

CITY OF MIAMI
BEYOND TRAFFIC:
THE SMART CITY
CHALLENGE
APPLICATION

PART 1
VISION NARRATIVE

CONTENTS

- 1 VISION
- 6 CITY POPULATION (BASED ON 2010 DECENNIAL CENSUS)
- 9 OTHER RELEVANT CITY CHARACTERISTICS
- 12 ANNOTATED PRELIMINARY SITE MAP
- 13 CONSISTENCY WITH DOT VISION ELEMENTS
- 24 RISK ASSESSMENT
- 25 TEAM COMPOSITION
- 26 TRANSPORTATION SYSTEM & DATA CHARACTERISTICS
- 27 COLLABORATION & PERFORMANCE ASSESSMENT
- 30 CAPACITY FOR PROJECT & RESOURCE LEVERAGING

VISION

City growth will continue to aggravate the already existing problems of congestion, pollution, infrastructure optimization, limited resources, and sea level rise and flood conditions arising from climate warming. Industry, cities, and authorities need new and innovative solutions to meet these threats. Miami and its partners propose to meet this challenge through smart technologies, providing new management tools for its leaders to increase predictability and economic prosperity, enhance the quality of life, improve road user safety and experience, and move toward a sustainable future.

The Smart Project being proposed by Miami, hereafter referred to as Smart Miami Project, will use innovative solutions that can be joined together with a portfolio of partnerships including the leading best-in-class companies and local institutions to provide smart urban mobility technologies that are efficient, cost-effective, scalable, replicable, intuitive, and transformational.

Pooling existing technology from partner agencies and a development of improved technology the Smart Miami Project will develop a central data repository to provide a fabric of shareable compatible data that will create opportunities for innovation in predictive planning that will inform decision making, enhance knowledge of assets, improve safety and mobility, and reduce congestion leading to a more vibrant community. The Smart Miami Project will serve as a role model for other cities in the US to learn from and copy, facilitating a rise of Smart Cities across the country.

CITY'S CHALLENGES

Miami is not alone in some of the transportation-related challenges it

faces over the coming decade, including an aging population, travel demand that stresses and exceeds peak period capacity, and projections for continued significant growth in both population and employment. At the same time, Miami must also address other challenges that, if not unique, are especially emphasized by its particular combination of geographic, cultural, demographic, and environmental characteristics as well as its transportation context within Florida and the US. More specifically:

- Miami is limited by its geographic surroundings, including an ocean and the Everglades; these constraints prevent further outward expansion and require vertical growth that will inevitably increase urban density.
- The near and mid-term effects of climate change have profound implications for future growth and development. Porous land and limited elevation represent just two challenges to the necessary mitigation that the City will have to undertake to ensure its long-term sustainability.
- Decision making for infrastructure improvements is made complex by the multi-jurisdictional nature of the City's transportation grid, where at least eight distinct entities have varying degrees of oversight over the City's transportation infrastructure.
- Two ongoing efforts to reintroduce intercity rail service with termini in downtown Miami, including an intercity rail line to Orlando and a second commuter rail to Palm Beach County, will require special coordination and integration with the many other available travel modes and within the context of the challenges already noted.







PROPOSED VISION

The Smart Miami Project is encapsulated in **Table 1**, which is presented in the framework of the 12 important vision elements identified by USDOT in its Smart City Challenge Notice of Funding Opportunity (NOFO) for ease of review and understanding.

Table 1. The City’s Vision

| VISION ELEMENTS | MIAMI’S VISION |
|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TECHNOLOGY ELEMENTS | |
|  <p>Urban Automation</p> | <ul style="list-style-type: none"> To more efficiently deliver city services to the public and the commercial sector through better automation of the delivery of those services drawing on a wider array of public and private data sources. To enable better automation within the commercial sector through making available in machine readable format real time information on the city’s infrastructure. |
|  <p>Connected Vehicles</p> | <ul style="list-style-type: none"> To develop and integrate the use of cell phone based and commercial truck and transit Automated Vehicle Location (AVL) connected vehicle applications with the existing road and smart grid sensor technology in the project area. |
|  <p>Intelligent, Sensor-Based Infrastructure</p> | <ul style="list-style-type: none"> To integrate in a common publicly accessible database the existing road sensor technologies on the freeways, the signalized arterials, and the current AVL technology used by transit operators. To augment the use of AVL by PortMiami to enhance efficiency, security, and reliability of critical freight movements. To extend real-time monitoring capabilities through the use of connected vehicles supplemented with additional road sensors connected to central control center(s). |
| INNOVATIVE APPROACHES TO URBAN TRANSPORTATION | |
|  <p>User-Focused Mobility Services & Choices</p> | <ul style="list-style-type: none"> To enhance both the availability of public transit and shared transportation services within the project site and the public’s knowledge of those services. To increase mobility services and choices (and the knowledge of those services) available to senior citizens, the disabled and the unemployed within the project area. To leverage technology to provide affordable and accessibility trip planning and transportation options for all users. |
|  <p>Urban Analytics</p> | <ul style="list-style-type: none"> To aggregate and supplement existing data sources and tools from public and private partners to create an open, machine and human accessible data repository with supporting analytical tools. To integrate the Miami-Dade MPO Transportation Planning tools already available to the public with the new central database(s). To extend the MPO planning tools to also address the needs of the utilities and the commercial sector for predicting future demand. |
|  <p>Urban Delivery & Logistics</p> | <ul style="list-style-type: none"> To expedite and lower the cost of providing urban delivery and logistics through the sharing of real-time information on transportation infrastructure status, through coordination with PortMiami and the Miami International Airport, and through improved real-time control of the infrastructure. |

Table 1. Continued

| VISION ELEMENTS | MIAMI'S VISION |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>Strategic Business Models & Partnering</p> | <ul style="list-style-type: none"> To build on the individual efforts of universities (FIU's ITS Lab), the commercial shared ride sector (Uber, Lyft, etc.), the commercial data aggregators (Google, INRIX, ESRI, etc.) to generate improved real time data information for all. |
| <p>INNOVATIVE APPROACHES TO URBAN TRANSPORTATION (CONTINUED)</p> | |
|  <p>Smart Grid, Roadway Electrification, & Electric Vehicles</p> | <ul style="list-style-type: none"> To build off of the ongoing upgrade to the utility grid toward computer based remote control and automation. The systems would include two-way communication technology, the augmentation of EV recharge stations in downtown garages and on-street parking, and the dissemination to the public of information on their availability in real time. |
|  <p>Connected, Involved Citizens</p> | <ul style="list-style-type: none"> To build on the success of the City's NET (Neighborhood Enhancement Team) website for linking residents to city services and expand this site's features and functionality to include non-city public and private services equally necessary for life in a smart city. To assist with those not able to access information digitally. |
| <p>SMART CITY ELEMENTS</p> | |
|  <p>Architecture & Standards</p> | <ul style="list-style-type: none"> To pursue a cost effective modular architecture, building on existing and developing standards, architectures, and processes for ITS and connected vehicles and other services that can flexibly incorporate new partners and services as the smart city evolves. |
|  <p>Low-Cost, Efficient, Secure, & Resilient Information and Communications Technology</p> | <ul style="list-style-type: none"> To advance information and communications technology (ICT) that is affordable, adaptable, efficient, secure and resilient, including integrated telecommunications platforms, enterprise software, storage, and visualization systems. To incorporate rigorous, proven processes to ensure that security mechanisms are embedded in systems and infrastructure to protect against attacks. |
|  <p>Smart Land Use</p> | <ul style="list-style-type: none"> To expand on the success of the City's current neighborhood-based planning process to promote smart land uses to promote sustainability, livability, accessibility, and reliability. To concentrate growth in compact walkable urban centers and promote compact, transit-oriented, walkable, bicycle-friendly land use, including neighborhood schools, complete streets, and mixed-use development with a range of housing choices. |

HOW THE VISION ADDRESSES THE CITY'S CHALLENGES

The vision described above responds to each of the 12 vision elements USDOT seeks to address in a fashion that also constructively addresses each of the City Challenges outlined earlier.

- The imbalance between travel demand and supply will be mitigated or resolved by improving the efficiency, safety and cost-effectiveness of an expanded palette of travel modes, and by providing equitable and integrated access to the wide range of available travel modes across temporal, spatial, and economic dimensions.
- Safer, more efficient, and more cost-effective use will be made of the limited available streetscape through real-time communication/management strategies, as well as open, machine and human accessible data repositories with supporting analytical tools.
- Innovative tools and strategies will be used to monitor and react to the effects of climate change, hurricanes, and other significant natural events. At the same time, Miami will become a model for other cities to emulate with respect to reducing its carbon footprint and minimizing its own contributions to climate change through reduced congestion and air pollution, as well as movement toward renewable non-polluting energy sources.
- The multi-jurisdictional partnerships maintained in the Smart Miami Project will sustain and enhance the collaboration among area transportation agencies that is critical to continued local success and a model that many other mid-size cities can emulate.

