Electronic Tolling

DETAILS

SECTOR | Transport

STAGE | Operations and Maintenance

TECHNOLOGIES | Electronic Toll Collection, DSRC, CCTV

SUMMARY

The solution is an Intelligent Transport Systems (ITS) Electronic Toll Collection (ETC) system for heavy-duty vehicles (HDVs). The system consists of a central system and roadside installations and equipment relying on Dedicated Short Range Communication (DSRC) technology using microwave tags inside vehicles to register vehicle passages under microwave receivers mounted on overhead gantries on each section of tolled road.

The solution replaces the toll-collection system based on tolling plazas and physical barriers, for which operational efficiency and long waiting times for vehicles are particular problems. The project is expected to result in savings in travel time and vehicle operating cost by reducing delays and enabling smoother traffic flows. It is expected to have an overall positive environmental and climate impact due to a significant local pollution improvement & fuel consumption/CO2 emission reduction. It allows a more refined application of user and polluter-pay principles in line with sustainable mobility policies. In addition, some positive impacts in the form of accident reduction, currently occurring at toll stations, may also be expected. As the system employs roadside ITS with capacity to generate traffic data, the system also enables such functionalities like (i) traffic information in real time; (ii) payment services; (iii) safe parking of trucks; and (iv) traffic monitoring (e.g. for transport of dangerous goods) and for measuring traffic flows and speeds, therefore contributing to improve transport efficiency on the road network.

As an effective way of applying application of user and polluter-pay principles, ETC systems (in particular, systems for implementing distance-based pricing policies) are expected to be implemented more widely in the current environment where public concerns intensify over climate crisis. There are variety of available technologies to implement ETC systems and project contexts might suggest different technologies. Besides the DSRC technology that has been adopted in this use case in Slovenia, such other technologies like Radio Frequency Identification (RFID), Global Navigation Satellite System (GNSS) or mobile communications using the GSM-GPRS standard can be given as examples of other technologies that could be used for ETC systems. Nevertheless, considering increasing traffic data intensity fed by different data sources and advancements in data processing technologies and artificial intelligence (AI), it might be expected to have more data and software intensive ETC systems rather than systems mostly relying on roadside equipment.

This use case is a contribution from the D20-LTIC (Long Term Investors Club) together with the LTIIA (Long Term Infrastructure Investors Association) , with some adaptations from the Global Infrastructure Hub.

VALUE CREATED

Improving efficiency and reducing costs:

The solution helps transforming the existing open system to a closed system, thus increasing the capture rate of vehicles using the network. This results in 8.5% increase in toll revenue, which can be used for financing of infrastructure.

The solution is also expected to improve operational efficiency of tolling system and transport network efficiency resulting in savings in travel time and vehicle operating cost by reducing delays and enabling smoother traffic flows.

Enhancing economic, social and environmental value:

Due to reductions in waiting times and congestion at toll plazas, the system offers travel time savings and reductions in fuel consumption as well as significant local pollution improvement and CO2 emission reduction.

In addition, some positive impacts in the form of accident reduction, currently occurring at toll stations, may also be expected.

As the new scheme is proposed to replace an existing toll collection system, no modal shift impact is expected assuming there is no change in pricing policy.

Project Investment Cost is EUR 105 million (2017).

RISKS AND MITIGATIONS

Technological Maturity:

- ETC systems employ mature technologies (i.e. data processing, DSRC, ANPR, CCTV, RFID, GNSS, etc.). However, increasing data availability and advancements in data analytics might bring forward new technologies (e.g. AI, Floating Car Data) for the use of ETC systems. Project context and data availability should be taken into account when selecting the appropriate technology.

System Accuracy & Reliability:

- Although underlying technologies of ETC systems are mature, critical functions (i.e. vehicle identification, measurement) are exposed to prediction errors – posing risk in system accuracy and reliability.

Cybersecurity:

- As other digital systems, ETC systems are at risk of cyber-attacks.

Privacy:

- ETC systems process vast amount of data, which might include also personal data. The systems should be designed, implemented and operated securing protection of personal data.

Employment & Workforce Transition:

- Introducing automated systems inherently carry the risk of job loss (in case the automated systems replace labour intensive manual systems) and skill gap due to uprising need for workforce transition. Special job placement services and training programs might help to mitigate these issues and to displace people to gained jobs in new services like Help Desk and Customer Service Points.

User Acceptance:

- Introducing new pricing schemes might cause frustration on people posing significant risk to put systems in place. Therefore, pricing strategy should be an integral part of the project.
- People's concerns over data privacy and cybersecurity issues should be carefully handled.

EXAMPLE: https://www.darsgo.si/portal/en/about-us

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