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Since the development of agriculture,
human population has increased by 1000x going from
~7 million to **7.8 billion** today.

350 Million Tons

2.8% of body weight / day

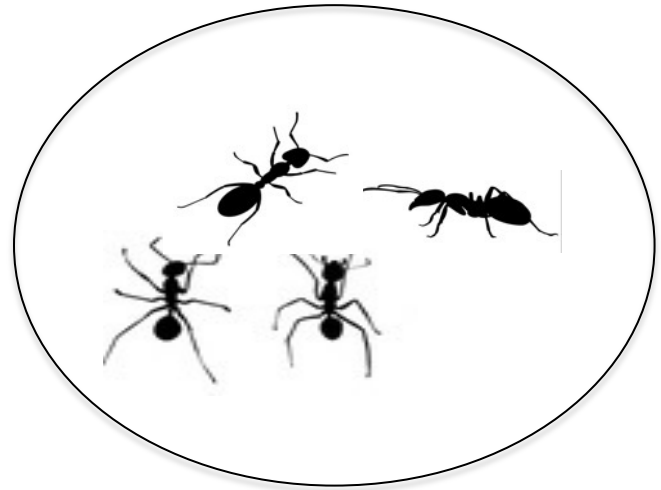


10 Million

Tons of food / day

~350 Million Tons

30% of body weight / day



>100 Million

Tons of food / day

Ants consume 10x more food, and enrich the world.



the golden rule for all species:
Ecosystem Services > Ecosystem Consumption



Iberá National Park – Restoration initiative launched by Kris and Douglas Tompkins

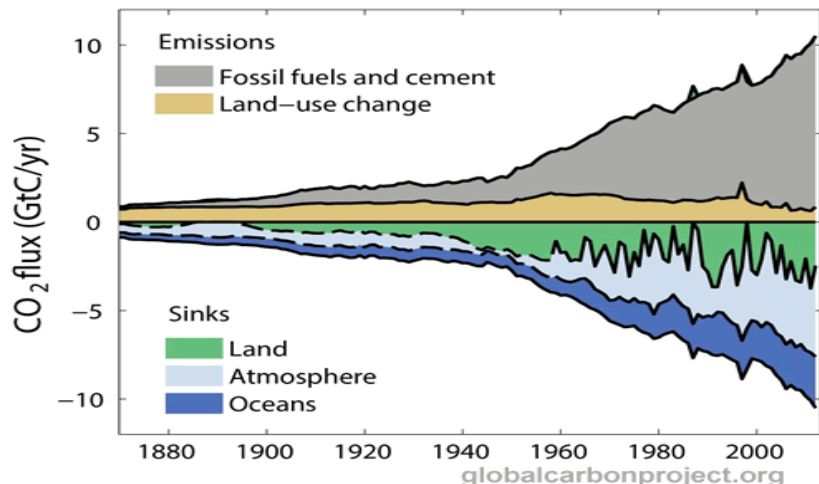


Our goal: create a **net-positive civilization** where:
Ecosystem Services > Ecosystem Consumption

In other words:
How can humanity be a **net positive to nature?**

So where are we starting from?

The Global Carbon Budget 1870-2012

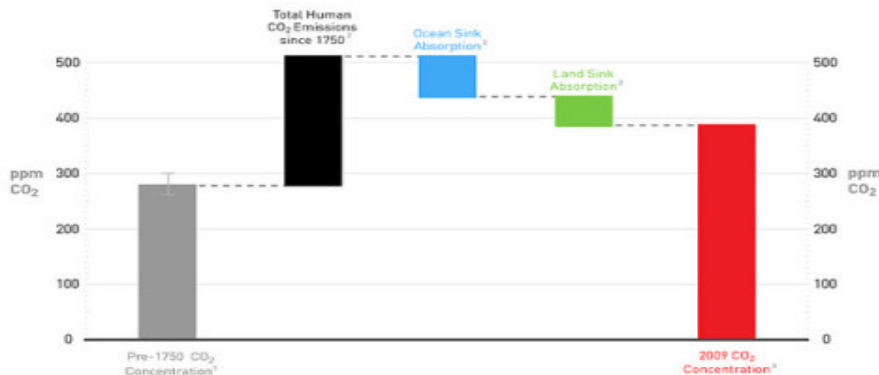


Why carbon sinks matter

If it weren't for the oceans, soils and plants CO₂ concentrations would be over 500ppm

