

Newlab



Turning Waste into Wealth: Driving Innovation in Puerto Rico's Circular Economy



About Invest Puerto Rico

Mandate

Invest Puerto Rico was created by Act 13-2017 as the official **business attraction** organization for the island, utilizing the expertise of the private and public sectors.

Mission

Promote Puerto Rico as a **competitive investment jurisdiction** to attract new business and capital investment to the island.

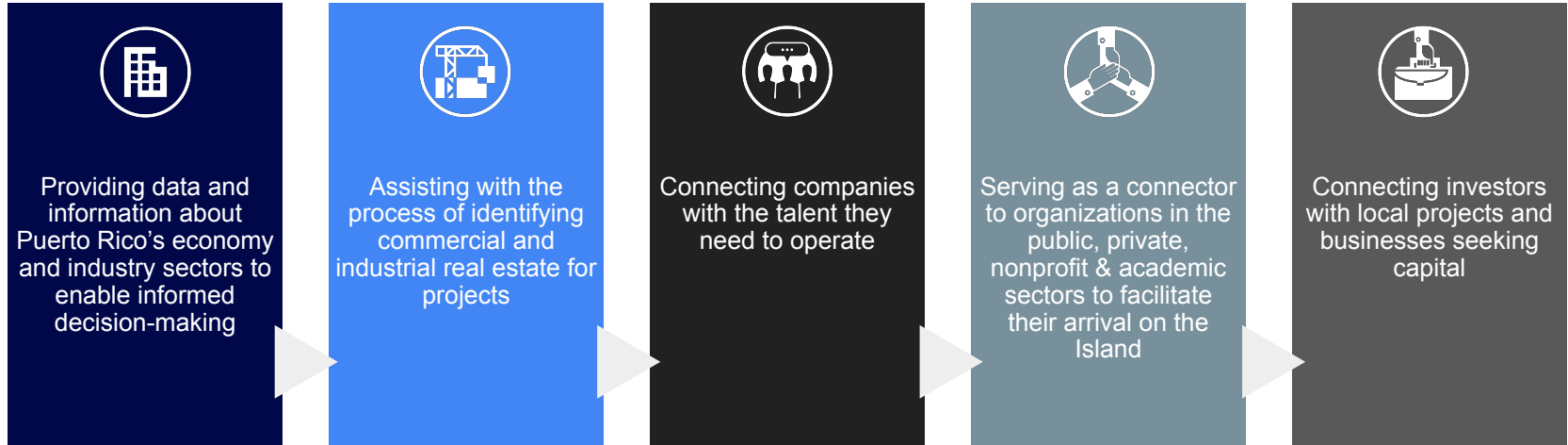
Vision

Serve as a **transformational and results-oriented** accelerator of economic development in Puerto Rico.



Our Services

We help companies and investors establish their operations on the island by:



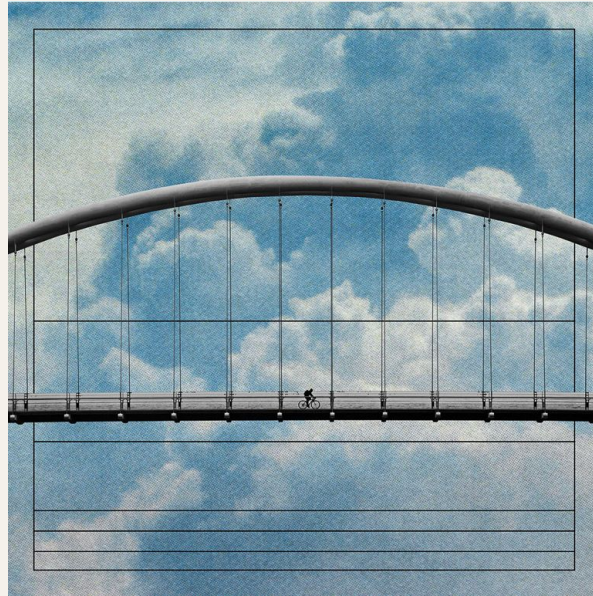
NEWLAB IS A DEEP TECH VENTURE PLATFORM FOCUSED ON ACCELERATING THE DEVELOPMENT AND SCALE OF CRITICAL CLIMATE TECHNOLOGIES



