Impact Assessment
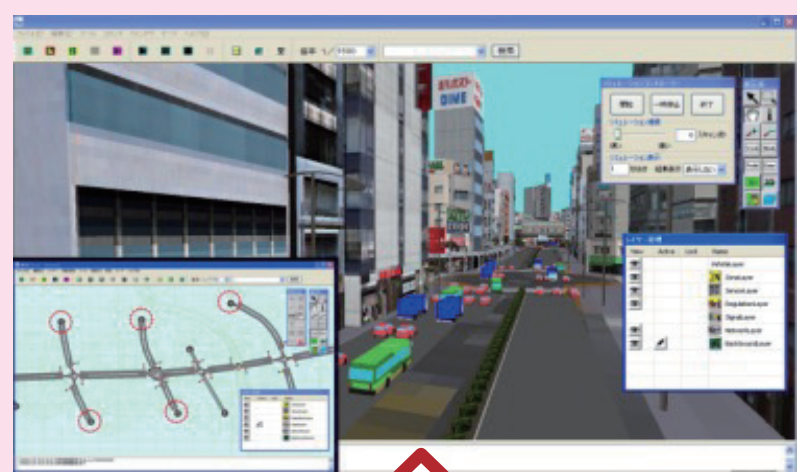
Development of an impact assessment tool for Automated Driving Systems on CO_2 emissions
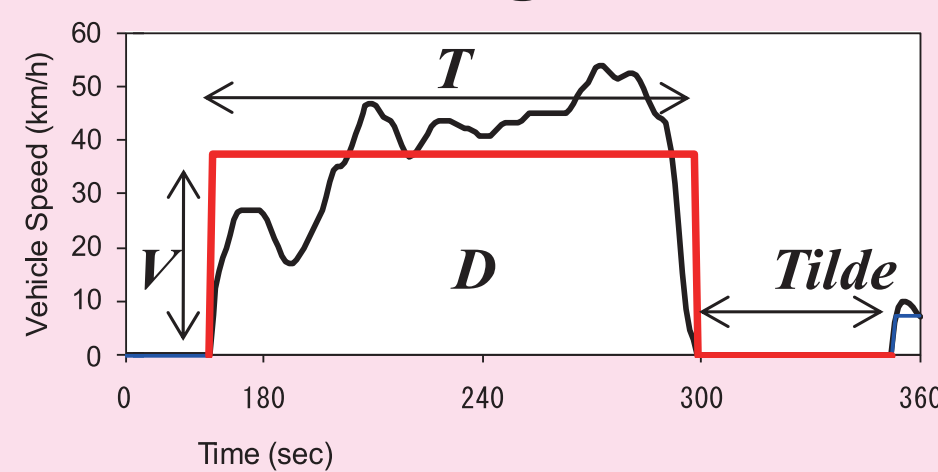
■ Objective

- The effect of CO_2 emission reduction by improvement of traffic flow and reduction of traffic accident by Automated Driving System will be quantified by an impact assessment tool.
- The impact assessment tool has been developed in accordance with the international joint report "Guidelines for assessing the effects of ITS on CO_2 emissions" published under international cooperation between Japan, Europe and the U.S. in 2013.
- The impact assessment tool consists of a traffic simulation and a CO_2 emission model.

Traffic Simulation: TS

Automated Driving Systems

Driving data

Express driving pattern by SSF (Stepwise Speed Function)