- The success already achieved through the City's NET website for linking residents to city services will be expanded to include non-city public and private services equally necessary for life in smart city, thereby facilitating an improved quality of life across the full and diverse range of demographic characteristics that define Miami.

IMPLEMENTATION, OPERATIONAL, AND MANAGEMENT APPROACH

Miami's approach for implementing and operating the demonstration project envisions that Miami-Dade County will serve as the host of an integrated platform wherein all information regarding traffic, transit, travel patterns, emergency situations, and major special events are compiled. It is Miami's vision to create a partnership with all government and quasi-government transportation-related agencies in the region, to enhance the data collection and make the best use of the information gathered. More specifically, this will include partnerships with the following:

- Miami-Dade Express Authority (MDX), which operates and maintains the major East-West tolled corridors. MDX has been a leader bringing technology to South Florida through the cashless toll expressway and the pay-by-plate.
- Florida Department of Transportation (FDOT), which owns all state roads through the county and the interstate system as well as the SunGuide Communications System, an incident management system deployed through all freeways and major state highways to observe and communicate with the public through the Dynamic Message Signs.

- Florida International University (FIU), will provide expert advice and guidance to implement technology improvements. A specific emphasis will be on the development and deployment of advanced electronic wayfinding systems that effectively disperse travelers in time, place, and mode.
- Miami Parking Authority, which operates and manages all on-street parking in downtown Miami. It is also anticipated that a Parking Coalition will be established among private parking providers in downtown Miami to allow for a single point of information for parking in Miami.
- Florida Power & Light (FPL) is currently in the process of deploying the smart-grid through the street lighting in downtown Miami.
- Miami-Dade County Traffic Signals and Signs is responsible for integrating all signal systems in the area, including drawbridge tender house.
- Miami-Dade County Transit is responsible for integrating all buses, heavy rail and automated people mover stations within Downtown Miami.
- South Florida Regional Transportation Authority is the provider of a Tri-County Commuter Rail and is working toward implementation of a commuter rail along US 1.
- Miami Downtown Development Authority is a quasi-governmental agency promoting the development of Downtown Miami, working as a key partner with private developers and event venues.
- South Florida Commuter Services, which promotes alternate modes of transportation for commuters.
- Miami International Airport and PortMiami are important contributors with respect to both freight and people movement.
- Emergency Response providers will be included as partners to assure that barrier-free access for emergency services is maintained, and the new technology is used to further boost response times.

This Partnership will pursue a cost-effective modular architecture that builds on existing and developing standards, architectures, and processes for ITS and connected vehicles and other services that can flexibly incorporate new partners and services as the smart city evolves. It will also advance information and communications technology (ICT) that is affordable, adaptable, efficient, secure and resilient, including integrated telecommunications platforms, enterprise software, storage, and visualization systems. Finally, it will incorporate rigorous, proven processes to ensure that security mechanisms are embedded in systems and infrastructure to protect against attacks.

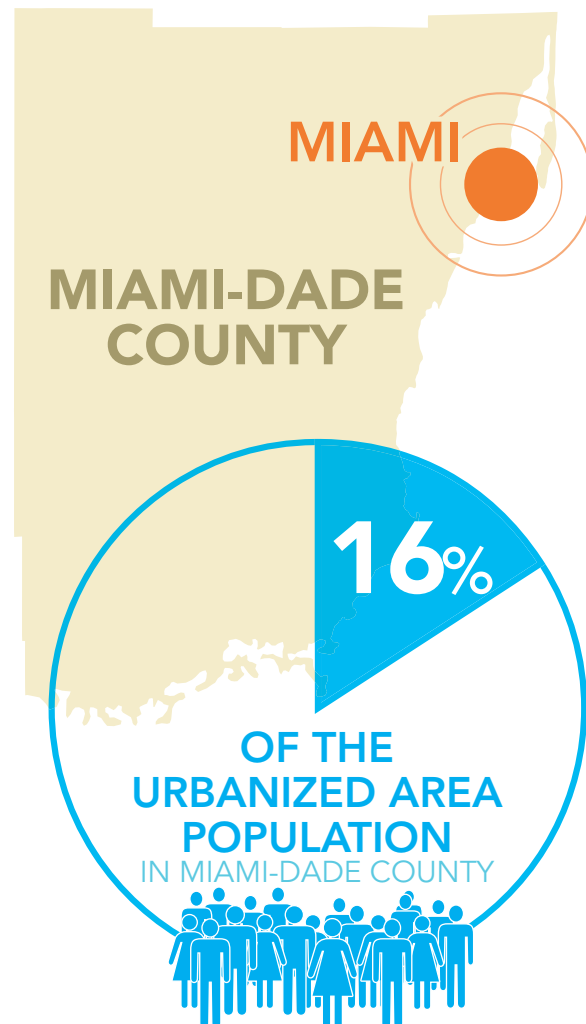
CITY POPULATION (BASED ON 2010 DECENNIAL CENSUS)

The City of Miami, known as the “Gateway to the Americas”, is a 35.87 square miles compact microcosm of economic, social, and ethnic diversity. The 2010 census data depicts that a majority of its residents come from minority backgrounds, with 70% Hispanic/Latino and 19.2% Black.

Prior to 2000, the Southeast Florida area consisted of three urbanized areas designated by the Census Bureau. Each designated urbanized area contained a central city and development at urban density levels surrounding that city within the respective boundaries for Miami-Dade, Broward and Palm Beach counties. By the time of the 2000 census and because of unique topographic constraints, development had occurred to a level that began to blur the county lines; this resulted in the U.S. Census Bureau designating a single urbanized area for all of Southeast Florida. The resulting single urbanized area is generally linear, quite narrow in the east-west direction and very long in the north-south direction. Despite this designation, the central cities continue to increase in population and density and their relationships with their respective surrounding local urban areas remain largely as they were prior to the re-designation. Thus, each of the previous three urbanized areas continue to function with a great deal of independence. In the spirit of this NOFO’s expressed interest in the local urban area population, therefore, this Application recognizes the local urban area to be equivalent to Miami Dade County, which is the functional local urban area surrounding Miami and which was also the boundary of the officially designated urbanized area prior to 2000.

The 2010 Census reflects a Miami population of 399,443 people with 11,136 persons per square mile. This represents 16% of the local urban area population, which was approaching 2,500,000 in the 2010 Census.

In 2010, Miami had 183,994 housing units, a \$30,375 median household income (US Census). Downtown Miami is the City’s central business district which has nearly 200 main offices and US branches of multinationals, a 222,000 daytime population, 81,000 residents and an average household income of \$95,928. There is 19 million square feet of Class A and B office space and 2.5 million square feet of retail space as well as the sea port, large sporting facilities, and museums.



DEMOGRAPHIC CHARACTERISTICS OVERVIEW

The relevant demographic characteristics of Miami are listed in **Table 2**.

Table 2. Smart City Characteristics of Miami

| Population | 399,443 (2010 census) |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dense Urban Population | 11,136 persons per square mile |
| Significant Proportion of Urbanized Area | City is 16 % of Miami-Dade County |
| ATTRIBUTE | CHARACTERISTICS OF MIAMI |
| Public Transportation | According to the 2013 APTA Fact Book, the Miami Urbanized Area is the ninth ranked urbanized area of the US in terms of unlinked annual passenger trips (160 million). Public transportation in Miami is operated by Miami-Dade Transit and the South Florida Regional Transportation Authority (SFRTA). It includes commuter rail (TriRail), heavy-rail rapid transit (MetroRail), an elevated people mover (MetroMover), a Trolley System, and buses (MetroBus). Miami has Florida’s highest transit ridership, 17% of residents using transit on a daily basis. The Miami Intermodal Center and Miami Central Station, near the airport, serve MetroRail, Amtrak, TriRail, MetroBus, Greyhound Lines, taxis, rental cars, MIA Mover, private automobiles, bicycles and pedestrians. |
| Conducive Environment for Demonstration | Miami is the 44th most populous city located in the 8th most populous urbanized area of the US. Downtown Miami is a major center for international banks, many large national companies, hospitals, research institutes and biotechnology companies. The PortMiami is the number one cruise passenger port in the world (home to 5 cruise lines) and one of the largest ports in the US, importing 8 million tons of cargo a year. Miami is home to two universities that collectively enroll 70,000 students . The Miami International Airport is first in the country in terms of international freight, second in international passengers and third in total cargo . |
| Continuity of Leadership and Capacity | Miami employs the Mayor-Commissioner system of government. Five commissioners are elected from their individual districts. The mayor is elected at large. Mayor Regalado was first elected in 2009. He was a city commissioner for 13 years before becoming mayor. The City Manager, Daniel J. Alfonso, worked 17 years with Miami-Dade County before coming to the City of Miami in 2011. The City employs over 4,000 employees. The adopted 2015-2016 operating budget of \$942 million includes \$2.2 million for technology. The 2015-2016 Capital budget is \$607 million. |
| Commitment to Sharing Economy | Miami currently hosts several car sharing operators: Miami car2go, Zipcar, Enterprise CarShare among others. In 2014, the LAB Miami, a campus for social and tech innovation located in Miami, hosted a sharing economy conference with a Miami-Dade commissioner and representatives from the private sector sharing economy. Miami’s CitiBike sharing service has been operating since 2011. It has a fleet of 1,500 bicycles available at 150 stations. Uber and Lyft have been operating in Miami since 2014 and serve the airport. Miami-Dade County is working on updating its regulatory framework for Uber and Lyft type services. |
| Commitment to Open Accessible Data | <p>The City currently operates a website for linking residents to government services. The NET provides quick links for permits, applications, services, resources, and reporting problems online and publicizes planning/zoning permits and waivers, tax preparation assistance, and hearing board processes. It also has a Department of Communications whose sole mission is to facilitate communication with the City’s residents.</p> <p>The City currently provides several “e-services” through its public website to support businesses. These e-services include: iBuildMiami Land Management, Building Online Access, City Address Check, Code Violation Search, GIS Zoning and Solicitations on line. The City and the County are moving to develop open data policies that further expand data access and connect citizens with city departments.</p> |

