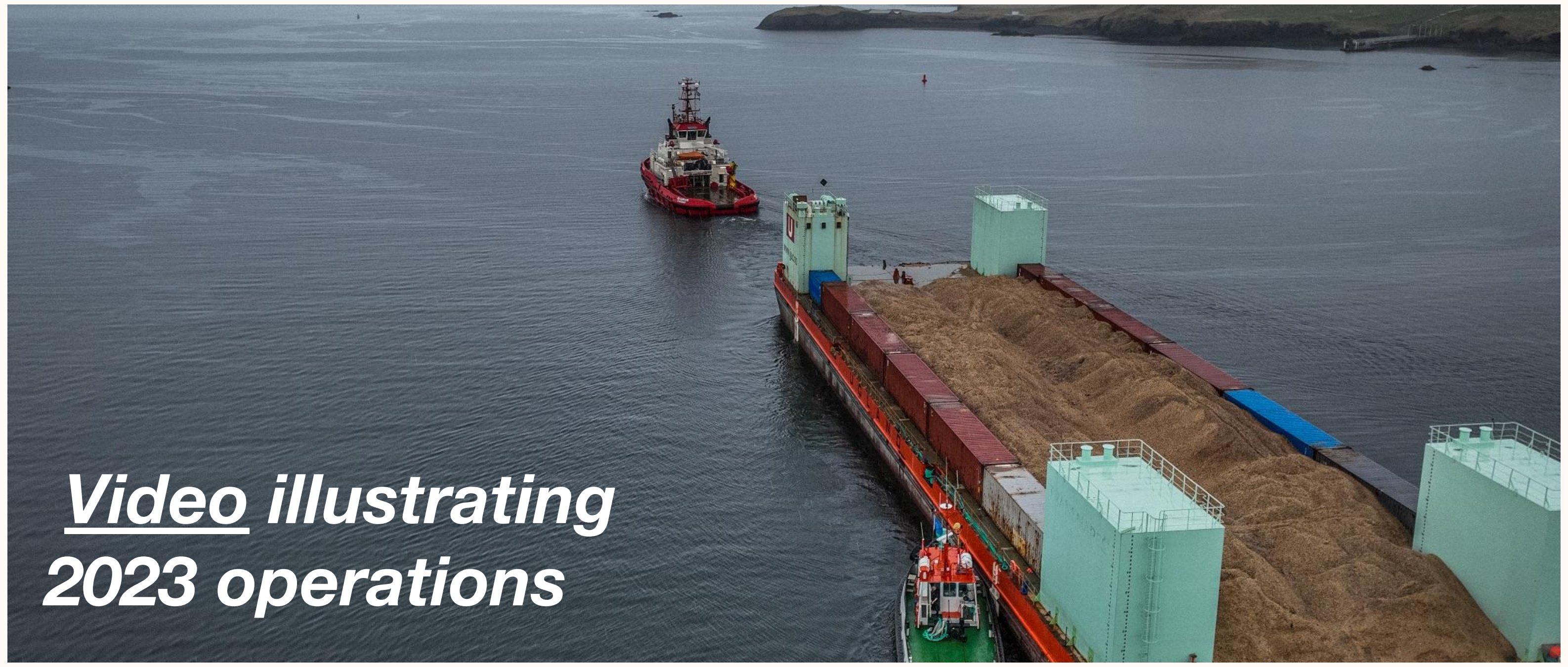
RUNNING TIDE

Microsoft + Running Tide

2023: We Launched The World's First Ocean CDR Project

With community and scientific stakeholders, industrial partners, and local talent to repurpose infrastructure, and launch a vibrant carbon removal project garnering national support.

Running Tide CEO & GM of Iceland with the Prime Minister of Iceland, Katrín Jakobsdóttir.



We've Built A Partner Network That's Second to None…

Research Collaborators

- Ocean Networks Canada
- Moss Landing Marine Laboratories
- NOAA
- SeaTrees by Sustainable Surf
- AWI
- Sjótækni
- Rutgers, The State University of New Jersey
- NASA Jet Propulsion Laboratory, California Institute of Technology
- Centre for Climate Repair at Cambridge
- The Roux Institute at Northeastern University
- Northeastern University
- Dartmouth
- Ocean Visions
- Háskólinn í Reykjavík / Reykjavik University
- GEOMAR

Operational Partners

- Eimskip
- et
- Wilhelmsen
- NorSea
- Great Northern Timber
- timbereye.
- Buksér & Berging
- idemitsu

CDR Industry Partners

- Microsoft
- shopify
- pledge
- Carbon Removal Alliance
- Reykjavik Protocol
- Watershed
- Chan Zuckerberg Initiative
- Deloitte.
- GoodZero FincoEnergies
- Carbon Business Council
- Patch
- E-liability Institute
- Commons

…And Delivered 21,000 Credits.

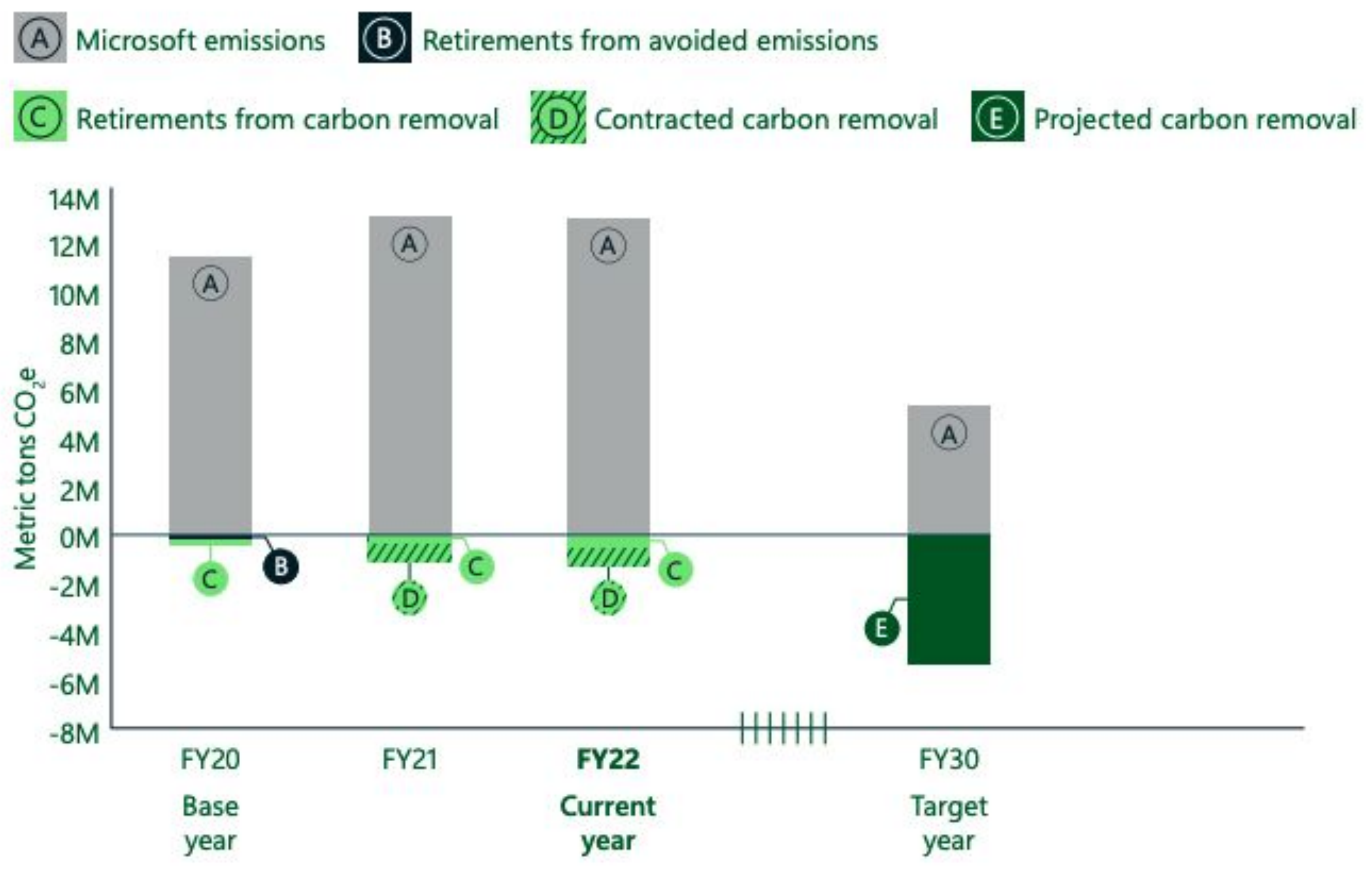
- Proven ability to win permits, and create new permitting pathways
- Proven ability to execute large CDR projects
- Proven ability to generate auditable data packages from supply chain & environmental measures
- Proven ability to provide full net-negative, carbon emissions and removal accounting
- Proven ability to reliably measure breadth of environmental parameters, in the open ocean
- Proven ability to operate in coastal waters and offshore
- Proven ability to work with industrial partners
- Proven ability to utilize variety of alkaline inputs
- Proven ability to generate widespread support across media and policy-makers around the globe
- Proven ability to hire and inspire the best scientists, engineers, and operators
- Proven ability to generate stakeholder buy-in from affected communities
- Proven ability to build and operationalize methodologies to professional, industrial levels of quality

Microsoft Projects Megatons of Annual Need for Removals by 2030

Carbon Table 1

Tracking our yearly progress toward carbon negative by 2030

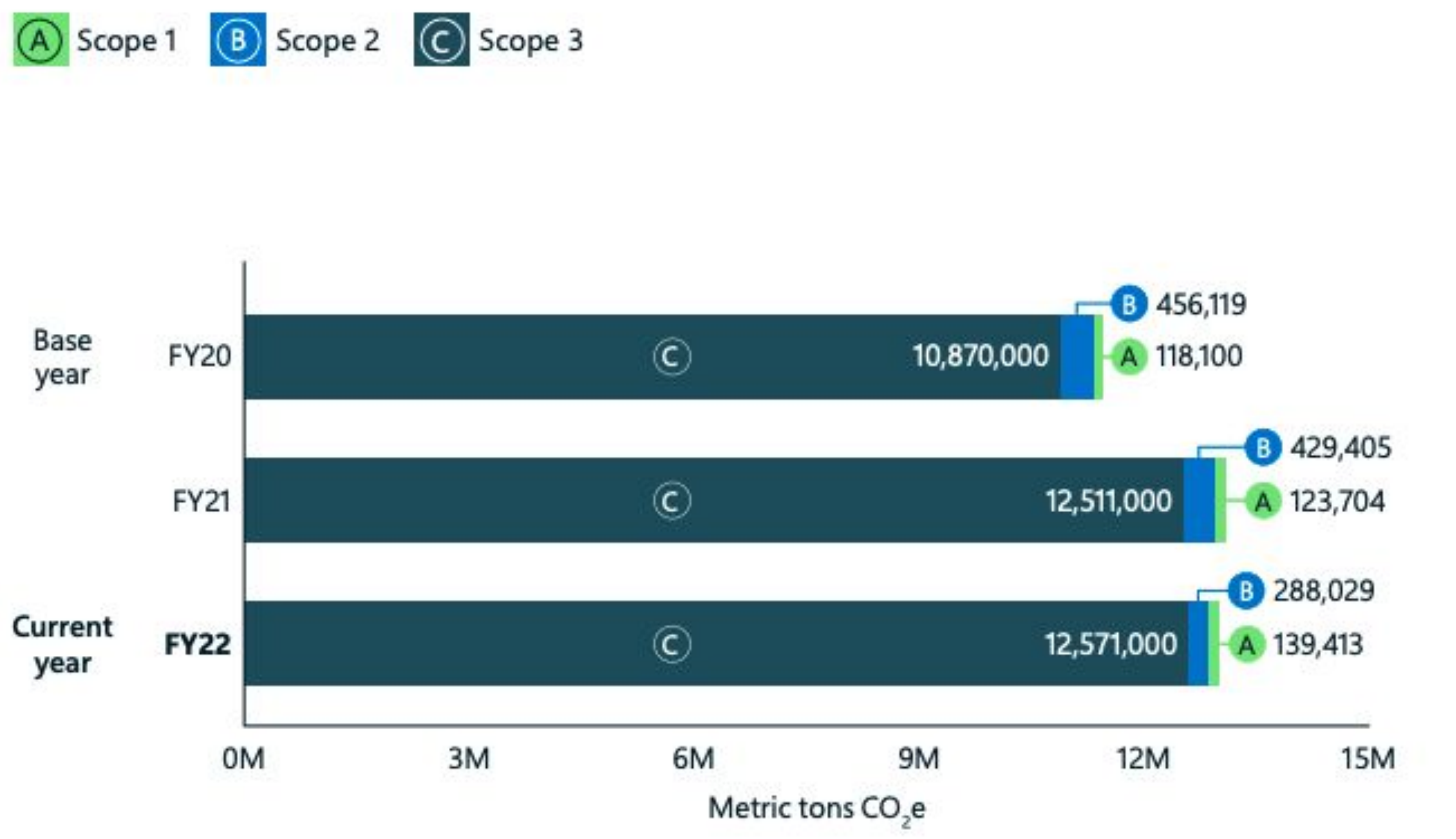
In FY22, we procured 1.44 million metric tons and retired 514,156 metric tons of carbon removal as part of our effort toward achieving our annual carbon commitment to be carbon neutral. Carbon removal contracted each year includes credits retired in the same year and to be retired in future years.



Carbon Table 2

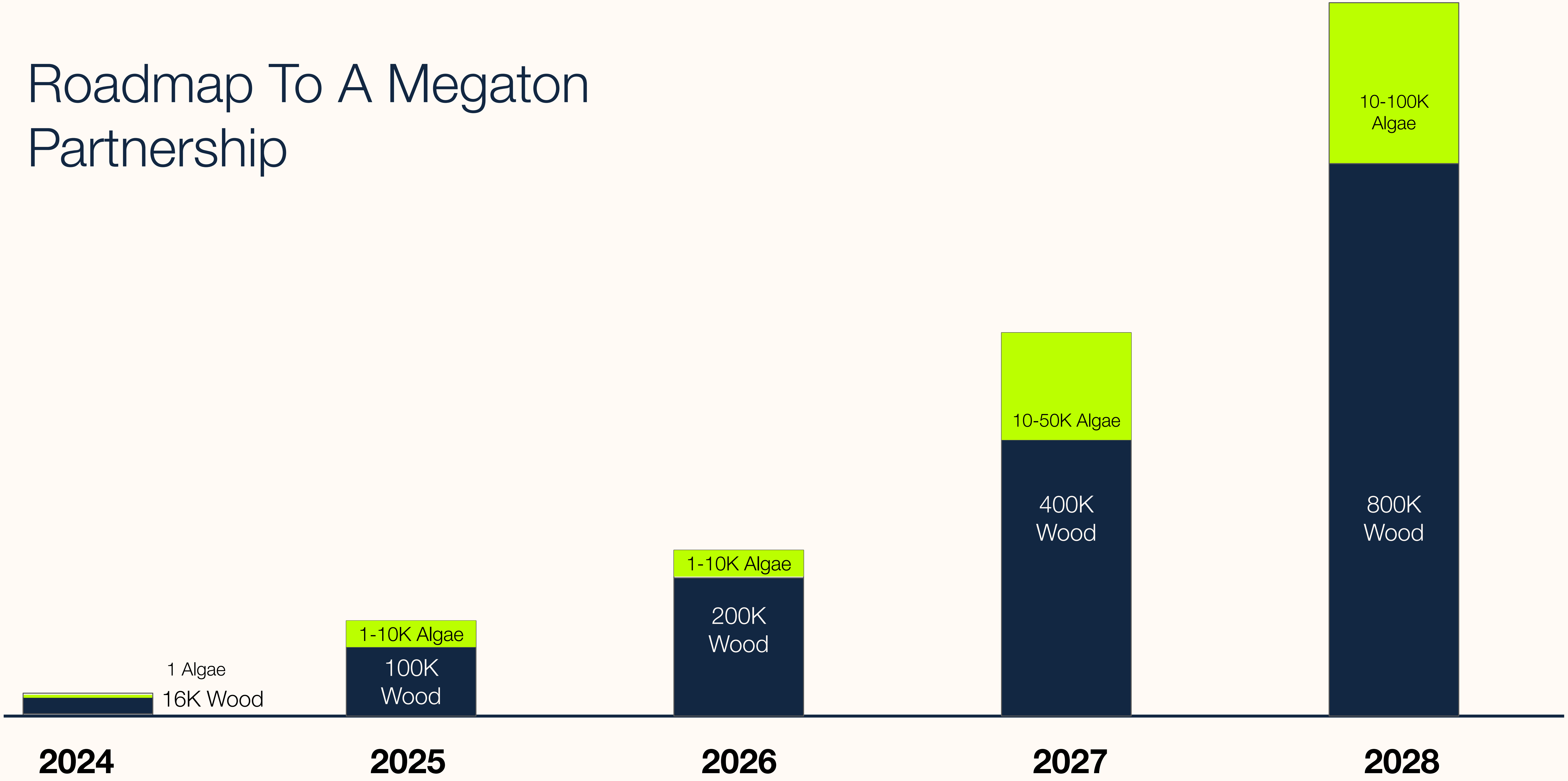
Tracking our emissions across Scopes 1, 2, and 3

Microsoft's overall emissions decreased by 0.5 percent in FY22. This was driven by improvements in our operations, telemetry-based measurement, renewable energy investments, sustainable aviation fuel purchases, and procurement of unbundled renewable energy certificates (RECs).



Running Tide can provide MSFT a megaton of medium and high durability carbon removals annually with positive socio-economic impact to communities on the front lines of climate change, and minimal negative ecological impact

Roadmap To A Megaton Partnership



OAE. *Lower mass transfer, but widely available inputs. The platform built to operationalize biomass sinking supports OAE with minimal incremental requirements*

Agenda

Breadth of Measurement (1hr)

- Microsoft-supported Development
- MRV development plans

Path to Scale (1hr)

- Projects
- Pathways

Partnership (30 min)

- Path to megaton
- 10 years

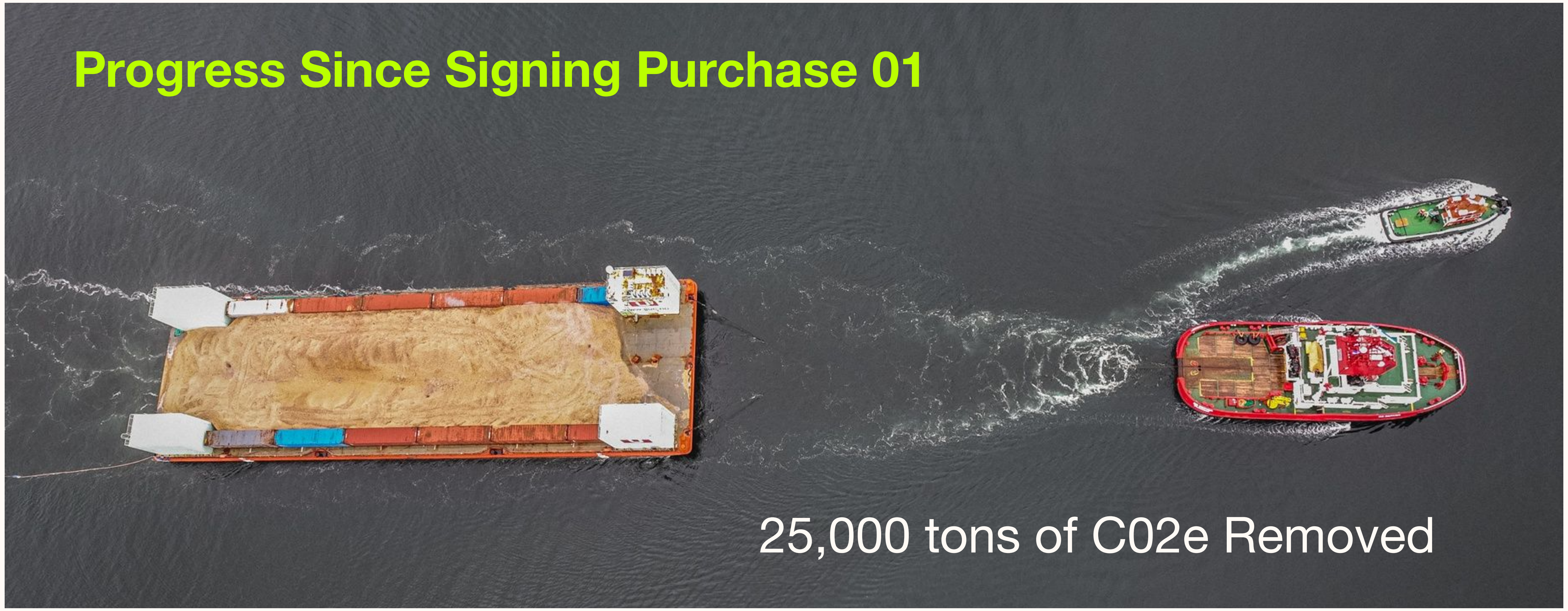
Research (45 min)

- Ecological Exposures
- Research Partnerships

Breadth of Measurement

Open ecosystem MRV

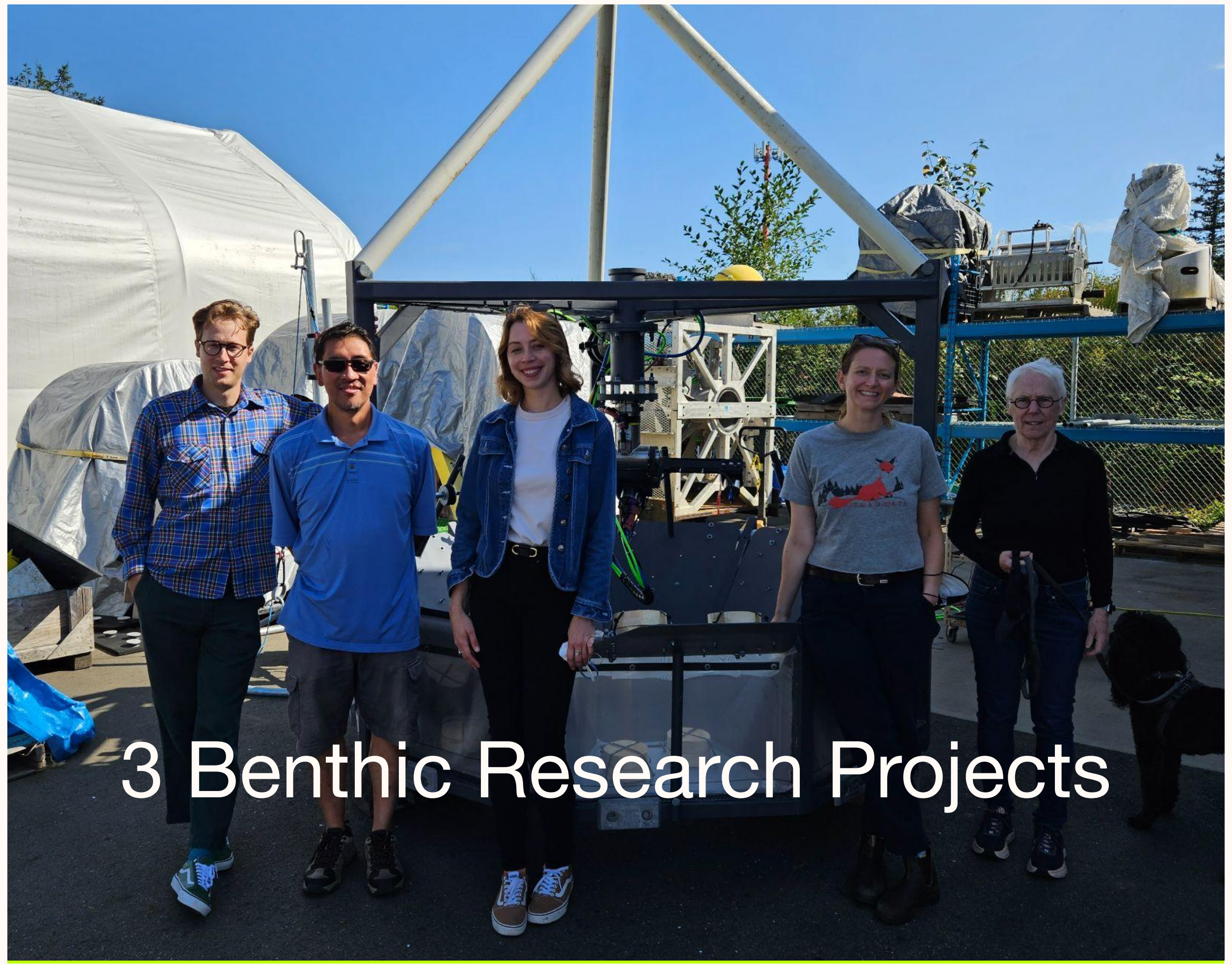
Progress Since Signing Purchase 01

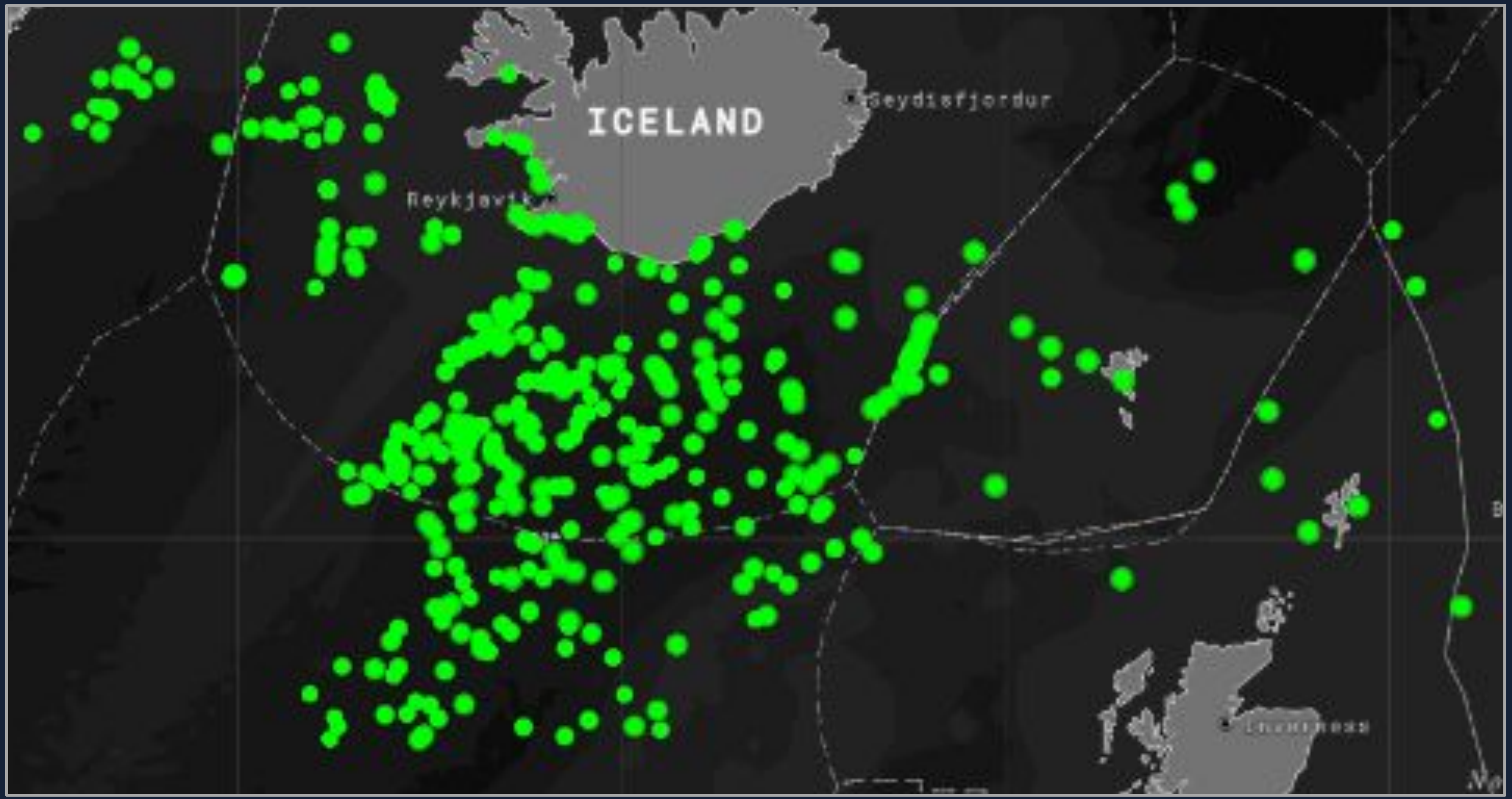

25,000 tons of C02e Removed

45k tons of raw material

6 Industrial Partners

500+ sensors, 15,000+ images
4M+ data points


3 Benthic Research Projects



Snapshot of sensors deployed into the ocean to measure our impact and validate our work

Contract 01 **Deliverables**

We're Here

TRANCHE 01 - August 2023

- 4,000 carbon removal credits
- Iceland Deployments 1, 2, 3, 4, 5

MRV Deliverables

- Report/update on evaluation of substrate sinking speed in laboratory and coastal settings
- Report/summary on updated modeling of lateral transport of substrates during sinking
- Identification of proposed partners for a substrate sinking rate study and preparation of a project plan relating thereto
- Signed MOU in place to perform modeling on Running Tide's 2022-2025 North Atlantic projects, as well as to contribute to an open source modeling tool which can be used and audited by the larger scientific community
- Report on prototype designs for customized instruments to track substrate sinking rate
- Identification of partners and report on Supplier's plan for benthic studies during Tranche 2 and Tranche 3 Delivery Periods.

