



U.S. Department of Transportation

ADDRESSING THE CHALLENGES OF TODAY AND TOMORROW

“Transportation is not just about concrete and steel. It’s about how people want to live.”

– Secretary Anthony Foxx

In December 2015, we launched our Smart City Challenge, asking mid-sized cities across America to share their ideas for how to create an integrated, first-of-its-kind smart transportation system that would use data, applications, and technology to help people and goods move faster, cheaper, and more efficiently.

Over the past year, the U.S. Department of Transportation (U.S. DOT), under the leadership of Secretary Anthony Foxx, has leveraged nearly \$350 million in public and private funds for smart city and advanced transportation technologies. Building on Beyond Traffic 2045, the Smart City Challenge provided a spark for cities looking to revolutionize their transportation systems to help improve people’s lives. Through the Smart City Challenge, the Department committed up to \$40 million to one winning city. In response, cities leveraged an additional \$500 million in private and public funding to help make their Smart City visions real. And, in October 2016, Secretary Foxx announced an additional \$65 million in grants to support community-driven advanced technology transportation projects in cities across America, including 4 of the finalists in the Smart City Challenge.

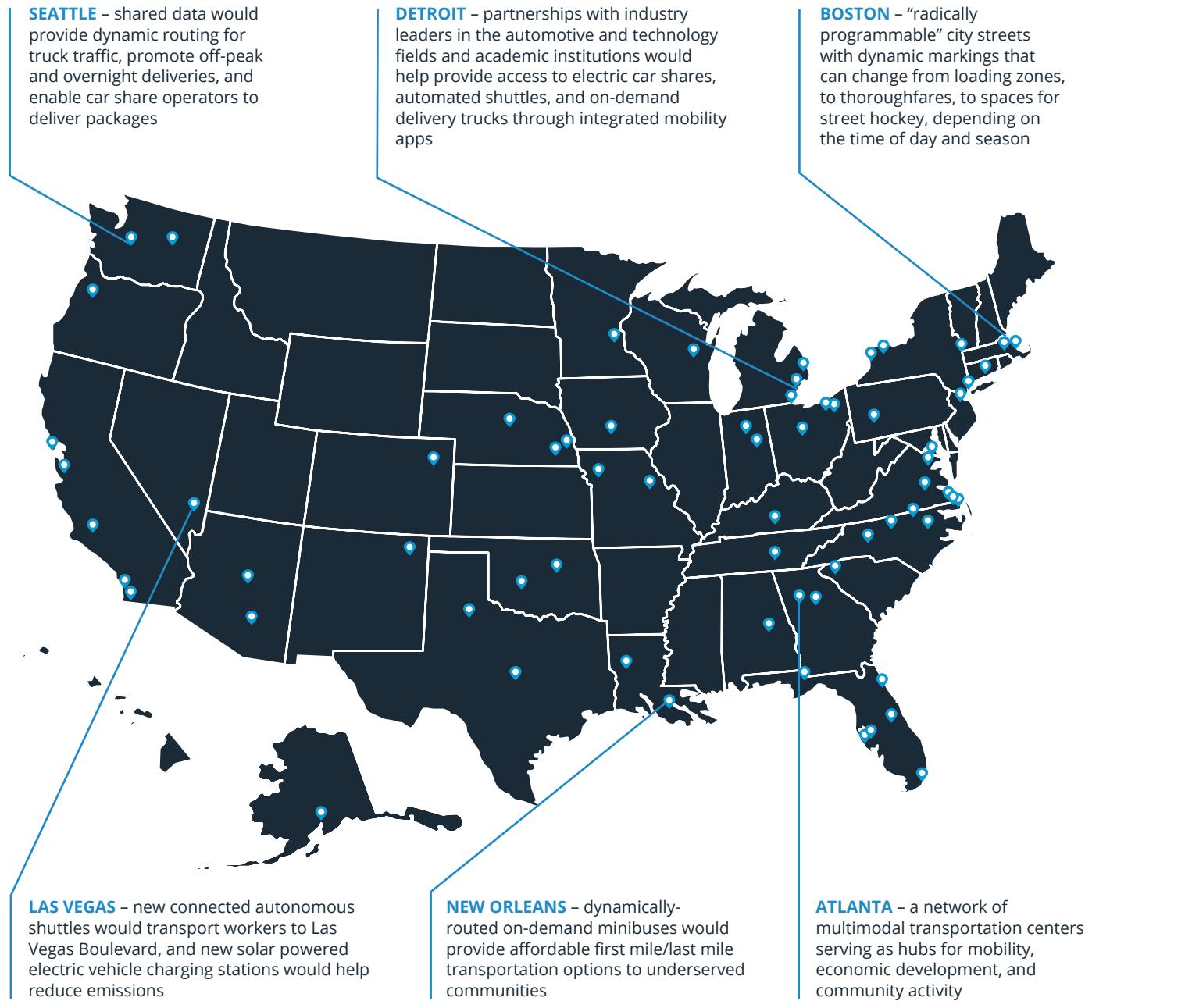
By challenging American cities to use emerging transportation technologies to address their most pressing problems, the Smart City Challenge aimed to spread innovation through a mixture of competition, collaboration, and experimentation. But the Smart City Challenge was about more than just technology. We called on mayors to define their most pressing transportation problems and envision bold new solutions that could change the face of transportation in our cities by meeting the needs of residents of all ages and abilities; and bridging the digital divide so that everyone, not just the tech-savvy, can be connected to everything their city has to offer.



WHAT WE LEARNED FROM ACROSS AMERICA

The response to the challenge was unprecedented—we received 78 applications. Cities from Albuquerque to Anchorage and Providence to Portland took the Challenge as an opportunity to create blueprints of their cities' transportation futures.

