UNLOCKING THE BIOETHANOL ECONOMY: A PATHWAY TO INCLUSIVE AND SUSTAINABLE INDUSTRIAL DEVELOPMENT IN DEVELOPING COUNTRIES

E-WORKSHOP – OPPORTUNITIES OF BIOENERGY AND BIOFUELS IN DEVELOPING ECONOMIES

WORKSHOP ORGANIZED BY IEA BIOENERGY IN COLLABORATION WITH UNIDO

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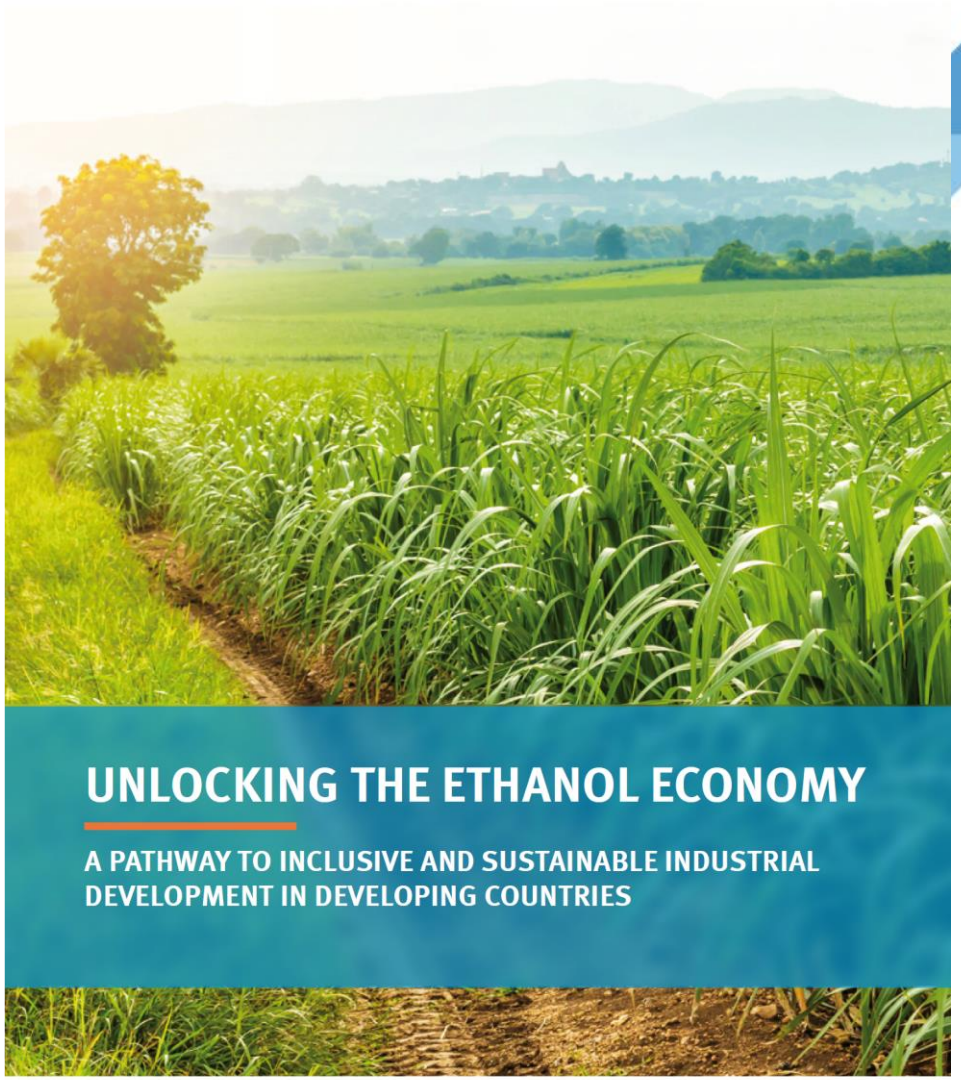
