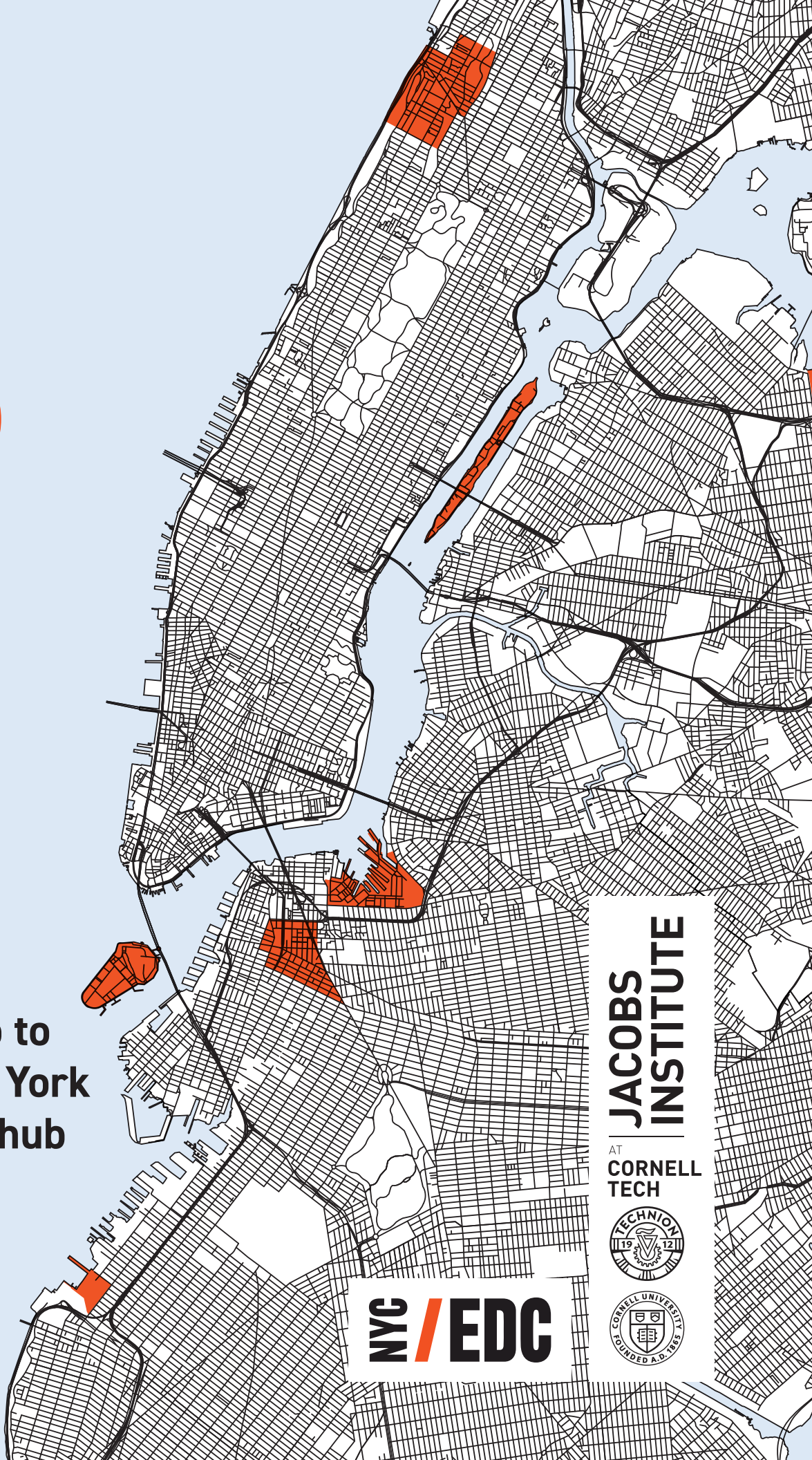
PILOT NYC

A roadmap to make New York the global hub of urban innovation



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JACOBS INSTITUTE AT CORNELL TECH

NYC EDC

Contents

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The *Pilot: New York City* report is the byproduct of a nine-month research collaboration between the Jacobs Urban Tech Hub at Cornell Tech and New York City Economic Development Corporation.

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Cornell Tech

In 2011, the City of New York issued a Request for Proposals to attract a new world-class engineering university to New York City's Roosevelt Island. Cornell Tech—a joint partnership between Cornell University and the Technion Israel Institute of Technology—won. With a $1 billion grant, Cornell Tech began accepting students and building a 12-acre campus. More than a decade later, over a thousand engineering students have graduated from Cornell Tech and nearly 100 companies have spun out from the campus. Cornell Tech is also home to the Jacobs Institute, an experimental, transdisciplinary graduate research institution. In 2020, the Jacobs Institute launched the Urban Technology Hub, a new academic center that generates applied research with cities, fosters an expanding tech ecosystem, and cultivates a new generation of urban technology leaders. The Hub bridges the gap between academic resources and public needs, organizing strategic partnerships between researchers, industry, communities, and government.

NYCEDC

New York City Economic Development Corporation (NYCEDC) is a mission-driven, nonprofit organization that works for a vibrant, inclusive, and globally competitive economy for all New Yorkers. NYCEDC has played a key role in the rapid tech expansion in New York, including launching commercialization and innovation support programs in partnership with industry actors like the Varick Street Incubator; ACRE; NYU Tandon and the Urban Future Lab; Newlab; Company Ventures; CIV:LAB, Inc.; JLL Technologies and TRC Engineers; and more. These programs have collectively supported hundreds of companies that have raised hundreds of millions of dollars in investment and created more than 2,000 jobs. NYCEDC manages over 64 million square feet of real estate assets across all five boroughs of New York City including commercial real estate properties as well as transportation, critical infrastructure, and energy assets. NYCEDC uses these assets to deliver results for NYC's economy and communities.

The Team

While we interviewed over 120 stakeholders throughout our research, we want to acknowledge the contributions of the core working team. We are excited to see this roadmap come to life, thanks to the collective efforts of New York's urban innovation community!

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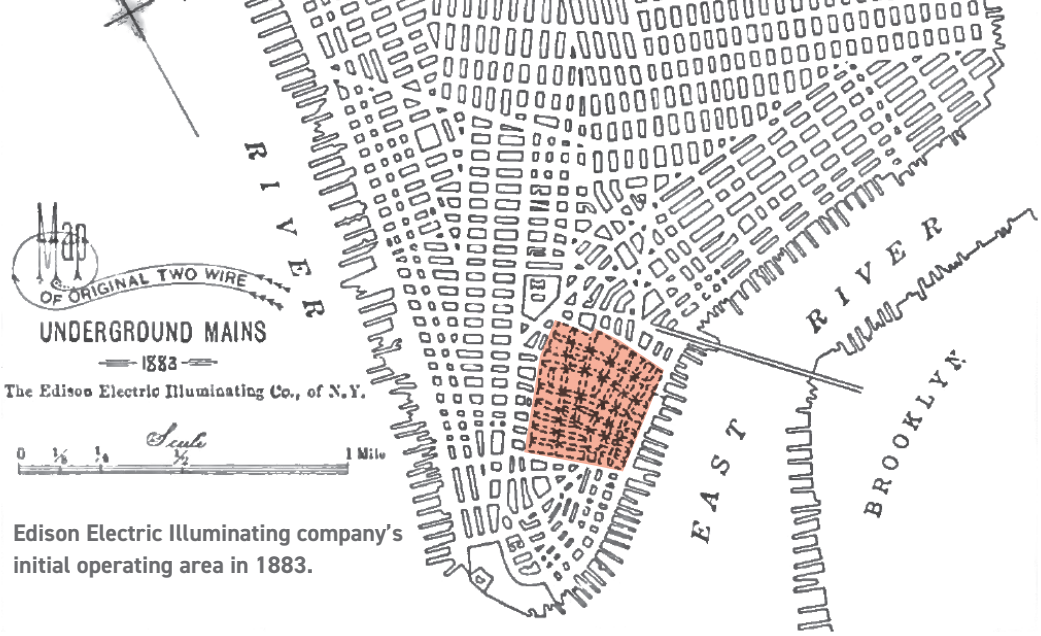


Edison Electric Illuminating company's initial operating area in 1883.

Executive Summary

In December 2022, the Governor and the Mayor of New York released the "New" New York Plan—an ambitious set of forty initiatives to revive New York coming out of COVID-19. That plan included the goal *"Make New York the Global Hub of Urban Innovation" (Initiative 31)*. New York's commitment to urban innovation builds on the city's storied history of pioneering technologies that transform how people live and work, like the commercial electric grid, which Thomas Edison piloted in 1882 on Pearl Street.

In the last decade, New York has made substantial investments in the field of urban innovation, with a specific emphasis on promoting the "green" economy. In 2022 alone, over **600 companies** formally applied to pilot their products through one of twelve City-run or City-affiliated programs, and **over 50 pilots** were deployed. Companies are excited to be in New York not only because it is the United States' biggest urban

market, with $2 trillion in GDP, but also because, through its PlaNYC process, it has become a pioneer in climate regulation. The City has one of the nation's strictest green building codes, and soon, it will have congestion pricing in the Manhattan core. New York has emerged as a testbed for urban climate technologies, like hardware to retrofit buildings and stations for micro-mobility charging.

Still, New York—like many other cities—suffers from what we call "**pilot purgatory**," meaning even successful pilots often do not lead to the government procurement orders or necessary policy changes to allow for the efficient large-scale adoption of new technology. This phenomenon is the urban analogue to the better-studied "valley of death," a euphemism for the Department of Defense's notoriously protracted procurement process, in which promising technologies often "die" during pilot phases. Pilot purgatory is particularly damaging to low-income, minority, and women-founded companies, who face structural disadvantages in accessing private funding.

The passage of landmark federal spending bills—the Inflation Reduction Act (IRA), the Infrastructure Investment and Jobs Act (IIJA), and the CHIPS & Science Act (CHIPS)—presents a catalyst for New York to double down on busting pilot purgatory. Through the three bills, the federal government is about to triple its spending on addressing climate change, and the majority of funds are going to developing and deploying early-stage technologies. Forty percent of the benefits of that spending must accrue toward communities who bear the brunt of environmental harms like pollution, through the Justice40 Initiative. The cities that show they can transition technologies from "pilot" to "proven"—and direct the benefits toward disadvantaged communities—will be best poised to take advantage of federal funding.

Over the last nine months, we conducted a 360-degree review of New York's urban innovation ecosystem to diagnose the root causes of—and solutions for—pilot purgatory. Our research involved interviews with **over**

Figure 1

How We Define Urban innovation

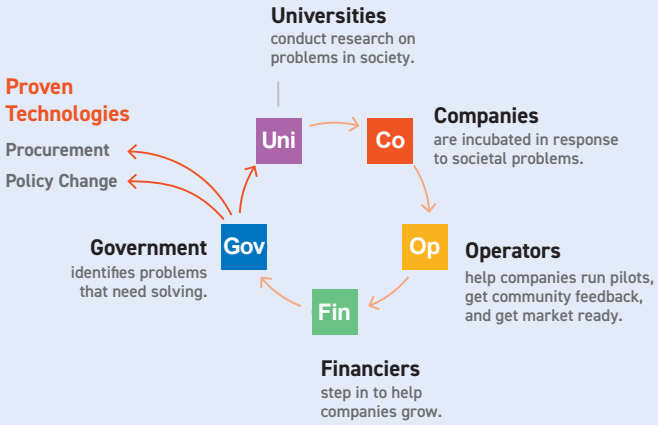
What is urban innovation?

We define urban innovation as the adoption of technology aligned with public interest in cities.

How does urban innovation work?

In our view, urban innovation consists of an ecosystem of five actors: government, companies, nonprofit program operators, academics, and financiers. Below is a simplified example of how these actors might work together to propel technologies from ideas to mass-market adoption. The adoption of proven technologies is accelerated by government procurement orders and policy changes.

The Urban Innovation Flywheel



How did you focus your study?

Within urban innovation, our study focused on the subfields of urban mobility, buildings, energy, and digital infrastructure, aligning with the City's climate goals and anticipated federal spending.

120 stakeholders, including government agencies, tech companies, nonprofit program operators, academics, and financiers. We then compared New York's experience with best practices in other cities.

Based on that research, we developed what we believe is a realistic roadmap (Figure 2) for accelerating urban innovation in New York City. The roadmap includes three recommended programs, which lay the foundation for implementing *Pilot: New York City*.

1. **First**, the City should bolster its own **innovation capacity** through supporting innovation personnel at agencies and initiating more direct collaboration with local universities, to ensure that promising pilots *transition* to procurement orders and policy changes.

2. **Second**, the City should pursue **procurement modernization** by codifying a "challenge-based" procurement method, allowing agencies to define the *problem* they are trying to solve and test different technology solutions in the real world, on the path to making a final purchase decision.

3. **Third**, the City should enhance its **support infrastructure for urban innovation startups** through convening a pilot network—a group of accelerators and dedicated pilot sites—that together offer a streamlined point-of-entry for startups launching and growing in New York City.

In the near term, these recommendations would provide the government leadership, process reforms, and civil society infrastructure needed to overcome pilot purgatory. Over the long term, these recommendations will strengthen local capacity to address the twin challenges of climate change and economic recovery, while expanding and diversifying New York's economy.

While our research was primarily focused on New York, we believe that many of the underlying concepts will also resonate with other cities. A core part of piloting is A/B testing, and New York should work with peers across the country to ensure America's cities remain engines for equitable and resilient growth in the 21st century.

Figure 2

Roadmap Summary

		Project 1 **Bolster Government Innovation Capacity**	Project 2 **Modernize City Procurement Processes**	Project 3 **Coordinate Startup Support Infrastructure**
Challenge		Across the New York City government, there is a strong desire to innovate, which often clashes with the reality of risk-averse processes, limited resourcing, and a shortage of technical staff. Most agencies are focused on basic service delivery, and do not have the capacity to transition pilots into proven, long-term solutions.	In New York City today, most pilots are run through "no-cost," "micro-purchase," or "demonstration project" procurement pathways. These procurement methods allow for relatively fast testing, but they do not create a legal pathway to scale successful technologies, perpetuating the issue of pilot purgatory.	While urban innovation companies want to be located in New York, many struggle with the process of "going to market" in the city. Through the Department of Small Business Services, New York supports retailers interacting with the City—but it is not equipped to handle the needs of urban innovation startups navigating activities like government permitting.
Opportunity		Central innovation teams have become popular across government, acting as "centers of excellence" serving agencies. In New York City, the Office of Technology and Innovation has launched a critical new program to support agency piloting. Due to New York's scale, the program will be most impactful if supplemented by on-the-ground innovation leads in key agencies.	There is a growing reform movement toward "challenge-based" procurement, in which an agency invites vendors to propose creative solutions to a challenge it is facing. The agency then pilots its preferred solutions, to inform a final purchase decision. The New York City Housing Authority has begun using challenges—creating a possible model for other agencies.	A network of pilot programs and dedicated sites, like Newlab and the Brooklyn Navy Yard, have emerged as mediators between companies, the government, and the public, acting as a first point of entry to New York. However, there is more demand from startups than current programs can accommodate. NYCEDC, which seeded this ecosystem, is poised to step up and respond to startup needs.
Recommendation		Leverage the excitement associated with PlaNYC into financial and technical support for innovation leads in key City agencies, to work on pilot projects associated with addressing climate change. Collaborate with local universities to define, scope, and validate pilots, bringing in third-party expertise.	Issue a new "challenge-based" procurement pathway for a five-year trial and create training to help agencies understand their pilot procurement options, including associated cyber and privacy policies. Propose and pass any necessary Procurement Policy Board changes to create a long-term legal structure for future challenge-based purchasing.	Launch a central business portal that would provide services to help urban innovation startups navigate New York. Pool resources and raise funding for a formalized network of pilot programs and sites, which would match supply and demand, and provide support on issues each player is too small to address individually (e.g. policy reform, debt financing).
Proposed Activities	Year 1 (2024)	• Empower and embed innovation leads in key City agencies • Trial program for universities to provide technical support on pilots	• Trial challenge-based procurement with ~2 City agencies • Develop pilot procurement, cyber, and privacy training for agencies	• Launch a portal with resources for startups "selling to or in" the City • Formalize a network of pilot programs and sites
	Year 3 (2026)	• Enhance and expand innovation support to additional City agencies • Establish system to measure and incentivize outcome-oriented pilots • Help guide academic R&D activity toward City priorities	• Establish permanent challenge-based procurement pathway • Harmonize language with New York State to enable cooperative buying	• Create a feedback loop with City agencies on emerging policy issues • Structure new financial products to support CapEx on pilot projects • Set up a Zero-Emission Test Zone in a Justice 40-designated area

2

Background

The History

> "New York's scale makes it doubly valuable. If you could actually pilot here and create a profitable business, why wouldn't everyone start their business here first?"
>
> **— Startup Interview**

New York has been a center for urban innovation since the Industrial Revolution. Its appeal to entrepreneurs is obvious: With 20 million people, the New York metro area is easily the nation's biggest urban market.

