Connected Nashville
A Vision for a Smarter City

Draft for community review
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Letter from Connected Nashville Co-Chairs

Nashville is a prosperous, safe and welcoming city. Our community’s commitment to keeping it vibrant has made Nashville an appealing place to live and work. Efforts to make improvements in critical areas such as affordable housing and better transportation have helped Nashville flourish.

In 2015, Metro Nashville Government developed a vision statement on use of technology in our transportation system to improve safety, enhance mobility for all and reduce our city’s impact on the environment. This vision statement was Metro Nashville’s submission to the US Department of Transportation Smart City Challenge. Although we didn’t win the challenge, we gained knowledge and built a process to use technology to meet local needs.

In May of 2016, Mayor Megan Barry challenged an assembled group of local experts in transportation, environment, economic development and education to draft a strategy to use technology and data to meet city goals for a smarter Nashville – a Connected Nashville. We did not need to reinvent the wheel; Metro Government has many planning documents such as the award-winning NashvilleNext, which lay out endorsed community goals.

The Connected Nashville working group has pinpointed many of those goals and, in this document, has suggested actions Metro Government can use to attain them. We are also keenly aware of digital disparities that shape access to the new tech worlds we are building, and understand that goals of inclusion and equity must shape the guidelines around technological development in a smart city.

As the working group has been researching our community’s goals to offer strategies to meet them, Metro Nashville Government has put work toward the vision for Nashville’s future:

• Hiring Metro’s first Chief Data Officer to create a culture within Metro Government where data is used to identify areas of opportunity.
• Developing a soon-to-be-released community response management system to allow our citizens to bring issues and service requests to a single contact point for resolution.
• Replacing traffic light systems to allow for synched, intelligent signalization to improve efficiency of traffic flow.

Additionally, Mayor Barry has committed to a $36M increase for Metro Nashville Public Schools to ensure equitable educational opportunities for students in all neighborhoods, a portion of which goes toward launching STEAM (Science, Technology, Engineering, Arts and Math) education in MNPS middle schools.

Metro’s focus is to make Nashville smarter, faster and better able to meet the needs of all of its citizens equally. At the same time, we must govern technologies, manage the security of systems and protect the privacy of residents and visitors impacted by them. Our goal is to build partnerships between the community, public sector, private businesses and academia to talk about how we can ensure a sustainable future and high quality of life for all Nashvillians.

Community feedback is critical for continuous refinement. The process thus far has been one of identifying worthy goals. The next step is to seek public input, through a series of meetings and a publicly available survey, as we continue to develop Nashville’s smart city vision. With feedback from you and key stakeholders in Metro departments and agencies on suggested strategies, we will complete a Community Recommendations document. We will circulate this draft throughout Metro Government, and it will serve as a starting point for collaboration around proposed, planned or current initiatives aimed at making Nashville a smarter, more connected city. We welcome your input and invite you to join this ongoing conversation about how we can use technology to improve the lives of Nashville’s citizens.

Sincerely,

Keith Durbin, Bryan Huddleston and Dr. Fallon Wilson

Connected Nashville Committee Co-Chairs

Draft for community review
Introduction

Nashville is a growing and vibrant city. To shape growth in the ways that our communities want, Metro Government departments and agencies develop plans to guide that growth. Foremost among existing plans is NashvilleNext, the product of a 3-year process informed by 11 thousand people with the purpose of guiding growth, development and preservation for the next 25 years. Nashville communities have also contributed to plans that direct transportation (Vision 2020), parks (Plan to Play), the environment (Livable Nashville) and education (The Academies of Nashville: A Five-year Plan for the Implementation and Sustainability of High School Reform), to name a few. Each offers compelling goals for Nashville to realize a better future.

Smart Civic Technologies Emerge

As Nashville has evaluated and solidified community goals, technological developments have ushered in a new era that promises to enable Metro Government and Nashvillians to meet challenges in ways that have not previously been feasible. A flourishing marketplace offers the promise of civic technology solutions to problems across government services. These technologies, in combination with gigabit connectivity, sensors that can provide real-time access to a vast array of community information, and innovative delivery methods, have created an environment for technology to play a larger role in society and government than ever before. All of these advances create the opportunity for a city to become a Smart City – a city that uses technology and data to solve local challenges.

Addressing Metro’s Priorities

Metro’s priority is to address the challenges that are at the forefront today, not to chase the latest dazzling technology, or technology for technology’s sake. Metro’s citizens want affordable housing, equitable educational opportunities and transportation solutions.

In 2016, Mayor Megan Barry charged the Connected Nashville working group to define, document and present recommendations to guide Nashville’s quest to become a smarter city through use of technology and data. Leaders and subject matter experts from Metro Nashville business, academia, the non-profit sectors and all levels of government came together to develop the 21 recommended strategies and their attendant strategic actions that make up Connected Nashville: A Vision for a Smarter City.
Guiding Principles

This document presents a number of specific strategies and actions that have the potential to make Nashville a smarter and more connected community. These strategies are not all-inclusive, nor can they anticipate future developments and demands. To guide future efforts, the Connected Nashville working group has developed the following guiding principles for Metro Government and our partners to consider as technology and data are used in the community.

Guiding Principle: Collaborative

Connected Nashville is focused on meeting community goals through active partnerships with engaged residents, academic partners, nonprofit agencies and the business community, along with government agencies within the Metropolitan Government, in surrounding counties, and at the state and Federal levels to maximize both opportunities and impact.

Guiding Principle: Community Focused

Connected Nashville is focused on meeting community goals to promote a high quality of life for all Davidson County residents, and a welcoming environment for visitors to Nashville. Using technology for community benefit includes respecting the need for individual privacy, protecting sensitive information, acknowledging citizen concerns and ensuring responsible and beneficial use of data and information.

Guiding Principle: Equitable and Inclusive

Connected Nashville is focused on meeting community goals that promote social, cultural, educational and economic opportunity and ensure inclusion, availability, affordability, and public access to the benefits brought by technology.

Guiding Principle: Responsible and Transparent

Connected Nashville is focused on meeting community goals to foster government that is open, transparent and accessible to our residents.

Guiding Principle: Sustainable & Resilient

Connected Nashville is focused on meeting community goals in a manner that is designed for endurance over the long run and with the ability to be adaptive and manage inevitable change.
The Spark
In late 2015, the United States Department of Transportation (USDOT) announced the Smart City Challenge. This was a unique funding opportunity to demonstrate and evaluate a holistic approach to transportation performance within a city using technology, and to integrate this approach with other domains such as public safety, public services and energy.

Our Submission
Through Mayor Barry’s leadership, Metro gathered a group of Nashville’s local transportation, technology and academic leaders to draft a vision for this opportunity. Though Nashville was not one of the finalists announced by the DOT, the process of the application submission sparked inspiration and collaboration around the concept of using technology and data to address transportation challenges. It likewise highlighted a number of the gaps in Metro Nashville’s ability to meet the challenge from strategic, technical and operational viewpoints. As a result, our Mayor committed to working toward Nashville’s vision in the coming years.

The Result
In May 2016, Mayor Barry convened and addressed the first meeting of the Connected Nashville working group. Her charge was that the group investigate and define community recommendations to inform Metro Government and the Nashville as a whole to support better-connected, more citizen-centered public services, and to better prepare Nashville to pursue opportunities that technology provides in the future. She named as Connected Nashville co-chairs Dr. Fallon Wilson, founder of The Ed Digital Think Tank and Co-Founder of Black in Tech Nashville; Bryan Huddleston, local technology leader, technology workforce development advocate and former CEO of Nashville Technology Council; and Keith Durbin, the Chief Information Officer and Director of the Information Technology Services Department of the Metropolitan Government.

What is it?
This document, Connected Nashville: A Vision for a Smarter City is the product of a year’s worth of effort from the working group, designed to focus on how we can apply technology to solve local challenges within six dimensions – education, transportation, environment, governance, livability and economy – recognized as part of a smart city framework. The “What is a Smarter City?” section of this document describes the smart city concept in detail. This is not meant to be an all-encompassing plan on all the dimensions listed here; rather, this document focuses on recommendations from specific, vetted community plans (See document references for details) and new recommendations that support planned activities. Additionally, these are draft recommendations. Metro departments and agencies will develop action agendas following review of
the draft. This draft is designed to provide to the community a set of recommendations for input, which have been devised systematically using the process illustrated in Figure 1.

A 76-person working group organized subcommittees around five areas of focus: Economic Development, Livability and Housing, Mobility and Transportation, Education and Achievement and Technical Standards. The five areas of focus developed into the six categories in our smart city framework: Economy, Mobility, Environment, Governance, People and Living. The subcommittees worked through the process phase by phase, supported by staff from Metro’s Information Technology Services Department.

