TRANSPORT & ENVIRONMENT

ALTERNATIVE FUELS IN MARITIME TRANSPORT

BILL HEMMINGS

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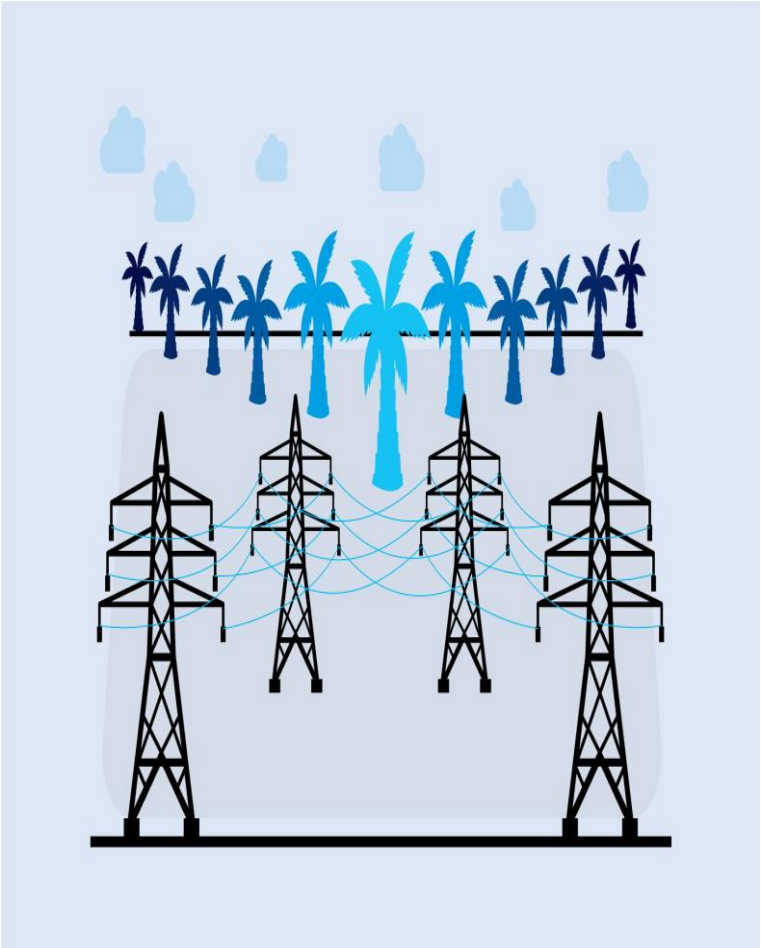
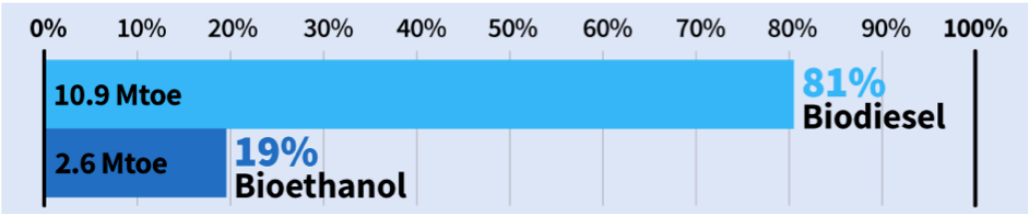
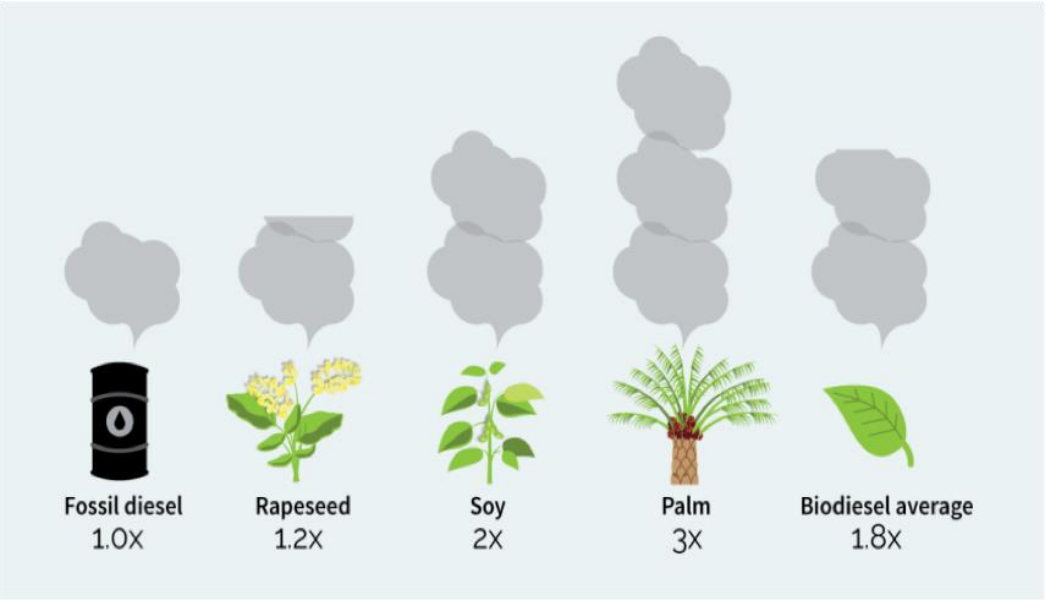
ALTERNATIVE FUELS MARITIME

