International Journal of Applied Science and Sustainable Dev... 19

← Back to Submissions

8936 / **Wiratama et al.** / Climate Mitigation And Waste Management In The Tourism **Library**

Workflow **Publication**

Submission **Review** **Copyediting** **Production**

Submission Files

Search

21724 IJASSD_Climate Mitigation And Waste Management In The Tourism Industry For A Sustainable Ecosystem.doc	April 26, 2024	Article Text	

Download All Files

Pre-Review Discussions

Add discussion

Name	From	Last Reply	Replies	Closed
No Items				

CLIMATE MITIGATION AND WASTE MANAGEMENT IN THE TOURISM INDUSTRY FOR A SUSTAINABLE ECOSYSTEM

I Gusti Ngurah Made Wiratama[1], I Made Wahyu Wijaya[2], Fransiskus Vebrian Kenedy[3]

[1,2,3]Universitas Mahasaraswati Denpasar

Email: rahde.wiratama@unmas.ac.id and wijaya@unmas.ac.id

ABSTRACT

Climate is one of the primary factors that influence international tourism. Most international travelers are interested in visiting nations with a distinct and more agreeable environment. This study aims to define the responses of tourism industry to face the climate change impacts through mitigation initiatives. Climate is a tourism resource that defines the viability of areas to sustain tourist activities, influences tourism demand, and affects operating expenses such as heating and cooling, artificial snow prices, and water and irrigation availability. Some mitigation efforts and waste management for the tourism industry to facing the climate change impacts are concerning on energy efficiency, resources and product supply, transportation, waste and wastewater management, and human resources development and awareness.

Keywords: Mitigation, Waste Management, Tourism, Sustainability, Climate Change

INTRODUCTION

Climate is one of the primary factors that influence international tourism. Most international travelers are interested in visiting nations with a distinct and more agreeable environment. Assume that frequent travelers residing in nations with cold climates would be interested in visiting countries with tropical climates, and vice versa (Book, 2007). According to Mbasera (2016), climate is one of the criteria that travelers evaluate while picking their travel destinations. This is one of the primary reasons why so many tourists visit Indonesia. Changes in climate include variations in air temperature, air pressure, wind, and humidity. Climate change will occur gradually over time. As a result of global warming, temperatures are increasing, weather patterns are shifting, sea levels are rising, and a variety of extreme occurrences are occurring. These catastrophes have occurred in nearly every region of the globe and influence tourism destinations, particularly those dependent on climatic and environmental conditions (Wijaya, 2019). The effects of climate change on the environment and human activity in numerous sectors are widespread. One of the sectors affected by climate change is flooding. Tourism is an economic driver and one of the greatest contributors to the region's original revenue (PAD). As the number of tourists visiting Indonesia rises, so does the number of tourist accommodations, such as hotels, condotels, homestays, hostels, and restaurants. The construction of tourist accommodations, such as hotels, has increased significantly. The construction of a hotel might have a favorable effect on the workplace. It also contributes to environmental contamination. The hotel is the most common type of lodging for travelers who are on a long trip. As the need for visitor accommodations grows, the hotel's construction continues to

expand. Tourists assess various hotel options in terms of pricing, quality, amenities, and location. Hotels play a crucial part in the tourism business. Hotels have a huge impact on society, the economy, and the environment. In addition to being affected by climate change, hotels also influence it and contribute to it. The hotel must have effective environmental planning and management to reduce its environmental impact. According to Njoroge (2015), climate has become one of the most important considerations in hotel-area climate change mitigation decisions. Changes in tourism patterns brought on by climate change necessitate adaptation and mitigation techniques to sustain the industry. Research According to Pramono (2016), three factors have a substantial impact on tourism in Bali. There are travel agent pressure issues, client pressure difficulties, and climate change issues. This study seeks to determine the factors that influence environmental management. The contentment of guests is one of the primary benefits that managers of five-star hotels in Bali notice from the process of environmental management.

The findings enhance the position of the green industry or the green industry trend, in which an increasing number of guests and tourists identify as environmentally conscious customers and desire to contribute to environmental protection. Educating travel agencies and tourists about the importance of maintaining a sustainable environment through environmental management mechanisms in Bali's five-star hotels is one way to achieve this goal. Rather than relying solely on conventional methods, such as enacting regulations, it is also important to directly socialize and monitor the hotel's implementation of these mechanisms. Climate change is another important issue. Climate change presents a difficulty for hotel management since climate predictions and the unpredictability of natural conditions will make it harder to organize ordinary hotel operations in open areas. This will also influence hotel visitors' activities.

RESEARCH METHOD

This study employed a comprehensive literature review to investigate the topic of waste management and mitigation in the tourism industry in pursuit of a sustainable tourism ecosystem. The review process involved identifying pertinent scholarly articles, reports, and case studies from a variety of databases, including academic journals and trade publications. The selected sources were evaluated critically based on their relevance, credibility, and recency, with a particular emphasis on studies that provided insights into successful practices and initiatives. Through this literature review, a solid understanding of existing knowledge and current trends in mitigation and waste management in the tourism industry was developed, which served as the basis for the subsequent analysis and synthesis of findings.

RESULTS AND DISCUSSION

3.1 Subsection the Effects of Climate Change on Tourism Industry

Climate change will have an impact on both demand (demand) and supply (supply) in the Indonesian tourism industry. Changes in environmental circumstances caused by climate change will reduce tourist attraction because they

are inconsistent with the location to visit on the demand side. Climate change can harm the ecosystem, natural resources, or cultural changes that were once a tourist draw. Climate change has an impact on temperature rise in the following ways: (1) the change in temperature in winter is greater than in summer; (2) the minimum daily temperature will increase; (3) the land is warmer than the ocean; (4) monsoon activity increases; (5) areas in latitudes with higher altitudes will experience greater warming; (6) the number of snowfall days will decrease; and (7) changes in the water storage and discharge cycle. Many activities in lodging establishments, such as hotels, will also produce emissions that contribute to climate change. Hotel emissions are projected to be 160–200 kilograms of CO2 per square meter of each room per year on average. Furthermore, on a five-star hotel level, tourists consumed 170-440 liters of water every night (Mbasera et al., 2016; Mousavi et al., 2017; Rajić et al., 2022). By 2011 Tourism is a particularly vulnerable sector to the effects of climate change, particularly in natural tourism regions such as mountains, beaches, oceans, rivers, and forests. The relationship between climate change and tourism can be viewed from two perspectives: the impact on travelers and the impact on tourist locations. The following are the effects of climate change that can affect tourism locations, tourist facilities, competitiveness, and sustainability (Scott et al., 2019; Scott & Gössling, 2022):

A. The direct effect

Climate is a tourism resource that defines the viability of areas to sustain tourist activities, influences tourism demand, and affects operating expenses such as heating and cooling, artificial snow prices, and water and irrigation availability. People's preferences for where to vacation are also influenced by the weather.

B. The effect is only indirect.

Climate change has the potential to create a wide range of disasters. In the long run, such disasters will have far-reaching negative consequences, such as environmental degradation or deterioration. Because natural and environmental conditions are the most appealing resources for tourism activities, environmental deterioration will have a significant detrimental influence on the tourism sector at both the destination and regional levels.

3.2 How Do Mitigation Policies Affect the Tourist Movements?

Tourism is one of the major causes of the significant growth in green house emissions. The movement of tourists from one location to another through vehicles results in considerable carbon dioxide emissions. This drives the national and international communities to establish mitigation regulations that require tourists to adjust their travel habits, such as by changing means of transportation or changing tourism locations. Climate change threatens a country's future economic growth and political stability. Continued climate change will disrupt global economic growth; climate-related global GDP decreases can reduce consumer interest in tourism and have a negative impact on tourism growth. Aside from climate change, tourism activities emit emissions that enhance the dangers of climate change. Tourists are more

interested in visiting unusual tourist destinations (Kuniyal et al., 2003; Protection et al., 2014; Scott et al., 2008). Tourism-related carbon emissions account for approximately 5% of worldwide carbon emissions (Scott et al., 2008, 2019). If housing services, such as hotels, are not adequately managed, they will emit emissions. The following are some sources of emissions from the hotel's operational activities:

A. Modes of transportation

Transportation activities do not exclude hotel operations. This activity takes place while tourists visit various locations. The use of hotel vehicles that run on fossil fuels contributes to greenhouse gas emissions. Tour facilities provided by hotels with small automobiles will increase fuel usage as more vehicles are used. Also, the use of private automobile rental services will increase vehicle use and carbon emissions. The fuel consumption of the vehicle is also affected by the destination.

B. Accommodation options

Tourist lodging is extremely significant in the tourism industry. Accommodation must be tailored to the needs of tourists in terms of both quantity and quality. With the surge in tourist visits, tourist managers now have access to a variety of low-cost lodging options. Carbon emissions may be generated by supporting facilities in such hotels. Every hotel is expected to be able to create energy savings in order to reduce carbon emissions. In general, energy usage in hotels includes room cooling and heating, hot water facilities, the use of refrigerators and freezers, and lighting.

3.3 Climate Change Mitigation Innitiatives by the Hospitality Sector

One of the effects of increased tourism activities is a rise in greenhouse gas emissions. There are four basic mitigation options for reducing greenhouse gas emissions, which are as follows ("Climate Change and Tourism – Responding to Global Challenges," 2008; Dogru et al., 2019; Loehr & Becken, 2021; Scott & Gössling, 2022):

Lowering energy consumption.

The most significant option for mitigation is to reduce energy use. Energy savings in the provision of accommodation services can be achieved through the selection of tourist sites, the use of transportation modes, and tour management systems. Tourism managers play a vital part in this mitigation effort. The operator can plan the tourist destination based on the distances and means of transportation available. The use of public transportation, such as buses or trains, is, of course, a priority. Furthermore, the hotel's offer of diverse facilities is intended to extend tourists' stays. The longer you stay at the hotel, the fewer your potential emissions from transportation modes. As a result, the manager must make an offer that fits the needs of the tourists while also considering the emissions generated.

Improved energy efficiency

The employment of cutting-edge technology to improve energy efficiency is an endeavor to reduce greenhouse gas emissions. One of the objects targeted in this scenario is aircraft transportation. In addition to reducing fuel consumption, the availability of new technology will improve flight quality, given the significant mobility of visitors in this

fashion. Improved energy efficiency is also used in the provision of tourist accommodations. High-efficiency gadgets will help save energy and minimize pollution.

