GLOBAL BIOFUELS ALLIANCE

KNOWLEDGE WEBINAR SERIES

BIODIESEL WEBINAR

Driving a Greener Tomorrow

IN COLLABORATION WITH

CPOPC | IEA Bioenergy Technology Collaboration Programme | IFGE Indian Federation of Green Energy

25 September 2025, Thursday



Izzana Salleh

Secretary General
Council of Palm Oil Producing Countries (CPOPC)



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Professor of Chemical Engineering



Eric van den Heuvel

Technical Coordinator
IEA Bioenergy TCP



Sandeep Chaturvedi

Chairman and Founder
The Biodiesel Association of India (BDAI)

KEY TOPICS

- Biodiesel Blending Legislations Across Countries
- Innovations and Scientific Advancements in Biodiesel Production
- Market insights and success stories on Biodiesel

IEA Bioenergy
Technology Collaboration Programme



Key findings on Biofuels in Emerging Markets

Eric van den Heuvel, Technical Coordinator
IEA Bioenergy TCP

[on behalf of Glaucia Mendes Souza – Task leader
IEA Bioenergy Task 39: Biofuels to Decarbonize transport]

GBA Webinar Series| Biodiesel | 25 September 2025

The IEA Bioenergy Technology Collaboration Programme (TCP) is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous.
Views, findings and publications of the IEA Bioenergy TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

IEA Bioenergy TCP - overview

Goal:

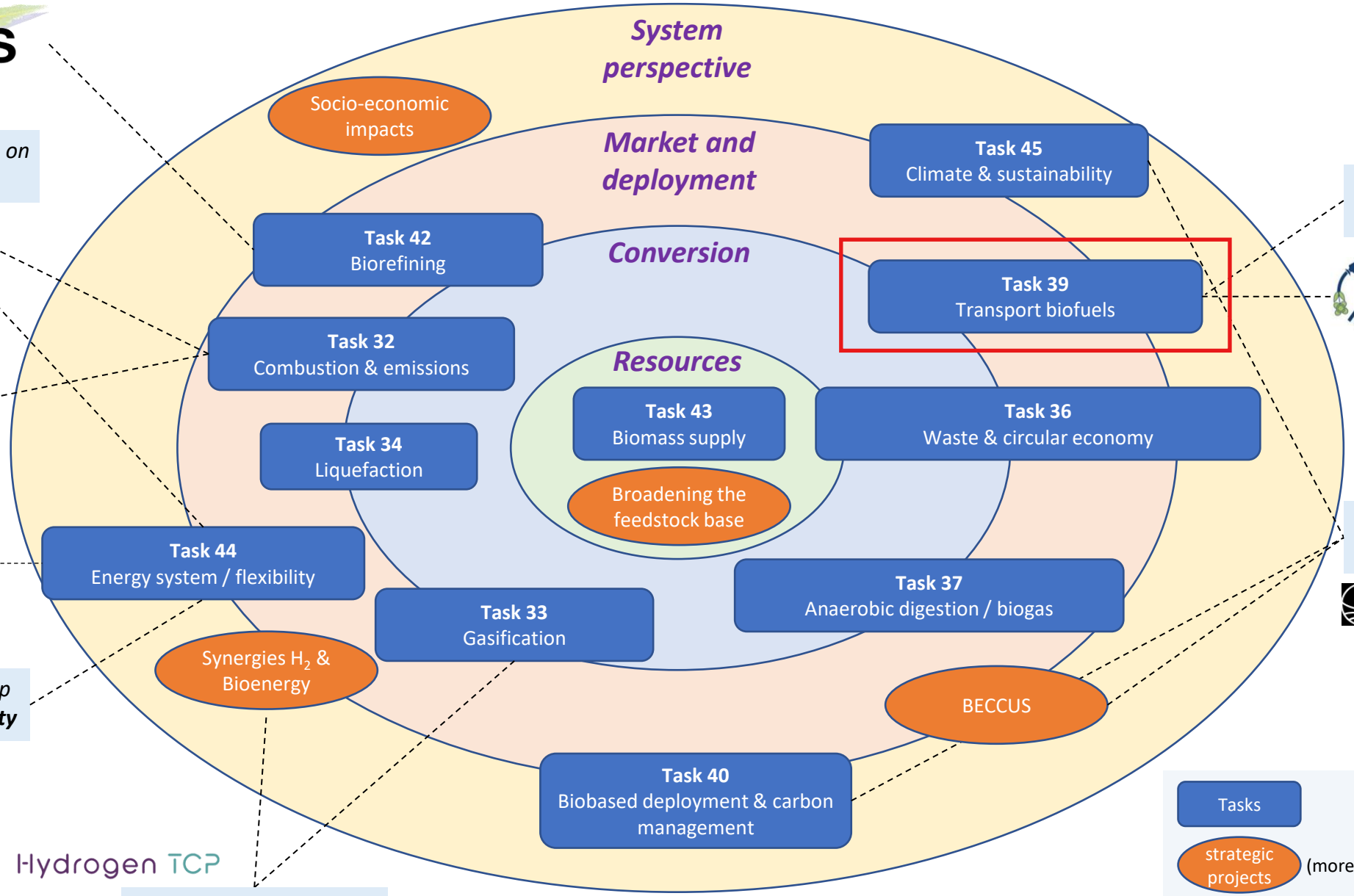
- Multilateral collaboration and info exchange on bioenergy research, technology development, demonstration, markets, and policy analysis
- Facilitate the commercialization and market deployment of sustainable bioenergy systems = climate positive, environmentally sound, socially acceptable and cost-competitive (incl. external costs

Mission:

- To increase knowledge and understanding of bioenergy systems to facilitate the commercialization and market deployment of sustainable bioenergy systems and technologies, and to advise policy and industrial decision makers.



IEA Bioenergy TCP - overview of all activities



TCP Coordination Group on ***Thermal Networks***

IEA DHC

INTERNATIONAL CENTRE FOR SUSTAINABLE CARBON

etsap

TCP Coordination Group ***Energy System Flexibility***

TCP ***Transport*** *Coordination Group*

IEA-AMF Technology Collaboration Programme on Advanced Motor Fuels

TCP Coordination Group on ***Carbon Management***

IEAGHG

Hydrogen TCP

TCP Coordination Group on ***Hydrogen***

IEA Bioenergy

Tasks

strategic projects (more Tasks/TCPs involved)

Link with other TCPs & TCP Coordination Groups



Technology Collaboration Programme
by IEA

Task 39: Biofuels to decarbonize transport

https://demoplants.best-research.eu

How to cite this database:
"IEA Bioenergy Task 39 Biofuels to decarbonize transport: Database on facilities for the production of advanced liquid and gaseous biofuels for transport"

Explanations and definitions

To add your project please contact Andrea Sonnleitner.

Links to other databases

IEA Bioenergy Database
Biomass conversion facilities

Task 32 Database
Biomass Cofiring initiatives

Task 33 Database
Gasification of Biomass and Waste

Task 34 Database
Pyrolysis Demoplants

Publication based on database "Development and Deployment of advanced biofuel demonstration facilities IEA Bioenergy: Task 39, December 2024"

PDF

Filter Projects

Projects

Search Owner/Name/Input | Submit

Owner	Name	Location	
Aarhus University	Center for Biorefining Technologies	Denmark	Info
Acelen	Acelen Bahia	Brazil	Info
Advanced Bioenergy Lab eGen	Reallabor ABL	Austria	Info
Advanced Biofuels Solutions Ltd	Swindon Advanced Biofuels Plant	United Kingdom	Info
Aemetis	Aemetis Carbon Zero 1	United States	Info
ALTACA ENERGY	ALTACA ENERGY	Turkey	Info
Anhui BBCA Biochemical	BBCA	China	Info
Anhui Guozhen Group and Chemtex Chemical Engineering	Fuyang project	China	Info
Arbios Biotech (Joint Venture of Licella and Canfor)	CS-1 Facility	Australia	Info
Arbios Biotech (JV Canfor Licella)	Chuntoh Ghuna Low-carbon Biofuel Plant	Canada	Info
ArcelorMittal	Ghent Steelanol	Belgium	Info

Map



merging

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and Jet

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e Utilization &

IEA Bioenergy
Technology Collaboration Programme

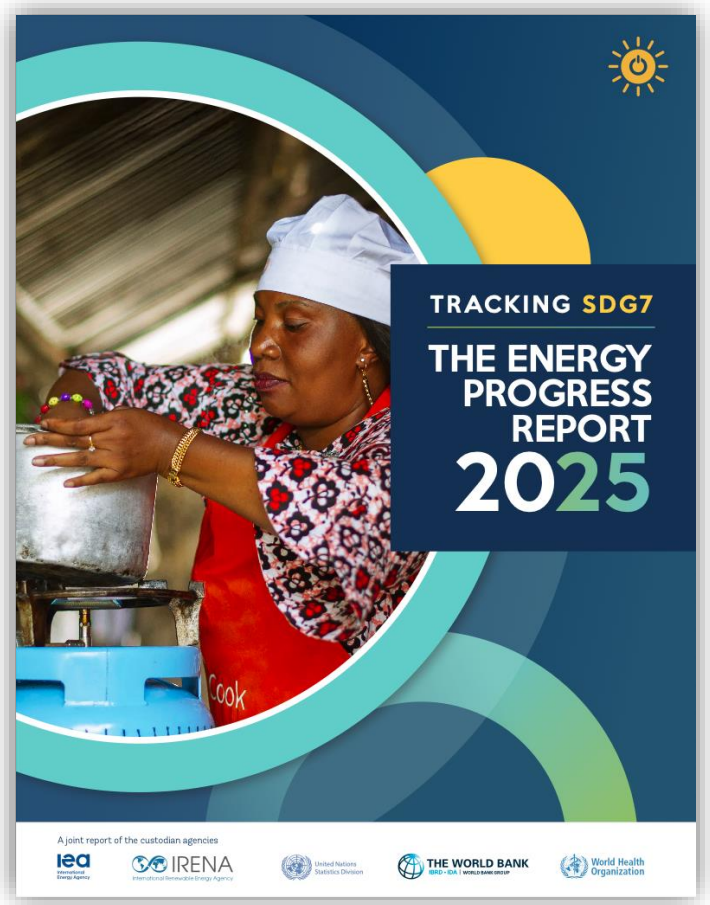
Task 39
Biofuels to Decarbonize Transport

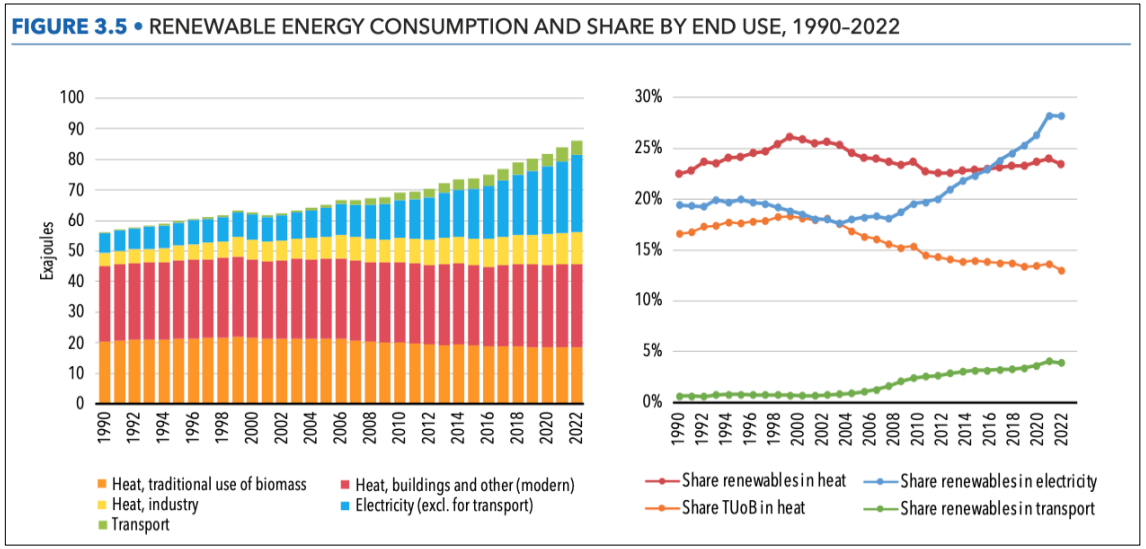


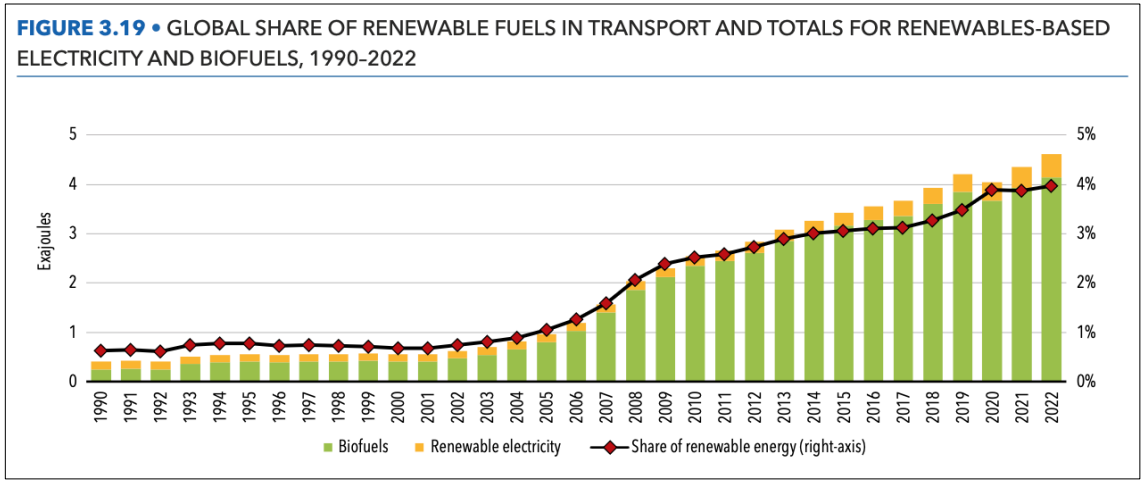
Key projects for 2025-2027

- Implementation Agenda including Emerging Markets
- Advanced Biofuels Demonstration Database (https://demoplants.best-research.eu)
- Renewable Hydrocarbons for Diesel and Jet Sectors
- E-Fuels and synergies with biofuel production
- Marine Biofuels
- BECCUS - BioEnergy Carbon Capture Utilization & Storage