ENERGY

TRANSITION THE WORLD TO SUSTAINABLE AND RESILIENT ENERGY SYSTEMS

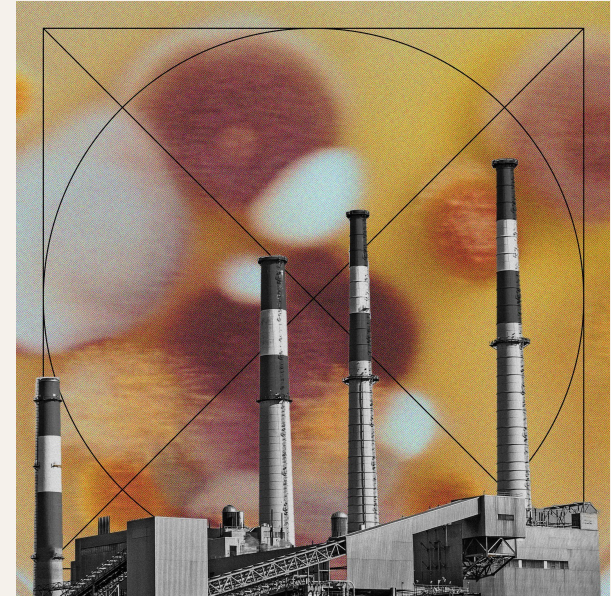
DTE **conEdison** **Ørsted**



MOBILITY

REDUCE ENVIRONMENTAL IMPACT AND INCREASE CAPACITY OF GLOBAL TRANSPORTATION

STELLANTIS **CROWLEY** **Ford**

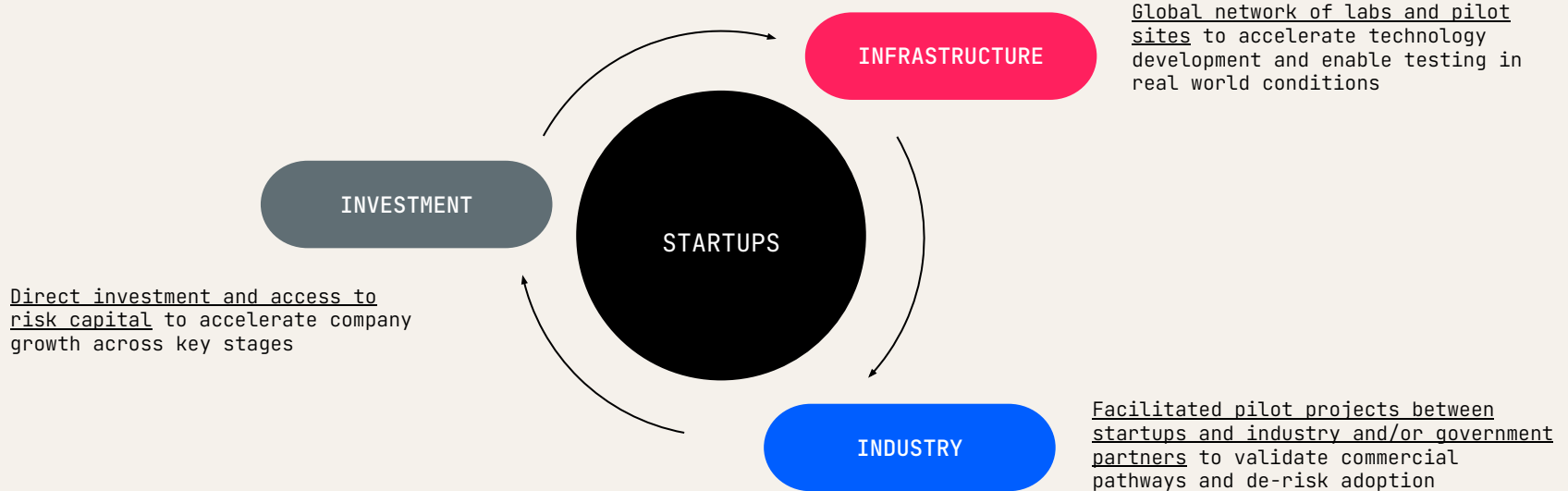


MATERIALS

ENABLE A FUTURE GENERATION OF SUSTAINABLE PRODUCTS AND SUPPLY CHAINS

BHP **invest PUERTO RICO** **ITOCHU**

OUR THREE-POINT MODEL IS DESIGNED TO ADDRESS THE MOST CRITICAL BARRIERS STARTUPS FACE: ACCESS TO CAPITAL, INFRASTRUCTURE, AND CUSTOMERS



WE HAVE BUILT A NETWORK OF LABS AND PILOT SITES TO ENABLE TECHNOLOGY DEVELOPMENT AND DEPLOYMENT

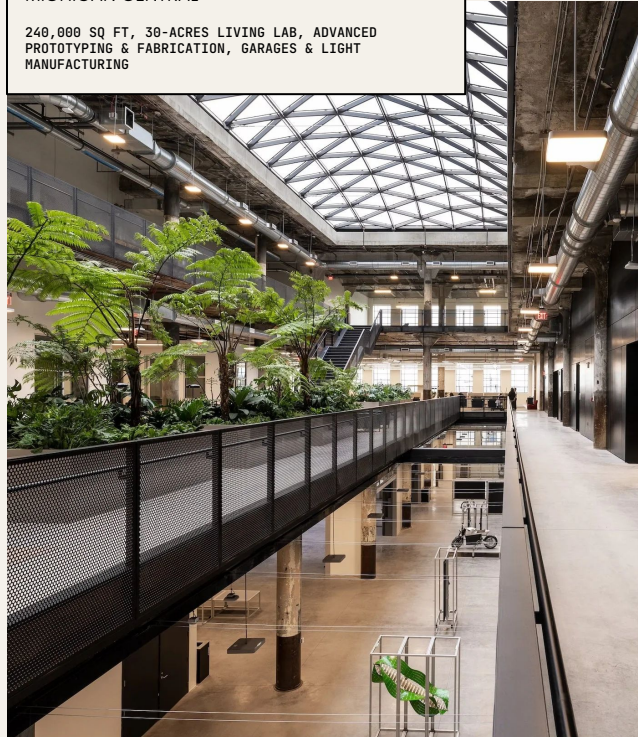
NEWLAB BROOKLYN BROOKLYN NAVY YARD

84,000 SQ FT., 300-ACRES OF URBAN ENVIRONMENT, ADVANCED PROTOTYPING & FABRICATION



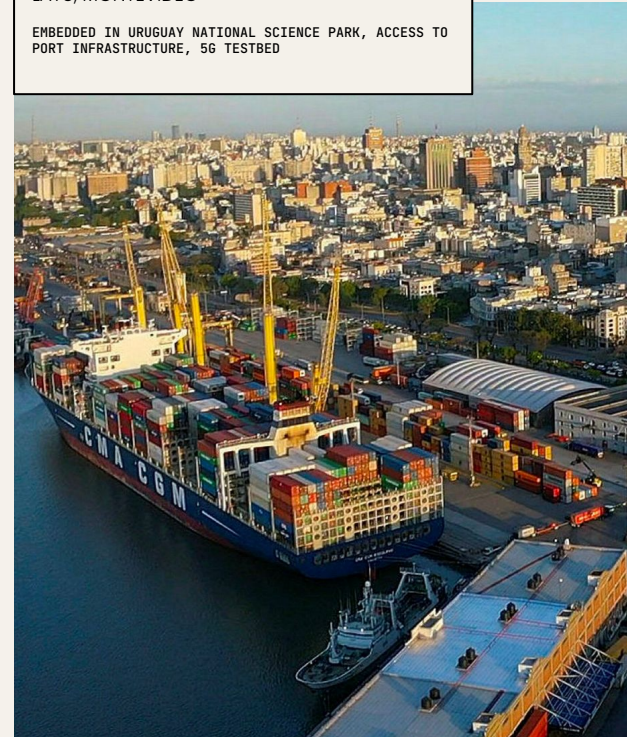
NEWLAB DETROIT MICHIGAN CENTRAL

240,000 SQ FT, 30-ACRES LIVING LAB, ADVANCED PROTOTYPING & FABRICATION, GARAGES & LIGHT MANUFACTURING



NEWLAB LATAM LATU, MONTEVIDEO

EMBEDDED IN URUGUAY NATIONAL SCIENCE PARK, ACCESS TO PORT INFRASTRUCTURE, 5G TESTBED



WE HAVE BUILT A NETWORK OF LABS AND PILOT SITES TO ENABLE TECHNOLOGY DEVELOPMENT AND DEPLOYMENT

TRANSPORTATION INNOVATION ZONE

Special zone enabling expedited permissions and rapid pilot deployment the public right of way.



