Better Use of Biomass for Energy

Joint IEA RETD / IEA Bioenergy Project

Uwe R. Fritsche - Oeko-Institut (Institute for applied Ecology)

with contributions from Bettina Kampman, CE Delft

Renewable Energies and Climate Change Abatement

COP 15 Side Event, EU Pavilion

December 15, 2009

Copenhagen, Denmark

IEA Bioenergy

RETD

IEA - RENEWABLE ENERGY TECHNOLOGY DEPLOYMENT

Better Use of Biomass for Energy

Main challenges and opportunities:

- Bioenergy for better greenhouse gas reduction
- Climate policies for better bioenergy development

Details: see Position Paper (available)

Background Report early 2010

Better Use of Biomass for Enery

Substantial options for better supply and conversion

“Good” bioenergy

- diversifies energy supply, reduces GHG emissions
- improves trade balances

”Bad” bioenergy if **no safeguards** against

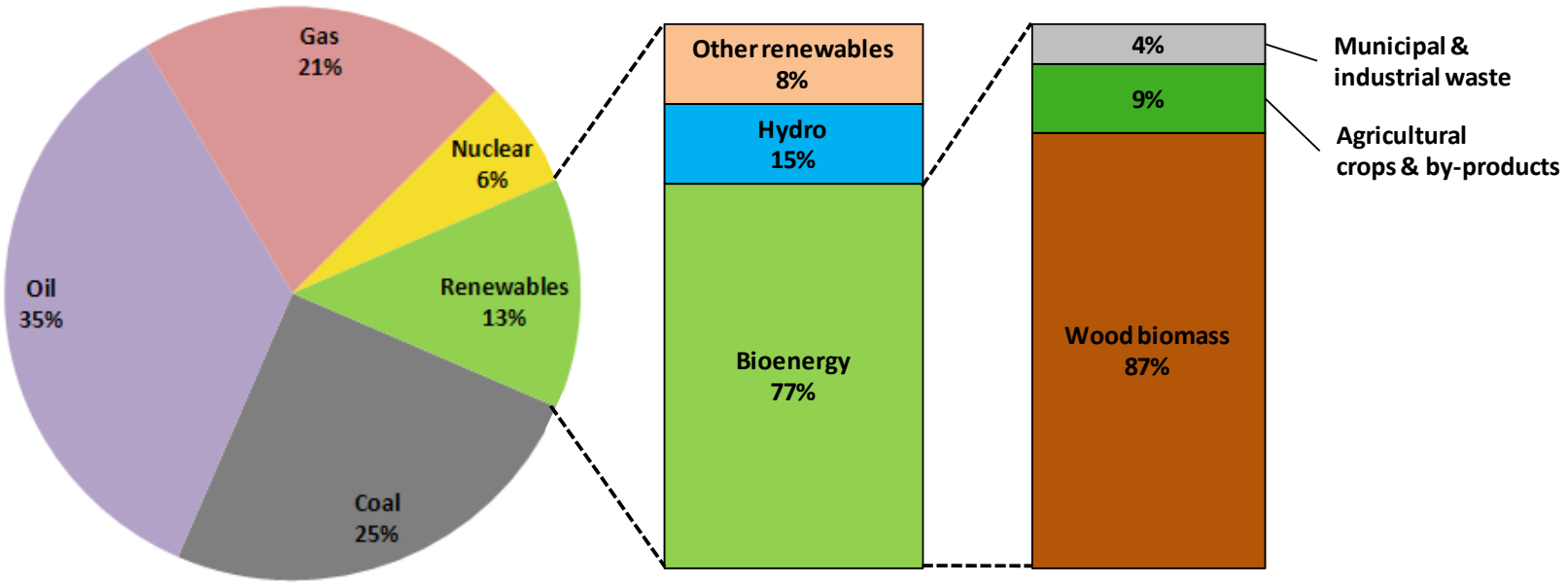
- GHG emissions, biodiversity loss
- food insecurity, overuse of water and soil

