
Diving Ecotourism as Climate Change Communicating means: Greek Diving Instructors' perceptions

Georgios Maripas-Polymeris, Aristeia Kounani, Maria K. Selevanti and Constantina Skanavis

Abstract

Since climate change and loss of biodiversity are the most significant challenges of coastal areas, it is imperative to design effective adaptation and mitigation strategies to achieve ecological sustainability patterns. The Diving Community could become powerful change agents as well as tackle and mitigate climate change, and thus marine ecosystems' extinction.

This research provides an extensive literature review to link the benefits of diving ecotourism. At the same time, the issue as to whether diving tourism can be an educational and communicational means of climate change in coastal regions, promoting sustainability as well is investigated. Based on face to face interviews with diving instructors who work in Greek Diving Centers, this survey also aims to reveal their perceptions towards diving tourism and climate change. Finally, it is going to evaluate and highlight the role of diving instructors and how they can promote mitigation and adaptation strategies through their trainings.

Keywords

Climate Change Communication · Diving Ecotourism · Diving Instructors · Greece

G. Maripas- Polymeris
Department of Environment, University of the Aegean,
Mytilene, Greece
E-mail: env12045@env.aegean.gr

A. Kounani (X)
Department of Environment, University of the Aegean,
Mytilene, Greece
E-mail: akounani@yahoo.gr

M. K. Selevanti
Department of Environment, University of the Aegean,
Mytilene, Greece
E-mail: maria.selevanti@gmail.com

C. Skanavis
Department of Public and Community Health, University of West Attica
Athens, Greece
E-mail: kskanavi@uniwa.gr

1 Introduction

Climate change is a pressing global issue of concern, having a wide range of impacts at different levels within society and industries. Human-induced changes to the environment started causing major socio-economic issues, catching major attention around the globe. Climate change is currently recognized as an important social and environmental issue, surpassing the world population and resources depletion topics. Climate is considered a significant factor in tourism development, and it is regarded as an invaluable asset in tourism globally, as it can have a direct and indirect impact on it (Siddiqui and Imran 2018). Countries like Greece having natural attractions can observe a decline in tourism consequential to climate change (Liu 2016). Extreme weather events (sea level rise (SLR), flood, drought, wildfire, infectious disease, etc.) as a fallout can influence tourist activity as well as their safety (Siddiqui and Imran 2018).

Several efforts to reduce the climate change impacts, like conservation societies, ecotourism, and the Paris Summit in 2015 require support to be implemented on a global scale. This can help to solve such global issues effectively (Siddiqui and Imran 2018). A promising sector of the tourism industry nowadays is diving tourism. Diving tourism, as one form of ecotourism, is an activity that requires effective management towards protecting ecological and cultural values and ensuring sustainable use of natural resources (Rangelm et al. 2014).

This specific research article investigates the role of diving ecotourism and diving instructors towards climate change mitigation and adaptation strategies. The main aim of the survey is the effective and purposeful investigation of the linkage between climate change and diving ecotourism, based on literature search. A specific target is to assess the perceptions of Greek diving instructors towards the climate change issue, diving ecotourism, as well as the impact of climate change on coastal regions. Another objective is to evaluate whether diving instructors could promote mitigation and adaptation strategies through their training pathways.

2 The Impacts of Climate Change on Coastal Regions

Coastal regions are some of the most climate change affected zones of the planet. Anthropogenic climatic forcing is mediated primarily by greenhouse gas emissions (predominantly by CO₂). The combination of elevated CO₂ and the resultant increase in global mean temperature will result in a cascade of physical and chemical changes in marine systems (Harley et al. 2006).

Climate change can affect coastal areas in a variety of ways. Coasts are sensitive to sea level rise, changes in the frequency and intensity of storms, increases in precipitation, and warmer ocean temperatures. In addition, rising atmospheric concentrations of carbon dioxide (CO₂) cause the oceans to absorb more of the gas and become more acidic. This rising acidity can have significant impacts on coastal and marine ecosystems (USEPA 2019). Furthermore, due to the warming of seawater, the global ocean is expanding. Coupled with freshwater input from ice-melt, thermal expansion of the ocean causes the sea level to rise by 2 mm per year (IPCC 2001). Sea level rise could erode and inundate coastal ecosystems and eliminate wetlands (USEPA 2019).

Undeniably, different regions of the world are affected differently from the impacts of climate change (Siddiqui and Imran 2018). These impacts are likely to worsen problems that coastal areas already face. Confronting existing challenges that affect man-made infrastructure and coastal

ecosystems, such as shoreline erosion, coastal flooding, and water pollution, is already a concern in many areas (USEPA 2019).

Major large-scale events like El Nino can also play an important role in understanding ongoing challenges (Siddiqui and Imran 2018). Furthermore, global warming is responsible for the destruction of the coral reefs and beaches in the tropical coastal areas. As a result, this could have an impact on economies that strongly depend on tourism (Agnew and Viner 2001).

2.1 Climate Change and Tourism

The association of tourism and climate change hints at complex interactions, and can be described as a two-way relationship. On the one hand the tourism sector is a great contributor to climate change (Nicholls 2006), since the emissions from global tourism, including transport, accommodation, and tourism activity subsectors, make up 5% of the total CO₂ emissions. The major contributor is the private automobile, and air transport (Chapman 2007), followed by other forms of transport, and the accommodation subsector (UNWTO 2008). On the other hand the tourism sector is considerably affected by the impacts of climate change, most significantly due to its effect on the attractiveness of tourism destinations and tourist flows (Amelung et al. 2007; Lise and Tol 2002).

Tourism depends on natural resources, such as, water, coastlines, landscapes and biodiversity. These elements influence the potential attraction of destinations (Yazdanpanah et al. 2016). Studies advocated that the selection of the destination, season and length of stay of a tourist is determined by various climate-related factors (Siddiqui and Imran 2018). Climate change threatens the existence of some of the relevant natural resources (Yazdanpanah et al. 2016). Major pressures in terms of the tourism industry aggravate the risk of species extinction, increasing heat waves, decreasing freshwater, increasing accidents due to wildfires, growing health and life insecurities, and rising risks of diseases. Alterations in coastal zones and loss of islands can contribute to the deterioration of the situation in developing countries as there are limited resources available for the people to manage and limit the constant consequences (Siddiqui and Imran 2018).