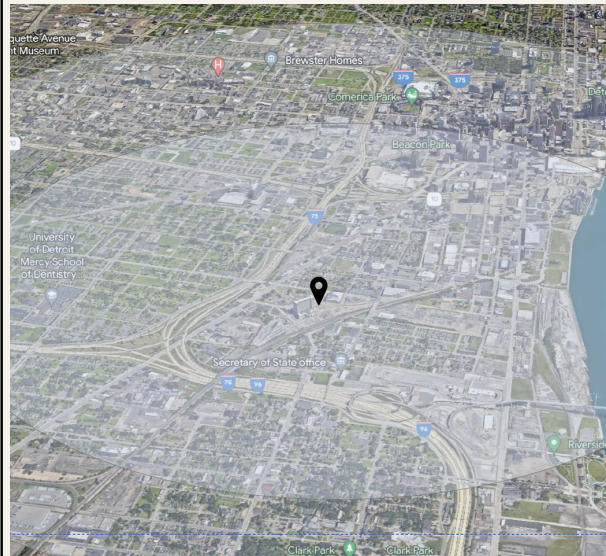
PORT OF MONROE

~30 miles from Detroit, Port of Monroe is the gateway to the Great Lakes and MI's multimodal transportation network.



URBAN AERIAL PROVING ZONE

First-of-a-kind UAS proving zone enabling persistent drone flight across key use cases including cross-board routes.



ACTIVATING THESIS-DRIVEN CHALLENGES TO DRIVE A PORTFOLIO OF INNOVATION PROJECTS AND ATTRACT STARTUPS, PARTNERS AND PUBLIC FUNDING

Selected Case Studies

ENERGY

ENSURING GRID RESILIENCE IN THE ELECTRIFIED FUTURE



MATERIALS

INCREASING CIRCULARITY TO SOLVE WASTE CRISES



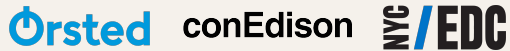
MOBILITY

EXPAND MULTIMODAL LOGISTICS TO INCREASE SUPPLY CHAIN RESILIENCE



ENERGY

IMPROVING RENEWABLE ENERGY PENETRATION WITH LONG DURATION ENERGY STORAGE



MATERIALS

REDUCING ENVIRONMENTAL IMPACT OF MINING WITH MORE EFFICIENT ROCK FRAGMENTATION



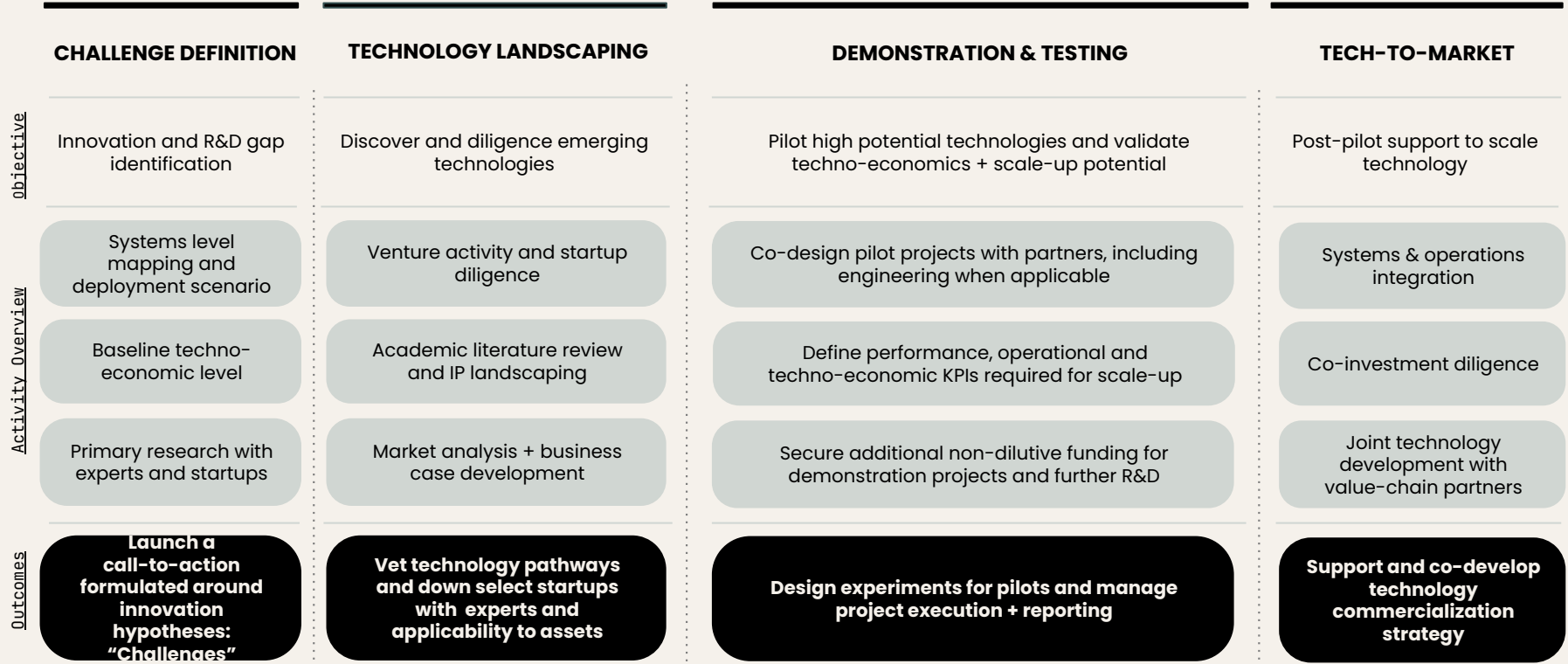
MOBILITY

ACTIVATE LOW-ALTITUDE AIRSPACE FOR SUSTAINABLE MOVEMENT OF GOODS

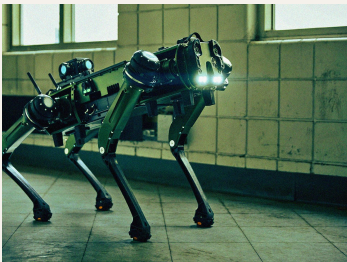


WE HAVE RUN 100+ PILOTS WITH 50+ PARTNERS; 30% ADVANCED TOWARDS COMMERCIALIZATION

Applied Innovation Studios Methodology (illustrative)