TRANCHE 02 - January 2024

- 8,000 carbon removal credits
- Iceland Deployments 9, 10, 13, 14, 15

MRV Deliverables

- Report/update on evaluation of substrate sinking speed in laboratory and coastal settings;
- Report/summary on updated modeling of lateral transport of substrates during sinking;
- Report regarding in-situ validation of substrate sinking rate (to be clarified in initial plan for substrate sinking studies);
- Report on how much biomass is exported to deep ocean upon sinking and how long it remains there (to be clarified in initial plan for benthic studies)
- Updated report on status of development of prototype for customized instruments to track substrate sinking rate;
- Report on status of empirical laboratory investigation of degradation rate of macroalgae organic carbon in deep sea environment;
- Report on status of Seaweed Sinking Working Group planning of field experiments to empirically characterize fate of sunken marine biomass in deep sea from perspective of carbon sequestration durability and ecological impacts;
- Report on status of development of custom observation platforms for imaging and biogeochemical study of marine biomass on sea floor;
- Ocean Visions report on how rapidly and completely dissolved inorganic carbon (DIC) is removed from the ocean by macroalgal growth and replaced by CO2 that is drawn down from.

TRANCHE 03 - Q1/Q2 2025

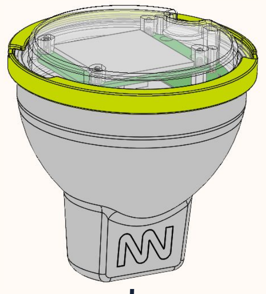
- 16,000 carbon removal credits
- Canada Project (TBC)

MRV Deliverables

- Report re status of field experiments with the Seaweed Sinking Working Group organized by Ocean Visions;
- Updated report regarding in-situ validation of substrate sinking rate (to be clarified in initial plan for benthic studies);
- Development and deployment of custom sensors to increase the fidelity of empirical observations.

Verification Fleet: Open Ocean Observation Platform

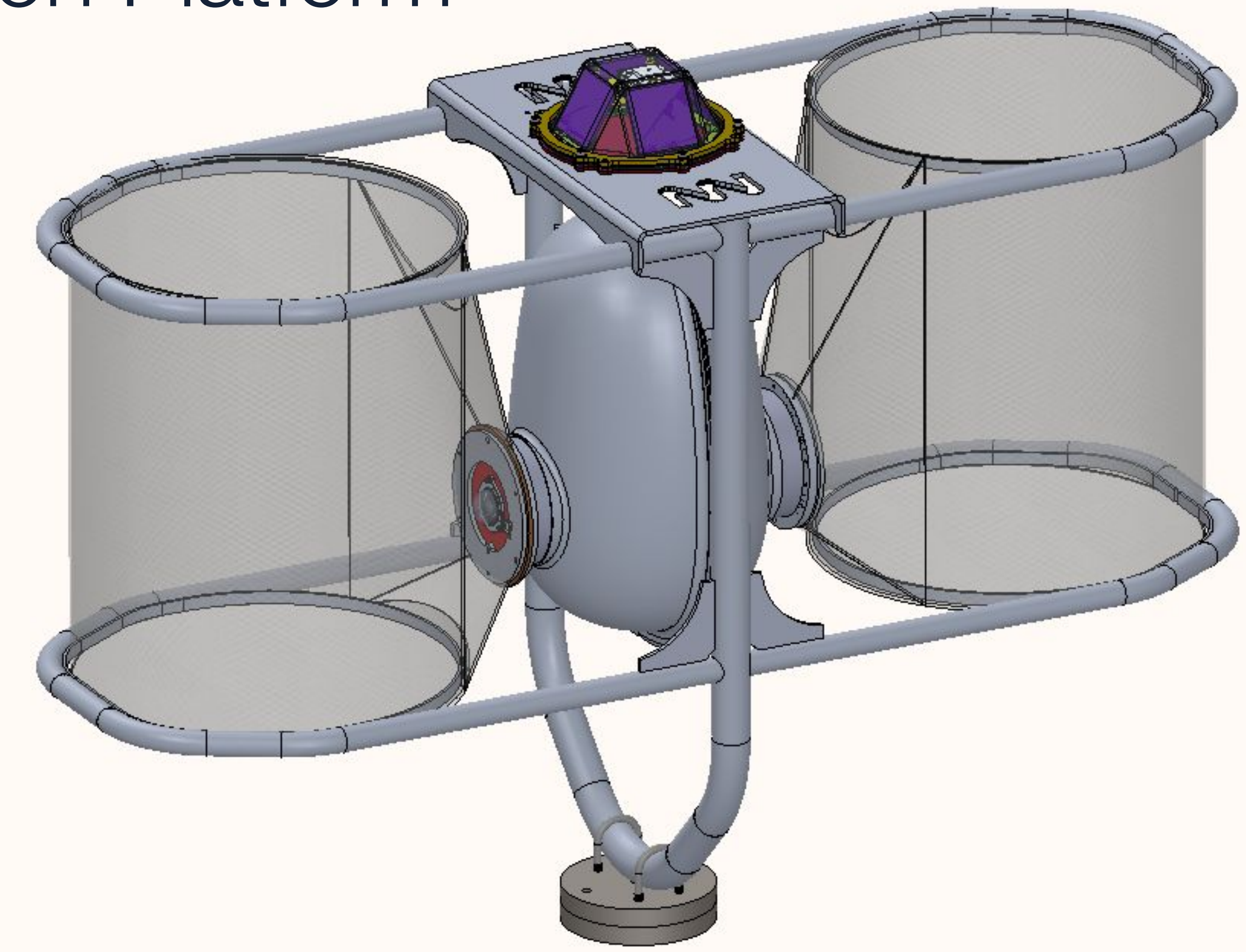
We focus on breadth of measurement, targeting high throughput solutions and improving multi-pathway focused hardware.



Trajectory
GPS

Accel Buoy
GPS, wave, surface temperature

Edge-processed proprietary algorithm for surface motion analysis

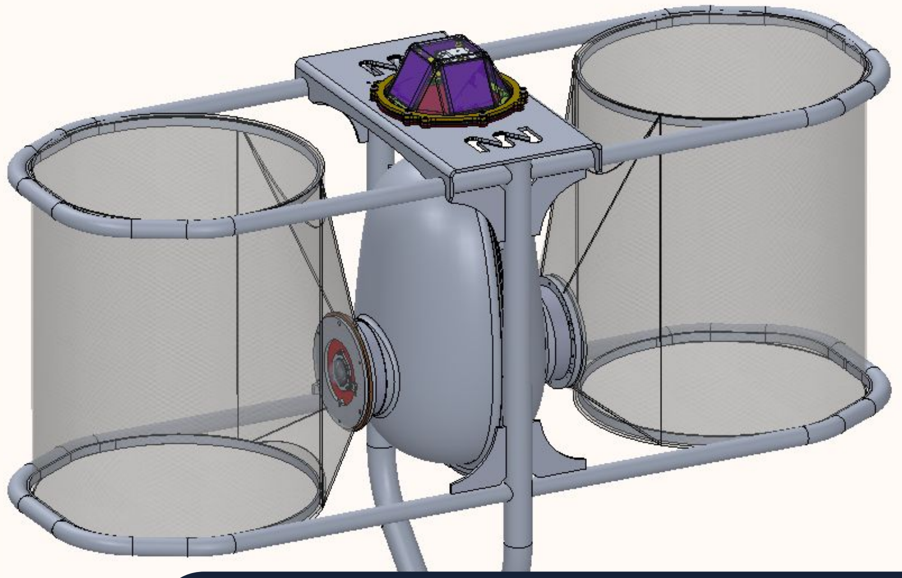


Cam-Lite
Float time, growth, surface temperature, fluorometer, pH

Performance improvements for deploys monitoring. Q2-24 flash, cellular communication and additional sensors (fluorometer, pH, salinity)

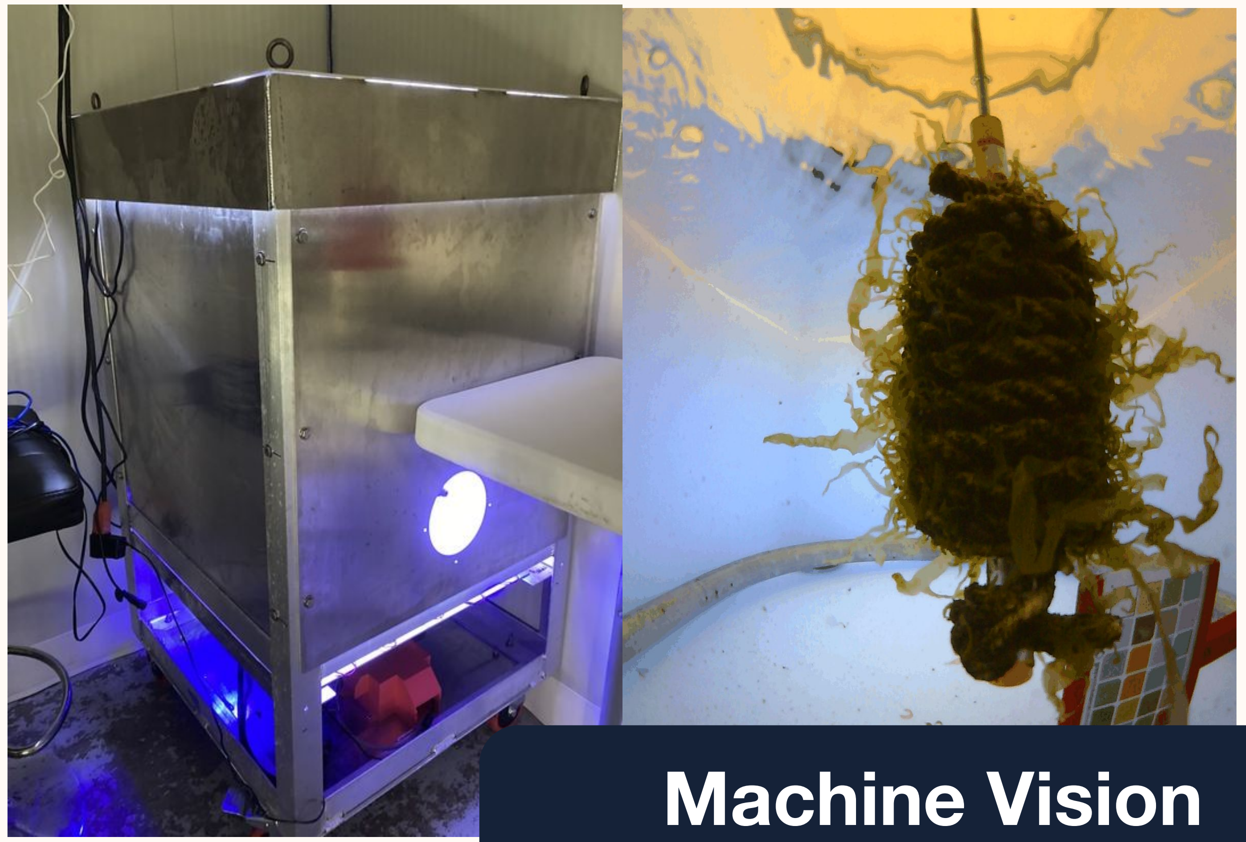
Verification Fleet: 3-5 Year Development Roadmap

Iterative development on machine vision training platform and open ocean observation platform to improve overall macroalgae quantification performance



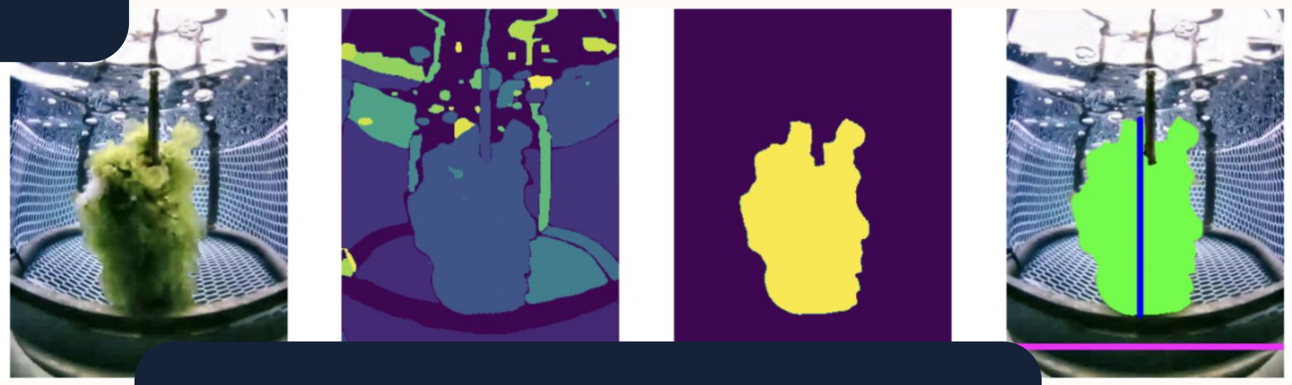
Open Ocean Observation Platform
Camera Buoys

- Iterate on hardware based on MV training platform
- Increase processing capacity to enable edge machine vision
- Incorporate state of the art satellite comms increasing data throughput and reducing operational costs



Machine Vision Training Platform

- Expand to accommodate additional macroalgae species
- Coastal imaging variant
- Optimize image sensing system

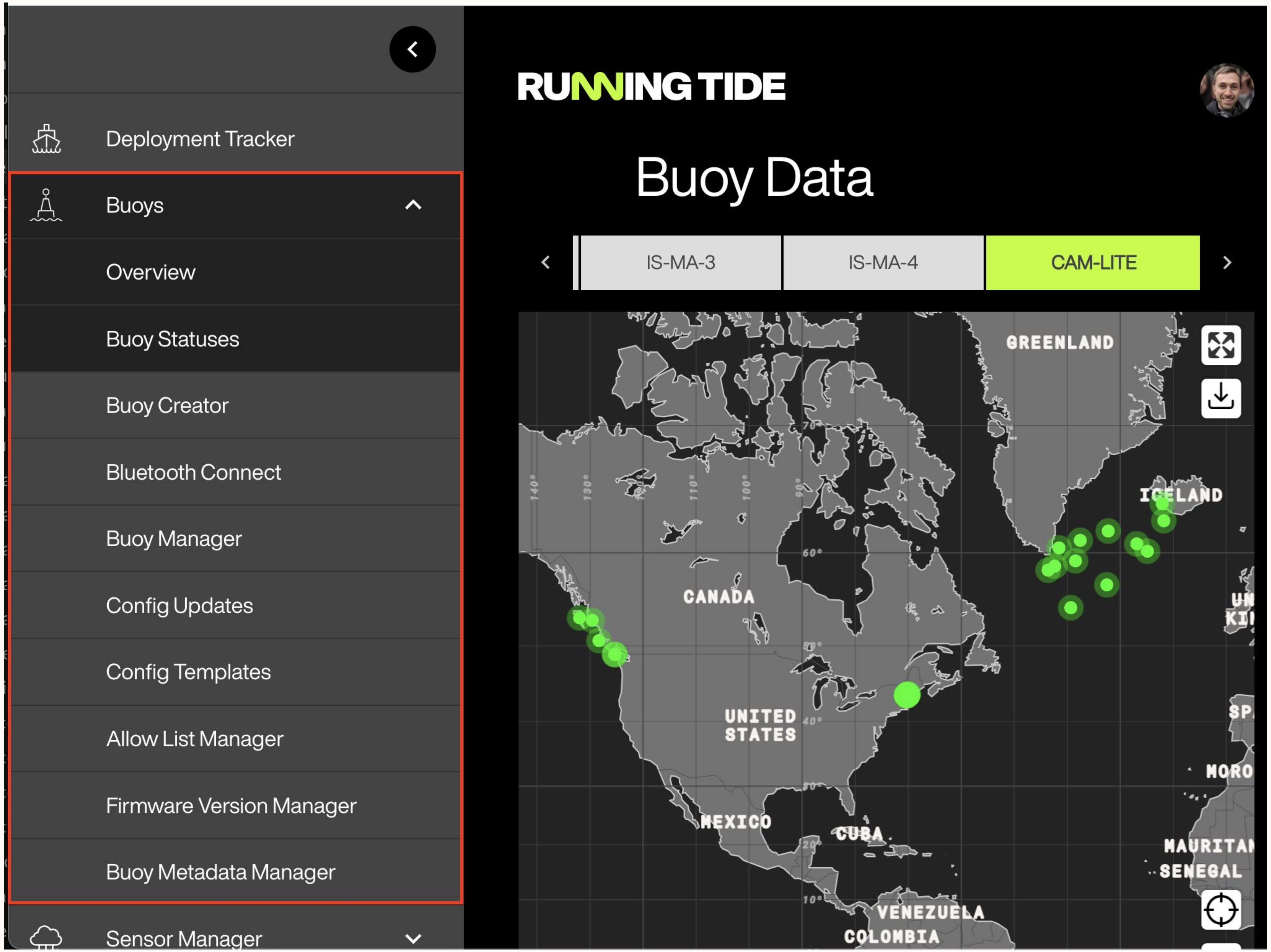


Deploy and Analyze

Verification Fleet: Management Dashboard

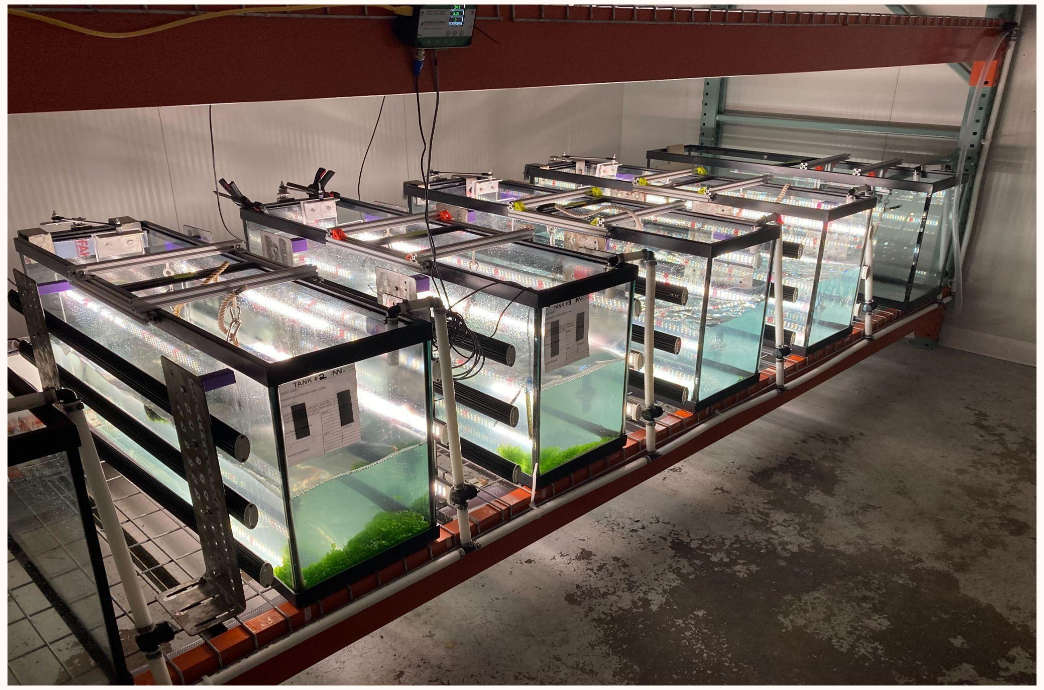
Custom fleet management dashboard:

- live data feed from verification buoys
- ability to configure data collection schedules
- ability to monitor hardware performance and reliability to drive improvements

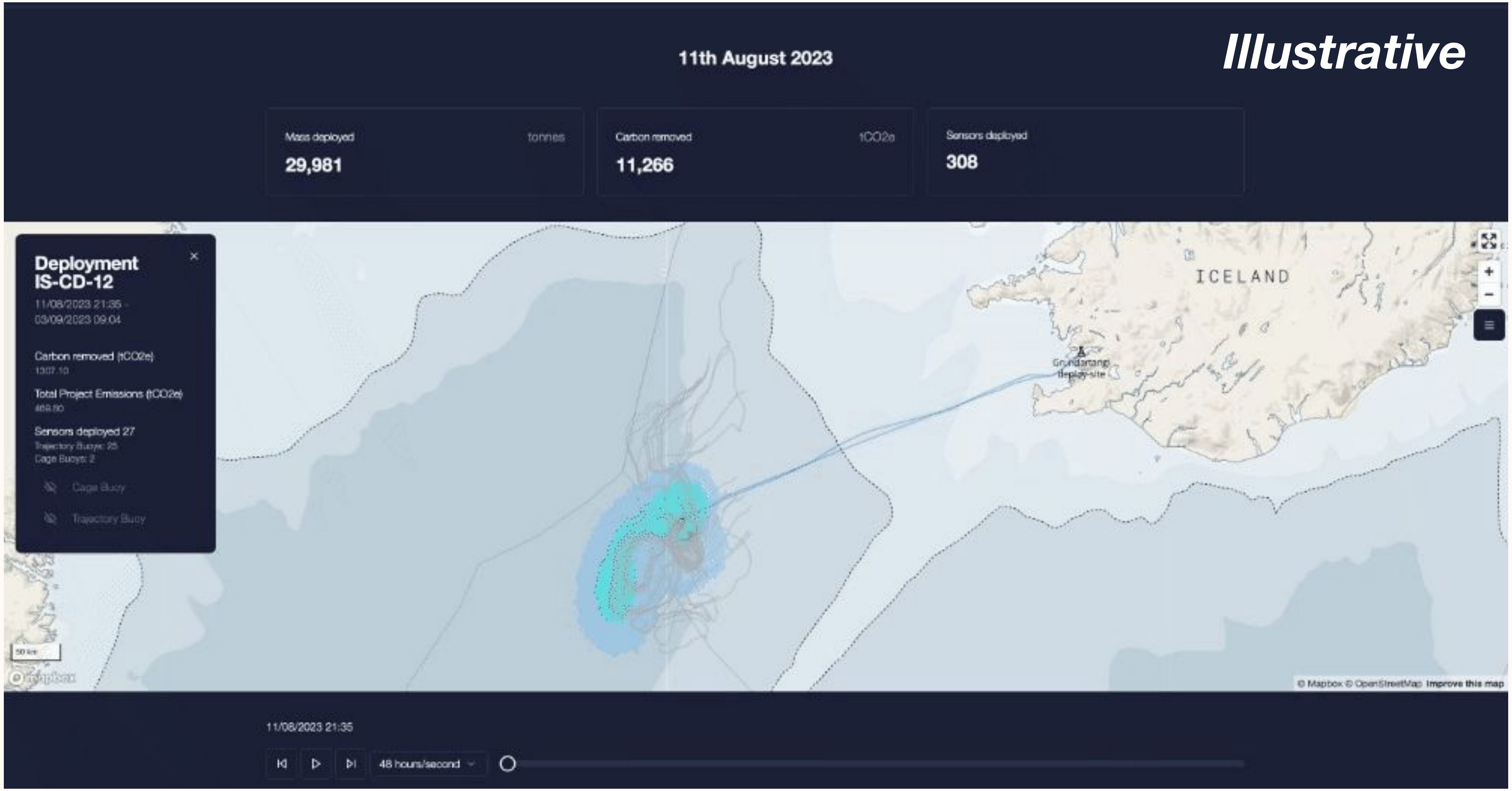


Laboratories: Controlled experimentation and quantification support

- ISO-compliant SOPs and lab standards
- Lab measurements guide and quantify sourcing, material development, post production validation, and credit generation.
- Grow lab capabilities include: wave tanks, growth tanks, climate controlled hatcheries, sterile working environments, ulva stock for sporulation, a sugar kelp gametophyte bank, synthetic seawater and water purification and filtration systems.
- Dissolution lab capabilities include: TIC/TOC analyzer; autotitrators; continuous pH, temperature, and conductivity for dissolution reactors, Growing library of tested materials tested from different sources and suppliers (Lime Kiln Dust, Cement Kiln Dust, Crushed Shells, Steel Slag, Olivine, Brucite).



Affected Water Tracker



Confidential - For Microsoft internal review only

Environmental accounting needs wide breadth of measurement to ensure alignment of industrial activity with the Earth System.

Running Tide is the world leader in integrated breadth of measurement across eCredit supply chains.

