Future Communities
Pilot Program

Case Study Research

November 2018
Introduction & Framework

1. Future Communities Pilot Program Overview

2. Vehicle Miles Traveled (VMT) and Emissions Reduction Research

3. Case Study Examples
Future Communities Pilot Program

Goals & Objectives

- Apply new technologies and data analytics to test innovative approaches for reducing emissions-producing VMT from local travel and municipal operations.

- Explore opportunities for data analytics and technology projects in a variety of contexts/communities, including projects that support and engage disadvantaged communities.

- Improve efficiency and reduce the costs of city and county municipal services.

- Identify and quantify relative impacts of a variety of technology-based VMT reduction strategies.

- Promote replicable Pilot Projects that support new policy development, improve processes for government service provision, and pilot innovative engagement practices with private sector mobility providers.
VMT and Emissions Reduction Research

SCAG’s Approach for Identifying Innovative Solutions
- Gather information on innovative opportunities from experts.
- Engage local municipalities to gauge capacity for success.
- Develop Call for Projects to identify solutions and test pilot projects.
- Provide guidance and conduct evaluation on the performance of pilot programs.

What We’ve Learned
- Scope projects with clear goals.
- Start small and expand upon success.
- Understand timeline and budget constraints.
- Innovate on tried and true methods.
- Provide strong leadership and policy support.
# VMT and Emissions Reduction Research

## Potential Reduction Strategies

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<td>Pricing Strategies</td>
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<td>Internet of Things (IoT) Applications</td>
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<td>Paratransit Service Optimization</td>
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<td>Asset Management &amp; Fleet Dispatch</td>
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<td>Foundational Data/IT Infrastructure</td>
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<td>Mobility as a Service (MaaS)</td>
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<td>Curbside Management</td>
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<td>Incentives for Non-Auto Trips</td>
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<tr>
<td>Incorporate New/Emerging Mobility Options</td>
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<td>Dispatch and Route Optimization</td>
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What is a Promising Practice?

Projects that reduce VMT generated by municipal operations
- Remote/teleconference services
- Fleet telematics
- Route optimization
- Internet of Things (IoT) or asset management applications

Projects that reduce VMT by using technology to maximize benefits of new mobility services
- Curbside management projects
- Smart parking projects
- Mobility as a Service projects
- Mobile apps that implement direct incentives

Other innovative or outside-the-box solutions
Case Study Guide

CONTEXT/PROJECT SETTING
- What is the issue being solved?
- What is the service market?
- What implementation/operations constraints were faced?
- How can tech/big data/IoT be applied to reduce VMT?
- What is the current practice of technology/data analysis and how can we improve its use for VMT reduction?

APPROACH & IMPLEMENTATION
- What components and deployment constraints exist?
- What technologies or data tools were deployed or could be applicable?
- What are relevant staffing needs?
- What do we know about costs of implementation?

RESULTS & REPLICABILITY
- What is the efficacy of the VMT reduction strategy?
- What data was collected and how was it used (analytics)?
- What are the costs and benefits, and policy and behavior changes?
- Is this project replicable across the region?
A Note on Innovative Practices

1. Because the FCPP aims to fund innovative projects, not all focus areas have well-documented examples.
2. Examples have been provided where available.
3. When no examples could be identified, the focus areas were explored conceptually to identify potential opportunities.
Focus Areas

1. Fleet Management & Fleet Telematics
2. Route Optimization
3. Remote Services
4. Incentives for Non-Auto Trips
5. Mobility as a Service
6. Internet of Things Applications
State of the Practice

- Equipment/ttech that allows information exchange between a vehicle fleet and central authority.

- Can unlock potential for fleet and routing optimization, and also has potential to improve safety and reduce operating costs.

- Goals for fleet efficiency can be articulated as policy and can inform telematics strategy and reporting.

- Many cities find data management/purchasing an implementation challenge, which could be avoided by implementing systems that passively, routinely upload data (i.e., “passive telematics”).