Increased use of renewable energy

The utilization of renewable energy sources such as wind, solar, geothermal, biomass, and waste helps to minimize greenhouse gas emissions. The use of renewable energy must be developed in the tourism sector, particularly in island tourism. Certain tourist spots on the island still use solar as a fuel source for power plants today. Aside from the high cost, solar energy will emit greenhouse gases.

Carbon Offset

Carbon is one of the energy sources that can be stored in the form of biomass. The high volumes of carbon dioxide produced by tourism mobilization must be compensated for by industry management and tourists. The kind of compensation is an additional cost that is proportional to the amount of carbon emissions produced. The introduction of this system will be able to minimize carbon emissions indirectly since travelers will be able to consider tourist sites to visit. The higher the additional cost of carbon compensation, the farther the tourist destination. According to projections given by the United Nations World Tourism Organization ("Climate Change and Tourism – Responding to Global Challenges," 2008; Deason et al., 2022; Olefs et al., 2021), the size of emissions reduction by 2035 with the implementation scenario of mitigation actions is as follows:

A. If all technologies (transportation, lodging, and tourism activities) operated at peak efficiency, emissions would be reduced by 38%.
B. Using a combination of modes of transportation, effective destination settings, and expanded stay times for tourists could potentially lower emissions by 44%. Some mitigation measures done on accommodation support facilities, such as hotels, are as follows (Carlton & Jacobson, 2013; Hernandez & Ryan, 2011).
C. Supply of food and drink.
   The utilization of local foods reduces carbon emissions from distribution activities. Temperature settings for refrigerators at the most efficient temperature of 3.20 C, with freezer temperatures ranging from -180 to -150 C. Several factors were considered when assembling the refrigerator to make it more efficient, including (1) allowing food to cool before storage, (2) storing materials not exceeding capacity, (3) regular cleaning and checking of the ventilator, condenser, and compressor parts, (4) ensuring the fridge door is closed tightly, (5) ensuring a stable power supply for the frigories, and (6) periodic cleaning of the freezer to maintain cooling efficiency.
D. Heating, cooling, and ventilation systems
   - Adjust the room temperature to between 200 and 250 degrees Celsius.
   - Good air circulation in the room.
   - Employ high-quality building materials to keep the room temperature stable.

- The water heater's temperature should not exceed 600 degrees Celsius.

E. Illuminated
   - The light has an automatic on/off system.
   - Proper room illumination and the usage of light bulbs to maximize beet efficiency Light bulbs have ten times the efficiency of traditional lamps and a tenfold longer service life.
   - The availability of natural light should be considered when designing the room.

F. Laundry
   - Make use of energy-efficient devices
   - Equipment that has reached the end of its useful life must be replaced.
   - When drying garments, lower the temperature.
   - full-capacity washing machine

G. Elevator
   - Elevator drives are powered by electricity.
   - Overloading should be avoided.

H. Recreational facilities
   - It is equipped with an automatic lighting system
   - Maintain the pool's temperature, especially at night.

I. Human capital
   - Staff education on energy conservation
   - cleaning and maintenance of equipment on a regular basis.
   - Encourage travelers to conserve energy.
   - Energy consumption measurement for evaluation or development.

The establishment of environmentally friendly hotel operations (green practices) is an important step that the hospitality industry must take today. Every hotel can take the lead in implementing environmental management in order to mitigate the effects of climate change. (Bielański et al., 2022; Deason et al., 2022; Gühnemann et al., 2021; Mbasera et al., 2016; Pröbstl-Haider et al., 2021; Rastegar & Ruhanen, 2023) developed a list of green practices and green initiatives that hotel management can implement (Table 1).

Table 1. Green Practice and Green Initiative for Hotel Accomodation

Green Practice	***Green Initiative***
Water Utilities	▪ Use low flow rate equipment to monitor the water lines on a regular basis to avoid leaks. ▪ Construct a drainage reservoir. ▪ Using the Rainwater Collecting Idea ▪ Utilize treated waste water for irrigation and watering plants.
Energy conservation	▪ Making use of natural sunlight during the day ▪ Make use of lighting. ▪ Make use of renewable energy sources like angi and sunlight. ▪ usage of automated on/off switches, particularly for room facilities. ▪ Unused installations should have their lights turned off.

Green Practice	*Green Initiative*
Waste management	▪ Recycle hotel garbage to be reused; for example, food waste composting might be utilized for park management. ▪ Minimize the use of paper in transactions and replace it with email.
Air quality management	▪ Using air filters. ▪ Ensure proper ventilation for the restaurant and the kitchen blower. ▪ Make a separate smoking area available. ▪ Make bicycles or compact automobiles available for use in the hotel area.
Environment contribution	▪ Utilize recyclable materials to meet the needs of travellers. ▪ Make the soap and shampoo. ▪ Purchase regional foods and beverages. ▪ Charging travellers for the usage of hotel items above and beyond what is given
Awareness development	▪ Environmental management training for staff ▪ Supplying environmental information sources such as posters, periodicals, or flyers ▪ Collaborating with local communities to safeguard the environment
Policy and standard	▪ Establishing environmental management guidelines ▪ Creating an environmental management SOP for all hotel facilities and activities

3.4 Climate Change Mitigation Innitiatives by the Hospitality Sector

The development of Indonesia's hotel industry continues to meet the demand for lodging from the tourism sector. The dynamics of the hospitality business have also been influenced by global warming. Indonesia is also guided in this regard by the ASEAN Green Hotel Standard (*ASEAN GREEN HOTEL STANDARD*, n.d.; Boronat-Navarro & Pérez-Aranda, 2020; Chen & Chen, 2012; Migale et al., 2019), which is a hotel standard guide intended to satisfy the notion of being environmentally friendly and energy efficient. Green Hotel Operation, Environmental Plan, Green Product, and Human Resource and Environment Management are among the requirements used at AGHS. Asean Green Hotel Standard. AGHS applies ecologically friendly standards to several critical factors, including:

1. Environmental policy and local driver requirements
   - Implement environmental activities to increase worker, customer, and supplier participation in hotel environmental management.
   - Develop a training plan to improve staff environmental stewardship.
   - Develop a plan for environmental management in hotel operations.
   - The hotel has an environmental monitoring program.
2. Use of ecologically friendly products
   - Promote the use of locally produced goods, such as food and craft materials.

- Urge people to use eco-friendly items.
- Collaborate with the local community.
- Create an activity plan to improve the quality of life in local communities.
- Offer programs to increase the local community's interest in environmental management.
- Provide jobs for the local communities.

3. Human Resource Development
   - Creating employee training programs for operational and environmental management in the hotel
4. The waste
   - Introducing waste management approaches using the 3R (reduce, reuse, recycle), disposal, and composition concepts.
   - Inviting hotel employees to take part in 3R activities such as cutting and composing.
   - Inviting hotel guests to participate in 3R (recording, cutting, and composing) activities.
5. Energy Conservation
   - Provide energy-saving solutions for the use of electronic devices.
   - Install an energy-monitoring gadget.
6. Water efficiency and water quality management
   - Water-saving strategies are being implemented in hotel operations.
   - water storage treatment on a regular basis.
   - Urge hotel guests to conserve water.
   - The hotel's water quality
7. Air quality (both indoors and outdoors)
   - Make a smoking-free zone and additional smoking-free zones.
   - Maintenance and regular monitoring of hotel air quality facilities, such as room cooling.
8. Noise control
   - Offering noise reduction programs in hotel operations
9. Waste Water Management
   - Implement a strategy to reduce wastewater output and prevent water pollution.
   - Have a waste water treatment system installed.
   - Promote the reuse of waste water for operational purposes, such as plant irrigation.
10. Hazardous and lethal compounds (B3)
    - Provide clear signage with information about dangerous and poisonous substances.
    - Possession of hazardous and poisonous substances
    - Inspections of hazardous and toxic material storage sites on a regular basis for cleaning and upkeep.

Chen and Chen (2012), like AGHS, argued that there are five keys that drive the concept of green in a hotel. Green purchases, environmental policies, management systems, employee education, and consumer education are examples of these.

- Environmental Purchase

  Green purchasing is an effort to meet the needs of hotels for items that are good for the environment. This concept's application is based on the

3R3E principle. (Economic, ecological, and equitable reduction, reuse, and recycling). This philosophy also encourages the use of local products. Hence, collaboration with product suppliers who share the same ideas will be able to aid in the implementation of the green purchasing concept.

- Policies on the Environment
  To adapt to the challenges of global warming, every hotel manager must implement environmental regulations. To actualize the concept of "green hotels," every element of hotel management must comprehend environmental policy, particularly during operation. Hotel managers should arrange for training for staff from all departments in order to improve employee care and understanding of environmental management. All hotel visitors should be aware of the appropriate environmental policy, not just the personnel. As a result, it is critical that hotel managers encourage visitors to participate in hotel management operations.
- Hotel Management Software
  For the green hotel idea to work, it is important to have a well-defined hotel management system. Each component of the hotel manager should be aware of their obligations and responsibilities at work, as well as their involvement in environmental management.
- Employee training
  In order for a hotel to try to be a "green hotel," its employees must change the way they act. Hotel managers should train their staff so they can understand how to use the green hotel concept. Employee training strives to reduce the negative impact of the environment and energy consumption.
- Consumer awareness
  People who stay in hotels should know the rules about the environment that apply to the hotels they stay in. The hotel manager must provide adequate information about the applicable environmental regulations and how guests can participate in them.

CONCLUSION

Climate change influences the viability of areas to sustain tourist activities, tourism various demand, and affects operating expenses such as heating and cooling, artificial snow prices, food production, transportation and water and irrigation availability. Some mitigation efforts and waste management for the tourism industry to tackling the climate change impacts are concerning on energy efficiency, resources and product supply, transportation, waste and wastewater management, and human resources development and awareness.

REFERENCES

Anon. n.d. *ASEAN GREEN HOTEL STANDARD*.

