Burning biomass for energy threatens forests and the climate

Mary S. Booth, PhD
Partnership for Policy Integrity

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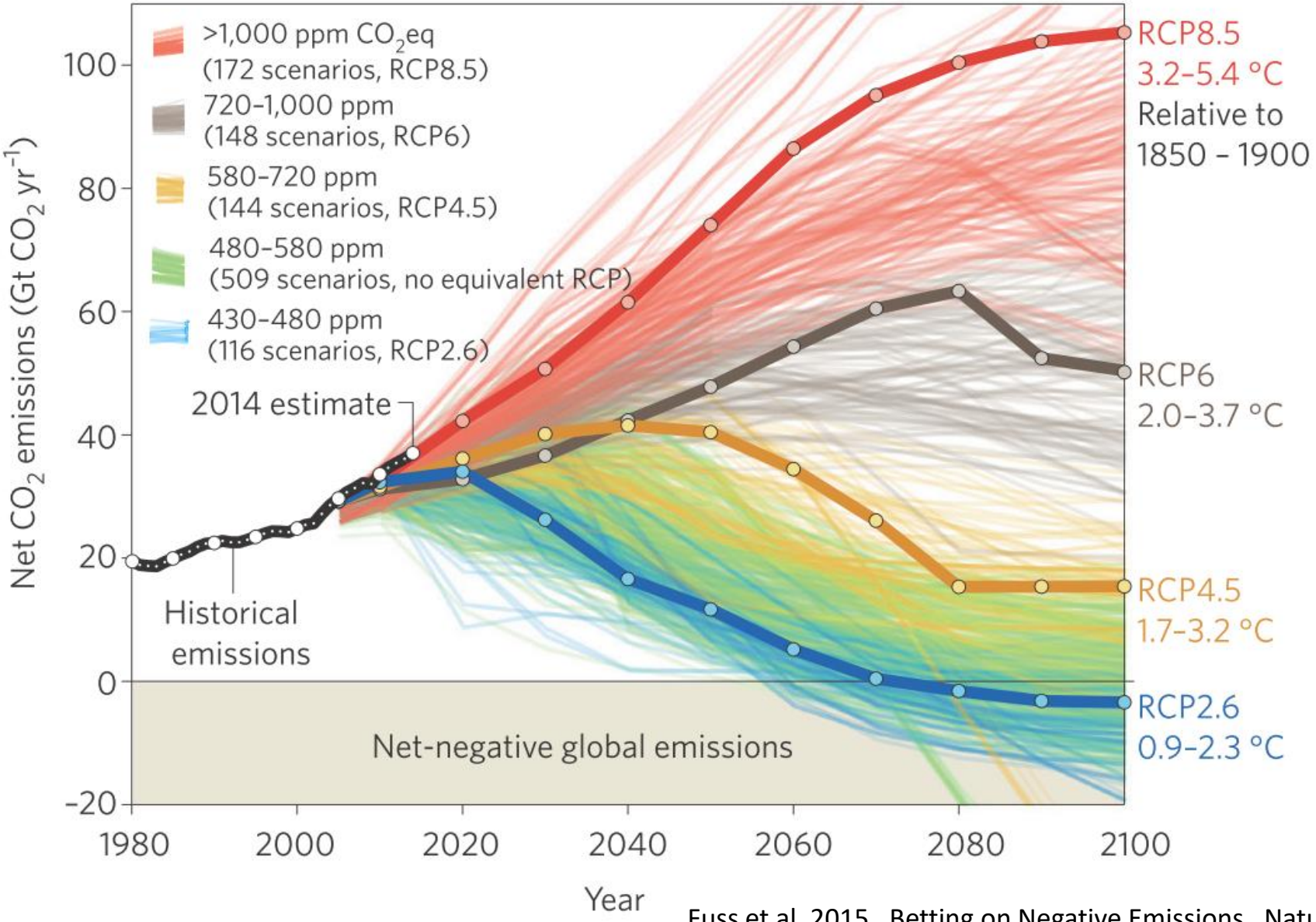
To keep temperature rise below 2 C, we need negative emissions – requires increasing forests



Fuss et al, 2015. Betting on Negative Emissions. Nature.

