

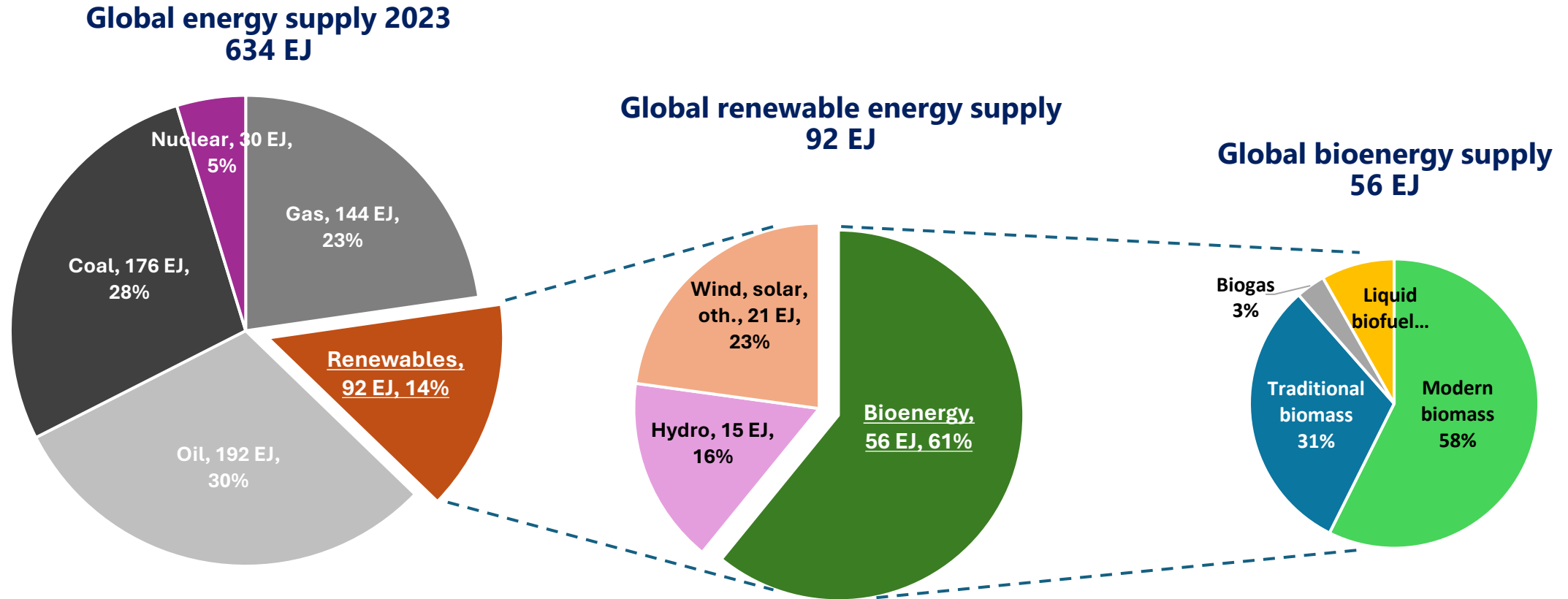
APEC Bioenergy Outlook

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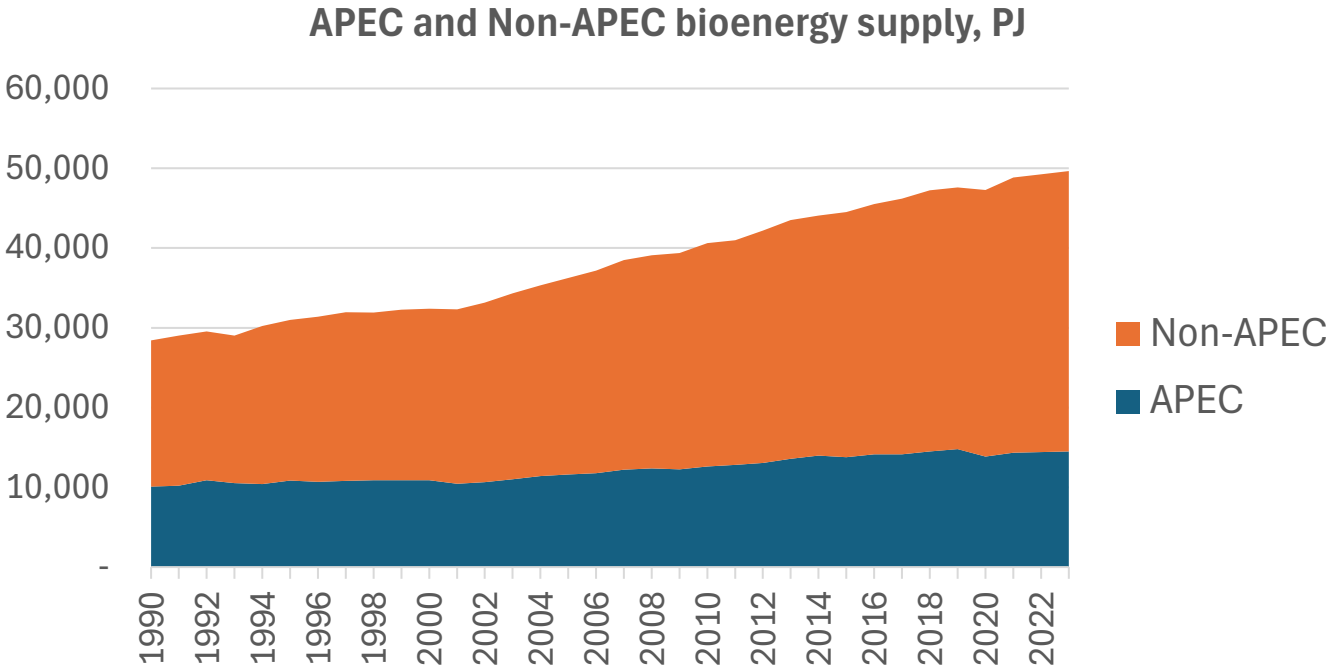
Bioenergy is the Cornerstone of the Global Renewable Mix



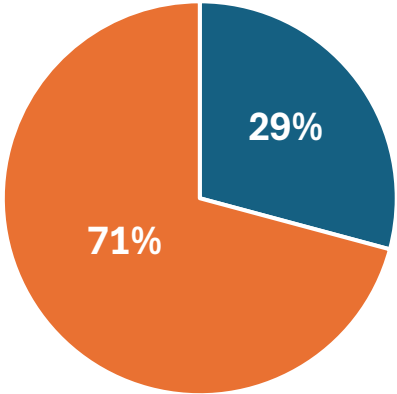
Source: EI, IEA, World Bioenergy Assoc.

- As of 2023, bioenergy accounted for 61% of global renewable primary energy supply.
- Biomass dominates in bioenergy supply, driven by uses in industry and power sectors (modern biomass), and building & household (traditional biomass).
- Liquid biofuels, while currently a small share, show robust growth potential.