Bielański, M., Korbiel, K., Taczanowska, K., Pardo-Ibañez, A., & González, L. M. (2022). How tourism research integrates environmental issues? A keyword network analysis. *Journal of Outdoor Recreation and Tourism*, *37*. https://doi.org/10.1016/j.jort.2022.100503

Book, ·. (2007). *Climate Change and Tourism: Assessment and Coping Strategies*. https://www.researchgate.net/publication/233759121

Boronat-Navarro, M., & Pérez-Aranda, J. A. (2020). Analyzing willingness to pay more to stay in a sustainable hotel. *Sustainability (Switzerland)*, *12*(9). https://doi.org/10.3390/su12093730

Carlton, S. J., & Jacobson, S. K. (2013). Climate change and coastal environmental risk perceptions in Florida. *Journal of Environmental Management*, *130*, 32–39. https://doi.org/10.1016/j.jenvman.2013.08.038

Chen, Y.-C., & Chen, Y.-T. (2012). The Advantages of Green Management for Hotel Competitiveness in Taiwan: In the Viewpoint of Senior Hotel Managers. *Journal of Management and Sustainability*, *2*(2). https://doi.org/10.5539/jms.v2n2p211

Climate Change and Tourism – Responding to Global Challenges. (2008). In *Climate Change and Tourism – Responding to Global Challenges*. World Tourism Organization (UNWTO). https://doi.org/10.18111/9789284412341

Deason, G., Seekamp, E., & Barbieri, C. (2022). Actor-network theory and organizational resilience to climate change in community-based tourism. *Journal of Outdoor Recreation and Tourism*, *38*. https://doi.org/10.1016/j.jort.2021.100483

Dogru, T., Marchio, E. A., Bulut, U., & Suess, C. (2019). Climate change: Vulnerability and resilience of tourism and the entire economy. *Tourism Management*, *72*, 292–305. https://doi.org/10.1016/j.tourman.2018.12.010

Gühnemann, A., Kurzweil, A., & Mailer, M. (2021). Tourism mobility and climate change - A review of the situation in Austria. *Journal of Outdoor Recreation and Tourism*, *34*. https://doi.org/10.1016/j.jort.2021.100382

Hernandez, A. B., & Ryan, G. (2011). COPING WITH CLIMATE CHANGE IN THE TOURISM INDUSTRY: A REVIEW AND AGENDA FOR FUTURE RESEARCH. In *Tourism and Hospitality Management* (Vol. 17, Issue 1).

Kuniyal, J. C., Jain, A. P., & Shannigrahi, A. S. (2003). Solid waste management in Indian Himalayan tourists' treks: A case study in and around the Valley of Flowers and Hemkund Sahib. *Waste Management*, *23*(9), 807–816. https://doi.org/10.1016/S0956-053X(03)00027-8

Loehr, J., & Becken, S. (2021). The Tourism Climate Change Knowledge System. *Annals of Tourism Research*, *86*. https://doi.org/10.1016/j.annals.2020.103073

Mbasera, M., Du Plessis, E., Saayman, M., & Kruger, M. (2016). Environmentally-friendly practices in hotels. *Acta Commercii*, *16*(1). https://doi.org/10.4102/ac.v16i1.362

Migale, G. H., Stimie, J. E., & Brent, A. C. (2019). Sustainable hotel strategy execution: A review and way forward. *South African Journal of Industrial Engineering*, *30*(4), 102–117. https://doi.org/10.7166/30-4-2025

Mousavi, S. A., Hoşkara, E., & Woosnam, K. M. (2017). Developing a model for sustainable hotels in Northern Cyprus. *Sustainability (Switzerland)*, *9*(11). https://doi.org/10.3390/su9112101

Njoroge, J. M. (2015). Tourism, millennium development goals and climate change in Kenya. In *African Journal of Hospitality, Tourism and Leisure* (Vol. 4, Issue 1). http//:www.ajhtl.com

Olefs, M., Formayer, H., Gobiet, A., Marke, T., Schöner, W., & Revesz, M. (2021). Past and future changes of the Austrian climate – Importance for tourism. *Journal of Outdoor*

Recreation and Tourism, *34*. https://doi.org/10.1016/j.jort.2021.100395

Pramono, J. (2016). Isu-Isu Pengelolaan Lingkungan pada Hotel Berbintang di Bali. *Jurnal Manajemen, Strategi Bisnis, Dan Kewirausahaan*, *10*(64–73).

Pröbstl-Haider, U., Wanner, A., Feilhammer, M., & Damm, A. (2021). Tourism and climate change – An integrated look at the Austrian case. *Journal of Outdoor Recreation and Tourism*, *34*. https://doi.org/10.1016/j.jort.2020.100361

Protection, B., Office, A. V., Family, S., Application, M. E., Treatment, M., Visitor, B., Stay, N. F., & Stay, N. O. F. (2014). *Application for a Visitor visa – Tourist stream*. *1419*, 1–15.

Rajić, M. N., Maksimović, R. M., & Milosavljević, P. (2022). Energy Management Model for Sustainable Development in Hotels within WB6. *Sustainability (Switzerland)*, *14*(24). https://doi.org/10.3390/su142416787

Rastegar, R., & Ruhanen, L. (2023). Climate change and tourism transition: From cosmopolitan to local justice. *Annals of Tourism Research*, *100*. https://doi.org/10.1016/j.annals.2023.103565

Scott, D., Amelung, B., Becken, S., Ceron, J.-P., Gossling, S., & Simpson, M. C. (2008). Climate Change and Tourism – Responding to Global Challenges. In *Climate Change and Tourism – Responding to Global Challenges*. World Tourism Organization (UNWTO). https://doi.org/10.18111/9789284412341

Scott, D., & Gössling, S. (2022). A review of research into tourism and climate change - Launching the annals of tourism research curated collection on tourism and climate change. *Annals of Tourism Research*, *95*. https://doi.org/10.1016/j.annals.2022.103409

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

Wahyu Wijaya, I. M. (2019). the Strategies To Reduce the Spread of Nitrogen From Domestic Wastewater Treatment To the Streams in Surabaya City, Indonesia. *International Journal of GEOMATE*, *16*(55), 204–210. https://doi.org/10.21660/2019.55.89776

8936 / **Wiratama et al.** / Climate Mitigation And Waste Management In The Tourism **Library**

Workflow **Publication**

Submission **Review** **Copyediting** **Production**

Round 1

Round 1 Status
Submission accepted.

International Journal of Applied Science and Sustainable Dev... 19

← Back to Submissions

[IJASSD] Editor Decision	2024-04-27 09:11 AM
[IJASSD] Editor Decision	2024-04-29 09:28 AM
[IJASSD] Editor Decision	2024-06-23 10:52 AM

Reviewer's Attachments **Search**

21727	ijassd-review-assignment-8936-Article+Text-21726.doc	April 27, 2024

Revisions

Search | Upload File

No Files

Review Discussions

Add discussion

Name	From	Last Reply	Replies	Closed
Revision	wiratama 2024-04-27 09:38 AM	-	0	

CLIMATE MITIGATION AND WASTE MANAGEMENT IN THE TOURISM INDUSTRY FOR A SUSTAINABLE ECOSYSTEM

I Gusti Ngurah Made Wiratama[1], I Made Wahyu Wijaya[2], Fransiskus Vebrian Kenedy[3]

[1,2,3]Universitas Mahasaraswati Denpasar

Email: rahde.wiratama@unmas.ac.id and wijaya@unmas.ac.id

ABSTRACT

Climate is one of the primary factors that influence international tourism. Most international travelers are interested in visiting nations with a distinct and more agreeable environment. This study aims to define the responses of tourism industry to face the climate change impacts through mitigation initiatives. Climate is a tourism resource that defines the viability of areas to sustain tourist activities, influences tourism demand, and affects operating expenses such as heating and cooling, artificial snow prices, and water and irrigation availability. Some mitigation efforts and waste management for the tourism industry to facing the climate change impacts are concerning on energy efficiency, resources and product supply, transportation, waste and wastewater management, and human resources development and awareness.

Keywords: Mitigation, Waste Management, Tourism, Sustainability, Climate Change

INTRODUCTION

Climate is one of the primary factors that influence international tourism. Most international travelers are interested in visiting nations with a distinct and more agreeable environment. Assume that frequent travelers residing in nations with cold climates would be interested in visiting countries with tropical climates, and vice versa (Book, 2007). According to Mbasera (2016), climate is one of the criteria that travelers evaluate while picking their travel destinations. This is one of the primary reasons why so many tourists visit Indonesia. Changes in climate include variations in air temperature, air pressure, wind, and humidity. Climate change will occur gradually over time. As a result of global warming, temperatures are increasing, weather patterns are shifting, sea levels are rising, and a variety of extreme occurrences are occurring. These catastrophes have occurred in nearly every region of the globe and influence tourism destinations, particularly those dependent on climatic and environmental conditions (Wijaya, 2019). The effects of climate change on the environment and human activity in numerous sectors are widespread. One of the sectors affected by climate change is flooding. Tourism is an economic driver and one of the greatest contributors to the region's original revenue (PAD). As the number of tourists visiting Indonesia rises, so does the number of tourist accommodations, such as hotels, condotels, homestays, hostels, and restaurants. The construction of tourist accommodations, such as hotels, has increased significantly. The construction of a hotel might have a favorable effect on the workplace. It also contributes to environmental contamination. The hotel is the most common type of lodging for travelers who are on a long trip. As the need for visitor accommodations grows, the hotel's construction continues to

expand. Tourists assess various hotel options in terms of pricing, quality, amenities, and location. Hotels play a crucial part in the tourism business. Hotels have a huge impact on society, the economy, and the environment. In addition to being affected by climate change, hotels also influence it and contribute to it. The hotel must have effective environmental planning and management to reduce its environmental impact. According to Njoroge (2015), climate has become one of the most important considerations in hotel-area climate change mitigation decisions. Changes in tourism patterns brought on by climate change necessitate adaptation and mitigation techniques to sustain the industry. Research According to Pramono (2016), three factors have a substantial impact on tourism in Bali. There are travel agent pressure issues, client pressure difficulties, and climate change issues. This study seeks to determine the factors that influence environmental management. The contentment of guests is one of the primary benefits that managers of five-star hotels in Bali notice from the process of environmental management.

