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Asia-Pacific Renewable Biomass Resources:

Strategic Reflections from the Philippines



15 October 2026

IEA Bioenergy TCP ExCo98 Workshop
Scaling Asia Pacific Bioeconomies

From Resource Abundance to Investable Value Chains

Bioeconomy competitiveness depends on the system around the resource — not on the resource alone.

Stage 1

Resources

- Agricultural residues
- Forestry residues
- Organic waste
- Used cooking oil (UCO)
- Industrial by-products

Stage 2

Conversion

- SAF & renewable diesel
- Ethanol & biomethane
- Biochar
- Renewable power
- Bioproducts

Stage 3

Value Creation

- Rural income & jobs
- Waste reduction
- Energy security
- Innovation
- Industrial upgrading

Stage 4

Regional Cooperation

- Harmonized standards & certification
- Joint R&D
- Climate finance
- Integrated markets & logistics

SAF is the anchor application — the broader goal is a competitive circular bioeconomy spanning the full value chain.

ASEAN's Renewable Biomass Resource Perspective

ASEAN's advantage is a recurring portfolio of diverse residues and waste streams — not dependence on any single dominant feedstock.

Feedstock Resource Families



Rice Straw & Husk



Sugarcane Bagasse & Molasses



Coconut Husk, Shell & Residues



Corn Stover & Cassava Residues



Oil-Palm & Pineapple Residues



Livestock Manure



Sustainable Forestry Residues



Organic MSW



UCO & Eligible Waste Lipids

Trend: Movement from single-product biomass use toward integrated multi-product value chains

Potential Output Families

Sustainable Aviation Fuel (SAF)
Anchor application for Asia-Pacific feedstock mobilization

Renewable Diesel & Biodiesel
Bioethanol, bio-oil — liquid fuel value chains

Biomass-to-Power
Biomass-fired generation, cogeneration, industrial heat

Biomethane & Biogas
Upgraded and grid-injected energy carriers

Biochar & Biofertilizer
Soil amendment, carbon sequestration, circular agriculture

Chemical Intermediates & Naphtha
Industrial upgrading, bio-based materials, export value

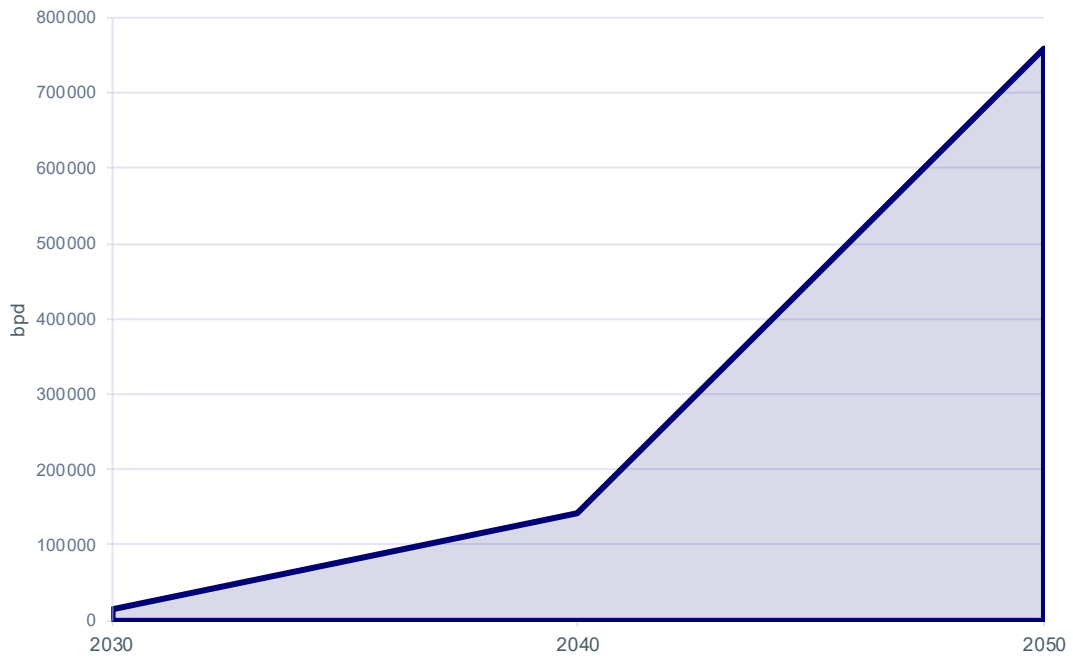
Regional Demand Signals Are Strengthening

Strengthening demand growth creates a regional market rationale for feedstock, processing, and trade partnerships across Asia-Pacific.