Short intro on renewable energy in transport







Source: International Energy Agency and United Nations Statistics Division

Short intro on renewable energy in transport, cont'd

FIGURE 3.5 • RENEWABLE ENERGY CONSUMPTION AND SHARE BY END USE, 1990–2022

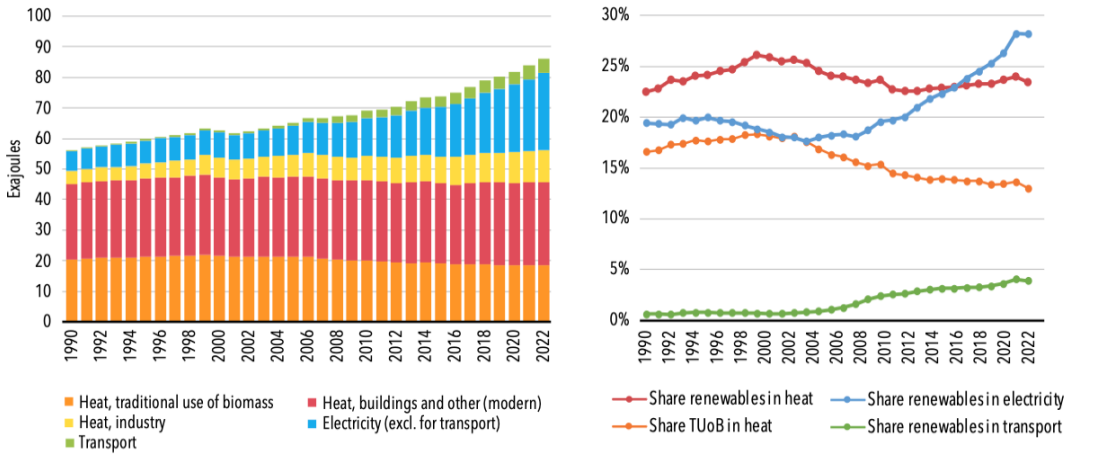


FIGURE 3.20 • RENEWABLE ENERGY SHARE AND TOTAL RENEWABLE ENERGY IN TRANSPORT ACROSS SELECTED COUNTRIES AND REGIONS, 2010, 2015, AND 2022

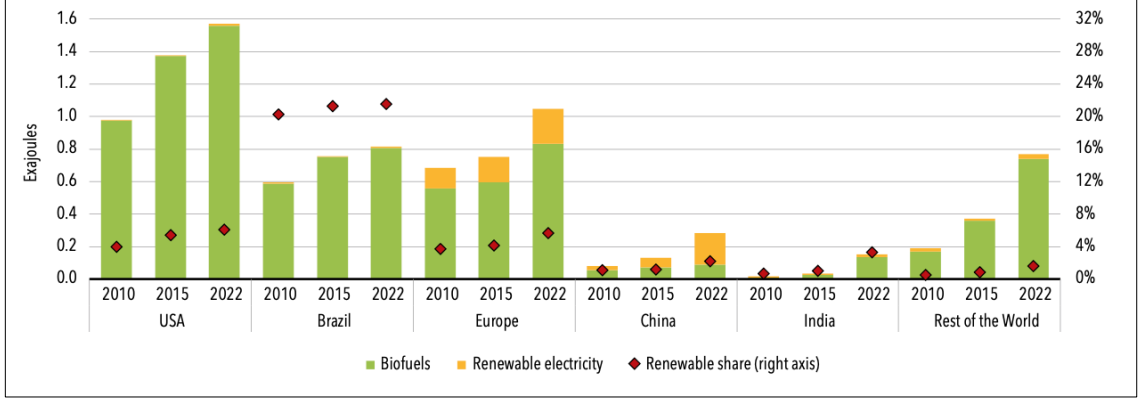


FIGURE 3.19 • GLOBAL SHARE OF RENEWABLE FUELS IN TRANSPORT AND TOTALS FOR RENEWABLES-BASED ELECTRICITY AND BIOFUELS, 1990–2022

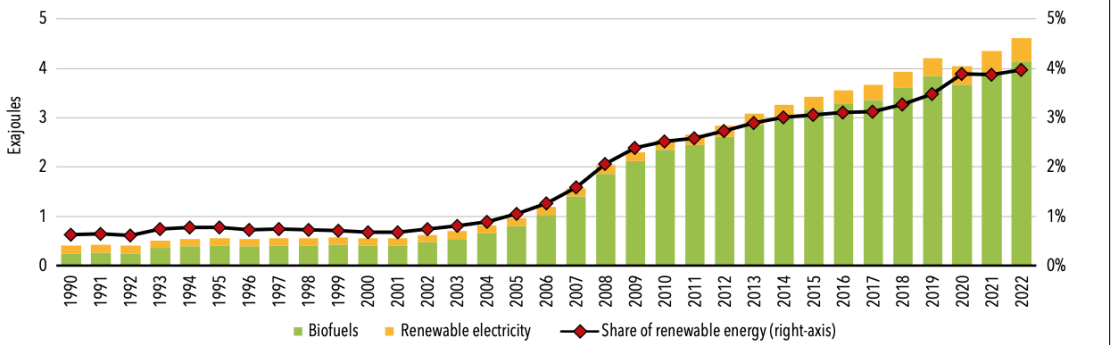
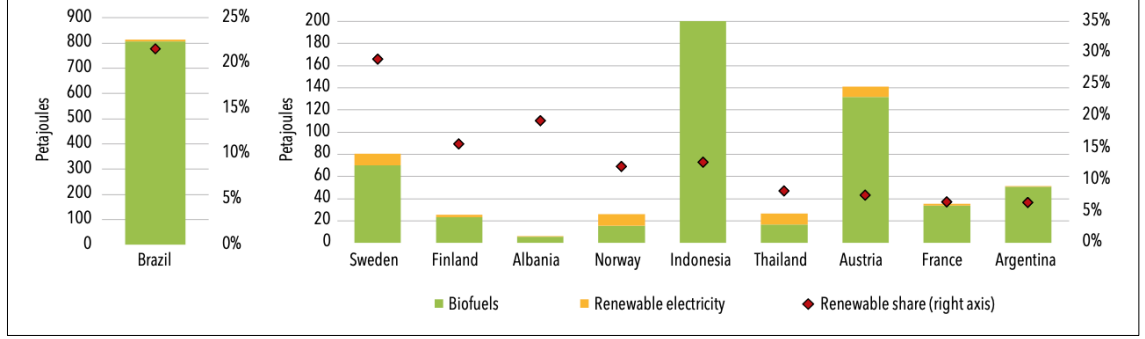
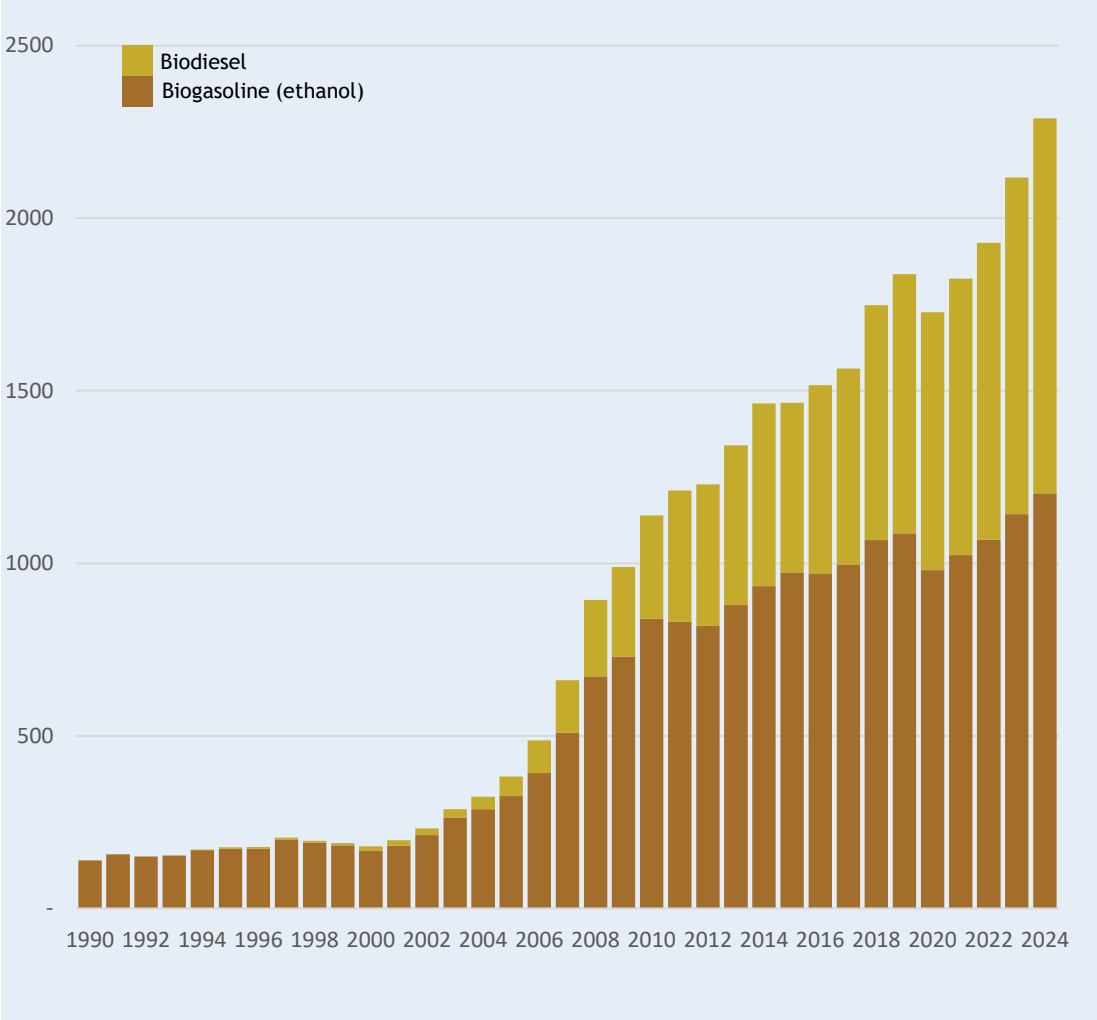


FIGURE 3.21 • TOP 10 COUNTRIES BY SHARE OF RENEWABLE ENERGY IN TRANSPORT, 2022

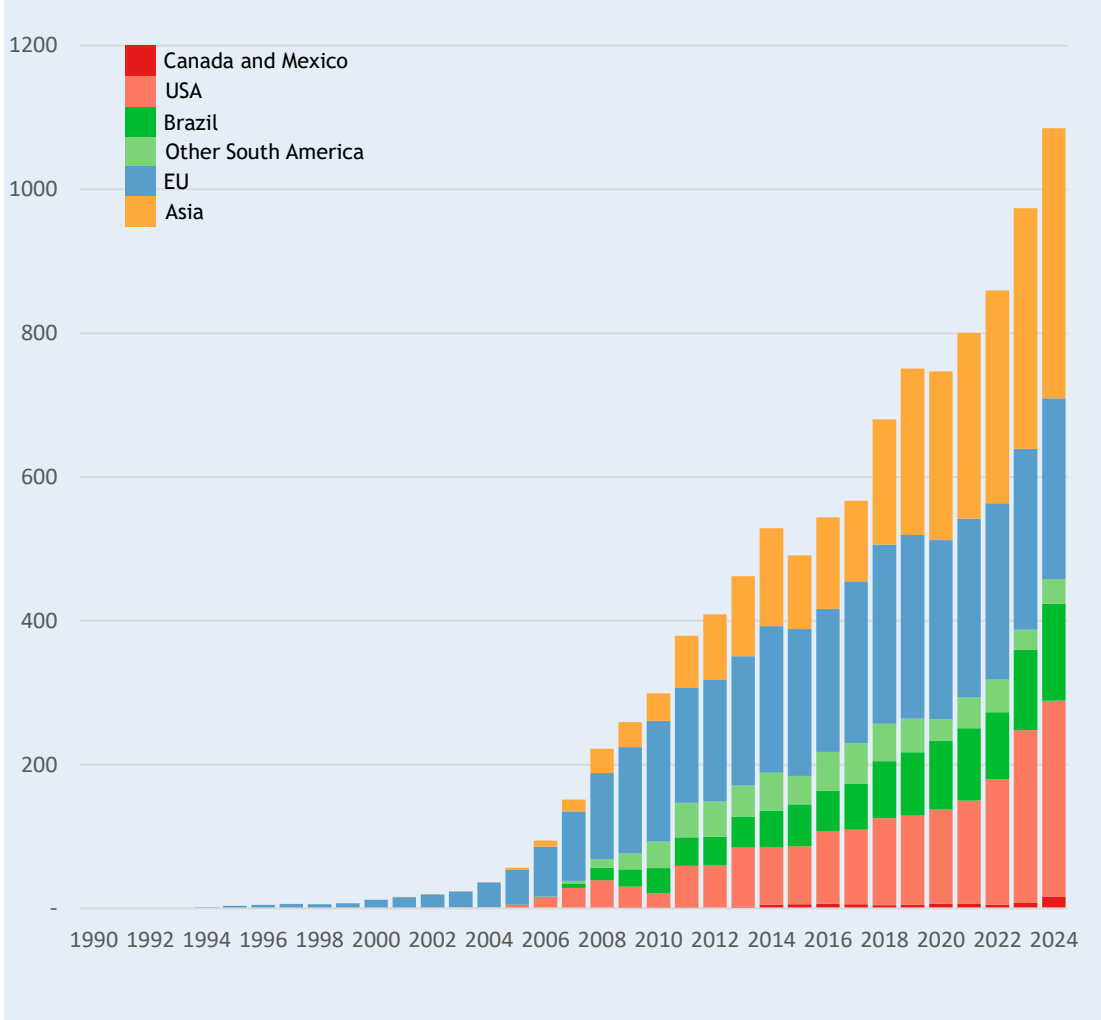


Source: International Energy Agency and United Nations Statistics Division

Historic development of global biofuel production
(in ’000 barrel of oil per day)