Non-APEC Leads in the Supply of Global Bioenergy



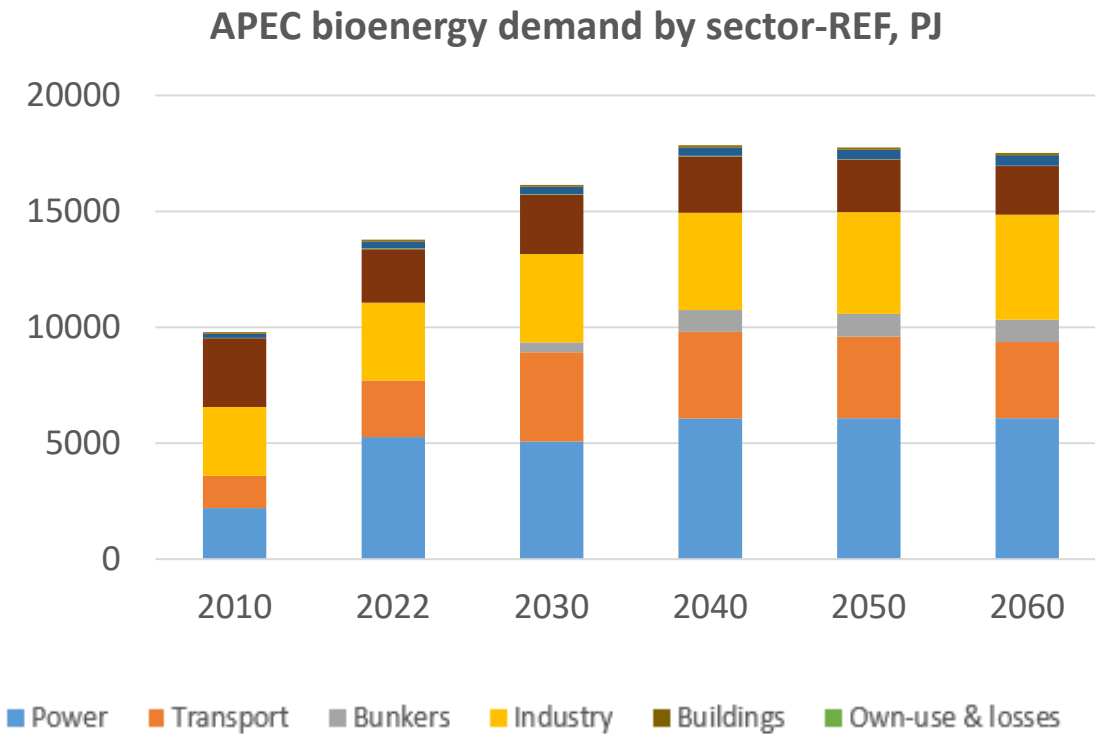
2022 Bioenergy supply share, %



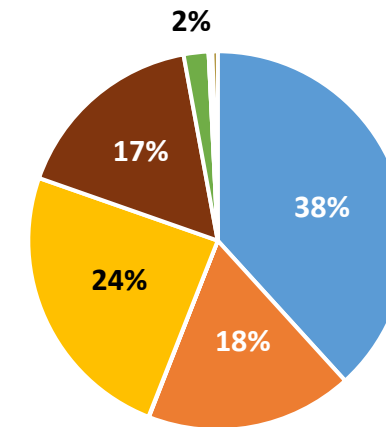
Source: Food and Agriculture Organization (FAO), 2023

- Bioenergy supply in APEC accounted for less than one-third of global supply in 2022.
- Non-APEC’s major contributing economies include Brazil, India, and economies in the Africa.

