



Carbon credit access for smallholder business (biochar business case)

October 2023

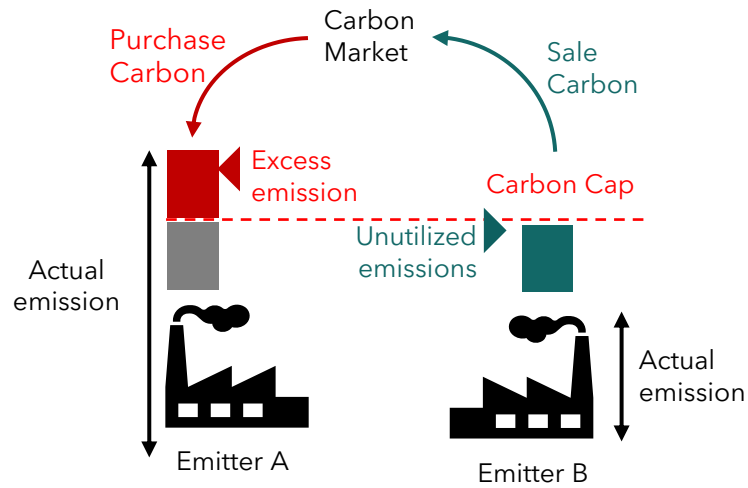
Dr. Perdana K Prihartato
General Manager Carbon Project

Carbon credits Overview

Carbon credit tradeable in the market, uses by company to offset their carbon emissions to meet government regulation or voluntary commitment

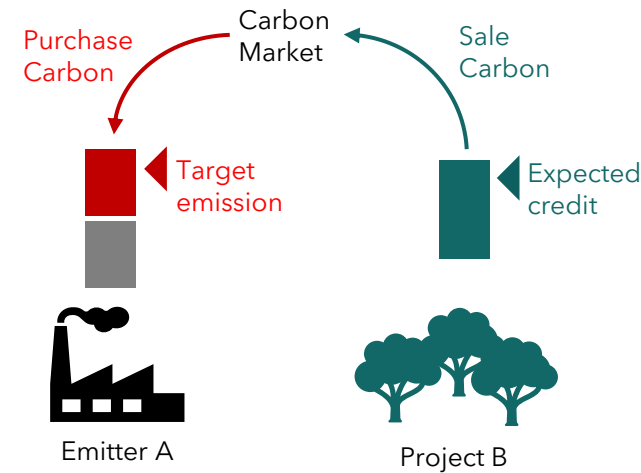


COMPLIANCE/REGULATED



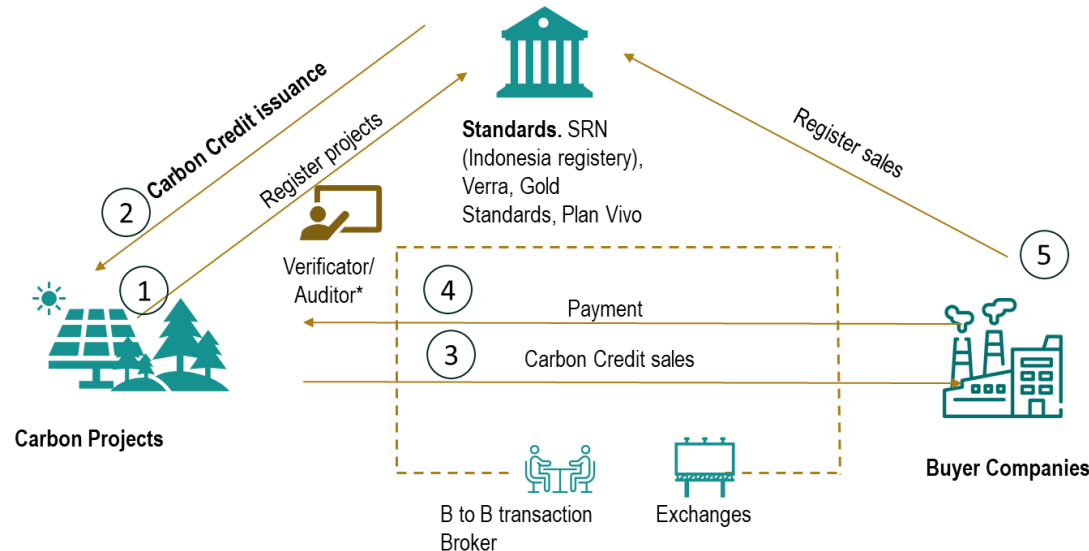
- Primarily structured as a cap-and-trade system, where participants trade allowances (permits to emit supplied by regulators)
- Driven by international/bilateral and government standards