Emission Model: EM

$$E = C_{dist} \cdot D_n + C_{V_n^2} \cdot V_n^2 + C_{V_n} \cdot V_n + \cdots$$
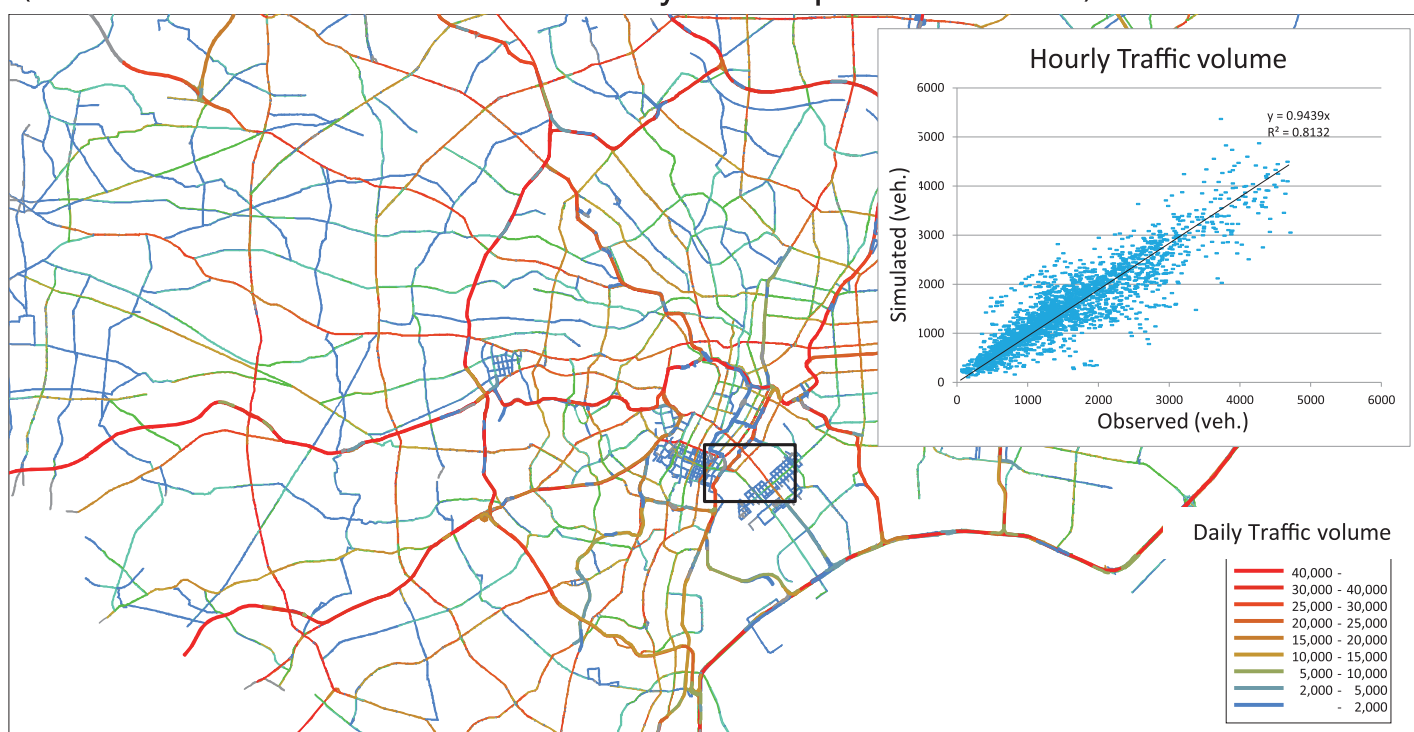
Estimate by Multiple regression from SSF data

CO_2 emission of target area

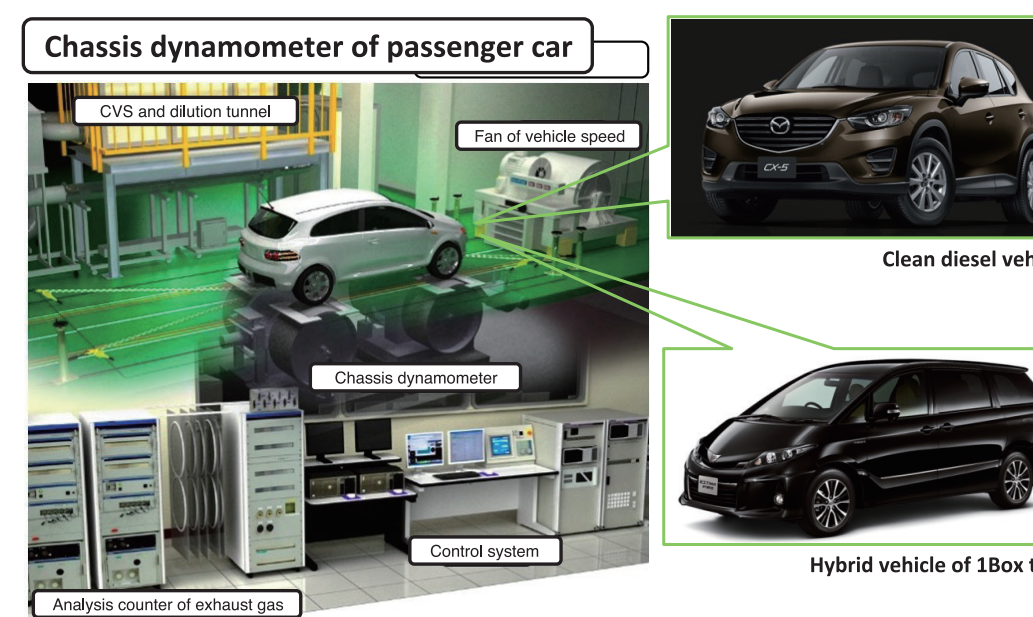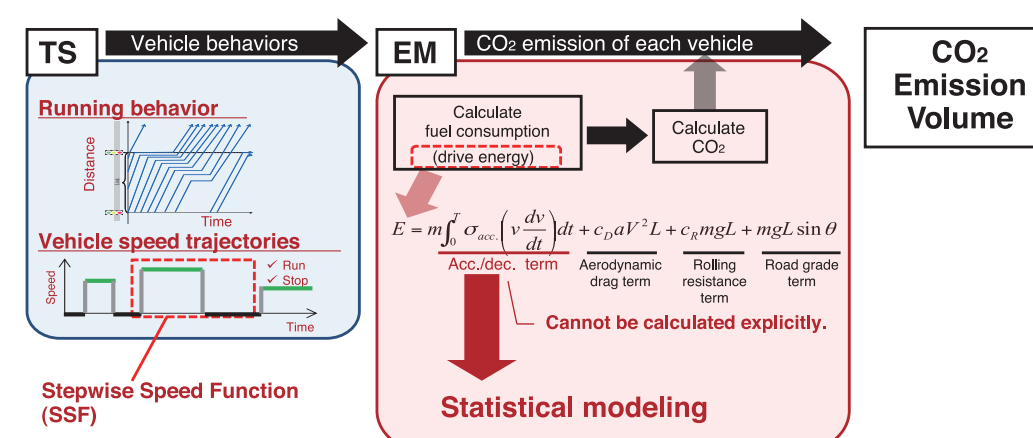### ■ Project Outline

