its world-class monuments and archaeological sites and traditions – culinary, ethno-religious,

architectural, etc. – that have shaped a unique cultural landscape over the centuries (Timothy, 2019), which in addition to the diverse natural beauty and landscapes, have contributed to EMME as an important tourist destination with increasing appeal.

However, the diverse geographic and environmental conditions of the EMME that have shaped its rich cultural heritage, now directly affect the stakeholders' capacity in these countries to address the increasing climate change impacts. These conditions threaten the entire area and pose significant challenges in mitigating the impacts on the tangible and intangible heritage of the EMME countries. These factors can also have serious consequences on the built environment and its representation (Sesana et al., 2021). In addition, intangible heritage may also be affected, as people in the region who act as communicators and carriers of its continuation, may need to abandon their places.

2. Materials and methods

In order to come up with comprehensive policy action recommendations for the region's adaptation to and mitigation of climate change, each country is briefly introduced in terms of its tourism offer [based on the UNWTO (2021) *Tourism Data Dashboard*] and dependency within a climate context and climate risks (e.g. the relevance of weather/climate for the main tourism offers). This is then followed by a synthesis of the climate and the carbon risks of tourism in the region, based on the most recent tourism and climate literature reviews on Africa (Dube et al., 2023), Asia (Kulözü-Uzunboy & Demiroglu, 2021; Fang et al., 2022) and Europe (Steiger et al., 2023). Here, we identified and coded 94 articles in terms of their EMME country coverage as well as thematic relevance categorized under "climate risks", i.e. impacts and adaptation issues, and "carbon risks", i.e. emission and mitigation issues, consistent with the aforementioned reviews.

3. Tourism in the EMME region

The EMME region had counted more than 150 million inbound tourism arrivals in 2019 (Figure 2), which is the year taken as a measure of tourism indicators given that later in the same year and for the next 2 years the COVID-19 pandemic unfolded leading to a sharp decline in international tourism flows. As can be seen in figure 2, Türkiye, Greece, the United Arab Emirates and Saudi Arabia are among the top destinations in the EMME region. Most countries in the EMME are already investing in tourism

development, either as a traditional economic sector or as an effort to diversify their economic basis; albeit EMME countries are experiencing varying levels of tourism development.

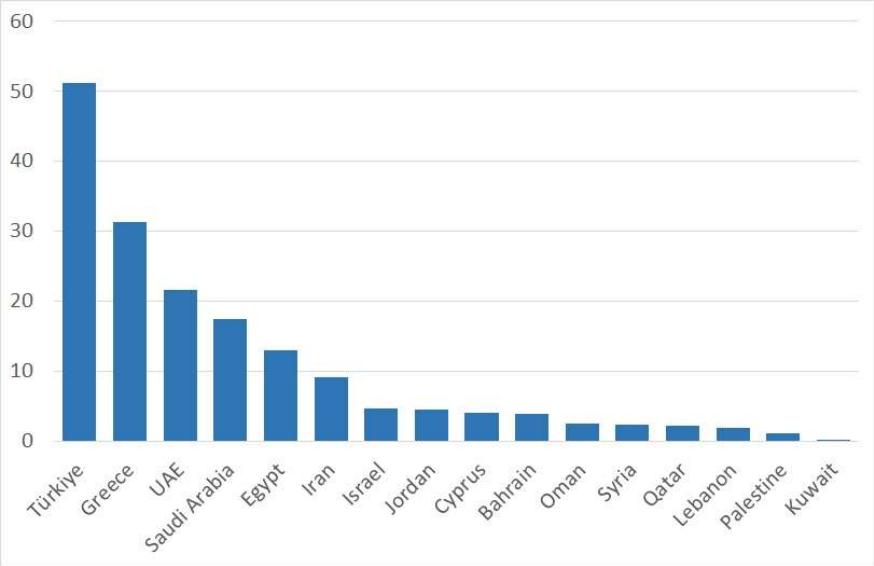

Figure 2: **Inbound tourism arrivals (in millions) in 2019 in EMME countries (overnight tourists) (UNWTO Tourism Dashboard and own elaboration).**

More specifically, and in order to further highlight the importance of the tourism sector in the EMME region, an overview of each country's key performance indicators is presented below, and a series of supporting figures is included in the Appendix. International tourism arrivals and the corresponding shares of arrivals per month are indicative of the dynamics and seasonal fluctuations of the tourism industry at each destination. The purpose of visit and arrivals by modes of transport also add up to the destination's profile and are indicative for the formulation of future policy measures in relation to climate change adaptation and mitigation. Last, the importance of tourism to the country's economy and employment are also indicative of the reliance of each country's national economy on tourism whereas other indicators including seasonality, tourism's social impacts and external factors (i.e., national and international conflicts) are considered as these reflect the nature of tourism development, associated impacts at the socio-economic level and influencing factors in each country in the EMME region. Country tourism indicators and relevant information was derived from the national tourism authorities and is restricted to pre-COVID19 numbers.

Bahrain

Tourism is an important sector of Bahrain's economy and is considered a key area of potential growth. International tourism arrivals have increased significantly since 2011 with a 10-year average annual growth of approximately 14% (up to 2019), reaching a peak of 4 million overnight tourists in 2015 and maintaining a steady course up to 2019. Although Bahrain's economy is largely dependent on the oil sector, tourism is becoming more important as an economic activity with the sector contributing approximately US$3.86 billion in 2019 which represents 10% of the country's gross national product. Tourist arrivals in Bahrain are generally spread throughout the year without any particular high peaks (as can be seen in the seasonality index for 2019). The vast majority of tourists in the last decade arrived by land and mainly for vacation and personal purposes while air transportation seems to be significantly decreasing. According to the recent tourism strategy of Bahrain, the aim is to make the destination in the near future an international hub that will offer a variety of tourism products including sports, leisure, culture, wellbeing and marina attractions. The country also aspires to develop conferences and business tourism through the development of appropriate facilities. Due to the continuous increase in greenhouse gasses emissions, water shortage and rising patterns in average temperatures and heat waves in the EMME region, Bahrain must carry out adaptation and mitigation policies in terms of its tourism offering during the colder months of the year and also counteract the effects of land transports.

Cyprus

Cyprus is highly dependent on international tourism that has been steadily increasing over the past decade and especially since 2015. International tourism arrivals have increased significantly since 2011 with a peak of 4 million overnight tourists in 2019 and a 10-year average annual growth of approximately 6% (up to 2019). Tourism revenue was €2684 million in 2019 with tourism constituting an important pillar of the Cyprus economy as well as a significant employer. In fact, in 2019 tourism contributed to more than 20% of the country's GDP with tourism's impacts being both direct and indirect as it supports other industries on the island including construction. Although tourist arrivals appeared to increase post COVID-19, the Ukraine-Russia conflict and the subsequent Hamas attack on Israel caused a decline in the number of tourists arriving to the island due to the fact that the Russian/Ukrainian and the Israeli markets were important for the destination and, hence, negatively affected by these conflicts. More than 50% of the tourist arrivals in Cyprus each year take place in the period from June to September, while approximately 75% take place in the period from May to October (as can be seen in the seasonality index for 2019). This indicates that there is a high degree of seasonality of the Cyprus tourism product which relies on sea and

sun, despite efforts of the national tourism authorities to diversify the product offering to include an array of niche tourism forms (e.g., agrotourism, cycling tourism, wine tourism, yacht tourism, casino tourism etc). The vast majority of tourists in the last decade arrived by air given that Cyprus is an island and mainly for vacation purposes, while transportation via water seems not to be significantly represented. Given the continuous increase in greenhouse gasses emissions and the increasing trends in mean temperature across the EMME region, adaptation and mitigation policies in Cyprus need to work towards profound changes in the country's tourism profile, especially in spreading the tourism offer throughout the year, and counteracting the effects of air transports. It should also be noted that tourism is a vital sector for the Turkish-Cypriot community in the northern part of the island, constituting 12% of the community's total economic activity through 1.5 million arrivals in 2019, prior to the COVID-19 crisis (Ertac & Cankan, 2021), which are forecasted to rebound to exceed 2 million in 2023 (Haber-Merkezi, 2023). While '3S' tourism (sun, sea and sand) is a major climate-dependent product in northern Cyprus, a diversified tourism product based on luxury casinos and cultural heritage makes it less vulnerable to seasonality. Such advantage, however, does not help maintain the capacity to respond to major shocks such as the pandemic and the climate crisis, due to the ongoing economic and political situation (Ertac & Cankan, 2021), implying a very high climate vulnerability for its tourism sector. For the same political reasons, the region's integration into the global mitigation efforts is also minimal.

Egypt

Tourism is a leading economic sector in Egypt, and one of the country's most important sources of national income. With the exception of the decline in arrivals in 2016, international tourism arrivals have maintained a steady course over the past decade (despite the industry being prone to political instability, terrorism etc), reaching a peak of 13 million overnight tourists in 2019 whilst accepting US$13 billion in the same year (8.5% of GDP). However, the adverse effects of the COVID-19 crisis on tourism globally were also reflected in the tourist arrivals in Egypt in 2020. Nonetheless, in par with global trends tourist arrivals and tourism revenue in Egypt have begun to increase since, offering optimism to the 13% of the workforce employed in the industry. Tourist arrivals in Egypt are generally spread throughout the year with slight peaks in the 3rd and 4th trimester (as can be seen in the seasonality index for 2018). The vast majority of tourists in the last decade arrived by air and for vacation purposes. Although cultural tourism remains a significant tourism product offering of the country, given its rich heritage, other forms of tourism have become popular over the years such as adventure tourism (i.e., scuba diving, desert

camping), beach tourism and medical tourism. Cruises along the Nile are also a popular activity in Egypt. Overall, tourism is an important industry for Egypt's economy that at the same time yields major social and environmental impacts. For example, indigenous tribes have been displaced as they seek employment far away from the Nile which is a popular tourism attraction whilst high levels of water pollution were noted in the river. Considering the increase in greenhouse gasses emissions, water shortage and continuously higher average temperatures and heat waves in the MME countries, Egypt needs to adapt and mitigate its policies to counteract tourism effects by directing tourism demand in the colder months of the year and also offset air transport impacts.

Greece

Tourism is one of the most important sectors of the Greek economy that has been steadily increasing over the past decade. International tourism arrivals have increased significantly since 2011 with a peak of 31 million overnight tourists in 2019 and a 10-year average annual growth of approximately 8% (up to 2019). These tourist arrivals yielded more than €2 billion in revenue in 2019 which makes up around 21% of Greece's GDP. Almost 70% of the tourist arrivals in Greece each year take place in the period from June to September (as can be seen in the seasonality index for 2019). This is reflective of the nature of the country's tourism product, which is largely based on sea and sun, primarily enjoyed in the country's many islands. Greece also offers other forms of tourism such as cultural tourism, wine tourism and gastronomy, thus capitalizing on its rich heritage and internationally renowned cuisine. The majority of tourists in the last decade arrived by air, although an increase has been noted in arrivals by land especially during the COVID-19 pandemic. Overall, tourism in Greece brings significant economic benefits as it offers income and employment to a vast number of people; the importance of tourism is particularly noticeable in peripheral areas such as islands where limited employment opportunities exist. Nonetheless, concerns have been raised in recent years over the social and environmental impacts of tourism. For example, in urban areas such as Athens the rise in demand for Airbnb seems to have had adverse effects on property prices and rentals as well as waste production (Stergiou & Farmaki, 2020). Greek adaptation and mitigation policies need to deal with the potential impact of climate change on natural resources, tourist attractions, tourism infrastructure and general infrastructure as well as tourism businesses. In addition, it is interesting to consider the potential effects on tourism regional concentration especially in spreading the tourism offer throughout the year.

Iran

Tourism in Iran is less developed yet plays a significant role in the Iranian economy with a 10-year average annual growth of approximately 16% (up to 2019). International tourism arrivals have increased significantly since 2011 and especially since 2017, reaching a peak of 9 million overnight tourists in 2019. Similarly, tourism revenue amounts to around US$5 billion in 2019 which makes up approximately 6% of the country's GDP. Tourist arrivals since the 2017 increase have been concentrated in the 3rd and 4th trimesters (as can be seen in the seasonality index for 2019). The vast majority of tourists in the last decade arrived by land and mainly for vacation and personal purposes while air transportation seems to be slightly decreasing. The main tourism product offerings in the country revolve around natural attractions (e.g., geological sites, desert) to cultural/heritage attractions (e.g., mosques, palaces) whereas due to the conservatism the government advises modest attire for visitors with sex segregation taking place in beaches and coasts. Although the tourism industry's potential was recognised in Iran, especially for women who represent half of the country's university graduates, the main issues that pose as current obstacles to Iran's further tourism development are political instability, international sanctions and conflicts in the Middle East. In relation to climate change, greenhouse gasses emissions, increasing mean temperatures, heat waves and water shortage problems in the region imply that Iran must adopt adaptation and mitigation policies to address the adverse effects on the tourism product of the country as well as land transport effects.

Iraq

Tourism development in Iraq is currently underdeveloped although it has the potential to attract international tourists and diversify the country's economy. Even though data on international tourism arrivals is not available after 2013 (when it reached almost 1 million tourists), the international tourism receipts are also indicative of the steady growth of the sector over the past decade and especially since 2014 (with the exception of 2018 decline in receipts). In 2019, tourism receipts in Iraq reached US$3.5 million whereas tourism contributed to almost 2% of the country's employment for the same year. The quarterly distribution of international tourism receipts can also be indicative of tourism seasonality in Iraq, with the highest peaks noted in the 4th quarter. The majority of tourists in 2019 had arrived in Iraq for personal purposes (family visits and business tourism) as well as for religious tourism activities. The country has generally been questioned in terms of its appropriateness as a safe tourist destination; yet, the country is working towards building political stability and security in order to further develop its tourism potential. In addition, the country needs to invest in adaptation and mitigation policies to

counteract the increasing effects of climate change across the region, especially in relation to the increase in mean temperature and heat waves which affect the wider region. For instance, should tourism demand grow further in the future it is imperative that Iraq invests on alternative sources of water to cover for the corresponding need.

Israel

Tourism is one of Israel's important sources of income, contributing almost US$8.5 billion in tourism revenue in 2019 (which makes up 2.8 of the country's GDP). It is also contributing to 3.5% of total employment in the country. The country has maintained a steady and slightly increasing course over the past decade in terms of tourism demand. International tourism arrivals have increased since 2016, reaching a peak of 4.6 million overnight tourists in 2019 and marking a 10-year average annual growth of approximately 7% (up to 2019). The majority of tourists Israel arrive to Israel for the abundance of cultural attractions, religious pilgrimage, wellness and spa facilities given the proximity of the country to the Dead Sea, desert tours as well as medical tourism. Tourism arrivals in Israel are generally spread throughout the year with small peaks in the periods from March to May and from September to November (as can be seen in the seasonality index for 2019). The vast majority of tourists in the last decade arrived by air and for personal and vacation purposes. In light of the continuous increase in greenhouse gasses emissions, water shortages and the rising trends in mean temperature across the EMME region require Israel to take action and adapt and mitigate its policies on air transport and transition to low-carbon tourism solutions. Notwithstanding, the recent Hamas terrorist attack and the retaliation of Israel in 2023 are likely to impose threats to tourism in the country. Israel has experienced in the past frequent terrorism attacks and is characterised by recurrent political instability due to tensions between Israel and Palestine, yet the escalation of the conflict in October 2023 will most probably worsen the situation, causing tensions in the wider EMME region as neighbouring countries get involved.

Jordan

Tourism is an important pillar of Jordan's national economy with promising niche tourism potential. International tourism arrivals have maintained a steady and slightly increasing course over the past decade, with a 10-year average annual growth of approximately 2% (up to 2019) and a peak of 4.5 million overnight tourists in 2019. Likewise, tourism revenue was US$6.77 billion in 2019 contributing almost 20% to the country's GDP whereas 4% of total employment is occupied in tourism. Tourism arrivals in Jordan

are generally spread throughout the year with the highest peaks recorded in the period from June to August (as can be seen in the seasonality index for 2019). The majority of tourists in the last decade arrived by land and for personal purposes although air transport seems to be rapidly increasing. The destination is known for its rich cultural attractions, especially renowned Petra, although in recent years attempts have been made to enrich the tourism product offering to include adventure tourism, wellness tourism (i.e., mud baths in the Dead Sea) and ecotourism among others. Jordan's tourism industry undoubtedly has great potential, yet the country must consider its development policies as these need to target adaptation and mitigation goals and deal with the negative impacts of climate change evident in the region. This is particularly true for the summer months where high temperatures and heat waves are noticed. Climate change may likely impact Jordan's key attractions as well such as the Dead Sea, therefore it is important that potential challenges are addressed immediately and adequately to safeguard tourism demand.

Kuwait

The tourism industry in Kuwait has not yet developed its full potential with international tourism arrivals in 2018 reaching a peak of 0.2 million overnight tourists in 2018, marking a negative 10-year average annual growth of approximately -3% (up to 2018). Tourism revenue in Kuwait was US$1198 million in 2019, a mere 6% of the country's GDP. Tourism arrivals in Kuwait are generally spread throughout the year without any particular high peaks except for January (as can be seen in the seasonality index for 2017). The majority of tourists in the last decade arrived either by land or air and mostly for personal purposes. However, both leisure and business tourist arrivals have significantly increased over the years. Whilst there is potential for the country to develop its tourism industry, it also needs to ensure its tourism policies embed adaptation and mitigation strategies that address the effects of climate change which are experienced in the EMME region, such as increasing average temperatures and water shortage problems. In addition, any developmental efforts need to account for potential social impacts on the local community.

Lebanon

Tourism is an important economic driver and source of income in Lebanon that has maintained a steady course over the past decade, reaching a total of 1.9 million overnight tourists in 2019 and around US$2 billion in tourism revenue for the same years. Approximately 40% of the tourist arrivals in Lebanon each

year take place in the period from June to August (as can be seen in the seasonality index for 2019). The majority of tourists in the last decade arrived by air with a significant decline in arrivals by land being noted. Tourism is Lebanon is mostly reliant on cultural attractions as well as nature with its mountainous region attracting ski tourists during winter. Recently, the national tourism authorities have attempted to enrich their product offering to include gastronomy, weddings and honeymoons, wellness tourism and sports and adventure. Evidently, the country has great potential in developing its tourism industry further given the rich cultural and natural resources it has; yet, care is needed in ensuring that social and environmental impacts are regulated. For example, in light of water shortage challenges and rising mean temperature across the EMME region, adaptation and mitigation policies must be implemented in Lebanon if the country is to address climate change problems. For instance, Lebanon could work towards spreading the tourism offer in the spring and autumn period. Tourism demand for the destination may potentially be impacted given the involvement of Lebanon in the recent escalation of the Israel-Palestine conflict in 2023, with several Western countries advising their citizens to avoid travel in the area.

Oman

Tourism is an important economic sector and income generator in Oman that has been steadily increasing over the past decade. International tourism arrivals have reached a peak of 2.5 million overnight tourists in 2019 with a 10-year average annual growth of approximately 5% (up to 2019). Tourism revenue amounted to US$3.08 billion in 2019 (that is 12% of the country's GDP) whereas the industry is regarded as an empowering route for female workers in particular. Tourism arrivals in Oman are generally spread throughout the year with small peaks in August and December (as can be seen in the seasonality index for 2019). The majority of tourists in the last decade travelled for vacation and personal purposes. The national tourism authorities have set up a strategy aiming to develop in the near future adventure, culture, nature, sports and gastronomy as part of its product offering. The rationale is to diversify the tourism product of Oman whilst addressing the need to sustainable development in tourism. Adaptation and mitigation policies in Oman thus need to work towards counteracting the effects of climate change, especially in relation to the continuous increase in water shortages and the increasing trends in mean temperature.