The findings enhance the position of the green industry or the green industry trend, in which an increasing number of guests and tourists identify as environmentally conscious customers and desire to contribute to environmental protection. Educating travel agencies and tourists about the importance of maintaining a sustainable environment through environmental management mechanisms in Bali's five-star hotels is one way to achieve this goal. Rather than relying solely on conventional methods, such as enacting regulations, it is also important to directly socialize and monitor the hotel's implementation of these mechanisms. Climate change is another important issue. Climate change presents a difficulty for hotel management since climate predictions and the unpredictability of natural conditions will make it harder to organize ordinary hotel operations in open areas. This will also influence hotel visitors' activities.

RESEARCH METHOD

This study employed a comprehensive literature review to investigate the topic of waste management and mitigation in the tourism industry in pursuit of a sustainable tourism ecosystem. The review process involved identifying pertinent scholarly articles, reports, and case studies from a variety of databases, including academic journals and trade publications. The selected sources were evaluated critically based on their relevance, credibility, and recency, with a particular emphasis on studies that provided insights into successful practices and initiatives. Through this literature review, a solid understanding of existing knowledge and current trends in mitigation and waste management in the tourism industry was developed, which served as the basis for the subsequent analysis and synthesis of findings.

RESULTS AND DISCUSSION

3.1 Subsection the Effects of Climate Change on Tourism Industry

Climate change will have an impact on both demand (demand) and supply (supply) in the Indonesian tourism industry. Changes in environmental circumstances caused by climate change will reduce tourist attraction because they

are inconsistent with the location to visit on the demand side. Climate change can harm the ecosystem, natural resources, or cultural changes that were once a tourist draw. Climate change has an impact on temperature rise in the following ways: (1) the change in temperature in winter is greater than in summer; (2) the minimum daily temperature will increase; (3) the land is warmer than the ocean; (4) monsoon activity increases; (5) areas in latitudes with higher altitudes will experience greater warming; (6) the number of snowfall days will decrease; and (7) changes in the water storage and discharge cycle. Many activities in lodging establishments, such as hotels, will also produce emissions that contribute to climate change. Hotel emissions are projected to be 160–200 kilograms of CO2 per square meter of each room per year on average. Furthermore, on a five-star hotel level, tourists consumed 170-440 liters of water every night (Mbasera et al., 2016; Mousavi et al., 2017; Rajić et al., 2022). By 2011 Tourism is a particularly vulnerable sector to the effects of climate change, particularly in natural tourism regions such as mountains, beaches, oceans, rivers, and forests. The relationship between climate change and tourism can be viewed from two perspectives: the impact on travelers and the impact on tourist locations. The following are the effects of climate change that can affect tourism locations, tourist facilities, competitiveness, and sustainability (Scott et al., 2019; Scott & Gössling, 2022):

A. The direct effect

Climate is a tourism resource that defines the viability of areas to sustain tourist activities, influences tourism demand, and affects operating expenses such as heating and cooling, artificial snow prices, and water and irrigation availability. People's preferences for where to vacation are also influenced by the weather.

B. The effect is only indirect.

Climate change has the potential to create a wide range of disasters. In the long run, such disasters will have far-reaching negative consequences, such as environmental degradation or deterioration. Because natural and environmental conditions are the most appealing resources for tourism activities, environmental deterioration will have a significant detrimental influence on the tourism sector at both the destination and regional levels.

3.2 How Do Mitigation Policies Affect the Tourist Movements?

Tourism is one of the major causes of the significant growth in green house emissions. The movement of tourists from one location to another through vehicles results in considerable carbon dioxide emissions. This drives the national and international communities to establish mitigation regulations that require tourists to adjust their travel habits, such as by changing means of transportation or changing tourism locations. Climate change threatens a country's future economic growth and political stability. Continued climate change will disrupt global economic growth; climate-related global GDP decreases can reduce consumer interest in tourism and have a negative impact on tourism growth. Aside from climate change, tourism activities emit emissions that enhance the dangers of climate change. Tourists are more

interested in visiting unusual tourist destinations (Kuniyal et al., 2003; Protection et al., 2014; Scott et al., 2008). Tourism-related carbon emissions account for approximately 5% of worldwide carbon emissions (Scott et al., 2008, 2019). If housing services, such as hotels, are not adequately managed, they will emit emissions. The following are some sources of emissions from the hotel's operational activities:

A. Modes of transportation

Transportation activities do not exclude hotel operations. This activity takes place while tourists visit various locations. The use of hotel vehicles that run on fossil fuels contributes to greenhouse gas emissions. Tour facilities provided by hotels with small automobiles will increase fuel usage as more vehicles are used. Also, the use of private automobile rental services will increase vehicle use and carbon emissions. The fuel consumption of the vehicle is also affected by the destination.

B. Accommodation options

Tourist lodging is extremely significant in the tourism industry. Accommodation must be tailored to the needs of tourists in terms of both quantity and quality. With the surge in tourist visits, tourist managers now have access to a variety of low-cost lodging options. Carbon emissions may be generated by supporting facilities in such hotels. Every hotel is expected to be able to create energy savings in order to reduce carbon emissions. In general, energy usage in hotels includes room cooling and heating, hot water facilities, the use of refrigerators and freezers, and lighting.

3.3 Climate Change Mitigation Innitiatives by the Hospitality Sector

One of the effects of increased tourism activities is a rise in greenhouse gas emissions. There are four basic mitigation options for reducing greenhouse gas emissions, which are as follows ("Climate Change and Tourism – Responding to Global Challenges," 2008; Dogru et al., 2019; Loehr & Becken, 2021; Scott & Gössling, 2022):

Lowering energy consumption.

The most significant option for mitigation is to reduce energy use. Energy savings in the provision of accommodation services can be achieved through the selection of tourist sites, the use of transportation modes, and tour management systems. Tourism managers play a vital part in this mitigation effort. The operator can plan the tourist destination based on the distances and means of transportation available. The use of public transportation, such as buses or trains, is, of course, a priority. Furthermore, the hotel's offer of diverse facilities is intended to extend tourists' stays. The longer you stay at the hotel, the fewer your potential emissions from transportation modes. As a result, the manager must make an offer that fits the needs of the tourists while also considering the emissions generated.

Improved energy efficiency

The employment of cutting-edge technology to improve energy efficiency is an endeavor to reduce greenhouse gas emissions. One of the objects targeted in this scenario is aircraft transportation. In addition to reducing fuel consumption, the availability of new technology will improve flight quality, given the significant mobility of visitors in this

fashion. Improved energy efficiency is also used in the provision of tourist accommodations. High-efficiency gadgets will help save energy and minimize pollution.

Increased use of renewable energy

The utilization of renewable energy sources such as wind, solar, geothermal, biomass, and waste helps to minimize greenhouse gas emissions. The use of renewable energy must be developed in the tourism sector, particularly in island tourism. Certain tourist spots on the island still use solar as a fuel source for power plants today. Aside from the high cost, solar energy will emit greenhouse gases.

Carbon Offset

Carbon is one of the energy sources that can be stored in the form of biomass. The high volumes of carbon dioxide produced by tourism mobilization must be compensated for by industry management and tourists. The kind of compensation is an additional cost that is proportional to the amount of carbon emissions produced. The introduction of this system will be able to minimize carbon emissions indirectly since travelers will be able to consider tourist sites to visit. The higher the additional cost of carbon compensation, the farther the tourist destination. According to projections given by the United Nations World Tourism Organization ("Climate Change and Tourism – Responding to Global Challenges," 2008; Deason et al., 2022; Olefs et al., 2021), the size of emissions reduction by 2035 with the implementation scenario of mitigation actions is as follows:

A. If all technologies (transportation, lodging, and tourism activities) operated at peak efficiency, emissions would be reduced by 38%.
B. Using a combination of modes of transportation, effective destination settings, and expanded stay times for tourists could potentially lower emissions by 44%. Some mitigation measures done on accommodation support facilities, such as hotels, are as follows (Carlton & Jacobson, 2013; Hernandez & Ryan, 2011).
C. Supply of food and drink.
   The utilization of local foods reduces carbon emissions from distribution activities. Temperature settings for refrigerators at the most efficient temperature of 3.20 C, with freezer temperatures ranging from -180 to -150 C. Several factors were considered when assembling the refrigerator to make it more efficient, including (1) allowing food to cool before storage, (2) storing materials not exceeding capacity, (3) regular cleaning and checking of the ventilator, condenser, and compressor parts, (4) ensuring the fridge door is closed tightly, (5) ensuring a stable power supply for the frigories, and (6) periodic cleaning of the freezer to maintain cooling efficiency.
D. Heating, cooling, and ventilation systems
   - Adjust the room temperature to between 200 and 250 degrees Celsius.
   - Good air circulation in the room.
   - Employ high-quality building materials to keep the room temperature stable.

- The water heater's temperature should not exceed 600 degrees Celsius.

E. Illuminated
- The light has an automatic on/off system.
- Proper room illumination and the usage of light bulbs to maximize beet efficiency Light bulbs have ten times the efficiency of traditional lamps and a tenfold longer service life.
- The availability of natural light should be considered when designing the room.

F. Laundry
- Make use of energy-efficient devices
- Equipment that has reached the end of its useful life must be replaced.
- When drying garments, lower the temperature.
- full-capacity washing machine

G. Elevator
- Elevator drives are powered by electricity.
- Overloading should be avoided.

H. Recreational facilities
- It is equipped with an automatic lighting system
- Maintain the pool's temperature, especially at night.

I. Human capital
- Staff education on energy conservation
- cleaning and maintenance of equipment on a regular basis.
- Encourage travelers to conserve energy.
- Energy consumption measurement for evaluation or development.

The establishment of environmentally friendly hotel operations (green practices) is an important step that the hospitality industry must take today. Every hotel can take the lead in implementing environmental management in order to mitigate the effects of climate change. (Bielański et al., 2022; Deason et al., 2022; Gühnemann et al., 2021; Mbasera et al., 2016; Pröbstl-Haider et al., 2021; Rastegar & Ruhanen, 2023) developed a list of green practices and green initiatives that hotel management can implement (Table 1).

Table 1. Green Practice and Green Initiative for Hotel Accomodation

Commented [IW1]: Please make sure its following the journal template, especially for the font style and size

Green Practice	***Green Initiative***
Water Utilities	▪ Use low flow rate equipment to monitor the water lines on a regular basis to avoid leaks. ▪ Construct a drainage reservoir. ▪ Using the Rainwater Collecting Idea ▪ Utilize treated waste water for irrigation and watering plants.
Energy conservation	▪ Making use of natural sunlight during the day ▪ Make use of lighting. ▪ Make use of renewable energy sources like angi and sunlight. ▪ usage of automated on/off switches, particularly for room facilities. ▪ Unused installations should have their lights turned off.