“Better” bioenergy

- increases sustainable energy
- contributes to climate change mitigation

Key: increased efficiency for cost and GHG reduction

Better Use of Biomass for Energy



Share of Bioenergy in Today's World Primary Energy Mix

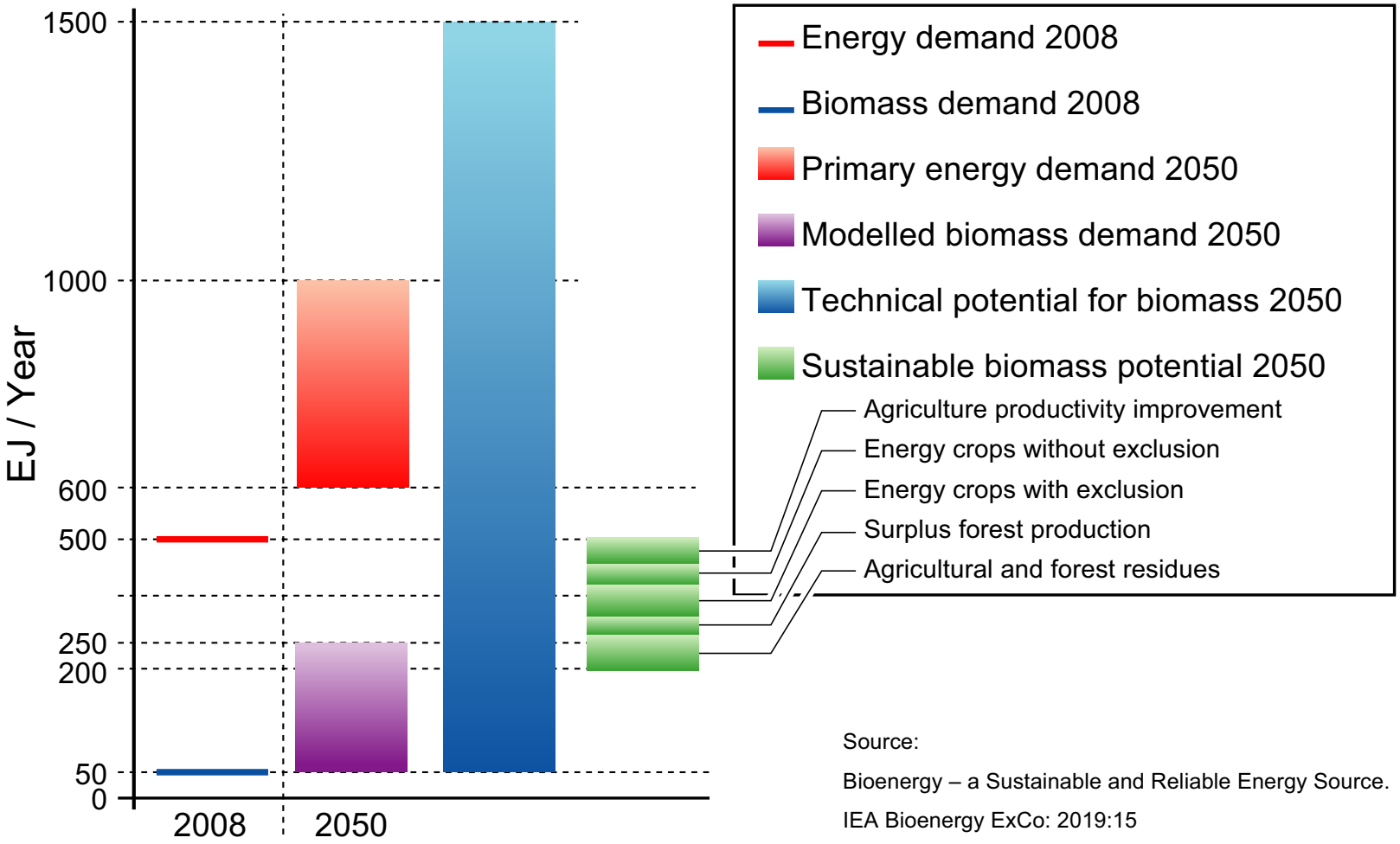
Source:
Bioenergy – a Sustainable and Reliable Energy Source. IEA Bioenergy ExCo:2009:05

Better Use of Biomass for Energy

Biomass supply can be increased, sustainability should be improved.