⚠ **All figures below are projected demand under report scenario — not guaranteed outcomes**

ASEAN 7-Country SAF Demand (Study Estimate)

Thousand barrels per day (bpd) · 2030–2050



15,000 bpd	142,000 bpd	760,000 bpd	~20% CAGR
2030	2040	2050	2030–2050

ASEAN SAF Supply Potential

ASEAN's potential SAF supply — largely from agricultural and forestry waste — dwarfs projected domestic demand, positioning the region as a prospective global SAF export hub.

2030	**500×**	Supply (7.5M b/d) vs. demand (15K b/d)
2040	**56×**	Supply (7.9M b/d) vs. demand (142K b/d)
2050	**11×**	Supply (8.5M b/d) vs. demand (760K b/d)

- Thailand, Indonesia, and the **Philippines** emerge as the largest potential surplus producers after meeting domestic mandates.
- Potential supply reflects feedstock resource availability — it does not equal committed or financed production.

Why the Philippines Matters

The Philippines combines a large agricultural base, energy-import exposure, growing aviation demand, and substantial waste streams — making it a strategic bioeconomy investment destination.

Island Archipelago

7,641

Islands forming the Philippine archipelago

Cropland Share of Land Area

42.3%

Land under active cultivation

Selected Crop Area, 2023

13.6M

Hectares across selected crop types

Agri, Forestry & Fisheries Jobs, 2023

12.3M

People employed — sector workforce

Aviation Fuel Consumption, 2023

~2.0 Mt

Total aviation fuel consumed annually across the Philippines

Avg. Energy-Import Reliance, 2018–2023

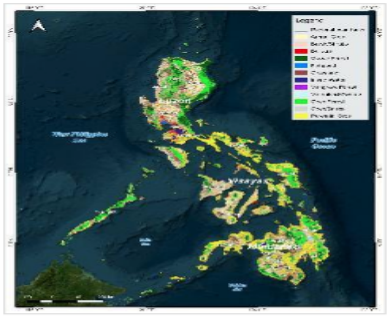
50.7%

Half of all energy sourced from imports — bioeconomy opportunity

1 Geography and climate

The **Philippines** is a **tropical agricultural archipelagic country** with over 7,641 islands. About **42.3%** of the country's land area are **croplands**. It has **4 climate types** which **affects crop suitability** in various regions of the country. Both aspects contribute to the **abundance and diversity** of potential SAF feedstocks.

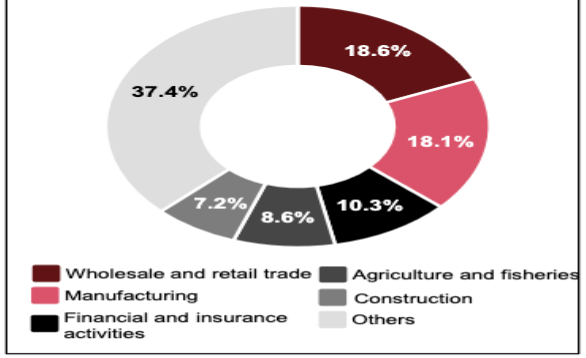
Land cover, by type (2020)



2 Economic growth

The Philippines economic growth is supported by **strong service** and **industry sectors**, suggesting a conducive environment for SAF production investments due to **robust infrastructure** and **industrial support.**

GVA of top 5 major industries (2023)
In percentages (%)



3 Institutional support

Government agencies such as **Department of Energy**, **Department of Transportation**, and **Public-Private Partnership Center**, are at the forefront in **developing energy and fuel infrastructure** while ensuring standards and promoting sustainability.

Department of Energy

Department of Transportation

National Economic and Development Authority

Civil Aviation Authority of the Philippines

Department of Trade and Industry

Department of Environment and Natural Resources

Public-Private Partnership Center

4 Biofuel development

The progress of the Philippines in biofuel development, guided by the **Biofuels Act of 2006**, provides a foundational framework that could **support** the future establishment of a **specific SAF policy.**

Relevant laws to the sustainable aviation fuel sector

1	**Biofuels Act of 2006**
2	**Renewable Energy Act of 2008**
3	**Department Circulars and Administrative Orders in relation to Biofuels**
4	**Commitment to International Policies and Guidelines**
5	**Pending Philippine legislations:** • **Senate Bill No. 380**: An act aiming to establish a national energy policy for petroleum exploration, impacting biofuel and SAF initiatives • **HB02608**: An act mandating bioethanol use as transport fuel, promoting biofuel development

Source: National Mapping and Resource Information Authority, Philippine Statistics Authority (PSA), Government websites
Airbus – ACT-SAF study for the Philippines
PwC

Philippines — Feedstock Portfolio

Philippine Residue- and Waste-Based Portfolio

The strongest near-term Philippine resource proposition is residues and wastes — not dedicated food crops.

