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CARBON FOOTPRINT MONITORING

Executive Summary

Greenearth through our partner, CarbonSpace offers an innovative digital Measurement, Reporting and Verification **(dMRV)** platform that enables companies across various industries to monitor carbon emissions throughout their supply chains and report accurately in compliance with major frameworks.

Measure, Report and Verify:

1. **Greenhouse Gas Emission**
2. **Track Carbon Footprint**
3. **Monitor Emissions Across Operations/Supply Chain**
4. **Report on Environmental Performance**

ISO14064 and GHG Protocol are accepted as carbon reporting standards

CarbonSpace is the only AI carbon MRV tool complying with these standards

Methodology accepted by global scientific communities and standards

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The Legacy Approach Is Flawed

The land serves as a critical lever in the pursuit of net zero carbon emissions.

But current tools for monitoring land-based carbon removal are not adequate. And these inadequacies generate risk.

Manual methods are **expensive** and **not scalable.**

Self-reported data is **biased.**

Industry averages and estimates have **high variance.**

The industry needs reliable monitoring tools to support nature-based carbon removal at scale.

CarbonSpace has developed a remote digital monitoring, reporting, and verification (dMRV) platform powered by third-party validated, satellite- and AI-based technology.

Now Monitor:
- **Carbon Sequestration**
- **Emissions on the Farm, Field, or Forest level**

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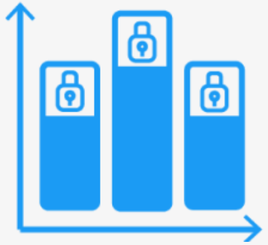
Issues with Current Monitoring Tools?

On-site sampling and industry averages are

INACCURATE & PERSIST RISK

Manual methods are

NOT SCALABLE & EXPENSIVE



Self-reported data fosters greenwashing and

NOT VERIFIED

Our Unique Value Proposition

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Empowering companies in managing their carbon footprint easily and accurately.

- **Precise Measurement, Reporting, and Verification (MRV) Platform**: Provides accurate tracking of greenhouse gas emissions across supply chains.
- **Facility Monitoring:** Monitors facilities like oil rigs, power plants, factories, and plantations, providing real-time data tracking to validate ESG goals.
- **Carbon Credit Creation:** Facilitates the creation of carbon credits, allowing companies to monetize their sustainability efforts and incentivize sustainable practices.
- **Actionable Insights**: Enables identification of carbon hotspots and setting ambitious reduction targets.
- **User-Friendly Interface**: Intuitive platform facilitates easy decision-making and driving of sustainability initiatives.
- **Compliance with Major Frameworks**: Aligns with GHG Protocol and Science Based Targets initiative (SBTi), ensuring regulatory compliance and industry leadership.
- **Enhanced Brand Reputation**: Demonstrates commitment to sustainability, fostering trust among stakeholders and attracting environmentally conscious customers.

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Inside Our dMRV Platform

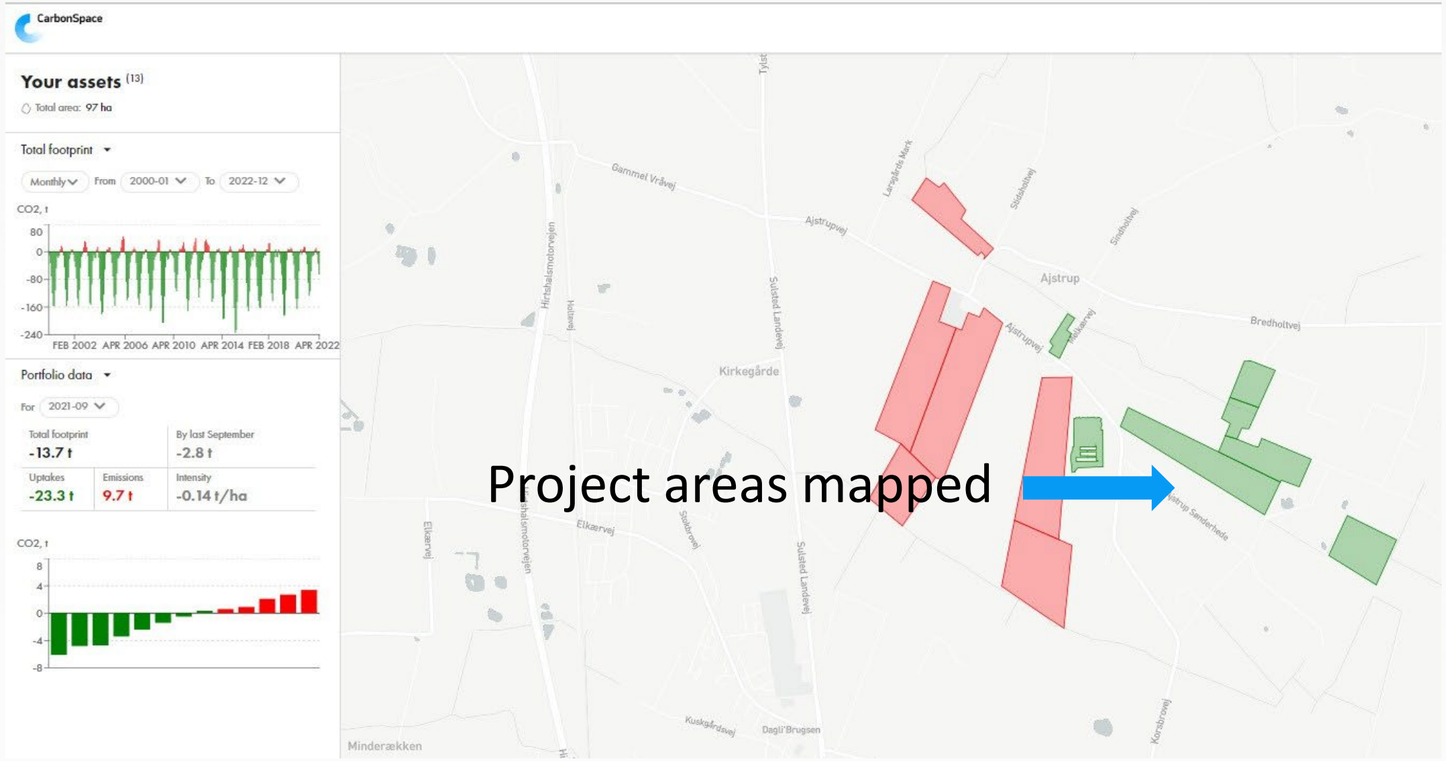
Carbon footprint measurements are visualized graphically:

