City of
Philadelphia

SMARTCITYPHL

ROADMAP

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INTRODUCTION

The City of Philadelphia established the SmartCityPHL initiative in 2017 to better understand and implement smart and emerging technology solutions that would improve City service delivery for its broad community of residents, businesses, and visitors. A key component of this initiative was to develop this roadmap of strategies and processes to drive the initiative forward.

This roadmap is intended to serve as an initial guide to spur innovation and collaboration in City government around smart city and the policies and technology surrounding it. It is intentionally designed for broad application so that as people and technology change, fundamental practices are applied while leaving room for iteration when it comes to specific projects and programs that support the initiative.

The roadmap also acknowledges the challenge our city faces in ensuring that smart city technologies are available and meaningful for our residents. Digital access and adoption remain significant hurdles among Philadelphia's communities, and even our municipal government employees face similar challenges as technology becomes a critical element of the workplace.

The creation of the roadmap was made possible by the John S. and James L Knight Foundation, key partners to the City of Philadelphia on projects that reinvigorate the city through placemaking, civic engagement, and leadership development.

The City worked with a team from Guidehouse LLP (formerly "PwC U.S. Public Sector") who provided extensive research and consulting services to support the development of this roadmap.

LEAD DEPARTMENT: Office of Innovation & Technology

CABINET REPRESENTATIVE: Chief Administrative Officer

WORKING GROUP:

Department of Streets

Waste & Litter Cabinet

Office of Sustainability. Energy Office

Office of Transportation, Infrastructure & Sustainability

Philadelphia Water Department

Department of Public Health, Air Management Services

Philadelphia Fire Department

Department of Health & Human Services

Department of Commerce

Department of Licenses & Inspections

Office of Emergency Management

Department of Planning & Development

Department of Public Property

PECO

Philadelphia Gas Works

Southeastern Pennsylvania Transportation Authority

DEFINITION: Smart city is a city that uses integrated information and communication technology to support the economic, social, and environmental goals of its community.

GUIDING PRINCIPLES

LOCALLY-INSPIRED

We will pursue projects that accurately reflect the needs of Philadelphia's communities and use the unique assets, culture, and existing resources present in the city.

INNOVATIVE

We will grow our capacity for research, discovery, piloting and evaluation to develop creative solutions to municipal challenges.

EQUITABLE

We will strive to engage and invest in our diverse communities so that all Philadelphians can benefit from and contribute ideas to smart city activities.

COLLABORATIVE

We will collaborate on project development and implementation with stakeholders and partners from government, private sector, startup, civic technology, academia, and local neighborhoods.

METHODOLOGY

ASSESSED EXISTING ASSETS & INITIATIVES

Created inventory of municipal assets and initiatives related to smart city

Categorized assets and initiatives by technology type (See page 5)

CONDUCTED FOCUS GROUP INTERVIEWS

Included:
3 City departments

Utility partners

Regional transportation authority

IDENTIFIED GAPS & OPPORTUNITIES

Assessed synergistic missions and goals across focus group interviewees

Developed connecting themes

Reported findings to the working group

FACILITATED BRAINSTORMING SESSIONS

Engaged working group in multiple brainstorming session throughout roadmap development to design processes and refine new ideas

BENCHMARKED PEER CITIES ON LEADING PRACTICES

Conducted a preliminary study to learn how other cities are approaching smart city

Included national and international cities

ENGAGED EXTERNAL STAKEHOLDERS FOR FEEDBACK

Presented preliminary ideas with universities

Hosted readiness workshop with Smart Cities Council

Facilitated public workshops with Generocity and Knight Foundation

EXISTING ASSETS & INITIATIVES

MOUNTING PLATFORMS

-Municipal buildings
-Municipal vehicles
-Bridges
-Streetlights
-Street furniture
-Public transportation infrastructure

COMPLEMENTARY INITIATIVES

-CleanPHL
-Greenworks
-Philadelphia 2035
-StartupPHL
-Vision Zero
-Digital Literacy Alliance
-Green City, Clean Waters
-Penn Futures-Early Childhood Initiative

SENSOR PROGRAMS

-Air monitoring sensors & index
-Fire Department wearables
-Automatic vehicle location
-Green stormwater sensors
-LIDAR
-Gunshot detection
-Lighting Control Pilots
-BigBelly Trash Bins
-Public Safety cameras
-Traffic counters
-Smart benches
-Transit System Priority
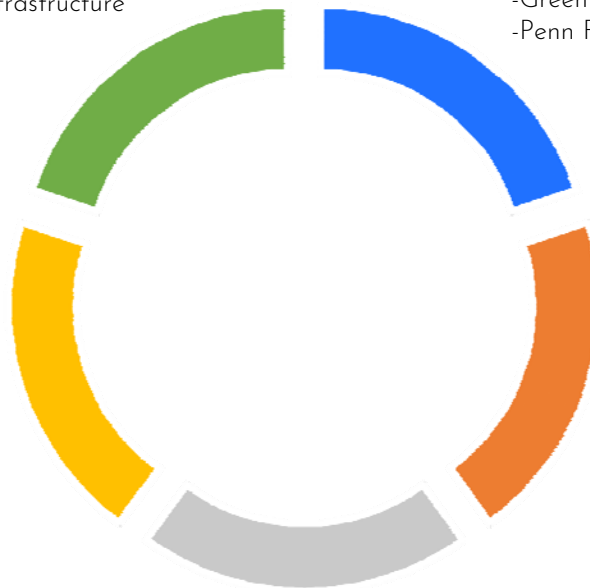
NETWORK ELEMENTS

-Institutional network
-Utility Infrastructure
-Municipal fiber
-LinkPHL
-Distributed Antennae Systems
  Program
-Utility Advanced Metering
  Infrastructure

DATA & SYSTEMS

-DataBridge
-Open Data Philly and the Metadata Catalog
-Atlas/MapBoard
-Address Information Systems
-CARES Integrated System
-Computer Aided Dispatch systems
-Police data warehouse
-Vacant Property Model
-Building Automation Platform
-EnergyCap
-eBilling portal
-Integrated Workplace Asset Management System
-Carto
-ArcGISOnline/PHLmaps
-Litter Index
-AMS CitizenServe Online Portal

READING GUIDE TO THE ROADMAP

STRATEGY 1: BUILD A STRONG FOUNDATION WITH POLICY AND INFRASTRUCTURE

This section will cover the foundational needs that we believe are necessities for any work. Topics include: Governance, Security & Privacy, Data, and Network Infrastructure. Each topic is designed to be framed as an action.

