

LILLIANA TECHNOLOGIES

CAPTURING CARBON &
REVITALIZING OCEAN ECOSYSTEMS

A BUSINESS WITH GLOBAL SCALING AMBITIONS

Benjamin Slotnick, Ph.D.

October 2022

 RICE ALLIANCE
Rice Alliance for Technology and Entrepreneurship

2022

**MOST PROMISING
COMPANY**

ENERGY VENTURE DAY DURING OTC
MAY 3, 2022

OCEANS ARE IN TROUBLE

CLIMATE CHANGE IS ACCELERATING



The ultimate challenge for our generation

FISHERIES ARE COLLAPSING



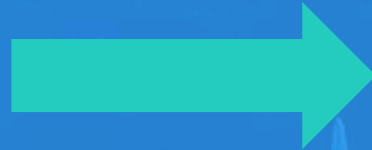
Local regulators care about fisheries; climate change is less of a priority

OCEAN DEAD ZONES* ARE INTENSIFYING



Now over 400 impacted areas totaling >250,000 km²

ALGAE MOST EFFECTIVE SOLUTION TO OCEAN CDR*



CAN CAPTURE THE
CO₂ EQUIVALENT OF



30,000 TREES PER MONTH

EACH KILOGRAM OF MICROALGAE

- Microalgae (diatoms) are the ocean's natural filter
 - Hyper-efficient at absorbing CO₂ (faster than trees, no water, no land)
 - Removes harmful pollutants, e.g. runoff from industrial farming

*National Academy of Sciences' Dec 2021 report concluded algae most effective, lowest cost, most scalable route to Ocean CDR

ALGAE REPRODUCE EXPONENTIALLY

LILLIANAH WILL REMOVE A TOTAL OF
20 BILLION TONS OF CO₂ BY 2030

That is equivalent to 40% of global human-induced carbon emissions in one year!

TWO SIMULTANEOUS BIOTECHNOLOGIES

Technology 1: Floating nutrients

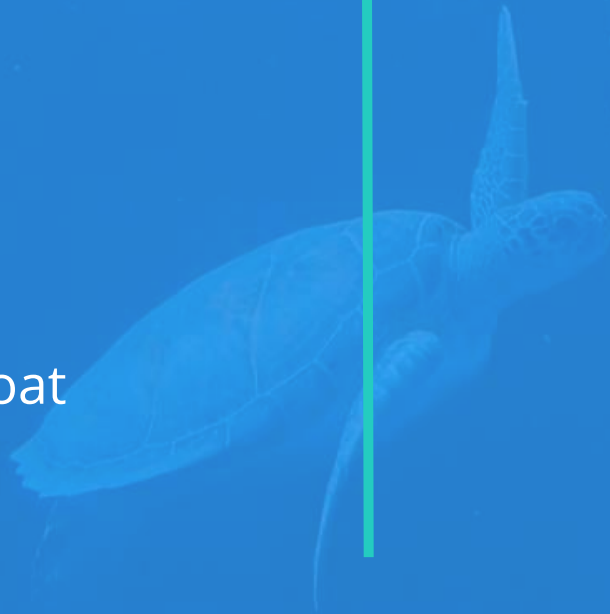
Most micronutrients sink
(unusable)

Lillianah helps micronutrients float
(helps algae grow)

Technology 2: Sinking Algae

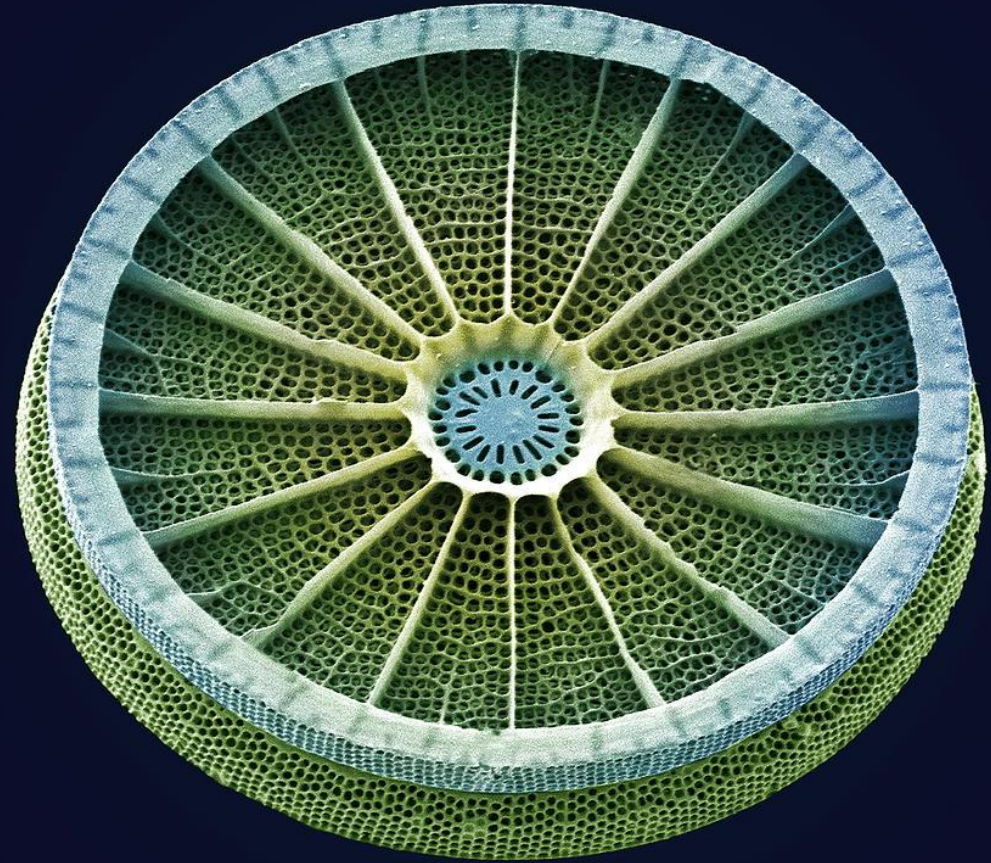
Most algae floats
(carbon not removed)

