Invest NYC SDG

Global Change Begins at Home

Advancing the UN Sustainable Development Goals in NYC

A GUIDE TO SUSTAINABLE PROGRESS IN YOUR COMMUNITY

NYU STERN
Center for Sustainable Business

SUSTAINABLE DEVELOPMENT GOALS

Author

Marianna Koval

Co-Authors

Katherine Ellison

London Clark

Editorial Contributors

Kendra Gibbs

Natalie Friedman

Sofia Perez

Design by Christina Van Vleck

About the New York University Leonard N. Stern Center for Sustainable Business

The NYU Stern Center for Sustainable Business (CSB) was founded on the principle that sustainable business is good business. We provide education, conduct research, and influence industry practice by proving the financial value of sustainability for business management and performance. By empowering current and future leaders to embed sustainability into core business strategy, we unleash the business value of sustainability and the transformative potential of business to solve societal challenges at speed and scale. To learn more, visit our website at stern.nyu.edu/sustainability or email sustainablebusiness@stern.nyu.edu.

Learn more about the United Nations Sustainable Development Goals at
https://www.un.org/sustainabledevelopment/

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"Invest NYC SDG has attracted the private sector to sustainable investments in one of the most investor-focused cities on the planet."

National Academies of Sciences, Engineering, and Medicine's report, *Operationalizing Sustainable Development to Benefit People and the Planet*, 2022

EXECUTIVE SUMMARY

Translating Global Goals Into Pragmatic Local Projects

Invest NYC SDG, an initiative of the NYU Stern Center for Sustainable Business (CSB), has spent the last four years identifying, creating, and promoting investable local projects that align with both the UN Sustainable Development Goals (SDGs) and New York City's aspirations. The following report explains our progress to date, including detailed descriptions of our five "center-stage" projects and providing resources such as a roadmap, "how-to" advice, and a toolkit for other local initiatives seeking to follow our path. This work has been made possible thanks to the generous support of our funders Mother Cabrini Health Foundation, Goldman Sachs, PepsiCo, Sims Metal Management, Con Edison, The New York Community Trust, and the Foundation for Food & Agriculture Research.

Context

In 2015, the United Nations called on world governments to adopt and act on 17 SDGs. To call these goals ambitious understates the case. They include ending hunger and poverty, achieving equal rights for women, combating climate change, and protecting the health of our oceans. As quickly became clear, genuine progress towards these worthy aspirations requires new financial models that combine philanthropy and private-sector incentives. The incentives aren't lacking: global business and finance sectors could benefit from major market opportunities worth as much as $12 trillion (USD) each year, according to the Business and Sustainable Development Commission, a global advisory initiative that mapped the "economic prize" available to business. Yet these opportunities will demand collaborations across industries and nations unlike any we have ever seen.

In 2018, New York City, the first US city to embrace the SDGs, pledged to report on its progress toward the UN goals. One year later, that effort became more urgent, as world leaders called for a Decade of Action to mobilize financing, strengthen institutions, and achieve the goals by 2030.

In response to that call, in April 2019 NYU Stern CSB launched our unique initiative: **Invest NYC SDG**.

OUR MISSION

Speed New York City's progress toward meeting the UN goals by contributing to a more sustainable, equitable, and resilient urban economy.

OUR APPROACH

Engage government, the private sector, and community stakeholders to catalyze relevant projects that can attract private investment.

OUR PROMISE

Leverage our global impact by sharing our resources and experiences with other local organizations looking to follow a similar path.

Progress

For the past four years, we have worked to identify private-sector business and finance opportunities that offer realistic business incentives, alignment with global and local government policies, partnerships with communities, and significant impact in meeting the SDGs and New York City's sustainability objectives. We have also taken the unusual step of creating and stewarding local projects, while identifying potential new government policies and finance innovations needed for their success.

A Promising Portfolio

From our base at NYU, we've deployed the university's special strengths—including its convening power, research resources, and student energy—to address six of the greatest challenges of our time: the built environment, climate resilience, food and health, renewable energy, sustainable transportation, and waste. After evaluating 35 diverse strategies, we created a portfolio of five model projects that can attract private investment to meet global sustainability goals:

The Equitable Commute Project – Providing lower-income commuters with subsidies and low-cost, accessible loans to purchase e-bikes, so as to offer more sustainable transportation options to residents of NYC's "transit deserts," while also reducing greenhouse gas emissions.

Decarbonizing NYC's Built Environment – Mobilizing innovative green financing to accelerate energy-efficiency retrofits and clean energy projects in the city's one million buildings.

Supporting Low-carbon Concrete – Processing and using previously unrecyclable glass to replace conventional ingredients, such as fly ash and slag, to create stronger, longer-lasting concrete, and reduce both greenhouse gas emissions and the toll on landfills.

Rikers Island Indoor Farm – Deploying soon-to-be idle land to meet the needs of hungry New Yorkers, while creating good-paying jobs and transforming a notorious penal colony into a visionary resource for well-being and resilience.

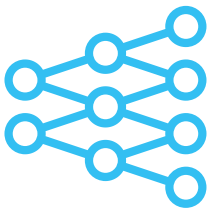
M.A.P. NYC – Creating a crowd-sourced map of all existing food production in New York City, including commercial and community efforts, to establish a baseline that will help set future goals to improve the city's food resilience and equity.

Broader Achievements

While each of these projects has made specific progress, described in this report, our initiative has also achieved several broader objectives:

$3.7 Million in **raised private-sector support**, enough to fund the project for five years

Hired staff (four full-time positions, one part-timer, and more than 65 graduate and undergraduate research assistants)



Assembled a wide network of supporters, including paid and pro bono consultants, and representatives from the city's leading industries

Recruited a 14-member steering committee, with representatives from the UN, the city's financial industry, government agencies, academia, and nonprofit organizations

Galvanized national and international interest, sharing findings with audiences across public and private sectors including the World Economic Forum, the National Academy of Sciences, and the Brookings Institution

Obtained critical support from the Mayor's Office and partnered with major city agencies to develop relevant projects

Published a Finance White Paper that maps the landscape of stakeholders, partnership models, and both traditional and innovative financing mechanisms for the six sectors addressed by the initiative

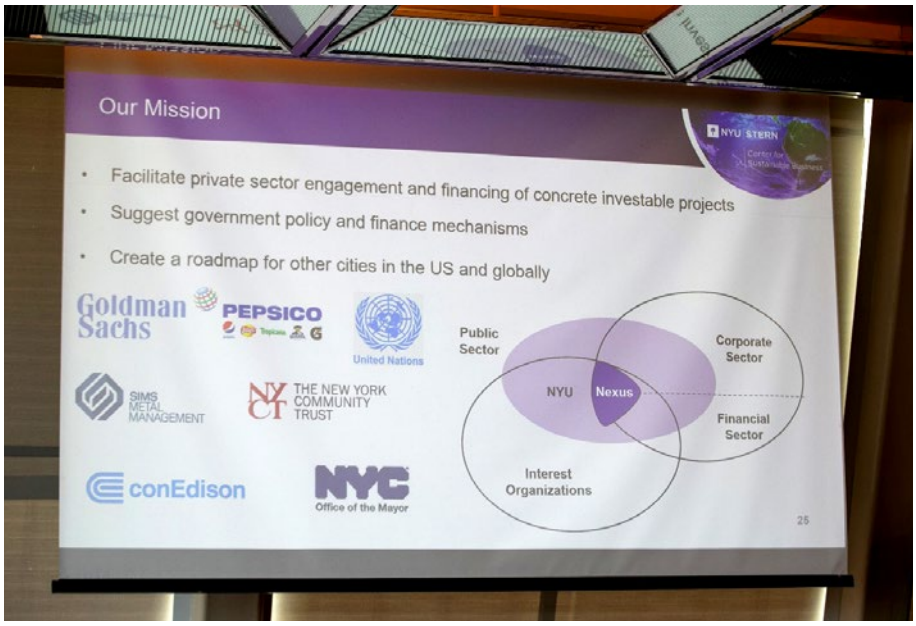
The collaborations that have been pioneered across public and private sectors provide other cities with an applicable model, which is described in detail in this report's Roadmap.

Key Learnings

The following are some high-level key learnings that may help others who are interested in launching similar initiatives and developing local projects to advance the SDGs.

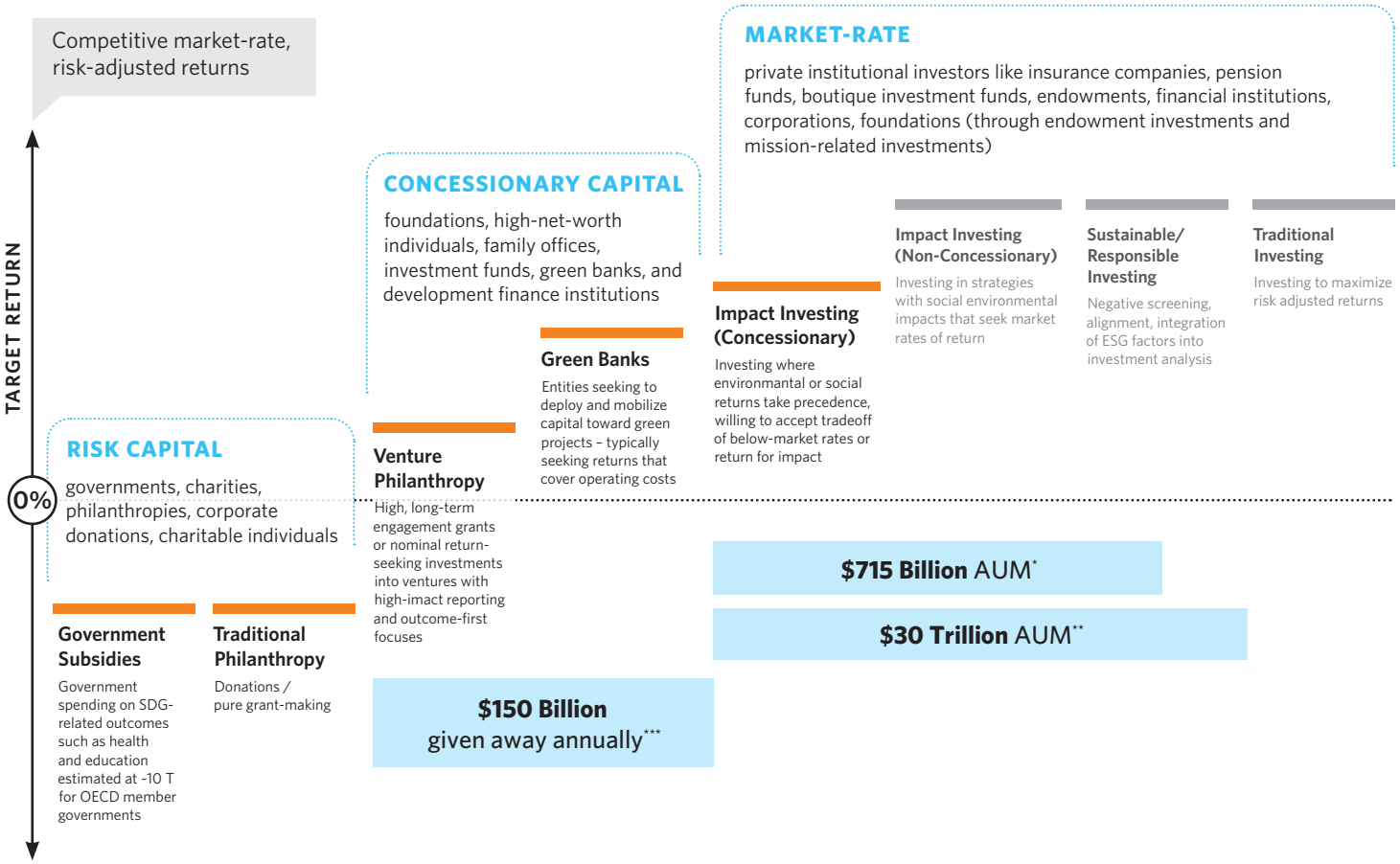
- **ACHIEVING IMPACT TAKES TIME, EARLY MONEY, AND SOME CREATIVITY**
  Advancing the UN SDGs at a local level with place-based projects is challenging and time-consuming work—and may also require imagination and creativity. As you study the barriers to achieving desired sustainability goals and consider environmental and social impact, you may well discover that you need to develop new projects to overcome those barriers. If you go that route, keep in mind that creating projects requires capital for project development, which is not readily available from private investors. That means that you'll need to tap philanthropic and government support, and recruit those funders early.

- **INVESTORS NEED TO SEE THE BUSINESS CASE**
  Private capital is urgently needed to support the development of innovative, sustainable projects that help advance the UN SDGs. In a perfect world, all businesses would pursue social and economic sustainability in concert with their pursuit of market share and shareholder value. In the world as it is, however, it's unrealistic to assume that most investors will finance social and environmental goals at the expense of profits. Most seek maximum returns with a minimum of risk, time, and complexity. Even "impact investors," who are inclined to support sustainability projects, also require some monetary gain. As you develop place-based projects or "solutions," work to ensure that those projects can become financially sustainable, with a projected return on investment.



NYU Stern Center for Sustainable Business Practice Forum, introducing Invest NYC SDG, on March 5, 2020.

Capital Landscape



*2020 Global Impact Investing Network Annual Impact Investor Survey 2020

**OECD Secretary-General 2020 Speech

***Dalberg Report

This chart has been adapted from *Making an Imprint in Impact Investing*, Goldman Sachs, and *Maximizing Outcomes in Impact Investing*, Jasjit Singh

- **BLENDED FINANCE MODELS REMAIN A WORK IN PROGRESS**
  Many sustainability experts today are optimistic about the potential of "blended" finance to supply the needed capital to achieve the SDGs. But this de-risking model, attempting to attract conventional investors to sustainability projects with early "patient," "concessionary," or "catalytic" capital—i.e., investments from governments, philanthropies, and impact investors who seek no or little return—has a mixed track record and has yet to be employed successfully on a large scale in the United States.

- **INVESTORS MUST BE INVOLVED FROM DAY ONE**
  If private sector money is essential to success in achieving our local and global sustainability goals, then the private sector must be at the table and a partner to government in developing those goals. Unfortunately, this has yet to happen to any significant degree, internationally or locally. Whether sustainability goals are created by the United Nations, the City of New York, or some other governmental organization, it's crucial to partner with investors and financiers early on. This will help ensure more achievable objectives, a more efficient role for private investment, smarter metrics to measure progress, and, ultimately, more investment dollars.

- **CROSS-SECTOR COLLABORATION CAN BE CHALLENGING**
  Any work to build coalitions across sectors inherits the underlying tensions between government and the private sector, and between universities and communities. Sustainability ventures will almost always require participation by local community organizations, but it can often be challenging to recruit their support. For genuine progress, they must be at the table from the beginning, and leaders of proposed new ventures must be familiar with their achievements, needs, and sensitivities.

- **A UNIVERSITY CAN PROVIDE AN EXCELLENT LAUNCH PAD**
  A university setting can be an ideal place not only to research but also to catalyze projects designed to make progress toward the SDGs. Universities offer faculty expertise, student research resources, prestige, and facilities for convening diverse partners. That's not to say there aren't downsides. Creating successful projects is an entrepreneurial process and goes beyond a traditional academic focus on research, methodology, and white papers. Furthermore, a university base can sometimes alienate prospective partners who can see such institutions as elitist.

As we stand near the halfway point of the UN's 15-year timeline for achieving the SDGs, we are dismayed by the mounting global consequences of our general disregard for sustainability. We therefore call on government agencies and philanthropies to collaborate with private-sector leaders and community-based organizations to accomplish much more—and to do so much more quickly. While our experience in New York City further illustrates the need for swifter progress, it has also taught us a hopeful lesson: that determined, place-based groups can make meaningful progress toward repairing our world, even when national consensus is lacking.

INTRODUCTION

Our New York City Story

New York City is a global pioneer in creating a more livable world. Its bold initiatives began with Mayor Michael Bloomberg's PlaNYC, followed by Mayor Bill de Blasio's OneNYC 2050, which promised to combine economic growth with progress toward a more equitable economy, resilience, and sustainability. In 2015, New York City became the world's first city to systematically align its sustainability goals with the UN SDGs.

The Invest NYC SDG Initiative is a small team of sustainability experts and experienced fundraisers based at the Center for Sustainable Business (CSB) at NYU Stern. Our founding leader is CSB Director Tensie Whelan, clinical professor for Business and Society, who works in partnership with Initiative Director Marianna Koval, a policy strategist and attorney.

"If we're going to scale up sustainability, we're going to need private-sector engagement. NYU Stern is uniquely positioned to act as a neutral convener between government and the private sector because we're not an NGO or an activist group, but we have credibility with business."

TENSIE WHELAN

Whelan and Koval have contributed their extensive networks in and beyond New York City. In her 15 years as president of the Rainforest Alliance, an international nonprofit organization dedicated to making businesses more environmentally responsible, Whelan transformed the organization into a globally recognized brand, increasing funding from $4.5 million to $50 million while recruiting 5,000 corporate partners in more than 60 countries. She holds a B.A. from New York University and an M.A. from American University, and has served as executive director of the New York League of Conservation Voters and vice president of the National Audubon Society. She was recognized by Ethisphere, a global watchdog of responsible business standards, as one of the 100 Most Influential People in Business Ethics.

Koval, who holds an A.B. from Princeton University, a J.D. from Fordham University Law School, and an M.P.A. from the John F. Kennedy School of Government at Harvard University, has more than 30 years of experience working in environmental sustainability, nonprofit leadership, public policy, and government in New York City. Prior to her work at NYU, she was a senior advisor to the Commissioner of NYC Department of Environmental Protection (DEP), creating green infrastructure policy and partnerships as part of a $2.4 billion stormwater-management program, and led the Brooklyn Bridge Park Conservancy for more than a decade, helping to attract $280 million in funding for the creation of this major city park.

On January 24, 2020, (L-R) Mayor Bill de Blasio, Tensie Whelan, Chief Climate Policy Advisor and OneNYC Director Dan Zarrilli, and Marianna Koval met at City Hall, where the mayor committed city support for the Invest NYC SDG Initiative.

Our Origins

Our initiative's roots date back to 2015, when UN member states ratified the 17 sustainable development goals (SDGs). This broad set of priorities—from ending hunger and mitigating climate change, to investing in health, education, and jobs—serves as a framework for progress toward greater global sustainability by 2030.

Also in 2015, NYC published a roadmap to sustainability, envisioning a dynamic and equitable local economy that would fight climate change while also increasing resilience to its impacts. The plan encompassed 24 smaller goals, from industry expansion and early childhood education, to an "80 x 50" plan that reduces the city's greenhouse gas emissions by 80% by 2050.

Invest NYC SDG's guiding vision has been to seek ventures that meet both the UN and NYC targets. In recent years, other U.S. universities have partnered with city governments on programs that incorporate the UN goals. In collaboration with the City of Houston, Rice University created the Houston Sustainability Indicators Project, which tracks and measures city progress on the SDGs, while the City of Los Angeles has engaged undergraduate and graduate students from local colleges and universities in SDG-focused research projects. Additionally, Arizona State University's Thunderbird School of Global Management has partnered with the City of Phoenix on the multi-stakeholder initiative Phoenix Global Rising, aimed at aligning Phoenix's economic development with the SDGs. Still, while these are all commendable efforts, none has developed projects to attract private investment while advancing both local and SDG goals.

Our Evolution

In 2017, Whelan saw an opportunity for CSB to help advance the SDGs in NYC by engaging corporate leaders who care deeply about sustainability in general and New York City in particular. She initially envisioned an initiative whose main objective would be to help attract private funds to existing businesses and projects that seek to advance the SDGs. As time went on, however, our role became more ambitious. We found that there were few existing projects that aligned with the SDGs, NYC goals, and private-sector interest—so in most cases we set out to create enterprises from scratch that could meet these three objectives.

We understood that city government needed private-sector resources to succeed in its pursuit of sustainability. We also knew that the private sector couldn't succeed alone, given the city's ownership and control of the sustainability plans and key infrastructure. Unfortunately, successful collaborations in New York City can be challenging. Often, government officials see the private sector as irredeemably profit-driven, while members of the private sector see government as impossibly slow and clumsy, bound up in needless rules.

Given the need for deep collaboration, CSB would have to be more than just an academic resource. By developing a process for identifying and vetting opportunities that businesses can scale with the support of city government, our project could help overcome inertia from both the private and public sector. We could create the space and support the conversation on the road to meaningful impact.

Marianna Koval moderating a panel on C-PACE financing at the NYU Stern C.H. Chen Institute for Global Real Estate Finance's InnovateESG 2023 conference on February 24, 2023.

Invest NYC SDG has greatly benefited from access to NYU's diverse academic universe. We've enlisted support and advice from experts throughout the university, including the schools of business, engineering, food studies, law, public health, public policy, and social work. Beyond these strengths and resources, however, we soon saw that our new venture required a wider skill set than many universities possess, including a rigorous focus on project deliverables and strategic implementation. We would need to be a convener, matchmaker, interpreter, and catalyst, strategically engaging with a broad range of partners and projects.