References

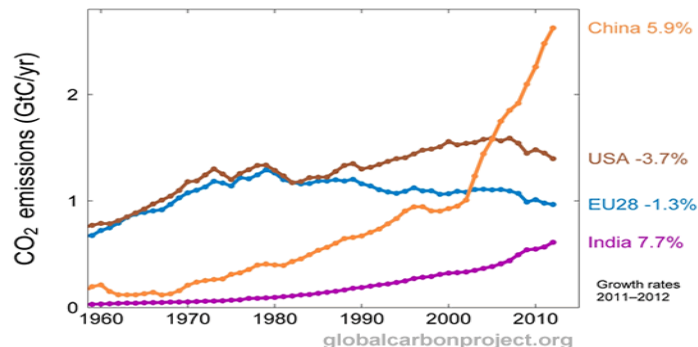
- IPCC: GWP, WGII p. 100
- IPCC: GWP, WGII p. 5.5.5 Supplemented with GCRAC
- IPCC: GWP, WGII GWP p. 142

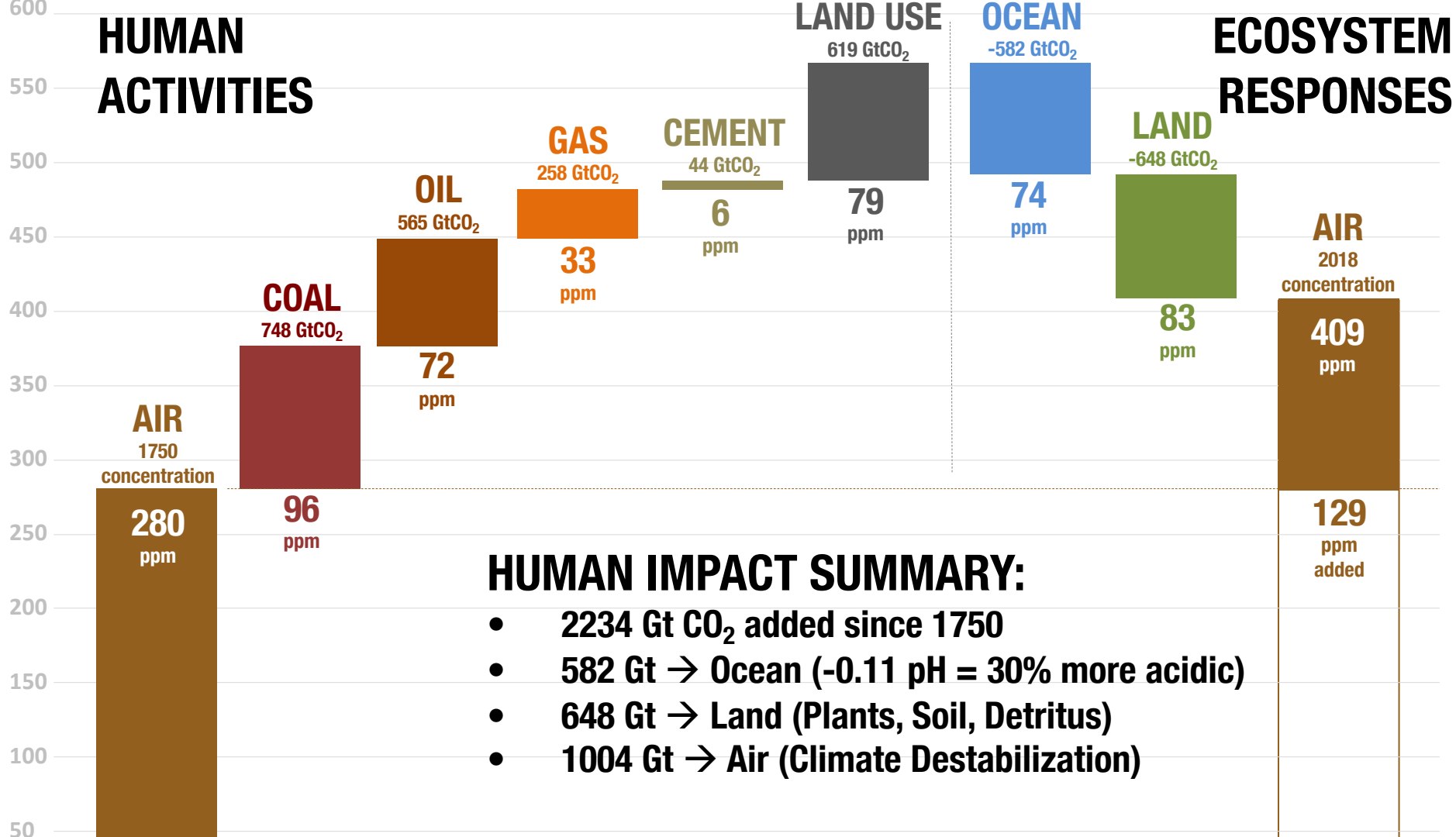


World GHG Emissions Flow Chart 2010

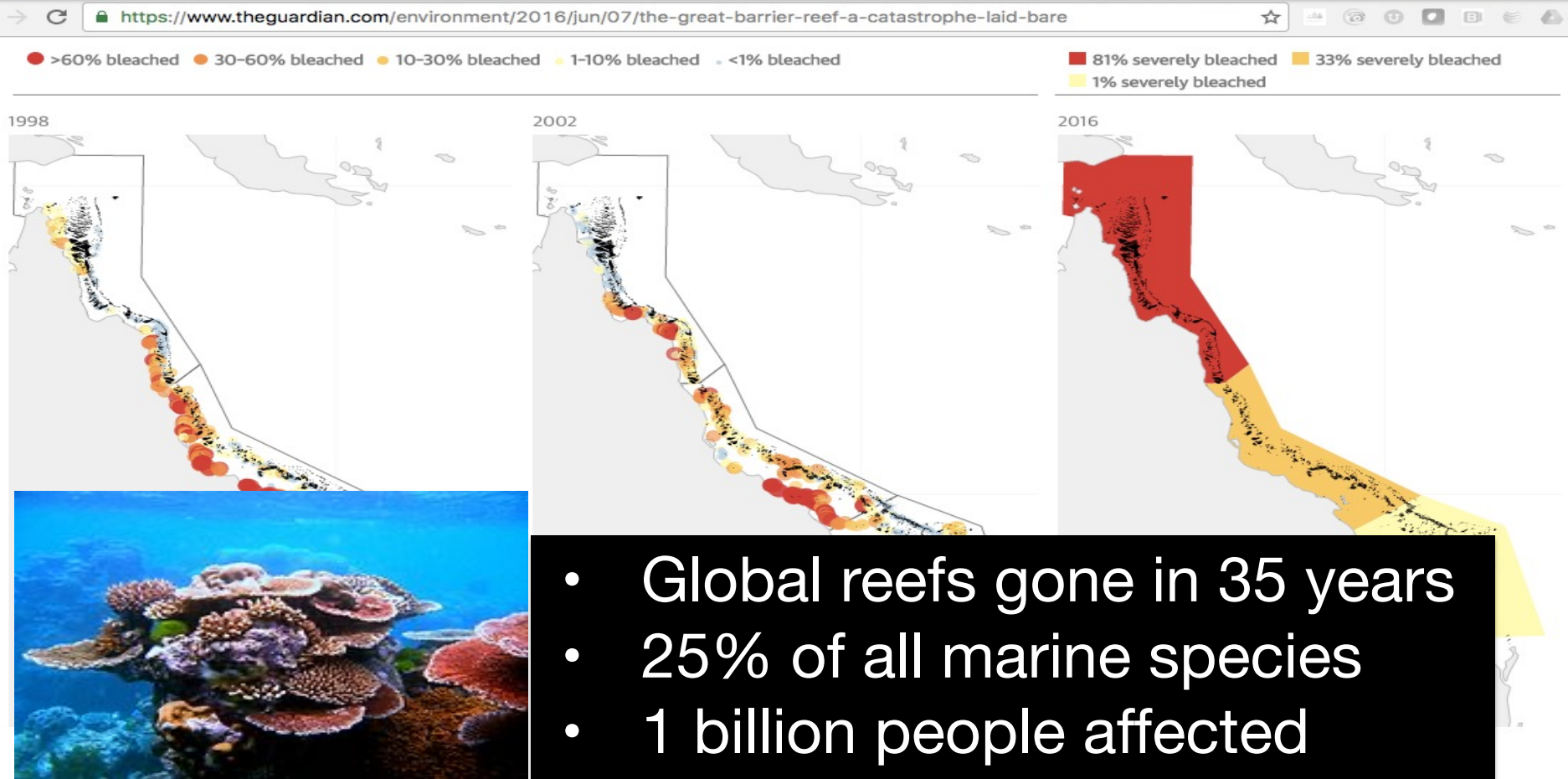


The Four Largest Emitting Regions





Some of these impacts are catching up with us fast...



Ocean Challenges

Macro-scale:

- Thermal Stress
- Upwelling Suppression
- Acidification

Fishing Practice:

- Regulatory Violations
- Overfishing
- Bycatch
- Trawling

Pollution

- Effluent (Human, Factory Farming, Aquaculture)
- Fertilizer, pesticides, eutrophication
- Solid wastes – plastics, heavy metals
- Oil spills and industrial errors
- Noise Pollution

Habitat Destruction

- Wetlands, Mangroves, Seagrasses
- Coral Reefs (dynamite, cyanide)
- Seafloor (via Trawling)
- Coastal Erosion

The damage is large and the time is short, so...