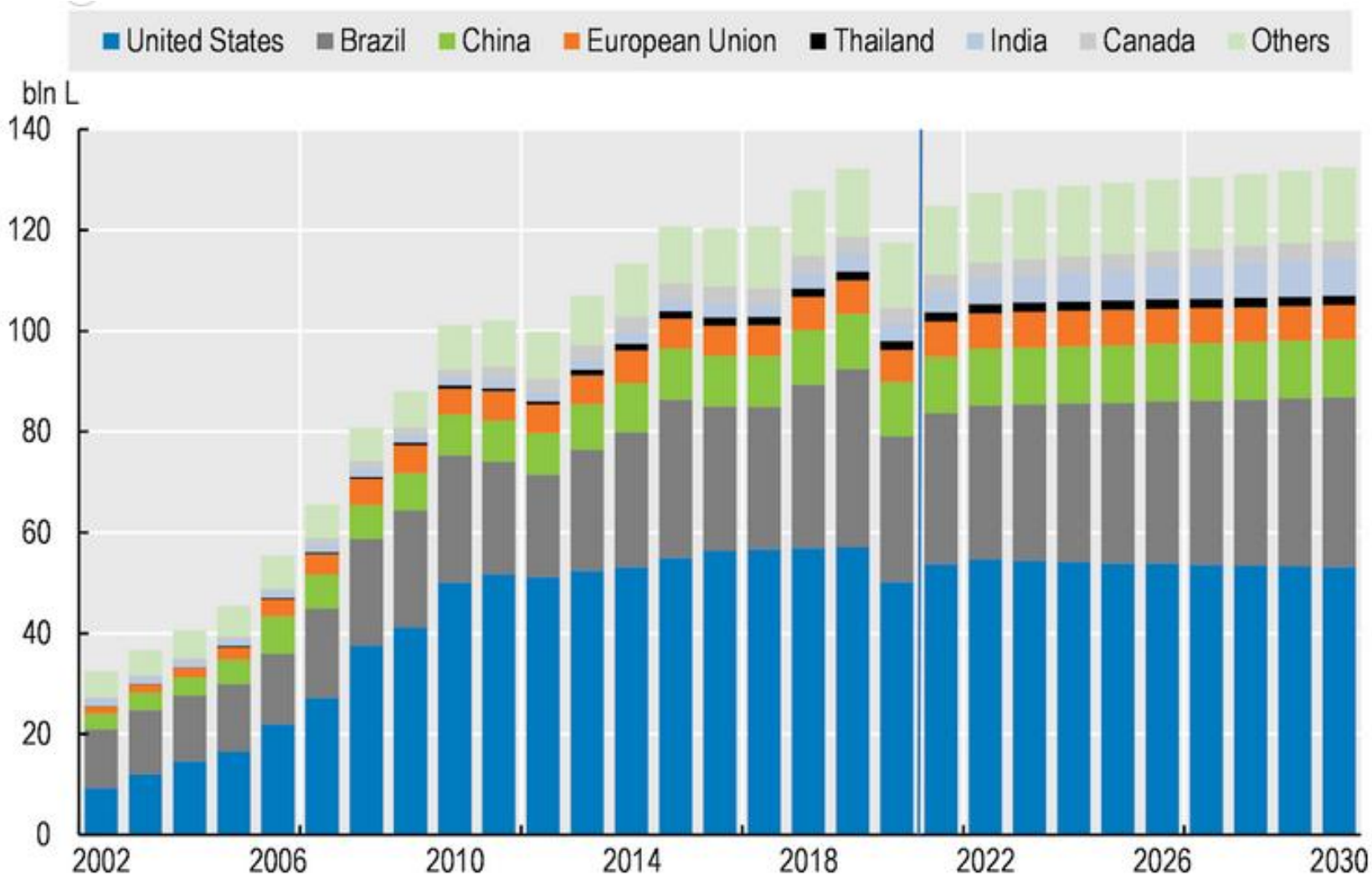
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

SUSTAINABLE DEVELOPMENT GOALS



Ref.: Unlocking the bioethanol economy: A pathway to inclusive and sustainable industrial development in developing countries, UNIDO, April 2022; https://www.unido.org/sites/default/files/files/2022-08/UNIDO_Ethanol_Summary_Report_screen.pdf