Lillianah helps algae sink
(carbon removed)



PROPRIETARY TECHNOLOGIES

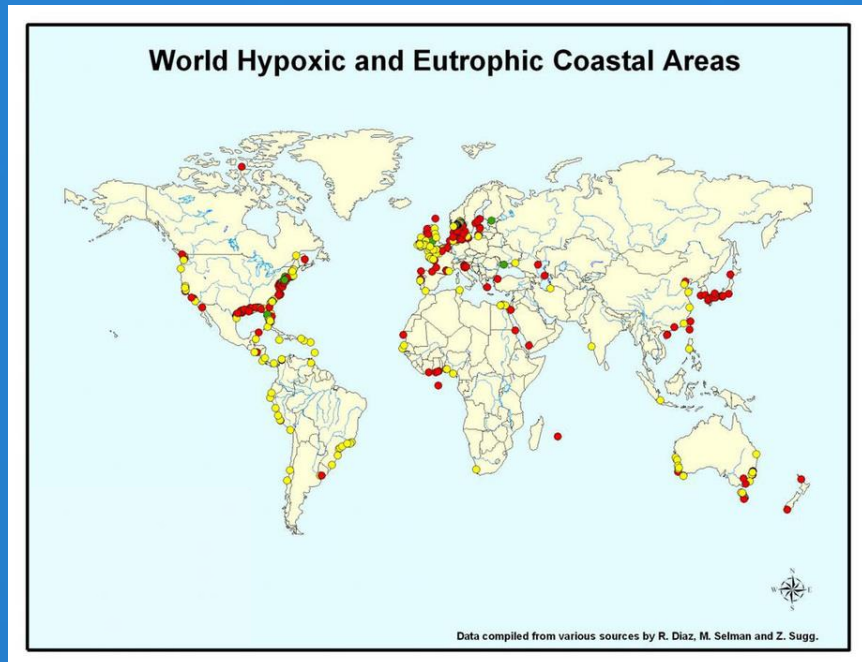
- Safely targeting, planning, creating, and controlling massive algal blooms through data science solutions
- Growth optimization by (1) natural communal response to boost/inhibit growth (2) enhancing productivity and impact through native species modification
- Automating offshore activities through ship-based bioreactor design and implementation and cryptographically validated dispersion devices
- Autonomous floating and underwater systems for measurement and verification of sequestered carbon



Pictured above: a diatom
(microscopic plant in the ocean)

