ASEAN Centre for Energy
One Community for Sustainable Energy

ASEAN's Sustainable Transport and Mapping of Potential Biofuels Trade-flow: Findings from the ASEAN Renewable Energy Long-term Roadmap

Presentation by:

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The ASEAN Centre for Energy (ACE) is an intergovernmental organisation to advance the ASEAN energy cooperation under the high-level framework of the ASEAN Community

The purpose of the ASEAN Centre for Energy (ACE) ...

ACE as a **catalyst for economic growth and development** by initiating, coordinating, and facilitating national as well as joint and collective activities on energy

... to be met through our role for the ASEAN Member States ...

Catalyst

To unify and strengthen ASEAN energy cooperation through sharing platform, policy advisory, best practices assessment, and capacity building activities.

Knowledge hub

To provide knowledge repository and services through data management, periodic publication, and work dissemination.

Think tank

To assist AMS in research and practical solutions identification on policies, legal, and regulatory frameworks and innovative technological solutions.

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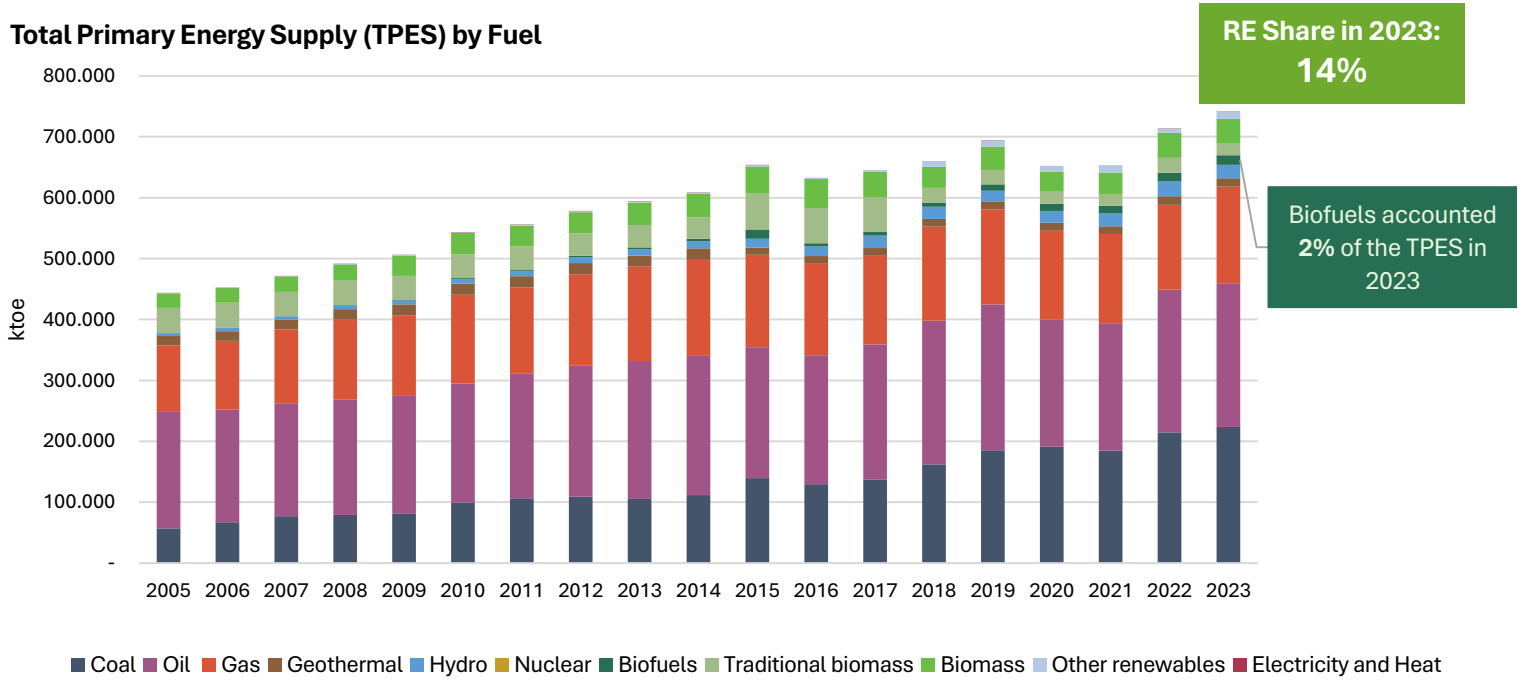
ASEAN Plan of Action for Energy Cooperation (APAEC) and guidance of the ASEAN Member States

ASEAN Energy Landscape and the Latest Development of Biofuels

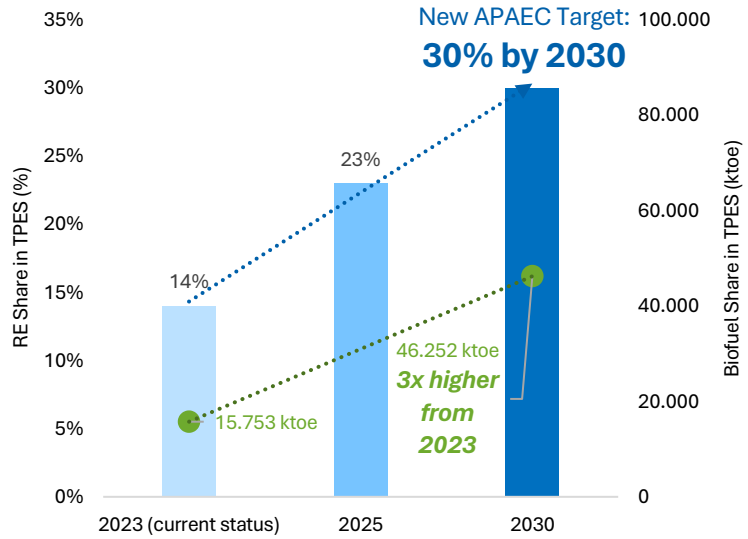
ASEAN Energy Development & APAEC 2026-2030 Vision: progressing toward a 30% RE share will require a threefold increase in biofuel use in TPES.