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<th>Challenges/Opportunities</th>
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<tr>
<td>Vehicle telematics</td>
<td>GPS platforms and reporting software to unlock service operations</td>
<td>- High reduction potential when paired with policy</td>
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<td>- Logistics hurdle for regular, widespread data uploading</td>
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<td></td>
<td></td>
<td>- Compatible with wide variety of fleet vehicles</td>
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<tr>
<td>Data/technology standards</td>
<td>Foundational standards and plug-and-play technologies that allow easier implementation of VMT reduction strategies</td>
<td>- Common standards allow data sharing across platforms and support the “Internet of Things”</td>
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<td>- Data/technology standards are difficult to develop and promote</td>
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<tr>
<td>Policy framework</td>
<td>Combining analysis with policy interventions to codify outcomes and ensure ongoing reductions</td>
<td>- Most municipalities do not currently have VMT reduction goals or policies</td>
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Case Study Example: Municipal fleet telematics (multiple)

Examples

- (Sacramento, CA) – spent $100,000 to outfit a tracking system in 184 of its vehicles, and realized a reported $60,000 in fuel savings in the first month by reducing unnecessary vehicle miles and vehicle use.

- (Riverside County, CA) – Water District approached fleet efficiency project to address budget shortfall, installing telematics devices on most vehicles. District was able to dispatch vehicles more efficiently and calculated that employees drove 165,000 fewer miles and saved $354,000 ($79,000 in fuel) in the first six months.

Context

- Cities seeking strategies to monitor and reduce operating and labor costs, vehicle and heavy equipment cost, and encourage safer driving practices.

VMT Reduction Approach & Potential

- Support in-service dispatch and route optimization.

- Improve vehicle efficiency by reducing idling time using driver scorecards and wireless vehicle maintenance alerts to optimize utilization.

- Reduce the number of fleet vehicles operating by identifying underutilization and/or inefficient use.
Case Study Example: Municipal fleet telematics (multiple)

Technical Components
- GPS units, software system to monitor.
- Data analytics and visualizations to help monitor fleets toward goals.
- Commercially viable products available now — could be adjusted to bring VMT reduction goal to the forefront.

Staffing & Resources
- Costs seen as reasonable overall (and cost savings often seen after implementation) but monthly data fees (e.g., $20/month/vehicle) a common hurdle. One manager found transition to electrified fleet helped avoid that fee because of data uploads systematized during daily charging.
- Organizations with strong fleet management role and systems (or possibility for them) are well-positioned for a successful telematics project.
- There are well established, high quality vendors and systems already available for this use case — may need to tailor performance metrics of system to include VMT reduction.
  - E.g., City of Seattle uses FleetFocus by Acidworks, housing all vehicle information in that third party database.
Case Study Example: **Municipal fleet telematics (multiple)**

**Replicability & Results**

- Compatible with municipally-operated fleets including heavy equipment, police, fire, and other emergency management vehicles.

- There are many secondary benefits, including cost reduction and safety. Driver behavior data recorded by telematics system can be used to reduce incidents and liability claims where municipal vehicles are involved.

- Although telematics systems are not primarily aimed at municipal VMT reduction projects now, the technology and systems are well-suited to VMT reduction goals and readily available today.
Focus Areas

1. Fleet Management & Fleet Telematics
2. **Route Optimization**
3. Remote Services
4. Incentives for Non-Auto Trips
5. Mobility as a Service
6. Internet of Things Applications
Route Optimization

State of the Practice
- Route optimization is process of determining the most efficient route, and must include a variety of relevant contextual factors to ensure meets user needs.
- This could be applied to big data analysis of fleet operations for fixed-route services such as school bus, waste collection, transit, or other municipal operations.
- The more complex and inefficient the use case, the more that route optimization can improve efficiency.
- Route optimization is often referenced as a smart cities approach; however, there is a limited number of implemented projects.
- Could be high potential for this approach if the right use case and implementation approach are identified.
- Can easily be leveraged toward VMT reduction goals
- Relates to telematics and fleet management best practices but less common, has high potential.

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<tr>
<td>Fixed-route service optimization</td>
<td>Increase speed, efficiency, and/or productivity of fixed route service by</td>
<td>- Large data sets needed, but most is readily available</td>
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<td>eliminating poor performing stops or consolidating resources services</td>
<td>- Off-the-shelf route optimization software available</td>
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<td>- Process to create optimized routing may be lengthy</td>
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Case Study Example: Public School Bus Route Optimization and Stop Consolidation

Context
- Boston Public Schools (BPS) facing budget challenges and money is prioritized for direct educational needs over other services.
- Routes were inefficient and poor quality of service not meeting the needs of students.

VMT Reduction Approach & Potential
- Looked into how many stops BPS could cut under various route consolidation scenarios.
- Individualized walk-to-stop maximums for each student.
- Strategic bus stop placement.
Route Optimization

Case Study Example: Public School Bus Route Optimization and Stop Consolidation

Technical Components

- There are other bus routing tools commercially available – however, they were not adequate to truly optimize routing.
- MIT lab created custom software, coding the solutions themselves – they could not find commercially available software that could visualize results end-to-end.
- Software “tries to eliminate the inefficiencies that human decision making can often introduce.”