How will net positive be possible?

Change Accelerator: Invention Catalyst



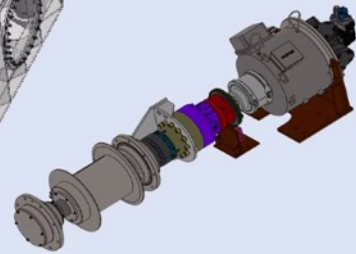
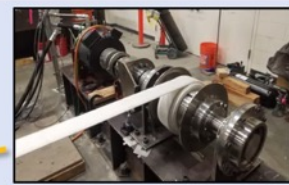
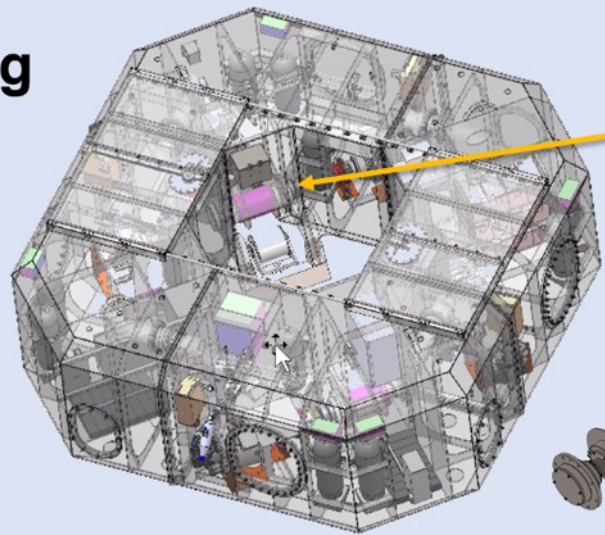
New capabilities shape our belief of what's possible,
and can drive rapid transformation.

Ocean Energy

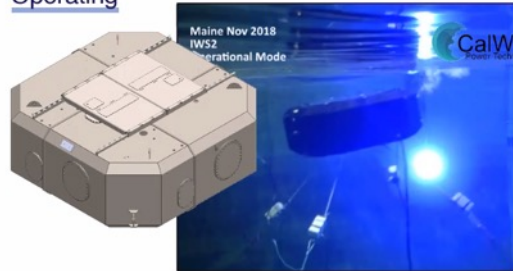
Pilot device manufacturing

Status as of Sep 21

- Location:** Scripps Pier, San Diego.
- Status:** Permits received; construction started.
- Testing:** Q3 2021 - 6-8 month.
- Funding:** Funded by U.S. DOE and seed investments

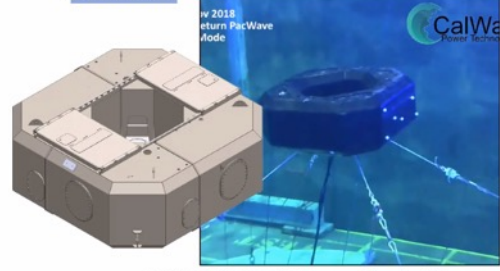


Operating

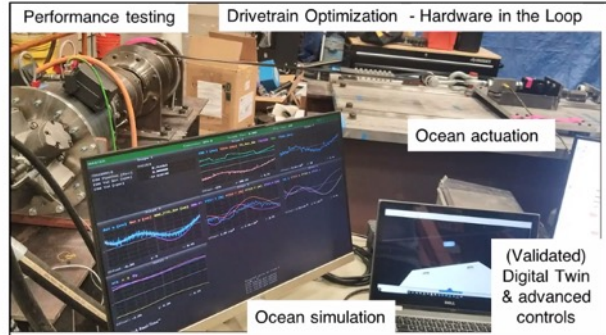


2018 & 2021 Wave Tank performance validation

Shutdown

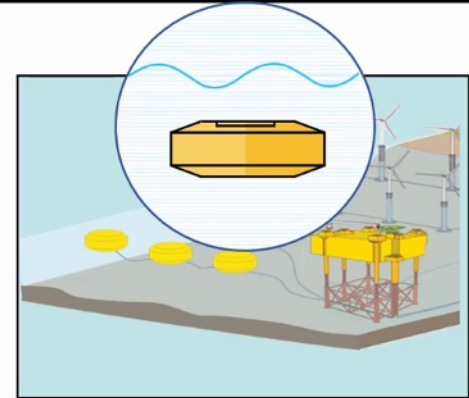
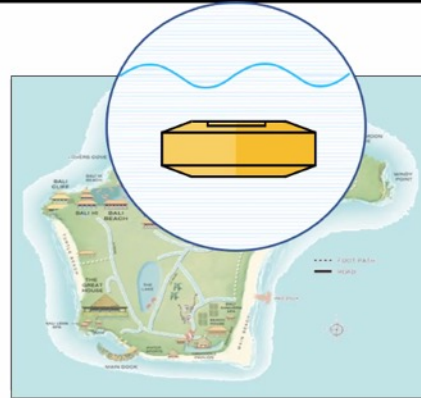