Overview of the site

Historical monthly and annual carbon footprint data.

Customizable metrics

Actual and historical carbon performance of different plots



Product demo: [video]

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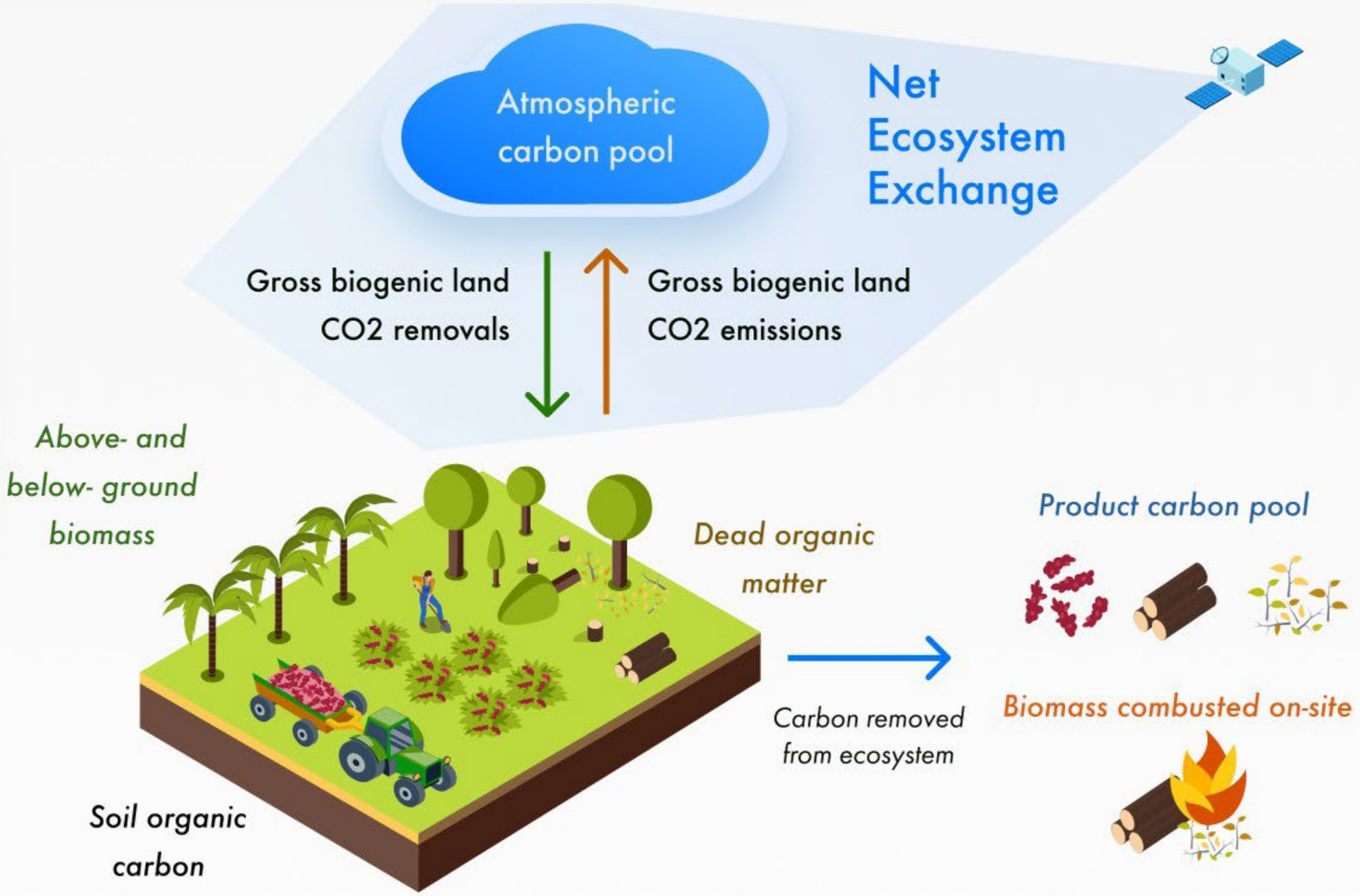
Measuring True Climate Impact

Our dMRV monitors the
Net Ecosystem Exchange (NEE).

NEE is a verified benchmarking tool for carbon change ideal for project evaluation.