1. Traffic simulation model

- A reference model to provide the relationships of modeling phenomena and mechanism for each Automated Driving System was drawn up.
- Functions for reproducing the behavior of a vehicle with Automated Driving System have been developed and installed in the traffic simulation model according to the reference model.

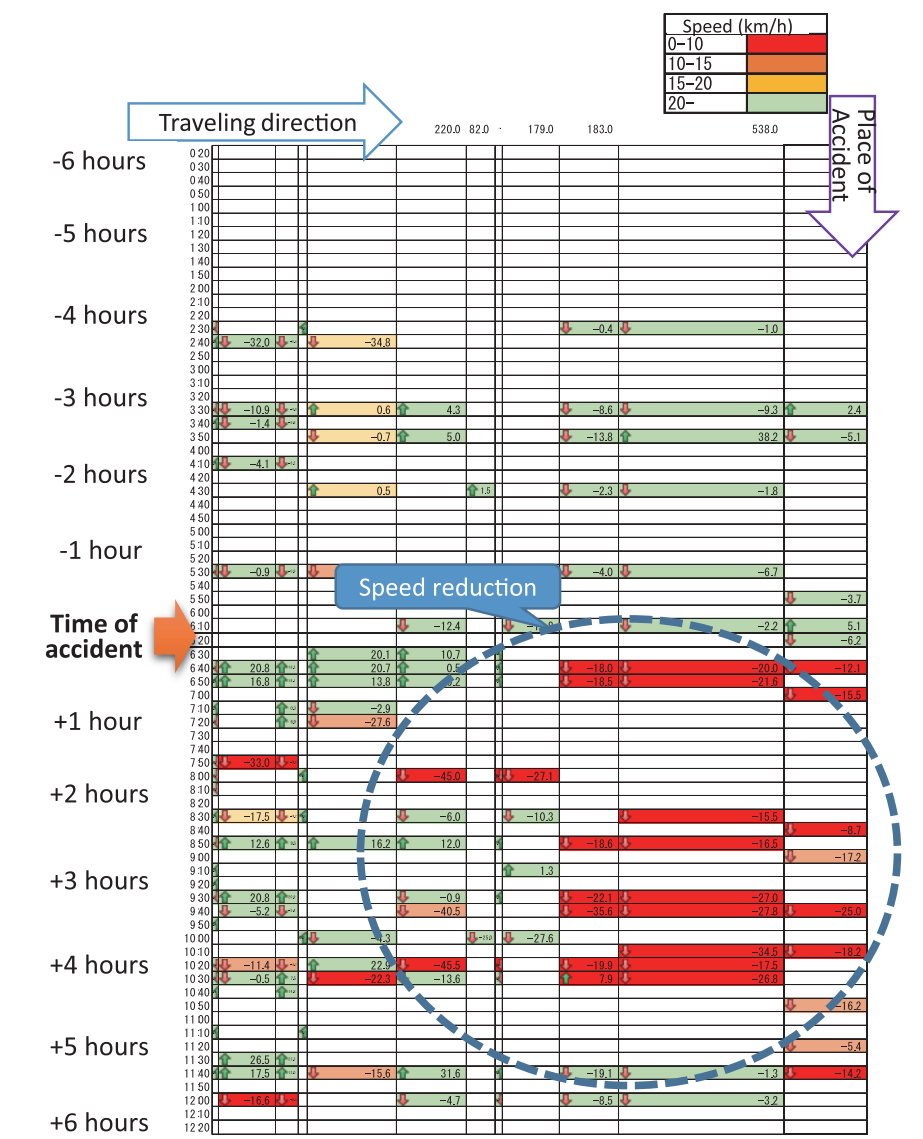〈Validation with traffic volume in Tokyo metropolitan network〉

