

Sustainability standards for biofuels

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Initial policy drivers for biofuels



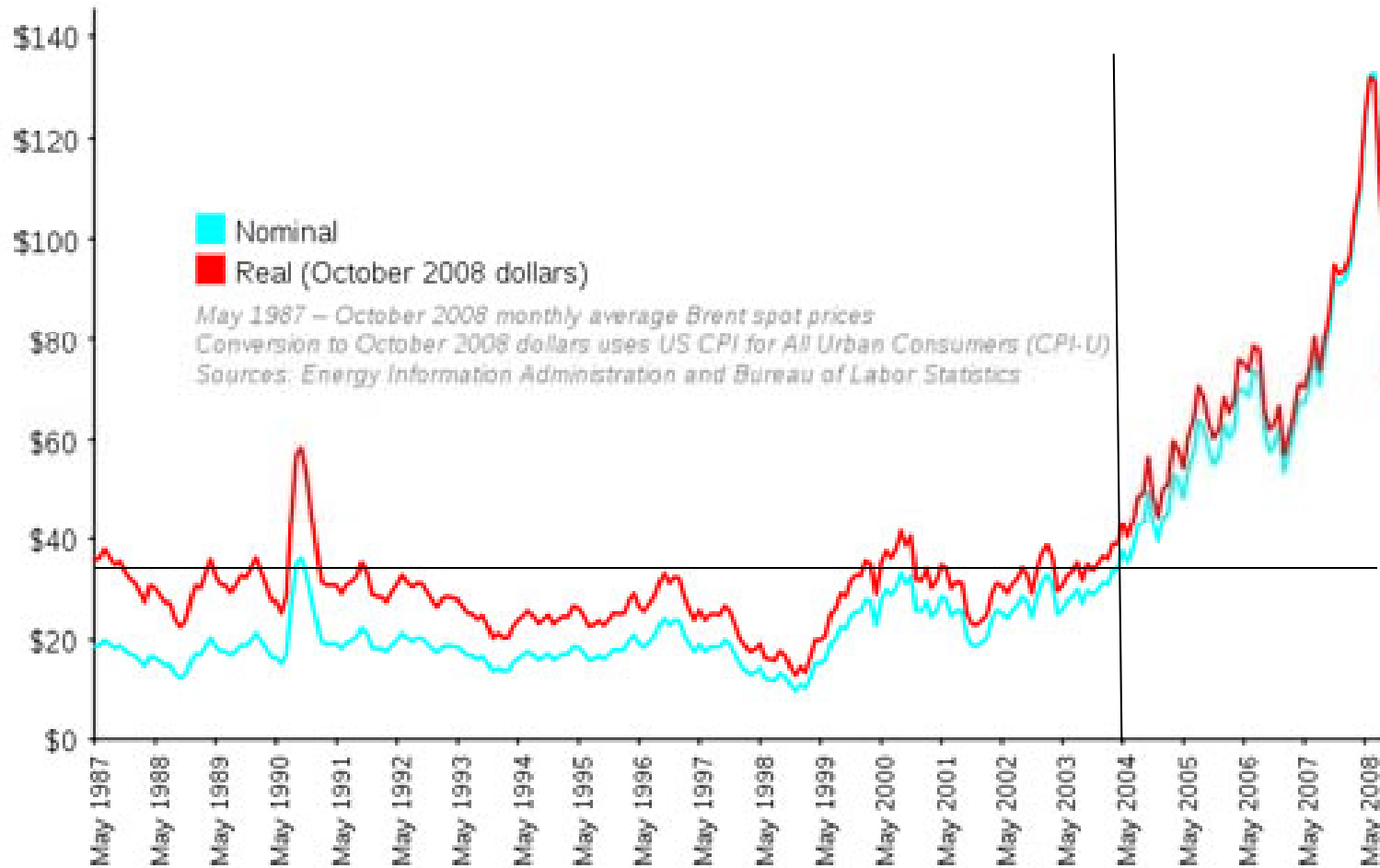
Government support for biofuels traces back to 1970s for fuel ethanol, 1990s for biodiesel. Motivated by desire to:

1. Aid farmers, or the rural sector more generally
2. Improve foreign exchange, through import substitution
3. Reduce dependence on energy imported from “unstable” countries
4. Improve quality of the air in cities

Interest in potential to reduce greenhouse gas (GHG) emissions is a relatively recent rationale.