VOLUNTARY



- Typically purchased by private sectors to achieve net zero commitments, public relations, certifications, reputation and social /environmental benefits
- Can be purchased from companies, projects, or carbon funds

IMPLEMENTATION STRUCTURE



Markets have developed for both voluntary and compliance credits in response to the demand of both consumers and governments



COMPLIANCE/REGULATED

VOLUNTARY

Mandatory systems regulated by government to cap emissions for specific sectors OR regulated systems established by cooperation of two countries or UN supervisory body.

Carbon credits/offset can be purchased by those that voluntary want to compensate for their emissions.

2020 - MARKET SIZE

\$100 B

Annual turnover \$250 B

\$300 M

2030 - MARKET SIZE

\$5 B - \$30 B

PRICE, historical

Varies in each ETS system, e.g EU ETS @85 EUR/t, Korea @15-20 USD/t

Katingan Mentaya Project = avoided deforestation projects @11-15 USD/t
Yara Yara Project (reforestation) 34 USD/t

Source:
GIC. Singapore Economic Development Board. McKinsey. Vivid Economics. *Putting carbon markets to work on the path to net zero*. October 2021
<https://boereport.com/2022/10/07/making-sense-of-carbon-registries-products-for-og/>

The framework of the voluntary market is more advanced than that of the regulated/compliance market. Several governments, notably Indonesia, have announced their intention to move to more regulated markets.



Some of CarbonX's projects could transition from a voluntary to a regulated/compliance market once it is ready

Differences between compliance and voluntary market:

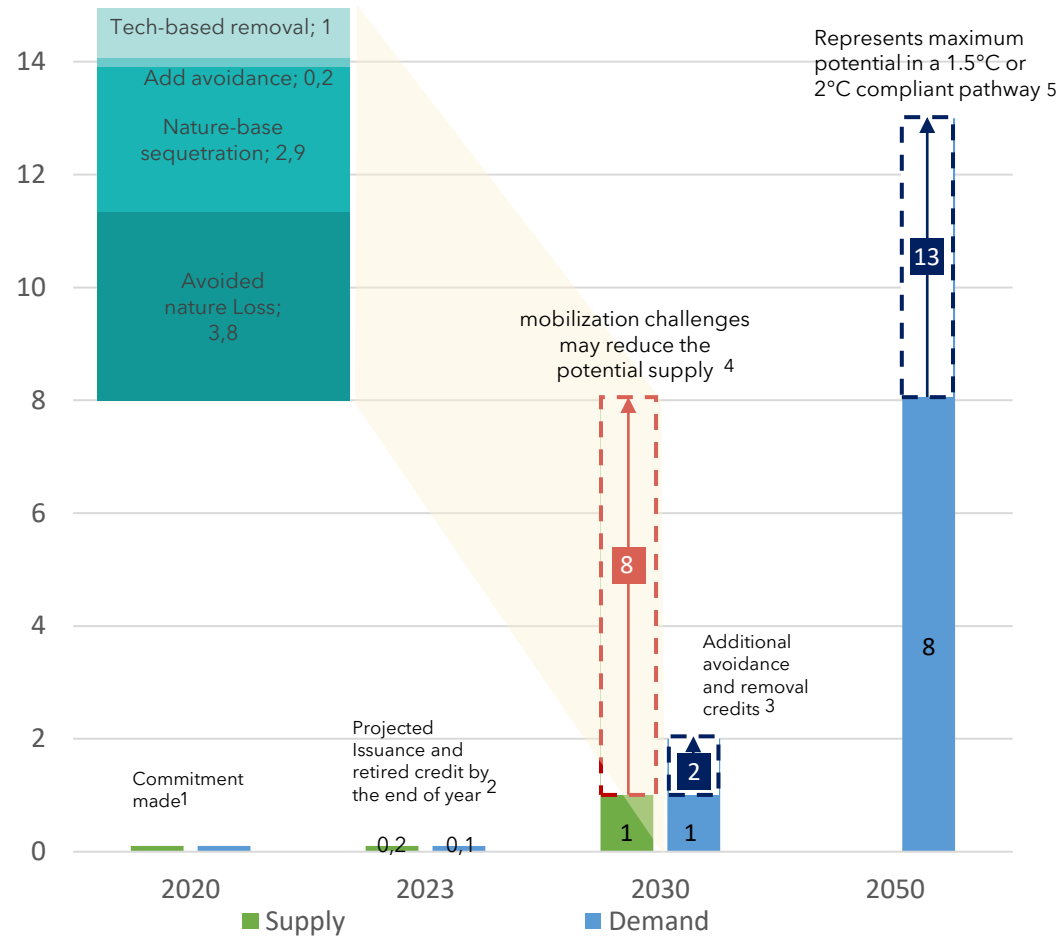
Compliance/regulated Market			Voluntary Market	
	Emissions Trading System (ETS)	Article 6.2 Int'l Cooperation	Article 6.4 Mechanism	Voluntary Carbon Market (VCM)
Description	Cap-and-Trade system	Cooperative approaches and international transfer of mitigation outcome (ITMOs)	International crediting mechanism. Overseen by UN supervisory body	Cooperative approaches and International Transfer of Mitigation Outcomes
Jurisdiction	National/regional	Bilateral	International	International
Credit Type	Allowance/Permit to Pollute	Credit generated from cooperative projects	A6, 4ERs (Project Based Offset Credits)	Project Based Offset Credits/Voluntary Carbon Credits (VCCs) e.g VER, GS, etc
Issued by	National Agency	Per G2G agreement on standards	By Host Country under the oversight of UN Supervisory Board	Verifying organization: Verra, Gold Standard, Plan Vivo, or Sovereign Agency, etc
Demand	Business unit above emissions cap	Buying country (by offering technology, financing project, etc)	International Market	Corporations (outside of compliance) with targets to reduce emissions or reach zero targets
Supply	Business unit below emissions cap or offset depending the national framework	Selling country (beneficiary of technology ER project finance, etc)	International Market	Companies/countries with emissions reduction projects (technology, forestry, etc.)
Examples	EU ETS, Swiss ETS (no longer allow offsets) California ETS, Quebec ETS, China National ETS	Japan joint crediting mechanism (JCM), Aussie IPCOS	Does not exist yet. Predecessor is CDM projects under Kyoto Protocol	Katingan Mentaya Project = avoided deforestation projects Yara Yara Project (reforestation)

