



RECLAMATION OF COAL MINING LAND USING ASHES FROM CO-FIRING ACTIVITIES

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Comestoarra.com was appointed by The Ministry of Environment and Forestry of Indonesia to create Detail Engineering Design (DED) of TOSS. On September 2021, the DED was published to the public;

Comestoarra.com was appointed by The Ministry of Energy and Mineral Resources as a technical member of bioenergy development due to the Decree of The Minister of Energy and Mineral Resources No. 88.K/73/DJE/2020 on 2 June 2020;

Comestoarra.com got Australian Awards 2018 in Renewable Energy, won Perusahaan Gas Negara (PGN) startup competition 2019 in implementing distributed hybrid renewable energy technology; and achieved Bukit Asam Award 2022 in carbon trading;

Comestoarra.com has contributed in energy transisiton and net zero emission programs since 2020.

WASTE MANAGEMENT PROBLEMS IN INDONESIA

BIOMASS RESIDUES



According to Ministry of Environment and Forestry (2021) in SIPSN Portal (<https://sipsn.menlhk.go.id/>), there are 33.171.983,20 ton / year of waste that has dominated by the wet **organic waste and biomass residues**.



ORGANIC WASTE

COAL FIRED POWER PLANT'S PROBLEMS: FLY ASH AND BOTTOM ASH



CAN BE USED FOR CONCRETE BRICKS

CAN BE USED FOR ROAD PAVEMENT

CAN BE USED FOR WAVE BREAKER

Unfortunately, the product is not significantly absorbed by the public and very costly.



Potentially to be used as the reclamation materials and returned into coal fired power plant.

TRANSPORTATION ISSUES, COST ISSUES, AND HAVE NOT BEEN CIRCULATED YET

TOO DUSTY AND FLUFFY, SO IT REQUIRES ADHESIVE FOR CO-BURNING

STILL HAVE A HIGH CALORIC VALUE FOR COAL WASTE FROM STOCKER OR CFB BOILERS

COAL MINING PROBLEMS: OPEN PITS IN EX-COAL MINING SITE



Source:
<https://ekonomi.bisnis.com/read/20201129/44/1323883/pengembangan-plts-di-lahan-bekas-tambang-bisa-jadi-opsi-reklamasi>



Source:
<https://www.niaga.asia/pansus-desak-perusahaan-tambang-di-kaltim-laksanakan-reklamasi/>

FABA MAY NEUTRALIZE ACIDIC SOIL

OPEN PITS IN EX-COAL MINING
LAND CAN BE FILLED

HOWEVER IT STILL NEED ADDITIONAL NUTRITION FOR
VEGETATION

THIS NEED TO BE FURTHER RESEARCH



SUSTAINABILITY FEED STOCK AND CONTINUITY OF SUPPLY



POTENTIAL MATERIAL 1: REJECTED PALM OIL AND PALM OIL RESIDUAL



POTENTIAL MATERIAL 2: ORGANIC WASTE FROM TRADITIONAL MARKET



POTENTIAL MATERIAL 3: VERTIFER AND BIOMASS RESIDUES

TANGIBLE AND INTANGIBLE BENEFIT FROM CO-FIRING ACTIVITIES:

1. REDUCE COAL CONSUMPTION AND CONTRIBUTE TO NET ZERO EMISSION;
2. SUPPORT LOCAL GOVERNMENT TO SOLVE WASTE MANAGEMENT PROBLEMS;
3. RECYCLING AND REUSING FLY ASH AND BOTTOM ASH AND MIXING WITH ORGANIC WASTE / BIOMASS RESIDUES.