APEC Bioenergy Demand Projections to 2060*



2022 APEC bioenergy demand mix, %

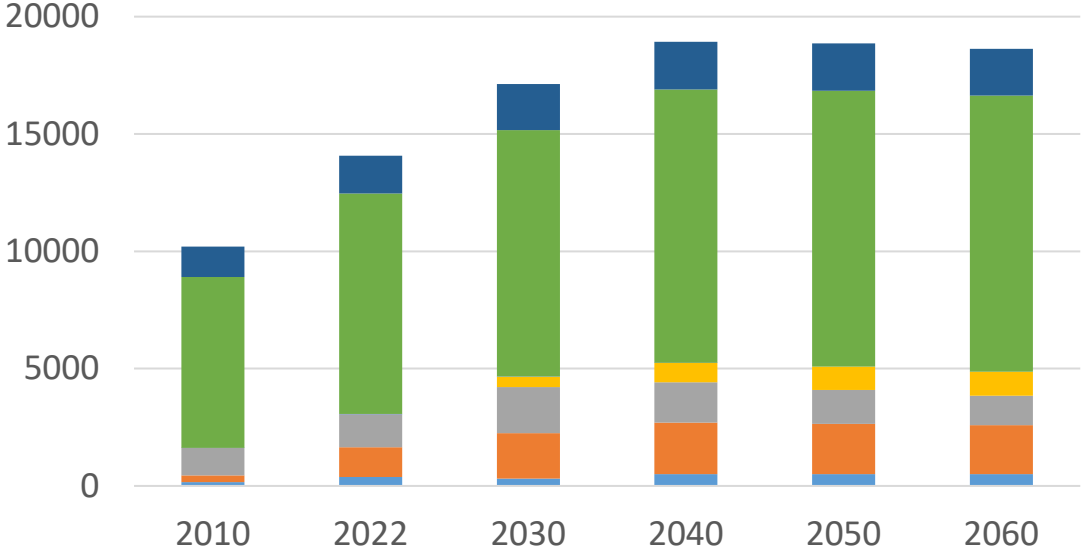


Source: * APEC Energy Demand and Supply Outlook, 9th Edition, 2025.

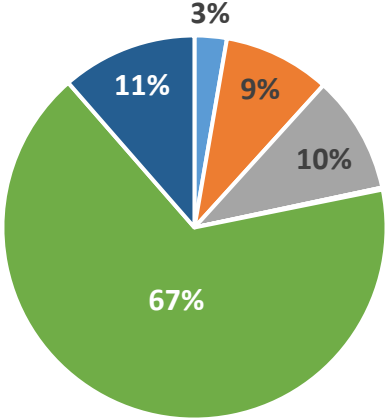
- Demand is projected to **peak in 2040** in the reference scenario (REF), followed by a marginal decline.