SCALING CLIMATE TECH AND EMPOWERING INDUSTRY PARTNERS TO TACKLE OPERATIONAL CHALLENGES AND IMPLEMENT GROWTH STRATEGIES



GHOST ROBOTICS

LEGGED ROBOTS FOR INDUSTRIAL APPLICATIONS



Piloted at Newlab Brooklyn to enable fully autonomous robots leveraging 5G network



Newlab investment syndication



Verizon strategic partnership for commercial deployments



Acquired at \$400M valuation



AMOGY

REPLACING PETRO-BASED FUELS WITH CLEAN ENERGY FROM AMMONIA



Piloted ammonia-powered semi truck at Newlab Brooklyn & Newlab Detroit with a closed urban environment



Newlab incubation & investment



Mitsubishi Corp strategic partnership to assess a large-scale deployment



Closed \$139M Series B



ACLIMA

MOBILE FLEETS FOR AIR QUALITY & GREENHOUSE MONITORING



Piloted in the streets of Brooklyn for mobile measurements of critical air quality indicators



Raised \$40M Series B



Awarded a contract through DEC and NYSEDA for NY statewide air quality mapping



Expanded NY presence with a company hub in NYC



LAUNCHER

ROCKETS DELIVERING SMALL SATELLITES TO ORBIT



Piloted at Newlab Brooklyn for a series of engine revisions with metal 3D printing for improved efficiency



EOS strategic partnership for co-development and manufacturing



SN-1 module made it to space



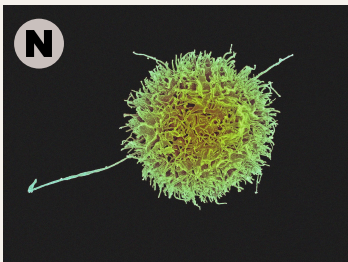
Acquired by Vast Space to support space station development