POPULATION (200,000 – 850,000)

The City’s 2010 Census population was 399,433, which is well within the USDOT target range.

URBAN POPULATION DENSITY

The urban population density is calculated to be 11,136 per square mile. This density will almost certainly increase in the future because Miami must grow vertically as it continues to increase its population and employment base.

REPRESENTATION OF THE LOCAL URBAN AREA (> 15%)

The method used by USDOT to compute the percentage that the City’s population represents of the local urban area is flawed in how it was applied to Maimi, due to the unique nature and growth characteristics of the South Florida area. The result was that USDOT concluded Miami’s population does not represent greater than 15% of the local urban area when in fact it does – Miami’s population actually represents 16% of the local urban area population. The following paragraphs explain why this is the case.

Prior to 2000, the Southeast Florida area consisted of three urbanized areas designated by the Census Bureau. Each designated urbanized area contained a central city and development at urban density levels surrounding that city within the county boundaries for Miami-Dade, Broward and Palm Beach counties. By the 2000 census, narrow linear development trends caused by the unique geography of the area (i.e., the ocean to the east and the Everglades to the west) were beginning to blur the county lines. This resulted in the designation of a single urbanized area for all of Southeast Florida, but which in reality is split between three different MPOs (Palm Beach, Broward, and Miami-Dade) and two FDOT districts.

The central cities in each of the three initially separate urbanized areas continue to increase in population and density and the relationships between the respective urban cores and their surrounding local urban areas remain as they were prior to 2000. Thus, each of the previously-designated three urbanized areas continue to function with a great deal of independence.

For these reasons, the “local urban area”, which is the language specifically used in USDOT’s NOFO, should be considered to be the area consisting of Miami-Dade County and exclusive of both Broward and Palm Beach counties. Thus when the actual development, operating, and travel patterns are seen in this truer light, it becomes clear that Miami’s population represents 16% of the surrounding local urban area population.



OTHER RELEVANT CITY CHARACTERISTICS

EXISTING PUBLIC TRANSPORTATION

A brief summary of the key components that make up Miami's existing public transportation system follows:

- Miami-Dade has an extensive transit system which includes the MetroRail through downtown Miami. There are several websites and mobile apps to access information and trip planning features, and that facilitate public information and outreach. The automated MetroMover runs through the Downtown and connects people to other transit modes, major centers of employment, education, and recreation.
- FDOT operates HOT/Express lanes and express bus services on I-95 into the downtown area. There are monitoring activities to adjust toll rates based on conditions.
- All Aboard Florida/Brightline is constructing a terminal in downtown Miami for express rail service to Ft. Lauderdale, West Palm Beach and Orlando.
- The transit system provides door-to-door service for seniors and disadvantaged.
- CitiBike is a Bicycle Share and Rental program of 500 bikes and 50 stations in the urban core and over 100 stations in neighboring Miami Beach.
- The Trolley System consists of 34 trolleys and 7 routes during peak hours, connected through AVL technology, which provides real-time tracking information for all trolleys.

- Further efforts to develop rail systems to better connect Miami are underway and two new terminals will be located in Downtown Miami at the same location Miami-Dade Transit is planning a large-scale intermodal center.



ENVIRONMENT CONDUCTIVE TO DEMONSTRATION PURPOSES

The environment within which the Miami demonstration project will be implemented is one that gives great assurance for success. Key distinguishing characteristics of the Miami environment that we draw to your attention include the following:

- Agency collaboration
- Business and leadership
- Technology
- Education

Highlights of important elements associated with each of these characteristics are summarized in the following paragraphs.

AGENCY COLLABORATION

Miami's transportation system is integrated physically as well as institutionally with systems under the jurisdictional control of its partner agencies. A few examples that highlight these ongoing cooperative relationships follow:

- The Metropolitan Planning Organization, FDOT, Miami-Dade Transit, Miami Beach, and Miami are cooperatively working on developing the Beach Corridor light rail transit (LRT)/ modern streetcar system to connect Downtown Miami to Miami Beach.
- FDOT's SunGuide Transportation Management Center (TMC) serves as the regional command post that monitors and controls a wide range of technologies providing reliable traveler information and coordination with incident responders within the roadways of Miami-Dade County.
- Miami-Dade County Traffic Signals and Signs provides integrated design, maintenance, and operations services for all signal systems in the area, including drawbridge tender house operations.
- Miami-Dade Transit oversees the integration of all buses, heavy rail and automated people mover stations within Downtown Miami.

BUSINESS AND LEADERSHIP

Miami offers a first-class business climate and the regional economic base remains diversified with both wholesale and retail trade, construction, banking, financial services, and tourism. The City is financially attractive and stable. International investment and local economic development activities continue at a rapid pace, indicating significant increases in urban density and population.

TECHNOLOGY

Miami is emerging as a new center for technology. Facebook, Twitter, Google, Uber, and Microsoft all have a significant presence in the City. Terremark's Network Access Point (NAP) of the Americas® is a Tier IV data center designed to interconnect Latin America with the rest of the world.

The City continues to improve its cloud infrastructure in order to provide current technologies and allow for future growth.



EDUCATION

Miami has become a regional center for learning and professional development. It is home to Florida International University, Miami Dade College, Miami International University of Art & Design, and Strayer University.

CONTINUITY, COMMITMENT, AND CAPACITY OF LEADERSHIP

Miami is governed by a Mayor-City Commissioner plan consisting of five district commissioners elected to four-year staggered terms. The Mayor is elected at large every four years. The City's 2013 strategic plan emphasizes data-driven management and ongoing public engagement. Through the City's strategic plan, management has made enhancement of transportation and mobility options high priority objectives and is prioritizing transportation by implementing plans that address congestion and pedestrian circulation.

COMMITMENT TO SHARED ECONOMY INTEGRATION

Miami is fully supportive of the shared economy concept and is already at the forefront in terms of its implementation:

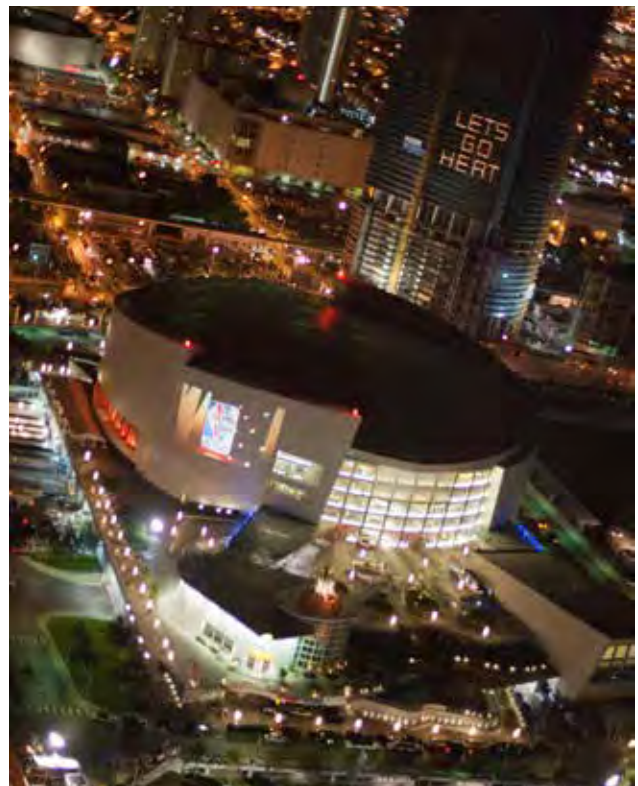
- CitiBike Bicycle Share program operates in Miami and Miami Beach.
- Uber and Lyft ride sharing programs operate in Miami-Dade County.
- Miami-Dade County has open data policies to make available data to developers and agencies.