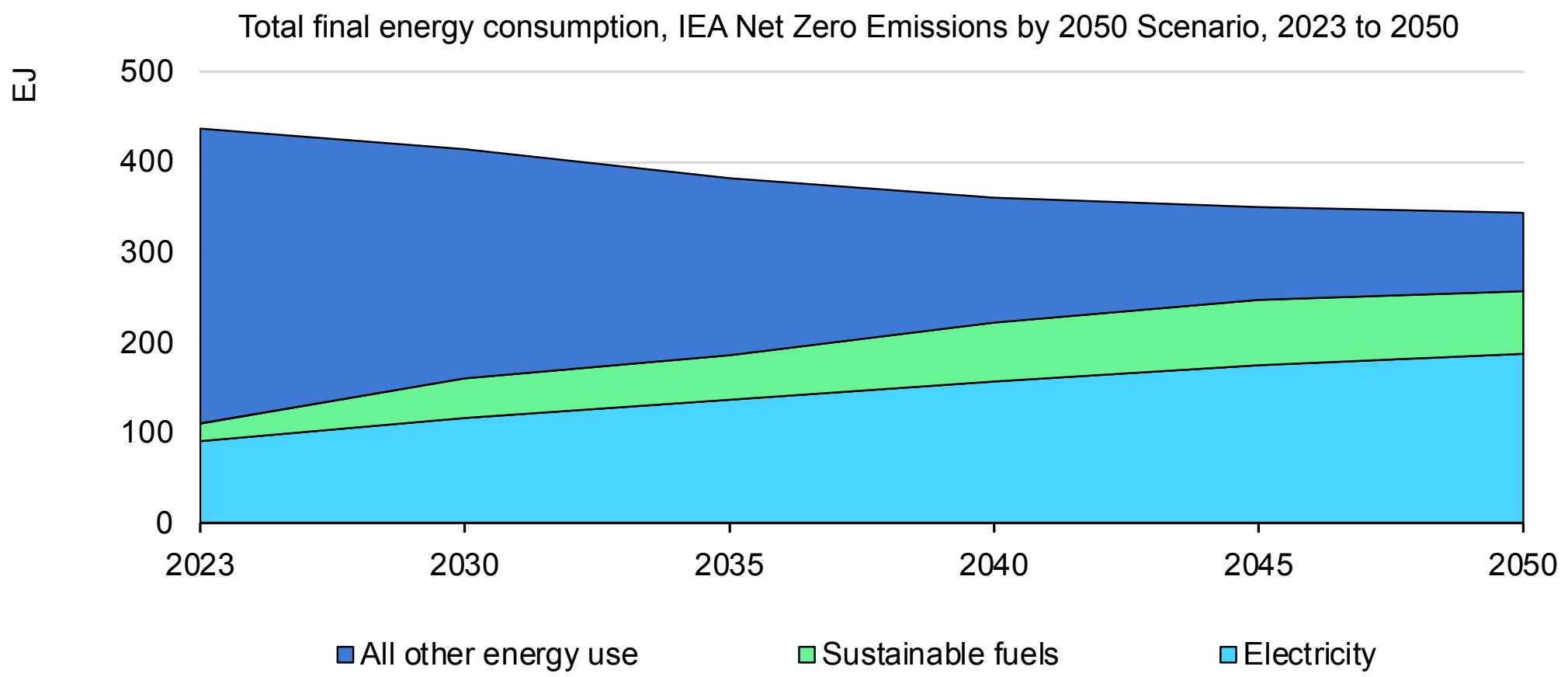


Source data: Energy Institute, Statistical Review world energy data 2025



Source data: Energy Institute, Statistical Review world energy data 2025

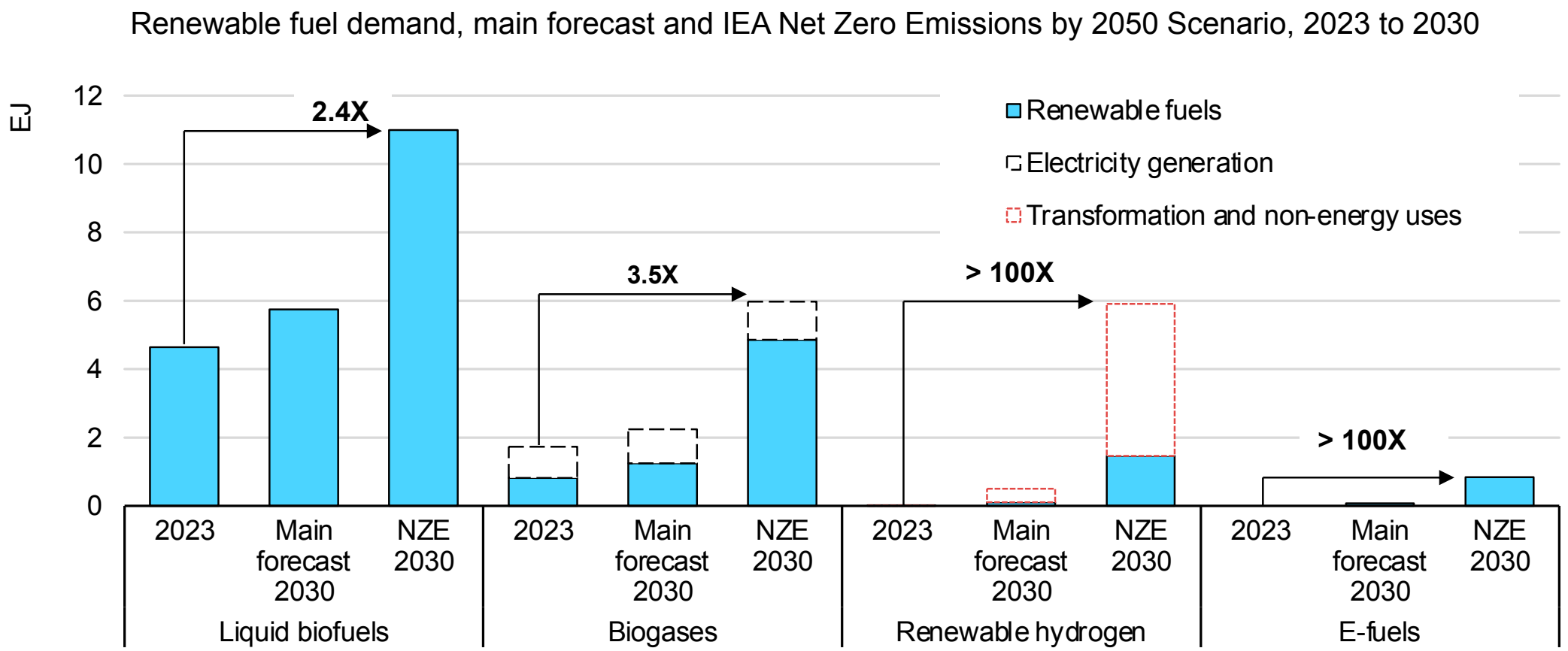
Sustainable fuels play a key role along electrification and energy efficiency measures



Source: IEA (2024) World Energy Outlook. Sustainable fuels includes modern bioenergy, low-emissions hydrogen and hydrogen-based fuels including low-emissions hydrogen used as a feedstock for non-energy purposes.

Sustainable fuels such as biofuels, hydrogen and hydrogen-based fuels provide 80 EJ of energy in 2050 in NZE, near equal to global electricity demand today. By 2050 they support one quarter of global energy consumption.

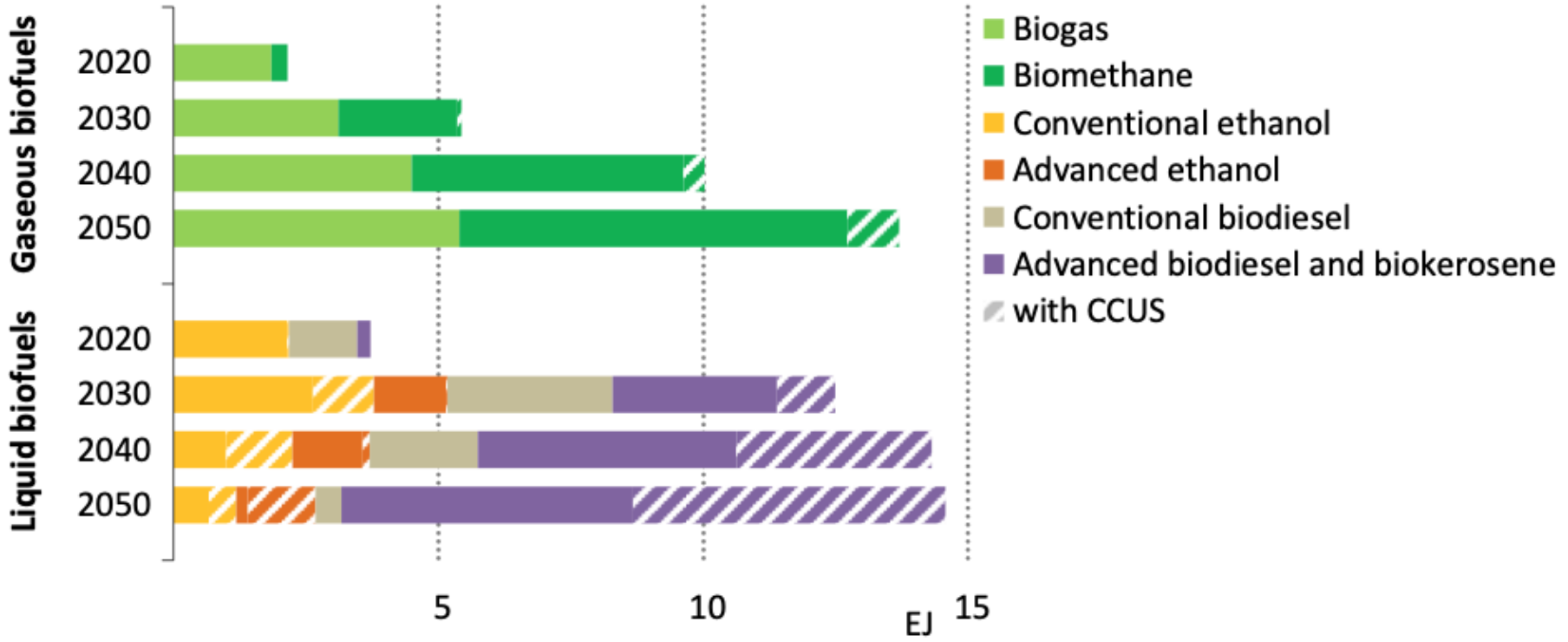
Despite their importance none of the main options are on track for net zero



Accelerated deployment depends on achieving a global vision for sustainable fuels, effective policies to close the cost gap, innovation to expand production potential and a common understanding on what makes a fuel sustainable.