Article 5, Paris Climate Agreement: *Parties should take action to conserve and enhance, as appropriate,* ***sinks and reservoirs of greenhouse gases*** *as referred to in the Convention,* ***including forests.***

Forests are our only significant carbon sink

U.S. GHG Emissions and Sinks by Sector (million tons CO_2 equivalent)

Sector	1990	2005	2011
Energy	5,806.2	6,891.2	6,333.6
Industrial Processes	348.4	364.6	359.9
Solvent and Other Product Use	4.9	4.9	4.9
Agriculture	456.2	491.9	508.7
Land Use, Land-Use Change and Forestry	15.1	28.0	40.3
Waste	185.0	150.9	140.8
Total Emissions	6,815.9	7,931.5	7,388.0
Land Use, Land-Use Change and Forestry (Sinks)	(875.8)	(1,099.9)	(997.6)
Net Emissions (Sources and Sinks)	5,940.0	6,831.5	6,390.4

997.6 ÷ 7,388 = equivalent of 13.5 % of US emissions sequestered

EU: forests take up 9 – 10% of emissions

From U.S. EPA 40 CFR Parts 60, 70, 71 et al. Standards of Performance for Greenhouse Gas Emissions From New Stationary Sources: Electric Generating Units; Proposed Rule (page 1441)

Article 4: "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases"

- Requires huge reductions in emissions, and massive increases in forest carbon sequestration. Meanwhile…

Drax powerplant in UK: Burns millions of tonnes of wood per year

Forests are being cut for biomass.

Forest following biomass harvesting for wood pellet manufacturing, North Carolina

Photo: Dogwood Alliance (www.dogwoodalliance.org)

Pellet industry harvesting in North Carolina: ***"Little remains but stumps and puddles in what was once a bottomland hardwood forest"***

Joby Warrick, Washington Post 6/2/2015

"How Europe's climate policies led to more U.S. trees being cut down"

Treatment of bioenergy as “carbon neutral” in energy sector

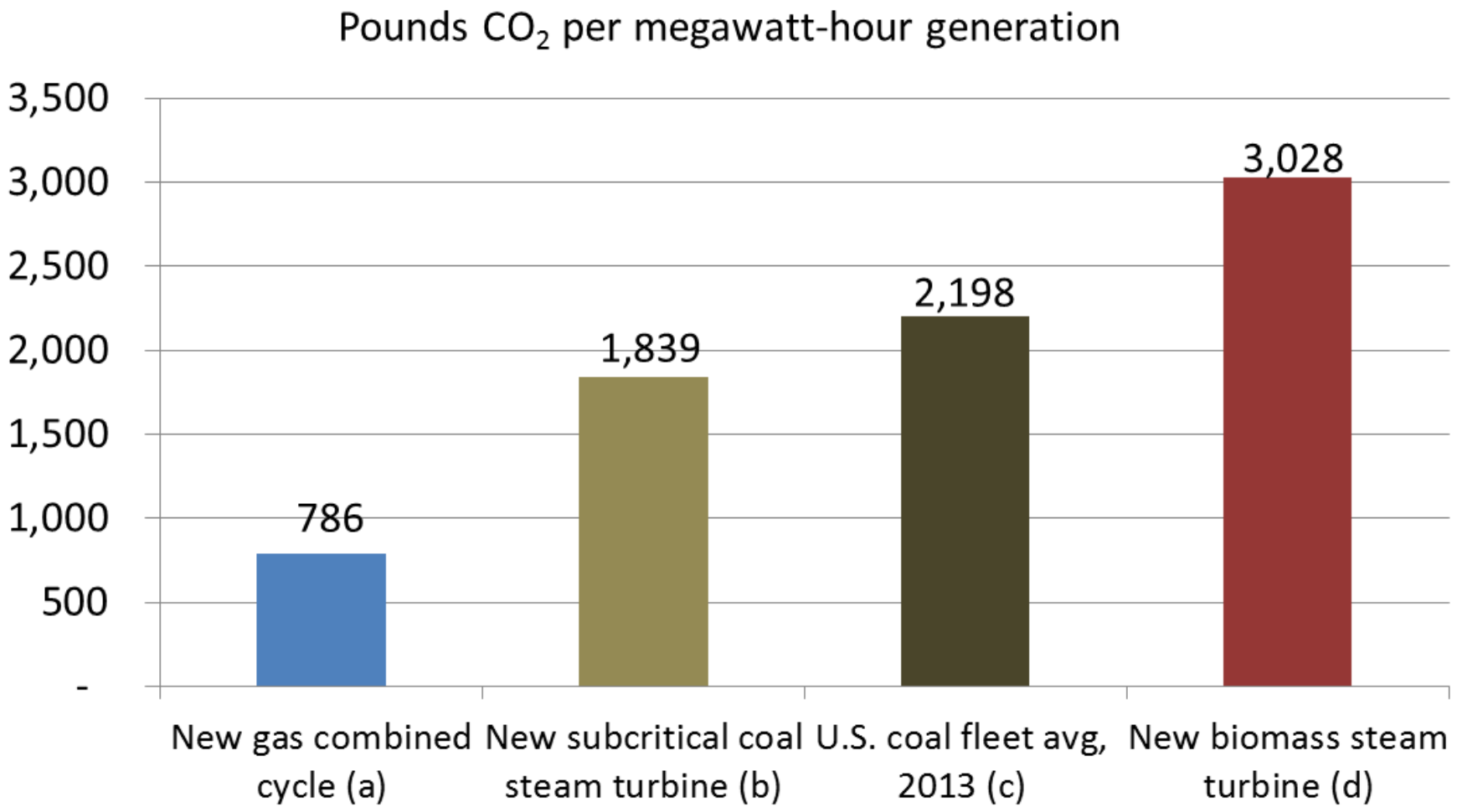
IPCC reports/accounts forest carbon reduction from biomass fuel in the land sector