2. CO_2 emission model

- The CO_2 emission model which is formulated with a regression formula by results of field tests and chassis dynamometer tests has been updated.

3. Analysis of traffic accident impact

- The influence of traffic accidents on traffic flow was analyzed by probe data and statistical data of traffic accidents.
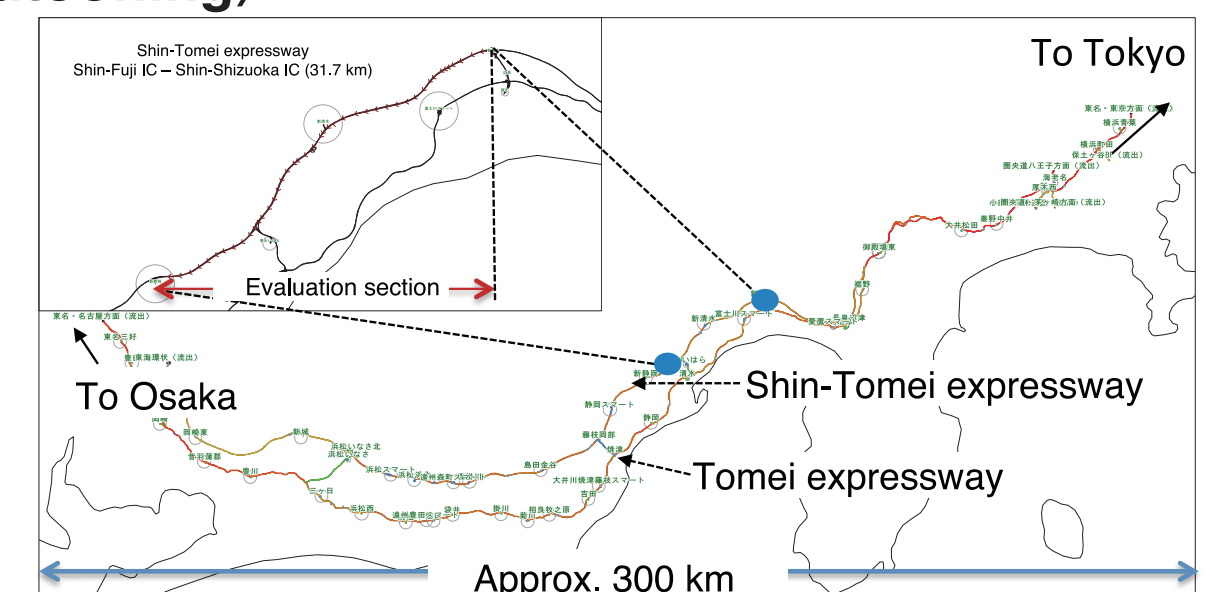

4. Evaluation in model cities

Model city	Target Automated driving system
Shin-Tomei Expressway	• Truck platooning • Automated driving on expressways
Tokyo 23 wards	• Advance Rapid Transit (ART) • Automated driving on local streets • Last-1 Mile transport by automated car • Automated valet parking
Kashiwa city, Chiba Pref.	• Green wave runs utilizing traffic signal information

〈Evaluation scenario of Truck platooning〉

1,000 platooning trucks operated by large logistics companies run in midnight on Shin-Tomei Expressway

4 Platooning trucks form a convoy with 4 meter spacing

〈Reference model for automated driving on expressways〉

SIP