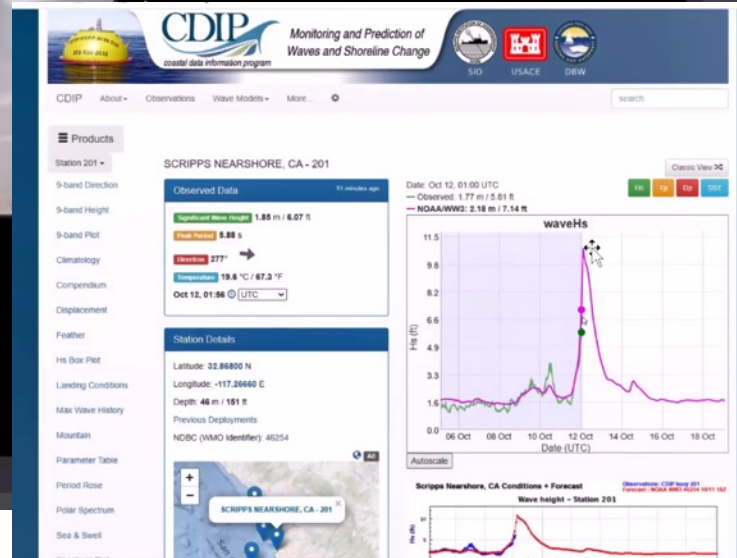
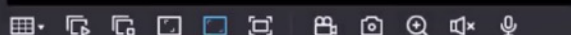
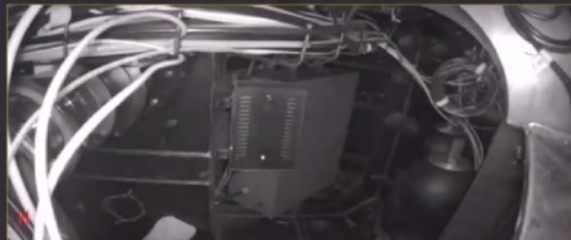
2018 & 2021 Wave Tank 50 year storm wave shut down validation



CalWave's submerged **Product Lines**

Name	xNode	x100	x800
Power [kW]	1-5 (continuous)	100	800
Size [m]	4	11	20
Application	Offshore IOT	Island micro grids	Utility scale farms
Differentiation	Light weight, versatile, onboard data center	Submerged, storm resilient, 24/7 power, 10-30 cent/kWh	Submerged, storm resilient, 24/7 power, 5-10 cent/kWh
Business model	Power and data as a service	Sale and after sales contracts	Sale and after sales contracts
Payback period	0.25-0.5y	6y (at 30 cent)	7y (at 5 cent)
Market entry	2022	2024	2026