BIOETHANOL IS A GLOBAL COMMODITY – DEVELOPMENT OF WORLD ETHANOL CONSUMPTION



Source: OECD/FAO (2021), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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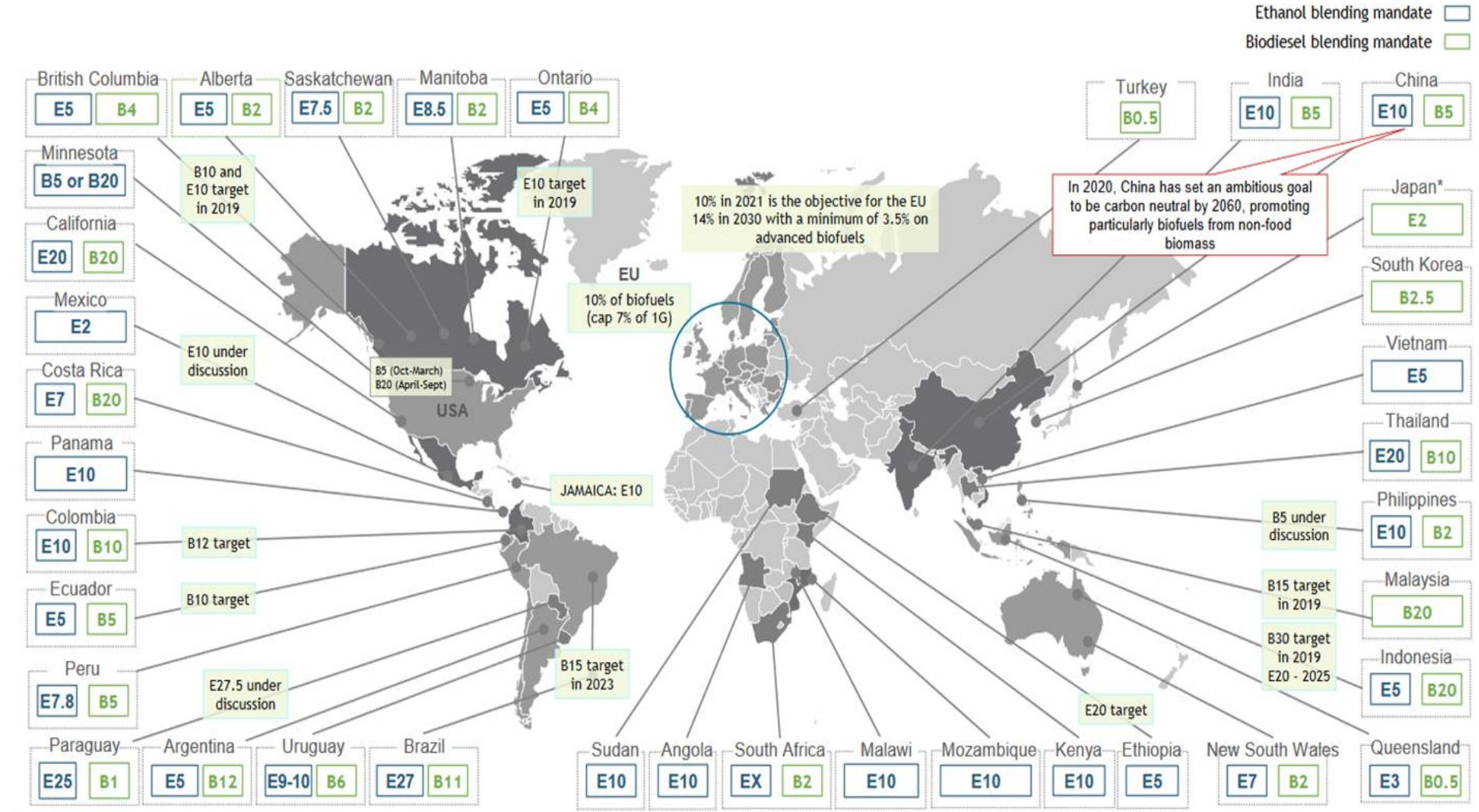
BIOETHANOL IS WIDELY USED AS A BLENDING COMPONENT IN GASOLINE



Source: Greenea Analysis, Governments websites

Note:

It is noticeable that most of the oil-producing - particularly from OPEP - have not implemented a biofuel mandate.