WE INVEST DIRECTLY AND BUILD NET NEW COMPANIES WHERE WE FIND WHITE SPACE



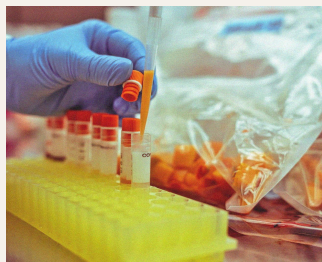
SAFEAI

AV-ENABLEMENT FOR HEAVY
INDUSTRY EQUIPMENT
SERIES B



APPLIED XL

DETECTING EARLY SIGNALS IN
CLINICAL TRIALS
VENTURE BUILD PARTNER



KINGDOM

TRANSFORMING CPG WITH
MICROBIAL SUPERCULTURES
SERIES A



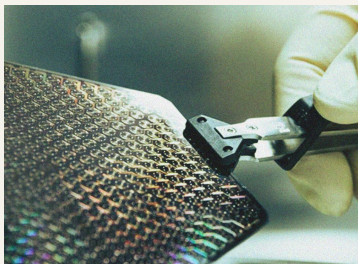
EXYN

AUTONOMOUS DATA COLLECTION
WITH PILOT-LESS DRONES
SERIES B



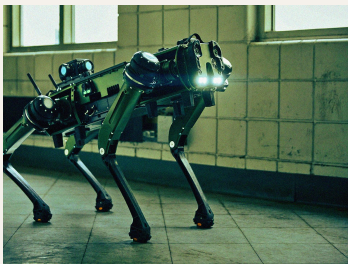
AMOGY

REPLACING PETRO-BASED FUELS
WITH CLEAN ENERGY FROM AMMONIA
SERIES B



SEEQC

QUBIT CONTROL CHIPS ENABLING
APPLICATION-SPECIFIC QUANTUM
SERIES A



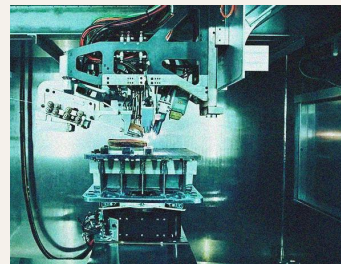
GHOST ROBOTICS

LEGGED ROBOTS FOR
INDUSTRIAL APPLICATIONS
GROWTH



LAUNCHER

ROCKETS DELIVERING SMALL
SATELLITES TO ORBIT
ACQUIRED FEB 23



NANOTRONICS

AUTOMATED INSPECTION FOR THE
PRODUCTION OF NANOSCALE MATERIALS
SERIES F



FERO LABS

OPTIMIZING FACTORY
PROCESSES THROUGH ML
SERIES A

NEWLAB BY THE NUMBERS

1,000+

MEMBERS

300+

COMPANIES

500K SF

OF ACCELERATION ASSETS

50+

INDUSTRY & GOV
PARTNERS

98+

PILOTS LAUNCHED
TO-DATE

400+

STRATEGIC
INVESTORS

\$5.8B+

RAISED BY
MEMBER COMPANIES

\$20B+

AGGREGATE VALUE
OF MEMBER COMPANIES

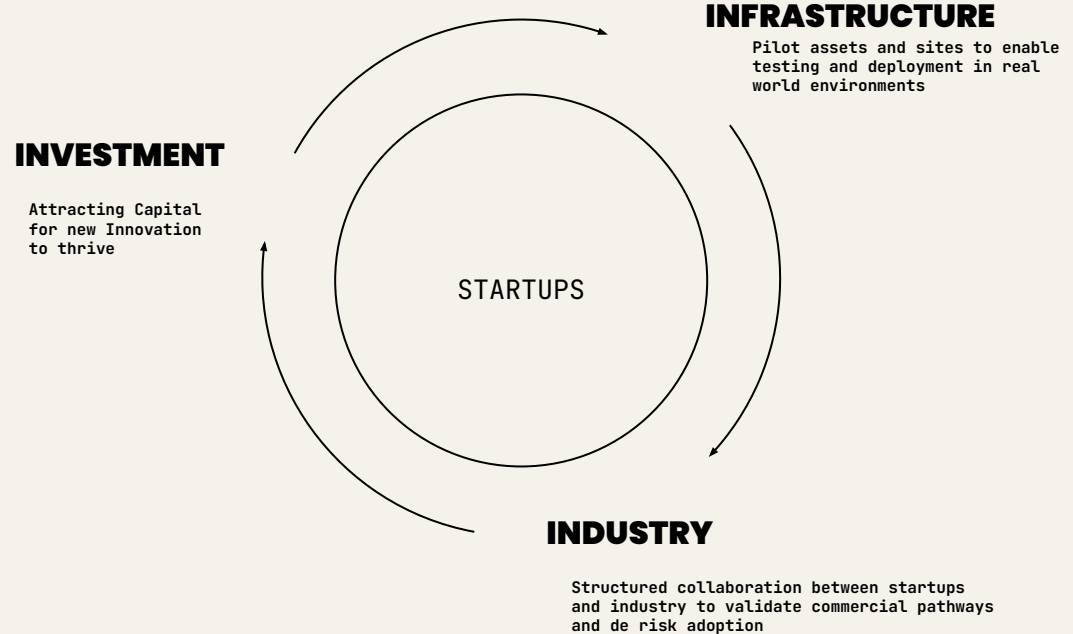
\$2.3B+

IN EXITS

OUR PROVEN FORMULA FOR ECONOMIC DEVELOPMENT

Innovation outposts act as a common ground that attracts and support problem owners, solution providers, and the necessary resources for emergent innovation to thrive.

For governments, having robust systems to scale emergent innovation is important to maintain competitive advantage, attract capital, and to promote economic growth.



WASTE-TO-X: Puerto Rico

An overview prepared by Newlab

CORE TEAM



Satish Rao, PhD
Chief Product Officer

Previously at Columbia Technology Ventures;
PhD Physics University of Illinois - Urbana Champaign

Capabilities:
Materials Science
Technology Development & Commercialization
Technology Licensing
Program Operations & Design
Partnership Strategy



Liz Keen
Chief Strategy Officer

Previously at Silicon Foundry, ACME Capital;
University of Southern California

Capabilities:
Partnership Strategy
Coalition building
Deal structuring



Carlos E. Trevino
V.P., Product & Programs

Previously at Mitsubishi Power, Xignux (G.E. Joint Venture);
*Economics & Management Science - Columbia University
Engineering - Purdue University*

Capabilities:
Energy Transition
Legacy Power Systems
Oil and Gas
Materials Science
Mgmt. Consulting
Systems Design
Partnership Strategy



Sydnee Grushack (Lead)
Director, Innovation Studios

Previously at Eunomia Research & Consulting (boutique waste and resource management firm); IBM.
MBA - NYU Stern; Environmental Studies - Emory University

Capabilities:
Circular Economy
Market Intelligence Technology
Due Diligence
Policy Analysis
Mgmt. Consulting
Innovation Strategy



Sahil Jain
Senior Director, Strategy

Previously at LanzaTech, Shell, Reckitt;
Chemical Engineering, University of Michigan

Capabilities:
Technology Development & Commercialization
Innovation Strategy
Systems Design
Partnership Strategy



Jonathan Meléndez
Design Strategy Lead

Industrial Design Faculty at Pratt Institute, Previously at Johnson & Johnson; *Master's in Industrial Design from the Rhode Island School of Design (RISD).*

Capabilities:
Design Research
Business Strategy
Product & Service Design
Strategic Foresight
Complex Systems Integration

CONTEXT

THIS PROJECT IS A COLLABORATION BETWEEN INVEST PUERTO RICO AND NEWLAB FOCUSED ON ENABLING THE CONVERSION OF LAND-BASED OR MARINE WASTE INTO HIGH VALUE-ADDED PRODUCTS

Our mission is to co-design and deploy a series of pilots that serve as proof cases for innovative solutions to the island's waste crisis and validate the waste-to-x market in Puerto Rico.

OUR PROGRAM IS IN THE PILOT IMPLEMENTATION STAGE



WHY WASTE TO X IN PUERTO RICO?

WHAT IS WASTE-TO-X?

The term refers to the process of collecting material typically referred to as waste and recycling this material into a high value-added product. The “X” here is intentional to indicate that there is work to be done to identify the ideal end product.

WASTE CRISIS

Puerto Rico is currently facing an unprecedented waste crisis. The island has approximately 29 operating landfills collecting the waste items of 78 municipalities, many operating in an unsanitary manner. Of those 29 landfills, 12 have closure orders from the US Environmental Protection Agency with others facing similar prospects in the future.

WASTE GENERATION

Puerto Rican businesses and households produce more waste per capita than the U.S. average. This trend further exacerbates the island’s waste crisis with a greater volume of waste to manage. Additionally, it is estimated that Puerto Rico only recycles 9-14% of its waste compared to the average recycling rate in the U.S. of 32%.

LOCAL MOMENTUM

Given these concerning statistics, many private and public entities in Puerto Rico have been keen on identifying solutions that could help alleviate the island’s waste crisis. Some solutions currently exist in the market and Newlab intends to collaborate and/or build on current local efforts.

ECONOMIC DEV.

The conversion of waste into value-added products (or “X”) in Puerto Rico could represent a new market/economy to be developed on the island. Models and solutions across the globe can serve to support and act as inspiration for Puerto Rico in dealing with the waste crisis.

A DIVERSITY OF WASTE MATERIAL GENERATED ON THE ISLAND

Household + Commercial

Ferrous metals
 Non-ferrous metals
 Yard waste
 White goods
 Pneumatics/Tires
 C&D
 Glass
 Food waste
 Low quality paper
 High quality paper
 Corrugated paper
 Plastic type 1 (PET)
 Plastic type 2 (HDPE)
 Plastic type 5 (PP)
 Plastics 3-4, 6-7
 Plastic film
 Household haz (HHW)
 E-waste
 Textiles
 Fats, oils, grease (FOG)
 Storm debris (Escombros)
 Photovoltaics

Agri.