Palestine

Tourism in Palestine is rather underdeveloped although it represents an important politico-economic driver, with significant potential for further development. International tourism arrivals recorded small fluctuations over the last decade with a peak of 0.7 million overnight tourists in 2019 and a 10-year average annual growth of approximately 6% (up to 2019). Likewise, tourism revenue reached US$726 million for the same year. Tourism arrivals in Palestine show some distinctive peaks in the period from September to November (as can be seen in the seasonality index for 2019). Although Palestine has started to work towards further developing its tourism potential, with most tourists visiting to culture, religious purposes and to learn about social issues (e.g., educational tourism), it is essential that it develops adaptation and mitigation policies to deal with the adverse effects of climate change in the region such as rising average temperatures and water shortages especially during the summer months. The Hamas terrorist attack on Israel in October 2023 and the subsequent retaliation of Israel on Palestine will likely lead to a freeze in tourist arrivals and tourism development in the near future, as already much of the infrastructure of the country has been destroyed during the escalation of the conflict.

Qatar

Tourism is considered among the most important drivers for development and diversification in Qatar's economy with a 10-year average annual growth of approximately 4% (up to 2019). International tourism arrivals recorded small fluctuations over the last decade with a peak of 2.8 million overnight tourists in 2014 and 2.1 million in 2019. Similarly, tourism revenue for 2019 was more than US$15 billion in direct and indirect contribution (representing a 10% contribution to the country's GDP). The quarterly distribution of international tourism receipts can be indicative of tourism seasonality in Qatar, with the highest peaks noted in the 1st and 4th quarter. The majority of tourists in 2019 arrived at the destination by air while land transport recorded a significant decline over the past decade. The national tourism authorities aspire to develop the destination to become an international hub and a year-round destination offering sports tourism, cultural tourism, art tourism, adventure tourism and events. Undoubtedly, the vision of the tourism authorities requires investment in infrastructure and facilities that require careful consideration of sustainability needs. Adaptation and mitigation policies in Qatar therefore need to work towards counteracting the effects of climate change, especially in relation to the continuous increase in water shortages and the increasing trends in mean temperature and extreme weather events.

Saudi Arabia

Tourism is an important economic driver in Saudi Arabia with a 10-year average annual growth of approximately 5% (up to 2019). International tourism arrivals have maintained a steady course over the past decade with a total of 17.5 million overnight tourists in 2019. Tourism revenue contributed approximately US$19.85 billion to the country's economy in 2019 which accounts for 6.5% of the GDP. Tourism arrivals in Saudi Arabia are generally spread from October to May (as can be seen in the seasonality index for 2019), although several fluctuations have been recorded over the past decade. The majority of tourists in the last decade arrived by air and for personal purposes while land transport seems to be rapidly declining. Tourists are mostly attracted to the country by the cultural heritage attractions, the outdoor activities that offer adventure to tourists as well as the beach activities in the Red Sea. The country's tourism development aspirations include to double the employment positions held by people in tourism in the next 10 years (to reach more than 1.5 million jobs) and become a leader in the Middle East in terms of tourism, promoting halal tourism to the growing number of Muslim travellers. Environmental ramifications are therefore possible as a result of tourism development plans so the country needs to invest in adaptation and mitigation policies in order to counteract the increasing effects of climate change across the region, especially towards reducing its greenhouse gas emissions and transitioning to low-carbon tourism solutions.

Syria

Tourism was an important economic pillar in Syria before the civil war with 8.5 million tourists having visited the country in 2010, bringing US$8.4 billion in revenue. In fact, its importance was evident in the contribution to the country's economy as tourism accounted for 14% of the GDP. International tourism arrivals have been rapidly increasing until 2010 both for personal and vacation purposes and mostly via land transport systems. Since the 2011 crisis though tourist arrivals dropped sharply as airlines suspended flights to the country and hotels closed down. Tourism could potentially become a driver for development in the post-war future of Syria as the country is home to six UNESCO sites. In this capacity, tourism can prove a vehicle not only for development and prosperity but also peace and political stabilization in the country. Although adaptation and mitigation policies cannot be the focus of tourism development in the present situation, Syria is already facing decreased precipitation levels and rising temperatures with multiple effects on the country's production system. Hence, any future developments post-war need to consider such issues.

Türkiye

Tourism is one of Türkiye's most important and dynamic economic sectors with a 10-year average annual growth of approximately 5% (up to 2019). International tourism arrivals have maintained a steady course over the past decade with a peak of 51 million overnight tourists in 2019. Tourism revenue reached US$34.5 billion in 2019, contributing significantly to the country's GDP. More than 50% of the tourist arrivals in Türkiye take place in the period from June to September (as can be seen in the seasonality index for 2019) reflecting a seasonal tourism product that is largely favoured by the sea and sun offering provided in the coastal regions of the country. The majority of visitors in the last decade arrived by air and for vacation purposes. The country's tourism product is quite varied including cultural tourism, medical tourism, wellness and spa, adventure tourism and gastronomy among others. An attempt has been made in recent years to de-seasonalize the tourism product of the country and diversify away from mass tourism in an effort to tackle the negative impacts of tourism development in tourist regions. Türkiye did not impose sanctions on Russia, unlike some other countries in the region, yet its tourism industry was initially affected by the Russia-Ukraine conflict as a decline in Russian tourist arrivals was noted in 2022.Furthermore, conflicts and instabilities emerging in the EMME region also pose future threats on the country's tourism sector. Regardless of the political situations, the growth of the tourism industry requires that adaptation and mitigation policies address the high risks of climate change across the region, especially towards spreading the tourism offer throughout the year, counteracting the effects from air transports and adapting to the warming and drying climate trends.

United Arab Emirates

Tourism is an important economic sector of the Emirati economy with most tourists flocking to Dubai and Abu Dhabi. For example, international tourism arrivals in Dubai reached a peak of approximately 22 million overnight tourists in 2019 (UAE recorded 25 million visitors for the same year) with a 10-year average annual growth of 12% (up to 2019). Tourism revenue for the region accounted to US$38.4 billion representing around 12% of the country's GDP. Tourism arrivals are generally spread throughout the year with small peaks in January and December (as can be seen in the seasonality index for 2019). The majority of visitors in the last decade arrived by air and for vacation purposes although land transport seems to be increasing. Dubai specifically has managed to establish itself as an international hub improving accessibility to the emirate whilst investing heavily on infrastructure and tourist facilities including marinas, museums, leisure attractions and shopping centres. As a result of the heavy development, the emirate was called to establish sustainability initiatives due to potential adverse effects of overdevelopment on the environment. The country needs to invest in adaptation and mitigation policies

especially towards reducing its greenhouse gas emissions, counteracting the effects from air transports and addressing UAE's water scarcity, drought and rising sea level.

4. Tourism and climate change in the EMME region

The 94 publications that study climate change and tourism in the EMME region (listed in appendix, box 18) display a very uneven research coverage spatially and thematically. The "climate risk", (i.e. impacts and adaptation) sub-theme is represented in 66 papers, whilst the "carbon risk", (i.e. emissions and mitigation) sub-them is covered by only 29 papers. Only one paper (Michailidou et al., 2016) follows a dual approach that takes account of the mutual interactions of the climate and tourism systems through both adaptation and mitigation actions. Spatially speaking, the European and the African sections of the EMME region are relatively well-covered, while most Asian countries are studied by just a few papers, usually as part of the global (Scott et al., 2019) and macro-regional (Demiroglu et al., 2020) climate risk assessment papers. Almost no carbon risk study is carried out for the Asian cases, except for Qatar (Suryan et al., 2020) and the UAE (Vij & Vij, 2012). Table 1 displays these spatial and thematic research gaps according to quantities of studies for each theme and country. Below we elaborate further on the results of the two sub-themes.

4.1 Climate risk

Over the last 50 years, the temperature in the EMME has increased significantly in comparison to other inhabited areas. Extreme weather events in addition to the expected changes in mean climate conditions, such as heatwaves and extended droughts, will affect all socio-economic sectors and pose severe challenges for coastal infrastructure and agriculture (Zittis et al., 2022). More specifically, the magnitude

Table 1: **Number of studies per EMME country and by climate risk/carbon risk**

Country	*Climate Risk*	*Carbon Risk*	*Total*
Bahrain	2	-	2
Cyprus	19	13	32
Egypt	7	3	10
Greece	38	15	53
Iran	9	-	9
Iraq	4	-	4
Israel	4	-	4
Jordan	3	-	3

Kuwait	1	-	1
Lebanon	3	-	3
Oman	2	-	2
Palestine	2	-	0
Qatar	3	1	4
Saudi Arabia	2	-	2
Syria	3	-	3
Türkiye	20	10	30
United Arab Emirates	2	1	3

of the winter precipitation decline in the Mediterranean region places severe restrictions on water resources with direct impacts on water-depended sectors such as the agrofood sector. These factors endanger the stability in the region and place it among the major climate change hotspots in the following decades (Tuel & Eltahir, 2020). By the end of the twenty-first century, the majority of climate models project additional declines in precipitation and temperature increases in the region. The water deficit will worsen over time due to changes in rainfall's amount and distribution as well as increased evapotranspiration in spring and summer (Del Pozo et al., 2019). Future scenarios highlight the increasing risks for the sustainability of key domains (water, ecosystems, food, health and security) and stress the need for pan-Mediterranean risk assessment and integrated adaptation and mitigation policies (Cramer et al., 2018). The response of tourists to the complexity of mitigation policies and its effects, the range of climate change impacts re-shaping destinations, as well as societal and economic impacts will shape the influence of climate change on tourism demand patterns (Gössling et al., 2012).

More analytically, the present climate conditions across the EMME region present great diversification with extreme and rapidly changing temperatures and precipitation levels. The northern part of the region experiences hot and dry summers, with occasional droughts and relatively wet winters, whereas the southern part simulates hot and desert-like climate conditions due to low precipitation levels (The Cyprus Institute, 2021).

Based on observations over the last 50 years, there is a clear aridification trend for most parts of the region. Future projections foresee rising temperatures and declining precipitation throughout the EMME, leading to an overall aridification of the region with major impacts on water resources and food production. The entire region is considered as a primary climate change hotspot raising great concerns over the future environmental, economic and societal conditions. The predicted intensification of heatwaves in addition to the scarcity of water resources pose a great threat for the future of many production sectors including tourism (Lelieveld et al., 2012).

More specifically, projections show an increase of 1-3°C in the next three decades, which will reach 3.5-7°C by the end of the century (The Cyprus Institute, 2021). Projections over the mean temperature trends in the EMME vary from 0.28° to 0.46°C per decade, with the highest values appearing in some continental locations such as Ankara, Baghdad and Riyadh (exceeding 0.4°C/decade) (Lelieveld et al., 2012). Moreover, by the end of the century rainfall will decrease by 20-30% across the EMME – with small fluctuations within the region – with severe and extended periods of drought. Precipitation levels may significantly decrease during the winter in the eastern Mediterranean coast (reaching up to 50%) whereas small increases might be recorded in the south-eastern part of the region. The heat stress in the EMME region is expected to increase the number of hot days and nights per year, starting from the southern part of the EMME and forwarding gradually to the north (The Cyprus Institute, 2021).

Indeed, summer 2023 season already saw the direct effects of the "Cerberus" and the "Charon" heatwaves on the tourism industry, where for instance the Greek authorities had to shut down the popular Acropolis site during the afternoons for visitor health safety. Such trends are projected to exacerbate, as the region is not only expected to lose its touristic climate comfort in the summer seasons but also become a health risk zone due to increased heat stroke possibility already by the 2021-2050 period, and even under a good mitigation scenario (RCP4.5), especially around the less mountainous regions of Cyprus, Israel, Qatar, Bahrain, UAE and the coastal zones of Egypt, Saudi Arabia and Iran (Demiroglu et al., 2020 – see http://climatechange.boun.edu.tr/en/holiday-climatology-of-the-mediterranean/ for an interactive map). Likewise, the drier and the warmer climates projected for the

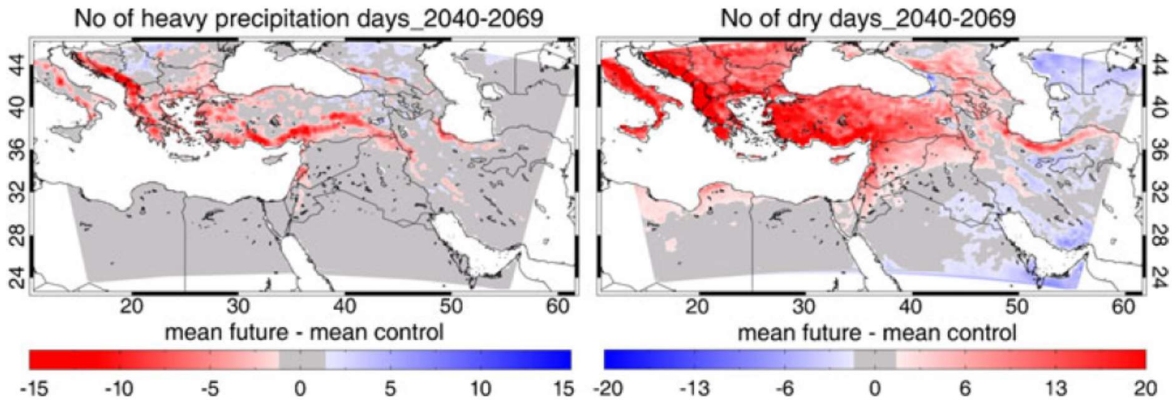

Figure 3: **Changing number of days per year with heavy precipitation (RR>10 mm, left panel) and number of dry days (RR<1 mm, right panel) - mean changes for 2040–2069 relative to the control period 1961–1990 (Lelieveld et al., 2012).**

region are expected to give rise to increased water shortage conflicts in Egypt (El-Masry et al., 2022), Greece (Klein et al., 2015; Michailidou et al., 2016; Katirtzidou & Latinopoulos, 2018; Skrimizea & Parra, 2019; Alamanos, 2021), Cyprus (Zachariadis, 2010) and Türkiye (Demiroglu et al., 2018), and higher fire risks, e.g. in Greece (Varela et al., 2020).

Climate change is also affecting the Mediterranean Sea, which is becoming warmer and saltier. In the last decades, an increase of marine heatwaves has been recorded in both frequency and intensity. The Levantine Intermediate water temperature has increased by 0.53°C since the mid-1990s. According to high confidence scenarios, projections show an increase of the annual-mean and basin-mean sea surface temperature by 0.6-1.3°C before the mid-21st century, and by 2.7-3.8°C at the end of the 21st century. Another important challenge to be met in the future is the expected sea level rise (SLR), which in the Mediterranean is mostly attributed to terrestrial ice melting and the dynamics of northeastern Atlantic. Projections in this case show a mean sea level rise that ranges between 37-90 cm and 20-110 cm (in relation to the end of the 20th century), depending on the calculation method and the different scenarios (Figure 4) (MedECC, 2020). Amplified by the storm surge events, SLR is expected to damage major coastal tourism zones in Egypt (El-Masry et al., 2022), Israel (Hall, 2018), Oman (Hereher et al., 2020), Iran (Hadipour et al., 2020), Cyprus (Leon et al., 2021), Greece (Tzoraki et al., 2018; Andreadis et al., 2021; Vandarakis et al., 2021), and Türkiye (Karaca & Nicholls, 2008). Given the multitude of compound and cascading impacts, Steiger et al. (2023) note the importance of integrated impact assessments for the most comprehensive vulnerability analyses of (especially coastal) tourism destinations.

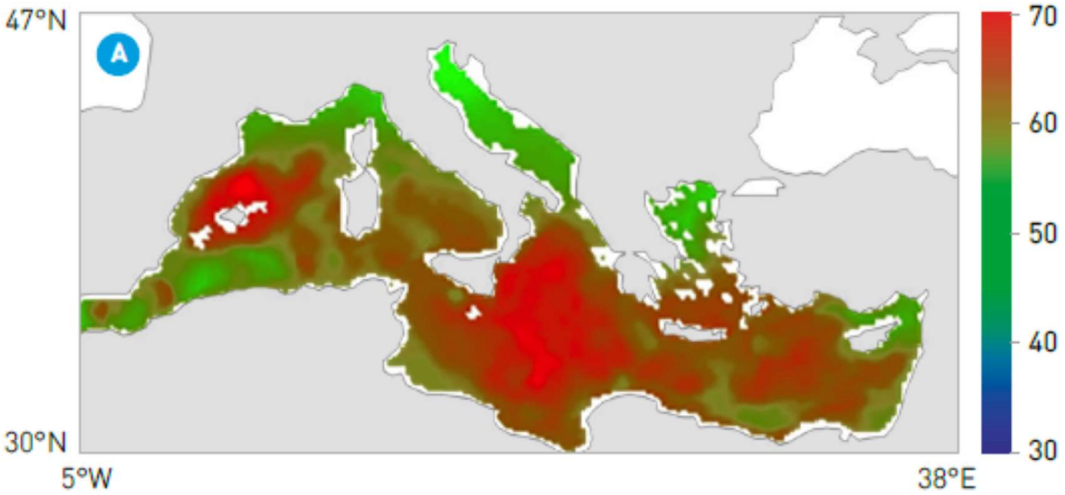

Figure 4: **Projected Mediterranean Sea level rise averaged in (2080-2099) with respect to present climate (1980-1999) (MedECC, 2020).**

The direct and indirect impacts of climate change on the tourism sector are far-reaching and already threatening the sustainability of weather-dependent tourism destinations worldwide. Tourism in EMME depends a lot on natural resources and landscapes – such as coastal and mountain landscapes – for the attractiveness of destinations and is therefore highly susceptible to changes affecting those elements (Buzinde et al., 2010). Climate change impacts and adaptation measures are the key factors affecting the attractiveness of destinations (Santos-Lacueva et al., 2017). However, the sensitivity of destinations to climate change manifestations as well as their adaptability to the consequential risks and opportunities that may rise vary significantly among different regions. Based on the global analysis of the climate change risk for tourism provided by the European Travel Commission (2018), the countries of East Mediterranean and Middle East region are facing a medium to high level risk for the future of tourism economy (Figure 5).

The increase in mean temperature and heat waves is expected to negatively affect summertime thermal comfort for tourists and, therefore, reduce the tourism flows in the core summer months from June to August. Sea level rise will most likely affect tourism infrastructure and activities located on the coast. Even more crucial to the tourism sector as well as the living conditions in EMME is the predicted limited access to fresh water resources. Especially the Middle East has been identified as the first region worldwide to run out of fresh water with major implications for the tourism sector itself, affecting both tourists and related infrastructures. The limited availability of water resources will enhance conflicts over the use of

water among the different economic activities in the region, especially during the summer months when tourism activity is at its highest peak (MedECC, 2020; The Cyprus Institute, 2021).

