ABSTRACT

Indonesia is a popular tourist destination, there has been an increase in the rate of tourism activities, which also causes positive and negative externalities. Some of the impacts are the addition of carbon footprint emissions from transportation and the activities themselves, which ultimately contribute to climate change. Karimunjawa Island is one of the most popular islands in Karimunjawa Islands, Jepara Regency, Central Java. It is the centre of all activities ranging from trade, tourism, and education to community associations, including the fishing community. The centre of tourism activity consists of many lodgings such as hotels, homestays, and villas that are the central accommodation for tourists, increasing the need for transportation to carry out daily activities. Knowing the high interest of tourists in the natural beauty of Karimunjawa, which increases tourism activities, it is necessary to realize the importance of ecotourism in preserving nature and supporting sustainable tourism.

This study aims to (1) Investigate the scope of carbon footprint and sustainable tourism research (2) Analyze carbon footprint (CO_2) emissions gained from tourism activities (lodging, transportation, and restaurants/cafes) on Karimunjawa Island, (3) Proposed formulation a low-carbon sustainable tourism strategy in Karimunjawa Island. The data in this study were obtained by collecting both primary and secondary data. This study conducted a mixed method, a mixture of qualitative and quantitative approaches. The qualitative approach was collected with semi-structured interviews with informants representing lodging, transportation, and restaurant/cafe and in-depth interviews with a total of 6 key informants, complemented by validation of information related to the distribution and development of potential tourism activities that cause carbon footprint through field surveys. The quantitative approach was collected with semi-structured interviews, a total of 50 respondents divided into 3 groups: 10 respondents from lodging, 30 respondents representing ship transportation, and 10 respondents representing restaurant/café determined by snowballing sampling, the calculation of carbon footprint emission based on IPCC Guidelines 2006.

The results indicate that: (1) Research studies related to carbon footprint already have many discussion perspectives. Climate change has a close perspective on the carbon footprint in the tourism sector. There is a theoretical gap between carbon footprint mitigation and its management. The need for in-depth studies from a social perspective can add new perspectives to reduce the theoretical gap; (2) The potential tourism activities that caused the carbon footprint emissions on Karimunjawa Island contribute directly to the economic turnaround of the community through three main sectors: lodging, transportation, and restaurants/cafes. The characteristics of each sector play a role in the business interaction, with the facilities provided increasing the convenience of tourists. An

evaluation of carbon emission consumption in the Karimunjawa tourism sector shows that the PPM (Parts Per Million) level of carbon footprint from transportation, especially water tourism with fishing boats and tourist boats, has the most significant contribution to primary carbon emissions. After that, the lodging sector contributes to carbon emissions in the second position and the restaurant/café sector in the last position in contributing to carbon emissions; (3) Co-management to build coordination between the government, business people, and local communities allows for more efficient and responsible management of natural resources, preserving the environment, and preventing overcapacity and ecosystem damage. Transparent coordination encourages innovation and environmentally friendly solutions, as well as education and regulations related to carbon emission reduction to support sustainable tourism in the future.

This study emphasizes the importance of sustainable tourism management by considering carbon emissions, environmental conservation, and coordination between tourism sectors. Effective emission reduction strategies, energy consumption monitoring, and better regulations are needed to minimize social and environmental impacts. With a multidisciplinary approach and strong collaboration, the balance between tourism growth and ecosystem sustainability can be maintained. Future research is suggested to expand the exploration of the relationship between tourism, carbon emissions, and environmental sustainability with a more comprehensive and data-driven approach. Further studies can explore innovative strategies in reducing environmental impacts, such as the use of environmentally friendly technologies and incentive policies for the sustainable tourism industry. In addition, the research can expand its scope to social and economic aspects, including the impact of tourism changes on the welfare of local communities and the effectiveness of regulations in maintaining a balance between tourism growth and environmental conservation. A multidisciplinary approach involving various stakeholders also needs to be strengthened to produce more holistic and applicable solutions.

Keywords: Carbon Emission, Tourism, Sustainable, Karimunjawa, Indonesia