Manure
 Crop residue

Water

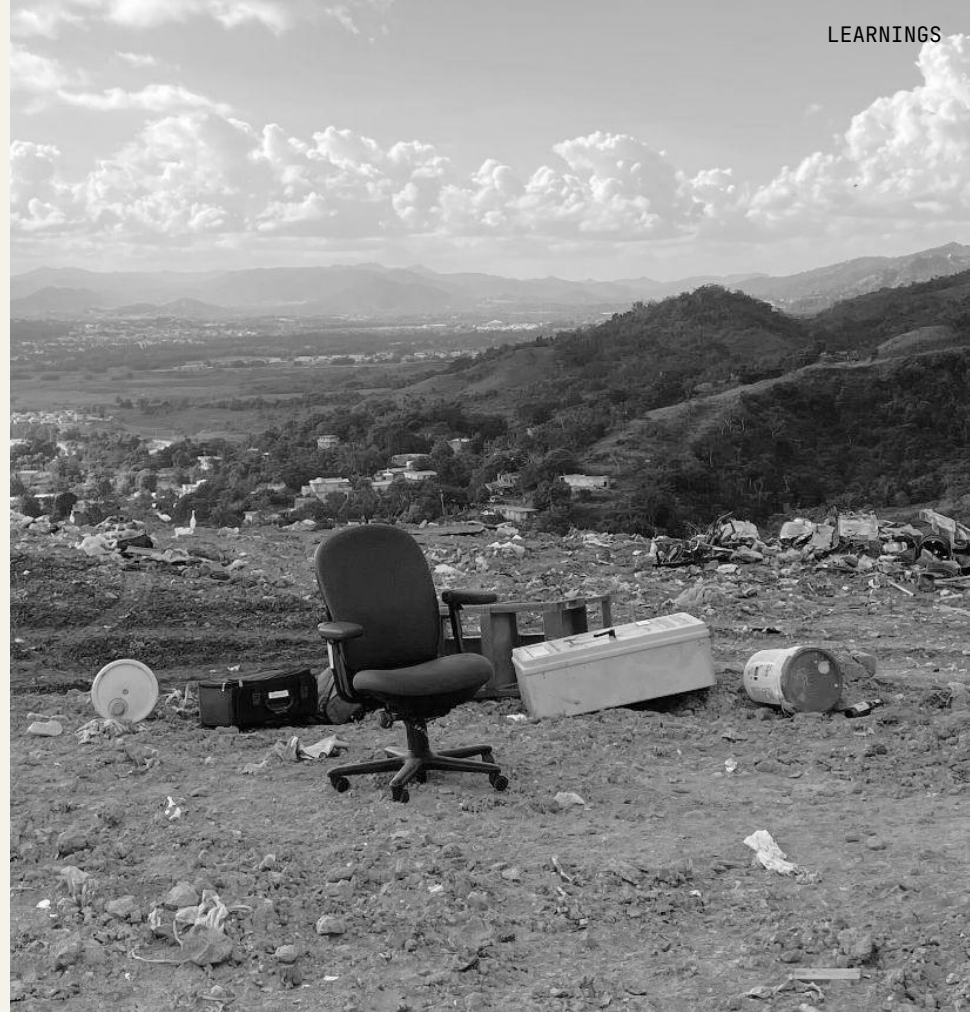
Sewage sludge
 Wastewater

Industrial + Pollution

Coal-ash
 Ammonia
 Sulfur
 Sulfuric acid
 Dichloromethane
 n-Hexane
 Hydrochloric acid
 Nitrate compounds
 Copper compounds
 Lead compounds
 Mercury compounds

Marine

Sargassum
 Cyanobacteria (Algae)





**BUILDING THE FUTURE
SARGASSUM VALUE
CHAIN IN PUERTO RICO**



**FINDING HIGH
VALUE-ADDED USE CASES
FOR END-OF-LIFE TIRES**



**IDENTIFYING NEW END
USE CASES FOR DISCARDED
PLASTICS IN PUERTO RICO**

OPEN CALL

CALL TO ACTION	CHALLENGES TO ADDRESS	RELEVANT TECHNOLOGIES
<p>Newlab is currently selecting a cohort of innovative companies developing technologies to facilitate the conversion of underutilized waste and resources into new products with the potential to generate economic development opportunities in Puerto Rico. The materials of focus are end-of-life tires, waste plastics and sargassum.</p>	<p>Solutions will address at least one of the following challenges:</p> <p>HOW MIGHT WE...</p> <ul style="list-style-type: none"> ... convert end-of-life tires into high value commodities that can be used locally or exported? ... prove the value of creating a localized supply chain for collecting, processing and/or creating products from sargassum? ...increase the viability of on-island plastics recycling, despite relatively low volumes of material collected? 	<p>Relevant technologies and solutions include, but are not limited to:</p> <p>Tires:</p> <ul style="list-style-type: none"> • Pyrolysis • Thermolysis • RCB end uses • Mechanical or chemical conversion into high-value end products <p>Sargassum</p> <ul style="list-style-type: none"> • Automated or retrofitted collection vehicles • Bio-refining • End uses from sargassum-derived compounds (alginate, fucoidons, etc.) • Mechanical or chemical conversion into high-value end products <p>Plastics</p> <ul style="list-style-type: none"> • Pyrolysis • Gasification • Depolymerization • Mechanical or chemical conversion into high-value end products

STUDIO COHORT ADVANCING WASTE-TO-X IN PUERTO RICO



Conversion of Tires/Plastics



Proving the Value of a Localized Sargassum Supply Chain in Puerto Rico



Honorary Cohort Member



CarbonCycle designs systems that use heat to convert used tires into fuels without significant energy requirements or harmful emissions. They will be conducting pre-development and permitting work for a small fixed Advanced Pyrolysis system that can thermally convert approximately 3 tons of scrap tires a day (roughly 300 passenger tires daily).



SOS Carbon, a spin-off from MIT tackles the environmental, social, and economic crisis caused by sargassum in the Caribbean via a series of products and services to collect, pre-process, and valorize sargassum. They will be testing the comprehensive collection of sargassum in Puerto Rico by unlocking the regulatory process for permitted sargassum collection, deploying littoral collection modules, drying and shipping sargassum to downstream users.



Thalasso Ocean is a Norwegian / Mexican company dedicated to sargassum management for local communities. They focus on the deployment of micro bio-refineries, transforming a hazard into a resource. They will be constructing and deploying a micro-biorefinery to process sargassum in-situ in Puerto Rico into useful compounds that can be sold and integrated into high-value products.



Sway is a clean tech startup scaling seaweed-based, rapidly compostable replacements for plastics, beginning with flexible packaging suited for apparel, accessories, dry goods, and beyond. This pilot will focus on converting sargassum-derived compounds into home-compostable, seaweed-based thermoplastic resin for scalable, flexible packaging solutions.