The group heard from national and international experts in smart city technologies, received an overview of existing and planned smart city technologies within Nashville government, and researched vetted community plans incorporating these technologies. These plans were the foundation of the recommendations contained in this report (Figure 2).
About this Report (con’t)

Features of this Report

Within this report there are 21 draft strategies. Each strategy reflects an element of the six smart city dimensions. The strategies are broken down into strategic actions, which serve as the suggested steps that Metro departments and agencies can take to support a given strategy.

Included with each strategy is a case study of how another city has used a technology-based solution to support progress. For these case studies, we selected cities (Figure 3) with distinct differences, and needs, and customized approaches to guide the thought behind the Connected Nashville draft recommendations. Every community has unique characteristics. Successful implementation of a smart city plan, which plays to a city’s strengths and directly answers a city’s challenges, requires attention to community input.

Figure 3, Cities Used for Case Studies
Request for Feedback

Now we turn to you, the members of the Nashville community, to provide your input to the base recommendations that the Mayor’s working group has drafted. With that feedback, the working group will refine the draft recommendations and present these to Mayor Barry and the leadership of Metro Government.

The ideas and priorities developed with your feedback will inform Metro and departmental actions plans, and Metro departments will set a course to meet goals laid out by the community. The draft recommendations ultimately presented will also give quasi-governmental, nonprofits and businesses thoughts on initiatives that they may undertake to serve the public and help to make Nashville a smarter and more connected city.
Participants

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What is a Smarter City?

Technology plays a role in nearly every aspect of the modern urban lives of Nashvillians. But just using technology does not make a city smart...

A smarter city:

• Achieves goals and meets challenges of its community through the use of technology and data.
• Uses technology, digital communication and data to gain a better picture of needed services and to interact with the community to solve community issues.
• Uses technology and innovation to improve the lives of citizens by improving the services it provides to its residents.
• Ensures equitable and inclusive access to quality of life for all of its citizens.

*Connected Nashville’s* holistic approach to becoming a smarter city is embodied in six dimensions critical to Metro’s future: Economy, Environment, Governance, People, Living, and Mobility.

These six dimensions comprise our strategy recommendations presented to Mayor Barry.
In order to assure continued growth for Nashville, our community must foster entrepreneurship and innovation to remain competitive in evolving local, national and global economic landscapes. To plan for ongoing economic success, we must encourage collaboration between government, academia and industry, and establish programs that make Nashville an attractive location for existing businesses and for prospective new corporate citizens.
Strategy 1:
Foster Healthcare Management Leadership

According to industry research by the Nashville Healthcare Council, Nashville’s healthcare industry “contributes an overall economic benefit of $38.8 billion and more than 250,000 jobs to the local economy annually. Globally, Nashville’s health care industry generates more than $84 billion in revenue and more than 500,000 jobs.” An August 2016 study by the Brookings Metropolitan Policy Program, entitled *From healthcare capital to innovation hub: Positioning Nashville as a leader in health IT*, states that Nashville’s opportunity “revolves around multiple areas of competitive advantage” including major IT investments within Nashville’s healthcare industry. Brookings further states that Nashville is at an advantage due to “substantial flows of high-value products and services generated in the region and sold through its extensive networks in national markets, and a high concentration of health-related research at Vanderbilt University”.

**Strategic Actions**

1. Support innovation in the region by creating easy to use transfer contracts between universities and key industry associations to increase the economic impact of Healthcare Information Technology (HIT).

2. Provide business support for local software firms selling their products outside the region.

3. To build closer business ties between healthcare and IT, form a consortium of IT firms as well as a cross-industry working group that focuses on using healthcare data to improve human health.

4. Expand existing accelerator programs by expanding partnerships with institutions, and explore nontraditional methods in IT and coding training.

5. Develop a mentoring program to provide HIT experience to students in a variety of clinical settings.

6. Launch a CEO network that brings global management to Nashville, helps young IT companies attract capital and connect to large healthcare firms, and strengthens the link between new businesses and established firms.

7. Work with partners to explore and develop local ability to use blockchain as a new way of recording, managing and authenticating healthcare records.

8. Sponsor coding user groups, and connect those groups with healthcare firms using HIT data-discovery challenges.
Medical Records on Blockchain

At the intersection of medical research and medical treatment, a team in Boston developed MedRec, an application designed to securely store medical records using blockchain, an online-distributed ledger for record-keeping. John Halamka, chief information officer at Boston-based Beth Israel Deaconess Medical Center collaborated with the MIT Media Lab to conduct a six-month pilot of MedRec at Beth Israel. Over the course of six months, researchers tracked inpatient and outpatient medication data with code deployed through virtual machines at MIT. In a simulation of the data exchange process between institutions that a blockchain application would utilize, the team recorded vaccination history, blood work records, treatments and prescriptions by using two different databases within Beth Israel. Positive results led to plans for additional pilots with a larger network of hospitals.

Strategy 2:
Develop Small Business Resources

According to American City Business Journals’ 2017 Small Business Vitality survey, Nashville ranked No. 18 among 106 metros in the area of small business success. During the first quarter of 2017, the Nashville Area Chamber of Commerce saw an average membership increase of 20 per month. Nashville is constantly expanding support for entrepreneurs and small businesses, but sometimes these efforts occur in silos, and it is often difficult for small business owners to gain full view of all opportunities. To stay on the path of progress, Nashville must create a network of small business resources, and use data and analytics to develop those resources based on current needs and trends.

Strategic Actions

1. Engage in a structured inventory assessment to understand what resources and capital funding networks are available, underused or at capacity, and make the results accessible to the public online.

2. Create digital tool with searchable databases of all available commercial real estate across the city, with options to sort by geographical area and property characteristics, with options to view detailed specifications and history.

3. Develop and promote a regional public/private open data platform, available to the public, which presents data from government, business and academic sectors in one web-based location, along with simple data visualization tools.
Small Business Support for the Digital Age

Austin Smart Start, a partnership between Austin’s Development Services and Economic Development agencies, helps new small business owners navigate the development review, permitting and inspections process. Smart Start is a municipal application that guides users through each of the major steps of the development process, answering their questions along the way, informing them about regulations and connecting them with resources.

Learn: http://bit.ly/AustinSmartStart
Strategy 3:

Embrace Data-driven Workforce and Development Approaches

Nashville's economic success relies heavily on our workforce. Developing a successful workforce requires ongoing enhancement of the methods we use to gather and analyze information related to our efforts. Tennessee Department of Labor and Workforce Development's five-year State Workforce Strategic Plan recommends that we “use Labor Market Information and other available data to drive decision-making and strategic planning.” The plan further states that “knowing where the jobs are, assessing the needed competencies and skills, and understanding the labor market context, all remain as important as ever for effective job-seeker and business relations programs.”

A key factor of Nashville's success in workforce development is the ongoing effort to fill technology sector jobs. The United States Commerce Department predicts that STEM jobs will continue to drive economic progress through 2018 (Forbes, 2015). Targeted economic and workforce development efforts require continual data collection for feedback and improvements. Using data and analysis, we can improve our local workforce development efforts, as well as recruitment efforts in specific geographical areas to ensure consistent, long-term economic growth across the city.

Strategic Actions

1. Explore new technologies that improve how we match applicants to jobs using job boards, algorithmic matching technologies, online skills assessments, career development portals and online social networks.

2. Use standardized methods such as shift share analysis of industries to determine causes and trends in regional job growth.

3. Create connections between policy, economic development and budget deliberations. Explore processes that will allow us to consider our goals for economic development when we conduct city budget planning.

4. Gather and analyze data on areas of impact, including economic and social, prior to awarding or renewing any incentives.

5. Explore business skills training and mentorship as an important component of rehabilitation of formerly incarcerated people, to equip them with the tools necessary to be successful, including digital literacy.
Creating Career Pathways with Data

In Lancaster County, Pennsylvania, workforce and education planners are applying a career pathway framework, using labor market data to drive long-term employment success. Manufacturing is the leading industry in Lancaster County. By reviewing projections of new and replacement jobs over a 10-year period, planners can identify occupation groupings within the industry, and each grouping can form a career “roadmap”. Using this information, they analyze databases that indicate the levels of knowledge and skills required at various levels of employment. This allows planners to determine what is required to reach entry, intermediate and upper-level categories for each “Production Career Pathway”. These data collections allow planners to assess what percentages of the workforce display skill compatibility with presently-available jobs and jobs that Lancaster County will need to fill over the next ten years.