The Best-laid Plans

By chronicling our path, we hope to help community leaders in other cities have an easier time making progress in "localizing the SDGs." At the same time, we understand that New York City presents unique challenges and opportunities. Further complicating the narrative is the fact that we have pursued our initiative amid two national crises.

The COVID-19 pandemic landed dramatically in NYC, killing tens of thousands of people, and causing public transportation and the local economy to grind nearly to a halt. On March 7, 2020, New York Governor Andrew Cuomo declared a state of emergency, and shortly thereafter the city was in full lockdown. In a matter of weeks, unemployment jumped from 4.1% to 14.2%, while the number of food-insecure citizens nearly doubled to more than two million. As with 9/11 and Superstorm Sandy, COVID-19 offered a harsh reminder of our city's vulnerability.

Our team shifted to work from home and watched as our vibrant city entered a period of darkness. The streets, subway cars, and high-rise office buildings emptied. Our city-agency partners were reassigned to emergency roles. Zoom meetings were interrupted by the sirens of ambulances taking critically ill fellow New Yorkers to the hospital.

The pandemic gave us a deeper sense of urgency and further emphasized our need to innovate and reimagine public- and private-sector solutions for building resilient and sustainable societies and economies. It also changed our working style. While we originally planned to convene in-person, cross-sector working groups, we had to switch to online meetings of people who didn't know each other well. After that proved unsatisfactory, we moved forward with one-on-one and small-group meetings, which were more time-consuming but represented the best option under the circumstances.

Then, on May 25, 2020, Minneapolis police officers killed George Floyd, following other high-profile police killings, which galvanized global protests and calls for racial justice. Black Lives Matter protests underscored the systemic racism in the U.S. criminal justice system and beyond.

In the wake of the pandemic and Floyd's killing, we were inspired to address the challenges that the pandemic had brought into sharp relief and to work harder to include equity concerns in our projects. We incorporated these goals into The Equitable Commute Project, focusing on the transportation needs of lower-income workers, and the M.A.P. NYC and Rikers projects, which prioritize NYC's food security.

By June 2020, we revisited our original ambitions in view of our own capacity and the world's limited attention and changing priorities, and we decided to reduce the number of projects we hoped to launch. By then we had also changed our general direction, putting less emphasis on driving private investment directly into existing businesses or projects, and more on developing novel, impactful, investable projects to support NYC's equitable economic recovery. This change evolved from what we were learning in our research, which increasingly shifted our focus to how we might best overcome the barriers to achieving NYC's sustainability goals.

Although we initially conceived of our initiative as lasting two years, we have since extended it, and it is still ongoing at this writing. In the Roadmap, we provide more details on our process.

Our Funding

We are indebted to our corporate and philanthropic partners. Goldman Sachs and PepsiCo were our first two corporate signatories, followed by Sims Metal Management and Con Edison. Collectively, they have provided $650,000—enough to sustain the initiative for what we initially thought would be its two-year life.

Another catalytic partner was the New York Community Trust (NYCT), which joined our effort in June 2019 with a $150,000, two-year grant, renewed in 2021 for $100,000 and again in 2022 for $129,000, bringing the total commitment to $379,000.

Mother Cabrini Health Foundation (MCHF) has become our largest funder. A New York State philanthropy that sees food access as a "social determinant of health," it wants to address food insecurity in its grantmaking. The foundation awarded us $300,000 in December 2020, and in late summer of 2021 invited us to propose a special initiative for $2 million in support over two additional years. MCHF funded this proposal, allowing us to expand our food and health work to Upstate New York, with a focus on rural food insecurity—an exciting new avenue for the Invest NYC SDG team. We've partnered with Cornell University and, at this writing, are completing a landscape analysis to provide the basis for potential investable projects in food production and distribution that create long-term solutions to food insecurity. Most recently, in December 2022, we were awarded a $300,000 grant by the Foundation for Food & Agriculture Research (FFAR), supporting our work to map agricultural food production throughout NYC.

We continue to pursue funding that supports our core projects. But as a time-limited initiative, we also are seeking and securing new "parents" to carry on our work. We have found a home for our Property Assessed Clean Energy (PACE) project at the new C.H. Chen Institute for Global Real Estate Finance at NYU Stern. Ideally, our NYC food projects will be folded into

the new Mayor's Office of Urban Agriculture, with continued leadership by community-based organizations and businesses. Our Equitable Commute Project has been a collaboration among seven committed organizations; they can realize the project's goals through continued education and advocacy for New York State e-bike subsidy legislation, and the expansion of Spring Bank's innovative e-bike lending program for lower-income working New Yorkers.

We have demonstrated what a small group of committed experts can do by mobilizing the resources of a great university, a forward-thinking city government, and an increasingly conscientious private sector, and we feel confident that our efforts can be replicated and expanded to reach a critical mass of change.

Invest NYC SDG Initiative Leadership

Tensie Whelan, *Clinical Professor of Business and Society* and *Director*
NYU Stern Center for Sustainable Business

Marianna Koval, *Director*
Invest NYC SDG Initiative, NYU Stern Center for Sustainable Business

Wythe Marschall, *Senior Research Project Manager*
Invest NYC SDG Initiative, NYU Stern Center for Sustainable Business

Divya Subramanian, *Associate Director*
Invest NYC SDG Initiative, NYU Stern Center for Sustainable Business

Kendra Gibbs, *Assistant Director*
Invest NYC SDG Initiative, NYU Stern Center for Sustainable Business

Chet van Wert, *Senior Research Scholar*
NYU Stern Center for Sustainable Business

EXECUTIVES-IN-RESIDENCE

Kendall Christiansen
Paul Lipson

SCHOLAR-IN-RESIDENCE

Gary Friedland

The Roadmap

WHO IS THIS ROADMAP FOR?

As much as our initiative is NYC-focused, we believe our on-the-ground experience can hold meaningful lessons for activists seeking to duplicate our work in and outside the United States. We also hope our recommendations inform leaders of banks and private corporations as they plan their environmental, social, and governance (ESG) commitments. Most broadly, we seek to inspire and empower individuals and groups—including universities, nonprofits, and advocacy organizations—to join our hands-on approach to creating a more sustainable world. Global change begins at home.

Invest NYC SDG is the first and only city-based initiative to date aimed at catalyzing private-sector investment to make local progress on the UN SDGs. From the start, we have made it part of our mission to help others follow our path in "localizing the SDGs." Your circumstances may vary from ours, but by following our story, you may learn from our challenges and successes.

The following section combines an overview of best practices culled from our experience—the strategic *how-to's*—with a chronological account of how we've spent the past four years. You will find additional resources in the Toolkit and further guidance in the Appendices, which includes a glossary of financial terms.

SUSTAINABLE DEVELOPMENT GOALS

Invest NYC SDG supports the Sustainable Development Goals

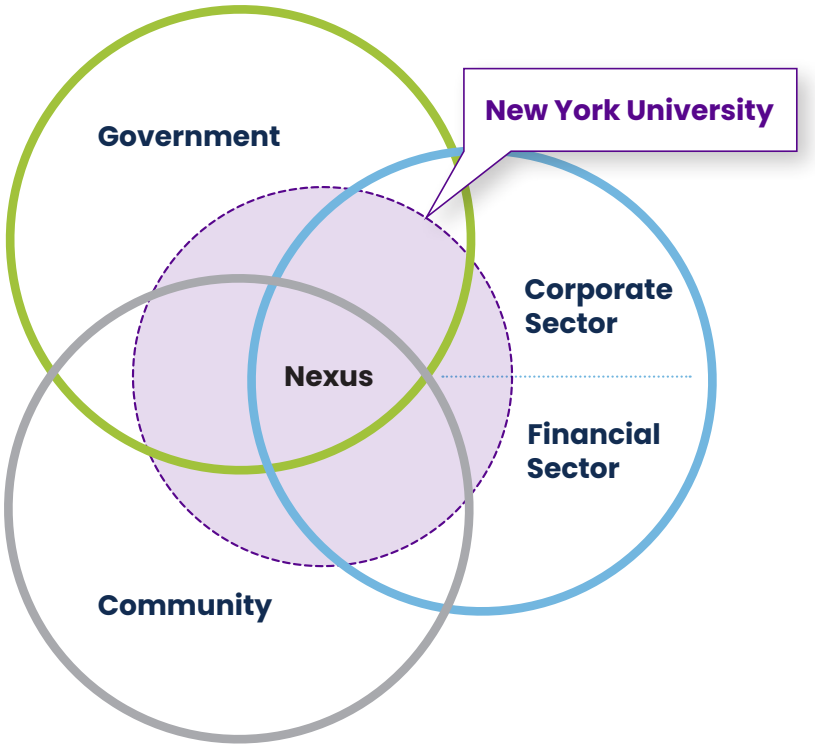
The How-tos

Step 1. Begin with Goals and Governance

Clarify your mission

Even as our strategies and tactics changed, we kept our eyes on our North Star: *to advance the global SDGs in concert with NYC's sustainability objectives by catalyzing projects that can attract private investment*. It has been helpful for our team to put this mission statement into words and refer to it often.

In Koval's first week at NYU, she stood at a whiteboard and drew a version of the Venn diagram below to help our team visualize this role. The diagram illustrated the sweet spot: the overlap between government goals, private-sector motivation, and community support. This is where we have sought opportunities, informed by the core values of the SDGs—equity and social justice.



Creating a Venn diagram helped us narrow our focus.

Appreciate the tensions

Initially, we failed to appreciate fully the fundamental tensions in seeking projects that advance equity and social justice while also attracting private investment. The main and most obvious obstacle, which we describe in greater detail below, is that most private investors don't finance social goals. They invest to make a profit, and most seek to gain that profit as quickly, easily, and safely as possible. Of course, this wasn't a huge surprise to us. Yet we were still disappointed to find that while some investors may be willing to support early, unproven project development, particularly involving new technologies, most will avoid ventures that lack fully scaled-up business models, leadership, customers, and revenue streams.

Establish a multi-sector advisory body

For governance, you'll need a well-connected steering committee that includes members with diverse expertise and networks. This group's main purpose is to provide strategic guidance, make connections, and lend funding support.

We recommend that you recruit a wide variety of committed stakeholders, including representatives of the private sector, government agencies, NGOs, and community-based organizations. Ideally, you'll include at least one industry representative from each focus area that you plan to pursue.

We began our search for steering committee members among our funding sponsors, after which we turned to the Mayor's Office and the NYC Economic Development Corporation (NYCEDC). We found that it was important to get the initiative in front of many people and discover who had the passion, knowledge, and network to help drive it forward.

Sims Metal Management became an advantageous partner for several reasons. The firm is a major player in NYC's curbside recycling system, which fits with our focus on waste. Tom Outerbridge, our primary contact (and later a member of our steering committee), was the manager of Sims' NYC material-recovery facilities. Not only did his vast industry knowledge and experience help us understand his field, but he also introduced us to Urban Mining Industries (UMI), which led to our collaboration with UMI in one of our five center-stage projects.

As you choose corporate partners, seek organizations whose operations are affected by at least one of your areas of focus and that are already engaged in sustainability work. An organization that has publicly committed to sustainability targets will likely be more willing to join your steering committee and perhaps even provide funding. Investing in your projects may help them demonstrate to their customers, investors, and employees that they are following through on their sustainability commitments. Look for senior corporate officers, to add clout, experience, and connections, but avoid the most senior ranks, where people may be well-intentioned but lack the time to engage meaningfully.

We suggest that you take similar care in **choosing a local government representative**. "Take time to figure out who has the most desirable expertise," says Koval. "One of the first places to look is among the sustainability teams embedded in mayors' offices in most mid-sized and large cities; they can be powerful networkers for you throughout the rest of the local government." Also, check out city agencies that are focused on economic development as their goals are likely to align with your own.

When recruiting **community representatives** for your steering committee, make sure to evaluate which community-based organizations are most effective in their field and have demonstrated a capacity to work in coalitions, preferably with government agencies and business representatives. Unfortunately, we have not yet succeeded in engaging a community-based organization representative to join our steering committee.

In our rush to get up and running, we assembled our steering committee with corporate funders, government representatives, and business and academic experts. We had less success with environmental justice organizations, perhaps partly because of our base in a business school. There's a widespread and often justified perception that business interests are too often at the root of environmental injustice. An additional hurdle is that community-based organizations often operate with limited budgets to tackle overwhelming missions, limiting their capacity to work beyond their own agendas.

In a similar vein, we regret not including more diverse board members. Our lack of sufficient attention to this issue may have hindered our later efforts to work with community groups.

In retrospect, we should have spent more time identifying and joining major projects aligned with our goals that were already being advanced by community-based organizations. Such collaborations could have created potential advisory board relationships.

Make the most of your new advisory board

Deploy your steering committee's potential by scheduling regular meetings for direction and feedback. Invest time in nurturing one-to-one relationships and consider embedding committee members in your project teams. This is another area in which we might have done better, but building personal relationships was particularly difficult during the pandemic when we were unable to meet face to face.

Put *everything* in writing

From the moment you start to work, create a comprehensive database, documenting your research progress and regularly framing your efforts in writing. As soon as you're able to envision your broad goals, prepare an **elevator pitch**—a clear and engaging description that can be expressed in the time it takes to travel one or two floors—and make sure your team members are familiar and agree with it. Having a concise explanation of your project handy—just a paragraph or two—is essential for networking, making it easier to follow up with potential funders and advisors, and the people willing to help steer you to them. "Your pitch will evolve over time but having something ready will make your life so much easier!" says Koval.

Ensure that you have a centralized approach for documenting your research progress. NYU uses Google software systems, including Google Drive, which worked well for us.

It's also worthwhile to maintain a file of meeting and call notes. Over time, you will take part in hundreds, if not thousands, of calls and meetings. Much useful information could be lost if not maintained in digital, searchable files. These will also help you stay current on follow-ups, introductions, and new research ideas.

As your projects develop, you will want to develop more sophisticated written products, including **pitch decks**—presentations that give potential funders or clients a quick summary of your business plan—and possibly a **business model canvas**, a more sophisticated visual aid that can capture various aspects of your efforts, giving potential investors or clients an overview of the various components of your business plan.

Step 2. Forge Key Connections and Secure Sufficient Human and Financial Resources

Choose your home

A project like ours could exist in a variety of settings.

As we've noted, Invest NYC SDG is based at a business school within a large urban research university, NYU. That platform came with many advantages and opportunities. NYU's reputation helped us gain people's interest and support. We could also tap the strengths of faculty and students across multiple disciplines at a low overall cost, employing graduate and undergraduate students as research assistants in return for a tuition subsidy or even course credit. As we soon and happily discovered, NYU faculty and students across a range of schools and disciplines were deeply interested in NYC's sustainability. We developed productive collaborations with NYU faculty from the departments of Urban Studies, and Nutrition and Food Studies, as well as the Tandon School of Engineering and the Wagner Graduate School of Public Service, which helped us deploy a much broader base of experts and knowledge than we could have if our work were limited to the Business School's resources. We also worked with the professor of a course on Social Impact Consulting who helped by assigning students projects related to our work.

As we built our partnerships and coalitions, we benefited from the university's support, logistical and otherwise, including a convenient and free setting for meetings, administrative help, and the ability to provide an "Executive in Residence" title to two experts whose insights were important to the initiative. Together with all of these benefits came some liabilities, however, including a mild culture clash. Our work was not an academic project; it required a rigorous and practical focus on project deliverables, business planning, and real-world strategic implementation. A white paper would not suffice.

Furthermore, while we were grateful for our student support, it was not completely reliable or continuous since students were continually moving on to other coursework or graduating. And students needed more management than professional consultants, which required a greater investment of time.

Select your staff

We relied on a combination of paid staff, paid consultants, pro bono advisors (including NYU faculty), and students. Generally, we recommend that you anticipate how much in-house expertise you already have and what breadth of external contacts you will need. Begin planning early to secure your financial and human resources. To the extent that you're able, select your staff carefully, seeking backgrounds and skills that include government, business, and fundraising experience, as well as strategic thinkers and good writers who can synthesize a lot of information. Ideally you will have at least one paid staff member with strong financial expertise, to help navigate funding sources, and interpret and communicate investment specifics.

We also suggest that you hire a chief researcher and two supporting researchers—either graduate or undergraduate student interns, if possible—for each focus area to be investigated. Given our six focus areas, we should have employed six chief researchers for the life of the project and two student research assistants per focus area. This was obviously another indication that we should have limited our initial focus areas.

We ended up with an initiative director, associate director, assistant director, senior food and health researcher (who also served as the New York City food and health project manager), New York State food and health project manager, part-time finance research scholar, more than 65 graduate and undergraduate student research assistants, and a half dozen as-needed consultants. As time went by, we filled some necessary positions after we had secured new funding. For example, as our work on food systems and health developed a higher profile during the initial year of the COVID-19 pandemic, we received additional grants to further this mission, allowing us to hire a full-time urban agriculture expert.

Once you've established your team, create an organizational chart and onboarding training process. We found it helpful to schedule weekly team and project check-in meetings, balancing the need for regular connection against the problem of overscheduling.

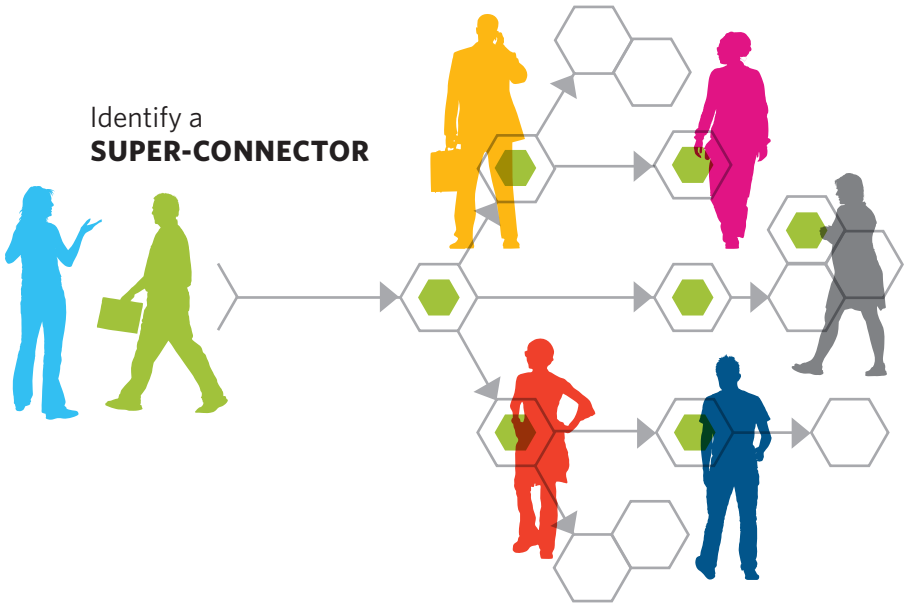
Find—and appreciate—your financial sponsors

We strongly recommend that you develop expertise in the landscape of available finance before you start fundraising. The possibilities are many: foundations, corporations, individual donors, and government agencies. Our initiative's initial funds came mostly from corporations with which the CSB director had a prior relationship and whose representatives we invited to join our steering committee. These funders supported our launch as part of their broad public commitments to sustainability. Goldman Sachs was specifically interested in whether we could develop a pipeline of projects for its investment.

Once you've gotten those commitments, don't neglect to recognize your funders with press releases, kudos on your website, and in any other way that makes sense. Keep funders engaged with regular communications on progress. Seek their advice continuously.

Find your Yodas

The earliest stages of research into your focus areas may seem like drinking from a fire hose. Set a goal of identifying one or two major experts in each field who would be willing to debrief you. These guides can also serve as "super-connectors," introducing you to other key players in their field. Try to tap the expertise of people who have already led successful development projects involving multi-sector partnerships. You may find them in businesses, government agencies, policy-oriented nonprofits, and industry associations. Schedule a coffee or lunch (your treat!) and listen.



Early in our research on the built environment, for example, we had a long meeting over coffee with Susan Leeds, the founder of NYCEEC, NYC's green bank. She was tremendously knowledgeable and, just as important, willing to share her knowledge, patiently explaining the barriers to green lending for energy efficiency, reeling off the list of critical stakeholders, and making introductions.

Create strong ties with local government

Some of your most essential relationships will be with government officials, given that local agencies—whether county-, municipal-, or state-level—control local policies and infrastructure. If your city has a sustainability plan, familiarize yourself with it as early as possible. It may not be identified as such, but there is likely some plan with goals across different municipal areas. Absent a city-wide plan, look at individual agency plans. Make sure you have at least a broad idea of pertinent laws before you take your next step, which is to identify and reach out to the government agency or agencies related to your projects, including sustainability officers. Find the most relevant and interested non-partisan, high-level civil servants, who often know more about policy than their bosses, and arrange to meet with them on a regular basis. While it's also helpful to have high-level support, from mayors and agency leaders, the relationships you forge with those further down the ladder will provide continuity as mayors come and go.