Staffing & Resources

- Key outside resource: MIT Operations Research Center – access to mathematicians who specialize in optimization algorithms.
Case Study Example: Public School Bus Route Optimization and Stop Consolidation

Replicability & Results
- BPS eliminated 50 bus routes through optimization (20% fewer bus stops), while increasing the number of students taking bus.
- Potential cost savings of $3 million to $5 million in 2018.
- Estimated up to 13,000 pounds daily reduction in carbon emissions.
- Broad applicability to thousands of vehicles and millions of VMT.
- Most crucial to a successful route optimization:
  - Interest, willpower, and control to implement changes.
  - Access to technical skillsets to study optimization.
1. Fleet Management & Fleet Telematics
2. Route Optimization
3. Remote Services
4. Incentives for Non-Auto Trips
5. Mobility as a Service
6. Internet of Things Applications
## Remote Services

### State of the Practice

- Remote services reduce demand for travel by offering services over teleconference or videoconference, offering services locally, or offering services online.
- Could work in a variety of municipal contexts and in many creative applications, but must be supported by municipal policies and IT infrastructure to allow remote work.
- Municipalities could examine which services generate large numbers of trips and could be accommodated by remote services – oftentimes there are secondary benefits to increasing these options.

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<td>Videoconferencing</td>
<td>Use webcam and AV support to hold interdepartmental meetings or public meetings</td>
<td>- Existing technologies are relatively affordable and implementation-ready</td>
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<td>- Quality sound and lighting, feed distortion, training staff to utilize</td>
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<td>Telecommuting</td>
<td>Employees elect not to commute on certain days, or to work from home exclusively</td>
<td>- Existing technologies</td>
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<td>- Remote access to office data network from external work station</td>
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<td>- Data/network security is critical</td>
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<tr>
<td>Online municipal service portals</td>
<td>Receive input on municipal maintenance issues and service needs via social media and web portal</td>
<td>- Integrate online input with appropriate municipal service department</td>
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Remote Services

Case Study Example: Video Conferencing for Court Appearances (multiple)

Examples
- Missoula County, MT; Columbia County, OR; Central VA; Benton County, AR

Context
- Implement videoconference technology in prisons and courtrooms to reduce transport needs.
- Beneficial in many settings, including rural jurisdictions.
- Court systems are ripe for this type of innovation — many unnecessary meetings and appearances.

VMT Reduction Approach & Potential
- VMT reduction for all attendees, including prisoner transport, lawyers, law enforcement.
- Secondary benefits include increased prisoner security, increased access to expert and witness testimony and translator services, improved due process.
Remote Services

Case Study Example: Video Conferencing for Court Appearances (multiple)

Technical Components
- Minimum investment using existing technology such as high-speed internet connection, monitors, web cameras, and audio support.
- Technology all on market and commercially available, often inexpensive.

Staffing & Resources
- Requires some changes to court protocol and procedures – must be addressed for a successful program.
Remote Services

Case Study Example: **Video Conferencing for Court Appearances (multiple)**

**Replicability & Results**

- Can be inexpensive to deploy.
- Ensure the approach enhances rather than diminishes access to critical public services.
- Not suitable for situations such as: poor connectivity, meeting/hearing requires reference to multiple documents, subject matter is complex, or issues of witness/participant credibility are involved.
- Different portions of a system may benefit more than others – *e.g.*, in court examples, civil practice requires many meetings that may not actually require in-person appearances.
- There are many potential opportunities for various municipal services to benefit from remote technologies, including improved web services, improved remote customer support, online appointments, increased automation of some municipal processes, and videoconferencing technology. Identifying which municipal services create a high number of trips and could be simplified can help a municipality determine if remote services projects can lead to VMT reduction.
Focus Areas

1. Fleet Management & Fleet Telematics
2. Route Optimization
3. Remote Services
4. Incentives for Non-Auto Trips
5. Mobility as a Service
6. Internet of Things Applications
Incentives for Non-Auto Trips

State of the Practice

- Transportation Demand Management (TDM) focuses on how people make transportation decisions, helps them make use of infrastructure in place for transit, ridesharing, walking, biking, and teleworking.
- Many municipalities incorporate fundamentals of TDM, but few have comprehensive programs.
- There is research to help predict effectiveness of common TDM measures — can be highly effective — and often very cost-effective compared to physical infrastructure.
- Data and technology can present innovative ways to increase effectiveness of such measures.
- Municipalities are using technology to promote incentives that change travel behavior, shifting trips from single-occupancy vehicles (SOV) to more efficient modes.