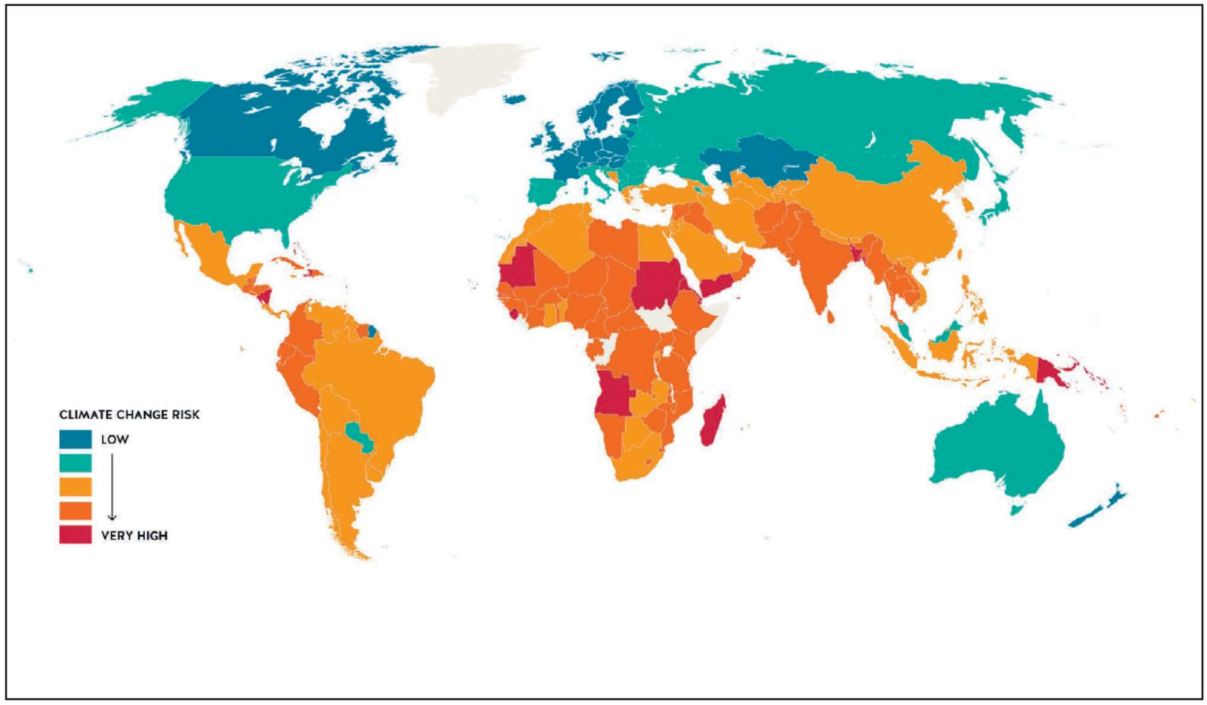

Figure 5: **Global climate risk for tourism (European Travel Commission, 2018).**

Apart from the direct impacts of climate change on tourism, there are also indirect but severe implications for tourism's primary resources in the region. The degradation of natural resources, including freshwater availability, may negatively affect the destinations' attractiveness. Climate change can lead to increased nutrient enrichment, which in turn poses a major threat to coastal and marine ecosystems because of potential eutrophication phenomena. The impacts of eutrophication on marine ecosystem services include, among others, the deterioration of bathing waters' quality and the alteration or even loss of natural habitats, which are considered primary resources for the type of tourism activities currently developed in the area. Coastal erosion due to sea level rise will also add to the degradation of the coastal landscapes, causing severe alterations to bathing sites (beaches) and affecting cultural heritage sites located on the coast (MedECC, 2020).

In conclusion, the tourism industry is highly sensitive to climate change and some types of tourism are more climate dependent than others. In countries such as Greece and Cyprus where the 3S (sun, sea and sand) model has been the dominant type of tourism over the past decades, the increase in temperature

may lead to a lengthening/extension of the tourist season. However, increased heatwaves and prolongued droughts will increase the demand for cooling energy while many areas – especially the insular ones - will face water supply problems. Thermal discomfort and extreme weather events are also expected to negatively affect the average of overnigh stays, thus leading to an important annual revenue loss for the tourist industry. At the same time, winter tourism will be severely affected since most ski areas in the region are vulnerable to temperature increase (Goh, 2012; Georgakopoulos, 2017; Demiroglu et al., 2021; Kulözü-Uzunboy & Demiroglu, 2021).

Moreover, cultural and religious tourism constitute the largest part of the tourism market in the Middle East due to the countries' rich living culture, ancient ruins and monuments and pilgrimage sites (Muslim, Christian, and Jewish) that attract millions of tourist each year. Extreme weather events such as heatwaves and droughts as well as sea level rising will affect not only tourism but also the living conditions of the citizens. The reduction of water resources is expected to be the most important issue in the Middle East because of the increased competition of the water-intensive tourism industry and other productive sectors (Timothy, 2019).

Other recent trends that have emerged in EMME over the past years, mostly in UAE, Qatar and Bahrain, where efforts have been made to diversify from traditional tourism (e.g., high-end, medical, sport tourism and mega-events) are also vulnerable to climate change effects. Thermal discomfort and competition over natural resources (mainly water) are again the main risks for the sustainability of this part of the tourism industry, especially when considering the highly urbanized population of these countries (Timothy, 2019).

4.2 Carbon risk

Despite the fewer studies on carbon risk of tourism in the EMME region, there are various footprint calculations for the different sectors of the tourism industry and the few countries, yet no comprehensive assessment exists at the pan-regional level, which should also preferably have a systematic approach since most emissions probably result from, but not within, travel to and from the region. Thus, EMME should not only be part of the global efforts towards climate change mitigation, but also be ready to adapt to mitigation from its source markets, since research (Mayor & Tol, 2010) already shows that policies towards higher taxes on longer flights will reduce both the global emissions and the tourism-led growth in the EMME economies.

Among the carbon accounting studies so far, most research has focused on the emissions from the hotel and restaurant sector in Egypt (Ragab & Meis, 2016), Cyprus (Michopoulos et al., 2017; Pablo-Romero et

al., 2017) and Greece (Bode et al., 2003); pointing out to tourism-led growth in emissions and the need to mitigate them, especially through transitioning to renewable energy sources (RES) or by innovative plans such as optimal accommodation site selecetion to minimize intra-destination transport emissions, as in the case of Attica, Greece (Pieri et al., 2016). Such supply side mitigation efforts could be well met by the increasing environmental awareness on the demand side, as already stated in early consumer surveys with results on high preferences and willingness-to-pay for facilities with RES in Crete (Tsagarakis et al., 2011).

Mitigation measures should also focus on the types of tourism developed in the region that significantly contribute to the emission of greenhouse gases such as the cruise sector. The cruise industry is one of the most important growth sectors in the Mediterranean and especially in Türkiye, Israel, Greece and Cyprus. Other countries in the EMME region such as Saudi Arabia, Qatar, Oman, Kuwait, UAE and Bahrain have started to attract increased numbers of cruise ships over the past decade in the Arabian Gulf (Timothy, 2019). However, the debated contribution of this sector to local economic sustainability and the inherent per-capita emissions that even exceed the notorious air travel footprints make the cruise industry a major discussion point on the tourism-climate nexus. Likewise, the emerging marina tourism in the region is also expected to face mitigation challenges, especially in insular countries like Cyprus where a flexible energy transition has been limited (Cruz-Pérez et al., 2021).

5. Policy action recommendations

The tourism sector is widely acknowledged among the most climate-sensitive sectors of global economy, both on the supply and demand side. Stakeholders involved in the tourism sectors (either as providers or tourists) are directly impacted by climate change and its indirect effects on a variety of environmental resources that are essential to tourism (Scott et al., 2009). Therefore, several Mediterranean countries such as Greece, Egypt and Cyprus have already developed adaptation strategies focusing on sustainable development in order to offset the negative impacts of climate change, which have been argued to also increase health crises such as COVID-19 (Zang et al., 2021). Some destinations are trying to spread tourism offers to spring and autumn in order to adapt to warming conditions and improve tourists' thermal comfort (MedECC, 2020).

5.1 Adaptation actions

Given the importance of the tourism sector in the overall economy of the EMME region, adaptation policies measures are required in order to increase resilience and moderate the climate change impacts on destinations (Jopp et al., 2010). Policy recommendations may address different aspects of tourism adaptation to climate change by introducing a wide range of measures and guidelines. These vary in terms of territorial coverage and face different challenges and implementation issues. In spite of their differences in context, objectives and implementation methods, policy recommendations should be stated in a complementary and corroborative framework to effectively address the multiple impacts of climate change on the sustainability of the tourism sector in the future. The suggested policy recommendations for the adaptation of tourist destinations in the EMME region to climate change implications are presented below.

P1. STRENGTHENING TOURISM CLIMATE CHANGE ADAPTATION SUPPORT	Objective P1.1.	Administrative support, organization and awareness building of climate change in tourist destinations
	Policy type	Adaptation/Policy Framework
	Territorial coverage	Local and regional
	Timing	Immediate implementation
	Measures	1. Raising awareness building among all types of stakeholders in the various sectors of the tourism industry and initiate supportive actions to enable the efficient implementation of related strategies. Initiating targeted awareness building actions at tourists through tour operators and other suppliers (airlines, hotels etc.).
		2. Highlighting the role of the local community in terms of the direct tourist impacts that affect its well-being.

The vulnerability of the EMME region to the manifestations of climate change (e.g., increasing temperature and heat waves, decrease in precipitation, sea level rise) stresses the need for raising awareness building of climate change impacts in tourist destinations and improving managerial skills (organization and support) at the local, municipal, and regional administrative level. The policy is part of an overall adaptation framework and can be implemented immediately with application at the local and regional level.

The main goals are to engage all sub-sectors and stakeholders of the tourism industry in awareness raising campaigns, strengthen the participation of local communities in the decision-making process, enhance the support of municipal and governmental authorities as well as to evaluate and monitor any potential actions. The policy is in line with EU and global policy strategies for a more sustainable tourism

development as well as other EMME CCI recommended policies that work towards the same goals (among others to highlight the necessary investments in infrastructure and technologies to address climate change impacts, reduce carbon footprint and create different sets of guidelines for public bodies, industry entrepreneurs and the public).

A key requirement for the effective implementation of this policy is the active involvement of different types of stakeholders, which could lead to coordination issues and challenges related to conflicting interests that may emerge. Among other preconditions and key issues for the successful implementation of the policy is the establishment of an effective and inclusive governance mechanism, the development of a communication strategy for the promotion of awareness raising campaigns to different stakeholders' groups and the sharing of best practices among the destinations of the region (e.g., use of alternative energy sources, promotion of local products in food supply chain, green roof incentives etc). Governmental support to interested parties and efficient organization to align the development and implementation of actions are also important. Finally, an evaluation of the outcomes needs to be foreseen and corrective actions to be taken if and where necessary.

P1. STRENGTHENING TOURISM CLIMATE CHANGE ADAPTATION SUPPORT	Objective P1.2.	Product diversification towards small scale development spread in time and space through niche tourism forms
	Policy type	Adaptation/Policy Framework
	Territorial coverage	Local and regional
	Timing	Immediate implementation with long term impacts
	Measures	1. Developing niche tourism forms (rural, cultural, agricultural, urban, nature-based, sport, wellness etc.) related to smaller scale development and with strong backward linkages to other industries.
		2. Spreading tourism flows in time and space for a more sustainable use of resources

The EMME region has been focusing for the past decades on the development of mass tourism activities and the 3S model (sea, sand, sun). In spite of its economic benefits, mass tourism has led to a series of negative impacts on the natural and cultural resources of the area, therefore affecting the very same assets that tourism depends on and threatening the sustainability of the tourism sector itself. The features accompanying mass tourism development (seasonality, unplanned coastal development and littoralization, resource exploitation, traffic congestion, overcrowding etc.) are by definition vulnerable to climate change impacts (increasing temperature and sea level rise, biodiversity loss, coastal erosion etc.)

and opposite to any necessary adaptation measures for the sustainability of the tourism sector in the future.

The policy aims to diversify the tourism product in EMME region through the development of selected niche tourism forms that focus on sustainable development of areas (rural, cultural, agricultural, urban, nature-based, sport, wellness etc.), not only to mitigate the impacts of mass tourism development to climate change but also to ensure the more viable future of the tourism industry itself. Many niche tourism forms are mostly related to smaller scale development in the hinterland (a feature compatible to coastal retreat scenarios) and can formulate strong backward linkages with other important industries (e.g., agro-food sector). Due to their nature and character, they require and at the same time, promote a more sustainable use of natural and cultural resources with significantly smaller environmental impact than mass tourism models, while at the same time, they actively incorporate local communities to their production and delivery, engaging this way more stakeholders (e.g., residents, local businesses, local authorities, tourists). Olya and Altinay (2016) introduced tourism weather insurance as an adaptive strategy that could mitigate risk of travel to travel to eastern Mediterranean coastal regions. They found that there is a demand from tourists as the insurance could provide a peace of mind about risk of interruption of their holiday plan by severe weather condition.

The policy a component of the adaptation framework and can be enforced at both the local and regional levels in light of the objective to develop strong relations with the industries related to tourism such as agriculture, transportation and commerce. The policy adheres to EU and global principles of sustainable tourism development in addition to other EMME CCI recommended policies that aims at employment, transportation, heritage management and local well-being. Moreover, the policy complements other frameworks related to innovation, biodiversity protection, climate observation networks and research activities and, at the same time, fulfills the Sustainable Development Goals at the societal, economic and environmental levels by proposing a better use of natural and cultural resources, highlighting the multiplier effects for the local economy, better working and living conditions among others.

The policy requires and at the same time promotes a change of mentality of many different stakeholders' groups, including tourists, local communities, tourist companies and different governance levels. Achieving cooperation among them and alignment of their interests can be challenging and requires strong communication efforts and top to bottom techniques. Each destination needs to decide which of the niche tourism forms are more suitable for development according to their resources, morphological characteristics and climatic conditions. Sharing of best practices related to niche tourism development,

evaluation methods and refinement techniques can contribute drastically to the successful implementation of the policy.

P2. REORIENTING TOURISM TO REDUCE CONCENTRATION AND OVERDEVELOPMENT	Objective P2.1	Touristically Enhancing less developed areas (e.g., mountainous, natural, rural, cultural, etc.)
	Policy type	Adaptation
	Territorial coverage	Local and regional
	Timing	Immediate implementation with long term impacts
	Measures	1. Maintaining and developing new infrastructure and superstructure (transportation – roads - signage, etc.)
		2. Producing needs assessment analysis at the destination level through stakeholder consultation

The diversification and reorientation of the tourism product in EMME requires a decongestion of tourism hotspots by spreading tourism activity on less accessible and less developed areas (e.g., mountainous, natural, rural, cultural, etc.) through the enhancement of their infrastructure and superstructure, and throughout the year (including non-peak seasons) -as many of niche tourism activities may take place also in non-peak tourist periods. Decongestion of tourism hotspots - usually coastal destinations - is fundamental to climate change adaptation and can be achieved by reorienting tourism to less accessible areas of the hinterland. Improving accessibility and understanding the tourist needs of these areas (in terms of services, facilities and infrastructure) are the key points of this policy. Notwithstanding, some destinations in the EMME region seem to have been attempting to increase tourist arrivals in a bid to recover the profit lost during the COVID-19 pandemic rather than decongesting tourist hotspots.

The overall adaptation framework incorporates this policy which is applicable at the local and regional levels, targeting the involvement and coordination of the public and private stakeholders' groups in the tourism reorientation process at various governmental levels (local, municipal, regional). The policy is consistent with EU and international guidelines for sustainable development in tourism. It also aligns with other EMME CCI policies that share the same goals on employment issues, community well-being and transportation among others. The policy also corresponds to policy frameworks promoting biodiversity initiatives and climate change actions. Last, it meets the principles of sustainability for the development of less accessible areas by enhancing new and existing infrastructure.

The policy requires and promotes the implementation of large-scale projects in various areas and is therefore challenging in terms of the necessary financial commitments that must be made. Policy

recommendations related to transportation, energy, and tourism as well as innovative processes and practices (e.g., non-fossil fuel transport) can provide useful input for efficient types of infrastructure and therefore facilitate the overall implementation of the policy. Also, a key issue towards successful implementation is the development of needs assessment analysis at each destination to highlight the necessary infrastructure/superstructure. This effort requires consulting and where necessary training local stakeholders about the local needs and how to identify and prioritize them. It also requires a constant communication framework among the different levels of governance engaged in the implementation and financing of large-scale projects.

P3. GREENER TOURIST ESTABLISHMENTS	Objective P3.1	Support development and transition towards greener tourist establishments
	Policy type	Adaptation and Mitigation
	Territorial coverage	Local and regional
	Timing	Immediate implementation with long term impacts
	Measures	1. Improving the efficiency of waste management
		2. Improving communication strategies addressed to tourists regarding the availability of the destinations' resources (e.g., water) and the need to protect them
		3. Implementing innovative techniques for the sustainable use of resources
		3. Issuing eco-labels and eco-stars
		4. Increasing the use of local production in the tourist chain in order to maintain and protect local resources
		5. Increasing the use of renewable energy resources, especially small-scale and self-consumption (solar, wind and sea power, desalination units, etc.)

Many tourist facilities across the EMME region operate in non-sustainable standards by exploiting the local natural resources and stressing the environment of tourist destinations. Such practices threaten the sustainability of destinations in terms of attractiveness and increase their vulnerability to climate change impacts. This policy aims to support the transition towards greener tourist establishments and therefore greener destinations by introducing green innovation measures in tourism services.

The policy falls under the umbrella of a wider agenda for adaptation in destinations which need to strengthen linkages with industries affiliated to tourism such as transportation and divert their strategies towards the achievement of sustainability as prescribed by the EU and international organisations. The policy must simultaneously address the requirements of other EMME CCI policies that have been suggested with regard heritage management, environmental protection etc. In this context, the policy

should correspond to initiatives aiming to protect the ecosystem by promoting green tourism, climate observation networks and research activities.

The policy requires a change of mentality and cooperation of many different stakeholders' groups, including tourists, local communities, tourist companies and different governance levels. Policy recommendations related to transportation, energy and tourism as well as innovative technologies can provide useful input for developing greener tourist establishments and facilitate the transition to greener destinations. Training - of both tourists and employees in tourism - on new installations (use, purpose, benefits etc.) and communication of the green innovations is also considered necessary for the efficient/responsible implementation of the policy measures both by tourist companies as well as tourists.

P4. REPOSITIONING OF THE TOURIST PRODUCT (BRANDING)	Objective P4.1	Repositioning of the tourist product (branding) in 50% of the areas suffering poor tourism marketing by 2030
	Policy type	Adaptation
	Territorial coverage	Local, National and regional
	Timing	Immediate implementation
	Measures	1. Developing and implementing bottom-up approaches in planning and decision making related to branding and marketing of tourist destinations.
		2. Developing sustainable brands that fully reflect the ethos of the destinations in order to attract tourists who appreciate the destinations' identity and respect local communities.
		3. Ensuring the active participation of the local communities

Many destinations across the EMME region are branded in ways that attract mass tourism flows by advertising mainly sun and sea related activities and ignoring other alternative tourist attractions, therefore excluding/suppressing the development of niche tourism activities. This policy aims to revise such branding and marketing strategies in order to reflect a broader stakeholder perspective that includes the vision of the local community and highlights the entire tourism potential of the destination. It promotes the development of sustainable brands that reflect the ethos of the destination and encourages the active participation of the local community in shaping and preserving each destination's identity.

Any adaptation framework requires policies like this one to be implemented at this instance to ensure local and regional challenges are addressed. In order for this policy to be implemented effectively, it is important for countries in the EMME region to improve the collaborative ties between the private and public sectors, reduce seasonality and spread tourism offers throughout the year whilst directing their efforts at improving the well-being of local communities. Given the directive of the EU and

intergovernmental organisations for development plans to follow the principles of sustainable development, it is imperative that the policy, and other EMME CCI recommended policies, focus on the creation of specialized forms of tourism that may contribute to the extension of the tourist season. The policy can thus support other policies that promote innovation, effective use of natural and cultural resources and community wellbeing through a series of actions.