Strategy 4:
Strengthen Nashville’s Entrepreneurial Spirit and Community

Nashville has a rich history of supporting entrepreneurs, at a consistently higher level than the national average (Livablity.com Top 50 Cities for Entrepreneurs 2016, WalletHub Best Places to Start a Business 2017, Forbes Best Places for Businesses and Careers 2017). Opportunities and resources are plentiful. New ideas are abundant. The framework that connects ideas to resources across Nashville is a critical component for continued success. This framework, if we strengthen it, will extend Nashville’s entrepreneurial training and development initiatives across all ages, genders, races, ethnicities, incomes and locations.

Strategic Actions

1. Explore and adapt programs that pull existing initiatives into a comprehensive platform that allows entrepreneurs to engage with diverse resources and services.

2. Encourage and assist Metro Nashville Public Schools in incorporating business skills across Nashville’s educational curriculum, especially through the Academies of Nashville.

3. Develop programs and partnerships to increase digital entrepreneurship capabilities related to ecommerce and online business opportunities for less traditional entrepreneurs for primary or auxiliary income.
Comprehensive and Customized Entrepreneur Engagement

The folks at Helsinki Business Hub understand that to attract and support entrepreneurship in Helsinki requires a multi-layered approach. HBH aims to foster continued business growth in Helsinki by making sure that the city offers resources to attract and serve entrepreneurs and new businesses. From tailored industry information and custom fact-finding tours to investor introductions and help understanding the business ecosystem, HBH creates a support system to ensure that entrepreneurs have everything they need to succeed – all free of charge.

In order to assure continued growth for Nashville, our community must foster entrepreneurship and innovation to remain competitive in evolving local, national and global economic landscapes. To plan for ongoing economic success, we must encourage collaboration between government, academia and industry, and establish programs that make Nashville an attractive location for existing businesses and for prospective new corporate citizens.
Davidson County’s short and long-term transportation functionality is a critical factor of sustained growth. Giving residents and visitors access to a variety of transportation options will reduce environmental impact caused by driving alone, as well as ease traffic and improve quality of life. According to the April 2014 Multimodal Mobility Study conducted by the Nashville Downtown Partnership, 85% of respondents stated a preference for walking, transit or biking downtown in an ideal mobility environment. Mobile platforms can provide real-time access to information and seamless trip planning between various on-demand and shared mobility options.

Strategic Actions

1. Implement systems, including a web and mobile app for residents and visitors that offers tools for wayfinding and fare payments, and a trip planning/decision making tool that provides information about options for bus, train, bike, walking and shared rides.

2. Use the web and mobile apps for the public to incentivize underused and more efficient modes of transport.

3. Use information provided through these systems to establish a baseline of existing modal options in targeted areas, promote options to users and track progress towards goals.

4. Ensure that the technology support elements including broadband, monitoring devices, traffic control devices and sensors are connected and adaptable, able to communicate in real time and are deployed in alignment with Metro Government plans and in step with regional Intelligent Transportation Systems goals.

5. Develop and set up data resources based on data within Metro Government, such as right-of-way projects and traffic incidents; share these openly to track closures and detours and improve traffic flow.

6. Integrate mobility awareness into curricula of organizations such as Financial Empowerment Center, Habitat for Humanity, college freshman orientations and others.
Customized Transit at Your Fingertips

Go Denver is a travel application for mobile phones that makes available all public and private travel options, allows users to select preferred transport, plan trips, compares results and track trips over time. As the app is used, the application is also designed to gather insights based on user preferences and activities in order to improve Denver’s transportation over time and better serve citizens.

Strategy 6:

Expand and Prioritize Advanced Vehicle Technologies

Traffic congestion still costs the average Nashville driver 45 hours a year on the road (Annual Urban Mobility Scorecard, Texas A&M, 2016), and Nashville drivers lose $1,632 each year due to traffic in the form of congestion-related delays, vehicle operating costs and car crashes (TRIP Report, Tennessee Transportation by the Numbers, 2016). The key to expanding the use of available alternatives to driving is coordination of technology with expansion of multimodal infrastructure, especially around higher density growth centers, and particularly to support future incorporation of autonomous vehicles. Nashville’s nMotion plan and other recommended projects, services, and infrastructure are aligned to reduce drive-alone trips by incorporating technology.

Strategic Actions

1. Continue to work with state-level agencies and policymakers to establish safety and registration policies for the manufacturing, testing and operation of connected and autonomous vehicles.

2. Work with automotive and technology industry leaders to test connected and autonomous vehicles traveling in urban contexts on fixed routes.

3. Explore prioritization of connected and autonomous vehicles that are fleet/shared ownership, electric, fully automated and, for passenger vehicles, shared by multiple passengers.

4. Evaluate the potential impacts of connected and autonomous vehicles on traffic and travel by modeling, parking, right-of-way allocation and management, and development impacts.

5. Plan for and pilot right-of-way technology that anticipates the communications and navigational needs of connected and autonomous vehicles.

6. Establish partnership with fixed-line transit with first mile/last mile connection via autonomous vehicles.
Pittsburgh: Driving the Future of Autonomous Vehicles

The city of Pittsburgh serves as a decades-long case study for autonomous vehicle (AV) integration. As early as the mid-1980s, scientists at Carnegie Mellon University were constructing self-driving cars from parts of other vehicles. In a 1989 CMU publication entitled ALVINN, An Autonomous Land Vehicle in a Neural Network, Dean Pomerleau, a computer science professor at CMU describes a self-driving unit developed as part of military-funded research. Today, Pittsburgh is the home of autonomous vehicle start-ups such as Aurora Innovation. Both Ford and Volvo have premiered their AVs in pilot programs in Pittsburgh. Most recently, in May of 2017, Carnegie Robotics announced a collaboration with Swift Navigation (a company out of San Francisco, a city matched only by Pittsburgh in its AV leadership) to develop cutting-edge GPS technology for autonomous vehicles.

Strategy 7: Enhance Parking Experience

Downtown Nashville and its immediate surrounding areas host a variety of events such as sporting events, concerts, festivals and conventions. The capacity of Bridgestone Arena alone is 20,000 people, not to mention the 69,000-person capacity of Nissan Stadium. With a single sold-out venue, much less situations like this summer’s simultaneous Stanley Cup playoff games and CMA Music Festival, downtown parking can be perceived as extremely limited. Part of the challenge is building awareness of available parking locations. Other challenges include lack of integrated resources, an imbalance between supply and demand, and zoning codes that can sometimes affect targets and inventory. A combined approach using technologies and policies can optimize the availability, productivity and connectivity of parking to support a comprehensive mobility system.

**Strategic Actions**

1. Plan and implement a pilot of smart and connected parking meters/spaces that allow for centralized management, smartphone payment, dynamic pricing and other features to assist the public in finding parking and Metro in managing the availability of parking.

2. With broad adoption of demand-based and progressive pricing, set targets for the number of blocks downtown that are between 60%-80% occupancy.

3. Link multimodal transit apps and systems to satellite parking/park-n-ride around urban core and activity centers.

4. Remove parking minimums in areas identified for growth in NashvilleNext, measuring inventory of parking supplied by code vs. by market.

5. Update zoning code to remove parking minimums and explore parking maximum targets for growth areas.
San Francisco’s Smart Parking Solution

With demand-responsive availability and pricing, SFpark utilizes garages and meters in a platform using an open data and source code to manage parking in San Francisco’s busiest areas. Sensors monitor patterns and state of the art meters feature expanded payment options for users. In addition to the parking information map available on the SFpark.org homepage, information on parking availability is distributed via a free SFpark iPhone app, Android app, and the region’s 511 phone system.

Strategy 8: Enhance Transportation Corridors

Historically, Metro Nashville’s streets and transportation infrastructure have been developed to ensure speedy and safe transit for automobiles to the detriment of walkers, bikers and public transportation riders (TDOT History, ©Tennessee Department of Transportation). As an element of developing opportunities for citizens to use all transit options, creating new and updating existing physical infrastructure that has smart technology incorporated from the beginning has been shown to support a successful multimodal transportation system (Transportation in the Digital Age: Disruptive Trends for Smart Mobility, Deloitte, March 2015).

Strategic Actions

1. Use data to establish baseline for performance along key corridors and between growth centers.

2. Implement guidelines for making transportation system decisions according to priority placed on increasing technology and infrastructure to support the following ordered list: 1) walking, bicycling, transit, 2) fleets of electric, fully automated, multiple passenger vehicles, 3) other shared vehicles, 4) vehicles used to deliver goods and freight and 5) low or no occupancy vehicles.

3. Establish zoning regulations that promote mixed-use infill and transit-oriented development and deemphasize zoning requirements centered on automobiles, such as removing parking minimums.