~1.4 Mt

Headline SAF potential annually (study estimate)

FT Pathway — ~1.2 Mt

HEFA Pathway — ~0.2 Mt

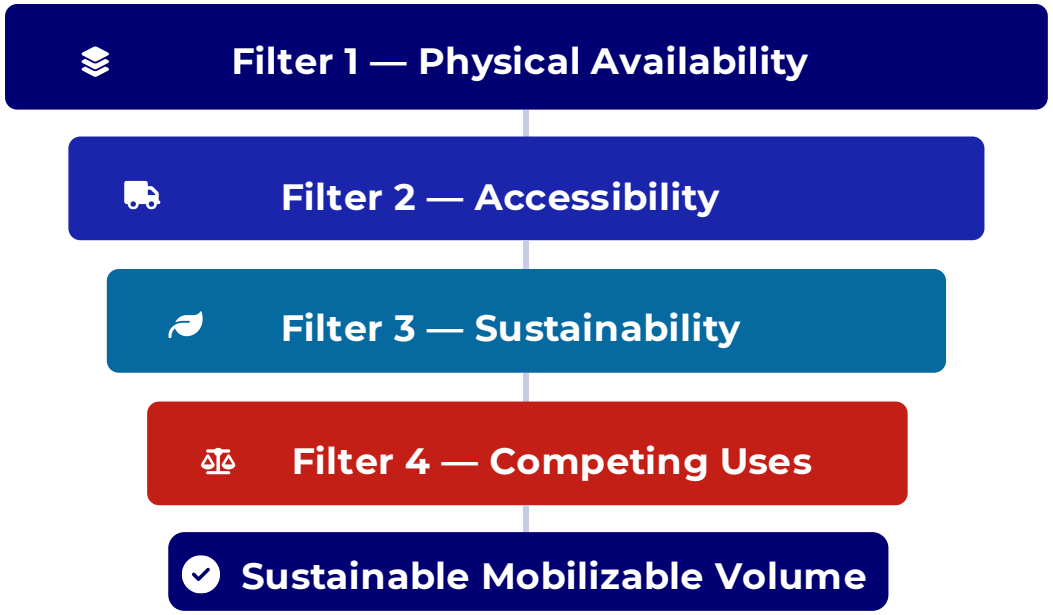
All figures are study estimates (Mt/year) from PwC/Airbus ACT-SAF Feasibility Study, October 2025.

Pathway	ICAO-CORSIA feedstocks	Available feedstock volume *(in million tonnes)*	Potential SAF volume *(in million tonnes)*
FT	Rice straw	4.8	***0.5***
FT	Municipal solid waste	2.4	***0.3***
FT	Rice husk	1.8	***0.2***
FT	Coconut husk	1.1	***0.1***
FT	Corn stover	0.9	***0.1***
FT	Coconut shell	0.4	***0.04***
FT	Pig manure	0.2	***0.02***
FT	Chicken manure	0.2	***0.02***
FT	Empty fruit bunch	0.02	***0.002***
FT	Forestry residues	0.004	***0.0005***
		Total SAF volume from FT pathway	***1.2***
HEFA	Used cooking oil	0.2	**0.1**
HEFA	Non-standard coconut	0.1	**0.04**
HEFA	Mixed animal fats	0.006	**0.003**
HEFA	Palm fatty acid distillate	0.002	**0.001**
		Total SAF volume from HEFA pathway	***0.2***
		Total SAF volume from all pathways	***1.4***

Please note: Despite high potential of FT, pathway is still not fully commercially available, further technological advancements required in coming years

From Theoretical Biomass to Sustainable and Mobilizable Supply

Responsible project development applies four sequential filters before declaring any feedstock investable.



FILTER 1 **Physical Availability**

Total biomass produced in a region —inventory before any deductions.

FILTER 2 **Accessibility**

Collection feasibility, logistics capacity, and geographic dispersion of the resource.

