IEA Bioenergy

Global Challenges
Global Collaboration

TCBiomass+

7 October 2019

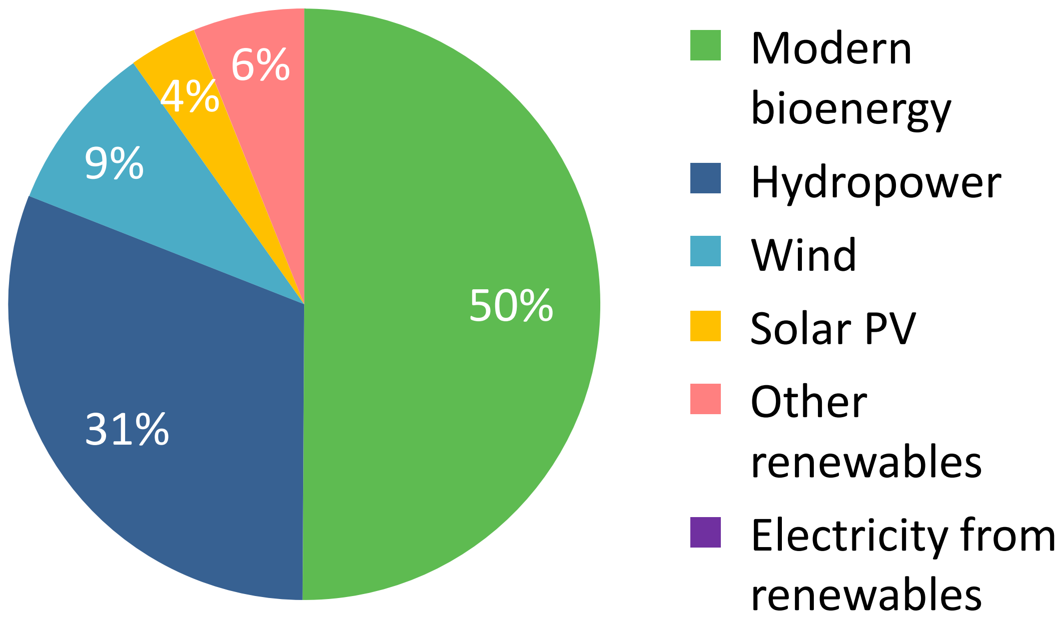
Jim Spaeth

Chair

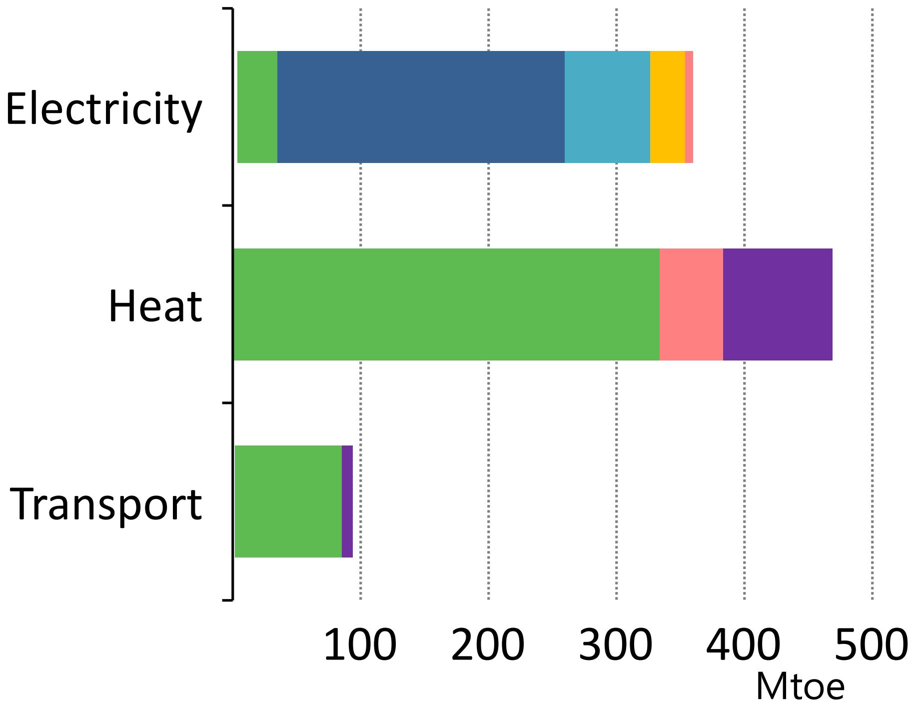
IEA Bioenergy