Supply can't match demand if fund mobilization and market challenges exists



Voluntary supply and demand scenarios for carbon credits

(gigatons per year)



- Base supply of 1 Gt in 2030 will be primarily Avoided Deforestation replicating the 2023 supply. This sort of credit will have low preference in 2030. Additionally, Almost half of the optimum supply in 2030 of 8 Gt comes from avoided nature loss.
- A stricter standards and baselines will also put pressure on credit supply.
- CarbonX has a mix of the combination of avoided and removals to meet market dynamics. Additionally, it will assure high quality and strong integrity projects.

¹ These amounts reflect demand established by climate commitments of more than 700 large companies.

² Projected the issuance credit by Dec 2023 is 0,2 Gt and retired credit is 0,1 Gt based on historical data from June 2023.

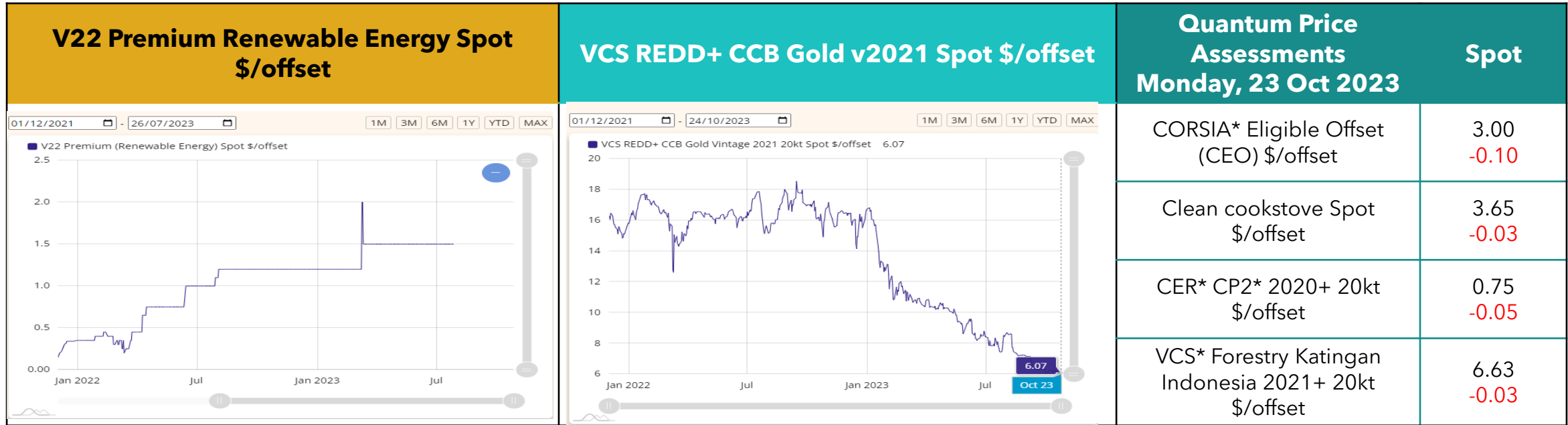
³ Demand excludes avoided planned deforestation. Addition 1Gt with avoided planned demand

