Forest.ai
Deploying AI at scale for optimized forest carbon management

36 BILLION
Annual tonnes of CO_2
1.5°
Projected temperature rise (in Celsius) by 2030

Forests

Annual Emissions

Source: Hannah Ritchie and Max Roser (2020) - "CO_2 and Greenhouse Gas Emissions". Published online at OurWorldInData.org

Annual Emissions

Storage Potential

Source: Hannah Ritchie and Max Roser (2020) - "CO_2 and Greenhouse Gas Emissions". Published online at OurWorldInData.org

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Annual Emissions

Storage Potential

Actually Tracked

Source: Hannah Ritchie and Max Roser (2020) - "CO_2 and Greenhouse Gas Emissions". Published online at OurWorldInData.org

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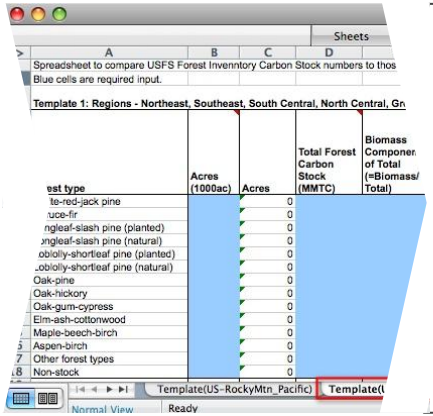
Current Method: Measuring Forest-Carbon Inventory

Labor-intensive

Extrapolated



Error-prone

~40%

Error rate in carbon sink accounting

FARE(Council on Food, Resource and Economics)

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optimize process + accurate data
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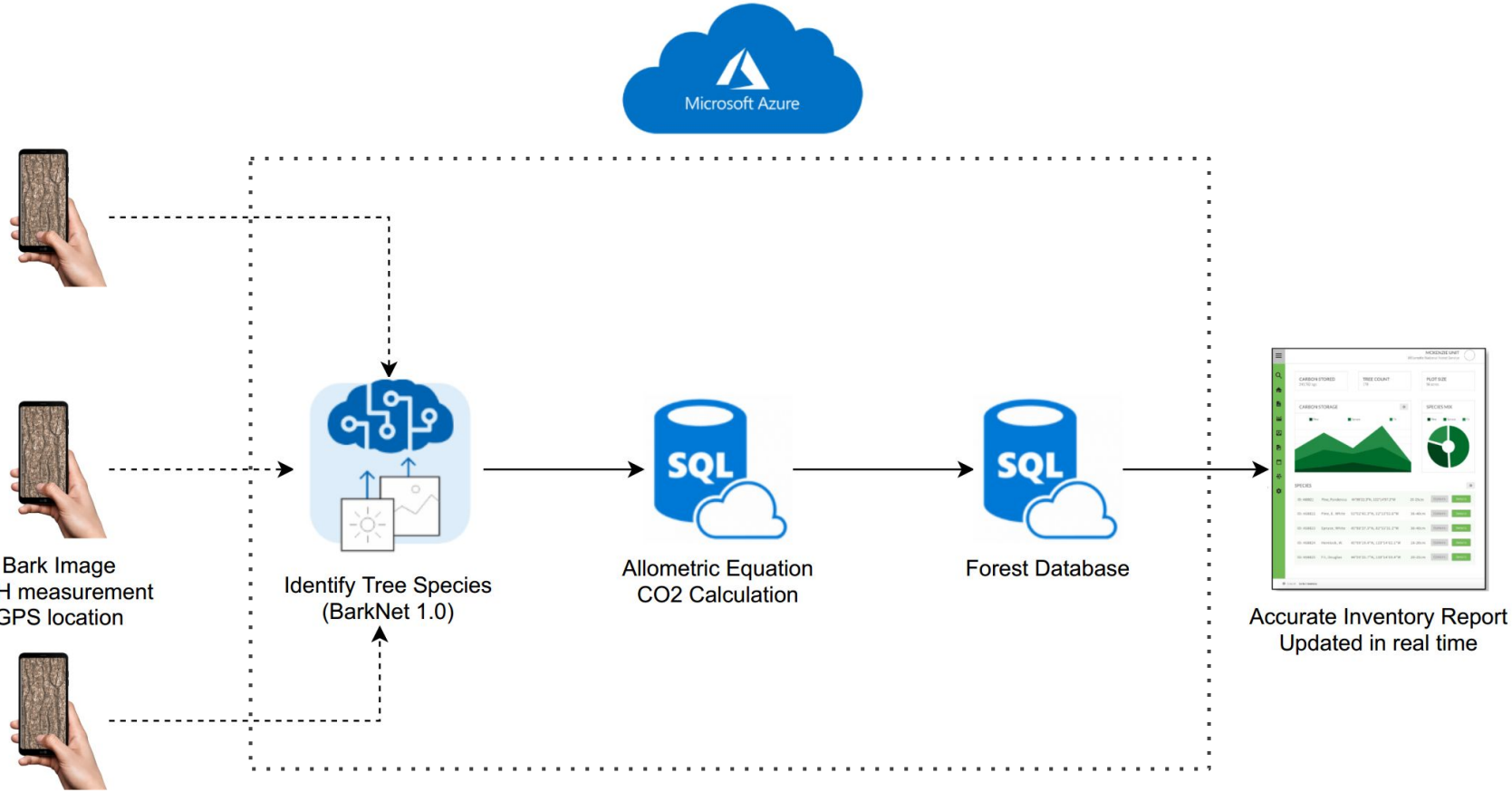
Microsoft Azure Powered Platform



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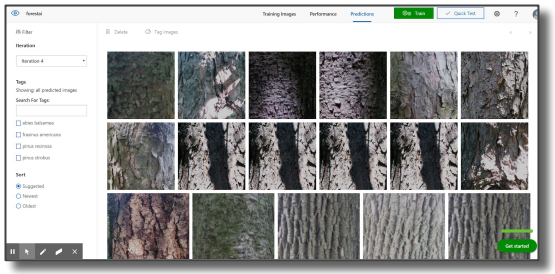
Identify Species