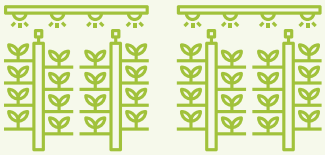
We also found it fruitful to create partnerships with economic development agencies. In NYC, those included the NYCEDC, and statewide, the Empire State Development Corporation (NYS ESD) and the New York Energy Research and Development Authority (NYSERDA).

When working with any government entities, it's helpful to understand and weigh political priorities before selecting projects. You should also be aware of how rapidly political support can shift when newly elected leaders arrive with new priorities.

Confront the obstacles to private-sector investment

Private investors are essential to your work. Without them, your projects will never be self-sustaining. Still, they aren't immediate partners. As we quickly learned, less-mature, untested projects generally need more patient and less risk-averse funders—usually part of a category known as "catalytic capital" that comes from philanthropies, green banks, and "impact investors." These funders are willing to forego some profits in return for a project's socially desirable outcomes. Were we to start over, we would make more of an early effort to recruit "impact investors" to our steering committee.

Even before the pandemic, one million NYC residents were considered "food-insecure," meaning they lacked reliable access to affordable and healthy food. COVID-19 reportedly doubled that number. In their interests, we looked for ways to deploy indoor farming to grow nutritious produce that would be sold at affordable prices.



95% less water
used in indoor farming as compared to traditional farms

300x
the potential productivity of indoor farms as compared to traditional farms

We were encouraged to learn that huge amounts of greens—more than 300 times the productivity of traditional farms, using 95% less water and no pesticides—can be grown indoors, year-round, in large warehouse-like facilities. This can help make local food supplies more resilient, support greater food security, and create good-paying jobs. Investment capital is pouring into the indoor-farming industry, which is projected to grow to more than $20 billion by 2029. But private investors, including Goldman Sachs, prefer to finance companies that produce the most profitable indoor crops: largely microgreens and baby greens sold for high prices by high-end grocers such as Whole Foods. At this stage, growing other healthy crops indoors at affordable prices requires government support. Government agencies can bring down the costs of land and energy, which are the greatest expenses for indoor farmers, thus increasing total revenue. Via a public-private partnership, government agencies can provide city-owned land and energy at low or no cost, thus creating an investable project while also expanding food access and creating employment. See our description of the **Rikers Island Indoor Farm** project for more details.

Step 3. Prepare for Coalition-building

Investigate mutual interests and find alignment

Start by stepping back and looking for mutual interests as you align your values and goals with those of prospective partners.

Our Venn diagram shows that there can be overlap between government goals, private-sector interests, and community support, but it is more complicated than it may first appear. Evaluate your potential partners—and anticipate some conflicts.

Align with community-based stakeholders

Community groups are usually essential collaborators. But community-based organizations and environmental justice groups in the U.S., for example, aren't interested in "top-down solutions." They want communities to develop solutions that meet communities' needs, rather than be engaged to provide support for outsiders' goals. Look for projects that have already been initiated within a community.

Be entrepreneurial—consider developing your own projects

We began the initiative thinking that our role was to serve as a matchmaker between existing projects and investors. But as we studied NYC's sustainability goals and the barriers to achieving them, we saw opportunities to create projects with partners—becoming more of a midwife instead.

As we researched the landscape of sustainable mobility, we learned that while NYC arguably has the best public transportation system in the U.S., more than a quarter of a million of its residents, largely from lower-income communities, face long and arduous commutes.

When the pandemic crippled public transportation, the city's transportation inequities grew more stark. Affluent New Yorkers were able to work from home, buy their own car, or Uber to work, while lower-income, frontline workers waited through long delays on subway platforms and at bus stops. Early in the pandemic, NYC and other cities launched bike libraries and giveaway programs. Cycling, bike sales, and particularly e-bike use dramatically increased throughout the world. All of this inspired us to create transportation options involving e-bikes for lower-income New Yorkers. The greatest barrier was cost, but other hurdles included fears about potential accidents and widespread unfamiliarity with e-bikes. Working with several partner organizations, we created a comprehensive program featuring e-bike subsidies and loans, workforce training, education, and coalition-building to support safe cycling infrastructure.

Develop your midwifery skills

With each new project, it's essential to:

1. Identify the most important stakeholders
2. Consider the capacity of possible partners, be they organizations, businesses, or individuals
3. Be flexible and make course-corrections when needed

Appreciate the challenge of midwifery and coalition-building

As you work to develop cross-sector projects, it's important to understand the complexity of your task. No current mechanism or entity provides a model or platform. Your work will largely be ad hoc. Furthermore, as you consider how to engage local government, recognize that it is not a monolithic entity but rather one that consists of executive leadership and multiple agencies, all with different goals, leadership, and histories. The same is certainly true for philanthropic organizations and the private sector, whether you're dealing with corporations or financial institutions.

Transportation Alternatives and Barretto Bay Strategies at The POINT's 2022 Town Hall on May 7, 2022.

Support your partners

As a catalyst and coalition-builder, it's likely that you will need to build the capacity of your partners. Throughout our initiative, we nurtured various members of our coalitions, formally and informally—such as helping to write grants for Transportation Alternatives, one of our partners in The Equitable Commute Project. For a different project, we supported Urban Mining Industries by using our NYU platform to set up meetings with the NYCEDC and media to promote glass pozzolan.

Set reasonable expectations

Although we initially conceived of our initiative as lasting two years, we soon realized that we needed more time. In retrospect, we now understand that we had been too ambitious in seeking projects from six areas of focus (the built environment, climate resilience, food and health, renewable energy, sustainable mobility, and waste). Considering our limited budget and two-year timeline, we might have fared better by choosing only three areas at most.

Narrowing the breadth of our initial research would have saved us time and money, and clarified our mission.

We were surprised—and you may be, too—to learn how much time it takes to do the research and analysis required to choose investable projects with confidence. From our experience, it takes at least six months to establish your team, define your governance model, and identify a list of focus areas and potential project ideas. At the 12-month mark, it still felt as if we had only just launched.

Make sure that you allow time for at least a few false starts and rabbit holes. We've had more than a few, including an ultimately fruitless pursuit of a venture to switch NYC's major museums to geothermal energy, and a plan for attracting private investment to install solar panels on rooftops of city-owned buildings. Both efforts fell victim to unexpected logistical snafus, and while each could still have a promising future, they became lower priorities than our five center-stage projects.

You can't avoid all false starts, but you can limit them by narrowing your focus as early and as much as you can. Specialize in fewer things so you can get truly familiar with your turf.

Relatedly, resist temptations to reinvent the wheel. Your own local government may be more or less rigorous about sustainability planning, giving you more or less upon which to build. Begin your work by becoming thoroughly aware of what is already being done!

Step 4. Periodically Review Your Strategic Focus and Criteria

Initially, we assumed we were looking only for *investable* projects, and thus were tempted to focus on projects that already had many of the pieces in place, used a proven business model, and had a clear path to profitability. Yet often these projects didn't really need our support or faced obstacles that we were no better equipped than their owners to manage. As we researched opportunities to advance decarbonization in buildings, for example, we talked with startups that ranged from a company that provided blockchain technology to support energy efficiency, to a firm that reduced energy consumption in steam-heated buildings by using a radiator enclosure to prevent overheating and waste. Ultimately, however, we decided that neither start-up required our support to attract more investment. Less-developed and more challenging projects were in greater need of the sponsorship, critical thinking, and multi-sector connections we could bring.

Work toward various kinds of impact

"Not everything that matters can be measured" is a quip often ascribed to Albert Einstein. From the day you begin your sustainability work, you will no doubt have many important but immeasurable positive impacts.

We learned to seize diverse opportunities that came our way to further our goals. For example, we found that we could have a powerful impact by designing private-sector intervention to catalyze investment. This was the case with our PACE project, which supports finance mechanisms to fund decarbonization in NYC buildings by working to remove a significant barrier to loans for energy retrofits and efficiency.

Be evangelists

One of the few benefits of the pandemic has been the expansion of webinars and other online meetings to share information, advocate on issues, and build connections globally—to join, lead, and share.

Seizing on every possible opportunity to spread the word, we became evangelists for the SDGs, sustainability goals, and our projects, participating in and convening webinars and other online meetings on related topics, in collaboration with influential groups including the World Economic Forum, the National Academy of Sciences, and the Brookings Institution.

Cast a wide net

As we began considering potential projects, we noticed patterns that were suggestive of larger themes. For example, several potential projects involved waterways in and around the city. With this in mind, we identified an opportunity to deliver freight by electric-powered barges rather than trucks from nearby airports and seaports—which led to other, related possibilities. Waterfront projects supporting offshore wind-energy projects relied extensively on maritime transportation. A glass-recycling operation could use barges to move heavy glass waste and intermediate recycled materials around New York Harbor and nearby waterways. An organic waste project we envisioned might also use e-barges. As we noticed that this maritime theme kept recurring in our research, we learned that New York City, which spans three islands and the southern tip of NY State's mainland, has 520 miles of coastline—more than Boston, Miami, Los Angeles, and San Francisco combined. We could see a future in which New York looks to the sea again, as it did in the past. We also realized that projects could develop in clusters, creating demand and supply of appropriate technologies, such as electric-powered barges.

Rigorously pare down your list of projects

After 12 months, we found ourselves with 35 potential projects, a much longer list than we could reasonably attempt to launch. We needed to narrow it down—a lot—so we established a set of criteria to prioritize them.

Each potential venture was evaluated according to the following concerns:

1. **TIMING:** Can the project become self-sustaining within a few years?

   We determined early on that we didn't want our projects to depend on philanthropic or government support for more than five years.

2. **BUY-IN:** Can you identify a primary commercial partner or client that is ready to play a central role? If regulatory or government support is needed, are the relevant agencies and civil leaders interested in supporting the project?

3. **IMPACT:** Can the project deliver significant impact in your city, county, or state, and can it catalyze subsequent investment in the sector? Can the project eventually be scaled up and replicated beyond your city?

4. **BARRIERS:** Are there any formidable challenges standing in the way of implementation?

   Be aware of the political calendar and potential changes in local leadership that may affect your project.

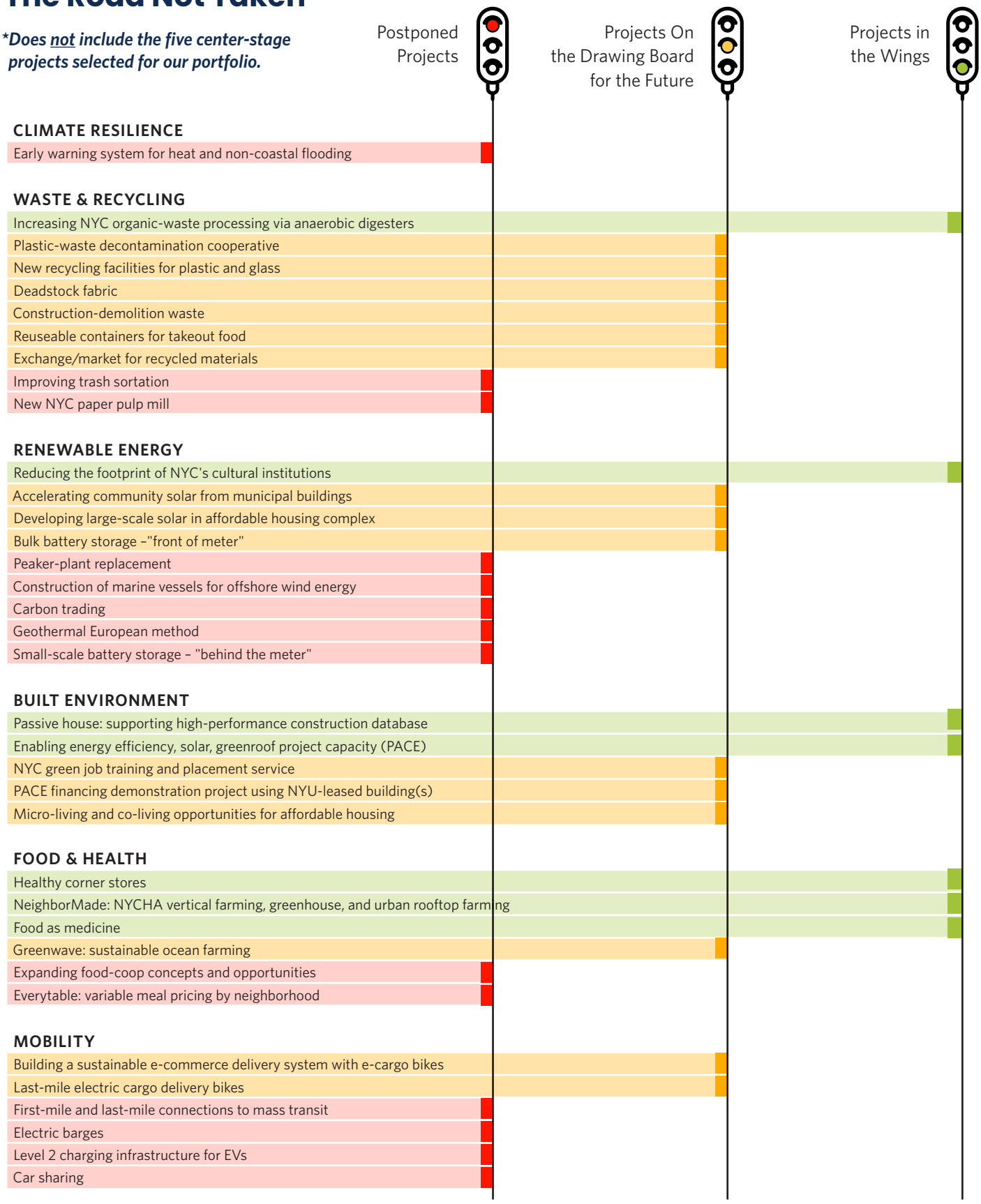
5. **METRICS:** How easily can you quantify a given project's potential impact?

As we compiled our list, we initially tried with each project to identify metrics such as cost, potential jobs, and reduced greenhouse gas emissions. But as we ultimately realized, it would be the unique combinations of these metrics that would help attract investment.

The perspectives of our stakeholders and partners were essential. We often prioritized projects by a simple standard: Which ones had the most support? While the projects that we eventually moved to our backburner might be excellent candidates for future investment, we could see that our partners weren't going to adopt them within our time frame. Several of these potential projects are described in Appendices C and D.

The Road Not Taken

Does not include the five center-stage projects selected for our portfolio.



A Brief Chronology

Our work wasn't as linear as the following pages might suggest. We were learning, making connections, researching, setting goals, and changing directions opportunistically throughout the process. That said, our initiative could be broken down into four stages: (I) goal-setting and setup, (II) discovery, research, and outreach, (III) analysis and project selection, and (IV) implementation.

STAGE I

Goal-setting and Setup

After launching our effort in April 2019, we spent six months under the leadership of sustainability consultant Chris Walker, assembling our core team and steering committee, engaging local government stakeholders and nonprofit experts, and recruiting student researchers. It was during this time that we also decided to focus on six SDG-related areas: the built environment, climate resilience, food and health, renewable energy, sustainable mobility, and waste. Walker also secured one of our first major funding commitments, from Sims.

STAGE II

Discovery, Research, and Outreach

After students returned to campus in September 2019, and Marianna Koval took over as project lead, we began deep research into our chosen focus areas—analyzing our findings and consulting with our advisors.

STAGE III

Analysis and Project Selection

Ideas for 35 projects emerged from student research and stakeholder outreach in our focus areas. We subsequently prioritized the projects according to our evaluation of each one against a set of criteria we developed, supplemented by feedback from stakeholders.

STAGE IV

Implementation

By May 2021, we had whittled down our initial list of projects to 11, with five that we now consider center-stage and six that we refer to as "backstage."

Below you'll find a more detailed chronology of our process, which we hope will be a useful guide for your own journey. Just keep in mind that your local needs, partners, and resources will surely differ in some respects from our own.

Stage I. Goal-setting and Setup

We clarified our mission

Long before our initiative launched, Whelan's vision and initial outreach helped form our future vision: we would work to support NYC in achieving its sustainability goals, derived from the SDGs, through projects capable of attracting private-sector support.

We hired staff

From April to September 2019, under Chris Walker's leadership, we assembled our early team of two full-time people, supported by a small team of student research assistants.

We recruited a steering committee

We formed a 12-member committee with a balance of representatives from finance, industry, academia, nonprofits, and city government, as you can see in the chart below:

NAME	TITLE*	ORGANIZATION
Lindsay Clinton	*Executive Vice President*	NYCEDC
Lara Croushore	*Chief of Staff*	NYC Office of Climate Policy and Programs
Sander Dolder	*SVP, Industry and Economic Innovation*	NYCEDC
Miles Draycott	*Former Chief Risk Officer*	NYC Retirement Systems
Jeff Gitterman	*Co-Founder*	Gitterman Wealth Management
Will Kennedy	*Senior Program Officer*	United Nations Fund for International Partnerships
Micah Kotch	*Managing Director*	URBAN-X
Nilda Mesa	*Director, Urban Sustainability and Equity Planning*	Columbia University, Center for Sustainable Urban Development
Tom Outerbridge	*President, Sims Municipal Recycling*	Sims Metal Management
Frances Resheske	*SVP, Corporate Affairs*	Con Edison
Aniket Shah	*Managing Director and Global Head of ESG and Sustainability Strategy*	Jefferies Financial Group
John Williams	*Chairman and CEO*	Impact Infrastructure

**Titles and organizational affiliations reflect committee members' positions at the beginning of our collaboration.*

We studied the landscape

As with any important project, we began by doing initial research to make sure we understood the relevant city landscape: the economics, stakeholders, opportunities, and challenges across sectors of the sustainable economy.

This meant getting to know the pertinent city plans and laws, which in New York City included *OneNYC 2050*, the *One City: Built to Last* sustainable development plan, and *PlaNYC 2030*. We were particularly inspired by the city's Climate Mobilization Act, enacted just as our initiative launched in the spring of 2019, and embodying some of the world's most ambitious legislative efforts to address climate change.

This process led to our selection of six general SDG-related focus areas to begin our brainstorming about projects, as illustrated in this chart:

ECOSYSTEM	Built Environment	Climate Resilience	Food & Health	Renewable Energy	Sustainable Mobility	Waste
PROJECTS	Energy efficiency, smart buildings, clean-energy projects	Adapting public infrastructure and private real estate to withstand predicted impacts of climate change	Food waste, food deserts, food insecurity, food transport, urban farming	Wind, solar, geothermal, identifying renewable-energy buyers	Public transportation, electric/hybrid vehicles, fuel efficiency, congestion management	"Circular solutions" with improved recycling systems for plastics, glass, metals, paper, food waste, wastewater
SDGs						

We networked

Once again, we were unusually fortunate. In CSB Director Whelan's previous decades of work, she had built an extensive network of private-sector contacts. In 2018, the year before Invest NYC SDG was launched, she began talking to them to secure strong, supportive partnerships. Goldman Sachs, PepsiCo, Sims Metal Management, Con Edison, and The New York Community Trust provided the funding that enabled us to launch and support our program for the next three years.

Nor did it hurt that both Whelan and Koval had previously worked with Mayor de Blasio, who was quick to lend his support.

That said, top-level leaders can only help so much. After securing the mayor's buy-in and establishing our main point of contact as Daniel Zarrilli, OneNYC director, and his chief of staff, Lara Croushore, we planned peer-to-peer sessions with government policymakers and regulators. We hoped to spark conversations around our focus areas and discover what stakeholders in the city administration saw as the chief opportunities for private-sector support. We then planned to share what we learned with the corporate and finance communities, in an effort to bring the sectors together around potential financing initiatives.

Our networking efforts helped us identify potential partners from New York City government agencies, corporations, finance institutions, and key community and environmental organizations. This process began at the initiative's onset and has continued throughout.

Mayor Eric Adams leading indoor urban agriculture initiatives as Brooklyn Borough President.

Stage II. Discovery, Research, and Outreach

We narrowed our focus

Starting in September 2019, after Koval took over as director, our student researchers conducted a semester-long sprint to complete an analysis of NYC's sustainability ecosystem and provide some initial suggestions for projects across our six focus areas. (See the Toolkit for a research guide and template.)

We retained a community- and government-relations consultant, Ibrahim Abdul-Matin, who had served as director of community affairs at NYC DEP and led citywide outreach for OneNYC 2050. He had also been a policy advisor in the Bloomberg administration, where he led all aspects of community relations, and citywide outreach and engagement regarding PlaNYC. Abdul-Matin became an invaluable guide to NYC's well-organized community-based environmental justice organizations and coalitions, including the NYC Environmental Justice Alliance, WE ACT for Environmental Justice, UPROSE, and The Point Community Development Corporation.