The City currently integrates with the sharing economy through its Financial Transparency Dashboard and will do likewise with this project to ensure success and optimization of resources. The City intends to make this project a model on how to integrate transportation data into public and private enterprises resulting in new business models.

COMMITMENT TO OPEN SOURCE DATA AND PUBLIC/PRIVATE ENTREPRENEURSHIP AND INNOVATION

Miami recognizes the critical importance of public-private partnerships in successfully navigating the sea of changes that are already well underway. Miami is fully committed to employing and promoting open source data protocols wherever possible and encouraging private entrepreneurship and innovation.

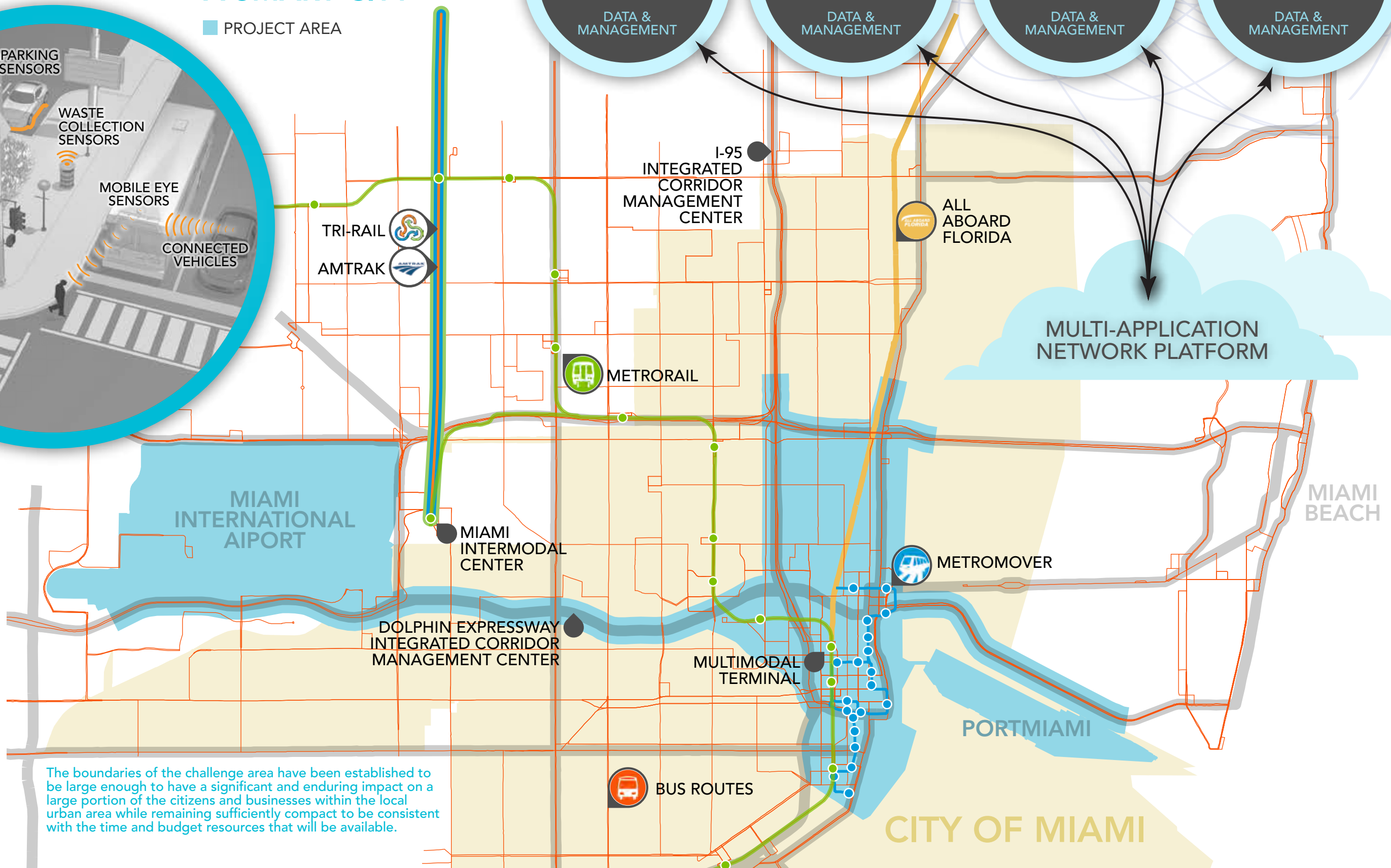
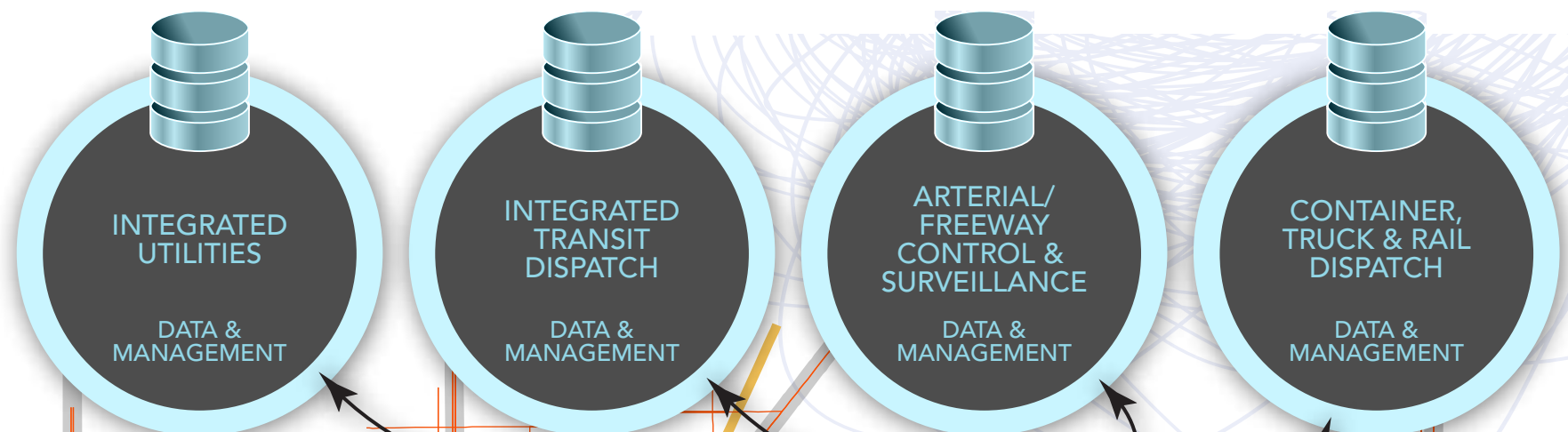
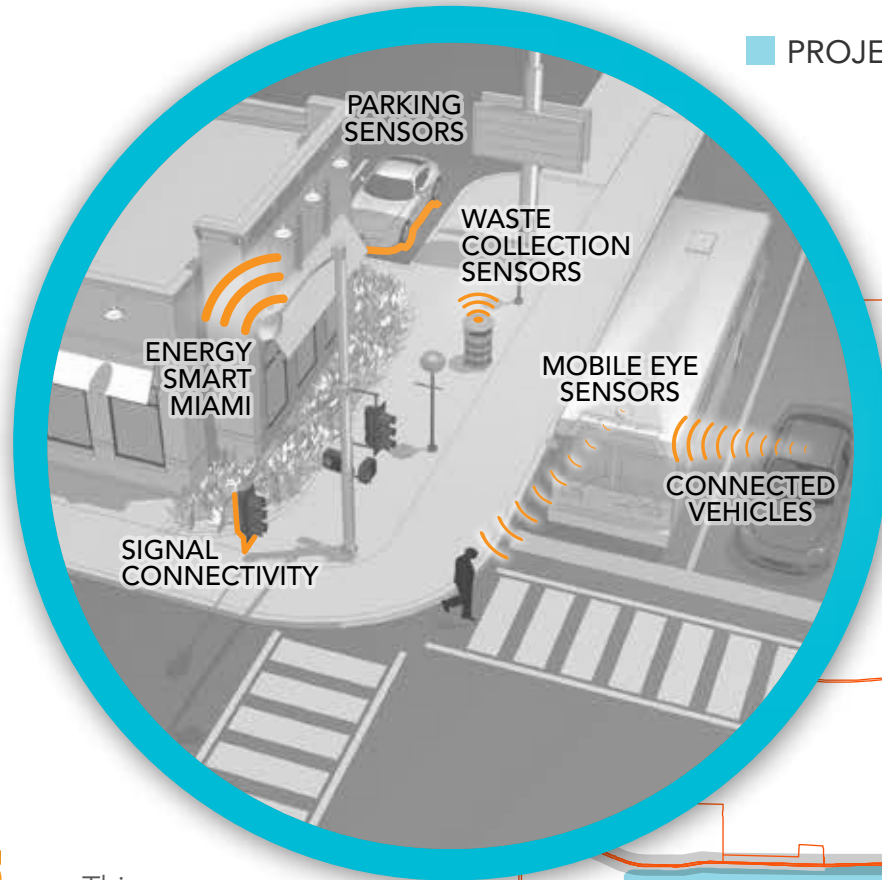
As an example, the Financial Transparency Dashboard is a part of the City's ongoing effort to enhance transparency and public engagement. Financial, operating, and performance information are available and easily accessible to the public, which has allowed unprecedented access to the City's financial information.