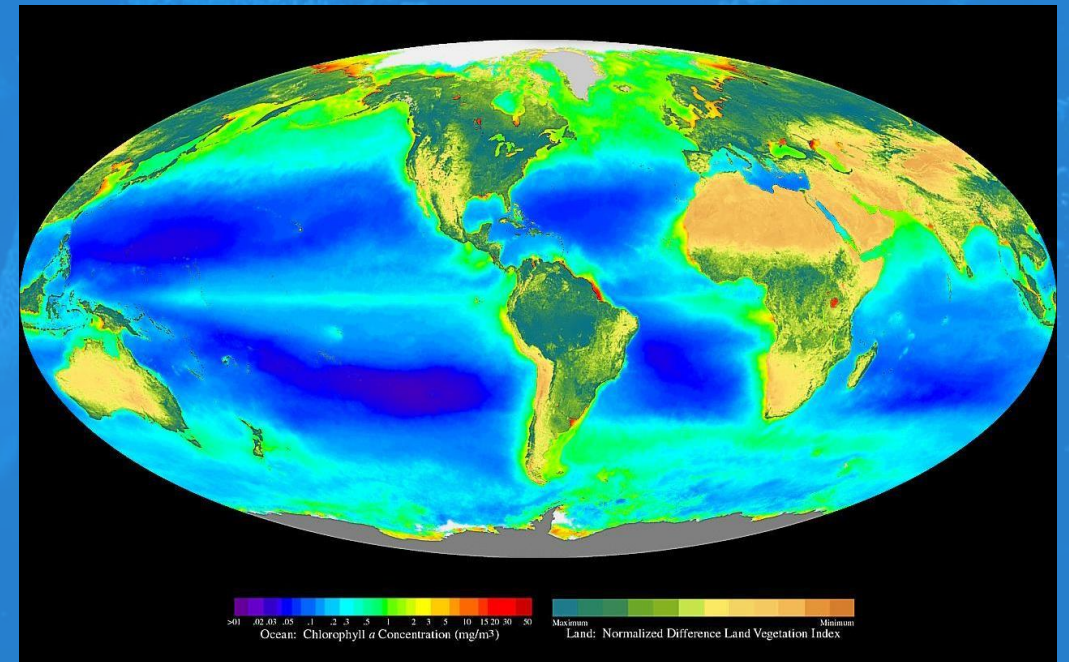
BUSINESS MODEL: **GENERATE & MONETIZE CARBON CREDITS**

Initial work in coastal markets



Large growth potential with >400
dead zones

Long term work in open oceans



Multi-gigaton carbon removal opportunities

GO TO MARKET

Three phase plan to unlock algae-based business models



Phase 1 (start small):
Solving acute local problems –
revitalizing dead zones and
fisheries



Phase 2 (build off local success):
Dedicated carbon capture projects
in coastal waters



Phase 3 (global scale):
Carbon capture projects in the
open ocean, enabled by Lillianah
and executed by partners

TIMELINE

✓ For Project 1 (coastal):
Obtain state regulatory approval. Complete recon and pilot work

Q2 2022

Q4 2022 / Q1 2023

Hire 7 personnel:
-3 c-suite roles
-4 Project 1 roles

Scouting & Initial approval for Coastal Projects 2 & 3

Q4 2022 / 2023

Kick off open ocean carbon removal work (R&D & regulatory approval)

Q1 2024

Q2 2023

For Project 1 (coastal): Reach post-revenue and commercialize via scaled deployment.
For Project 2 (coastal): Obtain state regulatory approval.

Coastal projects: Remove 10 million metric tons of carbon (or more) annually.
Open Ocean projects: Remove hundreds of millions of tons to billions of tons of carbon annually

2025 and beyond

By end-2024

Exceed \$15-20 million of annual carbon sales

OUR CUSTOMERS

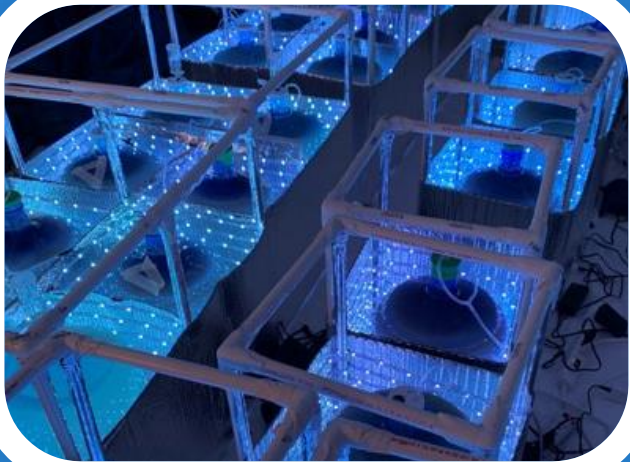
Any corporation looking to offset their emissions

- **Total addressable market** is extensive as any corporation can take part in purchasing carbon offsets
 - 25 million companies * \$20000 USD = \$500 billion USD
- **Serviceable addressable market** today includes the corporations that have already been proactive with carbon (<1% of the total market potential)
 - 250,000 companies * \$20000 USD = \$5 billion USD
- **Serviceable obtainable market** includes 1-5 corporations that have interest in pre-sales of carbon credits today
 - 5 companies * \$2 million = \$10 million USD

Future customers: Maritime operators, fishing boats, energy companies (oil & gas), all socially responsible companies