We tend to remember and celebrate the stories of iconic inventors like Edison and Tesla, whose products and services transformed urban life. But behind the scenes, innovation is a team sport, often super-charged by government spending. New York's government—particularly the State—has a compelling history of wielding its considerable purchasing power to bring innovations to market that benefit the public interest.

New York Procurement by the Numbers

$173 billion
in New York State Procurement in 2021

$43 billion
in New York City Procurement in 2022

4x larger
procurement budget than that of the next biggest US city

For example, in the 1990s, following the Montreal Protocol's mandate to decrease ozone-depleting refrigerant gasses, the New York City Housing Authority (NYCHA) and the New York State Energy Research and Development Authority (NYSERDA) released a Request for Proposal that committed to buying 20,000 units from whomever could design an affordable, "super-efficient" refrigerator for cities. The tactic worked: In response, Maytag, a home appliances manufacturer, created a new product line, which eventually also became popular in private buildings.

Today, NYCHA and NYSERDA are applying a similar playbook, with their Clean Heat for All Challenge. New York's Local Law 97 mandates new energy efficiency standards in most buildings over 25,000 square feet, including NYCHA apartments, which primarily use gas-powered heating and cooling. When it could not find a strong off-the-shelf solution to meet the law's standards, NYCHA launched its challenge, promising to buy 30,000 heat pumps—a heating and cooling device that runs on electricity—from a vendor that could figure out how to develop an affordable model that worked in cold-weather climates, and could be installed in a windowsill in less than one day. Last year, NYCHA selected two winners, and it is currently piloting their prototypes in a building in Woodside, Queens. NYCHA has set aside $70 million to eventually scale heat pumps across its extensive portfolio of buildings.

These examples reflect the fact that New York City is perfectly poised to be a market maker. With the proposed integrated processes for piloting, procuring, and evolving policy, the City can help launch new technologies that benefit New Yorkers—and also advance how people live and work in cities globally.

Window heat-pump unit developed by Gradient Comfort, an American startup and one of the winners of NYCHA's Clean Heat for All Challenge. After Gradient was selected as a winner in NYCHA's challenge, it was able to raise a $27.5 million Series A from private funders. Photo: Gradient

CitiBike was first piloted at the Brooklyn Navy Yard, New York's former shipyard which has been morphed into a 21st century industrial park. The Navy Yard has since formalized its piloting process, through its Yard Labs program. Photo: Yard Labs

The Last Ten Years

Over the last decade, the State, the City, and its agencies have been laying the groundwork for a thriving, 21st century urban innovation ecosystem, with a focus on the "green" economy. At the State level, NYSERDA has committed $800 million to support the commercialization of climate technologies. Much of the on-the-ground activity occurs in the City. NYCEDC—the City's nonprofit, mission-driven economic development organization—has helped launch pilot programs like the Hack the Building Code Challenge with the Department of Buildings; seeded urban-focused accelerators like Newlab; and opened its own real estate, like the Brooklyn Army Terminal, for testing of clean energy technologies. Additionally, in October 2023, the City's Office of Technology and Innovation (OTI) launched the Smart City Testbed Program, to help City agencies identify relevant technology vendors. Lastly, the City's investments in piloting are complemented by programs at a growing number of mission-aligned asset managers, like the Brooklyn Navy Yard and the Trust for Governors Island.

In the last year, over **600 companies** formally applied to pilot their products in the City of New York through a City-run or City-affiliated program (Figure 3) and **over 50** pilots occurred (Figure 4).

Figure 3: Timeline of City-Run and City-Affiliated Pilot Programs

You can find links to all the City-run and City-affiliated pilot programs at the end of this report.

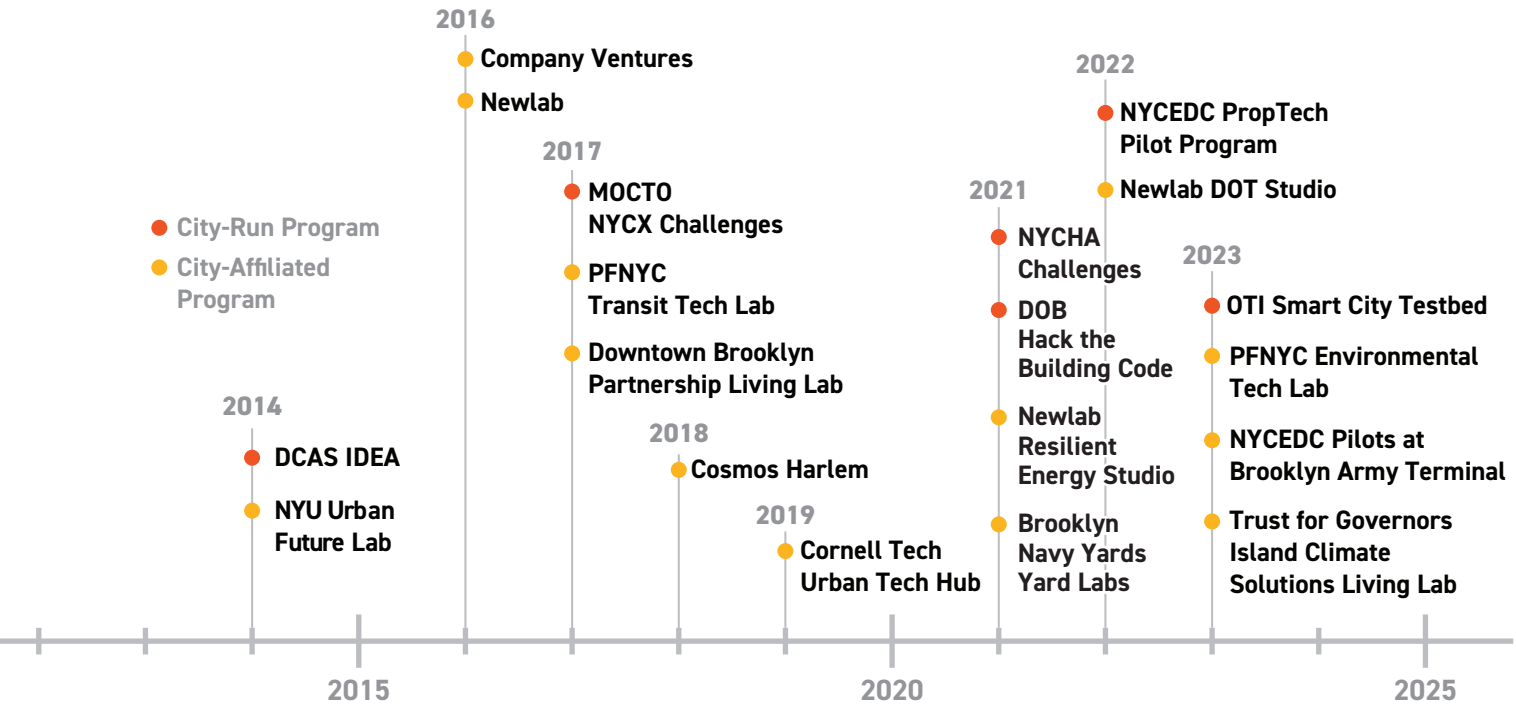
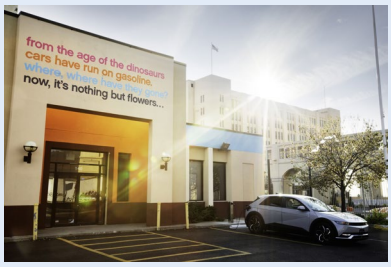


Figure 4

Five Pilots Happening Now in New York City



Curbside EV Charging Built for Cities

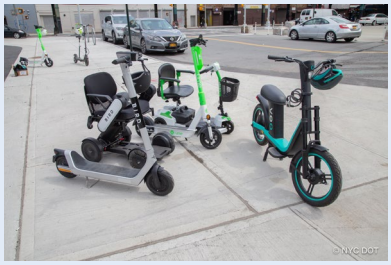
NYCEDC is piloting it's electric—a Brooklyn-based EV charging company that leverages a building's electricity supply for curbside charging—at the Brooklyn Army Terminal in Sunset Park. it's electric is using this pilot for user studies and live product development.

Photo: NYCEDC

Using Drones to Deliver Cargo

The Port Authority of New York and New Jersey is piloting the use of drones to deliver cargo between New Jersey and New York City. They hope to scale the program to reduce traffic in one of the world's most heavily trafficked corridors.

Photo: The Port Authority of New York and New Jersey



A Shared E-Scooter Program

The Department of Transportation is piloting a shared e-scooter program that brought 3,000 Bird, Lime and Veo e-scooters to the East Bronx. In 2024, the program will expand to areas that are lacking in transit in Queens.

Photo: NYC DOT

Roadside Sound Meters and Cameras

The Department of Environmental Protection is piloting using roadside sound meters and cameras to capture evidence of vehicles emitting noise in violation of New York State's Vehicle and Traffic Law and the City's Noise Code, for the purpose of automated ticketing.

Photo: NYC DEP

Treating CO2 in New York's Waters

The Trust for Governors Island is piloting Vycarb, a Brooklyn-based startup that has developed a real time detection and treatment system for measuring CO2 in water, identifying excess CO2, and mitigating it with natural minerals.

Photo: Vycarb

The Next Ten Years

While the City has emerged as a vibrant urban testbed, it still suffers from what we call "pilot purgatory"—meaning promising pilot projects do not always lead to the necessary procurement orders or policy changes to allow for the efficient adoption of new technology. While the City is strong at getting pilots started, there is an opportunity—and necessity—for the City to address tough questions about the subsequent path to deployment at scale.

The Department of Defense's (DOD) experience tackling the infamous startup "valley of death" should inform the City's attempts to address pilot purgatory. The DOD has historically spent millions on its demonstration-validation ("Dem/Val") process for trialing new technologies, but then struggled to get validated products deployed in the battlefield, due to antiquated procurement processes (companies "die" while waiting). DOD's procurement regime was designed for an era in which military technologies were developed in National Labs. But today, technology is often commercialized by the private sector, requiring new adoption pathways.

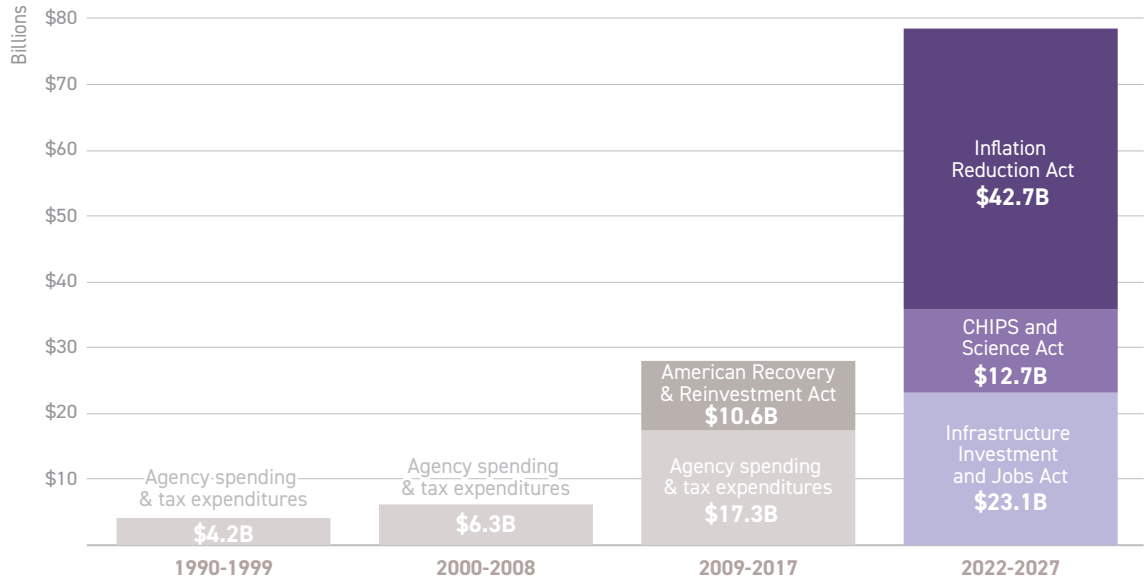
In 2016, the DOD set up the Defense Innovation Unit (DIU), which has slowly made inroads on helping companies cross the proverbial valley. The DIU's primary role is to run a rapid process for demonstrating, validating, and scaling technologies developed by the private sector, under a specialized procurement process known as the *"Other Transaction Authority."* It also runs a nonprofit that works with universities to help direct researchers toward studying problems of interest to the national security community, and makes direct investments to support American-made hardware companies.

Now, with climate change increasingly viewed as a threat to national security, the federal government is rapidly expanding its climate spending, which is set to rise three-fold above historic levels (Figure 5). Most of that money is going toward early-stage technology (Figure 6), as many of the technologies we need to achieve net-zero emissions are not yet available to the mass market. Rather, these technologies are still being tested in labs, or are in trials with early adopters, often led by startups.

As states and cities look to procure new climate technology solutions, they are encountering similar procurement challenges to those faced by the DOD. Much in the way the DOD has tried to tackle procurement head-on, New York should respond with similar urgency.

Figure 5: Projected Average Annual Federal Spending on Climate in the IRA, the IIJA, and the CHIPS Act.

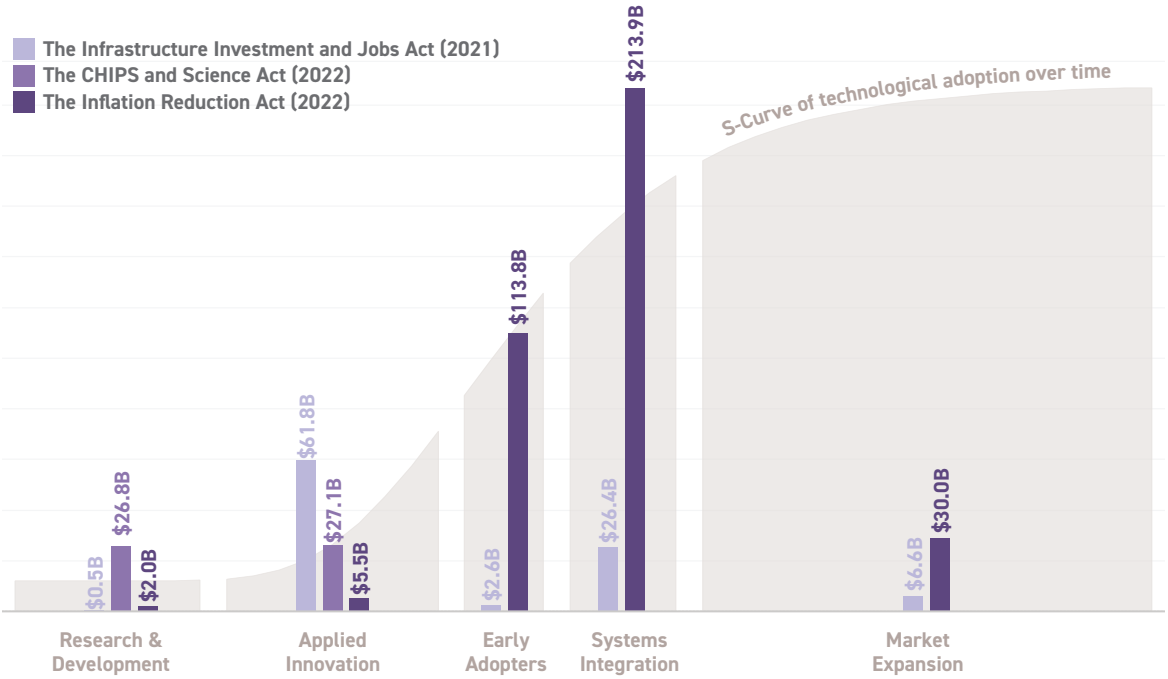
The projected average annual federal spending on climate from 2022-2027 is at least three times higher than historic annual average spending levels.



Citation: Rocky Mountain Institute estimate derived from Congressional Budget Office data as of September, 2022. Actual spending may vary from projected spending.

Figure 6: Total Projected Federal Spending on Climate in the IRA, the IIJA, and the CHIPS Act Mapped to Technology Readiness Level.

Most government spending on climate is going to technologies early in the innovation "S-Curve," a framework that is commonly used to chart the market acceptance of technology.