In-situ: from RT's own buoy fleet
Laboratory: From RT and partner labs
Derived: RT's ocean modeling and Research partnerships

	Demonstrated Capability	Next 24 Months Capability
Ecology	**In Situ** • Machine Vision Based Offshore Growth Measurement • Chlorophyll-A concentration • Camera systems for remote photo and video capture of coastal species **Laboratory** • eDNA for biodiversity in coastal and benthic environments **Derived** • Microbe eDNA for offshore marine species	**In Situ** • Automated eDNA sampling throughout the water column • MV for species identification - micro and macrofauna • Hydroacoustics for species ID, ambient noise, and vessel traffic **Derived** • Remote sensing of biomass feedstock to determine LUC
Biology	**Laboratory** • Nitrogen, Phosphorus, and Chl-a via water samples **Derived** • Growth in offshore nutrient conditions • Growth in offshore light conditions • Growth in Offshore Surface Roughness	**In Situ** • MV for Algae Seeding Attachment and alkaline float dissolution • Anti-biofouling solution across all systems **Derived** • Vertical float time vs. algae growth and attachment
Chemistry	**In Situ** • Real time pH and dissolved oxygen **Laboratory** • Carbonate chemistry water sampling **Derived** • Acid leaching • Alkalinity enhancement • Correlated carbonate chemistry in coastal environments	**In Situ** • Real time pCO_2 **Derived** • Full remote carbonate system accounting • Calibration-free buoy fleet - up to one year
Physics	**In Situ** • MV for Ocean Transport - Vertical (Float Time) • Ocean Transport - Surface Trajectories and sinking studies • Ocean Surface - Waves • Real time Temp, Salinity, Turbidity • Ocean transport - Surface Roughness **Derived** • Lab Based - Sinking Rates • Emissions Accounting through Supply Chain • Ocean Surface Roughness (Float Time, Dissolution)	**In Situ** • Ocean transport - Depth drift profiling • Manufacturing - Connected scales, temp, and moisture sensors for manufacturing intelligence **Derived** • Primary fuel use and energy use data passes automated QA/QC and data reporting enforcement across supply chain • Combustion analysis and emissions measuring on key emissions sources

Path to Scale

Empowering Industry-wide Open System Carbon Removal

The ocean is the ecosystem with the highest potential for CDR and remains relatively underexplored

70%
of earth's surface is covered by oceans

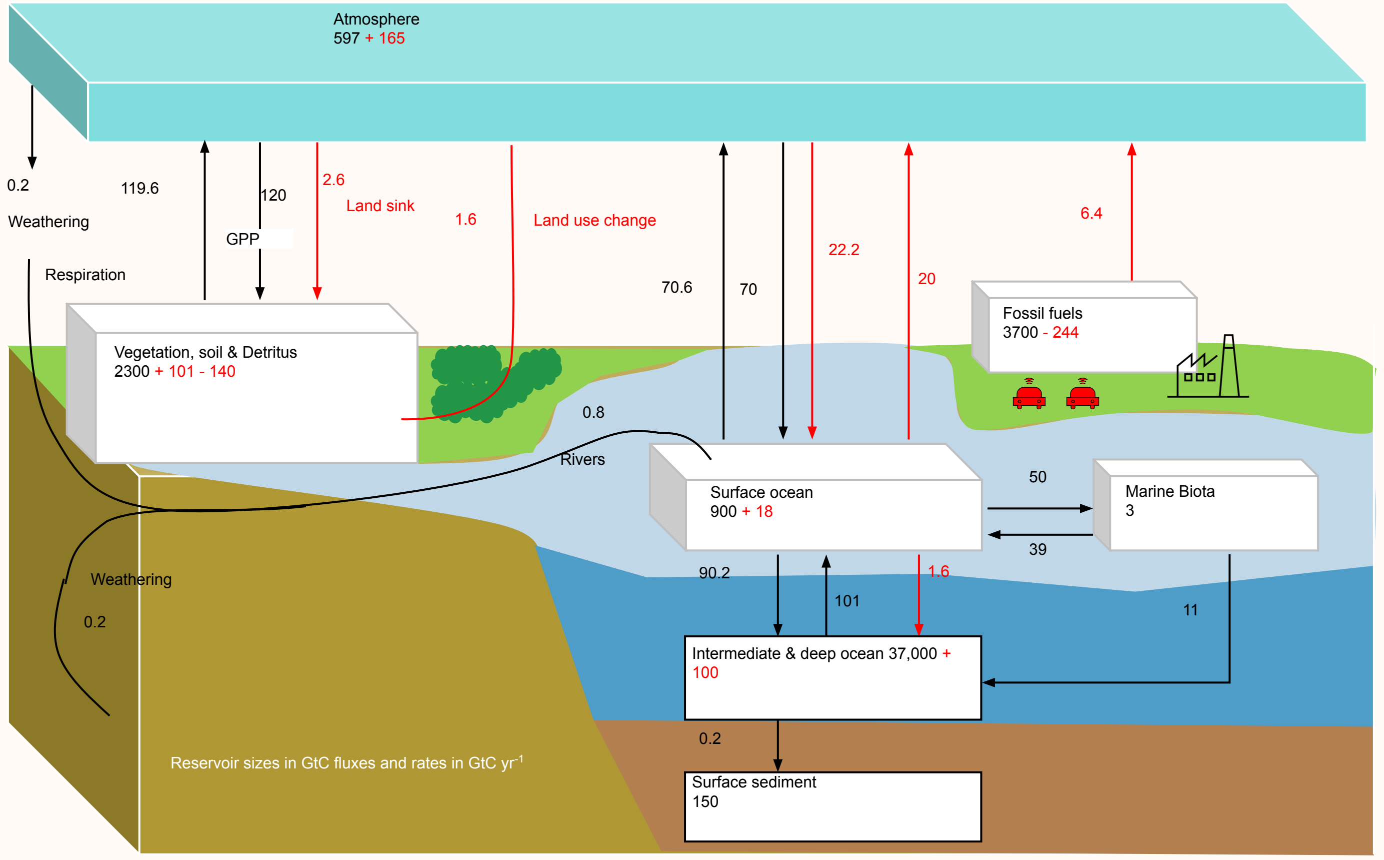
No competition for alternative uses of arable land

~30%
of yearly emitted CO_2 absorbed by ocean

Accumulating as acid and causing ocean acidification

16x
more CO_2 contained in ocean than in terrestrial biosphere

Easier to store excess CO_2 than in the terrestrial biosphere



>80%
of ocean unexplored

Responsible stewardship needed to protect fragile environment

<5%
of CDR startups (& funding) are ocean-based

Less competition for intellectual property and partnerships

<1%
of CDR credits are ocean-based[1]

Potential to sell targeted credits to ocean-focused purchasers

Running Tide expects to deliver up to 10's of $MtCO_2$ of removals by 2035 through 2 key levers – scale expansion and algae growth

2023-25

~250 $kTCO_2$ removed

With deployment across **2 beachhead sites (Iceland and Canada)**

Construction underway of **3 One-Megaton-processing plants** that will **reduce unit costs by 50+%** with economy of scale driving down transport & deployment costs

2026-30

Ramp to megatons at **$200-150** per tCO_2

Industry-leading unit economics achieved at Mt-scale

Reach removal run-rate with expansion into **5-10 locations**

2031-35

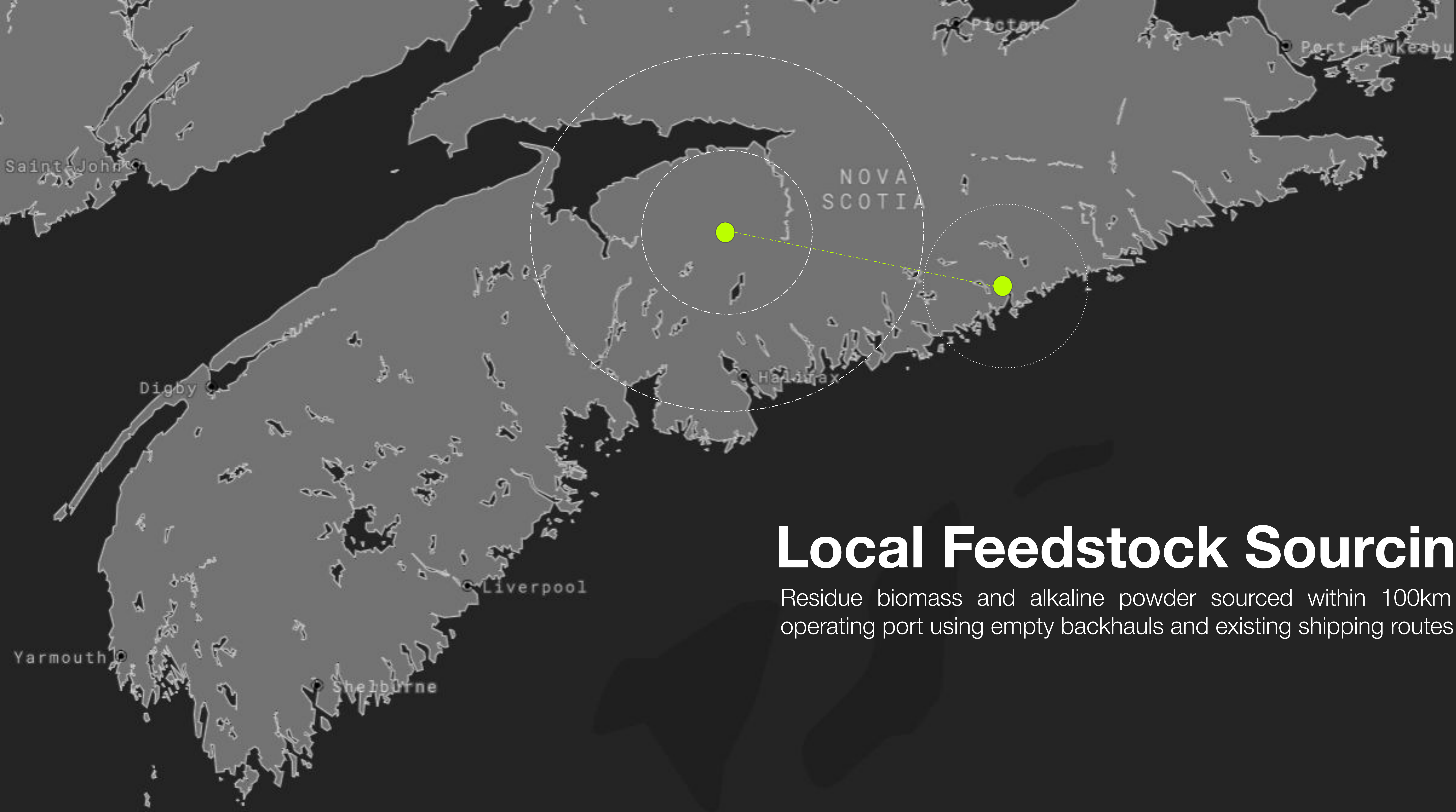
Up to **10's of** $MtCO_2$ / year at **<$100** per tCO_2

Removals per year with operations in 10-20 locations

Permission to Operate Canada

Signed Letter from Minister of the Environment and Climate

- **Running Tide's proposed operations are legal and do not require a permit for the disposal of materials at sea**. The Canadian Environmental Protection Act, 1999 does not establish a formal authorization process for placement activities because the activity is de facto permissible.
- **Running Tide is required to ensure that its activities meet the definition of placement through due diligence:** the activity is for a purpose other than mere disposal and is unlikely to cause marine pollution.
- While not required under the law, the Minster encouraged Running Tide to go beyond what is in the law, as part of its due diligence process in three specific areas: **community engagement/consultation, impact assessment and mitigation, and scientific coordination.** The Government encourages the use of the Annex 5 framework as an aid in performing this due diligence.
- **There is strong support for Running Tide's proposed activity at the highest level of the government.** It is very rare for a Minister to sign a letter to a commercial organization on a regulatory matter in Canada. The overall tone, lack of any language around risks or caution, and the fact that the Minister signed this letter himself (as opposed to delegating to a bureaucratic official) is a clear signal that the government is encouraging Running Tide to proceed, but to do so carefully. Running Tide has worked tirelessly to educate multiple stakeholders across all levels of government over the past two years, and this has led to strong support amongst key decision makers of the government to quote one senior official: "This is the type of innovation we need and is a no brainer."
- Under the current Canadian regulations, the determination that Running Tide's activity is considered placement would mean that its activities can scale out of Canada so long as it can continue to ensure that they do not cause harm to the marine environment.

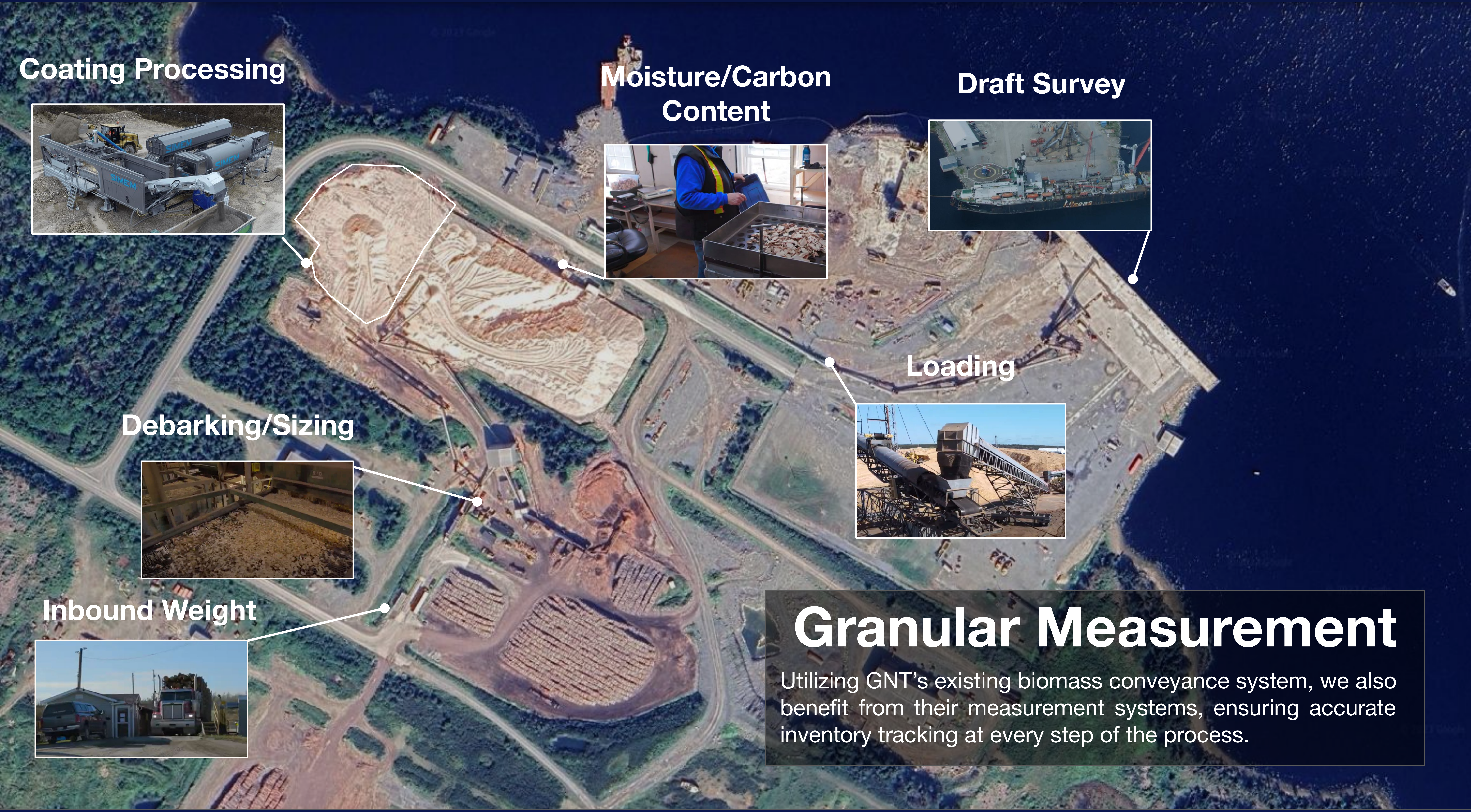


Local Feedstock Sourcing

Residue biomass and alkaline powder sourced within 100km of operating port using empty backhauls and existing shipping routes.

Leveraging Partnerships

By partnering with Great Northern Timber (GNT), we gain access to their ship loading terminal at the Port of Sheet Harbor (POSH), a streamlined biomass loading facility capable of moving 800,000 MT of material annually.

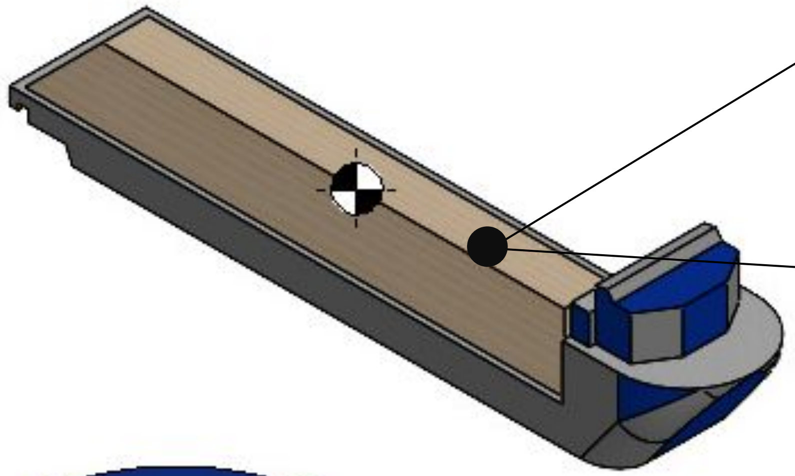


Granular Measurement

Utilizing GNT's existing biomass conveyance system, we also benefit from their measurement systems, ensuring accurate inventory tracking at every step of the process.

GPO Heavy-Lift

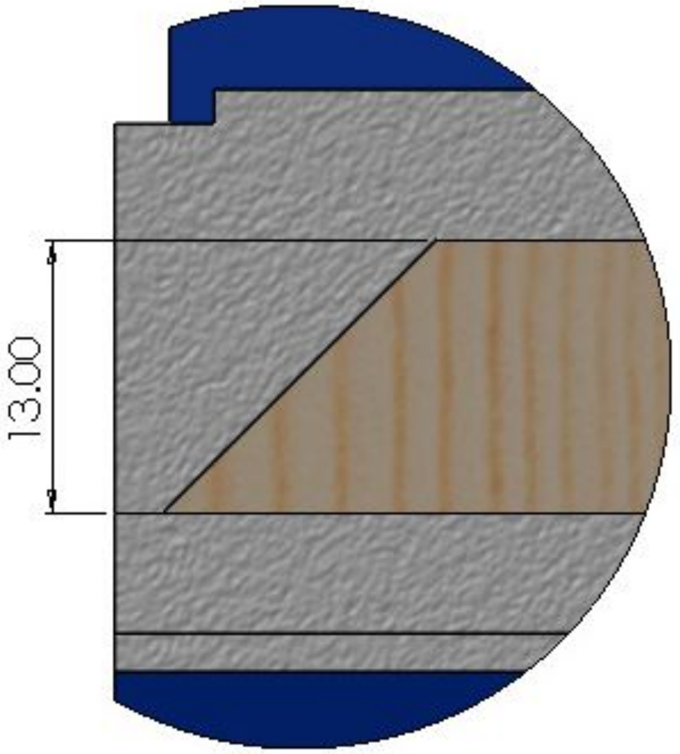
Semi Submersible, Open Deck



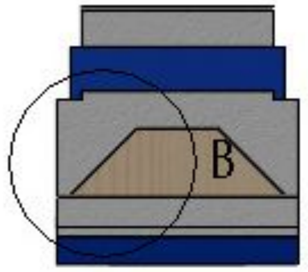
ρ_cargo = 350 - 500 kg/m3
Volume Stack = ~ 65,000 - 76,000 m3

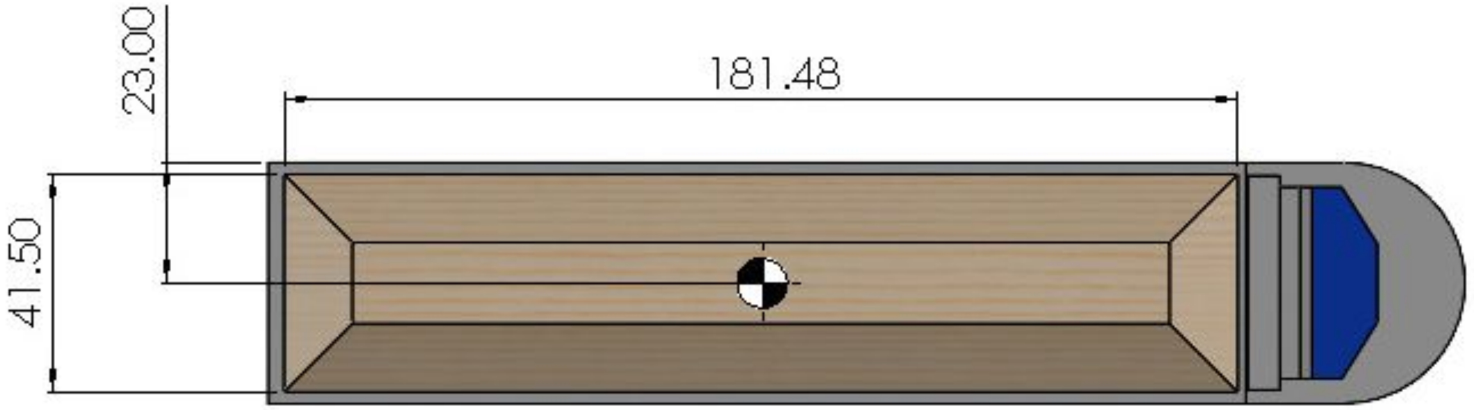
Material Deployment

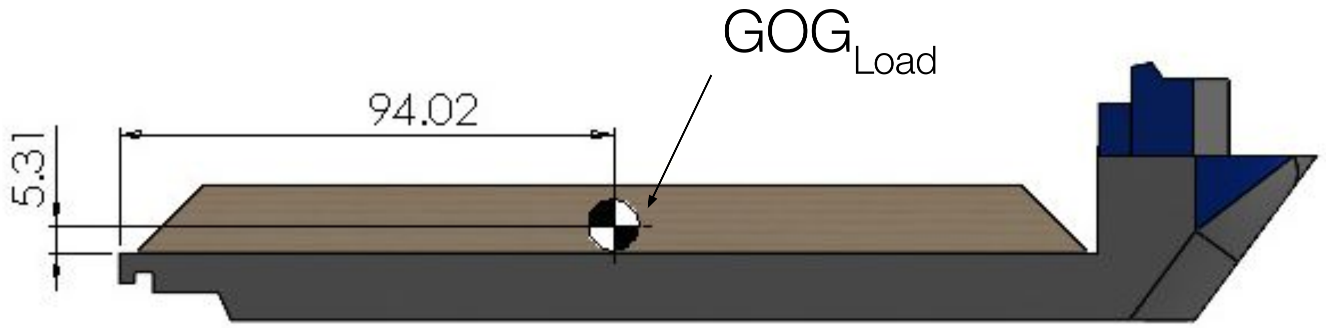
We select fast, high capacity deployment vessels to minimize fuel burn per mass of carbon deployed.



DETAIL B
SCALE 1 : 300

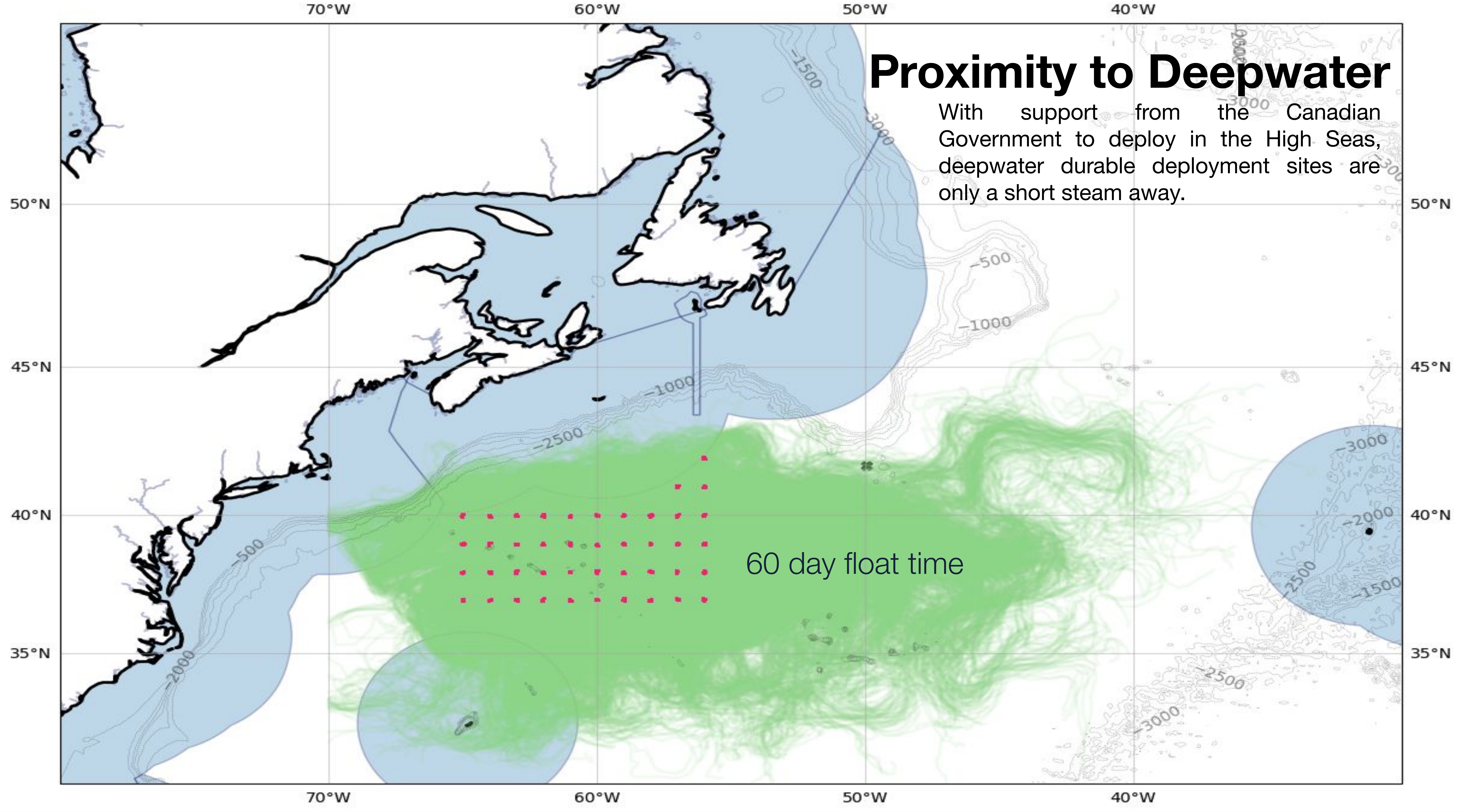






Proximity to Deepwater

With support from the Canadian Government to deploy in the High Seas, deepwater durable deployment sites are only a short steam away.