STRATEGY 2: CREATE A PROCESS FOR ENGAGEMENT AND PARTNERSHIP

This section of the roadmap is intended to depict the processes designed and employed to drive engagement, partnership, and project development.

STRATEGY 3: SUPPORT AND SUSTAIN IMPLEMENTATION OF PROJECTS AND PROGRAMS WITH FUNDING

This section will provide an overview of various funding mechanisms that we are considering to financially support and sustain our projects.

1

# BUILD A STRONG FOUNDATION WITH POLICY AND INFRASTRUCTURE

1A | ESTABLISH A GOVERNANCE STRUCTURE

A strong governance structure is arguably the most important foundational element to smart city success. Governance drives collaboration and standardization, which are critical elements in a smart city. An established governance model will solidify the City's decision-making process, reporting structures, and roles and responsibilities of participating members.

Our governance model will include:

- **Executive leadership**, who sets vision and direction
- **Smart City Director**, who identifies strategic opportunities, drives collaboration, and carries out the vision
- **Internal Working Group**, who collaborates and partners to inform and implement activities
- **External Advisory Committee**, who provides advisory services, research, funding, solutions, and workforce capacity
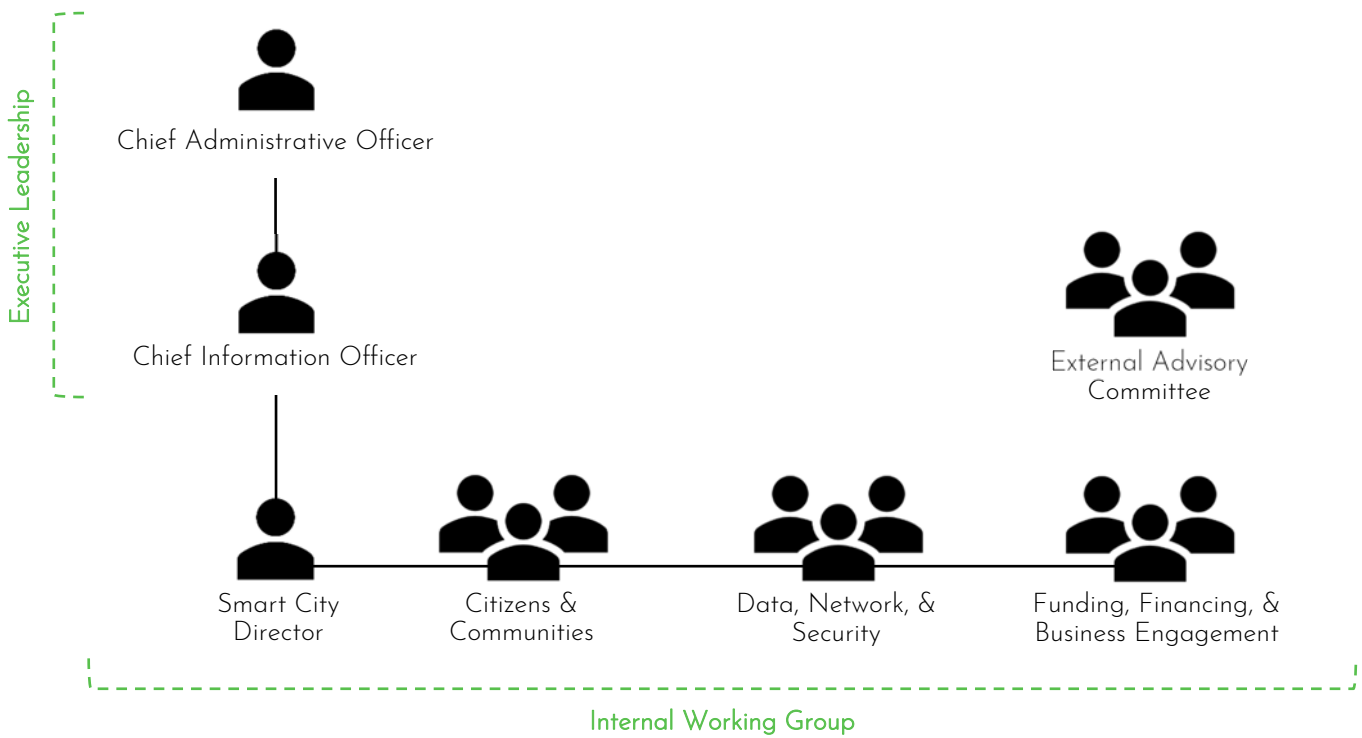
SUBCOMMITTEES

CITIZENS & COMMUNITIES: Comprised of community-facing departments, this sub-committee will be responsible for shaping and leading community engagement strategies and ensuring that solutions and projects will improve the lives of residents.

DATA, NETWORK, & SECURITY: These essential functions of the City's IT work in tandem with each other. This sub-committee will work to integrate and support asset management systems, ensure data accessibility and interoperability, and network security.

FUNDING, FINANCING, & BUSINESS ENGAGEMENT: Smart city projects have unique funding concerns and opportunities. This group will guide policy, best practice, and programs related to private sector engagement and developing funding strategies.

EXTERNAL ADVISORY COMMITTEE: We will leverage the expertise of different members of the Philadelphia community representing universities and colleges, private sector and community-based organizations to serve as advisors, sources of projects ideas, and to support the implementation of projects.

1B | CONTINUE BUILDING & EXPANDING ENTERPRISE SECURITY & PRIVACY POLICIES

Cybersecurity and privacy are fundamental to any technology infrastructure. The emerging needs of smart city applications include new hardware types that can create unique concerns. For example, small and low-cost sensors may not have robust security layers so understanding the limitations of technology and incorporating them into a holistic cybersecurity strategy is essential before distributing potentially thousands of devices across the City.