OUR PROCESS

Cultivate microalgae



Release
Algae

Coastal Regions



Along Shipping Lanes

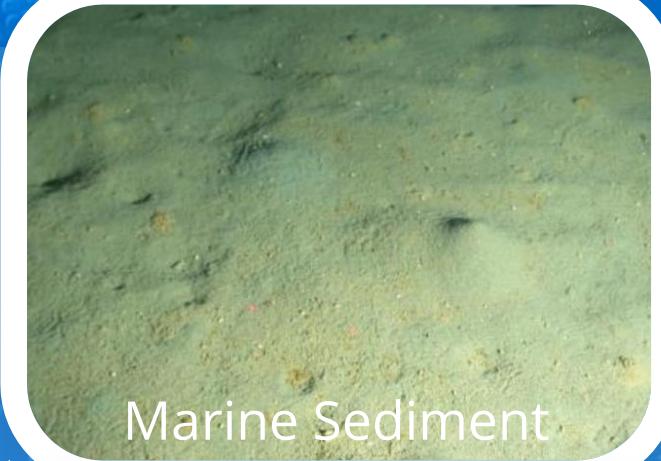


At Windfarms

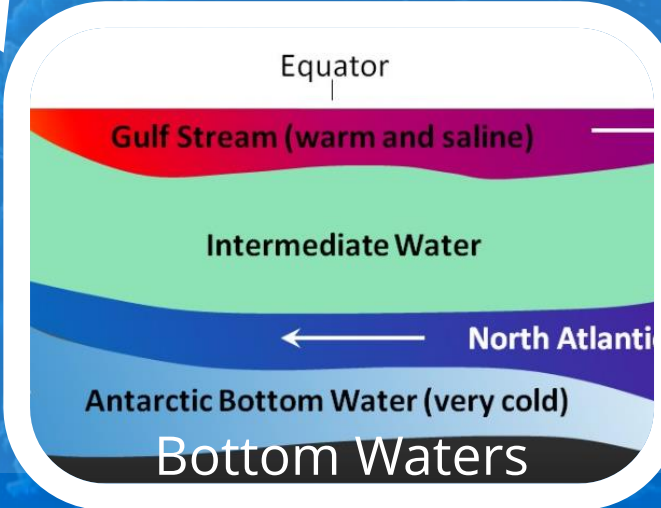


Carbon stored in:

Marine Sediment



Bottom Waters



TIME OF CAPTURE FROM RELEASE

Daily releases during commercial stage

- **Growth rate** doubles microalgae concentration each day under stable bloom conditions
- **Starting one day after each release and lasting up to 1 month**, microalgae sink and capture carbon
- **Cumulative carbon removal** takes place with each successive day since a new release is carried out every day
 - Carbon removal takes place from day 1 to up to 30 days after last release

CARBON PERMANENCE

Nearshore marine environments provide high quality carbon removal (>1000 years)

- **Account** for >**25%** of **carbon** even though nearshore represents just 0.2% of oceans
- **Removes** significant fraction of carbon humans release into atmosphere
- Increased primary productivity from increased nutrient supply and carbon burial

Focused delivery of carbon in nearshore marine systems increases carbon storage

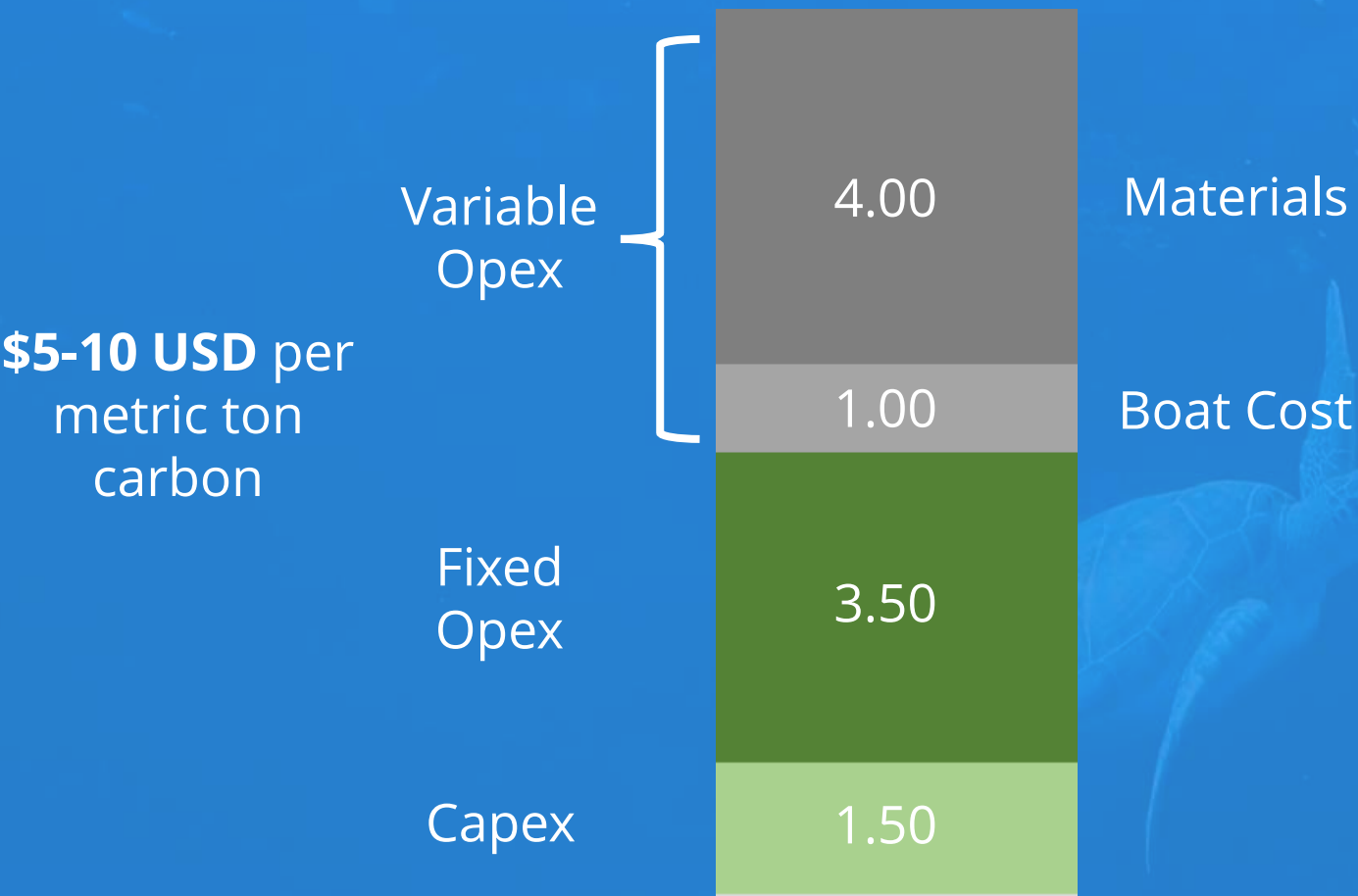
- **Higher sedimentation rates** increases carbon preservation
- **Smaller spatial extent of hypoxic dead zones** minimize carbon emissions
- **Limit carbon accounting** to water depths deeper than double wave-base (>20 ft)