Petroleum price rise in mid-2000s gave new boost ...

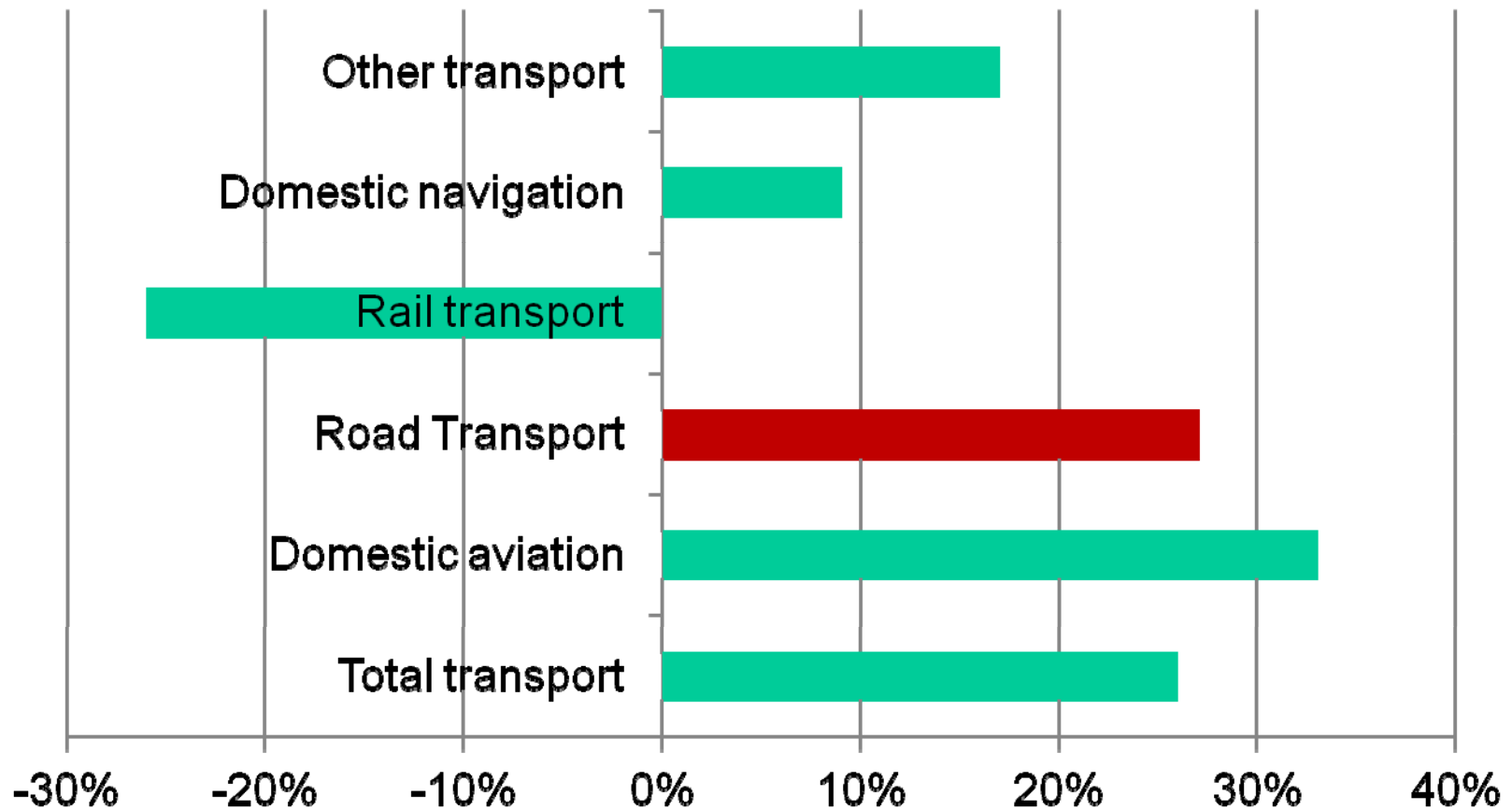




... as did rise in GHG emissions from transport



Growth in the EU's transport-related GHG emissions by mode, 1990-2004



Data Source: European Environment Agency.