On Security: The City has security policies in place that covers access control, physical device security, and operations management. The information security team at the Office of Innovation & Technology will continue to drive and develop the enterprise policies, procedures, and standards. Some key considerations include:

- Installing an active device management layer to monitor any sensors or cameras for irregularities

- Requiring new project teams to conduct a privacy self-assessment to identify privacy issues within the project and track resolutions before they commence work on the initiatives

On Privacy: The City collaborated on the development of the privacy policy for the LinkPHL digital kiosk pilot. This effort serves as a starting point for future smart city projects and the expansion of enterprise privacy policies. The initial policy was developed in partnership with the Department of Law, the Managing Director's Office, the Office of Innovation & Technology, and Intersection, the New York City-based provider of LinkPHL. Additionally, the City partnered with Drexel University's Chief Information Officer to serve as an external advisor to the City on this privacy policy.

Moving forward, the City will take steps to better understand the concerns of community members and privacy advocates when initiating smart city projects. We will look to established groups such as the American Civil Liberties Union (ACLU), the Internet Freedom Foundation (IFF), the Future of Privacy Forum (FPF), and academia to help the City develop comprehensive smart city privacy policies.

NYC IOT GUIDELINES

In 2017, the City of Philadelphia signed the City of New York's Internet of Things guidelines. This document contains a common framework for IoT and smart city technology deployment as it relates to privacy, data management, and security. The City will continue to use this framework alongside its partners across the globe to employ fair and just practices.

LINKPHL KIOSKS

Approximately 100 digital kiosks will be located across University City, Old City, and in local neighborhoods offering free gigabit public Wi-Fi. In addition to commercial advertising, the 55-inch screens will display public service information on local events and emergency messaging. City services, maps, and directions will be available through a tablet built into the kiosk. Implementation of the kiosks is led by the Office of Transportation and Infrastructure Systems, Department of Streets, and the Managing Director's Office.
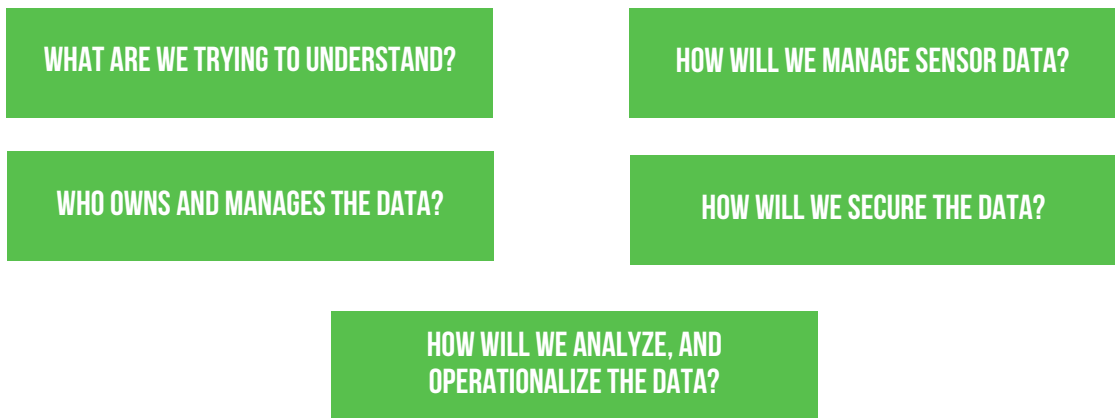
1C | FORMALIZE MASTER DATA STRATEGY

Smart cities are driven by data and equipped with real-time insights and analytics. Moving forward, the City will need a master data strategy that will guide and support the management of new forms and volumes of data. The strategy will establish the standards for improved data integration across stakeholders and will create the necessary environment for reliable and accurate data analysis and decision-making. This effort will help the City to harmonize key data types across the organization under a cohesive set of policies and |standards for the enterprise data layer. Ultimately, this work will lead to better service delivery to residents, businesses, and communities in Philadelphia.

Creating a master data strategy requires a combination of strategy, technical design, and stakeholder engagement. Moving forward, the City will design its master data strategy through the Data, Network, and Security sub-committee described in the working group (page 8). This working group will:

- **Formalize the Inventory of Common Data Elements in the City's Metadata Catalog:** Data such as addresses, streets, individuals, and City assets will be identified in the Metadata Catalog to ensure that technical designs and solutions are standardized on key elements.

- **Institute Proactive Policies and Standards:** Establish the operating model for governing data across departments and for use by solution providers.

- **Identify technology specifications and requirements for future procurements, software upgrades, and vendor engagements:** This will enable interoperability of disparate data sets to drive better decision-making throughout the City.

- **Continue building a strong technical and analytical workforce:** Proper training and education are important considerations to ensure that the workforce is equipped to support the City's demand for more data capacity.

GUIDING QUESTIONS

WHAT ARE WE TRYING TO UNDERSTAND?	HOW WILL WE MANAGE SENSOR DATA?
WHO OWNS AND MANAGES THE DATA?	HOW WILL WE SECURE THE DATA?

HOW WILL WE ANALYZE, AND OPERATIONALIZE THE DATA?

CURRENT SMART CITY-RELATED DATA INITIATIVES AT-A-GLANCE

DATA BRIDGE

Data Bridge is the City's data warehouse and integration solution for its geospatial data and select non-geospatial data. It is governed by the Office of Innovation & Technology and supports the delivery of analytics and applications throughout the City.

CARES INTEGRATED DATA SYSTEM

The City's Office of Health and Human Services department has a secured internal analytics, research and case management platform that receives information from eleven unique source databases.

ADDRESS INFORMATION SYSTEM

This system provides a unified view of the City's addresses and supports applications that require geocoding and address-based data look-ups.

METADATA CATALOG

The City created an online catalog in an effort to provide clear information about each open data release on Open Data. This catalog contains data definitions and descriptions for data sets collected and maintained by City agencies.

AUTOMATIC VEHICLE LOCATION (AVL)

The City's AVL systems provide real-time municipal vehicle data to assist in operations management and service delivery. Data produced by AVL are consumed by real time event servers (i.e. ArcGIS GeoEvent), and leveraged by City applications and analysis processes.

VACANCY MODELING

This tool identifies potentially vacant properties across Philadelphia by combining city datasets, analyzing and scoring them for every property record in the city. This solution has increased data accuracy and operational efficiency across stakeholders that deal with vacancy challenges.

LITTER INDEX

This map-based application surveys the litter conditions of city streets, parks and recreation sites, public school sites, green stormwater infrastructure, river ways, and vacant lots. This tool provides necessary data to prioritize litter prevention and remediation strategies.

ENERGYCAP

EnergyCAP is the City's utility bill management software to upload, audit, and report on utility bills for City owned buildings. In addition, it benchmarks buildings and creates dashboards to track project performance, and provides City departments with data to understand their energy impact.