Custom Vision



Predictions

Tag	Probability
fraxinus americana	99.1%
pinus strobus	0.8%
abies balsamea	0%

Capture

Process

Identify

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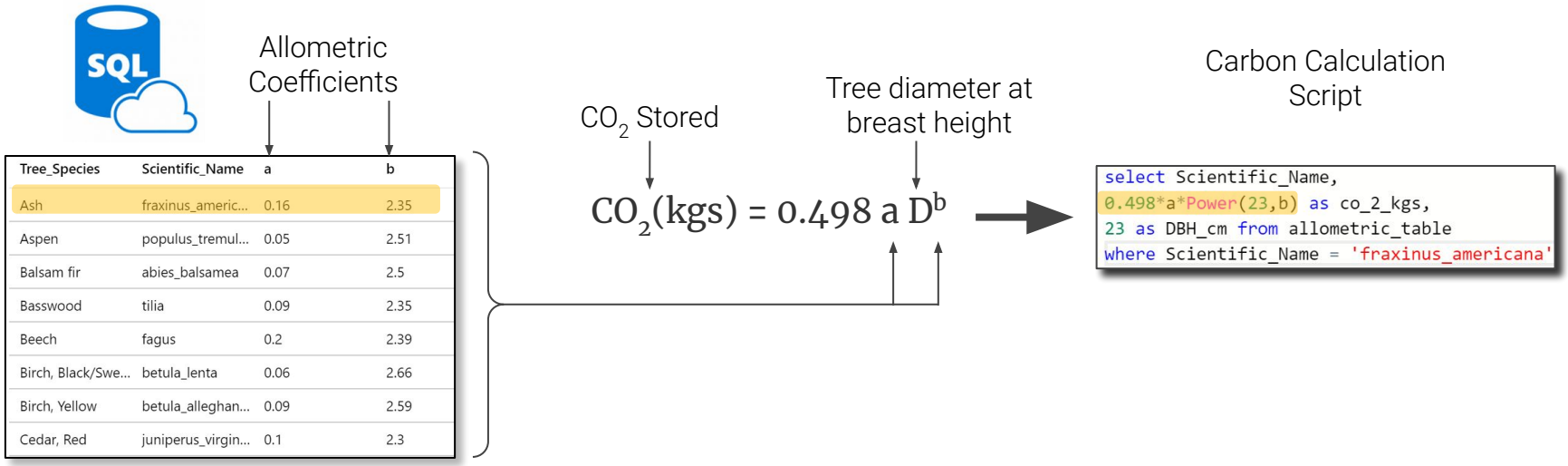
Species Specific Carbon Calculation



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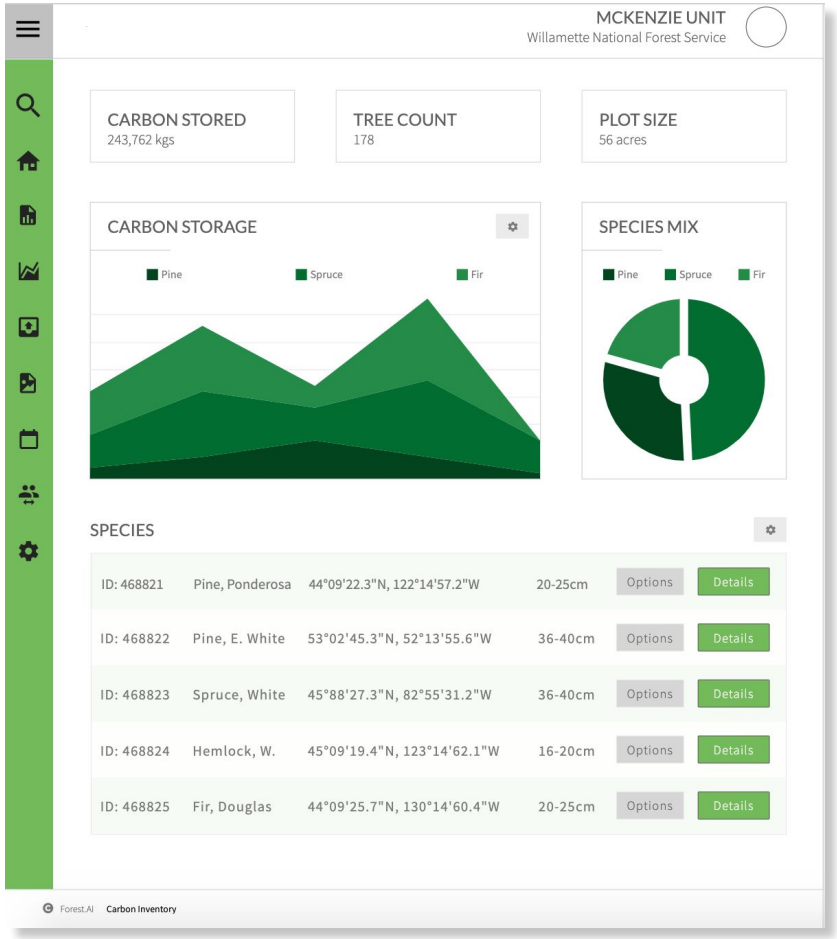
Accurate Forest-Carbon Inventory Report



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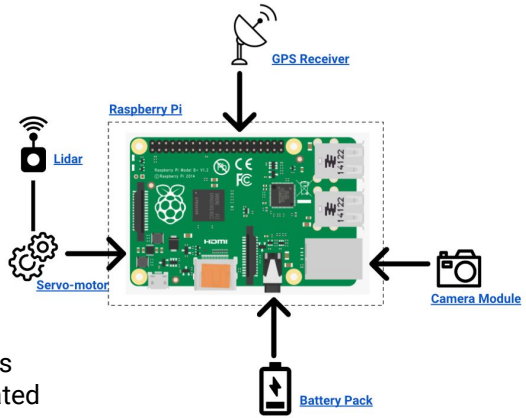
Product Roadmap



April 2020*

Funding

- Potential award through Microsoft AI for Societal Impact
- Pursue additional grant opportunities:

BC COUNCIL OF FOREST INDUSTRIES

FPInnovations

Mitacs

Summer 2020

Tool Refinement

- Integrate tools
- Build & test hardware
- User interface prototypes
- User feedback incorporated into tool

Fall 2020

Bring to market

- Pitch technology to local BC companies, then move to North American markets
- Key Partners: forest management agencies and commercial foresters

