Investigating Sustainable Urban Structures toward a Decarbonized Society

Topic: Sustainable production and consumption I (Chair: Shigemi Kagawa, Kyushu University)
Author: Chisato HOSOSHIMA
Co-Authors: Shigemi KAGAWA

With the adoption of the Paris Agreement in December 2015, efforts are now being made to decarbonize on a global scale, and Japan has also declared its goal of achieving carbon neutrality by 2050. In order to achieve this goal, each a municipality is required to reduce CO2 emissionspromote through specific policies. However, since there are significant differences in urban structures in each municipalityregion, the policies that should be implemented for decarbonization differ across from one municipalitiyes to another. This study estimates the impacts of different spatial structuresstructural differences between rural and urban areas on life-cycle CO_2 emissions from private vehicles, and examines effective urban structures in reducing CO_2 emissions, in order to determine how to achieve sustainable cities.â€€ To analyze how CO_2 emissions from private cars change due to after the development level of public transportation, an econometric multiple regression analysis at prefecture level in 2020 was performed by using the annual CO_2 emissions per driver (t-CO_2) in prefecture i (i=1,2,â€¦47) as the an objective variable y_i, and the percentage of electric vehicles among passenger cars, the number of train station per land areaãŽ¢, the number of bus stops per land areaãŽ¢, the percentage of drivers over 75-year-old who have returned their licenses, the number of stores per land areaãŽ¢, the dependence on private cars, and the average number of walking steps taken per day in prefecture i as the explanatory variables $x\_1i,x\_2i,x\_3i,x\_4i,x\_5i,x\_6i$,and x_7i. Subsequently, the spatial econometric analysis framework was combined with a multi-regions input-output analysis framework of the Japanese prefectures. Thise study analysis demonstratedshowed that an increase in the number of train stations and bus stops considerably contributed to decreasreducinges life-cycle CO_2 emissions from private vehicles. This is because the development of public transportation makes it possible for each individual to lead a lifestyle n adequate life without driving a car. For CO2 mitigation, we It was also found that increasing the number of stations and bus stops is more effective in cities than in rural areas. Theis sustainability estimated analysis frameworkmodel at prefecture level proposed in this study can help each municipality to determine the most suitable urban policy toward the decarbonization.