The policy entails changes in local governance and decision-making processes, like bottom-up approaches in tourism planning, which may raise significant challenges, especially in relation to established and financially affected interest groups. The key to the efficient implementation of the policy is the collaboration of different stakeholders' groups with the local community towards the configuration of a common vision for the future.

5.2 Mitigation actions

This type of policy includes different sets of measures with the scope to formulate an overall tourism related mitigation framework. The main goal is to reduce the environmental impacts of the tourism industry and in particular, its carbon footprint and water consumption. To some extent its carbon footprint is highly dependent on air and sea transport (Scope 2 emissions), at a broader regional-global scale, which needs also to be considered. Improving awareness and understanding of energy use in various tourism subsectors (such as accommodation), developing energy efficiency and renewable energy solutions, reducing energy consumption and emissions and raising consumer awareness to support change and overcome barriers. The general framework is presented in table 2.

More specific measures on mitigating the environmental impact of the tourism sector include assessing emissions from tourism related infrastructure and activities, reducing emissions from tourism and supportive activities, offset tourism-related emissions and designing novel tourist products with zero or negative emissions. Examples of such measures are shown in table 3.

Climate change is a global phenomenon and is rightly the subject of an intensive global policy search. However, in addition to possible international agreements at macro-level, which are mainly symbolic of recognising the common phenomenon and inciting joint actions, the national level is the predominant operational level of climate change policy. This is also the appropriate level of implementation of prevention and adaptation actions and of seeking coordination between the individual sectoral policies that are expected to address the effects of climate change. In the case of tourism, which is a multi-facet activity with multiple linkages and interrelations to other branches and sectors it is also important to seek

policies and actions at the destination level, meaning to concentrate on the particularities of place, whereby "place" it is meant at the appropriate spatial area and scale. So, there are different types of contexts and options (policies, plans and actions) and stakeholders in coastal cities, islands, mountain areas, etc. as well as in developed, developing or underdeveloped places. So, in some cases it is interesting to seek as well regional or local level actions.

Table 2. **General framework for mitigation actions in the EMME**

Decarbonisation	Measures	Decarbonising the energy and transportation sectors (which dominate regional CO2 emissions) through significant reduction in energy use, full decarbonisation of energy production through renewables, and Improvements in energy efficiency
	Goals	-To keep global warming at or below 1.5°C since pre-industrial levels, thus complying with the Paris Agreement's main targets. -To alleviate the regional impacts of climate change on crucial aspects such as human health, environmental conservation and sustainable development.
Improved access to sustainable water resources	Measures	Stimulate the use of use of non-conventional water resources (treatment of wastewater, rainwater harvesting for irrigation, policies to reduce water demand, improved leakage detection in urban water distribution systems, etc)
	Goals	-To improve access to safe water for the population of EMME countries -To contribute to the maintenance of appropriate public health, food security and environmental conservation in the region.
Modernisation of energy & water infrastructure	Measures	Remove financial barriers to enable clean energy investments. Green bonds; Third-party financing with the aid of private and development banks; Tendering/Auctions for renewable energy projects; Net metering/billing to encourage renewable electricity; Energy performance contracting Grants for investments in low-carbon electricity and modernisation of residential and industrial equipment.
	Goals	-Improve access of firms and households to low-cost capital -Accelerate investments in renewable energy and energy efficiency
Mandatory building codes for new buildings and renovations	Measures	Develop and implement mandatory building codes in the context of an Energy Efficiency Action Plan (EEAP). Transition from voluntary to mandatory building codes that set minimum performance requirements for new buildings and renovations

	Goals	-Reduce energy demand -Reduce morbidity and mortality caused by anthropogenic and natural pollution and -Adapt to heat waves, extreme temperatures, heavy rains
Circular waste management	Measures	Implement circularity in waste management practices to protect and enhance the urban natural habitat, mitigating water, air and soil pollution
	Goals	-Reduce the need for raw materials -Reduce GHG emissions -Increase people quality of life -Promote citizen awareness and behavioral change
Climate sensitive urban and spatial planning	Measures	Reduce vulnerability of both formal and informal settlements to climate change induced phenomena by promoting urban and spatial planning
	Goals	-Promote equity and justice -Reduce burden on the health system by increasing people wellbeing -Provide better service to citizens -Promote re-stabilization of ecological services
Safe water	Measures	Advancing the development and widespread use of cheaper technologies for the production and management of drinking water by non-traditional means
	Goals	-Reduce disease burden caused by consumption of unsafe water
Risk planning for sea level rise	Measures	Assess climate risks to/from the marine environment. Design measures to mitigate the risk of sea level rise and adaptation measures to deal with the damage. Quantify effectiveness, practicality, cost, time, and other resources. Select and Apply/Prepare sea level rise mitigation measures
	Goals	-Develop full risk mitigation and damage adaptation plans against sea level rise -Protect coastal areas, natural environment, infrastructure, and populations -Avoid placing new infrastructure in areas of high vulnerability to sea level rise
Cultural Heritage Climate vulnerability index	Measures	Correlate climate change parameters with impacts. Document and map endangered CH. Use of advanced science and technology to map, assess risk and monitor cultural and natural heritage. Create a Regional cultural and natural heritage monitoring mechanism.
	Goals	-Community resilience and adaptation to climate change -Evidence-based policy making and interventions -Forecast of climate-driven cultural heritage damage
Climate Cultural heritage education and outreach	Measures	Use Cultural heritage as a vehicle for climate action and an agent of societal change and adaptation. Harvest local knowledge and expertise at the country level while providing a

		regional framework of collaboration able to identify synergies and offer support, services, good practices, and solutions.
	Goals	-Protect and preserve natural and cultural heritage
Protect and preserve natural and cultural heritage	Measures	Based on the CH climate vulnerability index (13.1) design, cost and prioritize measures to protect individual CH from: Heat waves, Fires, Floods, Sea level rise
	Goals	-Costing and prioritization of CH adaptation actions
Greener cultural heritage: decarbonisation and water consumption reduction	Measures	Assess and monitor emissions and water consumption of CH infrastructure and related tourist activities. Promote low-emissions/water CH, tourism, and supporting (e.g. transport) activities. Improve energy efficiency and introduce renewable energy solutions in CH protection and related tourist activities. Offset CH-related emissions. Invest in emissions-reduction technology and R&D. Issuing eco-labels and eco-stars.
	Goals	-Reduce carbon and water footprint of Cultural Heritage protection and tourism activities
Natural Heritage protection	Measures	Apply vulnerability index (13.1) and Risk planning (13.3) to natural heritage and open archaeological spaces Offset CH-related emissions. Invest in emissions-reduction technology and R&D. Issuing eco-labels and eco-stars.
	Goals	-Community resilience and adaptation to climate change -Evidence-based policy making and interventions -Forecast of climate-driven natural heritage damage

Table 3. **Examples of potential mitigation measures applicable in the field of tourism**

Set of Measures I: Assess and Inform
I.1 Measure the emissions and the water consumption of each tourist 'elemental' activity (from flying to destination to jet-skiing to water for pools, and from food transportation to using sunscreen).
I.2 The emissions and water consumption of each tourist activity will be advertised with the same intensity as the price and will be included in all information about any tourist product.
I.3 Hotel and restaurant star ratings will include emissions
I.4 All new tourist investments will include an assessment of carbon footprint and provide ways of net zero carbon (in order to obtain a permission for a hotel, for a charter flight, for a rent-a-car operation, or to organize an athletic/cultural event
I.5 Lobby internationally so that when the cost of climate-friendly measures taken in the EMME region results in international competition imbalances, taxation or subsidies redress the imbalance
Set of Measures II: Reduce tourism-related emissions
II.1 Tax (or give tax rebates to) tourist activities according to emissions and water consumption
II.2 Encourage low-emissions tourist activities
II.3 Rental car, motorcycle, boat etc. companies can only rent out electric vehicles, (or modern low emission vehicles)
II.4 Prohibit certain high-emissions tourist activities

ii.5 New Airbnb licenses are only given for zero energy buildings (or for apartments with certain energy standards)
ii.6 Encourage shared activities such as public transportation
Set of Measures III: Offset tourism-related emissions
iii.1 All charter flights should offset their emissions
iii.2 Hotels should offset their direct energy consumption emissions
iii.3 Provide free (or low cost) consultation services to small tourist enterprises for reducing their carbon footprint
Set of Measures IV: Design novel tourist products with zero or negative emissions
iv.1 Net-Zero émissions agrotourism
iv.2 Use public transportation where possible
iv.3 Combine low-emission tourist activities to create low-emission tourist packages
iv.4 Climate-positive volunteer tourist products

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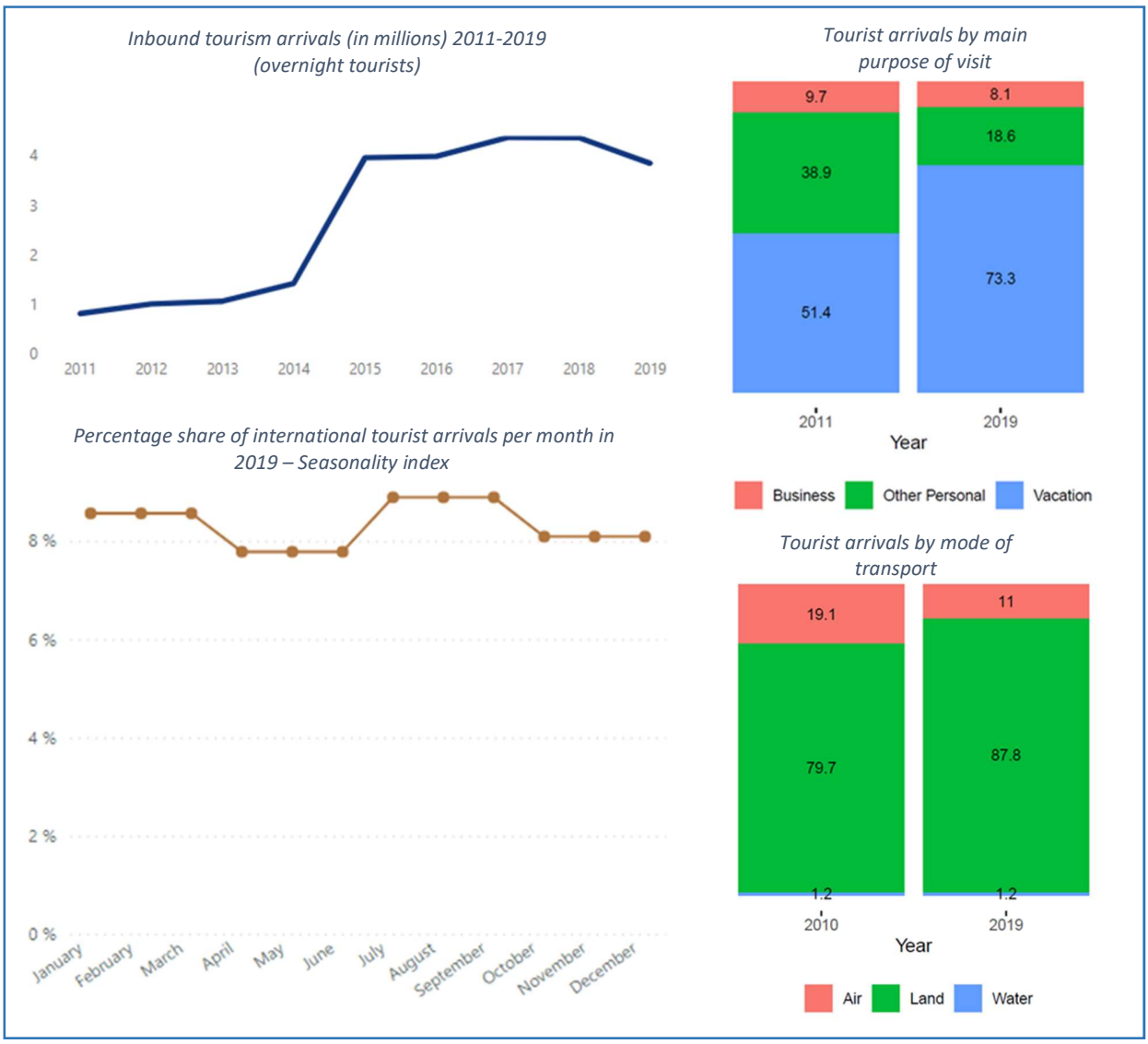
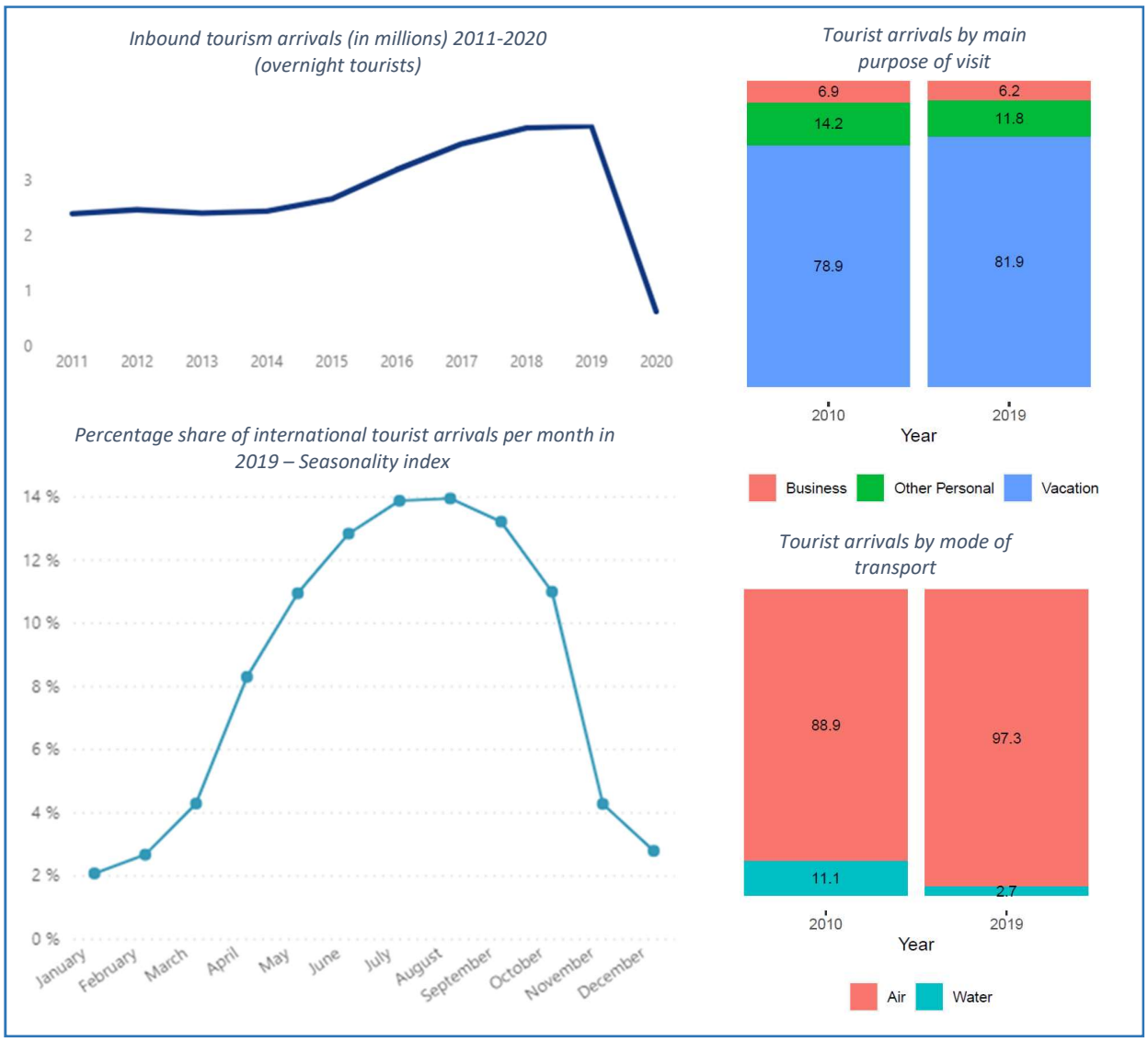
APPENDIX

Box 1: Key performance indicators for inbound tourism in Bahrain



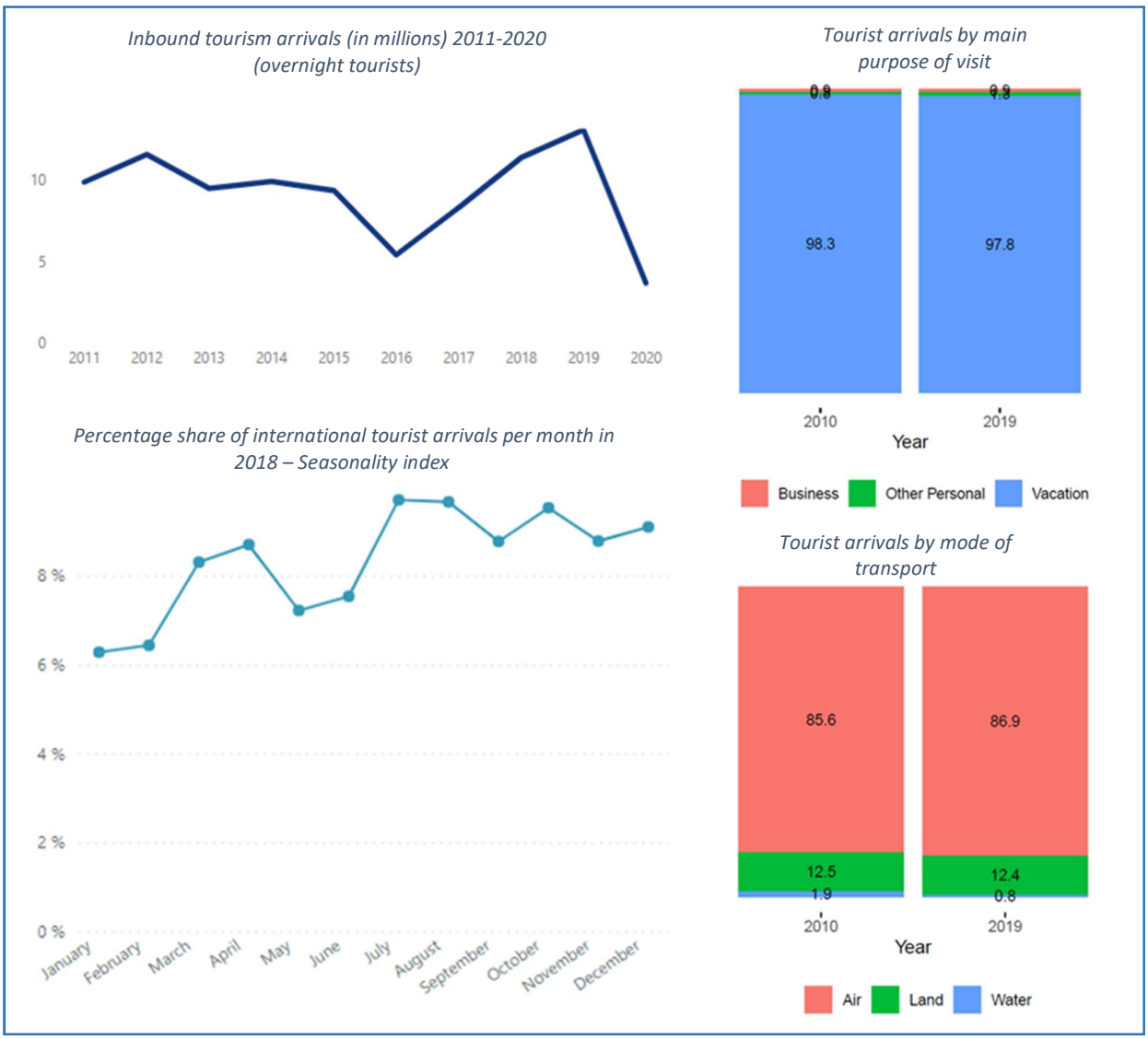
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 2: Key performance indicators for inbound tourism in Cyprus