Modern bioenergy: the overlooked giant of renewables

Total final energy consumption from renewables, 2017



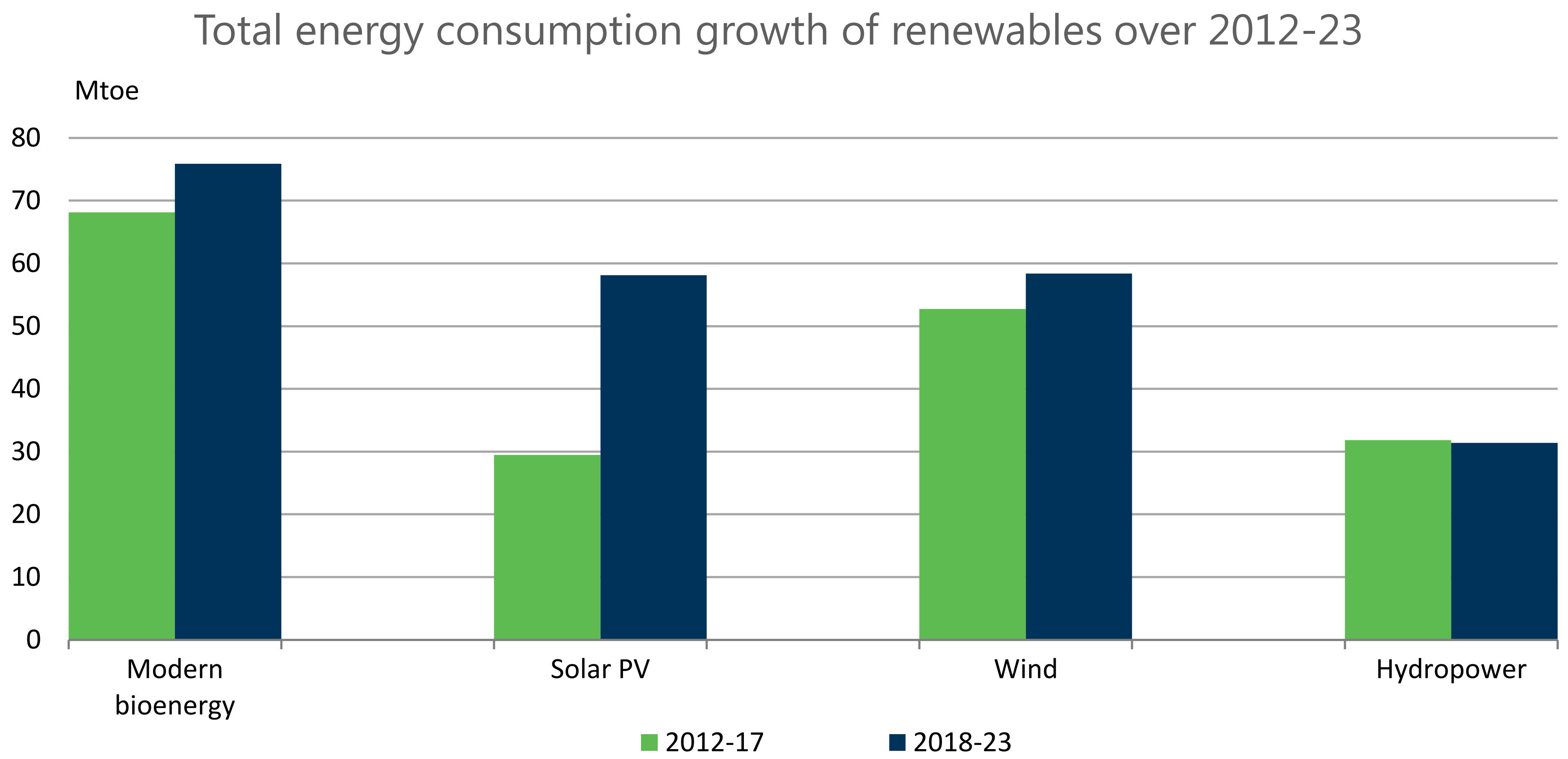
Total final energy consumption from renewables by sector, 2017