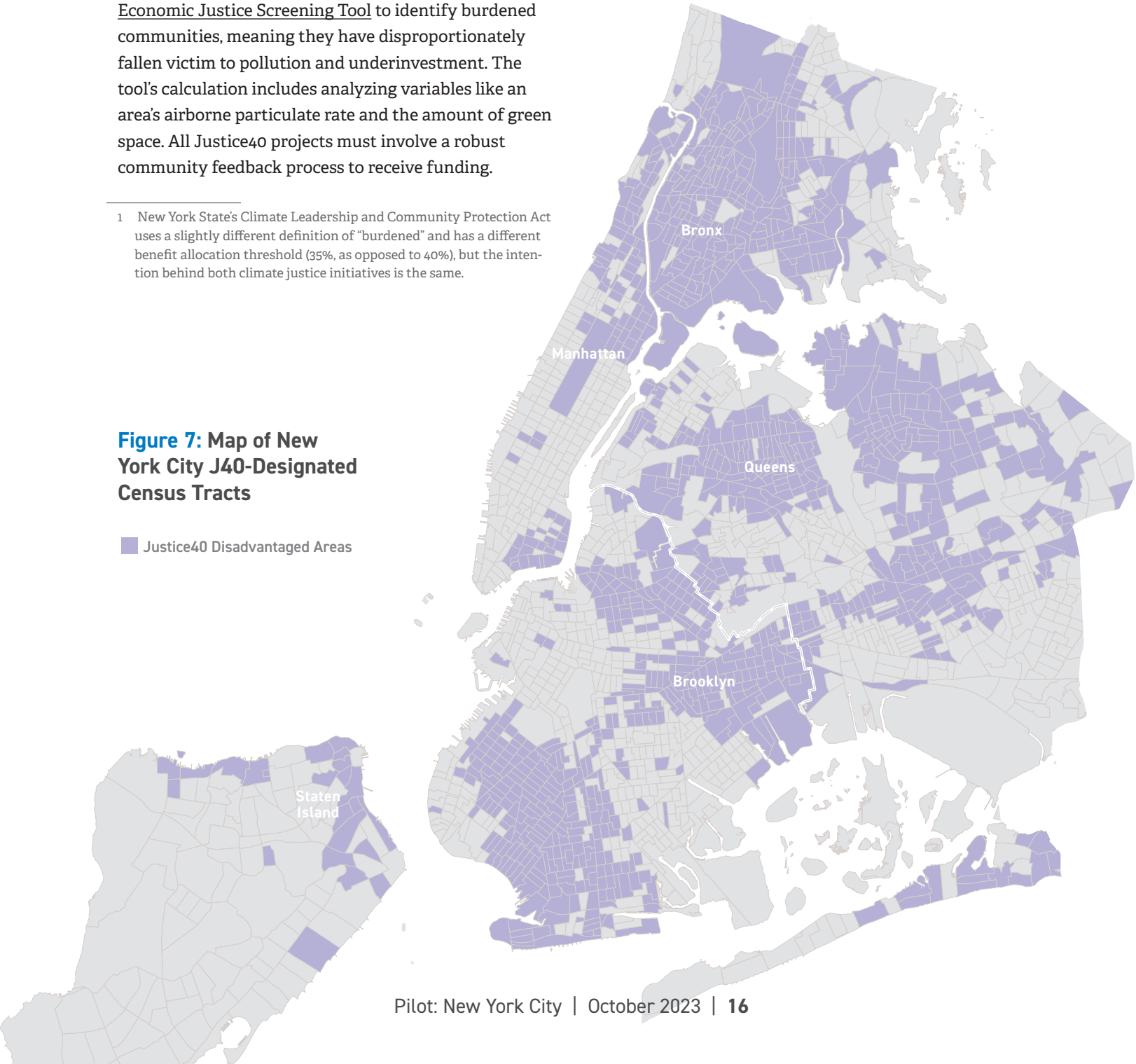
Citation: Rocky Mountain Institute estimate derived from Congressional Budget Office data as of September, 2022. Actual spending may vary from projected spending.

Yet cities are not battlefields, and addressing urban pilot purgatory will also require navigating the nuances of local policy and considering the impact of new technologies on communities. Fortunately, federal—and New York State—climate funds have a meaningful focus on equity and community input, acknowledging that environmental harms of the last century have unfairly impacted certain neighborhoods. Through the White House's Justice40 Initiative, 40 percent of the benefits derived from federal climate spending must go toward census tracts that qualify as "burdened" (Figure 7).[1] The White House has built a Climate and Economic Justice Screening Tool to identify burdened communities, meaning they have disproportionately fallen victim to pollution and underinvestment. The tool's calculation includes analyzing variables like an area's airborne particulate rate and the amount of green space. All Justice40 projects must involve a robust community feedback process to receive funding.

Many of the early-stage companies that make climate solutions still need to go through the process of trialing their products in the real world. Their interactions with the government will be characterized by big questions like where to open a factory and routine tasks like permitting. When rolling out new products, they will need to have deep engagement with residents, who may have hesitations. New York City has the opportunity to be a primary shaper in this complex but essential transition to the green economy, creating jobs and improving quality of life for frontline communities.

1 New York State's Climate Leadership and Community Protection Act uses a slightly different definition of "burdened" and has a different benefit allocation threshold (35%, as opposed to 40%), but the intention behind both climate justice initiatives is the same.

Figure 7: Map of New York City J40-Designated Census Tracts



PlaNYC, "New" New York, and Initiative 31

The good news is that New York already has the regulatory bones in place to attract companies developing products aligned with the public interest, especially those in the field of addressing climate change:

At the State-level, in 2019, New York passed the Climate Leadership and Community Protection Act (CLCPA), which charts a path to net-zero emissions by 2050. The City has made the same net-zero commitment through its long-term strategic climate plan, known as PlaNYC, which is updated every four years. Through the PlaNYC process, the City has become a first mover on climate mandates, like Local Law 97. But in order for the State and City's far-reaching climate laws to be enforced, technology needs to keep pace. For that reason, the latest PlaNYC—released in April 2023—calls out the need to spur the development of urban climate solutions, like battery storage fit for cities and new approaches to last-mile cargo delivery.

New York's interest in taking a comprehensive approach to addressing climate change also featured prominently in the Governor of New York and the Mayor of New York City's 'New' New York: Making New York Work for Everyone plan, released in December 2022. The plan includes a set of 40 initiatives to revive the region's economy coming off the heels of COVID-19. Climate equity initiatives—like designing a more affordable and integrated regional rail network—supplement other important goals, like increasing the supply of supportive housing.

Cornell Tech's Campus on Roosevelt Island, in New York City's East River. Photo: Max Touhey

One of those forty initiatives, *Initiative 31*, focuses on how to "*Make New York the Global Hub for Urban Innovation*." Initiative 31 has three components:

Make New York the Global Hub for Urban Innovation

1. Improve the use of technology to achieve New York's policy objectives
2. Grow the urban innovation sector (e.g., market size, job creation)
3. Solidify New York's brand as the leader in urban innovation

While PlaNYC establishes climate targets and regulations, Initiative 31 creates the operational infrastructure to mobilize agencies, companies, and civil society to bring related technologies to market. The *'New' New York* report defined a list of possible Initiative 31 outputs, from the creation of a new "innovation district" to a "digital front door" for young companies interacting with the City.

The report named NYCEDC as the primary agency responsible for executing Initiative 31. After its publication, Cornell Tech's Jacobs Urban Tech Hub, which has worked with NYCEDC on growing New York's tech sector, approached NYCEDC about conducting research on the last ten years of investments in urban innovation, to inform the Initiative 31 execution plan. We agreed to collaborate, and Initiative 31 was given a new public-facing name: *"Pilot: New York City."* We then assembled an Advisory Group composed of a diverse cross section of New York's urban innovation ecosystem to guide the research and findings.

3

Research

The Oonee Pod bicycle parking station in Hudson Square

Photos: Urban Tech Hub, Oonee

Definitions

We define urban innovation as the adoption of technology aligned with public interest in cities.

Within urban innovation, we focused our study on government agencies and companies pursuing place-based innovation, in the fields of mobility, buildings, energy, and digital infrastructure. This focus allowed us to conduct a tight, nine-month research sprint, correlated to anticipated federal spending from the IRA, the IIJA, and the CHIPS Act, and the climate goals of PlaNYC. For the purpose of this report, our definition excludes government agencies and companies purely focused on service innovation in fields like education, health and human services, and public safety. While service innovation is critical to maintaining a thriving city, it is a substantively different topic and therefore deserves its own detailed study.[1]

Additionally, it is worth noting that our understanding of urban innovation includes both companies *selling to*, and companies *selling in* cities.

1. Companies selling to cities.

This category of companies is usually classified as *"Gov Tech."* The end goal of companies is procurement by a government agency, or an affiliated entity.

2. Companies selling in cities.

This category includes companies that are selling to businesses or consumers, yet still must navigate complex urban landscapes while doing business.

Many companies in our sample set fall into both categories, as they have both public and private customers. Take for example, Oonee, a startup which makes secure bike storage pods. Oonee has contracts with several regional transportation departments, but it also sells to private developers. And even in those private sales, it still passes through the City's permitting regime.

1 A study of government service agencies and companies would make for a valuable phase two of the "Pilot:New York City" research and roll out.

Methodology

Our study included a 360-degree review of New York's urban innovation ecosystem over a nine-month period from January to September 2023. Our research team conducted 120 interviews with representatives from five distinct, but complementary groups: government, companies, program operators, academics, and financiers. We then compared each group's input with global best practices, and feedback from external experts. The quotes you see included throughout the report are derived from these interviews. All quotes were anonymized to ensure respondents felt comfortable speaking freely.

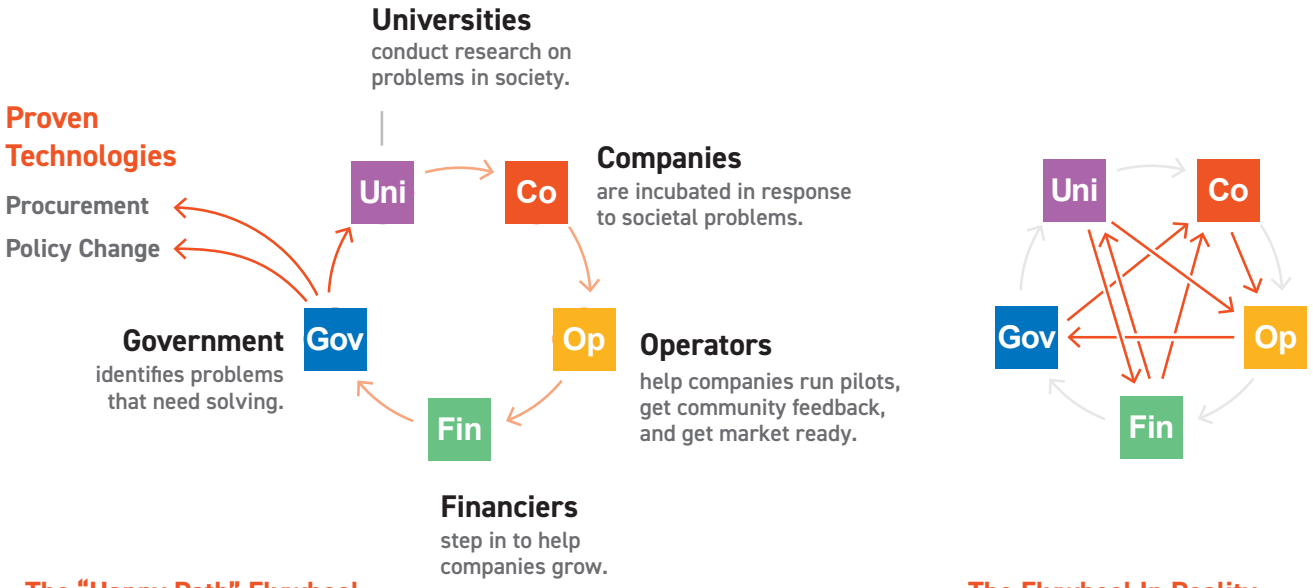
Figure 8: New York Urban Innovation Ecosystem

Gov	**Government**	~25
	Survey and interviews with City and State agencies, including operating agencies (e.g., Department of Parks & Recreation), innovation support agencies (e.g., Office of Technology and Innovation), and oversight agencies (e.g., Mayor's Office of Contract Services).	
Co	**Companies**	~30
	Survey and interviews with startups in mobility, buildings, energy, and digital infrastructure. ~Sixty percent of startups are Series A or earlier, ~80 percent have formal experience interacting with New York City or State government, and ~65 percent have formal experience interacting with other governments.	
Op	**Program Operators**	~10
	Survey and interviews with the largest nonprofit* operators of City- or State- affiliated programs in urban innovation. Program operators fell into two buckets: accelerators and pilot sites. Both groups play a critical role in intermediating between companies, government, and the public.	
Uni	**Universities**	~15
	Roundtable with representatives from Columbia University, Cornell Tech, City University of New York, and New York University. Both academic and commercialization staff attended (e.g., from Columbia, we hosted the Data Science Institute and Columbia Tech Ventures).	
Fin	**Private Financing**	~15
	Roundtable with representatives from leading New York-based venture funds and studios, who invest in urban innovation. Participants ranged from large funds interested in the category (e.g., Andreessen Horowitz) to smaller, specialized funds (e.g., Third Sphere).	
Exp	**External Experts**	~25
	Other Cities (~15). Interviews with practitioners who have pioneered best practices in other cities, like Berlin, Los Angeles, Seattle, and Boston. These precedents are featured throughout the report.	
	Methods (~10). Interviews with experts—academics and consultants—who specialize in the methods and theories that guide government innovation, like Steve Blank (Stanford Center for National Security Innovation) and Mitch Weiss (Harvard Business School, Public Entrepreneurship).	
	Total Interviews	~120

* Most operators listed are nonprofit, however, we included two for-profits exceptions—Newlab and Company Ventures—as they have received funds from the City of New York to operate startup programs.

Figure 9: Market Map of Research Participants

Figure 10: The "Happy Path" Flywheel vs. The Flywheel in Reality



The "Happy Path" Flywheel
In a perfect world, the flywheel would function as a loop to turn out innovative companies who focus on solving societal challenges.

The Flywheel In Reality
There is no one happy path—most companies ping-pong between different parts of the ecosystem, making constant communication necessary.

The "Happy Path"

This 360-research approach is based on the notion that, in an optimized urban innovation ecosystem—or what a tech product designer would call the "happy path"—one would see a positive flywheel effect, whereby these five groups work together to turn out companies that respond to the needs of city residents. The byproduct of the flywheel is procurement by a government entity (companies selling to cities) or policy change (companies selling in cities), to accelerate the adoption of technology that is in the public interest. The reality is in fact far more complex, with companies each taking their own path, usually involving ping-ponging between various parts of the urban innovation ecosystem.

In tech, product designers know that most users will not follow their idealized "happy path," so they design for a wide array of user journeys. A functioning urban innovation ecosystem also adopts that ethos to help companies get started and, assuming they perform, keeps them progressing.

Figure 11: Two Founding Journeys

We asked all companies we interviewed to create a timeline documenting their founding journey. Below, you can see two examples, which illustrate how the various parts of the ecosystem collaborate to propel companies from pilot projects to proven solutions.

voltpost

Voltpost retrofits lampposts into a modular EV charging platform.

Voltpost New York Team

2021

- **Uni — Universities**
  Founders meet at Columbia; participate in university accelerator programs and develop idea for a curbside EV charging company
- **Gov — Government**
  Spoke to DOT EV charging representative and received encouragement to pursue idea
- **Co — Companies**
  Voltpost founded
- **Op — Operators**
  Accepted to NYSERDA Venture For ClimateTech first cohort
  Accepted to Cleantech Open National Accelerator
- **Fin — Financiers**
  Pre-seed funding round, including angel and institutional investors

2022

- **Gov — Government**
  Selected to pitch at the National Renewable Energy Lab Industry Growth Forum
- **Op — Operators + Government**
  Joined New Lab-DOT Innovation Studio
- **Gov**
  Pilot in DOT Staten Island lot

2023

- **Op — Operators**
  Joined Google for Startups
  Joined Plug & Play Detroit Accelerator
- **Fin — Financiers**
  Raised $3.6M seed round

dollaride

Dollaride is a mobility company committed to improving transportation in underserved communities.