4. Promote flex lanes to strategically re-purpose right-of-way for traffic flow, transit, deliveries and other modes of mobility or activity, such as during one of Nashville’s many special events.

5. Incorporate features in existing or new mobile apps and web-based interfaces that promote incentives and alternatives to driving alone.

6. Incorporate into a web and mobile app the means to simplify and promote the MTA EasyRide corporate commuter benefits partnership program, as well as B-cycle memberships for business.

7. Enhance built environment along corridors with hardware that interacts in real time with all modes of travel; include feedback from low-cost sensors in landscaping and smart LED street lights.

8. Extend the traffic signal timing system and traffic management system beyond current extent to additional corridors and secondary streets.

9. Pilot use of and deploy traffic flow sensors that can contribute to traffic flow and cycle traffic lights dependent upon the situation.

10. Create parking districts in priority growth areas with revenues reinvested locally to support enhanced streetscaping and beautification efforts.
Creating and Connecting Diverse, Transit-friendly Communities

The Indianapolis Smart Corridors initiative includes automation of bus rapid transit (BRT) & car share routes, intelligent infrastructure & Intelligent Traffic Systems (ITS) and real-time data & dynamic modeling to manage travel demand. The City of Indianapolis has established a set of Multimodal Corridor and Public Space Design Guidelines that guide planning focused on using technology to support all modes of transportation, with seamless transitions from one mode to another.

Nurturing a smart community is not just about applied technology. It’s about using technology to make sure that 21st century education is inclusive, available to people at every stage of life, and centered on skills that are applicable to today’s tech-driven job market. It’s about embracing differences and learning from them. Fostering a society of smart people is about preparing Nashvillians to connect with a fast-paced global community in ways that are creative, meaningful and successful.
Strategy 9:
Reduce the Social Isolation of Learning Communities

Nashville can enhance individual empowerment, social inclusion, economic development, cultural prosperity and sustainable development by building what UNESCO terms a “learning city”. A learning city mobilizes its resources in all sectors to promote inclusive learning at all levels, revitalizes learning in families and communities, facilitates learning for and in the workplace, extends the use of modern learning technologies, enhances quality in learning and fosters a culture of lifelong learning.

Metro has worked to connect K-12 learning environments, as demonstrated by the many local partnerships with Metro Nashville Public Schools. A learning city also requires the unification of institutions providing education beyond K-12 into postsecondary, community college, university and technical training environments, and organizations operating in various sectors to reach people at all stages of life.

Strategic Actions
1. Align businesses, nonprofits, colleges, civic leaders, parents, faith communities, community organizations, and resources to reduce the social isolation of Nashville learning communities to support Nashville’s educational, digital equity, and career-oriented objectives. This will positively affect the talent pipeline and the success of our community as a whole.

2. Host citywide and global learning opportunities that bring diverse communities together.

3. Work within the community to develop and provide an online portal that aligns businesses, nonprofits, colleges, civic leaders, parents, faith communities, and community organizations to support learning.
A Smart Community - The Learning City Model

As applied in Bristol, the UK’s first learning City, UNESCO’s Global Network of Learning Cities (GNLC) is an international network focused on policies and strategies to support cities who promote lifelong learning in economically, socially, culturally and environmentally sustainable communities. Using modern technology and best practices, a learning city facilitates learning both inside and outside of the classroom, for and in the workplace, and within the family and community. Commitment at the local level is critical to successfully execute future-ready solutions. The Learning City model seeks to empower citizens with the knowledge to build a city that is sustainable, technologically advanced and inclusive.

Learn: http://bristollearningcity.com/
Strategy 10:

Develop STEM, Computational Thinking, and Problem Solving Skills

In March of 2017, Forbes Magazine published an article titled The Cities Creating The Most Tech Jobs 2017. Nashville ranked number 7 out of the 16 featured cities with a whopping 75% growth in tech-sector jobs within a 10-year period, from 2006-2016. The boom in tech-related jobs requires a re-engineering of how Metro educates K-12 students in school and out of school, especially as it relates to empowering female students and students from underrepresented communities (e.g. gender, race/ethnicity, immigrant/refugee communities, and differently abled) to pursue tech careers.

Strategic Actions

1. Train both teachers and education-based non-profit instructors in computational thinking and design thinking.

2. Given Metro Nashville Public Schools’ focus on literacy, align literacy standards with computer science standards to help teachers align both mandates.

3. Align assessments of STEM with literacy standards to help inform instruction and alignment of district priorities.

4. Map all existing in school and out of school STEM, media, arts, humanities and computational thinking trainings, and opportunities for youth in Davidson County to identify location, cost, timeframe, gaps and scale.

5. Build on Opportunity Now and MNPS data to track students’ STEM-related trajectories.

6. Develop free summer opportunities for students K-12 to enroll in STEM, media, arts, humanities and computational thinking programs, with special emphasis on scaling and creating programming for elementary students in order to ensure that older siblings can also enroll in tech-related summer experiences.

7. Create intentional tech programs that empower students from underrepresented communities (e.g. gender, race/ethnicity, immigrant/refugee communities, and differently abled) and diverse language communities. Collaborate with local colleges and universities that have National Science Foundation (NSF) Broadening Participation grants and TRIO grants to help fund tech inclusion programs for underrepresented communities.

8. Increase transportation options (e.g. Strive, mobile units, etc.) for students to attend STEM, media, arts, humanities and computational thinking programs throughout the week.
Cultivating STEM-Centered Success in Education

Through workshops, networking and recruitment, STEMteachersNYC is building a community of teachers committed to cultivating educational success in science technology, engineering and math fields. They offer year-round training in the form of workshops using the Modeling Instruction methodology to over 750 teachers in New York City. Between 2011 and 2017, the organization delivered 120 workshops.

Strategy 11:

Develop an Adaptable Workforce to Meet the Changing Needs of Business

The rapid development of technology has transformed the world of business. Nashville Technology Council (NTC) estimates that as of 2016, 1,600 tech jobs go unfilled annually in Middle Tennessee. Innovative and thoughtful action is required to develop the educational pathways and pipelines for the jobs of the future in Nashville. To help with this strategy, Governor Bill Haslam has put forth an ambitious goal of having 55% of Tennessee residents earn a post-secondary credential by the year 2025. Metro Nashville can assist in this effort by scaling current practices and building new pipelines of workers.

Strategic Actions

1. Provide students of all ages opportunities to increase their hard and soft skills through both experiences, access to tools, and support in career growth. Develop cultural, civic and commercial innovation centers around Nashville to build products and solve city issues.

2. Increase access to the breadth and depth of postsecondary information and the support to make that information actionable.

3. Develop a cross-city university/college/trade consortium to work together to align post-secondary options and opportunities for students and nontraditional students especially those from underrepresented communities in post-secondary programs.

4. Develop cultural, civic, and commercial innovation centers around Nashville to build products, solve city issues, and promote commerce.
Mayor Megan Barry’s Opportunity Now Program

Opportunity NOW is a coordinated initiative launched by Mayor Megan Barry to provide young people in Davidson County access to employment. In Nashville, we have seen fewer and fewer teenagers and young adults working during the summers and after-school. At the same time, Nashville employers across various industries are concerned about the lack of “soft” skills among their youngest employees—skills most readily learned through actual work experience. In its first summer, 2017, over ten thousand youth between the ages of 14 and 24 were connected to internship positions.

Strategy 12:

Increase Digital Literacy and Innovation Capacity

According to the Metro Nashville Public Schools’ BrightBytes survey produced in 2016, 16% of students are without a home computer, laptop or tablet while 10% are without home internet connectivity. The 2015 Metro Social Services Community Needs Evaluation estimated that 75,720 people in Davidson County did not have internet access. These Nashvillians, regardless of socioeconomic status, physical disability, language, race, gender, or any other characteristics that have been linked with unequal treatment, need assistance to enter the digital age.

This is further complicated by digital readiness, a person’s likelihood to succeed or struggle when they use technology to navigate their environment, solve problems and make decisions, and by the digital divide, which greatly affects underrepresented communities.

Strategic Actions

1. Encourage collaboration throughout Nashville by connecting existing organizations serving the community to strengthen technology adoption and digital empowerment.

2. Create solutions that will be sought and shared to enable people with disabilities, seniors and those who need some form of accommodation to more easily use a computer and access the Internet.

3. Work with community partners to create and execute an asset and deficit mapping process of digital inclusion in the city. This may take the form of a survey, as is performed every three years in Austin, Texas.

4. Develop a committee composed of Metro Nashville Public School tech leaders to help align in school and out of school tech trainings and opportunities for MNPS students and families.