1. Turkey only has a mandate of 0.5% of biodiesel

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BIOETHANOL AS COOKING FUEL IN DEVELOPING COUNTRIES

Consumption of ethanol as a liquid fuel for cooking

Ethiopia	6 million liters	Haiti	75,000 to 100,000 liters
Kenya	5 million liters	Madagascar	50,000 and 75,000 liters
Brazil	1 million liters	Nigeria	40,000 liters
Mozambique	300,000 to 400,000 liters	Tanzania	40,000 liters

BARRIERS	SOLUTIONS TO EFFECT GLOBAL CLEAN COOKING TRANSITION
— High energy cost of clean fuels	— Targeted subsidies
— Household investment cost of new stoves	— Investment in infrastructure; innovative consumer financing (microcredits, credit guarantees)
— Lack of established value and distribution chains	— Implementation of innovative business models
— Competing interests	— Supportive regulatory environment

Ref.: Unlocking the bioethanol economy, UNIDO 2022

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BIOETHANOL: BENEFITS AS A RENEWABLE ENERGY SOURCE FOR TRANSPORT AND CLEAN COOKING

Ref.: Unlocking the bioethanol economy, UNIDO 2022

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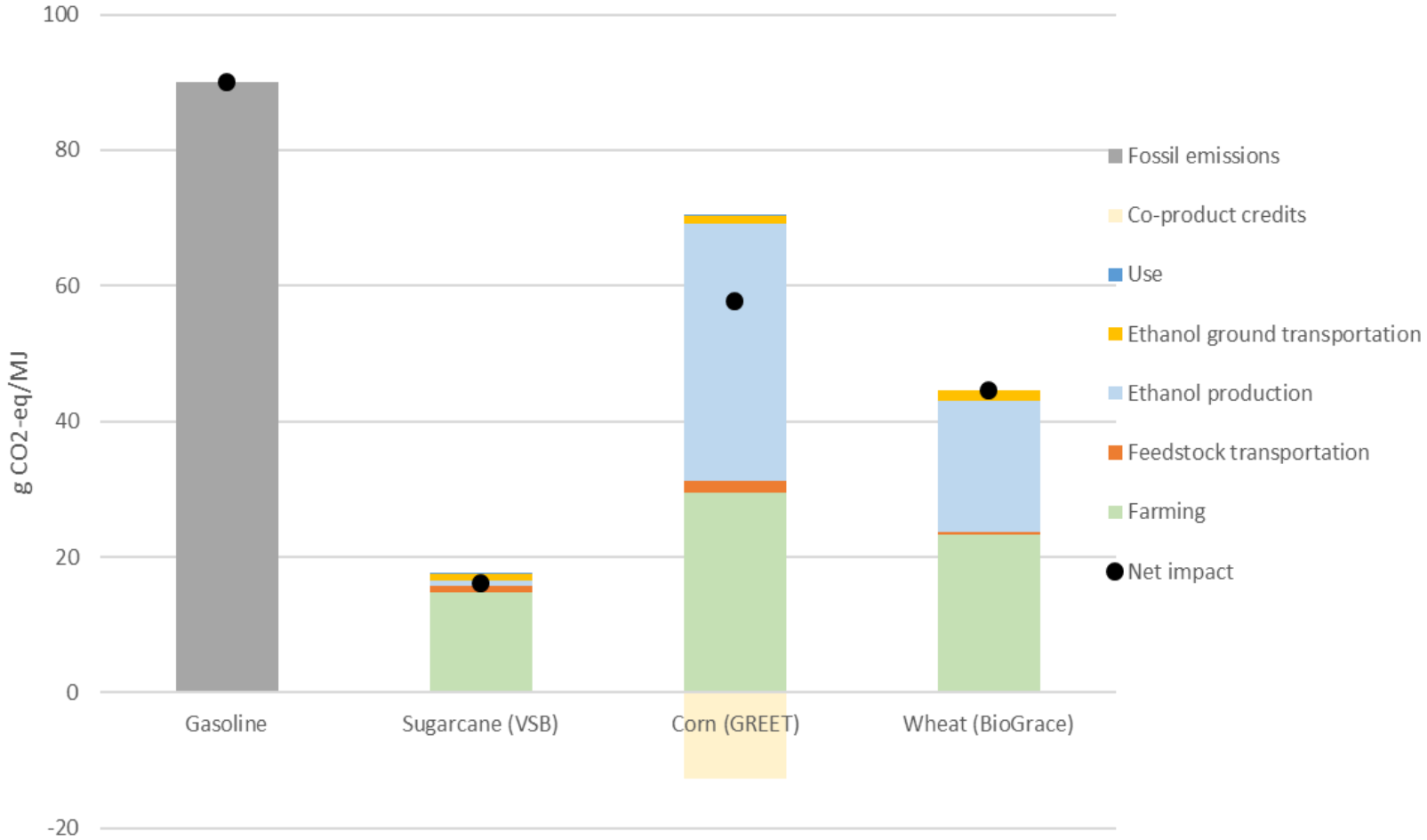
BIOETHANOL: GHG EMISSION REDUCTIONS