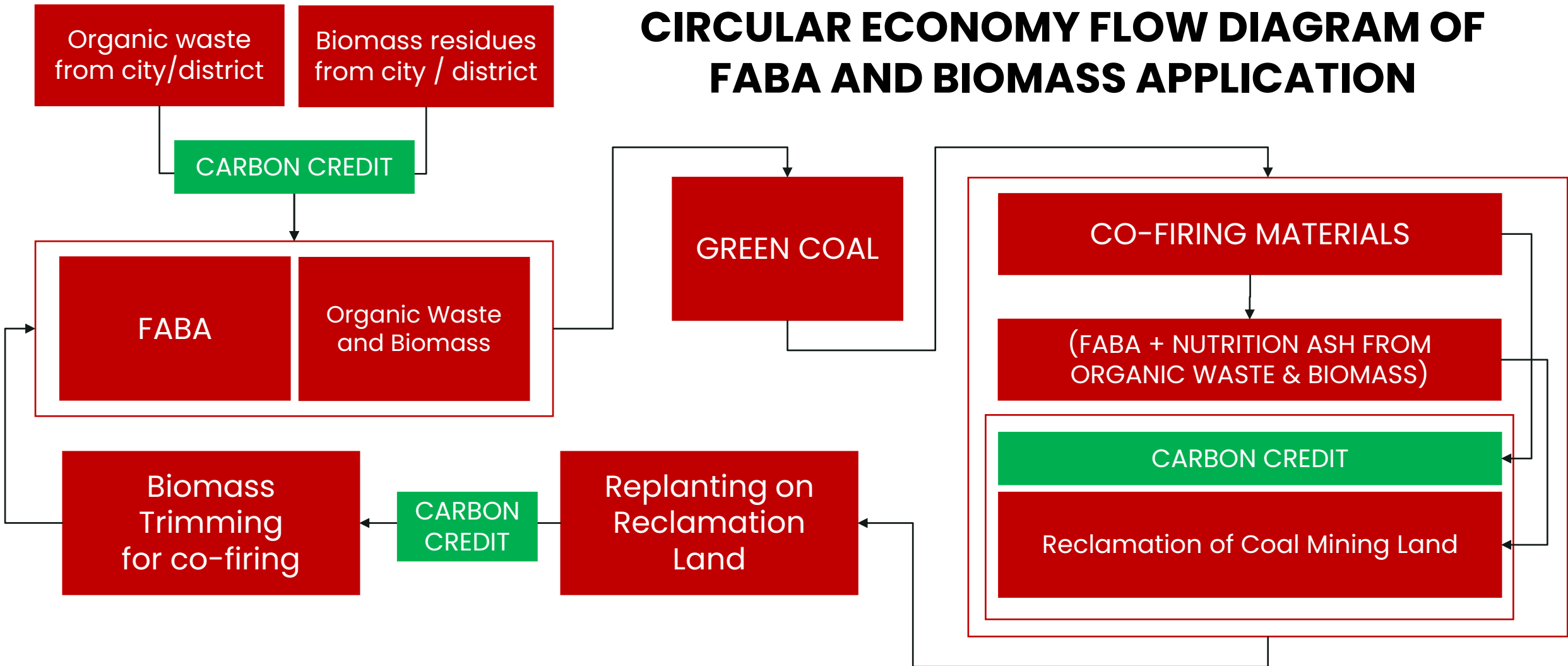
(FRESH) BOTTOM ASH STILL HAS CALORIC VALUE. HOWEVER IT NEEDS "GLUE" TO BE RECYCLED AND REUSED



EXISTING MILLION OF TONS OF FLY ASH AND BOTTOM ASH



CIRCULAR ECONOMY FLOW DIAGRAM OF FABA AND BIOMASS APPLICATION





- 1** FABA is sieved and blended with biomass materials
- 2** Manual mixing: 50 percent FABA and 50 percent biomass
- 3** Manual compacting process

- 4** Manual pelletizing
- 5** Manually compacted material is denser than manual pelletized
- 6** Sun drying to reduce moisture content.