- Objective is lower => zero carbon
- Endgame is zero carbon fuels
- Biofuels - sustainability criteria
  agreeing criteria, enforcing
- Not decarbonisation solution
- LNG
- What are we regulating?
  Ships or fuels?
- Questions of supply
  Alt fuels, electro fuels
- Certification and enforcement

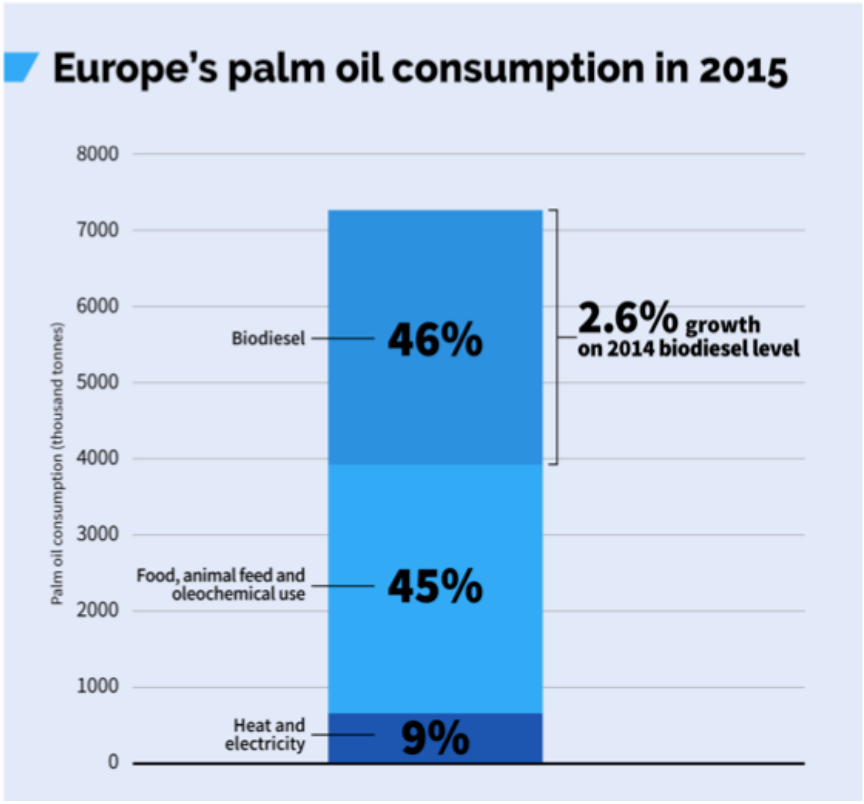


MOST EU BIOFUELS DON'T DECARBONISE TRANSPORT





EU crop biodiesel is on average 80% worse for climate than fossil diesel

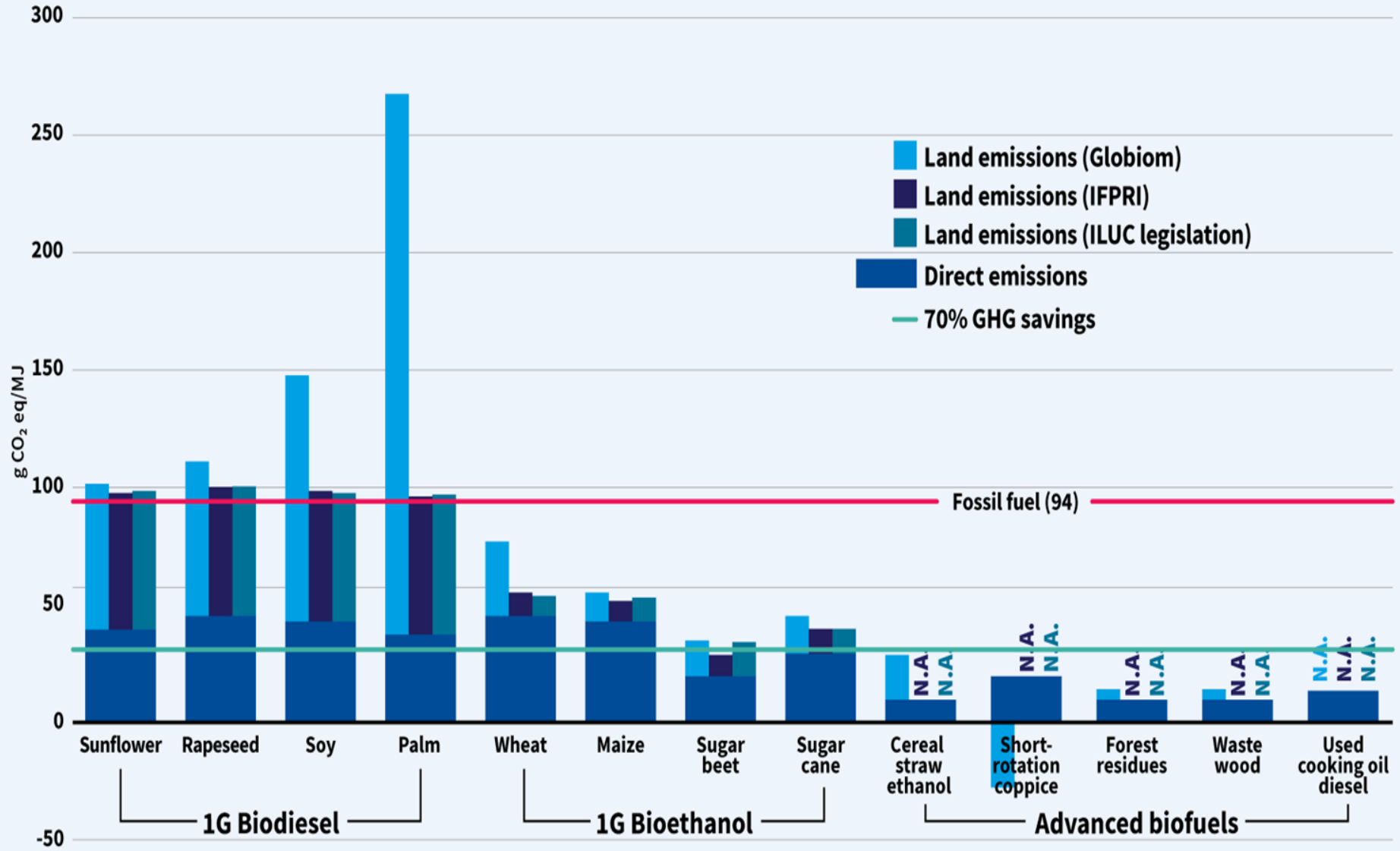


EU drivers are top consumers of palm oil

BIOFUELS EU EXPERIENCE

- “Biofuels are low carbon fuels, not zero emission fuels.
- Only zero C fuels deliver decarbonisation.
- Biofuels done wrong increase CO2 - look at the EU
- 25% EU biodiesel feedstock = imported palm oil
- Proper carbon accounting critical - DLUC & **ILUC**
- Acute lack of transparency about EU biofuel data and use
- Other issues: water, human rights, land grabbing, biodiversity, etc.
- Forests and grasslands
- negative emissions and carbon sinks
- **No** to crop-based biofuels.
- Wastes & residues