- All countries underuse bioenergy
  - global potential w/o degrading biodiversity, soils, & water: about 25 - 33% of global energy demand in 2050
- Improve sustainability: costs, GHG reduction and social impacts
  - Perennials, multiple cropping systems, agroforestry:
    - high yield, less agro-chemical inputs, biodiversity gains, improved water productivity, reduced erosion
  - Oil-bearing/lignocellulose plants on **degraded** lands
  - Land-based micro-algae need RT&D

Bioenergy Potentials



Source:

Bioenergy – a Sustainable and Reliable Energy Source.

IEA Bioenergy ExCo: 2019:15

Biomass Production: Land Use

Reduce Direct and Indirect Land Use Changes

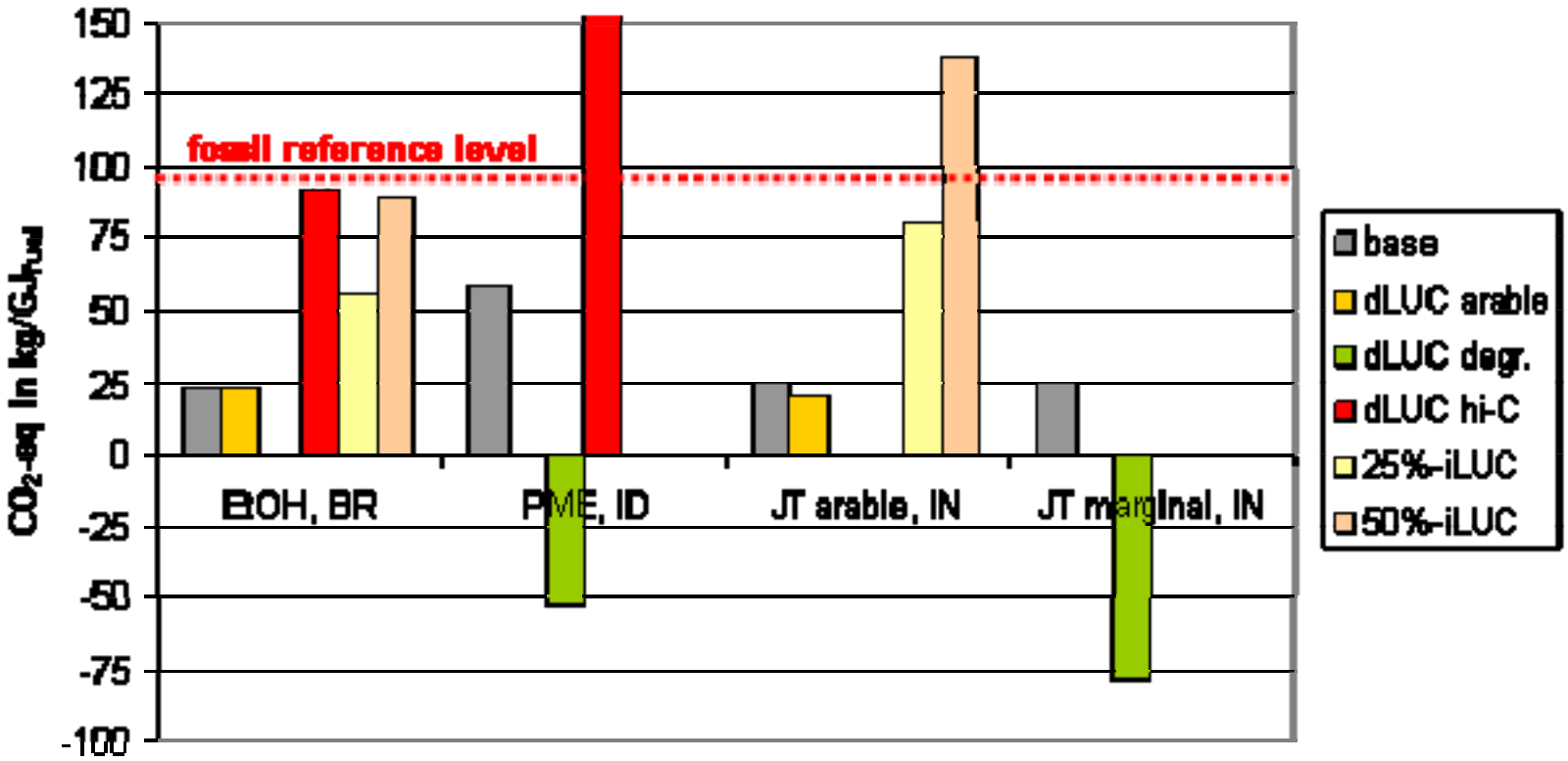
Direct land use change (LUC) effects:

- GHG certification required
- Participation of export countries required
- Progress in remote sensing, LUC monitoring

Indirect land use changes (ILUC) effects:

- Extent under debate
- May lead to significant GHG emissions
- May contribute to food insecurity
- Overall **framework for sustainable land use** needed

GHG from direct and indirect LUC



EtOH= bioethanol; **BR**= Brazil; **PME**= palmoil-methyl ester; **ID**= Indonesia; **JT**= Jatropha-oil; **IN**= India; **dLUC**= direct land use change; **iLUC** = direct + indirect LUC; **degr**.= degraded land with low carbon stock; **hi-C**= land with high carbon stocks

Source: Review of Bioenergy Life-Cycles: Results of Sensitivity Analysis for Biofuel GHG Emissions; UNEP DTIE, Paris 2009;

GHG from Indirect Land Use Changes

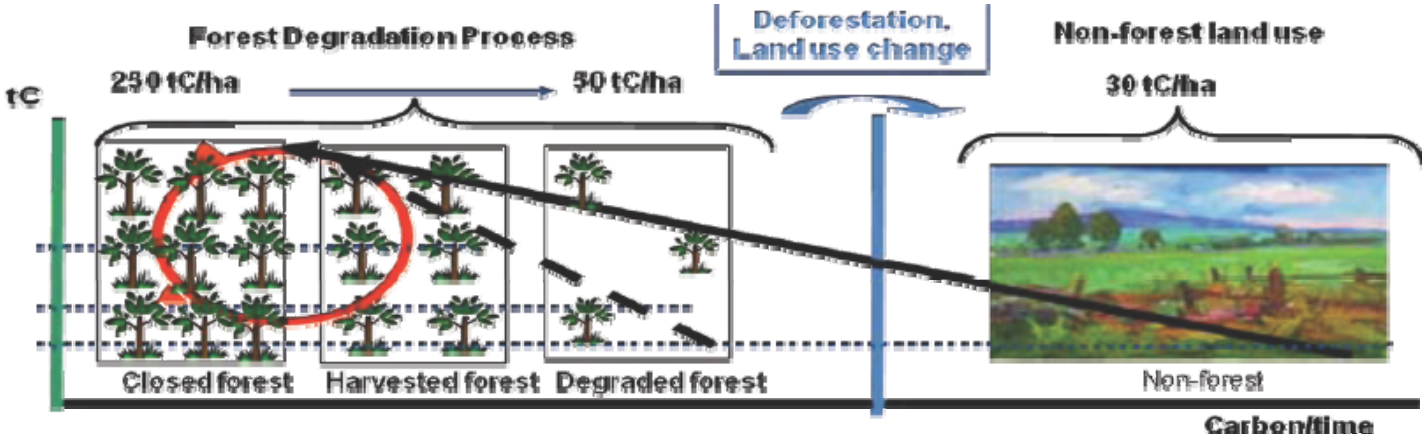
Bioenergy indirect LUC effects = direct LUC effects in food/feed/fiber/wood