Dollaride Founders Su Sanni (CEO) and Chris Coles (CTO)

2018

- **Co — Companies**
  Dollaride founded
- **Op — Operators**
  Joined Urban Future Lab Incubator

2019

- **Fin — Financiers**
  Raised funding from friends and family

2020

- **Gov — Government**
  Won Ignition Grant from NYSERDA to do a pilot in Jamaica, Queens
  Pilot interrupted by pandemic

2021

- **Co — Companies**
  Pilot continues
- **Fin — Financiers**
  Raised seed round from VCs
- **Gov — Government**
  Jamaica, Queens pilot leads to full contract

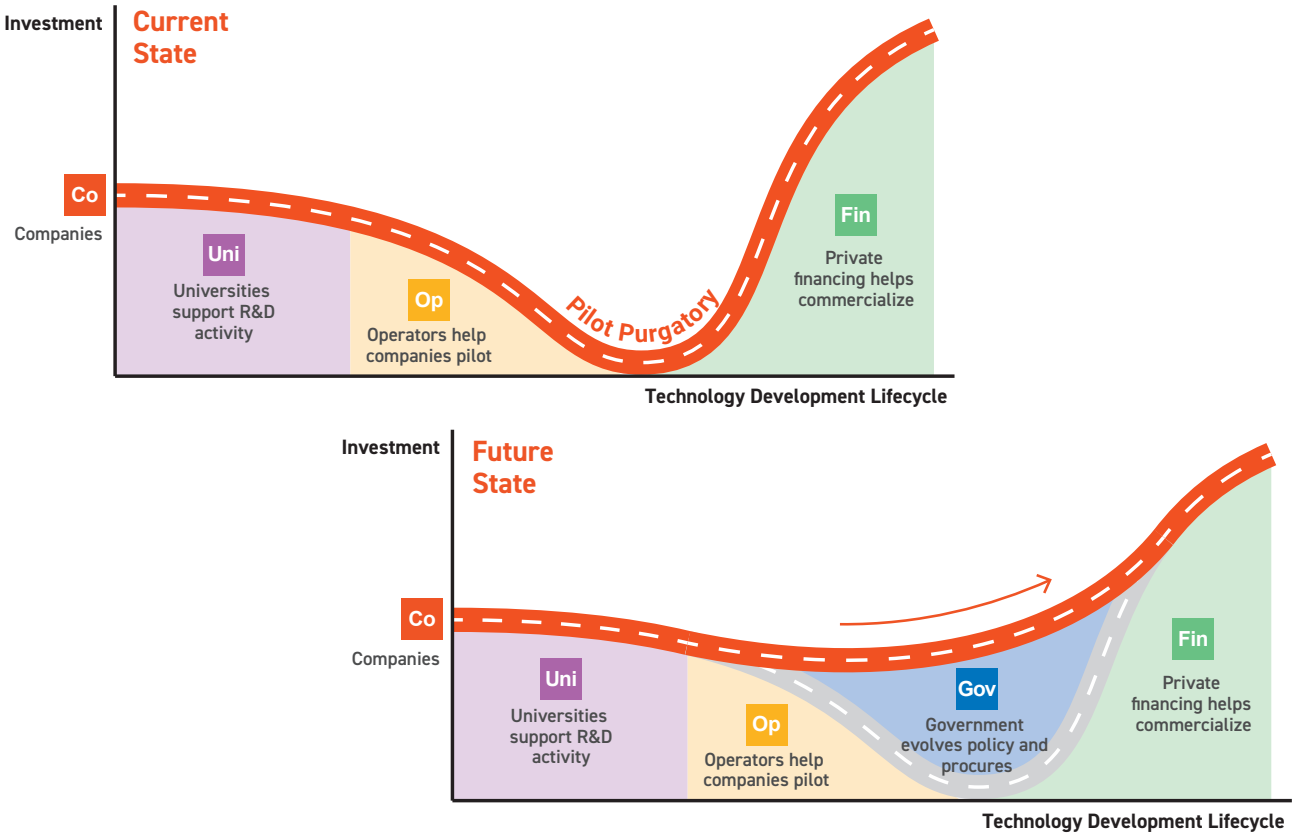
2022

- **Gov — Government**
  Won $10M NYSERDA Clean Transportation Prize

2023

- **Co — Companies**
  Delivered 3 EV commuter vans and charging stations with grant money
- **Gov — Government**
  Won contract with ESD to provide upgrades to 300 commuter van companies

Figure 12: Pilot Purgatory



Pilot Purgatory

The interplay between the five groups in the ecosystem also illustrates how promising ideas may stray from the happy path, and into the land of pilot purgatory. This purgatory tends to be particularly pernicious for companies started by low-income, minority, and/or women entrepreneurs, who may lack "friends & family" funding to tide them over while they wait on government action. These founders also continue to face structural disadvantages in accessing institutional private funding.

Here's how pilot purgatory might play out:

Let's say there is a new company, FacadeCo, which has developed a modular approach to quickly perform energy-efficient facade retrofits on small-to-medium-sized buildings. Figuring out how to decarbonize these buildings, whose landlords are often small business owners that are hard to reach, is critical to New York's goal of net-zero carbon emissions by 2050.

FacadeCo gets federal research dollars from the National Science Foundation (NSF). They use this money to develop their product and launch a pilot at one of the City's dedicated pilot sites. The pilot demonstrates that FacadeCo's product is safe to install and improves building energy efficiency, validated by a third-party study conducted by a local university.

But FacadeCo's product is expensive to produce, and the cost will not come down until FacadeCo can start producing in bulk and reach economies of scale. Getting a bulk order is challenging because FacadeCo's buyers are a disaggregated group of small building owners. Further, prospective buyers are reluctant to purchase as they know that installing FacadeCo will require special permission from the local Department of Buildings. Without a customer base, FacadeCo struggles to raise the private financing necessary to scale. This chicken-and-egg game continues until two years later, FacadeCo runs out of money.

There are two things the City could do to give FacadeCo a better chance of succeeding:

- **Procurement**: Consider ordering FacadeCo for qualifying government buildings, acting as a bulk first-buyer where the private market is not ready.
- **Policy**: Pre-certify FacadeCo's technology, so that small building owners know their installation will be approved by the Department of Buildings.

Some combination of the two approaches is likely necessary to give FacadeCo the best chance of survival, and then accelerate the adoption of their technology.

Measuring Success

> "When evaluating the success of our pilots, the question we ask ourselves is: 'Was there some next step?'"
>
> — Program Operator Interview

Today, efforts to track the number and outcomes of pilots in government-backed or affiliated pilot programs across cities are limited (the figures cited in this report are ground-up estimates, derived from data reported by interview participants). The lack of standardized data contributes to the issue of pilot purgatory. In our research, we found that government-backed pilots sometimes unintentionally extend for many years, without a go-no-go decision on procurement or policy change. While it is important for the government to have robust, risk-mitigated processes for scaling pilots, it is also important for the government to move quickly once a pilot clears internal review processes. Having proven technologies caught in a state of "purgatory" is bad for the public, and it is also bad for companies, who cannot plan their growth or raise capital to scale their operations, as financiers tend to shy away from uncertainty.

As New York thinks about how to tackle pilot purgatory, the Defense Innovation Unit's simple yet structured method for tracking its results can act as inspiration to ensure the City's piloting processes are operating efficiently. The DIU tracks the following metrics on an annual basis:

DIU By the Numbers (2022)

36	Solicitations for pilot projects
1,636	Commercial proposals received
142	Average business days to award a prototype agreement
81	Prototype OT contracts awarded to commercial companies
17	Commercial solutions transitioned to DOD users

These metrics do not encompass all of the DIU's activities. But the metrics act as key proxy variables, and also help determine the overarching measure of success: the share of pilots that transitioned from "prototype" to end user adoption.

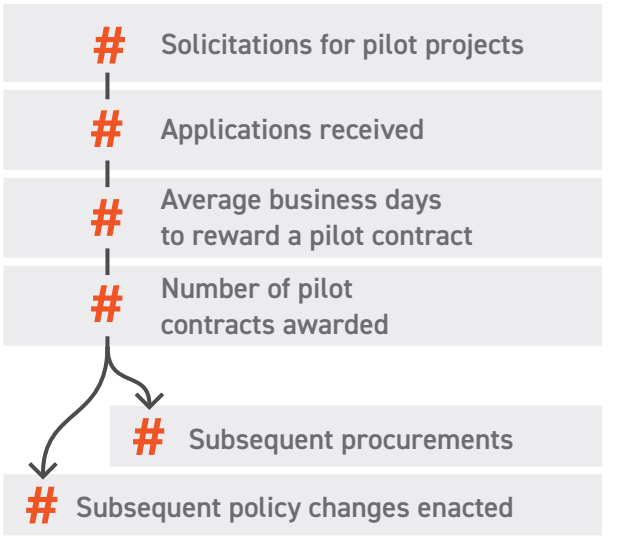
> "A commercial solution transitions when the prototype successfully completes and results in a production or service contract with a DOD or US government entity."
>
> — DIU

The percentage of transitions has been steadily increasing since the DIU was founded, a function of the program maturing. Today, the cumulative transition percentage sits at 47 percent.

Application to Cities

Across our research, we found that even the most sophisticated municipal innovation units tend to measure success by *"did we achieve our near-term goals"* rather than an outcome-driven approach, which looks at long-term impact. Looking at outcomes would help increase accountability and ensure pilots are scaling. Consider the following set of metrics, which adapt the DIU's framework to a municipal context:

Metrics to Measure Productivity of City-Run or City-Backed Pilot Projects



Definitions

Solicitation for pilot projects: The number of annual solicitations City agencies release for pilot projects. This number is highly variable, based on the size and budget of a City.

Applications received: The number of groups that respond to those solicitations. The goal is to drive this number up, to ensure that the City is drawing in a large and diversified vendor base.

Average business days to reward a contract: The time from solicitation release to a signed contract with a piloting company. The goal is to drive this number down, to improve efficiency.

Number of pilot contracts awarded: The number of contracts awarded in response to solicitations. We expect most solicitations to lead to piloting with multiple vendors, allowing the City to compare and contrast options during the pilot phase.

Subsequent procurement and policy changes: The procurements and policy changes that occur in response to pilot findings. This number should be viewed as a ratio *relative* to the number of solicitations released.

The Transition Rate

$$\text{The Transition Rate} = \frac{\text{\# solicitations that lead to procurement or policy change}}{\text{\# solicitations for pilot projects}} \times 100$$

The DIU's transition rate of 47 percent is higher than what we would expect in most cities, by virtue of the fact that the program tends to target relatively mature technologies.

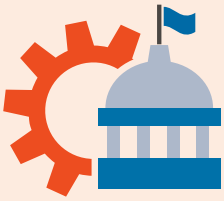
The federal government's Green Proving Ground (GPG) program, which provides a path for piloting new green building technologies on federal assets, provides a more realistic target. Out of the ~100 solicitations the GPG has issued over the last ten years, it has seen ~23 technologies transition—or a 23 percent transition rate. The number is lower *because* they are taking big bets on being the first to pilot new green building technologies.

> "If we saw anything higher than a 25 percent success rate, we wouldn't be an innovation unit. There is no point in 'piloting' a technology that is already proven."
>
> — GPG

As New York and other cities continue to refine their own innovation functions, they should learn from these federal examples. While the exact metrics each city will want to measure will depend on the local context, the concept of a transition rate is universal, and measuring it as an important first step to solving pilot purgatory.

4

The Roadmap



Project 1

Bolster Government Innovation Capacity

Summary

Challenge: Across the New York City government, there is a strong desire to innovate, which often clashes with the reality of risk-averse processes, limited resourcing, and a shortage of technical staff. Most agencies are focused on basic service delivery, and do not have the capacity to transition pilots into proven, long-term solutions.

Opportunity: Central innovation teams have become popular across government, acting as "centers of excellence" serving agencies. In New York City, the Office of Technology and Innovation has launched a critical new program to support agency piloting. Due to New York's scale, the program will be most impactful if supplemented by on-the-ground innovation leads in key agencies.

Recommendation: Leverage the excitement associated with PlaNYC into financial and technical support for innovation leads in key City agencies, to work on pilot projects associated with addressing climate change. Collaborate with local universities to define, scope, and validate pilots, bringing in third-party expertise.

The Challenge

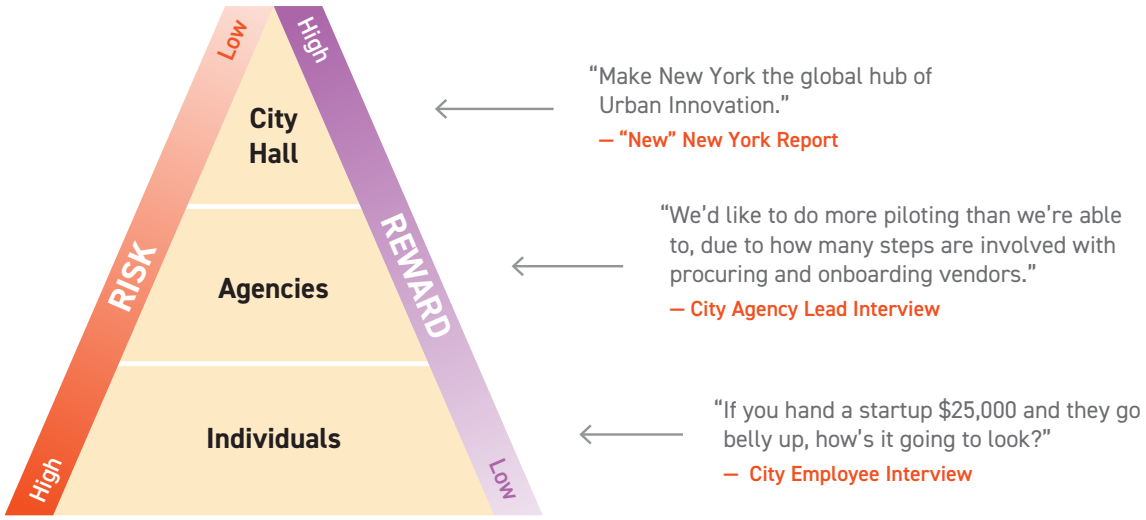
New York City employs over 300,000 workers—to put this in context, if the New York City government were a corporation, it would be among the 15 biggest companies in the United States. That makes the process of translating aspirations from City Hall, to agencies, to staff understandably challenging. At the same time, agency staff who want to try new ideas may lack autonomy and struggle to reach the right decision makers to advance their projects.

City government processes are, by design, intended to promote risk-averse behavior with a stringent hierarchy and tight series of procurement controls, which can be in conflict with the experimental nature of piloting. The intention, of course, is to ensure public money is spent responsibly. Promoting innovation requires a careful balance between the desire to try something new and the need for fiscal discipline and the assurance of public safety (for example, when it comes to new battery technology). Finding the right balance is difficult even for the best intentioned and hardest working City employees.

In our research, we saw that balance tilt toward risk aversion as we moved from City Hall ambitions to the on-the ground reality of City staff trying to implement pilots.

At the City Hall level—where the long-term vision is set—pilots are high-reward, as they create momentum toward realizing a better future, and tend to receive positive press. As the actual consequences of the pilot will often not be seen for a number of years, announcing a pilot is generally low-risk. At the agency level, this reward-risk calculation is inverted. Agencies have specific near-term mandates (e.g. collect the trash), and they tend therefore to focus on hitting associated

Figure 13: Government Risk vs. Reward



operational metrics. When executing pilots, agencies take on day-to-day complexity and risk, with interim steps closely monitored by lawyers. It is perceived as particularly risky for agencies to work with early-stage technology vendors, whose ideas may seem promising, but which lack the track record of a typical government contractor.

This structural push toward risk aversion is compounded by the fact that piloting can be time-consuming and costly. Staff must navigate procurement, cybersecurity, and privacy reviews, and in cases where the pilot bumps up against the edges of existing policy, their intergovernmental affairs team. Place-based operating agencies—like the Department of Transportation, the Department of Parks & Recreation, and the Department of Sanitation—may also need budget to cover third-party costs associated with installing hardware[1] and validating pilot results.[2] It can be challenging to find resources, especially in light of municipal budget shortages after COVID-19.

*Exhibit: Third Party Cost of Piloting**

$20,000 - $250,000
cost range observed for installing place-based pilots

$20,000 - $150,000
cost range observed for pilot validation by a lab or consultancy

*Ranges derived from conversations with research participants in Pilot: New York City.

While all the agencies we interviewed have in-house IT teams, those teams are rightly focused on foundational software infrastructure—like the desktop to cloud transition—and daily operations. Two of the ten agencies we interviewed recently added a "Head of Innovation" staff position, focused on how to incorporate *next-generation* technologies. In agencies with explicit decarbonization mandates, the "Head of Sustainability" sometimes de-facto ends up serving the innovation function, as the path to net-zero emissions requires experimentation. Still, many agencies remain primarily focused on delivering basic government services, and do not have capacity to see through pilot projects.

1 The City's default path has been to shift these costs to vendors. However, this approach is challenging for more capital-intensive pilots, as covered in Project 2: Procurement Modernization.

2 Agencies are typically themselves equipped to evaluate small-scale pilots. However, more complex pilots in which an agency wants to validate a vendor's technical claims (e.g. with respect to energy performance) may require third party validation (e.g. by a lab).

The Opportunity

Over the past decade, central innovation teams—which often sit in City Hall—have been created across US cities, to serve as "centers of excellence" to help agencies craft and deliver on an innovation agenda. At their best, innovation teams act as traffic controllers with agile operations to help address pressing problems in the city.

How Others Have Done It:

Boston Office of New Urban Mechanics (BONUM)

Vehicle side guards. Photo: City of Boston

BONUM was founded by Boston's late Mayor Thomas Menino, announced in his 2010 state of the City address. Four administrations later, BONUM continues to sit in City Hall and report through the Mayor's Chief of Staff. It has a core team of five FTEs, and five rotating fellows supported by outside philanthropy, many of whom graduate into agency roles. In 2022, BONUM conducted 77 projects. For each project, a BONUM project manager is assigned to service an agency. Projects are primarily focused on helping agencies define and prototype early versions of software applications, over which the agency then assumes ownership. However, BONUM has had occasional success with hardware pilots. For example, working with the US Department of Transportation Volpe Research Center, BONUM piloted vehicle side guards on 18 City-owned vehicles to reduce the risk of "under-ride fatalities" to cyclists in the case of a crash. After the pilot had been validated to improve cyclist safety, the City of Boston procured side guards for its own vehicles, and passed an ordinance requiring side guards for all large vehicle owners who hold City contracts.