Status Quo of ASEAN RE Target Achievement from APAEC Phase II (2020-2025)



- Under the ASEAN Plan of Action for Energy Cooperation (APAEC) Phase II (2021–2025), the region targets are 23% of RE Share in TPES and 35% of RE Share in Installed Capacity by 2025.
- RE accounts for **14% of ASEAN's TPES in 2023**, with **biofuels** contributing **around 2%**.

ASEAN Vision in the APAEC 2026-2030



The newly adopted APAEC 2026–2030 raises the bar to target **30% RE share in TPES and 45% in installed capacity by 2030.**

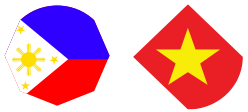
Achieving the 2030 RE vision demands **tripling biofuel use in TPES**, showing the need for **a rapid scale-up in transport** to close the gap.

Overview of the Biofuel Market and Development in ASEAN: categorisation of AMS based on the maturity of their biofuel markets, policy mandates, and industrial capabilities.

Established Leaders

- **Capacity:** Large biodiesel (ID, MY) and ethanol (TH) production.
- **Policies: Strong mandates**—B40 (ID), B20 (MY), E20 (TH).
- **Sustainability:** National schemes like ISPO (ID) and MSPO (MY).

Significant Markets



- **Potential:** Growing transport demand.
- **Challenges:** Low ethanol production; high import reliance.
- **Mandates:** E10 targets under-implemented.

Hubs & Developing Markets

- **Singapore:** No mandate; key hub for logistics, refining, and SAF development.
- **Cambodia, Lao PDR, Myanmar, and Brunei Darussalam:** Emerging markets with minimal mandates, limited capacity, but investment potential.

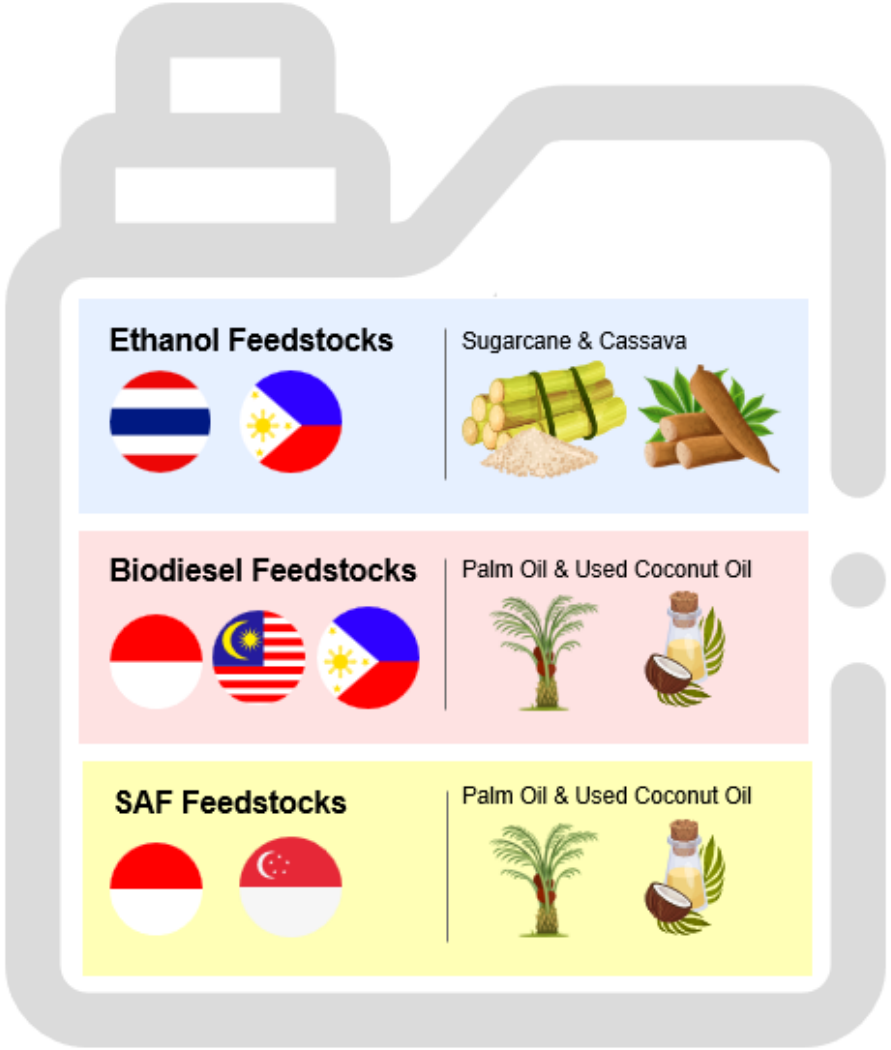
Blending mandates and SAF policies

ASEAN countries have varying biofuel mandates, with Indonesia leading in biodiesel (B40), Thailand in ethanol (E20–E85), while SAF development is emerging in Singapore and Indonesia without formal mandates.

Overview of the Biofuel Market and Development in ASEAN: Feedstock Use in ASEAN Countries

ASEAN biofuel production relies on locally available, agriculture-based feedstocks that vary by country and fuel type

- **Ethanol:** Thailand and the Philippines use sugarcane and cassava; Thailand leads in production, the Philippines relies on imports.
- **Biodiesel:** Indonesia and Malaysia use palm oil; the Philippines uses coconut oil.
- **SAF:** Singapore and Indonesia focus on used cooking oil and palm by-products; still in pilot stage.