Green Practice	*Green Initiative*
Waste management	▪ Recycle hotel garbage to be reused; for example, food waste composting might be utilized for park management. ▪ Minimize the use of paper in transactions and replace it with email.
Air quality management	▪ Using air filters. ▪ Ensure proper ventilation for the restaurant and the kitchen blower. ▪ Make a separate smoking area available. ▪ Make bicycles or compact automobiles available for use in the hotel area.
Environment contribution	▪ Utilize recyclable materials to meet the needs of travellers. ▪ Make the soap and shampoo. ▪ Purchase regional foods and beverages. ▪ Charging travellers for the usage of hotel items above and beyond what is given
Awareness development	▪ Environmental management training for staff ▪ Supplying environmental information sources such as posters, periodicals, or flyers ▪ Collaborating with local communities to safeguard the environment
Policy and standard	▪ Establishing environmental management guidelines ▪ Creating an environmental management SOP for all hotel facilities and activities

3.4 Climate Change Mitigation Innitiatives by the Hospitality Sector

The development of Indonesia's hotel industry continues to meet the demand for lodging from the tourism sector. The dynamics of the hospitality business have also been influenced by global warming. Indonesia is also guided in this regard by the ASEAN Green Hotel Standard (*ASEAN GREEN HOTEL STANDARD*, n.d.; Boronat-Navarro & Pérez-Aranda, 2020; Chen & Chen, 2012; Migale et al., 2019), which is a hotel standard guide intended to satisfy the notion of being environmentally friendly and energy efficient. Green Hotel Operation, Environmental Plan, Green Product, and Human Resource and Environment Management are among the requirements used at AGHS. Asean Green Hotel Standard. AGHS applies ecologically friendly standards to several critical factors, including:

1. Environmental policy and local driver requirements
   - Implement environmental activities to increase worker, customer, and supplier participation in hotel environmental management.
   - Develop a training plan to improve staff environmental stewardship.
   - Develop a plan for environmental management in hotel operations.
   - The hotel has an environmental monitoring program.
2. Use of ecologically friendly products
   - Promote the use of locally produced goods, such as food and craft materials.

- Urge people to use eco-friendly items.
- Collaborate with the local community.
- Create an activity plan to improve the quality of life in local communities.
- Offer programs to increase the local community's interest in environmental management.
- Provide jobs for the local communities.

3. Human Resource Development
   - Creating employee training programs for operational and environmental management in the hotel
4. The waste
   - Introducing waste management approaches using the 3R (reduce, reuse, recycle), disposal, and composition concepts.
   - Inviting hotel employees to take part in 3R activities such as cutting and composing.
   - Inviting hotel guests to participate in 3R (recording, cutting, and composing) activities.
5. Energy Conservation
   - Provide energy-saving solutions for the use of electronic devices.
   - Install an energy-monitoring gadget.
6. Water efficiency and water quality management
   - Water-saving strategies are being implemented in hotel operations.
   - water storage treatment on a regular basis.
   - Urge hotel guests to conserve water.
   - The hotel's water quality
7. Air quality (both indoors and outdoors)
   - Make a smoking-free zone and additional smoking-free zones.
   - Maintenance and regular monitoring of hotel air quality facilities, such as room cooling.
8. Noise control
   - Offering noise reduction programs in hotel operations
9. Waste Water Management
   - Implement a strategy to reduce wastewater output and prevent water pollution.
   - Have a waste water treatment system installed.
   - Promote the reuse of waste water for operational purposes, such as plant irrigation.
10. Hazardous and lethal compounds (B3)
    - Provide clear signage with information about dangerous and poisonous substances.
    - Possession of hazardous and poisonous substances
    - Inspections of hazardous and toxic material storage sites on a regular basis for cleaning and upkeep.

Chen and Chen (2012), like AGHS, argued that there are five keys that drive the concept of green in a hotel. Green purchases, environmental policies, management systems, employee education, and consumer education are examples of these.

- Environmental Purchase
  Green purchasing is an effort to meet the needs of hotels for items that are good for the environment. This concept's application is based on the

3R3E principle. (Economic, ecological, and equitable reduction, reuse, and recycling). This philosophy also encourages the use of local products. Hence, collaboration with product suppliers who share the same ideas will be able to aid in the implementation of the green purchasing concept.

- Policies on the Environment
  To adapt to the challenges of global warming, every hotel manager must implement environmental regulations. To actualize the concept of "green hotels," every element of hotel management must comprehend environmental policy, particularly during operation. Hotel managers should arrange for training for staff from all departments in order to improve employee care and understanding of environmental management. All hotel visitors should be aware of the appropriate environmental policy, not just the personnel. As a result, it is critical that hotel managers encourage visitors to participate in hotel management operations.
- Hotel Management Software
  For the green hotel idea to work, it is important to have a well-defined hotel management system. Each component of the hotel manager should be aware of their obligations and responsibilities at work, as well as their involvement in environmental management.
- Employee training
  In order for a hotel to try to be a "green hotel," its employees must change the way they act. Hotel managers should train their staff so they can understand how to use the green hotel concept. Employee training strives to reduce the negative impact of the environment and energy consumption.
- Consumer awareness
  People who stay in hotels should know the rules about the environment that apply to the hotels they stay in. The hotel manager must provide adequate information about the applicable environmental regulations and how guests can participate in them.

CONCLUSION

Climate change influences the viability of areas to sustain tourist activities, tourism various demand, and affects operating expenses such as heating and cooling, artificial snow prices, food production, transportation and water and irrigation availability. Some mitigation efforts and waste management for the tourism industry to tackling the climate change impacts are concerning on energy efficiency, resources and product supply, transportation, waste and wastewater management, and human resources development and awareness.

REFERENCES

Anon. n.d. *ASEAN GREEN HOTEL STANDARD*.

Bielański, M., Korbiel, K., Taczanowska, K., Pardo-Ibañez, A., & González, L. M. (2022). How tourism research integrates environmental issues? A keyword network analysis. *Journal of Outdoor Recreation and Tourism*, *37*. https://doi.org/10.1016/j.jort.2022.100503

Book, ·. (2007). *Climate Change and Tourism: Assessment and Coping Strategies*. https://www.researchgate.net/publication/233759121

Boronat-Navarro, M., & Pérez-Aranda, J. A. (2020). Analyzing willingness to pay more to stay in a sustainable hotel. *Sustainability (Switzerland)*, *12*(9). https://doi.org/10.3390/su12093730

Carlton, S. J., & Jacobson, S. K. (2013). Climate change and coastal environmental risk perceptions in Florida. *Journal of Environmental Management*, *130*, 32–39. https://doi.org/10.1016/j.jenvman.2013.08.038

Chen, Y.-C., & Chen, Y.-T. (2012). The Advantages of Green Management for Hotel Competitiveness in Taiwan: In the Viewpoint of Senior Hotel Managers. *Journal of Management and Sustainability*, *2*(2). https://doi.org/10.5539/jms.v2n2p211

Climate Change and Tourism – Responding to Global Challenges. (2008). In *Climate Change and Tourism – Responding to Global Challenges*. World Tourism Organization (UNWTO). https://doi.org/10.18111/9789284412341

Deason, G., Seekamp, E., & Barbieri, C. (2022). Actor-network theory and organizational resilience to climate change in community-based tourism. *Journal of Outdoor Recreation and Tourism*, *38*. https://doi.org/10.1016/j.jort.2021.100483

Dogru, T., Marchio, E. A., Bulut, U., & Suess, C. (2019). Climate change: Vulnerability and resilience of tourism and the entire economy. *Tourism Management*, *72*, 292–305. https://doi.org/10.1016/j.tourman.2018.12.010

Gühnemann, A., Kurzweil, A., & Mailer, M. (2021). Tourism mobility and climate change - A review of the situation in Austria. *Journal of Outdoor Recreation and Tourism*, *34*. https://doi.org/10.1016/j.jort.2021.100382

Hernandez, A. B., & Ryan, G. (2011). COPING WITH CLIMATE CHANGE IN THE TOURISM INDUSTRY: A REVIEW AND AGENDA FOR FUTURE RESEARCH. In *Tourism and Hospitality Management* (Vol. 17, Issue 1).

Kuniyal, J. C., Jain, A. P., & Shannigrahi, A. S. (2003). Solid waste management in Indian Himalayan tourists' treks: A case study in and around the Valley of Flowers and Hemkund Sahib. *Waste Management*, *23*(9), 807–816. https://doi.org/10.1016/S0956-053X(03)00027-8

Loehr, J., & Becken, S. (2021). The Tourism Climate Change Knowledge System. *Annals of Tourism Research*, *86*. https://doi.org/10.1016/j.annals.2020.103073

Mbasera, M., Du Plessis, E., Saayman, M., & Kruger, M. (2016). Environmentally-friendly practices in hotels. *Acta Commercii*, *16*(1). https://doi.org/10.4102/ac.v16i1.362

Migale, G. H., Stimie, J. E., & Brent, A. C. (2019). Sustainable hotel strategy execution: A review and way forward. *South African Journal of Industrial Engineering*, *30*(4), 102–117. https://doi.org/10.7166/30-4-2025

Mousavi, S. A., Hoşkara, E., & Woosnam, K. M. (2017). Developing a model for sustainable hotels in Northern Cyprus. *Sustainability (Switzerland)*, *9*(11). https://doi.org/10.3390/su9112101

Njoroge, J. M. (2015). Tourism, millennium development goals and climate change in Kenya. In *African Journal of Hospitality, Tourism and Leisure* (Vol. 4, Issue 1). http//:www.ajhtl.com

Olefs, M., Formayer, H., Gobiet, A., Marke, T., Schöner, W., & Revesz, M. (2021). Past and future changes of the Austrian climate – Importance for tourism. *Journal of Outdoor*

Recreation and Tourism, *34*. https://doi.org/10.1016/j.jort.2021.100395

Pramono, J. (2016). Isu-Isu Pengelolaan Lingkungan pada Hotel Berbintang di Bali. *Jurnal Manajemen, Strategi Bisnis, Dan Kewirausahaan*, *10*(64–73).