Project Pipeline

Project Name	Location	Projected Volume & Path to Scale	Permitting	Partners	Community Engagement and Co-benefits	Timeline / Current Status
Canada	Sheet Harbor	Megaton+, permission not volume constrained.	Ministerial Permission to Operate	GNT, Ocean Networks Canada, OFI	Established partnerships and political support.	operationalizing for 2024/2025
Iceland	Grundartangi Akranes	Up to 35k tons in current, multi-pathway permit.	Permitted	Eimskip, E.T., Busker & Berging	Well Established. Jobs and national climate leadership	Active
Japan	Tokuyama	Removal volume TBC. substantial industrial site	Exploring inclusion in Japan Blue-Carbon Scheme	Idemitsu	Early Stage - Outreach through potential industrial partner. Contribution to site and municipal climate goals	MoU for operational partnership drafted and under review
Norway	Averoy	50K tons per year in application.	Permitting upon completion	Wilhelmsen & NORSEA	Early Stage - Outreach through joint venture	Established Joint Venture
Nigeria	Lagos, Nigeria	TBC - tens to hundreds of thousands of tons	In exploration	Sea Seis, Hydrographer of the Navy	Early stage - Establishing high level buy-in from national and local govt	Exploratory phase. Potential permit in 2024

Pathway Development Status: 2024 Q1

Biomass Sinking

- TRL 8
- 0 tech risk
- Nearterm path to $140 per ton
- Limited in absolute scale due to competitive biomass uses (e.g. energy production)

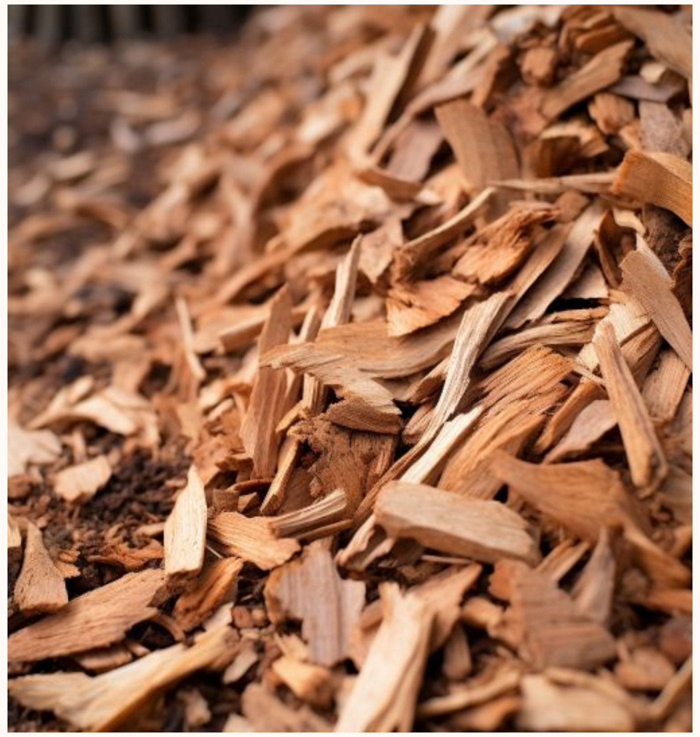
OAE

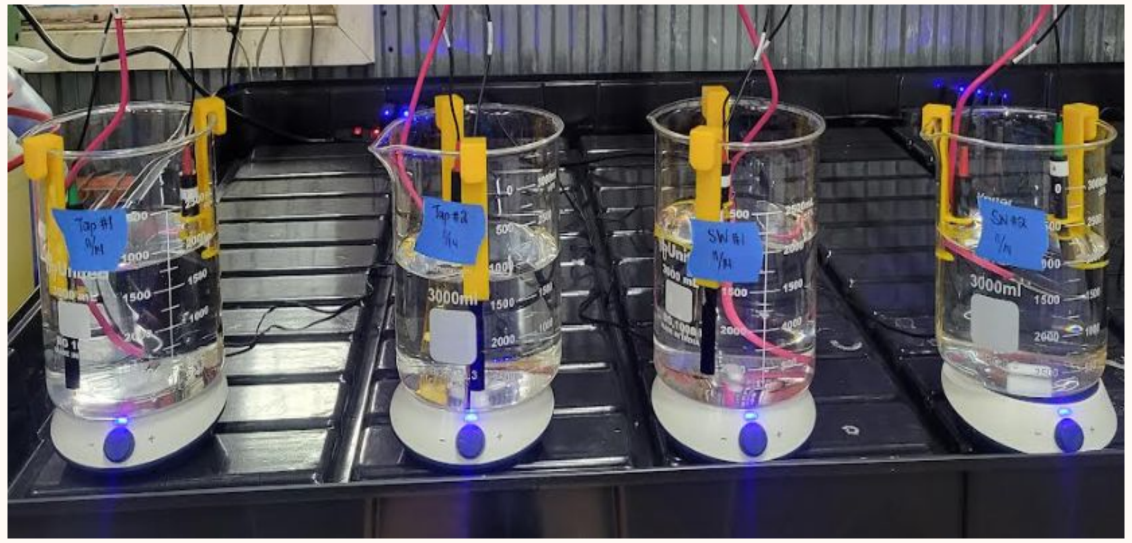
- TRL 6.0
- Necessarily, quantified net increase in alkalinity as part of 2023 operations
- Market driven focus through significant inbound
- Can support with minimal incremental quantification and credit generation costs.

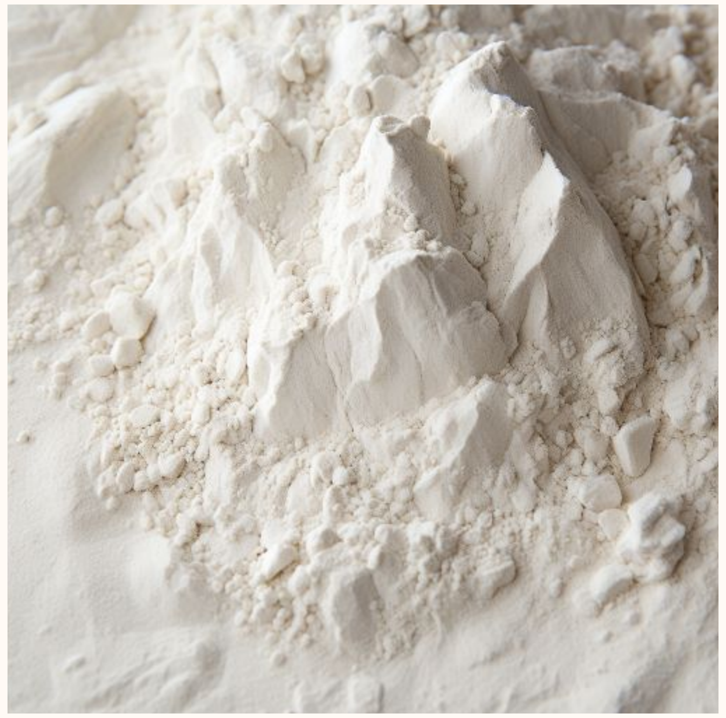
Algae

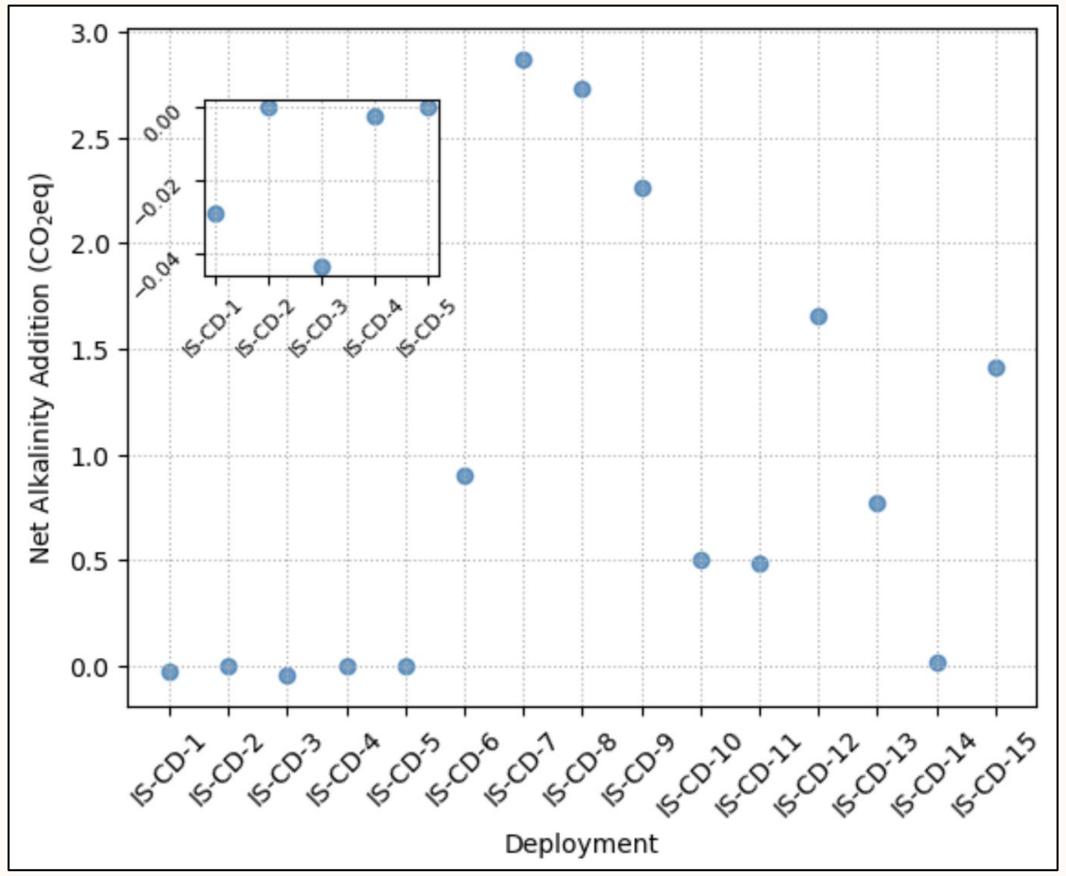
- TRL 4.0
- System multiplier
- Requires long term contracts
- Biological potential and uncertainty

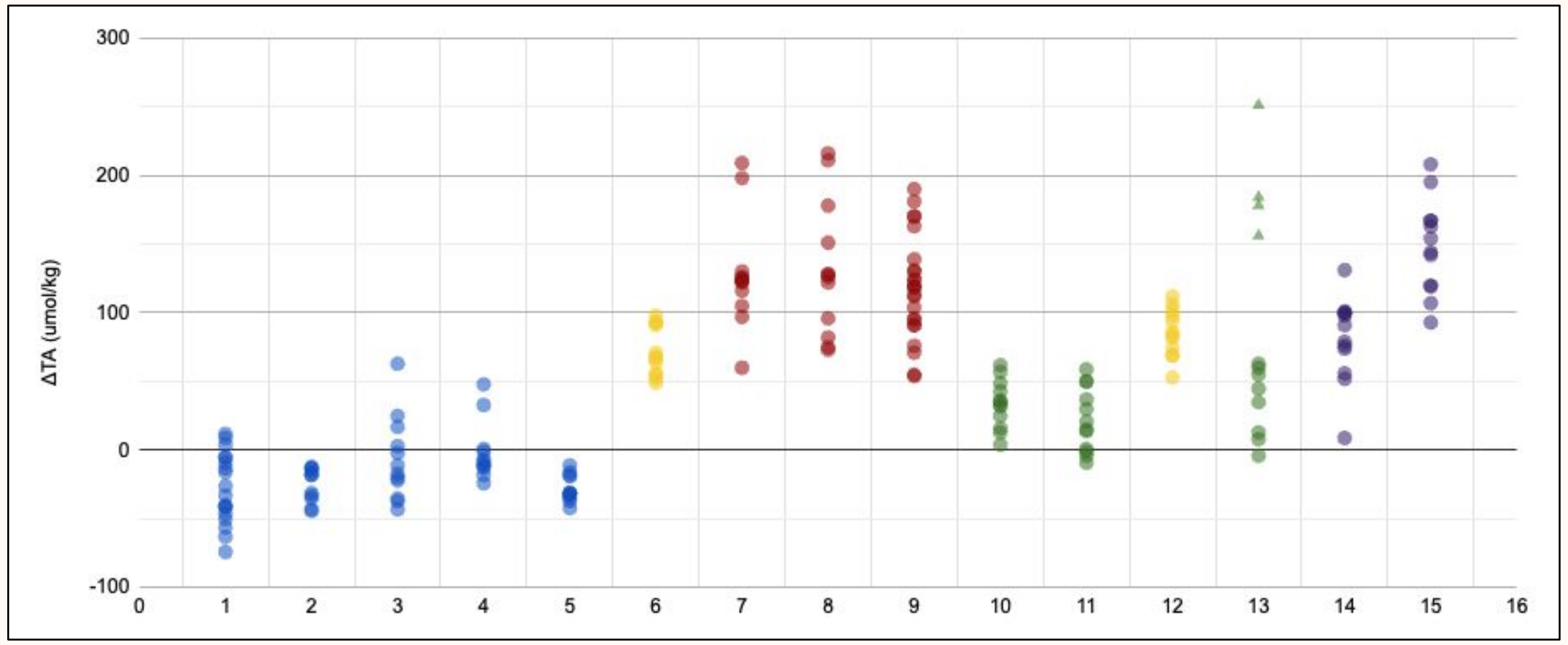
Iceland Operations: 2023 Alkalinity Enhancement

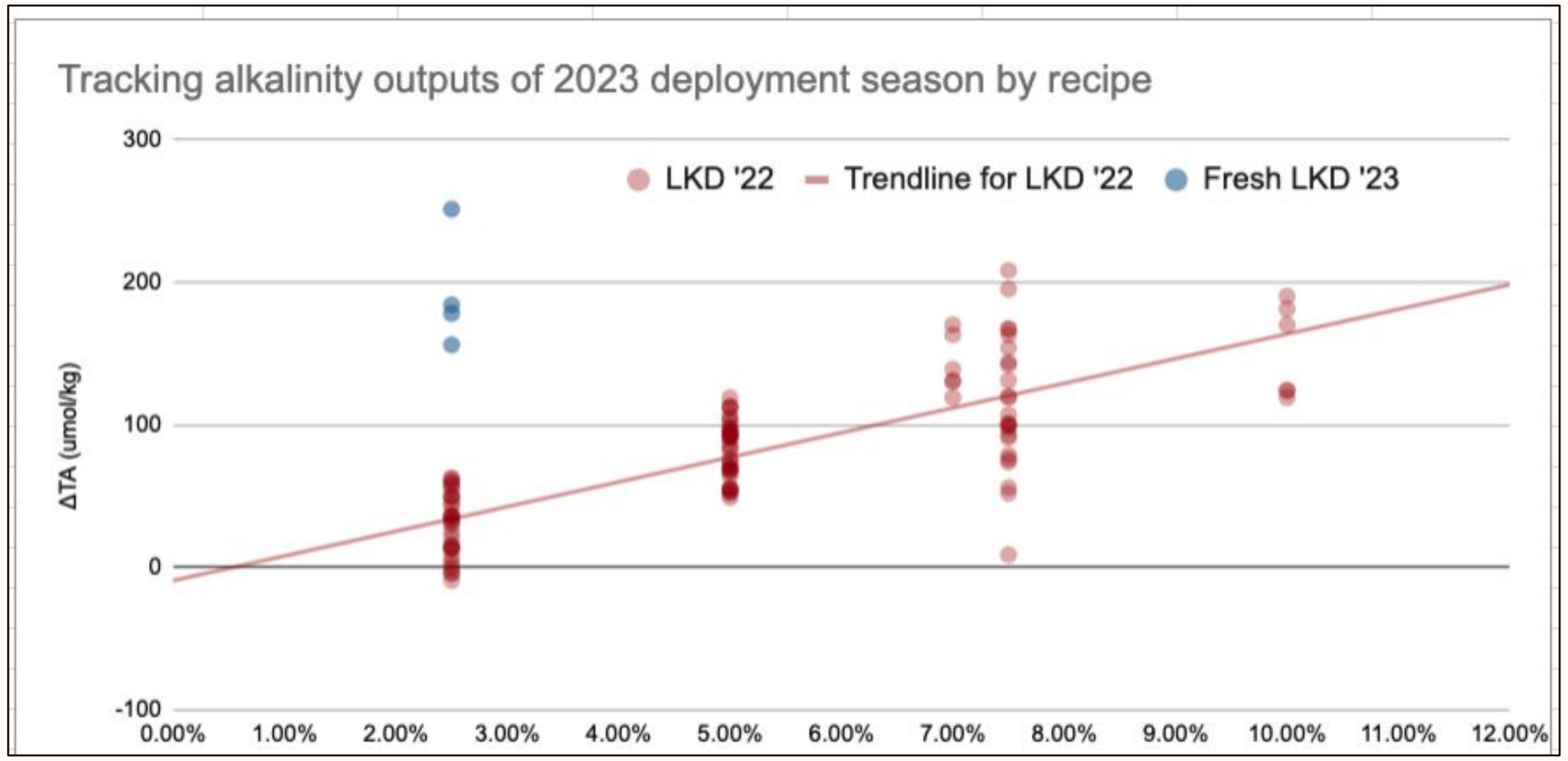








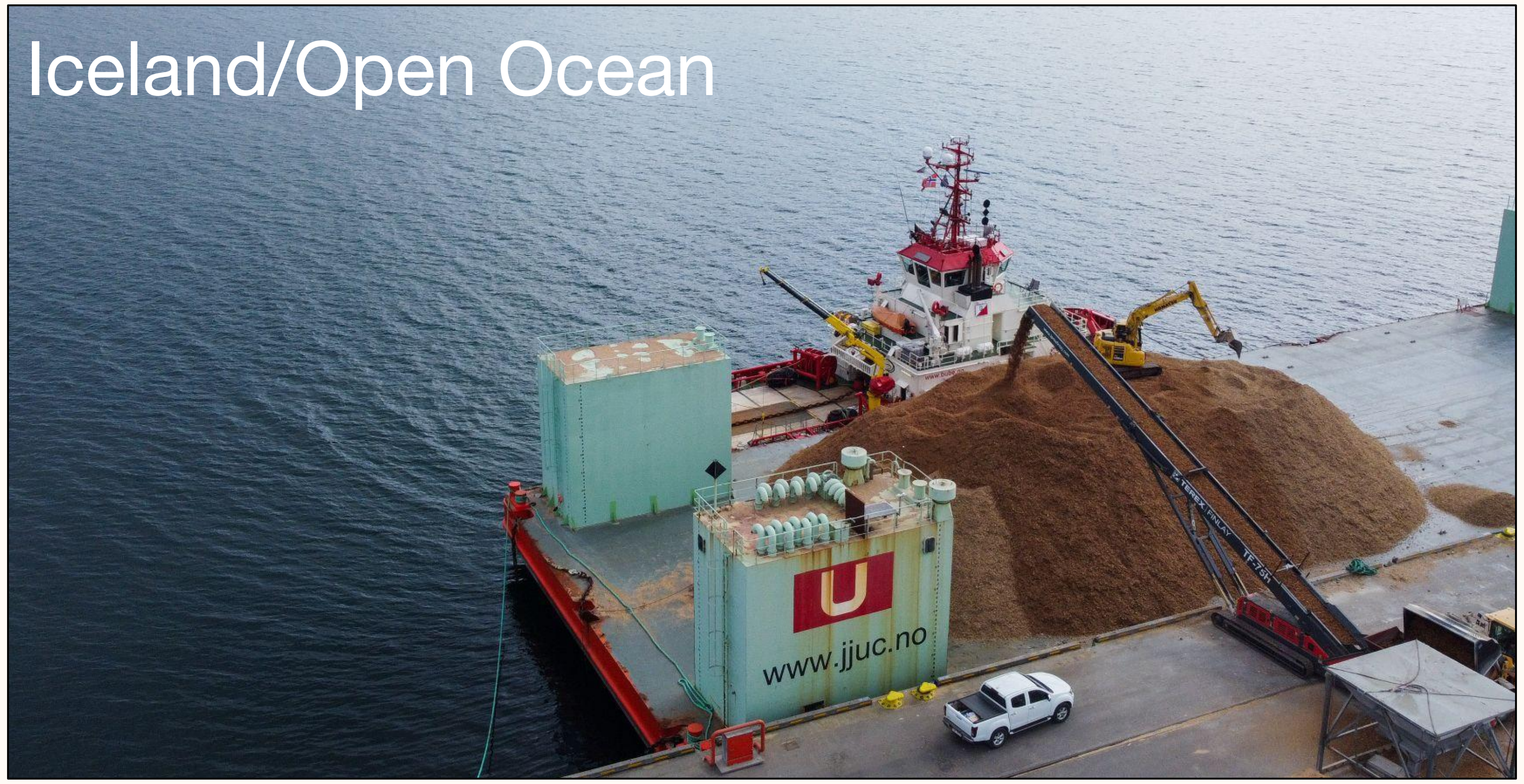




2024/2025 OAE Project Development

Deer Island

1. Modeled COGS appear to be reasonable for this stage and scale at \$250-\$350/ton CO_2e.
2. Requires incredibly low CAPEX due to existing system and infrastructure (figures are location dependent).
3. Likely operationalized via a staged approach, given state agency oversight
4. Logistics are likely bottleneck. Limited economies of scale beyond full utilization of single location.



Iceland/Open Ocean

1. OAE appears viable with achievable \$100/ton CO_2e COGS.
2. Path to scale leverages known industrial processes and infrastructure, with relatively low CAPEX requirements.
3. Preliminary analysis suggests that steel slag appears to be have cost and availability advantageous compared to brucite.

Macroalgae Roadmap

2024

- Quantify and deploy 1 ton co2e of macroalgae and deliver that to the world
- Offshore growth experiments in two oceans from two countries with multiple species
- Expand partnerships x 10 to build up knowledge base and train the next generation of ocean based CDR scientists and operators.
- Continue to develop the technical skills around cultivation, seeding and deployment in our facility in Iceland and with partners

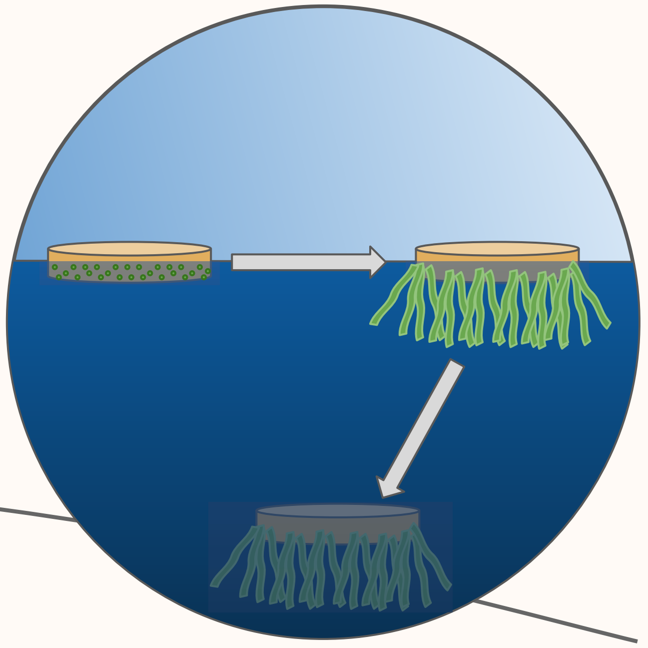
2025

- Leverage terrestrial biomass deployments to do multiple 1k ton co2e deployments and deliver to customers.
- Offshore growth experiments in two oceans from 4-5 countries with multiple species
- Expand partnerships x 10 to build up knowledge base and train the next generation of ocean based CDR scientists and operators.
- Continue to develop the technical skills around cultivation, seeding and deployment and expand footprint to more countries.

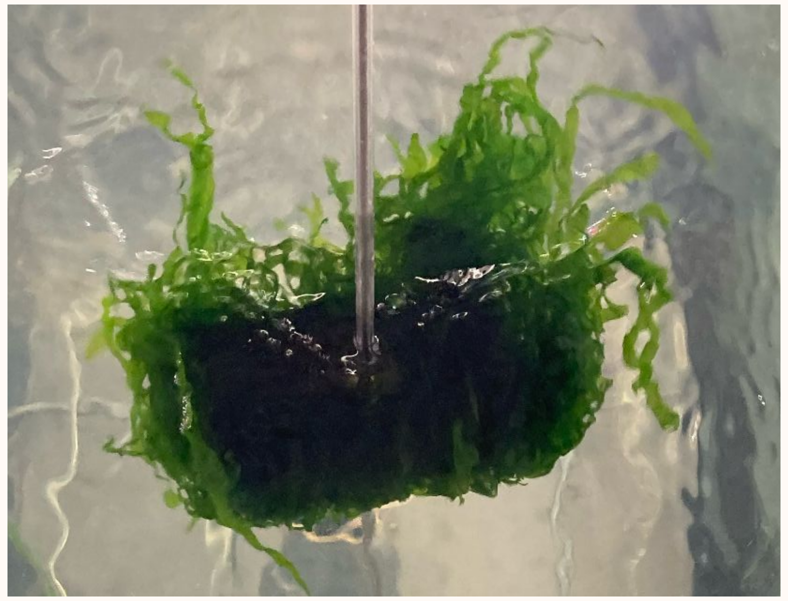
2026

- Leverage terrestrial biomass deployments to do multiple 10k-15k ton co2e deployments and deliver to customers.
- The next generation of ocean based CDR scientists and operators has gone through two years of training and are forcing me into retirement.
- We have stabilized large scale terrestrial biomass deployments and we are entering the hinge point where macroalgae unit economics takes center stage.

