Rural Intelligent Transportation Systems (ITS) Toolkit

Crowdsourced Data

TTI 2

Photo: Courtesy of Strava

Description: Crowdsourced data is obtained by soliciting the services of a group of people. This data is typically collected via the internet or mobile applications. Crowdsourced data can be used to gather real-time information on travel time, non-motorized route choice, road conditions (crashes, hazards, etc.), road weather, transit service time, and transit service conditions (delays, overcrowding, etc.). It can also be used to assist with maintenance, such as identifying locations in need of pothole repair.

Crowdsourced data can be gathered in many ways. Smartphone applications like Google Maps, Apple Maps, Strava, and Waze use the Global Positioning System (GPS) (see #OM3) on a smartphone to track users and provide information on travel times. Smartphone applications like Waze or OneBusAhead also allow users to report on traffic or transit conditions and hazards while they are on the move. Social media (see #TTI5) allows the public to provide information to the state department of transportation, which can then disseminate this information to the public, but quality control can be an issue.

Rural Transportation Critical Needs	Issues Addressed	Strategies Achieved
☐ Crash Countermeasures	☑ Pre-trip Information	☑ Road User
☐ Emergency Services	☑ En-route Information	☑ Road
☑ Operations & Maintenance	☑ Public Data Collection	☐ Vehicle
☑ Rural Transit & Mobility	☑ Public's Ability to Communicate to Transportation Agency or Emergency Services	☐ Safety Culture
☑ Surface Transportation & Weather		☑ Engineering
☑ Tourism & Travel Information		☐ Emergency Response
☑ Traffic Management		☐ Enforcement
		☑ Education

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Applicability	Partnerships	Key Components

•Crowdsourced data systems are a low cost solution that can be used in rural locations. One of the key benefits is that it can provide information for rural locations that agencies can't monitor regularly, due to reduced funding or low numbers of staff. This tool is also a great way to collect additional safety information like road conditions, crash locations, weather, and maintenance needs.	•Applications benefit from collaboration among numerous agencies, which may include:
	  •Departments of Transportation (Federal, State, Local)
	  •Law Enforcement
	  •First Responders
	  •Construction Companies
	  •Transit Agencies
	  •Public
	  •Private Transportation Information Agencies (e.g. Google, MapQuest, Apple)
		•Smartphone or Computer
		•Application – to provide information
		•User Base – general public or trained citizen reporters
		•Staff – to input information/process data from public
		•Staff Training
		•Training provided to public for citizen reporting programs to improve accuracy of reports.
		•Cameras – to validate reports (*optional*)
		•Traveler Information Systems (*optional*)

Examples of Implementation

- **Iowa Department of Transportation (DOT) Waze Connect Citizen Program**

In 2015 Iowa DOT partnered with the Waze Connect Citizen Program to launch a Waze layer on its integrated traveler information system (e.g., website and mobile application). This layer provided crowdsourced information from Waze on traffic, crashes, road closures, and weather.

- **Citizen Reporting Programs for Winter Weather**

State Departments of Transportation in Idaho, Iowa, Minnesota, Utah, and Wyoming have used crowdsourced "citizen reports" to collect information on snow and ice events. This program launched in Wyoming in 2006; as of 2015 all of the other states have launched citizen reporting programs. A citizen reporter is required to complete training prior to reporting road conditions to the state DOT.

- **Idaho Transportation Department (ITD) Citizen Reporting**

ITD has integrated citizen reporting through its 511 system. Users can create an account and log into the 511 to submit a report on weather conditions along their driving route.

- **California Roadkill Observation System (CROS)**

The CROS can be used to record roadkill observations. CROS was created in coordination with the University of California, Davis and the California Department of Transportation. The primary role of this system is to map roadkill hot spots and understand the factors that contribute to roadkill. The public can go online and provide information on the location of the roadkill and species. To date, over 52,000 roadkill observations have been logged.