2.2. Climate Change and Diving Tourism

Climate change, as a significant long-term challenge, will create new risks and opportunities for different segments of the tourism market place and alter the competitive relationship (Yazdanpanah et al. 2016). Marine tourism is a major contributor to local economies of both developed and developing countries. Despite its economic significance, marine tourism is based on natural resources that are extremely vulnerable to climate variation, and consequently is essentially influenced by the impacts of climate change. So, diving ecotourism as a form of marine tourism that is based on marine ecosystems is directly affected by the alterations in climate. Increased monsoonal weather will reduce the number of 'safe diving' days per year. The sea level is predicted to rise and monsoonal sea level rise will add another 2–3 cm to the rising level. Sea level rise will lead to vast coastal erosion of beaches. A typical example to this is the case of Koh Tao Island. Climate predictions suggest that the average rainfall for Koh Tao Island is likely to increase by 26% due to the increased frequency of heavier rainfall in the next 30 years (Tapsuwan and Rongrongmuang 2015). The sea level is predicted to rise by 20cm related to 2008. And consequently it is going to cause vast coastal erosion of the island's flat beaches. The impact of climate change could potentially be destructive to the dive tourism industry on Koh Tao Island. Coastal communities are vulnerable to climate change because they are isolated, have small land mass, their population and infrastructure are concentrated on the coastline, and their economy is dependent on natural resources (IPCC 2012; Scott et al. 2012; Tapsuwan and Rongrongmuang 2015).

Historically, communities can adapt to change and improve their resiliency to change in the process (Scott et al. 2012; Tapsuwan and Rongrongmuang 2015). Climate change is a rising concern for all forms of tourism which requires attention, further study, and demands holistic management steps to reduce its footprints in the long-run. There are various ways to make tourism a sustainable industry, and ecotourism is the best suited to this interest. Ecotourism can help people get familiar with nature (Siddiqui and Imran 2018). Diving ecotourism, as a form of ecotourism, can be a means to promote sustainability in coastal areas (Kounani et al. 2017).

3 Climate Change Communication (CCC)

Communication plays a crucial part in constructing notions of climate change and its relationship to the public within a society (Fox and Rau 2017). Climate change communication, developing out of science communication, aims to bring knowledge obtained through experimentation into the public arena so that the findings can be visible and relevant to everyday life (Dulic et al. 2016). Climate change communication examines a range of factors that affect and are affected by how we communicate about climate change. Much of the research in climate change communication focuses on public understanding of climate change, factors that affect public understanding, media coverage and framing, media effects, and risk perceptions (Chadwick 2017). Change is more likely to happen at a local level when community perspectives are embedded in the proposed local solutions and positive actions. This involves, for example, a change process that is clearly linked to local experience, in compelling and interactive ways (Fox and Rau 2017). Most of the current practices in communication of climate change have not been empirically evaluated regarding their effectiveness in raising awareness of climate change risks and stimulating adaptation action (Wirth et al. 2014; Grothmann et al. 2017).

3.1. The Role of Diving Ecotourism in Communicating Climate Change

Ecotourism, an integral part of sustainable tourism, is a form of tourism based on the contact with nature, providing the local communities with opportunities for both financial growth and social progress. Visiting natural areas with a view to being educated, researching or engaging in eco-friendly pursuits are the key components of the specific field (Kiper 2013). What is more, it aims at mitigating the adverse effects of tourism, thus supporting environmental conservation in the long term (Skanavis and Kounani 2017). Another element of ecotourism is the close contact with ecology and ecosystems as well as the creation of up-close environment-related experiences with the aim of making individuals more environmentally aware (Obenaus 2005).

Over the last decades, scuba diving has been playing a fundamental role in both marine and coastal tourism (Dimmock and Musa 2015), while at the same time emerging as a profitable business as over a million divers are certified every year, according to the Professional Association of Diving Instructors statistics (PADI 2019). As a result of this expansion, scuba diving has attracted a lot of investors interested in occupying with all the related industries resulting in the multiplication of scuba diving centers, schools, resorts, equipment shops, and charter businesses (Townsend 2008; Lucrezi et al. 2017). However, despite the economic benefits deriving from the specific industry, there are some environmental hazards that cannot be overlooked since diving, if not properly performed, can pose a great risk on the marine ecosystems (Musa et al. 2011; Lucrezi et al. 2013). These dangers increase proportionately with the number of certified drivers. Climate change profoundly affects dive-tourism as it is heavily dependent on the condition of coral reefs, something that is pretty clear if one thinks that coral reefs covered with algae, surface water pollution and destroyed marine life are not at all attractive to divers (SDL 2017).

The necessary changes into divers' behavior and the way they perform their diving activities can, however, significantly contribute to the prevention of such damage to a great extent (Fatt Ong and Musa 2011). Undoubtedly though, diving can be a pillar of environmental conservation due to its educational character, its close relation to the improvement of marine life and its strong interest in nature (Dearden et al. 2007; Skanavis and Kounani 2017).

3.2. The Role of Diving Instructors in Promoting the Education and Communication of Climate Change

Over the past twenty years, Climate Change and Environmental Education and Education for Sustainable Development, have taken the lead in encouraging environmental protection and sustainable development (UNICEF 2013). The contribution of environmental educators to raising awareness about environmental issues is major.

Diving instructors, through the alternative form of environmental education they offer, should emphasize on discovering methods through which tourism and activities can affect tourists' attitude towards the environment as they do not only train new divers but they should also influence them towards being environmentally conscious divers (Kounani et al. 2017; Cook 2019).

Once they realize the extent to which they affect the environment, divers can possibly comprehend that it is their responsibility and part of their role to make proper use of their skills so as to protect on their part marine ecosystems. Induced by their passion, they can make the difference and alleviate the problems plaguing marine ecosystems (Musa et al. 2011; Mowery 2017).

4 The case of Greece

4.1. The impacts of climate change in Greece

According to the estimations of the Research and Policy Institute "diaNEOsis", the temperature in our country is going to increase by 2.5° C by 2050, compared to 1961-1990, an increase attributed to climate change. Heat waves are going to be more frequent, a rise by 15-20 annually has been predicted, we are expected to experience more than 50 "tropic days" annually while at the same time a 12% decline in the average rainfall has been forecast.

The combination of the expected rise in temperature and the drop in rainfall will dry forest areas out, leaving them less protected against fires, while a 15% to 70% increase in the number of high risk days each year and an extension of 2 to 6 weeks a year in the high risk season, has been forecast, phenomena that will seriously impact soil fertility (Dianeosis 2017).

What is more, a considerable rise in the sea level is expected, which will take its toll on Greece since a great number of our country's residents live in close proximity to the coast and the majority of its resorts have been constructed by the sea. Given that tourism is one of the main sources of income for our country (Bank of Greece 2014), according to IPCC, it becomes clear that such a fact will result in a significant loss of the country's land and as a consequence a 2% reduction in the country's GDP (Sauter et al. 2013).