- To avoid double-counting, biomass CO_2 emissions are not counted in energy sector.

But the energy sector provides incentives for bioenergy

- Renewable energy subsidies
- Avoidance of carbon-trading fees

Biomass power plants emit more CO_2 per megawatt-hour than coal or gas facilities



Biomass plants being built today emit **~65%** more CO_2 per MWh than modern coal plants, and **~285%** more than natural gas combined cycle plants

Emissions from UK “Drax” plant – actual versus reported under EU Trading System

Table 6. CO_2 emissions 2013

Data from Drax coal-biomass plant in UK	**Actual CO_2 (t calculated)**	**EUETS CO_2 (t calculated)**
Coal and Petcoke	20,089,607	20,089,607
Biomass	2,799,391	0

CO_2 emissions rate

Coal: **862 kg/MWh**

Biomass: **965 kg/MWh**

Drax generation		2013	
Coal	TWh	23.3	88%
Biomass	TWh	2.9	12%

80%

At Drax the use of biomass saves more than 80% of the carbon dioxide emitted when compared to the use of coal

Drax annual report, 2015

EU Carbon trading system: rationale for bioenergy as zero-emissions

REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling

SEC(2010) 65 final
SEC(2010) 66 final

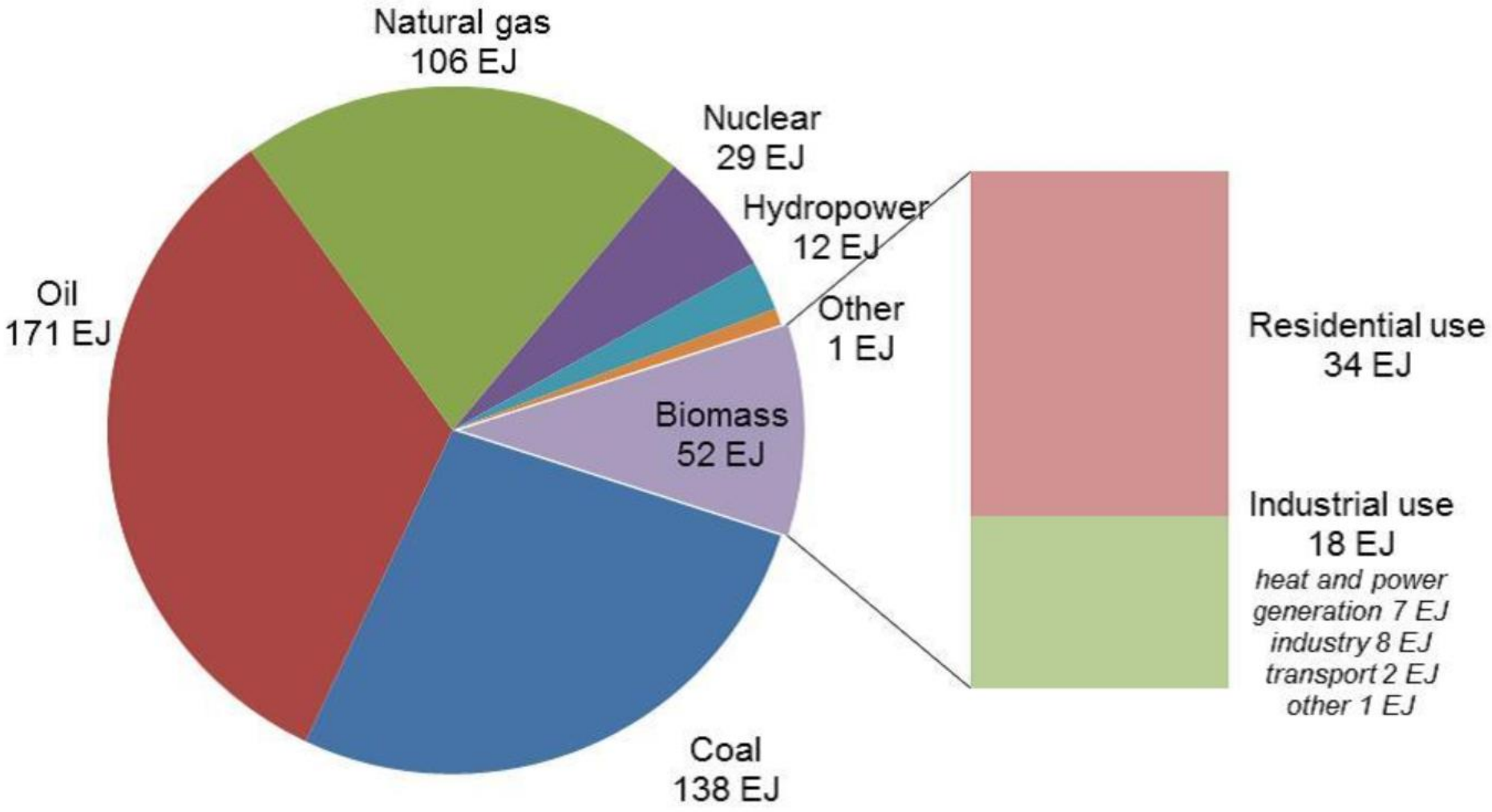
12. Emissions from the fuel in use, e_u, shall be taken to be zero for solid and gaseous biomass.