Latest Development of SAF in ASEAN: Gap Analysis of SAF Mandates *vs* Planned Production

Country	Demand: SAF Mandates and Policies	Supply: Existing or Planned Refineries for SAF
Indonesia	SAF: Policy (MinTrans Decree 8/2023), **targets 1% (2026/27) to 50% (2060)** using UCO/PFAD/CPO.	Indonesia has **2 planned facilities**, with a combined projected capacity of about **60,418 tonnes per year**.
Thailand	SAF: **1% blend (2026) to 8% (2036)** via AEDP. Feedstock: UCO, molasses-ethanol, future ATJ.	Thailand also has **2 planned plants** with an initial installed capacity of **16,438 litres per day annually.**
Malaysia	SAF: NETR targets **47% blend by 2050**.	Malaysia leads the region with **7 planned facilities**, potentially contributing over **1.3 million tonnes per year**—the highest among ASEAN member states, driven by large-scale investments from Petronas and other players.
Philippines	SAF: DOTr **exploring potential using agri-waste**.	The Philippines has **1 planned facility** expected to produce **91,000 tonnes per year**
Vietnam	SAF: Vietnam Airlines first SAF flight May 2024; agri-waste feedstock potential. **National SAF roadmap early stage**.	Vietnam has **2 planned projects**, although production capacity data is not yet available for either.
Singapore	SAF: SIA targets **5% SAF (2030).**	Singapore is currently the only country with **an operating plant**, with Neste's refinery in Tuas producing **1 million tonnes annually**.
Brunei Darussalam	No specific mandate or policy for SAF	There are no planned plants or refineries as of now
Cambodia		
Lao PDR		
Myanmar		

There are 15 planned SAF plants across ASEAN countries, along with two operating facility in Singapore and Thailand. **To meet future targets while stimulate economic growth, ASEAN will need to significantly enhance its SAF production capacity.** There is considerable potential in activating intraregional trading within SAF supply chains. However, achieving this will **require regional cooperation to facilitate timely exchanges** on technological advancements, policy incentives, regulations, investments, and other relevant areas.

Future Demand of Biofuels: Findings from the ASEAN RE Long-term Roadmap

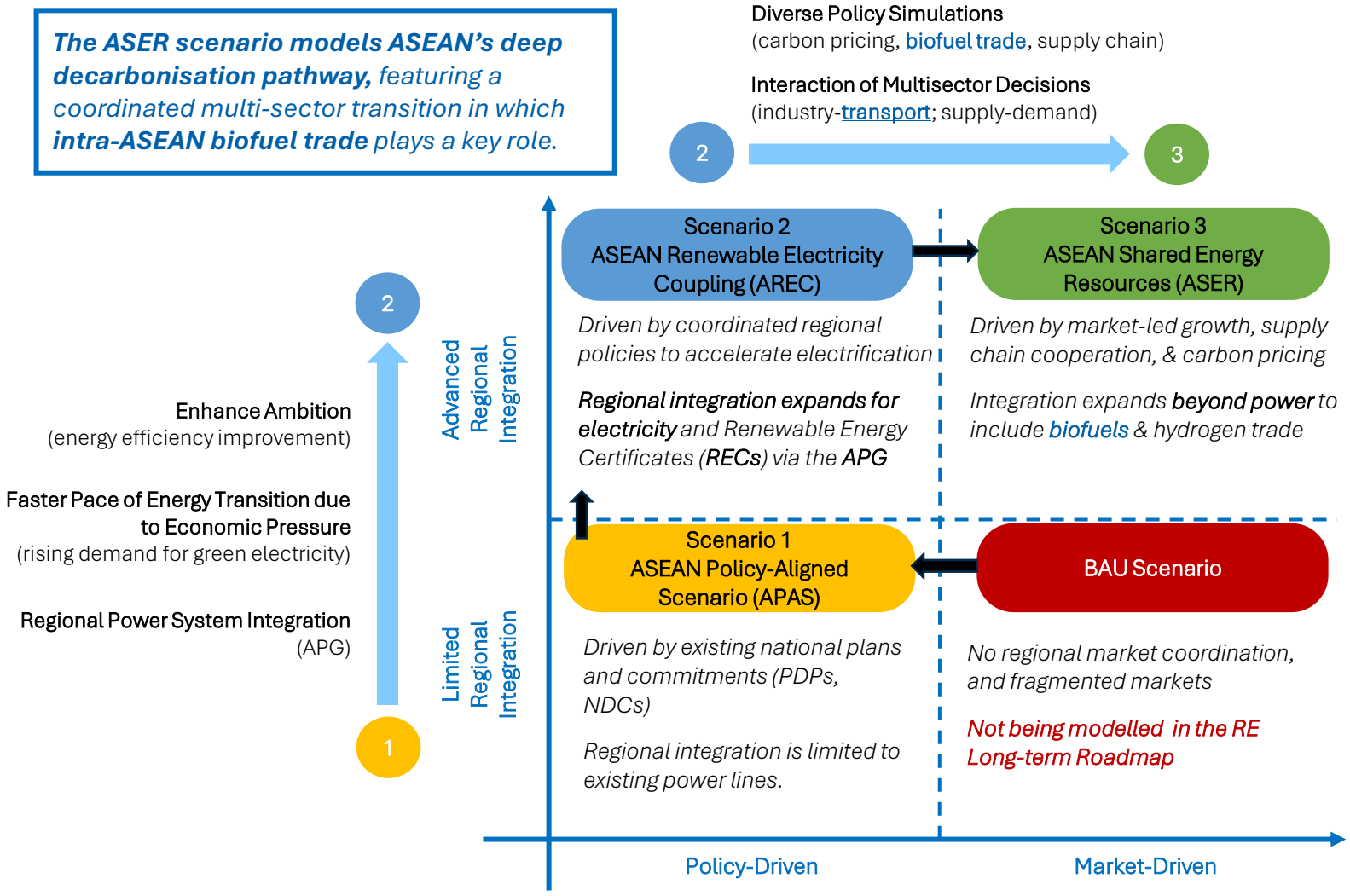
Introduction to the ASEAN RE Long-term Roadmap

The ASEAN RE Long-Term Roadmap is

ASEAN's evidence-based blueprint that translates the region's energy-transition vision under APAEC into clear choices, sequencing and actions.