BRITISH COLUMBIA

Ministry of Forests, Lands & Natural Resource Operations

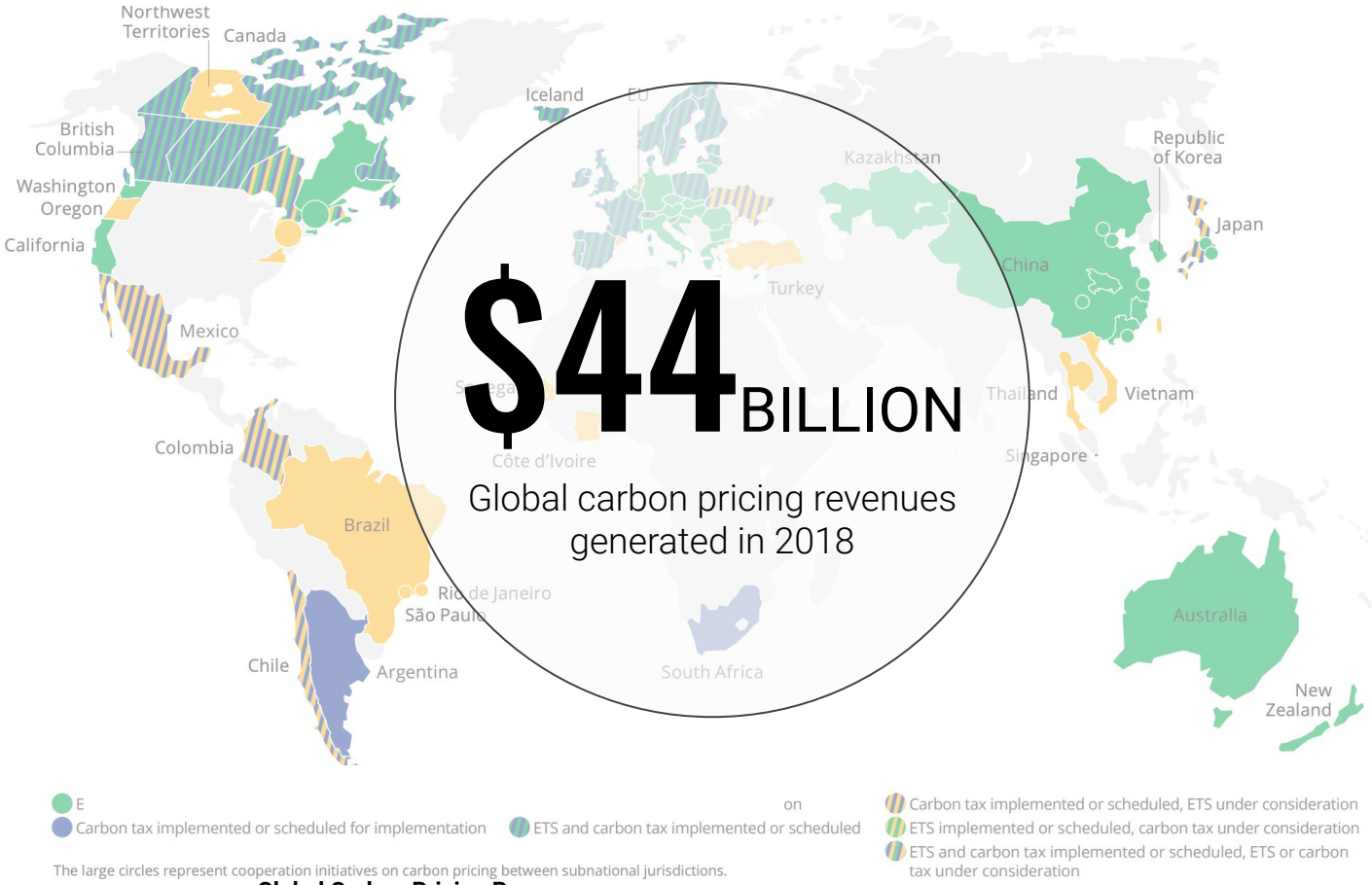
terrapass

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

JOHN DEERE

Deutsche Bank

Total Addressable Market



Global Carbon Pricing Programs
"State and Trends of Carbon Pricing 2019" State and Trends of Carbon Pricing (June), World Bank, Washington, DC.

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Scalable Solution

Accessible tool

Designed for automation

AI for Societal Impact Goals

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Thank you!

Michael Gracias

Electrical Engineer
MBA Candidate, UBC Sauder 2021

Alex Zelaya

Architect & Timber Expert
MBA Candidate, UBC Sauder 2021

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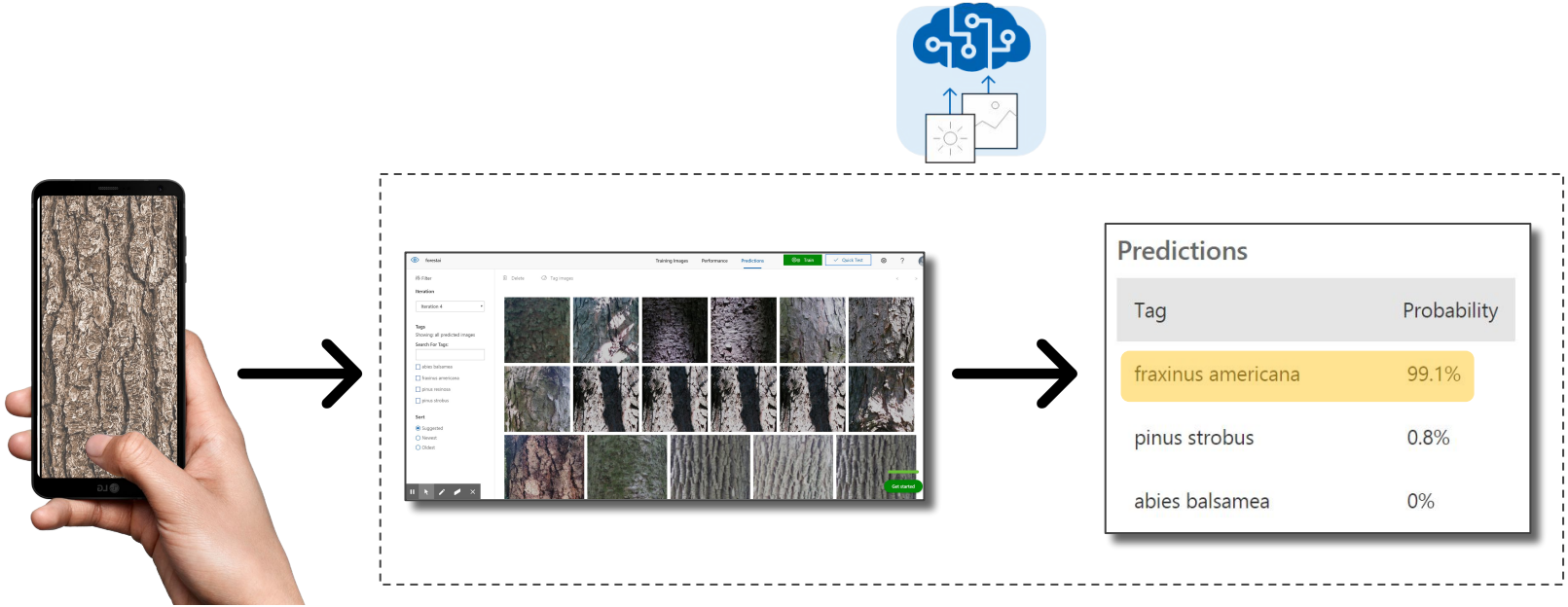
Appendix

Product

Detect Species with Azure Computer Vision

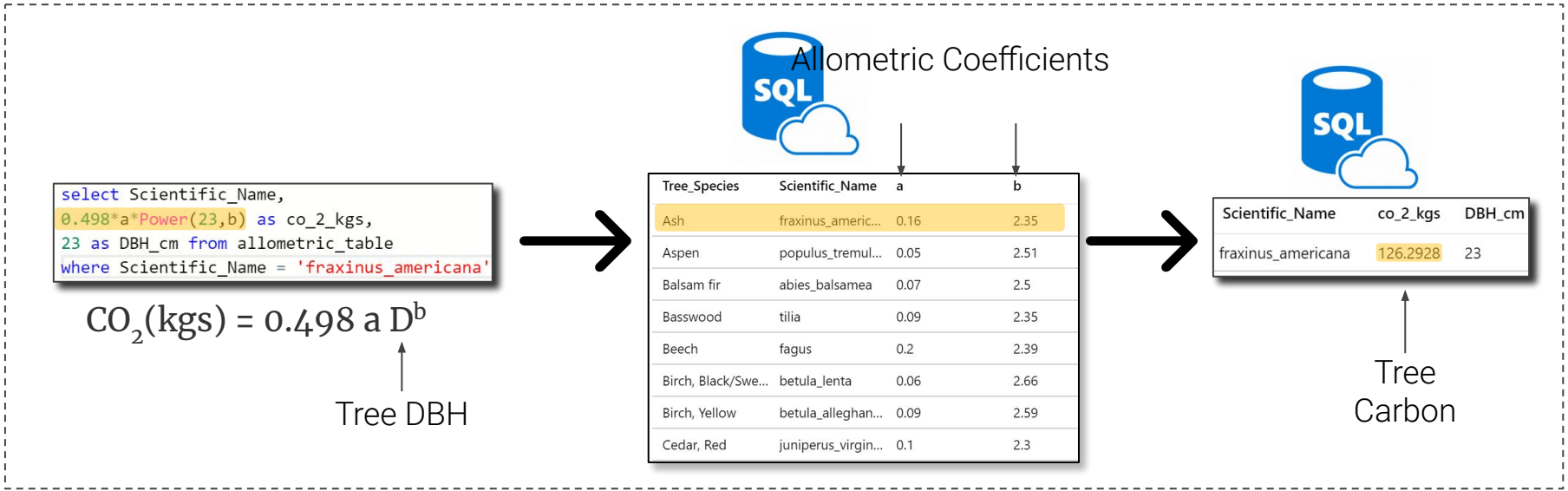


Capture
Take photo of tree bark and upload to cloud with DBH and GPS

Process
Cross-reference image against BarkNet 1.0 training set

Detect
Species correctly identified based on confidence interval

Calculate Carbon in Azure SQL



SQL Query Input
- "Scientific_Name"
- DBH (cm)