FILTER 3 **Sustainability**

Environmental, social, food-security, soil, water, and biodiversity criteria must be met.

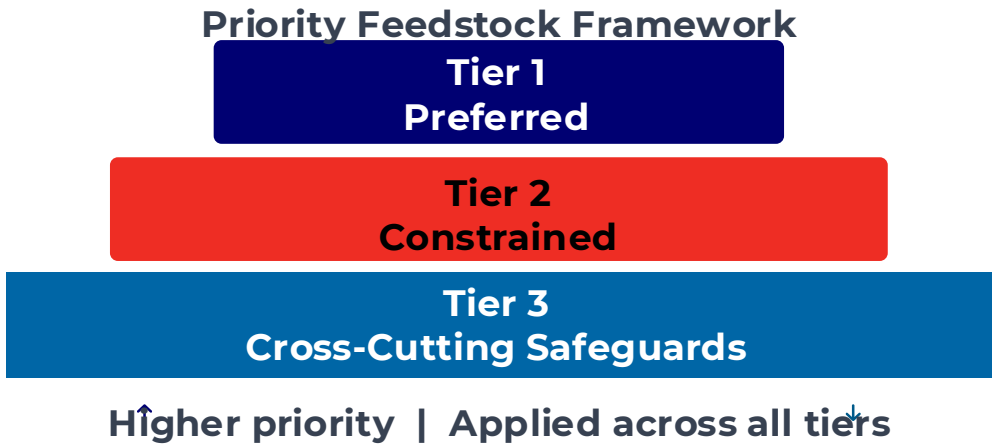
FILTER 4 **Competing Uses**

Existing highest-value applications that already absorb the resource — Philippine examples:

Rice straw → soil, feed **Rice husk → heat, power** **Coconut shell → activated carbon**
Bagasse → sugar-mill boilers **Corn grain → domestic demand** **UCO → export**

Sustainability and Food-Security Hierarchy

Philippine vision is waste first, residues carefully, food crops only under strong safeguards — sustainability is a precondition, not an afterthought.



Tier 1 — Higher-Priority Feedstocks

Rice straw · Rice husk · Organic MSW · Coconut husk · Selected coconut shell · Corn stover · UCO · Selected manure · Selected industrial & forestry residues · Non-standard coconut

Tier 2 — Constrained Under Current Conditions

Corn grain · Sugarcane · Molasses · Bagasse · Soybean · Palm FFB · POME · Sugar beet

Tier 3 — Cross-Cutting Safeguard Requirements (All Tiers)

Food · Feed · Fertilizer · Soil · Water · Biodiversity · Labor protections · No high-carbon-stock conversion · Traceability, lifecycle accounting, chain of custody · Equitable farmer and community participation

From SAF to Integrated Biorefineries

Biochar and Biofertilizer Can Strengthen the Value Proposition

Agricultural co-products can connect fuel projects back to Philippine farms and circular-economy objectives — but co-product claims must be matched to the actual conversion pathway.

Biochar

Thermochemical Routes — Pyrolysis / Gasification

Key Benefits

- Soil amendment and water retention, subject to agronomic validation
- Long-duration carbon storage where recognized by applicable methodology
- Higher-value use of lower-value solid residues

Value Chain

Dry Residues › Pyrolysis / Gasification › Biochar › Soil / Carbon Market

Compatible Feedstocks

Rice Straw | Rice Husk | Coconut Shell | Corn Stover | Agro-Forestry Residues

Biofertilizer / Digestate

Biological Routes — Anaerobic Digestion

Key Benefits

- Nutrient recycling from organic waste and manure systems
- Potential displacement of conventional fertilizer, subject to quality and safety requirements
- Additional value stream for anaerobic digestion-based facilities