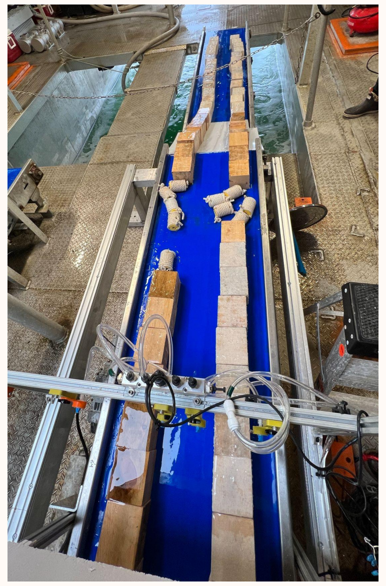
Macroalgae Carbon Buoy: End to End



Iterative R&D process

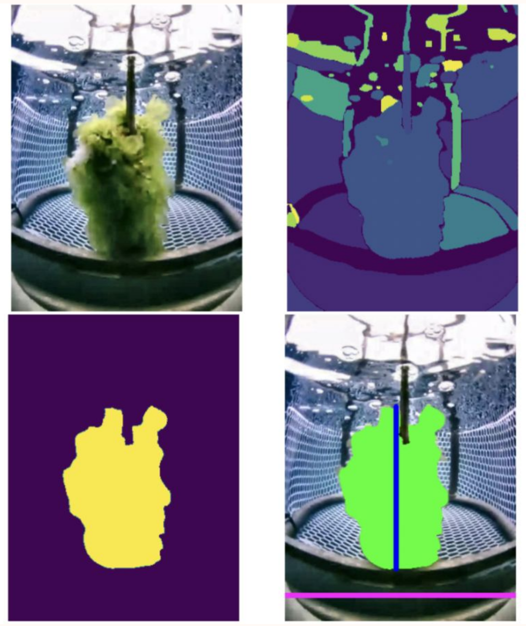


Substrate for float and growth



Seed & deploy process

Offshore testing of growth and float



Model and verify
(lab + offshore)

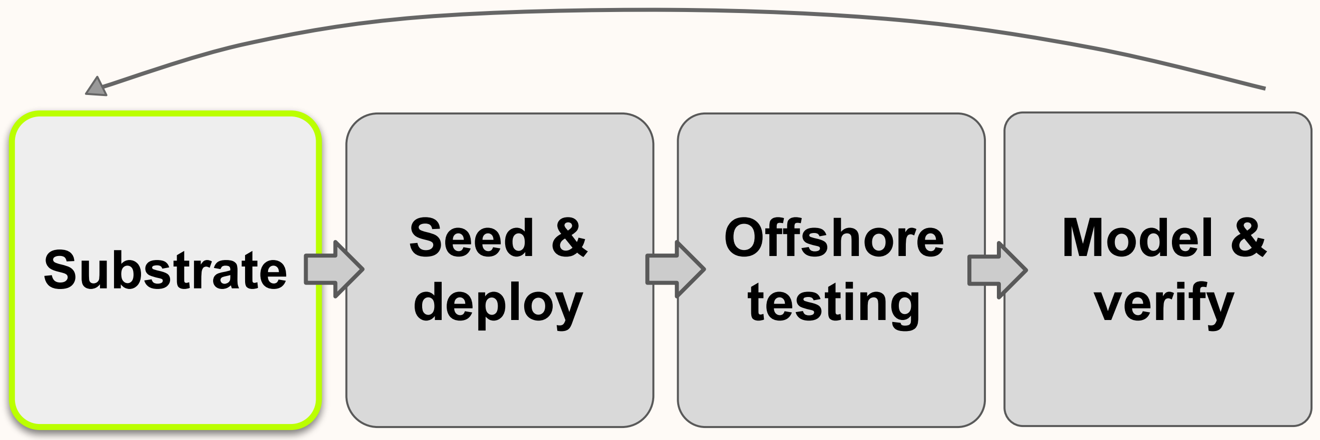
Paulownia wood
Readily available, carbon rich, long float time

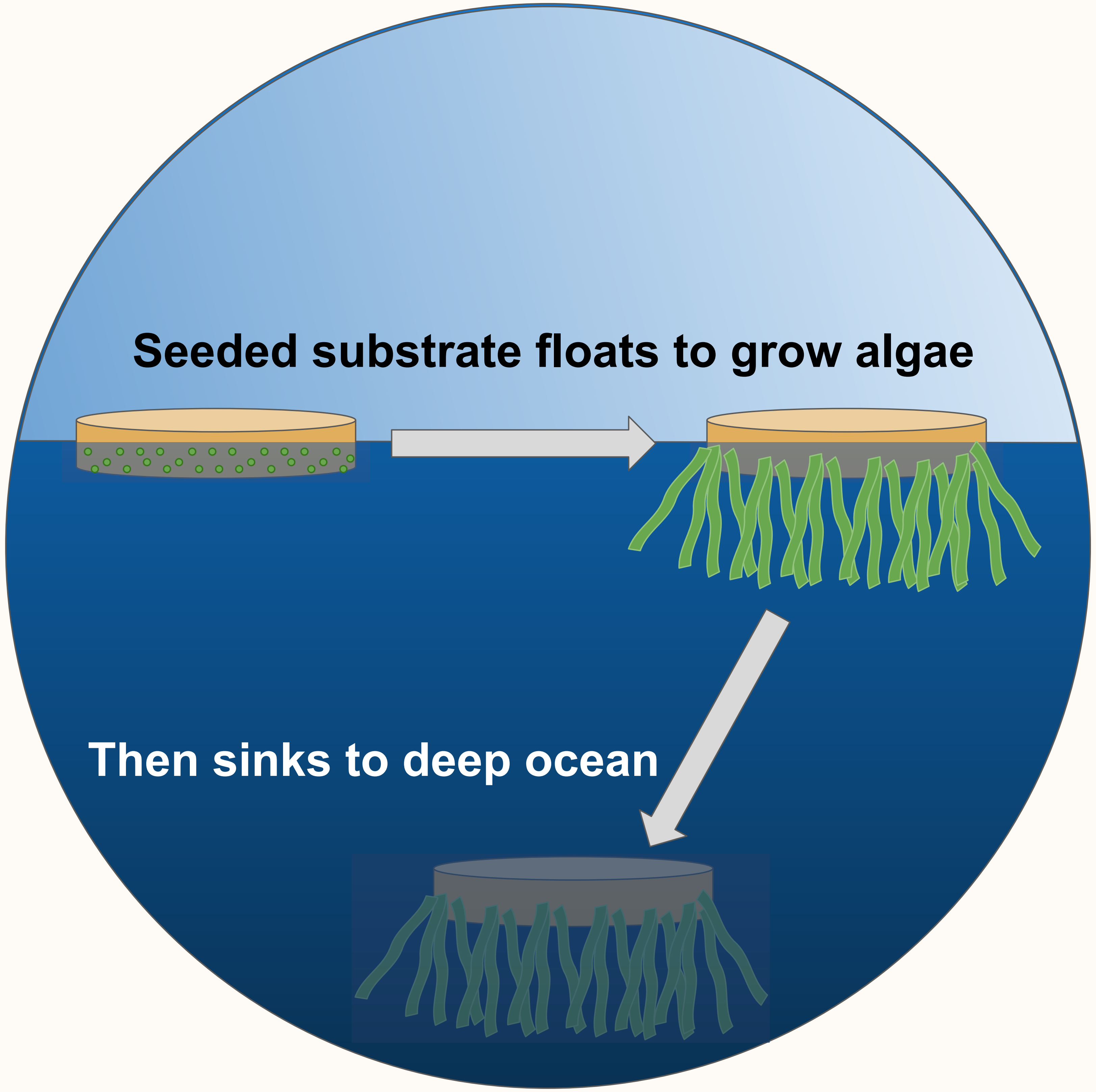
Fast seed application
2023: proved in lab
2024: prove offshore

Ocean camera buoys
2023: proved ulva growth
2024: ↑ growth, ↑ species

Quantifying results
Algae growth modeling
Machine vision training

Macroalgae Substrate R&D





Substrate design requirements:

- Float on the ocean surface 3-12 months
- Resist wear from handling and waves
- Support macroalgae growth
- Not harm any ocean ecosystems
- Scalable at low cost
- Net negative embodied carbon

2024 R&D will study paulownia wood:

✓ Low density and long float time
✓ Supports growth and attachment of MA
✓ Very fast growing/Long history
✓ Contains fast carbon to remove

Ulva lactuca grown on paulownia for 6 weeks

Open Ocean Growth Experiments

2023: Growth Success!

2023

day 1 of deployment

day 47, 6 weeks offshore

2023: Demonstrated Offshore Growth
Species: Ulva Lactuca
Seed Tech: Pre-grown in hatchery 4 weeks
Substrate: Cotton

2024: More Species, New Seeding Tech, New Substrate

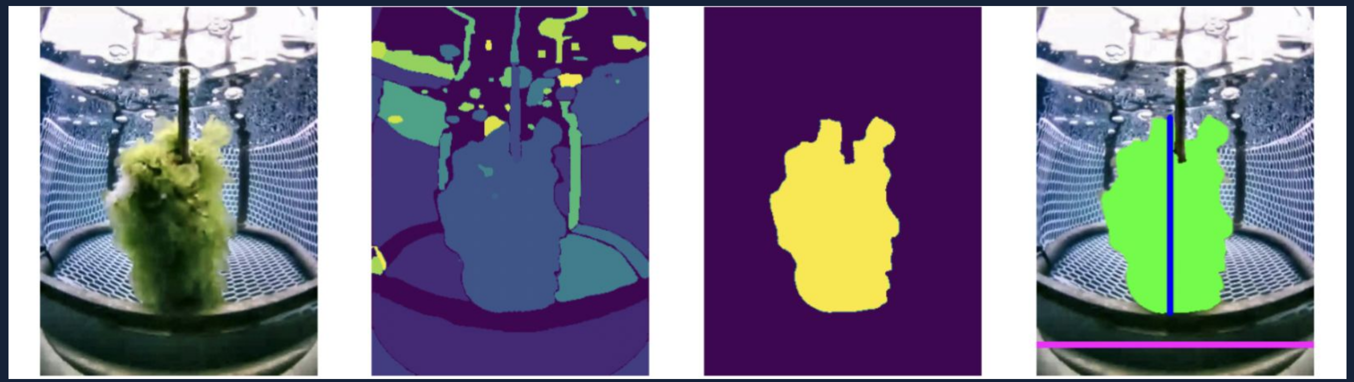
2024 (planned)

2024: 5 deployments planned in North Atlantic and Pacific
Demonstrate More Species: Sugar Kelp
New Seeding Tech: Seed and deploy with binder (no pre-grow)
New Substrate: Paulownia wood (baseline production substrate)

Open Ocean Growth Experiments

Measure, Model, Quantify

Building a machine vision training set to connect offshore images to biomass CO_2e



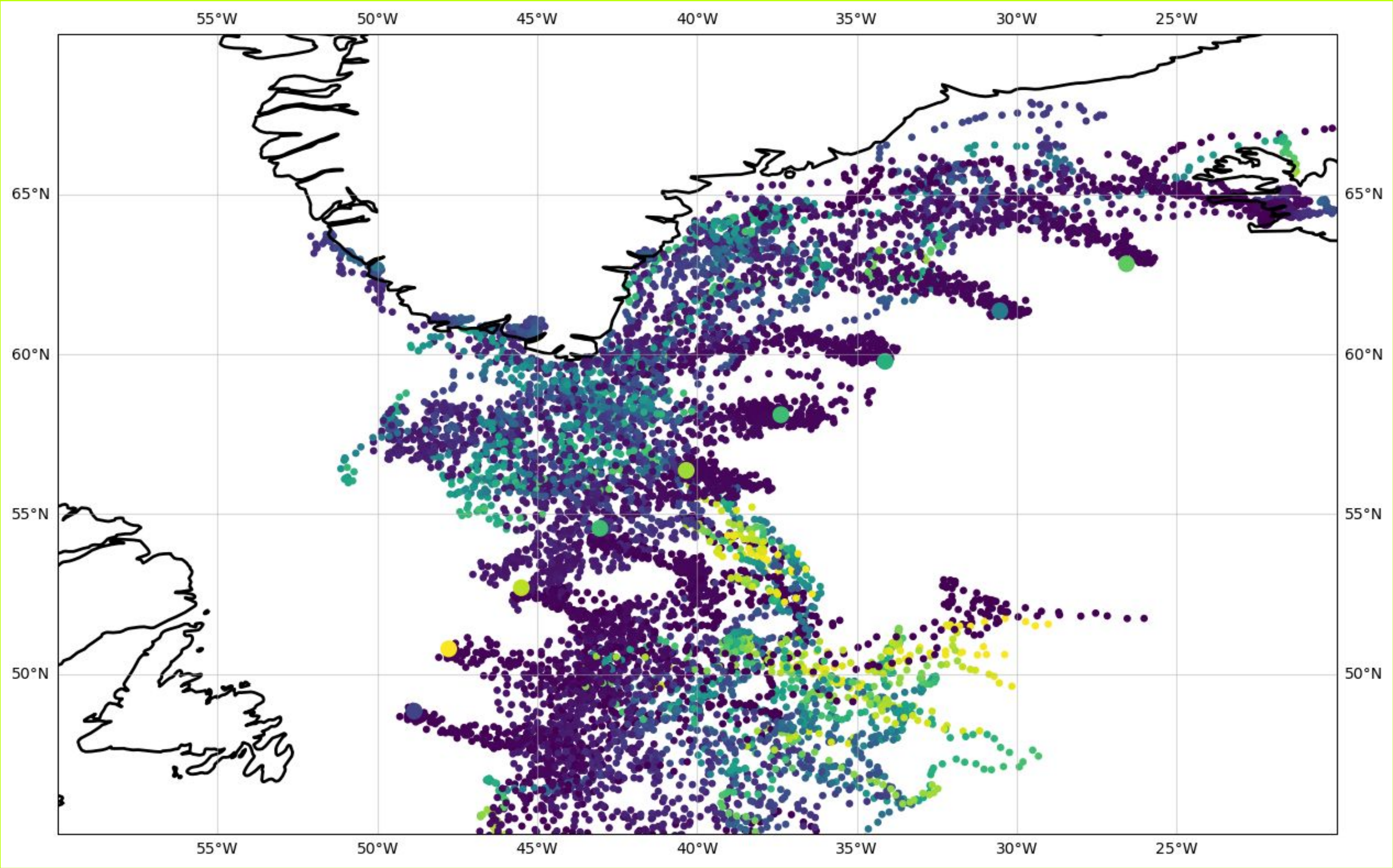
ORCA Onshore Research Camera Aquarium
Working towards first quantification of offshore growth in 2024. 500 images collected from 20 samples grown in hatchery on land so far

Offshore Camera Buoys
Continuing to refine current “cam-lite” system with added flash feature in 2024 for improved front lighting
Looking towards next gen edge processing system that can run MV on buoy

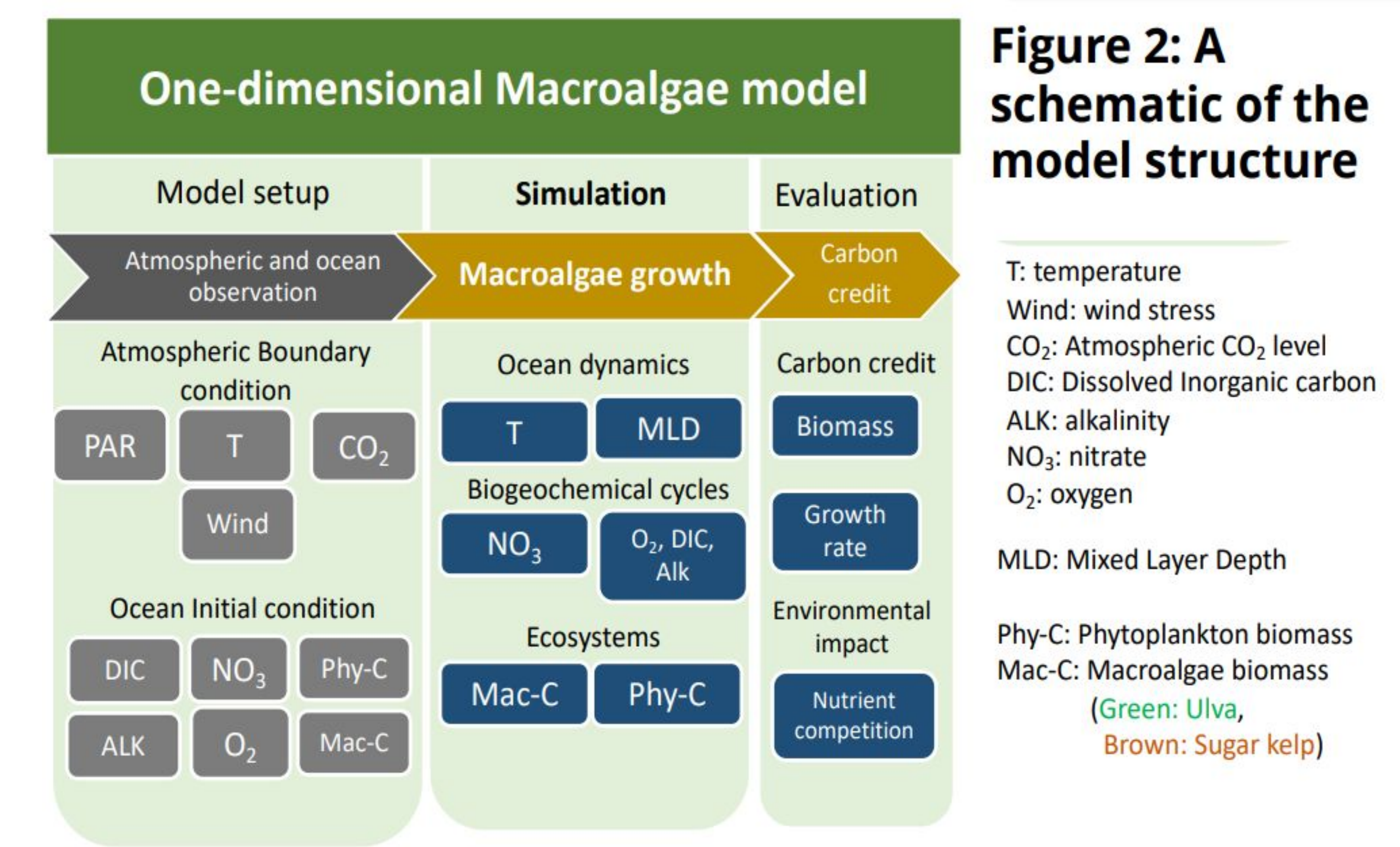
Open Ocean Growth Experiments

Measure, Model, Quantify

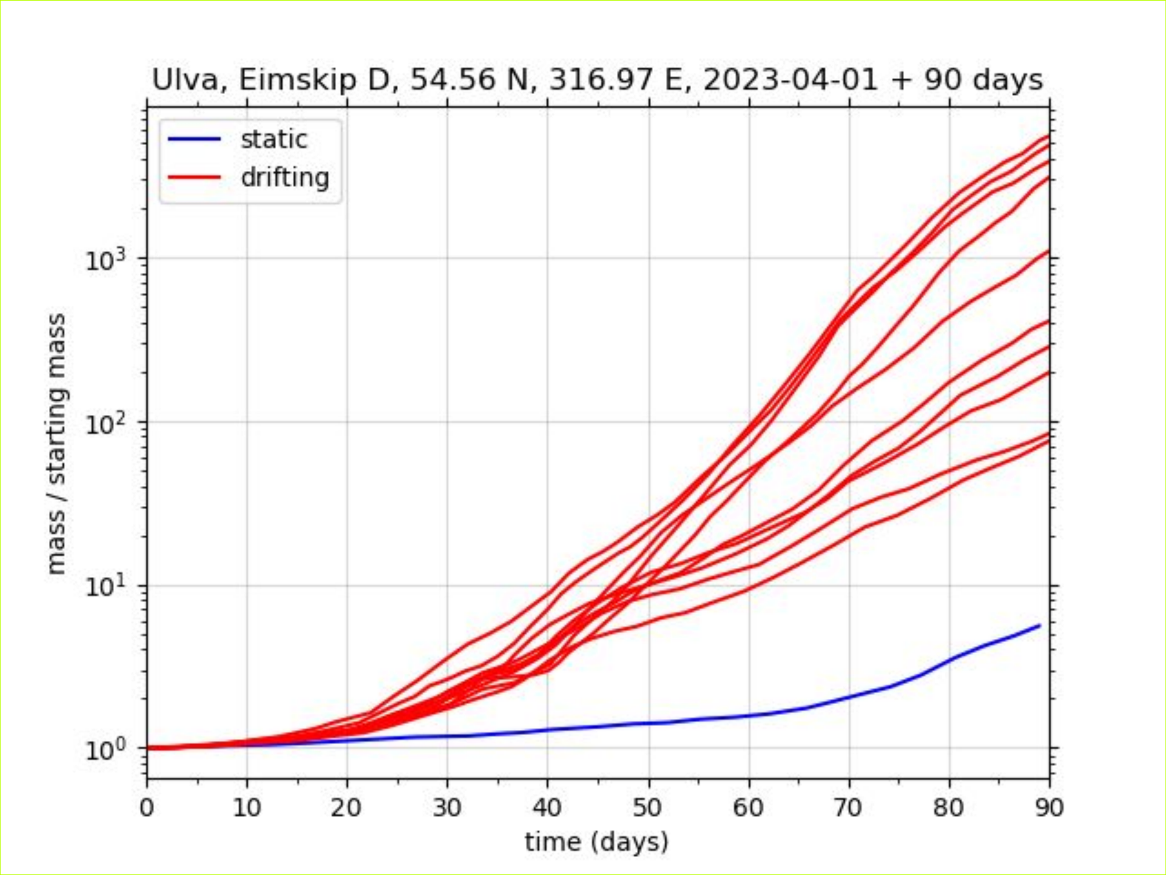
Expanding ocean modeling capability to connect existing trajectory models to nutrients, light and temperature conditions to predict growth
Validate growth predictions with offshore growth images



^ Growth of sugar kelp from 10 candidate deploy locations in the North Atlantic. Blue colors represent low biomass in the early stages. Green and yellow show larger biomass as trajectories move into warmer and/or nutrient rich water.



Model image from Dr. Megumi Chikamoto poster presentation at AGU Ocean Sciences Meeting 2024



< Time series of ulva growth from macroalgae model simulations in the North Atlantic, showing the difference between growth at a fixed location (blue) and trajectories in warmer water.

First Macroalgae Credit: 2024 Sink 1 ton CO2e

Grow, Quantify and Sink seaweed of the coast of British Columbia to sequester the equivalent of 1 ton CO_2

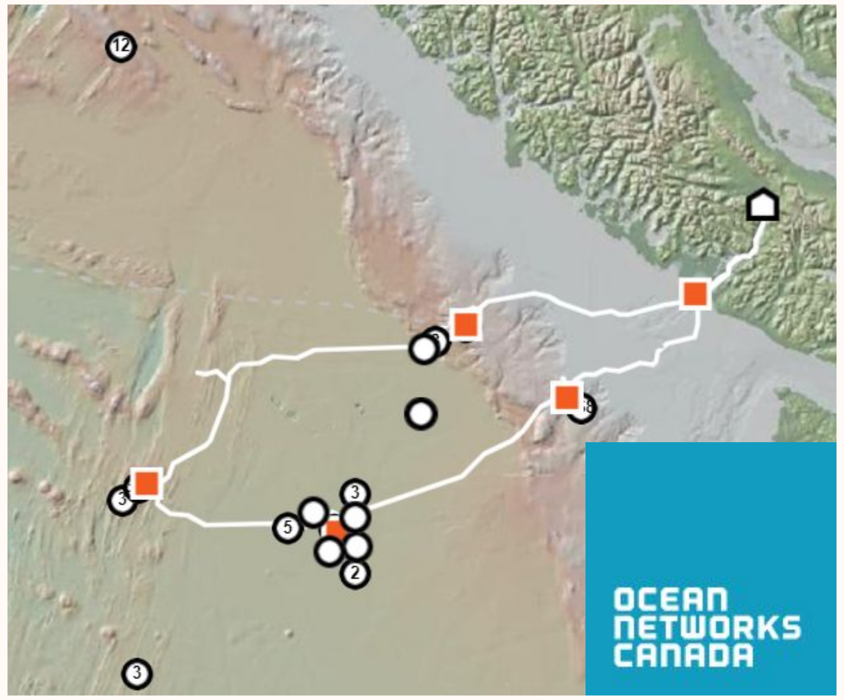
Partnerships

- West Coast Kelp, Huu-ay-aht Nation Partnership
  - Seaweed supply, growth site and biomass deliverable

- Ocean Networks Canada
  - Deployment of biomass along ONC route in June 2024

Methodology: Bamfield Seaweed Deployment

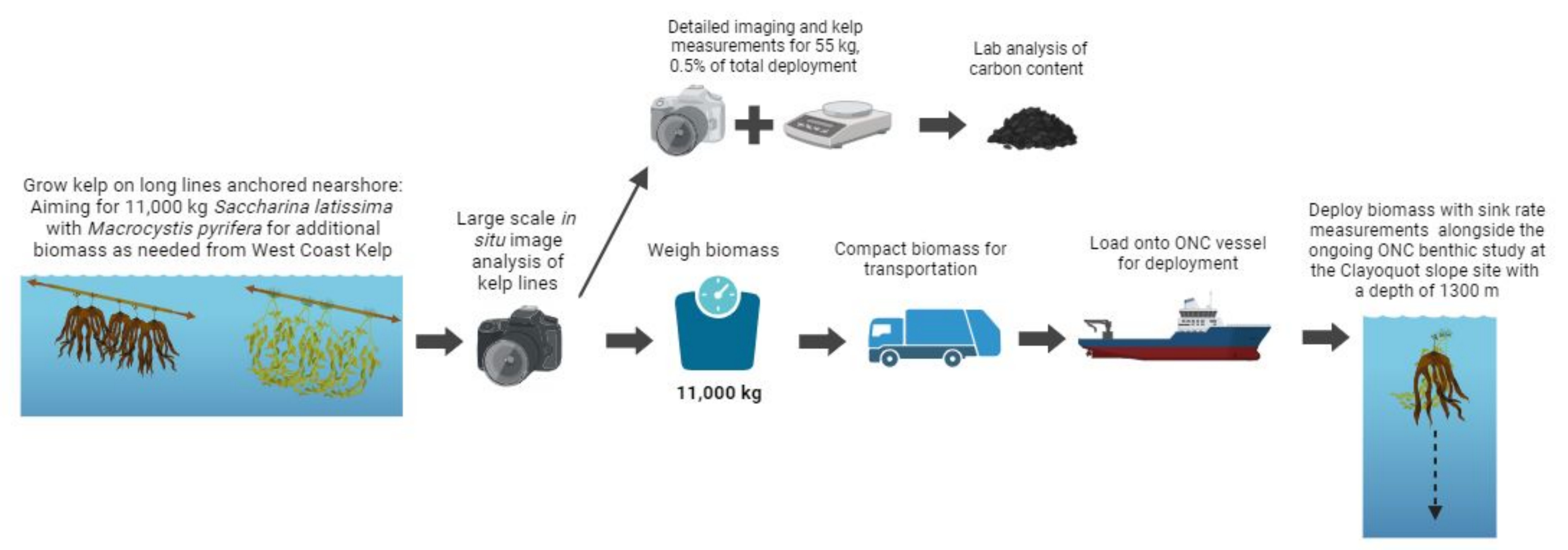
- Internal focus on quantification through image analysis and sample selection of weight



First Macroalgae Credit: 2024 Sink 1 ton CO2e Macroalgae

Infographic of Bamfield project Methodology

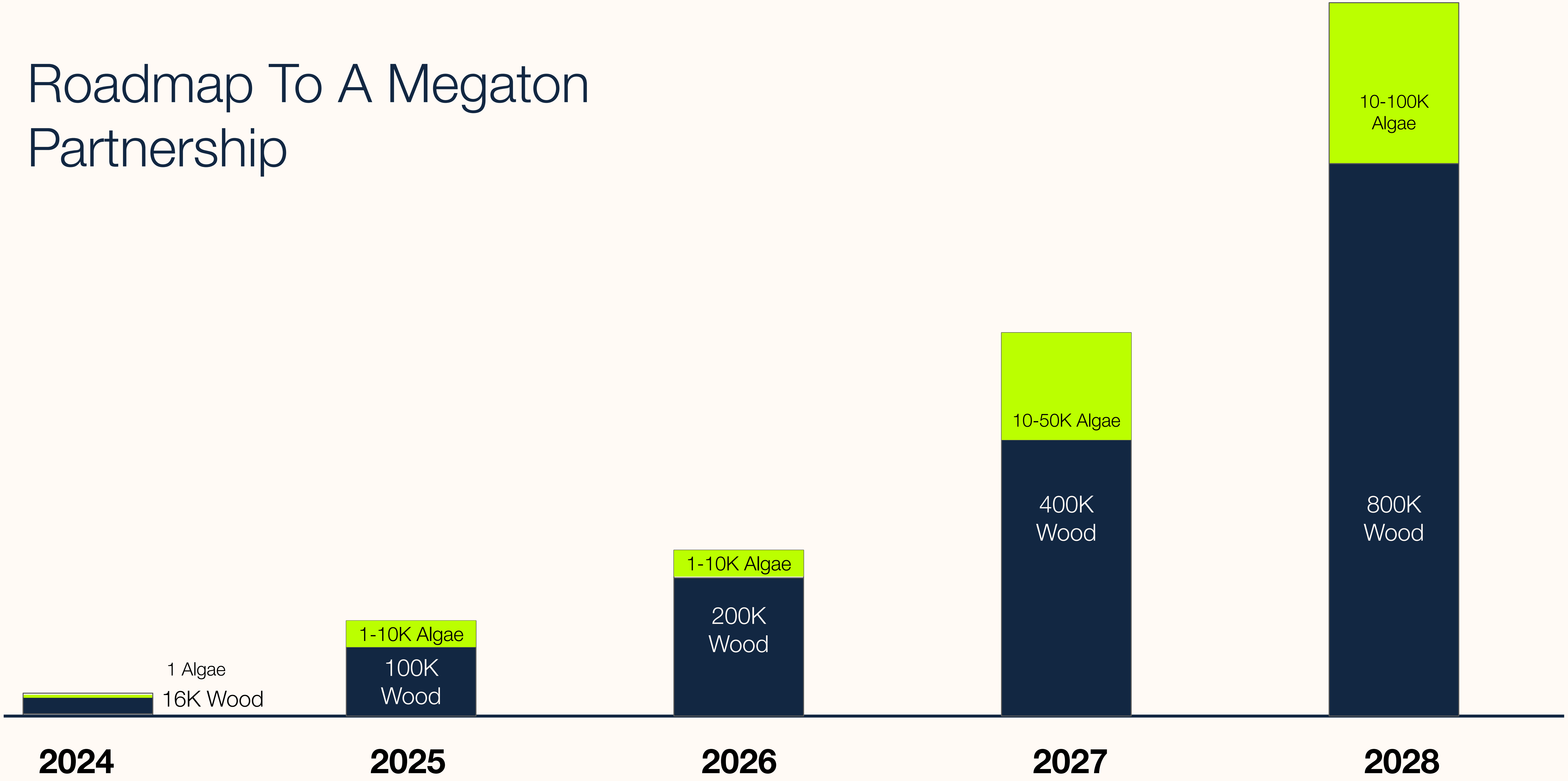
https://data.oceannetworks.ca/SeaTube
Clayoquot Slope Benthic Study