5. Create enhanced digital literacy programs that go beyond the basics to develop and support programs that enrich users’ experiences and enable people to move from novice to expert users, and for some to become digital innovators or professionals. Some cities are developing innovation hubs and citizen user testing groups (CUT) to build solutions to social problems in the city.

6. Create and develop programs providing access to affordable, available and sufficient devices and technical support. This includes partnering with local businesses on WiFi access for learning, seeking mobile hotspot programs and/or affordable LTE, increasing assistive tech (to help those with different abilities) at community sites, and increasing support for device ownership programs.

7. Develop trainings on the city’s web portals to empower Nashville residents with information about their communities.

8. Create resources to be integrated into all programs to encourage people to use the Internet responsibly while protecting their digital privacy and security. Parents and other caregivers will be provided training and resources so that they can actively guide their children’s online activities and protect their children’s digital safety.
Breaking Barriers to Digital Inclusion

Tech Goes Home (TGH) is a Boston-based organization whose goal is to directly deal with common barriers to technology adoption – a device, connection to the internet, and training that makes technology relevant to the recipient. TGH also understands that lack of availability is not the only challenge that people from traditionally excluded groups face when it comes to the digital divide. Their multi-layered approach tackles challenges at the school, home and community levels to ensure that the digitally excluded in underrepresented communities not only have access to tools and skills they need, but that they also have the opportunity to thrive as part of a supportive ecosystem.

Smart living represents a holistic approach to responsible management of the various elements of Nashville life. Promoting our culture, wise use of resources and ready access to affordable housing are all part of making Nashville a great place to live. Keeping Nashville a safe, happy and culturally vibrant city means taking care of both visitors and residents. A livable city is one that uses technology to gather, use and disseminate information on factors that affect the happiness of its residents while recognizing and respecting personal privacy.
Strategy 13:

Develop a Tool/Resource to Assist Residents in Accessing Affordable Housing Options in the City

There are many programs aimed at making housing more attainable for more people. However, even with the variety of programs that exist, a lack of cohesiveness results in a lack of knowledge about the variety of options that fall under the affordable housing umbrella. The additional challenge is that home inventory turnover in Nashville is quicker than the national average, and quickly rising rental costs can make the housing search cost-prohibitive. According to The Tennessean’s analysis of data gathered by the Associated Press, Nashville home inventory is down 66% since 2012. Zillow reports that Nashville’s average rental price is $130 per month higher than the national average. With for-sale homes filling quickly and rental units in high demand, residents seeking affordable housing need a resource that allows them to keep pace with local real estate movements. Current and potential residents will benefit from a single point of information about opportunities to find high quality, affordable, safe and attainable housing options in Davidson County. Additionally, a larger audience could benefit from a resource that helps illustrate what the picture of affordable housing currently looks like, and could look like, for Nashville.

Strategic Actions

1. Investigate and organize the publicly available information/datasets that are currently available from non-profit and government sources, and assimilate the data into a GIS-based mapping system. This would include the identification and potential development of key missing or needed data.

2. Create a housing navigation system providing housing types, availability and qualifications, including mapping and visualization tools.
Affordable Housing Made Accessible

Offered by the Department of Housing Preservation and Development and Housing Development Corporation (not NYC directly), NYC Housing Connect gives users the opportunity to learn about, search for and apply for affordable housing across the city. NYC Housing Connect works with private real estate professionals and community sponsors to promote and fill affordable housing opportunities.

Strategy 14:

Implement Proactive Tourism and Crowd Management

Nashville has long been known as one of the nation’s most vibrant tourist destinations, and is poised to continue that momentum into the near future. According to the Nashville Convention & Visitors Corp., Nashville attracts over 13 million visitors every year. Planning for crowds, monitoring crowds and managing crowds are essential elements of a smart and connected city. Nashville has the opportunity to use technology to enhance the tourism experience for visitors and provide more efficient crowd management tools for city management.

Strategic Actions

1. Pilot freestanding, internet-connected public information kiosks in high-traffic tourist areas. These can provide wayfinding, interactive information on nearby sites and amenities, free WiFi and device charging. Costs may be offset with cooperative marketing agreements.

2. Expand Metro’s public WiFi network to engage more community sites, particularly with additional coverage at Metro Parks locations.

3. Explore utilizing Music City Center’s wayfinding application at Nashville International Airport to provide personalized directions to airline passengers as soon as they exit their planes.

4. Explore technologies and conduct a pilot to offer location-based mobile phone messaging to residents and visitors in a geographic area.
Linking Citizens to the Benefits of Digital Access

LinkNYC is a service that offers kiosks across the city with free WiFi, device charging and phone calls. The kiosks include tablets that provide access to information about city services, maps and directions. All of this is free for users, because the kiosks and services are paid for by advertisers who display their marketing on the kiosks. The network is designed to utilize feedback from citizens to make improvements continuously over time.

The natural conditions that exist in Nashville, if we properly nurture and maintain them, support and benefit our daily lives. Smart environment is about active engagement in protecting the resources that drew people to Middle Tennessee. It includes maximizing the efficiency of our energy use while decreasing the total amount of energy we consume. Green buildings use technologies to monitor how our day-to-day lives positively or negatively affect our environment. Real-time monitoring and analysis of air quality, greenhouse gas emissions and water cleanliness can improve how we manage our resources and help us to make choices that improve the health and well-being of our communities for ourselves and our children.
Strategy 15:

Embrace Green Building and Energy Efficiency

The Mayor’s Livable Nashville Committee has set forth recommendations to use green building practices to positively impact our city’s livability. According to Nashville-Davidson County Greenhouse Gas Emissions inventories, as of 2014, commercial properties make up 27% of Nashville’s Greenhouse Gas Emissions. Enhancing the resource efficiency of new and existing buildings will facilitate decreases in annual energy use, water use, greenhouse gas emissions and storm water runoff for existing Metro Government and Nashville buildings, make utility bills more affordable for lower-income Nashville residents, and reduce the annual energy consumption of both government and commercial buildings sectors.

Strategic Actions

1. Continue to research and pursue technologies related to construction and management of a Net Zero building, which is a building with zero net energy consumption, meaning the total amount of energy used by the building on an annual basis is roughly equal to the amount of renewable energy created on the site.

2. Expand the implementation of building automation systems across multiple Metro agencies to increase the capabilities and efficiencies of Metro Government to gather data from energy, waste and water systems. This data may be used to pro-actively manage those subsystems in real-time, as in many cases changes to building automation systems can happen immediately.

3. Implement a robust energy tracking and building performance platform across multiple Metro agencies that would provide interactive, real-time visualization tools, such as dashboards, that allow Metro Government leadership to review and manage building systems for Metro’s building portfolio and assist in reaching building benchmark goals.

4. Encourage utilities providers to implement customer-side Advanced Metering Infrastructure, which will provide customers with access to real-time energy usage data.
On the Cutting Edge of Technology and Sustainability

There is no better example of a sustainable building than The Edge in Amsterdam, a connected and autonomous building with an app that gathers and updates user preferences. Also the greenest building in the world, the Edge boasts the highest sustainability score ever awarded: 98.4 percent.

Strategy 16:
Protect Our Natural Resources

Nashville continues to make great efforts to support our exponential growth in city infrastructure and people. To ensure sustainable growth, we must place equal importance on the preservation of the county's natural resources. Metro Nashville boasts over 12,000 acres of open space, including 108 Parks and 19 Greenways. Maintaining and conserving open space, increasing tree canopy cover, and improving the city’s compliance with the Clean Water Act and Clean Air Act will ensure that Nashvillians have clean air, clean water and greenspace now and for future generations.

Strategic Actions

1. Explore and pilot connected sensors across Davidson County to gauge air quality and to allow for review and consolidation of air quality indicators across multiple Metro communities and sites of specific interest.

2. Explore and pilot connected sensors across Davidson County in the Cumberland River and other sites of specific interest to gauge water quality and to allow for review and consolidation of water quality indicators across multiple Metro water features.

3. Support an urban tree canopy inventory through development of a site that will allow for mapping of Davidson County’s trees and make that data available openly for public use.
Vermont’s Smart Solution to Expanding the Urban Tree Canopy

Vermont Urban and Community Forestry is utilizing technology and data to assess, protect and expand tree canopy in various areas statewide. Part of a comprehensive digital resource hub, their Tree Canopy Assessments are a critical part of the organization’s Green Infrastructure Plan. Using both GIS imagery and photo interpretation, the organization offers tools to conduct assessments and provide metrics using simple visualizations.