Carbon sequestration occurs in the whole ecosystem, not just soil. NEE monitoring captures **carbon removals in all major carbon pools in the ecosystem.**

Our historical data allows target setting, baselining, and verification. Eg **in palm oil supply chains.**



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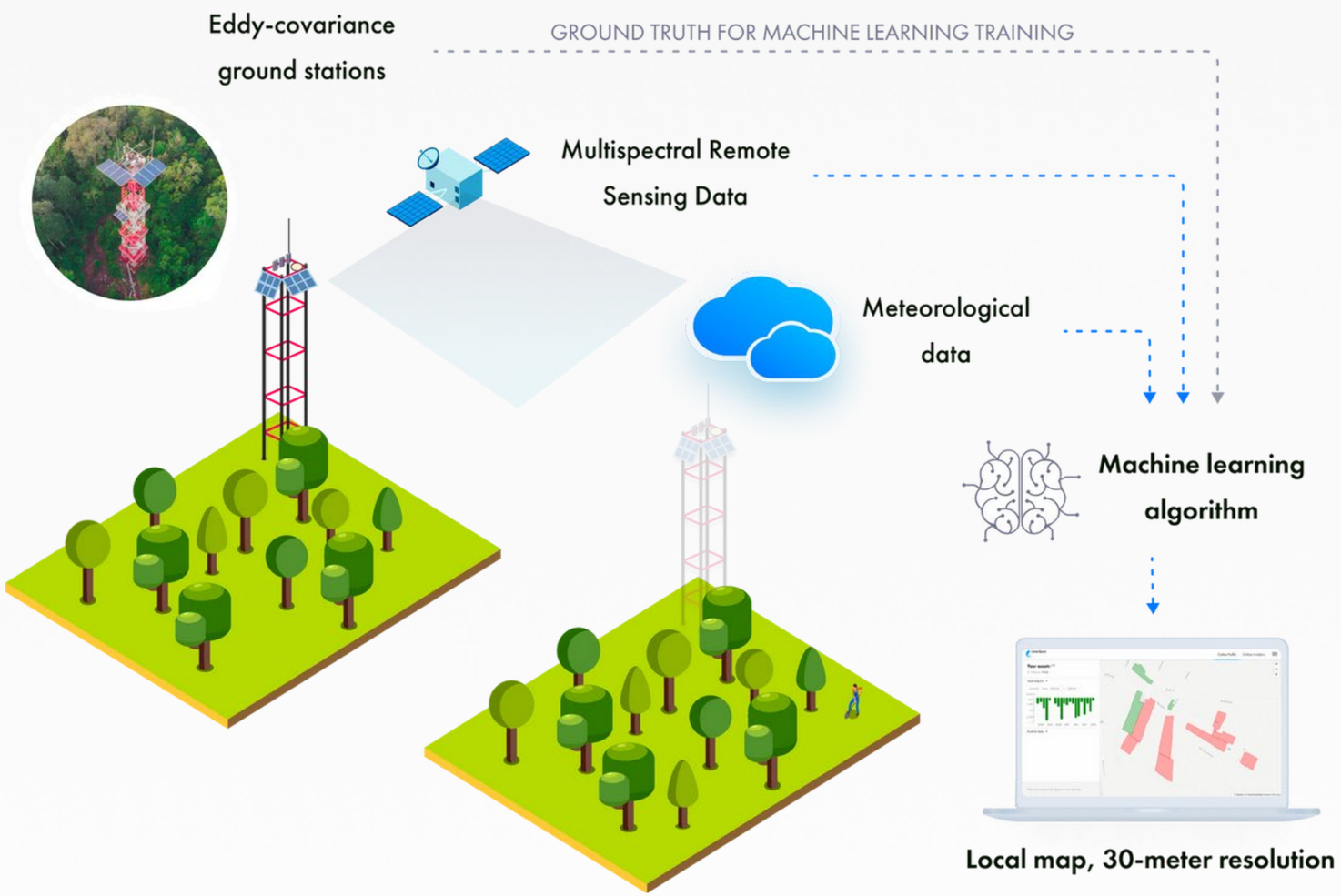
Unique Technology With Powerful Ground Truth



- ML algorithms trained on multispectral satellite imagery, meteorological data and net ecosystem exchange (NEE) data from ground stations.
- **Only remote technology that does not use proxies or industry averages.**
- Unrivaled accuracy due to direct estimates on the whole ecosystem level.
- 20+ years of historical visibility and monthly updates.
- Analyze any area 1 hectare or larger.

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Verification and Certification

Peer-reviewed, published approach: MDPI's Journal of Remote Sensing

remote sensing

Verified against ISO 14064-3 with Control Union as LCA partner

ISO 14064

CONTROL UNION CERTIFIED

Methodology accepted by global scientific communities and standards

GREENHOUSE GAS PROTOCOL

SCIENCE BASED TARGETS

FLUXNET A Global Network

OPEN FOREST PROTOCOL

CARBON STANDARDS international

ithaka institute

waldklima standard

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Potential Use Cases

1. **Carbon Insetting and Offsetting projects**: NEE helps companies measure the impact of carbon projects. It sets a baseline to see how effective these projects are in reducing emissions and improving the environment. **NEE helps track how much CO2 is removed from the atmosphere.**

2. **Regional and country level carbon flux measurements**: NEE is a cost-effective tool that can be used at regional or national levels to measure carbon emissions and absorption. It **helps identify areas with high emissions and assess projects** to reduce emissions are feasible on a larger scale.

3. **Afforestation, restoration or conservation:** Projects **involving planting new forests, restoring degraded land, or preserving existing forests**. Monthly measurements focus on how much **CO2 these projects remove and how the amount of carbon** stored in the trees changes over time.

4. **Life Cycle Assessment (LCA):** measures the **carbon impact of land restoration or degradation** throughout production. It compares actual changes in **carbon stored in the land**.

5. **NEE as an Individual Metric:** NEE is a single measure that helps **assess ecosystem health, set goals, and show improvements in projects.** The data is available from 2000.

6. **Climate data dashboards:** enable the identification of both **top-performing and underperforming** areas.