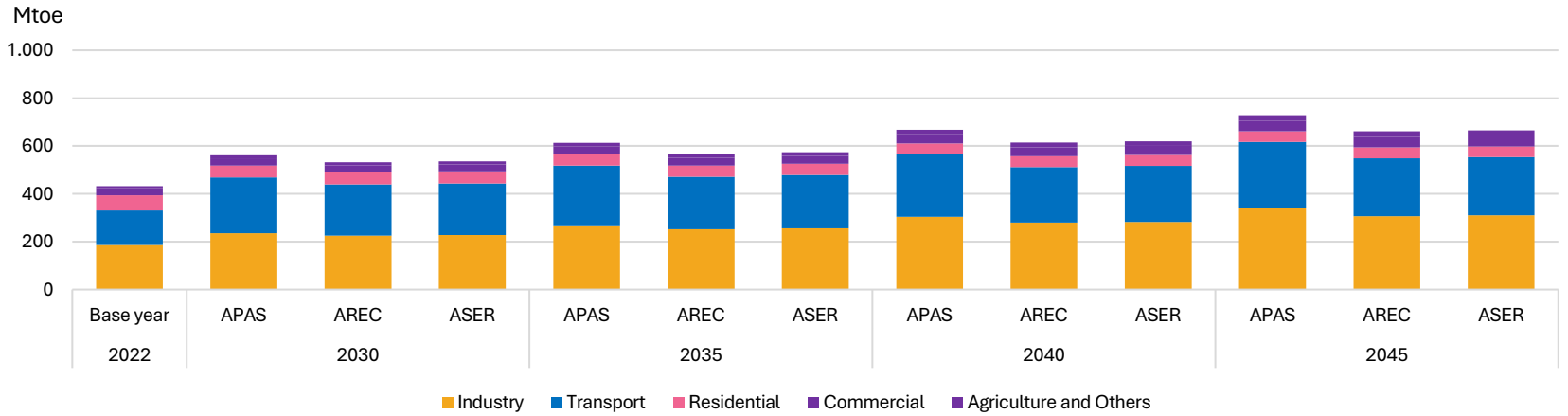
APAEC has adopted the Roadmap's results as its new targets, with the roadmap providing guidance across programme areas to align efforts toward the APAEC targets.

The ASER scenario models ASEAN's deep decarbonisation pathway, *featuring a coordinated multi-sector transition in which* ***intra-ASEAN biofuel trade*** *plays a key role.*



The industry and transport sectors account for the majority of the demand growth, but current decarbonisation options is still limited to curb the energy consumption.

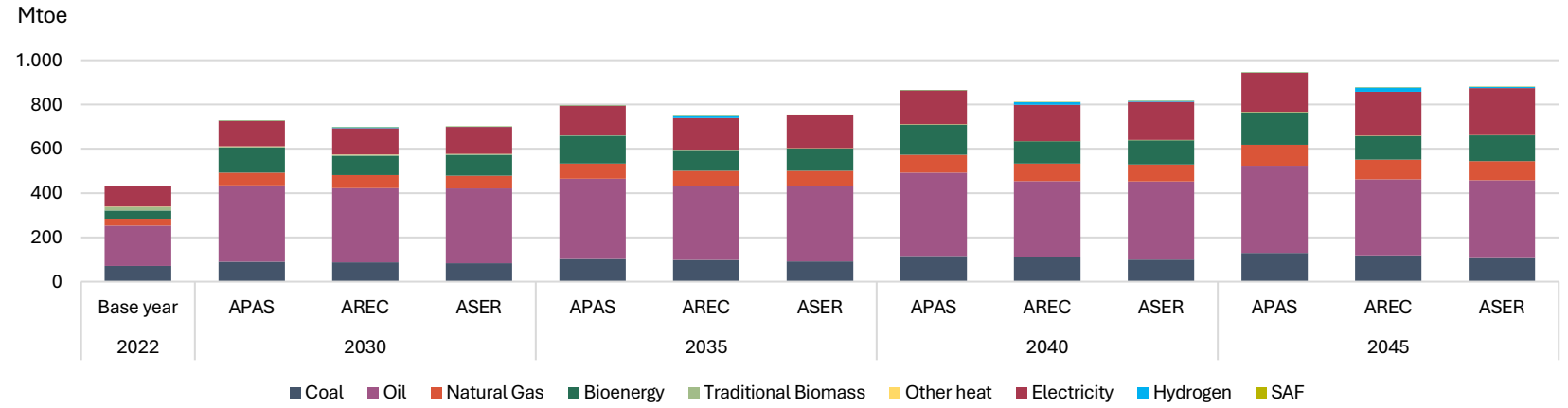
ASEAN TFEC by sector across scenarios (2022-2045)



Rising demand led by industry and transport

- Industry and transport continue to drive ASEAN's total final energy consumption (TFEC) growth across all scenarios.
- Both sectors expand rapidly with economic and mobility growth, reinforcing their position as the core sources of energy demand through 2045.

