

IMPLEMENTATION OF BIKE-SHARING SYSTEM IN JAPAN'S REGIONAL METROPOLITANS: A CASE STUDY IN OITA CITY

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ABSTRACT

Biking (cycling) has been widely recognized as an environmentally, socially and economically sustainable way of urban transport, because it is fuel-efficient, space-saving and encourages a healthy lifestyle. As one of the new-emerged mode of biking, bike-sharing system has been implemented in many metropolitans in Japan and around the world, being as urban dwellers' means of travel as well as a supplementary form of urban transportations, along with the boost of sharing economy and low-carbon transportation. However, the environmental impact of the implementation of BSS is not clear.

Based on the literature review on the transport system in Japan, usage of transportation in Japan, the role of bike-sharing system in Japan, and previous studies of learning about bike-sharing system by LCA, two major research gaps have been identified. One is the uncertainty of bike-sharing system's role in the transport system of regional metropolitans, and the other is limited previous studies about bike-sharing system's environment impact.

This research chose Oita City, a middle-cored city in Kyushu Island, Japan as study

area, aiming to explore the role of bike-sharing system in the improvement of sustainable urban mobility and the environmental impacts on the implementation of bike-sharing system in Oita City. The research objectives are: (1) To examine the status quo and characteristics of bike-sharing system in Oita City, in terms of station distribution and expansion, trip duration and distance, and patterns of bicycle activity; (2) To identify the environmental impacts on the implementation of bike-sharing system in Oita City, with the hypothesis of the implementation of bike-sharing system in Oita City has positive environmental impacts on regional sustainability.

In order to fulfill these research objectives, this research mainly utilizes several methodologies as the following: (1) Site observation in Oita City; (2) Interviews with staffs at the operating company and local government officers; (3) Data analysis and GIS modelling based on operational data; (4) Use H25 Oita Metropolitan area person trip investigation to identify people's original means of transport; (5) Conduct life cycle assessment (LCA) by OpenLCA software to calculate the greenhouse gas emissions (carbon dioxide, methane and sulfur hexafluoride); (6) Conduct global warming potential (GWP) calculation; (7) Make comparisons based on the results.

To conclude, on research Objective 1, the status quo and characteristics of bike-sharing system in Oita City have been examined in four major aspects, including Station (rent and return ports, starting and ending points), User (BSS registered memberships), Trip, and Facilitator. It was found that BSS has been mainly used as last-mile transportation. On research Objective 2, by comparing the product systems of BSS and traditional transport model, the difference in their GHG emissions in the 8-month

operation period has been identified, and GWP based on a ten-year lifetime scale has been evaluated. As a result, the hypothesis of “the implementation of bike-sharing system in Oita City has positive environmental impacts on regional sustainability” has been examined and supported by the calculation results.

Keywords: Bike-sharing System, Urban Mobility, Transport Mode, Life-cycle assessment, Global warming potential