Value Chain

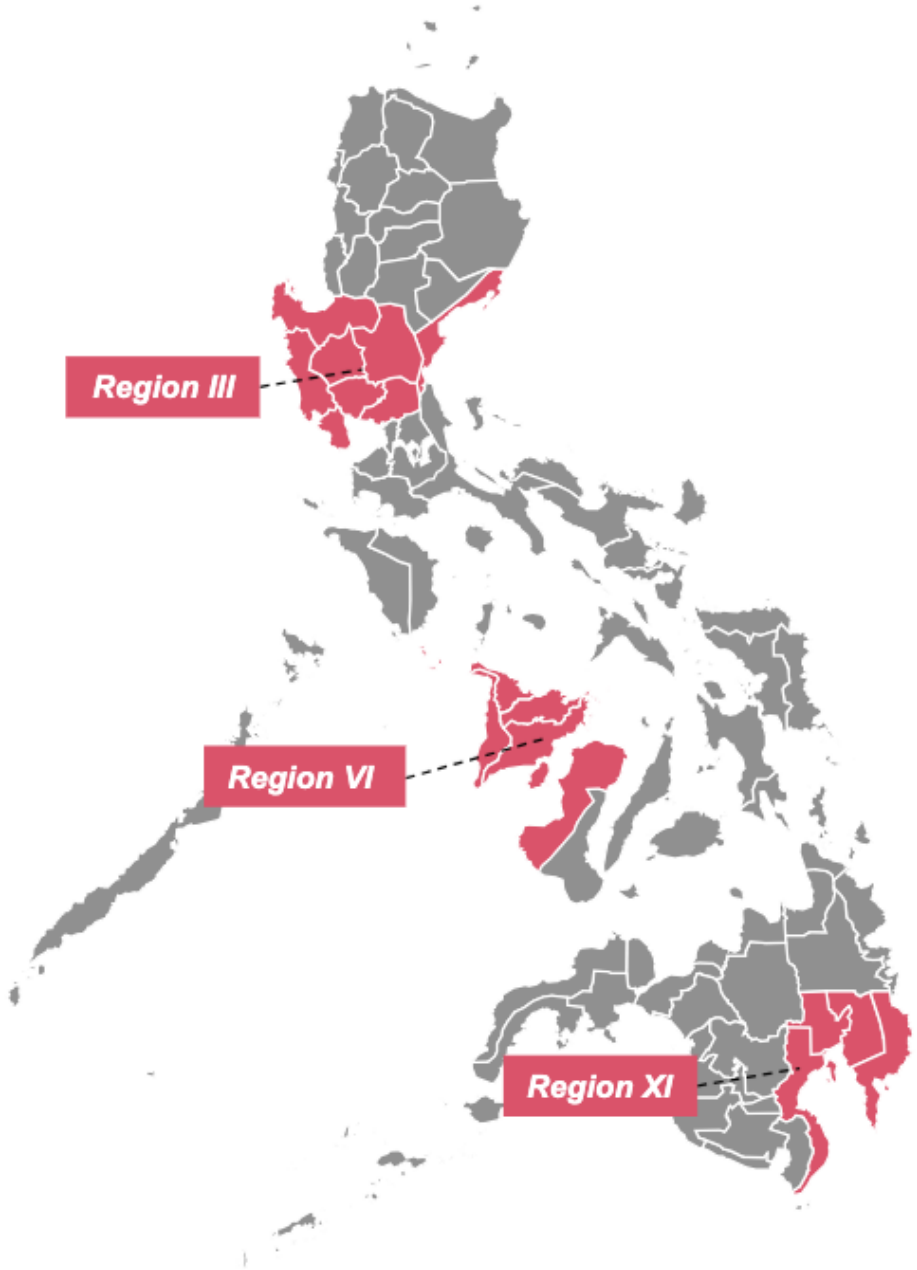
Organic Waste / Manure › Anaerobic Digestion › Digestate › Farm / Fertilizer Market

Compatible Feedstocks

Organic MSW | Pig Manure | Chicken Manure | Agro-Industrial Effluents

Initial Philippine Investment Geography

Feedstock availability must be considered together with demand centers, logistics, infrastructure, and land conditions to identify viable cluster sites.



Location considerations	
1	**Airport passenger movement** Locating a **SAF plant near airports** with nearby **substantial feedstock supply** and **significant passenger activity** ensures streamlined **logistics** and fulfills **high air travel demands**.. In Luzon, **Clark International Airport** recorded a passenger movement of **2.4 million** in **2024**. In Visayas, **Iloilo International Airport** managed to handle 4.8 million passengers, accounting for approximately 71.6% of the total 6.7 million annual passenger traffic in 2024.
2	**Potential SAF volume** When **sourcing feedstock** for processing into SAF, it is ideal to maintain a within a **100-kilometer radius** to **minimize the environmental impact of long-distance transportation** and **enable efficient production of high volumes** of SAF. **Central Luzon** and **Western Visayas** have the **highest SAF potential** within their **respective island groups**, with 0.2 million tonnes and 0.1 million tonnes, respectively, while **Davao** has 0.08 million tonnes. These regions have high feedstock potential in rice residues and MSW.
3	**Infrastructure access** **Robust infrastructure** is crucial for the success of a SAF plant. This infrastructure includes transportation networks, such as roads and ports, which are **essential for the efficient movement of feedstock. Western Visayas** boasts important roads such as the **Iloilo-Capiz Road** and **Bacolod-Silay Access Road**. In **Davao**, major roads like the **Catitipan Airport Road** and **Carlos P. Garcia National Highway** provide access to Davao International Airport.
4	**Industrial land prices** Regions with **favorable land prices** that do not compromise on logistical and operational efficiency offer a **competitive advantage**, ensuring the long-term sustainability and profitability of the SAF plant. For instance, **Central Luzon** has **moderate industrial land prices**, averaging **PHP 3,648.0 per square kilometer**, driven by burgeoning infrastructure and urban development