The applications proposed a wide range of innovative approaches to tackling urban mobility challenges. Here are just a few of the ideas from the 78 Smart City visions:



While the cities were diverse, many of the 78 applicants faced similar urban mobility challenges:

Providing first-mile and last-mile service for transit users to connect underserved communities to jobs



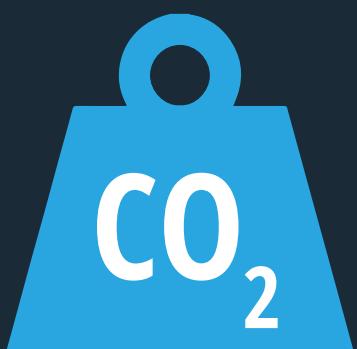
The typical job is accessible to only about 27 percent of its metropolitan workforce by transit in 90 minutes or less.

Coordinating data collection and analysis across systems and sectors



28 percent of all of the transit agencies in the United States have open data systems that freely provided transit times to the public.

Limiting the impacts of climate change and reducing carbon emissions



The 78 applicant cities represent over one billion metric tons of CO₂ emissions per year.

Facilitating the movement of goods into and within a city



Trucks stuck in stop-and-go traffic in metropolitan areas cost shippers an estimated \$28 million annually in truck operating costs and wasted fuel.



Reducing inefficiency in parking systems and payment



An estimated 30 percent of traffic in urban areas is caused by cars looking for parking.

Optimizing traffic flow on congested freeways and arterial streets



Outdated traffic signal timing causes more than 10 percent of all traffic delay on major routes in urban areas.

How We Move

44

cities proposed projects to test the use of automated shared use vehicles to help travelers connect to their destinations.



How We Move Things

11

cities envisioned improving urban freight delivery by implementing smarter curb space management (through sensors, dynamic reservations, and other technologies) to speed loading and unloading.



How We Adapt

17

cities proposed using inductive wireless charging to charge electric vehicles, buses, or shuttles.



How We Move Better

53

cities proposed implementing Dedicated Short Range Communication (DSRC) to connect vehicles to infrastructure and each other.



How We Grow Opportunity

9

cities proposed providing free public WiFi on buses, taxis, and public spaces. The seven Smart City Challenge finalists proposed over 60 unique strategies to increase access to jobs, provide training, reach underserved areas, and ensure connectivity for all.



How We Align Decisions and Dollars

45

cities proposed implementing a unified traffic or transportation data analytics platform, which would help them make better decisions with their limited resources.



ROUND TWO: SEVEN FINALISTS CREATE PLANS TO IMPLEMENT THEIR VISIONS

7 Finalists

Austin • Columbus • Denver
Kansas City • Pittsburgh
Portland • San Francisco

The U.S. DOT named seven finalists: Austin, Columbus, Denver, Kansas City, Pittsburgh, Portland, and San Francisco. The seven finalists dreamed big: they planned to implement autonomous shuttles to move city residents, to electrify city fleets, and to collectively equip over thirteen thousand buses, taxis, and cars with vehicle-to-vehicle Dedicated Short Range Communications (DSRC) technology. Over a three month period, these finalists worked closely with the Department, their residents, and each other to develop detailed plans to put their Smart City visions into action. Each received \$100,000 for public outreach, the production of pitch videos, and intensive technical assistance from Federal experts and private partners to further concept development. Through this process, the finalists refined their vision for what a smart city could be:

- Smart cities are improving **how we move** by supporting more affordable and sustainable mobility choices, improving the quality and reliability of transit services, enhancing pedestrian and bicycle infrastructure, and making better use of the space allocated to parking.
- Smart cities promote the efficiency, reliability and safety of **how we move things** through traffic signals that

prioritize freight movements, apps that provide truckers with information about routes and parking, automated low speed freight delivery systems that enable the consolidation of deliveries, and automated trucks.

- Smart cities are taking the lead in **how we adapt** to climate change by installing electric vehicle infrastructure, converting public fleets and buses to electric vehicles, incentivizing shared-use mobility options, and closely monitoring air pollution to identify and address emissions hotspots.
- Advances in technology are allowing cities to collect, analyze, and apply data to discover **how we move better**.
- Smart cities are taking steps to ensure that new technologies **grow opportunity for all** by connecting underserved communities to job centers through affordable, reliable transportation options and by bridging the digital divide.
- To enhance the capabilities of the public to understand transportation challenges and implement innovative solutions, cities are looking to develop new integrated data platforms to make better decisions and **align decisions and dollars**.



HOW WE MOVE

Our population is expected to grow by almost 70 million over the next three decades—and mid-sized cities are expected to grow at three times the rate of the rest of the country. This growth is expected to strain urban infrastructure across all transportation modes. Travelers in cities today face a range of challenges: heavy traffic, a lack of parking, trip planning complexity, and unsafe biking and walking conditions.

Despite these challenges, cities are experiencing a resurgence. Americans—young Americans especially—increasingly choose to live in cities and bike, walk, or take transit, rather than drive, to get where they are going. Smart cities will improve how we move by promoting more affordable and sustainable mobility choices through improved traveler information, intermodal connections, and new modes of transportation that connect people to destinations without needing to drive.

To combat congestion, the Smart City Challenge finalists proposed a wide range of strategies to make alternatives to single occupancy vehicle travel more convenient. Strategies proposed by a majority of the finalists included:

- Deploying integrated mobility marketplaces mobility marketplaces to allow travelers to easily plan multimodal trips, compare trip costs and purchase mobility services.
- Expanding bikeshare, carshare, and rideshare options.
- Improving transit service reliability by establishing bus rapid transit corridors, installing signal systems that prioritize buses, and getting real time transit information into the hands of riders.
- Ensuring the safety of pedestrians and cyclists with pedestrian detection and warning systems on trucks and buses and at busy intersections.