And beyond 2030 growth continues, with shift to other fuel types

Figure 3.7 ▷ **Global biofuels production by type and technology in the NZE**

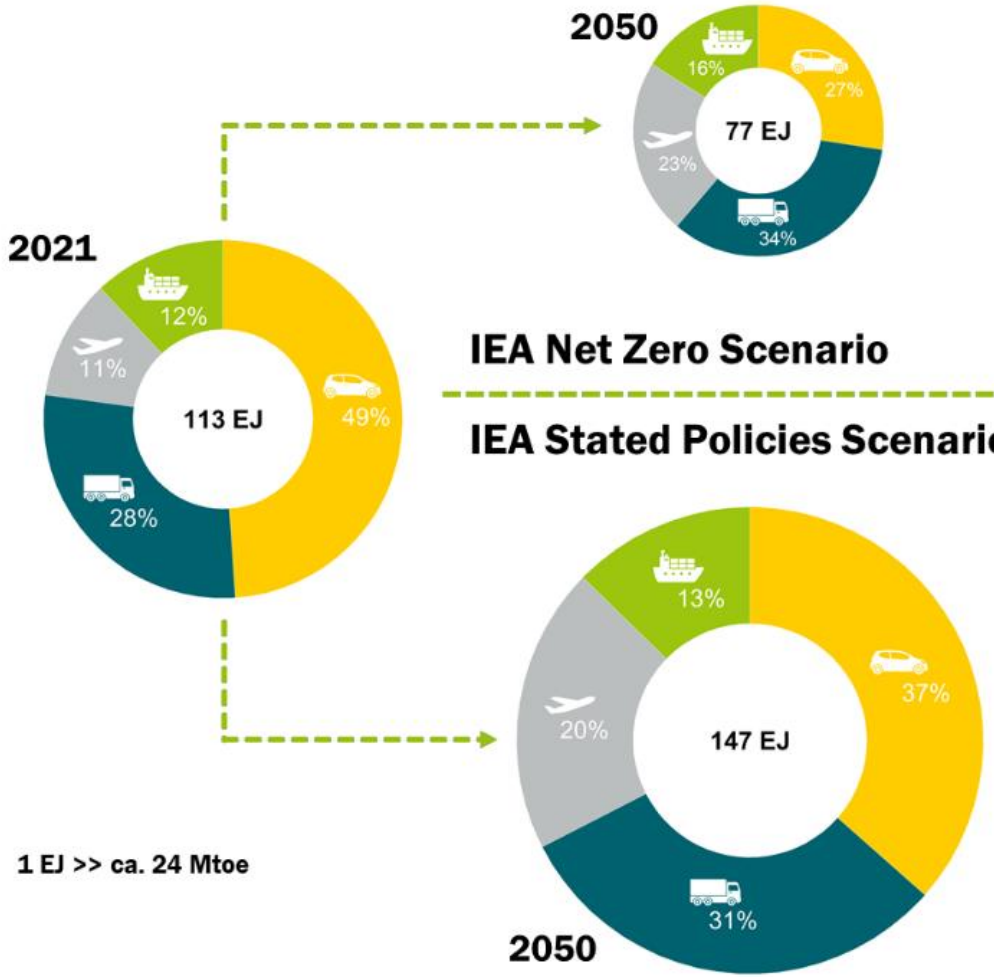


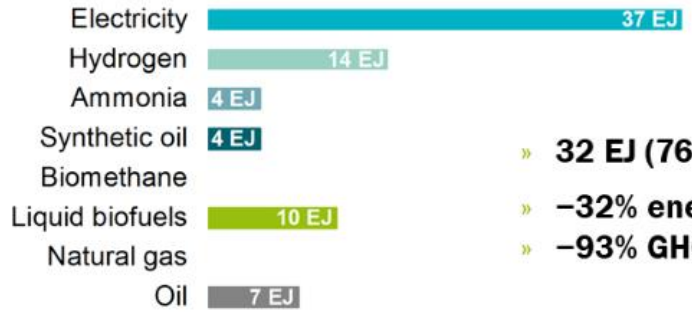
IEA. All rights reserved.

Liquid biofuel production quadruples while that of biogases expands sixfold between 2020 and 2050, underpinned by the development of sustainable biomass supply chains

Source: IEA, 2021, Net Zero by 2050 – A Roadmap for the Global energy Sector

IEA Scenarios on transport energy demand





- **32 EJ (764 Mtoe) renewable fuels**
- **−32% energy demand**
- **−93% GHG emissions**

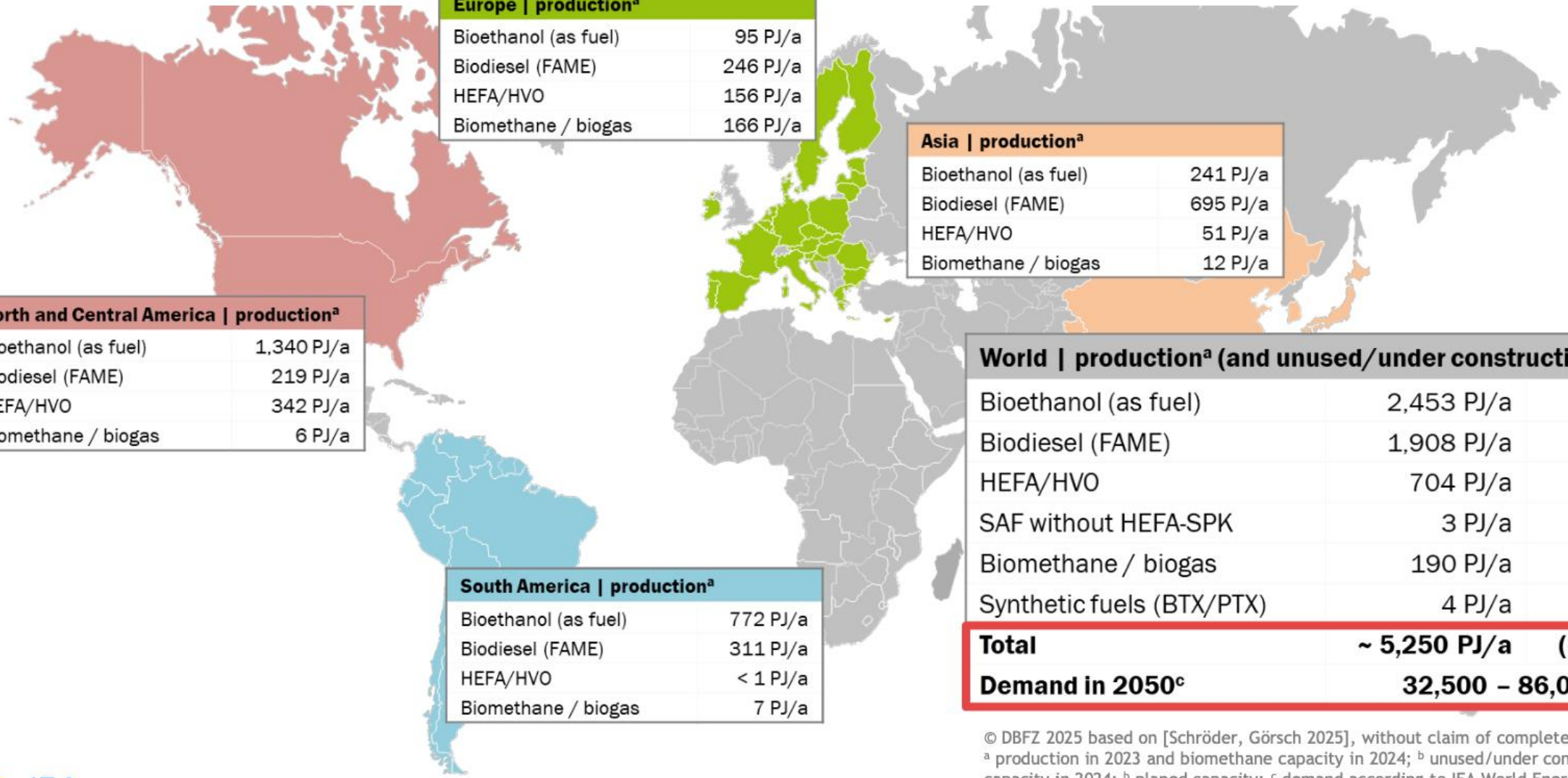


- **12 EJ (299 Mtoe) renewable fuels**
- **+30% energy demand**
- **+13% GHG emissions**

© DBFZ 2023

Note: Synthetic oil produced through Fischer-Tropsch conversion or methanol synthesis. It includes oil products from CTL and GTL, and low-emissions liquid hydrogen-based fuels. Liquid fuels derived from biomass or waste feedstock, e.g. ethanol, biodiesel and biojet fuels.

Need of ~10 times more renewables



Europe | production[a]	
Bioethanol (as fuel)	95 PJ/a
Biodiesel (FAME)	246 PJ/a
HEFA/HVO	156 PJ/a
Biomethane / biogas	166 PJ/a

Asia | production[a]	
Bioethanol (as fuel)	241 PJ/a
Biodiesel (FAME)	695 PJ/a
HEFA/HVO	51 PJ/a
Biomethane / biogas	12 PJ/a

North and Central America | production[a]	
Bioethanol (as fuel)	1,340 PJ/a
Biodiesel (FAME)	219 PJ/a
HEFA/HVO	342 PJ/a
Biomethane / biogas	6 PJ/a

South America | production[a]	
Bioethanol (as fuel)	772 PJ/a
Biodiesel (FAME)	311 PJ/a
HEFA/HVO	< 1 PJ/a
Biomethane / biogas	7 PJ/a

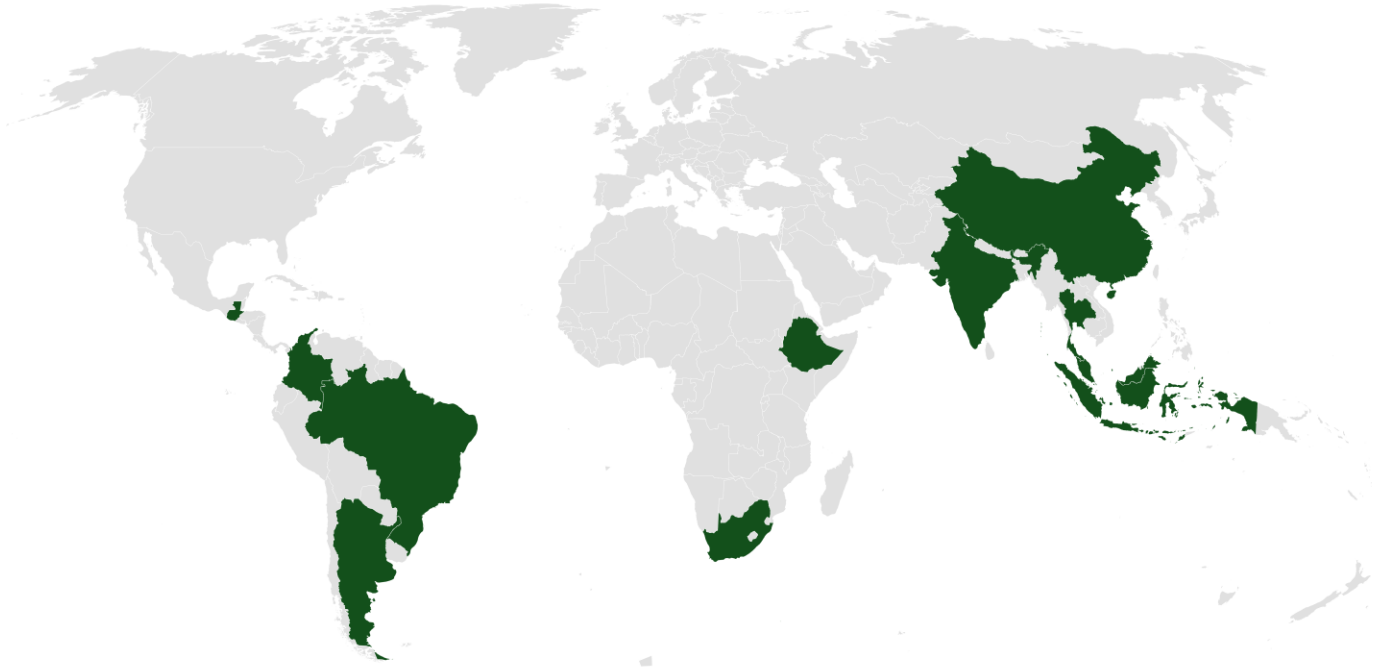
World | production[a] (and unused/under construction/planned[b])		
Bioethanol (as fuel)	2,453 PJ/a	(1,668 PJ/a)
Biodiesel (FAME)	1,908 PJ/a	(1,322 PJ/a)
HEFA/HVO	704 PJ/a	(3,907 PJ/a)
SAF without HEFA-SPK	3 PJ/a	(357 PJ/a)
Biomethane / biogas	190 PJ/a	(N/A)
Synthetic fuels (BTX/PTX)	4 PJ/a	(94 PJ/a)
Total	**~ 5,250 PJ/a**	**(~ 7,350 PJ/a)**
Demand in 2050[c]	**32,500 – 86,000 PJ/a**	

© DBFZ 2025 based on [Schröder, Görsch 2025], without claim of completeness

[a] production in 2023 and biomethane capacity in 2024; [b] unused/under construction/planned capacity in 2024; [b] planed capacity; [c] demand according to IEA World Energy Outlook 2021, DNV Pathway to Net Zero Emissions scenario 2023