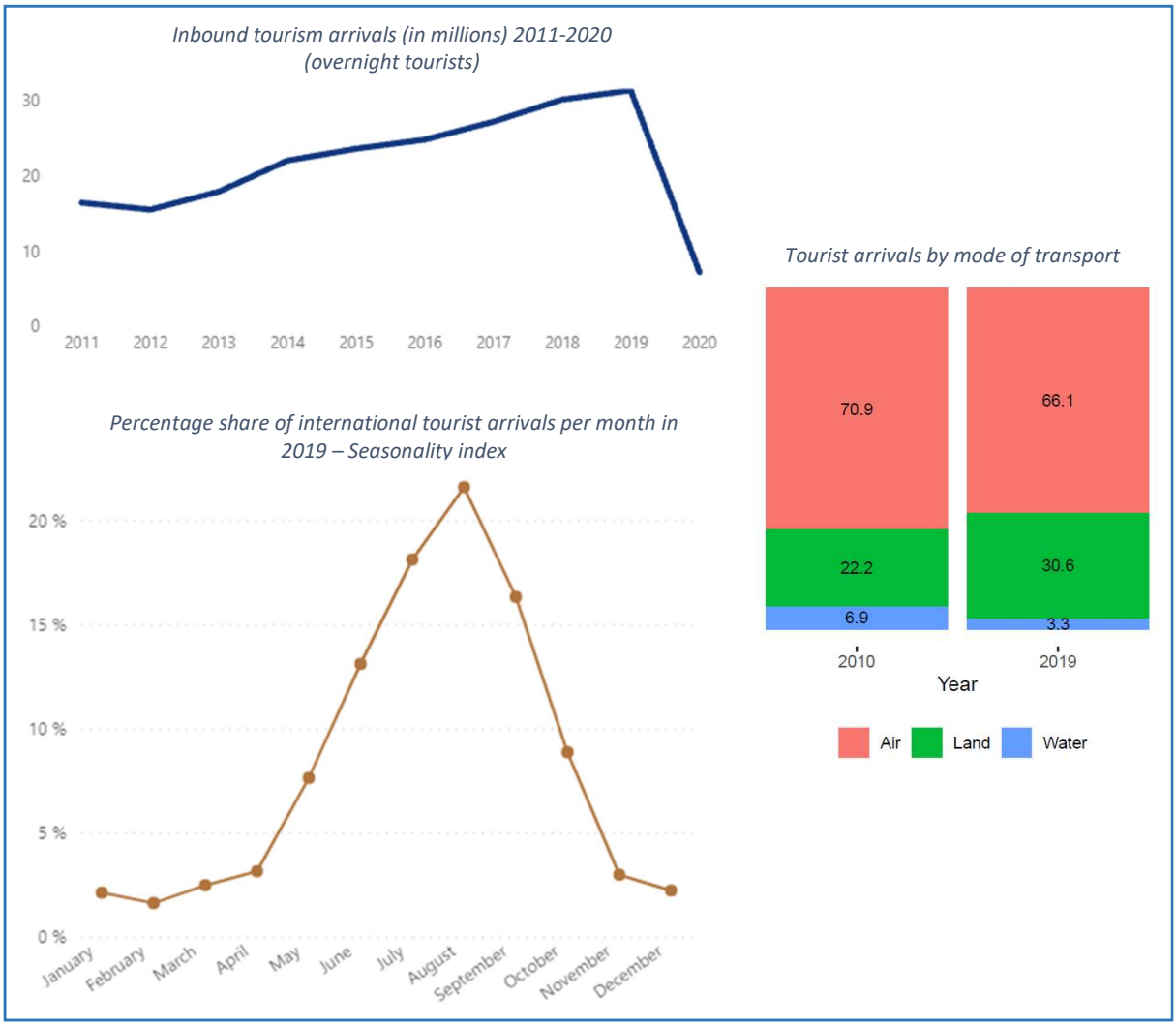
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 3: Key performance indicators for inbound tourism in Egypt



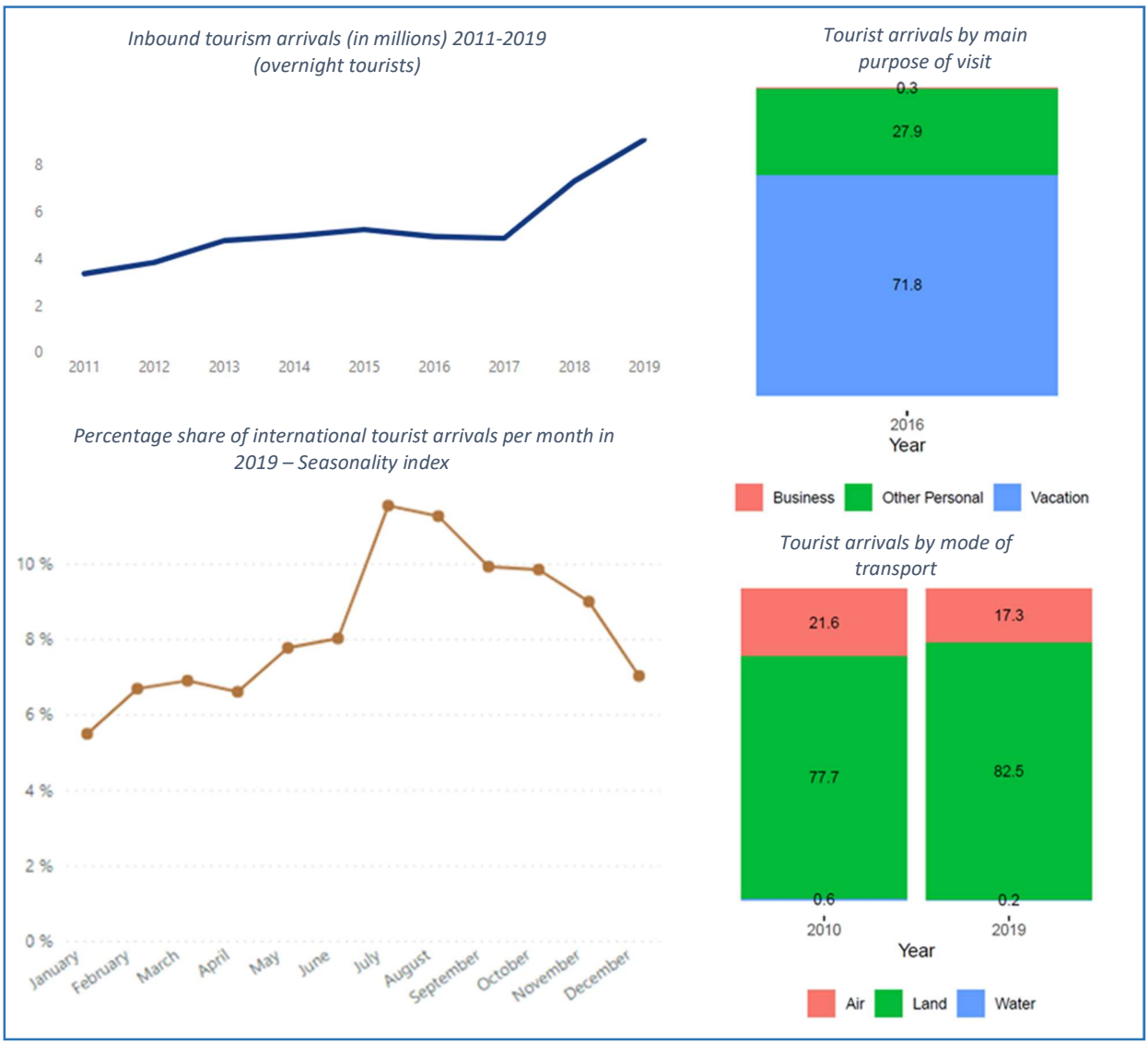
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 4: Key performance indicators for inbound tourism in Greece



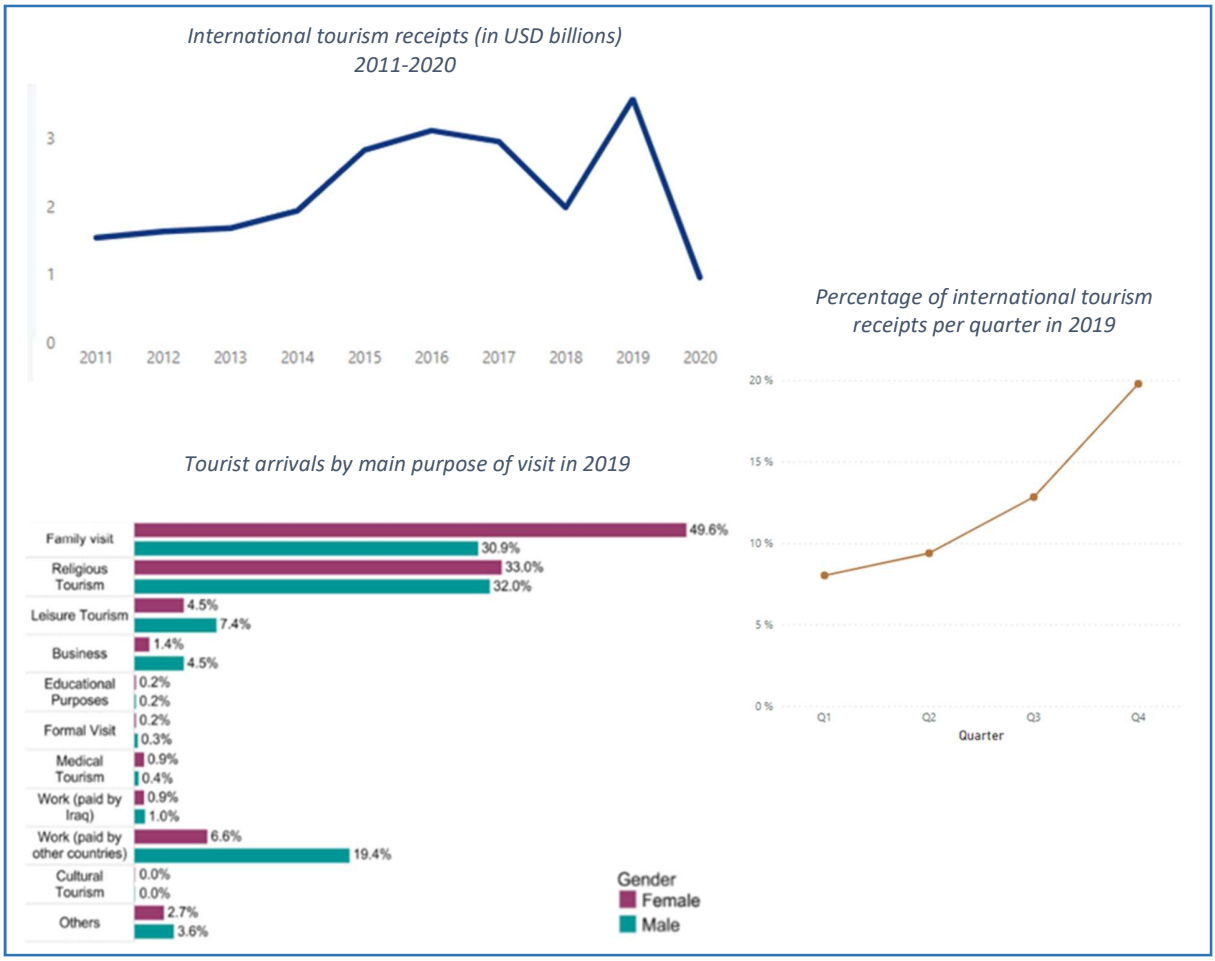
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 5: Key performance indicators for inbound tourism in Iran



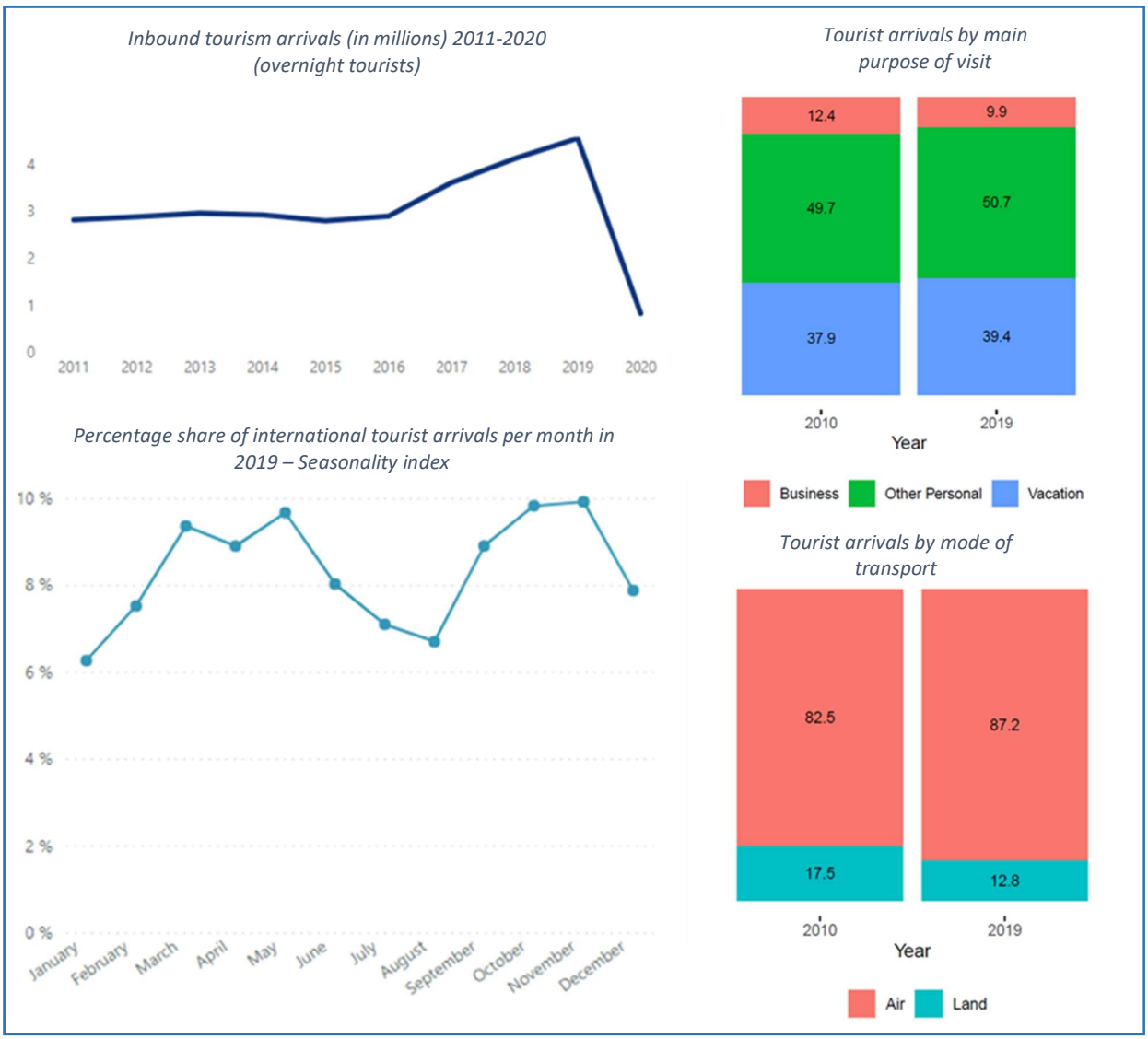
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 6: Key performance indicators for inbound tourism in Iraq



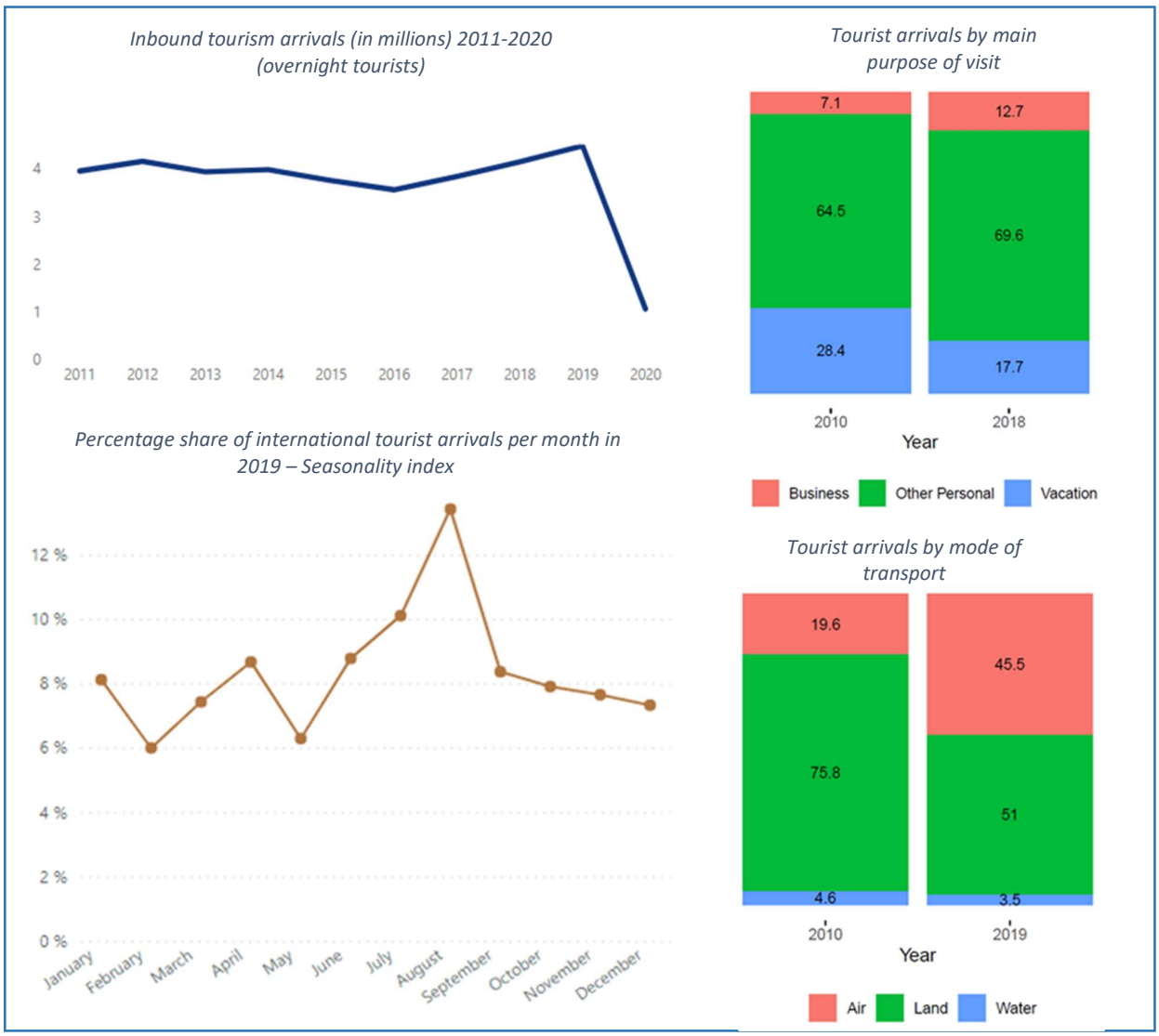
Source: KAPITA (2021), UNWTO Tourism Dashboard (2021) and own elaboration