We initially identified sustainability projects being advanced by NYC's environmental justice community that were aligned with city goals and that could be advanced with private investment. As an example, we found UPROSE's groundbreaking work to create the first cooperatively owned community solar project at the Brooklyn Army Terminal, a city-owned industrial park. This UPROSE project was well on its way, but it inspired our efforts to generate community solar power at Rochdale Village, a 120-acre affordable cooperative-housing complex in Queens, and attract private investments to put solar installations on NYC municipal buildings and generate community solar to provide low-cost electricity to lower-income New Yorkers. Rochdale Village's co-op board and management company did not move forward with a proposal from the mission-based solar company that we brought to the table. But, through the process, Rochdale learned that it was ripe to host community solar, and as of mid-2022 the co-op is exploring the opportunity. Our efforts to catalyze community solar on municipal buildings have been slowed by the mayoral transition and shifting city policy priorities.

We investigated innovative finance mechanisms

We spent eight months investigating potential investors and the finance mechanisms that could be deployed in each of our six focus areas. We commissioned sustainable finance expert Professor Cary Krosinsky and student researcher Ella Warshauer, who were supported by three Brown University research assistants, to examine models for financing New York City's sustainability goals and produce a white paper detailing those mechanisms. The paper included several case studies of successful projects elsewhere in the United States that were focused on sustainability and that had secured innovative financing.

Note: See the Toolkit for a more detailed description of how we approached our research.

Stage III. Analysis and Project Selection

By April 2020, we had assembled a list of more than 35 possible projects, but we knew we needed to slim it down to no more than a dozen that we might realistically lead toward implementation. By then we were also beginning to understand that the pandemic's impact on NYC would be profound, and that engaging government, community organizations, and the private sector would require our projects to explicitly address economic recovery and racial justice.

At that point we knew we needed more time for research. Fortunately, our increasing focus on food security led to additional funding to extend the initiative, first for an additional year, and then for another two years.

Stage IV. Implementation

We have dedicated what we anticipate will be the final year of our larger initiative to helping set up our identified projects for continued success by September 2023.

We prepared projects for investment

We worked to transform each of our five center-stage projects into pilots, completing pitch decks, financial pro formas, and partnerships. Creating these blueprints and partnerships required extensive engagement with a diverse range of stakeholders.

At this point we also prepared proposals for grants from government agencies and foundations, in consultation with sector contacts that we had taken care to establish and develop.

We began to find new homes for our projects and new parents to carry them forward

Given that Invest NYC SDG is a time-limited endeavor, with the mission of catalyzing change rather than long-term maintenance of businesses, part of our mission has always been to set up our projects for success after we close our doors. Along these lines, we've made the following progress:

The newly created C.H. Chen Institute for Global Real Estate Finance at NYU Stern, which studies the impact of climate change on real estate markets with a special focus on green finance, joined our efforts as a new home for the **Decarbonizing NYC's Built Environment** project.

At this writing, we are supporting negotiations with the NYCEDC about the financing and development of a new NYC site for the **Supporting Low-carbon Concrete** project. Urban Mining Industries and a sustainable investment fund may soon reach an agreement to build a facility to process previously unrecyclable glass waste into a pozzolan, for use as a concrete component.

We have shared our **M.A.P. NYC** data tool with the new Mayor's Office of Urban Agriculture and, thanks to recent additional funding from FFAR, we will partner to support its efforts to create a more resilient urban food-production system in NYC.

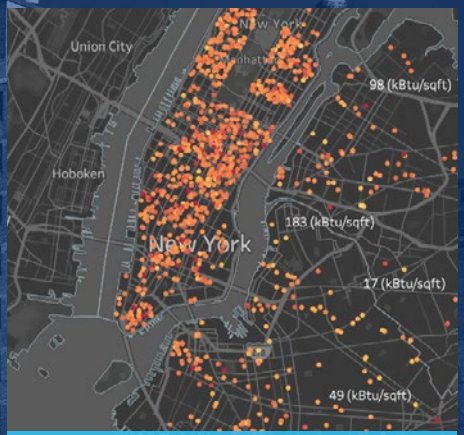
We're continuing to seek federal and state subsidies for **The Equitable Commute Project (ECP)**, while also supporting Spring Bank's expansion of its low-cost loan program for e-bike ownership; workforce development and training led by The HOPE Program; and research and advocacy to build demand for micromobility in and outside NYC.

Thanks to funding support for our food and health work through June 2024, we continue to disseminate our proposal for a **Rikers Island Indoor Farm**, getting feedback from key stakeholders and building a larger constituency among city leaders and community groups.

The NYC SDG Portfolio

Invest NYC SDG currently supports 11 projects, each of which is designed to make progress towards a combination of four or more of the UN SDGs while also meeting NYC's goals. We consider five of these projects, described below, as center-stage, because they have the most potential to take off without our further stewardship. The remaining six are detailed in the Appendices. Note the icons beside each project title to see which UN and NYC goals are being pursued.

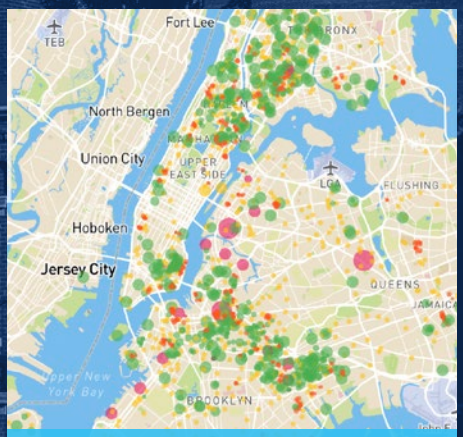
The Equitable Commute Project



Decarbonizing NYC's Built Environment

Supporting Low-carbon Concrete

Rikers Island Indoor Farm



M.A.P. NYC

The Equitable Commute Project (ECP)

THE GOAL

Increase e-bike ownership among lower-income commuters in New York City.

SDG TARGETS:

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

NYC GOALS:

- Workforce Development
- Industry Expansion & Cultivation
- Infrastructure Planning
- Thriving Neighborhoods
- Transportation
- Neighborhoods
- Healthy Neighborhoods, Active Living
- 80 x 50

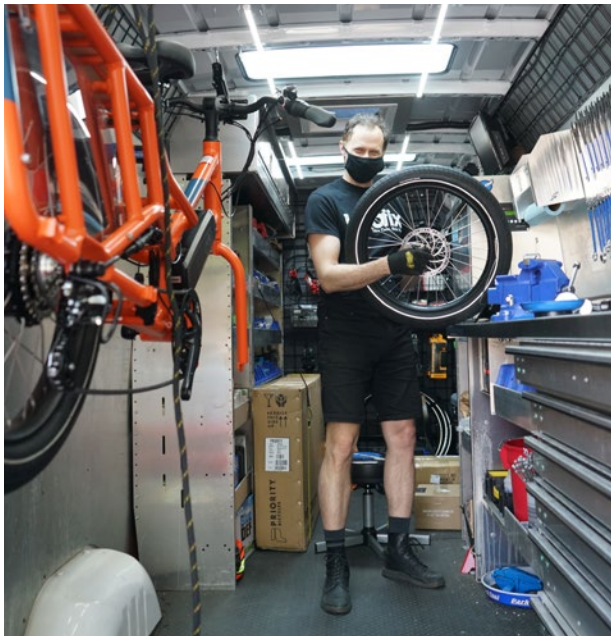
The Problem

Many of NYC's lower-wage workers endure long, complex, and unreliable commutes. One million New Yorkers travel more than an hour to their jobs and back, with more than nine out of 10 in this group earning less than $75,000 per year. Long commutes aren't just exhausting and frustrating; they also hinder economic prospects. Researchers have found that time spent commuting is the single most important factor in the odds of escaping poverty. Other societal costs include greenhouse gas emissions and traffic congestion caused by automobiles that could be replaced by bikes.

The Equitable Commute Project at the Hunts Point Spring Mingle, an annual public event hosted by Greater Hunts Point Economic Development Corporation, on May 20, 2022.

The Opportunity

E-bikes are well-suited for trips of less than ten miles—i.e., the vast majority of U.S. commutes, and often the "last mile" between homes and public transportation. Yet while e-bike commuting is booming in Europe and Asia, it hasn't been widely adopted in NYC, where only about 1% of residents use bikes of any kind to get to work. A major obstacle for lower-income New Yorkers is the cost of a good-quality e-bike, which can range from $1,200 to $3,000. A well-run program that provides subsidies or low-cost loans could lower that hurdle.



Velofix mobile bike shop assembling a Rad Power RadWagon e-cargo bike purchased by the ECP for a frontline/ essential worker from BronxWorks as a test pilot, on May 21, 2021.

Our Project

The Equitable Commute Project is a multi-year program designed to offer subsidies and low-interest microloans for the purchase of e-bikes to 3,000–5,000 lower-income workers living in the Bronx and Brooklyn. The loans are available to people with limited credit history—i.e., no credit score would be required. Other project goals include promoting e-bike best practices through a safety curriculum and rider training; spurring innovative, long-term infrastructure changes, such as protected bike lanes, through data collection and analysis; and creating up to 200 jobs in the e-bike industry through workforce training and development. We calculate that this program could save 125 hours in annual commute time per person enrolled, while tapping into as much as $100 million in direct and indirect state and federal government incentives to support e-bikes.

Our Collaborators

Our coalition brings together local nonprofits, community-development organizations, academic centers, and industry leaders, with additional support from members of key city agencies, and national and global advocacy groups. Our principle partners are: **Transportation Alternatives** (a 50-year-old NYC nonprofit that advocates for cycling); **The HOPE Program** (a leading NYC nonprofit that trains job-seekers for a broad range of sectors focused on sustainability); **Empire Clean Cities** (a nonprofit environmental organization and designated local U.S. Department of Energy-supported Clean Cities coalition); **Barretto Bay Strategies** (an urban solutions consulting firm) and principal Paul Lipson; **Brightside Strategies** (a consulting firm that works to decarbonize urban transportation) and founder Melinda Hanson; **Spring Bank** (a Bronx-based Community Development Financial Institution, or CDFI); **NYU's Rudin Center**; the **NYU Tandon School of Engineering**; and **C2SMART**. Individual support has come from Will Kennedy, senior programme officer of the UN Office for Partnerships.

THE EQUITABLE COMMUTE PROJECT TIMELINE

July 2020

This project emerged from a conversation about micromobility between Invest NYC SDG Director Koval and colleagues from the World Business Council for Sustainable Development in Geneva, Switzerland. Immediate interest and support came from micromobility expert Melinda Hanson, who explained how increasing ownership of e-bikes could not only improve commuters' lives but also reduce traffic and pollution, even in a city with excellent public transportation.

August–December 2020

We built the team and developed the ECP proposal. Paul Lipson connected us to The HOPE Program and Spring Bank, allowing us to incorporate a workforce-development component into the project. Within 10 months, Melanie Stern, Spring Bank's director of consumer lending and community reinvestment officer, developed an innovative e-bike loan program for people who have no credit history.

Throughout the winter and spring of 2021, we connected with the World Economic Forum, the Rocky Mountain Institute (RMI), and other U.S. and international organizations to educate ourselves about existing bike-distribution programs and share our proposal for NYC.

February 2021

To help attract funders, and with the support of the NYC Department of Transportation (DOT) and the NYCEDC, **we presented a webinar on the project, inviting professionals from foundations, corporate communications and sustainability departments, and community organizations**.

Spring 2021

We worked with NYU Stern Professor Matt Statler and the students in his Social Impact Consulting class, who **produced sophisticated presentations on how to engage employers and recruit employee participants, with suggestions for collecting data and establishing metrics for impact**.

August 2021

We entered the project in a statewide electric-mobility competition run by the New York State Energy Research and Development Authority (NYSERDA), a state agency that promotes energy efficiency and the use of renewable energy sources.

December 2021

We launched a pilot project in the Bronx, receiving positive attention in *The Verge*: "The E-Bike Revolution Comes to the Bronx."

January 2022

The ECP was selected as one of five finalists in NYSERDA's Electric Mobility Challenge, receiving $100,000 in direct funding and $50,000 in support from NYSERDA-retained consultants to build out a more detailed final proposal.

June 2022

The ECP submitted a final proposal to NYSERDA that included a three-year work plan and detailed budget.

July–August 2022

The safety of e-bike battery charging and storage became headline news after dozens of injuries and six deaths caused by fires from lithium-ion batteries. The Mayor's Office formed a working group to study the danger, while the NYC Council introduced four bills to combat the fires. The NYC Housing Authority (NYCHA), which manages New York's public housing, proposed an e-bike ban on its properties, but withdrew the idea after protests by residents and working cyclists.

September 2022

ECP was not among the winners of a $7 million grant.

October–December 2022

We moved forward as a collaboration of seven committed organizations, receiving significant local, national, and international interest. Chris Arnott, founder of Ride Kola, an Australian e-bike company, proposed that we collaborate on creating an Equitable Commute Global Coalition to unite groups working on similar efforts throughout the world. Back in New York, we participated in a NYSERDA-sponsored event to present our work to other potential electric-mobility funders and talked with NYSERDA about other funding opportunities. NYSERDA officials have informed us that they are currently focusing on bikeshare programs in upstate cities, and, while they support e-bike incentives, are wary of unfunded state subsidy laws.

January 2023

In an exciting new development, we signed a letter of intent with a major offshore wind-development team that is bidding on New York State projects; if it is awarded the contract, it will fund the ECP with $1 million, as part of its commitments to invest in both job opportunities and the health of disadvantaged communities. We are also advising NY State Assemblymember Robert Carroll, who has reintroduced an e-bike subsidy bill in the 2023 legislative session. As California moves forward with a state e-bike subsidy program, key New Yorkers are paying more attention, offering hope for New York State subsidy legislation.

We are also working closely with the Mayor's Office to provide research and expertise concerning lithium-ion battery fires associated with micromobility vehicles. We were pleased to see the NYCEDC include micromobility in its 2023 strategic plan, taking an ECP-inspired approach to equitable e-bike ownership. **We're convinced that it's only a matter of time before this project is funded and fully launched.**

Frank Walrond, foodservice coordinator for BronxWorks, and recipient of a Rad Power RadWagon e-cargo bike as part of an ECP pilot in 2021. Walrond uses the bike for daily commuting and to transport supplies between the five food kitchens he manages, which collectively serve hundreds of South Bronx seniors, homeless adults, and young people each day.

Micromobility Metrics

5,000

discounted/subsidized micromobility vehicles

5k Hrs

saved in commuting time every day

500 Mt

direct reduction in GHG emissions into the atmosphere every year

500+

new direct and indirect green jobs

$100M

new government incentives to be catalyzed

Key Learnings

- ***Cultural change can be an enormous challenge.*** Americans have hesitated to embrace a form of transportation that many regard as limited to recreational pursuits. Even bike companies have been slow to see the market. For example, TREK, the world's largest bicycle corporation, based in Wisconsin, predominantly markets bikes for recreational use. Its website does not display a single picture of e-bikes being used for commutes in urban settings. Yet 83% of Americans live in urban areas, where public transit is commonly of poor quality, particularly among lower income residents and communities of color.

- ***Political change is also slow going.*** While the Biden administration's Build Back Better Framework proposed $4 billion for e-bike subsidies, this item was dropped from the successful Inflation Reduction Act. Support for federal, state, and local e-bike incentives is lacking in part because there is virtually no U.S.-based e-bike manufacturing—roughly 99% of bikes in the U.S. are imported from China and Taiwan. That's in contrast to the incentives available for electric cars, where there is a huge U.S. industry that produces nearly nine million cars annually and employs nearly two million people.

- ***Tactically, however, we found an advantage in existing programs that could be adapted to address our project's goals.*** We managed to inspire and support Spring Bank to create an e-bike loan program, building on its existing Employee Opportunity Program. For now, we are prioritizing the expansion of this innovative program, which offers access to low-cost loans for e-bike ownership to people with no credit history.

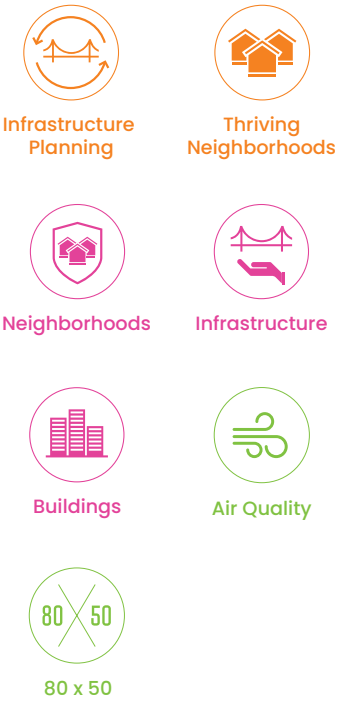
Decarbonizing NYC's Built Environment

THE GOAL

Mobilize innovative, low-cost financing to accelerate energy-efficiency retrofits and clean-energy projects in the city's one million buildings.

SDG TARGETS:

NYC GOALS:



The Problem

New York City's one million buildings are responsible for the vast majority of the city's greenhouse gas emissions—roughly 70%. International standards provide guidance for decarbonizing existing buildings, but lack regulatory teeth. Local Law 97 (LL97), a part of NYC's 2019 Climate Mobilization Act, requires owners of the 28,000 largest buildings (25,000 square feet or more), which emit the bulk of carbon emissions, to reduce them or face substantial fines. Penalties are scheduled to begin in 2024 and become increasingly onerous until 2050. The law has many problems, however, including the long delay before enforcement and various loopholes. What's more, many building owners, particularly owners of affordable housing, have trouble obtaining green financing and affording costly retrofits—penalties or not.

The Opportunity

A new finance program called PACE, or Property Assessed Clean Energy, is included in NYC's 2019 Climate Mobilization Act. PACE loans, which can be tapped to pay for 100% of the cost of energy-efficiency retrofits and other clean-energy projects, have longer terms and lower interest rates than conventional debt financing. Also, unlike conventional loans, PACE loan payments are included on a property's annual tax bill and collected by the city. When a property is sold, the assessment becomes a debt of the new property owner.

If fully implemented and adequately financed with support from PACE loans, LL97's impact would extend beyond reducing greenhouse gas emissions. According to the Urban Green Council, a nonprofit organization in NYC whose mission is to decarbonize buildings for healthy and resilient communities, the law will catalyze as much as $24.3 billion in private investment, creating up to 140,000 new jobs over the next decade. Yet the City's PACE program has barely begun, with only two loans having closed at this writing. (While we focused on PACE, we also recognized the need to train tens of thousands of workers to do the retrofit work. We describe our proposal for this training—which was tabled after COVID began—in Appendix D.)

Our Project

Invest NYC SDG has developed a new strategy to speed progress in decarbonizing real estate in New York City and elsewhere. Once the City's PACE program gets fully underway, property owners who want a PACE loan will have to ask their mortgage lenders to agree to such financing. We want to motivate banks to proactively *offer* PACE loans, by educating them on how they might benefit. Not only can they make more money by offering these loans, they can also enhance their reputations by reducing their "Scope 3" greenhouse gas emissions, defined in the Greenhouse Gas Protocol as pollution resulting from assets they don't directly own. Institutional investors are increasingly demanding that financial institutions disclose their Scope 3 emissions, and the SEC is weighing new regulations that require banks to report them.

To speed this process, our team has created a free, public data tool providing a trove of information for property owners, PACE originators, mortgage lienholders, and policymakers. The data tool, also known as the Carbon Compass, includes information on carbon emissions, energy consumption, and expected LL97 penalties for all large NYC buildings. It can also show which banks hold mortgages on the highest-emitting buildings, which helps prioritize outreach to mortgage lenders.

Our Collaborators

We worked closely with the **Mayor's Office of Climate and Sustainability (MOC&S)** (now renamed the Mayor's Office of Climate and Environmental Justice), and the **NYC Energy Efficiency Corporation (NYCEEC)**, the local green bank designated as the city's PACE administrator. We were supported by **Lara Croushore** who was formerly chief of staff to Daniel Zarrilli, NYC's chief climate policy advisor and OneNYC director. Critical advisers included **Miles Draycott**, former chief risk officer for NYC's Comptroller, and **Gary Friedland**, NYU Stern scholar-in-residence.

DECARBONIZING NYC'S BUILT ENVIRONMENT TIMELINE

Fall 2019

In a conversation with Miles Draycott, then chief risk officer for the $240 billion NYC Pension Funds, **Koval learned of Draycott's interest in pension funds purchasing PACE loans**, which Draycott viewed as worthwhile investment opportunities. By doing so, the investment funds might also help stimulate the loan market and reduce PACE interest rates.

December 2019

Draycott introduced Koval to Susan Leeds, the founding director of the NYCEEC, who explained how PACE works and the barriers to its use. In parts of the country where PACE programs had been launched, the uptake had been slowed by a requirement that property owners seeking such loans get consent from their mortgage holders. The mortgage holders have withheld consent, fearing they would be financially penalized in the event of a default. Leeds encouraged us to work on overcoming this barrier.

February 2020

We learned more about the new PACE law from attorney Jeff Gracer, co-founder and chair of the NYC Climate Action Alliance, which works to scale up cost-saving carbon-reduction measures in New York City's buildings. Gracer introduced us to roughly a dozen new contacts with expertise on relevant issues including LL97, the national PACE program, and more.