- Growth is driven by the power and transport sectors, both accounting for more than 50% in 2022.
- Industrial demand remains significant but stable, while residential building demand continues to shrink.

Biomass Dominance and Biofuel Growth in APEC Supply

APEC bioenergy supply by fuel-REF, PJ



2022 APEC bioenergy supply mix, %

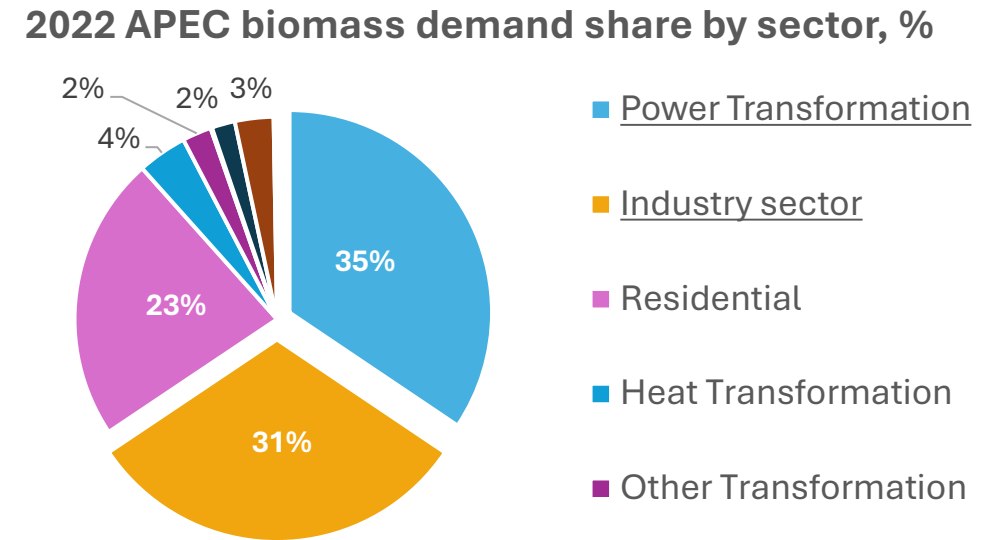
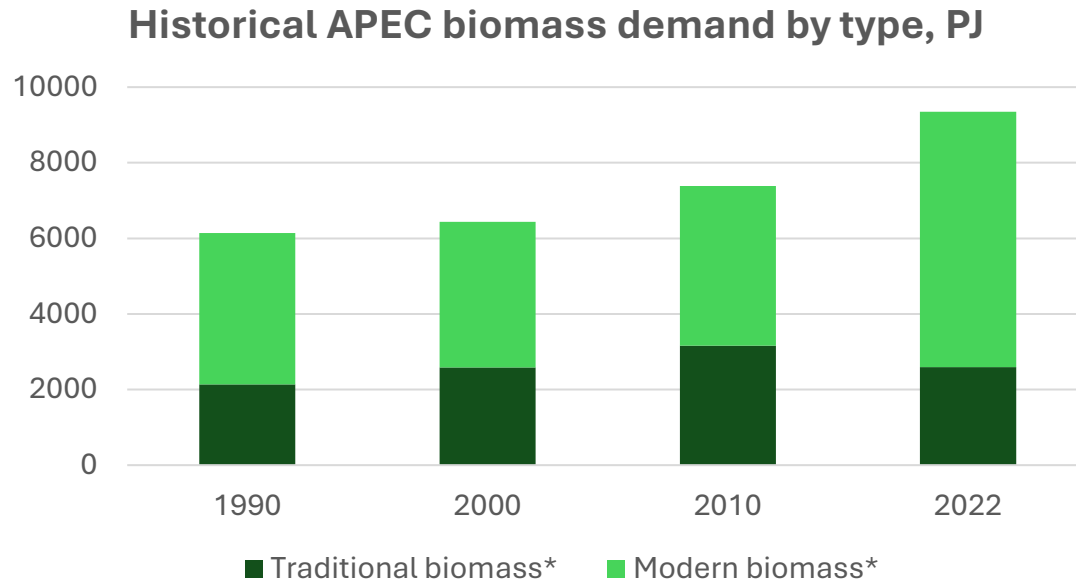