The tourism industry is a vital economic sector and occupies a dominant position in the Greek economy. As the research has revealed the continental tourist areas of the Greek mainland will more often face heat wave episodes. In most of the studied regions 5 to 15 more days exceeding the 35°C will occur every year. The largest increases are found in 'summer' days (>25°C) and 'tropical'

nights (>20°C). The former can be considered as a positive impact as it may prolong the tourist period. The number of ‘tropical’ nights per year seems to substantially increase especially in the islands. For example, Rhodes and Chania expect a sum of 40 additional ‘tropical’ nights. In coastal regions, such warm conditions in combination with high levels of relative humidity can result in uncomfortable conditions for foreigners and the local people (Giannakopoulos et al. 2009).

4.2. Scuba Diving in Greece

With a length of more than 15,000km, the Greek coastline comes first among those of the Mediterranean countries. The country also boasts a considerable number of islands and rocky islets, 3,000 in totals, and spread all over its archipelago (Scalkos et al. 2009).

Undoubtedly, due to its magnificent undersea sites, clear seas, rich marine life, mysteriously sunk ancient towns, well-known shipwrecks resting in the depths of the Greek seas as well as its unique seabed, Greece constitutes a pole of attractions for aspiring divers, transforming scuba diving from a simple leisure activity into a profitable business (Alternative Greece 2019). A further advantage of Greek seas is the visibility they offer ranging from 6 to 50 meters according to the period while most of the year the temperature in the country is pretty high (Scubandros 2019).

Well-off people mostly occupy with scuba diving who do not hesitate to spend considerable amounts of money in order to enjoy their favorite activity and this is exactly the type of tourists Greece wishes to attract particularly during the economic crisis the country is currently through as scuba diving is a significant source of revenue (Skanavis and Kounani 2017).

With the reformation of the related law, diving is allowed everywhere through Greek seas in contrast to the past when they could only dive in 620 miles of the 10,000 miles of Greek coastline (Skanavis and Kounani 2017). According to Galanopoulos (2012), in 2009 it was estimated that 186 diving centers certified by the Hellenic Ministry of Shipping were in operation and 5 training organizations for diving instructors were certified all around Greece, boosting touristic development in their wider area.

5 Methodology

In May of 2018, a questionnaire-based survey supplemented with semi-structured, face-to-face interviews was administered to 36 diving instructors from diving training centers all over Greece. The questions, 29 in total, were based on a bibliographic review of similar research projects. The first group of questions revealed the demographics of the sample. The second one targeted at revealing their knowledge and perceptions towards general environmental issues, scuba diving and climate change.

6 Results

6.1 Demographics

In Figure 1 and 2, the gender and the age groups of the participants respectively are demonstrated. As it is noticed the vast majority of them (83%) were males, while most of them were over 36 years old (64%).

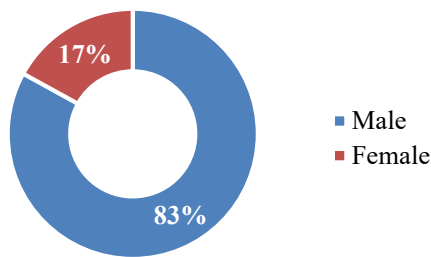


Figure 1. Gender of the respondents

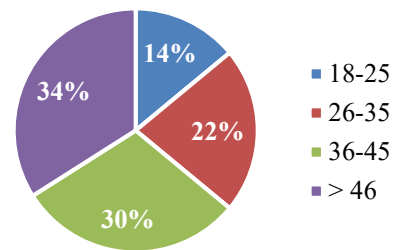


Figure 2. Age groups of the respondents

The marital status of the interviewees is shown in Figure 3. Overall, thirty-six percent of all respondents reported were married at the time of the survey, 47% reported they were single and 17% were divorced, while at the same time 61% had no children, 22% had one child and 11% had two children. A small percentage (6%) reported having three children (Figure 4).

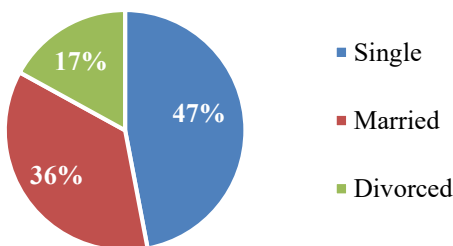


Figure 3. Marital status of the respondents

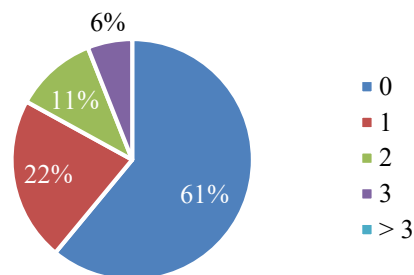


Figure 4. Number of children of the respondents

In the following figure we can see the place of origin of the respondents (Figure 5). Half of the respondents (50%) are from another Greek seaside area, while 33% are from the wider area of the diving center.

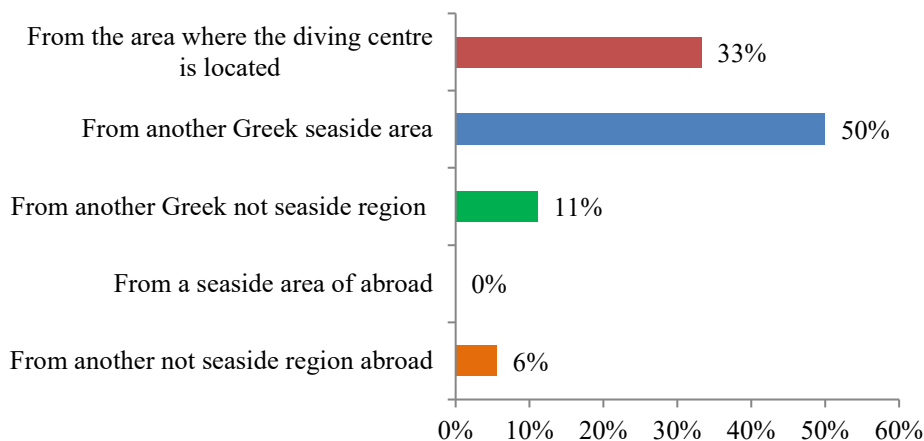


Figure 5. Respondents' place of origin

Approximately, 64% of the participants were university graduates, regarding their educational level as it is depicted in Figure 6. A small percentage of 3 of the participants reported being PhD holders.