Box 7: Key performance indicators for inbound tourism in Israel



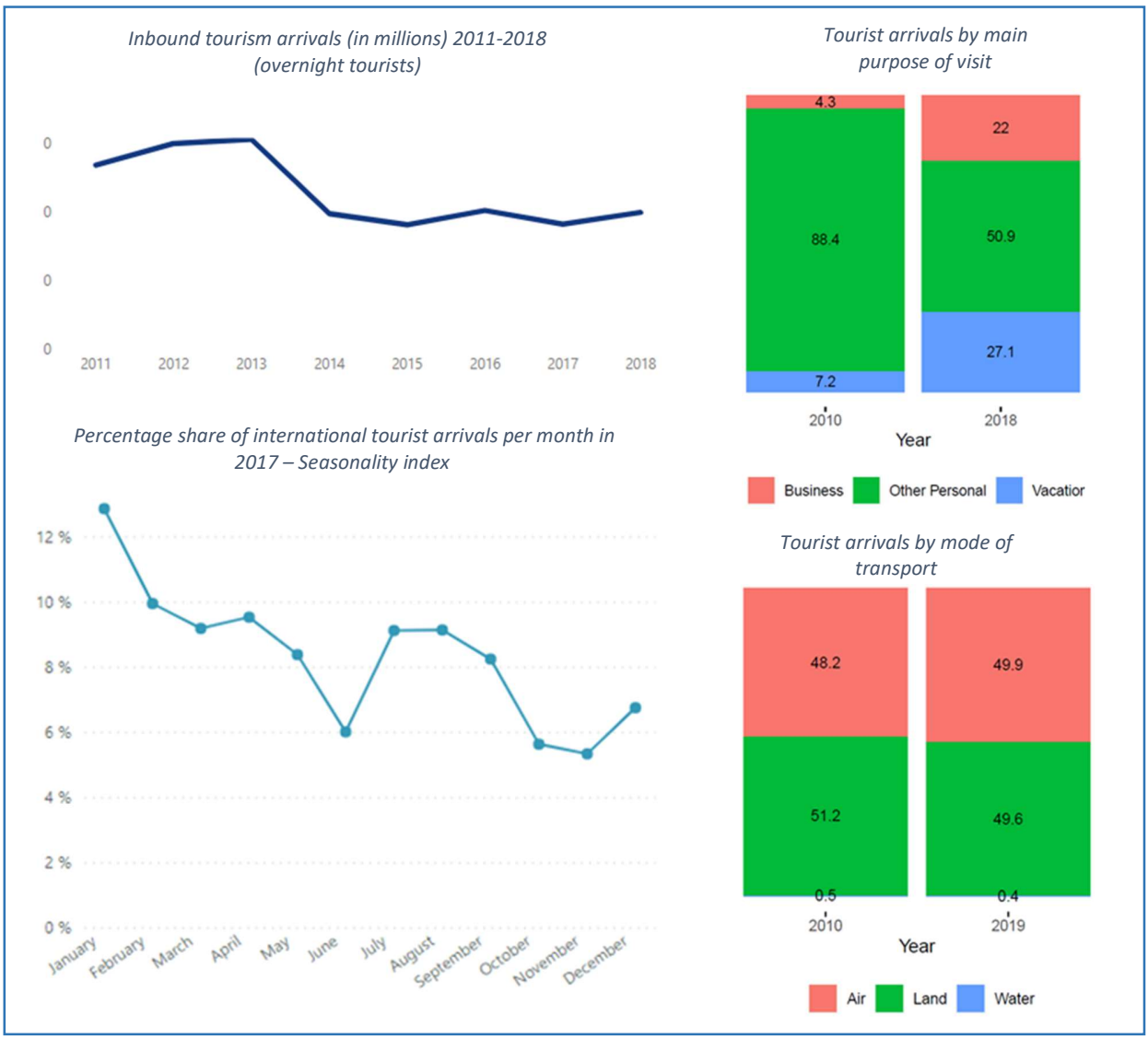
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 8: Key performance indicators for inbound tourism in Jordan



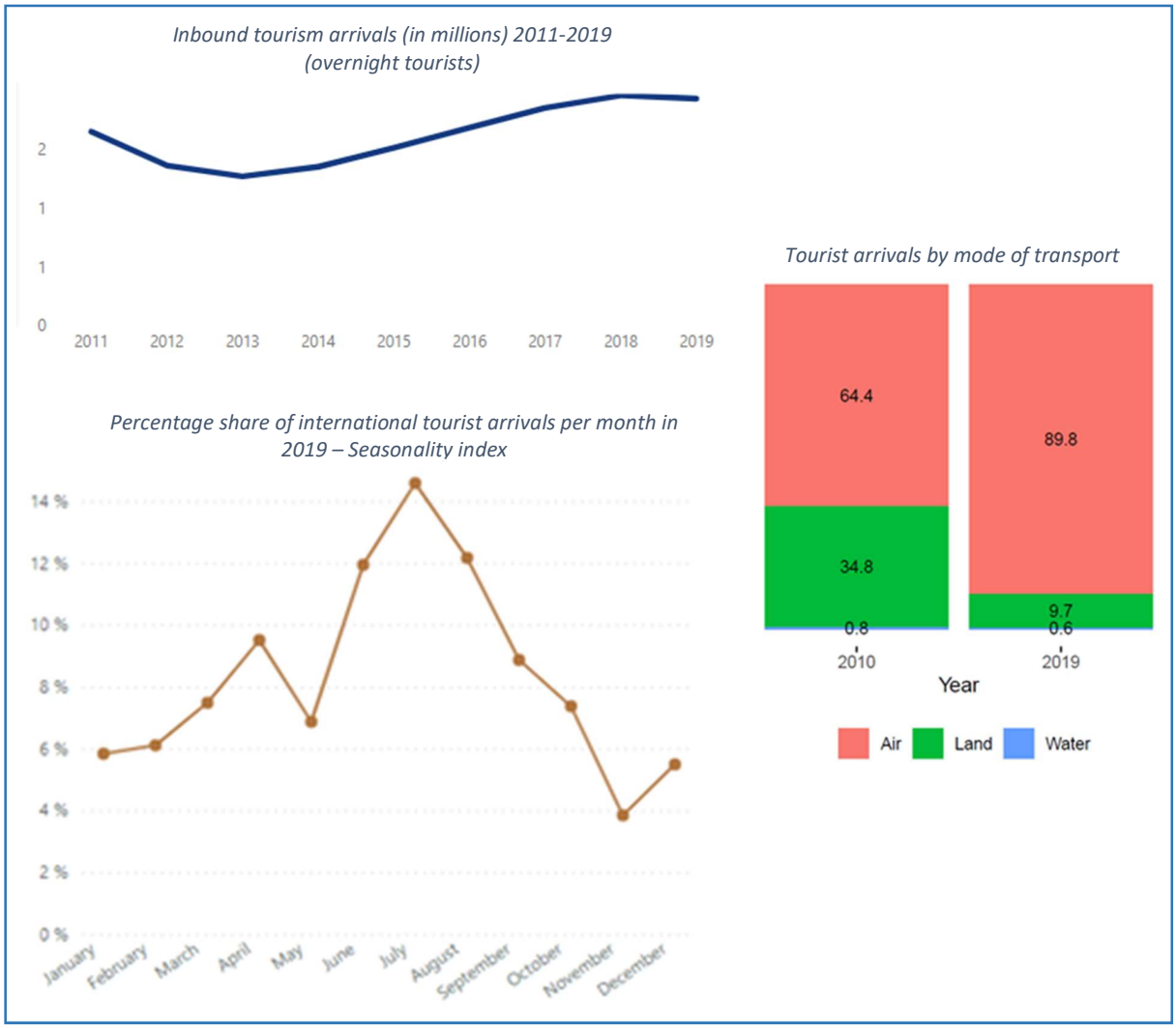
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 9: Key performance indicators for inbound tourism in Kuwait



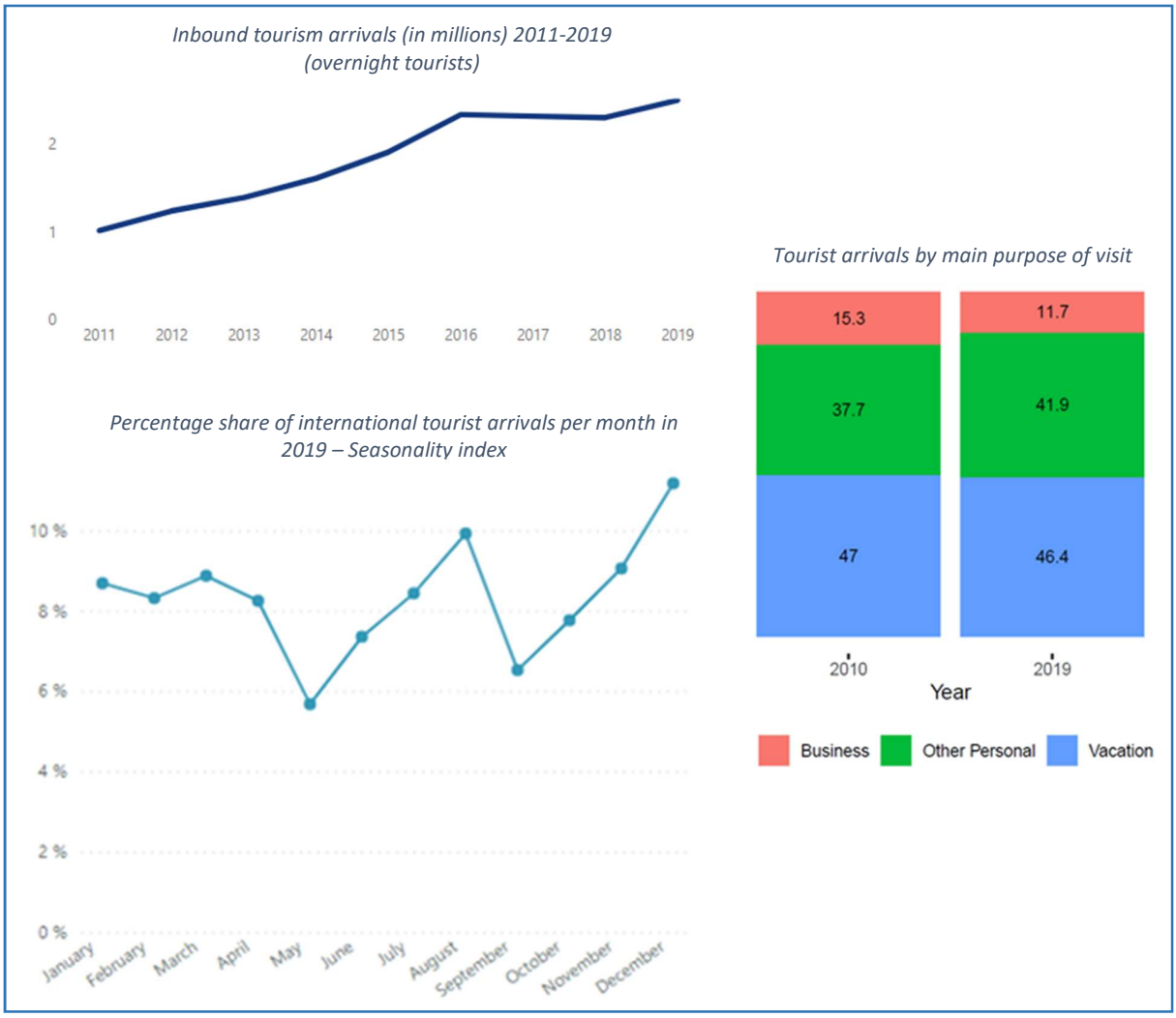
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 10: Key performance indicators for inbound tourism in Lebanon



Source: UNWTO Tourism Dashboard (2021) and own elaboration

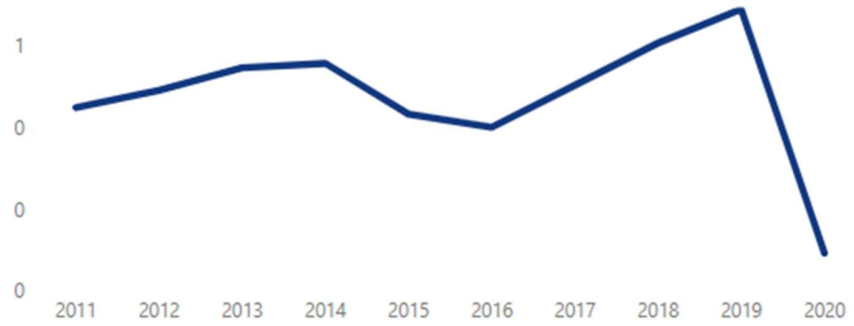
Box 11: Key performance indicators for inbound tourism in Oman



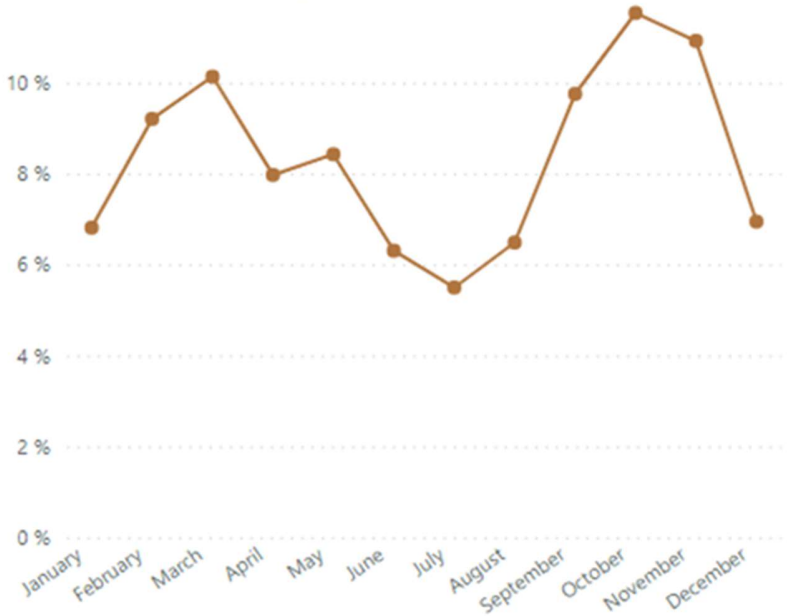
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 12: Key performance indicators for inbound tourism in Palestine

Inbound tourism arrivals (in millions) 2011-2020

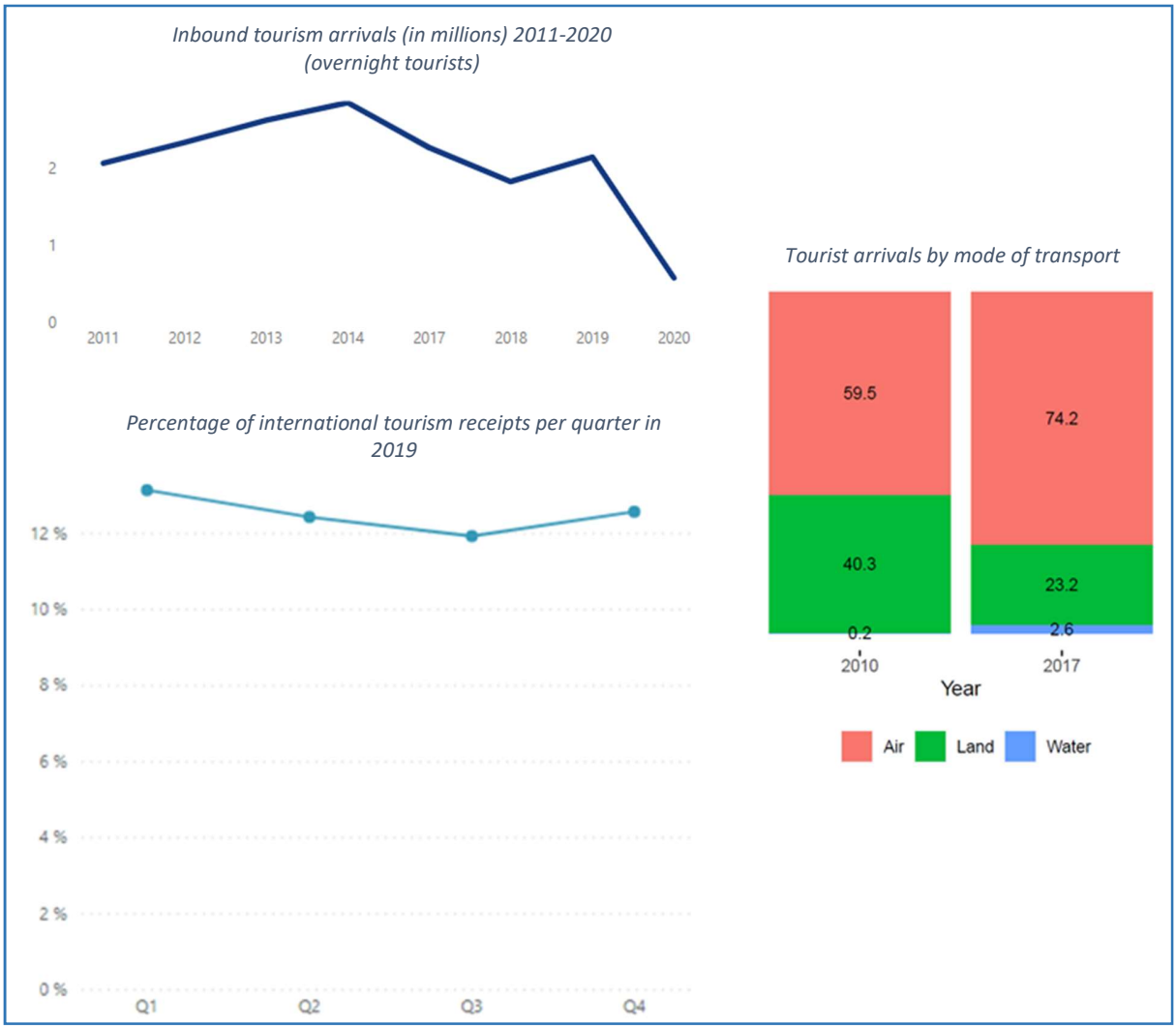


Percentage share of international tourist arrivals per month in 2019 – Seasonality index