■ Biogas ■ Biodiesel ■ Biogasoline ■ Biojet kerosene ■ Nonspecified liquid biofuels ■ Biomass ■ Waste & nonspecified bioenergy

* Source: APEC Energy Demand and Supply Outlook, 9th Edition, 2025.

- **Biomass** remains the cornerstone of supply in the power, industry, and building sectors in APEC.
- **Biodiesel** is emerging as an alternative for freight transport, with Southeast Asia as the leading producer.
- **Biogasoline** is expected to decline as the transport sector shifts toward Electric Vehicles (EVs).
- **Biojet kerosene** is poised for strong growth for sustainable aviation fuels (SAF), with the US leading production.

Shift in APEC Biomass Utilization: Rising Modern Biomass vs. Declining Traditional Uses*

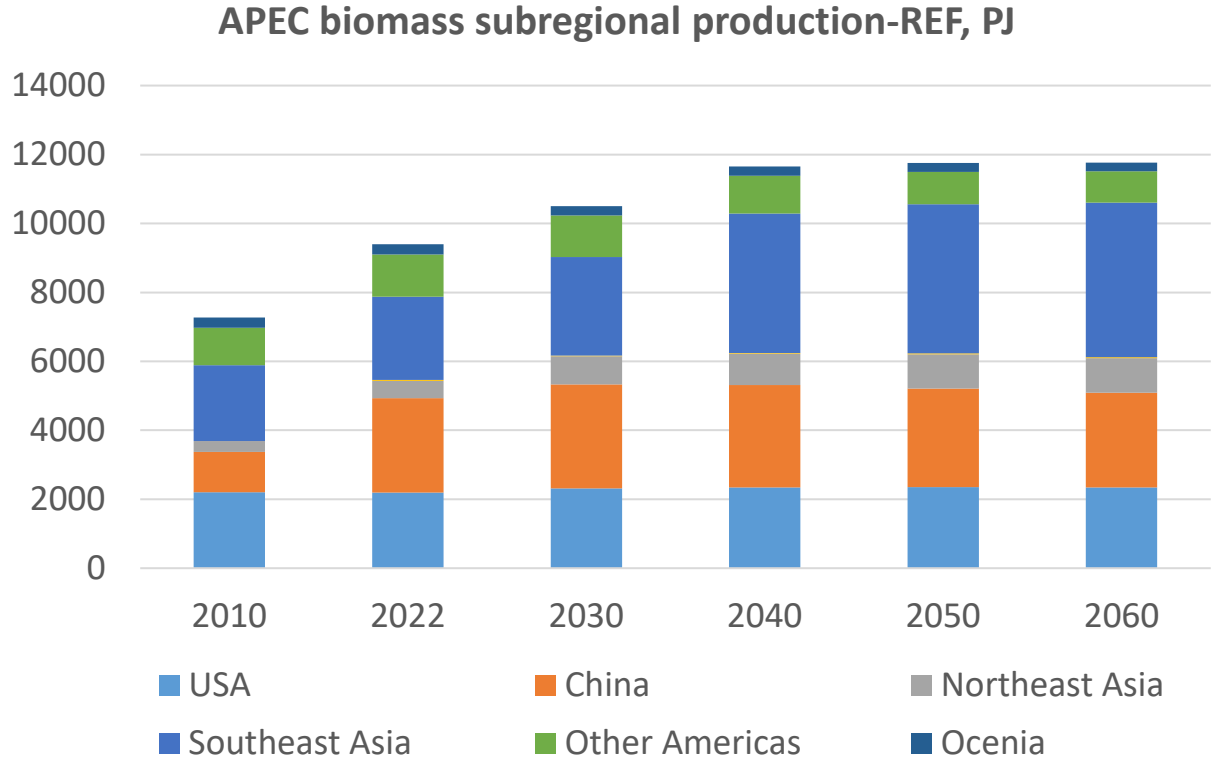


Source: APEC statistics (EGEDA)

- **Modern biomass** has been the primary engine for biomass demand growth over the last 20 years, driven by the industry and power sectors.
- Growth in LPG and electrification for heating and cooking is replacing **traditional biomass** with cleaner, more efficient alternatives.

* **Notes:** Traditional biomass refers to biomass energy used in residential, commercial and agriculture sectors. Modern biomass refers to biomass energy used in industry and electricity/heat generation.