ANNOTATED PRELIMINARY SITE MAP

THE CITY OF MIAMI IS POISED TO BE A SMART CITY

PROJECT AREA



This map identifies the boundaries of the geographic area that defines Miami's Challenge Area and highlights the locations of key elements including roadside technology components, existing and proposed infrastructure, and anticipated connected automated vehicle operations.

The boundaries of the challenge area have been established to be large enough to have a significant and enduring impact on a large portion of the citizens and businesses within the local urban area while remaining sufficiently compact to be consistent with the time and budget resources that will be available.

CONSISTENCY WITH DOT VISION ELEMENTS

The following sections demonstrate the consistency and integrated nature of the demonstration project proposed in Miami's vision with each of USDOT's twelve vision elements.



URBAN AUTOMATION

The Smart Miami Project will demonstrate a wide range of automated transportation applications and systems to safely and efficiently move people and goods. In addition to the examples of automated transportation given in the Notice of Funding Opportunity, specific urban automation elements contained within the Smart Miami Project include the following:

- Expansion of the FDOT and Dade Miami-Dade County jointly operated area traffic signal system using standard architecture.
- Corridor-based preemption for emergency vehicles will improve safety and response times in congested environments.
- Pump stations will be upgraded to autonomous operating capabilities.
- An automated waste collection system similar to what is currently in use in Barcelona will use sensors on trash and recycling bins so sanitation workers can monitor trash levels to plan optimal pick-up times and routes.
- Exclusive bus lanes will be added on downtown streets with automated violation/enforcement technologies.

- Red light running cameras installed at critical intersections.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

The Miami-Dade County traffic signal system will be expanded by integrating new technologies and operating strategies including adaptive signal control technology systems, arterial ITS infrastructure deployments, real-time arterials and signal system monitoring, traffic signal controller upgrades and signal retiming efforts.

The autonomous operation of pump stations will reduce costs and improve efficiency.

Automated waste monitoring and collection systems will declutter sidewalk areas, minimize noxious odors, decrease congestion, reduce noise and improve air quality.

Exclusive bus lanes will enhance public transport performance characteristics and promote the sharing economy.

Red light running cameras will enhance the safety of all travel modes.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

All travel modes – including private and shared autos; freight delivery; public transportation; bicycling; and walking – will realize significant improvements in the cost, safety, and quality of travel.



CONNECTED VEHICLES

The Smart Miami Project will develop and integrate the use of cell phone, truck and transit AVL connected vehicle applications and implemented through the following:

- Freeways – communication tools interfacing with CV's to maximize safety and throughput.
- Arterials – Vehicle routing, congestion, and travel time will be enhanced by communicating real-time information to CV's.
- Adaptive control/signal coordination conditions will be communicated to CV's through V2I protocols and technologies.
- CV communications will be extended to include pedestrians, bicycles and public transportation to create an environment of "Connected People".

The project will serve as a test site for developing and demonstrating safety, mobility, and environmental applications of connected vehicles employing commercially available communication technologies and dedicated short range communication (DSRC) technology.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

Implementation will include deployment of FHWA's new prototype for speed harmonization. Real-time information on bridge openings, traffic signal preemptions, and impending traffic signal phase changes will be communicated to CV's. MobilEye will be deployed on public transportation vehicles. The current AVL tracking technology and web interface of the

downtown Trolley lines will be expanded to include other transit systems in the area.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

All travel modes will realize significant improvements in the cost, safety, and quality of travel.



INTELLIGENT SENSOR-BASED INFRASTRUCTURE

Miami currently offers a variety of isolated sensor implementation programs, including online tracking of the trolley lines, integration of traffic signals into the TMC, the SunGuide traffic camera web portal, and the networking of all street lights in the project area.

Miami will leverage this with the urban IT infrastructure necessary to form a strong foundation for a city-wide sensing network for 24-7 monitoring of system performance and city operations.

Sensors will collect traffic, pedestrian, bicyclist, environmental data, and other information available throughout the city. The data will be integrated with existing transportation data and operations. Additionally, the infrastructure will be used to monitor transportation assets to improve infrastructure management, reduce maintenance costs, prioritize investment decisions, and ensure a state of good repair.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

Miami's Smart City vision is centered on a common data model supporting multiple data types aggregated in a common platform available to multiple agencies. Data from multiple sources will

be combined, including sensors in traffic signals, street lights, roadside stations, parking installations, and others. Data aggregation will provide a richer data set that enables richer analytics and visualization capabilities in real time. Key features include:

- Smart parking spaces, with sensors communicating the current status of each space and conveying that information to users.
- Smart parking garages, with sensors tracking the occupancy of each garage and conveying parking availability through a city-wide intelligent parking management system.
- Public Transit Tracking and Information System, expanding the current remote sensing technology for the Miami trolley system and integrating the remaining public transit systems.
- Multimodal Systemwide Traffic Counts, using sensor technologies at intersections and key mid-segment locations for 24-7 traffic counting.
- Travel time sensors deployed at strategic gateway points to the city and along key corridors.
- Intelligent Light poles, already operational in the Project Area.
- Environmental sensors, including gas-leak detectors, seismic monitors, rain gauges, sea level monitoring systems, and flood detectors, to provide environmental monitoring capability.
- Smart garbage collection, using sensors that allow optimization of garbage collection services.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

Smart Miami Project will take advantage of the extensive sensing architecture it already employs and will then supplement these sensors with additional elements of the envisioned connected environment to produce an integrated network with sharable data available to City staff in all departments, other agencies, and private entrepreneurs alike.

The results will be synergistic in the following ways:

- They will bring together the capabilities and needs of various city departments and partner agencies; and
- They will augment the ability of each department for autonomous decision-making while sharing sensing resources.



USER-FOCUSED MOBILITY SERVICES AND CHOICES

Smart city transportation is about offering choices that range from individual vehicles, to shared transportation services, ubiquitous transit connectivity, and a full range of multimodal transportation options. Miami's vision emphasizes an increasing detachment from the former, single-occupancy vehicle use, and emphasizes the latter choices. With its online trolley tracking system, availability of shared-use transportation services, shared water taxis, and high-occupancy vehicle lanes on the city's freeway network, Miami offers the foundation for this vision. The focus of this application is to significantly expand transportation options throughout the city and assure that the full spectrum of services is available to all users.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

Miami’s vision for user-focused mobility services places an emphasis on diversity, affordability, and accessibility of transportation options. Sustainable mobility for all transportation users means providing choices, offering incentives for green and health-focused options, and leveraging technology to make these options easy to use for all. Through an integrated transportation data network, it will be possible to relay information about alternative modes of transportation through smart phones and other technology, assuring that the information necessary to support smart and sustainable transportation choices can be accessed by all. Key features of Miami’s user-focused mobility vision include:

- Advanced traveler information systems.
- City-wide transit tracking system.
- Promoting and streamlining the city’s transit system.
- Expanding the city’s bike-sharing network.
- Providing safe and comfortable walking environment for short-range trips.
- Building a smart parking infrastructure that minimizes unnecessary delays.
- Integrating bridge opening and rail crossing information into the city’s smart transportation network.
- “Mobility on Demand” functionality supporting car sharing services.
- Expanding the city’s water taxi services.
- Assuring accessibility of transit services, intersection holding areas, and the sidewalk network.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

Smart Miami Project will take advantage of the existing trolley and MetroBus positioning system, bike-sharing program, and shared transportation services, among others, and build on these existing technologies to provide a broad diversity of transportation options. The vision for the project is to expand and supplement these existing services with expanded technology services to broaden the range of transportation options available to residents and visitors to the city. The mobility services will be integrated to support trip-making decisions across multiple modes.

The results will be synergistic in connecting and integrating transportation options provided by different city departments and partner agencies into a holistic set of mobility choices for Miami. They will also greatly expand the ability of each department to offer affordable and accessible transportation options to all users.



URBAN ANALYTICS

Urban analytics is what makes a knowledgeable city into a smart city. Miami and Miami-Dade County already have over a decade of experience with many features of a smart city already in place and functioning in the real world.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

Miami will build on the extensive commercial and public databases and analytical platforms already in place in Miami-Dade County, integrating and

augmenting them to create a truly smart and accessible database with supporting analytical platforms for commercial, private, and public users.