The seven finalists proposed to add more than
1,000 advanced traffic signals and
13,000 vehicles with dedicated short range communications (DSRC) technology.



Intelligent Traffic Signals

Building on U.S. DOT research on connected vehicles and adaptive signal control, Denver developed plans to integrate adaptive signal control and smart freeway ramp metering to optimize traffic flow on two major arterial highways. Adaptive signal controls and smart freeway meters adjust signal timing to accommodate changing traffic patterns by receiving and processing data from sensors. Denver will also test using DSRC data from connected vehicles data from connected vehicles to develop the next generation of dynamic traffic signal control.

Connected Vision Zero Corridors

San Francisco proposed installing multimodal intelligent traffic signal systems equipped with DSRC technology at high priority pedestrian collision locations to improve pedestrian safety, reduce idling, and prioritize transit and emergency vehicles to improve reliability and response times.



San Francisco

The Challenge

As the search for affordable housing continues to push people commuting into San Francisco further from the city, the roads into downtown experience ever growing congestion.

The Goal

Grow the number of regional commuters that use carpooling to improve affordability, increase mobility and relieve congestion on roads and transit.

The Solution

- Create connected regional carpool lanes and designate curb space for carpool pick-up/drop-off
- Make carpooling easy by developing a smartphone app for instant carpool matching and establish carpool pickup plazas for riders without smart phones
- Use connected infrastructure to monitor and optimize the performance of carpool lanes

HOW WE MOVE THINGS

Freight volumes are projected to increase by more than 40 percent over the next 30 years, straining our transportation system. As demand for freight in urban areas grow, challenges will increase for “first-mile” movement of goods out of urban factories and ports, and “last-mile” movement of goods from freight hubs to their final destinations. Truck drivers face special challenges in an urban setting - from determining a route, to finding a place to park, to getting around safely among cyclists and pedestrians.

The finalists to the Smart City Challenge proposed a range of innovative solutions to address their freight challenges:

- Improving reliability of freight by installing signals that prioritize truck movement along **freight corridors**.
- Providing truckers with **real-time information on parking availability** and truck routes.
- Demonstrating the potential for **automated and connected freight vehicles** to make freight movements safer and more efficient.

Truck platooning using automated and connected vehicle technologies could reduce truck CO₂ emissions by **7 percent**.



Green Freight

Freight vehicles are a major contributor to air pollution in urban areas. To tackle this challenge, several finalists proposed adopting truck platooning and freight signal prioritization. In truck platooning, two or more trucks driving one behind the other are connected through onboard technology this allows them to be driven much closer together, which improves aerodynamics, saves fuel, and reduces pollution and CO₂ emissions. Freight signal prioritization allows intelligent traffic signals to detect freight traffic and give them priority at intersections, reducing stop-and-go freight traffic.

Freight Lockers

Austin proposed installing special lockers at new multimodal Smart Stations. Partnering with a major delivery and logistics company, freight lockers would be established at both the downtown and residential stations to facilitate package and grocery deliveries. In areas with limited access to fresh food (known as “food deserts”), food lockers equipped with availability and temperature sensors would allow residents to pick up their grocery orders on the way to or from their destinations.

Denver

The Challenge

The health of Denver's economy is closely connected to efficient freight movements, yet growing populations along key freight corridors are creating congestion and reducing reliability, while the air pollution and noise caused by freight traffic disproportionately impact underserved communities.

The Goal

Make freight delivery more reliable and reduce air pollution, idling, and engine noise.

The Solution

Establish a connected freight efficiency corridor with comprehensive freight parking and traffic information systems, freight signal prioritization, designated parking and staging areas.



HOW WE ADAPT

Climate change is a major threat to our way of life. Transportation accounts for 27 percent of our Nation's greenhouse gas emissions. Air pollution and noise caused by traffic also affect the health and quality of life of Americans, particularly those near congested urban corridors.

Smart cities are leading the charge in the fight against climate change by shifting demand away from congested roadways to more sustainable modes and by making electric vehicles a practical, affordable option for more of their residents. Proposed strategies to increase the use of electric vehicles included:

- Supporting the use of electric vehicles by **taxis** and **transportation network company (TNC) fleets**.
- **Converting public fleets**, such as garbage trucks, buses and police cars, to electric vehicles.
- Subsidizing the purchase and use of electric vehicles through **tax exemptions, energy credits, and bulk buy and loan programs**.
- Installing electric vehicle **charging stations**.

Pittsburgh plans to convert
36,365 street lights
to LED technology, providing an
energy saving of 60 percent.



Wireless Charging

Portland will install stationary wireless inductive charging devices as part of a commercial pilot. Because the technology is wireless, drivers will be able to recharge electric vehicles by hovering over a charging coil or selecting routes with infrastructure that can refill their car's battery as they drive. This technology will be used to charge semi-autonomous electrified shuttles on circulator routes that link lower-density neighborhoods and employment areas to high-frequency transit lines.

Electric Vehicle Fleets and Infrastructure

Each finalist proposed policies to encourage the electrification of municipal and transit fleets. For example, Austin planned to work with taxi and transportation network companies to support the conversion of private fleets to electric vehicles. Many of the finalists also proposed to install charging stations, led by Denver's proposal, which included the installation of a network of 120 charging stations.