ScotWind Lease Round in Q1 '22 Signals Market Maturity

Scotland: 15GW Floating Wind by 2030

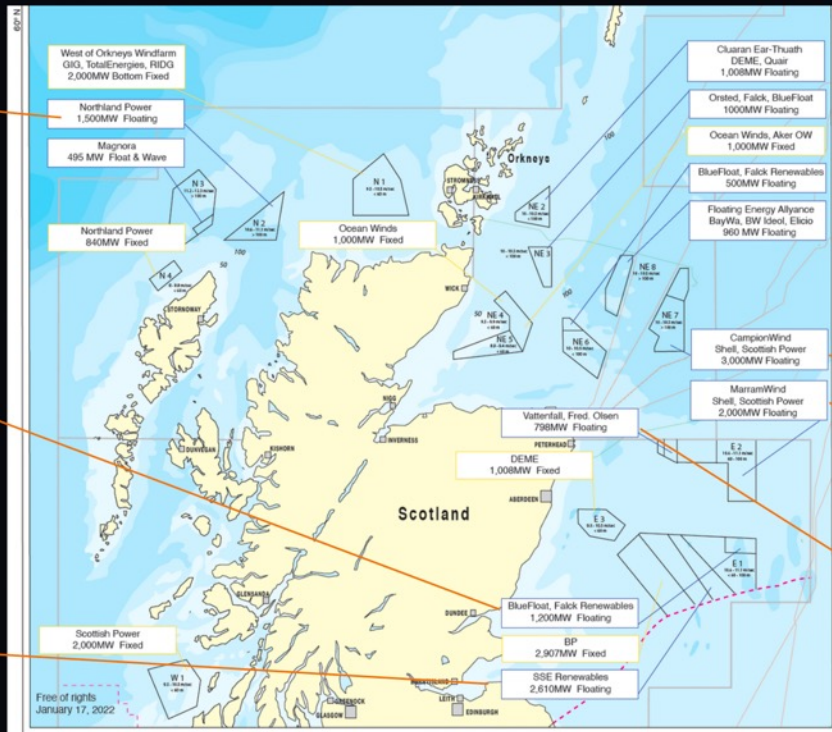
1.5GW



1.2GW

Falck
Renewables

2.6GW



1.0GW

1.0GW



1.0GW

3.0GW



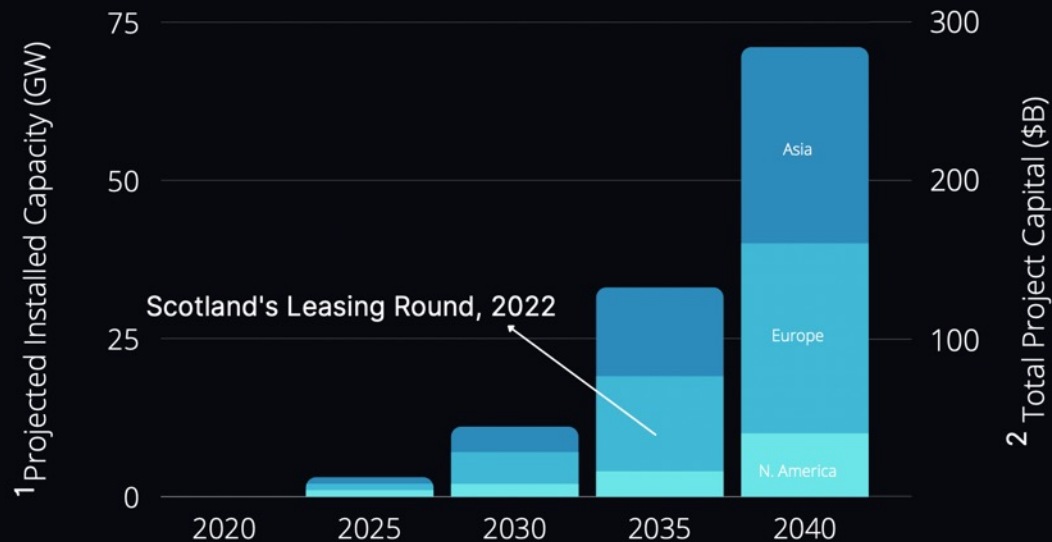
2.0GW



2.0GW



Floating Wind Market + Projections



¹ Carbon Trust Floating Wind JIP Phase II Summary Report, 2019

² BVG Associates Guide to an Offshore Wind Farm

Opening Deeper Shorelines to Wind Turbines

■ Floating (more than 60m) ■ Traditional offshore



Note: Suitable area winds exceed 7m/s and are situated within 55km and 200km from shoreline.

Data: British Oceanographic Data Centre, Global Wind Atlas

Planned or Proposed
Floating Wind Farms
(added)

"Floating Wind Could Supply the World's Electricity"
-Bloomberg News 06/05/2020

The OPEX Problem: Logistics

Draft, air draft and beam **restrictions**,
developed from the shipping container industry,
prevent the utilization of most industrialized ports