- 7** Burning test with gasification stove
- 8** The ashes result

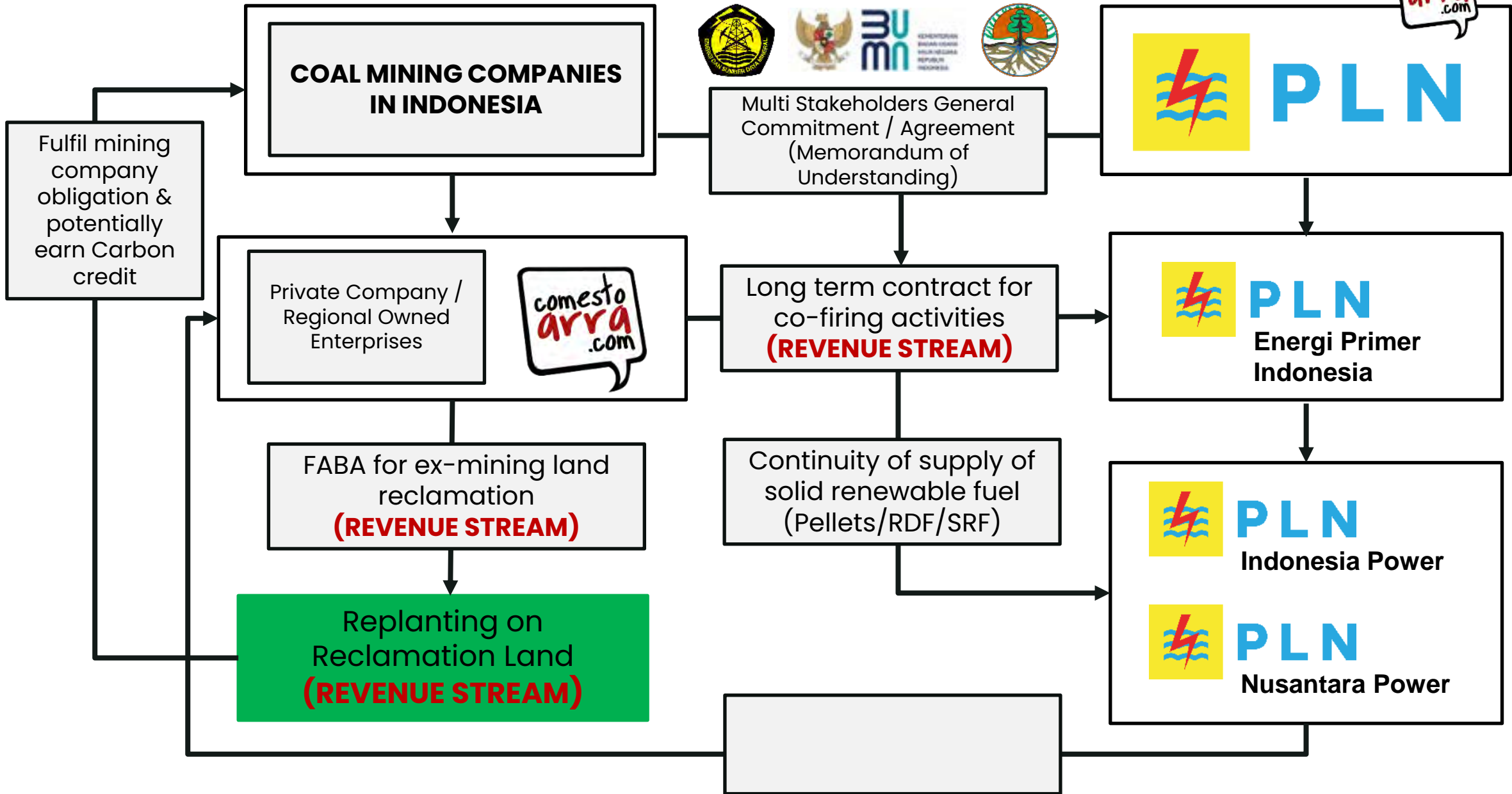


GENERAL DATA FROM CO-FIRING MATERIALS

TEST	BASIS	UNIT	Coal for stocker boiler	FABA after burned in stocker boiler	Bio dried mix biomass	Non bio dried mix biomass	FABA + Bio dried mix biomass
GENERAL ANALYSIS							
Total Moisture	arb	%	23,70	24,48	14,81	6,72	5,45
Moisture in the analysis sample	adb	%	13,61	5,84	7,22	6,39	5,80
Ash in the analysis sample	adb	%	4,80	40,82	9,77	9,20	22,51
Volatile Matter	adb	%	39,10	6,80	66,27	67,17	44,01
Fixed Carbon	adb	%	42,49	46,54	16,74	17,24	27,68
Total Sulphur	adb	%	1,88	1,32	0,32	0,30	0,62
Gross Calorific Value	adb	kcal/kg	5.831	4.187	4.757	4.554	4.674
	arb	kcal/kg	5.150	3.358	4.368	4.538	4.691