Modern bioenergy is the only renewable source that can provide electricity, direct heat and transport fuels
Two thirds of modern bioenergy heat is used in industry

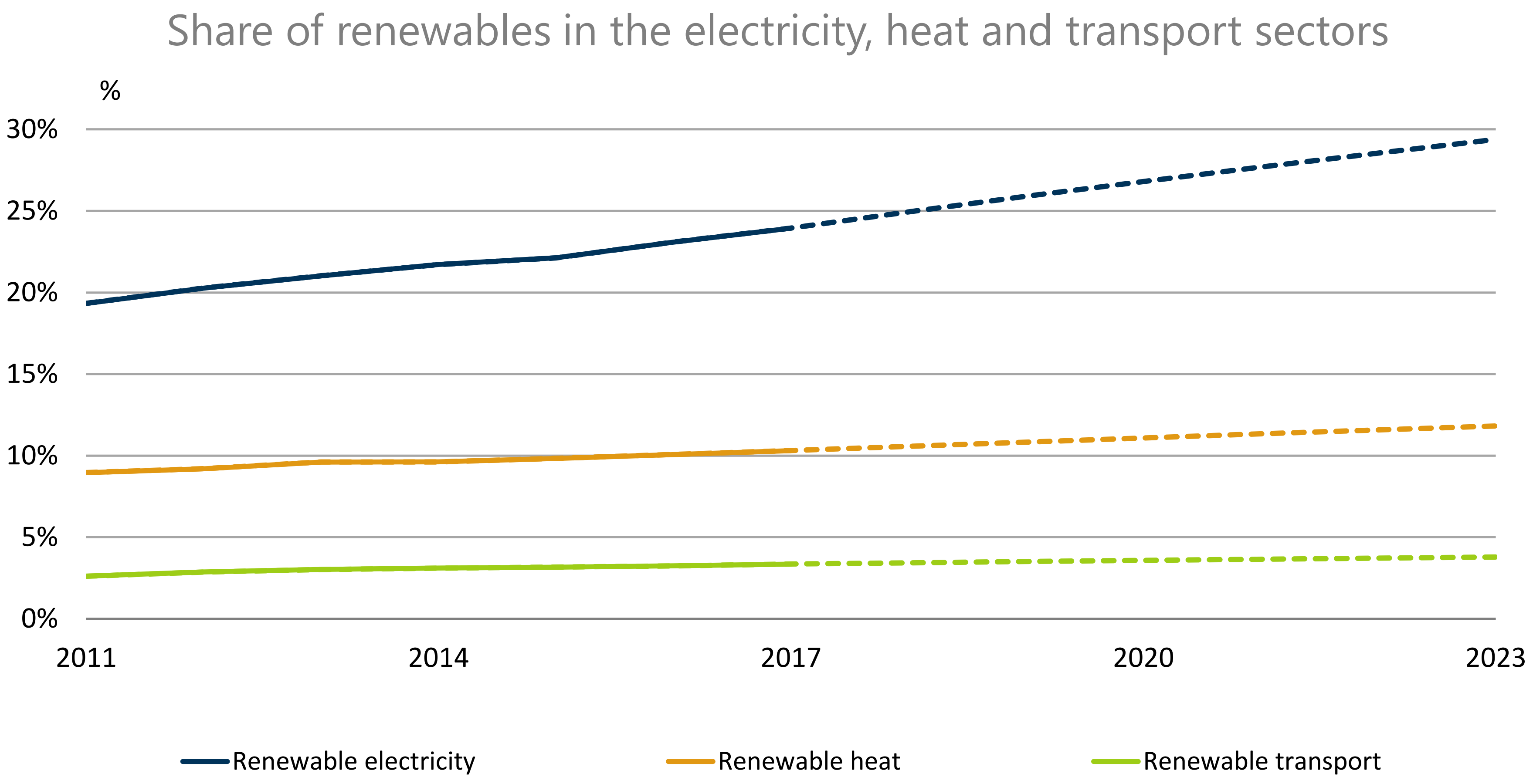
Source: IEA Renewables 2018