INTEGRATED WORKPLACE ASSET MANAGEMENT SYSTEM (IWAMS)

IWAMS is the city's asset management system for its capital assets, from buildings to statues. It tracks budgets, work orders and energy use. As a GIS-based asset intelligence tool, data can be exported in formats that can be mapped or analyzed as tabular data.

TESTING REAL-TIME DATA

Hundreds of City of Philadelphia vehicles are equipped with GPS based Automatic Vehicle Location (AVL) Systems which send locational data on a consistent basis. The City's AVL systems provide a near real-time steady stream (every 15 seconds) of vehicle data including: location, vehicle status, speed, heading, etc. In addition to being real-time, AVL data are also truly big data, where during peak activity over 1000 records per minute are being produced.

AVL has traditionally been utilized at the Streets Department through real-time monitoring of fleet vehicle locations. Recently, the focus of AVL has shifted beyond simple monitoring towards the need to incorporate the data into decision-making processes to improve operational efficiency.

To accomplish this new AVL initiative, the Office of Innovation and Technology's CityGeo team, in collaboration with the Streets Department, has established a platform to ingest, organize, and store the raw AVL big data. Raw AVL data, however, has limited usability, as there is there is no automatic ability to associate the GPS location data with the actual street traversed by the vehicle on its route. To enable the raw data for analytics, the CityGeo team has developed complex scripts and analytical processes to associate the raw AVL data to street segments. Once associated to street segments, the actual routes of vehicles can be used for further analysis.

The initial pilot project for this newly associated AVL data is the development of an internal snowplow tracking application to enable more effective and efficient deployment of maintenance vehicles during winter weather events. Additional AVL use cases are also in discussion, all aimed at optimizing fleet operations such as: garbage collection route analysis, congestion and delay mitigation, fuel consumption reduction, etc.

AUTOMATIC VEHICLE LOCATION ON CITY FLEET

The Office of Sustainability's Energy Office has a goal to reduce energy consumption by municipally-owned buildings and physical infrastructure by twenty percent by 2030. To achieve this goal, the Energy Office is working to reduce energy consumption across fifty of the largest municipal buildings which account for approximately seventy percent of the City's energy use and cost. Currently, many of these buildings are equipped with Building Automation Systems (BAS) to control HVAC through a web-enabled platform.

Moving forward, the BAS will allow for the City to utilize a centralized building monitoring solution to observe operations of all the buildings connected to the BAS in real-time. The building monitoring solution will suggest and provide energy-efficient schedules and temperatures and send alerts to facilities teams when parts of the system need maintenance support. Along with improving operations, similar building monitoring and continuous commissioning programs have been shown to save between eleven to twenty percent annually. With nearly 20 buildings already having BAS, even a three percent reduction in energy use in those buildings would save the City over $200,000 annually.

AUTOMATION OF MUNICIPAL BUILDINGS

1D | INTEGRATE ASSET MANAGEMENT OF CITY COMMUNICATIONS AND NETWORK INFRASTRUCTURE

The City's network infrastructure is a critical asset to power the smart city solutions because they require internet connectivity to send, receive, and process data. The City employs a range of connectivity options but they are not centrally managed as a single or shared asset. This causes unnecessary redundancy and a challenge to strategic planning and partnership. Moving forward, the City will work across City departments to coordinate the management of its communications and network infrastructure. Coordination and potential for integration becomes more valuable as more of the city's built environment becomes tech-enabled and requires the support of a network.

CONNECTED SOLUTIONS

PUBLIC COMPUTER CENTERS
SPEED DETECTION SENSORS
TRANSIT SYSTEM PRIORITY
GUN SHOT DETECTION
TRANSIT OPERATING CENTERS
BODY CAMERAS
TRAFFIC CAMERAS
GREEN STORMWATER SENSORS
AVL
BIG BELLY TRASH CANS
NEXTGEN911
HEALTH IMAGE PROCESSING
BUILDING CONTROLS
LIGHTING CONTROLS
METERING

DEPARTMENTS & PARTNERS MANAGING NETWORK INFRASTRUCTURE

OIT
PUBLIC PROPERTY
STREETS
GAS
WATER
PECO

CONNECTED SOLUTIONS

ABOUT THE CITY OF PHILADELPHIA'S INSTITUTIONAL NETWORK (I-NET)

The City's Institutional Network (I-NET) Agreement with Comcast offers the opportunity to replace and upgrade critical network infrastructure. As a result, the City can better support current and future demand for more robust data collection and analysis, while also enabling diverse applications such as police body cameras or transmitting X-rays across public health facilities.. The City plans to launch a program to engage the public in developing smart city solutions that leverage the network (See page 24, "I-NET Challenge").

While reducing overall network costs by about one-third, the I-NET significantly upgrades speed and capacity to over 225 City facilities with the network capacity at most locations increasing five-fold over today's capabilities. Also included in the agreement is special consideration for bandwidth needed by the City on an ad hoc basis for special events.

Additionally, the City's agreement with Comcast enhances digital access for the residents of Philadelphia. Comcast is providing courtesy Internet accounts for City recreation centers presently without service, and the City can now offer Wi-Fi in many City facilities.

PHASE 1— NEAR COMPLETION

Department of Public Health (20 sites)

District Attorney's Office (1 site)

Department of Human Services (1 site)

Fire Department (68 sites)

Office of Fleet Management (7 sites)

Department of Licenses & Inspections (3 sites)

Office of Emergency Management (1 site)

Office of Innovation & Technology (18 sites)

Philadelphia Parks and Recreation (16 sites)

Philadelphia Airport (1 site)

Philadelphia Police Department (60 sites)

Department of Prisons (9 sites)

Department of Public Property (4 sites)

Philadelphia Water Department (21 sites)

Department of Records (1 site)

Department of Revenue (5 sites)

Streets Department (14 sites)

Free Library of Philadelphia (7 sites)

PHASE 2—NEAR COMPLETION

Philadelphia Police Department (10 sites)

University of Pennsylvania Police (1 site)

Fire Department (1 site)

Philadelphia Water Department (20 sites)

Department of Public Health (4 sites)

Department of Public Property (2 sites)

Philadelphia Courts (1 site)

Philadelphia Parks and Recreation (1 site)