Technology Strategy

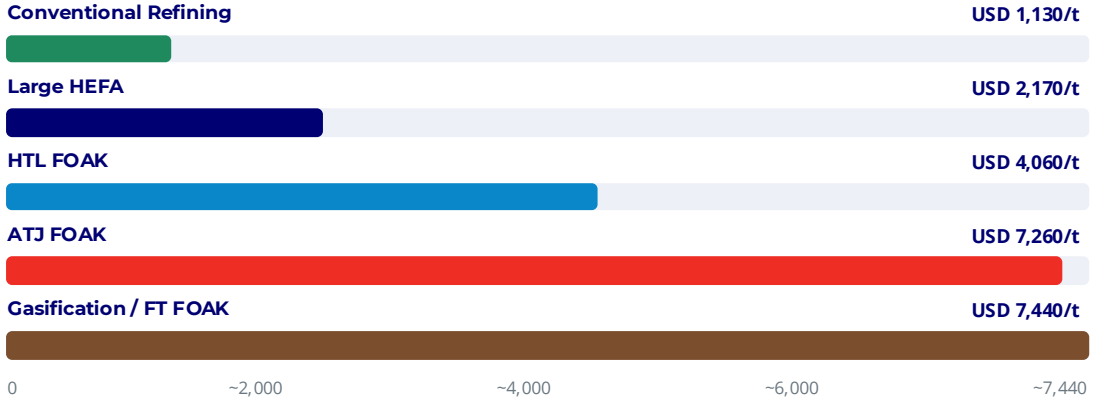
Deploy mature pathways where feedstock permits; partner to commercialize the pathways best suited to the Philippines' largest residue pools.

Pathway Maturity and Feedstock Fit

Pathway	TRL	Feedstock Fit	Key Context
HEFA	Mature	●●●○○	UCO and selected lipids — constrained by availability and competing uses
★ Gasification + FT	TRL 7–8	●●●●●	Best fit for rice, coconut, corn, forestry & waste — pre-commercial at integrated scale
ATJ	TRL 6–7	●●●○○	Via alcohol intermediates — sugarcane/molasses currently fully utilized
HTL	TRL 5–6	●●○○○	Earlier maturity stage; greater development uncertainty

Production Cost Comparison — High-Level Modeled Estimate

All figures are high-level modeled estimates, not guaranteed. USD per tonne of fuel.



- ATJ with refinery integration: approx. 20% lower CAPEX/barrel; approx. 10% lower levelized cost (modeled)
- Scale effect (scenario result only): FOAK 2,000 bpd → NOAK 10,000 bpd approximately halves unit CAPEX for biomass-intensive pathways

● Feedstock fit (filled = strong) ★ Priority pathway for the Philippines

PIONEERING SAF PROJECTS AND PRODUCTION OUTLOOK

SAFAsia Inc.

Power-and-Biomass-to-Liquids

A SAF production facility using the PBtL pathway

24,000 Tons/Year

ALCOM

Alcohol-to-Jet

Utilizing local corn biomass to create ethanol intermediate for convertion to jet fuel

100,000 Tons/Year

CAVITOIL

Municipal Waste

Transforming mixed waste via non-incineration processing into high-density fuel

9,000 Tons/Year

Supply & Demand Dynamics

Without a current domestic mandate, the Philippines immediate production capacity is position for the export market

Export-Ready

CURRENT STRATEGIC POSITIONING

~ 1.7Mt - 2.26Mt

estimated annual SAF production potential

With Policy-induced Demand

Even when the Philippines transition to a domestic-mandated blending regime, we have sufficent supply for both the local and export market