Data owned by: PT indo Pusaka Berau II Consultant: Comestoarra.com

***) Tested in Indonesia certified laboratory**



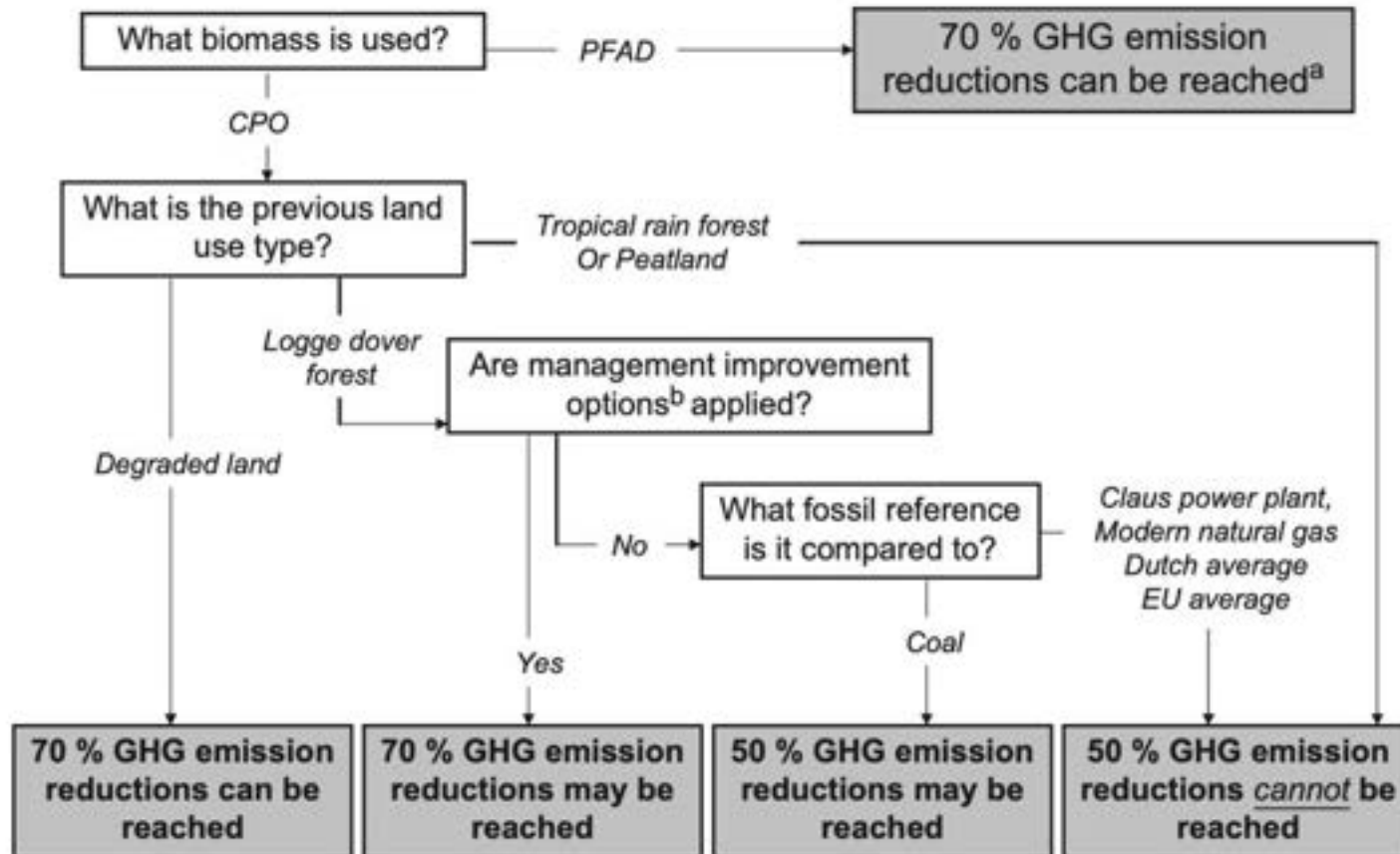


CARBON REDUCTION CALCULATION BASED ON UNITED STATES ENVIRONMENTAL PROTECTION AGENCY FRAMEWORK

Material	Jumlah	Satuan	Total	Satuan	Lokasi	Satuan	Daily	Satuan	Monthly	Satuan	Yearly	Satuan
Waste Management Processing	2,94	CO ₂ Eq	0,5	ton/day	16	unit	23,52	CO ₂ Eq	705,6	CO ₂ Eq	8.467,20	CO ₂ Eq
Waste Transportation to the landfill	20,58	CO ₂ Eq	Basic assumption: 8 tons of organic waste and/or biomass residues are transported to the landfill with the 10 tons capacity of truck. The unprocessed material can produce methane gas and also leachate.				20,58	CO ₂ Eq	617,4	CO ₂ Eq	7.408,80	CO ₂ Eq
Co-firing	1,94	CO ₂ Eq	The coal consumption will be reduced, the FABAs will be reused and can be optimally burned in coal fired power plant. FABAs that mixed with the biomass has the nutrition for reclamation. Therefore it can be used for replanting of biomass.				2.91	CO ₂ Eq	87.3	CO ₂ Eq	1.047,60	CO ₂ Eq
TOTAL EMISSION REDUCTION											16.923,60 ton CO ₂ Eq/Year	



GREEN HOUSE GASES BALANCE: CASE STUDY FROM COCONUT PALM OIL



Green House Gases balance

Source: Wicke, Dornburg, Faaij, dan Junginger (2007) dari *Universiteit Utrecht Copernicus Institute, Netherland*

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Data Explorer

The largest database of verified emission factors. Open to all.