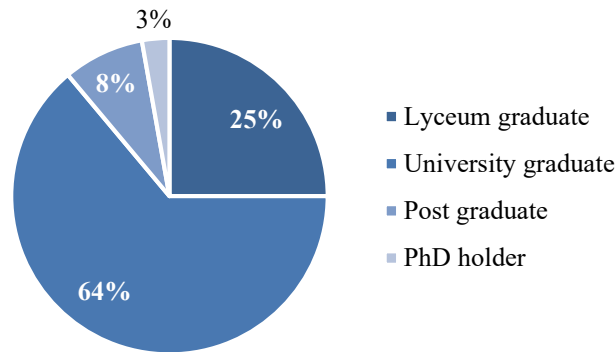


Figure 6. Respondents' educational level

In addition to their studies, only 75% of the respondents have received environmental education in their training as diving instructors. Furthermore, the reason behind their choice to practice diving as a profession is depicted in Figure 7. As it is revealed, the majority of them (75%) made this choice because of their love for the ocean and marine life and for the environment in general.

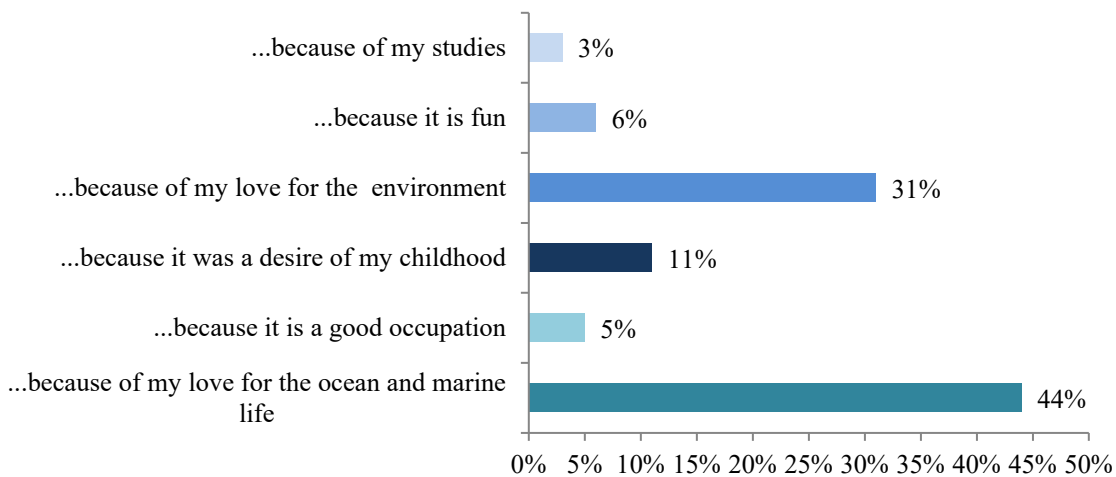


Figure 7. The reason behind the choice of participants to practice diving as a profession

6.2 Knowledge and perceptions towards general environmental issues, scuba diving and climate change.

Concerning the perceptions of the respondents towards the state of the environment, 72% of the participants believed that it is in poor condition, but with a lot of effort, it will possibly change for the better, while a small percentage believed that it is in a good condition, as shown in Figure 8.

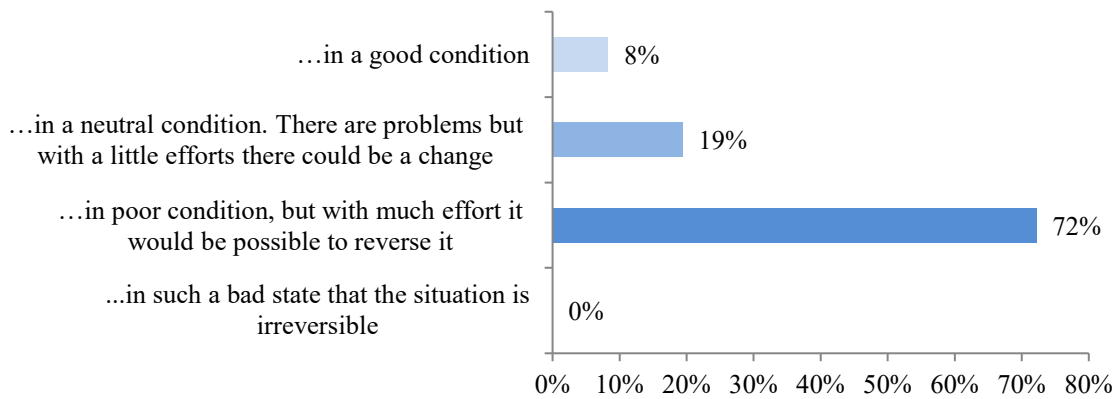


Figure 8. Respondents' perceptions toward the state of the environment

Meanwhile, the vast majority of them (97%) consider themselves environmentally conscious. Additionally, the participants were asked to express their opinion about the most serious environmental challenges our planet is confronted with, on a scale from 1 to 5, where 1=not serious and 5=extremely serious (Table 1). As it is observed, "water pollution" (Mean=4.48) and "deforestation" (Mean=4.22) were the most serious challenges.

Table 1. Participants' beliefs about the most serious environmental challenges our planet is facing

	Mean	Min	Max	St.dev
Water pollution	4.48	2	5	0.81
Deforestation	4.22	1	5	0.93
Threatened species	4.08	2	5	0.97
Air pollution	4.05	2	5	0.9
The increase of solid waste production	3.97	1	5	1.06
The depletion of ozone layer	3.77	2	5	0.92

On the other hand, the most serious problems coastal areas are facing, on a scale from 1 to 5, (1=not serious and 5=extremely serious), (Table 2), were "water pollution (from ships, urban and industrial waste)" (Mean=4.48) and "overexploitation of the coastal seabed" (Mean=4.37).

Table 2. Participants' beliefs about the most serious environmental problems coastal areas are facing

	Mean	Min	Max	St.dev
Water pollution (from ships, urban and industrial waste)	4.48	2	5	0.77
Overexploitation of the coastal seabed	4.37	2	5	0.87
Uncontrolled residential development of coastal areas	3.85	2	5	0.94
Extreme weather events	3.65	1	5	0.95
The coastal zone's watering	3.57	2	5	0.99
Sea level rise	3.54	1	5	1.09
Coastal erosion	3.31	2	5	0.89

Subsequently, the participants were evaluated concerning their perceptions towards diving tourism. Firstly, they were asked whether they considered “diving tourism as a form of ecotourism”, with the majority of the sample (85%) responding positively. Moreover, they were asked to express their views according to some comments related to diving tourism, using a scale from 1 (totally disagree) to 5 (totally agree). So, as it is observed in Table 3, the answers that are presented to be in the highest mean were “Diving tourism promotes the conservation of ecosystems in the area” (Mean=4), “Diving tourism is an economic activity that supports the local economy, since it brings great economic benefits to the region” (Mean=3.97), “Diving is associated with the cleanliness of the seabed in the area” (Mean=3.97), “Diving tourism is an economic activity that supports the local economy, since it brings great economic benefits to the region” (Mean=3.97) and “Diving is associated with the cleanliness of the seabed in the area” (Mean=3.97). It is worth noting that the comment “Diving is an activity that causes environmental degradation in the area” had the lowest mean (1.82).