⁴ Supply in 2030 could be up to 8 Gt, however with challenges it could drop to 1Gt.

- ✓ Drop by 3 Gt due to fund mobilization challenges
- ✓ Drop by 4 Gt if there's also additional hindrance where no cross boarder north/south, zero investment in avoided nature loss and BECCS.

⁵ Assume that all removal/ sequestration is supported by voluntary offsets whereas in reality it will be made up by a mix of voluntary and compliance markets as well as mechanisms other than offsets

Voluntary market carbon price outlook (Oct 2023)



Voluntary Carbon Market by basket price at different Sectors, 2019 - 2023:

Sector	Year 2019	Year 2020	Year 2021	Dec 2022	Oct 2023
Forestry based	\$5.8	\$6.5 ▲12%	\$7.25 ▲11%	\$8.0 ▲10%	\$5.1 ▼36%
Renewable Energy	\$1.42	\$0.87 ▼39%	\$1.1 ▲26%	\$1.7 ▲54%	\$1,4 ▼21%
Waste (Biogas domestic)	\$2.45	\$2.76 ▲13%	\$3.93 ▲42%	\$1.26 ▼68%	\$1,5 ▲19%
Energy Efficiency	\$3.87	\$1.03 ▼73%	\$1.57 ▲52%	\$2.6 ▲65%	\$1.9 ▼36%

Source: Ecosystem Marketplace, Platt

*Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

*Climate, Community and Biodiversity (CCB)

*Certified Emission Reduction (CER)

*Second Commitment Period (CP2) from Kyoto Protocol (2013-2020)

*Verified Carbon Standard (VCS)

Overview of Carbon Market in Indonesia



15% global nature-based potential realizable by 2030

- **#1** largest mangrove cover with 4 million hectare
- **#2** largest tropical forest and peatland cover
- **17%** of world fauna species

Envision to be Asia's leading **carbon hub** by 2025

- **USD 4-8 billion**¹ is expected to be traded in Voluntary Carbon Market exchange
- Indonesia will launch **carbon exchange in September 2023.**
- **launched ETS in power sector** in Feb 2023, with estimated value of USD 23 million under annual cap set for 2023

Regulatory framework poses **risk and opportunities**

- Indonesian carbon regulation is in the developmental phase. There is risks that government wants to retain more emission reductions within the country, particularly for forestry sector.
- CarbonX is confident that the Indonesian Regulatory framework will open for cross border carbon transaction
- It is also offering unexplored potential that yet been fully explored, such as biochar credits, blue carbon, etc.

¹ Assume 500 million tCO₂e each of offsets and allowances traded at 8-15 \$/tCO₂e