Pittsburgh

The Challenge

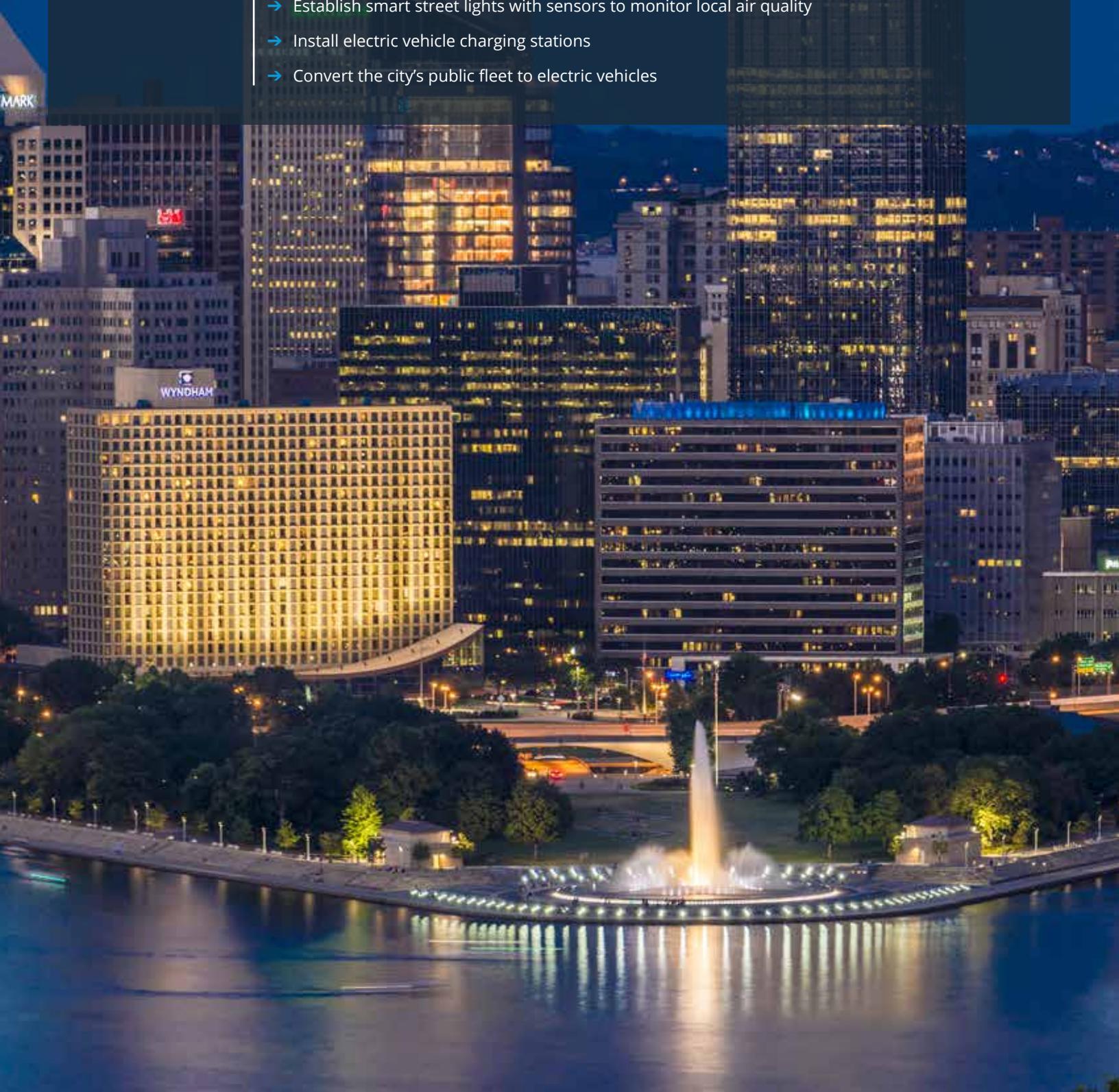
Pittsburgh has one of the highest air pollution levels in the country, and poor air quality is well known to cause serious health and social impacts.

The Goal

Jump-start electric conversion to reduce transportation emissions by 50% by 2030. Through demonstration projects in street lighting, electric vehicles, and power generation.

The Strategy

- Convert up to 40,000 streetlights to LEDs to reduce energy use
- Establish smart street lights with sensors to monitor local air quality
- Install electric vehicle charging stations
- Convert the city's public fleet to electric vehicles



HOW WE MOVE BETTER

New technologies, like automated and connected vehicles, will soon make travel significantly safer and more convenient. Advances in data processing are enabling governments and private companies alike to improve transportation services and better target investments. Government is evolving to support these beneficial technologies, while working to ensure they are safe and secure.

Cities want to hit the ground running on connected vehicles by adding DSRC technology to fleet vehicles first, so they can quickly demonstrate its potential to improve safety, decrease congestion, and reduce emissions. Cities are also pioneering new ways to collect, integrate, and analyze travel data to guide policies and investments, improve transparency, encourage collaboration, and optimize system performance.

The finalists proposed a wide range of strategies to collect and analyze transportation system data, including:

- Installing closed-circuit **cameras and sensors to collect data** on vehicle movements, transit reliability, and pedestrian and bicycle traffic.
- Collecting data from **vehicle probes, connected vehicles, and connected infrastructure**.
- Establishing **open data platforms** and inviting citizens to participate in hackathons.

New technologies are emerging that aim to change the way active transportation data is collected, making it less expensive and easier to collect, resulting in more reliable data.



Data-Driven Mobility

The Smart City Challenge finalists recognize that to get smarter they need to enhance their ability to collect, process, analyze and share data. They plan to take in data from an immense array of sources from connected DSRC infrastructure, crowdsourced data from smartphone users, and a variety of new sensors that can detect everything from air quality to road temperatures and conditions, from shots fired to earthquakes. They also understand that only by building a resilient, secure privacy-driven data platforms will the public feel confident sharing their data.