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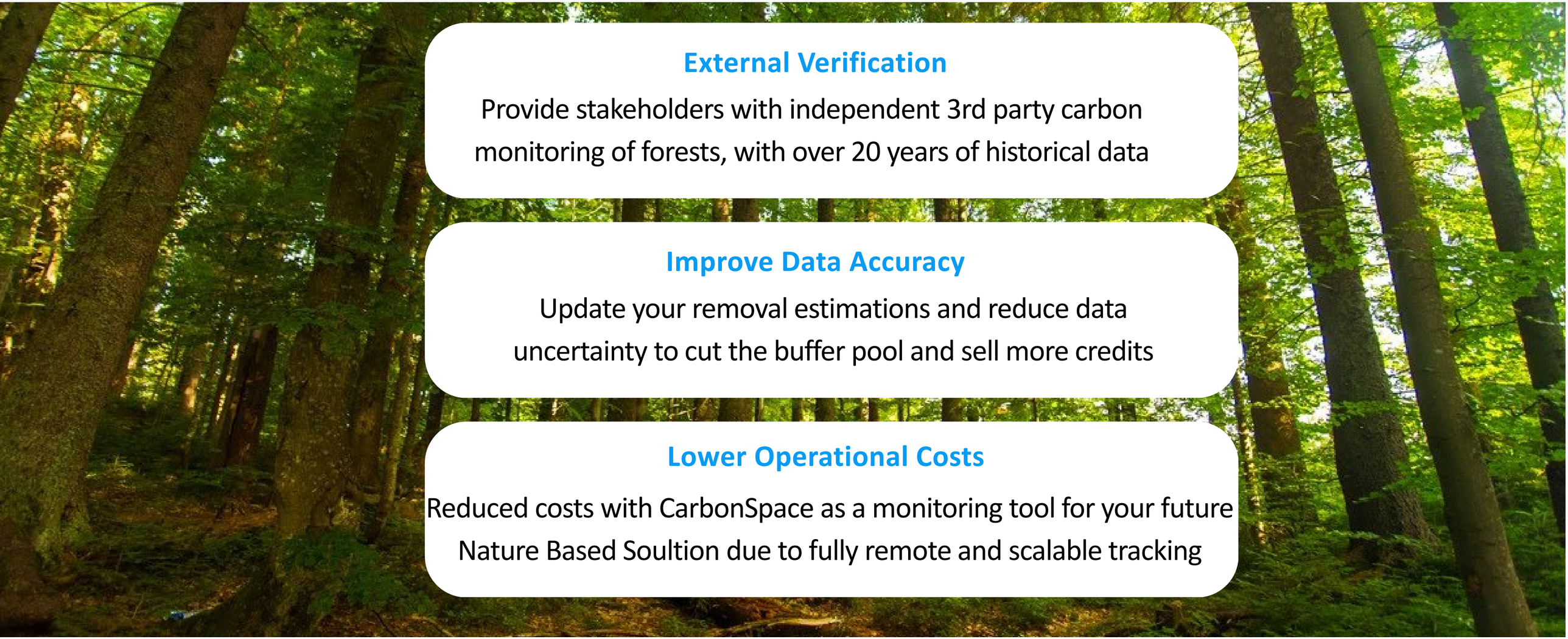
Portfolio

Reforestation and Forest Management (REDD+)



External Verification

Provide stakeholders with independent 3rd party carbon monitoring of forests, with over 20 years of historical data

Improve Data Accuracy

Update your removal estimations and reduce data uncertainty to cut the buffer pool and sell more credits

Lower Operational Costs

Reduced costs with CarbonSpace as a monitoring tool for your future Nature Based Soultion due to fully remote and scalable tracking

Reputation Risk and Underperformance Due to Inaccurate Carbon Data

- REDD+ projects face reputation risks due to lack of transparency and confidence in monitoring tools.
- Carbon footprint protocols use a combination of physical data and empirical models and use proxies
- Due to data limitations, significant buffer pools are required to ensure that carbon benefit estimates are conservative.
- These estimations are incomplete, costly, lack standardization and transparency, and are unaffordable for small projects