Calculate
Species specific allometric equations estimate quantity of CO_2

SQL Output
- "Scientific_Name"
- DBH (cm)
- CO_2 (kgs)

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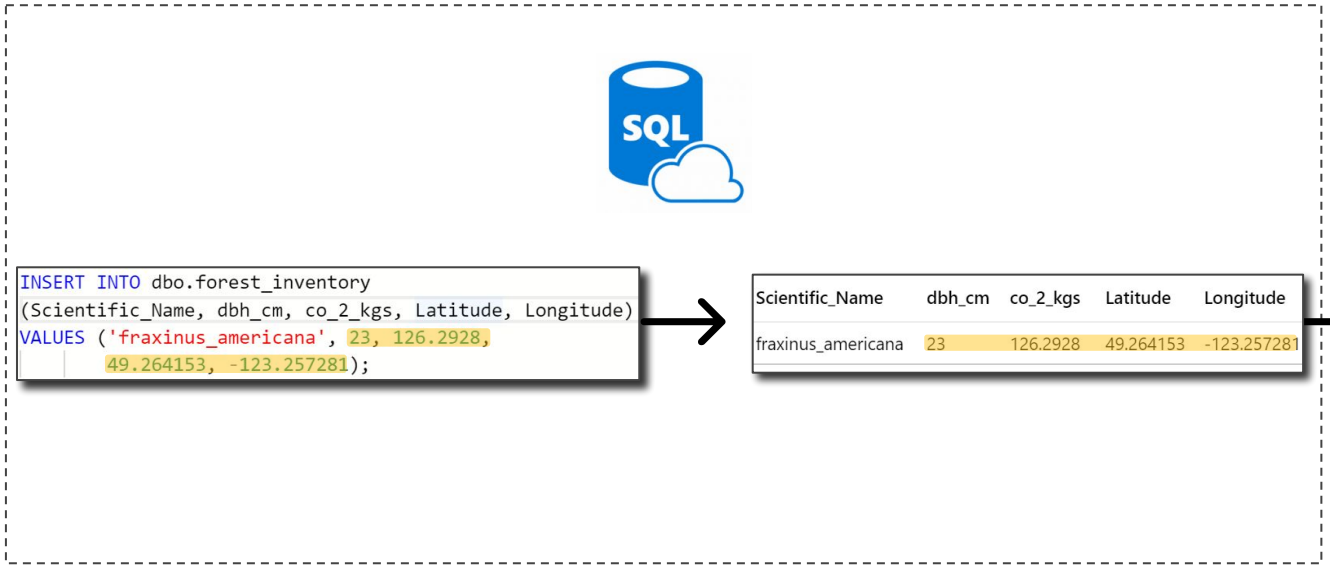
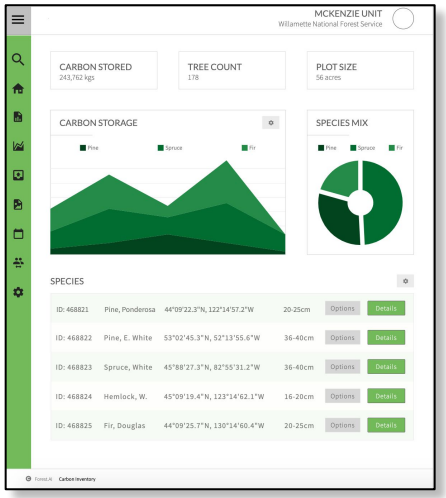
Generate Report via Azure SQL





SQL Query Input

- "Scientific_Name"
- DBH (cm)
- CO_2 (kgs)
- Latitude
- Longitude

Online Report

User-friendly data dashboard and map of forest inventory

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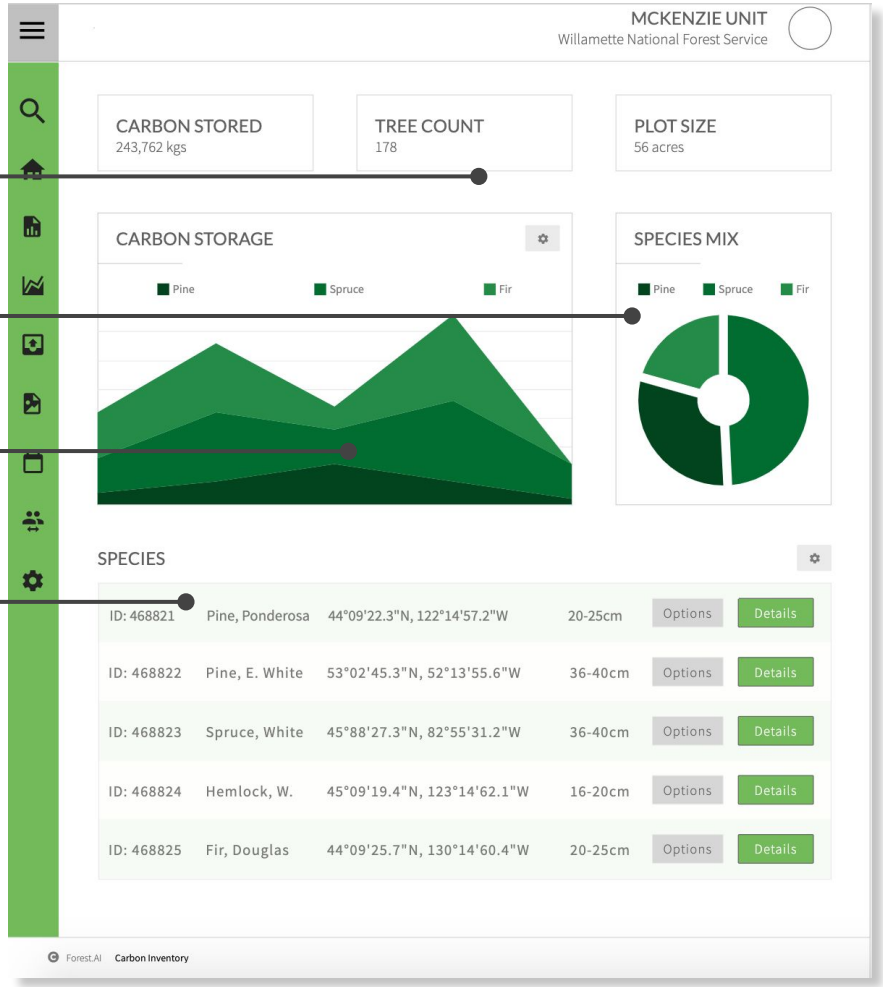
Data-driven insights at your fingertips

Forest plot overview

Species mix compiled by stand

Aggregated carbon per measured area

Tree inventory log



If awarded, funding would go towards improving tool integration and developing a user-friendly front-end interface