Focus on Emerging markets

Developing countries with large populations and potential for high energy demand

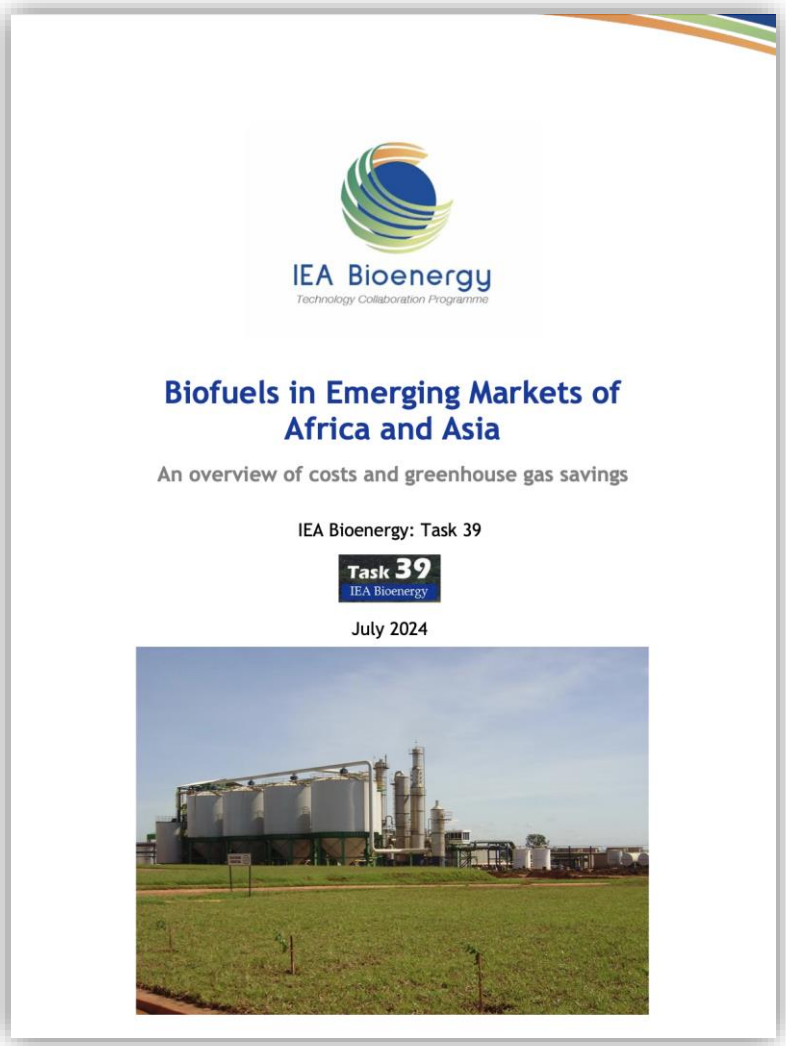


Argentina, Brazil, China, Colombia, Ethiopia, Guatemala, India, Indonesia, Malaysia, South Africa, Thailand

47.0% of the world's population
27.0% of the CO_2 emissions of the transportation sector

If this group of seven emerging economies were to achieve the same per capita carbon intensity of the transportation sector as the OECD average, worldwide emissions of the transportation sector would more than double (increase of 117%).

Biofuels in Emerging Markets



- Argentina, Brazil, China, Colombia, Guatemala, India, Indonesia, Malaysia, South Africa and Thailand
- Blending mandates of at least 10% and moderate increase if country already has blending mandate >10%.
- Additional biofuel production:
  - 45.7 billion liters of biodiesel
  - 64.7 billion liters of etanol (55% from doubling ethanol in Brazil)
- Required conversion of pastureland: 0.1% to 10.7%
  - This number depends on the share of pastureland of each country, which depends on local practices – Malaysia has a 1.1% share of pastures (BR: 21%, US: 27%, EU-27: 17%)
  - This number is affected by biofuel yield (liters per hectare)
  - Pastureland in Brazil and the US -> conversion of 0.25% to supply ethanol to Indonesia and Malaysia
  - Potential GHG savings > 300 Mt CO2e per year

Biofuels in Emerging Markets



Authors from:

Argentina
Brazil
Colombia
El Salvador
Guatemala
Nicaragua
Panama
Paraguay
Peru
India
Indonesia
Japan
South Africa
Germany
Austria

Strengthen Regulatory Frameworks Promoting the Sustainable Use of Biofuels for Land Transportation in the Short Term

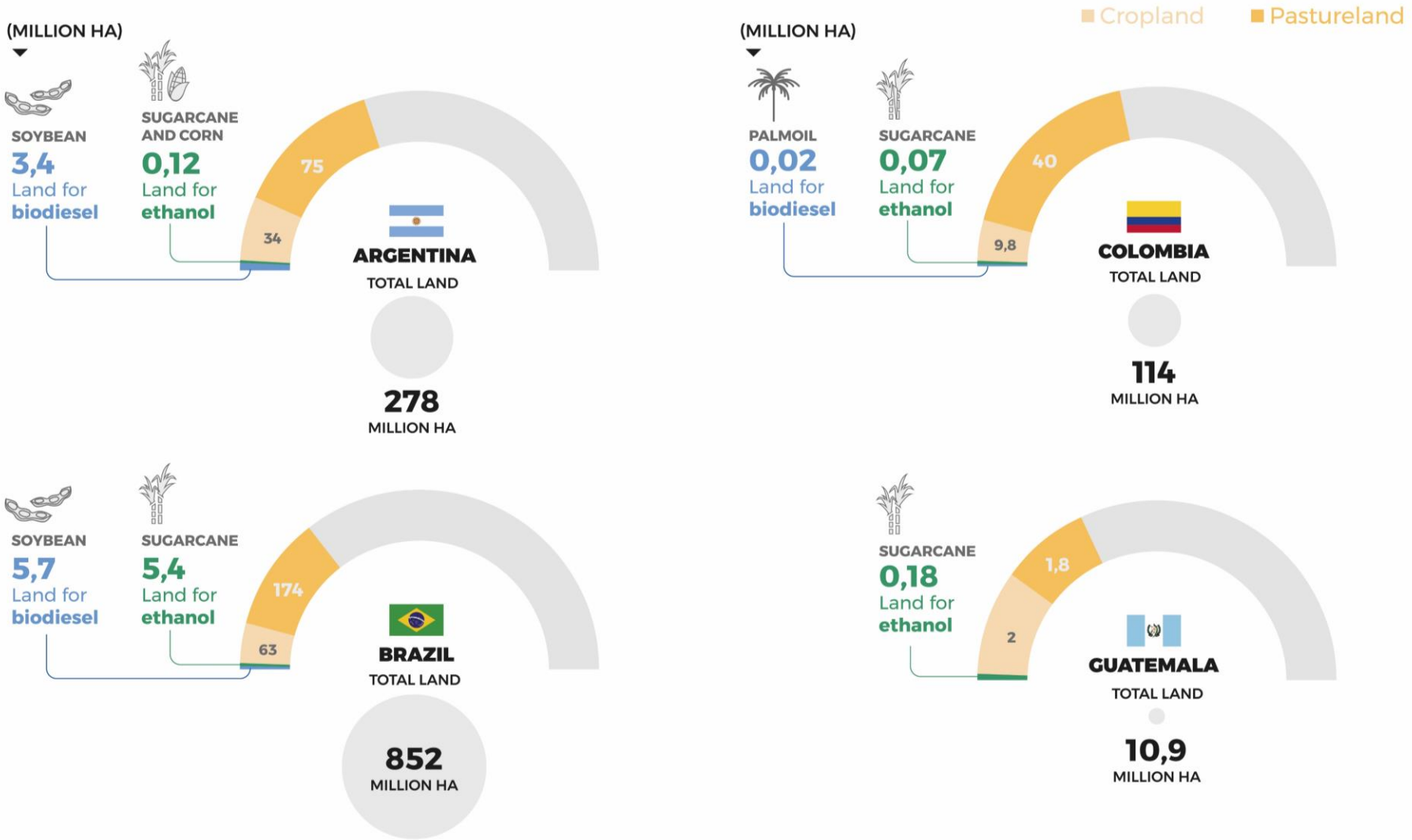
Work on the Standardization and/or Harmonization of Standards and Certification Mechanisms for Reducing Greenhouse Gas Emissions

Develop Common Regional and National Public Policies and Standards to Foster New Biofuels for subsectors such as Aviation and Maritime Transportation

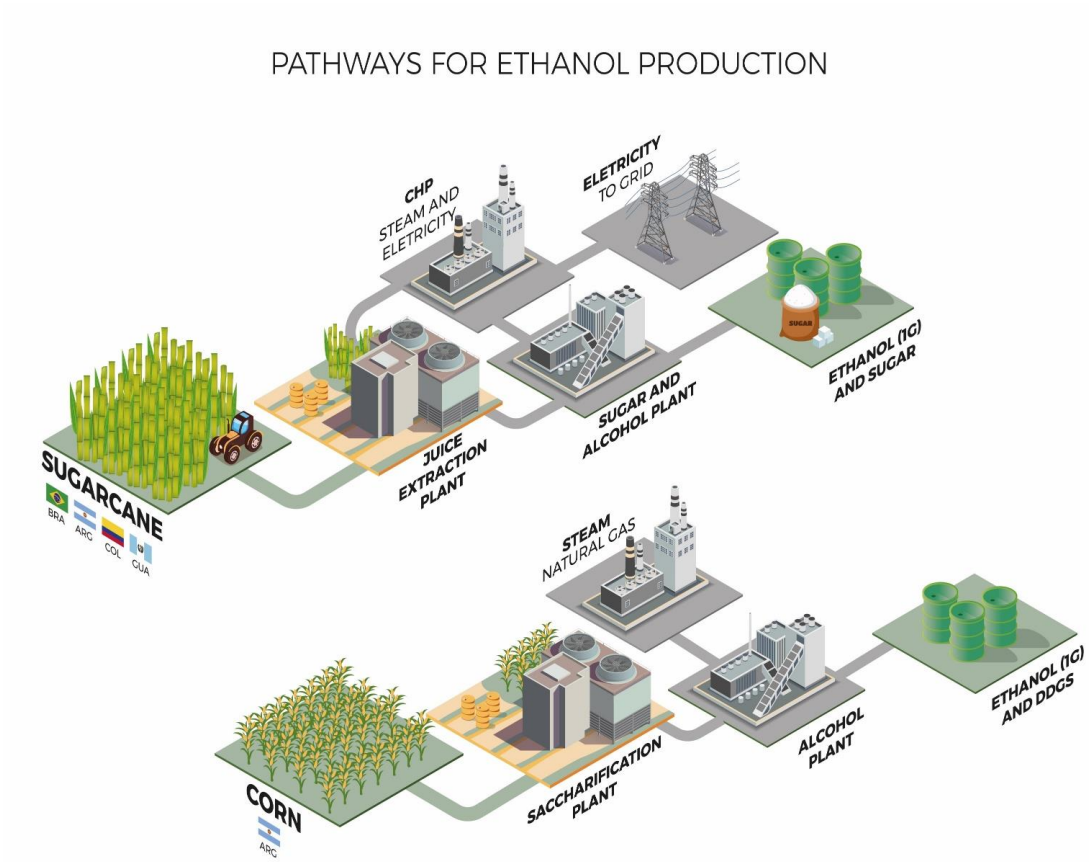
Biofuels scalability, compatibility with existing infrastructure, and potential for substantial GHG emissions reductions make them indispensable in the energy transition and social development