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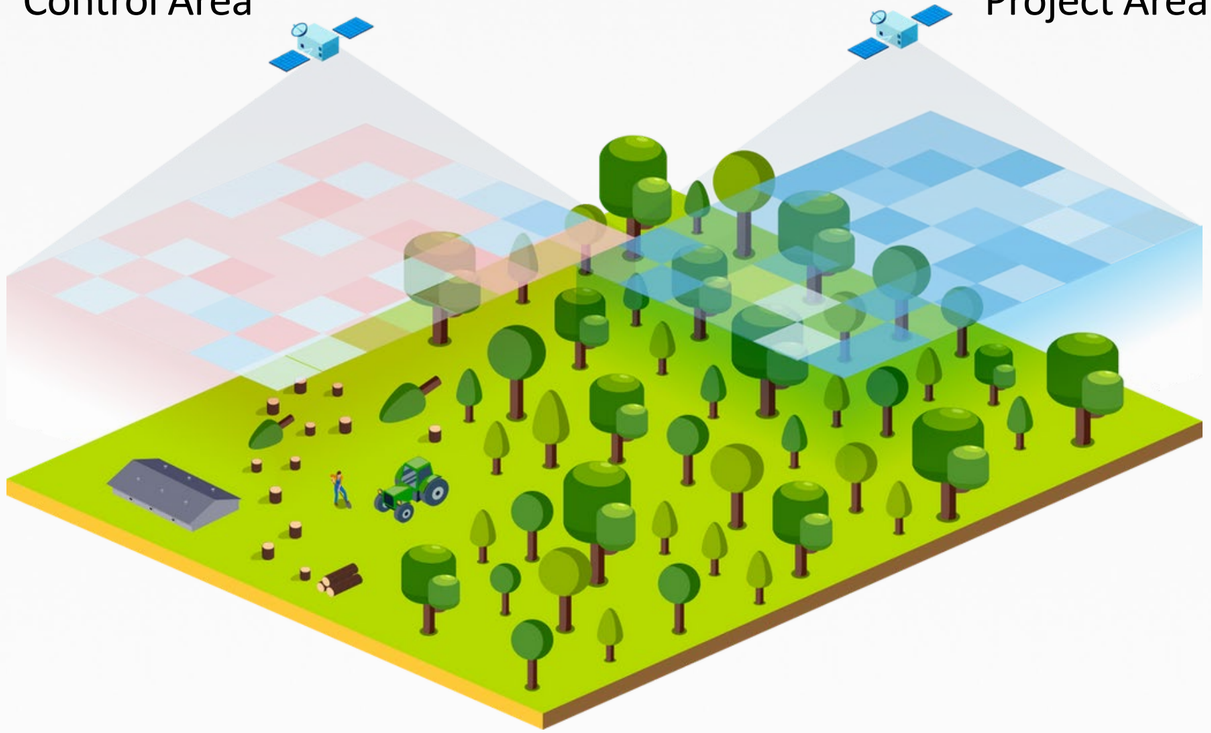
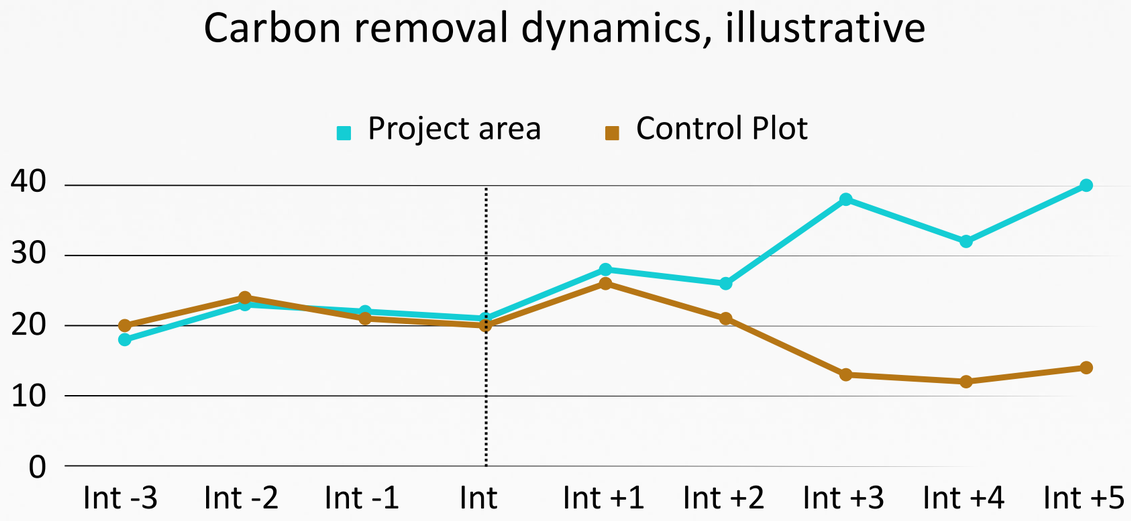
Our dMRV Is Optimal For REDD+ Monitoring



Scope: Biogenic Removals

Baseline: Historical & Control Plots



- After the start of the project, the project area carbon removals were higher than the pre-project average.
- After the start of the project, the project area carbon removals were higher than the control plot removals.
- The increasing trend in removals in the project area **signals ecosystem regeneration.**

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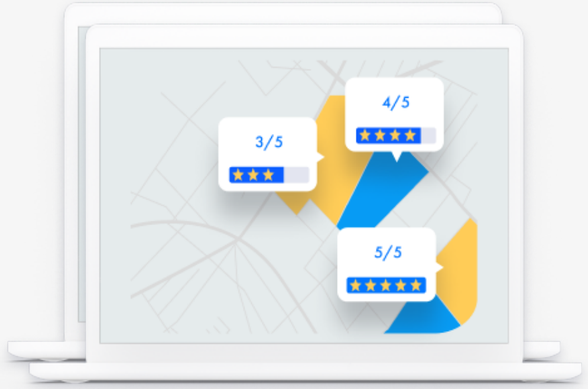
Portfolio

Decarbonising The Palm Oil Supply Chain



Supplier Assessment

- Comply with Corporate Sustainability Reporting Directive
- Rank suppliers based on performance
- Trade low carbon raw materials
- Check historical performance since 2000
- De-risk your supply chain

Carbon Claims

- Validated and verified carbon claims
- Alignment with Green House Gas Protocol
- Emissions by a particular industrial facility
- Direct measurements integrated in Life Cycle Assets
- Generate sustainability premiums

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Recognition Of Progressive Palm Oil Ecosystems

Malaysian Context:

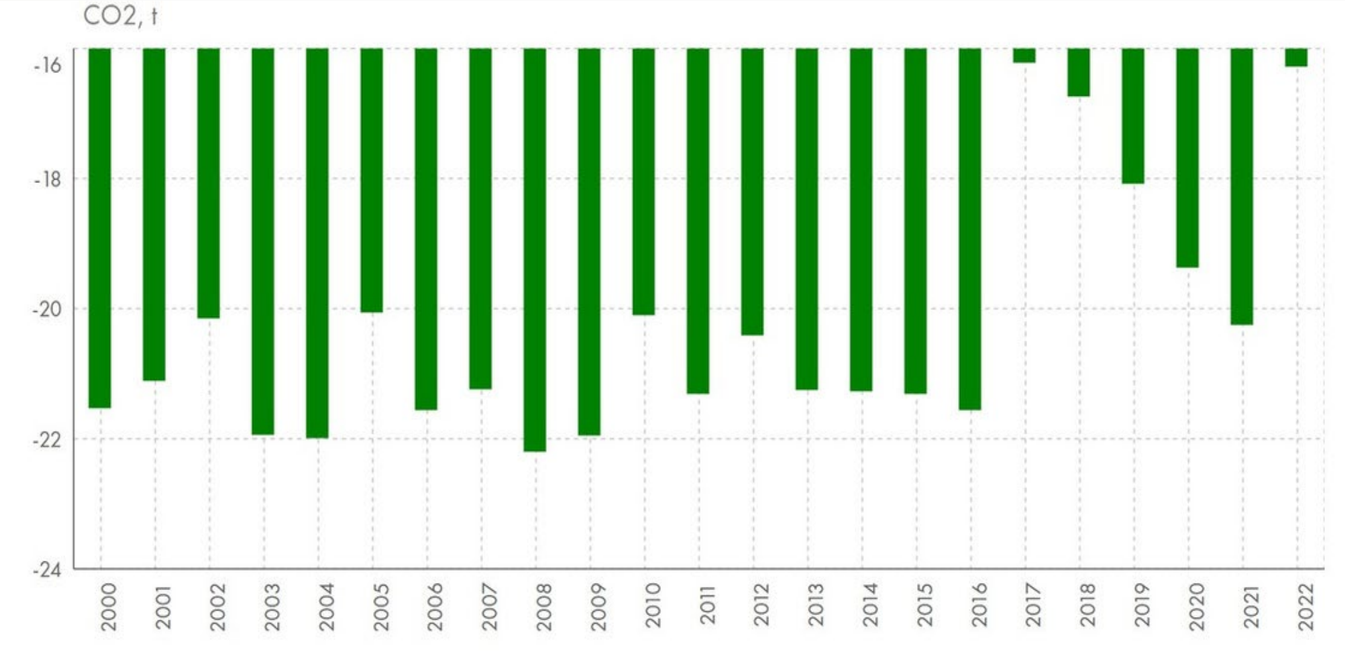
1. Smallholder + industrial plantations
2. River buffers, set aside and marginal areas
3. Insetting and circular economy interventions
4. RSPO drainability, HCS, HCV areas
5. Clear land tenure, traceability (or no maps)

- Net Ecosystem Exchange assessment with ground truthing.
- Supply base developments and plans compared.
- Business case identified for climate and biodiversity.

Young Replanting In Malaysia

- Significant carbon sequestration capacity loss persisting for over 5 years after plantation establishment.
- Rapid regeneration after 3 years.
- Oil palm trees are efficient in carbon sequestration.
- Importance of circular economy and EFB composting to preserve NEE climate impact.
- We recommend regular monitoring of the site.