ASEAN TFEC by fuel across scenarios (2022-2045)

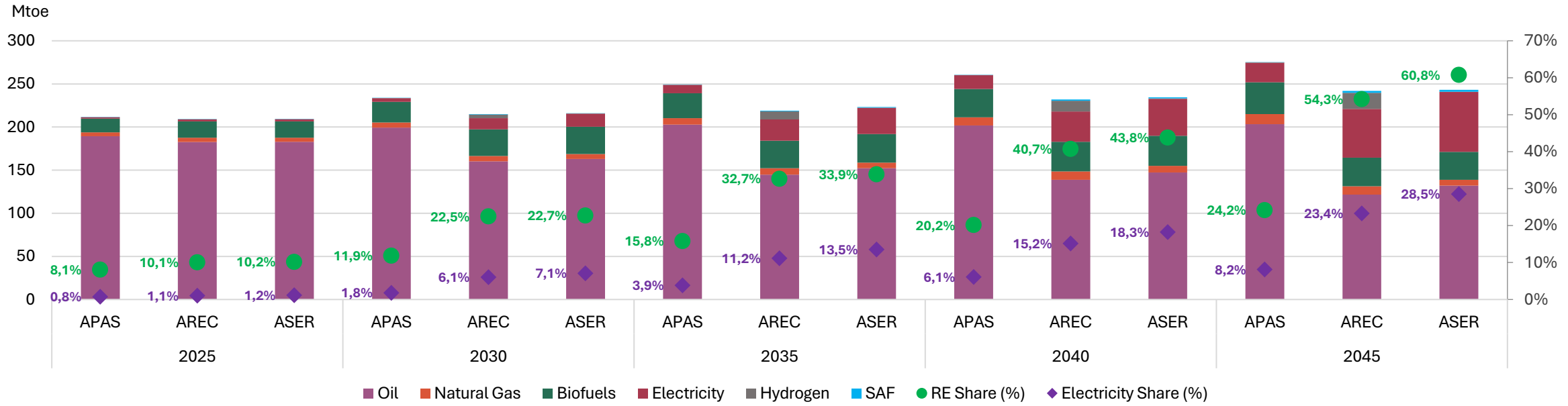


Gradual shift in fuel composition

- Oil remains the dominant fuel in end-use sectors, reflecting slow progress in deep decarbonisation.
- The uptake of electricity, sustainable fuels, and hydrogen rises steadily toward the long term, particularly under the sector-wide decarbonisation pathway (ASER Scenario).

Oil dominance in ASEAN transport weakens after 2035 as electrification and biofuels rise, setting the stage for regional coordination on clean fuel supply.

Transport TFEC by fuel and RE & electricity share across scenarios (2025-2045)



Oil dependence remains high in the near term

- Transport demand stays over 85-90% oil-based through 2030, with only marginal biofuel blending and limited electrification.
- Efficiency gains offset some growth, but deep decarbonisation remains minimal before 2035.

Post-2035 marks structural change

- In AREC and ASER, oil declines as RE share in transport climbs to 54-61% by 2045.
- Growth is led by EV adoption, rising biofuel and SAF use, and shifting hydrogen roles between transport and industry.

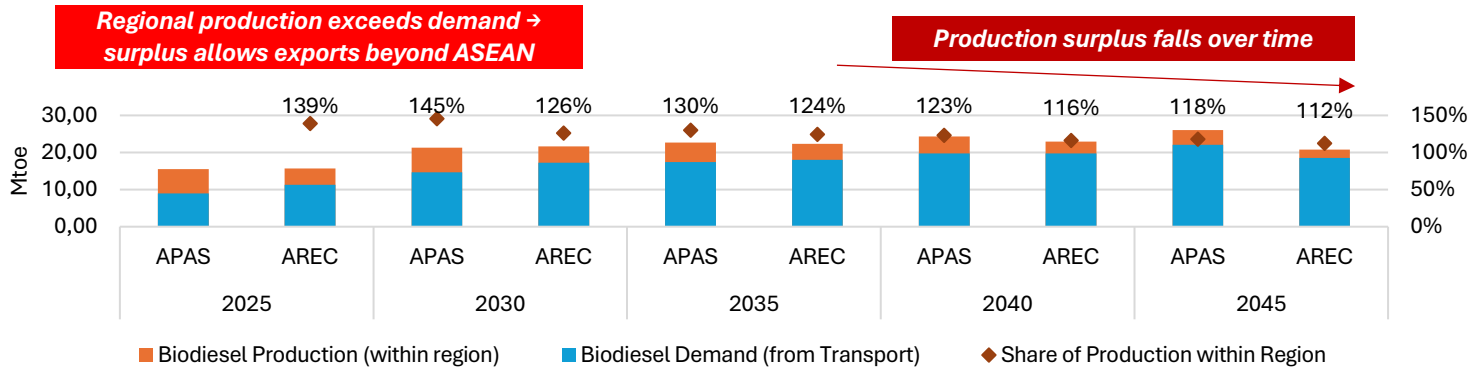
Regional coordination become essential

- The rise of clean fuels calls for aligned regional strategies on biofuel, electricity, and hydrogen supply.
- Integrated planning is needed to prevent fossil rebound and ensure long-term energy security.