Miami-Dade has several key components of a future central database already in place. These include FDOT's TMC and real-time databases that feeds the 511 Travel Information System, and RSS and Twitter feeds capabilities.

In addition, Miami-Dade currently has several analytical platforms and databases already in place. Most of these analytical platforms and tools are currently housed at the Miami-Dade Metropolitan Planning Organization, but the Florida International University also houses a significant analytical resource in its ITS laboratory. Miami will develop a distributed urban analytics database wrapped with analysis tools to assemble the databases and tools already available in the area, interface them with other available commercial databases and tools (e.g. INRIX, HERE, ESRI, GOOGLE, etc.), and augment them to fill the utilities, public safety, public health and other identified gaps. The analytical tools "wrap" the distributed central database so that the user need not worry about exactly where a particular data item comes from.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

The synergistic elements of this approach result from the mutually-beneficial effects of the extensive commercial and public sector investments in databases and tools; the existing 511 travel information system; the Southeast Regional Planning Model; FIU's ITS Laboratory; the INRIX, HERE, ESRI, and GOOGLE resources (among others); bicycle and car sharing services; and ongoing public and private sector database maintenance annual outlays. The approach

does not require public or private sector entities to change how they develop and operate their current databases and tools. It also hides the complexities of the various databases behind "wrapper" software.



URBAN DELIVERY AND LOGISTICS

The Smart Miami Project will enhance urban delivery and logistics through the sharing of real-time information on transportation infrastructure status, coordination with the PortMiami and the Miami International Airport, and improved real-time control of the infrastructure.

PortMiami, managed by the Miami-Dade County Seaport Department, is located just outside of Downtown Miami on a 520 acre island. Port Tunnel opened in August 2014 providing direct access to the Interstate System. Rail service was restored to the port earlier in 2014 and an on-port intermodal container transfer facility (ICTF) is under construction. A deep dredge is also underway that will allow for the main channel to accommodate post-Panamax ships.

Miami International Airport (MIA) is just eight miles outside of downtown Miami; it is the gateway to Latin America and the Caribbean and handles over 80 percent of cargo movements from these markets. It is expected to experience an average annual growth of 3.5 percent.

There are currently four foreign trade zones (FTZ's) in Miami-Dade County. FTZ 281 is the newest foreign trade zone designated in Miami-Dade County, extending from SW 8th Street in the south to the county border with Broward in the north. FTZ 281 will be among the first to be operated under the Alternative Site Framework's (ASF) streamlined process.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

The Smart Miami Project includes innovative solutions supporting efficient goods movement in ways that use data or deploy technology to create opportunities for a more efficient supply chain approach that delivers safer logistics management, improved on-time pickups and delivery, improved travel time reliability, reduced fuel consumption, and reduced labor and vehicle maintenance costs. In addition to the freight specific information exchanges and urban delivery hubs identified in the Notice of Funding Opportunity, the project will demonstrate the economic, safety, and congestion-related benefits of its urban delivery and logistics elements in the following ways:

- Smart sensor technology will improve last mile efficiency, reduce costs, increase city revenue, and enhance economic vitality of downtown core.
- Low-cost/high-payoff opportunities will be developed in Port Miami-related activities resulting in reduced VMT and increased safety.
- Data sources and dictionary elements will be updated and private and Big Data sources will be included through a central or interconnected data repository.
- The cost-effectiveness and timeliness of last-mile freight operations and decision processes will be improved.
- Asset management systems and predictive tools will be optimized using Big Data and ITS technologies.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

The planned Smart Miami Project improvements, combined with existing freight delivery systems as well as improvements already planned by the cooperating agencies, will result in the following synergistic outcomes:

- Reduction in urban freight congestion and delays through integration of ITS-related data sources including GPS data and vehicle to infrastructure connected devices.
- Collection, monitoring, management and sharing of salient truck travel attributes not previously available.
- Encouragement of private sector investments and archiving of critical disaggregated data such as cargo movement, origin-destination data, and mode of transport operations among others.
- Encourage smoother flow of port truck traffic, use of centralized pick-up points and Urban Consolidation Centers in conjunction with more effective use of the Foreign Trade Zones.



STRATEGIC BUSINESS MODELS AND PARTNERING

The Smart Miami Project relies on developing and sustaining strategic partnering opportunities between public agencies and the private sector to build on the individual efforts, assets, and capabilities of its partner agencies as well as the local universities (i.e., Florida International University's ITS Laboratory), the commercial shared ride sector's

activities (i.e., Uber and Lyft), state of the practice software developers and smart city managed service providers (i.e., Code For Miami, IBM, and Serco), smart city product vendors (i.e., Cisco, Verizon, Ericsson, and AT&T), and commercial data aggregators (i.e., Google, INIRX, and ESRI) to generate improved real time data information that is sharable and open for all.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

Miami will assemble, oversee and facilitate this assembly of talent, capability and assets to implement the specific vision elements identified in **Table 1** and described in the high-level overview herein. Technology solutions will focus on proven technologies that are already successfully deployed, using assets that either exist or are already planned for implementation and operation.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

The availability of real time data information will result in additional benefits that go well beyond those already identified. As an example, Cisco recently launched a citywide WiFi service as a component of the CIM. Citywide WiFi is convenient for citizens who want to connect to the Internet, but it has been found to provide substantial value beyond that. These WiFi services now enable connected services like automated parking management in which sensors and mobile apps help direct drivers to open parking spaces or improved public safety with IP-enabled video surveillance.

The availability of these connected services bring in tremendous benefits. For example, better parking management helps reduce traffic congestion in business districts, citizens spend less time searching for parking spots, CO2 emissions are

reduced, and the City is able to improve collections from parking violators. In this case, the network provides the foundation for innovative city services, with anytime, anywhere Internet access for residents, better citywide data collection, and support of local businesses.



SMART GRID, ROADWAY ELECTRIFICATION AND EV'S

This element of the Smart Miami Project includes strategies and initiatives that leverage the smart grid – a programmable and efficient energy transmission and distribution system – in an effort to support the adoption or expansion of roadway electrification, and electric vehicle deployment. The project will bring utility delivery systems into the 21st century with computer based remote control and automation. The systems would include two-way communication technology, the augmentation of EV recharge stations in downtown garages and the dissemination to the public of information on their availability in real time.

Florida Power & Light (FPL) currently has plans to connect nearly 500,000 street lights which will represent one of the largest, if not the largest, networked street light program in the world. The multi-application network platform that is the foundation of the Smart Miami Project will be the backbone of an interconnected smart grid and smart city through proven, standards-based solutions that are secure, flexible and reliable.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

The Smart Miami Project approach is to expand and promote assets already in place within the Challenge Area (such as, for example, EV recharge stations in downtown parking garages); and also to integrate related initiatives already being planned (for example, FPL's plan to connect and network nearly 500,000 street lights) into the multi-application network platform.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

The smart grid, electrification and EV's within Miami's Challenge Area will integrate and enhance the other components of the Smart Miami Project within the framework of the vision elements identified in **Table 1**. The smart grid system being planned by FPL is a model for the country as evidenced in the recent visit and associated remarks made about this planned project by Energy Secretary Ernest Moniz.



CONNECTED, INVOLVED CITIZENS

This vision element consists of strategies, local campaigns, and processes to proactively engage and inform citizens at the individual level by deploying hardware, software, and open data platforms in an effort to increase personal mobility. This element will leverage the use of crowd source data to achieve its objectives. Our vision for the Smart City Miami emphasizes full connectivity and integration of transportation and city services. We firmly believe that this full connectivity can only be achieved with the full support of connected, involved citizens. Our citizens, as well as our many annual visitors, play an integral part in our vision. Only if our citizens embrace

and promote the vision, will we be able to maximize its chance for success.

With the help of connected citizens and crowd-sourcing technologies, the City will be enabled to solicit opinions, sources, and surveys. Online platforms and open-source GIS serve as technology solutions that can connect citizens with city departments. By connecting with citizens, we will be able to find out what they would like to see in their communities, and may also keep them informed by streaming video of public meetings or publishing information to an online portal.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

Through use of technology and an inclusive public outreach and involvement process, Miami will include its citizens in forming, promoting, and implementing the Smart Miami vision. Key features of Miami's efforts for connected, involved citizens include:

- Use of digital decision-making tools that facilitate the inclusion of multiple stakeholders, including the public.
- Enhanced availability of open data and GIS (geographic information systems) to provide constituents with access to government information that is technically easy to retrieve, process and use, without a formal request process.
- Implement crowd sourcing platforms to solicit needed opinions or services from online social media networks or communities of citizens.
- Leverage crowd funding to tap the financial power of individual donors, and give them opportunities to donate small amounts of money to fund public works projects.
- Strengthen and expand neighborhood forums and other online meeting and

social media platforms help citizens stay informed about issues of interest and enable them to interact with each other, elected officials and municipal leaders.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

The synergistic elements of this approach include the following:

Smart Miami Project will leverage the City's existing public outreach systems, and expand them to provide broader accesses to all citizens. Through the use of technology, the City will build new ways for citizens to get connected with City departments, share data with residents, and provide ways for them to support the City with data. With more robust access to feedback the City will:

- Commit to getting better results for residents by using data and evidence,
- Measure progress and engage citizens along the way,
- Act on data and evidence for all major decisions, and
- Take stock to measure progress, learn, and make corrections and improvements.