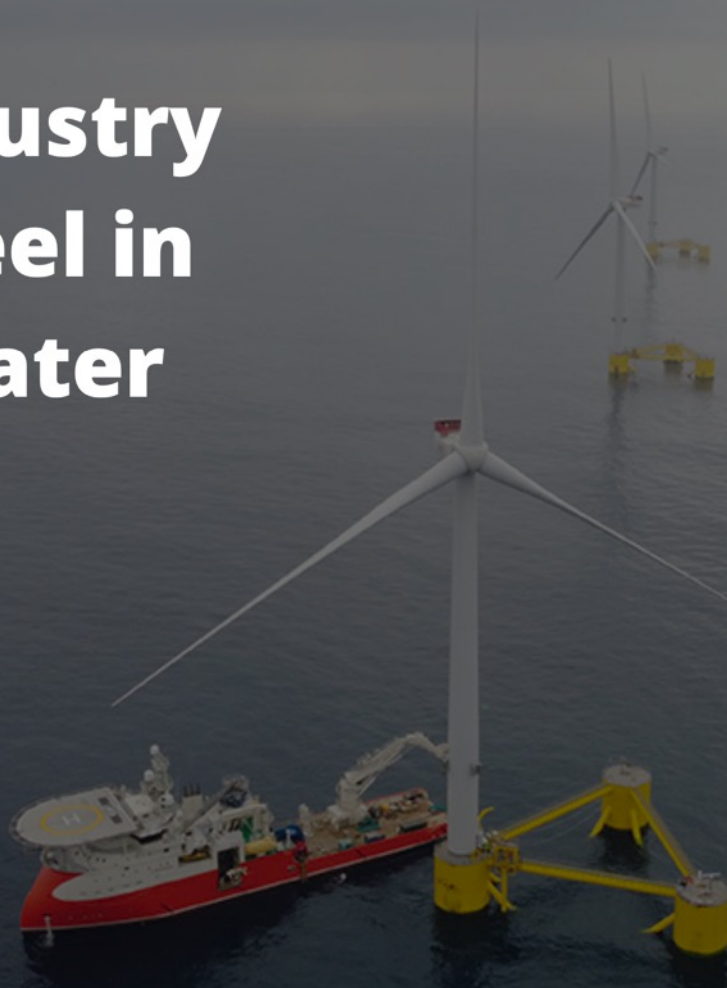
The Industry has Steel in the Water

25MW WindFloat Atlantic Project, Northern Portugal

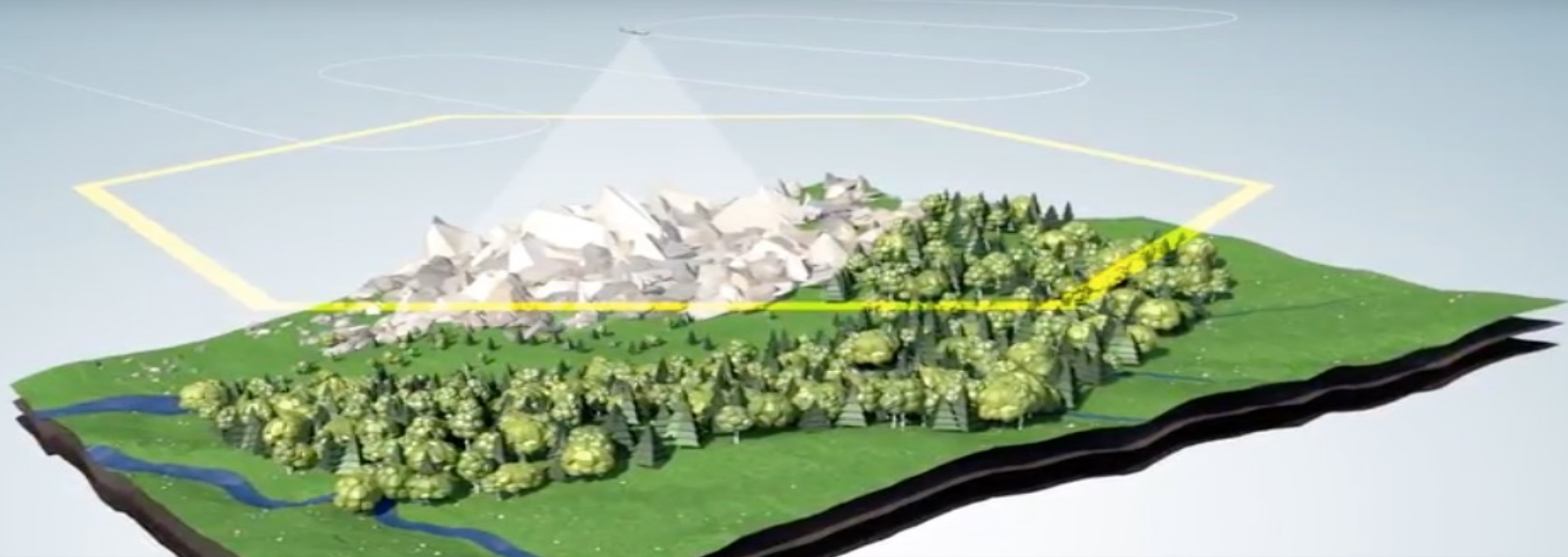
First Semi-Submersible Floating Wind Farm
COD 2020

3 x 8.3MW Vestas V174 Turbines

Principle Power's WindFloat Platform



Ecosystem Restoration



Catalyst: Plant 20 billion trees / year

<https://goo.gl/pWqrWV>



UAV Planting Mechanism



Biodegradable Seed Pods



Field Trials



Weights 2-20 tons | ~48% Carbon by Mass






20 billion trees / year:

- 9000 drones
- 450 staff

Total: \$80M / year

Catalyst: Active Coral Restoration

<https://goo.gl/LWdQYQ>

- 
1. Breed heat-resistant coral
 2. Speed up their growth using hyper-fragmentation
 3. Create large-scale effort to plant corals back into environment.