PANGAIA is a material science company that brings problem-solving innovations to the world through premium lifestyle products. Deeply embedded within the premium sustainable fashion goods. PANGAIA will test the creation of a sargassum-based yarn and contribute its manufacturing practices and supply chain expertise to determine the economic feasibility of a sargassum-based supply chain.



Flora Rural is a woman-led Puerto Rican startup developing nature-based building materials for the construction industry. Founded in 2023, they are currently focused on developing carbon-negative walls using soil and algae. Newlab will support their growth through membership resources.

COHORT PHASING

PILOT PERIOD - PHASE 1

Feb 2024

TIRES / PLASTICS

Pre-development work for tire processing plant working with OAFA to de-risk tech prior to implementation:

- Conduct economic and market feasibility study
- Undergo site planning and engineering assessments
- Obtain necessary permits
- Outreach to skeptics in DRNA and non-profit ecosystems

SARGASSUM - UPSTREAM

Demonstration collection and study on bycatch and impacts of near-shore sargassum collection to **inform and shortcut permitting processes**

3RD PARTY SARGASSUM PROVIDER

SARGASSUM - UPSTREAM

Delivery and testing of **on-the-ground micro-biorefinery** in PR with collected sargassum

3RD PARTY ALGINATE PRODUCER

SARGASSUM - DOWNSTREAM

Lab testing of integration of sargassum into bioplastic film and yarn production using proprietary processes

Business proof-point + market assessment

FUTURE DEVELOPMENT - PHASE 2

Dec 2024

OAFA CARBONCYCLE

Construction of tire processing plant on island at OAFA site to create local jobs and handle problematic waste stream through local processing

Creation of high-value products for use in local markets (oils, energy) and export (recycled carbon black)

Addition of **plastic processing capabilities to tire processing plant** through scale-up

Ramp up of sargassum collection operations

including involvement of local fishing communities and coordination with tourism industry



Continued establishment of additional micro-biorefineries

to serve developing sargassum market in PR

← SARGASSUM
← CELLULOSE
← ALGINATE +



Scaling up of plastic packaging film and yarn production

If pilot is successful, desire to locate manufacturing plant alongside feedstock in PR



SITE VISITS AND LOCAL PARTNERS





CARBONCYCLE, LLC
Thermal Conversion of Scrap Tires
February 2024

PROBLEM | Tires are also a huge value opportunity

Tires are full of valuable raw materials that could be put to new uses. Current recycling efforts are falling short, leaving a dangerous mess and missing a huge value opportunity.

Currently, less than 5% of PR's scrap tires are recycled. Others are stacked, stashed, landfilled, or shipped offshore to be burned for fuel. PR can do so much better.

Once & for All Tires LLC (OAFa) is on a mission to solve this problem. They make value-add rubber products from scrap tires for local sale and export. We want to increase OAFa's capacity to help them increase the number of scrap tires being sustainably recycled in PR.



SOLUTION | Advanced Pyrolysis Thermal Conversion

WE HAVE A SIMPLE, SUSTAINABLE, PROFITABLE SOLUTION

Convert the waste tires back into valuable commodities and energy in a clean, eco-friendly thermal conversion process.

ADVANCED PYROLYSIS

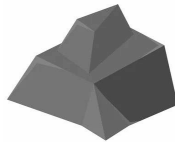
Thermal decomposition of materials at elevated temperatures in the absence of oxygen.



Not burning tires, but baking them to break down the complex organic compounds into simpler molecular structures. Turning tires back into their primary components.



SCRAP TIRE



CARBON



STEEL



OIL



SYNGAS



ENERGY

PUERTO RICO | Opportunity Awaits

Partnering with Once & For All LLC (Oafa) in Yabucoa to increase their capacity to recycle more tires.

- **PLANNING, DESIGN & PERMITTING**

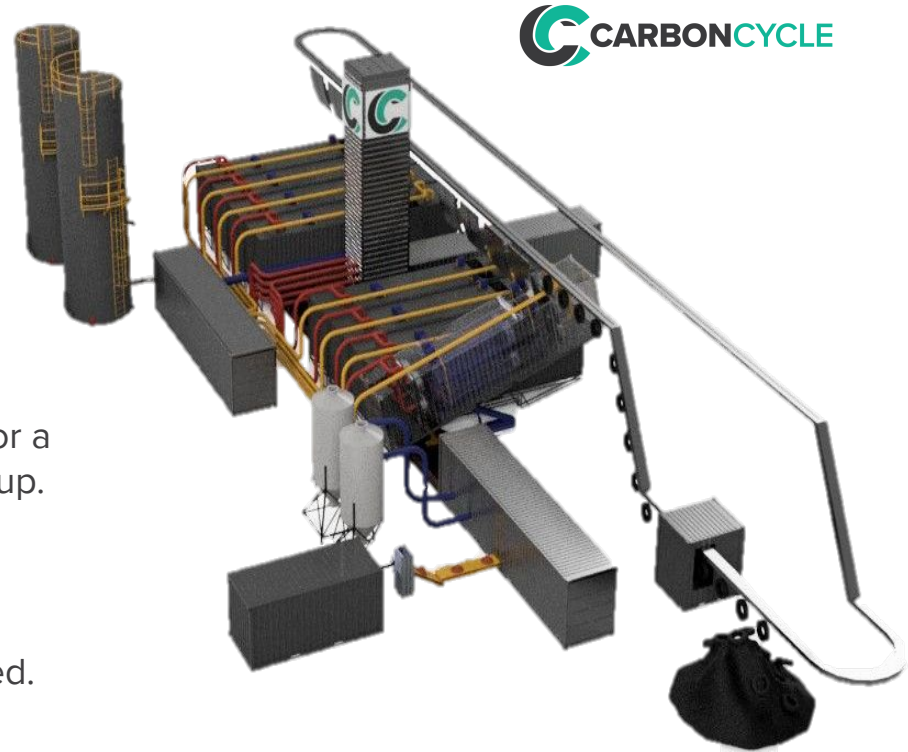
Further planning work to be completed to move closer to pilot system installation.

- **DEPLOY SMALL SYSTEM**

Deploy a 3-5 ton/day Advanced Pyrolysis system for a pilot. Built in Missouri, shipped to PR for easy start-up.