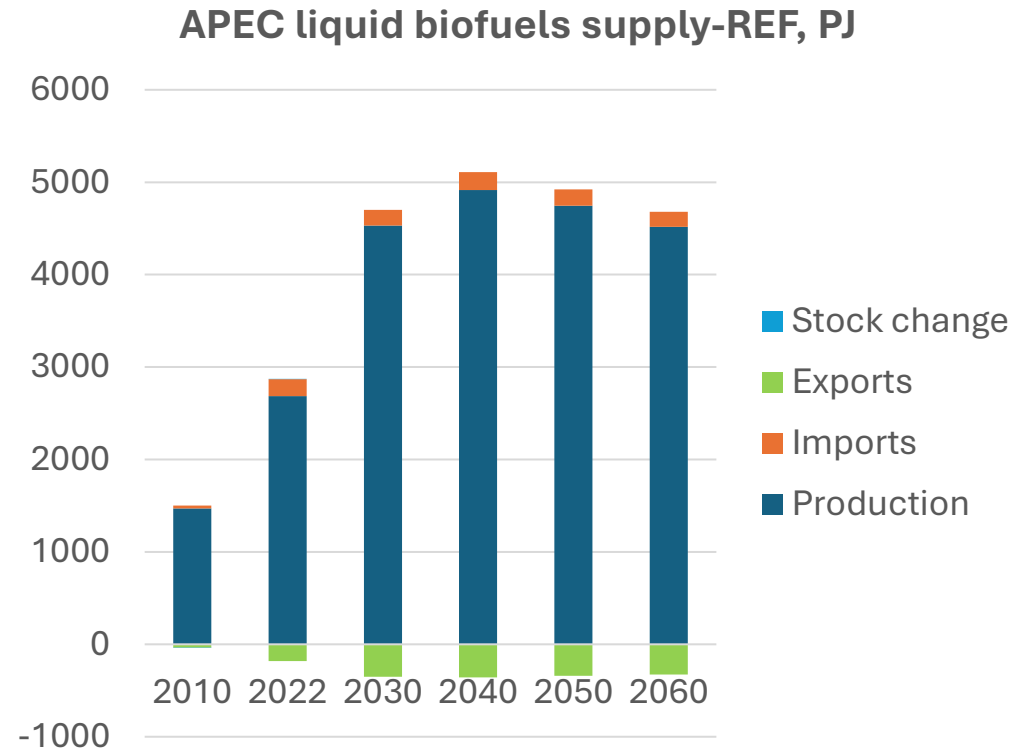
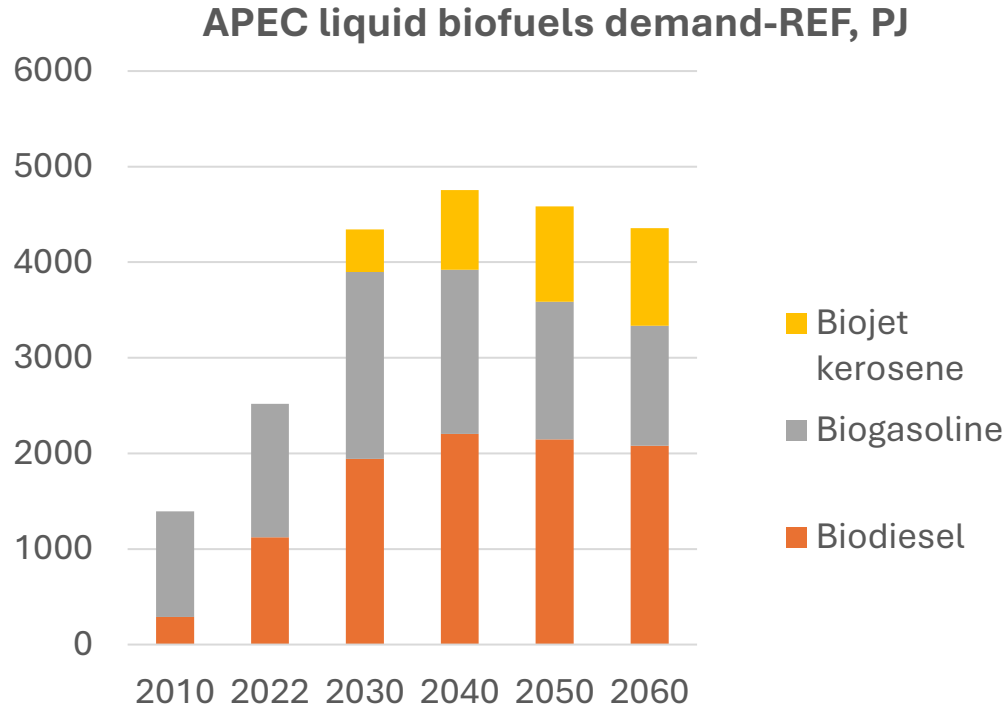
APEC Regional Biomass Production Outlook



Source: APEC Energy Demand and Supply Outlook, 9th Edition, 2025 (excluding Russia).

- APEC biomass demand is effectively met through regional production.
- Output is concentrated in **US, China, and Southeast Asia subregions**, leveraging vast agricultural feedstocks and residuals for large-scale production.