ARMED
MANUAL



100%

0%

0%

0%

STOPPED

ON
00:22:30

8



DEPTH
-1.5m

ALTITUDE
0.0m

WATER TEMP
26.7°C

INTERNAL PRESSURE
108.1 kPa

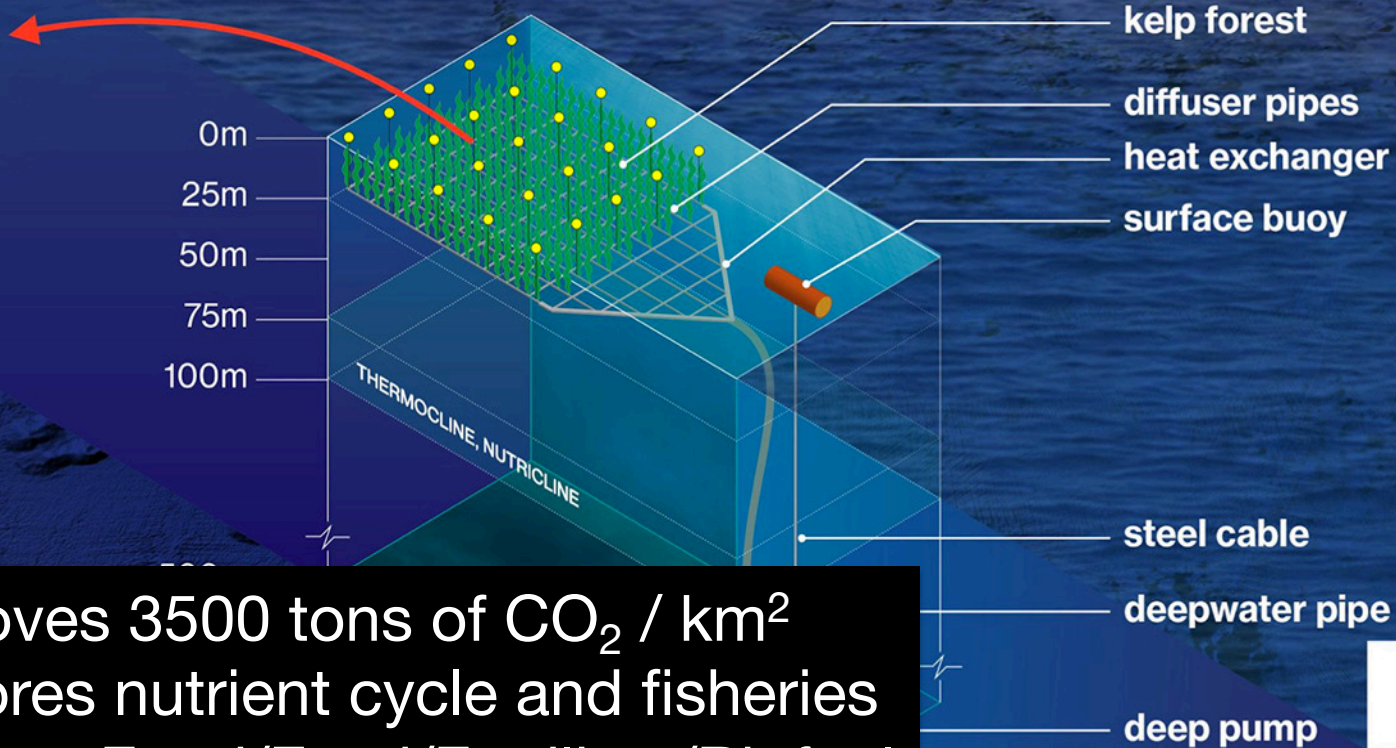
TURN COUNT
0

POWER
12.0V 48.5A

RUNTIME
00:31:49

Catalyst: Marine Permaculture

<https://goo.gl/K34pkb>



- Removes 3500 tons of CO_2 / km^2
- Restores nutrient cycle and fisheries
- Creates: Food/Feed/Fertilizer/Biofuel



Change Accelerator: **Awakening Global Consciousness**

“We have the world we have because we think the way we do.”



New perspectives *can* lead to new outcomes, but make sure it works!



Kingo Energy – Central America



Thank you.
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tom@tomchi.com