Still, innovation teams are early in their journey of figuring out how to have lasting impact and solve pilot purgatory, especially for hardware. Even the Defense Innovation Unit, with a $204.8 million prototyping budget, is still in a learning phase. In spring 2023—partly a response to the war in Ukraine—the unit was elevated to report directly to the Secretary of Defense to ensure its work remains a DOD priority, and an ex-Apple executive was named the new CEO.

The New York Context

In 2022, the City consolidated its technology and innovation support function in the new Office of Technology and Innovation (OTI). This office houses the Research and Collaboration team, which is focused on supporting the innovation needs of agencies. Its new Smart Cities Testbed Program—launched October 2023—will help agencies structure pilots, vet vendors, and navigate procurement, cybersecurity, and privacy reviews. The Office and Program are important steps in bolstering central capacity to help agencies, especially those without their own innovation resources.

At the City's largest place-based operating agencies, there is also growing recognition of the need for supplemental, dedicated in-house innovation leads. A fully centralized innovation support model may work in a city like Boston, which has a population of 650,000, a $4 billion procurement budget, and 20,000 government employees. But New York has a population, budget, and government that are over 10 times larger, making coordination between a central office and operating agencies all the more challenging. A central office will experience the greatest success if it has a motivated partner within each agency.

Looking forward, as the definition of "technology" evolves beyond the software-centric focus of the early 21st century, New York's innovation function needs to evolve and expand accordingly. Given momentum associated with developing and deploying early-stage technology to meet the climate goals of *PlaNYC,* New York has an opportunity to seize the moment and bolster both central support and innovation capacity within agencies.

Recommendations

Near Term (Year 1)

Empower and embed innovation leads in key City agencies

The City's place-based operating agencies should empower their emerging in-house innovation leads. To maximize impact, leads should consider structuring at least one procurement "challenge" within their agency, learning from the New York City Housing Authority's *Clean Heat for All* program, which enticed companies to develop affordable, cold-weather heat pumps. Challenges—covered in depth in Project 2—leverage New York's outsized buying power, prompting companies to develop products that respond directly to New York's—and other cities'—urban climate needs. Innovation leads can tie challenges to IRA, IIJA, and CHIPS funding opportunities, helping the City turn out shovel-ready projects that take advantage of this historic surge in federal spending.

With respect to organizational design, in addition to learning from NYCHA, City agencies can learn from State agencies, like the Port Authority, which are further ahead in their innovation reforms. In particular, it is critical that City agency innovation leads have access to executive decision makers, and have a process in place to engage and incentivize the rest of their organizations. Simultaneous top-down permission to experiment and bottom-up buy-in is necessary to help re-balance the risk-reward calculus within an agency, ensuring that proven pilots take flight and transition to procurements and policy changes.

How Others Have Done It:

The Port Authority of New York and New Jersey (PANYNJ)

A pilot of an autonomous, all-electric passenger platoon made by Ohmio, a New Zealand-based startup. Photo: The Port Authority of New York and New Jersey

PANYNJ—one of the busiest ports in the country—has a small innovation team with a larger dotted-line organization around those few staff. The team maximizes its impact through weekly meetings to peer review project proposals and set priorities, with an open bi-weekly "pitch meeting" attended by C-suite leadership. Anyone who successfully gets their proposal peer reviewed and incorporates the team's feedback can come and pitch new pilot ideas. The pitch meeting usually sees about 60 attendees, and staff who successfully propose and execute a pilot receive a $2,000 bonus. In 2022—the first year of the program—the team initiated 18 pilots—three of which are in phase two testing, two of which scaled, and eleven of which are waiting on findings; two were dead ends. One of our research participants, Runwise—which uses sensors across clusters of buildings to save on heating and cooling expenses—is scaling with PANYNJ.

Additionally, the City should look for ways to support the hiring of innovation leads at place-based agencies where the role is currently lacking. These roles could potentially be hired with the support of climate-focused philanthropy.

There is a successful and proven history of the philanthropic world stepping in to fund innovation "fellows"—and the share of philanthropic dollars dedicated toward climate change is growing. The Federation of American Scientists, for example, supports the placement of

mid-career STEM executives in federal government agencies, many of whom work on projects related to the energy transition. While not a permanent solution, fellows can help bring in difficult-to-hire expertise, and can catalyze an innovation culture in agencies. Further, having outside backers ensures that fellows stay focused on the long-term task of innovation and do not get diverted to daily operations of the agency.

Trial program for universities to provide technical support on pilots

To further enhance its support of agencies, the City should work closely with New York's research universities, which can help design meaningful pilots with strong evaluation criteria, analyze the results, and publish policy recommendations and findings. By working with universities, the City can draw on local expertise while offsetting some of the risk and cost associated with piloting, as universities are neutral, scientific third parties and typically have independent funding.

The demand is there: A lack of technical staff was flagged by the majority of New York City agencies interviewed for *Pilot: New York City*. (For comparison, when the City of Austin Office of Innovation recently offered one $75,000 grant to agencies for collaboration with a researcher at the University of Texas, it received 23 applications.) At the same time, a desire for more direct collaboration with City staff was the top request emerging from our *Academic Roundtable*, which included the input of academics and institutional staff from all the major New York research universities.

> "There must be a better way of matchmaking between the City's problems and the wealth of researchers you have in New York City. A small bit of small cash, a templatized contract, and some central coordination would go a long way."
>
> **— Academic Roundtable**

How Others Have Done It

University of Washington Urban Freight Lab

The City of Seattle collaborates with the University of Washington's Urban Freight Lab (UFL)—a public, private, academic partnership launched in 2016—to better understand its urban logistics system. UFL both supports and leads pilots in Seattle, applies empirical research methods to collect and evaluate data, and issues associated findings and policy recommendations. The Lab has contributed research on "The Final 50 Feet" of urban delivery and commercial vehicle behaviors, from vans to lockers to cargo bikes. The program was so successful that the University of Washington offered a competitive Technical Assistance Program to other cities (New York City DOT was a 2021 winner). Now, with the support of an IIJA grant, the UFL is working with eight US cities piloting different approaches to digitizing the curb, with the goal of improving efficiency for commercial vehicles.

New York has a wealth of academics conducting novel research on urban innovation, and has had some promising collaboration success stories. For example, in the FloodNet project, NYU and CUNY developed and deployed low-cost sensors to detect real-time street flooding, and convey that data to relevant City agencies. To enable more projects like Floodnet to come to fruition, there is an opportunity for an enhanced matchmaking process, pairing the innovation challenges of agencies with the research interests of local academics.

Importantly, the most successful applied research partnerships in other cities—like the collaboration between the City of Austin and the University of Texas—include both a dedicated City point of contact, *and* a partnerships manager representing the university system. The latter is critical to ensuring projects are scoped appropriately for academic researchers, and to coordinate applications for supplemental federal funding. We recommend the City work with local universities to structure a similar model to cover the scoping and validation of technology pilots. By focusing on technology pilots, the program should be eligible for National Science Foundation funding under its new Technology, Innovation and Partnerships Directorate, supported through the CHIPS Act.

Figure 14: The Most Successful Government Innovation Teams

	Key Feature	What good looks like	Rationale
Org Structure	**Reports to the mayor**	Priorities for the innovation team are fed by City Hall	Ensures the team feels license to innovate and commands respect with agencies
	Dotted line to agencies	Regular input from dedicated senior personnel in each agency	Ensures the team remains responsive to agency needs, and creates pathway to agency hiring
	Connected to civil society	Supported by the other four parts of the urban innovation ecosystem	Ensures the "flywheel" effect occurs and that government leverages partner's capabilities
Staff & Budget	**Procurement expertise**	Lawyer on staff who understands City procurement processes (legal, cyber, privacy, and budget)	Allows direct communication with procurement counterparts, including City lawyers, cybersecurity and privacy review team(s), and City budget professionals
	A mix of insiders and outsiders	Core staff of government insiders, with rotating cast of outsiders with private sector background	Ensures the team has a strong foundational knowledge of city operations, while maintaining exposure to new ideas and the latest in technology
	Independent piloting budget	Budget to cover the cost of early-stage pilots	Creates demand among agencies to collaborate

Long Term (Year 3)

Enhance and expand innovation support to additional City agencies

While OTI's Smart City Testbed program is just getting started, over the long term, OTI is poised to play a leading role in promoting innovation across New York City's agencies. As the City continues to enhance OTI's capabilities, it can learn from best practices of innovation teams in other cities, where we saw that successful innovation units typically shared a series of traits (Figure 14). OTI is also positioned to scale the programs mentioned in this report to include government services agencies, like the Department of Education and Health and Human Services.

Establish framework to measure and incentivize outcome-oriented piloting

To create accountability, the City should adopt a framework to track outcomes in piloting. It could adapt the Transition Rate concept, and set a target goal for the percentage of pilots that lead to procurement or policy change. As part of its focus on outcomes, the City should consider how it can leverage public recognition and financial incentives to promote successful delivery of pilot projects, learning from the approach used by the Port Authority. In partnership with the Frederick O'Reilly Hayes Prize Foundation, the City already administers the New York City Hayes Innovation Prize, an $1,000 award for innovators in agencies. Aligning the Prize so that it goes to agency staff who successfully participate in the OTI Smart Cities Testbed program could help signal the importance of piloting.

> "You need to give people recognition. Monetary recognition would be great, but even if it's just acknowledgement, it can go very far."
>
> — Former Deputy Commissioner

Help guide academic R&D activity toward City priorities

Beyond working with universities to validate pilots, long term, the City could play a more active role in guiding academic R&D activity. New York has 100,000+ full-time graduate students, a talent pool the City could draw from to help develop technology to meet its needs.

The National Security Innovation Network—a subsidiary of the Defense Innovation Unit—itemizes chal-

lenges that the DOD is facing, and "hands them off" to universities to tackle. Its flagship program, Hacking for Defense, started at Stanford in 2016, and is now offered at 70 universities throughout the country. Teams of professors and graduate students are assigned a DOD mentor and work on pre-scoped challenges. Fifty-four companies have spun out of the Hacking for Defense program. Most of these companies have commercial clients in addition to the DOD (take for example, Anthro Energy, which makes wearable lithium-ion batteries.)

A similar concept—Hacking for Cities—was tried once between U.C. Berkeley and the City of Berkeley. If New York and other cities were to coordinate on a list of challenges they are facing through a body like the US Conference of Mayors, it should be possible to set up a larger, cross-city program. As the country's biggest city, New York should take the lead.

Recommendation Summary

Year 1

- Empower and embed innovation leads in key City agencies
- Trial program for universities to provide technical support on pilots

Year 3

- Enhance and expand innovation support to additional City agencies
- Establish framework to measure and incentivize outcome-oriented piloting
- Help guide academic R&D activity toward City priorities

Progress to Date

The OTI Smart Cities Testbed Program is currently accepting applications, and will run eight pilots a year on behalf of City agencies. Meanwhile, some of the City's larger operating agencies are making progress on innovation lead hiring, like the Department of Environmental Protection, which is looking for an Assistant Commissioner for Strategy and Innovation. Lastly, based on the input included in this report, the Jacobs Urban Tech Hub and NYCEDC plan to trial a targeted program in 2024 to pair agencies with relevant academic researchers, for collaborations on pilot projects. These efforts constitute quick and important wins that lay the foundation for more robust innovation infrastructure in New York City government.

Project 2

Modernize City Procurement Processes

Summary

The Challenge: In New York City today, most pilots are run through "no-cost," "micro-purchase," or "demonstration project" procurement pathways. These procurement methods allow for relatively fast testing, but they do not create a legal pathway to scale successful technologies, perpetuating the issue of pilot purgatory.

The Opportunity: There is a growing reform movement toward "challenge-based" procurement, in which an agency invites vendors to propose creative solutions to a challenge it is facing. The agency then pilots its preferred solutions, to inform a final purchase decision. The New York City Housing Authority has begun using challenges—creating a possible model for other agencies.

Recommendations: Issue a new "challenge-based" procurement pathway for a five-year trial and create training to help agencies understand their pilot procurement options, including associated cyber and privacy policies. Propose and pass any necessary Procurement Policy Board changes to create a long-term legal structure for future challenge-based purchasing.

The Challenge

Across the United States, governments have struggled to adapt their procurement processes to accommodate rapidly evolving technologies. In most US cities, including New York, the majority of procurement dollars flow through traditional procurement methods such as Requests for Proposals (RFPs) or Competitive Sealed Bids (CSBs). Both methods are characterized by identifying a prescriptive set of characteristics against which vendors are evaluated, and a months- to years-long diligence process of checks and balances. CSBs also include the requirement to award the contract to the lowest-cost, qualified bidder. While these features ensure that the government is acting responsibly with public money, they simultaneously limit its ability to experiment with different vendors and adjust procurement requirements based on learnings. Further, long procurement lead times make it difficult for the government to keep pace with technology developments; consider the number of new artificial intelligence features released in the last six months alone.

In response, there is a growing procurement reform movement across federal, state, and local governments, especially for sectors that are deemed critical for national security, including adapting to and mitigating climate change. The hallmark program on which many other efforts are modeled is the DIU's Other Transaction Authority (OTA), which allows the Unit to award prototype agreements to vendors in 100 days and pilot their technologies before making large-scale procurement decisions. The DIU recently launched a training program to help teach other government procurement professionals about the OTA. They are actively collaborating with agencies like the General Services Administration (GSA), which oversees the federal government's real estate.

Figure 15: Overview of New York City's Pilot Procurement Pathways

	New York City Current Pilot Procurement Methods			New* Method
	No-Cost Pilots	Micro Purchase Pilots	Demonstration Projects	Challenge-Based Procurement
Typical $ Value	$0	<$20K	~$20,000-~$5,000,000	Any dollar value
Average Contract Cycle Time**	~1-2 month	~1-2 month	~1 year	Target six-months
Annual Volume	*Not tracked, likely majority of pilots*		~20	~2 in year one, scale after that
Competition Required	No	No	No	Yes, an evaluation of the vendor landscape is the first phase of challenge-based procurement
Contracting Process	At the discretion of agency Project Manager	At the discretion of agency Contracting Officer	Formal justification for Demonstration Project method must be approved by ~7 City oversight bodies	Tightly scoped process under the leadership of MOCS, in collaboration with partner agencies
Path to Scale	No	No	No	Yes

*NYCHA is currently using a variant of this method, so it is not "new" to New York City; NYCHA is technically a public development corporation, which has different procurement processes from other City agencies.

**Data derived from MOCS PASSPort. Time is benchmarked from when the contract is entered for MOCS review, to when it is signed. Cyber and privacy reviews may occur prior to the contract entering MOCS's system and can double the time it takes to close a contract.

Procurement methods similar to the OTA are sometimes grouped together under the banner of challenge-based procurement.

What is Challenge-Based Procurement?

In a challenge-based procurement, a government agency identifies the challenge it is trying to solve, and then invites vendors to propose creative solutions. A pilot phase, in which the city can try multiple vendors' products, is built into the process. Once the government has piloted multiple vendors, it will decide which, if any, to advance to a large-scale purchase.

New York City Pilot Procurement Options

In New York City, the Mayor's Office of Contract Services (MOCS) enforces the City's Procurement Policy Board (PPB) rules, and it publicly releases procurement data in the City's PASSPort portal. Procurements of goods and services under $20,000 dollars are left to the sole discretion of agencies, but procurements for higher dollar values typically go through a traditional, competitive procurement process. Agencies are permitted by the PPB rules to use a sole-source procurement method only when a vendor's product or service is deemed unique.[1] While the City does not track vendor response rates, based on national data, the average procurement is estimated to have between two to three respondents.

Through consulting with MOCS and agency staff that initiate pilots, we found that pilot projects today are happening through one of three methods: no-cost pilots, micro-purchase pilots, or demonstration projects (Figure 15). These methods do not provide a sustainable path to scaling up technologies that are successful, contributing to pilot purgatory.

1 An exception is made for certified Minority- or Women-Owned Businesses (M/WBEs), with whom the City can contract for up to $1 million without a formal competitive process. The M/WBE program is part of the City's efforts to promote diversity in its vendor base.

Under $20,0000

For pilots under $20,000, we observed two primary procurement methods, which typically take 1-2 months, and do not require any competition:

1. No-Cost Pilots: An agency project manager signs a short, non-binding agreement with a pilot company or an intermediary. Companies cover the expense of the pilot out of their own pocket. As no money is changing hands, this is not technically a procurement, and the agreement does not pass through a Contracting Officer.

2. Micro-Purchase Pilots: An agency Contracting Officer signs a contract with the pilot company or a program operator for up to $20,000. The decision is at the sole discretion of the agency, as it constitutes a micro-purchase in the City's Procurement Policy Board rules.