Pröbstl-Haider, U., Wanner, A., Feilhammer, M., & Damm, A. (2021). Tourism and climate change – An integrated look at the Austrian case. *Journal of Outdoor Recreation and Tourism*, *34*. https://doi.org/10.1016/j.jort.2020.100361

Protection, B., Office, A. V., Family, S., Application, M. E., Treatment, M., Visitor, B., Stay, N. F., & Stay, N. O. F. (2014). *Application for a Visitor visa – Tourist stream*. *1419*, 1–15.

Rajić, M. N., Maksimović, R. M., & Milosavljević, P. (2022). Energy Management Model for Sustainable Development in Hotels within WB6. *Sustainability (Switzerland)*, *14*(24). https://doi.org/10.3390/su142416787

Rastegar, R., & Ruhanen, L. (2023). Climate change and tourism transition: From cosmopolitan to local justice. *Annals of Tourism Research*, *100*. https://doi.org/10.1016/j.annals.2023.103565

Scott, D., Amelung, B., Becken, S., Ceron, J.-P., Gossling, S., & Simpson, M. C. (2008). Climate Change and Tourism – Responding to Global Challenges. In *Climate Change and Tourism – Responding to Global Challenges*. World Tourism Organization (UNWTO). https://doi.org/10.18111/9789284412341

Scott, D., & Gössling, S. (2022). A review of research into tourism and climate change - Launching the annals of tourism research curated collection on tourism and climate change. *Annals of Tourism Research*, *95*. https://doi.org/10.1016/j.annals.2022.103409

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

Wahyu Wijaya, I. M. (2019). the Strategies To Reduce the Spread of Nitrogen From Domestic Wastewater Treatment To the Streams in Surabaya City, Indonesia. *International Journal of GEOMATE*, *16*(55), 204–210. https://doi.org/10.21660/2019.55.89776

Notifications ×

[IJASSD] Editor Decision

2024-04-27 09:11 AM

I Gusti Ngurah Made Wiratama, I Made Wahyu Wijaya, Fransiskus Vebrian Kenedy:

We have reached a decision regarding your submission to International Journal of Applied Science and Sustainable Development (IJASSD), "Climate Mitigation And Waste Management In The Tourism Industry For A Sustainable Ecosystem".

Our decision is: Revisions Required

International Journal of Applied Science and Sustainable Development (IJASSD)

[IJASSD] Editor Decision 2024-06-23 10:52 AM

Reviewer's Attachments Search

21727 ijassd-review-assignment-8936-Article+Text-21726.doc	April 27, 2024	

Revisions

Search | Upload File

No Files

Review Discussions

Add discussion

Name	From	Last Reply	Replies	Closed
Revision	wiratama 2024-04-27 09:38 AM	-	0	

Notifications ×

[IJASSD] Editor Decision

2024-04-29 09:28 AM

I Gusti Ngurah Made Wiratama, I Made Wahyu Wijaya, Fransiskus Vebrian Kenedy:

We have reached a decision regarding your submission to International Journal of Applied Science and Sustainable Development (IJASSD), "Climate Mitigation And Waste Management In The Tourism Industry For A Sustainable Ecosystem".

Our decision is to: Accept Submission

International Journal of Applied Science and Sustainable Development (IJASSD)

[IJASSD] Editor Decision 2024-06-23 10:52 AM

Reviewer's Attachments Search

21727 ijassd-review-assignment-8936-Article+Text-21726.doc		April 27, 2024

Revisions

Search | Upload File

No Files

Review Discussions

Add discussion

Name	From	Last Reply	Replies	Closed
Revision	wiratama 2024-04-27 09:38 AM	-	0	

Notifications ×

[IJASSD] Editor Decision

2024-06-23 10:52 AM

I Gusti Ngurah Made Wiratama, I Made Wahyu Wijaya, Fransiskus Vebrian Kenedy:

The editing of your submission, "Climate Mitigation And Waste Management In The Tourism Industry For A Sustainable Ecosystem," is complete. We are now sending it to production.

Submission URL: https://e-journal.unmas.ac.id/index.php/IJASSD/authorDashboard/submission/8936

International Journal of Applied Science and Sustainable Development (IJASSD)

Reviewer's Attachments Search

21727 ijassd-review-assignment-8936-Article+Text-21726.doc		April 27, 2024

Revisions

Search | Upload File

No Files

Review Discussions

Add discussion

Name	From	Last Reply	Replies	Closed
Revision	wiratama 2024-04-27 09:38 AM	-	0	

International Journal of
Applied Science and Sustainable Development (IJASSD)
Vol. 6 No. 1, April 2024
p-ISSN: 2656-9051/e-ISSN: 2775-6874
DOI: https://doi.org/10.36733/ijassd.v6i1.8936

CLIMATE MITIGATION AND WASTE MANAGEMENT IN THE TOURISM INDUSTRY FOR A SUSTAINABLE ECOSYSTEM

I Gusti Ngurah Made Wiratama[1], I Made Wahyu Wijaya[2], Fransiskus Vebrian Kenedy[1]
[1]Environmental Engineering Study Program, Universitas Mahasaraswati Denpasar
[2]Regional and Rural Planning Study Program, Universitas Mahasaraswati Denpasar
Email: rahde.wiratama@unmas.ac.id, wijaya@unmas.ac.id

ABSTRACT

Climate is one of the primary factors that influence international tourism. Most international travelers are interested in visiting nations with a distinct and more agreeable environment. This study aims to define the responses of tourism industry to face the climate change impacts through mitigation initiatives. Climate is a tourism resource that defines the viability of areas to sustain tourist activities, influences tourism demand, and affects operating expenses such as heating and cooling, artificial snow prices, and water and irrigation availability. Some mitigation efforts and waste management for the tourism industry to facing the climate change impacts are concerning on energy efficiency, resources and product supply, transportation, waste and wastewater management, and human resources development and awareness.

Keywords: Mitigation, Waste Management, Tourism, Sustainability, Climate Change

INTRODUCTION

Climate is one of the primary factors that influence international tourism. Most international travelers are interested in visiting nations with a distinct and more agreeable environment. Assume that frequent travelers residing in nations with cold climates would be interested in visiting countries with tropical climates, and vice versa (Book, 2007). According to Mbasera (2016), climate is one of the criteria that travelers evaluate while picking their travel destinations. This is one of the primary reasons why so many tourists visit Indonesia. Changes in climate include variations in air temperature, air pressure, wind, and humidity. Climate change will occur gradually over time. As a result of global warming, temperatures are increasing, weather patterns are shifting, sea levels are rising, and a variety of extreme occurrences are occurring. These catastrophes have occurred in nearly every region of the globe and influence tourism destinations, particularly those dependent on climatic and environmental conditions (Wijaya, 2019). The effects of climate change on the environment and human activity in numerous sectors are widespread. One of the sectors affected by climate change is flooding. Tourism is an economic driver and one of the greatest contributors to the region's original

revenue (PAD). As the number of tourists visiting Indonesia rises, so does the number of tourist accommodations, such as hotels, condotels, homestays, hostels, and restaurants. The construction of tourist accommodations, such as hotels, has increased significantly. The construction of a hotel might have a favorable effect on the workplace. It also contributes to environmental contamination. The hotel is the most common type of lodging for travelers who are on a long trip. As the need for visitor accommodations grows, the hotel's construction continues to expand. Tourists assess various hotel options in terms of pricing, quality, amenities, and location. Hotels play a crucial part in the tourism business. Hotels have a huge impact on society, the economy, and the environment. In addition to being affected by climate change, hotels also influence it and contribute to it. The hotel must have effective environmental planning and management to reduce its environmental impact. According to Njoroge (2015), climate has become one of the most important considerations in hotel-area climate change mitigation decisions. Changes in tourism patterns brought on by climate change necessitate adaptation and mitigation techniques to sustain the industry. Research According to Pramono (2016), three factors have a substantial impact on tourism in Bali. There are travel agent pressure issues, client pressure difficulties, and climate change issues. This study seeks to determine the factors that influence environmental management. The contentment of guests is one of the primary benefits that managers of five-star hotels in Bali notice from the process of environmental management.

The findings enhance the position of the green industry or the green industry trend, in which an increasing number of guests and tourists identify as environmentally conscious customers and desire to contribute to environmental protection. Educating travel agencies and tourists about the importance of maintaining a sustainable environment through environmental management mechanisms in Bali's five-star hotels is one way to achieve this goal. Rather than relying solely on conventional methods, such as enacting regulations, it is also important to directly socialize and monitor the hotel's implementation of these mechanisms. Climate change is another important issue. Climate change presents a difficulty for hotel management since climate predictions and the unpredictability of natural conditions will make it harder to organize ordinary hotel operations in open areas. This will also influence hotel visitors' activities.

RESEARCH METHOD

This study employed a comprehensive literature review to investigate the topic of waste management and mitigation in the tourism industry in pursuit of a sustainable tourism ecosystem. The review process involved identifying pertinent scholarly articles, reports, and case studies from a variety of databases, including academic journals and trade publications. The selected sources were evaluated critically based on their relevance, credibility, and recency, with a particular emphasis on studies that provided insights into successful practices and initiatives. Through this literature review, a solid understanding of existing knowledge and current trends in mitigation

and waste management in the tourism industry was developed, which served as the basis for the subsequent analysis and synthesis of findings.