VALIDATION AND CERTIFICATION

- **Internal data collection**
 - **Data Buoys** in surface waters
 - Track blooms – quantify bloom size and chlorophyll amount including overall carbon drawdown
 - Confirm desired species and no negative consequences
 - **Underwater cameras** within water column
 - Continually monitor particles sinking (size and composition)
 - **Sediment Traps** at bottom of ocean
 - Constrain total carbon delivery
- **Independent Measurement, Reporting, & Validation (MRV)** through third party vendors (e.g., carbon brokers / auditors, universities, MRV companies)
- **Maintain database** for continued monitoring and verification



Cost Breakdown



Revenue will come from carbon credit sales at future spot price of carbon and/or at pre-sale agreements

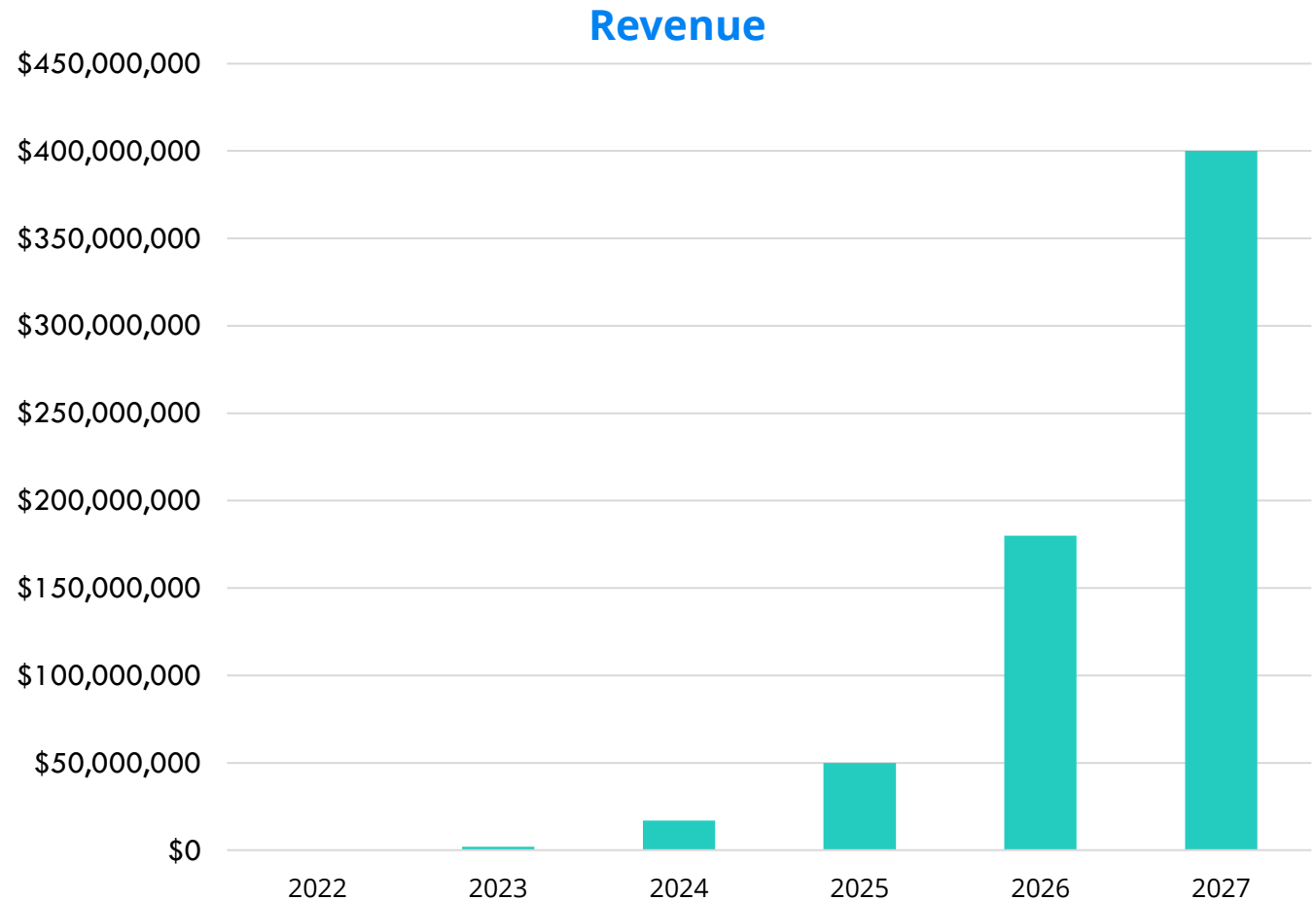
FINANCIAL PROJECTIONS

→ 2022/2023 sales pipeline \$4m

→ Multi-year pre-sales

→ 90%+ margins

→ Global scaling potential



*This assumes viable carbon credit market established by 2025

OUR CARBON CAPTURE PEERS

| | Cost | Time to 1 Gt+ | Land Use |
|---------------------------------------|--------------|--|---|
| AFFORESTATION (TREES) | \$5-50/ton | >10 years | Size of Australia |
| DIRECT AIR CAPTURE (DAC) | >\$100/ton | >10 years (pending energy breakthrough) | Insignificant |
| OCEAN ALKALINIZATION | \$40-260/ton | >10 years | 1 ton mining per 1 ton CO ₂ |
| SEAWEED/KELP (MACRO ALGAE) | >\$250/ton | >10 years | Negative |
| LILLIANAH (MICRO ALGAE) | \$5-50/ton | 3-5 years | Negative |