Biofuels in Latin America are avoiding 63,8 $MtCO_2eq/yr$

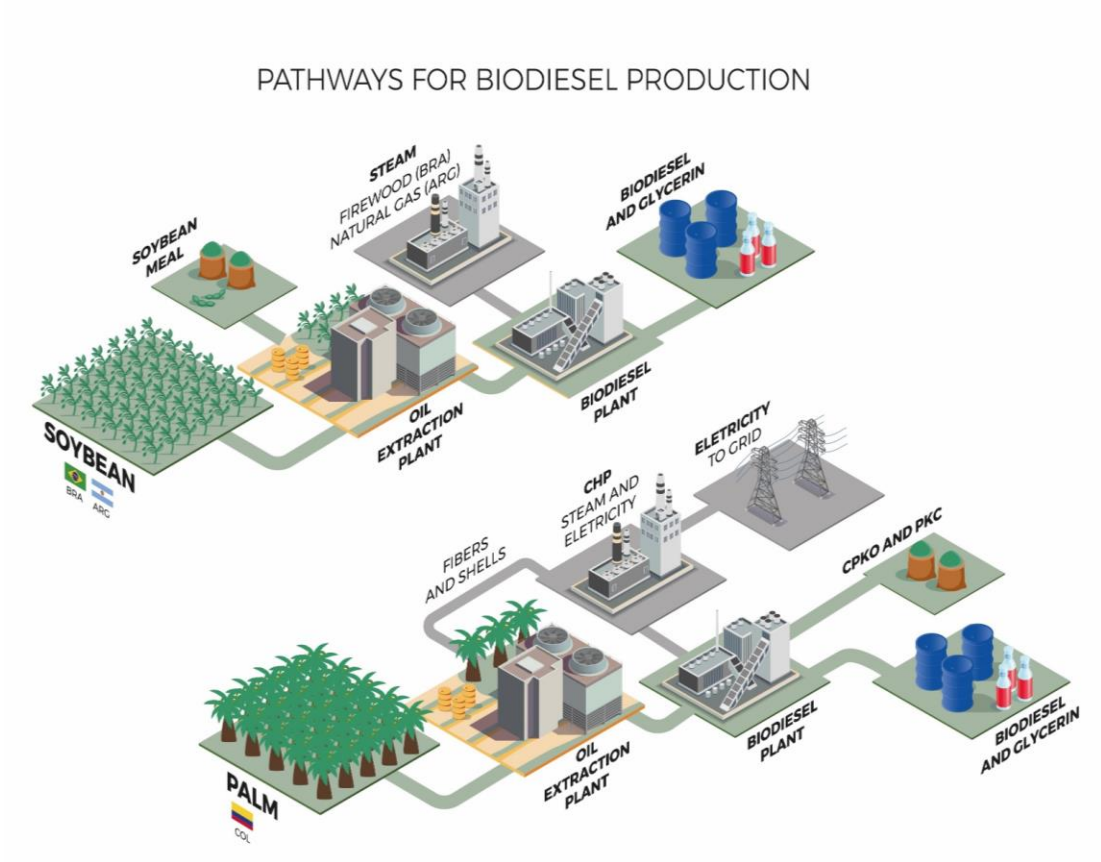
… using very little land



Food, feed, fuels and Power produced in parallel

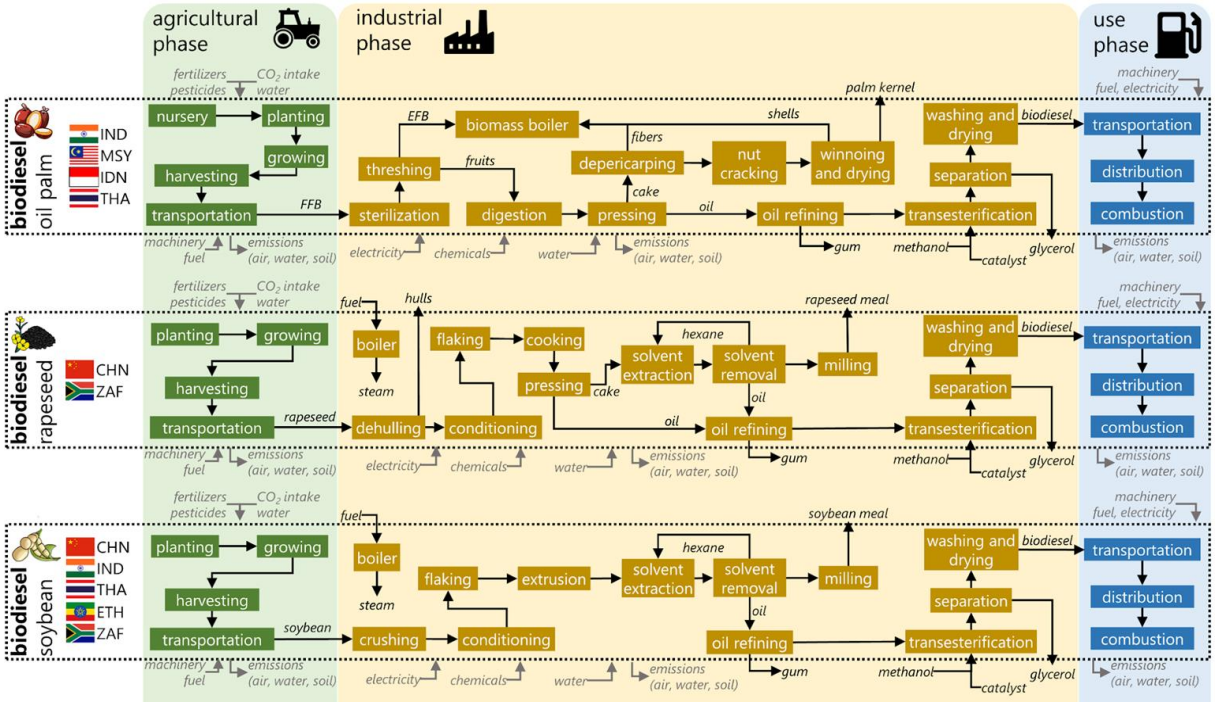


Sugar, DDGS
Bioethanol, Bioelectricity, Residues recycled

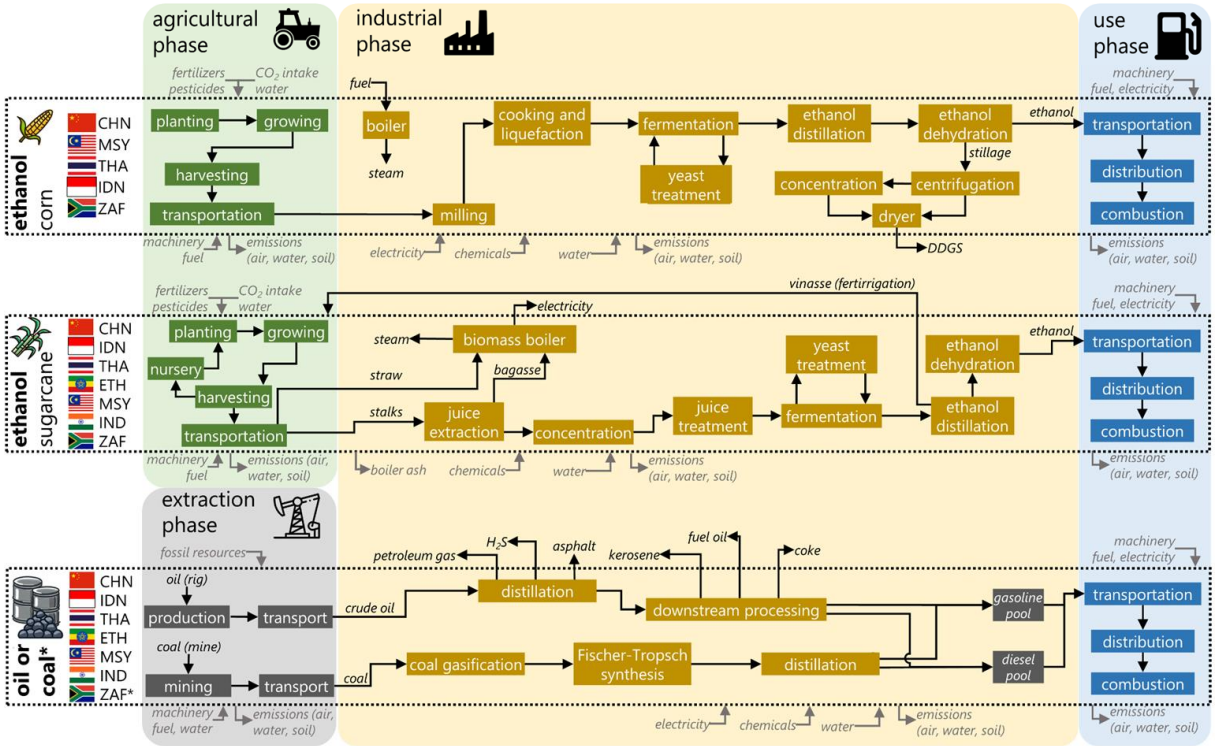


Protein for Food, Protein for Feed
Biodiesel, Bioelectricity, Residues recycled

Fuel production models

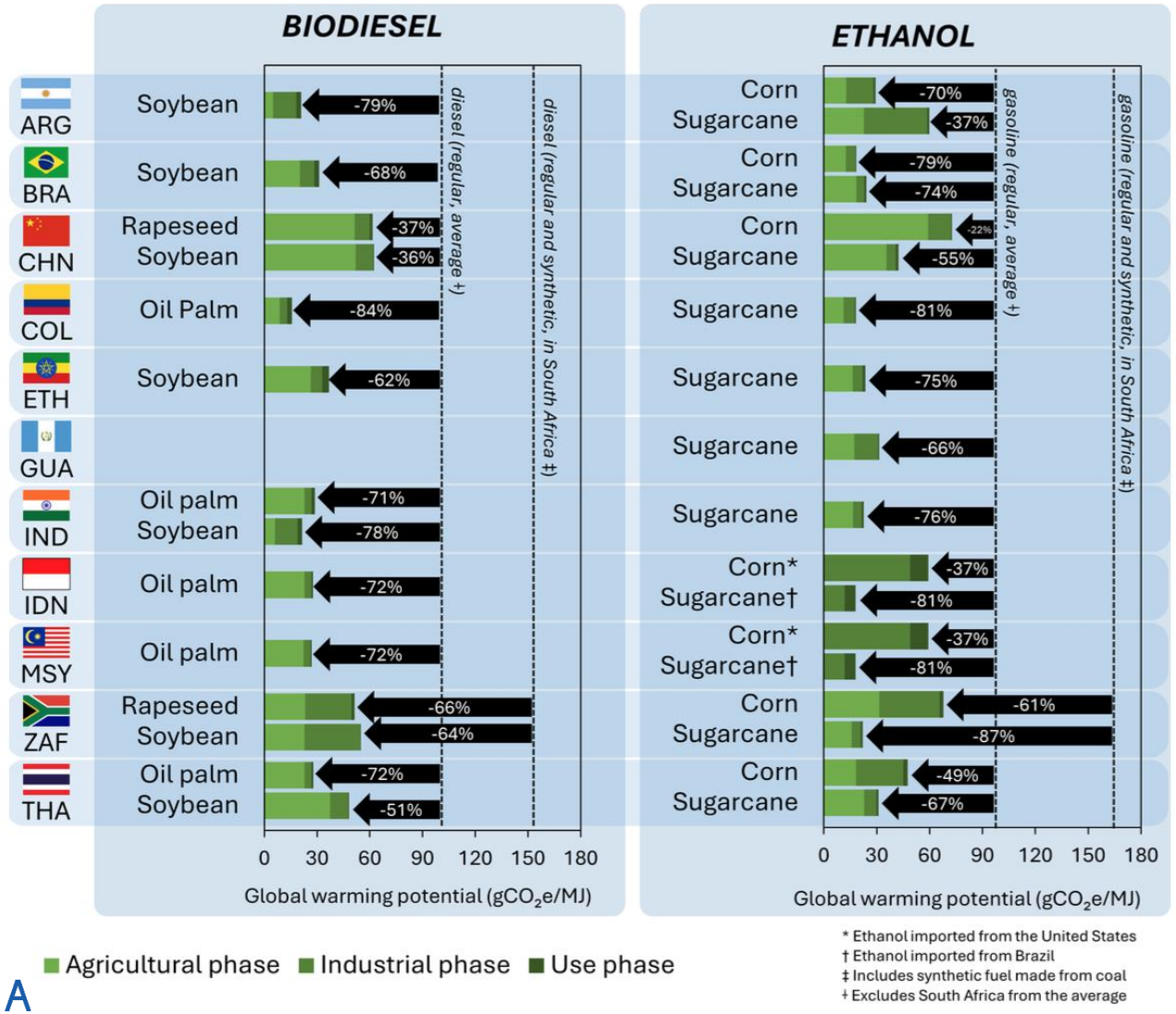


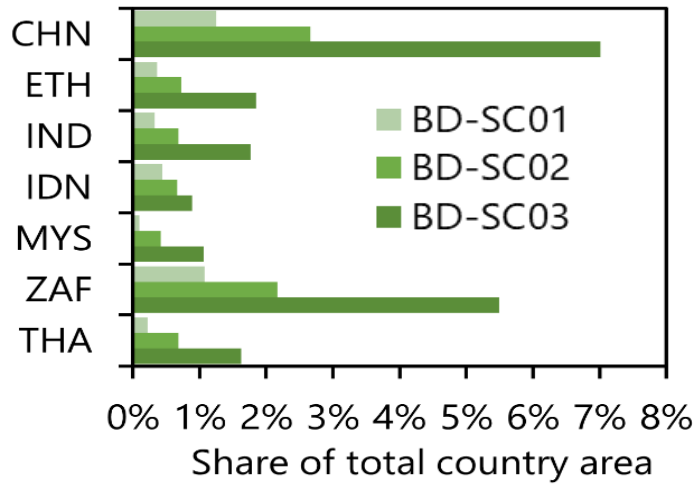
Biodiesel (oil palm, rapeseed, and soybean)

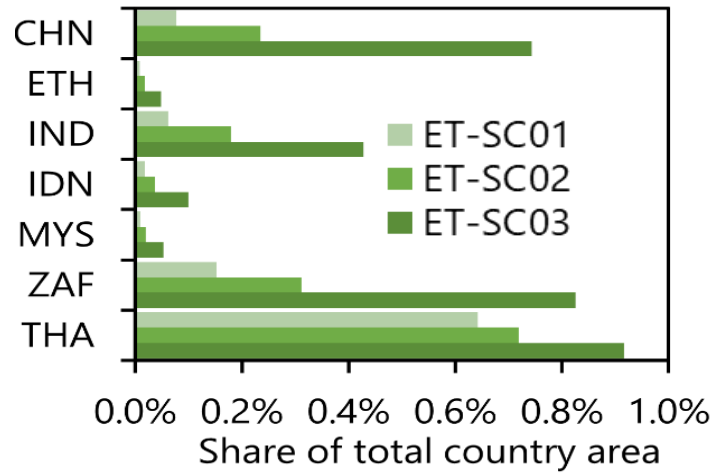


Ethanol (corn and sugar cane) and fossil fuels (as benchmark)

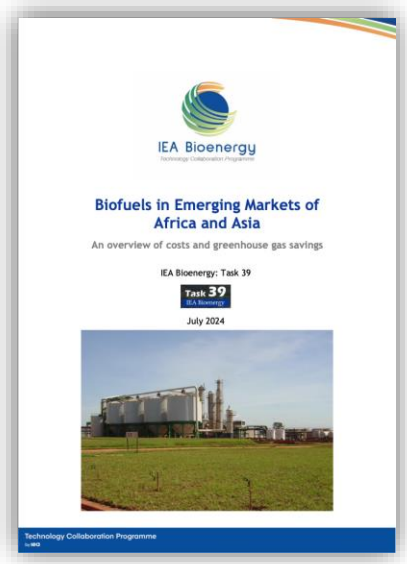
Reduction in the carbon footprint of up to 84% compared to the fossil reference | using limited land | avoided emission of 211 MtCo2eq/yr (in a moderate scenario)