Direct emissions plus land emissions



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Source: RED II, ILUC directive, Globiom, IFPRI

LESSONS FROM ICAO

- **“Merely” establishing sustainability criteria to replace offsets**
  - Not regulating fuel use
  - Certification, verification and enforcement = member (flag) states
  - 3 years AFTF work - Council deletes 10/12 sustainability criteria
- Out = land rights, food security, labour rights & biodiversity protection.
- In = 10% reduction threshold & 2009 deforestation cutoff
- Definition “amended” . Includes “green” fossil eg refinery solar panels
- **Political pressure producer nations weakens rules:**
  Political role ICAO Council
  - Brazil, USA, Malaysia, Indonesia, Liberia, Argentina, Colombia, Congo,

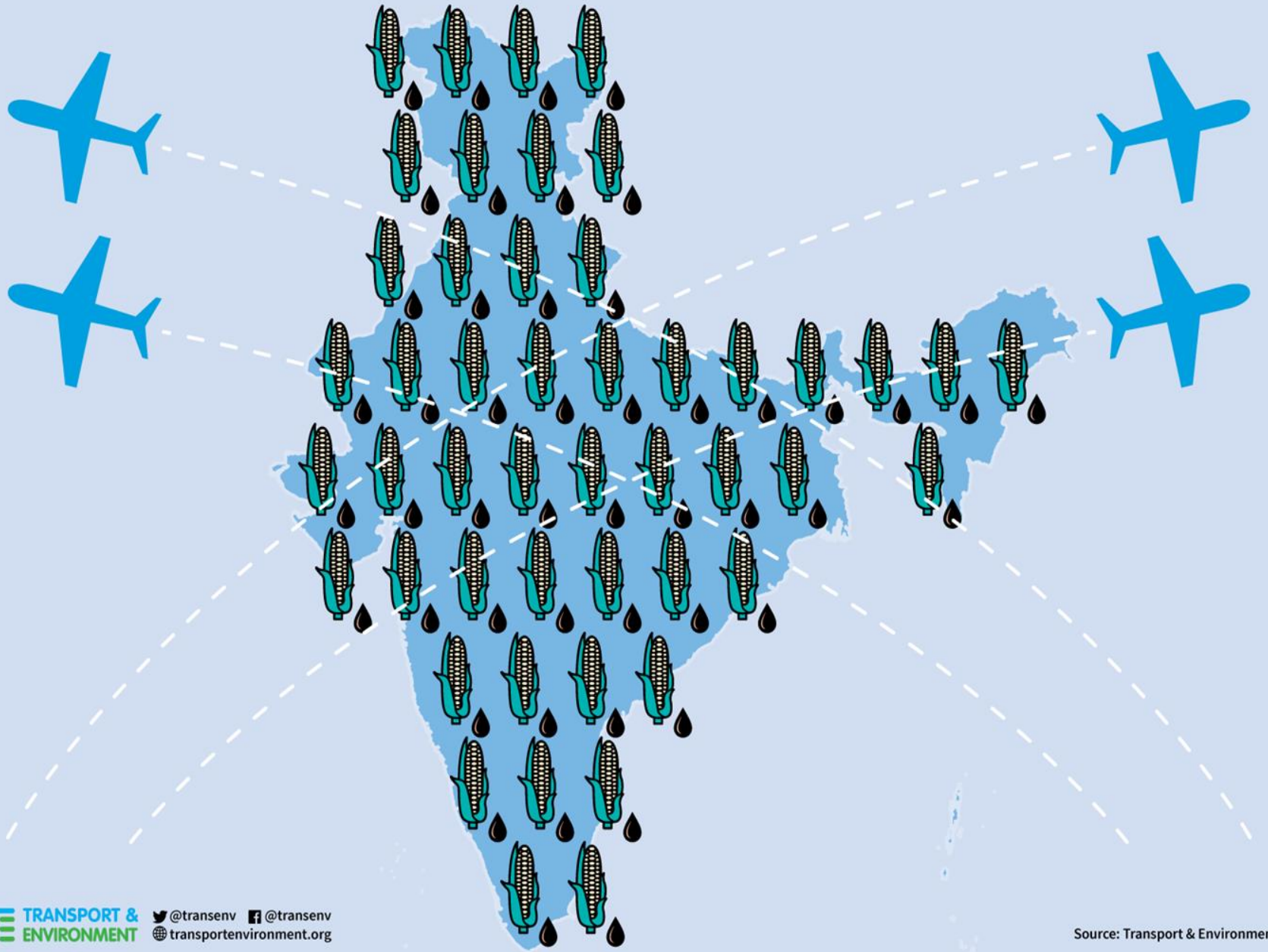
SUSTAINABILITY LESSONS

- Get it right from the beginning. Certainty needed
- Don’t grow food or grass crops for ethanol or diesel
- Even modest bioenergy production greatly increases global competition for land
- Reputational damage risk
- Creating incentives that relax sustainability criteria undermines the deployment of good fuels & credibility of climate action.

SUSTAINABLE ADVANCED BIOFUELS - AVAILABILITY

- EC 2016 REDII definition; “biofuels produced from feedstocks listed in part A of Annex IX as adopted in 2015 in the ILUC Directive.
- List includes wastes & residues but also energy crops, pulpwood.
- Wastes & residues provide 6.3-7.8 Mtoe advanced biofuels in 2030
- = around 2.3-2.8% EU BAU 2030 energy demand in road and rail.
- SAB for EU aviation in 2050 = 7,500 ktoe = 11.4% EU jet demand
- 7,500 ktoe SAB meets 13.4% of EU-related ship 2050 fuel demand
- Or 6.7% if available supply is split between EU aviation and ships