Table 3. Participants’ perceptions towards diving tourism

	Mean	Min	Max	St.dev
Diving tourism promotes the conservation of ecosystems in the area	4	1	5	0.94
Diving tourism is an economic activity that supports the local economy, since it brings great economic benefits to the region	3.97	2	5	0.9
Diving is associated with the cleanliness of the seabed in the area	3.97	1	5	1.04
Diving tourism is an economic activity that supports the local economy, since it brings great economic benefits to the region	3.97	2	5	0.9
Diving is associated with the cleanliness of the seabed in the area	3.97	1	5	1.04
Diving tourism promotes environmental education	3.91	1	5	0.98
Diving tourism is generally supported by the local community and provides jobs to local residents	3.4	2	5	0.99
Diving tourism is an activity most chosen for recreation and less for contact with the natural environment	3.05	1	5	1.06
Revenues from diving tourism benefit from environmental protection	2.94	1	5	1.11
Diving tourism causes decline to the biodiversity of an area if it is uncontrolled	2.71	1	5	1.18
Diving is an activity that causes environmental degradation in the area	1.82	1	5	1.13

In the sequel, participants were evaluated concerning their knowledge and perceptions towards climate change. The vast majority (97%) of the diving instructors answered that they were aware of what climate change means. Their perceptions towards “what climate change means” are depicted in Figure 9. Furthermore, Figure 10 presents diving instructors’ views towards climate change. The majority of the participants (56%) believed that climate change is mainly due to human activities such as the burning of fossil fuels”, while 42% believe that both human activities and natural changes contribute to climate change.

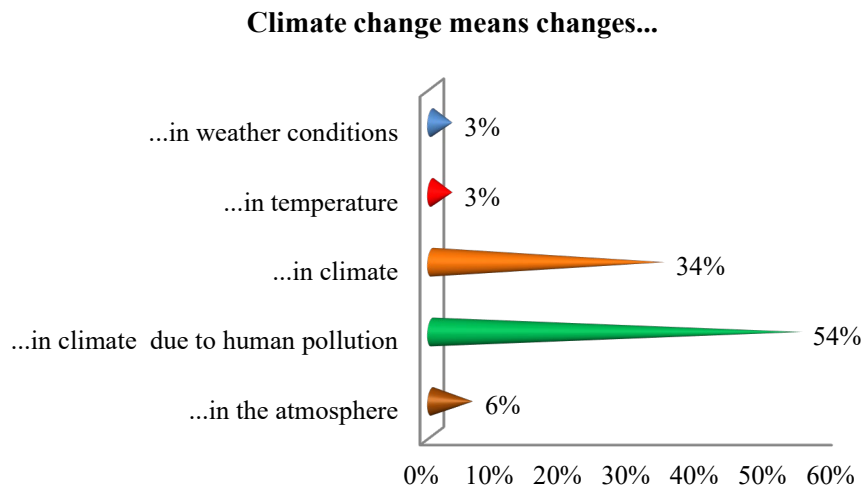


Figure 9. Respondents' perceptions toward "What climate change means...."

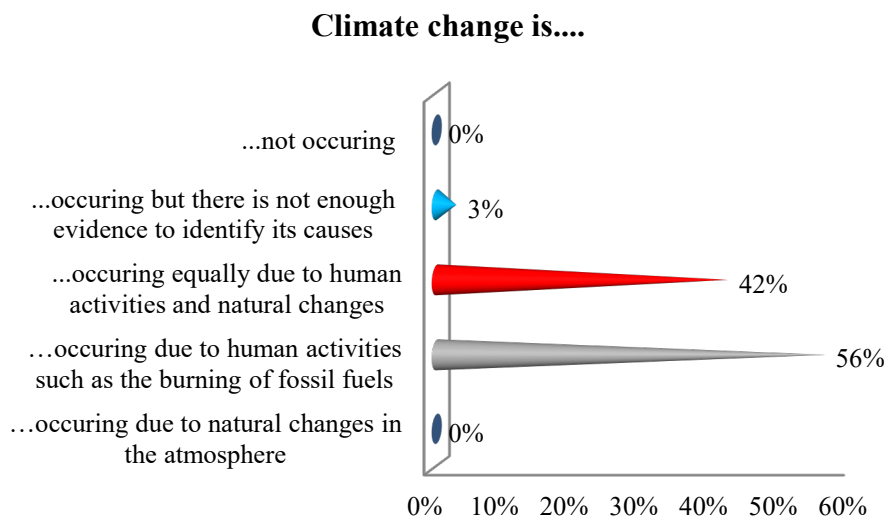


Figure 10. Respondents' perceptions toward climate change

Subsequently, participants were asked to express their opinion, illustrating the state of climate change, by choosing among a set of offered alternatives. Half of the respondents believe that "Earth's climate is in a delicate balance. A small rise in global warming will have devastating effects", while 25% of them believe that "The climate of the Earth is changing slowly. Global warming will gradually lead to dangerous impacts".

Overall, 86% of the diving instructors believe that Greece, which has many coastal regions, is particularly vulnerable to the effects of climate change. More specifically, they were asked to express their views according to some comments related to the effects of climate change on Greece, using a scale from 1 (totally disagree) to 5 (totally agree). So, as it is observed in Table 4, the answer that is presented to be in the highest mean was "Rising temperatures of seas, lakes and rivers resulting in the destruction of aquatic ecosystems" (Mean=3.65).

Table 4. Participants' perceptions towards the effects of climate change in Greece

	Mean	Min	Max	St.dev
Rising temperatures of seas, lakes and rivers resulting in the destruction of aquatic ecosystems	3.65	1	5	1.19
Immigration of species	3.62	1	5	1.14
Rising temperature	3.57	2	5	0.87
Acidification of the oceans	3.57	1	5	1.02
Greater floods	3.51	1	5	1.02
Frequent droughts	3.42	1	5	1.1
Increase sea level	3.42	1	5	0.99
Coastal erosion	3.4	1	5	1.08
Extreme weather events	3.2	1	5	1.09

After that, they were asked to evaluate a range of options that can help mitigate and/or reduce the effects of climate change, using a scale from 1 (totally disagree) to 5 (totally agree). "Reduction of electricity consumption or use of renewable sources" and "Education and awareness programs for climate change" are the options with the highest mean (Mean=4.37).