Bruce Schlein, then vice president of environmental affairs at Citi Impact and a NYCEEC board member, suggested the need for a map that could match LL97-covered buildings with mortgage lenders. Such a map would allow anyone to see at a glance which lenders held mortgages on NYC's most polluting buildings. This would help prioritize outreach to those banks based on carbon emissions in their portfolios. Our team took it from there, with plans to create a data tool to drive lender consent to PACE.

March 2020

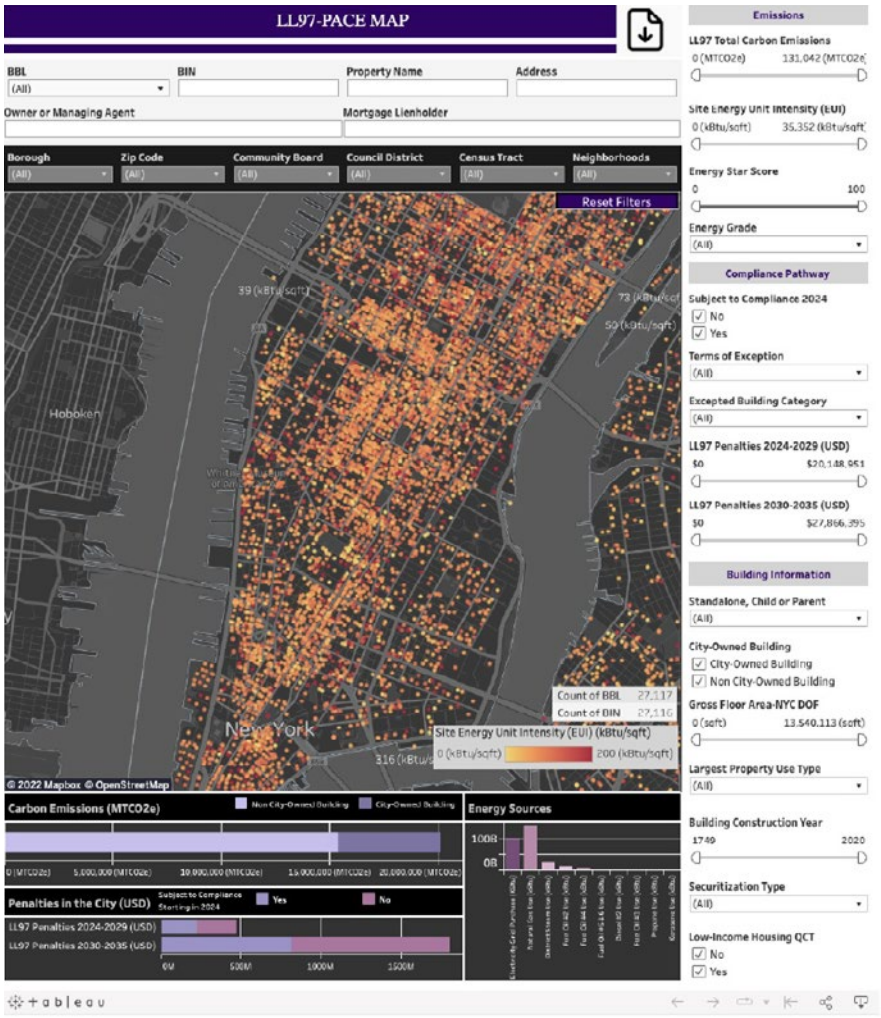
Invest NYC SDG team member Alejandro Cardona Vélez took the lead in creating the data tool, with pro-bono support from data engineers, scientists, and project managers.

June 2020

We secured a Memorandum of Understanding with MOC&S to collaborate on creating the data tool.

July 2020 – June 2021

A year's worth of effort and consultations with MOC&S resulted in the beta version of a free public database that serves as a one-stop information resource for property owners, PACE originators, mortgage lienholders, and policymakers.



NYC Carbon Compass, beta version, Feb. 2023

Our data tool provides a map of NYC buildings subject to LL97. It displays the relevant data from each building, including carbon emissions, energy sources, projected penalties, owner/management company, and mortgage holder. Using the filters listed on the side, anyone can search the tool by groupings of buildings, ascertaining, for example, the total carbon emissions from a single type of building, such as NYC's museums or hospitals.

Perhaps most importantly, the tool reveals a single mortgage lender's or owner's portfolio of buildings that are subject to LL97, as well as the total carbon emissions from that portfolio. This shows which lenders and owners contribute the most to NYC building emissions, helping the city prioritize efforts to reach its 2050 carbon neutrality goal. As changes are made to the law, and deferred compliance or exemptions created, the tool can also monitor the carbon that will *not* be reduced—the "carbon cost"—resulting from such decisions.

June – December 2021

We demonstrated our new data tool to organizations and leaders throughout the city, including the New York Federal Reserve, the NYC Comptroller's investment team, Ceres, the NYC Accelerator, NYSERDA, PACE Nation, RMI, BlocPower, the Urban Green Council, and Michael Greenstone's Energy & Environment Lab at the University of Chicago.

December 2021

An NYU Law School report revealed potential hurdles to increasing decarbonization through LL97 enforcement, showing that 91% of the square footage of buildings subject to LL97 will face no penalties until 2030 or later because of the slow rollout.

The report also made clear that most NYC commercial buildings will be able to meet the LL97 carbon caps without any investment in decarbonization, assuming New York State achieves its legislatively mandated goal of sourcing 70% of its electricity from renewable resources by 2030 and achieve 100% zero-emissions electricity by 2040. Commercial buildings can tap energy generated by the downstate electrical grid, into which renewable energy from offshore wind and solar is rapidly being added. The larger problem lies with multifamily residential buildings that use oil and gas systems to generate heat and hot water onsite, suggesting that they might be our most important focus.

February–May 2022

The Invest NYC SDG team made **PACE-financed building decarbonization the 2022 topic for NYU Stern's Sustainable Business Pitch Competition**.

Forty NYU Stern MBA and NYU Schack Institute of Real Estate students were tasked with making the business case for becoming PACE lenders to one of four major banks that hold mortgages on NYC properties subject to LL97. The student teams used the Carbon Compass data tool to develop proposals that might persuade banks to facilitate clean-energy loans for energy-efficiency retrofits in buildings within their lending portfolio. The student pitches created a valuable platform for outreach to banks.

Members of the 2022 NYU Stern CSB Sustainable Business Pitch Competition winning team, with Tensie Whelan, Marianna Koval, Eddie Stern, on May 4, 2022.

October 2022

At this writing, we have begun meetings with banks, including J.P. Morgan Chase, that have large NYC mortgage portfolios, to demonstrate the value of our Carbon Compass tool. We are stepping up to collaborate with and support major banks in launching and growing PACE in NYC and nationally, as well as helping banks reduce their Scope 3 emissions and taking a leadership role in decarbonizing NYC buildings.

The newly created C.H. Chen Institute for Global Real Estate Finance at NYU Stern, endowed with a $20 million contribution by C.Y. Chen and led by Professor Sam Chandan, will take ownership of the data tool and partner with Invest NYC SDG in implementing our bank-led decarbonization strategy. The Chen Institute, whose chief goals include studying the impact of climate change on real estate markets and examining green finance, smart-building technologies, and materials science, will be a perfect home for this project.

Key Learnings

- ***The most important lesson we learned is that carrots, rather than sticks, are often the most effective way to drive change.*** Making the business case on the potential profitability of PACE and the long-term benefits of energy-efficiency retrofits will likely be more compelling than threats of fines.

- ***As with all of our projects, we also found that major change doesn't come easy.*** Businesses do increasingly appreciate the financial and reputational risk of ignoring climate change. Major banks face new demands for carbon disclosure from investors and, perhaps soon, the SEC, compelling mortgage lenders to report on carbon emissions from properties in their lending portfolios. But it is an unfamiliar role for mortgage bankers to consider proactively working to reduce carbon emissions from buildings—even if it improves their reputation and makes money.

- ***On a more tactical level, we realized that even well-intentioned laws can create barriers to success.*** Here that barrier was lender consent to PACE. Identifying this problem prompted us to imagine a new leadership role for mortgage lenders.

Supporting Low-carbon Concrete

THE GOAL

Create low-carbon concrete by using ground-glass waste as a substitute for fly ash and slag, reducing greenhouse gas emissions and helping achieve NYC's goal of zero waste to landfill by 2030.

SDG TARGETS:

NYC GOALS:

The Problem

Durable and cheap concrete is one of the world's most prevalent building materials. But concrete production is a major source of greenhouse gases, accounting for as much as 8% of the world's emissions that drive climate change.

Meanwhile, every year, NYC generates 135,000 tons of post-consumer glass, only 60% of which is recycled. The other 40% ends up as trash that must be transported hundreds of miles away to landfills in Ohio and South Carolina.

The Opportunity

Ground-glass pozzolan—recycled and pulverized post-consumer glass—has been determined to be a more environmentally benign substitute for fly ash and slag, materials conventionally used to make concrete, significantly reducing greenhouse gas emissions emissions while improving the performance of all types of concrete construction. Fly ash, for example, is a byproduct of coal combustion and is widely considered an environmental hazard, yet it has been used in concrete since the 1940s. Slag, a byproduct of iron production, has been used in U.S. concrete since the 1980s. With coal and steel production in decline, neither of these components will be in abundant supply in the future.

While other technologies for low-carbon concrete are advancing, including CarbonCure and Sublime Systems, ground-glass pozzolan achieved the American Society for Testing and Materials (ASTM) standard and has been tested and used commercially for several years. It is proven to substantially reduce carbon emissions and extend concrete's lifespan by improving resistance to chloride and sulfate. Siting a ground-glass pozzolan plant in NYC would reduce greenhouse gas emissions from conventional concrete, while reducing glass waste and creating jobs.

Urban Mining Industries processing plant in Beacon Falls, Connecticut.

Our Solution

Invest NYC SDG joined with Urban Mining Industries (UMI), America's only commercial-scale glass pozzolan producer, to support the company in the siting, financing, and construction of a NYC pozzolan-processing plant, and in the subsequent commercialization of the product, which it markets under the name Pozzotive®.

Our Collaborators

Key support came from our steering committee member **Tom Outerbridge**, general manager at Sims Metal Management (now majority-owned by Closed Loop Partners, an investment firm focused on building a circular economy), **Amanda Kaminsky**, director of sustainable construction for Lendlease's Americas portfolio, and **Kendall Christiansen**, a waste and recycling expert who serves as an executive-in-residence at the CSB.

SUPPORTING LOW-CARBON CONCRETE TIMELINE

August 2019

Early in our team's research of NYC's commercial waste and recycling landscape, **we connected with Outerbridge**, a politically savvy recycling expert who oversees two facilities processing 100% of the metal, glass, and plastic and 50% of the paper collected by the NYC Department of Sanitation (DSNY).

Outerbridge opened our eyes to the ways in which glass waste is a major challenge for the recycling industry, since its bulk and weight makes it so costly to transport. (Glass waste became an even more pressing issue after January 2018, when China instituted its National Sword policy, a near-ban on foreign recyclable materials.) Outerbridge later introduced us to the CEO of UMI.

November 2019

We decided to support UMI's effort to expand to the New York City metropolitan area by establishing a plant near the Sims recycling facility. While our other projects focused on catalyzing private investment, our support for UMI played a more supportive role. Location was critical to the venture's competitive advantage because both glass-waste feedstock and the resulting ground-glass pozzolan are very heavy, making the cost-effectiveness of the material dependent on transportation distances. Over time our support for UMI's mission included helping to secure financing for its new processing plant and building market demand for ground-glass pozzolan.

March 2020

The ASTM issued a new standard, C1866, providing a global stamp of approval for ground-glass pozzolan as a substitute for fly ash and slag in concrete. Kaminsky had worked for a decade to achieve this goal, which was essential for creating a market for ground-glass pozzolan by ensuring that it would be specified in building procurement requirements.

Spring–Summer 2020

In search of a possible site for UMI's new plant, we conducted outreach to key city agencies, including the DSNY, the NYCEDC, the NYC Department of Design and Construction (DDC), and the NYC DOT.

Fall Semester 2020

We worked with NYU Stern Professor Matt Statler's Social Impact Consulting class to develop a plan to accelerate industry demand for ground-glass pozzolan in concrete. Students assessed barriers to its adoption by concrete manufacturers, architects, engineers, and construction firms, and developed additional materials including a market analysis of NYC concrete buyers by size and reputation, and a map of the physical locations of NYC recycling sites and concrete manufacturers to identify the best alternate locations for a UMI plant in NYC.

December 2020

With strong support from the State of Connecticut, **UMI began operating a first-of-its-kind, commercial-scale plant in the town of Beacon Falls**, capable of processing more than 50,000 tons of glass waste per year.

February 2021

We recruited Christiansen to our team, calling on his long experience in waste and recycling to help guide the search for a new UMI site in NYC and to consider other potential projects.

Urban Mining Industries plant in Beacon Falls, Connecticut.

March 2021

With Kaminsky and UMI CEO Patrick Russo, **we organized a panel discussion for Circular City Week**, sponsored by the Danish CleanTech Hub, to educate stakeholders about the benefits of using locally recycled glass pozzolan in concrete.

Spring–Summer 2021

Koval and the team visited UMI's new plant in Connecticut to see the operation in action. The working team also called on prospective finance partners to help accelerate UMI's plans, including tapping tax-free municipal bonds to finance construction once a site was secured.

During this period, we met several times with the Port Authority of New York and New Jersey (PANYNJ), one of the largest consumers of concrete in the NYC area. PANYNJ had already been testing ground-glass pozzolan as a potential component of concrete. If the test results are satisfactory, it will add Pozzotive to the list of permitted concrete additions in March 2023.

February 2021

We discussed our work with a member of the Gateway Development Commission, which is leading one of the most urgent infrastructure projects in the U.S. today. As it replaces and updates aging rail infrastructure between Newark, New Jersey, and NYC's Penn Station, Gateway will undoubtedly use a lot of concrete, and the commission has adopted procurement guidelines that prioritize sustainable materials.

September 2022 — **Mayor Adams signed an executive order requiring the city's capital-project agencies to "make their best efforts" to use low-carbon concrete in capital projects and sidewalks.**

October 2022 — **As this report goes to publication, discussions about financing and overall development of a new UMI site in NYC are still underway.**

UMI and Sims have tentatively agreed that UMI will build a glass-waste processing plant adjacent to the Sims recycling facility at the South Brooklyn Marine Terminal on the Brooklyn waterfront. This location, near transport links and other industries, would be ideal. The two businesses are also negotiating funding with the NYCEDC.

In the third quarter of 2022, Closed Loop Partners acquired a majority stake in Sims, bringing new capital and influence to the discussions.

This development is encouraging, and we take pride in our contributions to date, including bringing this low-carbon concrete opportunity to the attention of the NYCEDC and making the case for its impact on major NYC sustainability goals including waste and carbon reduction.

Key Learnings

- ***Our high-level lesson from this project was sobering.*** Given the increasing urgency to reduce global carbon emissions, the creation of low-carbon concrete from unrecyclable glass waste seemed like a no-brainer to us, but it has not been easy to get businesses and government agencies on board.

Unprocessed glass waste, Urban Mining Industries processing plant in Beacon Falls, Connecticut.

- ***We are pressing the conservative construction industry to replace materials that have been used in concrete for 40 (slag) to nearly 100 years (fly ash).*** Additionally, government agencies can take years to adopt new priorities. For example, the NYCEDC's traditional mission has been to create jobs while generating the highest return from its real estate assets. Sustainability goals, including zero waste to landfill, only recently became part of its mandate, and it has been slow to adopt them.

- ***On a more tactical level, we have learned that projects such as this one can be multi-dimensional puzzles.*** They benefit from advisors who are able to see the big picture, understand the roles and resources of multiple stakeholders, and persist in connecting the dots. Christensen was that person for this project. We also found immense value in having Outerbridge, an industry expert, on our steering committee.

Rikers Island Indoor Farm

THE GOAL

Accelerate the growth of NYC's emerging sustainable food economy, creating good jobs and achieving profound impact by repurposing a notoriously destructive penal colony into NYC's largest indoor farm.

SDG TARGETS:

NYC GOALS:

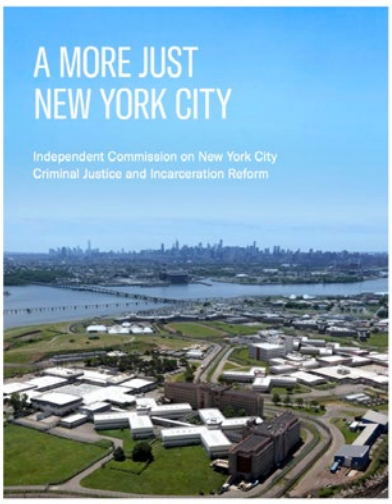
The Problem

Rikers is a 413-acre island in the East River, between the Bronx and Queens, in the middle of New York City. Since 1932, it has been home to the city's main jail complex, which has been notorious for its brutal conditions. As of late 2022, Rikers housed some 6,000 inmates, most of whom were are awaiting trial. In 2021, in acknowledgment of how the island has become a potent symbol of the failings of our criminal justice system, the NYC Council enacted the Renewable Rikers Act, mandating that the jails close by 2027. Yet to date there has been no consensus on what will replace them.

The Opportunity

Community leaders have called for Rikers to be transformed into a hub of renewable and sustainable industries. Installing solar power facilities and a new wastewater-treatment plant on the island would remove aging infrastructure from marginalized neighborhoods, freeing that land for better uses. But we believe the soon-to-be former prison complex offers another opportunity: to support local food security.

NYC has a rare chance to use part of this large plot of land to strengthen its food resiliency, in a project that is likely to attract investor interest. Throughout the world, hundreds of millions of dollars have been pouring into ag tech, including indoor farms.



The Independent Commission on New York City Criminal Justice and Incarceration Reform's final report (the "Lippman Commission Report"), recommending the closing of Rikers Island jails, published in April 2017.

What's more, regional political momentum is growing. In 2019, the New England State Food System Planners Partnership launched its New England Feeding New England: Cultivating a Reliable Food Supply project. The partnership's goal is to produce 30% of the food that's consumed in New England within New England by 2030. NYC could lead the Atlantic region with a similar bold call.

The Rikers transformation could help spur urban agriculture in NYC, with indoor farming providing large amounts of affordable, healthy food, year-round. An extra benefit would be hundreds of new, well-paying jobs.

Our Solution

We've proposed building a cooperative indoor commercial farm on Rikers, supported by private financing. Our team has developed various financial models for farms ranging in size from two to 32 acres. The largest version of the farm could grow more than 36 million pounds of greens, vegetables, and berries, with an added aquaculture system that could produce up to two million pounds of steelhead trout per year. Our project would also create more than 1,500 jobs, including employment for formerly incarcerated New Yorkers, while creating a path to worker ownership.

Cooperative indoor farm business on Rikers Island creating jobs and growing affordable, healthy food, year-round

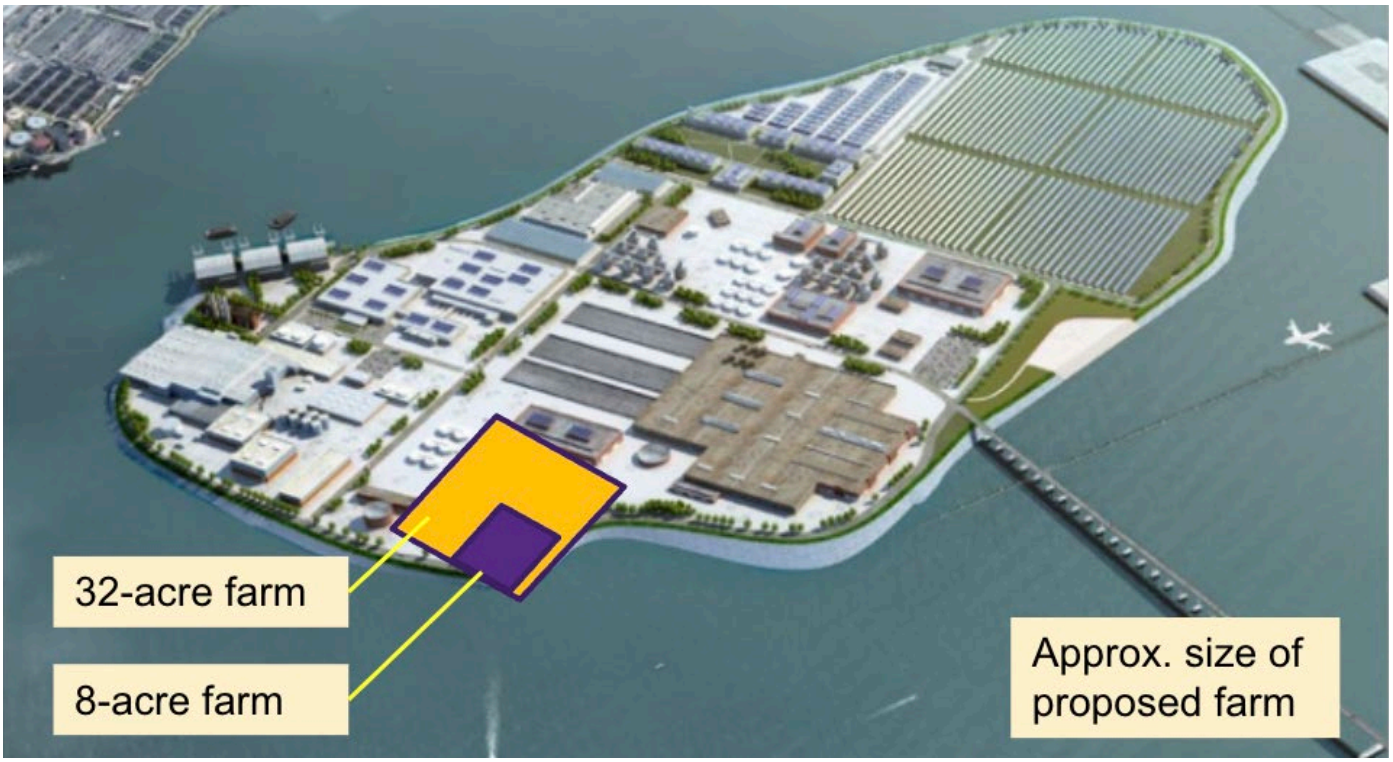
32 acre farm
with vertical farm, greenhouse, and aquaculture

138,250 lbs
daily fresh food production

36M lbs
annual food production

$185.3M
annual market value

1,552
total jobs



A rendition showing the scale of a proposed indoor farm on 413 acre Rikers Island. Picture from "A More Just New York City," Independent Commission on New York City Criminal Justice and Incarceration Reform, 2017. Please note that we are showing roughly the scale of the farm in relation to the island, not proposing any specific location.