USE OF FUNDS

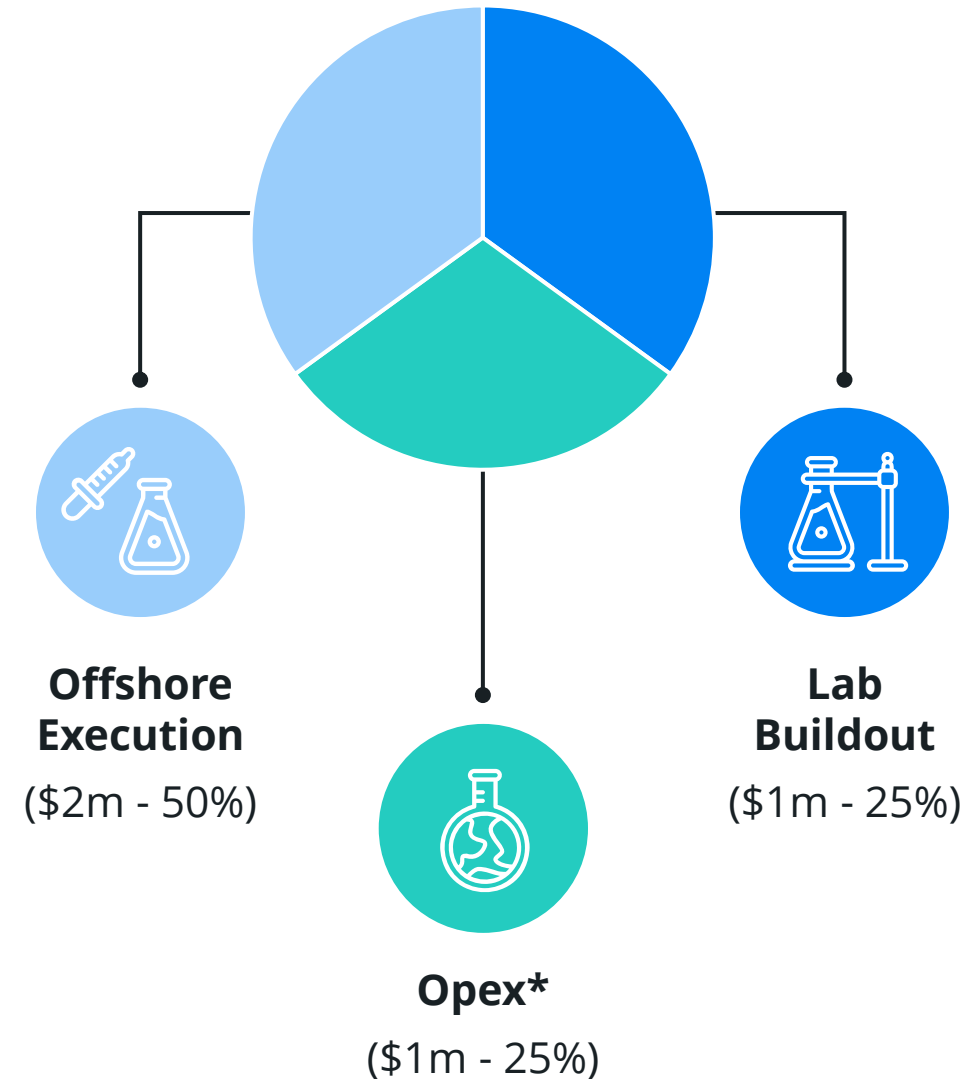
\$4,000,000

Seed

Funds extend through Lillianah's first commercial season for Project 1

- Enable post-revenue conditions

*Patent pending



*Includes lab opex, salaries, SG&A, and legal/IP fees

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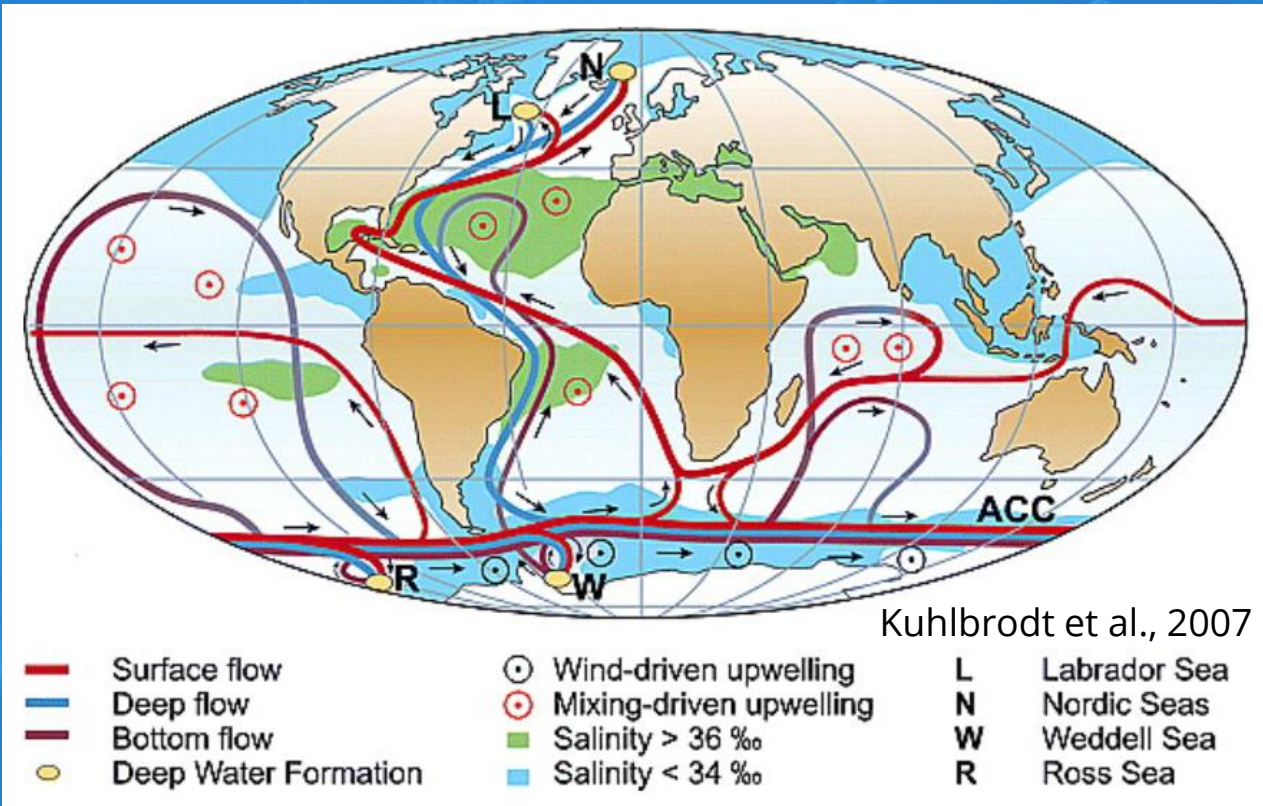