DATA, ARCHITECTURE AND STANDARDS

This vision element emphasizes interoperable regional architectures, employing the National ITS Architecture and Connected Vehicle Reference Implementation Architecture (CVRIA), among others to achieve uniform operation that is accessible to everyone for safe and

efficient transportation operations. As part of this effort, the nature of required interfaces to other City and County systems will be defined utilizing existing networking or other standards when available. Where new standards are needed, these needs will be fully documented. Further, these interfaces will be documented using the CVRIA system architecture tools with feedback provided to the USDOT to facilitate expansion of CVRIA to accommodate these additional interfaces. The demonstration site will use existing ITS standards, architectures, and certification processes for ITS and connected vehicle based technologies (where feasible) so as to support nationwide deployment of ITS infrastructure and connected vehicle technologies. Exceptions, when needed, will be documented.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

The City of Miami's Smart City vision for data and architecture is to have a single platform hosted by Miami-Dade County that is accessible to all city departments, emergency departments, and system operations within the County. This system will build on the County's current Advanced Traffic Management System (ATMS), which is a state-of-the-art, distributed traffic signal monitor and control system managing over 2,000 intersections. It will integrate the current traffic signal operations system with future technologies including: transit, on- and off-street parking sensors, traffic count devices for all modes, and climate-related sensors.

The architecture developed as part of this effort will follow the CVRIA/National ITS Architecture. Each architecture data flow will be mapped to ITS standards which will establish the protocol for how devices operate and data exchanges occur.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

The Miami Project will result in a cost effective modular architecture, building on existing and developing standards, architectures, and processes for ITS and connected vehicles and other services that can flexibly incorporate new partners and services as the smart city evolves.



LOW-COST, EFFICIENT, SECURE, AND RESILIENT ICT

The vision element includes determining the extent to which systems will collect or store Personally Identifiable Information (PII) and PII-related information, and ensure that there is a legitimate need for this information to meet the goals of the system. The system will further guarantee that the data is only accessible for, and used for, the legitimate purposes of the Smart City vision.

This element further includes working with the USDOT developed prototype security credential management system (SCMS), which will be available for use in DSRC-based communications. The SCMS will provide digitally signed certificates that can be used to ensure trusted DSRC communications between connected vehicle devices, roadside devices and the SCMS. The SCMS will be supplemented with physical security of deployed devices and security for non DSRC communications. Industry best practices will be used.

As the central technology provider for Miami-Dade County, Information Technology Department (ITD) services are designed to improve government access, efficiency, and public value through responsive service, integrated information,

and a shared infrastructure that is cost-effective, secure and reliable. Services that the County ITD provides include business intelligence report/dashboard authoring; enterprise content management (ECM) oversight and operations; enterprise asset management system (EAMS) oversight and operations; enterprise resource planning; and enterprise sustainability for countywide sustainability efforts (i.e., a countywide utility bill management solution).

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

The Smart Miami team will work closely with ITD to ensure the privacy protection of personal identifiable information as well as the security protection of each management system associated with the multi-application network platform that is the foundation of the Smart Miami Project.

The City will also work closely and collaboratively with its partners, and particularly its hardware and product providers, to develop and implement measures for assuring the physical security of deployed devices. This will include but not be limited to electronic monitoring and tamper-detection systems.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

In 2013 the Public Technology Institute's Annual Solutions Awards Competition recognized Miami-Dade County's Private Cloud implementation, where County data are stored and accessed from anywhere at any time, securely. As a result of this implementation, the ITD's Private Cloud infrastructure has saved the County over \$2 million in capital and related licensing costs in physical server replacements; this is one example of the types of synergistic outcomes that can be expected to emanate from the Smart Miami Project.



SMART LAND USE

The Smart Miami Project will expand on the success of the City's current neighborhood based planning process to promote smart land uses that promote sustainability, livability, accessibility, and reliability. In concert with Miami's mixed-used zoning ordinance, the net effects of the Smart Miami are expected to concentrate growth in the compact walkable urban center and promote intensification of transit-oriented, walkable, bicycle-friendly land uses.

Miami is significantly advantaged by its mixed-use zoning ordinance and particularly Miami 21, which is intended to densify the local urban area. Miami 21 is inherently mixed use; allowing a range of residential, commercial, office, and institutional uses in many of its zoning categories. This has created a dynamic land development climate that is fluid and highly responsive to changing conditions. Miami's public and private realms are strategically poised to take advantage of Smart City investments.

SUMMARY OF APPROACH AND PROPOSED TECHNOLOGY SOLUTIONS

Miami's approach to incorporating smart land use into the Smart Miami Project is one of fully utilizing the strength and adaptability that already exists in its current zoning ordinance, which foresee and allow the kind of mixed land use changes that are expected to follow the deployment, operation and management of the integrated smart city components that make up the Smart Miami Project. Miami 21 has encouraged the densification of Miami's central business district and greater downtown area. Miami has also found a data aggregation partner in Gridics, which has developed an application that provides access to a range of data from

a variety of sources. The Gridics team has relied on the City as the authoritative source for much of this data, and in exchange the City has been provided early access to this platform. Gridics allows high level zoning and land use analysis to be conducted on a single platform, bringing in data from multiple sources. Adding Smart City mechanisms listed in previous sections to Gridics' layers of data will allow City planning and zoning staff to conduct high-level analysis through the lens of the transportation-land use connection.

SYNERGISTIC ELEMENTS FOR MEASURABLE, COST-EFFECTIVE IMPACT IN DEPLOYMENT & OPERATION

Miami 21 has encouraged the densification of Miami's central business district and greater downtown area. Providing for a mix of uses allows neighborhood servicing commercial and office uses to open as the market demands, and in close proximity to existing and emerging population centers. The City's commercial corridors have been rebuilt to function as Mixed-Use, transit-oriented, walkable centers for adjacent residential neighborhoods.

The multi-application network platform that is the foundation of the Smart Miami Project will open the door to business and employment activities in the Project Area that can leverage the available sharable data and technologies, and who can benefit from reduced congestion, increased reliability, and enhanced accessibility and cost-effectiveness of the transportation system serving the Project Area. The benefits that will come through last-mile freight deliveries is just one example of how the Smart Miami Project can significantly and constructively affect land use characteristics in the Project Area.

RISK ASSESSMENT

The City proposes integration of risk management into the strategic and decision-making processes organization wide. A risk sensitive approach will be utilized to avoid potential failures. When feasible and beneficial, policy will be integrated into the municipal code and pertinent regulations.

The most significant technical risk anticipated by the Project Team is the team's ability to seamlessly integrate disparate databases into a single multi-application network platform; the risk of failure here is considered to be minimal. The most significant policy risk is that conflicting policies among partners may impede the effective flow of critical information; the risk of failure here is low. The most significant institutional risk is in

the continued stability of the partnership agencies and their staff; the risk of failure here is considered to be minimal.

Internal and external risks will be considered holistically. They will be managed as a system, while considering the underlying factors that directly impact organizational effectiveness and mission success. Leadership will commit to employing a consistent approach across the organization, actively participate, and support risk management practices and incorporate risk information into their decision making. Information will cascade up to provide leadership with an organization-wide view of the risks to promote better tradeoff decisions and enhance application of foresight.

The following chart shows the steps comprising the process.



TEAM COMPOSITION

PARTNERS

The City of Miami intends to create a partnership with the other government and quasi-government transportation agencies serving the Miami-Dade County area, and will also bring specialized outside expertise to its partnership as shown below.



| PARTNERS | SPECIALIZED OUTSIDE EXPERTISE |
|-------------------------------------------------|-------------------------------|
| Florida Department of Transportation | ESRI |
| Miami-Dade County Traffic Signals and Signs | General Motors |
| Miami International Airport | Google |
| PortMiami | IBM |
| Miami-Dade Transit | INRIX |
| Miami Parking Authority | Lyft |
| Florida Power & Light | MobileEye |
| Miami-Dade Express Authority | Uber |
| Miami Downtown Development Authority | |
| Florida International University | |
| South Florida Regional Transportation Authority | |

STAKEHOLDERS

Stakeholders who will likely be directly affected by the Smart Miami Project will be kept abreast of its activities and their input will be solicited regularly. An initial list of stakeholders includes local and regional hospitals, emergency service providers, Miami-Dade County Public Schools, Miami Chamber of Commerce, and Miami residents.

