



Review

Advances and challenges in sustainable tourism toward a green economy

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HIGHLIGHTS

- Challenges and barriers in tourism sector toward sustainability are illustrated.
- A total of six key cross-disciplinary elements in sustainable tourism are proposed.
- Strategies, framework and details of KPI system for green tourism are provided.
- A case study of the Green Island, Taiwan toward a circular economy is presented.
- Transformative changes in tourism such as water-energy-food nexus are described.

GRAPHICAL ABSTRACT



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ABSTRACT

This paper provides an overview of the interrelationships between tourism and sustainability from a cross-disciplinary perspective. The current challenges and barriers in the tourism sustainability, such as high energy use, extensive water consumption and habitat destruction, are first reviewed. Then the key cross-disciplinary elements in sustainable tourism, including green energy, green transportation, green buildings, green infrastructure, green agriculture and smart technologies, are discussed. To overcome the challenges and barriers, a few implementation strategies on achieving sustainable tourism from the aspects of policy/regulation, institution, finance, technology and culture are proposed, along with the framework and details of a key performance indicator system. Finally, prospects of the potential for tourism to contribute to the transformative changes, e.g., a green economy system, are illustrated. This paper shine a light on issues of importance within sustainable tourism and encourage researchers from different disciplines in investigating the inter-relationships among community/culture, environment/ecology, and energy/water/food more broadly.

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1. Introduction

1.1. Significance and importance of sustainable tourism

Travel and tourism have a tremendous contribution to our modern economical system. According to the statistics reported by the United Nations World Tourism Organization (UNWTO), global travel and tourism industry, including tourism-related business such as catering and cleaning, represents 9.8% of total global gross domestic product (UNWTO, 2017a) and 7% of global trade (UNWTO, 2017b) in 2016. They also create approximately 11% of the world's existing employment (direct & indirect) in 2016 (UNWTO, 2017a). However, this great contribution to economic development also has a significant impact on the environment and ecosystem. For instance, CO₂ emissions for global tourist trips including same-day visitors' amount to about 1302 million tonnes (Mt) CO₂ (Peeters and Dubois, 2010), corresponding to 5% of global anthropogenic CO₂ emissions in 2005, i.e., 26,400 Mt CO₂ (IPCC, 2007).

In fact, considering the amount of CO₂ emissions from tourism including transportation, as well as the great growth rates of tourists, its contribution to the climate change is not small comparing to that of all other sectors (Bows et al., 2009). Peeters and Dubois (2010) first developed a 30-year projection model based on an emission inventory made

for 2005. They found that improvements in technology alone cannot reach the targets of CO₂ emission reduction for sustainability. Without a radical shift, the future tourist travel system will not meet the significant CO₂ emission reduction required for avoiding dangerous climate change (Peeters and Dubois, 2010). In other words, immense transformations in not only transport modes but also destination choice are necessary (Peeters and Dubois, 2010).

Fig. 1 shows a roadmap of connecting tourism industry with sustainable development around the world. Since the late 1980s, the research in tourism field has given substantial focus on the issue of sustainability (or sustainable development) (Hall, 2010). At that time, the concept to connect tourism activity and the environment, known as "alternative tourism", was proposed and developed (Aall, 2014). The United Nations (UN) plan of action for "Sustainable Development Agenda 21" adopted at the Rio Conference in 1992. After that, the UNWTO had presented its perspectives on sustainable tourism. In 1996, a separate Agenda 21 for tourism, developed in a partnership with the UNWTO, the World Travel & Tourism Council (WTTC), and the Earth Council (EC), was published. Followed by this document, the Quebec Declaration on "Ecotourism" was announced at The World Ecotourism Summit in 2002, and the Davos Declaration on "Climate Change and Tourism responding to Global Challenges" was announced afterwards in 2007. Until the Rio + 20 in 2012, the outcome document "The Future We Want" largely

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