Mobility Marketplaces

Six of the seven finalists proposed creating 'mobility marketplaces' to allow residents to find and pay for a variety of transportation options – bikeshare, carshare, transit, rideshare – all in one place. These marketplaces would have a single shared payment platform, which could be managed via smartphone app, website, or payment card. Portland proposed integrating dynamic pricing and incentives into their mobility marketplace so that during a sporting event, for example, special discounts could be made available through the mobility platform to promote the use of transit or bikeshare.

Kansas City

The Challenge

Despite advances in transportation technology and urban planning, we still lack basic data on how cities work and how infrastructure affects the everyday lives of our citizens.

The Goal

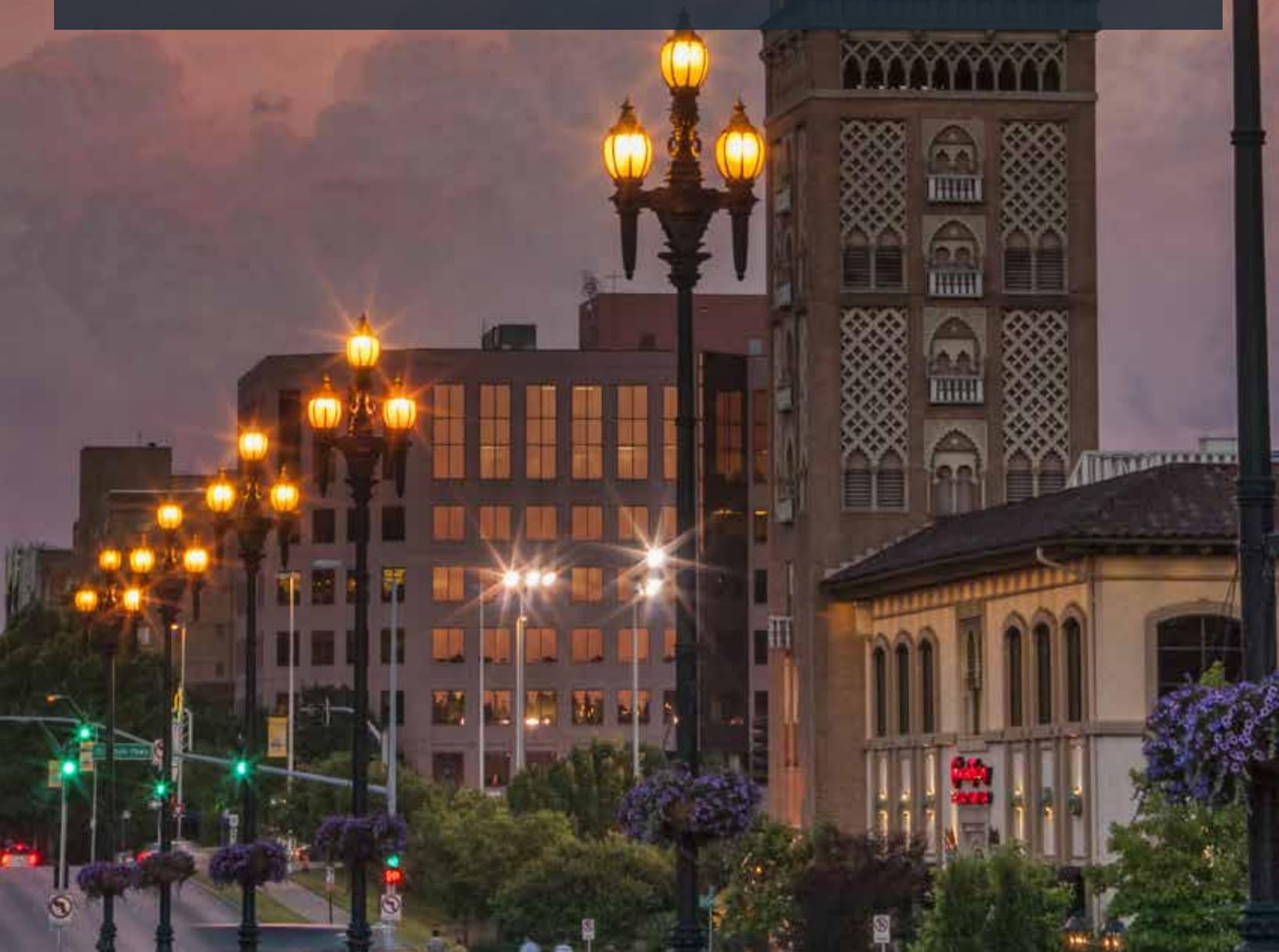
Advance our understanding of urban travel and quality of life to inform the transportation decisions of citizens and public officials.

The Strategy

Make the urban core a more 'Quantified Community,' by collecting and analyzing data on:

- Travel flows
- Traffic crashes
- Energy usage
- Air pollution
- Residents' health and physical activity

Make these data available through an open data architecture, to allow for unprecedented studies in transportation engineering, urban systems operation, planning, and the social sciences, promote entrepreneurship and empower citizens.



HOW WE GROW OPPORTUNITY FOR ALL

Transportation policy and investments must empower Americans to connect to opportunity and to come together, not grow further apart. In cities, historic racial and economic divides have been perpetuated by planning, infrastructure, and socioeconomic policies that have isolated neighborhoods, encouraged sprawl, enabled economic segregation, and overlooked pockets of poverty. To bridge the digital divide and avoid repeating the mistakes of the past, cities must plan for a future transportation system that meets the needs of all city residents, not just the wealthy or tech savvy.