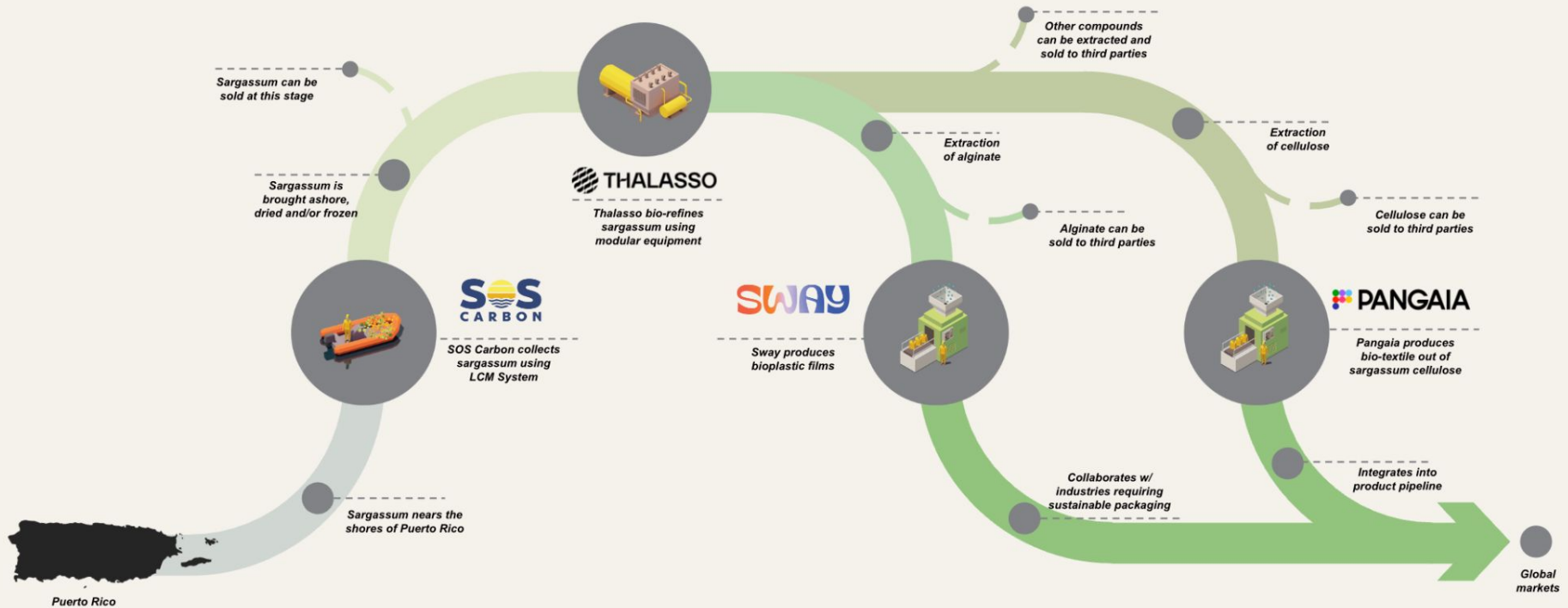
- **SCALE TO FIT THE PROBLEM**

With a successful pilot paving the way, scale the system to a capacity that better fits the Island's need.



CREATING AND TESTING A SARGASSUM VALUE CHAIN

INTERCONNECTED DEVELOPMENT - IDEAL STATE



Sustainable Agriculture Solution from SEAWEED Mitigation

Reliable sargassum supply chain Caribbean-wide



The most cost-effective sargassum harvesting operation: **reliable supply-chain**



70 tons/day/boat
capacity



60% revenue

<2-4 weeks lead



>10 jobs/system



>5% crop yield

Caribbean-wide operations and collaborations



Newlab



Environmental and social responsibility for a sustainable Blue Economy



Marine ecosystem protection

Integration & empowerment of the local communities

80 fishermen trained up to date

Newlab



Puerto RICO YEAR 2: Puerto Rico

WE ARE COMMITTED TO ADVANCING WASTE-TO-X, TACKLING A NEW CHALLENGE, & QUALIFYING NEWLAB IN PR

WORKSTREAM 1

Advancing Waste-to-X

Description

Increase the impact of Waste-to-X Studio pilots by supporting the selected cohort to scale in Puerto Rico.

Core activities:

- Continued on Island Business Development
- Marketing Support
- In lock step with workstream 3: Identify capital to Scale Ph1 startup operations.

WORKSTREAM 2

Tackling a New Challenge

Description

New Innovation Studio solving the island biggest challenges, catalyzing new sectors and propelling economic development.

Core activities:

- Identify new Topic
- Discovery Research
- Startup Recruitment
- 3-5 Pilots
- Pilot assessment

WORKSTREAM 3

Sourcing Scale Funds

Description

Collaboratively pursuing federal funding opportunities and exploring various forms of financing to support the expansion of all active workstreams.

Core activities:

- Identify public/private capital to Scale Phase 1 startup operations.
- Identify Industry partners to support Phase 2 pilots.
- Identify public/private capital to fund a Newlab Puerto Rico.

WORKSTREAM 4

Newlab Platform Puerto Rico

Description

Conduct market assessment and develop actionable roadmap for establishing continued Newlab Innovation ecosystem in Puerto Rico.

Core activities:

- Comprehensive Innovation Center market assessment
- Map of available resources, potential partners, and startups to kick-start innovation center
- Potential projected budget and got to market strategy

AN ADVANCED TECH ECOSYSTEM SOLVING THE ISLAND'S BIGGEST CHALLENGES, PROPELLING ECONOMIC DEVELOPMENT

Selecting the right topic for a second Innovation Studio in Puerto Rico is vital to ensure our efforts can pave the way for an Innovation Platform on the Island. Below we've surfaced initial key considerations to drive the selection process.

Key considerations for topic selection

- Connections to existing InvestPR & Newlab network
- Clear potential for economic development
- Strong and relevant global innovation ecosystem that can be brought to PR.
- Relevancy to local challenges, and potential to create local impact.
- Significant industry momentum and innovation capital

Potential Topic Areas

- Coastal resiliency & Blue Carbon
 - Renewable and Resilient Energy Systems
 - Advanced and Flexible Manufacturing
-

WHAT'S NEXT?

Continue Phase 1 Pilots

Date: March ('24)

Phase 1 Demo Week

Date: April ('24)

Topic Research

Date: January → May ('24)

Phase 2 Open Call

Date: Summer ('24)

Newlab



Newlab