Biofuels displace oil and recycle CO₂!



Source: Energy Future Coalition (www.energyfuturecoalition.org/biofuels/benefits_env_public_health.htm)



Common approach used to encourage biofuels



- **Fuel-excise tax exemptions** (or reduced rates), or provide production bounties
 - Australia, Canada, China, Chinese Taipei, Brazil (certain states), EU, India, Japan, Korea, Philippines, Switzerland, Thailand, United States, among others
- **Mandated levels** of biofuel use or shares in transport fuels
 - Canada, China, Chinese Taipei, Brazil, EU, Indonesia, India, Korea, Malaysia, Philippines, Thailand, United States



However, biofuels differ upstream from use



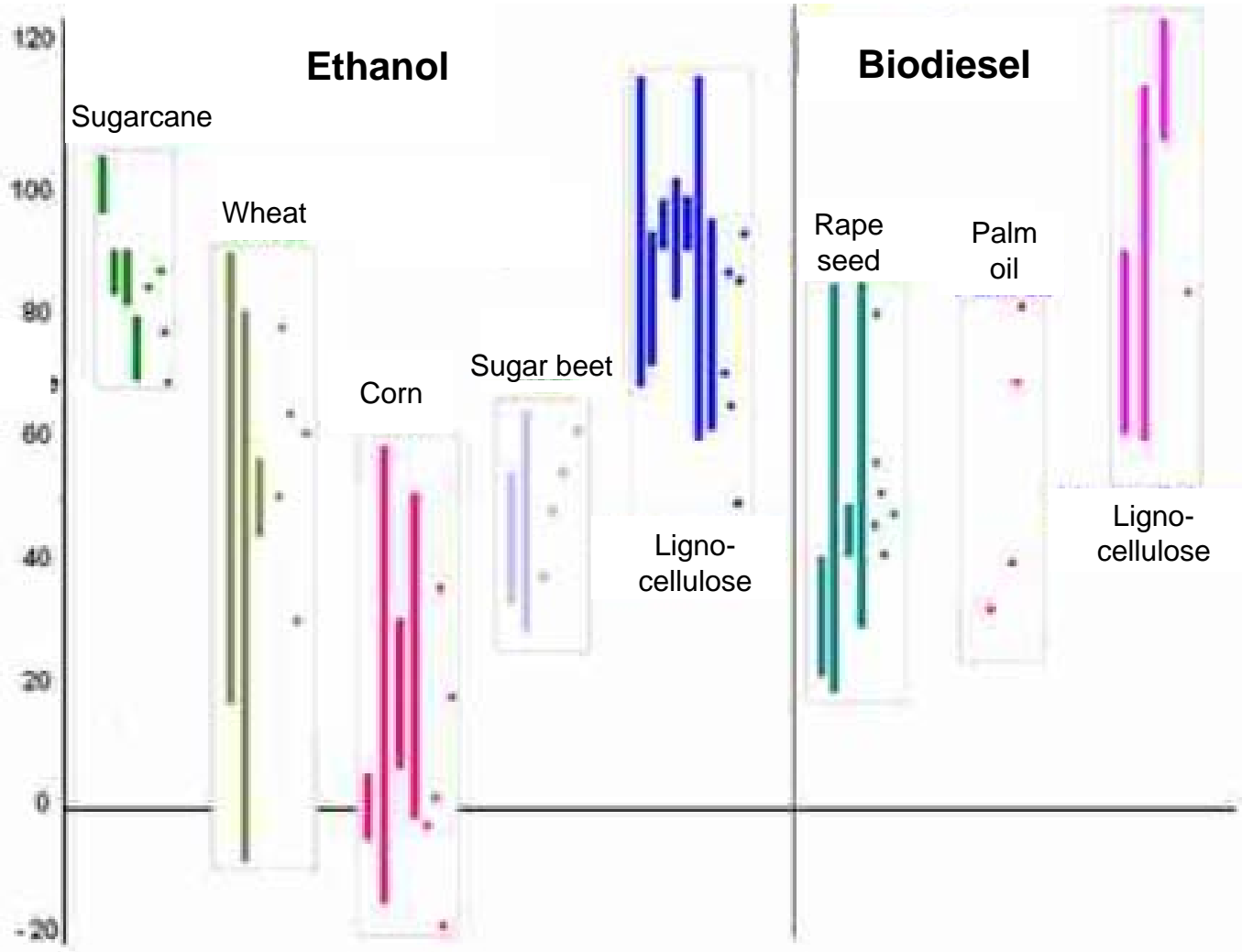
- **Biofuels feedstocks differ, in terms of:**
 - the agricultural production systems (input intensity, farm size, agro-climatic conditions)
 - yields, costs and demand in other markets
- **Biofuel production technologies differ:**
 - dependence on fossil-fuel inputs
 - co-products produced (protein, electricity)
- **As a result, direct GHG emissions differ**