DEMONSTRATION GOVERNANCE PROCESSES

The Governance process for the Smart Miami Project will be via a Partnership established through a mutually-executed Memorandum of Understanding. It will be governed by a Steering Committee composed of an elected official or an Executive Manager from each of the member organizations and will be chaired by the Miami City Manager.

A Management Team will report to the Steering Committee at regular intervals and will coordinate and oversee the day-to-day activities of the Smart Miami Project through its own staff as well as outside consultants, industry collaborators, and subject matter experts.

TRANSPORTATION SYSTEM & DATA CHARACTERISTICS

EXISTING TRANSPORTATION CONDITIONS

Particular characteristics of the transportation system serving the Smart Miami Project Area are presented in **Table 3**.

Table 3. Smart Miami Project Area Transportation System Characteristics

| SYSTEM DESCRIPTOR | EXISTING CONDITION |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Arterial Miles (linear) | 18 miles of Arterial are within the project boundaries |
| Freeway Miles (linear) | 22 miles of Freeway are within the project boundaries |
| Transit Service Providers | Miami-Dade Transit and the South Florida Regional Transportation Authority operate: TriRail, MetroRail, MetroMover, and MetroBus. 160 million annual passenger trips. |
| Shared-Use Mobility Service Providers | Miami car2go, Zipcar, Enterprise CarShare, CitiBike |
| TMC Configuration and Staffing | FDOT and Miami-Dade County both operate TMC's, working together to manage the arterial and freeway surveillance and control systems |
| Traffic signals | 875 Traffic Signals are within the project boundaries |
| EV Charging Stations | 16 exist currently with an RFP out now to add more |

EXISTING DATA COLLECTION PRACTICES

A wide variety of data are currently collected by the government, quasi-government, and private entities that operate, manage, and use the transportation services provided within the Smart Miami Project area. These include such variables as volume counts, crash data, travel time and delay observations by travel mode, and passenger boarding/alighting data among others.

The resulting databases are generally archived and maintained by the entities responsible for collecting the raw data.

PLANNED DATA COLLECTION PRACTICES

Existing data collection practices will be continued and additional data collection/archiving activities are planned, particularly as they related to connected vehicles and roadside sensors.

ANTICIPATED DATA INTEGRATION

The integration of existing and planned databases is the hallmark feature of the planned Smart Miami Project. In particular, the multi-application network platform depicted earlier in the Annotated Preliminary Site Plan will enhance the quality and accuracy of the individual databases while at the same time creating value added opportunities to enhance the cost-effective management and operation of every element of the transportation system serving the Smart Miami Project Area.

COLLABORATION & PERFORMANCE ASSESSMENT

ANTICIPATED OPPORTUNITIES FOR COLLABORATION

The City will work closely with its Partners, outside consultants and subject matter experts as well as USDOT representatives to ensure that the multi-application platform it develops for assimilating and disseminating data from street-level operations and sensors is open and sharable.

The City intends for the multi-application platform developed in this project to be modular so that it is scalable to different applications. The platform will also be devoid of proprietary software and non-standard architecture so that it is easily transferable and adoptable by other mid-size cities. In this regard, the Partnership will regularly and actively publicize its work and progress, while inviting comments and soliciting suggestions at all times from the transportation community at large.

ANTICIPATED DOCUMENTATION CONTRIBUTIONS

Documentation of the Smart Miami Project will be comprehensive in two respects. First, the multi-application platform developed, deployed, and operated as part of this Project will be fully documented with respect to its configuration, characteristics, capabilities, and use. Second, the progression of work leading to the ultimate implemented and operating products will be chronicled, including but not limited to alternatives considered, successes achieved, lessons learned, and evaluation/assessment outcomes realized. The result will be comprehensive documentation sufficient to facilitate the transfer and use of Project products to other venues and environments and also to guide USDOT and other cities toward best practices and

next steps to be undertaken as part of future actions and initiatives.

MEASURABLE GOALS AND OBJECTIVES

Performance assessment and system monitoring is a critical aspect of the City of Miami's Smart City Vision. The performance metrics identified in this section are readily measurable and quantifiable, to assure that progress and success can be tracked across the following six performance categories:

1. Safety for All Transportation System Users,
2. Mobility,
3. Efficiency and Economic Competitiveness,
4. Sustainability and Access to Destinations,
5. Climate Change and Public Health, and
6. Quality of Life and Social Equity.

The City of Miami vision includes safe, reliable and affordable ways to reach important destinations such as employer, healthcare, schools and other daily needs. The performance measures identified in each category are shown in the **Table 4** along with how they relate to the twelve FHWA Smart City Vision Elements.

Table 4. Continued

| URBAN AUTOMATION | CONNECTED VEHICLES | INTELLIGENT, SENSOR-BASED INFRASTRUCTURE | USER-FOCUSED MOBILITY SERVICES & CHOICES | URBAN ANALYTICS | URBAN DELIVERY & LOGISTICS | STRATEGIC BUSINESS MODELS & PARTNERING | SMART GRID, ROADWAY ELECTRIFICATION, & ELECTRIC VEHICLES | CONNECTED, INVOLVED CITIZENS | ARCHITECTURE & STANDARDS | LOW-COST, EFFICIENT, SECURE, AND RESILIENT INFORMATION AND COMMUNICATIONS TECHNOLOGY | SMART LAND USE |
|-----------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------|------------------------------------------|-----------------|----------------------------|----------------------------------------|----------------------------------------------------------|------------------------------|--------------------------|--------------------------------------------------------------------------------------|----------------|
| | | | | | | | | | | | |
| PERFORMANCE CATEGORY & MEASURES | | | | | | | | | | | |
| SUSTAINABILITY | | | | | | | | | | | |
| Walk Score, Bike Score, and Transit Score | | | | | | | | | | | |
| Sidewalk continuity | | | | | | | | | | | |
| Bicycle facility continuity | | | | | | | | | | | |
| Presence of pedestrian facilities in proximity to transit stops | | | | | | | | | | | |
| Percentage of bus stops that are ADA-compliant | | | | | | | | | | | |
| Percentage of children walking and bicycling to school | | | | | | | | | | | |
| Number of residents using carpool and vanpool services | | | | | | | | | | | |
| Percentage of Population in proximity to transit | | | | | | | | | | | |
| | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | | ✓ |
| CLIMATE CHANGE | | | | | | | | | | | |
| Walk Score, Bike Score, and Transit Score | | | | | | | | | | | |
| Energy efficiency of transportation facilities | | | | | | | | | | | |
| Air quality and emissions | | | | | | | | | | | |
| Rates of active transportation (ex. walking and biking trips as a portion of total trips in community) | | | | | | | | | | | |
| Travel time and reliability from residential areas to health facilities | | | | | | | | | | | |
| ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | ✓ | | ✓ |
| QUALITY OF LIFE AND SOCIAL EQUITY | | | | | | | | | | | |
| Percentage of Household expenditures on housing and transportation by gender, age, income, race, ethnicity, and disability status | | | | | | | | | | | |
| Quality of automobile trips | | | | | | | | | | | |
| Quality of transit experience | | | | | | | | | | | |
| Quality of the bicycle environment | | | | | | | | | | | |
| Quality of the pedestrian environment | | | | | | | | | | | |
| ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | | | ✓ |

The City of Miami will track these performance measures on a continuous basis for the duration of the project, and will prepare bi-annual status reports summarizing and documenting the progress of our effort in each of the categories. These progress reports will be made available to USDOT, as well as stakeholders and residents within the City of Miami.

OPPORTUNITIES FOR INDEPENDENT VERIFICATION

City staff will be available to work with USDOT on any additional data requests. We recognize the importance of independent evaluation in the Smart City process, and we believe in full transparency in tracking our progress. City staff will work directly with USDOT and provide any requested data pertaining to the Smart Cities project, and assist with additional data collection or data inference requests. This includes providing USDOT or independent evaluators access to the site and site staff in coordination with City staff. We will be available and assist with any surveys, interviews, or evaluation-related experiments requested in this context.

CAPACITY FOR PROJECT & RESOURCE LEVERAGING

CAPACITY TO UNDERTAKE THIS PROJECT

The City is a financially attractive and stable organization. The City's General Fund Reserve marked its fourth year of positive growth for the year ended September 30, 2014.

Miami will manage data collection, evaluate trends, track results and align resources to all goals and activities. The City has extensive existing capability to track measurable outcomes at various levels in order to prepare required reporting documents for funding agencies that support the project. All partners will share information regularly with the City.

RESOURCE LEVERAGING OPPORTUNITIES

The City can leverage the considerable assets included within internal departments and offices, and with external partners like Miami-Dade County and the Florida Department of Transportation. Partners will also help leverage this project in their respective organizations. The City will also seek to leverage the resources of local educational institutions.