Ref.: Unlocking the bioethanol economy, UNIDO 2022

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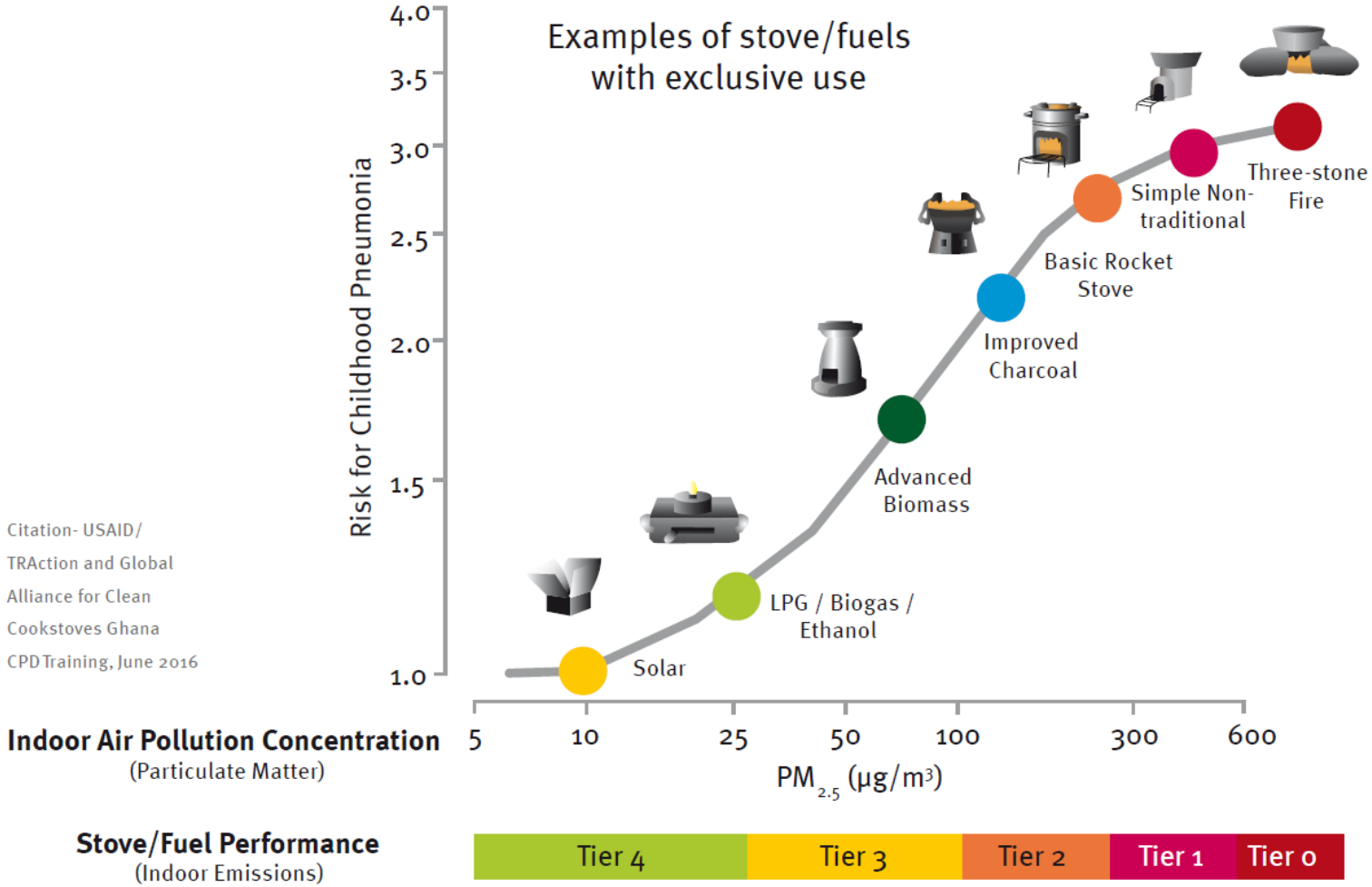
BIOETHANOL: IMPROVEMENT OF INDOOR AIR POLLUTION