Smart Governance

Governance is a shared responsibility between the Metro Government and the community. Together we can build a strong, sustainable, smart and connected infrastructure, which comprises the technological, structural and community resources needed to support and enhance living. It is the responsibility of the government to be transparent and responsive to its citizens, and civic engagement is the responsibility of the community. Smart governance facilitates civic engagement by using technology to understand community priorities and to align the direction of technology-based solutions across Metro’s departments and agencies.
Strategy 17: Enhance Civic Engagement Infrastructure

Nashville's residents and visitors expect to interact with their networks through digitally-enabling technologies such as the web, mobile apps, texting, and various types of social media. Meanwhile, Metro's population mix continues to become a more diverse, multi-cultural environment as Nashville grows rapidly. To engage our public now and in the future, Metro departments and agencies must likewise use a variety of communications channels, in the modes and languages used by our residents. Developing a modern and consistent set of tools for civic engagement will increase awareness of Metro Government's services and enhance transparency. Over time, it will also improve accountability as Metro departments and agencies understand the true demand and types of services necessary and respond to those needs.

Strategic Actions

1. Explore and implement a Digital/Mobile First executive order that demands that for all new services supported by technology and upon the upgrade/replacement of technology solutions, the new technologies shall be implemented with a goal of allowing constituents to use those technologies online or via mobile app as a primary means.

2. Continue implementation of hubNashville, a community response management system planned for release in the third quarter of 2017, which will provide residents and visitors the opportunity to contact Metro Government through various channels, get access to services and report problems, and then track the status of those reported issues toward resolution.

3. Explore and implement a tool whereby authorized government public safety officials can access a voice/text communications system that can reach mobile and landline phones within specified geographic areas to alert phone holders of disasters or threats to safety.

4. Foster and promote the development of relevant, multi-language Internet content and online services such as multilingual web portals, community based web sites, content development training programs, and new collaborations across Nashville communities.

5. Pilot the broadcast of Metro’s public, educational and government (PEG) television channels providing access to Metro Government video content to be simulcast in multiple languages.

6. Investigate and pilot existing and potential mechanisms by which departments and agencies can gather feedback from residents on key issues including legislation, budgets, and proposals that may then be used to enhance decision-making.

7. Pilot methods by which Metro Government public meetings may be conducted virtually online in an authenticated and trusted method using video, and remain in accordance with state open records and other relevant laws and regulation.
hubNashville: One-stop Citizen Service Experience

hubNashville is Nashville’s 311 service, scheduled to launch in late August, 2017. hubNashville is a way to provide citizens with one-stop service and access to multiple departments at once time. Through hub, citizens can call, text or email Nashville 311, submit service requests, track those requests and receive follow-up on actions taken to resolve those requests. hubNashville eliminates the need to go through multiple channels to access city services.

Strategy 18:

Expand Communications Infrastructure

Wired and wireless Information and Communications Technologies (ICTs) form the backbone of Metro Government’s communications infrastructure, including access to the Internet. Many smart city technologies rely on continuous flow of voluminous data to optimize systems, service delivery or real-time reporting. Slow, intermittent or unavailable connectivity places undue limits on smart city applications and services. Metro has historically relied upon outside vendors for these services, including a far-flung leased fiber optic cable backbone for operations. As new communications technologies develop, Metro must be able to provide a coherent, stable, robust and scalable ICT network upon which to pilot and adopt those technologies to be prepared for when and how Metro operations and services begin to require them.

Strategic Actions

1. Using the Broadband Plan developed by Metro Government as a guide, design and deploy extension of the current Metro-owned fiber infrastructure to support current and potential infrastructure projects.

2. Pilot a conversion of standard street lighting to smart and connected LED-based street lighting to explore Metro network opportunities to integrate sensors to provide WiFi mesh and operational and data support of other Metro programs, in addition to reducing energy consumption.

3. Partner with Vanderbilt and other universities to join USIgnite and establish a 100 gigabit internet pipe that will enable opportunities for development of a community application ecosystem that explores and utilizes the possibilities of massive bandwidth.

4. Explore opportunities to expand the existing Metro Public WiFi footprint to incorporate additional Metro government locations to include more and broader Metro parks coverage, at housing authority facilities, and all Metro customer service sites beyond those presently served.
An Oasis of Integrated, Smart Technologies

Dubai Silicon Oasis is a smart community, part of whose strategy as an early adopter of technology services, is to become one of the first integrated communities in the region, utilizes smart LED street lights that can utilize lower levels of power when people are not present, provide feedback on environmental conditions and relay safety warnings.

Strategy 19: Continue to Develop a Robust Data Infrastructure

Access to detailed, real-time information empowers people, and the systems that support them, to meet their goals. A city’s operational systems and the activities of its inhabitants generate astonishing quantities of data. This data is captured by an increasingly wide array of sensors and control systems. To derive meaning and benefit from this data, Metro must be able to move it across a robust, secure telecommunications infrastructure. The supporting data architecture should promote and support collaboration through consolidation, storage, analysis, reporting, security management and visualization of data in an aggregated, accessible, and transparent manner. This data infrastructure will facilitate computing, optimization, and predictive modeling and provide real-time management alternatives, advice, and solutions to the continual challenges facing our growing smart Metro.

Strategic Actions

1. Pilot a data aggregation platform that will allow Metro to aggregate, store and organize data from multiple, disparate governmental systems for use by Metro Government and partners.

2. Continue to develop and promote the Metro Open Data program by engaging more departments and agencies and continuing to publish additional data sets.

3. Perform a proof-of-concept open data platform that allows for cities and counties within the Metro Planning Organization to standardize and contribute open datasets to a regional open data platform.

4. Pilot, with a data aggregation platform, a system that will allow for large-scale analysis of aggregated data collected from across multiple platforms.

5. Develop a visualization platform will allow the community as well as data analysts to work with multiple data sets, and present reports and dashboards of findings.

6. Drive a data-driven culture within Metro Government through ongoing training, including development of a Metro Data Academy associated with the Open Data program.

7. Investigate community training for and pilot the use within Metro Government of blockchain technology as a potential foundational technology.
Open. Friendly. Smart.

The City of Mesa has developed a robust and user-friendly open data portal that makes data more accessible to the public by presenting data, as a rule, in visual formats whenever possible, in addition to the machine-readable versions. The portal also highlights data related to city priorities (transform neighborhoods, community safety, workforce development, sustainable economy and placemaking). Users are given the option to search for data sets, or they may use site suggestions for datasets related to their selected items. The city also provides access to data submitted by external agencies.

Smart Cities drive technology solutions using not only the data created by human hands, but also through the inputs from and readings of an array of sensor types, that can capture points in time continuously. When technology solutions are deployed in combination with a communications infrastructure that can transport readings, the ‘Internet of Things’ or IoT is the broad term for these connected technologies. These datapoints in time may then be analyzed and acted upon in aggregate and in combination with other data.

**Strategic Actions**

1. Investigate and pilot test sensor network to monitor connected air and watershed water quality at both movable and key fixed sites across Davidson County.

2. Continue to develop and expand Metro’s existing safety camera network to incorporate more critical human and vehicle traffic sites.

3. Pilot a program around using Metro’s safety camera infrastructure as counting tools for vehicles and pedestrians.

4. Continue to expand the availability for Metro Nashville Police Department to access and incorporate existing safety cameras from government, academic and private organizations.

5. Pilot a program to use a localized beacon network to provide for localized communications for tourists during special events and emergency activations.
A Smarter, Greener Vision

In what was a feature program in the White House 2014 Smart America Challenge, San Jose entered a six-month pilot with Intel to design and install sensors throughout the city to increase transportation efficiency and improve air and water quality. This was part of San Jose's Green Vision, a 15-year plan for sustainability developed in 2007.

Strategy 21:  
Develop Smart City Infrastructure

Meeting community goals using technology is not just about the technical tools that address community issues and meet community goals. There is an array of structural processes that have emerged in smart cities globally, which speed and facilitate adoption of solutions. Key among these is the concept of governance, which is a methodology that defines the responsibilities, accountabilities and processes for designing and executing smart city objectives.

**Strategic Actions**

1. Review the smart city governance models of other cities, and devise a Metro Government-centered governance structure to coordinate, collaborate, manage and audit the direction of smart city initiatives.

2. Adopt the recommendations of the Connected Nashville Technical Standards committee regarding Analytics, Interoperability, Security, and Infrastructure standards as common practice for Metro IT systems procurements and development.

3. Continue to develop the Information Security Management program mandated by Mayor Barry’s Executive Order #34 and directed by Metro’s Chief Information Security Officer to manage the current technology environment as well as the radically connected environment envisioned through the use of smart city technologies.