Table 5. Participants' opinions towards the ways in which the effects of climate change can be mitigated/reduced

	Mean	Min	Max	St.dev
Reduction of electricity consumption or use of renewable sources	4.37	2	5	0.72
Education and awareness programs for climate change	4.37	1	5	0.87
Creating campaigns by the media	4.22	2	5	0.87
More frequent use of mass media	3.74	1	5	1.22
Reduction of products consumption	3.14	1	5	1.21
Change in diet (less meat consumption, etc.)	3.02	1	5	1.14

The vast majority of the sample (94%) believed that it is possible for dwellers to become aware of climate change through diving tourism. More specifically, the diving instructors were asked to express their opinion about the ways environmental awareness can be achieved, by choosing among a set of offered alternatives (Figure 11). Almost half of the respondents (47%) believe that environmental awareness can be achieved through providing environmental education during the diving training process.

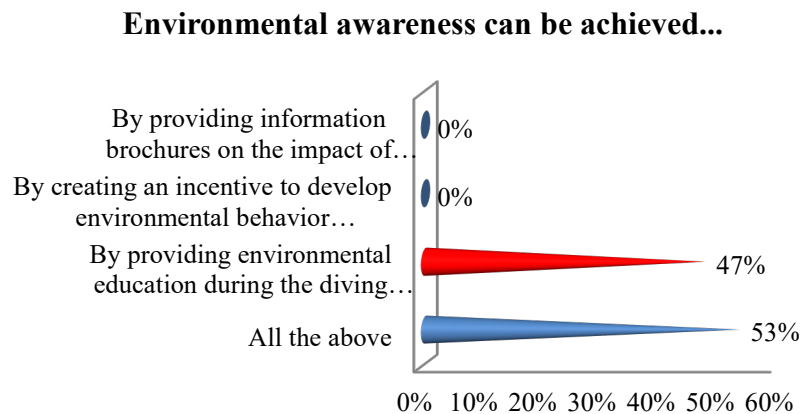


Figure 11. Participants' opinions towards the ways environmental awareness can be achieved

Participants were also asked to express their views according to some comments related to the role of diving tourism on climate change education and communication, using a scale from 1 (totally disagree) to 5 (totally agree). So, as it is observed in Table 6, the answers that are presented to be in the highest mean were "Diving tourism can be a means of promoting education and communication on climate change" (Mean=4.2) and "Diving training promotes responsible environmental behavior" (Mean=4.08).

Table 6. Participants' perceptions towards the role of diving tourism on climate change education and communication

	Mean	M in	Max	St.dev
Diving tourism can be a means of promoting education and communication on climate change	4.2	2	5	0.89
Diving training promotes responsible environmental behavior	4.02	1	5	1.06
The trainee's contact with the environment through diving training increases their environmental awareness	4.02	1	5	0.97
Diving tourism promotes sustainability and can therefore promote campaigns to reduce the impact of climate change	3.82	2	5	0.79
Diving training can promote strategies to reduce the impact of climate change	3.77	1	5	0.92
Diving training promotes communication of climate change	3.65	1	5	0.79

Moreover, 81% of the respondents stated that they have already used their training as a means of promoting climate change communication and education. Finally, the vast majority of the diving instructors (89%) have tried to raise trainees' consciousness towards climate change issue during their training.

7 Discussion

According to Skanavis and Kounani (2017) Greek diving instructors are individuals with a rich environmental background, environmentally conscious, that love the ocean and diving ecotourism. Similarly, Greek diving instructors that participated in this survey are individuals that have received environmental education in their training as diving instructors; they appeared to have high levels of environmental consciousness. In their majority they have chosen this profession due to their love for the ocean, marine life, as well as the natural environment in general.

In regard to the participants' beliefs concerning the most serious environmental challenges our planet is facing, "water pollution" and "deforestation" appeared to be the dominant ones. Concerning their perceptions towards the most serious problems coastal areas are facing they considered water pollution and overexploitation of the seabed as the most important ones, while they advocated that "sea level rise" and "coastal erosion" are less serious problems.

Diving ecotourism is considered to be a vital source of employment, since it contributes significantly to local incomes (Cinner 2014), but on the other hand it appears to pose numerous challenges. Great rates of visitation to coastal areas lead to increasing pressures to marine ecosystems, which combined with the large numbers of, in many occasions, inexperienced divers have multiplied the concerns in diving areas (Wabnitz et al. 2018). The participants in this research had a similar belief, as they said that "diving ecotourism is an economic activity that supports the local economy, since it brings great economic benefits to the region". In contrast to Wabnitz et al. (2018) the results of the research revealed that they considered diving ecotourism, as a form of ecotourism, that "promotes the conservation of ecosystems in the area", "is associated with the cleanliness of the seabed in the area", and it is worth noting that the comment "diving is an activity that causes environmental degradation in the area" had the lowest mean.

Regarding diving instructors' viewpoints towards climate change, research conducted in Thailand, revealed that the diving instructors believed that human activities, such as the burning of fossil fuels as well as numerous other human activities can provoke climate change (Tapsuwan and Rongrongmuang 2015). Similarly, over half of Greek diving instructors (56%) believed that climate change is mainly due to human activities such as the burning of fossil fuels, while 42% believed that both human activities and natural changes contribute to climate change. A great portion of the 86% of the diving instructors believed that Greece, as a country that has many coastal regions, is particularly vulnerable to the effects of climate change.

As Wabnitz et al. (2018) stated increases in sea surface temperatures of between 1 and 3°C by 2100 are projected to significantly impact ecosystems in the tropical. In a similar way this research revealed that the respondents considered that "rising temperatures of seas, lakes and rivers result in the destruction of aquatic ecosystems".

With regard to improving the effectiveness of climate change education and communication programs, increasing public participation in climate change policy making and enhancing the adaptive capacity of the dive tourism industry are broad enough to apply to many dive tourism industries around the world (Tapsuwan and Rongrongmuang 2015). Likewise, the vast majority of the participants of this specific survey (94%) believed that it is possible for locals to become aware of climate change through diving tourism. More specifically, almost half of the respondents (47%) believed that environmental awareness can be achieved through providing environmental education during the diving training process. Furthermore they agreed that the trainees' contact with the environment through diving training could increase above all their environmental awareness. Also, they supported the notion that diving tourism could be a means to implementing sustainability and can therefore promote campaigns to reduce the impact of climate change. Consequently, they claimed that diving trainings can promote strategies to reduce the impact of climate change, and thus promote communication of climate change.