Search among 48,800 emission factors

Advanced Search

Popular Searches

Transport Energy Cloud Computing Air Travel Spend-based EXIOBASE ecoinvent

Recommended Data Sources

Explore All

BEIS
The Department for Business, Energy & Industrial Strategy is the UK Government agency that issues emission conversion factors for use by UK and international organisations to report on greenhouse gas emissions.

ecoinvent
ecoinvent is a Swiss not-for-profit association that provides a Life Cycle Inventory (LCI) database that supports various types of sustainability assessments. This data enables users to gain a deeper understanding of the...

EPA
The Environmental Protection Agency (EPA) is the United States government agency that provides regularly updated default emission factors for organisational greenhouse gas reporting in the United States.

EXIOBASE
EXIOBASE is a global, detailed Multi-Regional Environmentally Extended Supply-Use Table (MR-EEU) and Input-Output Table (MR-IOT). It was developed by harmonising and detailing supply-use tables for a large...

GHG Protocol
The GHG Protocol is the de-facto standard-setting organisation for greenhouse-gas accounting. As well as producing guidance on estimating and categorising emissions, it also provides a set of the most commonly...

GLEC
The Global Logistics Emissions Council (GLEC) is a partnership between industry, government, and non-governmental organisations that aims to develop and promote a standardised approach for measuring and...

Source: <https://www.climatiq.io/data>

Home > Live Carbon Prices Today

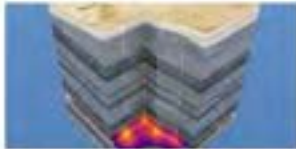
↑4% KEUA \$32.22 ↑0.21 0.68% KCCA \$25.33 ↑0.07 0.28% SMOG \$122.83 ↑1.40 1.15% CRBN \$154.30 ↑0.33 0.21% GRN

Live Carbon Prices Today

Trending Right Now



Capture6 Secures Over \$8M Grant for Innovative Carbon Capture Technology



Nvidia AI Tech Ramps Up Carbon Capture & Storage Predictions 700,000x

CarbonCredits.com Live Carbon Prices	Last	Change	YTD
Compliance Markets			
European Union	€86.15	-	+7.69%
California	\$29.30	-	+0.79%
Australia (AUD)	\$28.25	-	-6.41%
New Zealand (NZD)	\$37.00	-	-51.58%
South Korea	\$8.01	-	-28.04%
China	\$8.06	+0.25%	+0.64%
Voluntary Markets			
Aviation Industry Offset	\$1.53	-	-28.00%
Nature Based Offset	\$2.29	-	-50.00%
Tech Based Offset	\$0.88	-	-20.91%

CarbonCredits.com Real-time Pricing

[Click here to learn how carbon credits are priced.](#)