APEC Liquid Biofuels Demand and Supply Outlook

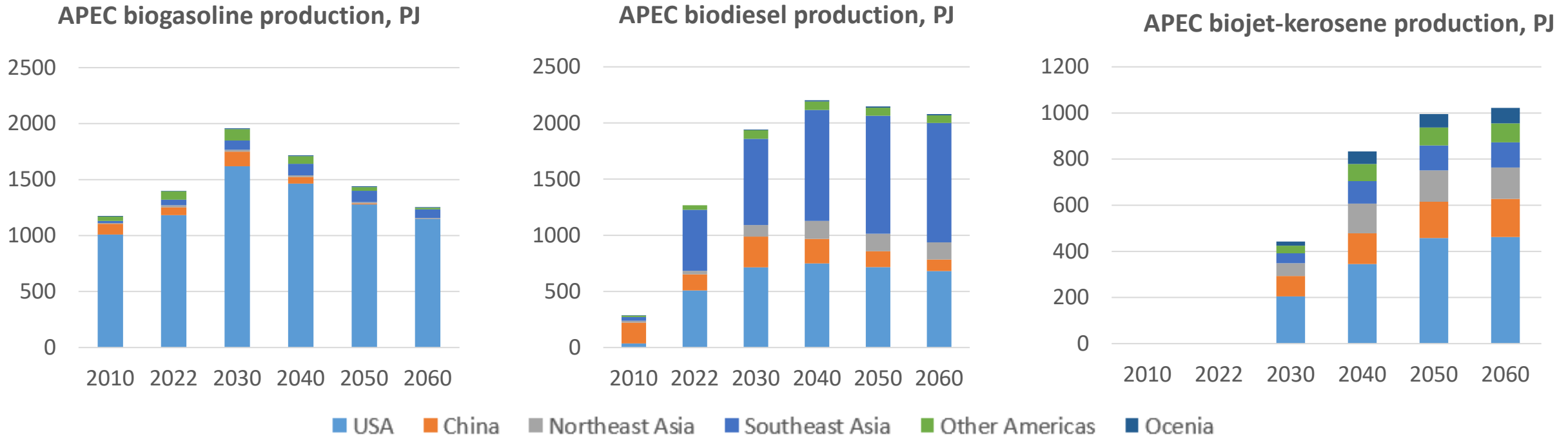


* Source: APEC Energy Demand and Supply Outlook, 9th Edition, 2025.

* Source: APEC Energy Demand and Supply Outlook, 9th Edition, 2025.

- Biofuel demand is projected to peak in 2040, followed by a decline due to the shifts toward EVs.
- APEC is largely self-reliant in liquid biofuels supply, despite the evolving product-mix profile.
- Economies must actively optimize feedstock supplies to align with shifting demand trends.

APEC Regional Biofuels Production Outlook



* Source: APEC Energy Demand and Supply Outlook, 9th Edition, 2025.

- **US:** Leads in biogasoline and biojet kerosene production.
- **Southeast Asia:** Leading producer of biodiesel. Requires focused management of feedstocks and land-use sustainability.
- **Infrastructure:** US and Northeast Asia are increasingly re-purposing conventional oil refineries for hydrotreated vegetable oils (HVO) and biojet kerosene production for sustainable aviation fuels (SAF).

Key Takeaways

- **Pivotal Role of Bioenergy:** Bioenergy remains a cornerstone of the global renewable energy mix, currently providing 61% of the renewable primary energy supply, with a steady shift from traditional to modern industrial applications.
- **Peak Demand and Sectoral Growth:** APEC bioenergy demand is projected to peak by 2040, driven primarily by the power and transport sectors, with emerging needs in marine and aviation bunkers.
- **Regional Self-Reliance:** The APEC region is effectively self-reliant in meeting biomass and liquid biofuel demands through aggregated regional production, particularly from the US, Southeast Asia, and China.
- **Strategic Feedstock Management:** As the product mix evolves—with biodiesel and biojet kerosene showing strong growth—economies must prioritize the strategic management of feedstocks and agricultural residuals to ensure supply security, as well as the land-use sustainability.
- **Infrastructure Transition:** Leading sub-regions like the US and Northeast Asia are increasingly re-purposing conventional oil refineries toward advanced biofuel production capacity.
- **Roles of biofuels on supply security:** APEC and non-APEC biofuels producing economies are implementing accelerated blending mandates in response to the recent supply tension in the Middle East.

Thank you.