Guidance assumes biomass is wastes and residues, not whole trees

Wood pellets mostly from "*processing residues from forest based industries*,"

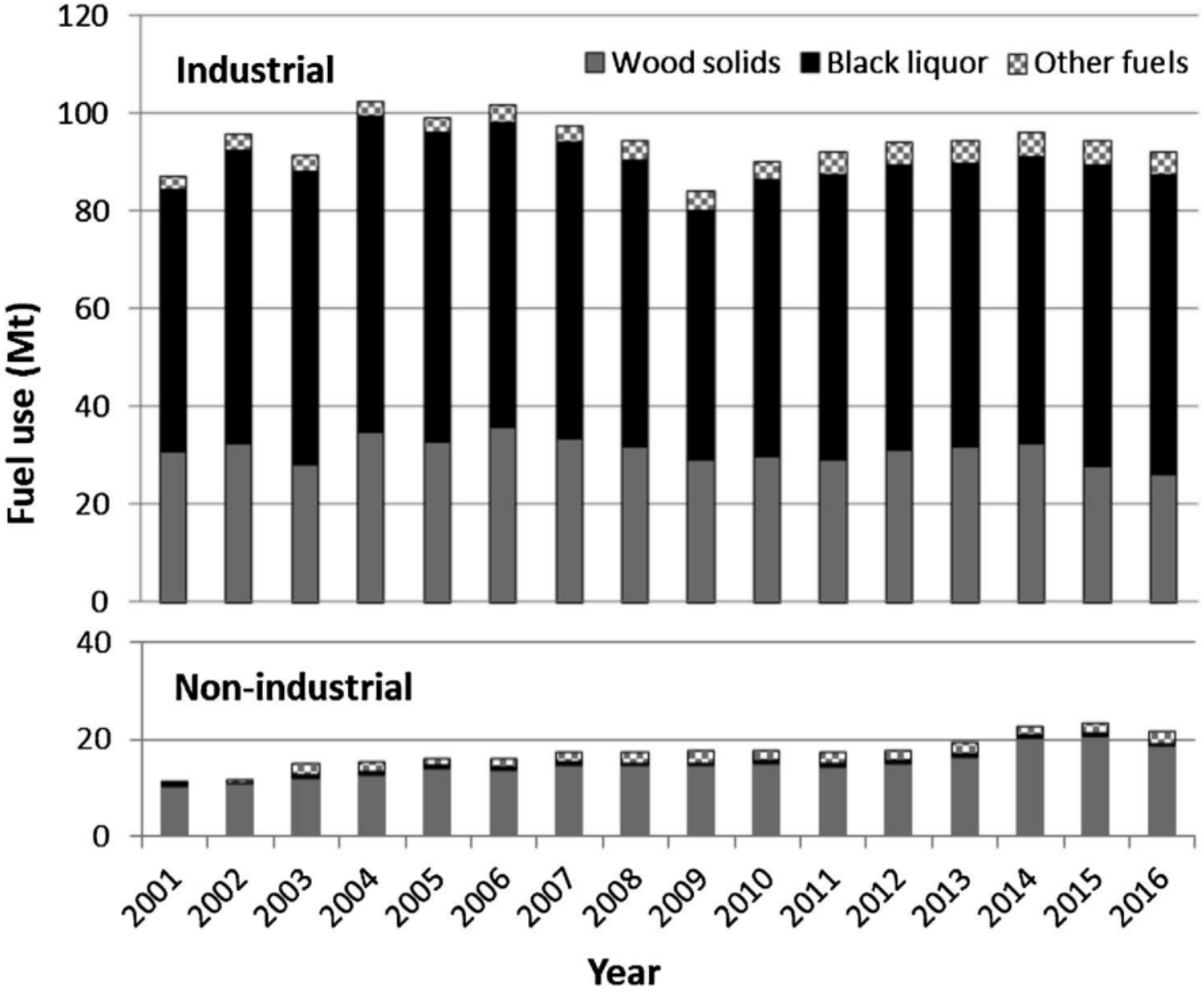
Woody biomass from "*logs, stumps, leaving and branches, and residues from wood-processing industries*" such as "*bark, off-cuts, woodchips, sawdust*."