Ranges in estimates of direct life-cycle GHG emissions



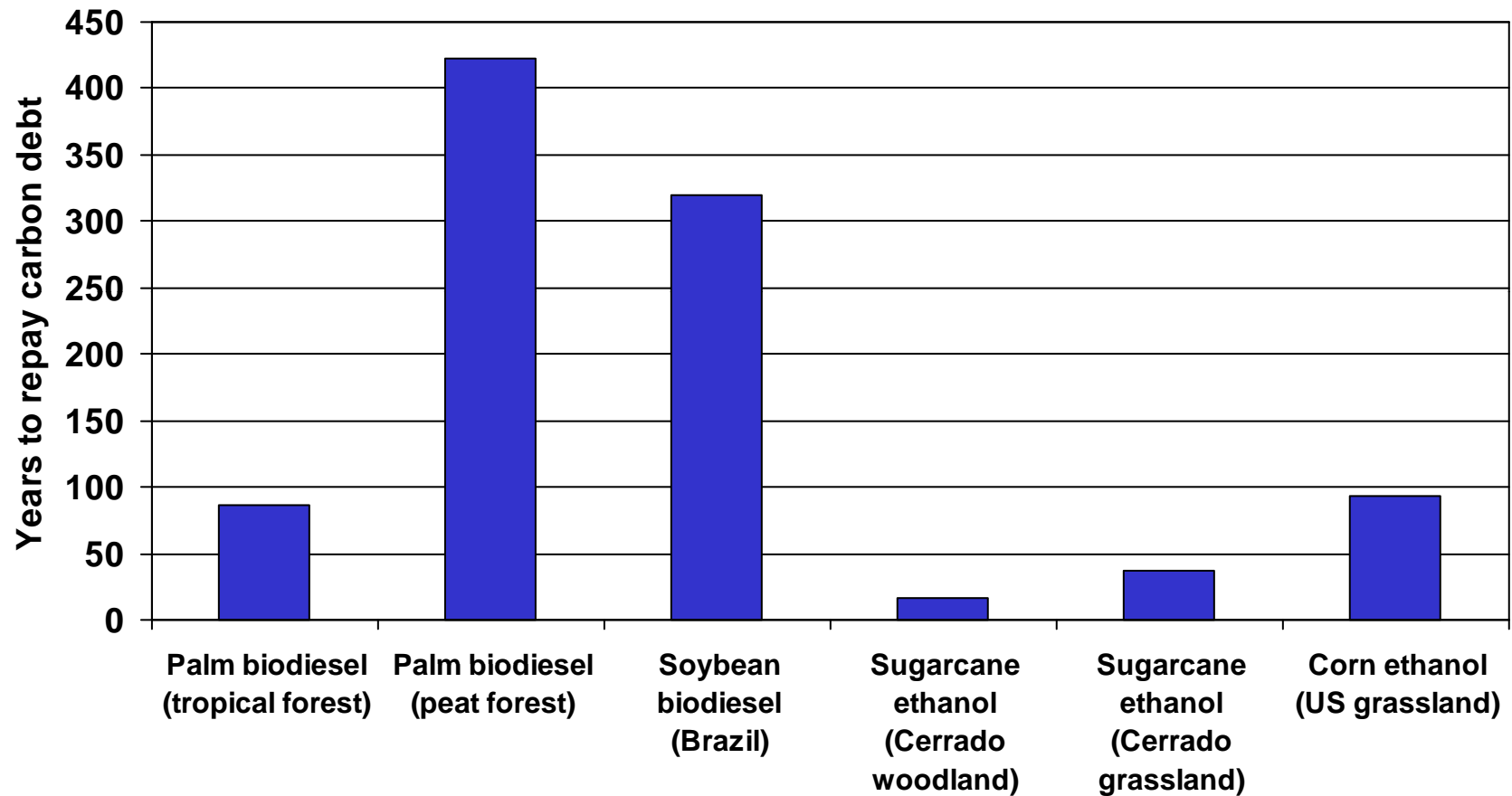
% Reduction in life-cycle GHG emissions compared with petroleum fuel