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<td>Mode-shift incentives</td>
<td>Currency incentives can range from points to dollars, discounted tickets or fares to customized gifts.</td>
<td>- Opportunity for small pilot testing</td>
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<td>- Private partnership opportunities to incentivize transportation services</td>
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<td>- Major event venues or city-sponsored events</td>
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<td>Mobility apps</td>
<td>Several apps on the market currently can directly manage mobility information, use and incentives, whereas others track miles and use of modes.</td>
<td>- These third party systems are market-ready and could be paired with policy, incentives, or marketing efforts</td>
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<tr>
<td>Gamification of behavior incentives</td>
<td>Incentives in place to encourage goals. Could be paired with online platform/mobile app.</td>
<td>- Encourage behavioral changes</td>
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<td>- Capacity to measure and track reduction</td>
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<td>- Opens up to wider audience through mobile platforms</td>
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Incentives for Non-Auto Trips

Case Study Example: Aspen Mobility Lab App

Context
- Any shift away from SOV will reduce VMT, regardless of mode.
- Reward commuters who shift from driving alone – carpooling, riding a bike or taking the bus.

VMT Reduction Approach & Potential
- App contains sensors for tracking travel mode choices.
  - E.g., determine whether the user is driving alone, carpooling, riding a bike or taking the bus.
- Rewards come in the form of points redeemable at various businesses, with more points generated per mile traveled using alternate transportation.
- Shifts during peak times may have higher potential for emissions reduction due to idling caused by congestion.
Incentives for Non-Auto Trips

Case Study Example: Aspen Mobility Lab App

Technical Components
- Using an existing app called Miles to track people’s commuting behavior and provide rewards, plugging in this tool into broader innovative program.

Staffing & Resources
- Must fit in with city VMT/TDM/mobility goals and programs – most common hurdle is creating and operating a comprehensive program to truly see results.
- The underlying science and tech is straight forward and available – can help unlock successful TDM programs if well-managed.

Replicability & Results
- No infrastructure changes needed to deploy.
- Targeting about 350 city employees, 750 commuters in 2019.
- Hopes to reduce the number of cars entering core by 800.
- FY 19 – $375,000 for prizes, $200,000 for marketing and recruitment.
Incentives for Non-Auto Trips

Case Study Example: Durham Mayors Challenge ‘Nudge’ Program

Context

- Goal was to deal with increasing traffic congestion and reduce the need to build more parking downtown – and reduce overall dependency on single-occupancy vehicles.
- City designed program to encourage transit, provide customized trip counseling and then reward participants who were taking transit.
- Pioneer in use of behavioral science to “nudge” people out of their personal vehicles.
- Emailed personalized route maps from individual’s home to work addresses.
- Reward employees who ride the bus with a lottery eligibility. Employees who chose to ride the bus were eligible for a $163 weekly cash prize.
- Watch the overview video here!

VMT Reduction Approach & Potential

- Primary goal: reduce drive alone rate to downtown by at least 5%.
Incentives for Non-Auto Trips

Case Study Example: Durham Mayors Challenge ‘Nudge’ Program

Technical Components

- Trip counseling tool that created personalized routes including mapped options, time comparisons, and benefits.
  - Key metrics: Health, Time, and Money calculations.
- Heavy use of social media to promote the program.
- Go Durham bus lottery created a game that made riding the bus a competition.

Staffing & Resources

- Tested concept with $100,000 “test and learn’ grant, then was awarded another $1 million to focus on additional methods and scale up lessons learned during pilot.
- City partnered with Duke’s Center for Advanced Hindsight, downtown BID, and several employers.
Incentives for Non-Auto Trips

Case Study Example: Durham Mayors Challenge ‘Nudge’ Program

Replicability & Results

- No infrastructure changes needed to deploy.
- Could be deployed quickly.
- Tested with city employees to fine tune before scaling up.
- Communications strategy during implementation key.
- Exceeded goal of reducing single-person vehicle trips into the city’s core by 5 percent.
- Commuters who received personalized travel alternatives drove alone 12 percent less often.
- Commuters who were invited to play the bus lottery game used non-drive alone commute options 19 percent more often – and reported less stress and higher levels of happiness.
- Program could be continually scaled for even higher impact.
Focus Areas

