

# **A comparative analysis of the adoption potential of hydrogen fuel cell vehicle in Tokyo**

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Hydrogen fuel cell vehicle (HFCV) are recognized to have the potential to reduce fossil fuel dependence and CO<sub>2</sub> emissions. Japanese government has included the promotion of HFCV adoption as a part of national economic development agenda. As Tokyo has an important demonstration role as the capital, its progress in the popularization of HFCV deserves more attention. However, the metropolitan area surrounding Tokyo has differences in population distribution, economic development, facility construction, and cultural needs. In addition, due to the initial stage of HFCV promotion, the distribution of support facilities and situation of subsidy policy varies between districts. Therefore, different factors and barriers influence the willingness of customers to accept HFCVs in Tokyo. Recognizing the differences will benefit the future facility planning and policy formulation of HFCV promotion.

Analytic hierarchy process (AHP) and field surveys are employed in this study to propose a group of factors that may affect customers' preferences on HFCV, and to prioritize them and identify the critical ones. It indicates that fuel availability, economic costs, vehicle performance, environmental friendliness, policy support and social condition are the most important 6 dimensions in affecting customers' attitude towards HFCV. The lower-level factors of each dimension also identify the most critical ones through AHP: the fuel availability is mainly determined by the number of hydrogen refueling stations. The economic cost is mainly affected by the affordability of consumers. The vehicle performance is mainly restricted by the distance travelled by the car. Policy support is mainly reflected in the amount of subsidies. Social conditions are determined by the number of 4S shops is determined. This study uses GPS data via mobile phone users to discover individual travel behavior and accurately calculate the distance travelled by car. Other data can be obtained from industrial reports and government planning information. Therefore, the 6 dimensions can be evaluated by the corresponding lower-level factors. Furthermore, the distribution of the 6 dimensions in each district is figured out by Pareto Analysis to reflect the adoption potential.

The results show that the districts with high adoption potential for hydrogen fuel cell vehicles are mainly areas with low public transport dependence, high income levels, and well-planned corresponding facilities, such as Minato-Ku and Koto-Ku. According to the results, some policy implications are proposed from the prospective of improving and demonstrating government leading HFCV facility construction and operation, and costs reductions.