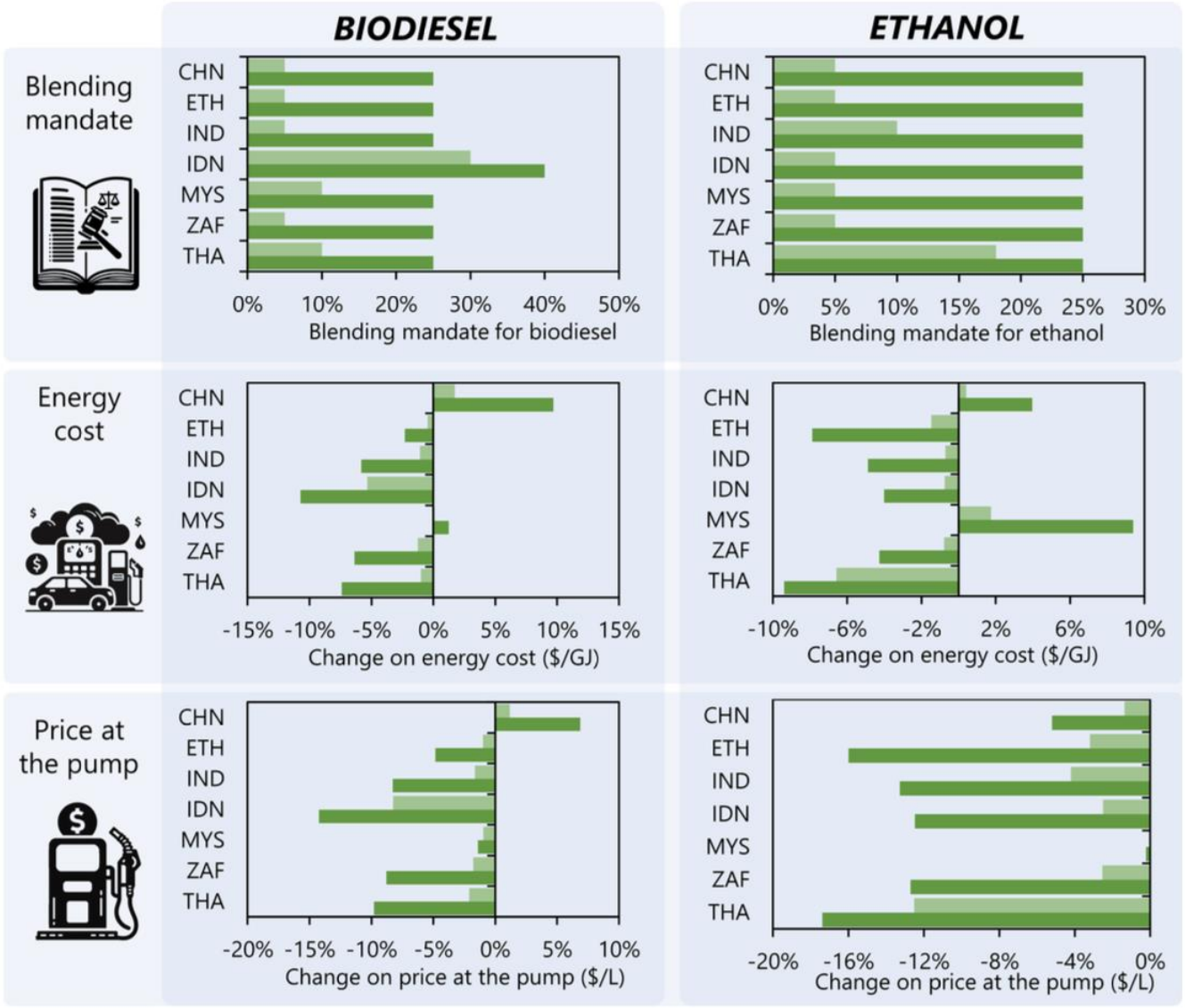






Assessment of higher blending mandates may lower the cost of fuels





Scenario 1: at least a total of 5% of biofuels are blending in diesel and/or gasoline

Scenario 2: at least 25% biofuels are blended in diesel and/or gasoline.

Available for further questions and discussions

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IEA Bioenergy
Technology Collaboration Programme

www.ieabioenergy.com

CPOPC
COUNCIL OF PALM OIL PRODUCING COUNTRIES

Biodiesel Blending Legislations Across Countries

CPOPC | Webinar on Biodiesel – Global Biofuels Alliance | 25 Sept 2025



Setting the Context



CPOPC:

- Alliance of biodiesel-producing countries (Indonesia and Malaysia are members, with Colombia as an observer country).
- Thailand is also a key biodiesel producer, though it is not a CPOPC member

Mission:

- Advance sustainable palm oil and biodiesel as drivers of energy transition.

Focus:

- Position biodiesel as a legislation-backed climate and development solution, not just a fuel.

Palm Oil Producer Narrative:

- Turning agricultural surplus into sustainable energy.
- Together, Indonesia, Malaysia, Thailand & Colombia supply 20% of global biodiesel.

Global Relevance:

- Delivers on GBA's vision: equitable, low-carbon fuels with energy sovereignty for developing nations.



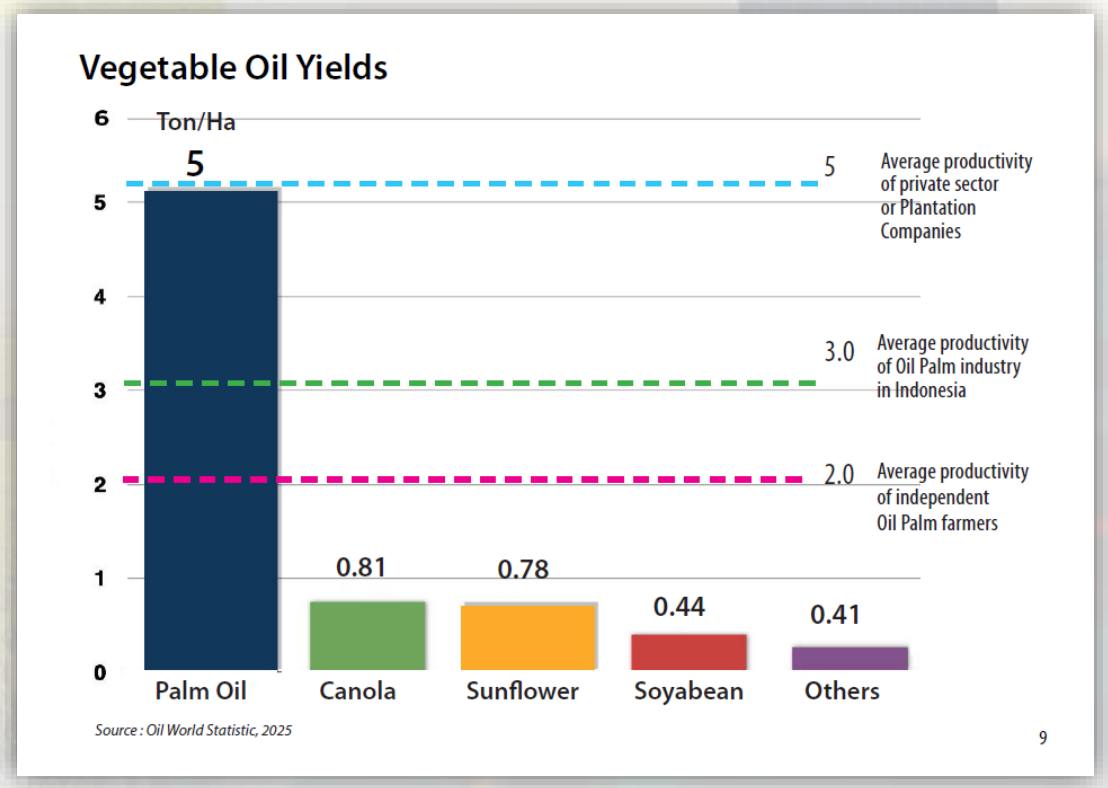
Biodiesel Production (million tonnes)*			
Country	**2025F**	**2024**	**2023**
Indonesia	13,20	12,12	11,44
Malaysia	0,85	0,93	1,30
Thailand	1,55	1,63	1,60
Colombia	0,79	0,78	0,78

**including HVO (Oil World, 2025)*

Palm Biodiesel in the Circular Bioeconomy

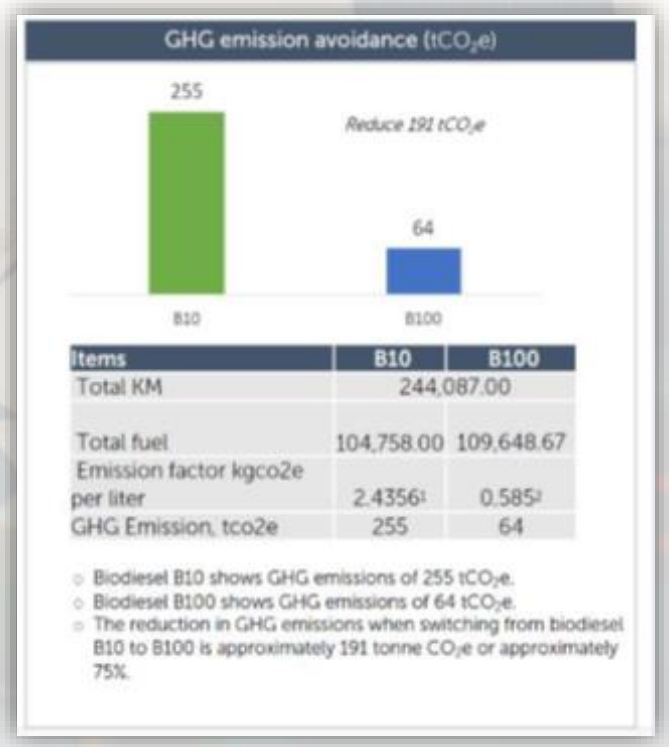
- Palm-based biodiesel **leverages circularity**: PFAD, UCO, and mill residue become low-carbon transport fuels.
- Palm oil delivers the **highest oil yield per hectare**, reducing land-use pressure compared to soy or rapeseed.





Palm Biodiesel in the Circular Bioeconomy

- **Indonesia's B40 rollout** will reduce ~40 million tonnes CO_2eq/year — significant for NDC compliance.
- **GHG reduction impact**: MPOB B100 trials show up to **75% emissions reduction** compared to B10.
- Mandates also **protect smallholders** (~1.9 million households in Indonesia) and reduce **fuel import dependency**.

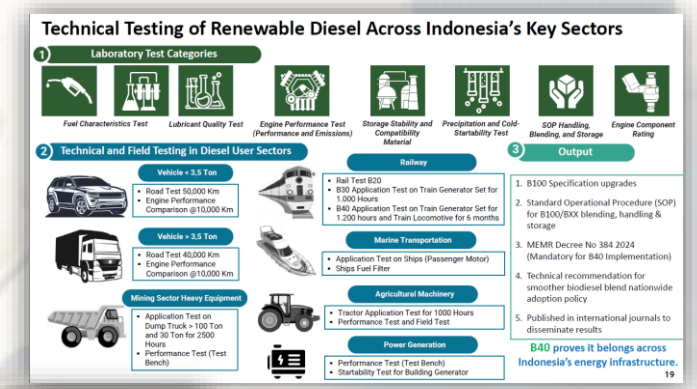


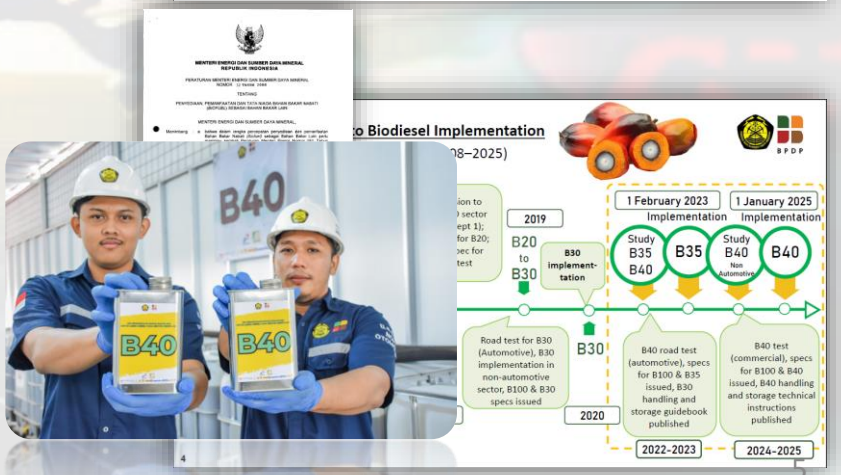
Items	B10	B100
Total KM	244,087.00	
Total fuel	104,758.00	109,648.67
Emission factor kgco2e per liter	2.4356[1]	0.585[2]
GHG Emission, tco2e	255	64

- Biodiesel B10 shows GHG emissions of 255 tCO_2e.
- Biodiesel B100 shows GHG emissions of 64 tCO_2e.
- The reduction in GHG emissions when switching from biodiesel B10 to B100 is approximately 191 tonne CO_2e or approximately 75%.