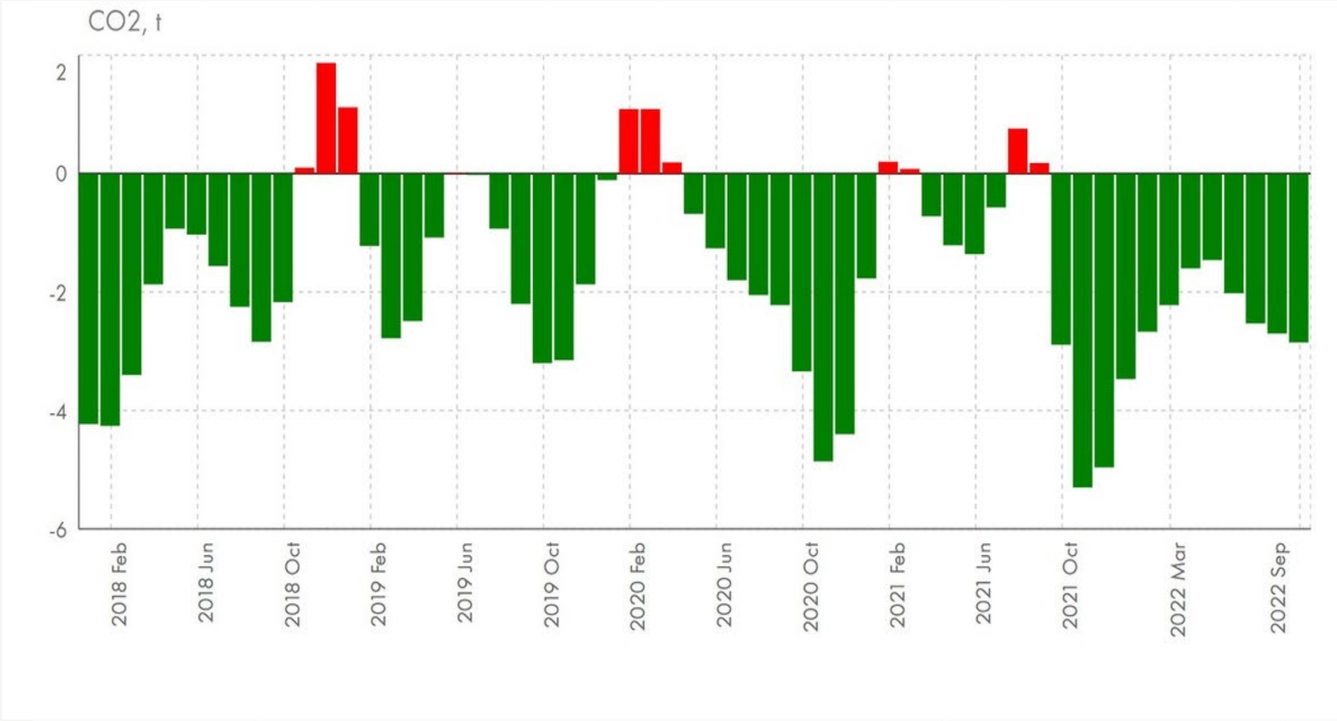
Annual carbon flux tCO2



Young Replanting In Malaysia

- NEE data shows significant loss in carbon due to deep plowing and planting earthworks.
- Vegetation sequestration takes up after 2-3 years but carbon release from soils is higher on lower rain levels.
- Impact of innovative replanting practices (reduced size of machinery, depth of plowing, biochar application, etc.) will be visible.
- We recommend regular monitoring and corrective actions on replanting sites.

Monthly carbon flux tCO2



Portfolio

Monitoring the efficiency of a mangrove conservation project in Senegal

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Mangrove Restoration

- Location: Sénégal - Kamobeul Bôlon, Oussouye - Seleki area
- Type of project: Mangrove reforestation
- Total area: 12 ha (3 assets)
- The Company was interested in remotely tracking the health of 3 mangrove forest restoration projects.
- CarbonSpace platform was used to set up tracking, analyze the historical carbon fluxes, as well as to compare these results with on-site observations and own CO2 sequestration estimations.

ELOUB 6.4 On-Site Observations

Total area: 6.4 ha

Type: Mangrove

Planted species: Rhizophora

Reforestation date: 2012

- The largest plot, where more than 30,000 mangrove trees have been planted.
- It is still not homogenous, and some parts suffered from drought in 2018-2019.
- The mortality rate is quite uncertain (20-80%) and varies significantly across results of on-site visits.
- However, the vegetation index and satellite imagery in RGB indicate that the area tree cover increased significantly since the inception of the project.

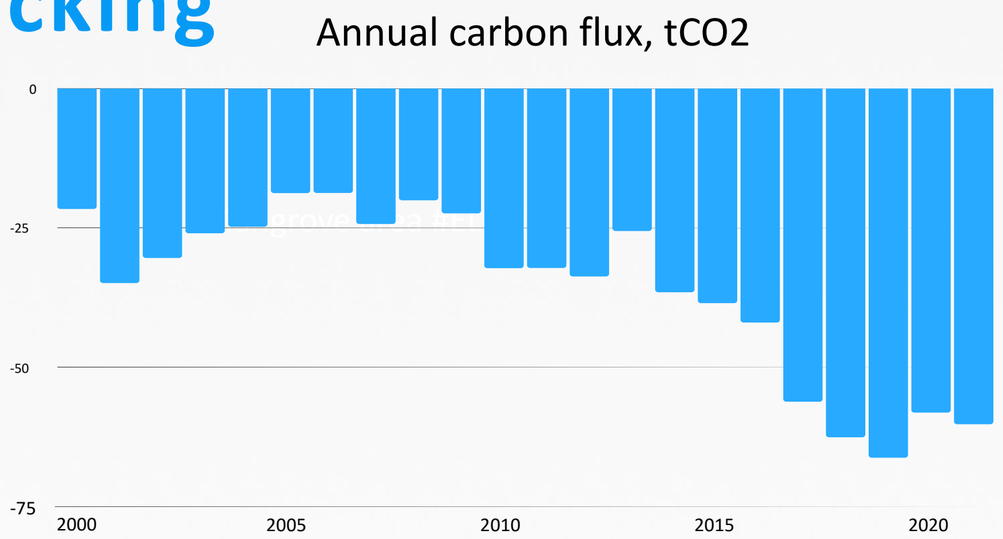
ELOUB 6.4 Site - Carbon Flux Tracking

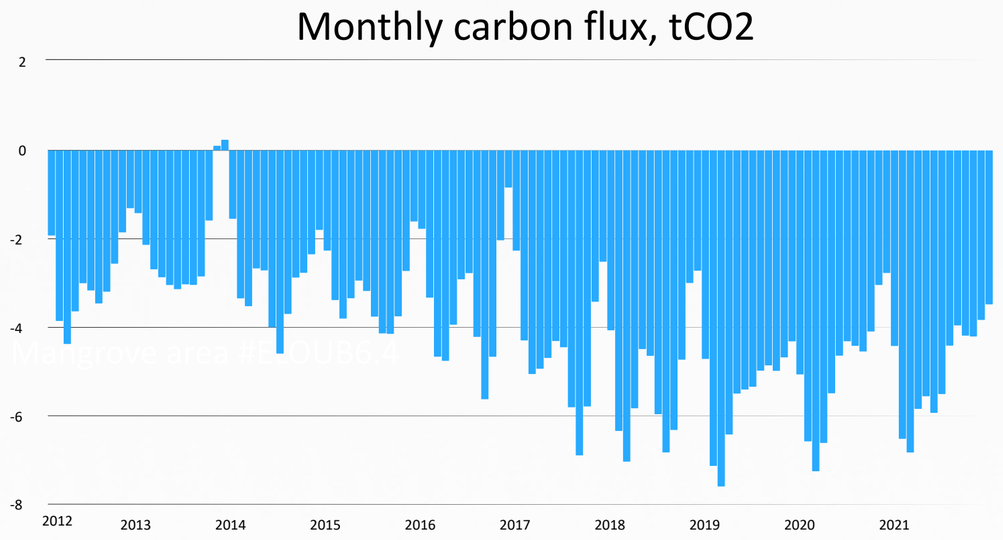
- Before the reforestation, the land still served as a total carbon sink, generating consistent annual carbon sequestration **(on average 25,5 tCO2/year in 2000-2011, or 3.9 tCO2/ha/year)**

- Following the reforestation (2012-2016), the average annual carbon uptake improved by **37% and reached over 35 tCO2/year, or 5.5 tCO2/ha/year.**

- During the last 5 years, the average annual carbon uptake reached **60,6 tCO2, or 9.4 tCO2/ha/year**.