Source: International Energy Agency



Plus, a carbon debt can result from land conversion



Source: J. Fargione, J. Hill, D. Tilman, S. Polasky, and P. Hawthorne, "Land Clearing and the Biofuel Carbon Debt", *Science Express*, 7 February 2008

Policy response? Sustainability standards!



Roundtable on
Sustainable
Biofuels

- Non-governmental **Roundtable on Sustainable Biofuels (RSB)** created in 2007.
- Various other “roundtables” also created for feedstocks, e.g.:
 - Roundtable on Sustainable Palm Oil
 - Roundtable on Responsible Soy
- **Switzerland** established sustainability standards for biofuels, which started to go into effect in July 2008.
- **EU** adopted its “Renewable Energy Promotion Directive” in 2009, requiring sustainability standards by December 2010.
- In Feb 2010 **U.S. EPA** established standards relating to renewable fuels.



Biofuel sustainability standards



- *All:*
 - Require minimum reduction in (direct) life-cycle greenhouse-gas emissions, through comparison with corresponding petroleum-based fuels.
 - Seek to minimize emissions from land conversion, esp. peat soils.
 - Seek to protect areas of high biodiversity
 - Do not *de jure* restrict imports, but **do determine eligibility for subsidies and mandates**
- *Some* also address indirect emissions from land conversion (ILUC), and even Social impacts



New idea: low-carbon fuel standard



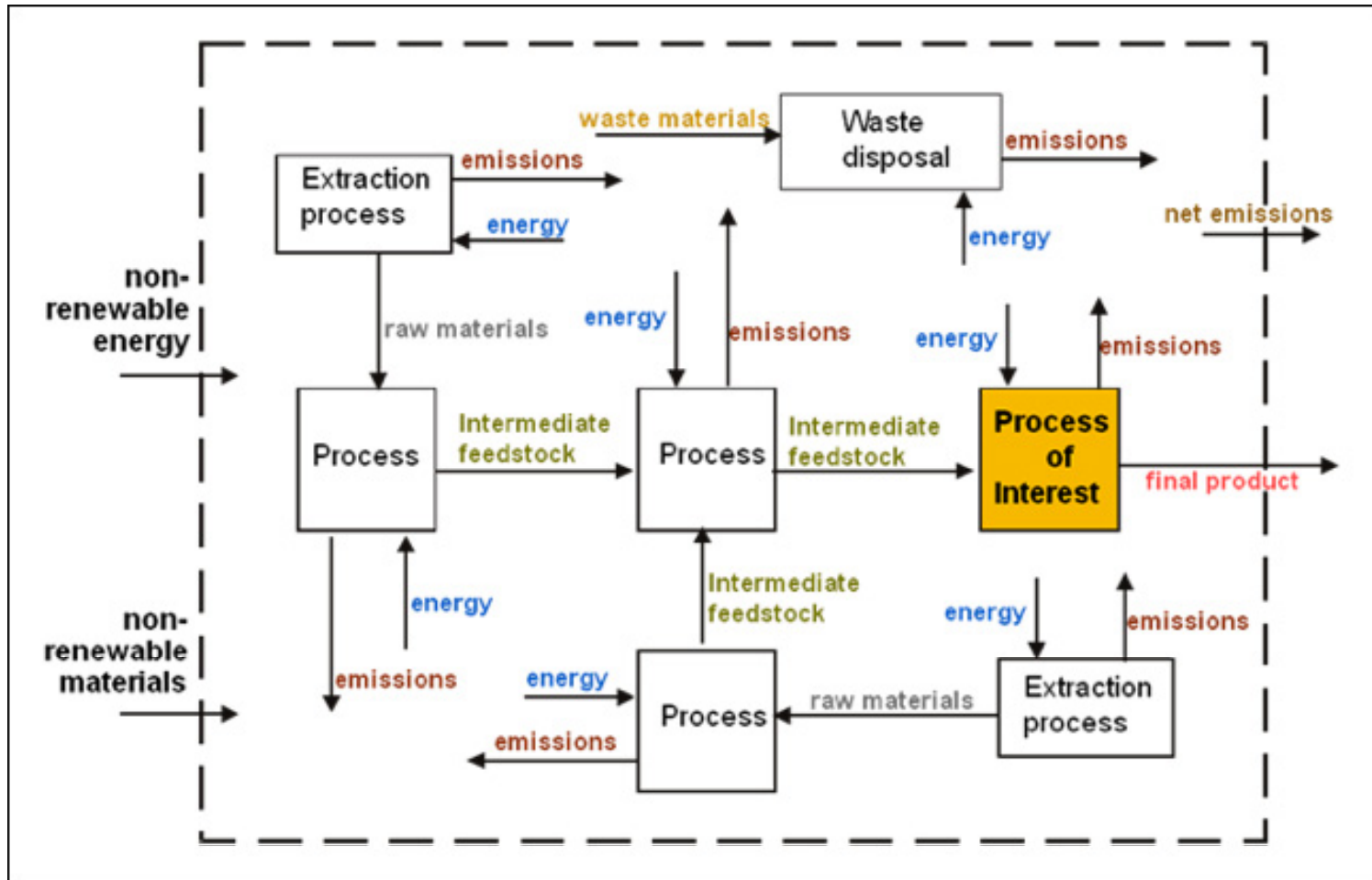
- Goal is to reduce carbon emissions across *whole* of the transport sector
- Less technologically prescriptive than mandating biofuel use
- Rather, fuel suppliers can get credit through numerous means for reducing life-cycle GHG emissions
- Important difference: market premium is created proportional to reduction in GHG emissions achieved
- LCFS pushed initially in California, picked up also by EU. (Both to go into effect starting 2011.) British Columbia's started in 2010.