- **Safe Routes Portland App**

The saferoutesPDX app allows users to find a safe route to a Portland area school and report any issues they encounter while bicycling or walking there.

- **Crowdsourced Bicycle Data**

Cities like San Francisco, Atlanta, and Portland are using smartphone applications to crowdsource bicycle route information in their cities. This information is being used by planners to understand bicyclist behavior and identify where bicycle infrastructure would have a positive impact in the community.

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Implementation Considerations (General)

- An agency should consider using a free source or application to gather crowd sourced data before creating its own.
- An agency must consider staffing costs for processing public-provided data for accuracy.
- It is worthwhile to take the time to train citizens on what should be reported and how (for example reliable traveler information on road and traffic conditions and weather events), because they will provide better reports and reduce the amount of staffing costs for validating reports.
- An agency could also consider providing users with limited reporting capabilities until they have proven their ability to provide accurate information.
- The agency must consider the quanity and method for validating crowd sourced data (with staff, cameras, number of similar reports).

Implementation Considerations (Pro)

- Applications can increase access to real-time travel and weather information.
- Data dissemination can improve safety and mobility of local roads.
- Usage can alleviate congestion issues (people are aware of an event on their route and can avoid that area if necessary).
- Usage can engage a wide range of stakeholders.
- Deployment can be less expensive than alternative data gathering efforts.
- Usage increases knowledge of maintenance needs in remote areas where staff cannot travel often.

Implementation Considerations (Con)

- Quality control can be difficult, and agencies may receive false reports. However, citizen reporting programs with a training aspect can help curb false reporting.
- Usage can cause unsafe conditions if drivers are distracted while reporting events.
- Usage requires access to the internet or cell service.

Opportunities for Future Expansion

- Connected vehicles can be used as "vehicle probes" that can provide passive crowdsourced information on weather conditions and speed/travel time data.

Additional Resources

- *Crowdsourcing and Its Application to Transportation Data Collection and Management*, found here: https://ledantec.net/wp-content/uploads/2014/09/Misra-et-al-2014-Crowdsourcing.pdf
- *Citizen Reporting Program for Road Weather Information at Utah Department of Transportation*, found here: https://rosap.ntl.bts.gov/view/dot/26826
- *Estimate Benefits of Crowdsourced Data from Social Media*, found here: https://rosap.ntl.bts.gov/view/dot/3517

Useful Tip

Want to try crowdsourcing? A low-cost safety tip is to start small with a pilot and begin collecting one particular piece of information from the public through your existing social media (e.g., Facebook or Twitter) or mobile app.

Cost Range

(Cost/financial information, where noted, is based on 2016 dollars (unless otherwise specified). Cost/financial information is estimated, and will vary based on size and scope of project, number of units, etc. In general, capital costs include initial purchase costs of hardware, software, and other required equipment. Maintenance and operations costs include staff time to operate, monitor and maintain systems; data collection; system upgrades; evaluation; etc.)

Capital Costs: The total capital costs for this tool ranges from low (less than $50,000) to high ($100,000 to $250,000). Many crowdsourcing smartphone applications like Facebook, Twitter, Google Maps, Waze, OneBusAhead, and Moovit are *free*, but an agency may consider creating its own application. For instance, as part of the Federal Highway Administration (FHWA) Pooled Fund North/West Passage project, the ITD developed a web interface through its 511 Traveler Information System for citizens to enter reports as a component of its citizen reporter program. The cost to develop the web interface was $65,000[1]. The Minnesota Department of Transportation created a similar web interface for its citizen reporter program. The cost to develop the web interface was $63,700. The Utah Department of Transportation developed an Android and iOS smartphone application that allows a citizen reporter to enter a report. The cost to develop this smartphone application was $120,000.

Operations Costs: The operations and maintenance costs for this tool are low (less than $50,000). For example, the FHWA Pooled Fund North/West Passage project found that operations and maintenance costs for its citizen reporting programs ranged from $5,000 to $13,000 per year[1].

National Center for Rural Road Safety

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