Indonesia: Leading the Global Biofuels through B40

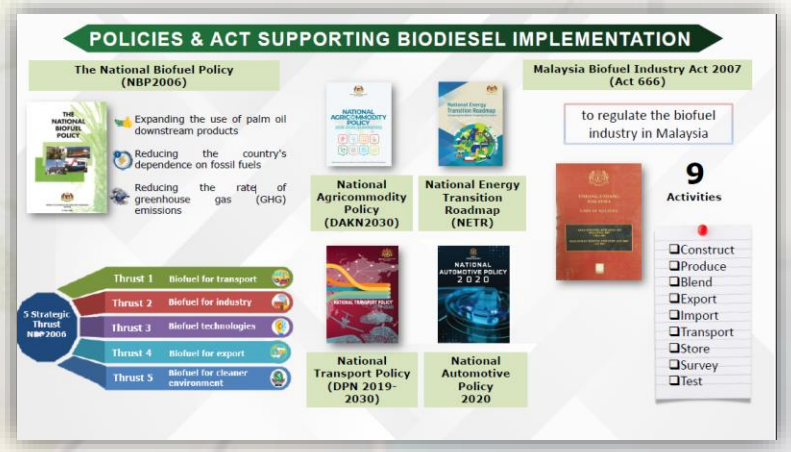
- **Legal journey**: From Decree 32/2008 → B40 mandate in 2025 → roadmap to B50 in 2026.
- **Key driver:** BPDPKS incentive, redistributing palm oil export levies to subsidize biodiesel in 2016.
- **Field implementation:**
  - B40 tested across cars, trucks, rail, mining, and marine.
  - Nationwide trials confirm no major engine problems.
  - Journalists and stakeholders invited to observe trials for transparency.
- **Challenges:**
  - Distribution/logistics uneven outside Java and Sumatra.
  - Variation in fuel quality noted in some storage/distribution points.

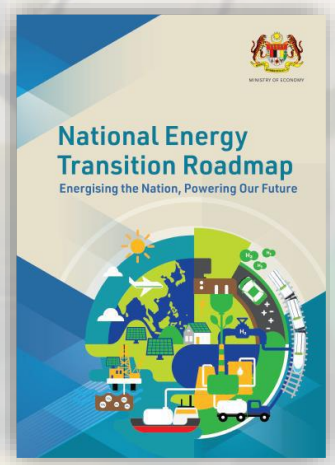




Malaysia: R&D-Driven, Legally Structured

- **Policy base:** Governed by Biofuel Industry Act 2007 (Act 666).
- **Mandates:**
  - B10 in transport (nationwide)
  - B7 in industry
  - B20 in transport (Pulau Langkawi, Kedah, Labuan & Sarawa)
  - B30 in transport planned in 2030
- **Field implementation:**
  - B100 trials in trucks (PETRONAS, Scania), passenger vehicles (Mazda CX8), ports, and KLIA ground equipment
  - Stable B100 performance: no jerking, no maintenance differences, ~25,000 km service interval confirmed
- **Challenges:**
  - Fuel filter clogging and stability issues occasionally observed in higher blends.
  - Trade barriers (EU RED III, EUDR, tariffs) pose external risks.



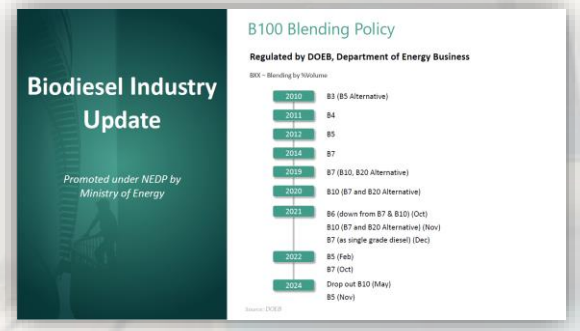






Thailand: Adaptive and Market-Responsive

- **Mandates:**
  - Flexible blending (B5–B10 for regular diesel, B20 as an alternative).
  - Adjustments tied to palm oil price/stock monitoring system.
- **Field implementation:**
  - Mandate flexibility avoids supply shocks.
  - Testing ongoing for marine biodiesel (B24 VLSFO) and SAF (1% by 2026).
- **Strengths:**
  - Biodiesel serves as a buffer stock policy to stabilize CPO market.
  - Moves toward bio-hydrocarbons and EV-biofuel hybrid strategy under TIEB 2037
- **Challenges:**
  - Frequent policy adjustments create uncertainty for industry.
  - EV expansion competes with biodiesel demand.







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Colombia: Palm Biodiesel for Climate and Rural Development



- **Legal framework**:
  - Law 693 (2001) mandated biofuel blending.
  - Law 939 (2004) introduced tax incentives (VAT, excise exemptions).
- **Mandates:** B10–B12 in key cities since 2008; B20 targeted by 2030.
- **Field implementation:**
  - Bus and logistics fleets in Bogotá, Medellín show reliable operation on biodiesel.
  - ~70% CO_2 reduction verified in fleet operations.
  - 8 biodiesel plants integrated into fuel supply chain.
- **Socio-Economic role:**
- Biodiesel stabilizes palm oil demand, secures smallholder off-take, supports post-conflict rural inclusion.
- **Challenges:**
  - Higher logistics costs and weak distribution in remote regions.
  - Land-use and sustainability concerns require strong ISCC/RSPO alignment for export ambitions.



Comparative Policy Models

Country	Blend Mandate	Policy Style	Strategic Objective
Indonesia	B40 (2025)	State-subsidized, mandatory	Energy security, rural income
Malaysia	B10-B20	Regulated + R&D driven	Climate action, trade compliance
Thailand	B5 & B20	Market volatility management	Price stabilization, SAF readiness
Colombia	B10–B12	Incentive-driven, legislated blending	GHG reduction, rural inclusion, export readiness

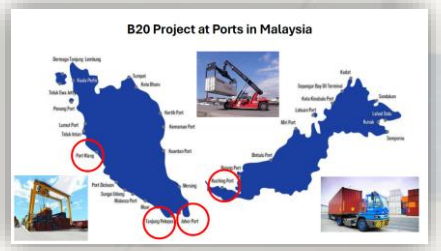


Insight:

Each approach is calibrated to local realities — but all are delivering low-carbon fuels at scale.

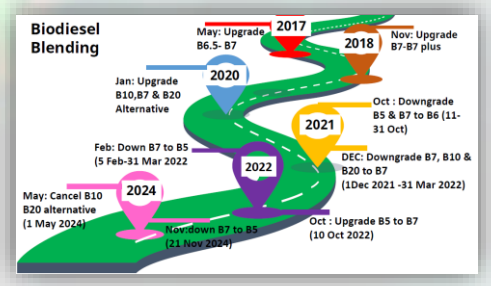
Field Implementation Lessons

Country	On-the-Ground Deployment	Key Lessons
Indonesia	B40 tested in trucks, rail, marine, power, agriculture, mining	Engine reliability proven; nationwide rollout feasible; logistics challenges
Malaysia	B100 trials in trucks, cars, ports, mills; B20 in airports	Fuel stability (90+ days) confirmed; KPIs tracked; some filter/stability issues
Thailand	Flexible B5–B20 mandates; marine biofuels (B24 VLSFO); SAF pilots	Flexibility avoids shocks; biodiesel as buffer stock; SAF & EV integration
Colombia	B10–B12 in cities since 2008; fleets reliable; 8 plants in distribution	Verified ~70% CO_2 reduction; rural impact; gaps in remote logistics & certification





Scania's Launch & Test Drive 2024 Event on August 15-17 with Trucks and Buses using B100



Cross-Cutting Lessons

- **Mandates work** when backed by *clear laws, stable funding, and technical testing*.
- **R&D and trials** build confidence for higher blends and wider sector adoption.
- **Flexibility vs. stability:** Some countries prioritize *long-term scaling* (Indonesia, Malaysia), others *market adaptation* (Thailand, Colombia).
- **Beyond energy:** Biodiesel delivers climate action + rural development + market stability.
- **GBA opportunity:** Harmonize blending roadmaps, align certification (ISPO, MSPO, TASPO, RSPO, ISCC), and build South–South cooperation for biofuel resilience.



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Market Insights & Success Stories of Biodiesel in India

Webinar on Biodiesel - Global Biofuels Alliance 25th September 2025

BIODIESEL IN INDIA - KEY DRIVERS

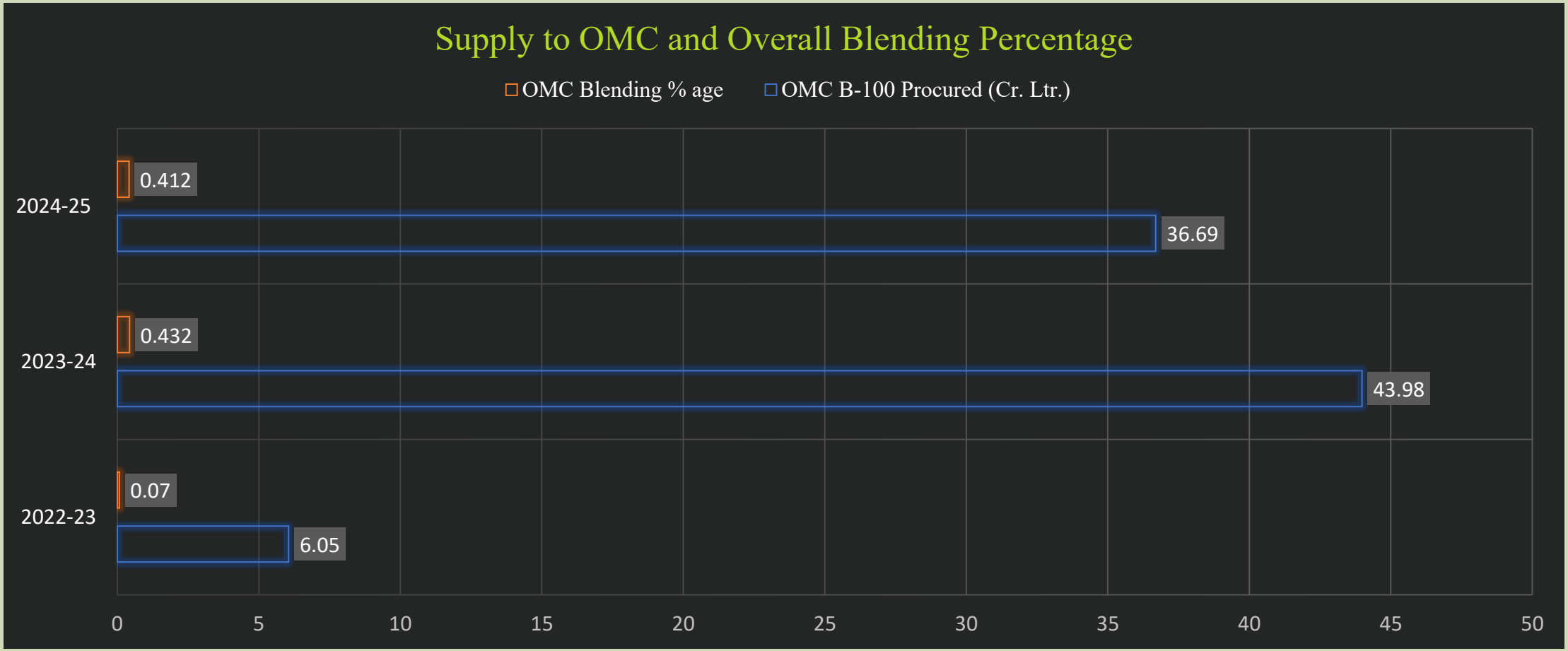


- India’s energy demand and climate commitments
- Biofuels are pillar of India’s bioenergy strategy
- The National Biofuels Policy 2018
- Atmanirbhar Bharat

MARKET SNAPSHOT

Financial Year	IOC		OMC	
	B-100 PROCURED (CR. LTR.)	BLENDING % AGE	B-100 PROCURED (CR. LTR.)	BLENDING % AGE
2022-23	3.70	0.08	6.05	0.07
2023-24	23.25	0.49	43.98	0.432
2024-25	20.48	0.525	36.69	0.412

MARKET SNAPSHOT



FEEDSTOCK ECOSYSTEM

- Indigenous feedstocks: Animal Fat, By- product from Vegetable oil refining like Palm-Stearin , Fatty Acids, Acid Oils, UCO and TBO’s like Pongamia
- A strong Oil seed cultivation and vegetable oil refining is essential for robust supply chain of by products
- Circular economy: converting waste to energy



THE SUCCESS STORY

MARKET INSIGHTS				
Sr. No.	**State**	**Biodiesel Plants enrolled with OMCs**		
		Till 2021	2022-2025	Total
1	Assam	1	0	1
2	Andhra Pradesh	3	6	9
3	Gujarat	6	16	22
4	Haryana	0	4	4
5	Jharkhand	0	2	2
6	Karnataka	0	5	5
7	Madhya Pradesh	0	7	7
8	Maharashtra	1	7	8
9	Odisha	0	2	2
10	Punjab	0	1	1
11	Rajasthan	9	10	19
12	Tamil Nadu	1	5	6
13	Telangana	1	5	6
14	Uttar Pradesh	2	25	27
15	West Bengal	1	9	10
	Total	25	104	129

POLICY LANDSCAPE

- National Policy on Biofuels (2018, updated 2022)- all stakeholders
- 5% biodiesel blending target by 2030- road map for smooth operations
- The policy- resilient to absorb price shock in veg oil matrix- risk mitigation
- Global cooperation opportunities- Carbon credit and trade



THANK YOU



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