These two paths are the fastest way to get a pilot into the field, as they do not require flowing through the City's full procurement process. However, the cost of many *place-based* pilots exceeds the $20,000 threshold, meaning these pathways may not be available to agencies unless the vendor is willing to offer its services for free.[2]

Over $20,000

For pilot projects in excess of $20,000, the City offers the Demonstration Project method. A Demonstration Project is *"a short-term, carefully planned pilot exercise designed to test and evaluate the feasibility and application of an innovative product, approach or technology not currently used by the City."* In order to use the Demonstration Project method, agency staff must write a justification memo, which an Agency Chief Contracting Officer, MOCS, and approximately four additional oversight bodies must approve.[3] The Demonstration Project method includes the ability for the City to accept unsolicited proposals from vendors.

Demonstration Projects are limited to three years, with the option of a one-year extension. At the conclusion of a Demonstration Project, the contracting agency evaluates the vendor and either discontinues use or can release a competitive RFP to acquire a similar technology. However, they cannot "default" to working with the same vendor on a long-term contract.

The Demonstration Project method sees relatively low utilization today. In our interviews we found this third method is sometimes viewed as having limited advantage for agencies as it does not create a pathway to a large-scale purchase. Additionally, there is low awareness among agency staff about the method and how it should be utilized, which has the impact of extending review timelines. These factors contribute to a negative perception of the method among certain agencies and vendors.

> "There is a lot of back-and-forth clarifying what things mean. And we do not want to pilot a project and then have it go nowhere."
>
> **— Agency Interview**

> "You cannot tell a startup they will receive a million dollars then expect them to wait two years for it."
>
> **— Startup Interview**

Cybersecurity and Privacy Reviews

Lastly, the City has robust cybersecurity and privacy review processes, which apply to all pilot procurement methods described in this report (including no-cost pilots). These review processes function at two levels: Each agency has its own Chief Information Security Officer and Agency Privacy Officer, who handle cyber and privacy reviews, respectively. Central policy is coordinated by the Office of Technology and Innovation (OTI), which is home to NYC Cyber Command, and the Office of Information Privacy. OTI helps resolve edge cases and provides final procurement sign-off on more complex contacts.

2 The offering of free services, especially for large contract values, is counter to procurement best practices, as it creates a competitive advantage for legacy players who can bear the cost. Through our research, we found that young companies—especially those run by diverse founders, who may have more limited access to capital due to structural inequities—are less likely to be able to afford "free" pilots.

3 The number of approvals required depends on contract size and the nature of the vendor's product (some products must go through additional cybersecurity reviews).

Figure 16: Traditional Procurement vs. Challenge-Based Procurement

	Traditional Procurement	Challenge-Based Procurement
Process	Government identifies prescriptive solution and requirements	Government identifies problem and objectives
	Vendors provide a quote to implement	Vendors propose different possible solutions
	Government evaluates written proposals	Government chooses a subset of vendors to pilot and evaluates results
	Final solution that meets government's specifications at lowest cost is procured	Final solution that *performs* to meet government's objectives is procured
Vendors	Vendors claims evaluated against historical track record and a forward-looking risk assessment; tends to favor establish companies who have a track record	Vendor claims assessed via a real-world pilot, coupled with a forward-looking risk assessment; tends to open playing field to younger companies
Government Role	Decision-making led by procurement team, with input from agency clients	Agency clients play a more intensive role in technical validation of pilot performance

In our research, we found that the agency staff who initiate pilots are often not fully abreast of the City's evolving cybersecurity and privacy policies, and may struggle with what to anticipate during a review and convey that effectively to vendors. This can lead to false starts in which agency staff expend time negotiating with a preferred vendor, before learning that the vendor is not capable—or not willing—to comply with city policies.[4] While these cases are ultimately caught before a contract is signed—ensuring New Yorkers remain protected—training on OTI's policies would likely increase efficiency for both agency staff and vendors.

The Opportunity

New York City Mayor Eric Adams has been a staunch advocate for procurement reform, including reforms focused on cutting red tape in government, and increasing the share of certified Minority- and Women-Owned Business Enterprises (M/WBEs) that hold City contracts. While there is a need to increase awareness of existing procurement pathways, there is also an opportunity for MOCS to codify challenge-based procurement. This codification would create a rigorous yet efficient pathway from pilot to scale, enhancing innovation without sacrificing procurement integrity. Challenge-based procurement—which asks vendors to *show* they can perform via pilots, instead of relying purely on a vendor's historical track record—should also allow more diverse and smaller vendors to compete for City contracts and contribute fresh thinking. Opening procurement to earlier-stage vendors is particularly important in light of the IRA, IIJA, and CHIPS Act's emphasis on spurring the domestic manufacturing industry. That spending has led to a growing number of young, American-made startups in the climate tech space, who may struggle to compete in traditional procurement processes.

As described in the introduction to this report, the New York City Housing Authority (NYCHA) first deployed "challenges" in the 1990s to incentivize the development of energy efficient refrigerators, before the method saw a long hiatus. Recently, NYCHA has revived its challenges, launching one in each of the last three years: Clean Heat for All Challenge (2021, Heat Pumps), Clean Curbs for All Challenge (2022, Trash Containers), and Clean Stoves for All (2023, Induction Cooking). (NYCHA is not subject to the City's procurement code—the agency designed its own challenge process, which is not readily available to other City agencies.)

One of the winners of NYCHA's Clean Heat for All Challenge—Gradient Comfort, an American HVAC startup founded in 2017—is a strong example of how challenges can bring in newer players, and also transform a start-up's journey, creating a multiplier effect that allows climate-friendly innovations to spread to the private market. NYCHA's pilot and subsequent 10,000-unit order was Gradient's first big contract, and they have

4 If a vendor is non-compliant, they are given feedback on steps they may take to achieve compliance. However, certain vendors—especially those that lack US-based LLC—may not be capable or willing to take on required compliance activities.

since gone from seed-stage company to raising a $27.5 million Series A.

This renewed focus on challenges is growing in popularity across the country, particularly since California Governor Gavin Newsom codified the method in a 2018 Executive Order, in response to the state's wildfire crisis. Challenge-based procurement has since been used in California on technology contracts ranging in size from $100,000 to $750 million. In reforming technology procurement, cities and states, including California, have also taken the opportunity to more fully integrate and build literacy on related cyber security and privacy review procedures.

How Others Have Done It:

California's Adoption of Challenge-Based Procurement

Wildfire monitoring and suppression in California during 2018. Photo: Pacific Southwest Forest Service, USDA

California suffered a particularly devastating wildfire season in 2018 and was in search of a technology solution to help with early wildfire detection and prevention. However, there was no established procurement method in California for comparing multiple technology vendors and then procuring the best solutions. In response, California Governor Gavin Newsom issued an Executive Order to codify the RFI2, or the "Request for Innovative Ideas," a new challenge-based procurement method. For the wildfires request, California had 133 vendors respond—ranging from startups to academic institutions—and chose to compare three vendors with distinct approaches in the 2019 wildfire season. For example, one vendor used a combination of LIDAR, local thermometers, and weather sensors to detect fires, and one relied on satellite data. After the season concluded, the state moved forward with one of the participating vendors, for a contract of $15 million, to build an integrated wildfire management system. The effort also led to regulatory reforms and the creation of a new Office of Wildfire Technology R&D. Lastly, to make the RFI2 method broadly accessible, California consolidated all future technology procurement under the State's Chief Information Officer, who would go on to offer challenge-based procurement as-a-service to other agencies.

Recommendations

Near Term (Year 1)

Trial challenge-based procurement with ~2 City agencies

NYCHA's recent success with challenges in their "Clean For All" programs provides important momentum for expanding use of challenge-based procurement in the City of New York.

Routes for the City to bring challenge-based procurement to more agencies include, but are not limited to:

1. The City can issue a new Innovative Method like California's RFI2. Innovative Methods are essentially "tests" of new procurement pathways that last for up to five years, before they must be adopted by the City's Procurement Policy Board.
2. The City's Procurement Policy Board could change its rules to allow for more flexibility in the way RFPs are crafted and how needs are communicated to potential vendors.

We recommend that the City explore these and other approaches, with a target of launching a city-wide trial of challenge-based procurement by the end of 2023. This foundation would allow select agency partners to begin running challenge-based procurements in 2024. The City should aim to try the method with at least two agencies.

Develop pilot procurement training program for agencies

Additionally, we recommend that MOCS create guidance and training materials on all four pilot procurement methods, to use with agency staff and contracting officers. This will help ensure agencies choose the "right" procurement method for the stage of their pilot project or program, creating efficiency for agency staff, legal and budget departments, and vendors. MOCS should coordinate their training materials with OTI—particularly NYC Cyber Command and the Office of Information Privacy—so that the materials include information on the City's cybersecurity and privacy requirements and processes. Clearly highlighting cybersecurity and privacy expectations for pilot projects upfront will help agency staff be more judicious in the vendors with which they choose to work, and give vendors time to prepare for required compliance activities.

Long term (Year 3)

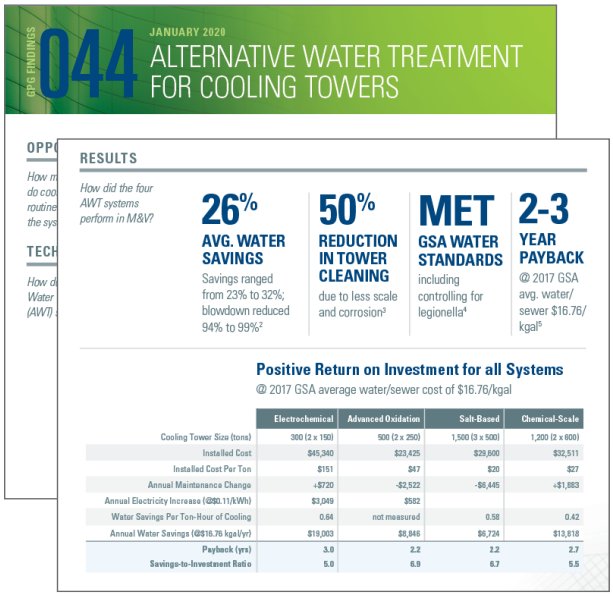
Establish permanent challenge-based procurement pathway

Based on outcomes of the challenge-based procurement trial and agency training, the City may seek to permanently codify challenge-based procurement. Permanent codification could potentially occur through modification to the City's Demonstration Project method, to which any changes would have to pass through the City's Procurement Policy Board.

As the City studies how to codify challenge-based procurement going forward, it may also want to explore expedited procurement pathways for past vendors who have already successfully completed a government-run or -affiliated pilot program that included technical validation. An example is the Department of Citywide Administrative Services (DCAS) IDEA program, which tests energy efficiency technologies on government buildings. All pilots are validated by a third-party lab, and then DCAS issues a recommendation regarding whether the technology should be adopted.

How Others Have Done It:

The General Service Administration (GSA) Green Proving Ground



Example of a validation report on a Green Proving Ground technology. Image: General Services Administration

The DCAS IDEA program is modeled after the GSA's Green Proving Ground (GPG) program, which allows American startups to test their technologies on federal buildings. After ten years of validating 23 energy efficiency technologies, in September 2023, through the IIJA, the GSA received nearly $1 billion to apply vetted technologies to the federal government's building portfolio. The GSA specifies GPG technologies in the requirements they give to all general contractors involved in construction and maintenance of federal buildings. If a general contractor chooses to opt out of using a GPG technology, it must offer a justification. Specific vendors—those who participated in GPG—are offered as examples of companies who can meet the GSA's specifications. While contractors are not required to procure from those vendors, many do, as the vendors have been pre-vetted.

Harmonize language with New York State to enable cooperative buying

Over the long term, proposed procurement changes should be coordinated with the State of New York. When City and State language is harmonized, agencies in cities across the state can leverage "cooperative purchasing"—essentially, group buying. This both avoids duplicative procurement processes and allows New York's cities to get better pricing through larger orders. Cooperative purchasing is particularly advantageous for small cities, which do not have the purchasing power to get favorable pricing on their own. For example, smaller housing authorities in the state were able to take advantage of NYCHA's energy efficient refrigerator challenge in the 1990s.

Recommendation Summary

Year 1

- Trial challenge-based procurement with ~2 City agencies
- Develop pilot procurement, cyber, and privacy training for agencies

Year 3

- Establish permanent challenge-based procurement pathway
- Harmonize language with New York State to enable cooperative buying

Progress to Date

Through the writing of this report, we have had a chance to learn about what has worked–and what has not—in other jurisdictions that have tried and scaled challenge-based procurement methods, like California. City oversight agencies—in collaboration with operating agencies interested in using the method—are now actively exploring how to structure a challenge-based procurement trial to start in 2024. This report also effectively contains the "menu" of pilot procurement options that are currently available to agencies, which can be succinctly packaged into training and used by agency staff in their conversations with Contracting Officers. As New York City refines its own procurement processes, it will continue to compare notes with other city, state, and federal entities that are exploring similar reforms.

Project 3

Coordinate Startup Support Infrastructure

Summary

The Challenge: While urban innovation companies want to be located in New York, many struggle with the process of "going to market" in the city. Through the Department of Small Business Services, New York supports retailers interacting with the City—but it is not equipped to handle the needs of urban innovation startups navigating activities like government permitting.

The Opportunity: A network of pilot programs and dedicated sites, like Newlab and the Brooklyn Navy Yard, have emerged as mediators between companies, the government, and the public, acting as a first point of entry to New York. However, there is more demand from startups than current programs can accommodate. NYCEDC, which seeded this ecosystem, is poised to step up and respond to startup needs.

The Recommendation: Launch a central business portal that would provide services to help urban innovation startups navigate New York. Pool resources and raise funding for a formalized network of pilot programs and sites, which would match supply and demand, and provide support on issues each player is too small to address individually (e.g. policy reform, debt financing).

The Challenge

> "New York is almost more of a nation state than it is a city. And because of that, there are economies of scale—there is a lot of money, there are customers—but there's also an enormous amount of bureaucracy. Nothing is easy."
>
> — Startup Interview

In our *Pilot: New York City* startup survey, we asked companies to classify a list of benefits they hope to receive from interacting with New York City or State government, as "very important," "somewhat important," or "not important." (Figure 17)

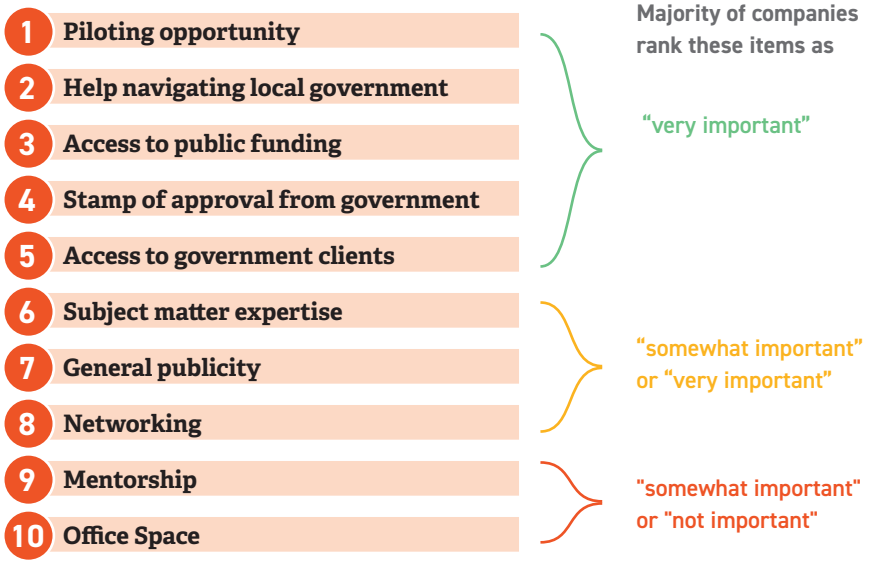
We then dug into their responses in one-on-one interviews and discovered two, interrelated challenges:

1. Finding the right opportunities.

Companies struggled to identify the right incentives, financing, piloting, and procurement opportunities. Ironically, this is partly because there are so many, but they are diffused across the city's various agencies and civic organizations who operate programs on behalf of the City.

Figure 17: Top Needs of Urban Innovation Companies

We asked companies: What benefits do you hope to receive from interacting with New York City or State government? Please rank. The majority of respondents are climate tech companies, who are Series A or earlier.



"There are about half a dozen civic groups and agencies that I imagine could be good customers, but I am not sure how to find out about opportunities and I don't have any contacts...if I hear about opportunities, it is word of mouth."

— Startup Interview

2. Turning opportunities into reality.

Once an opportunity is verbally secured, companies struggle to navigate approval processes involving multiple agencies. This is a particular challenge for companies trying to launch technologies that do not fit into pre-existing licensing and permitting pathways. That can lead to projects that get stuck in a limbo, with no clear picture of who to call for help.

Advocacy & Permitting

29/30 startups

who participated in our research asked for a "caseworker"

"You shouldn't have to hire a lobbyist to [get something done in the city] - because we can't afford a lobbyist."

— Startup Interview

Up to 17 permits

can be required for new energy projects across four City agencies

"We have been waiting two years for a permit...it's because nobody knows who is supposed to be giving a permit, since our technology has not been tried before in New York."