North America's Largest Biochar Plant Announced In Canada



The Ultimate Guide to Understanding Carbon Credits

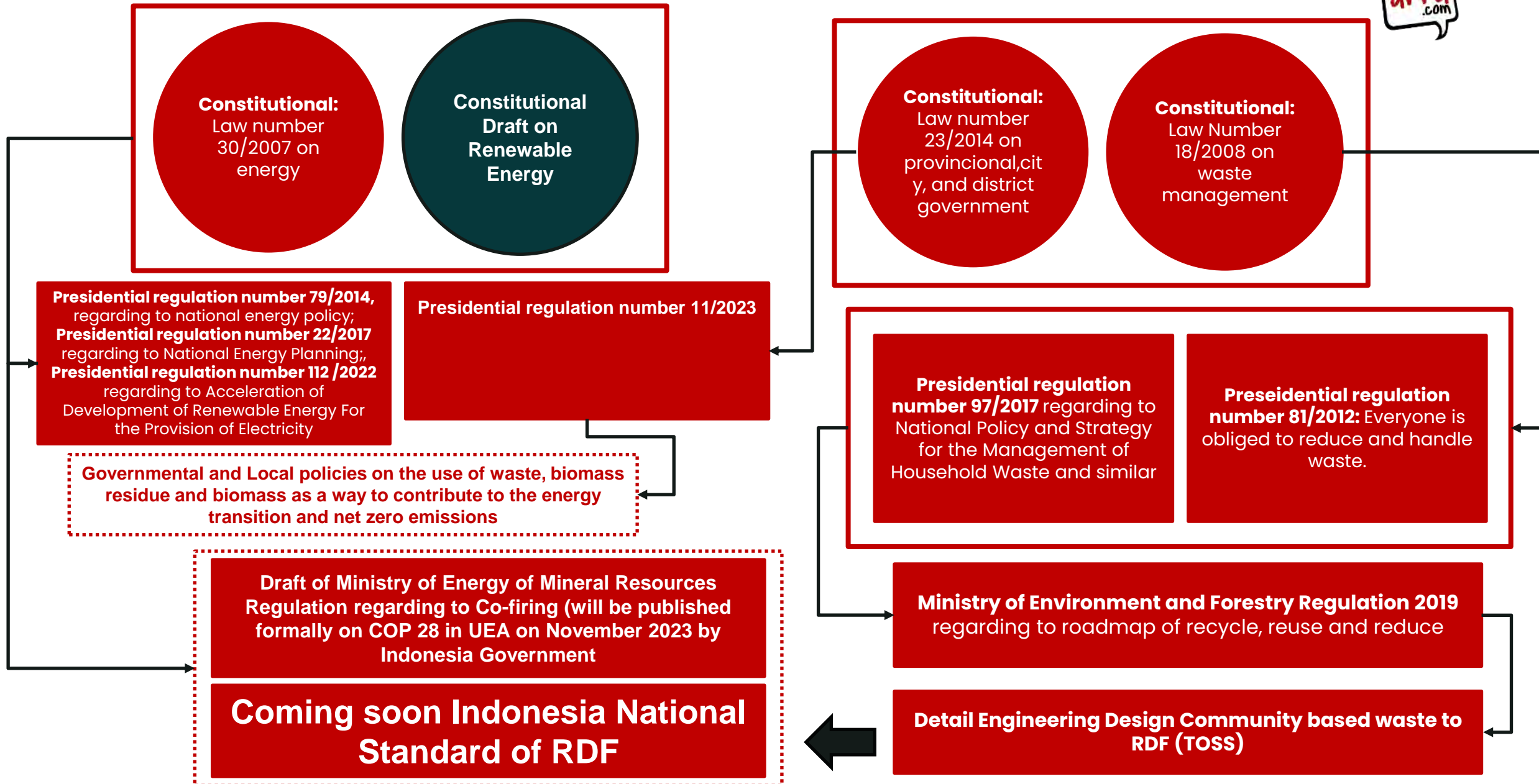
Mandatory Compliance Market Carbon Pricing

Mandatory (Compliance) Market: Mandatory (compliance) markets are governed by national, regional, or provincial law and compel emission sources to meet GHG emission reduction targets. Because compliance program offset credits are

Voluntary Market Carbon Pricing

Voluntary Carbon Market: Voluntary Carbon Markets enable carbon emitters to offset their unavoidable emissions by acquiring carbon credits generated by initiatives aimed at removing or decreasing GHG emissions from the environment.

WHAT NEXT?
Lets work together!



Dashboard Carbon Emission Estimations

Carbon Emission Estimations

TDS Emission Calculator

Name	Category	Source	QTY	Unit	Emission
Mixed food and garden waste disposal (organic) - composting	Food and Organic Waste	BEIS [ar5]	1	kg	0.00
Mixed food and garden waste disposal (organic) - landfill	Food and Organic Waste	BEIS [ar5]	1	kg	0.36
Food Waste - Composted	Food and Organic Waste	EPA [ar4]	1	kg	0.10
Food Waste - Combusted	Food and Organic Waste	EPA [ar4]	1	kg	0.05
Food Waste - Landfilled	Food and Organic Waste	EPA [ar4]	1	kg	0.62
Compost derived from food and garden waste (Primary material production)	Organic Products	BEIS [ar4]	1	kg	0.14
Mixed Organics - Combusted	Food and Organic Waste	EPA [ar4]	1	kg	0.05
Mixed Organics - Composted	Food and Organic Waste	EPA [ar4]	1	kg	0.18