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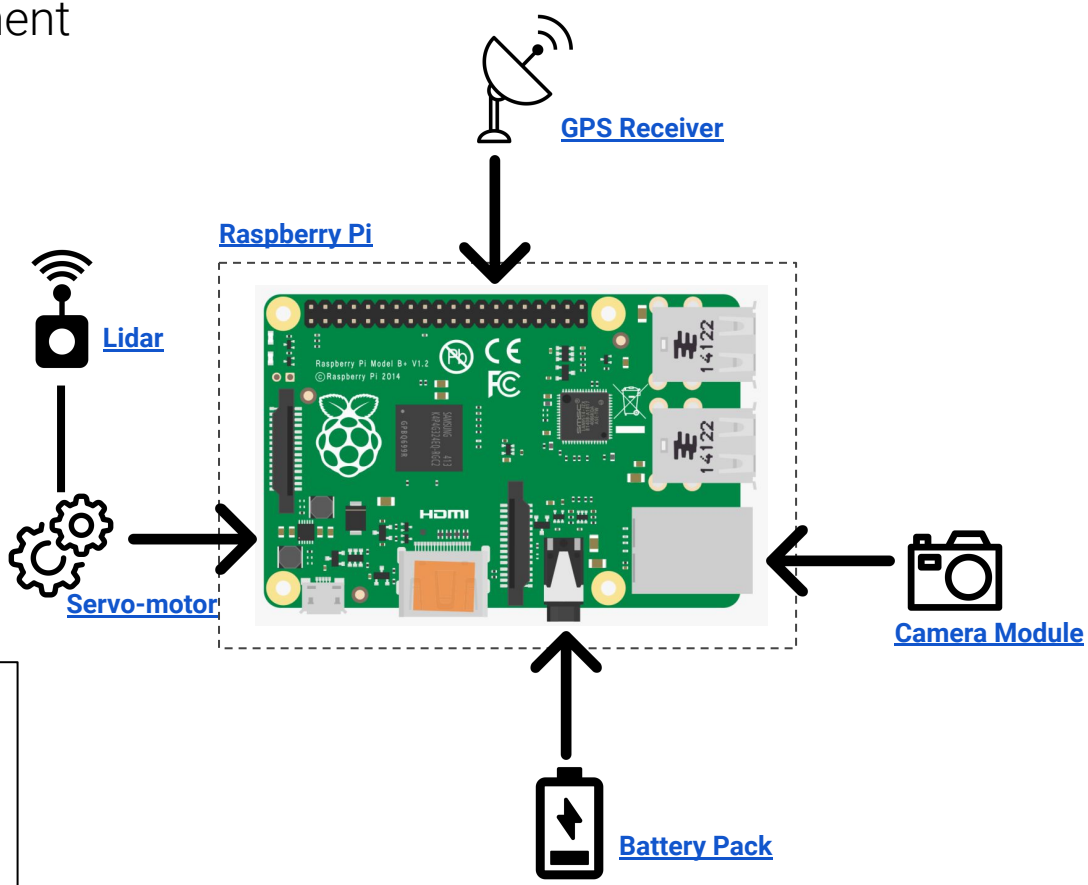
Requirement: Hardware Development

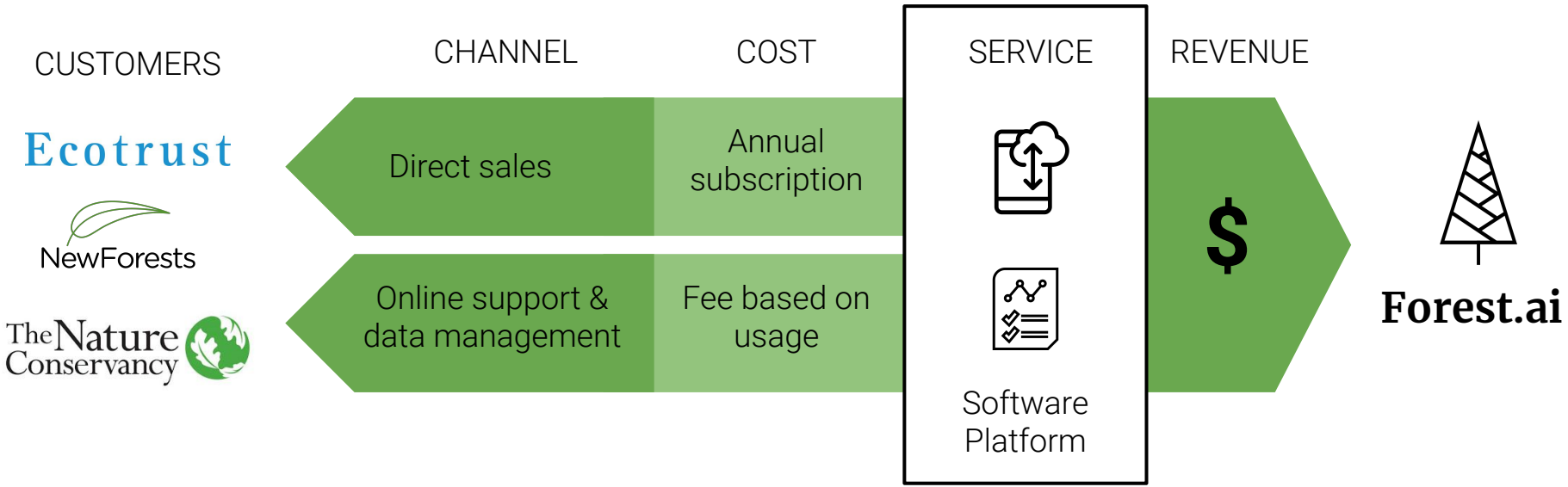
Component	Price
Raspberry Pi 4, Model B 4GB	$60.00
Camera Module V2, 8 megapixel	$30.00
Lidar-Lite v3HP, IPX-7 rated	$150.00
Servo-motor, 125 oz bipolar stepper	$31.00
Battery Pack, PiJuice HAT	$70.00
GPS Receiver, GP-735, 56 Channel	$46.00
Sub-total	$387.00
30% Misc. Material	$116.00
TOTAL	**$503.00**



If awarded, funding would go towards hardware development to create a fully automated product that measures DBH, tracks GPS and remotely connects to Microsoft Azure.