5 & 10-year Partnership

How we change the world

Roadmap To A Megaton Partnership



Capital, Long Term Contracts, Financing to fit operations the primary remaining gate for this to be reality

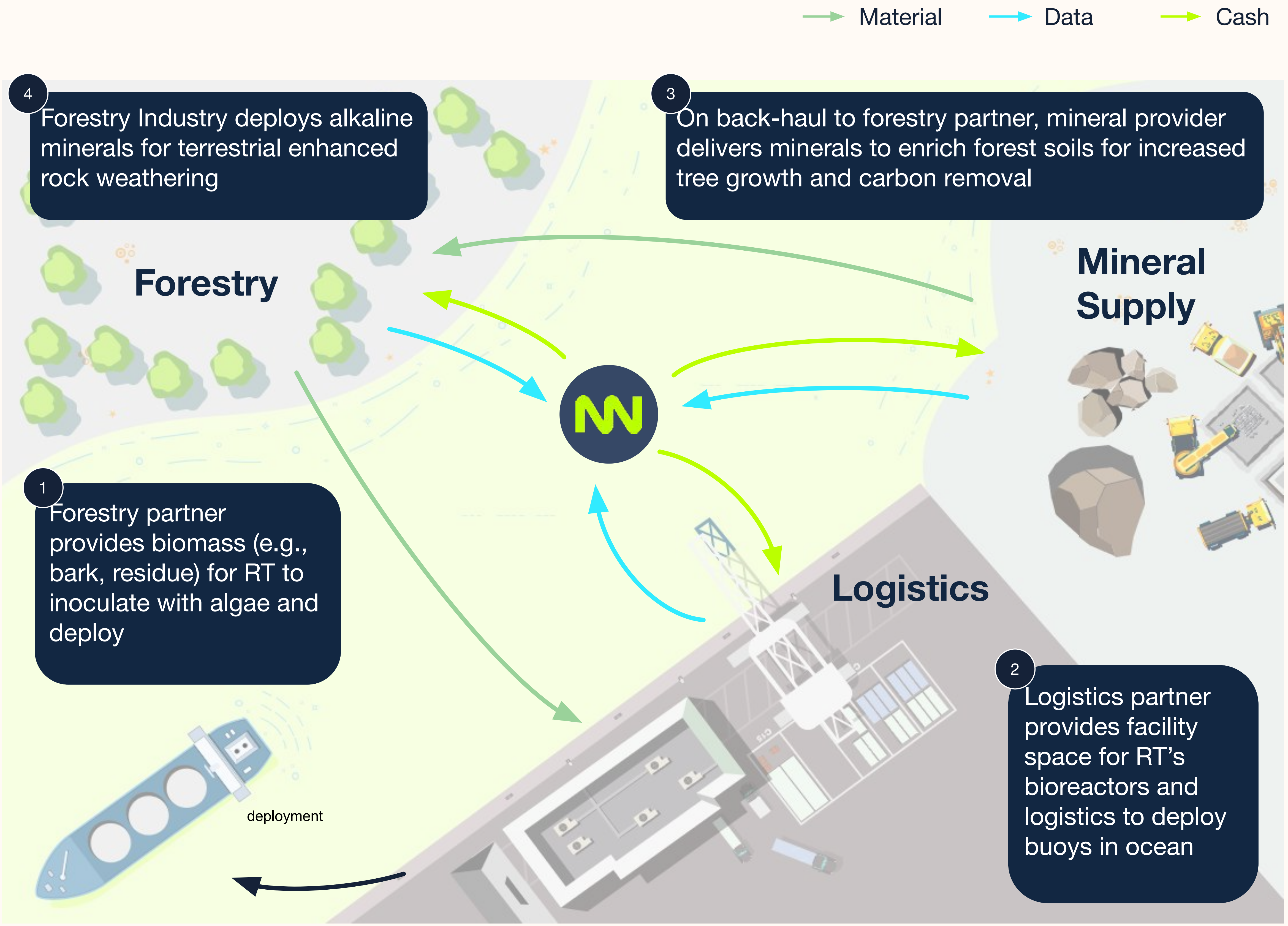
10 Year Price*Quantity Table

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Volume	94,000	150,000	200,000	400,000	500,000	600,000	600,000	600,000	600,000	600,000
Price	$250	$250	$225	$225	$225	$200	$200	$175	$175	$175

Risk Transfer Within a Megatonne Partnership

Parameter	MSFT Requirements	Deliverables
External Governance	credits certified against an external governance framework	• listing on registry that provides ICROA certification
Fitness with Compensatory requirements	**publicly listed	• XXXX
Social License	Reykjavik protocol	• XXXX
Credit composition (Wood, Algae, OAE)	defined mix of credits	• incentives to do more of the type of work MSFT is hoping to see (e.g. Algae)
MRV		

Tech-enabled Multi-megaton Project Developer to 2030



Partnership Opportunities

Offtake	Ramping to hundreds of thousands of tons annually
Project Development	5-10 established, operational projects, each capable of scaling to 1MT of annual removal. Iceland, Canada, Norway, Japan, +1 in global south. +1 in southern hemisphere Potential for dedicated project(s) to support carbon neutral MSFT Operations
Permitting & Policy	Open ocean permission to operate. 5-10 country EEZ operations.
Platform	Opportunity for Integration of RT data into Planetary Computer MSFT as technology partner CIF investment potential

Research

Advancing Shared Ocean Knowledge

Perspective on Ecological Impacts

The purpose of Running Tide's Technologies Ocean CDR: Catalog of Environmental Exposures, is to give an overview of potential environmental exposures that may arise from the proposed carbon removal. The document is intended to be used on a project specific bases to perform an environmental impact assessment (EIA). Running Tide has developed an exposure classification meant to assess potential exposure that may lead to environmental impact or produce environmental harm. It additionally provides guidance on how to determine the risk associated with that impact or harm. Running Tide categorized their assessment of environmental exposures into six sections:

1. Pelagic ecology
2. Pelagic economic activity
3. Benthic ecology
4. Pelagic ecology
5. Benthic ecology activity
6. Earth system impacts.

Running Tide evaluated exposures to these factors on the basis of the underlying knowledge and the general consensus on these and classified as:

- **Speculative exposures** are hypothetical in nature and are either proposed as exposures by our own teams or mentioned as a possibility in the literature. Speculative exposures are not supported by substantial rigorous analysis, consensus, or relevant empirical evidence.
- **Substantiated exposures** are either presented with supporting evidence and/or analysis in multiple peer-reviewed publications or identified by governing bodies in governmental publications. Substantiated exposures do not yet have consensus, and there may be some publications and bodies of work that offer alternative hypotheses or results.
- **Consensus exposures** are strongly supported with empirical evidence, rigorous analyses, and widely accepted as an exposure across researchers, governmental agencies, and industry.

Implementing a framework to mitigate undesirable impacts

Catalog of Environmental Exposures

Environment	Impact
Pelagic	Shading of light
	Novel ecologic connectivities
	Exposure to foreign substances
	Harm to marine mammals
	Alkalinity perturbation
Benthic	Organic carbon perturbation
	Increased oxygen consumption
	Redox perturbation
	DIC perturbation
	Alkalinity perturbation
	Introduction of foreign substances

Carbon Removal Project Design

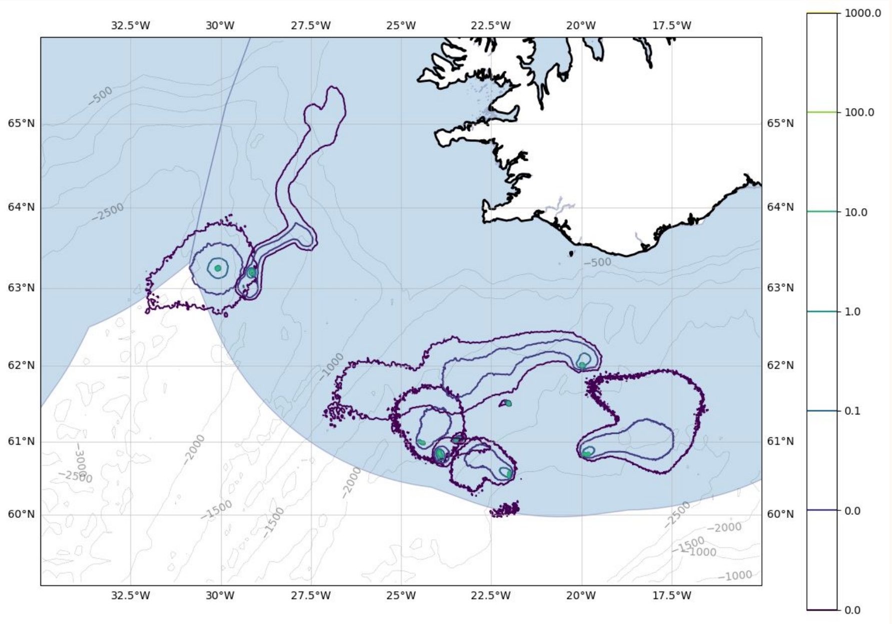
Evaluate value chain from sourcing to material placement

Material 1

```
**** All guidance passed for As
**** All guidance passed for Cd
No results for co
**** All guidance passed for Cr
**** All guidance passed for Cu
**** All guidance passed for Fe
No results for hg
**** All guidance passed for Ni
**** All guidance passed for Pb
**** All guidance passed for Se
No results for v
```

Material 2

```
**** All guidance passed for As
**** Failed guidance for Cd :
                Level of contamination (ex. tier or level of mitigation)
Country
Iceland                                            level 1, no action
Iceland                                            level 2, no action
Iceland                                     level 3, slight pollution
Finland                                                       level 1
France                                                        level 1
The Netherlands                                               level 1
Norway                                                        level 1
Spain                                                         level 1
Sweden                                       background concentration
United Kingdom                                                level 1
**** All guidance passed for Co
**** All guidance passed for Cr
**** All guidance passed for Cu
**** All guidance passed for Fe
**** All guidance passed for Hg
**** All guidance passed for Ni
**** All guidance passed for Pb
**** All guidance passed for Se
**** All guidance passed for V
```



Deep Sea Experimentation Supported By Running Tide

Clayoquot Slope

- Began Sept. 2023
- ~1300 m depth

Fram Strait

- Began June 2023
- ~4000 m depth

Iceland

- First iteration began Apr. 2023
- 15-20 m depth

Benthic Modeling: NIVA

Through RT-Norsea, we engaged the Norwegian Institute for Water Research (NIVA) to model the impacts of potential deployments in the Norwegian Sea on the benthic biogeochemistry after biomass deposition. We are awaiting the final version of the report, however, the results of the study will be public after submission as part of the permit application to operate in Norway, and will be presented at the European Geophysical Union conference in April (link to abstract).

This study looked into the "maximum amount of woodchips that can be accumulated on the seafloor without dramatic changes in the oxygen regime, acidification and biogeochemistry".

- The results showed that a concentration on the seafloor of 3600 gC m^{-2} and 5 mm deep is still within acceptable water quality guidelines.
- For context, the density of wood chips on the seafloor during the 2023 deployments from Iceland was modeled to be, at a maximum, 15 gC m^{-2} and ~0.06 mm deep.

Table 3.1. Investigated scenarios during numerical experiments.

Scenario	Deployed woodchip, t (24 h)$^{-1}$	Surface water area of deployment	Sinking rate cm s^{-1}	Addition of $CaCO_3$, weight %
S1	2000	1 km X 1 km	1.5	5
S2	1000	1 km X 1 km	1.5	5
S3	4000	1 km X 1 km	1.5	5
S4	2000	1 km X 1 km	0.75	5
S5	2000	1 km X 1 km	0.375	5
S6	2000	1 km X 1 km	1.5	0

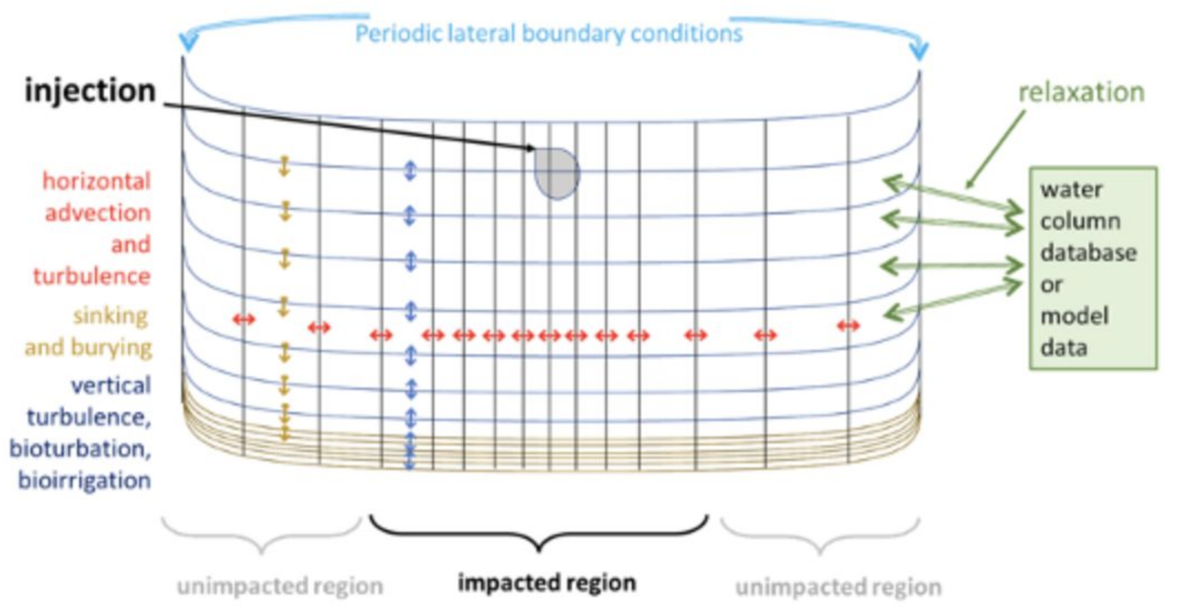


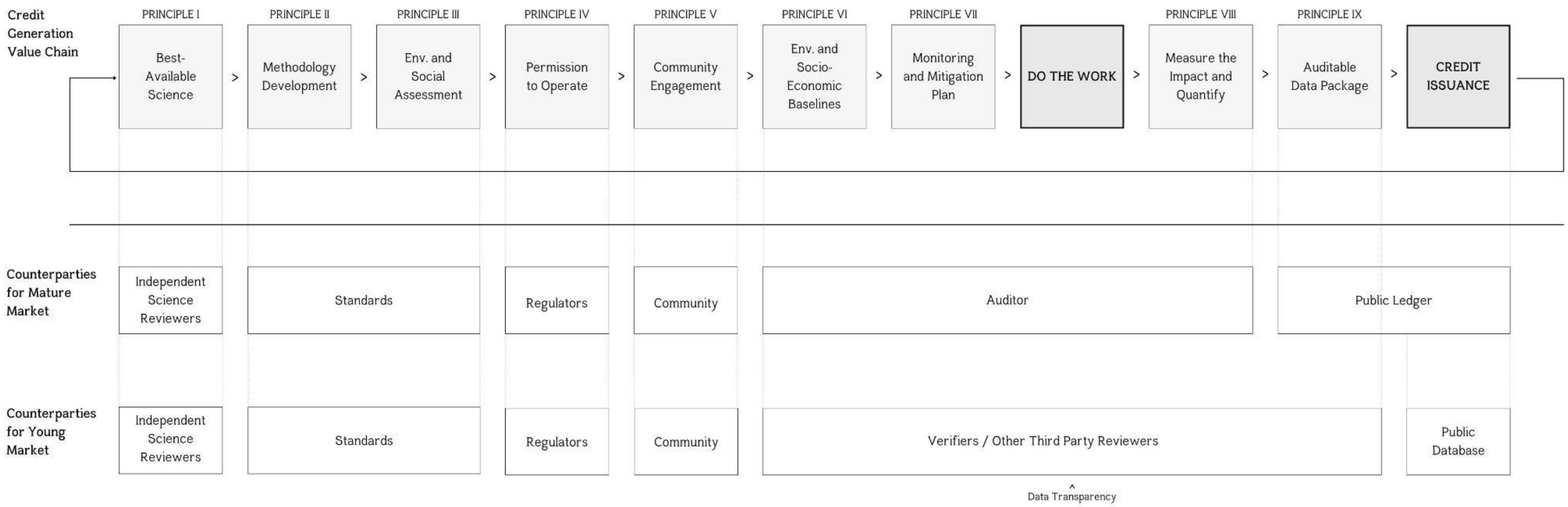
Figure 2.1. Scheme of 2-Dimensional Benthic -Pelagic Model 2DBP with the injection point in the center of the transect.

Other Active Research

Project Name	Start Date	Notes
Rapid MCDR with JPL	April 2023	• Develop simplified model and datasets for quantification of OAE and Marine Biomass Sinking interventions • Further develop ECCO-Darwin for CDR applications
Iceland Coastal Benthic Experiment	June 2023	• To expand the knowledge and understanding of carbon additionality in the benthic layer of coastal sites across Running Tide's operating locations. • Provide data on the ecological impact of sinking carbon substrates and eventually macroalgae biomass. • This data can also serve as preliminary or supplemental data for third party investigations (academic, NGO, etc.) into carbon additionality at the benthic layer, specifically (or not) to evaluate Running Tide's processes.
Open Ocean Sensor Suite Deployment	May 2023	• To understand the immediate environmental impacts of deploying Running Tide's carbon removal system on the surface layer of the ocean. • To understand the transport, dispersion, and sinking of the substrate. • To understand and quantify the net carbon impact of deploying Running Tide's system. • To gather real world in-situ data to train our oceanographic models.
Open Ocean Macroalgae Growth	June 2023	• To understand growth rates and potential of Ulva lactuca in open ocean conditions. - To collect water samples to enable us to recreate the ocean environment for continued lab studies.
Iceland Carbonate Dissolution #1	May 2023	• To determine the dissolution, dilution, and potential impact of LKD (lime kiln dust, CaO) deployment in the surface ocean.
Deepsea Benthic Experiment #1	Sept 2023, IP	• To test the degradation rate of carbon buoy materials on the deep seafloor and monitor impact to the deep benthos.
Deepsea Benthic Experiment #2	June 2023	• To actively monitor the ecological and environmental impact and degradation of carbon buoy materials on the seafloor.
Iceland Carbonate Dissolution #2	Q1/Q2 2024	• To understand the comparative transport of substrate, trajectory buoys, and dissolved alkalinity, as well as the dissolution rate and addition of trace metals in open ocean environments.

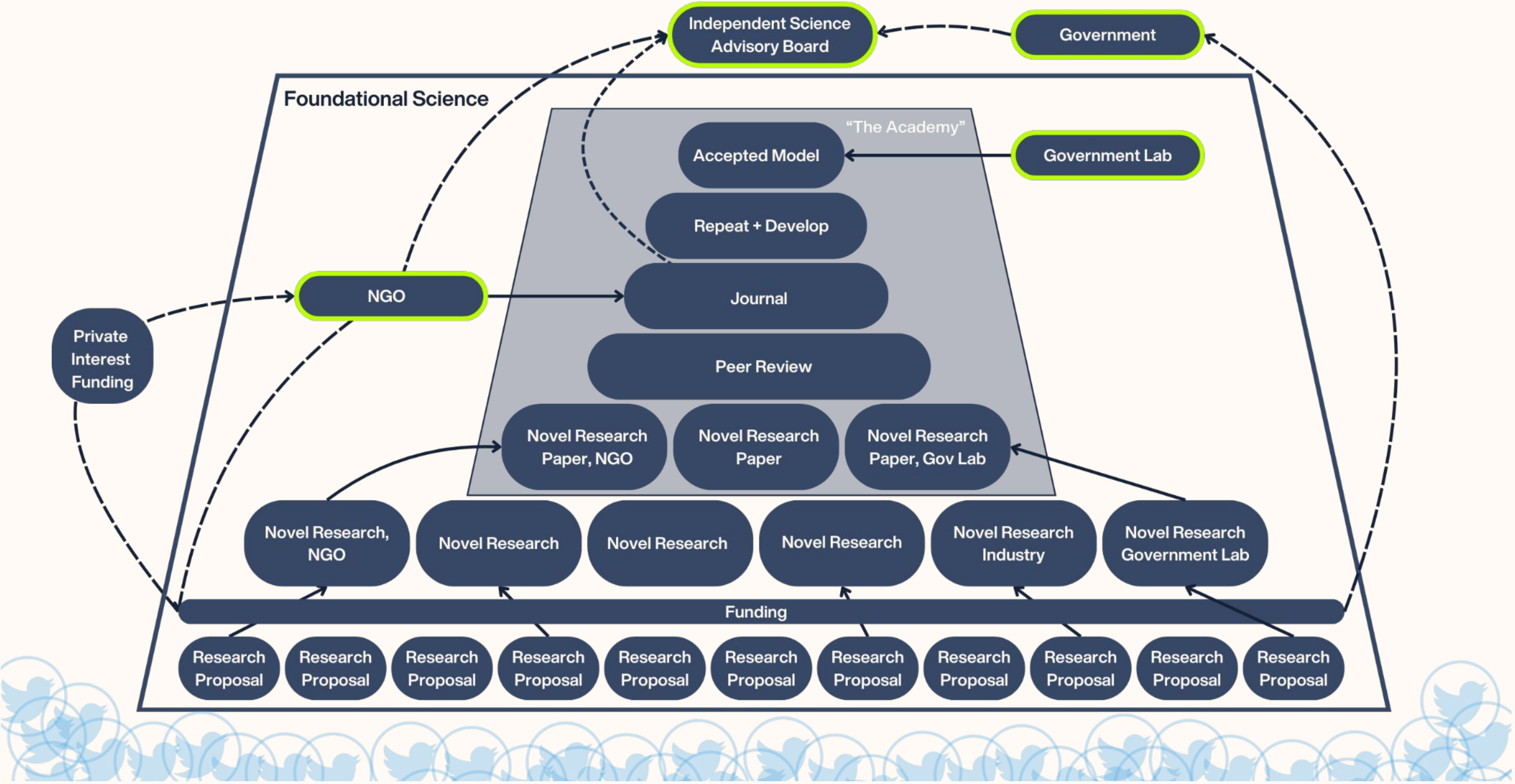
Reference Slides

ENVIRONMENTAL CREDIT GENERATION ARCHITECTURE



REYKJAVIK PROTOCOL

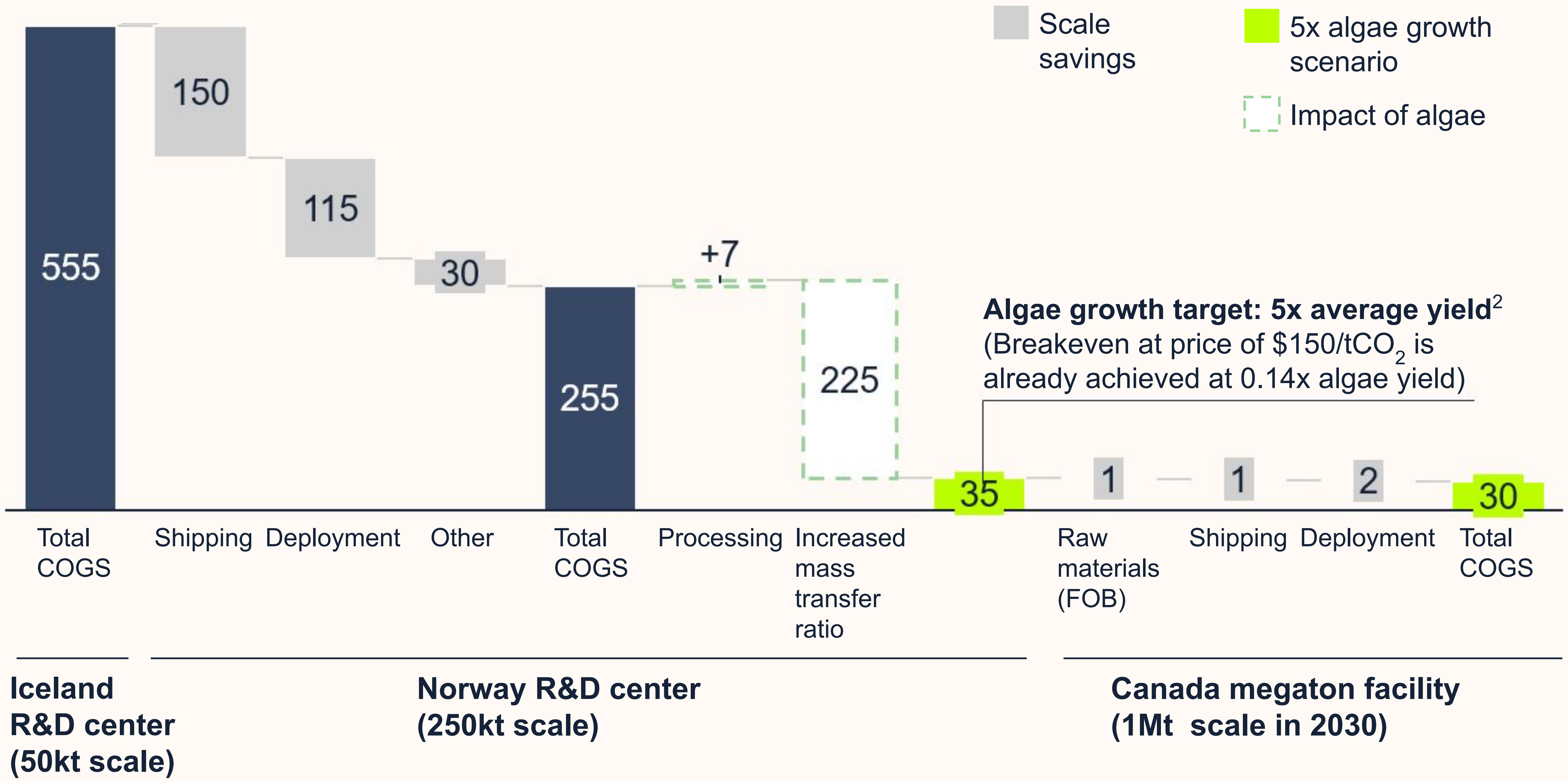
The "Best Available Science" Funnel



Long-term goal to drop unit cost to ~$255/t$CO_2$ by operating at industrial scale, and to well under $100/t$CO_2$ leveraging algae growth