Area the size of India required to fuel aviation with biofuels



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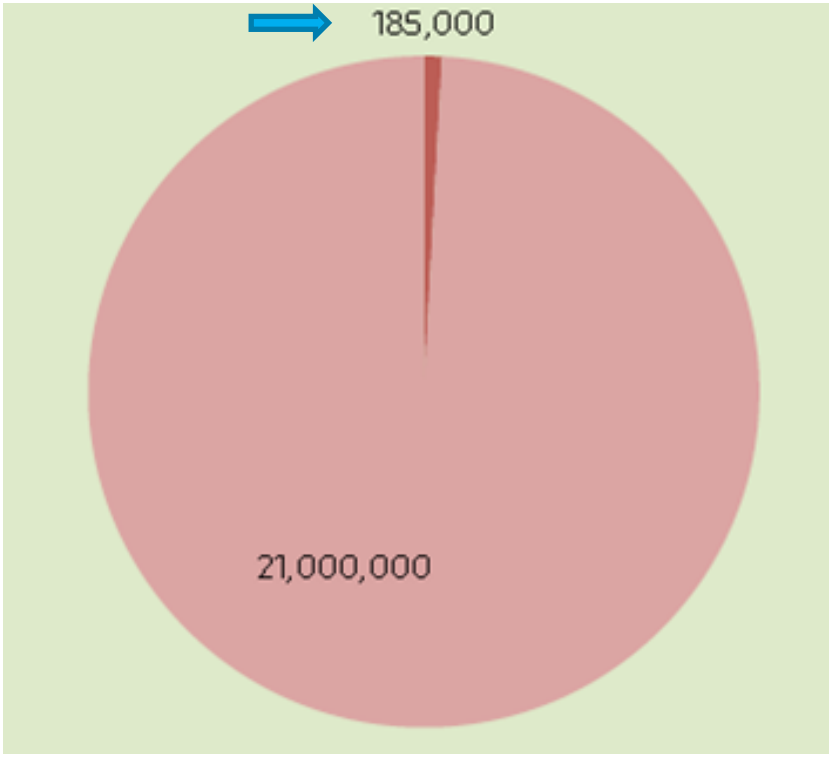
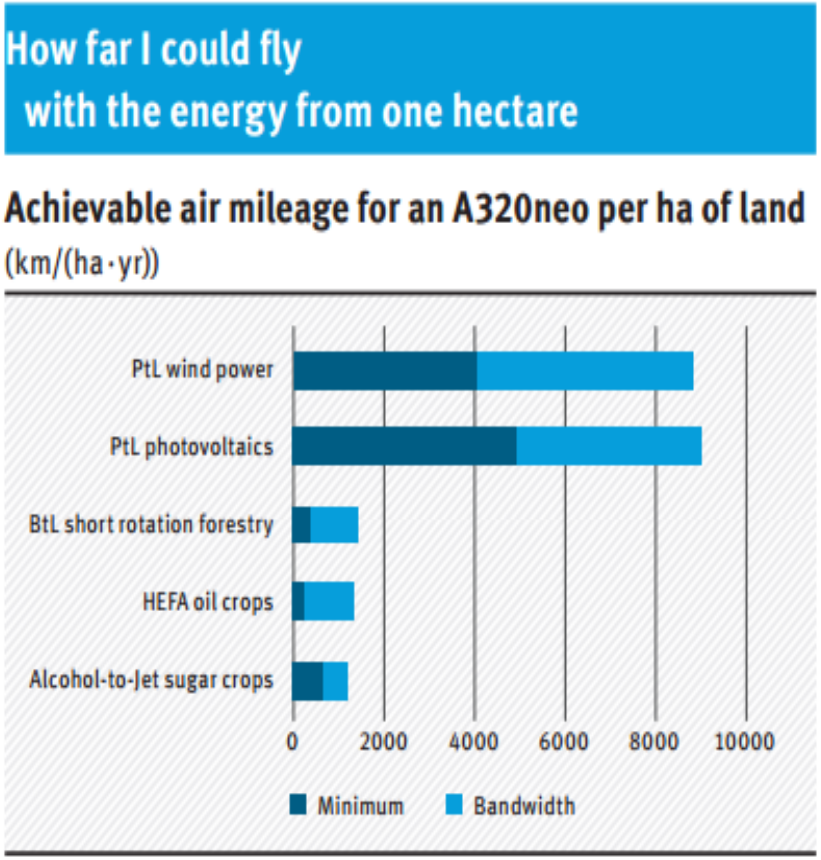
Source: Transport & Environment