Cities recognize that innovation can't just be pursued for its own sake; they want to use these technologies to create new mobility options to connect their residents to jobs, workforce training, education, and healthcare; and make sure the benefits of these investments accrue to all parts of the community. The seven finalists proposed over 60 unique strategies to increase access to jobs, provide training, reach underserved areas, and ensure connectivity for all. The Challenge finalists proposed a number of ways to ensure the benefits of smart city technology reach everyone, including:

- **Improving first-mile/last-mile connections** to transit, whether through subsidized whether through subsidized TNCs, car and bike share (TNCs), car and bike share, or autonomous shuttles
- Expanding access to **free public Wi-Fi** on buses, taxis, and parks
- Developing specialized **apps for non-English speakers and people with disabilities**
- Providing **universal transportation payment cards** for the unbanked and subsidizing the use of a range of travel services by people with low incomes

Columbus aims to reduce infant mortality in Franklin County by 40% by creating smart corridors and smart payment projects that improve access to pre-natal care for individuals in underserved neighborhoods.



Bridging the Digital Divide

A 'digital divide' separates those with access to the Internet, smartphones, and credit, and those who do not benefit from these services. Kansas City would build connected kiosks that would provide not only transit information or Wi-Fi, but information on local libraries, parks, and even access to job applications. Austin would create Smart Stations to reconnect residents. Gentrification has pushed away from downtown with new mobility options like vanpools, bus rapid transit, carshare, and more.

Accessibility Apps

Portland sought to develop a mobile app to benefit people with disabilities. One app would help mobility device users navigate their system of Americans with Disabilities Act (ADA)-compliant ramps by offering trip planning based on accessibility. It would support the visually impaired by highlighting locations with audible traffic signals. The app would also provide data to the City about where people with disabilities are traveling, which will inform the development and future updates of the City's ADA transition plan. The app could include specific features for paratransit service, such as including information about how to use fixed route service or about subsidized ridesharing services. Portland planned to host a hackathon to develop new services and improve existing services using open source data.

Austin

The Challenge

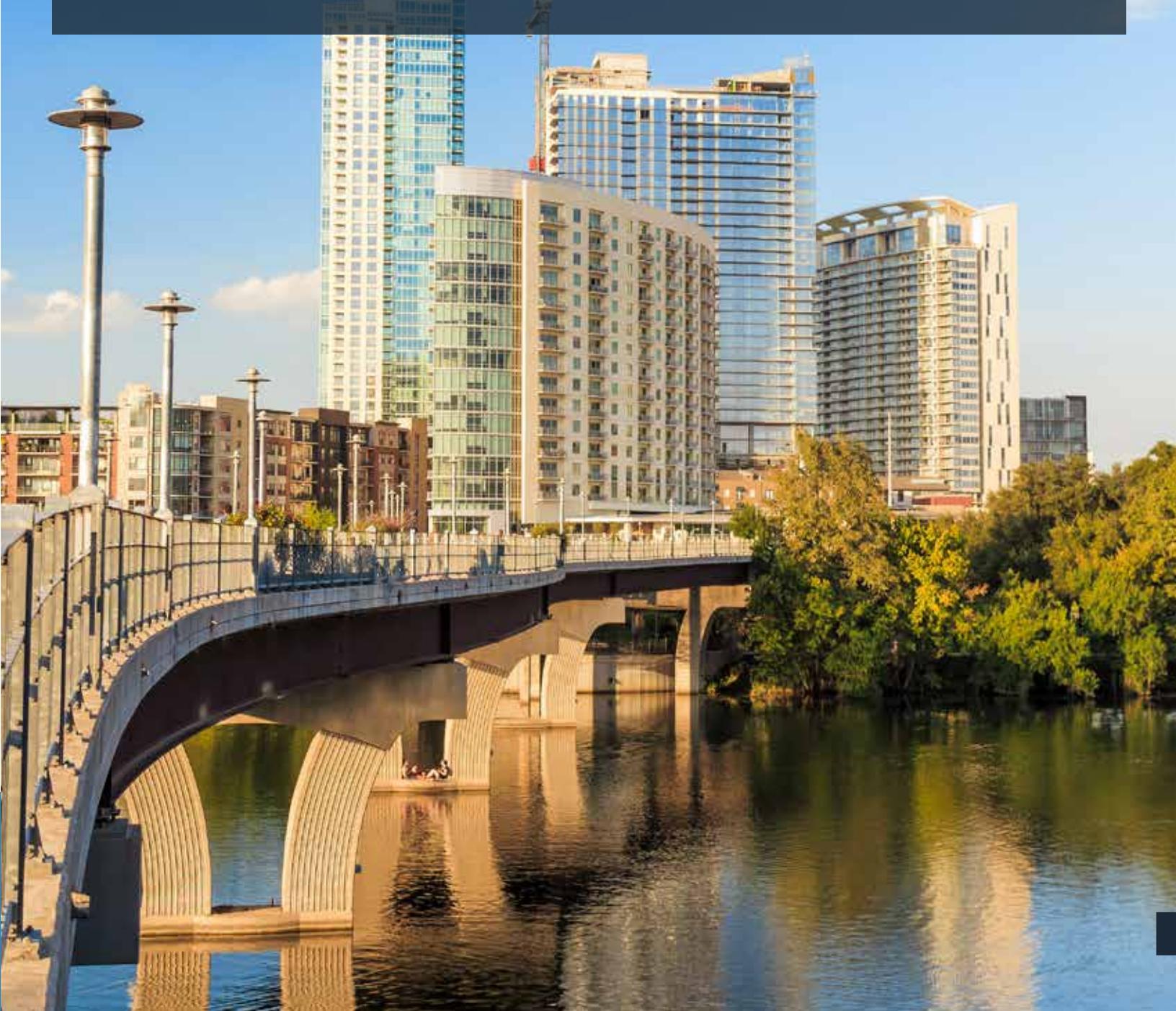
In the early 1960s, the I-35 highway was built through the low-income neighborhoods, dividing the city into West and East Austin. The region's racial divides have become increasingly acute for its minority populations, which struggle with higher poverty rates, more isolated neighborhoods, lower educational attainment, and lower employment levels.