Funding & Business Model

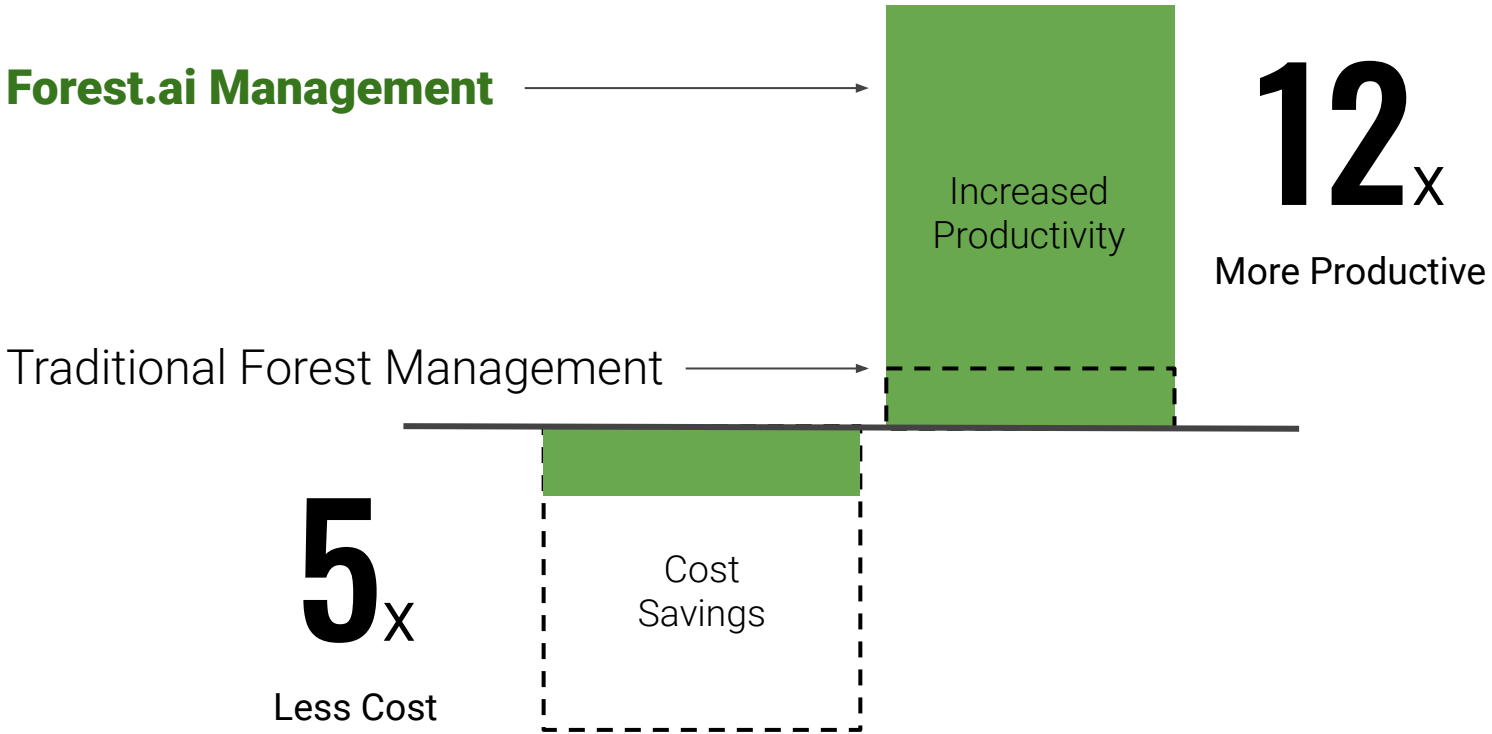
Business Model



Funding Requirement

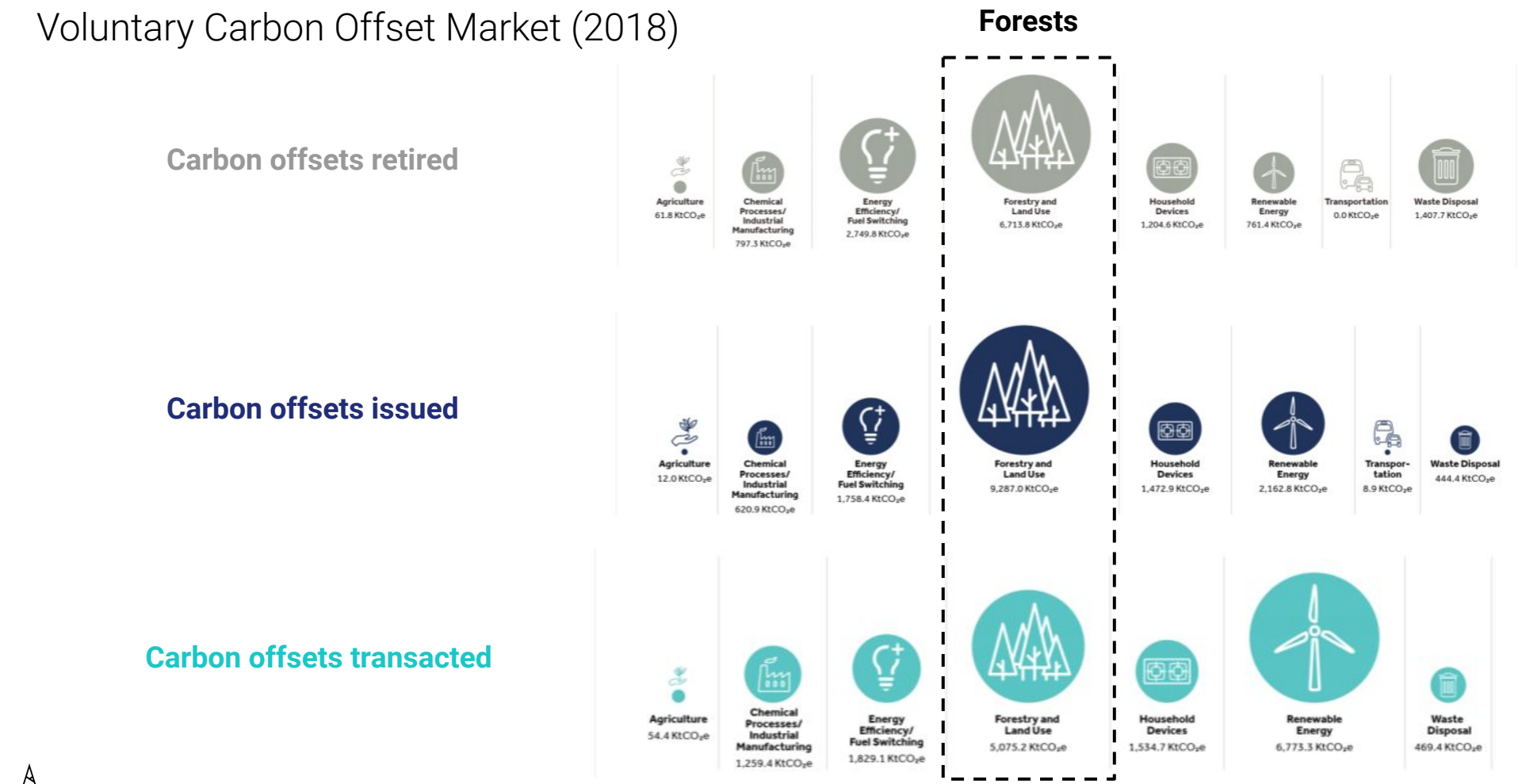
Item	Price
Salaries (4 months 2 FTE @ 50$/hr)	$64,000.00
Hardware Development x 4	$2,012.00
Development space	$8,000.00
MS Azure ($380 per month x 4)	$1,520.00
Travel Budget	$5,000.00
Marketing Budget	$5,000.00
Sub-total	$85,532.00
Contingency (20%)	$17,106.00
TOTAL	**$102,638.00**

Cost & Productivity Comparison



Voluntary Carbon Offset Market

Voluntary Carbon Offset Market (2018)