Modern bioenergy set to lead renewables growth



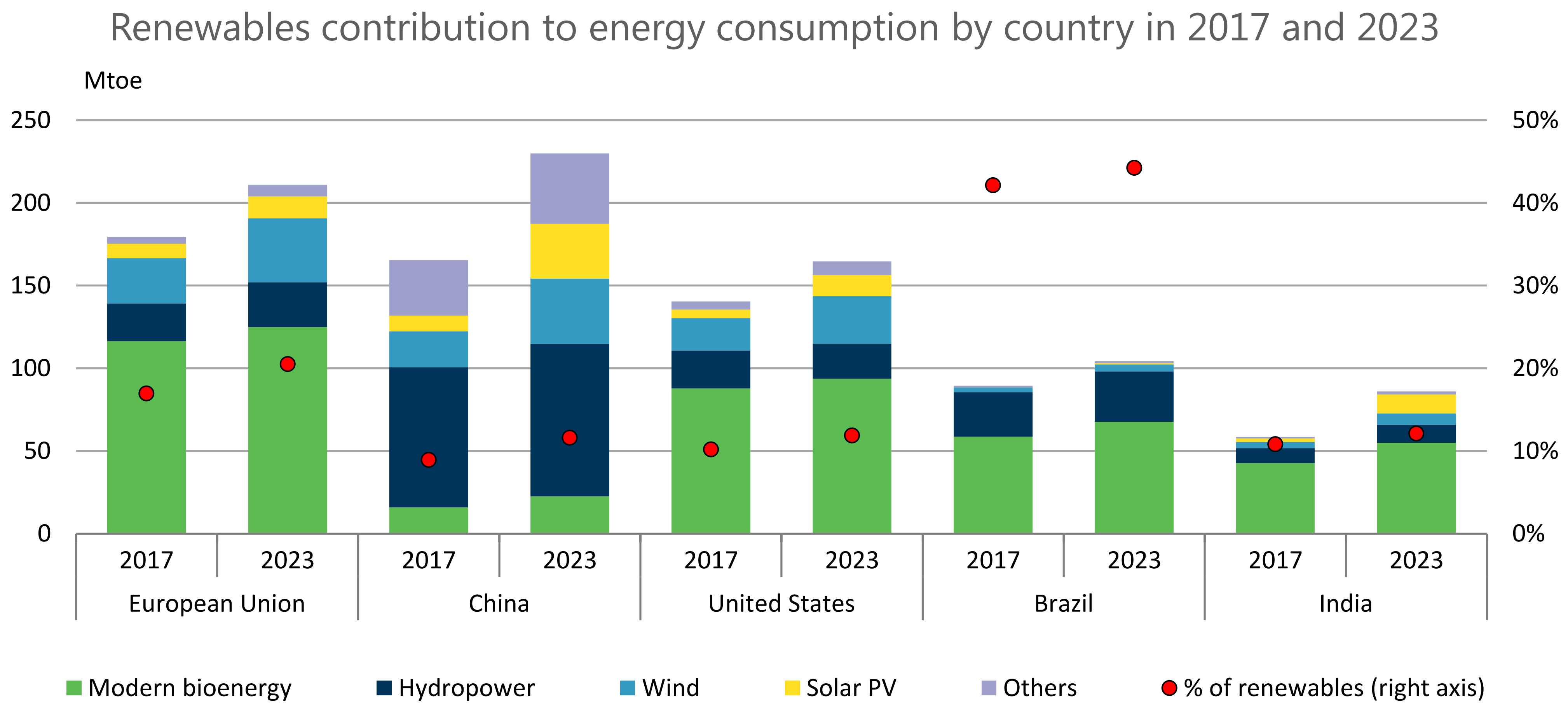
Total renewable energy consumption is expected to increase by almost 30% over 2018-2023, covering 40% of global energy demand growth