The Goal

Connect underserved communities to economic opportunities and reduce the spread of poverty.

The Strategy

Austin will create a Mobility Marketplace that will improve access to mobility services for unbanked users, older Americans, and those with disabilities. Multi-lingual Smart Ambassadors will partner with community organizations to demonstrate new technologies and mobility services and engage with citizens in underserved communities to understand their needs.



HOW WE ALIGN DECISIONS AND DOLLARS

As the transportation system has grown and become more complex, transportation decision-making has become more difficult, transportation projects have become more costly, and revenue challenges have grown. In recent decades, investments have failed to keep pace with increasing needs and much of our infrastructure has fallen into disrepair. The seven finalists propose a wide range of strategies to use technology to create efficiencies, improve public services, support innovation, and engage their citizens in the planning process.

- Building integrated data platforms that combine public and private-sector data to improve decision-making, both in real-time and through historical analysis.
- Developing new open data portals with real-time Application Programming Interfaces (APIs) to increase transparency, spur innovation, and support research.
- Using new data sources, such as sensors, video processing, smartphone app data, and crowdsourcing, to inform policymakers and promote better allocation of limited taxpayer dollars.

A survey by the National Association of Realtors found Americans strongly prefer **walkable neighborhoods** with parks and transit options nearby.



Community Parklets

Already located throughout San Francisco, parklets are public spaces built on top of on-street parking spaces, typically providing seating and other pedestrian amenities. San Francisco plans to expand parklets throughout the City, obtaining community input on design elements, installing Wi-Fi kiosk access points, and documenting impacts on its users. The goal of the parklets is to increase pedestrian and cyclist amenities and increase digital equity through greater access to Internet connectivity.

Reducing Commutes by Optimizing Land Use

Rapid population growth is forcing Austin to rethink how it uses its land. New mobility services, enhanced data integration, or electric vehicles will not on their own solve these challenges. Austin is exploring ways to create walkable and bikeable urban environments and reduce lengthy, sprawl-inducing commutes by reclaiming land that has traditionally been allocated for road expansions and parking facilities. Through property redevelopment, infill, and transit oriented development, Austin intends to cultivate stronger, less car-dependent and more equitable communities.

Portland

The Challenge

People in underserved communities are at a higher risk of missing out on new technological advances; these citizens may lack access to new tools, and more significantly, their needs and issues may not feed into the data collection and study that guides development of those tools.

The Goal

Ensure that all communities have access new transportation options and improved methods for making informed transportation choices.

The Strategy

Make community members a part of the development and implementation of Smart City technologies from beginning to end through a public education campaign and a smart city video contest.

Establish partnerships with community organizations to ensure that low-income, disabled, older, minority, and immigrant residents have a voice.

Engage with residents through walking and van tours, “pop ups”, idea walls, supper chats and youth-led canvas initiatives.