Biochar checks all of the boxes to meet credits principals

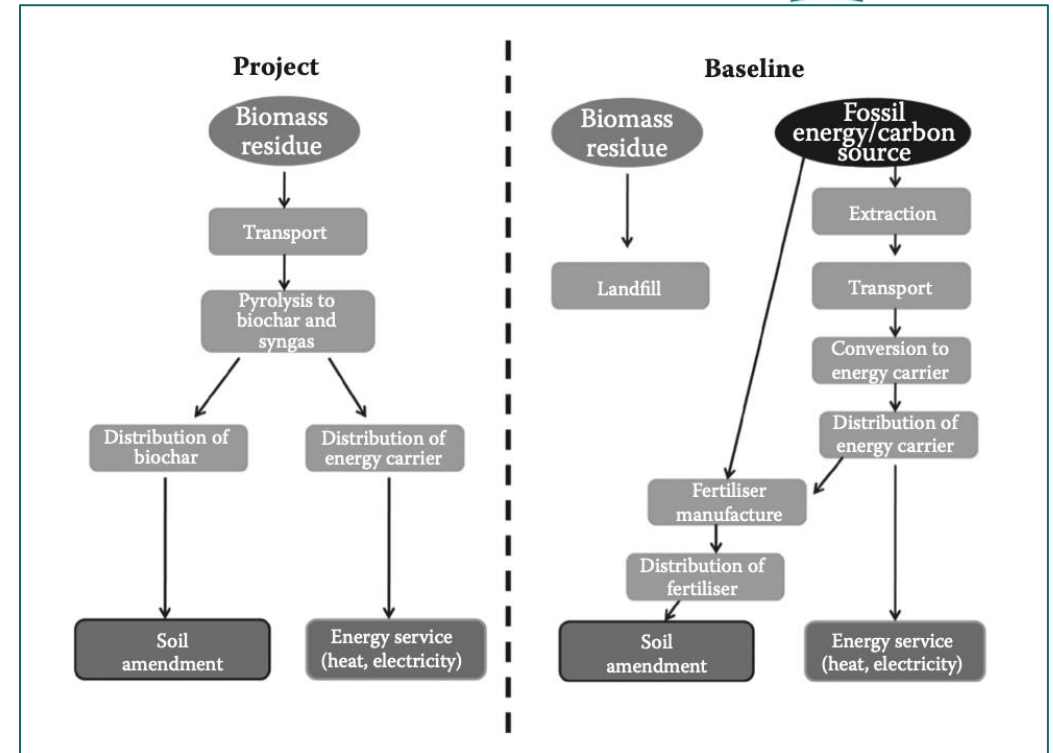
Biochar carbon credits are credits representing a permanent sequestration of carbon. This differs from avoidance or reduction credits since it physically traps carbon in a stable form for long periods.

Methods:

- Up until now, certification (validation) for credits generated from biochar projects are undertaken by Puro.earth marketplace.
- Verra has finalized its methods on accounting carbon in biochar (VM0044). It is categorized as waste management.

Price:

Typically sold at price range 20-170\$/tCO₂e. Outside revenue from electricity or energy generation