Unlocking ASEAN Biofuel Trade: Exploring Potential and Policy Implications

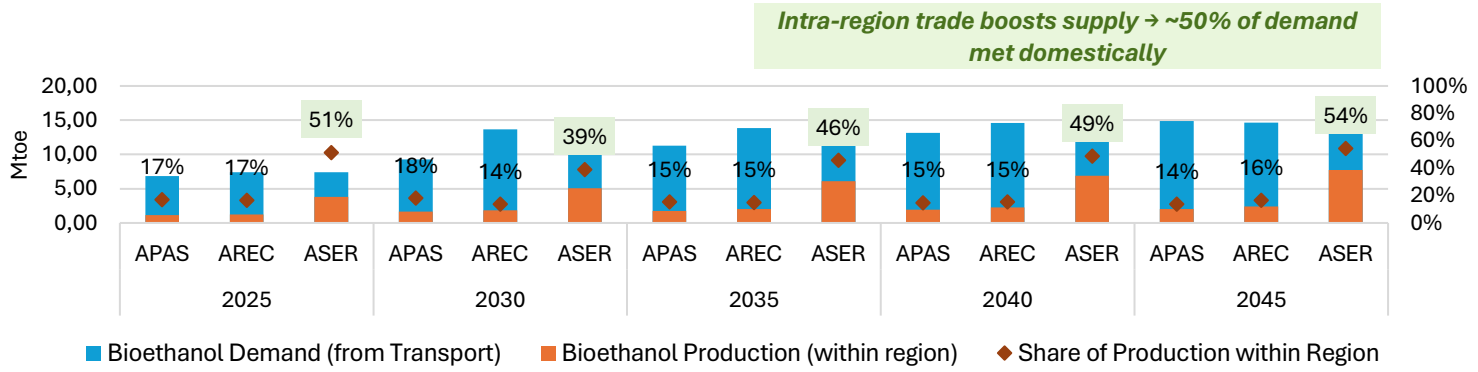
Current production shows contrasting outlooks: biodiesel surplus narrows with demand growth, while intra-region trade significantly improves bioethanol security.

Regional biodiesel production already exceeds demand but surplus tightens over time as domestic use rises.



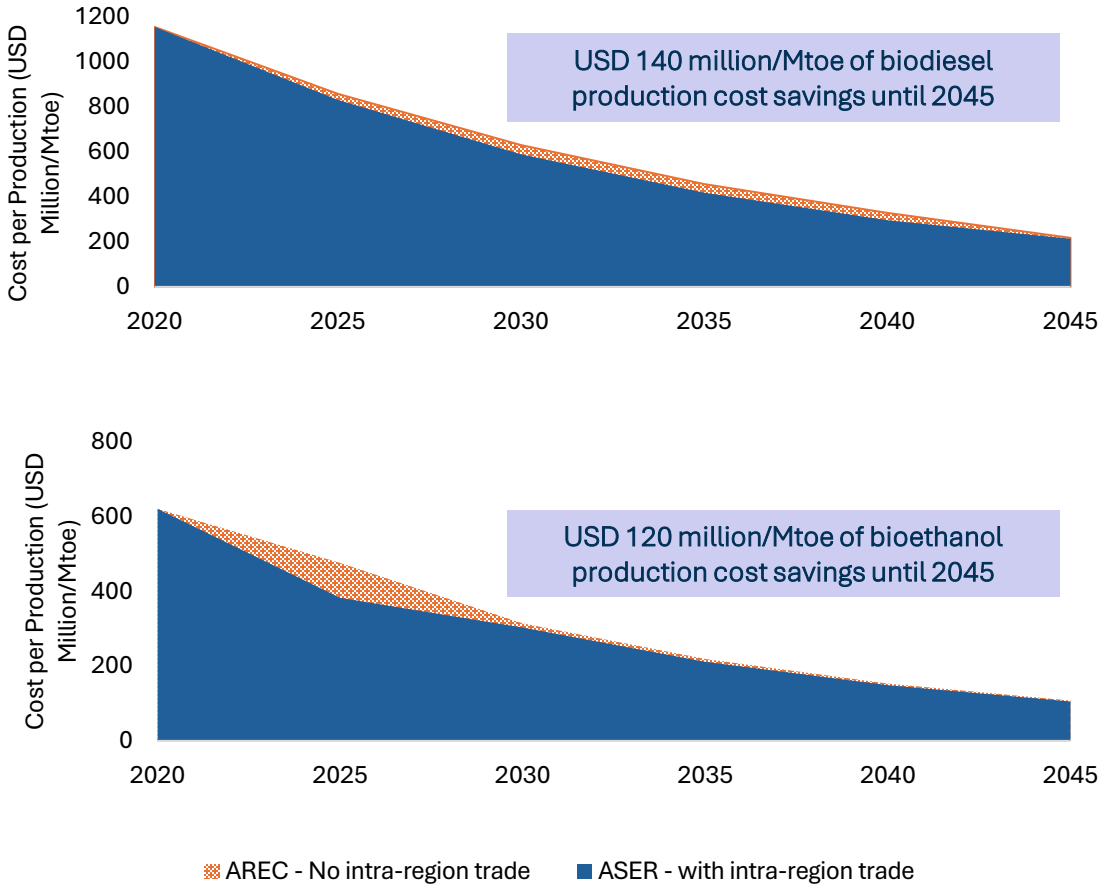
- Current production capacity already exceeds regional demand.
- Surplus allows continued exports beyond ASEAN in the near term.
- In AREC scenario, higher demand reduces the surplus over time due to the increasing demand of biodiesel in the region.

ASEAN's bioethanol supply meets under 20% of demand today, but intra-regional trade could double regional coverage to more than half by 2045.



- Under APAS and AREC, only 10–20% of demand can be met by regional production.
- With ASER (intra-region trade), production capacity is optimised and regional supply covers ~50% of demand by 2045.
- This improves regional resilience and reduces reliance on imports from outside the region.

Why Intra-ASEAN biofuel trade matters: regional cooperation reduces production and import costs, while stimulating investments within the region.