1. Fleet Management & Fleet Telematics
2. Route Optimization
3. Remote Services
4. Incentives for Non-Auto Trips
5. **Mobility as a Service**
6. Internet of Things Applications
# Mobility as a Service (MaaS) Interim Project

## State of the Practice

- Brings together existing and emerging transportation services using standardized data formats and integrated payment systems for end-to-end trip planning, booking, and electronic ticketing across all modes.
- At its most ambitious, aims to make car ownership optional (not necessary) by offering competitive mobility choices (fast and cheap) to residents and users.
- European and Asian cities have pushed these concepts furthest. (Helsinki, Singapore)
- Slower, more challenging progress in U.S., but high interest and investment toward goal.
- High interest in test cases that implement achievable steps toward ‘full’ MaaS.
- Optimizing/improving passenger experience to keep transit competitive with private mobility options.

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<td>“Mobility wallet”</td>
<td>One-stop digital mobility platform</td>
<td>- Growth in US slower due to fragmented state and federal regulatory and legislative systems,</td>
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<td>- Private sector data sharing challenges</td>
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<td>Integrate private micromobility/microtransit providers</td>
<td>Manage emerging “first/last mile” and “dockless” mobility options (i.e. – bikeshare, scooters) in manner that achieves city goals</td>
<td>- Cities struggling to determine their role amid deployment of new options,</td>
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<td>- Ideally new options would support high-capacity transit, VMT reduction, and other city goals</td>
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<td>- Innovative data sharing and fare collection needs</td>
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Case Study Example: **RideTap Mobile Ticket App**

**Context**
- Nesting the functionality of a mode aggregator app within the TriMet mobile tickets app.
- First generation effort that evolved into what is currently TriMet’s MOD Sandbox app that aims to grow functionality to include integrated payment.

**VMT Reduction Approach & Potential**
- Positions other modes to support transit.
- Growth in shared modes increases likelihood of using transit.
- Offers transit users access to:
  - Bike Share
  - Carshare
  - Lyft Line
Case Study Example: **RideTap Mobile Ticket App**

**Technical Components**
- Multimodal menu accessible by main drop down menu.
- Mode options appear in a carousel and a ride card carousel that is intuitively swipeable.
- The recommended ride option appears first.

**Staffing & Resources**
- Transit agency contracted vendor to develop app. Cooperation from private mobility providers key to multimodal integration – often the biggest challenge to integrated app.
- Key roles:
  - TriMet: Revenue office, mobile ticketing project manager
  - moovel (vendor)
    - Project Manager
    - Development team
    - Communications team
Case Study Example: **RideTap Mobile Ticket App**

**Replicability & Results**

- Set the stage for collaboration across mobility service providers.
- Underscored the need for integrated payment focus for the FTA MOD Sandbox program.
- Similar readily available iterations could be deployed in variety of systems/settings to boost transit use.
- MaaS projects can be impactful if serve to emphasize sustainable modes.

In *The New York Times* article titled **Do-It-Yourself Transit Planning, by App**, Amy Zipkin highlights Mohamed Alyajouri, who lives in Beaverton, Ore., and develops health programs for a nonprofit, was fed up with the track work on MAX Light Rail, which runs into downtown Portland. Trains were rerouted, forcing riders to disembark and walk several blocks or ride a shuttle bus to get back on a train.

So Mr. Alyajouri turned to his cellphone to find a better solution.

As cities grow and concerns about pollution and congestion rise, commuters in urban areas are increasingly turning to apps to compare and combine public and private transportation alternatives. "The shared modes complement public transit, enhancing urban mobility," said Darnell Grisby, director of policy development and research at the American Public Transportation Association, a trade group based in Washington.

Since 2013, the mass transit service TriMet has offered passengers in Portland the option to purchase fares on bus, light rail and commuter rail service through an app called TriMet Tickets. About 8.6 million fares have been purchased since 2013, or 3 percent of total ridership. In May, TriMet began a three-month experiment with RideTap, an app integrated into TriMet Tickets that allows commuters to schedule rides with Lyft, a car service company, or Car2Go, a car-sharing option. "Alternative ride sources are a pressure-relief valve to transit agencies," said Nat Parker, chief executive of Moovel, which developed RideTap.
Focus Areas

1. Fleet Management & Fleet Telematics
2. Route Optimization
3. Remote Services
4. Incentives for Non-Auto Trips
5. Mobility as a Service
6. Internet of Things Applications
Internet of Things Applications

State of the Practice

- Trend of putting variety of devices online continues to grow overall, including municipal applications. City examples somewhat limited so far: utilities, traffic systems, environmental conditions, water, waste, and parking systems have seen IoT development.