RESULTS AND DISCUSSION

Subsection the Effects of Climate Change on Tourism Industry

Climate change will have an impact on both demand (demand) and supply (supply) in the Indonesian tourism industry. Changes in environmental circumstances caused by climate change will reduce tourist attraction because they are inconsistent with the location to visit on the demand side. Climate change can harm the ecosystem, natural resources, or cultural changes that were once a tourist draw. Climate change has an impact on temperature rise in the following ways: (1) the change in temperature in winter is greater than in summer; (2) the minimum daily temperature will increase; (3) the land is warmer than the ocean; (4) monsoon activity increases; (5) areas in latitudes with higher altitudes will experience greater warming; (6) the number of snowfall days will decrease; and (7) changes in the water storage and discharge cycle. Many activities in lodging establishments, such as hotels, will also produce emissions that contribute to climate change. Hotel emissions are projected to be 160–200 kilograms of CO2 per square meter of each room per year on average. Furthermore, on a five-star hotel level, tourists consumed 170-440 liters of water every night (Mbasera et al., 2016; Mousavi et al., 2017; Rajić et al., 2022). By 2011 Tourism is a particularly vulnerable sector to the effects of climate change, particularly in natural tourism regions such as mountains, beaches, oceans, rivers, and forests. The relationship between climate change and tourism can be viewed from two perspectives: the impact on travelers and the impact on tourist locations. The following are the effects of climate change that can affect tourism locations, tourist facilities, competitiveness, and sustainability (Scott et al., 2019; Scott & Gössling, 2022):

A. The direct effect

Climate is a tourism resource that defines the viability of areas to sustain tourist activities, influences tourism demand, and affects operating expenses such as heating and cooling, artificial snow prices, and water and irrigation availability. People's preferences for where to vacation are also influenced by the weather.

B. The effect is only indirect.

Climate change has the potential to create a wide range of disasters. In the long run, such disasters will have far-reaching negative consequences, such as environmental degradation or deterioration. Because natural and environmental conditions are the most appealing resources for tourism activities, environmental deterioration will have a significant detrimental influence on the tourism sector at both the destination and regional levels.

How Do Mitigation Policies Affect the Tourist Movements?

Tourism is one of the major causes of the significant growth in greenhouse emissions. The movement of tourists from one location to another through vehicles results in considerable carbon dioxide emissions. This drives the national and international communities to establish

mitigation regulations that require tourists to adjust their travel habits, such as by changing means of transportation or changing tourism locations. Climate change threatens a country's future economic growth and political stability. Continued climate change will disrupt global economic growth; climate-related global GDP decreases can reduce consumer interest in tourism and have a negative impact on tourism growth. Aside from climate change, tourism activities emit emissions that enhance the dangers of climate change. Tourists are more interested in visiting unusual tourist destinations (Kuniyal et al., 2003; Protection et al., 2014; Scott et al., 2008). Tourism-related carbon emissions account for approximately 5% of worldwide carbon emissions (Scott et al., 2008, 2019). If housing services, such as hotels, are not adequately managed, they will emit emissions. The following are some sources of emissions from the hotel's operational activities:

A. Modes of transportation

Transportation activities do not exclude hotel operations. This activity takes place while tourists visit various locations. The use of hotel vehicles that run on fossil fuels contributes to greenhouse gas emissions. Tour facilities provided by hotels with small automobiles will increase fuel usage as more vehicles are used. Also, the use of private automobile rental services will increase vehicle use and carbon emissions. The fuel consumption of the vehicle is also affected by the destination.

B. Accommodation options

Tourist lodging is extremely significant in the tourism industry. Accommodation must be tailored to the needs of tourists in terms of both quantity and quality. With the surge in tourist visits, tourist managers now have access to a variety of low-cost lodging options. Carbon emissions may be generated by supporting facilities in such hotels. Every hotel is expected to be able to create energy savings to reduce carbon emissions. In general, energy usage in hotels includes room cooling and heating, hot water facilities, the use of refrigerators and freezers, and lighting.

Climate Change Mitigation Innitiatives by the Hospitality Sector

One of the effects of increased tourism activities is a rise in greenhouse gas emissions. There are four basic mitigation options for reducing greenhouse gas emissions, which are as follows ("Climate Change and Tourism – Responding to Global Challenges," 2008; Dogru et al., 2019; Loehr & Becken, 2021; Scott & Gössling, 2022):

Lowering energy consumption.

The most significant option for mitigation is to reduce energy use. Energy savings in the provision of accommodation services can be achieved through the selection of tourist sites, the use of transportation modes, and tour management systems. Tourism managers play a vital part in this mitigation effort. The operator can plan the tourist destination based on the distances and means of transportation available. The use of public transportation, such as buses or trains, is, of course, a priority. Furthermore, the hotel's offer of diverse facilities is intended to extend tourists' stays. The longer you stay at the hotel, the fewer your potential emissions from

transportation modes. As a result, the manager must make an offer that fits the needs of the tourists while also considering the emissions generated.

Improved energy efficiency

The employment of cutting-edge technology to improve energy efficiency is an endeavor to reduce greenhouse gas emissions. One of the objects targeted in this scenario is aircraft transportation. In addition to reducing fuel consumption, the availability of new technology will improve flight quality, given the significant mobility of visitors in this fashion. Improved energy efficiency is also used in the provision of tourist accommodations. High-efficiency gadgets will help save energy and minimize pollution.

Increased use of renewable energy

The utilization of renewable energy sources such as wind, solar, geothermal, biomass, and waste helps to minimize greenhouse gas emissions. The use of renewable energy must be developed in the tourism sector, particularly in island tourism. Certain tourist spots on the island still use solar as a fuel source for power plants today. Aside from the high cost, solar energy will emit greenhouse gases.

Carbon Offset

Carbon is one of the energy sources that can be stored in the form of biomass. The high volumes of carbon dioxide produced by tourism mobilization must be compensated for by industry management and tourists. The kind of compensation is an additional cost that is proportional to the amount of carbon emissions produced. The introduction of this system will be able to minimize carbon emissions indirectly since travelers will be able to consider tourist sites to visit. The higher the additional cost of carbon compensation, the farther the tourist destination. According to projections given by the United Nations World Tourism Organization ("Climate Change and Tourism – Responding to Global Challenges," 2008; Deason et al., 2022; Olefs et al., 2021), the size of emissions reduction by 2035 with the implementation scenario of mitigation actions is as follows:

A. If all technologies (transportation, lodging, and tourism activities) operated at peak efficiency, emissions would be reduced by 38%.
B. Using a combination of modes of transportation, effective destination settings, and expanded stay times for tourists could potentially lower emissions by 44%. Some mitigation measures done on accommodation support facilities, such as hotels, are as follows (Carlton & Jacobson, 2013; Hernandez & Ryan, 2011).
C. Supply of food and drink.
   The utilization of local foods reduces carbon emissions from distribution activities. Temperature settings for refrigerators at the most efficient temperature of 3.20 C, with freezer temperatures ranging from -180 to -150 C. Several factors were considered when assembling the refrigerator to make it more efficient, including (1) allowing food to cool before storage, (2) storing materials not exceeding capacity, (3) regular cleaning and checking of the ventilator, condenser, and compressor parts, (4) ensuring the fridge door is

closed tightly, (5) ensuring a stable power supply for the frigories, and (6) periodic cleaning of the freezer to maintain cooling efficiency.

D. Heating, cooling, and ventilation systems
   - Adjust the room temperature to between 200 and 250 degrees Celsius.
   - Good air circulation in the room.
   - Employ high-quality building materials to keep the room temperature stable.
   - The water heater's temperature should not exceed 600 degrees Celsius.

E. Illuminated
   - The light has an automatic on/off system.
   - Proper room illumination and the usage of light bulbs to maximize beet efficiency Light bulbs have ten times the efficiency of traditional lamps and a tenfold longer service life.
   - The availability of natural light should be considered when designing the room.

F. Laundry
   - Make use of energy-efficient devices
   - Equipment that has reached the end of its useful life must be replaced.
   - When drying garments, lower the temperature.
   - full capacity washing machine

G. Elevator
   - Elevator drives are powered by electricity.
   - Overloading should be avoided.

H. Recreational facilities
   - It is equipped with an automatic lighting system
   - Maintain the pool's temperature, especially at night.

I. Human capital
   - Staff education on energy conservation
   - cleaning and maintenance of equipment on a regular basis.
   - Encourage travelers to conserve energy.
   - Energy consumption measurement for evaluation or development.

The establishment of environmentally friendly hotel operations (green practices) is an important step that the hospitality industry must take today. Every hotel can take the lead in implementing environmental management to mitigate the effects of climate change. (Bielański et al., 2022; Deason et al., 2022; Gühnemann et al., 2021; Mbasera et al., 2016; Pröbstl-Haider et al., 2021; Rastegar & Ruhanen, 2023) developed a list of green practices and green initiatives that hotel management can implement (Table 1).

Table 1. Green Practice and Green Initiative for Hotel Accomodation

Green Practice	*Green Initiative*
Water Utilities	▪ Use low flow rate equipment to monitor the water lines on a regular basis to avoid leaks. ▪ Construct a drainage reservoir. ▪ Using the Rainwater Collecting Idea ▪ Utilize treated waste water for irrigation and watering plants.

Green Practice	*Green Initiative*
Energy conservation	▪ Making use of natural sunlight during the day ▪ Make use of lighting. ▪ Make use of renewable energy sources like angi and sunlight. ▪ usage of automated on/off switches, particularly for room facilities. ▪ Unused installations should have their lights turned off.
Waste management	▪ Recycle hotel garbage to be reused; for example, food waste composting might be utilized for park management. ▪ Minimize the use of paper in transactions and replace it with email.
Air quality management	▪ Using air filters. ▪ Ensure proper ventilation for the restaurant and the kitchen blower. ▪ Make a separate smoking area available. ▪ Make bicycles or compact automobiles available for use in the hotel area.
Environment contribution	▪ Utilize recyclable materials to meet the needs of travellers. ▪ Make the soap and shampoo. ▪ Purchase regional foods and beverages. ▪ Charging travellers for the usage of hotel items above and beyond what is given
Awareness development	▪ Environmental management training for staff ▪ Supplying environmental information sources such as posters, periodicals, or flyers ▪ Collaborating with local communities to safeguard the environment
Policy and standard	▪ Establishing environmental management guidelines ▪ Creating an environmental management SOP for all hotel facilities and activities

Climate Change Mitigation Innitiatives by the Hospitality Sector

The development of Indonesia's hotel industry continues to meet the demand for lodging from the tourism sector. The dynamics of the hospitality business have also been influenced by global warming. Indonesia is also guided in this regard by the ASEAN Green Hotel Standard (*ASEAN GREEN HOTEL STANDARD*, n.d.; Boronat-Navarro & Pérez-Aranda, 2020; Chen & Chen, 2012; Migale et al., 2019), which is a hotel standard guide intended to satisfy the notion of being environmentally friendly and energy efficient. Green Hotel Operation, Environmental Plan, Green Product, and Human Resource and Environment Management are among the requirements used at AGHS. Asean Green Hotel Standard. AGHS applies ecologically friendly standards to several critical factors, including:

1. Environmental policy and local driver requirements
   - Implement environmental activities to increase worker, customer, and supplier participation in hotel environmental management.
   - Develop a training plan to improve staff environmental stewardship.