Significant production cost savings:

- By 2045, intra-region trade reduces production costs by **USD 140 million per MTOE for biodiesel** and **USD 120 million per MTOE for bioethanol.**

Reduced reliance on imports:

- ASEAN can **avoid up to USD 305 million annually in import costs** by sourcing more supply within the region.

Strategic implication:

- Intra-ASEAN trade is not just about cost — it's about **energy security, resilience, and regional prosperity.**

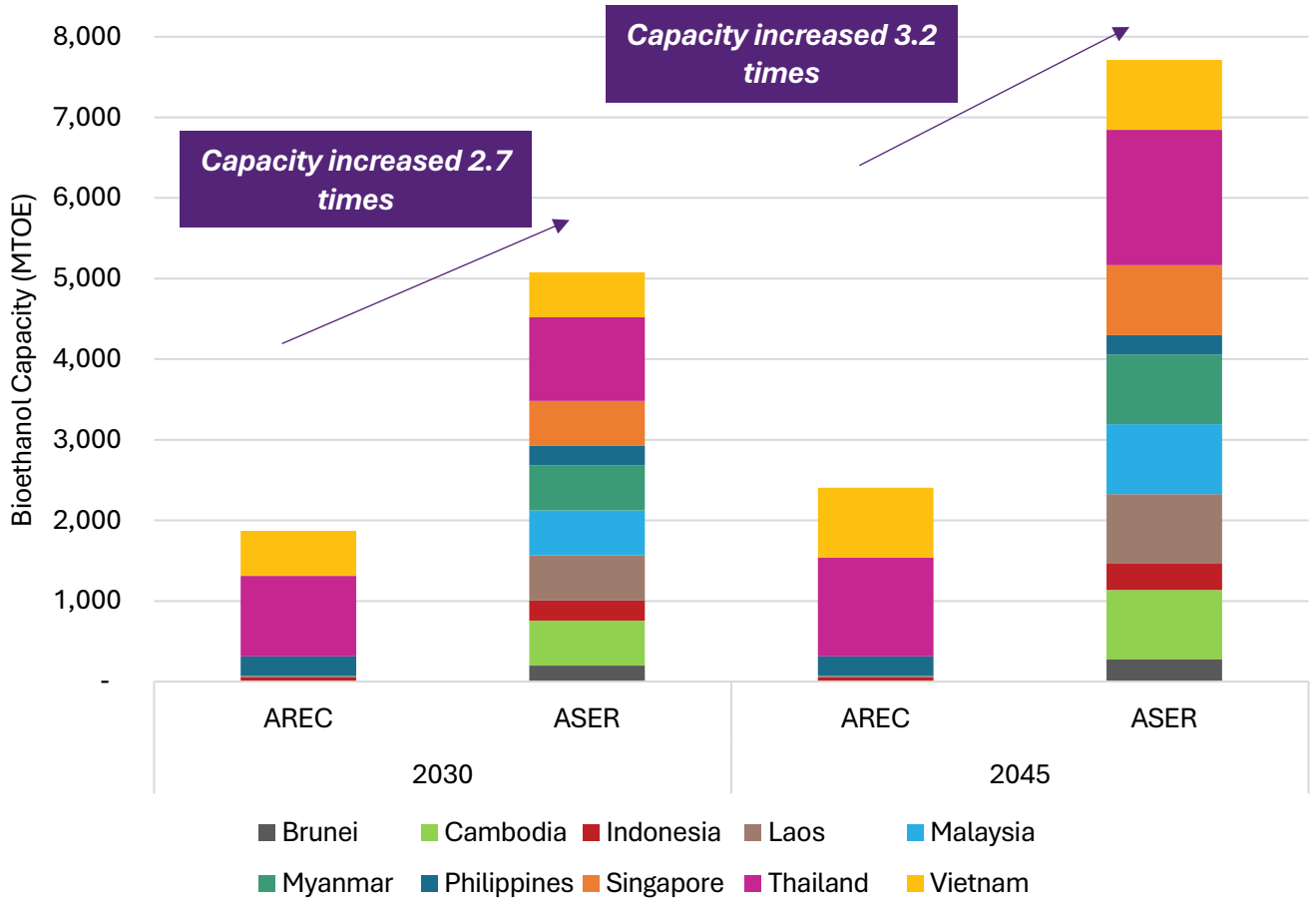
Keeping the Economic Value Within ASEAN

Keeping the biofuel value chain within ASEAN strengthens local industries, attracts new investments, and creates green jobs.

+USD 600 Million Investment Opportunity by 2045

How Intra-ASEAN trade builds new capacity: regional collaboration drives new capacity and redefines ASEAN bioethanol trade dynamics.

Comparison of Bioethanol Capacity in ASER (with Intra-ASEAN Trade) vs. AREC (without Intra-ASEAN Trade)



Expanding Capacity Through Trade

- Intra-ASEAN trade boosts bioethanol capacity to over three times higher by 2045 compared to the no-trade case.
- The optimisation demonstrates how regional coordination can unlock cost-effective opportunities that remain untapped under siloed, country-by-country development.

New producers emerges

- Under the ASER scenario, countries such as Malaysia, Cambodia, and Lao PDR become active bioethanol exporters, even without previous mandates or large domestic demand.
- Their participation diversifies the regional supply base and reduces over-dependence on traditional producers like Thailand and the Philippines.

Linking capacity to feedstock availability

- The trade-enabled growth is supported by efficient feedstock reallocation across borders.
- These dynamics builds an integrated regional bioethanol supply chain, supporting long-term sustainability.

Achieving a functional intra-ASEAN biofuel market depends on tackling persistent gaps in policy alignment, infrastructure, and coordination.