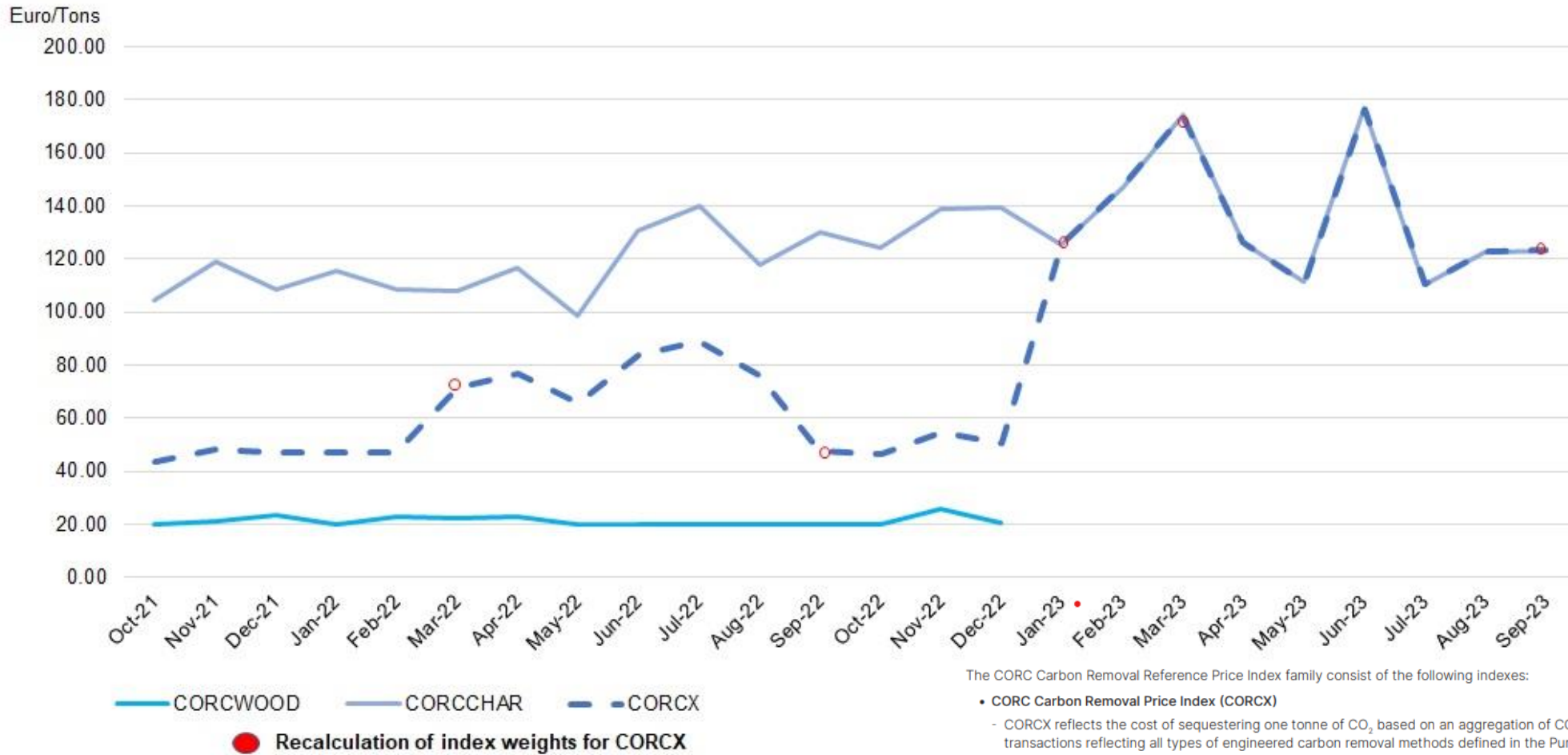
Key points from Verra:

- ✓ Purpose-grown feedstock could not be considered into an eligible biochar project under Verra's method
- ✓ Could be used on soil and non-soil application
- ✓ Projects must also ensure every biochar produced that will be verified can be traced (e.g with GPS or similar technology) to ensure permanence

Biochar Market is Expected to Reach USD 6.3 Billion in 2031



CO2 Removal Certificate Weighted Index Family (CORCX)

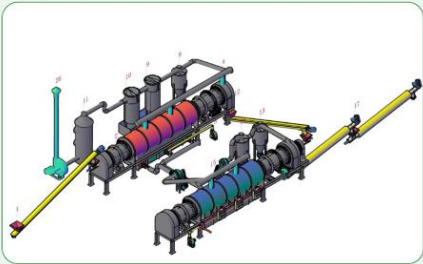
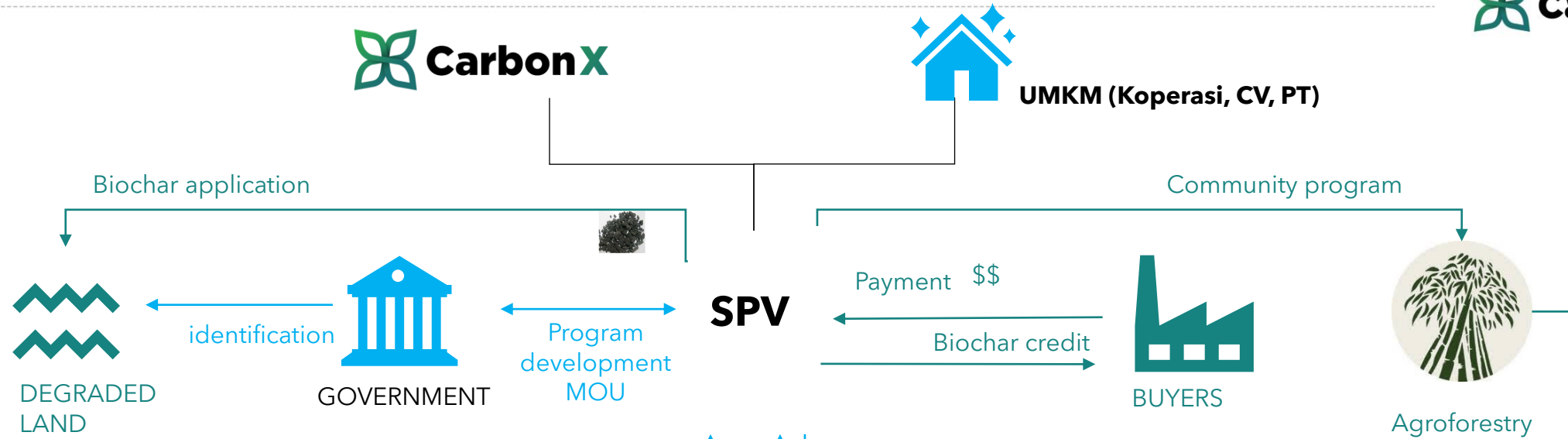