2022 Analysis

Unit costs for multi-pathway carbon removal intervention (biomass buoy with OAE and algae coating), $/t$CO_2$[1] removed



~50% decrease in $/t$CO_2$ from $555 for current Iceland operations to **$255** in Norway at ~0.25Mt scale, driven by **economies of scale in shipping and deployment**

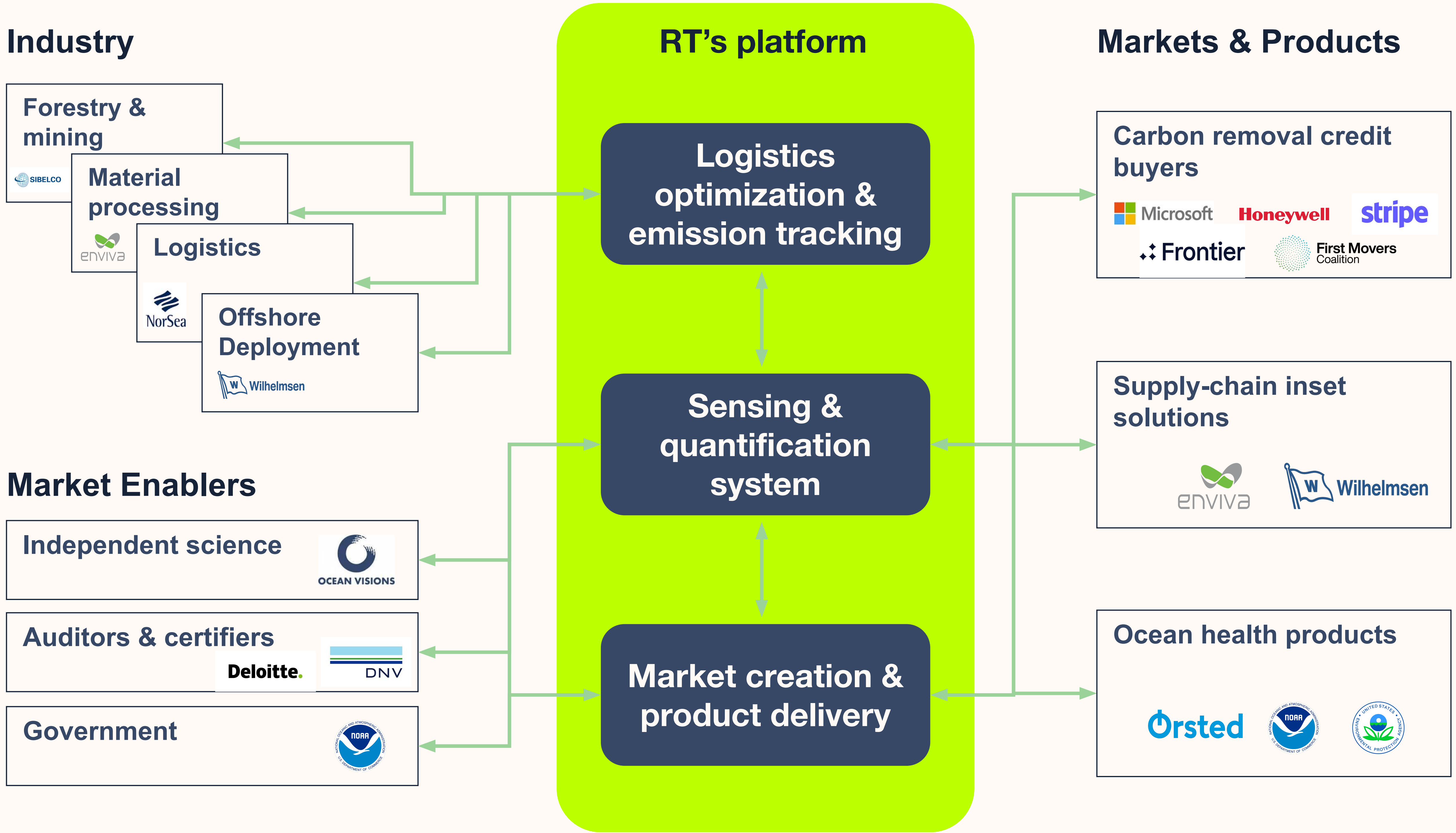
~90% decrease in $/t$CO_2$ from $555 for current Iceland operations to **$30** in Canada at 1Mt scale, **driven primarily by algae yield**

Additional manufacturing cost to enable algae growth (e.g., seeding material in bioreactor) is negligible compared to the leverage the additional captured carbon provides

1. Unit costs are calculated based on the costs of purchasing, transporting, processing, and deploying buoy substrate material (primarily wood biomass measured in green metric tons - GMT), which are converted to costs per net tCO_2 removed by accounting for the CO_2 equivalency of the deployed biomass and quantification uncertainty haircuts & supply chain emissions. 1 GMT biomass contains 0.5t dry wood, which is 50% carbon, thus 1 GMT biomass contains 0.25t carbon. Accounting for quantification uncertainty and emissions at Mt-scale of operations, 1 GMT biomass deployed is equivalent to ~0.9 tCO_2 removed
2. Algae yield is defined as the dry weight of algae grown relative to the actual weight of the biomass buoy. Conversion to CO_2 removed by the algae assumes 30% carbon content of dry algae and a 50% uncertainty haircut.

RT partners with established industrial leaders to develop soft and hard infrastructure to deploy nature-based carbon removal solutions

ILLUSTRATIVE

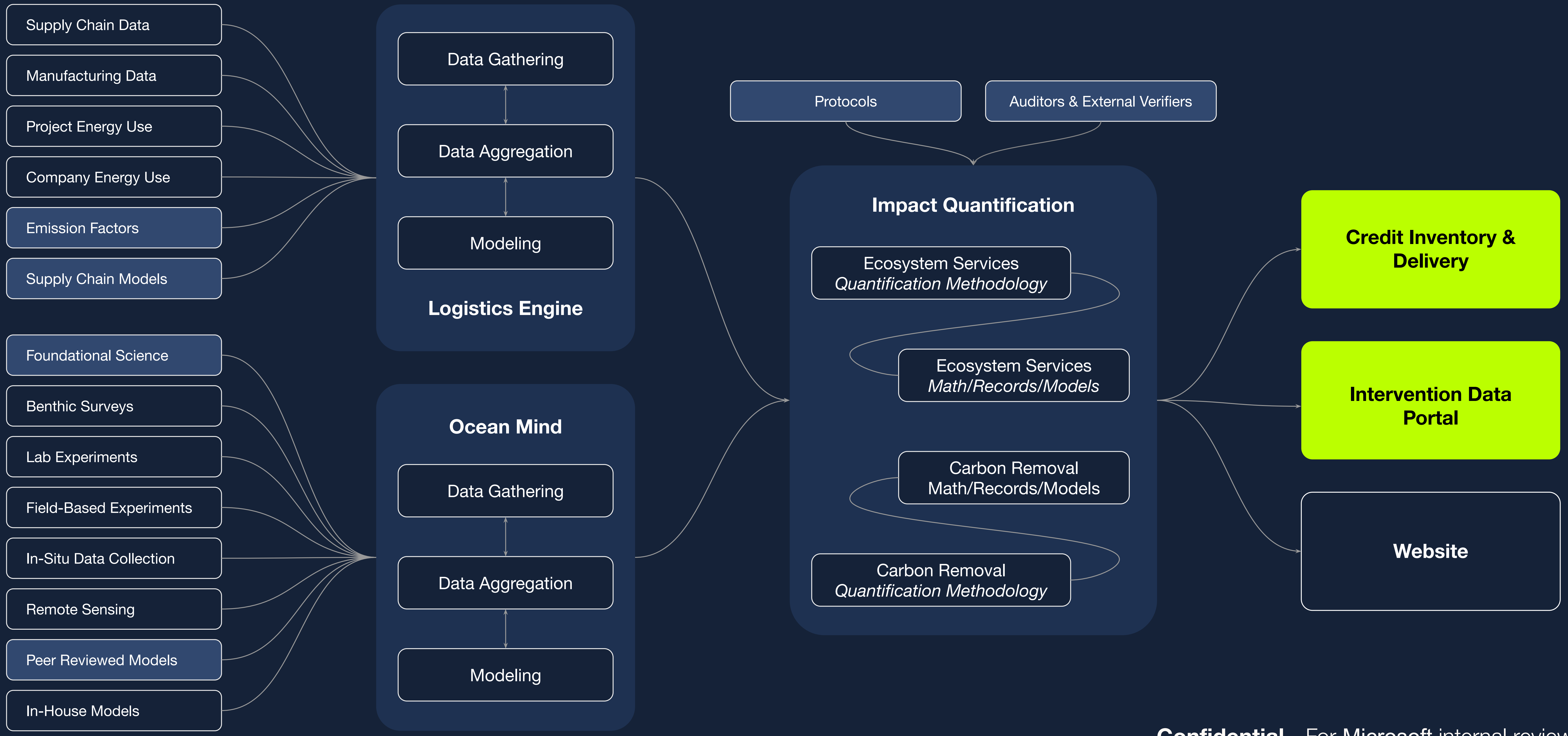


Running Tide connects **earth-system insights with supply chain intelligence** to create a removal-focused **industrial architecture**

Running Tide will **direct and quantify carbon removals** at scale, enabling established industry players to transition to fast-to-slow carbon operations and **de-risk businesses with large carbon liabilities**

Tech and Data Flows: From Sensors to Credits

Running Tide provides a data platform that ingests intervention data and quantifies impact.



We Developed, Peer-Reviewed, and Published The First Quantification Standard For Open Ocean CDR

- ISO-conformant multi-pathway Framework Protocol
- Methodology to quantify 2023 operations
- Guidance for evaluating environmental exposures, responsible sourcing, governance principles
- Docs.RunningTide.Com - public repository of data and documents to transparently share our work in a timely manner
- Ongoing knowledge sharing with the scientific community

Reporting for the Icelandic Government

As part of our permit, we share data and consult with relevant institutions and agencies in Iceland on an ongoing basis. These are the Marine and Freshwater Research Institute, the Environment Agency of Iceland, the Icelandic Coast Guard, and the Transport Authority. We share reports quarterly related to ongoing, planned, and completed research projects and deployments.

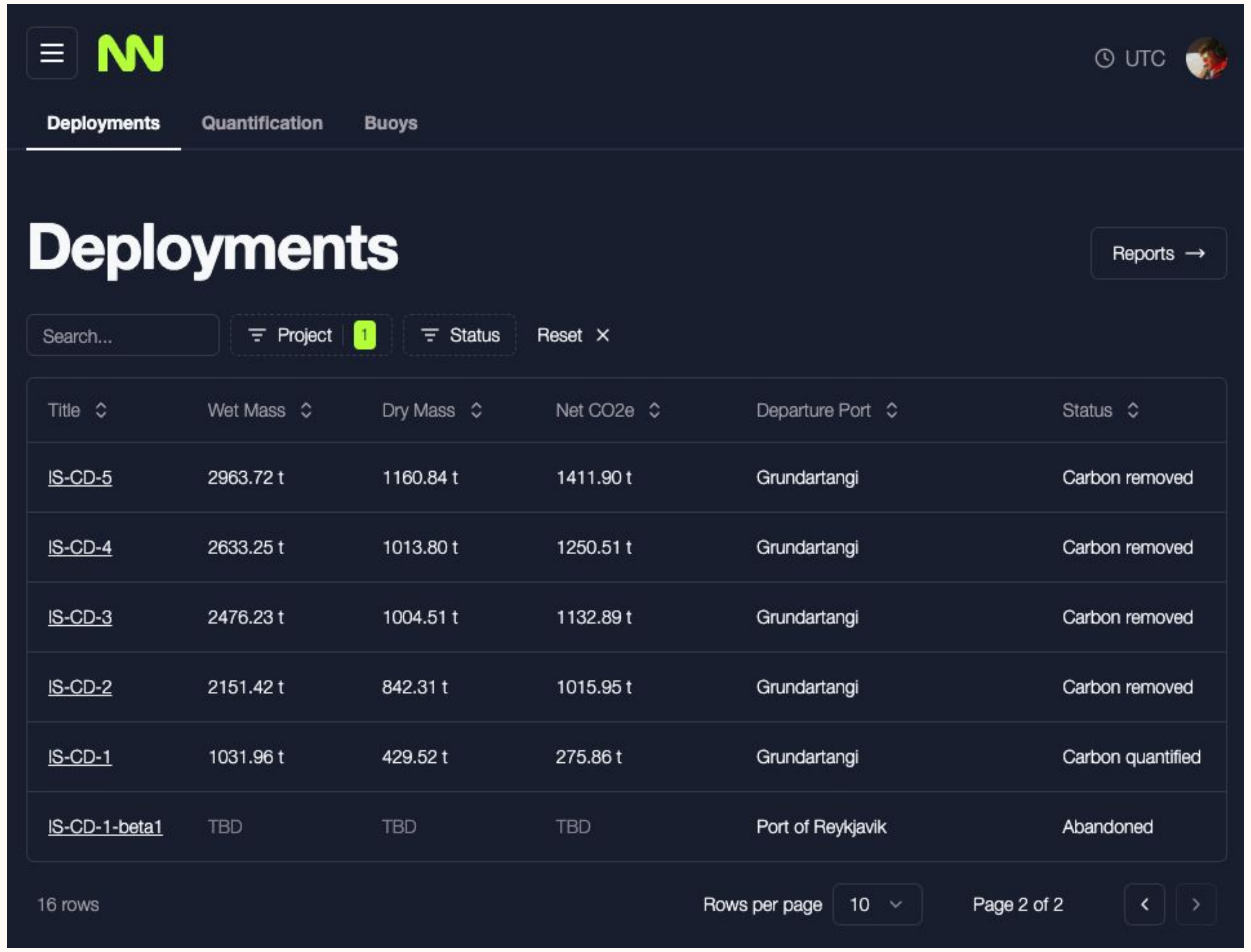
Q3 / 2023	Type
Iceland Research Program Progress Report - Q3 2023	Q3 '23 Report
Appendix I: Running Tide 2023 Iceland Experiment Overview	Q3 '23 Report
Appendix II: Iceland Benthic Pilot Preliminary Overview	Q3 '23 Report
Appendix III: Open Ocean Growth Experiment Overview	Q3 '23 Report
Appendix IV: Scientific Overview of Active Research Projects	Q3 '23 Report

Ongoing Research

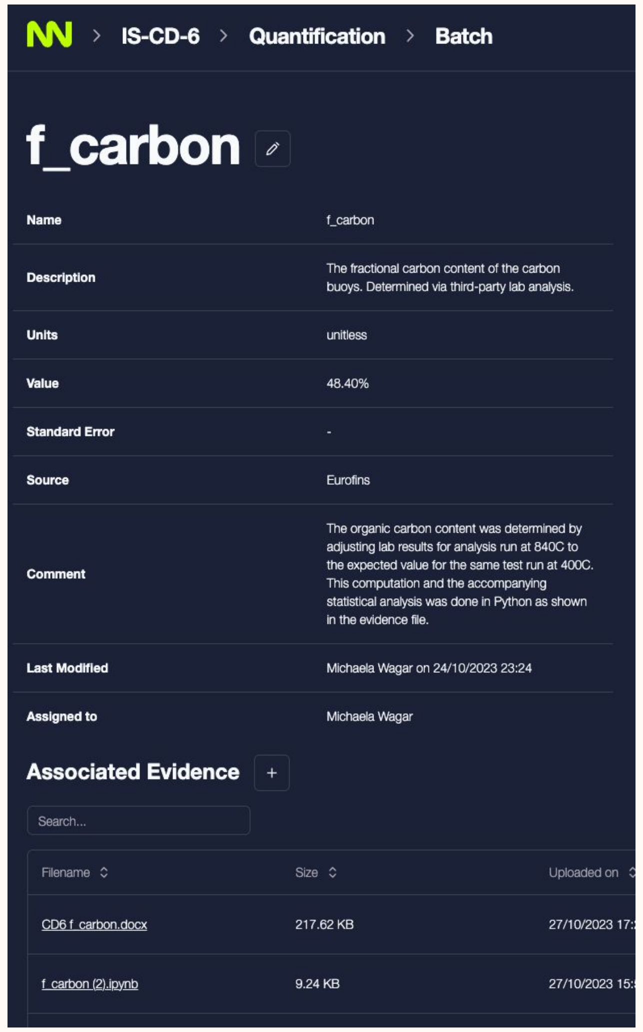
Link	Type
Running Tide's Ocean Carbon Removal Research Roadmap	General
Catalog of Potential Environmental Exposures	General
Review letter on Running Tide's Catalog of Environmental Exposures	General
Ocean Surface Transport Methodology Report	Ocean Transport
Benthic Research Live Video Feed	Benthic Zone

Quantification In Code: The Infrastructure For Scale

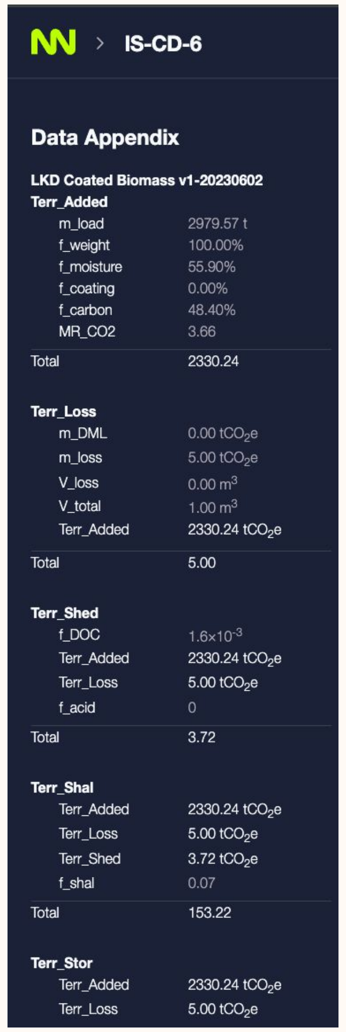
Our team builds software to track, monitor, and quantify our impacts for auditability.



Operational and monitoring data from each deployment are collected in our internal deployment tracker tool, and accessible as an internal dashboard.



Details and measurements are entered for each variable to create a traceable, record that drives quantification.



Pathway-specific models, a suite of ocean physics models, and lifecycle emissions analyses calculate net carbon removed.

Project Considerations

OAE moves Co2 from the fast cycle to the slow cycle by shifting the carbonate balance in the ocean, allowing a given volume of seawater to dissolve more carbon than it otherwise would. Alkaline minerals can be directly deployed into the surface ocean, alkaline water can be produced, at a land-based processing facility, using alkaline minerals, before being deployed

Either approach benefits significantly from being executed in conjunction with other, existing operations due to a minimal increase in emissions that must be accounted for. Intervention materials should be selected for their reactivity with seawater and their proximity to the deployment port of origin.

Reducing extraction, transportation, and processing emissions is critical to manage unit economics; however, while increased processing incurs additional emissions, smaller grain sizes equate to increased surface area and decreased dissolution time for a given volume of material.

Oxides and hydroxides tend to dissolve rapidly in the slightly alkaline seawater environment (pH >8) and are conducive to OAE interventions. Scientific literature, validated by our in-house testing, shows that portlandite, brucite, and lime are all excellent candidates. Careful attention to the production process of each mineral derivative is essential. For example the calcination process of producing quicklime (CaO), which can be hydrated as slaked lime (Ca(OH)2), results in the release of carbon dioxide. This carbon emission must be taken as an additional discount against the carbon removal intervention, roughly halving efficiency, unless the lime is produced as a byproduct of another process, as is the case with Lime Kiln Dust (LKD).

The deployment mechanism and rate should be designed to optimize the introduction of alkalinity, balancing efficiency, logistical complexity, cost, ecological impact, and precipitation risk. Besides the obvious ecological impact considerations of an acute alkalinization of surface seawater, seawater is super-saturated with calcite and aragonite (CaCO3) which can precipitate out of solution given a sufficiently high spike in pH. Precipitation of any mineral form of calcium carbonate drives off CO2, degrading intervention efficiency. Importantly, alkaline water or powdered minerals introduced into a ship's wake and into the turbulent water of the open ocean surface tend to dilute rapidly. Even so, care should be taken to ensure pH returns to normal ocean levels on timescales shorter than the nucleation time of CaCO3 as aragonite or calcite to prevent a significant intervention efficiency loss and reducing cost effectiveness. A well designed intervention should have little risk of secondary precipitation.

MRV Foundations

Running Tide's proprietary verification platform and sensor suite, collectively "Ocean Observing Platforms," collect real-time data from deployment monitoring to inform quantification. Tracer buoys deployed alongside interventions provide trajectory and sea-state data collected in-situ as the alkaline perturbation advects over time. This data, combined with extensive lab studies of mineral dissolution rate, floating and sinking behavior, and carbonate system chemistry, will drive a model-based verification and quantification scheme.

In practice, alkalinity introduced over time reacts nonlinearly to shift the balance of the carbonate system. The partial pressure of dissolved carbon dioxide re-equilibrates at the surface on timescales between 3-9 months while residence time of surface water varies geographically and seasonally over shorter periods of time between 2 and 20 weeks. To quantify carbon moved from the fast cycle to the slow cycle, it is important to ascertain the difference in equilibrium state of the carbonate system before and after the intervention activity. Although we determine the stable equilibrium state after deployment using a computational model conducive to Monte Carlo simulation for determination of quantitative uncertainty, it is useful to think about the quantification steps linearly.

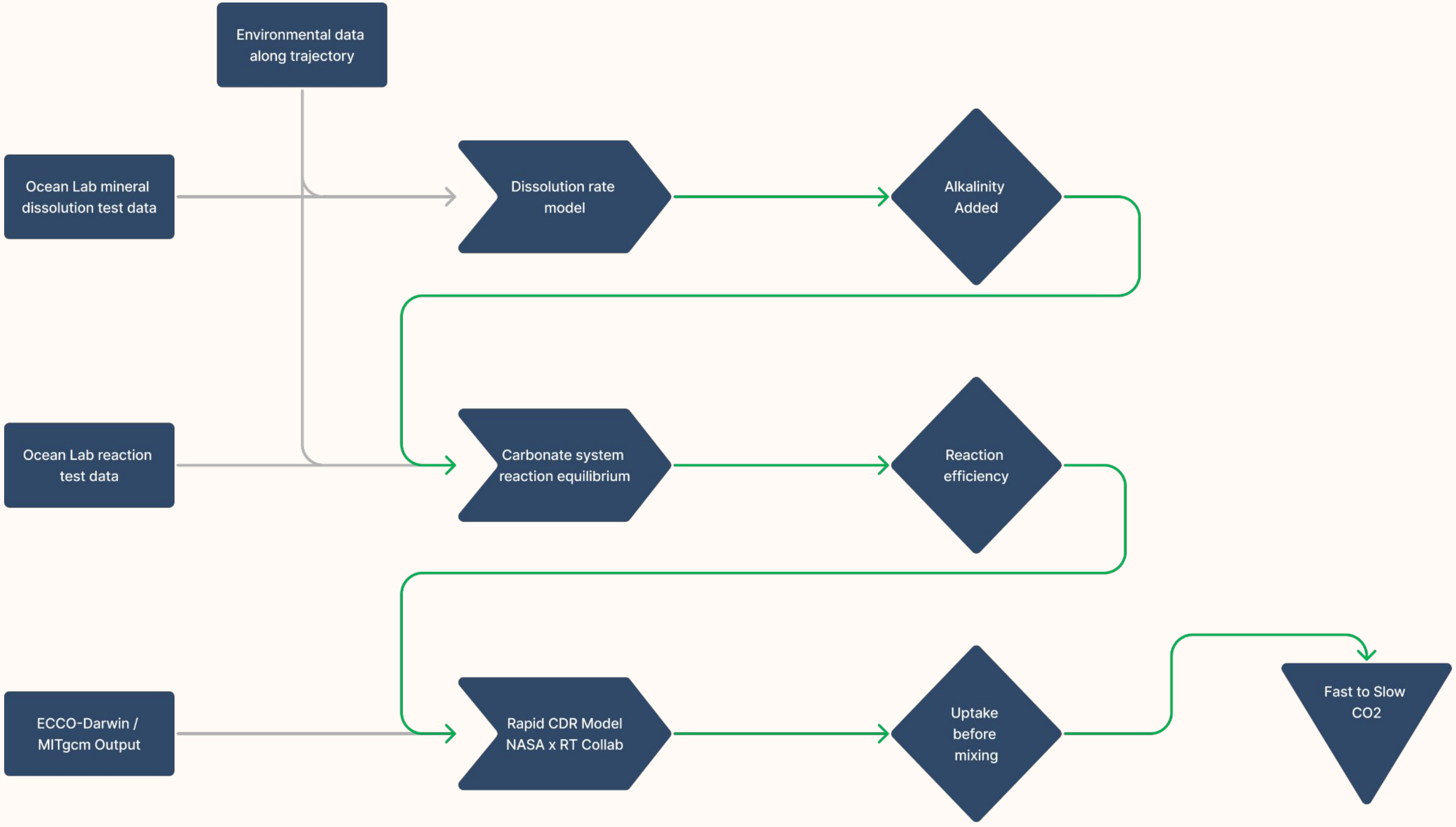
In the case that solid mineral material is deployed directly into the ocean, Running Tide will combine in-situ measurements from our Ocean Observing Platforms with reactivity studies of the deployed material, float time and sink rate studies, and environmental data from leading reanalysis models (e.g. HYCOM, Copernicus) along with modeled and observed trajectories to computationally determine the amount of alkalinity added.

As discussed previously, alkalinity drives the carbonate system to consume carbon dioxide, producing carbonate and bicarbonate. This reaction is not perfectly efficient, and some added alkalinity will remain as unreacted hydroxyl anions or the presence of additional carbonate anions depending on the alkaline mineral composition. Given a temperature, pressure, salinity, and pH, the equilibrium state of the carbonate system is well understood in seawater and can be determined analytically, as well as verified using test data from our ocean lab. We will use in-situ observations from our verification fleet and publicly available environmental datasets to determine the efficiency of the carbonate reaction with a quantifiable degree of certainty and take an appropriate discount.