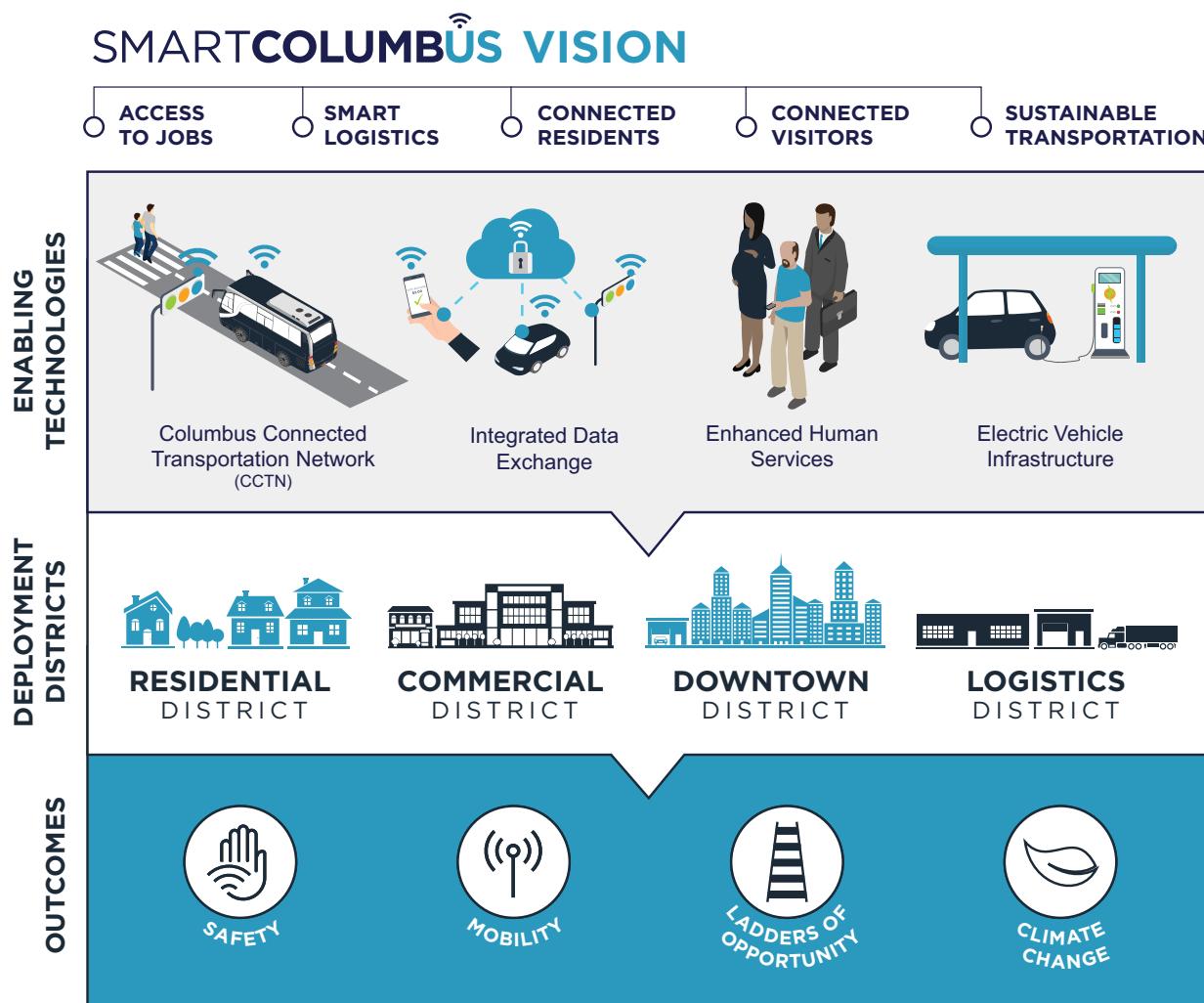


THE WINNER: COLUMBUS, OHIO

Columbus put forward an impressive, holistic vision for how technology can help all residents move better and access opportunity .

The City of Columbus proposed a comprehensive, integrated plan addressing challenges in residential, commercial, freight, and downtown districts using a number of new technologies, including connected infrastructure, electric vehicle charging infrastructure, an integrated data platform, autonomous vehicles, and more. Columbus plans to work closely with residents, community and business leaders, and technical experts to implement their plan. They have committed to collaborate with Austin, Denver, Kansas City, Pittsburgh, Portland, and San Francisco to share best practices to help other cities across America replicate their successes. Public roll-out of the various Smart Columbus pilot projects will begin in 2017.

Columbus Smart City Challenge Implementation Vision



At U.S. DOT, we expect Columbus – and all seven finalists – to serve as models for cities looking to become smarter. We are committed to providing continued support to all of the finalists by connecting them to partnerships, technical assistance, and funding opportunities. The Department identified \$2 billion in Federal funding opportunities to help other American cities implement Smart City projects.

We plan to monitor the progress of Columbus and other cities closely, and to collect and share their success stories and lessons learned. Our hope is that the Smart City Challenge marks an important first step in the transformation of urban mobility and accessibility, not just in Columbus or our finalist cities, but across the country. We're excited to see where this journey takes us.

Columbus

The Challenge

Each year in Franklin County, 150 babies die before their first birthday. And, twice as many African-American babies are likely to die as white children. In Columbus, these deaths are concentrated in neighborhoods in which there are lower levels of income, education and health. One neighborhood loses four times as many babies as in the neighborhood next door.

The Goal

The Solution

Reduce infant mortality by 40 percent and to cut the health disparity gap in half by 2020.

Columbus will leverage a new central connected traffic signal and integrated transportation data system to develop a suite of applications to deliver enhanced human services to residents and visitors. The City plans to integrate an electronic appointments and scheduling platform for doctor visits with transit tracking so that rescheduling is automated and expecting mothers need not wait weeks to reschedule appointments. These applications include a multi-modal trip planning application, a common payment system for all transportation modes, a smartphone application for assistance to persons with disabilities, and integration of travel options at key locations for visitors. Columbus will establish a smart corridor connecting underserved neighborhoods to jobs and services. The smart corridor will enhance Bus Rapid Transit (BRT) service by installing smart traffic signals, smart street lighting, traveler information and payment kiosks, and free public Wi-Fi along the route. Six electric, accessible, autonomous vehicles will be deployed to expand the reach of the BRT system to additional retail and employment centers.



WHAT COMES NEXT

"From automated vehicles to connected infrastructure to data analytics, technology is transforming how we move around our country, and some of the most exciting innovation is happening at the local level"

- Secretary Anthony Foxx .

In October 2016, Secretary Foxx announced an additional \$65 million in grants to support community-driven advanced technology transportation projects — including support for four of the Smart City Challenge finalists to implement ideas developed as part of their applications. In all, these advanced technology grants will fund 19 technology-driven projects in local areas to fight congestion, increase connectivity, and improve access to opportunity.

Smart Cities Challenge finalists receiving grants included:

- Pittsburgh - nearly \$11 million to deploy smart traffic signal technology – proven to reduce delays at street lights by up to forty percent – along major travel corridors.
- San Francisco - nearly \$11 million to implement connected vehicle technologies to allow the signal system to detect red light-violating vehicles and adjust timing, and personal wireless devices to prioritize pedestrian travel and safety at intersections. This includes a pilot of a shared, electric, autonomous shuttle.
- Denver - \$6 million to upgrade its traffic management center, build a connected vehicle network, and install automated pedestrian detection at difficult crosswalks.
- Portland - the transit agency, TriMet, will receive funds to integrate shared-use mobility options into its existing trip planning app, allowing users to plan efficient trips even without nearby transit access.

Projects supported by these grants are building on the success of the Smart City Challenge. Leveraging funding from local and private partners, these cities will bring cutting-edge technology to their communities, demonstrating in real-world settings the tools that will transform our transportation system in the next 30 years.

The Smart City Challenge finalists' proposals identified more than 150 industry and non-profit partners pledging more than \$500 million in resources, technology solutions, and technical support to implement smart city initiatives.