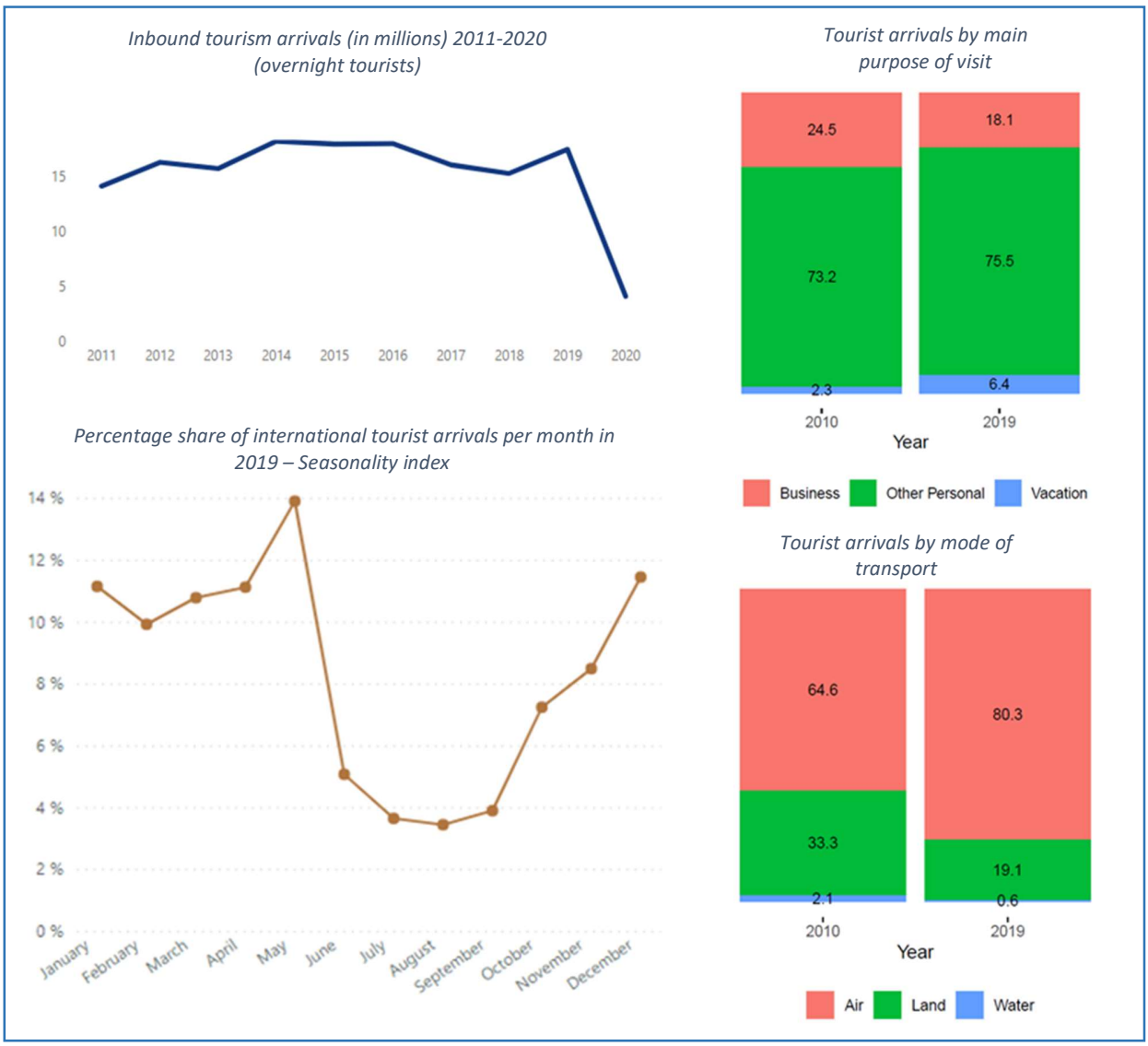
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 13: Key performance indicators for inbound tourism in Qatar



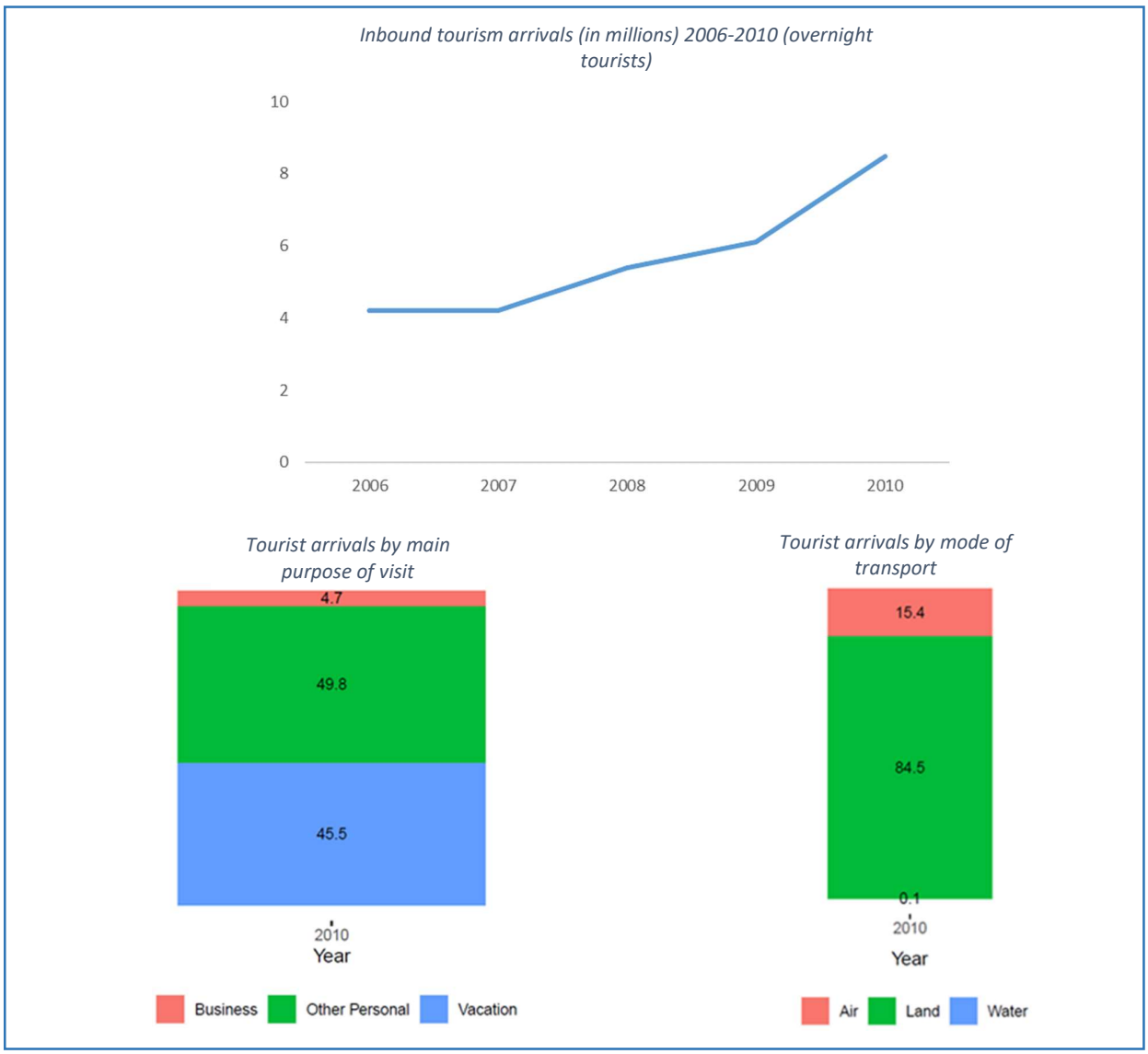
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 14: Key performance indicators for inbound tourism in Saudi Arabia



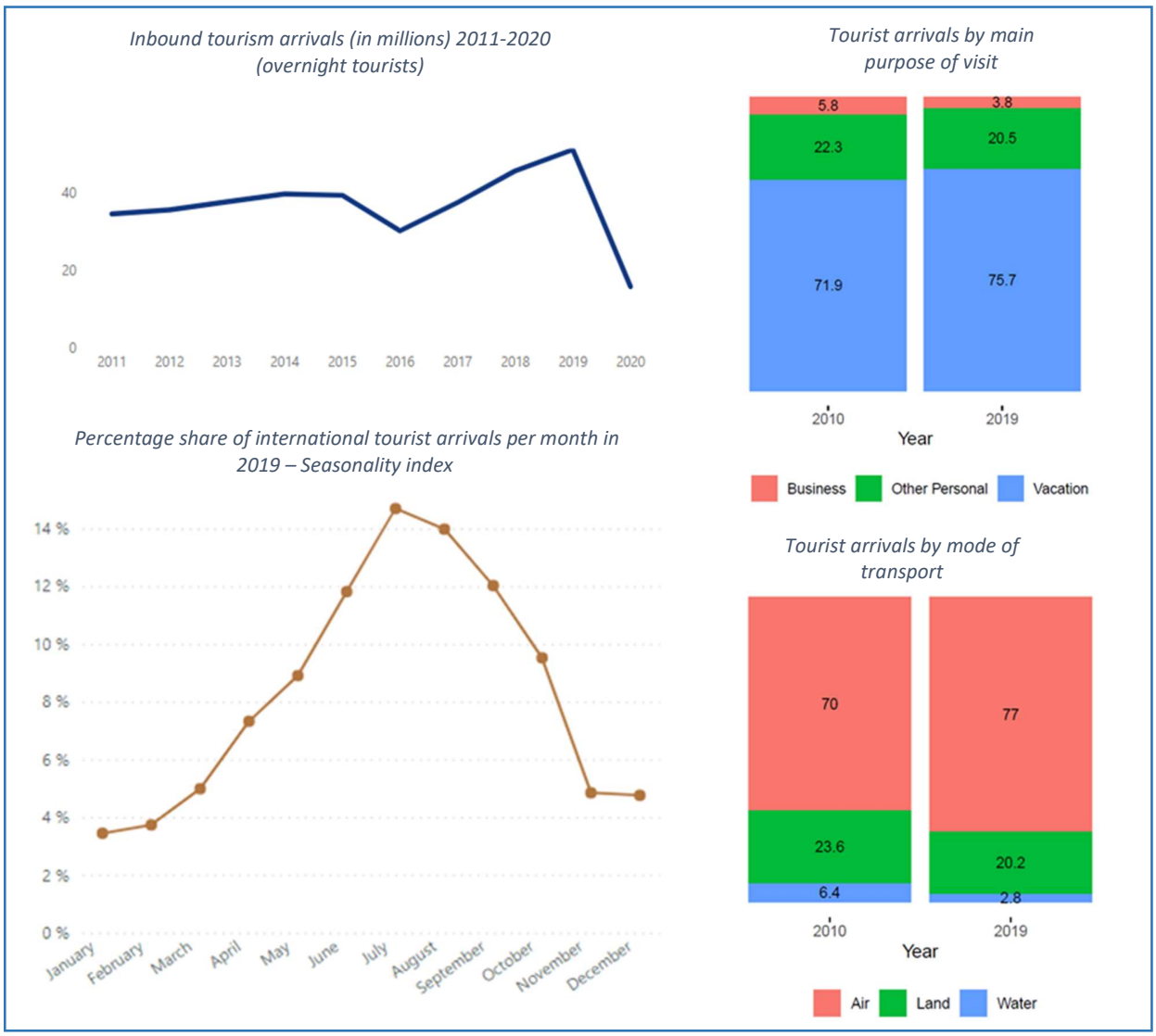
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 15: Key performance indicators for inbound tourism in Syria



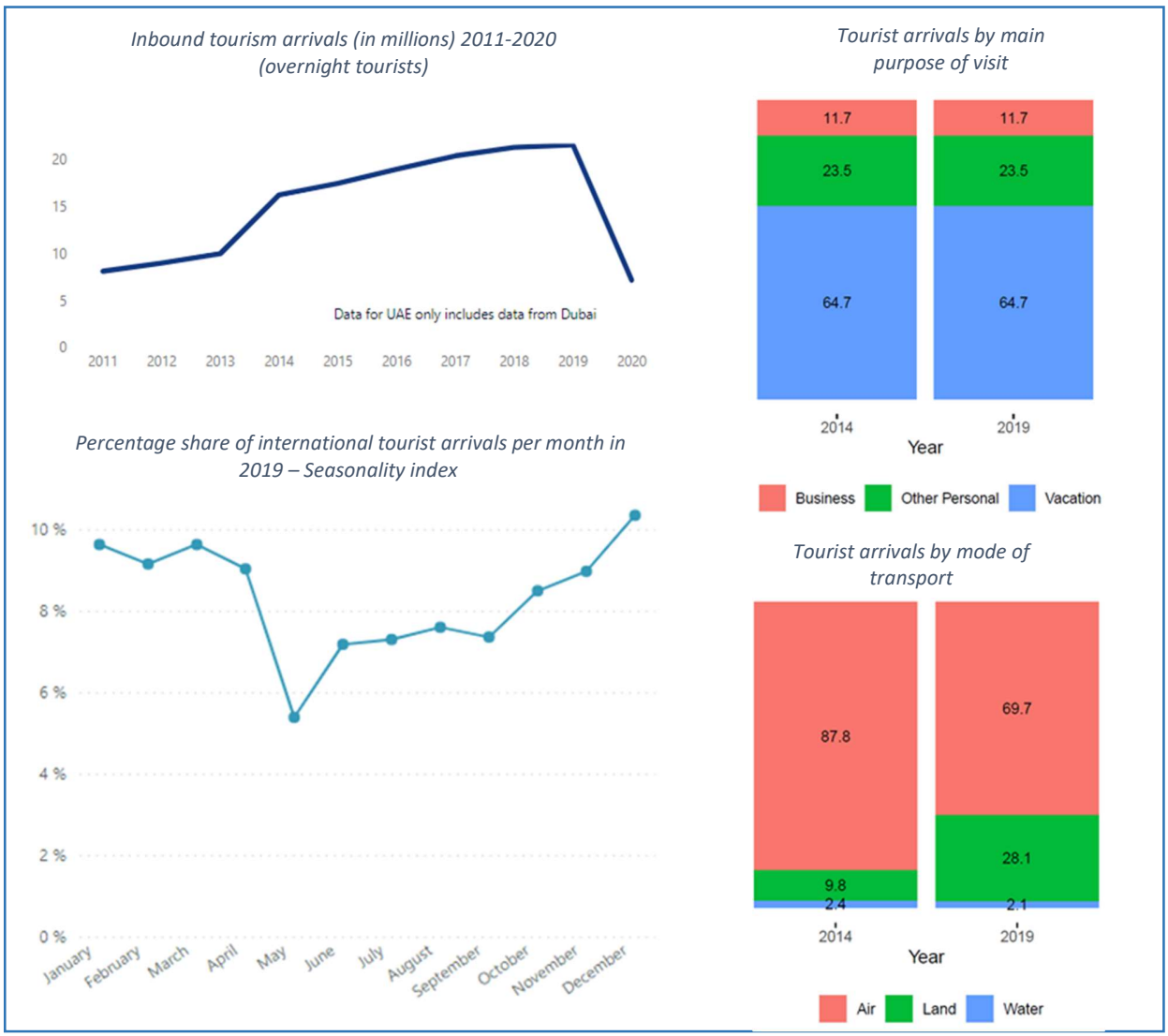
Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 16: Key performance indicators for inbound tourism in Türkiye



Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 17: Key performance indicators for inbound tourism in United Arab Emirates



Source: UNWTO Tourism Dashboard (2021) and own elaboration

Box 18: List of Publications on EMME region

Publications	Theme
Alamanos, A. (2021). Water resources planning under climate and economic changes in Skiathos Island, Aegean. Journal of Water Supply: Research and Technology-Aqua, 70(7), 1085–1093. https://doi.org/10.2166/aqua.2021.061	climate risk
ALDabbas, A., Gal, Z., & Attila, B. (2018). Neural network estimation of tourism climatic index (TCI) based on temperature-humidity index (THI)-Jordan region using sensed datasets. Carpathian Journal of Electronic and Computer Engineering, 11(2), 50–55. https://doi.org/10.2478/cjece-2018-0019	climate risk
Amelung, B., & Moreno, A. (2012). Costing the impact of climate change on tourism in Europe: results of the PESETA project. Climatic Change, 112(1), 83–100. https://doi.org/10.1007/s10584-011-0341-0	climate risk
Amengual, A., Homar, V., Romero, R., Ramis, C., & Alonso, S. (2014). Projections for the 21st century of the climate potential for beach-based tourism in the Mediterranean. International Journal of Climatology, 34(13), 3481–3498. https://doi.org/10.1002/joc.3922	climate risk
Andreadis, O., Chatzipavlis, A., Hasiotis, T., Monioudi, I., Manoutsoglou, E., & Velegrakis, A. (2021). Assessment of and adaptation to beach erosion in islands: An integrated approach. Journal of Marine Science and Engineering, 9(8), 859. https://doi.org/10.3390/jmse9080859	climate risk
Asane-Otoo, E. (2015). Carbon footprint and emission determinants in Africa. Energy, 82, 426–435. https://doi.org/10.1016/j.energy.2015.01.053	carbon risk
Bakhtiari, B., Bakhtiari, A., & Afzali Gorouh, Z. (2018). Investigation of climate change impacts on tourism climate comfort in Iran. Global NEST Journal, 20(2), 291–303.	climate risk
Barrios, S., Ibanez, J.N., 2015. Time is of the essence: Adaptation of tourism demand to climate change in Europe. Climatic Change 132 (4), 645–660. https://doi.org/10.1007/s10584-015-1431-1	climate risk
Bode, S., Hapke, J., & Zisler, S. (2003). Need and options for a regenerative energy supply in holiday facilities. Tourism Management, 24(3): 257-266. https://doi.org/10.1016/S0261-5177(02)00067-5.	carbon risk
Camelia, S.; Ion, H. R.; Marius-Razvan, S. (2020). The analysis of CO2 emissions determinants in accommodation and food service activities using quantile regressions. Romanian Statistical Review, 3: 34-52.	carbon risk
Chatziioannou, I.; Bakogiannis, E.; Kyriakidis, C.; Alvarez-Icaza, L. (2020). A Prospective Study for the Mitigation of the Climate Change Effects: The Case of the North Aegean Region of Greece. Sustainability, 12: 24. DOI: 10.3390/su122410420.	climate risk
Ciscar, J. C.; Iglesias, A.; Feyen, L.; Szabo, L.; van Regemorter, D.; Amelung, B.; Nicholls, R.; Watkiss, P.; Christensen, O. B.; Dankers, R.; Garrote, L.; Goodess, C. M.; Hunt, A.; Moreno, A.; Richards, J.; Soria, A. (2011). Physical and economic consequences of climate change in Europe. Environmental Sciences, 108(7): 2678-2683. https://doi.org/10.1073/pnas.1011612108	climate risk