The CORC Carbon Removal Reference Price Index family consist of the following indexes:

- **CORC Carbon Removal Price Index (CORCX)**
 - CORCX reflects the cost of sequestering one tonne of CO₂ based on an aggregation of CORC transactions reflecting all types of engineered carbon removal methods defined in the Puro Standard.
- **CORC Biochar Price Index (CORCCHAR)**
 - CORCCHAR reflects the price of sequestering one tonne of CO₂ in the form of biochar.
- **CORC Bio-based Construction Materials Price Index (CORCWOOD)**
 - CORCWOOD reflects the price of sequestering one tonne of CO₂ from bio-based construction materials.

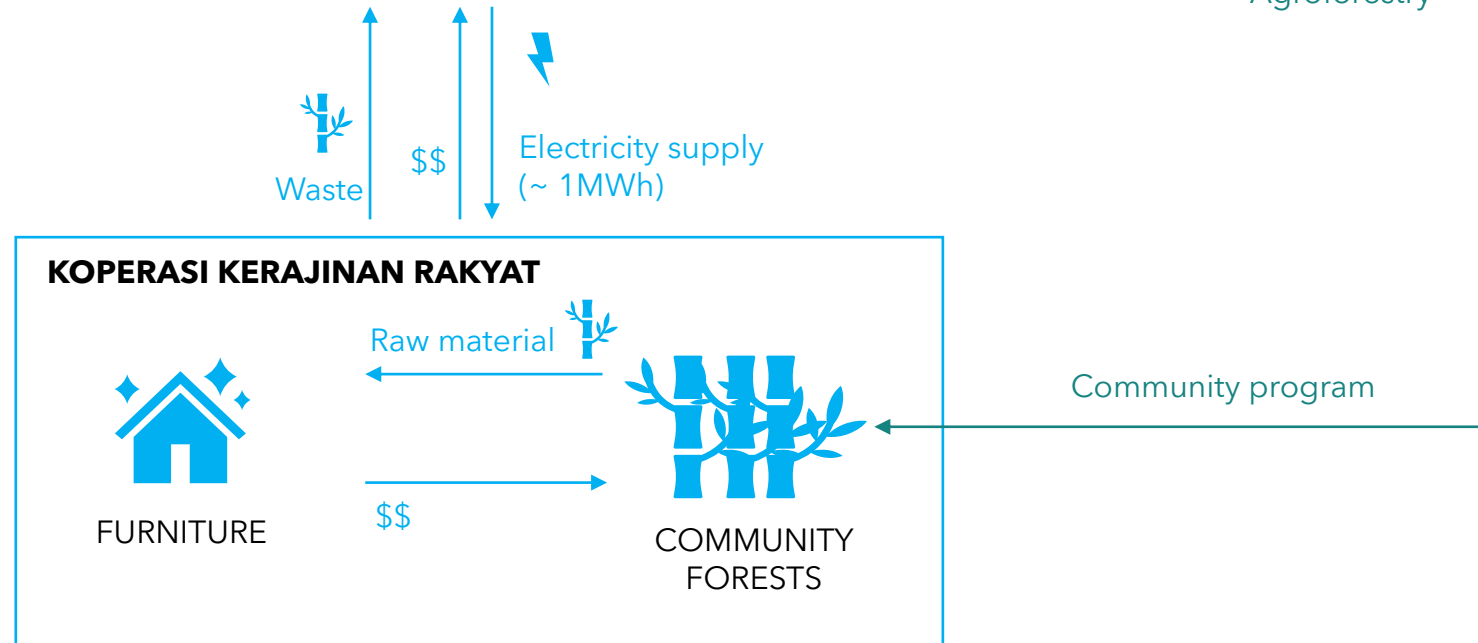
- ✓ The global biochar market was valued at \$170.9 million in 2020
- ✓ The market is expected to reach USD 6.3 billion by 2031
<https://www.transparencymarketresearch.com/biochar-market.html>
- ✓ CAGR of 13.2% from 2021 to 2030.
<https://www.alliedmarketresearch.com/biochar-market-A11816>