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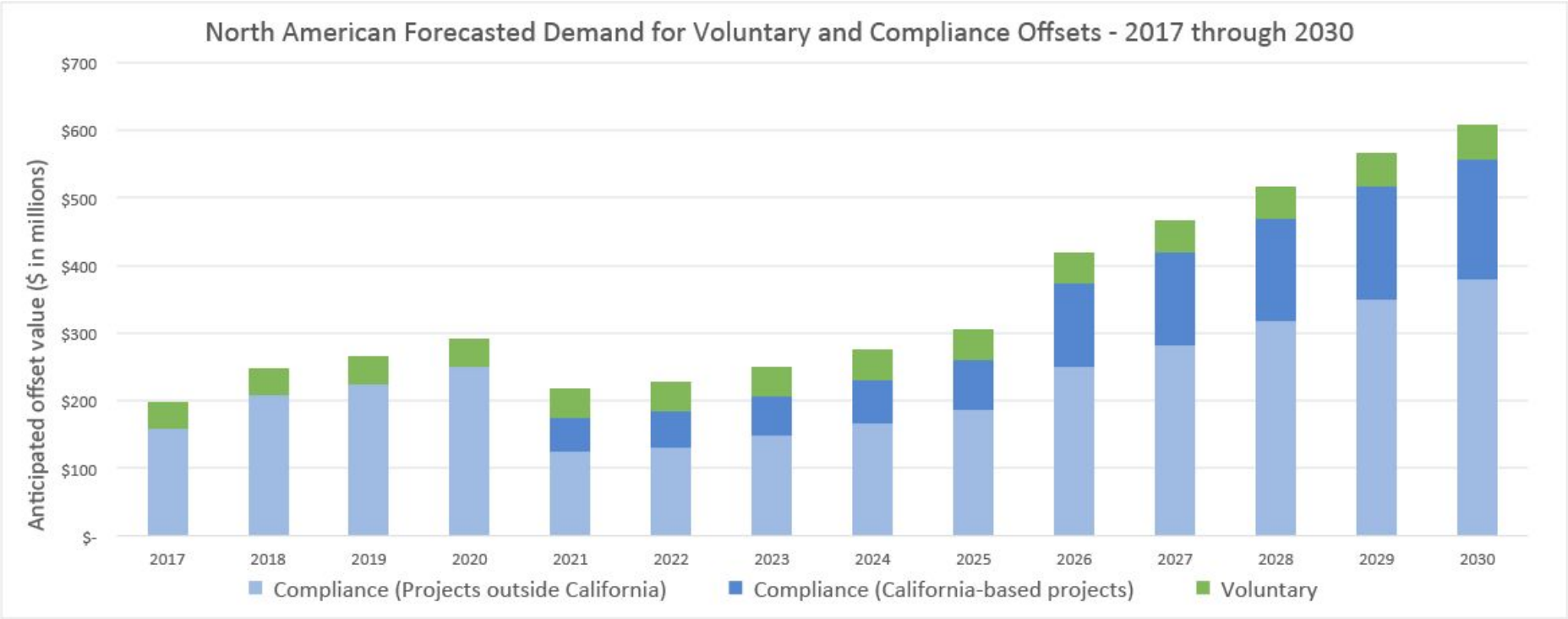
Demand Projections: Voluntary Carbon Offset Market (California)



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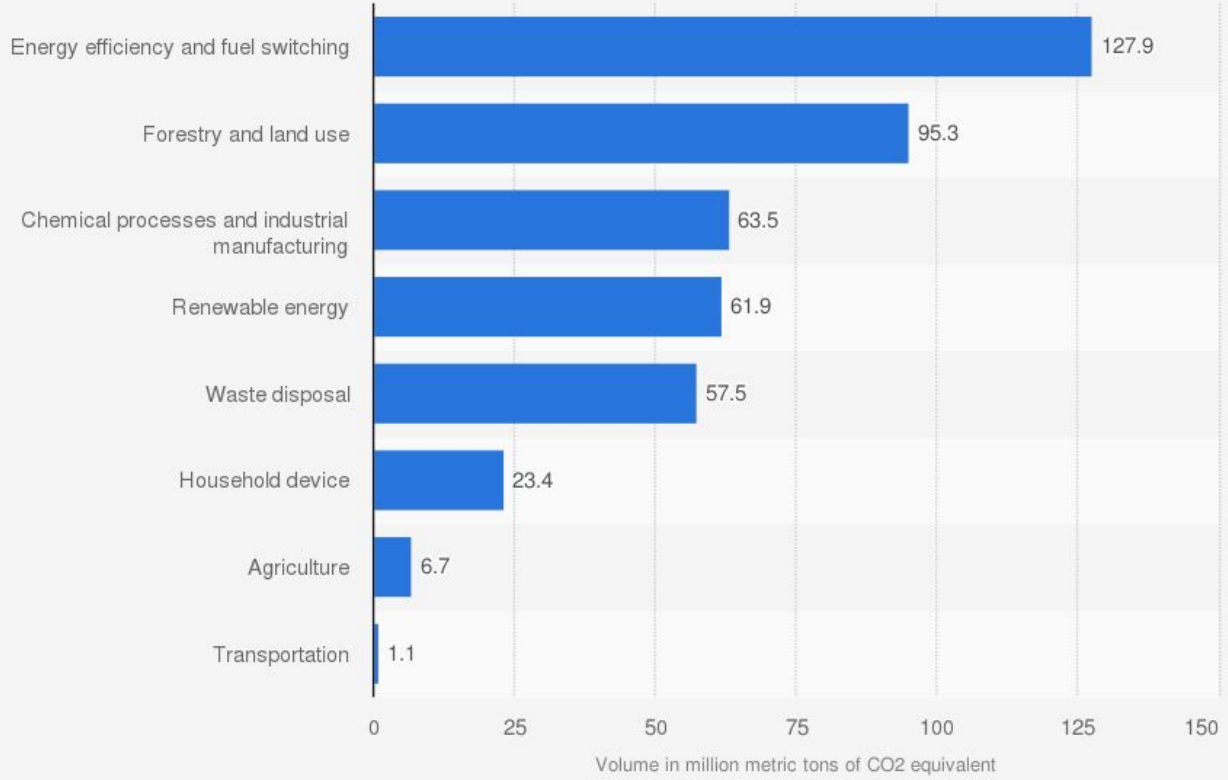
Volume of voluntary carbon offset market transactions worldwide between 2005 and April 2018, by project category (in million metric tons of carbon dioxide equivalent)