4. Form a working group of department heads and interested members of the public to investigate the implications of privacy for Metro Government and its residents in a connected and data driven world, and propose actions and policy to address as findings dictate.

5. Establish one or more test beds in the Metro Government right-of-way and/or on Metro property to allow for centralized, real-world testing of technologies by university partners and potential vendors, with the active participation of Metro departments and agencies.

6. Develop public-private partnerships and leverage these to establish a Smart City technology demonstration lab within a central Metro Government facility that will allow elected officials, department and agency executives, Metro staff and vendors, as well as members of the public to see smart city technologies in action and to understand their impact on Metro operations.

7. Embrace Metro Government’s annual Public Investment Plan (PIP) process, which provides Metro departments and agencies, along with partners inside and outside of Metro Government, the opportunity to present innovative ideas in a “shark tank”-like process and receive funding through Metro’s annual budget.

8. Investigate innovative methods of expediting, testing and exploring proofs of concepts for smart city technologies by forming a working group of interested small businesses, focused on potential technology partners, to benchmark peer cities and create recommendations for Metro.

9. Explore the work done in other peer and larger cities who have sought to expedite and enhance the procurement process through a Public Private Partnership Office.
Building a Template for Smart City Solutions

City Innovate Foundation’s purpose is to tackle city challenges with the use of data and technology, in a process that develops, tests, and shares potential solutions. The organization’s goal is to “codify, share, and scale best practices in innovation and technology as they are developed in leading cities and government agencies across the world”.

## Glossary

<table>
<thead>
<tr>
<th>Word/Phrase</th>
<th>Comment/Definition</th>
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<tbody>
<tr>
<td>Accelerator programs</td>
<td>Accelerator programs support new business owners with short term funding, mentoring and in-depth coaching from experienced members of the business community.</td>
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<tr>
<td>B-cycle</td>
<td>A fee-based bike share initiative operated by the Nashville Downtown Partnership, a nonprofit management organization.</td>
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<td>Blockchain</td>
<td>A type of technology using a distributed digital ledger (digital record) that keeps records of digital transactions and displays them publicly and chronologically.</td>
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<tr>
<td>Cooperative marketing</td>
<td>Cooperative marketing is a form of commercial resource sharing. It allows two entities to share the cost of, and platform for, promoting a product or service, and both entities benefit from the results. An example would be WiFi sponsored by one company as part of an event where another company offers music downloads.</td>
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<tr>
<td>Data discovery</td>
<td>A process of gathering data from various systems, and then analyzing that data to discover any existing trends or patterns.</td>
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<td>Data visualization</td>
<td>Putting data into a visual context can make it easier to understand. A pie chart or bar graph is an example of a data visualization tool that helps us easily identify patterns or trends.</td>
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<tr>
<td>Data-driven</td>
<td>Focused on, determined by or dependent upon the collection or analysis of data.</td>
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<td>Day of Digital Inclusion</td>
<td>An online Twitter Town Hall to address the impact that digital access and skills can have on society, families and individuals, hosted by NDIA (National Digital Inclusion Alliance), along with partners and affiliates from around the country.</td>
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<tr>
<td>EasyRide</td>
<td>An MTA/RTA commuter program that offers complimentary use of for the use of fixed route buses, select Relax &amp; Ride (R&amp;R) regional buses, and Music City Star regional rail services.</td>
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<tr>
<td>Flex lanes</td>
<td>Flex lanes are a method to manage traffic congestion. A flex lane allows traffic to travel in either direction, depending on traffic conditions. Traffic signals are used to let drivers know whether a lane is open or closed, and whether to use it for driving or turning.</td>
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<tr>
<td>GIS</td>
<td>A geographic information system or geographical information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.</td>
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<tr>
<td>Green Buildings</td>
<td>A green building is one whose building process and structure alike are resource-efficient and responsible.</td>
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<td>HIT</td>
<td>Acronym for Healthcare Information Technology.</td>
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<td>Hour of Code</td>
<td>A global movement by Computer Science Education Week and Code.org, reaching tens of millions of students in 180+ countries through a one-hour introduction to computer science and computer programming.</td>
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<tr>
<td><strong>ICT</strong></td>
<td>Acronym for <strong>Information and Communications Technology</strong>.</td>
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<tr>
<td><strong>Infrastructure</strong></td>
<td>The basic physical, technological and organizational structures and facilities (e.g., buildings, roads, power supplies, computing and communications capabilities) needed for the operation of a society or enterprise.</td>
</tr>
<tr>
<td><strong>Intelligent Transportation System</strong></td>
<td>Intelligent transportation systems are systems that use information and communication to monitor and improve transportation and allow safer, more connected use of various modes of transportation.</td>
</tr>
<tr>
<td><strong>KILL-A-Watt</strong></td>
<td>A device used to detect ‘phantom’ electricity use, which amounts to electricity expenditure that is wasted.</td>
</tr>
<tr>
<td><strong>LinkNYC</strong></td>
<td>LinkNYC is a communications network that delivers gigabyte free public WiFi to millions of New Yorkers, small businesses, and visitors through free-standing, ad-supported kiosks across the 5 boroughs.</td>
</tr>
<tr>
<td><strong>LTE</strong></td>
<td>Acronym for <strong>Long-Term Evolution</strong> - a standard for high-speed wireless communication for mobile phones and data terminals.</td>
</tr>
<tr>
<td><strong>Mobility</strong></td>
<td>The quality or state of being mobile. In this context, we refer to mobility as how people move around the city using various modes of transportation (walking, biking, ride share, etc.).</td>
</tr>
<tr>
<td><strong>Modal</strong></td>
<td>In the context of the definition above, “modal” is of or pertaining to a mode of transportation.</td>
</tr>
<tr>
<td><strong>MPO</strong></td>
<td>Acronym for <strong>Metropolitan Planning Organization</strong> - representatives from local, state, and federal government agencies that are responsible for planning and prioritizing projects for federal funds.</td>
</tr>
<tr>
<td><strong>MTA</strong></td>
<td>Metropolitan Transit Authority, the public transportation agency serving Nashville and Davidson County.</td>
</tr>
<tr>
<td><strong>Multimodal</strong></td>
<td>In the context of “mobility,” multimodal refers to a transportation plan that integrates multiple modes of transportation (e.g. walking, biking, public transport and autonomous and connected vehicles).</td>
</tr>
<tr>
<td><strong>NashvilleNext</strong></td>
<td>NashvilleNext is the 2-year long plan for Nashville’s future, released in 2015 and intended to guide growth, development, and preservation in our city over the next 25 years.</td>
</tr>
<tr>
<td><strong>Nashville Reads</strong></td>
<td>Nashville Public Library’s citywide book club where everyone in Nashville is encouraged to read the same book at the same time.</td>
</tr>
<tr>
<td><strong>nMotion</strong></td>
<td>Released in 2016, Nashville MTA/RTA’s Strategic Plan, a 25-year comprehensive plan designed to meet the Nashville area’s vision for transit.</td>
</tr>
<tr>
<td><strong>Opportunity Now</strong></td>
<td>Opportunity NOW is a coordinated initiative launched by Mayor Megan Barry to improve access for young people in Davidson County to employment and on-the-job skills training.</td>
</tr>
<tr>
<td><strong>Parking minimums</strong></td>
<td>Zoning regulations that require a developer to build a minimum number of parking spaces per unit, depending on the area. This has potential to lead to overbuilding, displacement of ground-level retailers or wasted space.</td>
</tr>
</tbody>
</table>
## Glossary (con’t)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PEG Channels</strong></td>
<td>Public, Educational, and Governmental Channels - channels that provide essential local programming not provided by other media.</td>
</tr>
<tr>
<td><strong>Right-of-way</strong></td>
<td>The strip of land over which facilities such as roads, sewers, streetlights, etc are built.</td>
</tr>
<tr>
<td><strong>Shift share analysis</strong></td>
<td>A determinant of the portion of economic growth or decline that can be attributed to regional factors, national factors, economic industry, etc.</td>
</tr>
<tr>
<td><strong>STEM</strong></td>
<td>Science, technology, engineering, and mathematics.</td>
</tr>
<tr>
<td><strong>Streetscaping</strong></td>
<td>Streetscaping refers to the design quality of a street, and includes both natural and built elements that contribute to the street's aesthetic value.</td>
</tr>
<tr>
<td><strong>Transfer contract</strong></td>
<td>A legally binding document that governs the transfer of technology and licenses from its place or group of origin (such as a university) to wider distribution to people and places outside of the organization (such as to a hospital or business).</td>
</tr>
<tr>
<td><strong>Transportation modes</strong></td>
<td>The means by which we achieve mobility. This can include walking, biking, driving, and public transportation such as buses, trains. This also includes all surfaces (air, land or sea).</td>
</tr>
<tr>
<td><strong>TRIO</strong></td>
<td>The Federal TRIO Programs (TRIO) are Federal outreach and student services programs designed to identify and provide services for individuals from disadvantaged backgrounds.</td>
</tr>
<tr>
<td><strong>UNESCO</strong></td>
<td>Acronym for United Nations Educational, Scientific, and Cultural Organization. UNESCO is responsible for coordinating international cooperation in education, science, culture and communication.</td>
</tr>
<tr>
<td><strong>User Group</strong></td>
<td>In the context of technology, a user group is a club whose focus is on a specific technology or tech-based skill.</td>
</tr>
<tr>
<td><strong>USIgnite</strong></td>
<td>US Ignite is a nonprofit organization that “helps to accelerate new wired and wireless networking advances from research to prototype to full-scale smart community and interconnected national deployments.” <a href="http://us-ignite.org/about">us-ignite.org/about</a></td>
</tr>
<tr>
<td><strong>VisionZero</strong></td>
<td>Originating in Sweden in 1997, Vision Zero is now a multi-national project focused on road traffic safety. Its aim is to achieve a highway system with no fatalities or serious injuries in road traffic.</td>
</tr>
<tr>
<td><strong>Wayfinding</strong></td>
<td>Tools and resources used to guide travelers on location and direction. This can includes signs, maps or other graphics, or audible tools.</td>
</tr>
</tbody>
</table>
Below is a listing of plans and reports whose previously vetted goals are included within the draft community recommendations.