~15 - 17 Kt

estimated local SAF demand with 1% blend

~ 87Kt

estimated local SAF demand with 5% blend

Supply-friendly

with local mandate in place

Partnerships Are the Implementation Mechanism

No single institution or country can independently organize sustainable feedstock, technology, finance, certification, infrastructure, and demand — partnerships are needed



Governments

Policy & Facilitation

- Policy, infrastructure & facilitation
- Standards & risk-sharing

Industry

Supply & Offtake

- Feedstock, conversion & logistics
- Blending & offtake commitments

Academia & Research

Knowledge & Skills

- Feedstock characterization & pilots
- Lifecycle assessment & skills

Financial Institutions

Capital & De-risking

- Development capital, equity & debt
- Guarantees & blended finance

Farmers, Cooperatives & LGUs

Stewardship & Aggregation

- Waste managers & implementation
- Benefit-sharing & aggregation

Philippine Coordinating Institutions:

DOE | NBB | DTI / BOI | DA | DOST | DENR | DOTr | CAAP / CAB | PPP Center | LGUs | Universities | Airlines | Refiners | Waste Firms | Banks | Technology Providers

Five Asia-Pacific Partnership Platforms

Regional cooperation should directly and measurably reduce project-development barriers across the value chain.

01 Biomass Data & Mapping

- Harmonized definitions & competing-use methods
- Geospatial information & logistics data

02 Sustainability & Certification

- CORSIA-aligned systems & traceability
- Lifecycle accounting, mass balance, fraud controls

03 Joint R&D & Demonstration

- Residue densification, MSW prep, gasification, FT
- ATJ, biomethane & carbon-intensity measurement

04 Investment & Project Development

- Connect feedstock owners, developers, technology providers
- Fuel buyers, banks, climate funds & investment-promotion agencies

05 Green Logistics & Bioeconomy Corridors

- Aggregation, ports, storage & certified trade
- Integrated supply-demand corridors across the region

The ASEAN 2050 SAF Outlook recommends consideration of an ASEAN SAF Alliance to coordinate supply, demand, certification, trade frameworks, and policy alignment.

Investment Outlook

Closing the commercialization gap requires coordinated investment across feedstock aggregation, refining technology, blending infrastructure, and demand-side policy signals.

Supply

Feedstock & Aggregation

- Feedstock mapping and collection infrastructure
- Local aggregation hubs and logistics networks
- Sustainability traceability systems

Technology

Refining & Scale-Up

- Near-term: pilot-scale HEFA projects to generate proof points
- FT demonstration plants in biomass-rich clusters
- First-of-a-kind risk sharing to bridge CAPEX gaps
- Technology transfer embedded in project pipelines

Infrastructure

Blending & Logistics

- Pre-treatment and blending facility investment
- Cross-border SAF supply chain connectivity
- Blended finance: equity, debt, and development capital
- Workforce capability and technical training