Citation- USAID/ TRAction and Global Alliance for Clean Cookstoves Ghana CPD Training, June 2016

Ref.: Unlocking the bioethanol economy, UNIDO 2022

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BIOETHANOL: SOCIO-ECONOMIC BENEFITS (BRAZIL)

Socio-economic benefits of fuel ethanol in Brazil

Ethanol fuel production (2019)	36.0 billion liters
Ethanol fuel consumption (2019)	33.8 billion liters
GHG emissions avoided (2019) *	~ 53 million tons of CO_2-eq
Total GHG emissions in transport sector (2019) **	~ 190 million tons of CO_2-eq
Dependency on petroleum imports (2019)	Below zero (Brazil is a net exporter of ethanol)
GDP value of sugarcane energy sector (2018)	43 billion US$
Contribution to national GDP (2018)	2.4%
Investment in sugarcane production (2019/2020)	~ 10 billion US$
Jobs attributed to sugarcane, sugar and ethanol production (2019/2020)	2.3 million (direct and indirect impact)

*Based on life-cycle assessment

**Based on combustion only

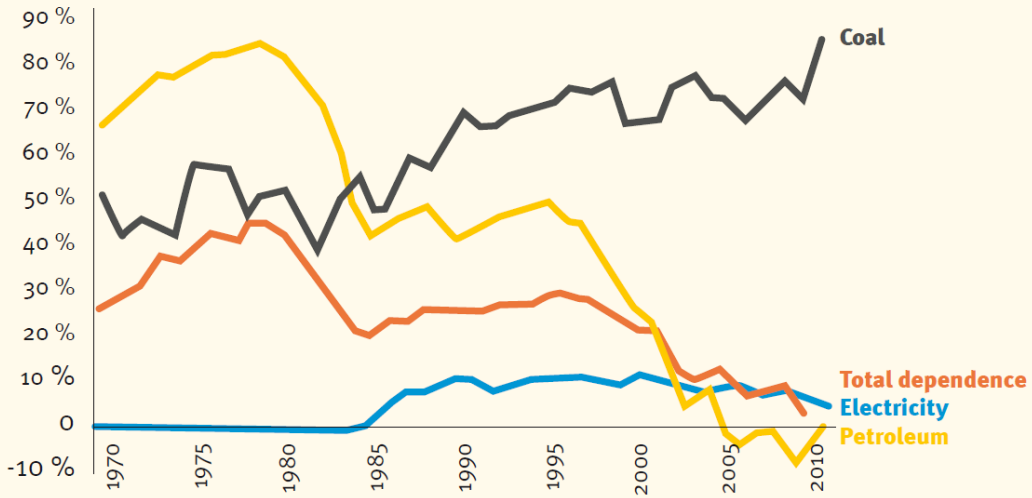

Figure 7: Brazilian dependence on energy imports (EPE, 2012)