SUPPLY EXAMPLES

If all used US cooking oil goes to US aviation

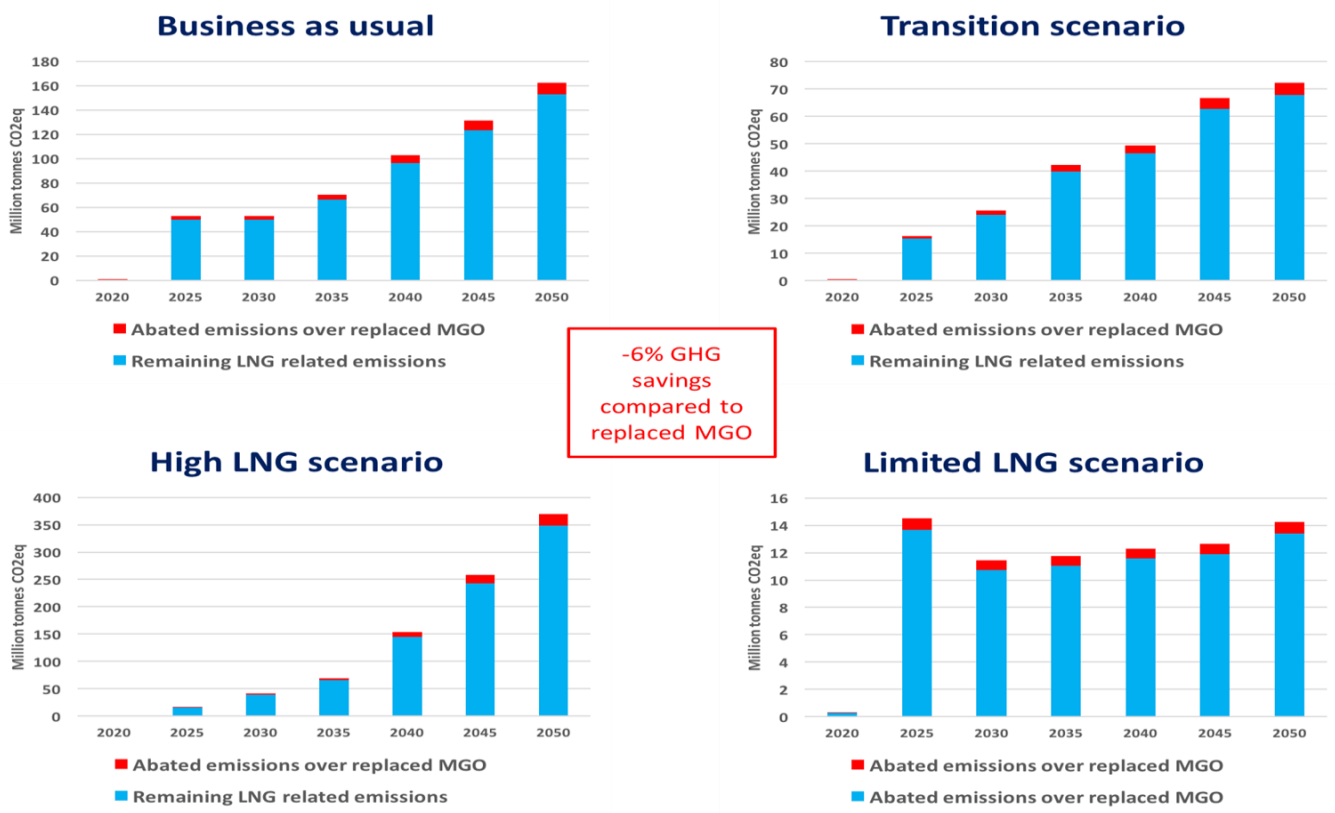


How much used cooking oil could be available for the aviation industry in the US? (in million gallons)



IS LNG THE ANSWER?

LNG provides limited GHG reductions;
6% (MGO) to 10%(HFO/LSHFO) at best
after accounting for methane slip and leakage