— Startup Interview

Combined, these challenges put smaller companies developing new technologies at a disadvantage—especially startups who have limited runway, and do not have access to "friends and family" networks to tide them over. Due to structural inequities in capital access, these companies are disproportionately likely to be minority and women owned businesses (M/WBEs), hindering the City's goal of promoting diversity in the green economy.

The New York City Department of Small Business Services (SBS) supports young companies on regulation, financing, legal issues, incentives, and M/WBE certification. SBS even assigns ambassadors to help with licensing and permitting, via the Business Express Services Team (BEST) team. Companies have access to a single portal, in which they can track and manage all transactions with the City. However, these SBS services were designed to fit the needs of traditional brick-and-mortar and service businesses (what "small business" has historically meant to cities)—not the needs of startups operating in complex urban environments.

How Others Have Done It

Grow London

In 2023, London & Partners, the economic development arm of the City of London, launched Grow London, which effectively acts as a business development service, focused on the needs of startup companies and others considering the London market. Companies can book office hours with experts in industries the City is trying to promote, like sustainability. Additionally, when London identifies priority sectors, it consults relevant companies and then, if appropriate, establishes fast-track permitting pathways—for example, companies in the waste-to-energy sectors are now able to receive permits through a specialized pathway.

This focus on the needs of traditional brick-and-mortar and service businesses also applies to how the City, through SBS, runs its M/WBE certification process. M/WBE certification expands opportunities for companies led by designated minority groups and women to access government contracts, helping to rectify a lack of diversity in the city's vendor base. At least 51 percent of a company must be held by members of a designated minority group and/or women in order for it to receive M/WBE certification. However, as diverse-led startups raise subsequent rounds of venture financing and grow their teams, many end up without majority ownership of their company, making them ineligible for M/WBE status.[1] That means minority- and women-led startups may not reap the same City procurement advantages as traditional small businesses, who typically have less dilutive capitalization structures.

The Opportunity

> "New York shouldn't be the easiest [place to launch an urban innovation company], but it also shouldn't be the hardest."
>
> **— Venture Roundtable**

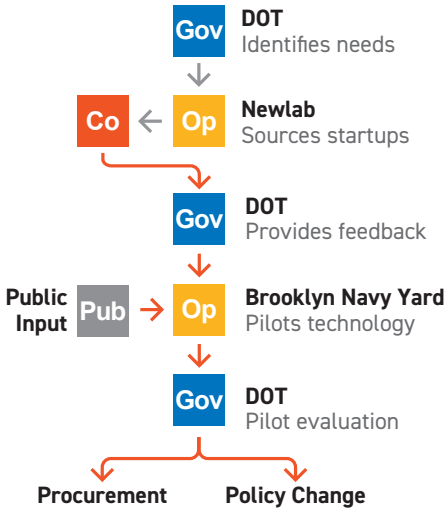
The Office of Technology and Innovation Smart City Testbed Program—launched earlier this month—creates an entry point for startups who want to work with City agencies. This program builds on the legacy of a network of accelerator programs and nonprofit pilot sites, which help companies navigate the process of "going to market" in New York. These third-party operators have historically served as intermediaries between companies, the government, and the public.

Accelerator Programs

Accelerators like the Partnership for New York City's Tech Labs work with government agencies on structured, themed programs to source startups. For example, the Partnership for New York City recently signed a contract with the Department of Environmental Protection (DEP) to run the Environmental Tech Lab, focused on identifying technology for predictive maintenance and automation of inspections of water and wastewater assets. Newlab also operates a similar studio program on behalf of the Department of Transportation (Figure 18).

1 Ownership stake held by institutional investors does not qualify for the M/WBE threshold, even if the investors themselves identify as members of a designated minority group and/or women.

Figure 18: Newlab's Transportation Innovation Studio creates an interface for the Department of Transportation to work with startups on pilots, and collect public input.



Pilot Sites

Accelerator programs are in turn dependent on having dedicated pilot sites, which can act as an initial test ground for new climate technologies. Pilot sites—which are often run by nonprofit entities—have procedures to facilitate public input and can provide fast access to building and infrastructure systems as they typically have their own facility management teams. At pilot sites, companies can perfect their technologies in a semi-controlled environment, and policy makers, investors, customers, and community stakeholders can come to inspect pilot results, before technologies go "live" in the rest of the city.

While semi-controlled pilot sites have been used informally for testing of new technology since the mid-2000s, the first formal location to launch was the Brooklyn Navy Yard's Yard Labs program in 2020. Now, a number of other sites are coming online offering structured programs.

Figure 19: 2023 Pilot Program Sites

1. COSMOS Harlem

What it is: FCC-designated Innovation Zone for advanced wireless technologies (beyond 5G) that includes Columbia's campuses and West Harlem.

Technology focus areas: Edge computing applications in fields like robotics, immersive virtual reality, and traffic safety.

Managed by: Columbia / ssputz@columbia.edu

Website: www.cosmos-lab.org

2. Airports

What it is: JFK and LaGuardia are New York's two main airports.

Technology focus areas: Airport customer experience, airline handling equipment, and passenger ground transportation.

Managed by: Port Authority / ihub@panynj.gov

3. Roosevelt Island

What it is: A 139-acre island managed by the Roosevelt Island Operating Corporation, which is home to 11,722 residents and the 12-acre campus of Cornell Tech.

Technology focus areas: Last-mile logistics and district-scale energy infrastructure.

Managed by: Cornell Tech / urbantechhub@cornell.edu

Website: tech.cornell.edu

4. Brooklyn Navy Yard

What it is: A 6.3M-sq-ft active manufacturing campus and future home to the Electric Alley and Electric Curbside.

Technology focus areas: Mobility and curb management.

Managed by: Brooklyn Navy Yard, Yard Labs / YardLabs@bnydc.org

Website: brooklynnavyyard.org/yard-labs

5. Downtown Brooklyn

What it is: Willoughby Plaza is the main public square in Downtown Brooklyn, steps from Fulton Mall, Brooklyn's most famous shopping district.

Technology focus areas: Mobility and public space sensing technologies.

Managed by: Downtown Brooklyn Partnership

Website: downtownbrooklyn.com/make-it-in-brooklyn/living-lab

6. Governors Island

What it is: A 172-acre island and future home to the Center for Climate Solutions providing direct waterfront access, natural areas, built environment, and a growing community of tenants.

Technology focus areas: Water, built environment, and nature-based solutions.

Managed by: Trust for Governors Island / livinglab@govisland.org

Website: govisland.com/about/climate-solutions

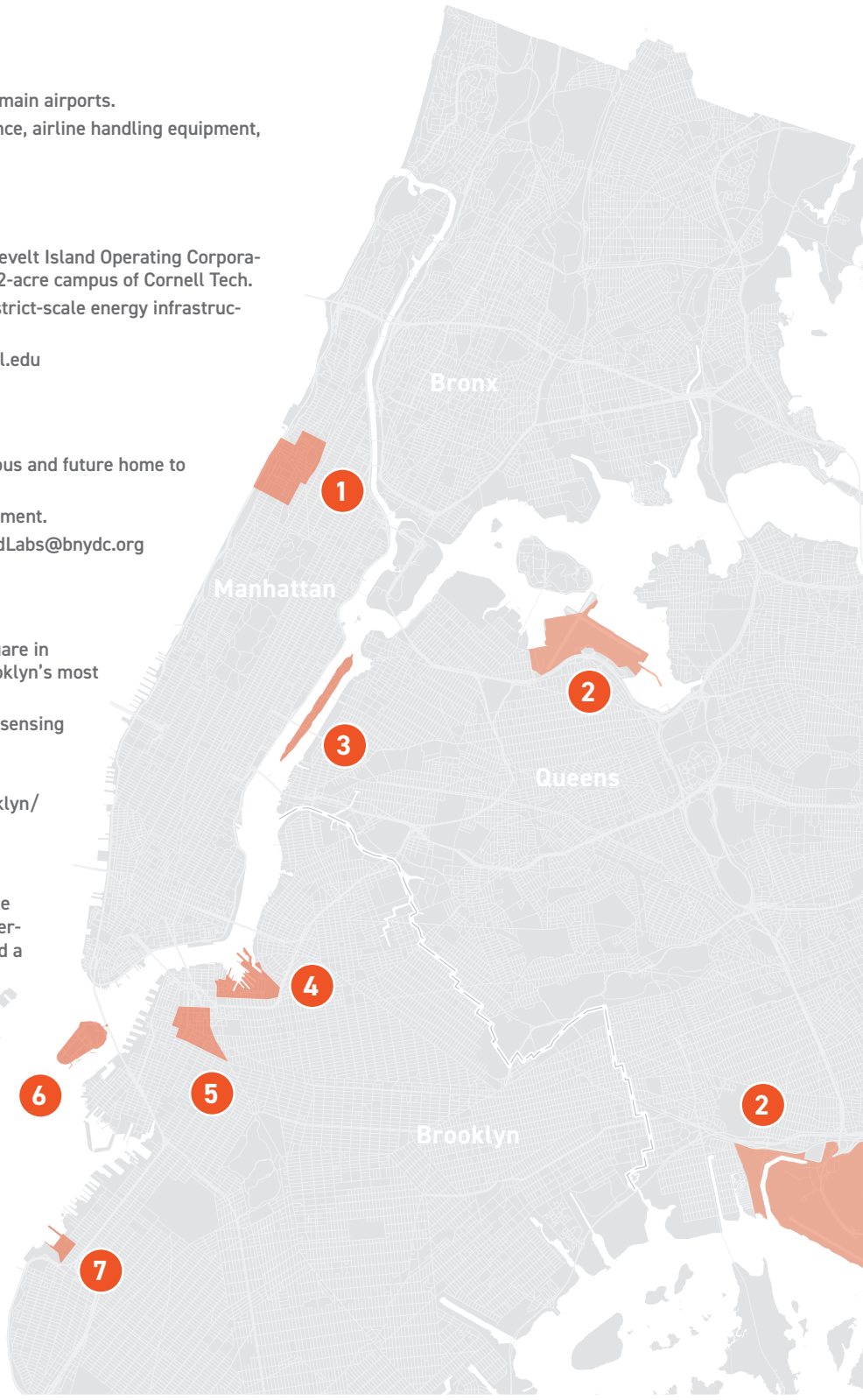
7. Brooklyn Army Terminal

What it is: A modern industrial and manufacturing hub home to over 100 businesses and over 4,000 jobs.

Technology focus areas: Proptech and climate tech solutions, particularly for retrofitting.

Managed by: NYCEDC / pilots@edc.nyc

Website: edc.nyc/program/pilots-bat



NYCEDC's Assets

NYCEDC is also beginning to open its 65 million square feet of real estate for piloting, starting with its recent launch of Pilots at Brooklyn Army Terminal. Distributed across all five boroughs, over 100 of NYCEDC's assets fall within Environmental Justice Area Census Tracts. That makes these sites a priority for investment under the federal government's Justice 40 Initiative, which aims to deploy federal dollars into historically disadvantaged communities.

Figure 20: Map of Key NYCEDC assets relative to J40 Tract Designation

1. Kingsbridge Armory

Kingsbridge Armory is a historic military facility that is actively seeking redevelopment and the creation of new economic opportunities in the Bronx.

2. Hunts Points

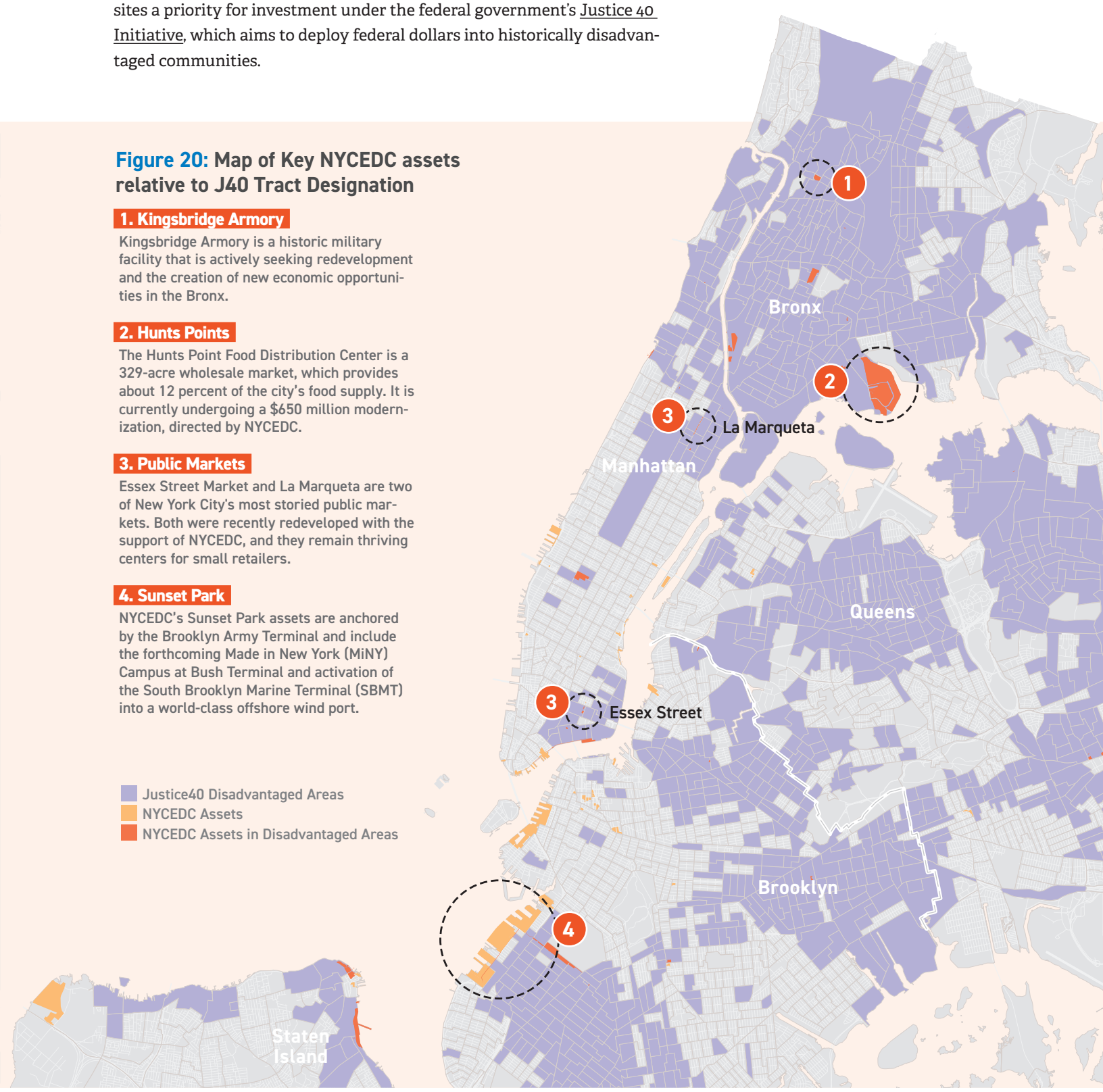
The Hunts Point Food Distribution Center is a 329-acre wholesale market, which provides about 12 percent of the city's food supply. It is currently undergoing a $650 million modernization, directed by NYCEDC.

3. Public Markets

Essex Street Market and La Marqueta are two of New York City's most storied public markets. Both were recently redeveloped with the support of NYCEDC, and they remain thriving centers for small retailers.

4. Sunset Park

NYCEDC's Sunset Park assets are anchored by the Brooklyn Army Terminal and include the forthcoming Made in New York (MiNY) Campus at Bush Terminal and activation of the South Brooklyn Marine Terminal (SBMT) into a world-class offshore wind port.



There remains substantially more demand from startups than existing pilot programs and sites—mostly thinly resourced nonprofits—are equipped to accommodate. Additionally, there is currently no formal means of collaborating or speaking as a unified voice across the City's pilot programs and sites. These nonprofits are on the front lines of working with climate startups and the community, and often have a strong read on unmet ecosystem needs. For example, the Brooklyn Navy Yard's Yard Labs program raised and pinpointed the precise challenge around M/WBE certification for startups, and the Yard is now running a study on how to diversify its own startup base. The City should draw on the knowledge the network has accumulated.

Applications vs. Spots for NYCEDC Proptech Piloting Program

270 Applications
15 spots
in NYCEDC's Proptech Piloting Program

How Others Have Done It:

European Network of Living Labs

Certified ENoLL Locations. Image: enoll.org

Founded in 2007 as a EU-backed initiative to enhance European economic competitiveness, The European Network of Living Labs (ENoLL) creates economies of scale across piloting zones in European countries. ENoLL has two primary service offerings: first, it runs a capacity-building program to help reduce the burden of entry for new Living Lab facilities. Second, it runs "task forces" on emerging areas of technology and policy, to help Living Labs compare pilot results and conduct science-based advocacy to EU policymakers. ENoLL has over 200 certified members and is active in coordinating grant proposals on behalf of its members, who may be eligible for EU funding.