Source
Ecosystem Marketplace
© Statista 2020

Additional Information:
Worldwide; 2005 to April 2018

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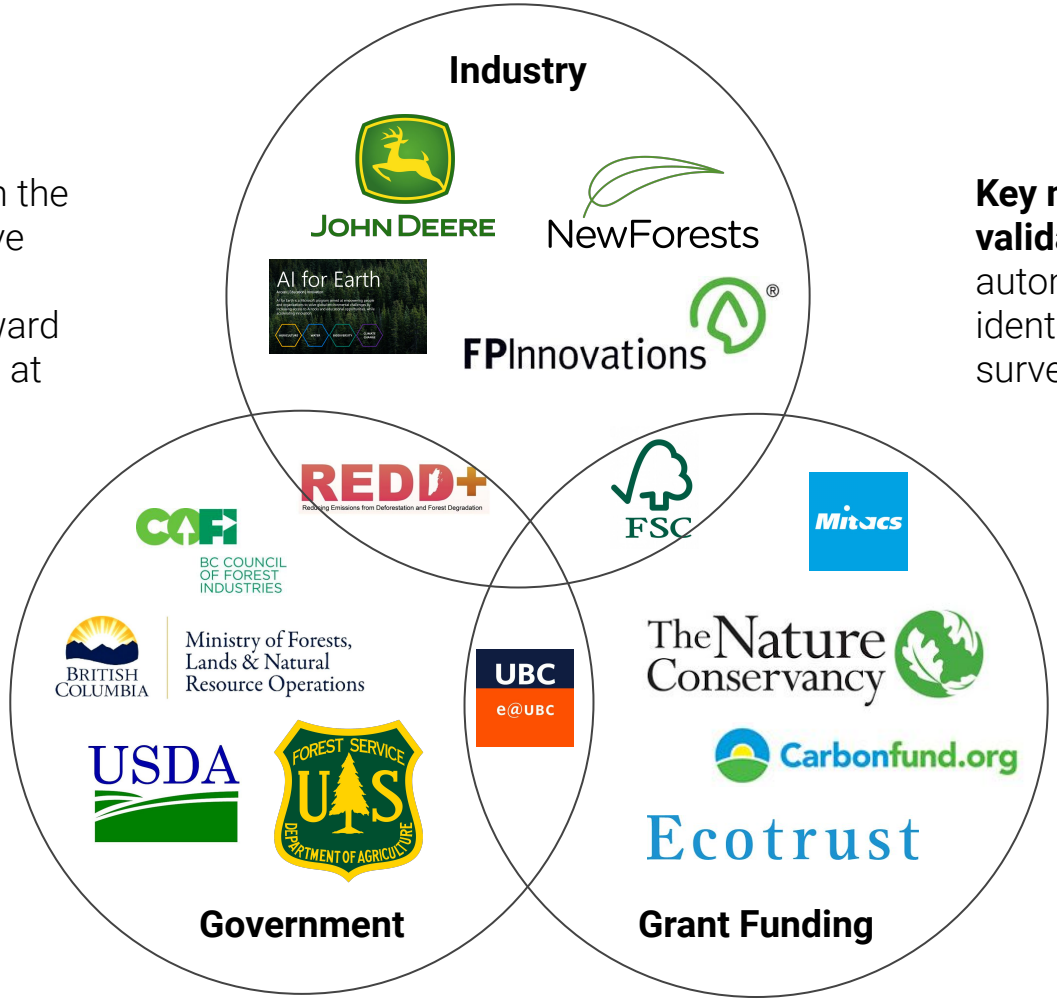
Figure 1. Locations of Voluntary Carbon Offset Projects, 2008-2018

Miscellaneous

Key Partners

Key stakeholders within the forest carbon space have already been identified. Moving this project forward will require participation at all levels.

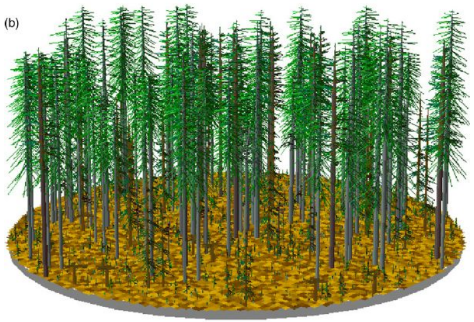


Key needs have been validated, including automated tree species identification, scaled carbon surveying at low-cost.

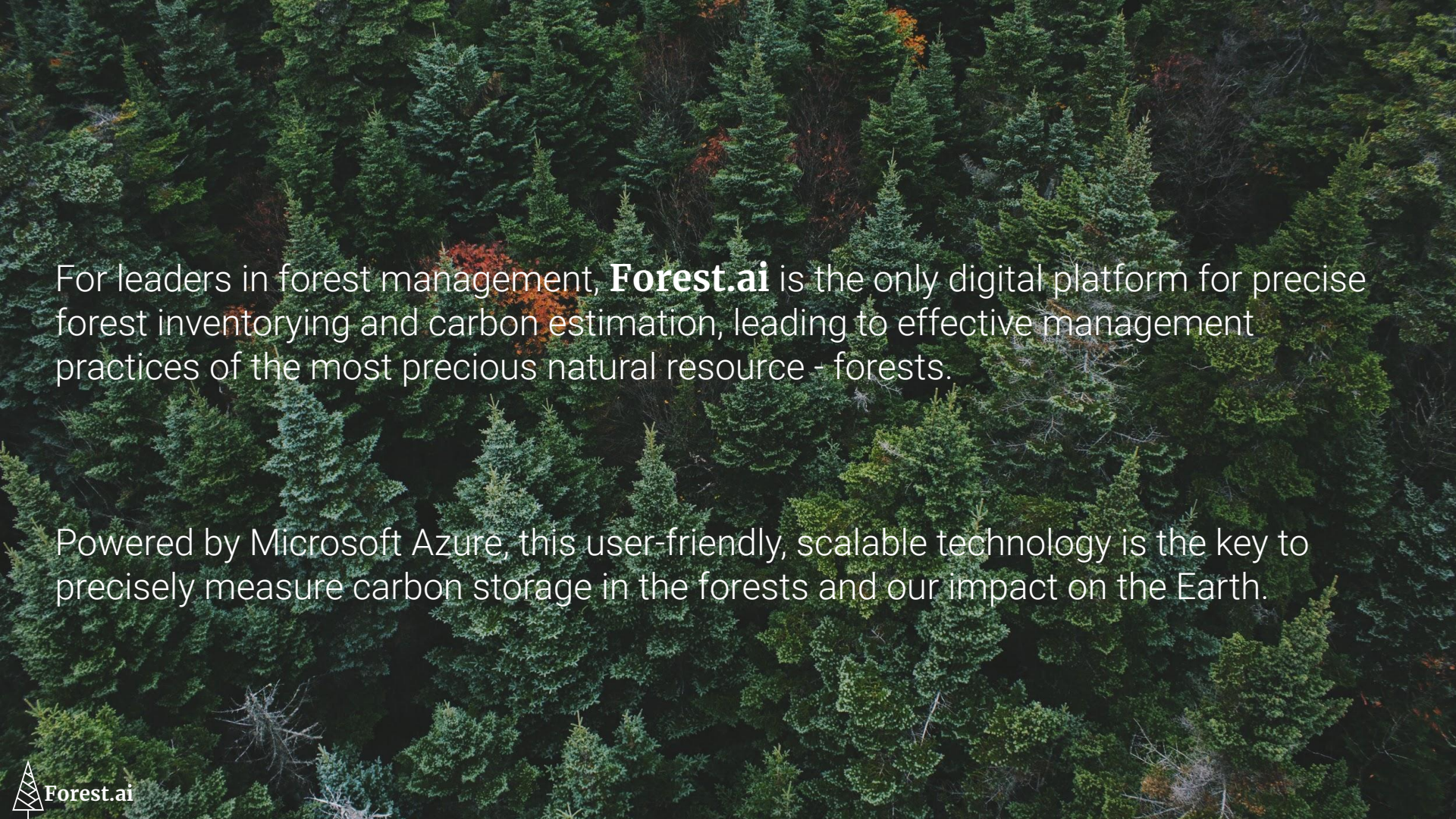
Use Case: Developing world, threatened forests

- Affordable
- Universal
- User-friendly

Use Case: Scaling up forests to meet demand



- Scalable
- Autonomous
- Real-time


For leaders in forest management, **Forest.ai** is the only digital platform for precise forest inventorying and carbon estimation, leading to effective management practices of the most precious natural resource - forests.
Powered by Microsoft Azure, this user-friendly, scalable technology is the key to precisely measure carbon storage in the forests and our impact on the Earth.
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