The Academies of Nashville: A Five-year Plan for the Implementation and Sustainability of High School Reform, Metro Nashville Public Schools, 2010


Downtown Multimodal Mobility Study, Nashville Area Metropolitan Planning Organization, 2016

Gear Up 2020, Urban Land Institute Nashville, 2016

Livable Nashville, Mayor’s Livable Nashville Committee, 2017


Metro Nashville Child and Youth Master Plan, Mayor’s Office of Children and Youth, 2010

Milton Keyes’ Urban Data School: Smart City Data Literacy for Schools, MK Smart, 2016


MPO 2040 Regional Transportation Plan, Nashville Area Metropolitan Planning Organization, 2016


Nashville Next, Metro Planning Department, 2015

Nashville USDOT Smart Cities Challenge, Metro Government of Nashville and Davidson County, 2016

NashvilleNext: Education and Youth, Metro Planning Department, 2015

nMotion High Capacity Corridors, Nashville MTA, 2015


Shaping the Healthy Community: The Nashville Plan, Nashville Civic Design Center, 2016

TDOT Long Range Plan, Tennessee Department of Transportation, 2015
This document is distinct from prior recommendations in this document in that it is highly technical in nature. The goal is to present a set of minimum requirements and standards that help us to select technology in the best interest of our citizens based on global industry best practices. The terms and concepts used here do not reflect the language that we use in day-to-day conversation. The information contained in this document will inform policy development, software development and service contracts that protect your privacy, promote cost-effective systems and guarantee that any data collected remains secure.

Integration and Interoperability
Interoperability and integration are critical to facilitate interface, prevent failure dynamics and ensure system flexibility and scalability. Interoperable platforms require machine readable, open API access data for bulk, non-real-time, and real-time data to serve different purposes and functions. Heterogeneity in both message (data) layers and behavior (control) layers is one of the biggest emerging challenges for governance enterprises given the driving need for integrated systems to provide useful and timely services to employees, residents and visitors. To address integration and interoperability, solutions must meet the following minimum requirements:

- Operational within Metro’s defined technical environment
- Standardized or interoperable format and syntax for the data and content such as HTML or JSON;
- Inclusive of Interface Definition Language (IDL) to facilitate communication between software components that do not share a language
- Compliant with international information communication technology (ICT) standards, such as oneM2M, FIWARE, KSPA.

Security
There are numerous advantages inherent in a city’s thinking in a holistic way about the services it provides to its citizens. Too often however, considerations of security and privacy are afterthoughts in technology-centric initiatives. It is vital that Nashville’s services are end-to-end secure. Consideration of smart cities’ technological solutions requires that security risks be actively assessed, understood and addressed by appropriate technical and managerial controls.

Metro has developed an extensively detailed Cyber Security Checklist for Smart Cities Technology; a summary of absolute minimum requirements for technology solutions appears below.

- Solution provides controls to address physical security needs. This includes safeguards that take into consideration where the devices are located during operation, what security controls the devices feature (e.g. tamper resistant or tamper evident), and the sensitivity of the data processed by devices. Breaches of physical security must generate alerts.
- Solution fails safe/close in the case of a system malfunction or crash.
• Solution has undergone third party penetration testing (“pentest”).
• Solution provides centralized mechanism for application/infrastructure administration.
• Solution provides automatic and secure updates of software, firmware, etc. for all components.
• Solution provides mechanisms for auditing and logging events, including security events.
• Solution can be continuously monitored.
• Solution provides mechanisms for real time alerting for defined events, including security events. Alerts are available via multiple modes (text, email, etc.).
• Solution utilizes strong cryptography to protect data, both at rest and in transit.
• Solution requires unique username and password to access functionality and supports strong authentication mechanisms (one-time passwords, certificate- or biometric-based authentication, etc.).
• Device level authentication is used for machine to machine (M2M) communications.
• Devices used within solution have a mechanism to prevent tampering by unauthorized sources.
• Solution does not use any backdoor/undocumented/hardcoded accounts.

Privacy
Protection of privacy is a growing concern with citizens. Data collection through various technical solutions and devices may raise concerns about potentially negative impacts on constituent privacy. To address concerns around privacy, solution providers must be able to assure Metro and to provide citizens with accurate and reliable information about city data collection and use, and policies and mechanisms for controlling that data in whatever format it may exist. Contractual provisions to address privacy and data use concerns include:

• Providers assert no ownership of data outside of providing for the agreed upon service. This stipulation includes data that results from analysis of primary data.
• Solution or provider data collection and use is well documented, including what is collected and for what purpose(s).
• All data collected is securely stored and transported.
• Data storage elements are subject to specific controls (e.g., how much data is retained, location of storage, etc.).
• Solution only collects citizen information directly relevant and necessary to accomplish specified purpose(s), and only retains citizen information for as long as is necessary to fulfill those specified purpose(s).
Appendix 2:
Metro Nashville Smart City Initiatives

**Transportation**
- Bloomberg/Aspen Automated Vehicles (Mayor)
- Gateway/WiFi devices in vehicles (MTA)
- Murfreesboro Pike TSP (PW, MTA)
- Multi-modal with Lyft (MTA)
- TransitHub (MTA)
- Open Payment system (MTA)
- NIST GCTC study- Social computing platform for multi-modal transit (MTA)
- NSF Smart & Connected Corridor & testbed (MTA, PW)
- TDOT Active ITS (PW)
- Traffic Signalization (PW)
- Transportation4America
  - Data Analytics: Video analytics vehicle and pedestrian volume counts (ITS, Planning)
  - Shared Mobility: Bicycle GPS/air quality monitoring sensors (MPO, MTA)

**Economic & Community Development**
- Anytime Access for All (MNPS)
- ConnectHome (MDHA)
- Digital Inclusion Fund (Mayor)
- Blockchain –Identity POC (ITS)

**Environment**
- Building automation (GS)
- Beacons & Wayfinding (MCC)
- Climate Smart Nashville (Planning)
- Complete Streets (Planning)
- Rockefeller 100 Resilient Cities (Mayor)
- WonderWare (Water)
- Air Quality Sensors (Health)
- LED connected, smart, sensored street lights (PW)
- Parking meters (PW)

**Engagement**
- hubNashville (Mayor)
- Open Data (ITS)
- Metro Data Academy (ITS)
- Metro Public Wifi (ITS)

**Public Safety**
- Gateway/WiFi devices in vehicles (NFD, MNPD)
- NIST GCTC study- Integrated Analytics and Scheduling for Emergency Responders (NFD)
- Data Driven Justice Initiative (MNPD, DCSO)

**Infrastructure**
- Broadband Roadmap (ITS)
- Technical Standards
- Analytics/Computing Platform
- Open Data Program
- USIgnite

**Strategy**
- Connected Nashville
- MTA nMotion
- Nashville Next
- Gear Up 2020
- Moving The Music City
- Vanderbilt VISOR
- MetroLabs Network

*Italics indicates in planning phase* Updated 9/4/17
To view the latest information about Nashville's Smart City Initiatives please visit:

https://connected.nashville.gov.

Scan to view survey and give feedback!

Draft for community review