Our Collaborators

Daniel Zarrilli, former Mayor Bill de Blasio's chief climate advisor, encouraged us to pursue our proposal. **Omar Freilla**, founder and former executive director of Green Worker Cooperatives, supported strategic outreach to community groups and the vision of a worker cooperative. **Ibrahim Abdul-Matin**, author of *Green Deen: What Islam Teaches About Protecting the Planet* and co-founder of Green Squash Consulting, a management consulting firm, helped with government relations and community outreach.

Empire State Greenhouses, which has been developing an eight-acre greenhouse and vertical farm in collaboration with the State University of New York College of Agriculture and Technology at Cobleskill, tutored us in the technology and business aspects of vertical farms.

Hudson Valley Fisheries, which operates a four-acre, commercially successful indoor fish farm in Upstate New York, shared detailed financial and operating information that enabled us to model the aquaculture operations that we envision for our larger versions of the Rikers farm.

Professor Michael Timmons of Cornell University, a pioneer in indoor recirculating aquaculture and author of a major textbook on the subject, advised us about the potential and relevant technologies for indoor fish-farming.

Agritecture, a NYC-based advisory services firm specializing in urban and controlled-environment agriculture, provided consulting support. This included access to a planning tool for urban farms that helped us model the feasibility of variously sized farms that use a range of growing methods.

RIKERS ISLAND INDOOR FARM TIMELINE

2013

Columbia University urban food-system researcher Kubi Ackerman led an effort to map the open space that is potentially available for urban agriculture in NYC, including rooftops, vacant lots, and community gardens. Further research showed that many rooftops were not structurally capable of supporting large commercial farms, while vacant lots were vulnerable to commercial building or housing development. Understanding these limitations fueled our later interest in indoor, vertical farming, which can grow exponentially greater amounts of fruits and vegetables on a given piece of land.

2016

In a strong sign of international interest in indoor agriculture, **AeroFarms completed construction in Newark, New Jersey, of the world's largest indoor vertical farm: a $30-million, 70,000-square-foot facility** capable of harvesting up to two million pounds of produce per year.

From roughly 2016 to 2019, several NYC-based firms developed state-of-the-art vertical farms on other sites.

April 2020

The United Arab Emirates invested $150 million in four emerging global ag-tech companies that are involved in indoor vertical farming, including AeroFarms.

February 2020

In a meeting with Zarrilli, he invited us to suggest potential uses for Rikers after the jails were closed. We suggested that even eight acres—just 2% of Rikers Island's area—would be more than enough space for a vertical farming demonstration project. Zarrilli urged us to develop a more detailed proposal.

March–April 2020

The earliest weeks of the pandemic exposed the fragility of US food distribution systems, with experts predicting that climate change would bring increasing numbers of serious disruptions in the future.

April–July 2020

The founders of Empire State Greenhouses, developers of an eight-acre greenhouse and vertical farm in Cobleskill, New York, generously shared proprietary information, including capital investment, operating methods, crop selection, and staffing needs. Their contributions helped give our operational and financial projections credibility, while other organizations were sufficiently interested to allow us to include them in our proposal as potential partners.

Our team developed a robust proposal including estimates of food production, employment opportunities, revenue streams, and required investment. We proposed creating an eight-acre demonstration farm with half of the space allocated to a vertical farm and the other half to a greenhouse featuring an aquaculture operation for crop diversity.

In our Rikers Island proposal, we sought to balance our main goal of food-supply resilience with rigorous analysis of other potential outcomes that would broaden the project's appeal:

- We demonstrated the potential of multiple methods and crops, including traditional greenhouses that grow a wider variety of crops, technology-intensive vertical farms, and indoor fish farms that can provide a valuable source of protein, albeit with less-proven technologies.
- We compared potential job creation with and without automation.
- We evaluated and compared other opportunities such as using the project for university research and creating employee ownership while balancing maximum crop production and profit from a successful commercial farm.

August 2020

We provided our proposal to the Mayor's Office, even as public discussions about Rikers' conversion continued between the city administration and civic organizations. The Renewable Rikers coalition, composed of environmental-justice and criminal-justice groups, led the effort to close Rikers while pressing officials to use the land to transfer "back of the house" infrastructure—including a wastewater resource recovery facility—out of lower-income NYC communities, and develop a large solar-energy production and storage facility on Rikers.

February 2021

The NYC Council passed legislation mandating the removal of all jail facilities from Rikers Island and the construction of four smaller jails in four of the city's five boroughs. The law also created a new entity, the Rikers Island Advisory Committee, to be composed of "relevant commissioners, persons impacted by Rikers, and experts in environmental justice and sustainability" to advise on potential uses of the island.

The legislation referred to two specific uses—renewable energy and wastewater treatment—without specifying other types of sustainable development.

Summer 2021

We conducted research with leaders of worker cooperatives, including cooperative farms and green-energy cooperatives, and eventually retained expert Omar Freilla (Green Worker Cooperatives, Collective Diaspora) to help us with employee-ownership models.

August 2021

We hired Agritecture consulting, which provided reliable production data and worked with us to develop an economic pro forma, establishing credibility for a commercial-scale indoor farm on Rikers Island.

November 2021

The NYC Council created an Office of Urban Agriculture and an urban agriculture advisory board to "expand this important industry and improve the sustainability of our local food production."

January 2022

Mayor Eric Adams took office, with a track record of supporting urban agriculture and promises to improve NYC's food system. No previous NYC mayor had demonstrated as much interest as Adams in expanding urban agriculture as a vital NYC industry, while also helping solve health problems caused by poor nutrition and food insecurity. We had established good working relationships with Adams' staff during his previous job as president of the Brooklyn Borough, during which time we collaborated on on his 2021 report, *The New Agrarian Economy*, about the promise of urban agriculture in NYC.

October 2022

We remain optimistic about the Rikers proposal, amid continuing signs of support from the Mayor's Office. We have also attracted interest from potential investors and Dave's Killer Bread Foundation, which is exploring a role in helping to train formerly incarcerated New Yorkers.

We formally presented our proposal to leaders of the Renewable Rikers coalition, explaining how the project could complement the coalition's proposed uses, be set up quickly as an interim use project, with mayoral support, and help accelerate the decarceration of the jails. The coalition leaders were reluctant to immediately endorse what might be an impediment to their goal of moving noxious infrastructure from environmental justice communities to Rikers. They asked us to wait and re-open the discussion after studies evaluating the feasibility of the solar and water resource recovery facility are completed in the Spring of 2023.

At this writing, continued city control of Rikers is uncertain. The island has been subject to a federal consent decree since 2016, after several lawsuits alleging human rights abuses, and it continues its decades-long culture of violence, racking up 19 inmate deaths in 2022. As a result, the federal judge overseeing the consent decree is weighing whether or not to permanently transfer control to the federal government.

We plan to return to the Renewable Rikers coalition and continue to seek broad support for the indoor farm, including with the Rikers Island Advisory Committee.

Key Learnings

- ***As a high-level lesson, we learned that early coalition-building is critical for broad political support, especially for a politically sensitive project like this one.***

- ***Our most important mistake with the Rikers project was our failure to keep community stakeholders prominently in mind.*** Instead, we excitedly responded to a request for proposals from a top City Hall leader and immediately got to work developing an economic pro forma, employment estimates for people who were formerly incarcerated, and pathways to worker ownership of a successful commercial indoor farm. In retrospect, we were looking for kudos from the Mayor's Office, when we could have had more success by reaching out to community organizations as early as August 2020, respectfully asking for their feedback and collaboration. By failing to use our political savvy, we opened ourselves up to suspicion and the perception that we were an elite, privileged group trying to impose a top-down solution.

- ***A tactical tip: Try to find a model for your project***, as we did with Empire State Greenhouses, whose managers may ultimately become partners with a Rikers indoor farm.

M.A.P. NYC: Mapping Agricultural Production in New York City

THE GOAL

Expand government, business, and community commitments to urban agriculture by mapping the extent and nature of commercial, community-driven, and educational agricultural production in NYC.

SDG TARGETS:

NYC GOALS:

Healthy Neighborhoods, Active Living

Zero Waste

80 x 50

Air Quality

Parks & Natural Resources

The Problem

The COVID-19 pandemic exposed the weakness of our local food-distribution system, which too often relies on long, fragile supply chains. As climate change worsens, these disruptions are likely to grow. Increased local food production could help make NYC more resilient. Yet even though the city is home to a vibrant community garden movement, a school system in which hundreds of students learn to grow food every year, and a rapidly growing commercial indoor and rooftop agriculture sector, we currently have no inventory of the scope of this industry nor any goal for expanding it. As NYC considers its land-use policies, within the context of many competing interests, we need a strong constituency for urban agriculture.

The Opportunity

Growing food locally within city limits can create jobs, as well as help address a range of social problems related to and beyond food supply. Such challenges include a lack of knowledge about food and nutrition (especially among youth), a general lack of connection to living systems, an abundance of vacant spaces such as rooftops and untenanted lots that could benefit from greenery, and, of course, food insecurity, which is highest in low-income neighborhoods.

While we have limited data on NYC's urban agriculture, we do have a few good starting points. Organizations working with schools document their own efforts, and a 2012 report by Columbia University's Earth Institute has tracked the amount of NYC space available for urban growers. Additionally, NYC has long kept a limited map of the many community gardens stewarded by the Parks Department through its GreenThumb program. Still, no one has yet produced a city-wide census of food production. What foods are being grown, by whom, and where do they go once they have been harvested? Collecting such data would be an important first step toward building more local food resilience, providing a baseline from which to launch other programs and policies.

Our Solution

Our team has developed NYC's first crowd-sourced map of existing food production. The project, called Mapping Agricultural Production in NYC (M.A.P. NYC), relies on existing data from relevant city agencies as well as new data solicited from farms and gardens, including commercial farms that do not report data to the city, but it excludes private backyard gardens. The first iteration of the map was published in late 2021 at https://mapnyc.herokuapp.com. Urban growers can now sign up to become verified editors of data about their farms or gardens. The crowd-sourced nature of the site makes data collection much easier for researchers and incentivizes growers to share their achievements via a Wikipedia-like model. Its capacity to show the great breadth of farms and gardens across NYC also helps motivate policymakers to see the sector as worthy of attention and resources.

Creating this novel data tool provides a baseline for predicting and moving toward a greater quantity and quality of locally grown food. Our new tool may also help researchers investigate questions such as: Where are the opportunities for new urban agriculture sites? How can the city best support urban growers? and, ultimately, How can urban agriculture support a more food-secure NYC?

Our Collaborators

The project is directed by **Wythe Marschall**, a Harvard doctoral candidate and full-time researcher and project manager at the NYU Stern Center for Sustainable Business. Marschall's dissertation research and previous work with the Cornell Small Farms Program focused on commercial indoor farming in NYC. From 2021–2022, he co-directed the M.A.P. NYC project with **Dr. Alice Reznickova**, an assistant professor of Technology, Culture and Society at NYU Tandon. **Students at the Center for Urban Science and Progress (CUSP)** and **NYU Tandon** provided research and data-science support.

M.A.P. NYC TIMELINE

October 2019

While researching ways to increase the capacity of NYC's agricultural food production, we tried to understand the barriers and were **struck by the lack of collaboration between commercial farmers and community gardeners**. We were also intrigued by indoor-farming companies that produce large volumes of fresh, healthy food within cities year-round.

March 2020

The onset of the COVID-19 pandemic increased food insecurity in NYC, highlighting the need for a larger local food supply, rather than reliance on long and fragile supply chains.

July 2020

In conversations with senior staff at the NYCEDC, we realized that while the agency was interested in this burgeoning industry, there was no organized constituency for urban farming in NYC. Affordable housing was the priority for any no- or low-cost land. We decided to help support a common agenda for community and commercial growers who need access to land, by showing the possibilities of growing more food in the city. To do this, however, we needed to understand the baseline of local food production, a critical first step in organizing NYC's urban growers into a visible political constituency.

December 2020

Mother Cabrini Health Foundation gave us $300,000 in support of our work to increase NYC's urban agriculture. Our stated goals included expanding the availability of fresh, healthy, affordable food in underserved neighborhoods, directly addressing diet-related disease in these communities, and building businesses that support increased food production and equitable food distribution, while creating quality jobs.

February 2021

The publication of ***Food Forward NYC*, the city's first 10-year food plan, reflected growing interest in creating a sustainable food system in NYC**, yet the plan did not lay out a clear legislative agenda.

March 2021

We established three goals for our new project:

- Create a digital map of NYC urban agriculture as a tool for researchers, funders, and policymakers, with metrics including production, distribution, labor, and community services.
- Provide a tool for urban growers and related organizations to which they could upload their data.
- Help create a new political constituency to advocate for urban agriculture.

May 2021

Invest NYC SDG hired Wythe Marschall as the senior researcher and project manager for food and health projects.

May–June 2021

Marschall collaborated with Reznickova at NYU to develop a preliminary methodology for surveying growers, in conjunction with their NYC urban agriculture contacts. We contacted leading supporters of urban farming and gardening, including NYC Parks, GrowNYC, Urban Design Forum, NYC Agriculture Collective, and the New York City Community Garden Coalition to strategize about the best ways to collect data. We also brought together private-sector and community growers to foster long-term relationships and a shared agenda around land use and energy availability. This process allowed us to form an expert advisory board, including growers, members of relevant city agencies, Cornell Cooperative Extension agents, food-security experts, food-policy experts, and urban planners.

July–August 2021

As we researched other urban agriculture projects, we were most directly inspired by the Maryland Food System Map, created by the Johns Hopkins Center for a Livable Future. We consulted with NYC growers, relevant city agencies, and other stakeholders about what data to collect and how best to visualize it.

September–December 2021

Realizing the magnitude of the information gap, we moved to implement two rounds of a new, comprehensive survey to collect data on production, finances, and land use from farms and gardens. We initially focused on the 100 largest sites, including all of the commercial farms. Next, we created a minimally viable map—a version with enough features to validate its use and attract early users for testing. This map helped us obtain feedback from growers and other stakeholders, and improve the development process.

October 2021

The NYC Council voted to establish a new Office of Urban Agriculture as part of its plan to adapt to climate change.

December 2021

We received a grant for $2 million from Mother Cabrini Health Foundation to develop pilot projects that improve food security in New York State. These funds will both support our current work in NYC and extend our ability to work in other parts of the state, in collaboration with Cornell University.

December 2021 – March 2022

We partnered with geographers at the University of Michigan and the City University of New York who research urban agriculture by examining satellite-generated data on land use. Together, we've worked to create a new urban-agriculture toolkit that cities can use to better understand their urban-agriculture sectors, connect with growers, and site new farms and gardens by identifying appropriate vacant lots and roofs. Urban growers working with the Urban Design Forum suggested that M.A.P. NYC could serve as the basis for a resource-sharing platform to help growers support each other—a venue to trade compost, seeds, tools, volunteers, and expertise, while also informing the policy recommendations made by the new Office of Urban Agriculture.

Spring–Summer 2022

We sought to improve M.A.P. NYC by finalizing the system for creating verified users, which will allow farmers and gardeners to edit their own entries on the map. We also planned for the expansion of the map data to include green roofs, compost drop-off sites, pollinator gardens, and farms and gardens in metropolitan New Jersey.

December 2022

The Foundation for Food & Agriculture Research (FFAR) awarded us $300,000 to expand M.A.P. NYC and fund a series of participatory workshops, bringing together the Office of Urban Agriculture, urban growers, researchers, a professional web developer, and other key NYC food-system stakeholders. Creating the first-ever complete census of urban agriculture that covers the city's five boroughs will help NYC's new Office of Urban Agriculture and growers align on goals for data collection, sharing, visualization, and analysis. This baseline will help inform policy recommendations, stimulate local food production, and provide more resources to urban growers.

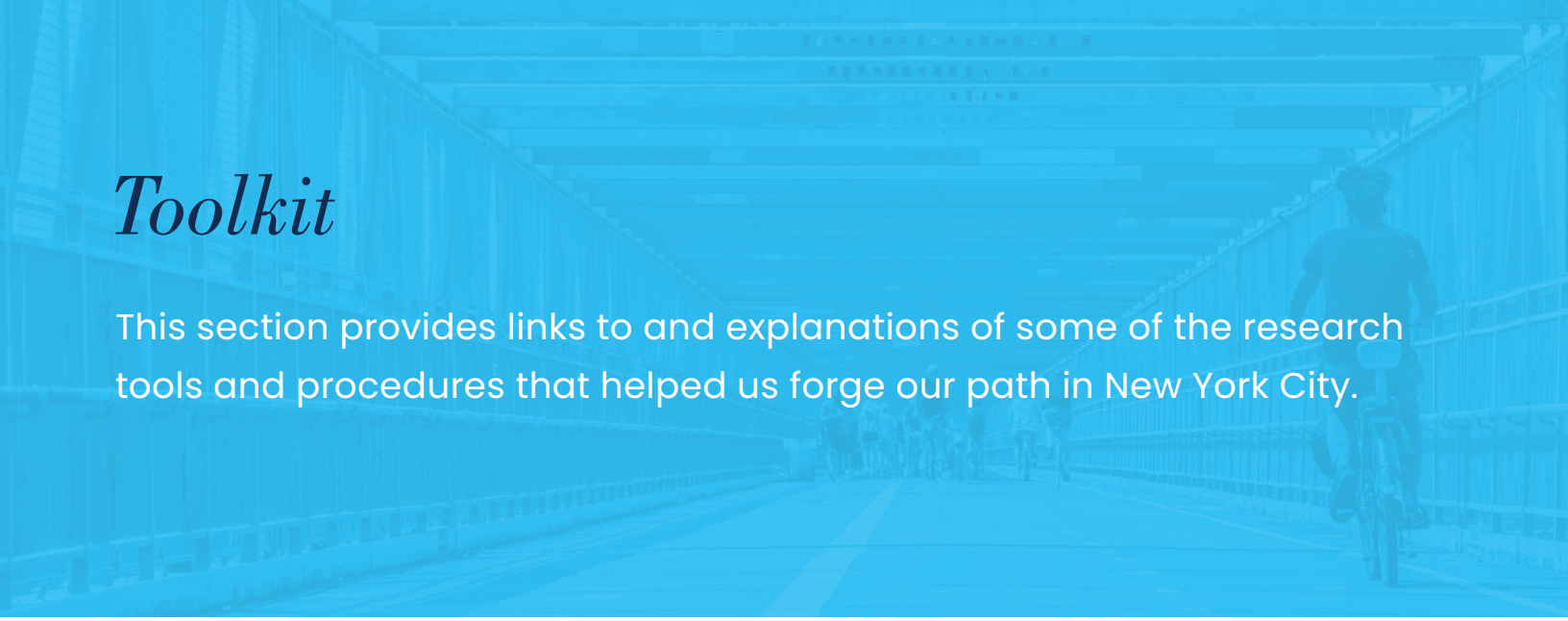
Ongoing

We are coordinating our mapping work with the Office of Urban Agriculture and its first director, Qiana Mickie (former executive director of Just Food, NYC), as we continue to conduct research and mentor student researchers.

