Mitigating the Climate Risk of Biofuels

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Technical Seminar on Marine Biofuels

February 12, 2026

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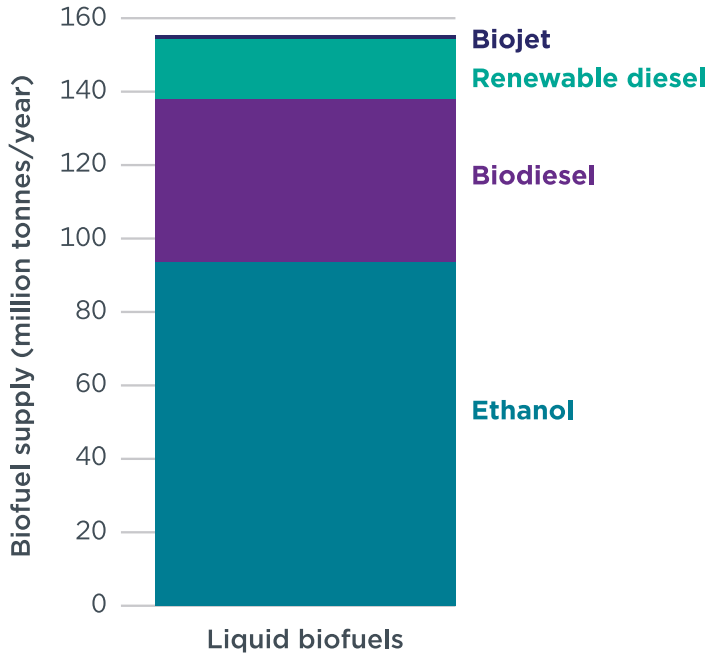
Biofuels for transport

Renewable diesel capacity around the Globe

Source: IEA Bioenergy Task 39 Biofuels to decarbonize transport: Database on facilities for the production of advanced liquid and gaseous biofuels for transport

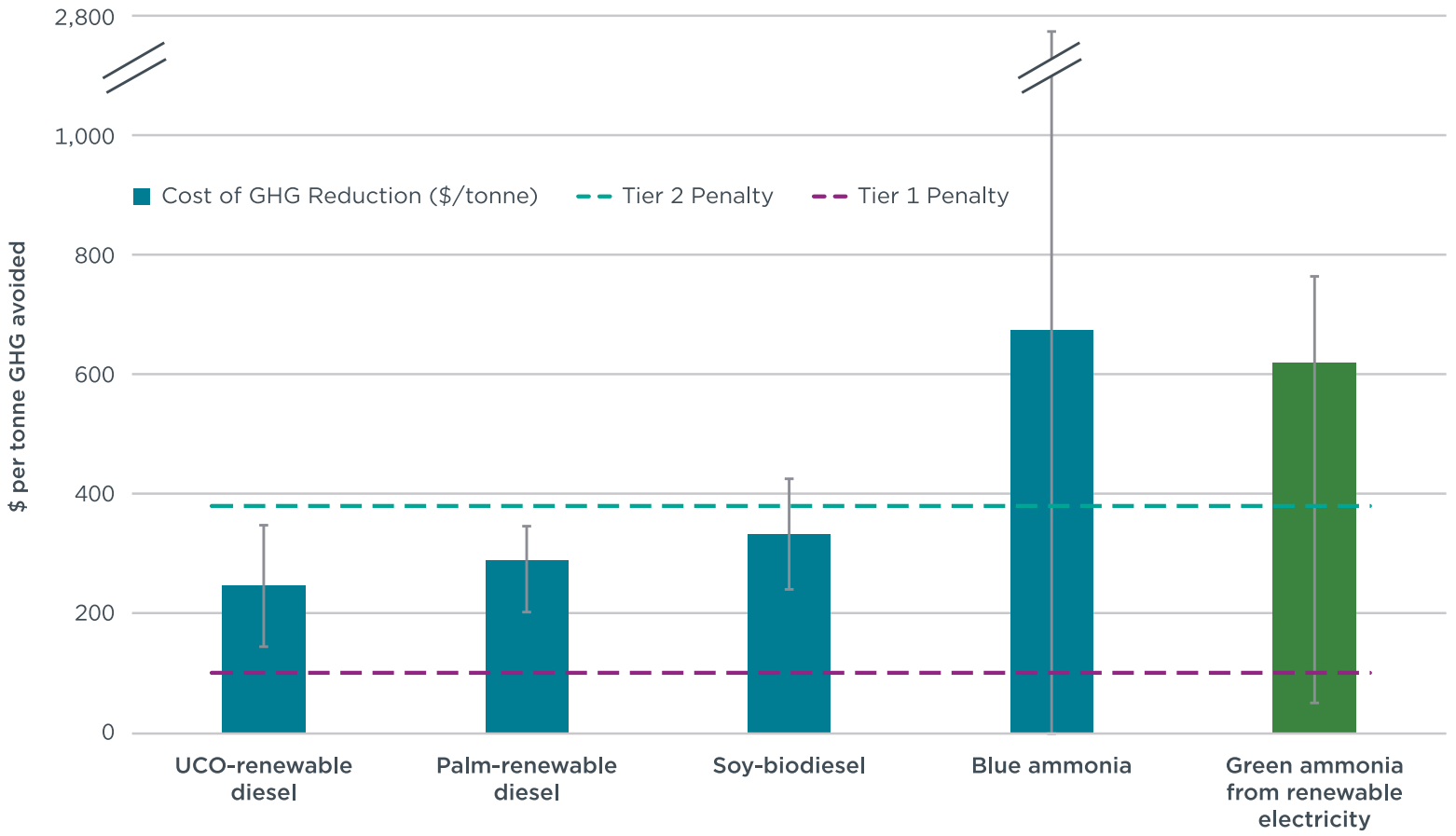
Consumption of liquid biofuels reached 4% of global demand in 2024