Department of Human Services (3 sites)

Office of Innovation & Technology (1 site)

Office of Fleet Management (1 site)

DENSITY OF COVERAGE THROUGH THE INSTITUTIONAL NETWORK

Comcast_Circuit_Points - Density

High

Low

2
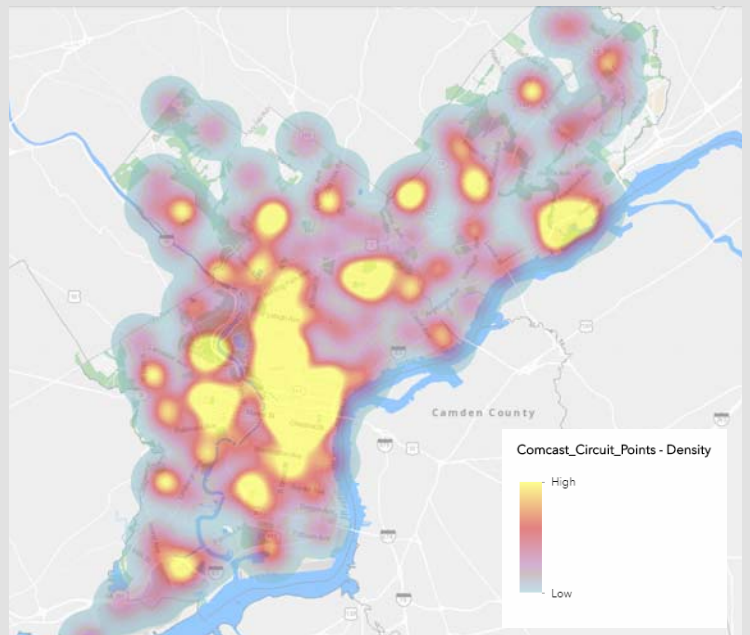
CREATE A PROCESS FOR ENGAGEMENT AND PARTNERSHIP

2A | GROUND SMART CITY IN CHALLENGES & EVALUATE SOLUTIONS

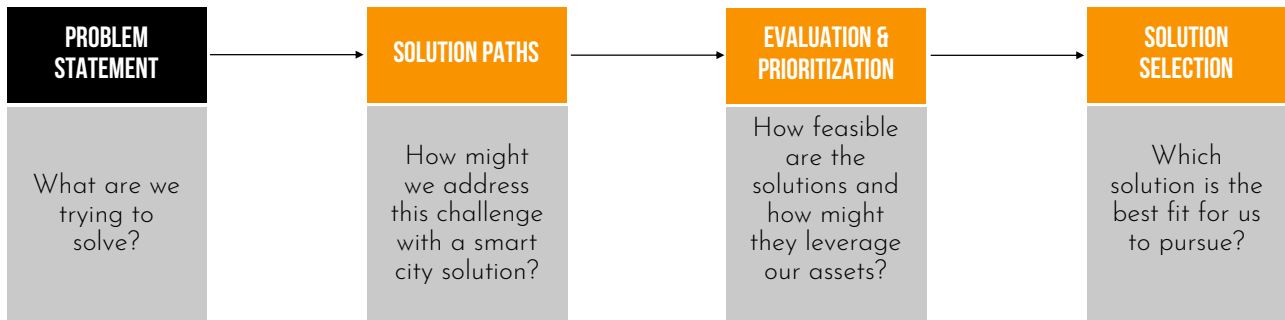Fundamentally, we believe that smart city is a strategy for how we might improve our ability to tackle existing challenges that have been difficult to solve and understand with our current means. With this perspective in mind, it is important that any smart city project the City pursues is grounded in a challenge or problem that aligns with its broader mission and purpose. The diagram below shows the process we will use to select and evaluate appropriate and feasible smart city projects.

PROBLEM STATEMENT	**SOLUTION PATHS**	**EVALUATION & PRIORITIZATION**	**SOLUTION SELECTION**
What are we trying to solve?	How might we address this challenge with a smart city solution?	How feasible are the solutions and how might they leverage our assets?	Which solution is the best fit for us to pursue?

At each step of the process, there are key questions that we will ask to guide the discussions and decisions we will make.

The first step is to establish a **problem statement** that conveys a challenge we are facing or trying to solve. For example, language access is a challenge that we are trying to solve so that residents with limited English proficiency can have the same access to information and services provided by the City.

With the established problem statement, **solution paths** need to be identified. Sometimes, solutions can and will be internally generated and may leverage existing assets. However, at this stage of the process the City will also engage with a broader community to identify interesting and potentially impactful smart city solutions. We will look to peer city programs, marketplace solutions, and interact with the public to gather ideas for how we might address the challenge. Solutions may fall within the following categories:

- Asset/environmental monitoring
- Remote/automated asset management
- Citizen digital engagement and services
- Internal data management and culture

Once we gather a long list of solutions, we will **evaluate and prioritize** them through criteria based on the following guiding questions:

- **Foundation:** Does the City have relevant assets that can make successful deployment easier and cheaper?
- **Community Impact:** Does the program tangibly improve the experiences and outcomes of the community?
- **Risks**: What are the potential problems with deploy the solutions (e.g. cybersecurity risks)
- **Maturity of Technology:** Has the technology successfully deployed in other places?
- **Engagement:** Are key stakeholders motivated to implement this project?
- **Resources:** How much funding will this project require?
- **Capacity:** Do we have the necessary tools and team to effectively manage the project and the data that will be generated?
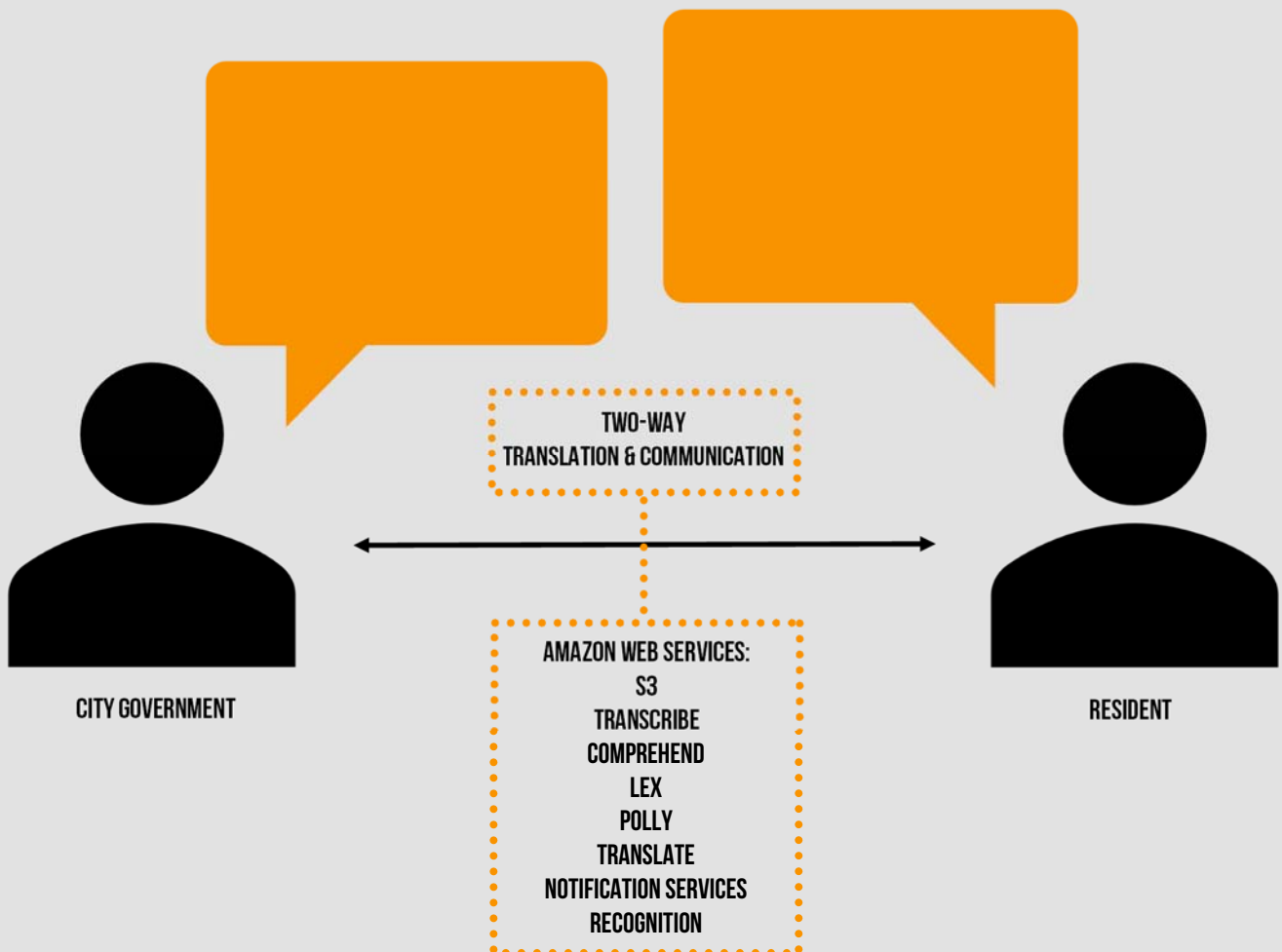
CHALLENGE: HOW MIGHT WE PROVIDE BETTER LANGUAGE ACCESS TO UNDERSTAND AND COMMUNICATE WITH RESIDENTS?

The City of Philadelphia is committed to making municipal services equitable and thoughtfully engaging its communities to shape services and policies. However, language access can often be a barrier to having meaningful dialogue with communities where English is a second language or of limited proficiency. The City celebrates its diverse communities and wants to make sure that language access is not a barrier to receiving services or participating in civic activities. To tackle this challenge, the City is piloting and developing a multi-lingual and voice-powered engagement platform.

The pilot effort will provide a completely new way of thinking about how the City can increase access to information and services for all residents. Through the use of voice-powered technology, the City will be able to interact with residents in their native languages as the platform leverages both hardware and software to auto-detect languages and translate conversations in real-time.

In addition, voice-generated data can be collected, mined, and analyzed to capture opinions, ideas, and thoughts from the community. The platform will initially be designed by a cross-departmental team including the Office of Innovation and Technology, the Office of Immigrant Affairs, and Philadelphia Parks and Recreation. It will continue to be developed and refined with members of the community. This project aims to create a more user-friendly and meaningful way for non-English speaking residents to interface with municipal partners.

The voice-powered engagement platform was a winner of the We Power Tech award through the 2018 Amazon Web Services (AWS) City on a Cloud Challenge. This award provides credits to the City for AWS services and products that will provide translation and analytics capabilities to the city.
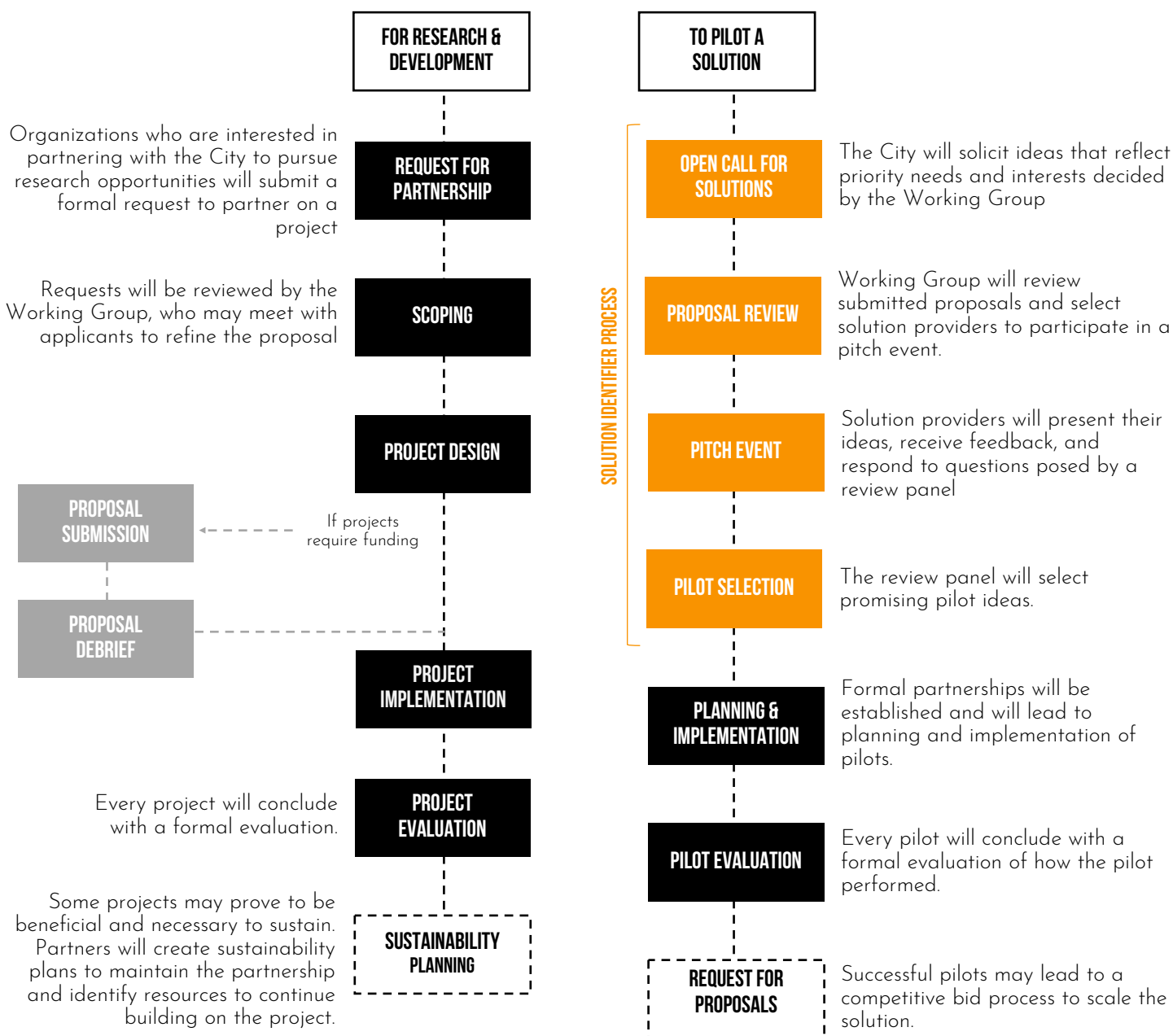
TWO-WAY
TRANSLATION & COMMUNICATION