How UMKM can access BioChar market proposed business model

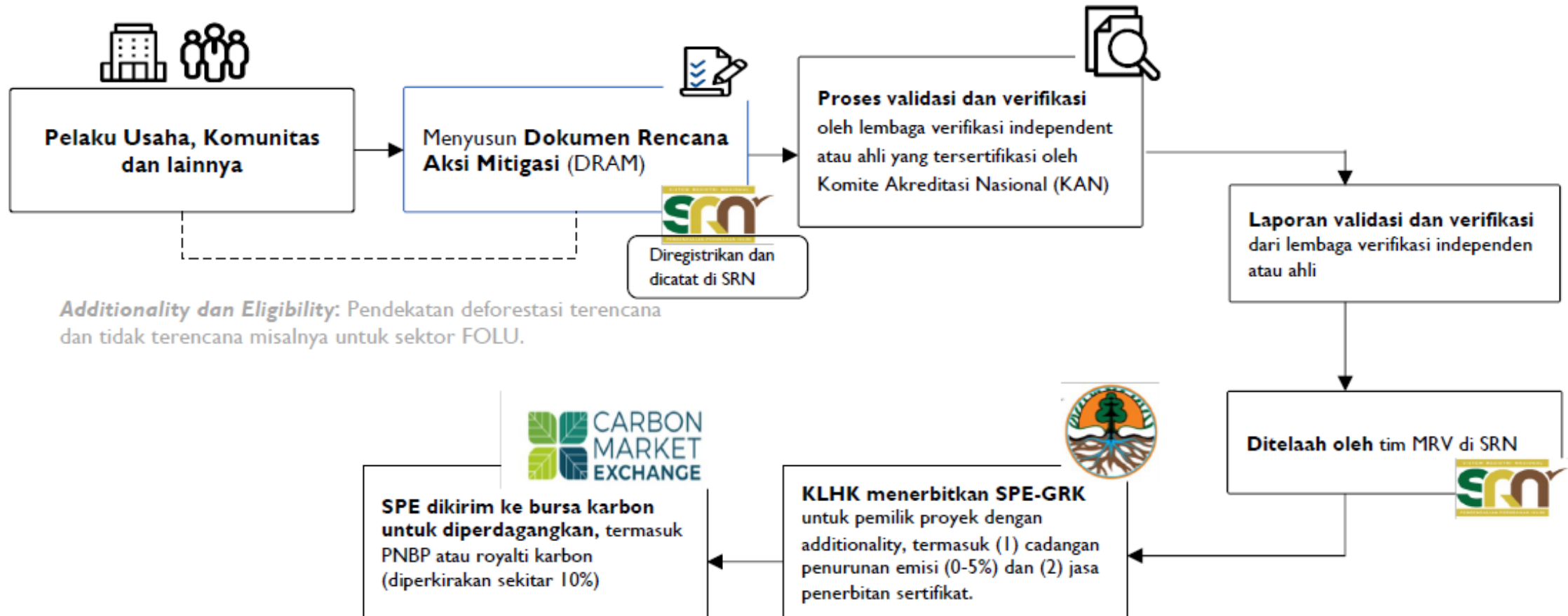


Pyrolysis Reactor Specifications

Machinery Supplier	Gongyi Xiaoyi Hongji Machinery Factory (China)
Input Capacity	3 tonnes/hour (or 7-9m ³ /hour)
Pyrolysis Type	Continuous
Residence Time	30 min
Pyrolysis Temperature	600-700°C



Indonesia's carbon credit issuance process





Indonesia

Treasury tower 7th Floor , suite 7JKL
District 8, SCBD lot.28
Jl. Jendral Sudirman Kav. 52-53
Jakarta 12190 - Indonesia

T +62 21 27085488 / 27085081
F +62 21 27085391

Singapore

10 Anson Road
#03-05 International Plaza
Singapore 079903

T +65 6323 3956
F +65 6323 3959

www.carbonx.com