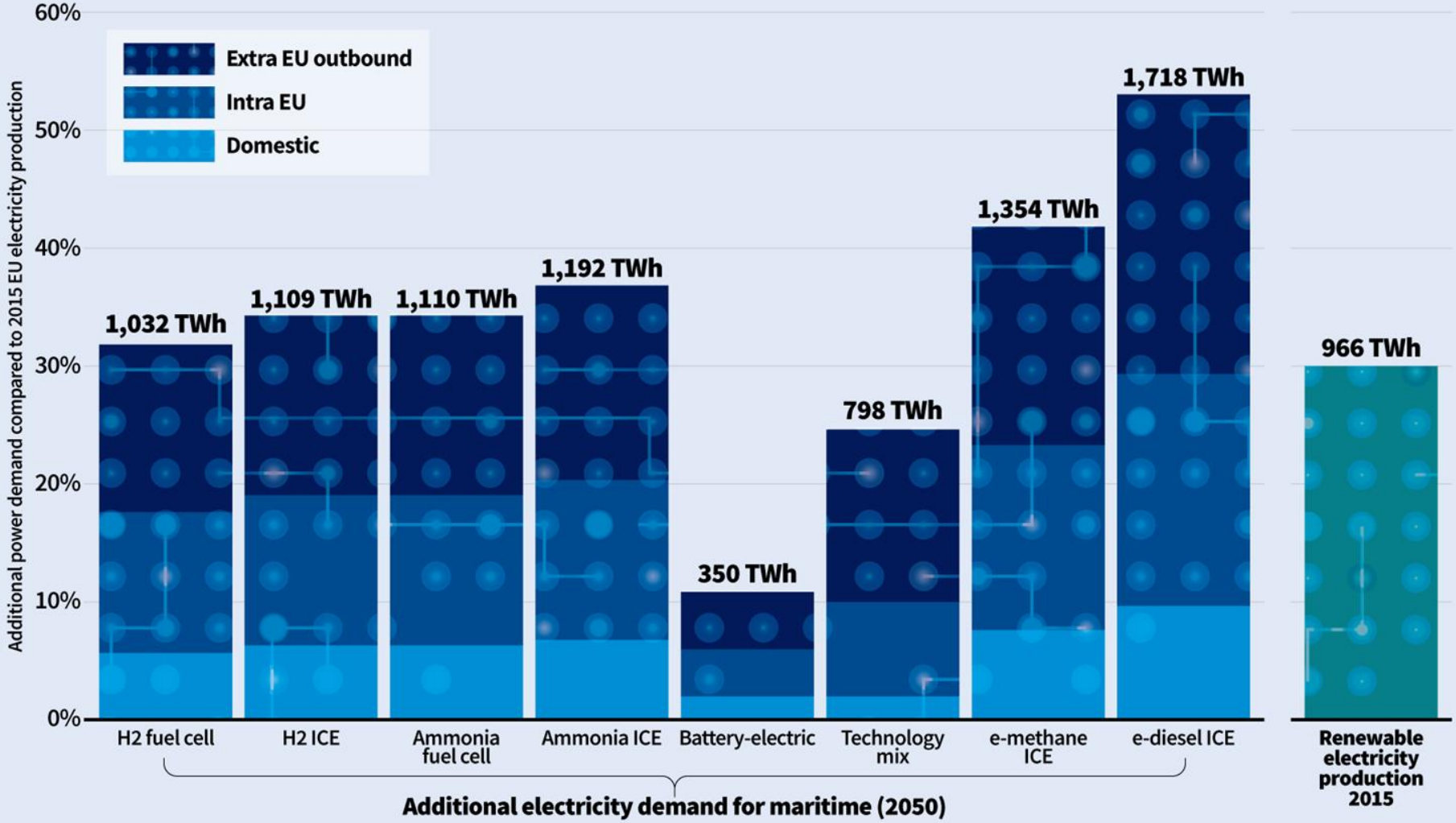


https://www.transportenvironment.org/publications/lng-marine-fuel-eu

SYNTHETIC FUELS FOR SHIPPING

- Battery-electric technology and hydrogen/ammonia fuels
- Technology mix; all 3 best for EU shipping
- Minimises renewable energy needed
- And associated infrastructure - electricity transmission grids, shore-side charging stations, hydrogen/ammonia production plants, new ship propulsion and energy storage designs, and new port bunkering infrastructure.
- Tech mix requires 25% additional electricity generation over current EU 2015 levels
- Electro-methane & electro-diesel & CO2 from air capture require;
  - 42% and 53% additional renewable electricity over EU 2015 levels.
- Start with SSS

Shipping's additional electricity demand under different technology pathways in 2050



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Source: Transport & Environment (2018)

FUEL BLENDING ISSUES

- IMO regulates ships. States refuse to regulate ship fuel suppliers
- LCFS - California & EU regulate fuel suppliers not the vehicles
- Blend mandate on suppliers doesn’t regulate what’s in vehicle
- IMO LC standard will require CO2 reductions at the ship level
- Proving the fuel delivers low C at the ship level great challenge
- Especially for biofuels & synthetic methane & diesel
  - May not be enforceable at the ship level
  - % biofuel yes. Upstream sustainability?
  - Synthetic hydrocarbons identical chemical signature

ALTERNATIVE FUELS & ENFORCEMENT

- Irrespective of the biofuels LCA/sustainability performance
- Enforcement will rely on BDN & sustainability certificates
  - - unreliable
- And on port state inspections?
  - % of biofuel in blend can be tested
  - Sustainability and LCA not so
  - Synthetic methane and diesel still emit GHG
  - Physical properties indistinguishable from fossil equivalents without mass spectrometry
  - At high price premium => fraud

END