

Simple method of investigating CO₂ emissions from vehicles on actual roads

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1. Background and purpose of the research

CO₂ emissions by the transportation sector have shown a falling trend in recent years, but account for about 20% of all CO₂ emissions in Japan. To reduce these emissions, it is essential to take an integrated approach applying measures in many areas including improving fuel performance of individual automobiles and using alternative energy, eco-driving, switching to public transportation, smoothing road traffic flow, and transforming the structures of cities.

In order to accurately clarify the effectiveness of these measures, it is necessary to make a detailed assessment of CO₂ emitted from automobiles traveling on actual roads, but because a rational survey method to do so is not fully established, traffic volume and average driving speed data and CO₂ emission coefficients by speed are used to estimate CO₂ emissions from road traffic in specified sections.

Under such circumstances, a method using store-bought fuel gauges to perform simple and detailed surveys of CO₂ emissions by an automobile traveling on an actual road was established.

2. Outline of the simple CO₂ emission survey method using fuel gauges

The fuel gauges used for this survey were connected to the diagnosis use connector in each automobile as shown in Photo 1, permitting the date and time, vehicle speed, engine revolutions, fuel injection time, GPS, and other data stored in the vehicle's ECU to be recorded on a memory card. Based on the data collected by this instrument, the instantaneous fuel consumption per second and CO₂ emissions were estimated.

The instantaneous fuel consumption is proportional to the engine revolutions and fuel injection time. The total fuel consumption, which is the total of the instantaneous fuel consumptions, was corrected using the quantity of actual fuel supplied to each automobile's fuel tank before and after the survey as the positive value. The CO₂ emissions were converted from the quantity of fuel consumption, a technique identical to the method used to calculate the greenhouse effect gas national inventory.

Figure 1 shows an example of survey results. This survey method can clarify behavior of automobile CO₂ emission behavior before and after an intersection. In this case, the CO₂ emissions were high during idling while the vehicle was stopped in front of the intersection and during acceleration after passing through the intersection.

We aim to continue to accumulate results of surveys using various vehicles and under various driving conditions to provide this survey method for general use.



Photo 1. View of Installation of Fuel Gauge in an Automobile

Connected to the diagnosis use connector at the driver's seat to collect vehicle data

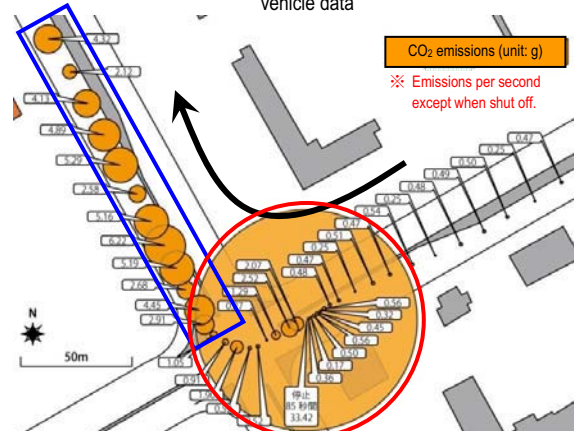


Figure 1. Distribution of CO₂ Emissions Turning Right at an Intersection

CO₂ emissions are large during idling and while accelerating after a right turn

[Sources]

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