At the heart of both: an LCA model



Simplified schematic diagram of life-cycle assessment (LCA) model



Source: U.S. National Renewable Energy Laboratory (www.nrel.gov/analysis/sustain_lca.html)



Critical points

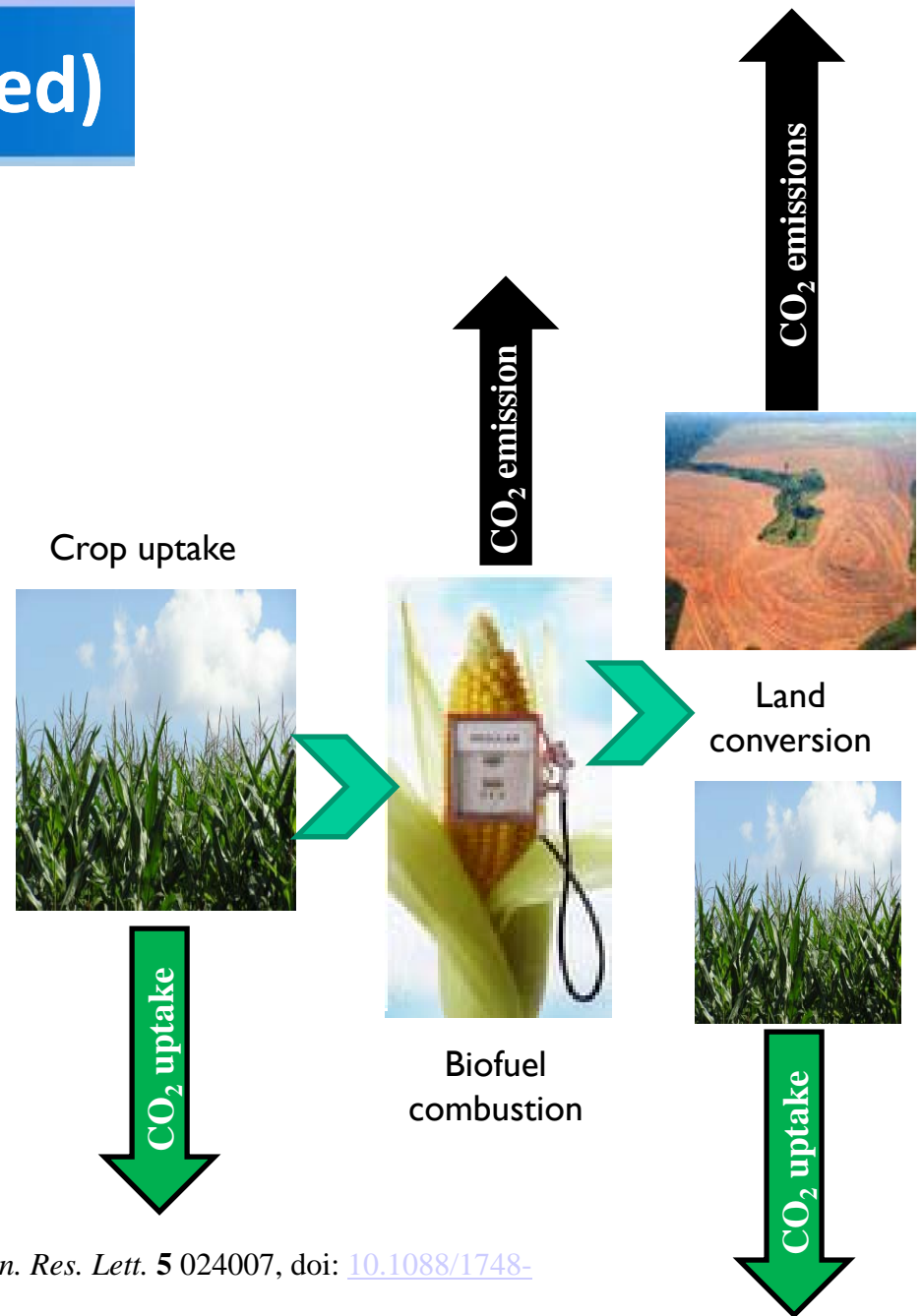


- **National standards differ — e.g., threshold values for GHG reductions:**
 - 40% in Switzerland; 35% in the EU, rising to 50% from 2017 on; 60 % for new installations from 2017 on
 - Two levels in the United States: 20% (“renewable fuel”) to 50% (“advanced biofuel” and “biomass-based diesel“)
- **LCA models supporting the standards:**
 - Are complex *process* models, requiring specialized knowledge to understand and apply
 - Are operated by government officials in importing countries
 - Allow (or require) degree of expert judgement
 - Are driven by data that may be incomplete, out of date, subject to wide variation through time and over short distances

« Critical points (continued)

Partial-equilibrium and computable general-equilibrium (CGE) models generating estimates of indirect land-use change (ILUC):

- Are obtuse as well as highly complex *economic* models
- Are driven by data that may be incomplete, out of date, subject to wide variation through time and over small geographic areas
- Etc.



Source of graphic: Based on Timothy D Searchinger 2010 *Environ. Res. Lett.* 5 024007, doi: [10.1088/1748-9326/5/2/024007](https://doi.org/10.1088/1748-9326/5/2/024007)



Meanwhile, scientists are questioning GHG rationale for biofuels



From Abstract for A. Bouët et al., “Modeling the Global Trade and Environmental Impacts of Biofuel Policies, IFPRI Discussion Paper 01018, August 2010:

“We find that emissions released because of ethanol programs significantly worsen the total carbon balance of biofuel policies. ... We conclude by pointing out the critical aspects that have to be refined in order to improve our understanding of the environmental implications of biofuel development.”

Selection from Abstract for T. Searchinger, “Biofuels and the need for additional carbon”, *Environ. Res. Lett.* 5 (2010):

“When biofuels cause no direct land-use change, they use crops that would grow regardless of biofuels so they do not directly absorb additional carbon. All potential greenhouse gas reductions from such biofuels, as well as many potential mission increases, result from indirect effects”



Potential trade issues



- **Heterogeneous standards could increase conformity assessment costs for exporters**
- **Assessment and recognition of conformity-assessment certifiers to be undertaken in some cases by governments of importing companies**
- **The standards relate to non-product-related processes and production methods (npr-PPMs) that**
 - **Rely on models and representative data, not direct measurement or observation**
 - **Those models and data may be contested**
 - **Lack of scientific consensus on many of the underlying assumptions**
- **Could some of these measures – in their design or implementation – distort trade, or be challenged as discriminatory?**



Thank You



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