To Smartly Use and Protect Roads and Support Logistics
～Smartly Using Probe Data～

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1. From ETC to ETC2.0

ETC has evolved from an electronic toll collection system to ETC2.0, a driving support system.

To help drivers avoid congestion, it provides wide-area congestion information, permitting drivers to use their car navigation systems to intelligently select routes. To support safe driving, it provides information about the end of congestion ahead, broken-down cars, fallen objects, and other dangerous phenomena through car navigation systems. As quick support after disasters, it is integrated with probe data collected by the private sector to clarify passable routes and support inspections immediately after the disaster and the work to reopen damaged roads is planned based on the information . Other services include a service that performs cashless settlements at parking facilities.

New services such as preferential treatment of detours, managing the operation of heavy vehicles , and managing the operation of commercial vehicles etc. can be introduced, in addition to such services, by utilizing information collected through ETC2.0.

2. Smartly Using Probe Data

It is constantly in demand to support the creation of road space providing smooth, safe, and pleasant environments, regional revitalization , and economic activities such as logistics. As stated above, it permits the collection of big data through the deployment of ETC2.0 and the spread and penetration of ICT into daily life, and its analysis is counted on to expand its use in various new fields.

ETC2.0 probe data are the locations and acceleration, etc. of vehicles with time information, as basically, data are collected on almost all roads traveled by vehicles equipped with ETC2.0. This permits the clarification of information such as origin and destination points, traveling speed, acceleration, routes traveled, and traveling times of vehicles (without identifying the vehicles), and it is possible to clarify the state of road space related to smoothness, safety, and the environment etc. by analyzing these types of information.

1) Selecting routes to travel efficiently

When heading towards a destination, drivers want information about congestion on the road ahead. And if there are predictions of congestion during the time a driver will travel through a route , the driver can select the most convenient route. But it is very difficult to predict congestion on every route of a road network. It will first be necessary to have a method of predicting traffic volume a specified period of time in the future. To establish a prediction method, it will be necessary to grasp the origin and destination points of automobile traffic, routes traveled, trends in changes of routes traveled after congestion appears, etc., and based on these findings, to estimate the state of congestion of the network and changes in state of congestion and selected route, and to predict these based on the results of these estimates. And it will probably also be necessary to predict trends in routes selected by drivers who have obtained congestion predictions (impacting factors not limited to only these). Such information about present conditions and road traffic conditions after a specified time period is utilized by road users to select routes, which results in effective use of traffic capacity of the road network, and such efforts are essential to effectively use the probe data.

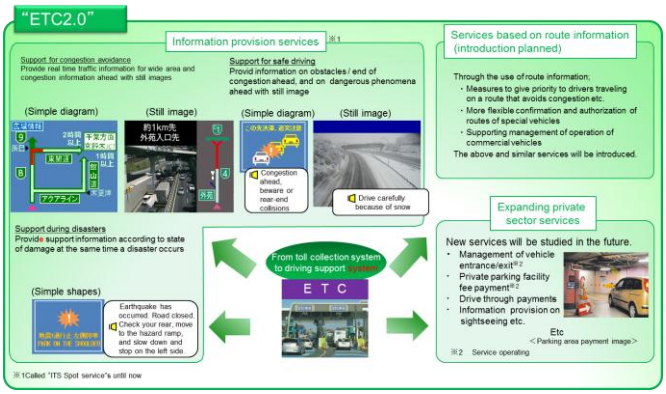

Figure -1 ETC2.0[1)]

2) Efficiently traveling with little wasted time

Time to travel from point A to point B, required time, varies according to the time of day , weekday/holiday and season, etc. Road users probably start out considering how early or how late they can afford to arrive according to their experience or congestion prediction information. But, for both late and early arrivals, the importance varies, and it is probably necessary to take various actions to

avoid arriving early or late. In other words, road users require estimated travel times with a specified degree of reliability, and smooth irregularities of this time. Probe data can be used to clarify such time reliability and to evaluate the effectiveness of countermeasures.

3) Traveling safely

About 60% of traffic accidents involving elementary school children walking on roads occur within 500m from the childrens' homes, so safety measures for neighborhood streets remain essential. To improve the safety of residential roads , measures at potentially hazardous spots , traveling speed reduction, and elimination of through traffic are necessary, and to eliminate through traffic, it is also necessary to smooth traffic on surrounding arterial roads.

By combining data obtained from probe data and drive recorders, it is possible to identify trends in potentially hazardous phenomena (causes and locations of occurrence), the relationships between through traffic volume and routes with the state of congestion on surrounding arterial roads. In other words, it is data that can be used to promote overall countermeasures to improve safety and smoothness in an entire region based on change over time of road traffic conditions on roads in residential districts and on surrounding arterial roads.

4) Rationalizing road maintenance

About 90% of the structural impact on road bridges is by heavy vehicles with illegal loads, so it is necessary to strengthen regulations against illegally loaded vehicles. Essentially, special vehicles must obtain authorization to use a road from the road manager and comply with conditions for authorization. It is possible to confirm the routes traveled by authorized vehicles using probe data, and by linking this to the results of inspections of structures, it is also possible to maintain structures based on the state of travel by special vehicles, and to authorize routes based on the state of soundness of structures. Using it as data to support appropriate management of such special vehicles, will contribute to the rationalization of road maintenance .

5) Supporting logistics

Logistics service operators provide highly rapid and reliable on-time distribution services to their customers, and enact operation plans and manage operations to protect the safety of their drivers and other employees and ensure rational staffing and consider economic factors such as wear on their vehicles and fuel costs. If a logistics service operator can specify its own vehicles, it can track their traveling location in real time, the state of congestion, and driving behavior on the network based on this probe data, and probe data contributes to supporting more efficient logistics operations in this way.

6) Various evaluations using different types of data

The above is no more than a small part of matters now under consideration, and more ideas will appear in the future.

In the future, as cars equipped with ETC2.0 increase , the time and sections where probe data is obtained will also increase, and it will be possible to more accurately clarify the state of traffic conditions. This will permit more accurate evaluations of individual projects, so that it will be possible to assess specified measures by accumulating the effevtiveness of individual projects , furthermore to conduct nationwide evaluations based on the promotion of various policies related to roads (for example, reduction of time lost to congestion or CO_2 emissions by congestion throughout Japan), allowing probe data to be used as data for administration and management.

It will be used as data to help users make more smart selections, such a selecting the routes they want to travel and the times they want to travel based on present state of and predictions of road traffic on expressways, etc.

And although analysis is necessary, we think that probe data will be used to quickly clarify economic and social activities in various regions.

3. In Conclusion

Probe data is information with greater potential than we now think possible. While considering how probe data will be used in the future, and how it can be developed by adding new information and improving collecting information, by forming links with concerned persons and internationally exchanging information , we will strive to take measures to use probe data smartly to smartly use and maintain roads, and support logistics .

[Sources]

1) Council for Social Infrastructure, Road Committee, 13th meeting of the National Arterial Road Subcommittee (held September 19, 2014), selected from document 1.