- Develop a plan for environmental management in hotel operations.
- The hotel has an environmental monitoring program.

2. Use of ecologically friendly products
   - Promote the use of locally produced goods, such as food and craft materials.
   - Urge people to use eco-friendly items.
   - Collaborate with the local community.
   - Create an activity plan to improve the quality of life in local communities.
   - Offer programs to increase the local community's interest in environmental management.
   - Provide jobs for the local communities.
3. Human Resource Development
   - Creating employee training programs for operational and environmental management in the hotel
4. The waste
   - Introducing waste management approaches using the 3R (reduce, reuse, recycle), disposal, and composition concepts.
   - Inviting hotel employees to take part in 3R activities such as cutting and composing.
   - Inviting hotel guests to participate in 3R (recording, cutting, and composing) activities.
5. Energy Conservation
   - Provide energy-saving solutions for the use of electronic devices.
   - Install an energy-monitoring gadget.
6. Water efficiency and water quality management
   - Water-saving strategies are being implemented in hotel operations.
   - water storage treatment on a regular basis.
   - Urge hotel guests to conserve water.
   - The hotel's water quality
7. Air quality (both indoors and outdoors)
   - Make a smoking-free zone and additional smoking-free zones.
   - Maintenance and regular monitoring of hotel air quality facilities, such as room cooling.
8. Noise control
   - Offering noise reduction programs in hotel operations
9. Waste Water Management
   - Implement a strategy to reduce wastewater output and prevent water pollution.
   - Have a waste water treatment system installed.
   - Promote the reuse of waste water for operational purposes, such as plant irrigation.
10. Hazardous and lethal compounds (B3)
    - Provide clear signage with information about dangerous and poisonous substances.
    - Possession of hazardous and poisonous substances
    - Inspections of hazardous and toxic material storage sites on a regular basis for cleaning and upkeep.

Chen and Chen (2012), like AGHS, argued that there are five keys that drive the concept of green in a hotel. Green purchases, environmental policies, management systems, employee education,

and consumer education are examples of these.

- Environmental Purchase
  Green purchasing is an effort to meet the needs of hotels for items that are good for the environment. This concept's application is based on the 3R3E principle. (Economic, ecological, and equitable reduction, reuse, and recycling). This philosophy also encourages the use of local products. Hence, collaboration with product suppliers who share the same ideas will be able to aid in the implementation of the green purchasing concept.
- Policies on the Environment
  To adapt to the challenges of global warming, every hotel manager must implement environmental regulations. To actualize the concept of "green hotels," every element of hotel management must comprehend environmental policy, particularly during operation. Hotel managers should arrange for training for staff from all departments to improve employee care and understanding of environmental management. All hotel visitors should be aware of the appropriate environmental policy, not just the personnel. As a result, it is critical that hotel managers encourage visitors to participate in hotel management operations.
- Hotel Management Software
  For the green hotel idea to work, it is important to have a well-defined hotel management system. Each component of the hotel manager should be aware of their obligations and responsibilities at work, as well as their involvement in environmental management.
- Employee training
  In order for a hotel to try to be a "green hotel," its employees must change the way they act. Hotel managers should train their staff so they can understand how to use the green hotel concept. Employee training strives to reduce the negative impact of the environment and energy consumption.
- Consumer awareness
  People who stay in hotels should know the rules about the environment that apply to the hotels they stay in. The hotel manager must provide adequate information about the applicable environmental regulations and how guests can participate in them.

CONCLUSION

Climate change influences the viability of areas to sustain tourist activities, tourism various demand, and affects operating expenses such as heating and cooling, artificial snow prices, food production, transportation and water and irrigation availability. Some mitigation efforts and waste management for the tourism industry to tackling the climate change impacts are concerning on energy efficiency, resources and product supply, transportation, waste and wastewater management, and human resources development and awareness.

References

Anon. n.d. *ASEAN GREEN HOTEL STANDARD*.

Bielański, M., Korbiel, K., Taczanowska, K., Pardo-Ibañez, A., & González, L. M. (2022). How tourism research integrates environmental issues? A keyword network analysis. *Journal of Outdoor Recreation and Tourism*, *37*. https://doi.org/10.1016/j.jort.2022.100503

Book, ·. (2007). *Climate Change and Tourism: Assessment and Coping Strategies*. https://www.researchgate.net/publication/233759121

Boronat-Navarro, M., & Pérez-Aranda, J. A. (2020). Analyzing willingness to pay more to stay in a sustainable hotel. *Sustainability (Switzerland)*, *12*(9). https://doi.org/10.3390/su12093730

Carlton, S. J., & Jacobson, S. K. (2013). Climate change and coastal environmental risk perceptions in Florida. *Journal of Environmental Management*, *130*, 32–39. https://doi.org/10.1016/j.jenvman.2013.08.038

Chen, Y.-C., & Chen, Y.-T. (2012). The Advantages of Green Management for Hotel Competitiveness in Taiwan: In the Viewpoint of Senior Hotel Managers. *Journal of Management and Sustainability*, *2*(2). https://doi.org/10.5539/jms.v2n2p211

Climate Change and Tourism – Responding to Global Challenges. (2008). In *Climate Change and Tourism – Responding to Global Challenges*. World Tourism Organization (UNWTO). https://doi.org/10.18111/9789284412341

Deason, G., Seekamp, E., & Barbieri, C. (2022). Actor-network theory and organizational resilience to climate change in community-based tourism. *Journal of Outdoor Recreation and Tourism*, *38*. https://doi.org/10.1016/j.jort.2021.100483

Dogru, T., Marchio, E. A., Bulut, U., & Suess, C. (2019). Climate change: Vulnerability and resilience of tourism and the entire economy. *Tourism Management*, *72*, 292–305. https://doi.org/10.1016/j.tourman.2018.12.010

Gühnemann, A., Kurzweil, A., & Mailer, M. (2021). Tourism mobility and climate change - A review of the situation in Austria. *Journal of Outdoor Recreation and Tourism*, *34*. https://doi.org/10.1016/j.jort.2021.100382

Hernandez, A. B., & Ryan, G. (2011). COPING WITH CLIMATE CHANGE IN THE TOURISM INDUSTRY: A REVIEW AND AGENDA FOR FUTURE RESEARCH. In *Tourism and Hospitality Management* (Vol. 17, Issue 1).

Kuniyal, J. C., Jain, A. P., & Shannigrahi, A. S. (2003). Solid waste management in Indian Himalayan tourists' treks: A case study in and around the Valley of Flowers and Hemkund Sahib. *Waste Management*, *23*(9), 807–816. https://doi.org/10.1016/S0956-053X(03)00027-8

Loehr, J., & Becken, S. (2021). The Tourism Climate Change Knowledge System. *Annals of Tourism Research*, *86*. https://doi.org/10.1016/j.annals.2020.103073

Mbasera, M., Du Plessis, E., Saayman, M., & Kruger, M. (2016). Environmentally-friendly practices in hotels. *Acta Commercii*, *16*(1). https://doi.org/10.4102/ac.v16i1.362

Migale, G. H., Stimie, J. E., & Brent, A. C. (2019). Sustainable hotel strategy execution: A review and way forward. *South African Journal of Industrial Engineering*, *30*(4), 102–117. https://doi.org/10.7166/30-4-2025

Mousavi, S. A., Hoşkara, E., & Woosnam, K. M. (2017). Developing a model for sustainable hotels in Northern Cyprus. *Sustainability (Switzerland)*, *9*(11). https://doi.org/10.3390/su9112101

Njoroge, J. M. (2015). Tourism, millennium development goals and climate change in Kenya. In *African Journal of Hospitality, Tourism and Leisure* (Vol. 4, Issue 1). http//:www.ajhtl.com

Olefs, M., Formayer, H., Gobiet, A., Marke, T., Schöner, W., & Revesz, M. (2021). Past and future changes of the Austrian climate – Importance for tourism. *Journal of Outdoor Recreation and Tourism*, *34*. https://doi.org/10.1016/j.jort.2021.100395

Pramono, J. (2016). Isu-Isu Pengelolaan Lingkungan pada Hotel Berbintang di Bali. *Jurnal Manajemen, Strategi Bisnis, Dan Kewirausahaan*, *10*(64–73).

Pröbstl-Haider, U., Wanner, A., Feilhammer, M., & Damm, A. (2021). Tourism and climate change – An integrated look at the Austrian case. *Journal of Outdoor Recreation and Tourism*, *34*. https://doi.org/10.1016/j.jort.2020.100361

Protection, B., Office, A. V., Family, S., Application, M. E., Treatment, M., Visitor, B., Stay, N. F., & Stay, N. O. F. (2014). *Application for a Visitor visa – Tourist stream*. *1419*, 1–15.

Rajić, M. N., Maksimović, R. M., & Milosavljević, P. (2022). Energy Management Model for Sustainable Development in Hotels within WB6. *Sustainability (Switzerland)*, *14*(24). https://doi.org/10.3390/su142416787

Rastegar, R., & Ruhanen, L. (2023). Climate change and tourism transition: From cosmopolitan to local justice. *Annals of Tourism Research*, *100*. https://doi.org/10.1016/j.annals.2023.103565

Scott, D., Amelung, B., Becken, S., Ceron, J.-P., Gossling, S., & Simpson, M. C. (2008). Climate Change and Tourism –

Responding to Global Challenges. In *Climate Change and Tourism – Responding to Global Challenges*. World Tourism Organization (UNWTO). https://doi.org/10.18111/9789284412341

Scott, D., & Gössling, S. (2022). A review of research into tourism and climate change - Launching the annals of tourism research curated collection on tourism and climate change. *Annals of Tourism Research*, *95*. https://doi.org/10.1016/j.annals.2022.103409

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

Wahyu Wijaya, I. M. (2019). the Strategies To Reduce the Spread of Nitrogen From Domestic Wastewater Treatment To the Streams in Surabaya City, Indonesia. *International Journal of GEOMATE*, *16*(55), 204–210. https://doi.org/10.21660/2019.55.89776