Policy

Demand Signals & Standards

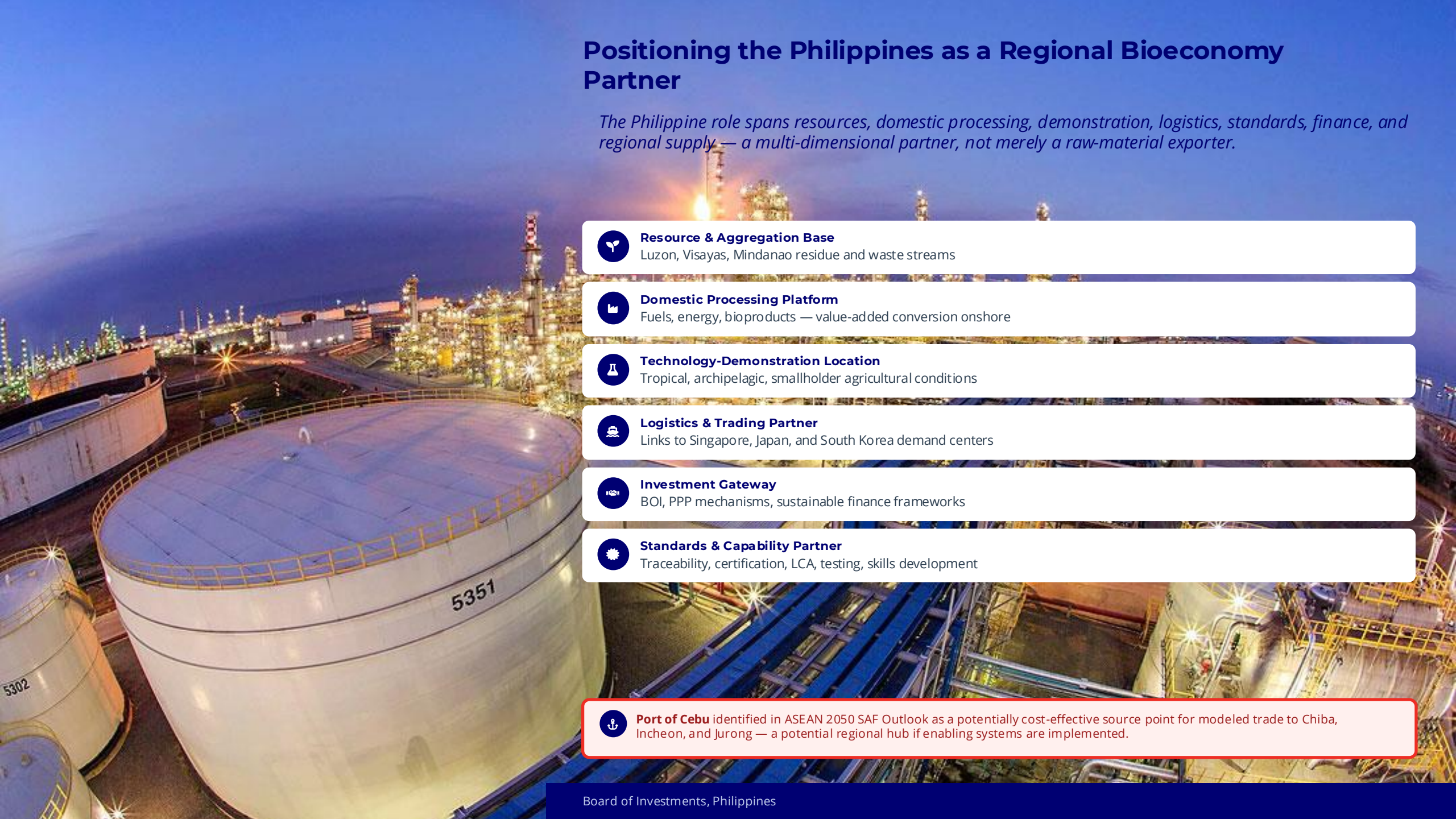
- Long-term airline offtake commitments for bankable cash flows
- Binding blending mandates to anchor domestic demand
- ASEAN SAF Alliance: shared certification framework
- Cross-border project pipelines via regional coordination

Near-term priority: commercial and demo projects matched to locally available feedstocks and technology readiness

Financing structures must combine equity, debt, blended finance, and first-of-a-kind risk sharing to fund local aggregation and processing at scale.

Positioning the Philippines as a Regional Bioeconomy Partner

The Philippine role spans resources, domestic processing, demonstration, logistics, standards, finance, and regional supply — a multi-dimensional partner, not merely a raw-material exporter.



Resource & Aggregation Base
Luzon, Visayas, Mindanao residue and waste streams

Domestic Processing Platform
Fuels, energy, bioproducts — value-added conversion onshore

Technology-Demonstration Location
Tropical, archipelagic, smallholder agricultural conditions

Logistics & Trading Partner
Links to Singapore, Japan, and South Korea demand centers

Investment Gateway
BOI, PPP mechanisms, sustainable finance frameworks

Standards & Capability Partner
Traceability, certification, LCA, testing, skills development

Port of Cebu identified in ASEAN 2050 SAF Outlook as a potentially cost-effective source point for modeled trade to Chiba, Incheon, and Jurong — a potential regional hub if enabling systems are implemented.

Closing Reflections

A Philippine Invitation to Partnership

Partnership determines whether biomass leaves the field as waste, leaves the country as a low-value raw material, or becomes a platform for shared prosperity.

Reflection 01

The Resource Opportunity Is Real

Asia-Pacific holds a diverse and recurring base of agricultural, forestry, industrial, and waste biomass resources — with the Philippines as a natural contributor across multiple feedstock families.

Reflection 02

The Principal Constraint Is Coordination

Collection, logistics, technology, finance, standards, sustainability governance, and demand signals must develop together — no single institution or country can organize this alone.

Reflection 03

The Strongest Regional Model Connects Systems

Sustainable feedstock systems, domestic value-added processing, regional markets, technology partnerships, and shared standards must be linked — not developed in isolation.

The Philippines, through the Board of Investments, invites IEA and regional partners to build these systems together.

Let’s Build the Bioeconomy Together



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