- **Short-term:** minimize ILUC effects
  - use residues and wastes
  - favor high-efficient production + conversion systems
  - cultivate on underutilized, abandoned or degraded land (no competition with food, feed, fiber)
- **Medium-term:** reduce ILUC through REDD
- **Long-term:** comprehensive policy
  - Global GHG cap in UNFCCC incl. all LUC emissions
  - GHG certification for all biomass incl. direct LUC

Climate Negotiation: REDD

REDD: Financial rewards for reduced emissions from deforestation and degradation

- If financially viable, deforestation could be reduced significantly
- Could reduce GHG emissions from ILUC if implemented effectively



Better biomass use for Climate

Bioenergy can be used to aim for maximum GHG reduction

- In most countries: **best in electricity and heat**, less for transport fuels
- Up to 2050, strict climate targets might require
  - shifting to biofuels for trucks, ships and aviation
  - bioenergy with CCS to reduce atmospheric CO_2
- Cultivation of perennial crops on low-carbon land:
  - sequester atmospheric C in soils
  - reduce deforestation pressures (development alternatives, access to modern energy)

Better Biomass Use for Energy

Biomass use for energy can be an important contributor to climate change mitigation

- Reduces GHG emissions
  - from land use changes and fossil fuel use
- Improves access to modern energy
- Reduces atmospheric CO_2
- Reduces sources of GHG and enhances sinks

- **Stringent climate policies drive better biomass use**
- **Better biomass use drives climate change mitigation**

Indicators for Better Biomass Use

- **Improve efficiency of biomass resources use**
  - Increase fossil fuels replaced
  - Increase efficiency of traditional stoves and heating, CHP
  - Invest in improved energy efficiency
- **Maximize GHG emission reduction**
  - Demand minimum GHG reduction
  - Provide incentives to reduce more emissions
  - Favor waste and residues, prevent/limit use of arable and grassland
- **Optimize biomass contribution to security of supply**
  - Reduced oil dependence: next generation biofuels + electric vehicles
  - If aim is secure gas supply: biomethane
  - Reduce risks/impacts of fluctuating biomass price and availability
- **Avoid competition with food, feed and fiber**
  - Cultivation on land set free from higher agricultural yields
  - Cascade use of residues and wastes
  - Develop bioenergy and global food security strategies jointly

Critical milestones mark key “breakthroughs” needed to forward better use

Near-term: regulation and incentives

- Harmonizing sustainability standards for biomass trade (GHG incl. LUC, biodiversity, social)
- Shifting towards advanced cropping systems (perennials on abandoned/degraded lands, agroforestry)
- Waste recycling, “cascading” use of biomaterials

Medium/longer-term: RT&D

- Next generation conversion,biorefineries, CCS for bioenergy plants
- Improve land-based algae production and conversion
- E-vehicles with bioelectricity

RETD
IEA - RENEWABLE ENERGY TECHNOLOGY DEPLOYMENT

Better policy is needed to establish and disseminate better practices

- **Policy support only when demonstrating**
  - reducing net GHG emissions
  - maintaining biodiversity
  - energy security
  - and low social tradeoffs
- **Performance-based incentives**
  - proportional to the benefits delivered

IEA Bioenergy

THANK YOU

For additional information on the BUBE project:
Online: www.iea-retd.org and www.ieabioenergy.com

Contact: IEA_RETD@ecofys.com or u.fritsche@oeko.de

IEA Bioenergy

RETD
IEA - RENEWABLE ENERGY TECHNOLOGY DEPLOYMENT