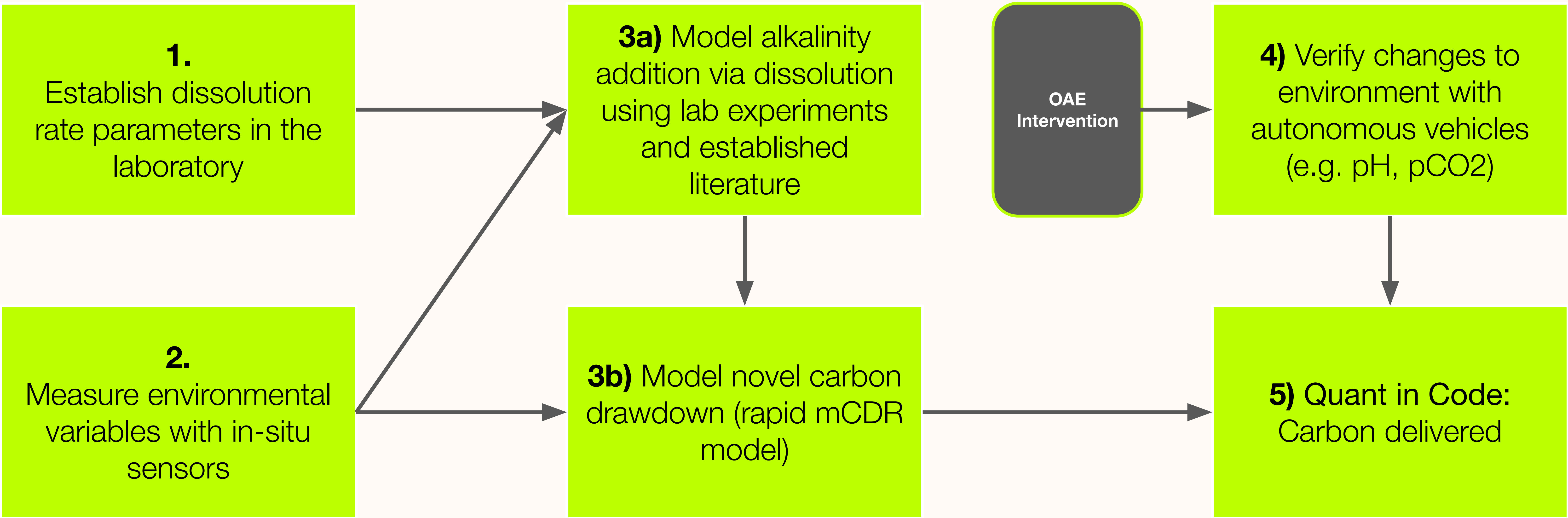
Because alkaline water must reach pCO2 equilibrium to move fast carbon to the slow cycle, any water that subducts out of the mixed layer to the interior or deep ocean before reaching equilibrium must be discounted from final quantification. Measuring subduction directly in a deployment region is not operationally feasible. Thus we rely on a combination of ocean mixing models and Global Circulation Models (GCMs) to understand subduction rates. As determined in numerous computational studies (He & Tycha, Jones), the rate of subduction before re-equilibration can vary dramatically depending on geography and seasonality. Careful intervention location selection is required to ensure efficiency remains above 80%. Running Tide has partnered with researchers at NASA JPL and Moss Landing to study and understand these ocean dynamics through the further development of the ECCO-Darwin GCM and the development of a novel, optimized vertical column model that can be used operationally to understand mixing for the purpose of quantification. As part of our methodology development effort in 2024, we plan on further integrating these models (among others) into our quantification platform.

MRV Foundations Cont.

Our verification diagram (figure 5) omits both secondary precipitation and the additional formation of particulate organic carbon, from increased photosynthetic activity, driven by silicates or iron in the applied minerals (commonly cited in OAE literature and framework methodologies for OAE intervention development). This is done for illustrative simplicity. Running Tide's OAE methodology will need to address both of these considerations. We believe that through careful intervention design we can mitigate the risk of secondary precipitation. Increase of photosynthetic activity due to the presence of iron or silicates (fertilization effect) will be an important ecological consideration and likely a net positive for carbon sequestration. Although the biological systems are complex and quantification of the fertilization effect requires further research. Maintaining a conservative approach, Running Tide's 2024 methodology will likely motivate a future fertilization methodology but omit carbon sequestration via additional POC formation from the quantification calculus. At initial scale, we expect this omission to be de minimis.



OAE Measurement Schematic: Running Tide's OAE MRV Plan



Running Tide OAE 2024 MRV Development Plan

Insight	Data	Technology	Contribution
Materials testing	Dissolution/reaction rates of candidate alkaline minerals with seawater as well as trace, minor, and major elemental composition (brucite, limestone, LKD, CKD, olivine, iron/steel slag)	Materials are tested in-house(?) to determine the reactivity of a candidate material. Materials are additionally tested for harmful materials such as pesticides and trace metals prior to deployment.	Candidate materials undergo rigorous testing to ensure that they are safe and effective materials for OAE carbon removal projects. For multipathway deployments, alkaline minerals are tested with biomass to ensure alkalinity additions more than compensate for acid leaching from biomass.
CO2e gross removal quantification	Mass and composition of material to be deployed	Deployed material is sent to third party labs for additional tests of carbon content. Subsamples are sent back to RT labs to test for reactivity and floating duration of material on a deployment-by-deployment basis. The mass of the material is weighed and verified.	The mass of alkaline materials loaded onto the deployment vessels must be accurately measured because it is used as a key input to calculate the amount of alkalinity released to the seawater via dissolution, from which the CO2 removal credit is ultimately derived.
Alkaline mineral dissolution and reactivity in surface water	Alkalinity added and subsequent change to surface carbon chemistry	Similar to the approach RT takes to modeling and validating material trajectories and plume location, RT will develop a dissolution reaction model and validate/tune it against in-situ measurements of temperature, sea state, pH, etc. Additional field trials and model sensitivity testing will drive monitoring plans.	Determine how much alkalinity ends up dissolving in the surface water and, thus, is available for sequestering atmospheric CO2, as well as the maximum alkalinity that can be dissolved into the surface waters before inducing secondary precipitation of carbonates.

Running Tide OAE 2024 MRV Development Plan, con’t

Insight	Data	Technology	Contribution
Air-sea CO_2 equilibration	Flux of novel carbon into the sea surface after deployment of alkalinity	Computed via RT oceanographic modeling using a 1D simplified physics model (currently under peer review) that has been proven to accurately represent air-sea gas fluxes against fully coupled earth system models. Inputs to this model will include remotely sensed and in-situ measurements of ocean surface physical and chemical properties.	Modeled results of air-sea CO_2 fluxes will demonstrate the efficiency of an OAE deployment, and will resolve appropriate re-equilibration time scales (~decades).
In-situ data aggregation and integration	Trajectory, temperature, and float time (for multipathway deployments) of material plume after deployment	Data are collected by RT observational buoys, which transmit GPS locations (i.e., plume trajectory), temperature, wave dynamics, and floating state of material within plume back to RT servers. These data are then used to tune and validate trajectory and dissolution models.	Data integration and model tuning is a key piece of Running Tide’s MRV framework. Our models alone can be effectively used to project possible outcomes from deployments as well as identify optimal locations and times for removal projects, the data collected provide information necessary for model optimization and uncertainty quantification.
Online OAE deployment interface (‘Running Tide Dashboard’)	Quantity of alkaline mineral deployed, trajectory/dispersal of deployed mineral, dissolution of mineral based on measured surface seawater temperature and wave dynamics, and resulting sequestration of CO_2 in the surface ocean	Expanding on the deployment tracking and removals quantification system developed for our biomass projects in 2023, we'll adapt our existing software suite and create new tools for internal monitoring and quantification aligned with the new OAE pathway.	Our internal tools serve as a robust foundation for disseminating public reports, and would be built to enable transparent sharing of OAE deployment data build public trust and secure societal/regulatory license for marine CDR activity.

OAE Ocean Modeling - Current State

Lagrangian trajectory modeling:
Our current model infrastructure for terrestrial biomass includes a Lagrangian transport model that uses third party velocity fields to simulate the movement of material on the ocean surface. We use ocean surface currents from HYCOM, a global general circulation ocean model, as well as wind and wave velocity data from ERA5 to force our trajectory simulations.

Model optimization:
Our models are optimized against in-situ GPS data using a gradient descent optimization scheme. Our optimization algorithm appropriately tunes the weights of the velocity fields to minimize the error between modeled and observed trajectories. See our Ocean Surface Transport Methodology Report for further details.

Stochastic representation of unresolved dynamics:
To account for the small scale and three-dimensional dynamics unresolved in our modeling work, we introduce variability into several input parameters in a series of Monte Carlo simulations. Specifically, we include a stochastic dispersion term that is tuned to best represent the spread of the in-situ trajectory buoys on the surface. Preliminary results suggest that this stochastic dispersion term more than compensates for potential drift during material sinking, and further field experiments could help fine tune this parameter to more accurately represent dispersion of material. For additional details on lateral variability introduced into our simulations, please refer to this document.

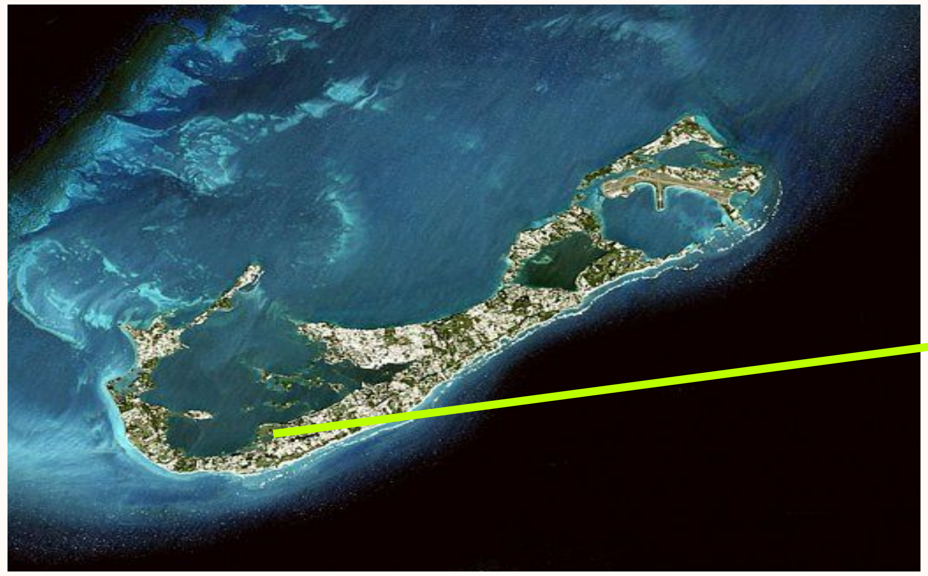
OAE Ocean Modeling - Under Development

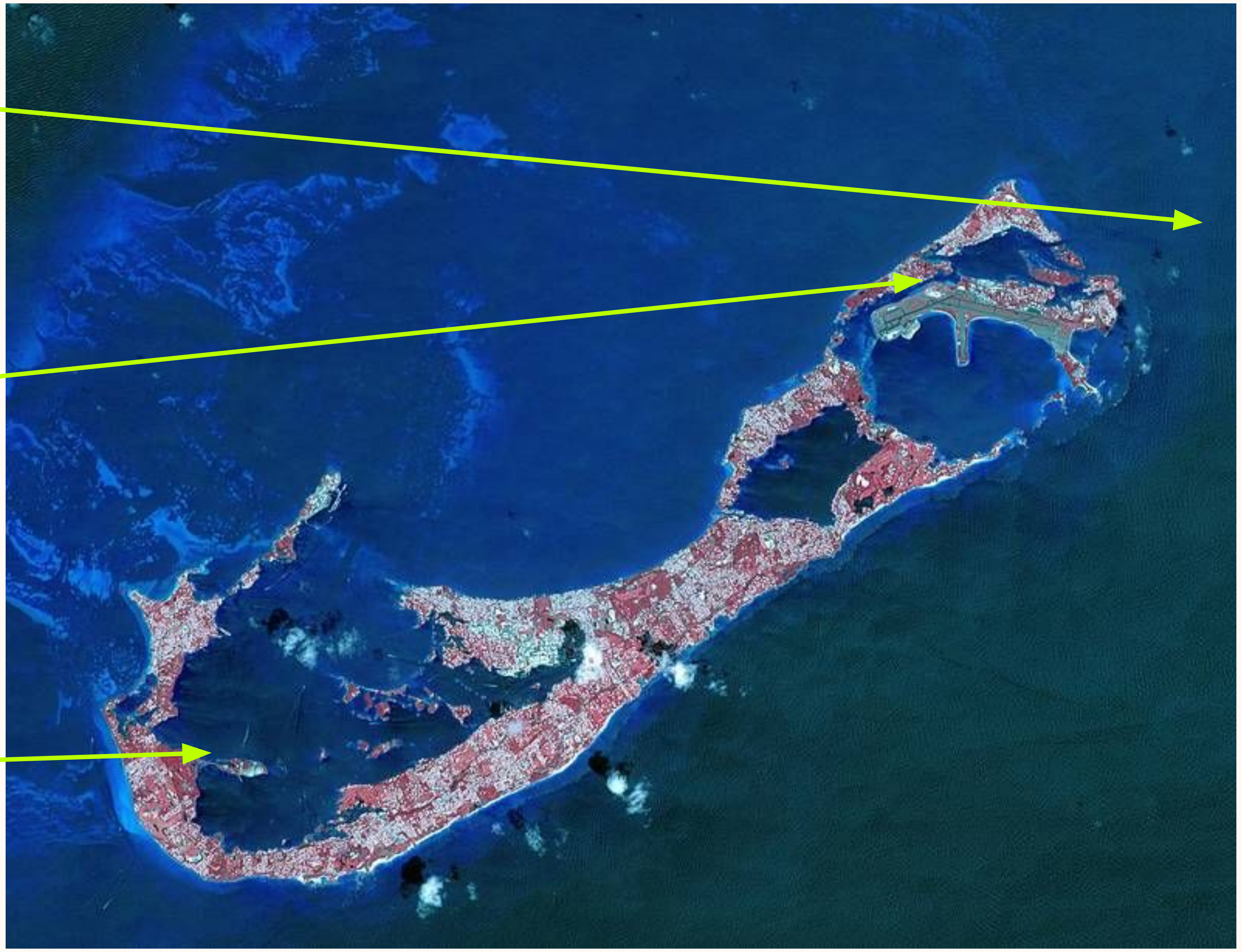
Dissolution reaction model:
A small scale process model that will represent the dissolution of alkaline minerals that are introduced to the ocean surface. This model will describe how the material interacts with the ocean surface and will provide a statistically bounded estimate of the amount of alkalinity added to the surface over a deployment period and the following several days.

Rapid mCDR model:
A 1D simplified physics model that has been developed by scientists at Running Tide and Moss Landing/NASA JPL that computes the flux of novel carbon drawn down into the ocean surface from the atmosphere. The simplified physics model has been developed and validated against a fully coupled earth system model.

Integration with in-situ measurement:
Our current modeling infrastructure for terrestrial biomass sinking includes tuning against in-situ measurements of material float time and plume location, and modeling for OAE will include a similar approach to data integration and verification. Through small scale field trials and model sensitivity analyses, we can identify the variables most important for high certainty verification of OAE and design monitoring plans to capture these variables with the appropriate level of precision.

Bermuda



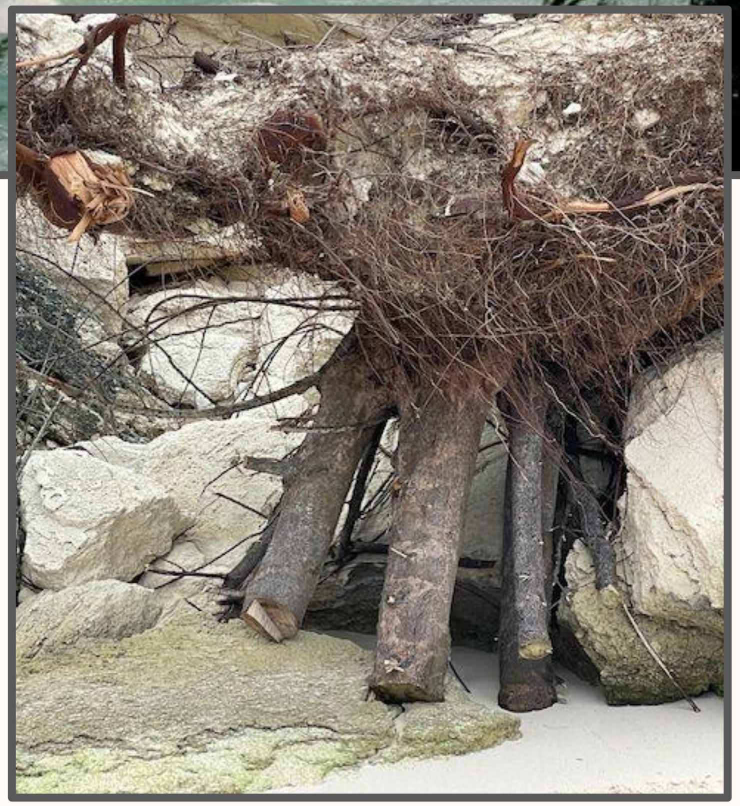


- Deepwater Access within 2nm off St Georges - lends itself to small volume day trips
- Local scientific collaboration
  - BIOS Interested in research, particularly on alkalinity enrichment
- Local Operations:
  - Local Barge Operator - Crisson 300t barge, on board for day trip ops
  - Morgan's Point loading and staging

Local Biomass Opportunity: Invasive Species Eradication

The Australian Pine(*Casuarina equisetifolia)* is a hardwood (not pine) introduced into Bermuda in the 1950's as a wind barrier species, and has spread over the island. It is a fast growing (10' per yr), dense wood, and roots penetrate the limestone cliffs. Stroms regularly uproot the trees, causing irreversible damage to the limestone island and accelerating erosion. It is seen as a major challenge and there is significant interest from locals in using this as a biomass source. Opportunity to pair our work with local issue with major social buy-in. Marsh Folly open to making a separate waste pile of Casuarina at their facility.

We can pair invasive species eradication with coastal resilience and carbon removal.



2024 Bermuda Project

Project Size: 5,000t CO_2e

Operational Site: Morgan's Point

Deployment Location: Bermuda waters

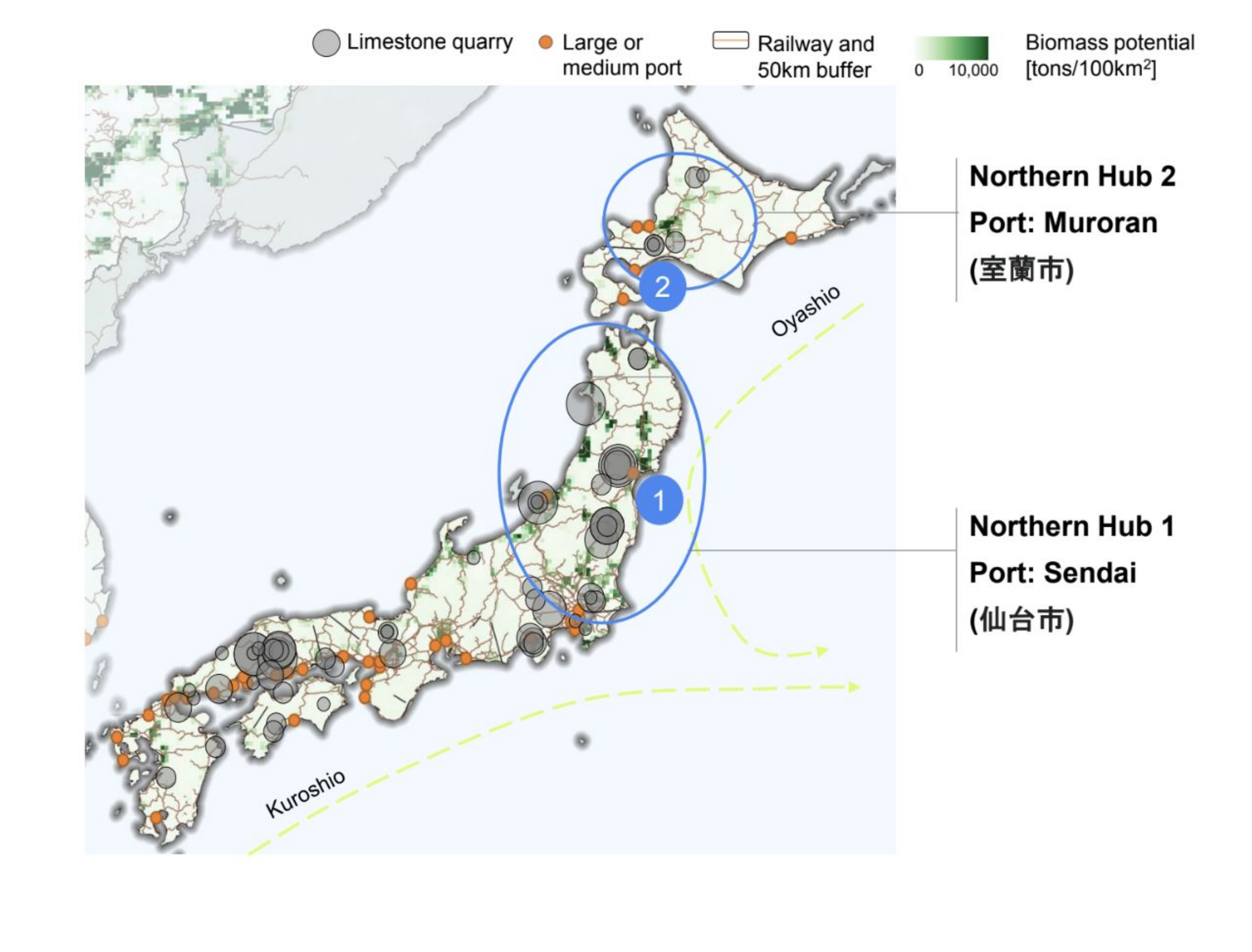
Carbon Removal Methods: Biomass sinking and OAE.

Permit: In process. Mid April deadline

Timing: Deploy July-Sept, credits verified and delivered by end of year

Anticipated Project Costs: $1-2M

Japan Site Analysis



- Easterly currents likely to provide long float times for any deployment from Japan
- Significant algae industry
- Sufficient biomass and alkaline mineral resources to support large projects.
- Very strong engagement from potential operational partners
- Preliminary discussions point towards Supportive regulatory environments

Verification Fleet: Substrate Wearable Development

Trajectory Wearable *(2024)*
- Directly mounted to substrate
- Monitor substrate float time and flips using dual GPS devices to inform substrate design

Accel Wearable *(planned 2026)*
- IMU sensor measures macroalgae growth from changes in substrate motion
- Shrink device by utilizing smaller D2D satellite comms as they become available

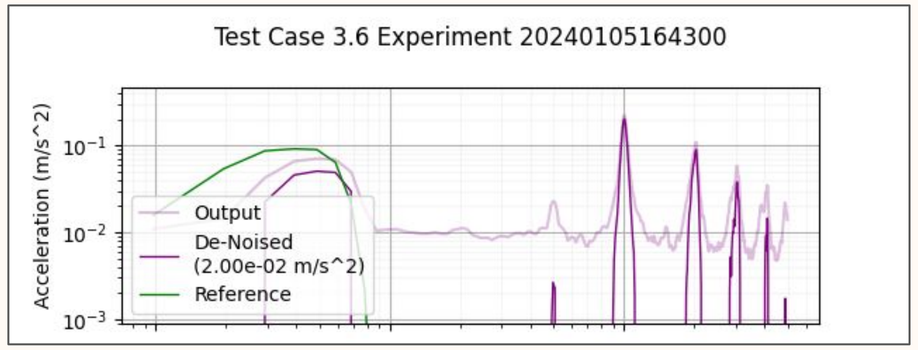
2024

2025

2026

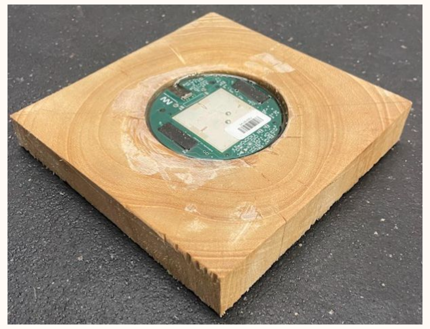
Trajectory Wearable
Float time, Flip

Accel Buoy
Wave Motion



Algorithm Training in Hatchery + Coastal

Comms + Electronics Miniaturization



concept shot of embedded miniaturized system

Accel Wearable
Growth
(via motion signature)

Iceland R&D Operations

Running Tide employed two site supervisors and two data collectors working alongside the production crew provided by our industry partner.

In addition, we had a technician to support the prep and setup of the measurement sensors and devices.

In addition to 2023 deployment ops, we stood up a team to run a macroalgae research lab in the town of Akranes.

Iceland Operational Partners

- **Eimskip**: Shipping, sensor deployments, ship agency and inland logistics. We are also developing a longer term partnership where Eimskip would own and operate deployment vessels for carbon removal deployments.

- **ET**: Heavy machinery operations. ET is a local heavy industry operations group that has worked with companies like Rio Tinto, Elkem, Century Aluminum on material handling and processing.

- **Buksér og Berging**: Barge and Tug operations. They are a leading supplier of marine services within port and terminals, towage, offshore work and complex marine operations.

front page | Business | **200 miles** | Sports | Englishthe ball | The people | Smartland | Food | Children | travels | Spades

Product price | Quota | Establishes | Pistols | Ship register | Fisheries | Ports | Ship locations | Latest landings | Service record | About the w

200 miles | The morning newspaper | 26.1.2023 | 11:22 a.m

Gather information about the ocean

A network of measuring devices was installed in international waters south of Iceland. *Photo/Running Tide*

Morgunbladid

The carbon removal company Running Tide recently deployed a network of high-tech measuring devices in international waters south of Iceland. The purpose is to gather data about the ocean area and ocean currents, but the company intends to carry out research related to the disposal of carbon in the future, as stated in Morgunblaðin .

It says that the measuring devices will collect data that will be automatically sent to the company's headquarters, and that the sensors in the devices will measure, among other things, the temperature, chlorophyll and pH value of the sea, as well as creating real-time sea currents and the effect of ocean currents.

Ulva Seed Stock Cultivation

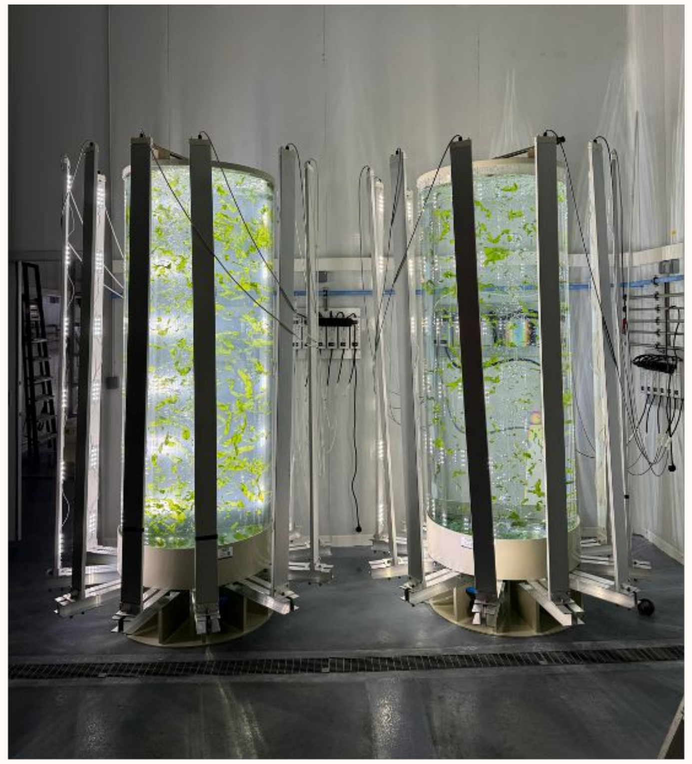
Alda, Iceland

Developed ulva cultivation and spore generation technology

Capable of seeding 100’s of substrate tons per week

Developing ability to store tissue to seed 1,000’s of substrate tons at a time

[Macroalgae at Alda - Annual Report 2023.pdf - Google Drive]



4L → 100L → 500L → 1000L

Ulva biomass harvest
1kg/week per 1000L PBR
Multiple PBRs can be harvested simultaneously

1000L sporulation PBR
5-8 day process
First test yielded approx. 50 billion spores

Sporulation induction
Mechanical processing

Seeding