Key Learnings

- ***Our high-level lesson was that you can bring together groups with seemingly disparate interests in a common project with a shared goal—in this case our novel, Wiki-style tool.*** Commercial growers and community growers don't always agree, but both can benefit from more visibility with—and interest from—policymakers, the public, and other stakeholders. Another benefit of bringing these disparate groups together was that our project allowed them all to remain in control of their own data.

- ***As a tactical tip, data collection can be an essential first step to strategic decision-making, and data visualization can be as important as collection.*** Still, we found that even a simple, clean visualization strategy, like the one we followed, can take significant resources and time to get right. In particular, we had to budget time to manage the data-science students whose labor came at no cost.



Toolkit

This section provides links to and explanations of some of the research tools and procedures that helped us forge our path in New York City.

Research Guide

To guide our early efforts, we developed a routine that may help you focus your own research. We began by explicitly framing our goal.

OUR GOAL

In this project, we seek to identify the best private-sector business and finance opportunities, with interested participants, realistic incentives, alignment with government policy, community support, and significant impact toward meeting the SDGs.

The steps below helped us organize our time so that we could gather the most useful information, ask the most relevant questions, and ultimately whittle down our project list from 35 to five. We gave our researchers the following prompts:

Step 1.
Define the Problem

Define the problem that we seek to help solve. For example: "How does NYC achieve sustainable mobility, and how can the private sector invest?"

Step 2.
Narrow the Focus

For example, we sought to narrow our broad focus on sustainable mobility by investigating NYC's green transportation options. This then helped us to envision opportunities already identified by others for reducing carbon emissions from transportation, including:

- Reducing vehicular travel
- Electrifying cars, buses, and trucks
- Improving public transportation
- Expanding resources for pedestrian and bicycle transportation

Step 3. Outline the Ecosystem

For each of our six focus areas, we identified relevant NYC public-sector organizations, private-sector companies, and NGOs including environmental justice organizations, and noted the key players and relationships. We reviewed government policy goals at the city and state level, recent legislation, and related reports, and identified community organizations that might be interested in collaborating with us.

This stage included identifying experts who might help us learn about the new terrain. We also researched potential investors, including those who had helped with similar impact-driven projects in the city.

Step 4. Provide Relevant Statistics to Quantify the Opportunities

As we identified and defined each ecosystem, we looked for relevant statistics to quantify "the size of the prize"—i.e., potential impact—and prioritize our focus within each area.

Below are some examples of questions we asked:

- For our Decarbonizing NYC's Built Environment project: What is the current impact of the problem and the solution in terms of carbon-emissions levels?
- For our Equitable Commute Project: What are the economics of the problem in terms of lost income from lengthy commutes and reduced economic mobility?
- For all projects: Other than our primary focus, are there other SDGs that may align, such as Good Health and Well-being (3), Decent Work and Economic Growth (8), and Sustainable Cities and Communities (11)?
- What are current trends and projections for growth in each area? E-bikes, for example, are projected to be a $40 billion market by 2030.

Step 5. Identify the Hurdles

Consider why this problem has yet to be addressed. What has impeded investment? Increasing cycling—micromobility—provides an opportunity for sustainable mobility, for example, but the barriers include:

- Safety concerns for prospective cyclists, due to NYC's limited protected bike-lane infrastructure
- The limited capacity of many New Yorkers to ride, due to age or physical fitness
- The unaffordability of e-bikes for lower-income New Yorkers
- The lack of a trained green workforce to support the growing micromobility industry

Step 6. Identify Expert Resources

Consider who may be most useful to interview. Can they help validate your findings and challenge market perceptions of the problems and their solutions? What is their degree of influence and potential interest?

List additional people and organizations, beyond your key players, who may be able to share subject-matter expertise and provide feedback.

Step 7. Explore Other Relevant Efforts and Benchmarks

Consider what other cities and players, both in and outside the United States, are doing to tackle the problem. Are there best-in-class examples among them?

Who are the key players in these other cities that could potentially be engaged in your locale?

Have groups in other cities identified effective technologies that might be deployed in your community?

Step 8. Identify Potential Financial Stakeholders

Consider which financial institutions or other investors may be involved, as well as their investment focus and capital capacity.

What are their particular areas of interest or expertise?

Who, if anyone, is developing innovative financial approaches, and how are these approaches working?

Step 9. Identify Existing and Potential Projects That May Address the Problem

Are there proof-of-concept projects being piloted in your region or elsewhere? Are there active projects that just need financing and/or private-sector engagement to reach scale?

Do these projects offer workforce opportunities or community advantages? Are there any other significant SDG impacts?

Are there interesting ideas that might be developed as projects (considering where there are interested key players, realistic business incentives, and alignment with government policy and community support)?

Step 10. Compile the Research

Next, take the research and synthesize it into a report that will guide project identification and development. Our initial wide-ranging research resulted in the following papers that detailed the ecosystem for each of our six focus areas:

- The Built Environment
- Climate Resilience
- Food and Health
- Renewable Energy
- Sustainable Mobility
- Waste

Step 11. Outlining and Prioritizing Potential Projects

Our project outline template, sample project outline, and the criteria that we used to prioritize potential projects may provide a starting point for others interested in doing similar work.

Project Outline Template

Sample Project Outline – Geothermal Retrofits

We evaluated each potential project through different lenses: how it might meet the SDG targets, and how it might further the goals of government agencies, the community, and potential private investors. Did the project match the Venn diagram nexus?

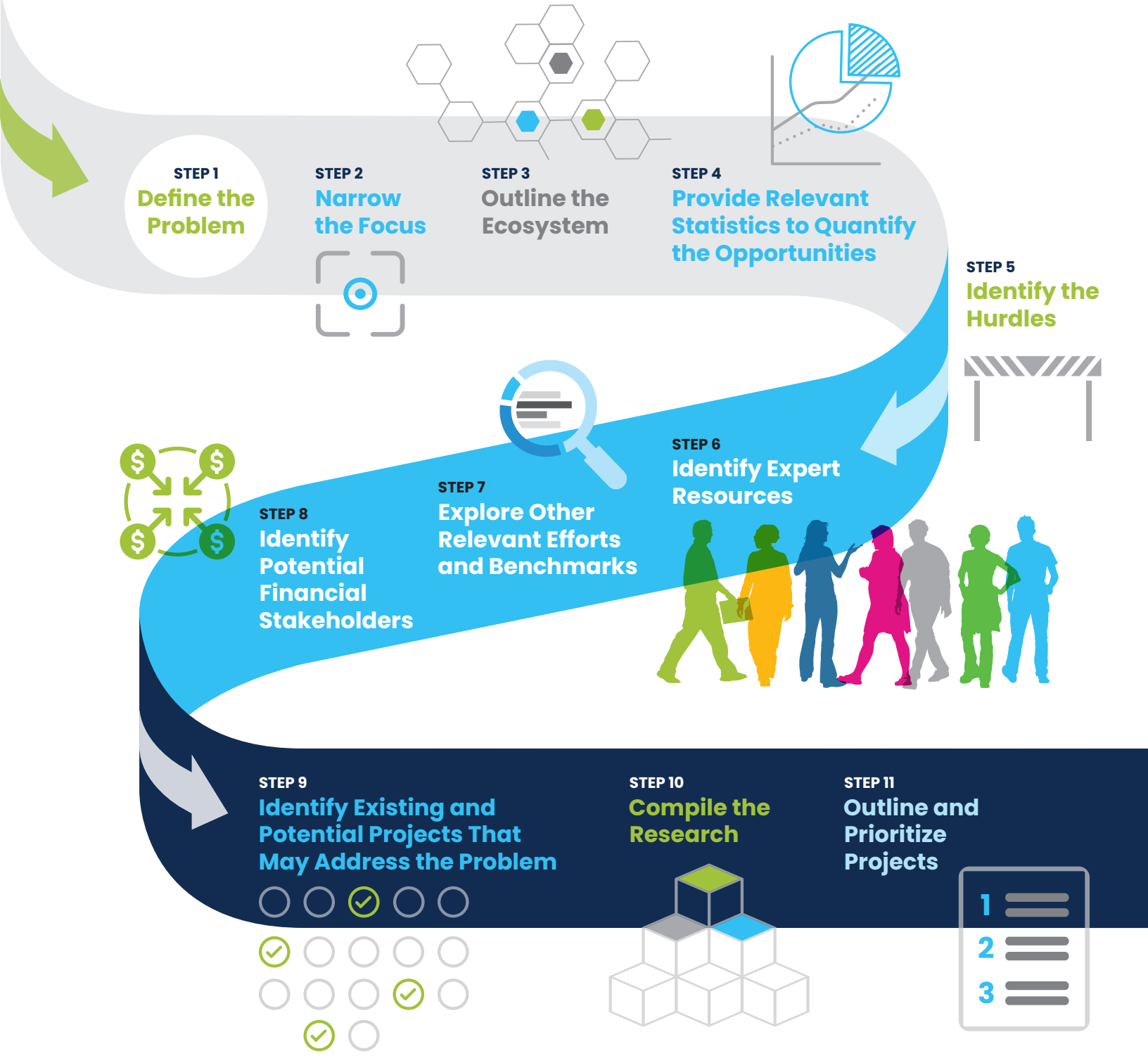
Finally, we applied 10 additional criteria:

- Aiding COVID-19 recovery
- "Do-ability"
- Interested parties
- Value of the business opportunity
- Potential for job creation
- Ability to address multiple SDGs
- Impact on greenhouse gas emissions
- Scalability and replicability
- Potential to serve as a demonstration and inspiration (PR effect)
- Innovative/systematic change

Measuring Impact Once Your Projects Are Operating

United for Smart Sustainable Cities (U4SSC) has developed key performance indicators for cities that are working to advance the SDGs. This global UN initiative also provides a methodology to help cities measure progress toward the SDGs. Its 91 key performance indicators fall into three categories: the economy, the environment, and society and culture.

The Research Pathway



Conclusion:
An End to Investment Inertia?

Despite trillions of dollars available, "investable" projects are few—but social-impact entrepreneurs can chart the way

The world is quickly running out of time to take meaningful action to save our planet.

Hurricane Ian's historic damage to Florida in September 2022 was only the latest reminder that the human toll from climate change is bound to worsen unless we take major steps to reduce greenhouse gas emissions. And the turmoil engendered by the COVID-19 pandemic, followed by the Russian assault on Ukraine and its impact on food prices and supply, have all underscored the vulnerabilities of our food system. Similar developments are certain to exacerbate not only sustainability crises but our enormous social inequities.

Globally and locally, people are urgently seeking solutions, with no lack of ambitious goals.

United Nations member states and local, state, and federal government agencies throughout the world have spent a staggering amount of time and resources churning out sustainability plans. Yet in all too many cases, these goals and plans lack the essential ingredient of clear and actionable roadmaps.

Immense capital is available for progress toward sustainability.

Many leading multinational corporations have explicitly embraced the UN Sustainable Development Goals (SDGs), in their websites, press releases, and corporate responsibility reports. Amazon, Barclays, Etsy, Facebook, Google, HSBC, IBM, L'Oréal, Nielsen, PepsiCo, Pfizer, SAP, Sony, Telefonica, and Unilever, among others, have joined UN efforts to promote the goals and report on their progress. (See businessfor2030.org.)

On Wall Street, many major financial institutions have made large green finance commitments. Bank of America set a target of $1.5 trillion to finance sustainability projects by 2030, while J.P. Morgan pledged $2.5 trillion over 10 years. BlackRock committed $1 trillion, and Goldman Sachs pledged $750 billion. These pledges fuel the hope behind the notion of "billions to trillions," a phrase coined by the World Bank in 2015 to describe how roughly $135 billion a year spent by governments and international agencies on development assistance might catalyze trillions in private investment to make progress toward the SDGs. But there is also money to be made in pursuing the SDGs—with as much as $12 trillion per year in new business opportunities, according to the Business & Sustainable Development Commission, a UN-supported group.

Even World Bank officials, however, acknowledge the fundamental obstacle that's in the way of progress.

"We need to radically rethink how we unlock resources and connect the billions of dollars in official development assistance (ODA) to trillions in investment of all kinds, public and private, national and global," said Bertrand Badré, the World Bank Group's chief financial officer, in 2015.

Seven years later, we're still waiting for that radical rethinking.

The challenge is more complex than simply matching social needs to existing pots of money. Much of those desirable trillions in private-sector funds are held back by a lack of what the private sector regards as "investment-worthy" projects. The Global Impact Investing Network 2020 Annual Impact Investor Survey found that many investors don't even know about the range of sustainably oriented opportunities that exist. But they do know this: they intend to prioritize projects that fit a specific investment model, yield a desired financial return, or have suitable exit options in case things don't pan out.

To a woeful degree, governments have yet to adequately understand the private sector—and vice versa.

This is a global challenge and has also been our mandate for Invest NYC SDG. We need to bridge the gap between government sustainability plans and private-sector investment criteria. Making matters more complicated in the United States, we lack the tradition and apparatus of multilateral institutions like the World Bank and International Monetary Fund that have generated large sums of capital for project development in developing nations.

We *do* have an increasingly robust venture capital community that is making bets throughout the world on innovative renewable energy sources and other technological advances related mostly to green energy.

Just last May, Al Gore's venture-capital firm launched a $1.7 billion fund that's meant to profit from the "sustainability revolution." A fund backed by Bill Gates aims to invest $15 billion in "clean tech." New technologies are certainly needed, but we're seeking another, more complex sort of moonshot: new *projects*, mostly in local settings, that direct resources to help solve problems in real time. In other words, while we appreciate the creative energy behind the discovery that ground-glass pozzolan can replace fly ash to make a stronger kind of concrete with less waste and fewer greenhouse gas emissions, we also need the energy—and the funds—to push through the red tape of NYC land-use agencies to find and secure a viable site for such a plant. This sort of effort requires new types of collaboration between private capital (both business and finance), public agencies, and interested philanthropies. All of these sectors should have representatives at the table, from the earliest definition of goals and the development and financing of projects, to regular reporting on their progress. Within each project, planners must also ensure that the private sector can meet its own needs for reasonable returns and manageable risks.

Of course, some worthy projects won't meet these criteria—at least not in the short run.

That's why we hope to see bold innovations, both here in the U.S. and throughout the world, to augment our supply of "concessionary capital": low-interest loans, grants, equity funding, and other types of seed money that elsewhere in the world has typically come from major development banks and multilateral funds.

This list includes the powerful resources of **impact investors**, a growing force for change in global finance. As we have previously explained, impact investors accept lower rates of return for investments that create social and environmental benefits. They don't entirely give up on the prospect of financial return but instead make calculated tradeoffs between risk, return, and impact. We are encouraged by recent developments, such as the MacArthur Foundation's Catalytic Capital Consortium, which aspires to bring together global impact investors to produce a more organized response to the enormous demand for their funds.

We must expand the pool of available concessionary capital so that we can develop and accelerate those innovative local projects that can help us solve our biggest global challenges.

Some of these new resources should come from government agencies and philanthropic organizations. These entities can help create "blended capital" by using their more "patient" risk capital to develop brand-new projects, offering traditional investors incentives that may lower the risks of their contribution.

Throughout his recent campaign, Mayor Adams stressed his commitment to sustainability and his interest in working with business leaders. We have faith that we can work together to help create a new playbook for this sort of blended finance.

Our four years of efforts have identified obstacles, but also revealed new opportunities.

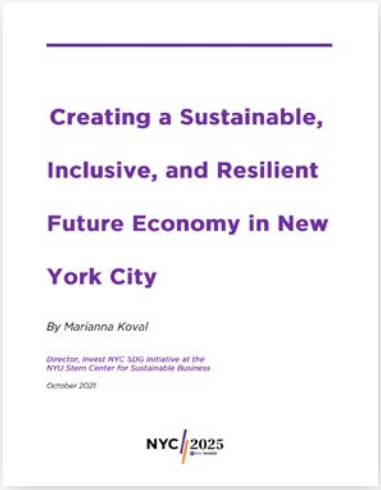
Initiatives like ours are still relatively few, but could help address many of the problems that stymie the development of impactful sustainability projects. We can find, create, and develop such projects and make sure that government agencies, philanthropies, and traditional investors have opportunities to be involved. We can also help cement collaborations between the private and public sectors to create transformative change.

Most broadly, we have illustrated the power of a small team of motivated advocates, blessed with the resources of a major university, to identify and prepare projects that expeditiously address social and environmental goals in ways that can interest and engage private investors. Our private-sector partnerships have helped raise capital that kept us up and running. Our work with students has nurtured the next generation of sustainability-minded business leaders. The collaborations we have pioneered across the public and private sectors provide a model that is applicable to many other cities.

As we continue with our work, we hope that future city administrations, NGOs, and business leaders in and outside NYC will join with us to create a more sustainable and equitable future, one community at a time.

APPENDIX A

Successful Sustainability Planning for Private-Sector Investment: A Policy Proposal



As New York City prepared to welcome a new mayoral administration in the fall of 2021, the NYU Wagner Graduate School of Public Service sought policy proposals to create a stronger and more equitable city. Invest NYC SDG Director Marianna Koval submitted our recommendations in this report: "Creating a Sustainable, Inclusive, and Resilient Future Economy in New York City."

APPENDIX B

Glossary of Finance Terms

Below we list brief explanations of several finance terms used in this report and in the sustainability field at large.

Blended Finance

Blended finance combines "concessionary" or "catalytic" capital (usually public or philanthropic funds from governments, foundations, nonprofits, or development banks), with impact (generating positive social or environmental impact beyond financial returns) and full-return private capital (such as money from pension funds, insurance companies, or banks). "Blending" helps attract private finance. Since concessionary capital accepts a lower (sometimes zero) return, the borrower can then pay a higher return to the private, for-profit finance provider. Currently, most blended finance partnerships occur in developing countries.

Community Development Financial Institutions

Community Development Financial Institutions (CDFIs) are private financial institutions with a primary mission of promoting community development in low-income and economically distressed communities through individual and small-business lending and outreach programs. CDFIs can be structured as community development banks, credit unions, loan funds, or venture capital funds.

Concessional Finance

The World Bank defines concessional finance as "below-market rate finance provided by major financial institutions, such as development banks and multilateral funds, to developing countries to accelerate development objectives." The term does not represent a single mechanism or type of financial support but includes a range of below-market rate products used to promote a climate or development objective. The most common forms of concessional finance are loans, grants, and, on a more limited basis, equity investments. For example, the $11 billion Climate Investment Funds (CIF) was created by G8 and G20 countries in 2008 and works exclusively through six multilateral development banks to provide concessional financing in 72 middle- and low-income countries for projects that reduce greenhouse gas emissions.

Credit Enhancements

Credit enhancements reduce the risk of loss to lenders and investors, encouraging them to put money into unfamiliar markets or products. They also encourage lenders to reduce interest rates or provide longer loan terms to borrowers. Credit enhancements can take different forms, including providing additional collateral (through a loan-loss reserve (LLR) or debt-service reserve), obtaining third-party assurance of payment (through a loan guarantee or loan-loss insurance), or prioritizing a lender's repayment order (through a subordinated or senior capital structure).

ESG Funds

ESG funds are equity and/or bond portfolios for which environmental, social, and governance (ESG) factors have been integrated into the investment process. There are more than 600 ESG funds and ETFs (exchange-traded funds) based in the U.S—for example, Vanguard's FTSE Social Index Fund, which is the largest ESG-screened index fund in the U.S.

Green Banks

Green banks are typically quasi-public entities (they can also be public, nonprofit, or independent private entities) that invest in and mobilize additional capital for green (low-carbon, climate-resilience) projects. Green banks mix low-cost public financing with private-sector funds to deliver cheaper financing, as public funds mitigate risk, and help to structure investments to induce private investment. For example, NY Green Bank is a state-sponsored, specialized financial entity working with the private sector to increase investments in New York's clean-energy markets to develop a more efficient, reliable, and sustainable energy system.

Green Bonds

Green bonds are fixed-income instruments that are earmarked to raise money for climate- and environmentally-friendly projects. They are issued by municipal entities, the private sector, or multilateral institutions. For example, green bonds may be issued to fund "renewable energy and energy-efficiency projects, clean public transportation, pollution prevention and control, conservation, sustainable water and wastewater management, and green buildings."

Impact Investing

Impact investing is generally considered investment that intentionally creates social or environmental benefits alongside some level of financial return. For example, private equity company TPG Capital's Rise Fund invests in companies like Little Leaf Farms, an indoor farming company that produces locally grown lettuce using 90% less water than conventionally grown lettuce—benefits that go beyond return on investment.

Patient Capital

Patient capital is another term for long-term capital. With patient capital, investors are willing to make a financial investment in a business without the expectation of turning a profit quickly, in anticipation of more substantial returns later on. Examples of patient capital include pensions, sovereign wealth funds, and university endowments.

Risk Capital

Risk capital refers to money or assets allocated to speculative activity, used for high-risk, high-reward investments, and exposed to a high risk of a loss in value. Risk capital is typically used for speculative investments in penny stocks, angel investing, private lending, futures and options trading, private equity, day trading, and swing trading of stocks and commodities.