According to Balantyne and Parker (2011) diving instructors, having the essential role of ocean ambassadors, can increase knowledge of environmental issues, while they concentrate on ways in which tourism and leisure experiences can deliberately and positively influence the environmental behavior of visitors and raise consciousness. In a similar way Greek instructors can act as conservators of the ocean and promote climate change mitigation strategies. This fact is strongly revealed from the outcomes of this research, since 81% of the respondents stated that they have already used their training as a means of promoting climate change communication and education, as well as the majority of them (89%) have tried to raise trainees' consciousness towards climate change issues during their training.

8 Conclusions

To combat climate change various essential steps must be taken worldwide. Paris Agreement, in 2015, recognized the great need of limiting the impacts of climate change via different approaches that aim at the decrease of global average temperature. Diving Ecotourism could be a key contributor to raising awareness on climate change communication strategies in coastal areas. Diving tourism cannot achieve sustainability goals without the support of local communities, academic institutions, the Managing Authorities, non-governmental organizations, but predominantly in the absence of diving instructors' contribution (Dimmock and Musa 2015). The outcomes of this research revealed that diving instructors in Greek diving centers appeared to have received adequate environmental education to meet the requirements to promote climate change mitigation and adaptation strategies. Effective interpretational and educational programs can have a 'transformative' influence that induces among participants not only a deeper understanding of the attraction itself, but also a consequent adherence to a more ethical and environmentalist ethos.

References

- Agnew, M.D., & Viner, D. (2001). Potential impacts of climate change on international tourism. *Tourism and Hospitality Research*, 3, 37-60
- Alternative Greece (2019) Alternative Tourism Greece: Scuba Diving Greece - Diving Centers – Schools. Retrieved from: <https://www.alternativegreece.gr/WebForms/CategoryDisplay.aspx?ID=91>
- Amelung, B., Nicholls, S., & Viner, D. (2007). Implications of global climate change for tourism flows and seasonality. *Journal of Travel Research*, 45(3), 285–296. doi:10.1177/0047287506295937
- Ballantyne, R., & Packer, J. (2011) Using tourism free-choice learning experiences to promote environmentally sustainable behaviour: the role of post-visit 'action resources', *Environmental Education Research*, 17(2), 201-215, doi:10.1080/13504622.2010.530645
- Bank of Greece. (2014). Greek tourism and climate change: Policies adaptation and new development strategy. Retrieved from: https://www.bankofgreece.gr/BogEkdoseis/CCISC_Tourism%20and%20climate%20change_Fw%20Ch1.pdf
- Galanopoulos, G. (2012). Diving tourism in Greece. ATEI of Crete, School of Management and Economics, Heraklion

- Chadwick, A. (2017). Climate Change Communication. *Oxford Research Encyclopedia of Communication*, pp.1-29, Oxford University Press, USA, doi:10.1093/acrefore/9780190228613.013.22
- Chapman, L. (2007). Transport and climate change: A review. *Journal of Transport Geography*, 15(5), 354–367. doi: 10.1016/j.jtrangeo.2006.11.008
- Cinner J. (2014) Coral reef livelihoods. *Current Opinion in Environmental Sustainability*, 7,65–71. <https://doi.org/10.1016/j.cosust.2013.11.025>
- Cook, N. (n.d.). (2019) The Importance of Marine Conservation as a Dive Professional. Retrieved February, 20, 2019, Retrieved from <https://goo.gl/8KuaNu>
- Dianoesis (2017). The Impact of Climate Change on the Greek Economy. Written by Georgakopoulos T, Retrieved from: <https://goo.gl/E6ZZki>
- Dimmock, K., & Musa, G. (2015). Scuba diving tourism system: A framework for collaborative management and sustainability. *Marine Policy*, 54, 52-58
- Dearden, P., Bennett, M., & Rollins, R. (2007). Perceptions of Diving Impacts and Implications for Reef Conservation, *Coastal Management*, 35(2-3), 305-317, doi: 10.1080/08920750601169584
- Dulic, A., Angel, J., & Sheppard, S. (2016). Designing futures: Inquiry in climate change communication, *Futures*, 81, 54-67.
- Fatt Ong, T., & Musa, G. (2011). An examination of recreational divers' underwater behavior by attitude behaviour theories. *Current Issues in Tourism*, 14(8), 779-795, doi: 10.1080/13683500.2010.545370
- Fox, E., & Rau, H. (2017). Disengaging citizens? Climate change communication and public receptivity. *Journal of Irish Political Studies*, 32(2), 224-246, doi: 10.1080/07907184.2017.1301434
- Giannakopoulos, C., Kostopoulou, E., Varotsos, K., Plitharas, A. (2009). Climate change impacts in Greece in the near future, A Report of National Observatory of Athens, Greece.
- Grothmann, T., Leitner, M., Glas, N., & Prutsch, A. (2017). A Five-Steps Methodology to Design Communication Formats That Can Contribute to Behavior Change: The Example of Communication for Health-Protective Behavior Among Elderly During Heat Waves, *SAGE Open*, January-March 2017, 1– 15, doi: 10.1177/2158244017692014
- Gossling, S., & Hall, C.M. (2006). *Tourism and global environmental change: Ecological, social, economic and political interrelationships* (vol. 4). Taylor & Francis.
- Harley, C.D.G., Hughes, A.R., Hultgren, K.M., Miner, B.G., Sorte, C.J.B., Thornber, C.S., & Williams, S. (2006). The impacts of climate change in coastal marine systems. *Ecology letters*, 9(2), 228-241. <https://doi.org/10.1111/j.1461-0248.2005.00871.x>
- IPCC (Intergovernmental Panel on Climate Change) (2001). *Climate Change 2001, Synthesis Report. A Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, UK
- IPCC (Intergovernmental Panel on Climate Change) (2012). *Managing the Risks of Extreme Events and Disasters to Advance, Climate Change Adaptation Special Report of the Intergovernmental Panel on Climate Change*. Field, B., Barros, V., Stocker, T.F., Qin, D., Dokken, D.J., Ebi, K.L., Mastrandrea, M.D., Mach K.J., Plattner, G.-K., Allen, S.K., Tignor, M., & Midgley P.M. (Eds.), Cambridge, UK and New York, NY: Cambridge University Press.
- Kiper, T. (2013). Role of Ecotourism in Sustainable Development. In M. Ozyavuz (Eds.), *Advances in Landscape Architecture*. London: IntechOpen, doi: 10.5772/55749
- Kounani, A., Skanavis, C., Koukoulis, A., & Polymeris-Maripas G. (2017), Diving Tourism as a Tool for the Promotion of the Sustainable Management of Coastal Areas: the role of the scuba diving instructors, the 7th Pan-Hellenic Conference on Management and Improvement of Coastal Zones, 20-22 November 2017, Athens, pp. 89-100 (in Greek)
- Lise, W., & Tol, R.S. (2002). Impact of climate on tourist demand. *Climatic Change*, 55(4), 429–449.