Bioenergy share in global energy production (IEA 2013)

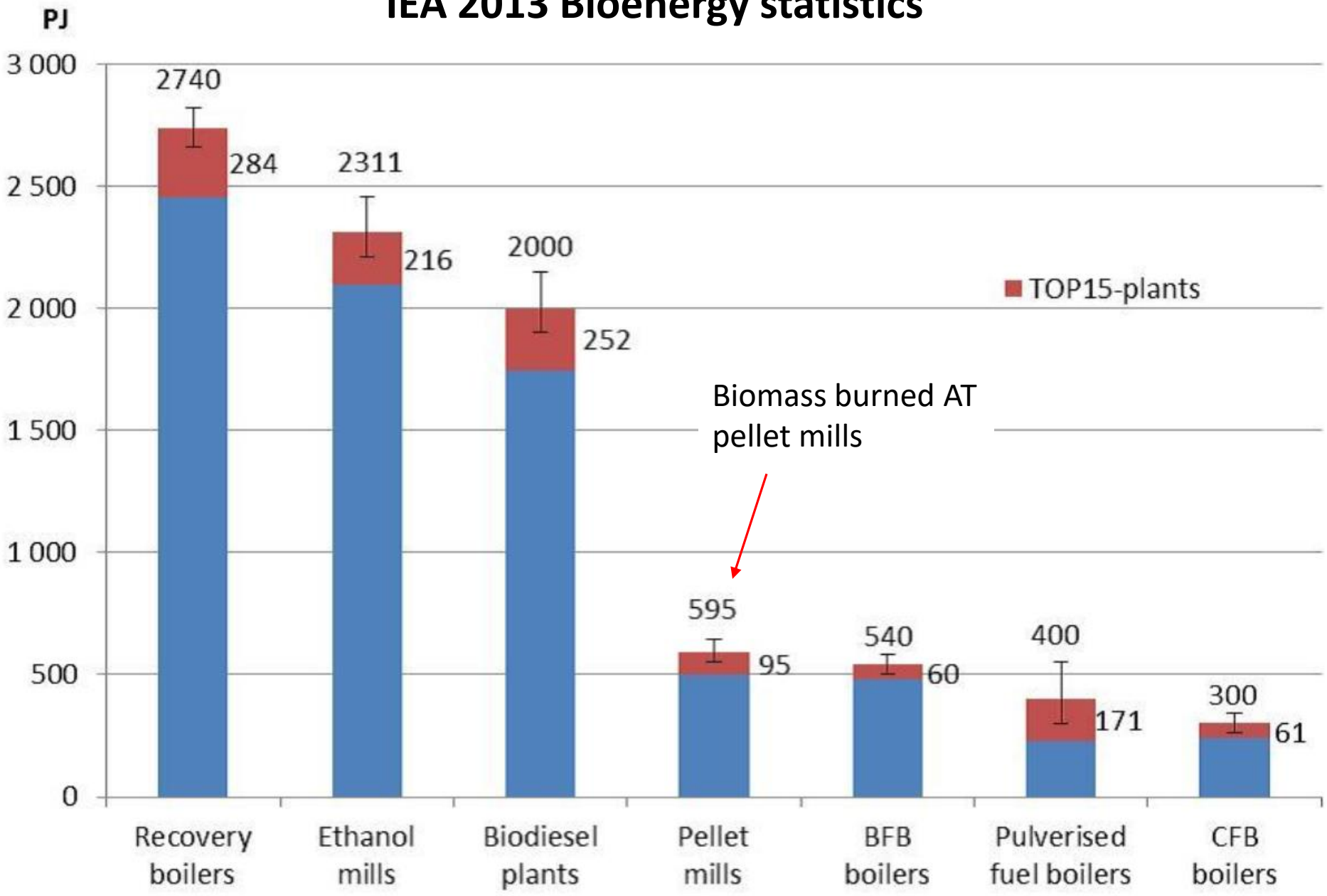


http://biomassmagazine.com/articles/9444/iea-task40-biomass-provides-10-percent-of-global-energy-use