Ref.: Unlocking the bioethanol economy, UNIDO 2022

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CHALLENGES AND STRATEGIES

Feedstock production

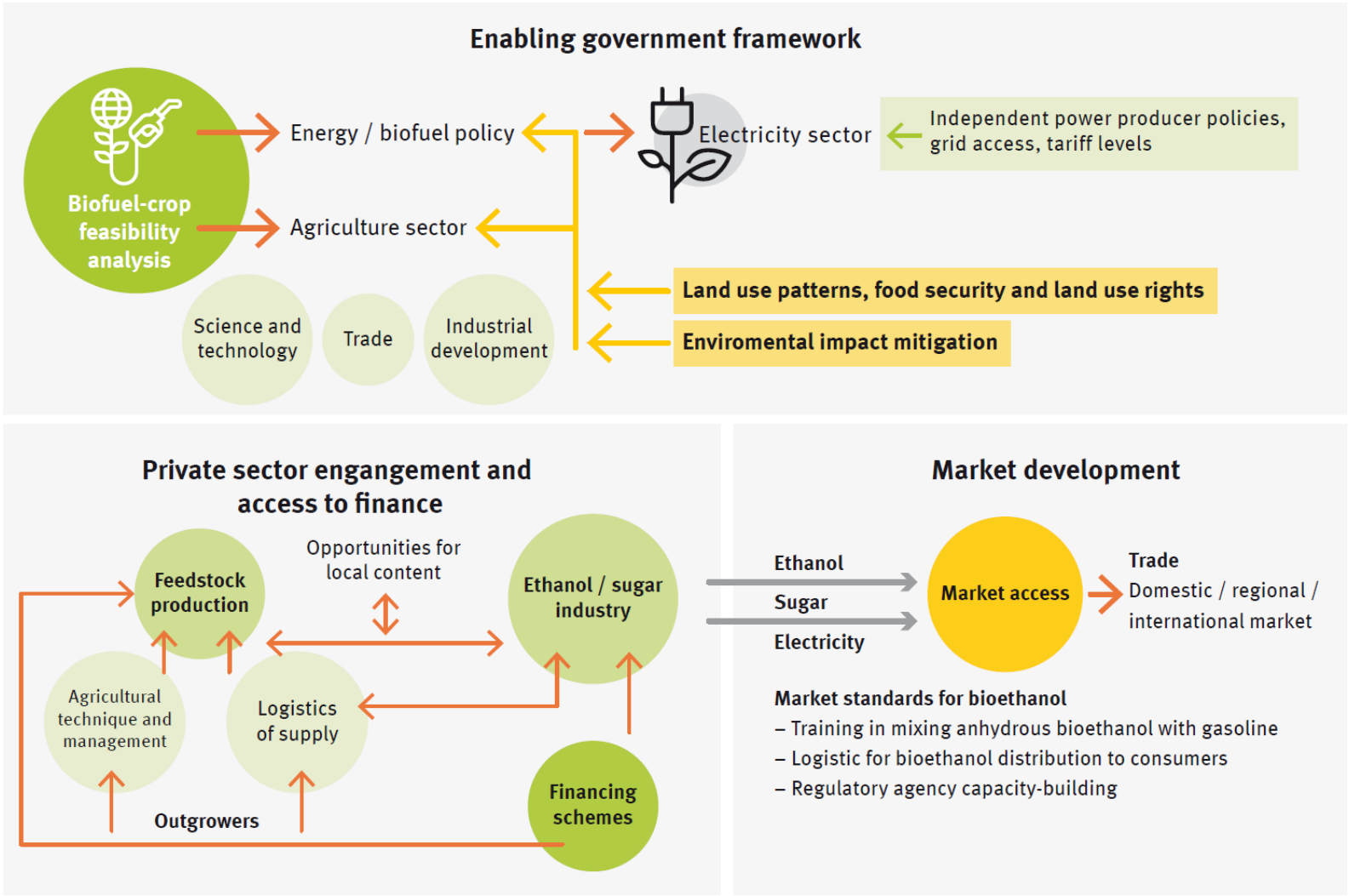
Challenge	Strategies
– Effect on food availability and food prices	– Monitoring of food security – Balancing the incentives (blending mandate, subsidies) with national feedstock availability
– Direct and indirect land use change with negative effects on vegetation such as rainforests – Loss of biodiversity through large-scale monocultural plantations	– Resource assessment to identify promising feedstocks – Agri-ecological zoning to identify suitable cultivation areas – Sustainability framework to safeguard the deployment of ethanol – Crop rotations and intercropping – Supporting small-scale plantation systems
– Inefficient land use	– Support of R&D in breeding and new varieties
– Air pollution and health risks from harvesting techniques	– Mechanical harvesting
– Displacement of small-scale farmers from their land	– Inclusion of land use patterns and land use rights in mapping and zoning
– Biomass supply chains	– Clear concept for supply chains – Involvement of local stakeholders from early planning stage