Source: IEA Renewable Energy Progress Tracker

The NZF could increase demand for biofuels, particularly vegetable oil-based biofuels

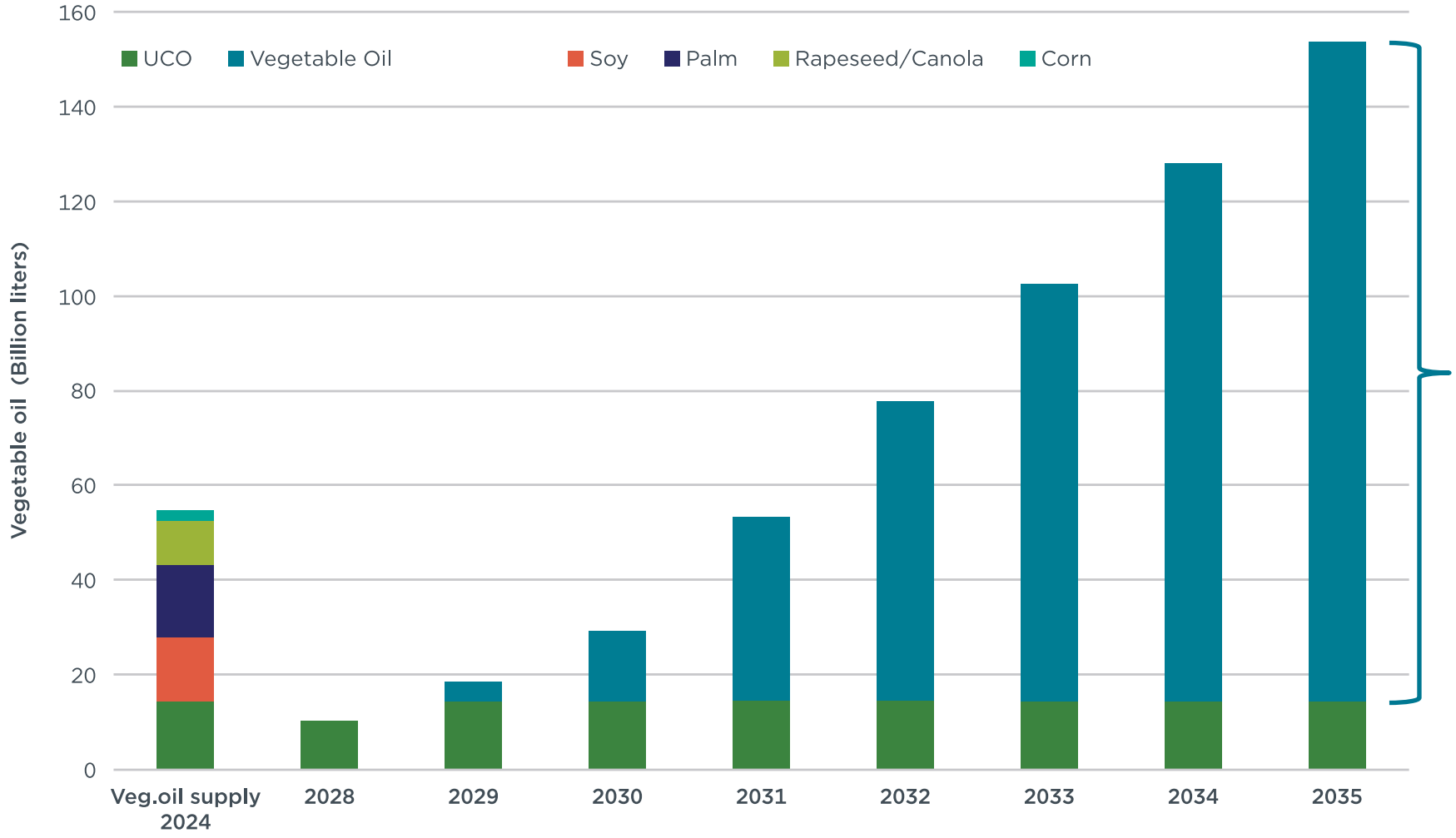
Fleet owners will choose the least expensive fuel that meets requirements