Dashboard Carbon Emission Estimations

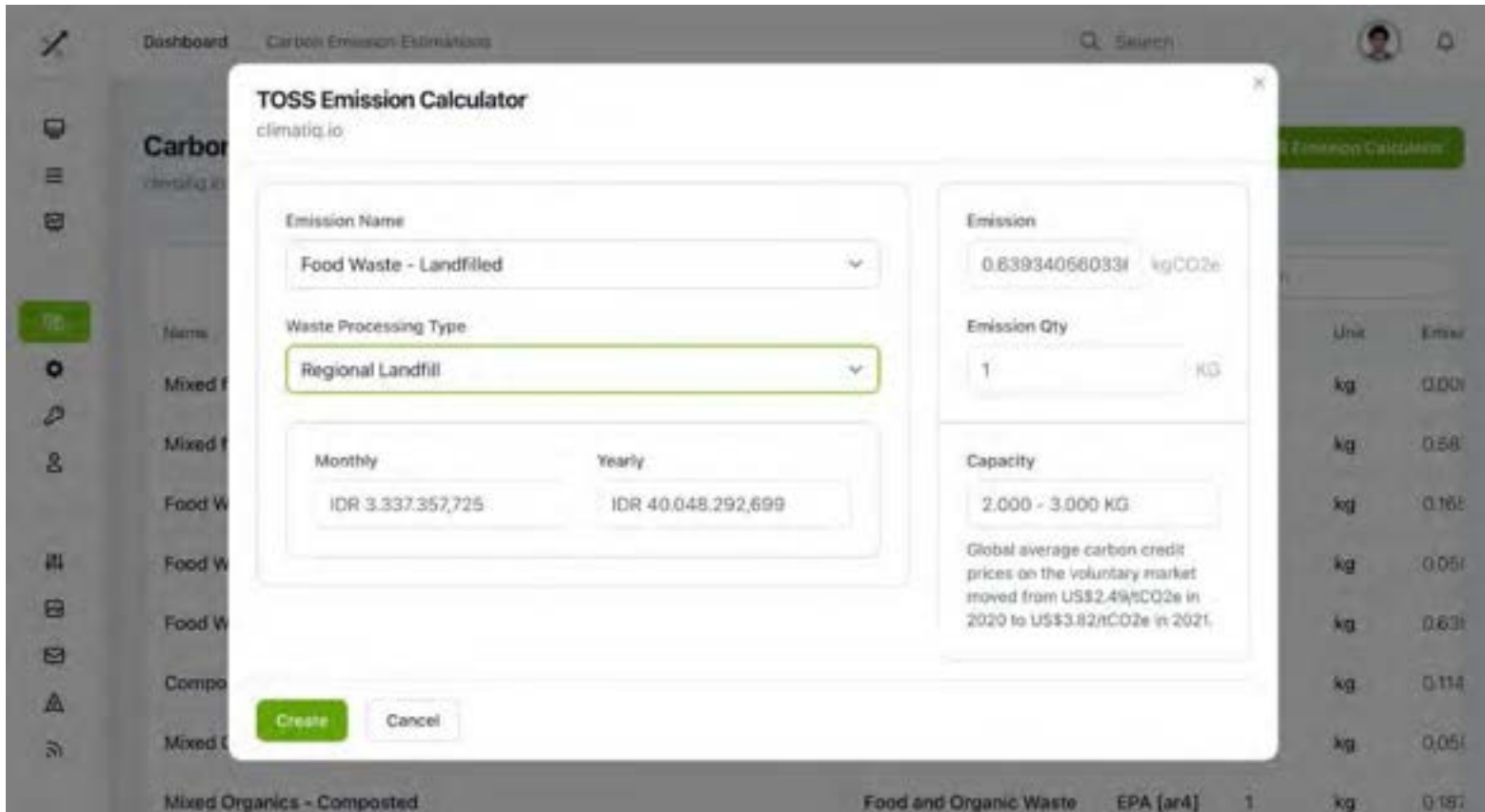
Carbon Emission Estimations

TDS Emission Calculator

Source	QTY	Unit	Emission	Savings	Income	Monthly
BEIS [ar5]	1	kg	0.00891058 kgCO2e	-	IDR 0,401	IDR 12,029
BEIS [ar5]	1	kg	0.58732567 kgCO2e	-	IDR 26,430	IDR 792,890
EPA [ar4]	1	kg	0.16534569663856 kgCO2e	-	IDR 7,441	IDR 223,218
EPA [ar4]	1	kg	0.056119565545219 kgCO2e	-	IDR 2,480	IDR 74,406
EPA [ar4]	1	kg	0.63934056033614 kgCO2e	-	IDR 28,770	IDR 863,110
BEIS [ar4]	1	kg	0.11483221 kgCO2e	-	IDR 5,167	IDR 155,023
EPA [ar4]	1	kg	0.056119565545219 kgCO2e	-	IDR 2,480	IDR 74,406
EPA [ar4]	1	kg	0.1879292285715 kgCO2e	-	IDR 8,433	IDR 252,980

Comestoarra.com has developed the carbon emission estimations platform that can be integrated with global carbon trading market platforms, such as USEPA, carboncredit.com, UNFCCC, etc;