Sustainability Bonds

Sustainability bonds are a bond instrument whose proceeds will be exclusively applied to finance or refinance a combination of green and/or social projects or activities. These bonds can be issued by companies, governments, and municipalities.

Sustainable Investing

Sustainable investing is an investment approach that attempts to deliver long-term sustainable financial return by encompassing a wide spectrum of approaches, the core of which starts with incorporating ESG information.

Venture Capital

Venture capital (VC) is a form of private equity and a type of financing provided to startups and small businesses that investors believe have long-term growth potential. VC generally comes from personal investors, investment banks, and other financial institutions.

Venture Philanthropy

Venture philanthropy taps traditional venture capital (VC) to achieve philanthropic goals. Venture philanthropy is often engaged in by charitable startups, green companies, or B Corporations (companies that have been certified as meeting the environmental and social standards set forth by the nonprofit B-Lab).

APPENDIX C

In the Wings

In addition to the five center-stage projects highlighted in our report, we have also developed the following six projects that need a little more work before they are ready to debut.

SDG TARGETS:

NYC GOALS:

Healthy Corner Stores

This project seeks to expand the availability of healthy, affordable food in NYC's 13,000 (and counting) corner stores, which are largely minority-owned and often the only convenient food sources in many neighborhoods. In partnership with City Harvest (a Brooklyn-based nonprofit that is New York City's largest food rescue organization), NYU Steinhardt's Department of Nutrition and Food Studies, and a multi-stakeholder working group—and building on small-scale programs active elsewhere in the United States—we propose a pilot project to lay the groundwork for commercially viable and scalable healthy-food supply chains for small stores.

Suppliers of healthy food, including fresh produce, grab-and-go foods, and nutritious sandwich ingredients, often have minimum order requirements that are too high for small stores. Our pilot would surmount this barrier by introducing an additional link in the food supply chain: a project manager or broker to connect suppliers and distributors with corner stores, aggregating orders to meet minimum order requirements. This pilot would also encompass training, to familiarize store owners with best practices for ordering and merchandising new products, marketing and promotion of healthy food offerings, and data collection and evaluation to measure impact.

Based in the Hunts Point neighborhood of the Bronx, the pilot would not only align with the city's goals in the Hunts Point Forward development plan, launched in 2022, but also serve as a model for subsequent citywide expansion. We are currently in talks with distributors, the community-based organizations Bronx Health REACH and BronxWorks, and the Bodega and Small Business Group to secure support for this project.

PITCH DECK

SDG TARGETS:

NYC GOALS:

NeighborMade

In partnership with Green City Force (GCF), an AmeriCorps nonprofit that teaches green skills to low-income NYC youth, and the New York City Housing Authority (NYCHA), we organized an NYU Stern MBA pitch competition to bring food and agriculture entrepreneurship to NYCHA communities. The winning concept, NeighborMade, envisioned a network of small, high-tech indoor farms on NYCHA campuses. The farms would be commercial businesses, supporting the creation of generational wealth for NYCHA residents, while providing new opportunities for GCF's training programs and creating a source of products for a linked, value-added commercial food business (selling salads, sauces, and other food items). Working with the winning MBA students, our team developed a plan for a new business that would support the mission of GCF.

We outlined a business plan for a partnership between NYCHA, a managing nonprofit organization (such as The Campaign Against Hunger or GCF), and one or more "big sister" food or restaurant brands whose representatives could help NYCHA entrepreneurs sell products created using hyperlocal, NYCHA farm-grown produce. We would need to model in more detail the overall startup and operational costs of a modular vertical farm on NYCHA properties, possibly in collaboration with Agritecture, with whom we have worked in the past. We would also need to collaborate on a community plan to engage NYCHA residents, select a pilot site, and adapt the farm plan to that site.

Together with NYCHA and GCF, we identified a BIPOC-led farm, organized as a worker cooperative, that is actively pursuing a similar NYCHA-engaged strategy in the South Bronx. This project, ReBORN Farms, controls a high-tech rooftop greenhouse on top of a NYCHA building and has support from the city and the NYCEDC to expand to a nearby site to create a ground-level modular farm. We are now in talks with ReBORN to help them launch a linked indoor farm and value-added food business in the South Bronx.

PITCH DECK

SDG TARGETS:

NYC GOALS:

Healthy Neighborhoods, Active Living

Early Childhood

Healthcare Access

Food as Medicine

Food as Medicine (FAM) refers to programs focused on the link between nutrition and health, including medically tailored meals and fresh fruit-and-vegetable prescription programs, such as Produce Rx. Produce prescription programs have helped treat chronic illnesses such as diabetes and heart disease, but no general preventative program exists. We are looking at solutions that engage the private sector to increase the flow of subsidized healthy foods to people who can most benefit from them and prevent chronic, expensive, food-related illnesses. Two years of research and stakeholder outreach suggest that the greatest opportunity lies in identifying a stable cohort of privately insured employees and piloting a FAM program where a private insurance company can see the financial savings they derive from *preventive* food prescriptions for those who are most at risk of chronic diseases caused by poor nutrition, like diabetes and heart disease.

We want to test a new program that encourages physicians to write "food Rxs" for at-risk New Yorkers, to be filled at pharmacies (such as CVS) and paid for by private insurers (such as Aetna). A preventative "Food Pharmacy" program is ambitious, but evidence suggests that it could improve health outcomes, while saving money for healthcare providers. Invest NYC SDG is considering whether a pilot would be best launched in NYC or upstate New York. Our next steps:

- Create partnerships—with an insurer, pharmacies, and vendors
- Develop partnerships with community-based organizations—drawing from our existing relationships and building new ones
- Partner with other technical experts—leaning upon the NYU system (e.g., the NYU School of Global Public Health, the Nutrition and Food Studies Department at NYU Steinhardt, the NYU Grossman School of Medicine, NYU Langone Health, and the NYU School of Law)
- Quantify potential impacts—business, community, and individual
- Design the pilot—select target geography and population, engage the community, and seek funding for implementation

PITCH DECK

SDG TARGETS:

NYC GOALS:

Supporting a High-Performance Construction Database to Accelerate Decarbonization of Buildings in NYC

"Passive House" is a voluntary standard for energy efficiency in building construction and renovation. Developed in Germany in 1996, and not limited to residential construction, Passive House employs principles such as constructing airtight buildings with double- or triple-paned windows and doors to reduce energy requirements and greenhouse gas emissions as much as possible. In 2019, New York architect Michael Ingui launched the Passive House Accelerator to catalyze use of these practices. The company has since become a leading advocate for Passive House construction and decarbonization of buildings.

Two major obstacles, however, inhibit broader adoption of energy-efficient and low-carbon construction methods: workforce skills and product access. Invest NYC SDG began working with the Passive House Accelerator team in 2021 to help them develop Source 2050, an unprecedented curated marketplace of energy-efficient and high-performing construction products. This soon-to-be launched initiative will help architects, contractors and engineers find and buy products to achieve their energy-efficient goals, while collaborating to improve future practices.

We sponsored the Passive House Accelerator team for the Capstone Program of NYU Tandon's Center for Urban Science and Progress (CUSP), providing them with a team of three data-science students and a faculty mentor to develop the Source 2050 platform. The CUSP team has been key to getting Source 2050 ready to launch. We continue to support the Passive House Accelerator and Source 2050 team by helping them find investment to launch the platform.

SDG TARGETS:

NYC GOALS:

Organic Processing via Anaerobic Digesters and Public-Private Partnerships

Invest NYC SDG is working to build a circular economy for the two-million tons of organic waste that NYC produces each year, which could help reduce greenhouse gases, achieve the city's goal of zero waste to landfill by 2030, and capture the residual value in organic waste. As part of this work, we have collaborated with the Port Authority of New York/New Jersey (PANYNJ) to support sustainability planning for organic-waste processing. We provided research and recommendations from best-in-practice airports throughout the world and matchmaking with innovative anaerobic-digestion (AD) systems and composting opportunities. We have since been examining long-term and short-term solutions for organic-waste processing, including co-digestion at NYC DEP wastewater resource recovery facilities (WRRFs), the use of institution-sized anaerobic digestion, and composting at commercial scale. We met four times with DEP leadership to explore opportunities for public-private partnership to attract private capital for the upgrading of NYC DEP's co-digestion capacity (simultaneous anaerobic digestion of multiple organic wastes in one digestor) at its 14 NYC WRRFs, which would contribute to the department's carbon-neutrality plan. We also explored various AD technologies that can be piloted at PANYNJ airports, and met with PANYNJ and the Queens Country Farm Museum to pilot a program to compost organic waste from JFK airport at the Queens site.

PITCH DECK

SDG TARGETS:

NYC GOALS:

Reducing the Carbon Footprint of NYC's Cultural Institutions

Invest NYC SDG developed a strategy to install geothermal energy at The Metropolitan Museum of Art and the American Museum of Natural History, respectively the third and 13th largest users of energy among NYC-owned buildings. Both are cultural organizations housed in NYC-owned buildings on NYC-owned land, with annual utility bills that are paid by the City of New York. Geothermal heat pumps (GHPs), a widely applicable technology, would substantially reduce energy consumption. Deploying power-purchase agreements (PPAs) at these two museums to purchase geothermal energy could serve as a model for other cultural institutions that operate in public facilities, as well as other city-owned buildings.

PITCH DECK

APPENDIX D

On the Drawing Board: Future Opportunities

We have identified six additional projects—which are still on the drawing board—that meet our requirements of matching SDGs, NYC targets, and investor concerns.

SDG TARGETS:

NYC GOALS:

Building a Sustainable E-Commerce Delivery System

Electric or hybrid barges, in conjunction with e-cargo bikes, could reduce vehicle emissions, optimize traffic, increase freight capacity, and conserve NYC roadway infrastructure, providing a more sustainable way of moving freight. From June 2020–August 2021, we worked with private-sector investors, the NYCEDC, and the NYC DOT to develop an improved system for e-commerce parcel deliveries via marine-based transportation, with e-cargo bike last-mile involvement, focusing on links from Hunts Point and Red Hook (major e-commerce distribution hubs) to Midtown Manhattan. We also investigated electric barges, such as those developed and operated by ZULU Associates in Western Europe for zero-emission operations on inland waterways, and short sea and coastal routes. Our objective would be to encourage collaboration between marine operators and NYC government, as well as with private entities that control NYC docks. In July 2021, we met with major e-commerce shippers who invited proposals, while we also worked to develop a small pilot project with the Captain Ben Moore, the first hybrid cargo vessel in the U.S.; a seafood distributor at Hunts Point; McInnis Cement Marine Terminal; and the NYCEDC.

PITCH DECK

SDG TARGETS:

NYC GOALS:

Developing Large-Scale Solar in Affordable Housing

This project proposes to expand the deployment of solar in NYC to comply with long-term LL97 energy-efficiency mandates and demonstrate the value of the PPA model.

As part of this work, we partnered with a mission-based solar developer, Sunlight General Capital, to finance and construct a major community solar installation at Rochdale Village, a housing cooperative and neighborhood in southeast Queens that describes itself as the world's second-largest affordable-housing complex. The village has 120 acres, 20,277 residents, and its own 21-megawatt (MW) cogen power plant that in 2017 emitted 69,719.2 metric tons of CO2 from 1,309,145,209 kBtus of natural gas. Sunlight General Capital provided the co-op with a proposal to install solar panels and generate upwards of 10 MW of community solar energy, but the Rochdale Village co-op board and property management company decided instead to solicit other proposals from solar installers.

PITCH DECK

SDG TARGETS:

NYC GOALS:

Supporting Economic Recovery and a Robust Energy-Efficiency Market With NYC Green Jobs–Training and Placement

New York City's Climate Mobilization Act is predicted to create tens of thousands of new, skilled jobs to audit, install, and run the energy-efficient and smart-building technology required in building construction. Increasing energy efficiency depends just as much on how buildings are run as on how they are built, and NYC lacks a technically sophisticated workforce to do this. The Invest NYC SDG team worked with a variety of industry and philanthropic players to understand how to close this gap—investigating workforce training and placement through private sector–funded apprenticeships. The team learned that existing workforce development programs are often misaligned with industry needs or fail to include a job-placement component. Individuals usually attend multiple community colleges and training programs before securing a job and often lack a plan to progress with their career. On the industry side, construction and property-management firms and HVAC providers face an aging technician workforce and difficulty in finding new employees. There is a clear need to loop private companies into curriculum development and training, to improve existing workforce-development training and placement programs. We proposed a three-way privately funded partnership to establish a program that uses an employer-driven skills-based curriculum and is collaboratively operated by a community college or nonprofit, and a private-sector or nonprofit manager.

PITCH DECK

SDG TARGETS:

NYC GOALS:

Early Warning System for Heat and Flooding Emergencies

New York City faces increasing emergencies from the direct and indirect impacts of climate change, requiring early warning and rapid-response systems. Current city response teams are routinely overwhelmed by calls and social-media posts that, if not properly analyzed, can simply become distractions instead of providing helpful information. A much more useful data-analysis and alert system could be designed using advanced AI and algorithmic engines. Dataminr, one of New York's top technology firms, has developed an advanced AI platform that detects the earliest signals of high-impact events and emerging risks. It captures alerts on public social-media data or in public sensor data such as machine transmitters on aircraft. Its data output can record and analyze key indicators and send early warnings to critical populations, such as first responders, businesses, and institutions. Key indicators could include, for example, a NYC map to show the frequency of "citizen-reported" water- or heat-related events across social media and other real-time platforms. When used with temperature readings, this information could identify neighborhoods with the greatest need, and be invaluable to property owners, hospitals, retail stores, and any private business that is at risk of harm to their assets, supply chain, or personnel. We held several meetings with representatives of the NYC Mayor's Office of Climate and Sustainability to explore a collaboration with Dataminr, but the proposal has not moved forward.

PITCH DECK

SDG TARGETS:

NYC GOALS:

Accelerating Community Solar from Municipal Buildings

Invest NYC SDG sought to accelerate NYC solar power beyond its current 1%, reduce greenhouse gas emissions, and reduce the energy costs of lower-income communities by unlocking the solar capacity of NYC-owned buildings. We studied NYC's unmet goal of generating 100 MW of solar on municipal buildings by 2025, and found that only about 30 MW had been completed or was in progress. Of the 2,008 buildings evaluated by the city, 1,579 city-owned roofs were deemed as "non-solar ready"—often due to poor conditions resulting from deferred maintenance. Yet these roofs represent an additional potential capacity of roughly 115 MW. We also found that it is not economically feasible to install solar to provide energy to a city-owned building. That's because a state agency, the New York Power Authority (NYPA), provides NYC buildings with energy at a 30-40% discount, which is much cheaper than solar energy. Other impediments to increasing rooftop solar power are labor-union agreements and prevailing wage requirements, as well as the complexity of NYC contracting and procurement processes. Our proposed solution is to implement a new lease/concession model, in which private-sector solar developers include needed roof repairs in solar installations and generate community solar systems that can sell the electricity generated at a discount to local low-income communities.

This proposal did not move forward during the final year of the de Blasio administration, but may find legs with Mayor Adams, who has said that carbon reduction should begin at home, with NYC's own municipal buildings.

PITCH DECK

SDG TARGETS:

NYC GOALS:

Housing

Thriving Neighborhoods

Healthy Neighborhoods, Active Living

Micro-Living and Co-Living Opportunities for Affordable Housing

Over the past 20 years, the average rent for NYC apartments has increased by nearly 40% while average incomes have increased by less than 15%. Meanwhile, nearly one million extremely low-income NYC households must compete for the barely 400,000 affordable units that are available. Creating lower-cost micro-living and co-living units could help NYC reach its goal of boosting affordable housing by 200,000 units by 2022, and 300,000 units by 2026. Potential solutions include various shared-living arrangements, where residents share common areas (analogous to college dorms) but have their own bedroom and bathroom. Student researchers found strong interest in New York City to test these ideas and their scalability, including Carmel Place, a modular housing and micro-living multifamily building built in the Kips Bay neighborhood of Manhattan, and an initiative called ShareNYC.

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OUR STEERING COMMITTEE*

Lindsay Clinton
Executive Vice President, NYCEDC

Lara Croushore
Chief of Staff, NYC Office of Climate Policy and Programs

Sander Dolder
SVP Industry and Economic Innovation, NYCEDC

Miles Draycott
Former Chief Risk Officer, NYC Retirement Systems

Jeff Gitterman
Co-Founder, Gitterman Wealth Management

Will Kennedy
Senior Program Officer, United Nations Fund for International Partnerships

Micah Kotch
Managing Director, URBAN-X

Nilda Mesa
Director, Urban Sustainability and Equity Planning, Columbia University Center for Sustainable Urban Development

Tom Outerbridge
President, Sims Municipal Recycling, Sims Metal Management

Frances Resheske
SVP Corporate Affairs, Con Edison

Aniket Shah
Managing Director and Global Head of ESG and Sustainability Strategy, Jefferies Financial Group

Isabel Verkes
Sustainable Investment Data Research, Arabesque

John Williams
Chairman and CEO, Impact Infrastructure

** Titles and organizational affiliations reflect committee members' positions at the beginning of our collaboration.*

OUR FUNDERS

Con Edison
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OUR STUDENT RESEARCHERS:

NYU

Nico Ampuero
Haiqiang An
Natalie Aresta-Katz
Thu Aung
Lotus Belle-Glover
Karina Bhakta
Maria Krizia Bilbao
Carly Cabral
Inti Robinson Campbell
Alexander Cao
Alejandro Cardona
Karen Chu
London Clark
Michael Connors
Anna Corey
Christina Curry
Riya Kishor Dedhia
Ligia Deschamps
Taylor Donegan
Alan Fang
Natalie Friedman
Rosalie Garro
Danting He
Sally Ho
Rohan Kalyani
Huanran Kong
Michelle Lapadula
Harry Leoncio Rios
Yuanzhe Luo
Susan Mathew
Ashlynn McCool
Abigail Melissen
Katherine Merifield
Parker Reposa
Raquel Rodriguez
Megan Rose
Jeremy Rucker
Hendrik de Ruiter
Sevastian Sanchez
Yasmin Smeets
Diana Striplet
Emma Thomsen
Ashley Torres
Anique Toscano
Arati Venkatram
Max Wang
Shiny Weerakoon
Sophie Weiss
Gianna White
Lu Yii Wong
Patrick Wu
Xiaolin Yi
Weiya Yuan
Dingrui Zhang
Yuetong Zhou

BROWN UNIVERSITY

Devyn Collado
Sophie Purdom
Patrick O'Rourke Reed
Ella Warshauer

CORNELL UNIVERSITY

Synnie Cao
Catheryn Ojinika Ibegbu
Cecilia Theodosy Msogoya
Avery Quinn Sirwatka
Hao Tang
Naimisha Vidavalapati
Joyce Duyen Vu

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Vishal Baijal
Global Head of Data & Analytics, ESG, Venture Capitalists*

Peter Erwin
Associate Director, NYC Energy Efficiency Corporation (NYCEEC)

Kapil Hinduja
Lead Software Engineer, Impetus

Fred Lee
Co-CEO, NYCEEC

Susan Leeds
Founder, CEO Emeritus, and Member of the Board of Directors, NYCEEC

Ayan Majumder
IS Technical Specialist, Huntington National Bank

Marketproof

MBS Data

NYC Mayor's Office of Climate and Sustainability

Zachariah Rosenberg
Senior VP of Technology, Walker & Dunlop

Bruce Schlein
Director, Global Head of ESG, OMERS Infrastructure

Sujesh Sukumaran
Senior Engineer, American Express

Daniel Zarrilli
Chief Climate Policy Advisor and *OneNYC Director,* City of New York

** Titles and organizational affiliations reflect committee members' positions at the beginning of our collaboration.*

ADDITIONAL THANKS TO OUR REVIEWERS:

Alison Berg
Associate Director of Communications, NYU Stern Center for Sustainable Business (CSB)

Max Bouchet
Senior Project Manager and *Senior Policy Analyst, Center for Sustainable Development,* Brookings Institution

Cristina Bueti
Counsellor, International Telecommunication Union

Kendall Christiansen
Principal, Gaia Strategies

Miles Draycott
Invest NYC SDG Steering Committee Member, NYU Stern CSB, and *Former Chief Risk Officer,* NYC Pension Funds

Melinda Hanson
Founder and *Principal,* Brightside Strategies

Will Kennedy
Senior Programme Officer, UN Office for Partnerships

Wythe Marschall
Senior Research Project Manager, Invest NYC SDG at NYU Stern CSB

Tony Pipa
Senior Fellow, Center for Sustainable Development, Brookings Institution

Alexander Puutio
Senior Expert, Office of the Assistant Secretary-General, United Nations

Divya Subramanian
Associate Director, Invest NYC SDG at NYU Stern CSB

Chester Van Wert
Associate Research Scientist and *Adjunct Assistant Professor,* NYU Stern

Dominic Wilhelm
Executive Director, United Leaders Centre, United Cities

Center for Sustainable Business
NYU Stern School of Business
44 West Fourth Street, Suite 8-190
New York, NY 10012

www.stern.nyu.edu/sustainability