CITY GOVERNMENT

AMAZON WEB SERVICES:
S3
TRANSCRIBE
COMPREHEND
LEX
POLLY
TRANSLATE
NOTIFICATION SERVICES
RECOGNITION

RESIDENT

2B | ESTABLISH A PIPELINE FOR PARTNERSHIP

Like many cities, Philadelphia believes that partnerships are a critical component to building, implementing, and sustaining smart city solutions. Engagement and collaboration are at the heart of SmartCityPHL. Engagement with the community ensures that the voices of residents and stakeholders are thoughtfully considered and reflected in the way smart city solutions are created and designed. Partnerships allow for increased capacity to realize and implement ideas and solutions in a sustainable manner.

Without a clear process, the strategic focus of SmartCityPHL can be lost as potential projects are reviewed by disparate stakeholders rather than adhering to common goals and guidelines. Moving forward, the City will employ the process depicted below to engage and identify partners to drive the SmartCityPHL initiative forward.

PITCH + PILOT

FOR RESEARCH & DEVELOPMENT	TO PILOT A SOLUTION

Organizations who are interested in partnering with the City to pursue research opportunities will submit a formal request to partner on a project

REQUEST FOR PARTNERSHIP

OPEN CALL FOR SOLUTIONS

The City will solicit ideas that reflect priority needs and interests decided by the Working Group

Requests will be reviewed by the Working Group, who may meet with applicants to refine the proposal

SCOPING

PROPOSAL REVIEW

Working Group will review submitted proposals and select solution providers to participate in a pitch event.

PROJECT DESIGN

PITCH EVENT

Solution providers will present their ideas, receive feedback, and respond to questions posed by a review panel

SOLUTION IDENTIFIER PROCESS

PROPOSAL SUBMISSION

If projects require funding

PILOT SELECTION

The review panel will select promising pilot ideas.

PROPOSAL DEBRIEF

PROJECT IMPLEMENTATION

PLANNING & IMPLEMENTATION

Formal partnerships will be established and will lead to planning and implementation of pilots.

Every project will conclude with a formal evaluation.

PROJECT EVALUATION

PILOT EVALUATION

Every pilot will conclude with a formal evaluation of how the pilot performed.

Some projects may prove to be beneficial and necessary to sustain. Partners will create sustainability plans to maintain the partnership and identify resources to continue building on the project.

SUSTAINABILITY PLANNING

REQUEST FOR PROPOSALS

Successful pilots may lead to a competitive bid process to scale the solution.

2C | PROVIDE EDUCATION AND TRAINING FOR BETTER ENGAGEMENT AND INFORMED DECISION-MAKING

The idea of becoming a smart city can be exciting for some and confusing for others. Conferences, meetings, webinars, and other education forums often begin smart city conversations with questions like "What does smart city mean to you?" or "What is a smart city?" It can feel frustrating to begin every conversation this way because it often leads to philosophical discussions rather than tangible actions, challenges, and opportunities. There is a need both internally as well as externally to engage stakeholders in learning about smart city technology and policy to develop common language and understanding about the topic. The City will launch an **education and workshop series** covering different areas of competency and topics pertaining to smart city. The objective of this program will be to proactively engage stakeholders in open discussion and learning so that when projects are being shaped, shared and common knowledge will spur productive dialogue and decision-making.

This program will build upon past events that the Office of Innovation and Technology hosted to engage different members of the Philadelphia community in shaping the roadmap. It will also bring together partners to shape and inform the curriculum, program offerings, and educators.

READINESS WORKSHOP

The City of Philadelphia hosted a Readiness workshop with the Smart Cities Council in October 2017. Over 200 participants from both local and national organizations gathered to share, learn, and discuss ideas about smart city. These conversations informed the core values and focus of the roadmap.

TECH IN THE COMMONS

The City of Philadelphia led a two-part workshop series in Spring and Summer 2018 with local media company Generocity and the Knight Foundation. The program engaged community-based organizations to learn about how smart city technology can be leveraged to solve hyperlocal, community challenges.