Biomass fuels burned in the US



IEA 2013 Bioenergy statistics



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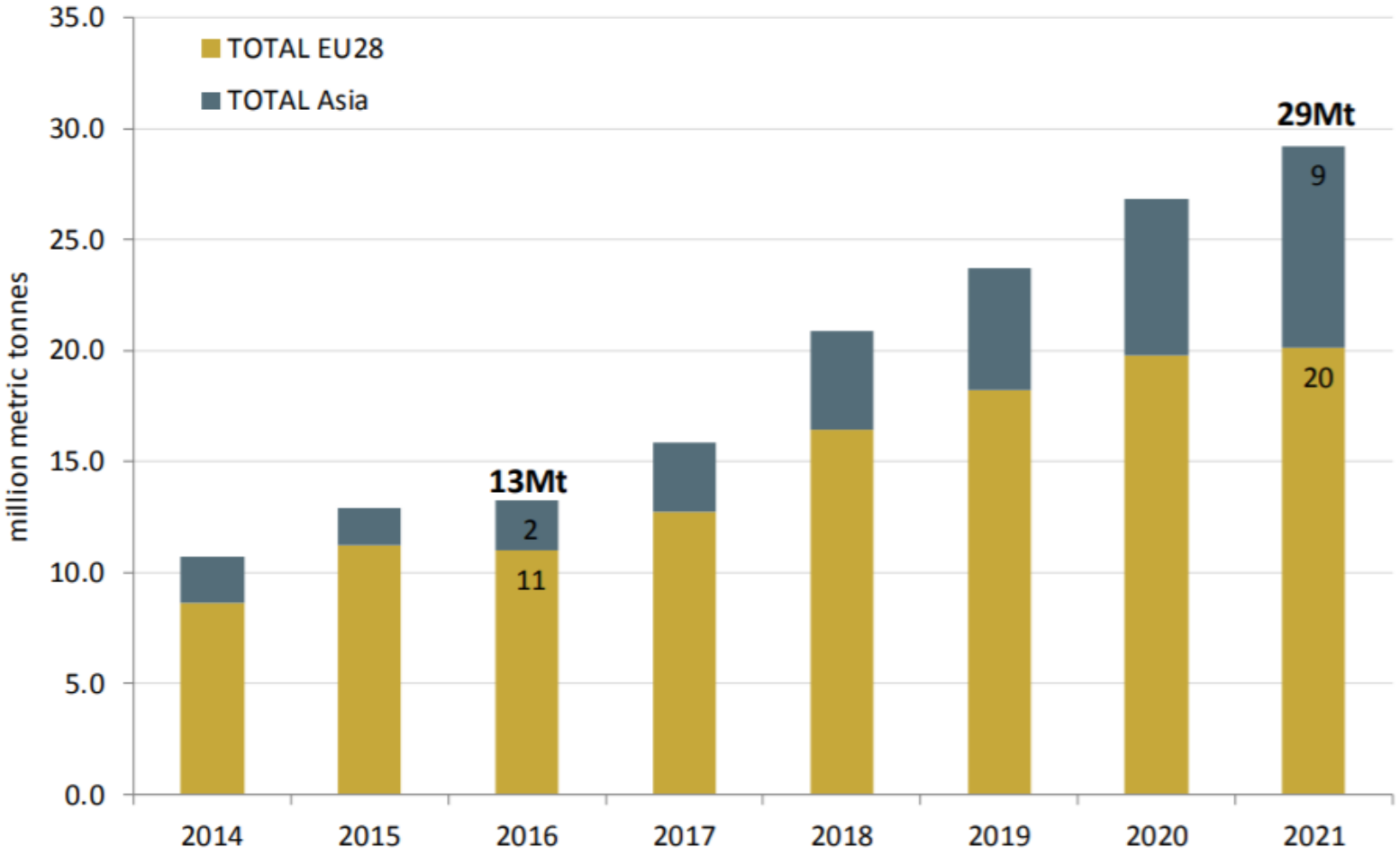
The outlook for industrial wood pellet demand in the EU and Asia



- Asian demand expected to account for 31% of industrial market by 2021

HAWKINS WRIGHT

Source: Hawkins Wright, the Outlook for Wood Pellets

http://task32.ieabioenergy.com/wp-content/uploads/2017/03/03-Fiona_Matthews.pdf

Enviva pellet plant, Ahoskie, North Carolina

Photo: Dogwood Alliance (www.dogwoodalliance.org)

Forest harvesting for wood pellet manufacture degrades US forests

Wood pellets for fuel in the UK

Projected demand in UK: Drax, Lynemouth, Teesside

~17.7 m green tonnes per year (9.7 m tonnes dry)