- Liu, T.M. (2016). The influence of climate change on tourism demand in Taiwan national parks. *Tourism Management Perspectives*, 20, 269–275. doi:10.1016/j.tmp.2016.10.006
- Lucrezi, S., Saayman, M., & Merwe, P. (2013). Managing diving impacts on reef ecosystems: Analysis of putative influences of motivations, marine life preferences and experience on divers' environmental perceptions, *Ocean & Coastal Management*, 76, 52-63, doi: 10.1016/j.ocecoaman.2013.02.020
- Lucrezi, S., Milanese, M., Markantonatou, V., Cerrano, C., Sara, A., Palma, M., & Saayman, M. (2017). Scuba diving tourism systems and sustainability: Perceptions by the scuba diving industry in two Marine Protected Areas. *Tourism Management*, 59, 385-403, doi: 10.1016/j.tourman.2016.09.004
- SDL (Scuba Dive Life) (2017) Making Sustainable Tourism the Standard in the Dive Industry. Retrieved from: <https://scubadiverlife.com/making-sustainable-tourism-standard-dive-industry/>
- Mowery, L. (2017). Will the sport of Scuba Diving end by 2050? Retrieved from <https://goo.gl/S2vDEd>
- Musa, G., Seng, W. T., Thirumoorthi, T., & Abessi, M. (2011). The Influence of Scuba Divers' Personality, Experience, and Demographic Profile on their Underwater Behavior. *Tourism in Marine Environments*, 7(1), 1-14
- Nicholls, S. (2006). Climate change, tourism and outdoor recreation in Europe. *Managing Leisure*, 11(3), 151–163. doi: 10.1080/13606710600715226.
- Obenaus, S. (2005). Ecotourism - Sustainable Tourism in National Parks and Protected Areas. Banff National Park in Canada and National park Gesause in Austria - a Comparison. Diplomarbeit an der Universität Wien. Wien, 171 S., p.171, Retrieved from: https://www.nationalpark.co.at/images/Forschung/2260/Dokumente//Obenaus_2005_Ecoto urism_Sustainable_Tourism_in_National_Parks_and_Protected_Areas.pdf
- PADI (Professional Association of Diving Instructors statistics) (2019). Worldwide Corporate Statistics. Retrieved February 18, Retrieved from: <https://goo.gl/TLJATm>
- Rangelm, M.O., Pita, C.B & Goncalves, J.M.S. (2014). Developing self-guided scuba dive routes in the Algarve (Portugal) and analyzing visitors' perceptions, *Marine Policy*, 45, 194-203.
- Sauter, R., ten Brink, P., Withana, S., Mazza, L., Pondichie, F. with contributions from Clinton, J., Lopes, A, Bego, K. (2013) Impacts of climate change on all European islands, A report by the Institute for European Environmental Policy (IEEP) for the Greens/EFA of the European Parliament. Final Report. Brussels.
- Scalkos, G., Strigas, A., Moudakis, C., & Stergioulas A. (2009). Mapping of the Content State of Diving Tourism in Greece. *Journal of Applied Science*, 9 (21), 3829-3835.
- Scott, D., Simpsons, M.C., & Sim, R. (2012). The vulnerability of Caribbean coastal tourism to scenarios of climate change related sea level rise. *Journal of Sustainable Tourism*, 20, 883–898. doi:10.1080/09669582.2012.699063
- Scubandros (2019) Scuba Diving in Greece. Retrieved from: <https://scuba-andros.gr/scuba-diving-in-greece/>
- Siddiqui, S., Imran, M. (2018). Impact of Climate Change on Tourism, In R. Sharma & P. Rao (eds.) *Environmental Impact of Tourism in Developing Nations*, Publisher: IGI Global, Hersee PA, USA, pp.68-84 doi: 10.4018/978-1-5225-5843-9.ch004
- Skanavis C., & Kounani A., (2017), Diving Ecotourism as an Educating Tool for Encouraging Sustainable Development: The Case of Skyros Island, Innovation Arabia 10: Health and Environment Conference, 6th-8th March 2017, Dubai, p.188-197.
- Tapsuwan, S., & Rongrongmuang, R. (2015). Climate change perception of the dive tourism industry in Koh Tao Island, Thailand. *Journal of Outdoor Recreation and Tourism*, 11, 58–63
- Townsend, C. (2008). Dive tourism, sustainable tourism and social responsibility: A growing agenda. In Garrod, B., Gössling, S. (Eds.), *New Frontiers in Marine Tourism*. New Frontiers in Marine Tourism, (pp. 139-152), Elsevier, doi: 10.1016/B978-0-08-045357-6.50010-3

- UNICEF (2013). Climate Change and Environmental Education - A companion to the Child Friendly Schools Manual. Retrieved from <https://goo.gl/u27U4J>
- UNWTO (United Nations World Tourism Organization) (2008). Climate change and tourism- Responding to global challenges. Madrid, Spain. Retrieved from: <https://sdt.unwto.org/sites/all/files/docpdf/climate2008.pdf>
- USEPA (United States Environmental Protection Agency) (2019) Climate Impacts on Coastal Areas, Retrieved from: https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-coastal-areas_.html
- Wabnitz, C.C.C., Cisneros-Montemayor, A.M., Hanich, Q., & Ota, Y. (2018). Ecotourism, climate change and reef fish consumption in Palau: Benefits, trade-offs and adaptation strategies. *Marine Policy*, 88, 323–332
- Wirth, V., Prutsch, A., Grothmann, T. (2014). Communicating climate change adaptation—State of the art and lessons learned from ten OECD countries. *GAIA*, 23(1), 30-39
- Yazdanpanah, H., Barghi, H., Esmaili, A. (2016). Effect of climate change impact on tourism: A study on climate comfort of Zayandehroud River route from 2014 to 2039. *Tourism Management Perspectives*, 17, 82–89