Photo Credit: Julie Zeglen, Generocity

3

SUPPORT AND SUSTAIN

IMPLEMENTATION WITH FUNDING

3A | IDENTIFY FUNDING OPPORTUNITIES TO SUPPORT AND SUSTAIN IMPLEMENTATION

Executing smart city projects will require funding at varying stages of development. Several cities including New York have dedicated line items for technology infrastructure. Others like San Jose have created dedicated funding streams in their annual budget as part of technology leasing deals (e.g., street pole access for small cells equipment), which serve a similar purpose of giving the SmartCityPHL team funding and latitude to execute its projects rather than having to request funds for each initiative. Public funds are often limited but are crucial to maintaining momentum for smart city initiatives.

Because smart city is a cross-functional issue, it often does not have specific budgets attached. In Philadelphia, funding projects will require a combination of funding sources to deliver a project (e.g., a grant for hardware, plus a university partnership for analytics, combined with a social impact bond to drive staffing and implementation).

Adding multiple funding tools into a single project increases the labor, time, and complexity; however, with limited internal sources of funding, this will be our strategy to execute our projects. Sources of funding may include: capital funding, research grants, federal and state grants, public private partnerships, performance contacts, philanthropic grants, vendor financing and credits, and parallel revenue through leasing programs. Without combining different sources of funding, capacity and scope can be too limiting for larger smart city projects.

Below is an overview of various sources of funding that have been used to support smart city-related projects. We hope to diversify our sources of funding moving forward so that successful projects can scale according to the needs of the city. For example, the City does not currently have smart city projects supported by grants in partnership with research institutions. We will use the Pitch+Pilot model to build partnerships with local universities and colleges so that proposal for research funding can be well-designed and competitive for research grant opportunities that align with the City's smart city needs.

PUBLIC PRIVATE PARTNERSHIPS

Public Private Partnerships (PPP) entail an exchange of assets and services to implement and maintain a project. The City funded the initial Indego bikeshare program through a PPP. The LinkPHL digital kiosks and the City's bus shelters are also supported through a PPP that generate revenue through advertisements. In addition, the City's high-speed I-NET was made possible through a franchise agreement.

GOVERNMENT GRANTS

Traditional sources of funding often come from state and federal agencies. The Pennsylvania Department of Transportation has provided the City with funding for numerous smart city projects including the expansion of the Indego bikeshare program; the transportation fiber and wireless network; implementation of a transit signal priority system, and development of an active transportation management system. In addition, grants from the Environmental Protection Agency support the City's Air quality monitors program and the Philadelphia Air Quality Survey.

PHILANTHROPIC GRANTS

Philanthropic organizations are great partners to the City and often support new ideas. The Knight Foundation provided the City with grant funding to develop this roadmap, the Tech in the Commons community program, and the Soofa smart bench pilot at Eakin's Oval.

CITY FUNDING

Individual departments allocate portions of the City's capital and operational budgets to support smart city projects and programs. Sensor projects such as those used for green stormwater infrastructure monitoring, public safety, and asset tracking (e.g. GPS for automatic vehicle location program) are supported by capital funds. More uniquely, the City's Energy Efficiency & Sustainability Fund utilizes capital dollars to grant departments with extra funding to implement energy savings projects in their buildings and operations.

PERFORMANCE CONTRACTS

Performance contracts with Energy Service Companies allow the City to use annual utility and operational savings to support project repayment without an up-front budget allocation from the City. The City has entered into performance contracts to reduce energy consumption at the Philadelphia Museum of Art, correctional facilities, and public safety buildings. The City will consider performance contracts to support its efforts around smart street lighting.

VENDOR FINANCING & CREDITS

Partner vendors provide the City with credits to access and utilize various services and product offerings. Through this arrangement, the City is able to test new ideas at no cost to the City. Currently, we are using Amazon Web Services credits to build a voice-powered translation platform and Microsoft Enterprise Cloud Readiness credits to pilot their chatbot technology.

LEASING ASSETS

The City manages the public right-of-way (ROW) and also own public land that can be used to mount different technologies. Leasing assets is one way to either generate revenue or support smart city initiatives. With the up-and-coming rollout of 5G, the City is leasing ROW spaces for companies to install 5G hardware through a Master Lease Agreement program.

ENERGY EFFICIENCY & SUSTAINABILITY FUND— INDOOR AIR QUALITY PILOT

The Energy Efficiency & Sustainability Fund (EESF), managed by the Office of Sustainability's Energy Office, encourages City agencies to reduce their energy consumption. EESF offers funding to departments on a competitive basis to support innovative energy efficiency and sustainability focused projects within existing City-owned facilities. To date, EESF investments have saved the City approximately $2.9 million in energy costs.

Though originally created to focus on energy utility cost savings, EESF now supports projects that address additional sustainability goals envisioned in *Greenworks, A Vision for A Sustainable* Philadelphia, including increased occupancy comfort, indoor air quality, waste diversion, and climate resiliency, and also seeks to educate and engage municipal employees on sustainable practices.

One recent project piloted indoor air quality (IAQ) sensors and an air cleaning device in the One Parkway Building. Although the initial building automation system (BAS) design includes temperature and humidity sensors, these additional sensors allow the BAS to show building operators measurements of CO_2, VOCs, and particulate matter which are known air contaminates. These sensors are connected to an air cleaning device which turns on when air quality is less than desirable, ensuring that building occupants are exposed to healthy air throughout the day. Data provided from IAQ sensors can also be used to influence building operations such as cleaning practices and air flush-outs after new carpet or furniture installations.

TIMELINE OF ACTIVITIES

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The timeline of activities depicts actions that the City will take to initiate key elements of the roadmap. Each action is associated with a specific strategy and color coded accordingly.

🟢 **Strategy 1-Foundations**

🟠 **Strategy 2-Process & Partnership**

🔵 **Strategy 3-Funding**

2018—Q4
- 🟢 Complete LinkPHL pilot privacy policy
- 🟢 Assess opportunities to integrate network infrastructure asset management across stakeholders
- 🔵 Break ground for LinkPHL Kiosks
- 🔵 Open RFP for building monitoring system

2019—Q1
- 🟢 Establish Executive Order for SmartCityPHL and Advisory Committee
- 🟢 Kick-off the governance structure
- 🔵 Begin development and engagement for Amazon Web Services voice and translation project
- 🟠 Release open call for solutions through Pitch+Pilot
- 🟠 University research partnerships begin scoping and refining of projects with City departments

2019— Q2
- 🟠 Develop community education series
- 🟢 Create plans for Master Data Strategy through the working group
- 🟢 Review key findings for network infrastructure asset management