Ciscar, J. C.; Szabo, L.; van Regemorter, D.; Soria, A. (2012). The integration of PESETA sectoral economic impacts into the GEM-E3 Europe model: methodology and results. Climatic Change 112: 127-142. https://doi.org/10.1007/s10584-011-0343-y	climate risk
Cruz-Perez, N.; Rodriguez-Martin, J.; Garcia, C.; Ioras, F.; Christofides, N.; Vieira, M.; Bruccoleri, M.; Santamarta, J. C. (2021). Comparative study of the environmental footprints of marinas on European Islands. Sci Rep, 11: 9410. https://doi.org/10.1038/s41598-021-88896-z	carbon risk
Demiroglu, O. C., Akbas, A., Turp, M. T., Ozturk, T., An, N., & Kurnaz, M. L. (2018). Case study Turkey: Climate change and coastal tourism: Impacts of climate change on the Turquoise Coast. In Jones, A.L., Phillips, M.R. (Eds.), Global climate change and coastal tourism. Recognizing problems, managing solutions and future expectations (pp. 247–262). CABI, Wallingford, Oxfordshire.	climate risk
Demiroglu, O. C., Turp, M. T., Kurnaz, M. L., & Abegg, B. (2021). The Ski Climate Index (SCI): Fuzzification and a regional climate modeling application for Turkey. International Journal of Biometeorology, 65(5), 763–777. https://doi.org/10.1007/s00484-020-01991-0	climate risk
Demiroglu, O. C.; Turp, M. T.; Ozturk, T.; Kurnaz, M. L. (2016). Impact of Climate Change on Natural Snow Reliability, Snowmaking Capacities, and Wind Conditions of Ski Resorts in Northeast Turkey: A Dynamical Downscaling Approach. Atmosphere, 7: 4. DOI: 10.3390/atmos7040052.	climate risk
Demiroglu, O. C., Saygili-Araci, F. S., Pacal, A., Hall, C. M., & Kurnaz, M. L. (2020b). Future Holiday Climate Index (HCI) performance of urban and beach destinations in the Mediterranean. Atmosphere, 11(9), 911. https://doi.org/10.3390/atmos11090911	climate risk
Deniz, A. (2011). An Examination of the Tourism Climate Index in Turkey. Fresenius Environmental Bulletin 20(6): 1414-1424.	climate risk
Dogru, T., Bulut, U., Kocak, E., Isik, C., Suess, C., & Sirakaya-Turk, E. (2020). The nexus between tourism, economic growth, renewable energy consumption, and carbon dioxide emissions: Contemporary evidence from OECD countries. Environmental Science and Pollution Research International, 27(32), 40930–40948. https://doi.org/10.1007/s11356-020-10110-w	carbon risk
El-Masry, E. A., El-Sayed, M. K., Awad, M. A., El-Sammak, A. A., & Sabarouti, M. A. E. (2022). Vulnerability of tourism to climate change on the Mediterranean coastal area of El Hammam–EL Alamein, Egypt. Environment, Development and Sustainability, 24(1), 1145–1165.	climate risk
Eyuboglu, K., & Uzar, U. (2020). The impact of tourism on CO2 emission in Turkey. Current Issues in Tourism, 23(13), 1631–1645. https://doi.org/10.1080/13683500.2019.1636006	carbon risk
Fitchett, J. M., & Roshan, G. (2020). Climate change threats to cultural and heritage tourism in Iran. In Cultural and heritage tourism in the Middle East and North Africa (pp. 218–238). Routledge.	climate risk

Georgopoulou, E.; Mirasgedis, S.; Sarafidis, Y.; Hontou, V.; Gakis, N.; Lalas, D. P. (2019). Climatic preferences for beach tourism: an empirical study on Greek islands. Theor Appl Climatol 137: 667-691. https://doi.org/10.1007/s00704-018-2612-4	climate risk
Ghaderi Z, Khoshkam M, Henderson JC (2014). From snow skiing to grass skiing: implications of climate change for the ski industry in Dizin, Iran. Anatolia, 25(1): 96-107.	climate risk
Giannakopoulos, C., Le Sager, P., Bindi, M., Moriondo, M., Kostopoulou, E., Goodess, C. M. (2009). Climatic changes and associated impacts in the Mediterranean resulting from a 2 °C global warming. Global and Planetary Change, 68(3): 209-224. https://doi.org/10.1016/j.gloplacha.2009.06.001.	climate risk
Giannakopoulos, C., Kostopoulou, E., Varotsos, K.V., Tziotziou, K., Plitharas, A. (2011). An integrated assessment of climate change impacts for Greece in the near future. Reg Environ Change, 11: 829-843. https://doi.org/10.1007/s10113-011-0219-8	climate risk
Grillakis, M.G., Koutroulis, AG, Tsanis, I.K., 2016. The 2 degrees C global warming effect on summer European tourism through different indices. International Journal of biometeorology, 60 (8): 1205–1215. https://doi.org/10.1007/s00484-015-1115-6	climate risk
Gurbuz, I. B.; Ozkan, G. (2020). Integrated environmental impact and risk assessment in rural women entrepreneurs. Environmental Science and Pollution Research, 27(19): 23837-23848. DOI: 10.1007/s11356-020-08753-w.	climate risk
Gyamfi, B. A., Bein, M. A., Adedoyin, F. F., & Bekun, F. V. (2021). To what extent are pollutant emission intensified by international tourist arrivals? Starling evidence from G7 Countries. Environment Development and Sustainability. 7896–7917. https://doi.org/10.1007/s10668-021-01765-7	carbon risk
Hadipour, V., Vafaie, F., & Kerle, N. (2020). An indicator-based approach to assess social vulnerability of coastal areas to sea-level rise and flooding: A case study of Bandar Abbas city, Iran. Ocean & Coastal Management, 188, 105077. https://doi.org/10.1016/j.ocecoaman.2019.105077	climate risk
Hall, C. M. (2018). Tourism and climate change in the Middle East. In Routledge Handbook on Tourism in the Middle East and North Africa (pp. 199–210). Routledge.	climate risk
Hejazizadeh, Z., Karbalaee, A., Hosseini, S. A., & Tabatabaei, S. A. (2019). Comparison of the holiday climate index (HCI) and the tourism climate index (TCI) in desert regions and Makran coasts of Iran. Arabian Journal of Geosciences, 12(24), 1–13. https://doi.org/10.1007/s12517-019-4997-5	climate risk
Hereher, M., Al-Awadhi, T., Al-Hatrushi, S., Charabi, Y., Mansour, S., Al-Nasiri, N., Sherief, Y., & El-Kenawy, A. (2020). Assessment of the coastal vulnerability to sea level rise: Sultanate of Oman. Environmental Earth Sciences, 79(15), 1–12. https://doi.org/10.1007/s12665-020-09113-0	climate risk
Hzami, A.,Heggy, E.,Amrouni, O.,Mahé, G.,Maanan, M., &Abdeljaouad, S. (2021). Alarming coastal vulnerability of the deltaic and sandy beaches of North Africa. Scientific Reports, 11(1): 2320. https://doi.org/10.1038/s41598-020-77926-x	climate risk

Işik, C., Kasımatı, E., & Ongan, S. (2017). Analyzing the causalities between economic growth, financial development, international trade, tourism expenditure and/on the CO2 emissions in Greece. Energy Sources Part B-Economics Planning and Policy, 12(7), 665–673. https://doi.org/10.1080/15567249.2016.1263251	carbon risk
Jacob, D., Kotova, L., Teichmann, C., Sobolowski, S. P., Vautard, R., Donnelly, C., Koutroulis, A. G., Grillakis, M. G., Tsanis, I. K., Damm, A., Sakalli, A., & van Vliet, M. T. (2018). Climate impacts in Europe under +1.5 degrees C global warming. Earths Future, 6(2), 264–285. https://doi.org/10.1002/2017EF000710	climate risk
Juvan, E., & Dolnicar, S. (2014). Can tourists easily choose a low carbon footprint vacation? Journal of Sustainable Tourism, 22(2), 175–194. https://doi.org/10.1080/09669582.2013.826230	carbon risk
Karaca, M., & Nicholls, R. J. (2008). Potential implications of accelerated sea-level rise for Turkey. Journal of Coastal Research, 242(2), 288–298. https://doi.org/10.2112/07A-0003.1	climate risk
Katavoutas, G., Founda, D., Kitsara, G., & Giannakopoulos, C. (2021). Climate change and thermal comfort in top tourist destinations—The case of Santorini (Greece). Sustainability, 13(16), 9107. https://doi.org/10.3390/su13169107	climate risk
Katircioglu, S. T. (2014). International tourism, energy consumption, and environmental pollution: The case of Turkey. Renewable & Sustainable Energy Reviews, 36: 180-187. DOI: 10.1016/j.rser.2014.04.058.	carbon risk
Katircioglu, S. T., Feridun, M., & Kilinc, C. (2014). Estimating tourism-induced energy consumption and CO2 emissions: The case of Cyprus. Renewable & Sustainable Energy Reviews, 29, 634–640. https://doi.org/10.1016/j.rser.2013.09.004	carbon risk
Katirtzidou, M., & Latinopoulos, P. (2018). Allocation of surface and subsurface water resources to competing uses under climate changing conditions: A case study in Halkidiki, Greece. Water Supply, 18(4), 1151–1161. https://doi.org/10.2166/ws.2017.166	climate risk
Klein, J., Ekstedt, K., Walter, M. T., & Lyon, S. W. (2015). Modeling potential water resource impacts of mediterranean tourism in a changing climate. Environmental Modeling & Assessment, 20(2), 117–128. https://doi.org/10.1007/s10666-014	climate risk
Kulözü-Uzunboy, N., & Demiroglu, O. C. (2021). Climate change adaptation: Capacity building for winter tourism in Western Asia. In W. Leal Filho, A.M. Azul, L. Brandli, P. G. Özuyar, T. Wall (Eds.), Climate action: Encyclopedia of the UN sustainable development goals (pp. 1–14). Springer.	climate risk
Kundzewicz, Z. W., Giannakopoulos, C., Schwarb, M., Stjernquist, I., Schlyter, P., Szwed, M., & Palutikof, J. (2008). Impacts of climate extremes on activity sectors—stakeholders' perspective. Theoretical and Applied Climatology, 93(1–2), 117–132. https://doi.org/10.1007/s00704-007-0327-z	climate risk
Lam-Gonzalez, Y. E., Galindo, C. G., Hernandez, M. M., & Leon, C. J. (2020). Understanding the heterogeneity of tourists' choices under climate change risks: A segmentation analysis. Atmosphere, 12(1), 22. https://doi.org/10.3390/atmos12010022	climate risk

Lee, J. W., & Brahmasrene, T. (2013). Investigating the influence of tourism on economic growth and carbon emissions: Evidence from panel analysis of the European Union. Tourism Management, 38, 69–76. https://doi.org/10.1016/j.tourman.2013.02.016	carbon risk
Leitão, N. C., & Lorente, D. B. (2020). The linkage between economic growth, renewable energy, tourism, CO2 emissions, and international trade: The evidence for the European Union. Energies, 13(18), 4838. https://doi.org/10.3390/en13184838	carbon risk
Lemesios, G., Giannakopoulos, C., Papadaskalopoulou, C., Karali, A., Varotsos, K. V., Moustakas, K., Malamis, D., Zachariou-Dodou, M., Petrakis, M., & Loizidou, M. (2016). Future heat-related climate change impacts on tourism industry in Cyprus. Regional Environmental Change, 16(7), 1915–1927. https://doi.org/10.1007/s10113-016-0997-0	climate risk
Leon, C. J., Giannakis, E., Zittis, G., Serghides, D., Lam-Gonzalez, Y. E., & Garcia, C. (2021). Tourists' preferences for adaptation measures to build climate resilience at coastal destinations. Tourism Planning & Development, 1–27. https://doi.org/10.1080/21568316.2021.1958914	climate risk
León, C. J., Lam-González, Y. E., Galindo, C. G., & Hernández, M. M. G. (2020). Measuring the Impact of Infectious Diseases on Tourists' Willingness to Pay to Visit Island Destinations. Atmosphere, 11(10), 1117. https://doi.org/10.3390/atmos11101117	climate risk
Lise, W.; Tol, R. S.J. (2002). Impact of climate on tourist demand. Climatic Change 55: 429-449. https://doi.org/10.1023/A:1020728021446	climate risk
Mahmoud, D., Gamal, G., & El-Seoud, T. A. (2019). The potential impact of climate change on Hurghada city, Egypt, using tourism climate index. GeoJournal of Tourism and Geosites, 25(2), 496–508. https://doi.org/10.30892/gtg.25218-376	climate risk
Matzarakis, A., Endler, C., & Nastos, P. T. (2014). Quantification of climate-tourism potential for Athens, Greece—Recent and future climate simulations. Global Nest Journal, 16(1), 43–51.	climate risk
Mayor, K.; Tol, R. S.J. (2010). The impact of European climate change regulations on international tourist markets. Transportation Research Part D: Transport and Environment, 15(1): 26-36.	carbon risk
Menegaki; Tsounis, N.; Agiomirgianakis, G. M. (2021). The economic impact of climate change (CC) on the Greek economy. Environ Dev Sustain, 24: 8145-8161. https://doi.org/10.1007/s10668-021-01776-4	climate risk
Michailidou, A. V., Vlachokostas, C., & Moussiopoulos, N. (2016). Interactions between climate change and the tourism sector: Multiple-criteria decision analysis to assess mitigation and adaptation options in tourism areas. Tourism Management, 55, 1–12. https://doi.org/10.1016/j.tourman.2016.01.010	climate risk
Michalak, D. (2017). A Comparative Analysis of Initiatives and Adaptation Measures To Climate Change Undertaken in Poland and Eastern EU Countries. Comparative Economic Research, 20(3): 95-115. https://doi.org/10.1515/cer-2017-0022	climate risk

Michopoulos, A., Ziogou, I., Kerimis, M., & Zachariadis, T. (2017). A study on hot-water production of hotels in Cyprus: Energy and environmental considerations. Energy and Buildings, 150, 1–12. https://doi.org/10.1016/j.enbuild.2017.05.071	carbon risk
Moreno, A., & Amelung, B. (2009). Climate change and tourist comfort on Europe's beaches in Summer: A reassessment. Coastal Management, 37(6), 550–568. https://doi.org/10.1080/08920750903054997	climate risk
Morin, S.; Samacoits, R.; Francois, H.; Carmagnola, C. M.; Abegg, B.; Demiroglu, O. C.; Pons, M.; Soubeyroux, J. M.; Lafaysse, M.; Franklin, S.; Griffiths, G.; Kite, D.; Hoppler, A. A.; George, E.; Buontempo, C.; Almond, S.; Dubois, G.; Cauchy, A. (2021). Pan-European meteorological and snow indicators of climate change impact on ski tourism. Climate Services, 22: 100215. https://doi.org/10.1016/j.cliser.2021.100215	climate risk
Nastos, P. T., & Matzarakis, A. (2019). Present and future climate-tourism conditions in Milos Island. Greece Atmosphere, 10(3), 145. https://doi.org/10.3390/atmos10030145	climate risk
Pablo-Romero, M., Sánchez-Braza, A., & Sánchez-Rivas, J. (2017). Relationships between hotel and restaurant electricity consumption and tourism in 11 European Union countries. Sustainability, 9(11), 2109. https://doi.org/10.3390/su9112109	carbon risk
Pala, A. (2020). The relation between climate change and economic growth: the investigation the regional differences with RCM model in EU-28 countries. International Journal of Economic Sciences, IX(1), 135–154. https://doi.org/10.20472/ES.2020.9.1.008	carbon risk
Pata, U. K., & Balsalobre-Lorente, D. (2022). Exploring the impact of tourism and energy consumption on the load capacity factor in Turkey: a novel dynamic ARDL approach. Environmental Science and Pollution Research, 29(9), 13491–13503. https://doi.org/10.1007/s11356-021-16675-4	carbon risk
Peeters, P., Szimba, E., & Duijnisveld, M. (2007). Major environmental impacts of European tourist transport. Journal of Transport Geography, 15(2), 83–93. https://doi.org/10.1016/j.jtrangeo.2006.12.007	carbon risk
Perch-Nielsen, S. L., Amelung, B., & Knutti, R. (2010b). Future climate resources for tourism in Europe based on the daily Tourism Climatic Index. Climatic Change, 103(3–4), 363–381. https://doi.org/10.1007/s10584-009-9772-2	climate risk
Pieri, S. P., Stamos, A., & Tzouvadakis, I. (2016). Reducing tourist carbon footprint through strategic mapping of the existing hotel stock—Attica. International Journal of Sustainable Energy, 35(8), 734–745. https://doi.org/10.1080/14786451.2014.943757	carbon risk
Ragab, A. M., & Meis, S. (2016). Developing environmental performance measures for tourism using a Tourism Satellite Accounts approach: A pilot study of the accommodation industry in Egypt. Journal of Sustainable Tourism, 24(7), 1007–1023. https://doi.org/10.1080/09669582.2015.1107078 [Taylor & Francis Online], [Web of Science ®], [Google Scholar]	carbon risk
Refaat, S. A. (2015). Egyptian tourism with the expected water scarcity crisis. In V. Katsoni (Ed.), Cultural tourism in a digital era (pp. 39–56). Springer.	climate risk

Roson, R. and Sartori, M. (2014), "Climate change, tourism and water resources in the Mediterranean: A general equilibrium analysis", International Journal of Climate Change Strategies and Management, Vol. 6 No. 2, pp. 212-228. https://doi.org/10.1108/IJCCSM-01-2013-0001	climate risk
Rossello, J. (2011). North Atlantic Oscillation influences on European airline traffic. Transportation Research Part D: Transport and Environment, 16(2): 183-187. https://doi.org/10.1016/j.trd.2010.09.003.	climate risk
Saseanu, A. S., Ghita, S. I., Albastroiu, I., & Stoian, C.-A. (2020). Aspects of digitalization and related impact on green tourism in European Countries. Information, 11(11), 507. https://doi.org/10.3390/info11110507	carbon risk
Scott, D., Hall, C. M., & Gössling, S. (2019). Global tourism vulnerability to climate change. Annals of Tourism Research, 77, 49–61. https://doi.org/10.1016/j.annals.2019.05.007	climate risk
Scott, D., Rutty, M., Amelung, B., & Tang, M. T. (2016). An inter-comparison of the Holiday Climate Index (HCI) and the Tourism Climate Index (TCI) in Europe. Atmosphere, 7(6), 80. https://doi.org/10.3390/atmos7060080	climate risk
Sghaier, A., Guizani, A., Jabeur, S. B., & Nurunnabi, M. (2019). Tourism development, energy consumption and environmental quality in Tunisia, Egypt and Morocco: A trivariate analysis. GeoJournal, 84(3), 593–609. https://doi.org/10.1007/s10708-018-9878-z	carbon risk
Sharaan, M., Somphong, C., & Udo, K. (2020). Impact of SLR on beach-tourism resort revenue at Sahl Hasheesh and Makadi Bay, Red Sea, Egypt; A hedonic pricing approach. Journal of Marine Science and Engineering, 8(6), 432. https://doi.org/10.3390/jmse8060432	climate risk
Simo-Kengne, B. D. (2022). Tourism growth and environmental sustainability: Trade-off or convergence? Environment, Development and Sustainability, 24(6), 8115–8144. https://doi.org/10.1007/s10668-021-01775-5	carbon risk
Skrimizea, E., & Parra, C. (2019). Social-ecological dynamics and water stress in tourist islands: The case of Rhodes, Greece. Journal of Sustainable Tourism, 27(9), 1438–1456. https://doi.org/10.1080/09669582.2019.1630420	climate risk
Soares, MB; Alexander, M; Dessai, S (2018) Sectoral use of climate information in Europe: A synoptic overview. Climate Services, 9: 5-20. https://doi.org/10.1016/j.cliser.2017.06.001.	climate risk
Sobhani, B., & Zengir, V. S. (2020). Evaluation and zoning of environmental climatic parameters for tourism feasibility in northwestern Iran, located on the western border of Turkey. Modeling Earth Systems and Environment, 6(2), 853–864. https://doi.org/10.1007/s40808-020-00712-1	climate risk
Suryan, L., Daoutis, G., & Girrbach, L. (2020). Cut carbon, cut cost-feasibility of applying PAS 2080 [Paper presentation]. International Conference on Civil Infrastructure and Construction. https://doi.org/10.29117/cic.2020.0126	carbon risk
Tranos, E.; Davoudi, S. (2014). The Regional Impact of Climate Change on Winter Tourism in Europe. Tourism Planning & Development, 11(2): 163-178. DOI: 10.1080/21568316.2013.864992	climate risk
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