- The annual carbon sequestration **improved by 240%.**





ELOUB3.4 On-Site Observations

Total area: 3.4 ha

Type: Mangrove

Planted species: Rhizophora

Reforestation date: 2012

- During the on-site visits, the area was classified as an excellent site with deep "potopoto" (mud), a real forest with grown trees already in propagule production.
- The mortality rate was zero, and the height of the growing trees is 4-5 meters.

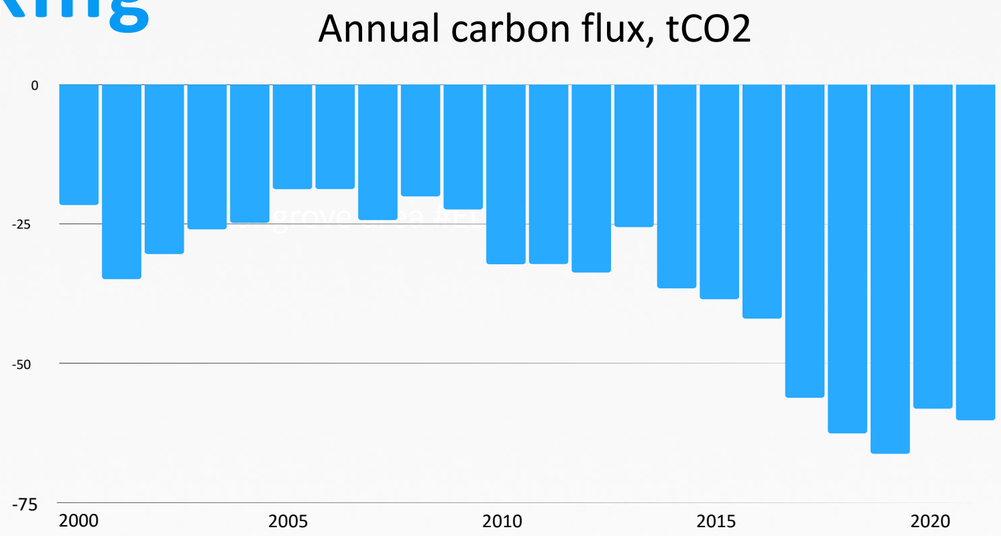
ELOUB 3.4 Site - CarbonFlux Tracking

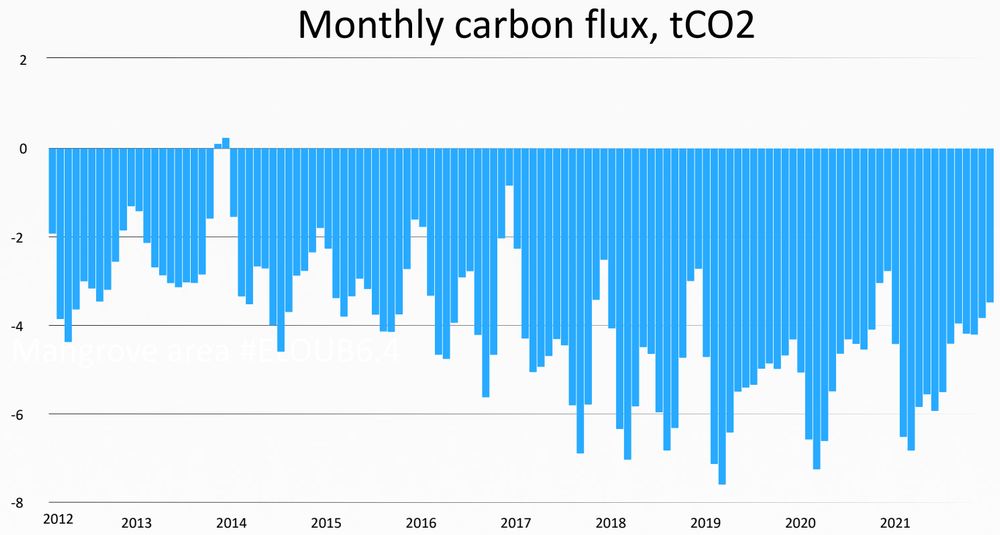
- Before the reforestation, the area served as a total carbon sink, generating consistent annual carbon uptake **(on average 11 tCO2/year in 2000-2011, or 3.2 tCO2/ha/year)**

- Following the reforestation (2012-2016) the average annual carbon uptake improved by **44% and reached 15.7 tCO2/year, or 4.6 tCO2/ha/year.**

- During the last 5 years, the average annual carbon uptake **reached 27.4 tCO2, or 8 tCO2/ha/year.**

- The annual carbon sequestration **improved by 250%.**





About CarbonSpace

- Ireland-based technology company founded in 2020, with a subsidiary in the USA.
- Alumni of the European Space Agency's AI Kickstart program. NASA's Carbon Monitoring System Policy Speakers. Japanese Space Agency lead scientist.
- >50 projects in >25 countries and 4 continents, covering >3M hectares of land.
- PhDs in Space Tech, Environmental Sciences, Machine-Learning, and Carbon Finance.
- Solid network of Institutions, scientist and change managers and advisors with extensive experience in the fields of Sustainability, Forestry, Agritech, and Spacetech

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Thank You

Nur Inspirasi Sdn Bhd