Regulatory and Policy Divergence

- ASEAN Member States have **varied blending mandates, subsidy schemes, and sustainability criteria**, leading to misalignment of regulations.
- **Lack of harmonised standards** hinders cross-border certification and trade of biofuels and feedstocks.

Logistical and Infrastructure Gaps

- **Limited infrastructure for biofuel transport and storage**, especially for inter-island logistics (e.g., in the Philippines).
- Inadequate port facilities and **lack of regional distribution networks** impede efficient trade flows.

Feedstock Challenges

- **Availability is uneven**—some AMS face shortages, others face surpluses.
- **Sustainability concerns and competition with food/feed uses** limit feedstock mobility across borders.
- Cross-border trading could **amplify price swings** and affect local farmers.

Economic and Financial Viability

- **Differences in cost structures**, including production costs, logistics, and import tariffs, **affect trade competitiveness**.
- **Lack of financial incentives and risk-sharing mechanisms** reduces investor interest in cross-border ventures.

Geopolitical and Institutional Factors

- **Weak regional coordination mechanisms** for biofuels.
- **Uncertainty in political will**, trade protectionism, or shifting energy priorities among AMS.

Key Takeaways & Policy Strategies to Unlock Regional Cooperation on Biofuels

Short-Term Measures (Quick Wins ≤2030)

- Harmonise blending and fuel standards
- Regional certification/traceability
- "Green lanes" for cross-border biofuel trade

Long-Term Measures (2030–2040)

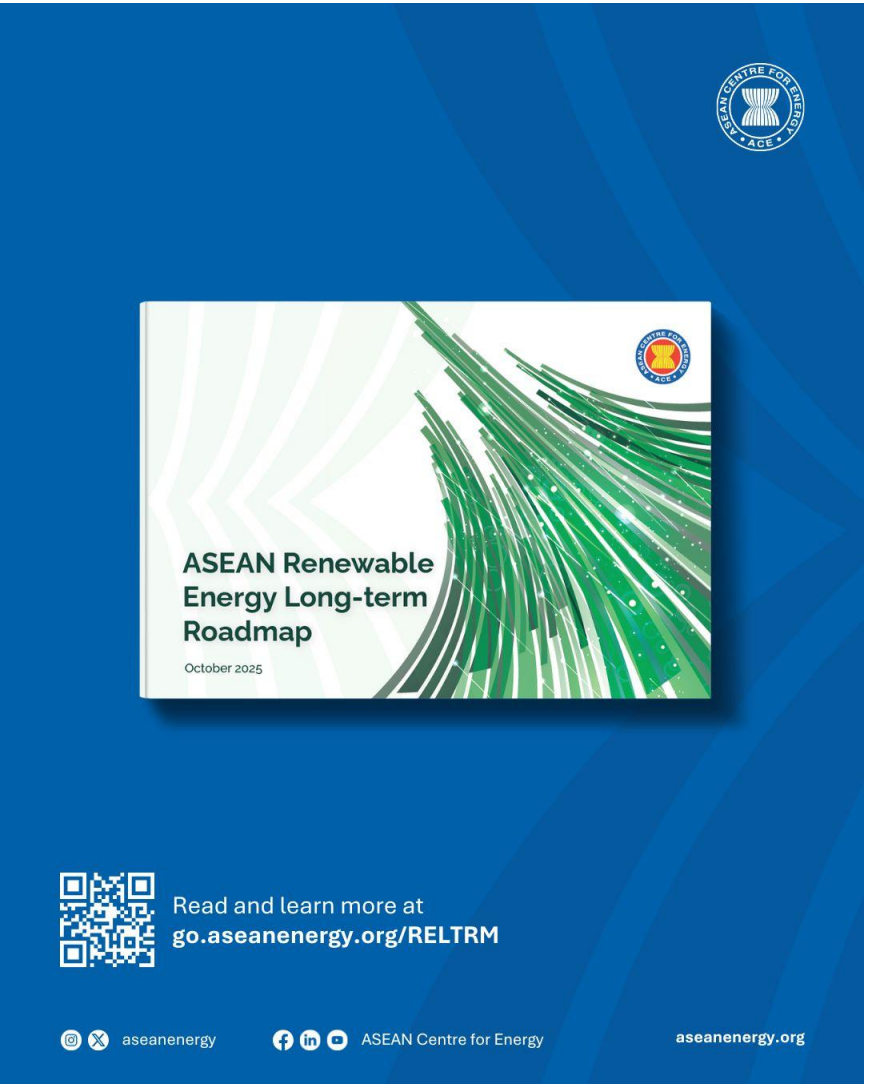
- Regional infrastructure and storage
- Scaled feedstock mobilisation
- Cross-border R&D and technology transfer

Mobilising Private Sector Participation

- Enable bankable projects and de-risking instruments
- Promote investment incentives and bilateral trade agreements
- Strengthen public-private partnerships in logistics, R&D, and pilot plants

Institutional Coordination Mechanism

- ASEAN Biofuel Taskforce under RE-SSN
- ACE as facilitator of regional roadmap and collaboration



The ASEAN Renewable Energy Long-term Roadmap (RE LTRM) has officially been endorsed at the 43rd ASEAN Ministers on Energy Meeting (AMEM) on 16 October 2025 in Kuala Lumpur, Malaysia. To read more, please visit *go.aseanenergy.org/RELTRM*

The Biofuel Market Potential for Regional Cooperation in ASEAN, developed by ACE in collaboration with ERIA, explores how regional cooperation can unlock ASEAN's biofuel market.

The study serves as a key foundation for future initiatives, including the ASEAN RE Long-term Roadmap, and recommends establishing an ASEAN Biofuel Taskforce to harmonise standards and create a shared sustainability certification framework.

Read more through:
https://www.eria.org/research/biofuel-market-potential-for-regional-cooperation-in-asean

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