- Food- and feed-based biofuels are commercially available and relatively cheap
- Used cooking oil-based biofuel is the cheapest option.

Source: ICCT, *Estimating the maximum potential vegetable oil demand for international shipping under the IMO's Net-zero Framework*

Vegetable oil demand could reach 3.5x current biofuel use



From 40 billion liters in 2024 to 140 billion liters by 2035.

Source: ICCT, *Estimating the maximum potential vegetable oil demand for international shipping under the IMO's Net-zero Framework*

Increased demand for vegetable oils could trigger deforestation

Why large demand for vegetable oil-based biofuels is a concern

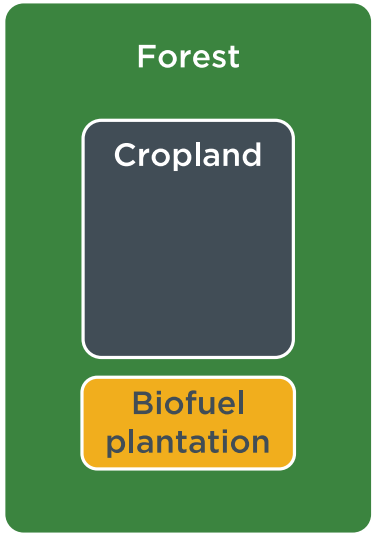
- Major concern with palm and soy is peatland drainage and deforestation, respectively.
- Vegetable oils such as palm, soybean, rapeseed and sunflower are highly substitutable.[1,2] Rising demand for one of them can impact the price of others.
- Recent research found causal relationships between biofuels demand and increase in deforestation and carbon emissions.[1]

Source: Chen et al., Using Vegetable Oils for Biofuel (2025)
Endnotes are on Slide 18

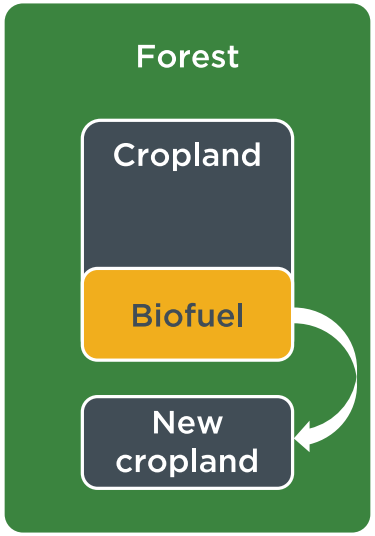
Land use change emissions are the most important factor influencing food and feed biofuel GHG emissions

Land use change can contribute to emissions from biofuels in two ways:

Direct land use change (DLUC)
New cropland is created for the production of biofuel feedstocks



Indirect land use change (ILUC)
Existing cropland is used for biofuel, forcing other materials to be produced on new cropland



Source: El Takriti et al., *Understanding Options for ILUC Mitigation* (ICCT, 2016).

Policies either include default ILUC emission factors or cap/limit/phase-out high-ILUC risk biofuels

	ILUC quantification	Phase-out high-ILUC risk feedstocks	Limit/cap food/feed biofuels	Exclusion of food/feed biofuels
ICAO CORSIA	✓[3]			
California's Low Carbon Fuel Standard	✓		✓[5]	
U.S. Renewable Fuel Standard	✓			
EU Renewable Energy Directive		✓[4]	✓	
FuelEU Maritime				✓
ReFuel EU				✓

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ILUC is a global phenomenon and it cannot be mitigated via regional or project-level approaches

LCA Guidelines include a qualitative risk-based approach with limited operational guidance

