Transport efficiency and safety in the advanced economies have long benefited from information and communication technology (ICT). However, these ICT applications have typically been high-cost, customized infrastructure systems. Now the era of the Internet, digital mobile communication, and “big data” analysis has created a new global potential for less costly and more powerful “intelligent transport systems” (ITS). The World Bank is supporting client transport agencies in deploying these new tools—including cloud-based services, open data standards, and smartphone applications—to more efficiently manage transportation assets and improve road safety. In the process, such projects have also demonstrated improvements in the traveler’s experience and the attractiveness of public transit. Moreover, the greater potential of the new technologies to reduce congestion and travel times means that the new era has also strengthened the potential of ITS to reduce greenhouse gas (GHG) emissions. However, realizing the potential of ITS in developing countries depends on improvements in assessment practices to find what works best and in the data capabilities of domestic institutions. Significant improvements in these areas are critical to the success of ITS.

Improving Efficiency and the Traveler’s Experience

The new generation of ICT tools are helping improve the management of national transport infrastructure. The World Bank is helping Belarus develop “weight in motion” control systems that continuously monitor axle loads, making it easier to stop overweight trucks while allowing those under the weight limit to bypass inspection. Another focus is helping clients create traffic control centers that use ICT to improve traffic management, emergency response, and the availability of information for road travelers.

The new ICT tools also show promise for improving urban systems. They include vehicle-locating systems using global positioning system (GPS) information; fare collection and revenue management; and traffic signaling; and improved information for transit travelers. The potential to replicate these technologies across the globe rests in large part on their use of the General Transit Feed Specification (GTFS) open data standard. These technologies are enabling the following urban transport applications, among others:

- E-ticketing to integrate fare systems and revenue distribution across multiple transport modes
• Area traffic control to improve vehicle flow and thus reduce air pollution and cut GHG emissions
• Dispatch and vehicle location systems to shorten transit times, including reductions of as much as 69% for bus rapid transit (BRT), thus also reducing GHG emissions

New user-level ICT systems being advanced by the World Bank include a new transit information system in Brazil and a smartphone app in Belarus to report road surface problems. In Brazil, the transit agencies covering ferries, metro, trains, and intercity buses in the state of Rio de Janeiro are working to transmit travelers’ information, using GTFS, to electronic signage as well as to travelers’ mobile devices. The data will also help stakeholders conduct multimodal planning.

In Belarus, the World Bank team worked closely with the national road agency to develop a new smartphone application, RoadLab, which allows automatic evaluation of road roughness and detection of major road bumps based on smartphone accelerometers in real time. It also allows road users to report live road safety hazards with precise GPS information. This user-based approach also promotes citizen engagement and enhances government accountability by enabling road agencies to promptly and strategically respond to collectively identified problems. Built with open protocols, the product will be easily applied globally.

The World Bank has supported other crowdsourcing transport applications to transmit opinions and complaints to road agencies and in turn permit the agencies to address them in a cost effective manner.

World Bank support has helped produce smartphone apps that employ locational data to collect user-generated origin-destination information about transit use (see Connections Note #2). It has also helped create tools for estimating travel demand patterns from the call detail records generated by mobile phones (see Connections Note #4) and, with the GTFS standard and census data, to evaluate the accessibility of public transport systems in real time.

**Road Safety**

Improving road safety is a focal point of ITS work. Speed cameras and remotely controlled electronic signs to discourage road traffic violations have helped reduce the incidence of accidents. A 2007 report on studies of speed camera programs worldwide found crash reductions ranging from 9 to 41 percent. Road safety “hackathons” use crowdsourcing to develop safety-enhancing web-based and smartphone applications. Data management systems help authorities collect and analyze systematic information on road incidents and create responses to make roads safer (see Connections Note #12).

**Challenges**

The deployment of ITS in the developing world faces some significant obstacles that must be overcome if ITS is to be widely applicable in developing countries. However, the lack of adequate research on cost effectiveness is a global challenge.

**Interoperability.** The various client agencies in a multiagency project may not have a mandate to share data, and the data to be exchanged may not conform to standardized formats.

**Data analysis.** Even when data systems are integrated and standardized, editing the raw data so that it can yield useful results often challenges the capacity of agencies in developing countries.

**Documenting effectiveness.** The connection between ICT and transport benefits experienced anecdotally has not received enough systematic research (see Connections Notes #16 and #17). Also needed are case studies to highlight the technological and institutional conditions required for success.

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69% The potential reduction in travel times for bus rapid transit with ITS integration