- More closely related to VMT reduction, some cities have used sensors to better collect data on bike, pedestrian, and car traffic at busy intersections, or to better provide transit travel information. Public transit has adapted IoT, with many riders now following buses online through GPS-enabled apps. Less publicly visible, some systems are adapting IoT for maintenance and safety applications.

- Some cities have installed sensors to gain better data about parking occupancy as part of a broader parking program. Within closed systems (e.g., campuses), there have been more IoT examples that better track mobility tools and tie into sharing platforms, moving toward MaaS-like services.

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<td>Optimize fleet deployment</td>
<td>Use sensors (street lights, traffic signals, electrical transformers, garbage bins) to align fleet usage and service needs</td>
<td>- Could combine with enhanced Transportation Management Demand (TMD) &amp; traffic control devices</td>
</tr>
<tr>
<td>Transit data</td>
<td>Widespread adoption of real-time transit data via GPS and data feeds has improved user experience</td>
<td>- Has allowed transit data to be integrated in to MaaS type systems</td>
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<td>- Accuracy varies but overall a major improvement</td>
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<td>Parking sensors</td>
<td>Electromagnetic sensors deployed in ground or on poles/curbs to detect/report space usage</td>
<td>- Can support a well-designed parking pricing program</td>
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<tr>
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<td>- Can provide programmatic data on parking usage</td>
</tr>
<tr>
<td>Bike, pedestrian, and car traffic sensors</td>
<td>Some cities deploying sensors at busy intersections</td>
<td>- Scaling to system wide benefits and goals can be challenging</td>
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<tr>
<td>Non-branded package storage lockers</td>
<td>Consolidates deliveries in walkable locations</td>
<td>- Reduce the need for residents to use SOVs</td>
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<td>- Enables consolidated parcel delivery and less circulation</td>
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Case Study Example: Garbage Bin Sensors and Fleet Operations (multiple)

Examples
- (Santa Clarita, CA) is using waste containers in the park which were checked every single day are now being checked once or twice a week.
- (Pittsburgh, PA) reducing the time it currently takes to service waste bins by about 30%-50%, or at least 15,000 hours of staff time that could be redeployed.
- (Baltimore, MD) is moving forward on a $15 million project to deploy 4,000 smart trash receptacles across the city.

Context
- City councils and urban waste collecting companies look to save cost by reducing operating hours, trucks maintenance, road wear and CO2 emissions.

VMT Reduction Approach & Potential
- Better information about need for city services allows for fleet optimization and decrease of unnecessary trips.
Internet of Things Applications

Case Study Example: Garbage Bin Sensors and Fleet Operations (multiple)

Technical Components
- A few key categories of objects affecting waste and recycling industry:
  - Radio-frequency identification (RFID) technology on carts.
  - Sensors that detect fill levels on all types of containers – allows optimized pick-ups.
  - Garbage trucks increasingly wired – allowing dispatchers to track in the field, alert maintenance shops about issues, and generally improving efficiency.
  - Small digesters analyze content of waste and can inform generators how to reduce waste.
- Commonly deployed in commercially available smart waste bin products now:
  - Ultrasonic sensors measure the level of waste in a bin and utilize Wi-Fi to transmit information for as-needed servicing.
  - Digital platform conducts historical data and predictive analytics to make insights like optimized collection routes for maximum efficiency.

Staffing & Resources
- Today's smart bin products have lease arrangements (e.g., $60–$250/mo./bin) or capital purchase options – these are widely deployed, existing vendors.
- Sensors compatible to install on any container; nominal monthly monitoring fee per sensor.
Internet of Things Applications

Case Study Example: Garbage Bin Sensors and Fleet Operations (multiple)

RepliCity & Results

- VMT reduction and others goals are clearly measurable and well-documented by similar projects.
- Global smart waste collection technology market expected to grow rapidly, from $57 million in 2016 to $223 million in 2025.
- Deployed in busy areas, infrastructure and sensors could potentially also provide other services.
- Although this may not score highly as an ‘innovative’ solution since has strong market share now, but if could be considered if strategically deployed with a VMT reduction goal, or part of broader fleet efficiency package.
- This type of approach works well in variety of contexts. Lessons learned from this application directly relevant to other innovative IoT applications to reduce municipal VMT.
Thank you

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