Current language in IMO LCA Guidelines

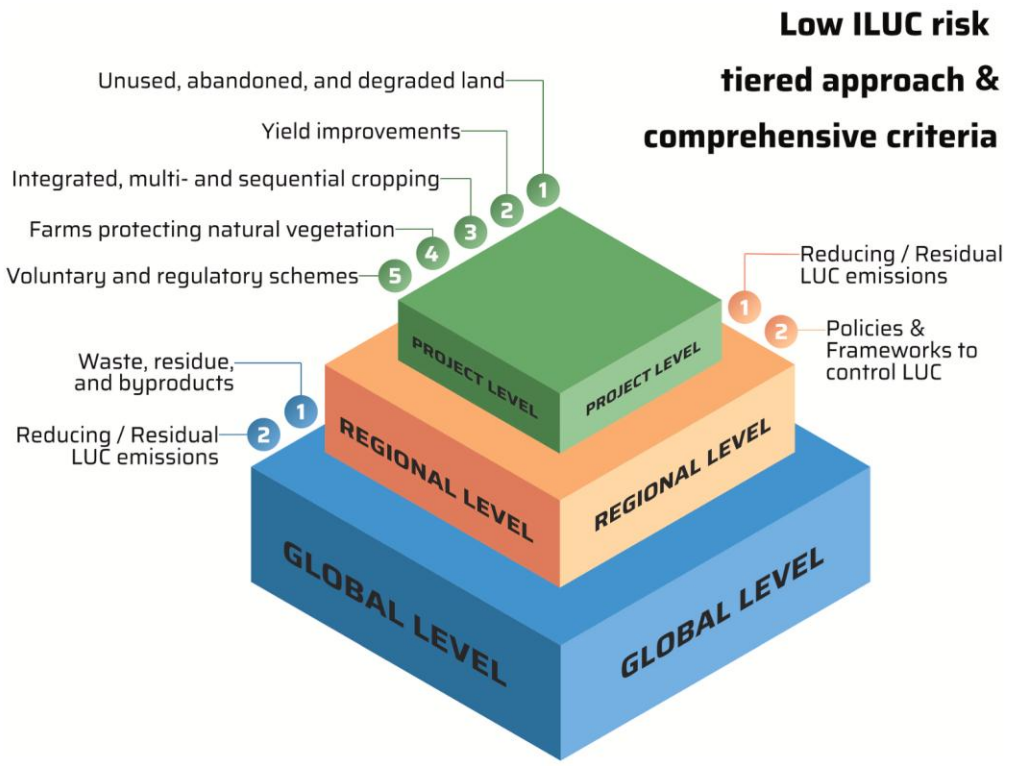
High-ILUC risk

"…projects based on, or displacing, food and feed crops, resulting in a significant expansion of feedstock production area shifting into land with high carbon stock; and…"

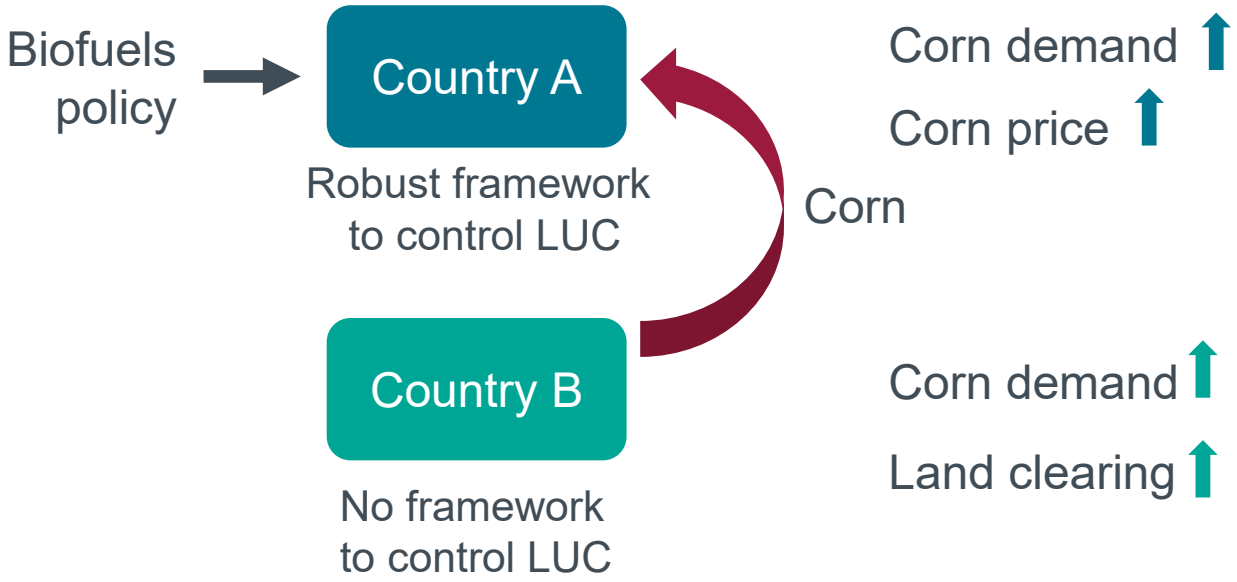
Low-ILUC risk

"…projects that supply additional feedstock without disrupting existing land uses. When productivity is increased on an area in agricultural production, only additional yields should be considered as low-ILUC rather than the entire production."