- Drax alone consumes more than the total annual forest carbon sink of North Carolina on a yearly basis (growth minus removals = 6.4 m dry tonnes/yr)

~160,000 hectares per year

Over 10 years of subsidy allocation, 1.6 million hectares of forests up smokestacks

And it’s not “residues”… it’s whole trees

Photo courtesy Dogwood Alliance

Calculation of net emissions and Net Emissions Impact (NEI)

Environmental Research Letters

Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy **(https://bit.ly/2Ca21Fj)**

Mary S Booth[1,2]

[1] Partnership for Policy Integrity, Pelham, Massachusetts, United States of America
[2] Author to whom any correspondence should be addressed.

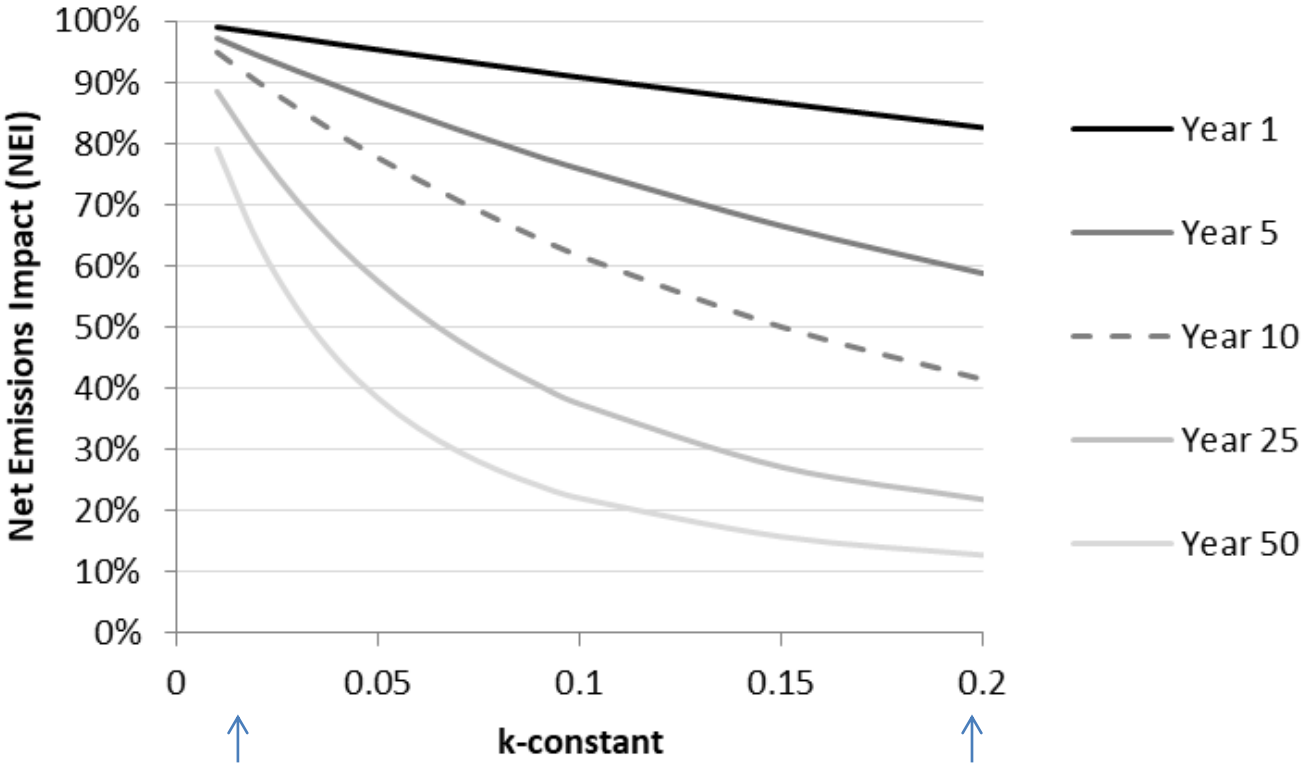
$$\text{Net } CO_2 = \text{direct } CO_2 - \text{alternative fate } CO_2$$

$$\text{NEI} = \frac{\text{net } CO_2}{\text{direct } CO_2}$$

Alternative fates:

1. Burning w/o energy recovery
2. Leave onsite to decompose

Net Emissions Impact versus **k** for different years



Very slow decomposition but not unheard-off for cooler, wetter ecosystems

Extremely fast decomposition (no record of rates this fast in literature we surveyed)

Conclusion: Cumulative NEI for plants burning green wood that is assumed to otherwise decompose is never less than 40% at year 10