The Category has been adjusted with the Indonesian energy transition and net zero emission program, such as co-firing, dedieselization, reclamation using organic waste and biomass;



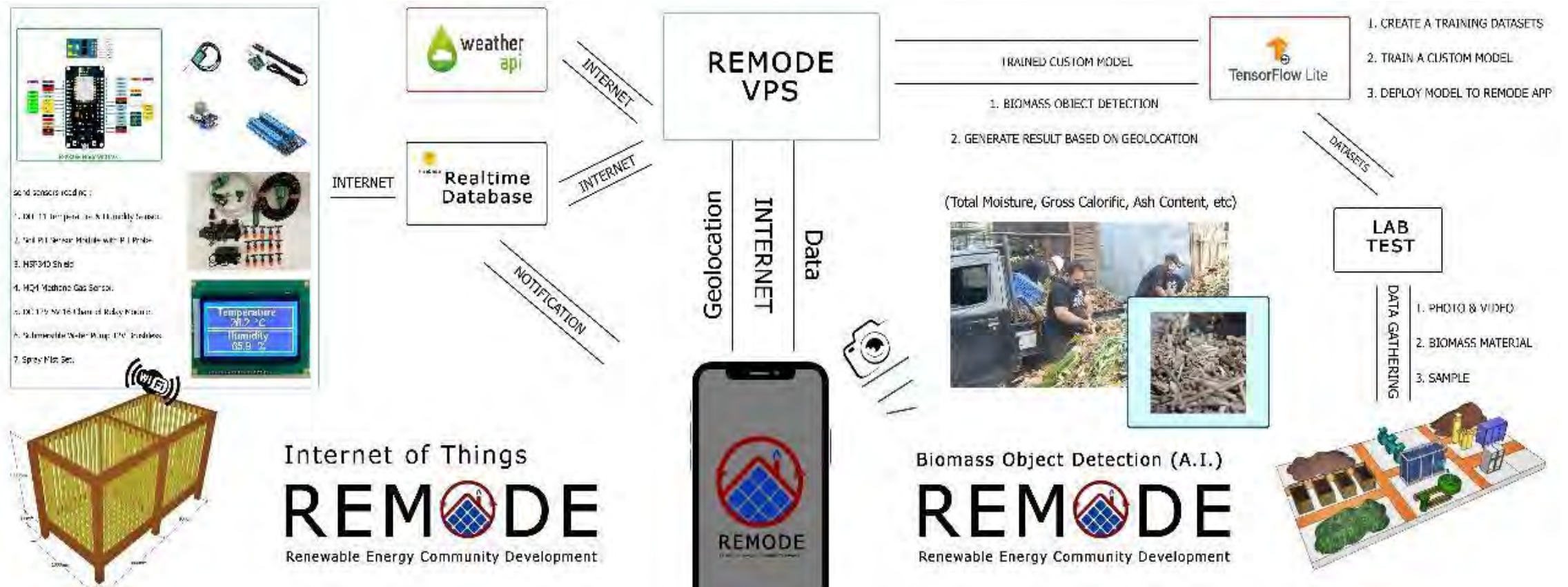
User has to input the daily activity data (individual or group or company) by using comestoarra.com's technology. It could be organic waste and/or biomass processing, it could be co-firing and/or dedieselization activities, and reclamations;

Comestoarra.com's technology uses AI and IoT to assist the database from users.

The platform also can calculating the saving money from the daily activities.



REMODE will utilize IoT technology for data mining and aggregation from the production process and AI will be used to aggregate data and user behavior in the digital platform. From all collected information and data, datasets training will create a certain model that could be used to detect objects with possible calories, moisture, and other ingredients.



POST CO-FIRING ACTIVITIES (IF THERE ARE NO EX COAL MINING LAND)

FABA can be used for the blending material of organic waste and biomass

FABA can be reuse as the bricks which are used for the construction of public housing infrastructure, religious buildings, and public facilities.



FABA is sent and then managed by local enterprises

Village-owned enterprises has a very important role in running the TOSS ecosystem and also the use of FABA Ropa coal fired power plants

The solid renewable fuel send to the coal fired power plant (commercialized)

ALL ACTIVITIES HAS MONITORED WITH REMODE AND CARBONEX



THANK YOU FOR YOUR ATTENTION

FOR MORE INFORMATION:
PLEASE CONTACT +628558700084
OR labs@comestoarra.com
Youtube: [Comestoarra.com](https://www.youtube.com/Comestoarra.com)



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