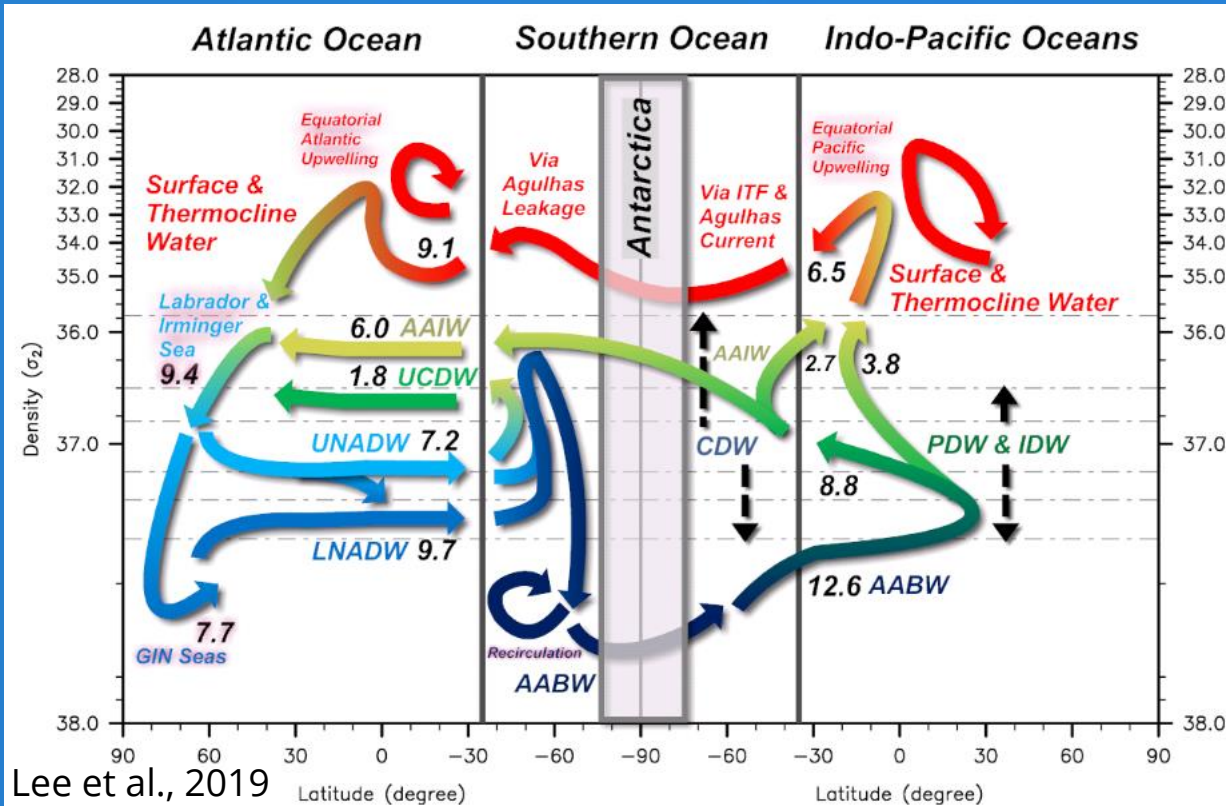
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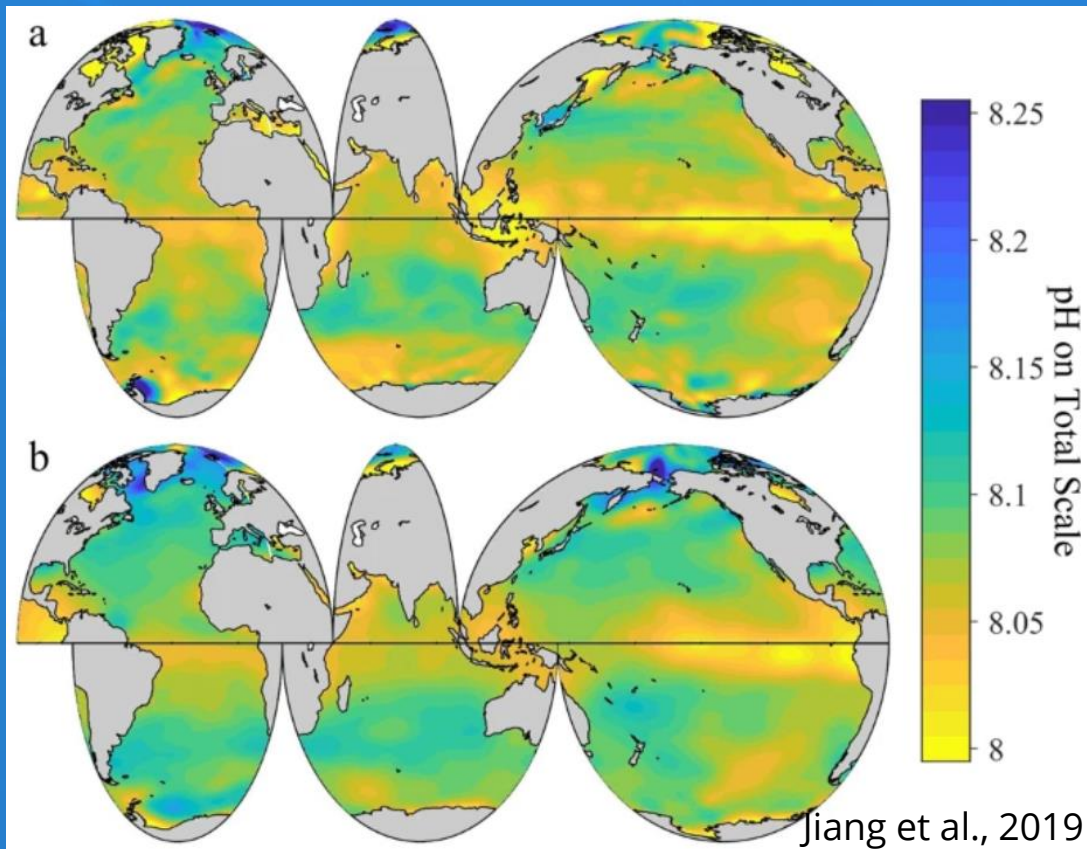
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ADDITIONAL BACKGROUND (KEY FACTORS: Meridional Overturning)



Target preferred shipping lanes and/or coastal regions with beneficial currents movement

ADDITIONAL BACKGROUND (KEY FACTORS: Surface Water pH)



pH of surface waters throughout our oceans impact the rate of carbon dioxide uptake from the atmosphere

Trends in annual water-quality loads to the Gulf of Mexico (Published by USGS)