Global projections

Current bioenergy use: ~57 EJ

- ~55% is “traditional” use for domestic cooking, heating

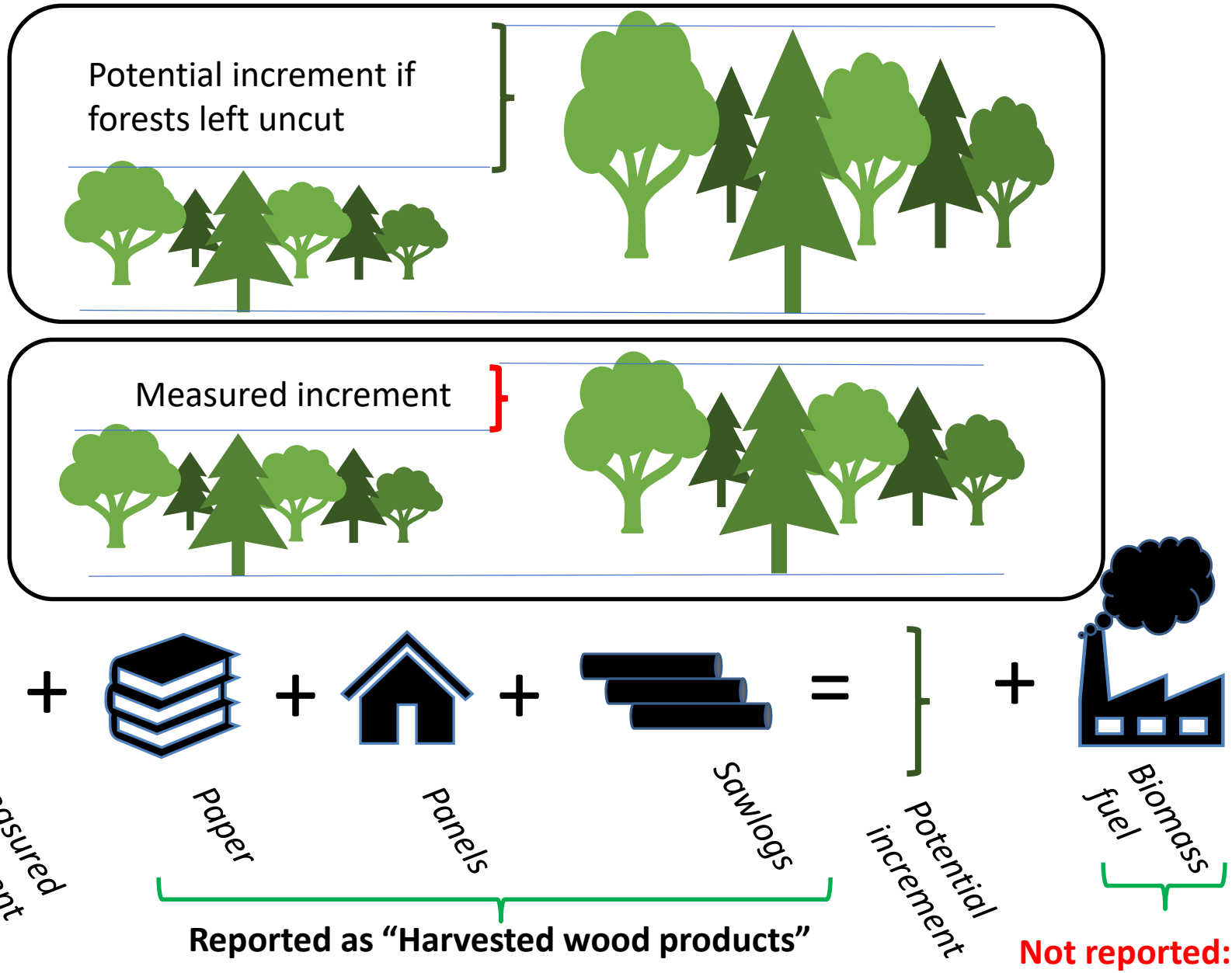
Projected bioenergy for electricity: 100 – 500 EJ

- 100 EJ as “wastes and residues”
- Translates to about 9 billion tonnes of CO_2 emissions

Wood Pellet industry 10x current size: just 4.5 EJ

How do we fix the bioenergy loopholes?

1. Track biomass production and use so we know how much forest carbon is going up smokestacks



"Parties strive to include all categories of anthropogenic emissions or removals in their nationally determined contributions…"

How do we fix the bioenergy loopholes?

1. Track biomass production and use so we know how much forest carbon is going up smokestacks
2. Include bioenergy in carbon trading programs so companies pay for the CO_2 pollution they emit
   - Weight emissions by NEI to reflect net impacts?

Mary S. Booth

mbooth@pfpi.net

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