

“Technical Research and Development for Road Policy Quality Improvement”

Study Summary

No.	Title	Principal Researcher
No.2022-1	Technical development of project assessment methods for road investment including travel time savings	The University of Tokyo Prof. Hironori Kato
This study aims to develop a method to assess road investment projects in Japan for sustainable development in the society, in which important policy parameters including values of travel time saving and reliability are estimated while the time-of-day travel demand forecasting methods incorporating induced traffic demand are proposed.		
1. Backgrounds and Objects In Japan, about 25 years have passed from an introduction of cost-benefit analysis for project assessment of road investment. Socio-economic conditions, technological development in transportation industry, and data availability have been significantly changed in the past decades while the project assessment method has not been updated so that many challenges have been pointed out in practice. Notably, a new approach to the benefit computation method such as important parameters in estimating project benefit and travel demand forecasting methods is highly required in line with recent conditions in Japan. This study aims to unveil the challenges in road project assessment and to propose an update of existing methods and an introduction of new approach in Japan through extensive review of practices in other countries. 2. Activities in Research Period This study performs the following two tasks. (1) Estimation of basic parameters in road project assessment Updates of value of travel time saving with the latest data; Estimation of travel time variability and value of travel time reliability with empirical data; Estimation of travel cost incorporating the new technology vehicles such as electric vehicles; Estimation of traffic accident rate using a statistical approach. (2) Development of travel demand forecasting model and empirical analysis on road-investment impact Traffic assignment method in road network incorporating the time-of-day variation; Empirical analysis of impacts of road investment on local economies and induced traffic demand; and Development of traffic demand forecasting method to estimate the induced traffic demand caused by a new road investment. 3. Study Results This study has achieved many results. One of them is to update the values of travel time saving and reliability with the empirical data from Japan. This study showed a method to estimate them using the nation-wide traffic data from the Road Traffic Census and the GPS-based vehicle tracking data from the ETC 2.0 in Japan. The average travel time and day-to-day travel time variability were estimated with the travel times of all vehicles observed in the ETC 2.0 during a year for representative highway and expressway routes between 5x5 km grid-zone-based origin-destination pairs in Kita-Kanto region while the travel route choices of observed drivers for the above origin-destination pairs were collected from the Road Traffic Census. Then, logit-based traffic route choice models were estimated for estimating the values of travel time saving and reliability by vehicle type: passenger, cargo, and all vehicles. The results unveiled the values of travel time of passenger, cargo, and all vehicles were estimated to be 27.1, 39.8, and 28.8 JPY/minute, respectively, while the travel time reliability ratios, which are defined as the values of travel time reliability divided by the value of travel time saving, for passenger, cargo, and all vehicles was estimated to be 0.69, 1.37, and 1.07, respectively.		

4. Papers for Presentation

Journal Papers

- 1) Kanai, Y., Wetwito, J., Kato, H. (2025). Meta-analysis on indirect impacts of highway investment: Evidence from Japan. *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2679, No. 2, pp. 991–1002.
- 2) Kato, H., Sanko, N., Ishibe, M., Sakashita, A. (2024). Value of travel time savings for leisure trips in autonomous vehicles: Case study from the Tokyo Metropolitan Area. *Transportation Research Interdisciplinary Perspectives*, Vol. 24, 101080.
- 3) Gouto, R., Kato, H. (2025). Maintenance and repair costs of passenger vehicles with different powertrains: Case study with vehicle owner survey in Japan. *Transportation Research Interdisciplinary Perspectives*, Vol. 34, 101648.
- 4) Yamada, S., Sakashita, A., Tsuchiya, T., Kato, H. (2025). Average travel speed and traffic accident risk: Evidence from nationwide data for trunk highways and expressways in Japan. *IATSS Research* (accepted).

Presentations at International Conferences

- 1) Gouto, R., Sakashita, A., Alves, L. B. O., Hussain, B., Kato, H. (2024). Revisiting vehicle operating costs in Japan: Considering new vehicle technologies in cost-benefit analysis for road projects. *Transportation Research Board 103rd Annual Meeting*, Washington D.C. (U.S.), January 2024.
- 2) da Silva, J. H., Kato, H. (2024). Road infrastructure and human development: A cross-country analysis. *Transportation Research Board 103rd Annual Meeting*, Washington D.C. (U.S.), January 2024.
- 3) Wetwito, J., Kanai, Y., Otazawa, T., Kato, H. (2024). Impact of introducing ring-road expressway on land value in suburban area: Empirical evidence from Tokyo. *Transportation Research Board 103rd Annual Meeting*, Washington D.C. (U.S.), January 2024.
- 4) Kanai, Y., Wetwito, J., Kato, H. (2024). Meta-analysis on indirect impacts of highway investment: Evidence from Japan. *Transportation Research Board 103rd Annual Meeting*, Washington D.C. (U.S.), January 2024.

5. Study Development and Future Issues

First, although this study successfully proposed a travel demand forecasting method to estimate the time-of-day traffic flows using the User Equilibrium approach and a project assessment method in line with the proposed travel demand forecasting method, our proposals have not been well accepted by the consultants in practice. To upgrade the current methods in travel demand forecasting and project assessment, further efforts may be required including the consensus building among stakeholders. Second, as for the estimation of benefits from the improvement of travel time reliability caused by road investment, this study proposed a method to estimate the value of travel time reliability with the empirical equation of travel time variability with the big data in Japan. However, to introduce them into a national guideline, further studies may be required including additional robustness tests with more empirical case studies. Additionally, this study successfully proposed a new framework for modeling a travel demand incorporating the induced traffic demand, however, we found that the model estimation may require further exploration for improving the model accuracy. More empirical analysis on the impacts of road investment to induced traffic demand may be also required.

6. Contributions to Road Policy Quality Improvement

First, our proposed methods to estimate the travel time variability and the value of travel time reliability with empirical data available in Japan are expected to contribute to the introduction of benefit components regarding the improvement of travel time reliability caused by road investment into a practical cost-benefit analysis in Japan. Further studies are expected to extend our proposals to the official guidance. Second, this study computed the values of travel time with the latest statistical data, following the current official guideline of cost-benefit analysis in Japan. The proposed results should be directly applied to the updates of official guideline. Additionally, our study further showed the method to evaluate the impacts of road investment on economic activities and traffic demand in neighboring areas, using a statistical causal inference approach.

7. References, Websites, etc.

Part of study achievements will be available at the PI's personal web page.