ILUC is a global phenomenon



Source: Novaes et al. 2026, Energy Policy



ILUC is a global phenomenon that cannot be addressed through jurisdictional approaches and policies

- Global restrictions on high-ILUC feedstocks (e.g., food/feed crops) may be significantly more effective than a purely jurisdictional approach.[6]
- Jurisdictional measures primarily safeguard against the DLUC. They fail to address the risk of cross-boundary leakage in a global commodity market (ILUC).[7]
- **Amazon Soy Moratorium:**
  - Slowed deforestation in the Amazon.[8] However, leakage of deforestation into other biomes, such as the Cerrado, was detected.[9]
  - Brazilian Amazon soy area increased from 0.4 M ha in 2001 to 4.6 M ha in 2019.[10] 49% of the expansion involved primary and non-primary forests.

Endnotes are on Slide 18

Project-level ILUC should include additionality

- ILUC is a system-level, market-mediated effect driven by global demand, displacement, and land competition—it is not something that can be reliably screened out at the project level.
- Additionality: Certification could guarantee that production for biofuels represents additional supply compared to a business-as-usual scenario, in the absence of the IMO Net-Zero Framework.
- Yield improvements, multi-cropping and sequential cropping,[11] and the development of unused, abandoned, or degraded land,[12] are practices widely applied today. These are necessary to ensure an adequate food supply in the future.

Endnotes are on Slide 18

Considerations on high-ILUC risk biofuels should be a priority

Recommendations for effective ILUC mitigation

To avoid detrimental deforestation and other land use change emissions induced by an increase in biofuel demand under the NZF:

- the IMO could cap or exclude the highest risk feedstocks universally, at global level.
- Excluding high-ILUC risk feedstocks could be done using quantitative metrics based on rigorous scientific criteria.
- Project-level ILUC considerations should adhere to robust additionality criteria, to avoid certification of business-as-usual practices as “low-ILUC” risk.

Questions?
Contact: g.seber@theicct.org

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Endnotes

1. Chen, T. J., Sexton, R. J., & Smith, A. Working Paper. **2025**. *Using Vegetable Oils for Biofuel Accelerates Tropical Deforestation and Increases Carbon Emissions*, Univ. of California Davis
2. Berry, S. **2025**, *Biofuels and Land Use: Empirical Evidence and GTAP Models*, Biofuel and Land Use Change Public Forum Presentation.
3. Projects that satisfy low-land use change risk practices gets an ILUC value of zero instead of the default emission factors.
4. Projects that can satisfy low-ILUC risk criteria are exceptions. Palm is designated as high-ILUC risk, soy is shown to qualify as high-ILUC risk in the amended Delegated Regulation (EU) 2019/807, pending approval. European Commission **2026**, *Draft act, Review of the methodology and data for high ILUC-risk biofuels and trajectory for the gradual decrease*
5. Caps credits from the use of soy, canola and sunflower oils for compliance per company.
6. Yarlagadda et al., "Emissions Leakage and Economic Losses May Undermine Deforestation-Linked Oil Crop Import Restrictions," *Nature Communications* 16 (2025): 1520.
7. El Takriti et al., *Understanding Options for ILUC Mitigation* (ICCT, 2016).
8. Heilmayr et al. **2020**, *Brazil's Amazon Soy Moratorium reduced deforestation*. Nature Food,1, 801-810.
9. Lambin, E. F. et al. **2018**. *The role of supply-chain initiatives in reducing deforestation*. Nature Climate Change, 8(2), 109-116.
10. Song et al. **2021**, Massive soybean expansion in South America since 2000 and implications for conservation. Nature Sustainability, 4(9), 784–792..
11. Haye et al., *Assessment of the Potential for New Feedstocks for the Production of Advanced Biofuels – Final Report* (Publications Office of the European Union, 2022).
12. Searle et al., *Analysis of High and Low Indirect Land-Use Change Definitions in European Union Renewable Fuel Policy* (ICCT, 2018)