Ref.: Unlocking the bioethanol economy, UNIDO 2022

Market issues

Challenge	Strategies
– Local population does not receive fair share of added value; large-scale or foreign investors obtain most added value	– Local content requirements – Outgrower schemes for production of feedstock by small farmers – Investments in education, national R&D for agricultural practices and conversion technologies
– Blending mandates encourage imports instead of supporting national production	– Only allow provision of domestically produced ethanol – Require permits for ethanol imports or exports
– Lack of investment	– Clear framework for investors (including policies) – Funding for investments into the agricultural sector and the biofuel manufacturing sector – Access to credit, loan guarantees – Tailor-made financing schemes to support large-scale industries and local SMEs – Social financing schemes (results-based financing practices, pay-as-you-go schemes, mobile payments, microcredits)
– Production price for ethanol higher than for current fuels for transport and/or cooking	– Tax exemptions – Remove/decrease fossil fuel subsidies to make ethanol competitive
– Volatility of fossil fuel prices	– Variable ethanol subsidies
– Negative public perception of biofuels due to e.g. land grabbing, land use change, inappropriate project planning, lack of understanding of the agricultural sector by potential investors	– Early introduction of safeguards to avoid negative effects

ENABLING FRAMEWORK FOR BIOETHANOL INDUSTRY



Ref.: Unlocking the bioethanol economy, UNIDO 2022

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RECOMMENDATIONS FOR ESTABLISHING A BIOETHANOL INDUSTRY

- **Establish collaboration** and learn from countries that have already successfully implemented an ethanol industry (Biofuture Platform, IRENA, IEA Bioenergy)
- Create an **integrated policy framework**, covering the aspects: **strategic priority, policy clarity and certainty, market access, financial support, sustainability governance, innovation support**
- Involve representatives of all **stakeholders along the value chain**
- Identify **country-specific drivers and set clear targets**
- Carefully assess **country-specific risks and barriers** and develop strategies to overcome them
- Develop a set of measures to **create the market for ethanol**, make it affordable, and stimulate feedstock production and investments along the value chain, while minimizing negative impacts
- Appoint and authorize the **appropriate institutions** to implement and drive these measures against clear time lines and with clear achievement levels

Ref.: Unlocking the bioethanol economy, UNIDO 2022

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RECOMMENDATIONS FOR ESTABLISHING A BIOETHANOL INDUSTRY

- Ensure that a certain **percentage of ethanol produced is reserved for cooking fuel markets** when aiming to introduce ethanol both as a blending component for transport fuel and as a cooking fuel. Require the ethanol supply chain to hold strategic stocks to ensure no shortfalls in cooking fuel.

- Make use of **pre-existing infrastructure and markets** for feedstock production, ethanol production, and final use in transport and clean cooking applications.

- Promote and support **research and innovation** to develop and strengthen local ethanol markets and value chains.

- Frequently **evaluate progress** towards identified targets, as well as all impacts, and adapt the set of measures accordingly.

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