Recommendations

> "No matter how much talent you have, unless you create the conditions for people to experiment, it will be easier for people to test things elsewhere."
>
> — Startup Interview

Near Term (Year 1)

Launch a portal with resources for startups "selling to or in" the City

OTI's Smart City Testbed program gives startups a consolidated point of contact for proposing pilots to agencies. To extend its reach and ensure that pilots translate into companies that stay and grow in New York, NYCEDC should enhance the portal with business development resources. This could include a go-to-market guide for the City of New York, a map directing companies to the most appropriate pilot locations, and a live feed of funding and procurement opportunities. An enhanced portal will effectively function as an equivalent to SBS BEST, but instead of brick-and-mortar, it will cover the needs of startup companies who are either "selling to or in" cities (i.e., companies that meet our definition of *Urban Innovation*, on page 7). The portal can be manned in part by NYCEDC, which has a Business Development team.

Formalize a network of pilot sites and apply for federal funding

The City's pilot programs and sites have begun to collaborate more intensively through the *Pilot: New York City* writing process. As New York's urban innovation ecosystem reaches the next stage of maturity, we recommend NYCEDC formalize this collaboration in a new "pilot network," composed of the City's emergent pilot programs and sites. Creating a network will allow programs to more effectively respond to startup

demand and foster economies of scale across existing and potential new sites. The network itself should take on the following initial mandate, consistent with the needs observed in our study:

Near-Term Mandate

1. Shared Resources: Reduce the time and cost of opening and operating pilot facilities by offering shared legal templates and other deployment resources.
2. Fundraising: Submit federal funding applications to access relevant IRA, IIJA, and CHIPS Act grants, bolstering each site's facilities with technical and financial support.
3. Coordination: Match companies to the appropriate pilot sites, including sending companies upstate, which in some cases may be a more appropriate first point of entry to the New York region.
4. M/WBE Certification: Support companies on M/WBE certification and advise the City on potential reforms to M/WBE qualification policies to produce more equitable outcomes.

Long Term (Year 3)

Create a feedback loop with City agencies on emerging policy issues

Over the long term, for the network to succeed, it will need to meaningfully develop its ability to organize around shared policy interests. Network members–under the leadership of NYCEDC—have already begun informally playing this role. For example, on the issue of permitting for next generation energy storage technology, NYCEDC—in conjunction with Newlab, through its Resilient Energy Studio—has coordinated policy discussions with the Fire Department about battery permitting, based on lessons from three ongoing energy storage pilots. The ability to observe patterns across pilots and relay lessons would create a voice for emerging urban innovators that do not yet have their own established channels for advocacy.

Structure new financial products to support CapEx on pilot projects

The network should also seek to fill identified financial gaps in the urban innovation ecosystem.

A significant obstacle to pilot deployment is that early-stage companies often struggle to find debt financing and insurance because they lack a track record. As chair of the network, NYCEDC should look into opportunities to fill these gaps, along with other civic-minded investing bodies. NYCEDC is increasingly using financial products—like its new NYC Catalyst Fund—to achieve economic development objectives. Based on input from pilot locations, the network could consider creating products at concessionary terms that accelerate the physical deployment of climate solutions. In doing so, the network should collaborate with more mature state entities like the New York State Energy Redevelopment Authority (NYSERDA), which manages the New York Green Bank (providing concessionary debt to larger climate tech deployments) and recently launched an insurance accelerator, to incentivize the development of climate tech insurance products and policies.

How Others Have Done It

L.A. CleanTech Incubator's Debt Fund

In 2021, the Los Angeles CleanTech Incubator (LACI)—which was seeded by the City of Los Angeles and the State of California—launched a $6 million debt fund. That fund offers low-interest, no-collateral loans of up to $250,000 to clean tech companies who go through LACI's incubator, or which are affiliated with a network of pre-approved accelerators. LACI chose to launch the fund after conducting a federally funded study that showed a lack of cost-effective debt financing was preventing aspiring minority and women cleantech entrepreneurs from piloting.

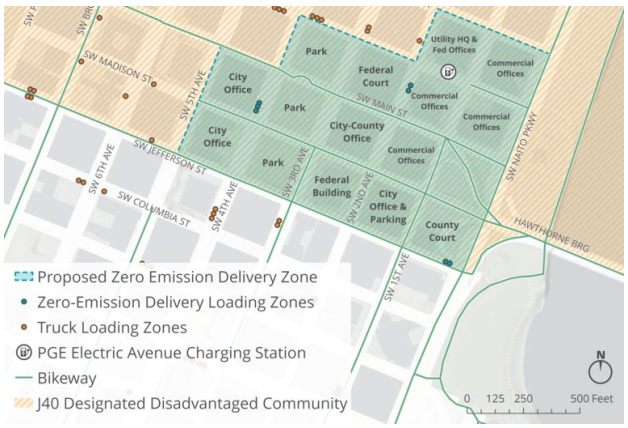
Set up a Zero-Emission Test Zone in a Justice 40-designated area

While the semi-controlled environment of pilot sites can serve as a door to the New York market, eventually startups need to operate in the real world. OTI's Smart City Testbed program helps companies make that leap by working with selected startups to identify locations in New York's public realm for piloting, and receiving input from the community. Long term, the network should work with the City's Department of Transportation (DOT) to establish a more robust zero-emission test zone—an area where only zero-emission vehicles, pedestrians, and cyclists are granted access—a move to which 35 global cities have already committed. The establishment of a zero-emission test zone creates the infrastructure to promote experimentation with related innovations in urban mobility.

In New York, the DOT is already exploring creating a comparable zone. The DOT should do so in a neighborhood facing long standing air quality concerns that is expected to benefit from J40 investment, a project that may be eligible for federal funding through a federal DOT SMART Grant. In helping to scope a Zero-Emission Test Zone, the network can bring its considerable expertise to bear, ensuring the City is both effectively working with local startups and co-creating climate solutions with the communities that will benefit most from an equitable transition to the green economy.

How Others Have Done It

Portland's Zero-Emission Delivery Zone



A map of Portland's zero-emission test zone, funded by a SMART grant from the IIJA. Image: City of Portland

Portland recently received a $2M federal SMART grant to develop a "zero-emission" delivery zone in a J40-designated area of its downtown, to pilot a range of sustainable mobility technologies including digital curb management and curbside electric vehicle charging. If successful, Portland will be eligible for Phase Two SMART grant funding of up to $15 million.

Recommendation Summary

Year 1

- Launch a portal with resources for startups "selling to or in" the City
- Formalize a network of pilot sites and apply for federal funding

Year 3

- Create a feedback loop with City agencies on emerging policy issues
- Structure new financial products to support CapEx on pilot projects
- Set up a Zero-Emission Test Zone in a Justice 40-designated area

Progress to Date

In 2023, OTI launched its Smart Cities Testbed Program, and NYCEDC has started to develop content for an expanded business portal. During the writing of this report, each network member has made substantial progress on its own program, with the launch of The Trust for Governor Island's Living Lab, and NYCEDC's Pilots at Brooklyn Army Terminal. As a group, prospective pilot network members have begun quarterly meetings. Under the banner of the pilot network, we applied for funding from the Economic Development Administration Build to Scale Program, to enhance the group's capacity to work with a greater number of companies. Lastly, the DOT's Curb Management Action Plan includes a commitment to piloting a Low Emission Test Zone, a step toward creating a real-world area for urban mobility piloting.

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Next Steps

During the late 20th century, technological progress was driven by engineers developing software in pristine office parks in Silicon Valley. As the United States doubles down on its green industrial policy, progress will increasingly be driven by companies operating real assets in complex urban environments, which are the source of most of the county's emissions by virtue of their population density.

As the United States' biggest city, New York is primed to lead this charge—and has already developed a robust ecosystem for climate technology. According to Pitchbook data, annual venture funding for climate tech startups in the New York City metro area has increased five-fold between 2016 and 2022 and 2023 is on track to set a new record (Figure 21). By 2040, the City projects that $88 billion in gross-city-product (GCP) will be driven by the green economy.

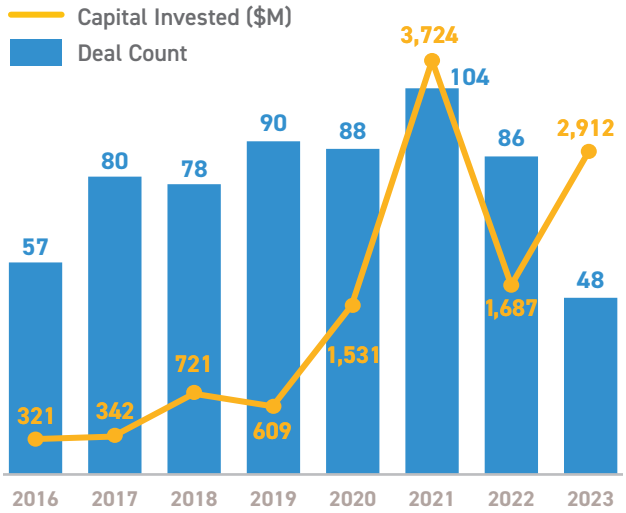
To realize the green economy's potential, the City needs to double down on the difficult task of overcoming pilot purgatory. It needs to do so in a manner that makes New York better for *everyone*, collaborating closely with the vast network of nonprofit accelerators and pilot locations, which have extensive experience working with frontline communities.

The first step in making New York a global hub of urban innovation is for the City to look inward, bringing on innovation staff with relevant technology backgrounds and reforming the culture within agencies. Staff should be rewarded not just for satisfying the operational metrics of their day jobs, but also for trying new things. And for technical support, the City can lean on the expertise of its renowned research institutions, which have shown, through projects like Floodnet, that they can rapidly develop novel technologies that help solve acute city needs, like emergency response to street-level flooding.

Next, the City should reform its procedures, enabling agencies to pilot new technology and quickly double down on solutions that work. That means modernizing procurement, so that vendors bring their best ideas and *show* that they can perform via deployments, leveling the playing field for early-stage companies. As part of this transformation, the City should wield its purchasing power to upgrade and decarbonize its own assets. The New York City Housing Authority has

Figure 21: New York City Climate Tech Deal Count and Venture Funding

Venture funding declined in 2022 due to macroeconomic conditions. However, the overall venture market—and climate tech in particular—has regained its momentum in 2023. Analysis based on Pitchbook Data, October 2023.

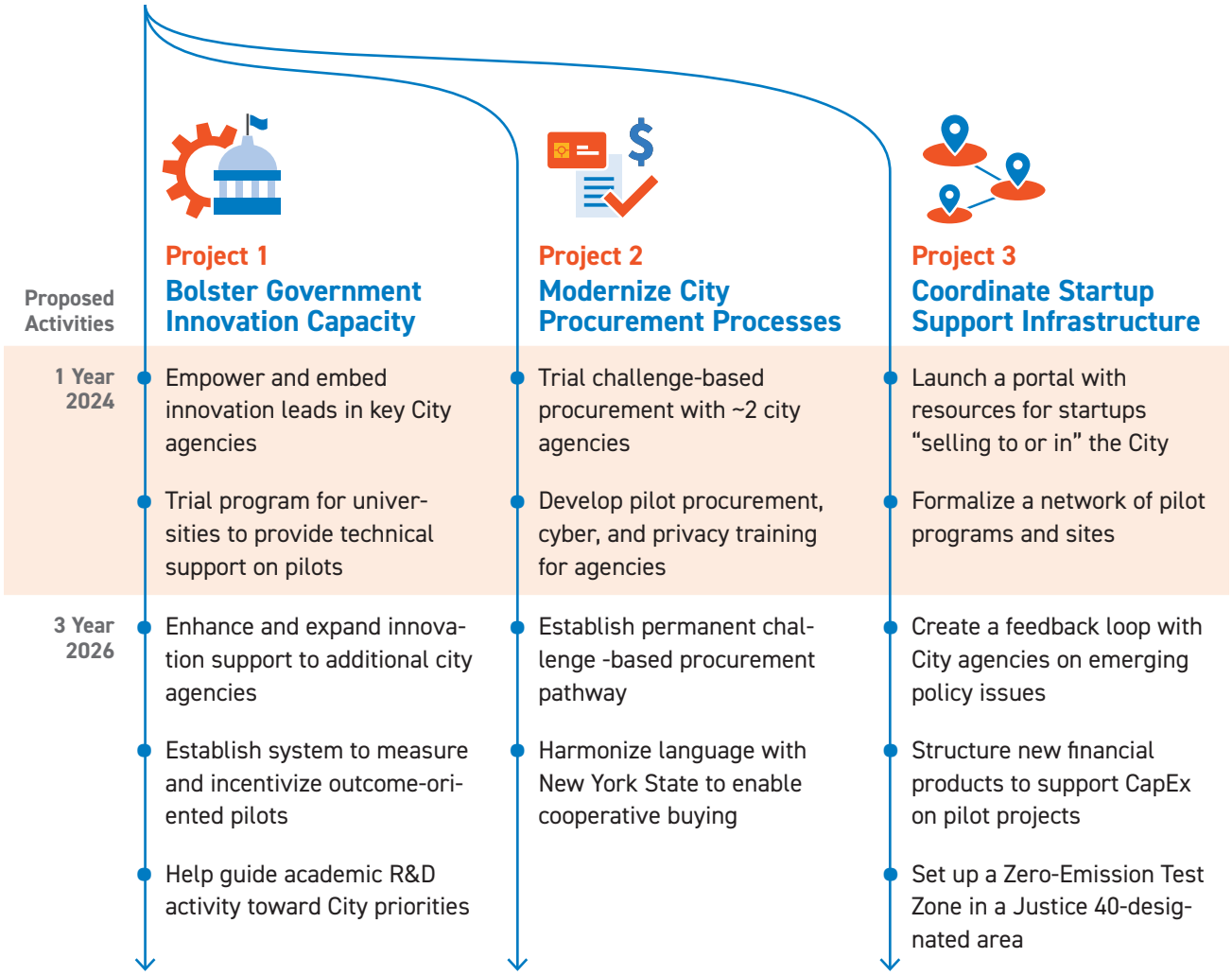


pioneered the creation of new green building products, while directly improving quality of life for its tenants. The City should replicate this challenge-based model for other place-based operating agencies.

Lastly, to help urban innovation startups navigate going to market in New York, the City should offer a business portal to support on tasks like permitting, similar to the support it already provides for conventional brick-and-mortar businesses through Small Business Services. The portal would be powered in part by a network of accelerators and pilot sites, who are often the first point of entry for urban innovation startups in New York today. Formalizing these nonprofits into a "pilot network" would allow for more effective pooling of resources and advocacy on issues of shared interest, like how to more effectively support minority and women-owned startups. Simultaneously, in order to ensure that startups graduate from semi-controlled pilot sites to city streets, New York should structure a Zero-Emission Test Zone, modeled on similar zones in other global cities.

When it comes to addressing pilot purgatory, there is no one magic bullet. Rather, a compendium of approaches is required, which means collaboration across City

Figure 22: Summary of Next Steps



agencies (particularly OTI, MOCS, and NYCEDC), civil society actors like nonprofits and universities, and the private financiers who step in to help accelerate and scale technology solutions that are working.

As New Yorkers have experienced first-hand, climate change is already impairing quality of life due to increasingly frequent and severe natural disasters. While New York City is at risk, it is also home to one of—if not the only—municipal government in the country with the scale and resources to catalyze the invention of urban climate solutions. It should use its catalytic powers, benefitting not only New Yorkers, but city-dwellers across the United States. This report lays out programs and proposed milestones for both the City and the broader urban innovation community. We are excited to get working!

Glossary of City-Run and City-Affiliated Pilot Programs

Brooklyn Navy Yards Yard Labs
www.brooklynnavyyard.org/yard-labs

Company Ventures
companyventures.co

Cornell Tech Urban Tech Hub
urban.tech.cornell.edu

Cosmos Harlem
www.cosmos-lab.org

Downtown Brooklyn Partnership Living Lab
www.downtownbrooklyn.com/make-it-in-brooklyn/living-lab

Department of Buildings Hack the Building Code Challenge
www.nyc.gov/site/buildings/codes/innovation-challenge.page

Department of Citywide Administrative Services IDEA Proram
www.nyc.gov/site/dcas/business/energy-management-idea-program.page

Newlab DOT Studio
www.newlab.com/challenge/providing-safe-affordable-and-dependable-electric-micromobility-charging

Newlab Resilient Energy Studio
www.newlab.com/challenge/integrating-safer-energy-storage-for-dense-urban-environments

New York City Economic Development Corporation Pilots at Brooklyn Army Terminal
edc.nyc/program/pilots-bat

New York City Economic Development Corporation Proptech Piloting Program
edc.nyc/program/proptech

New York City Housing Authority Challenges
www.nyserda.ny.gov/all-programs/Innovation-at-NYSERDA

New York University Urban Future Lab
ufl.nyc

NYCX Challenges
www.nyc.gov/html/nycx/challenges.html

Office of Technology and Innovation Smart City Testbed
www.nyc.gov/site/buildings/codes/innovation-challenge.page

Partnership for New York City Environmental Tech Lab
envirotechlab.nyc

Partnership for New York City Transit Tech Lab
transitinnovation.org/lab

Trust for Governors Island Climate Solutions Living Lab
govisland.com/about/climate-solutions