Renewables progress vary by sector



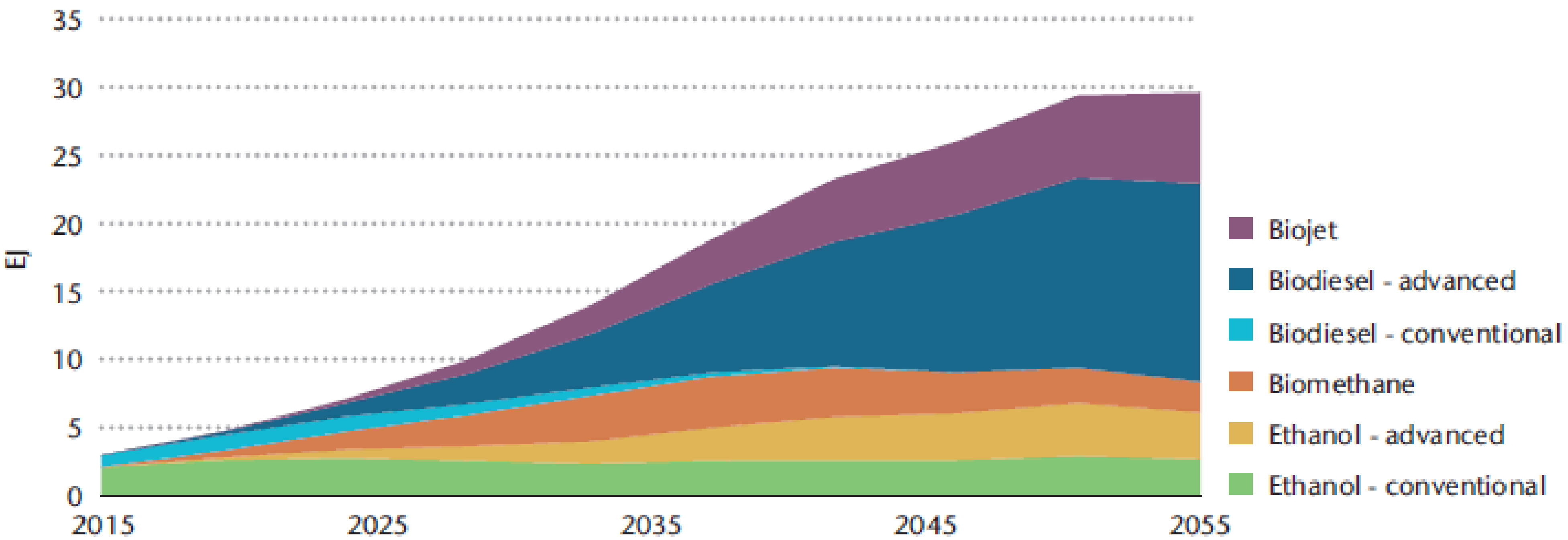
Progress is fastest in electricity driven by rapid wind and solar expansion; modest increase in heat; renewables share in transport remains lowest despite biofuels and EVs growth

China becomes the largest renewable energy consumer



China accounts for the largest absolute growth over the forecast period surpassing the EU, while renewable energy consumption in India increases by 50%

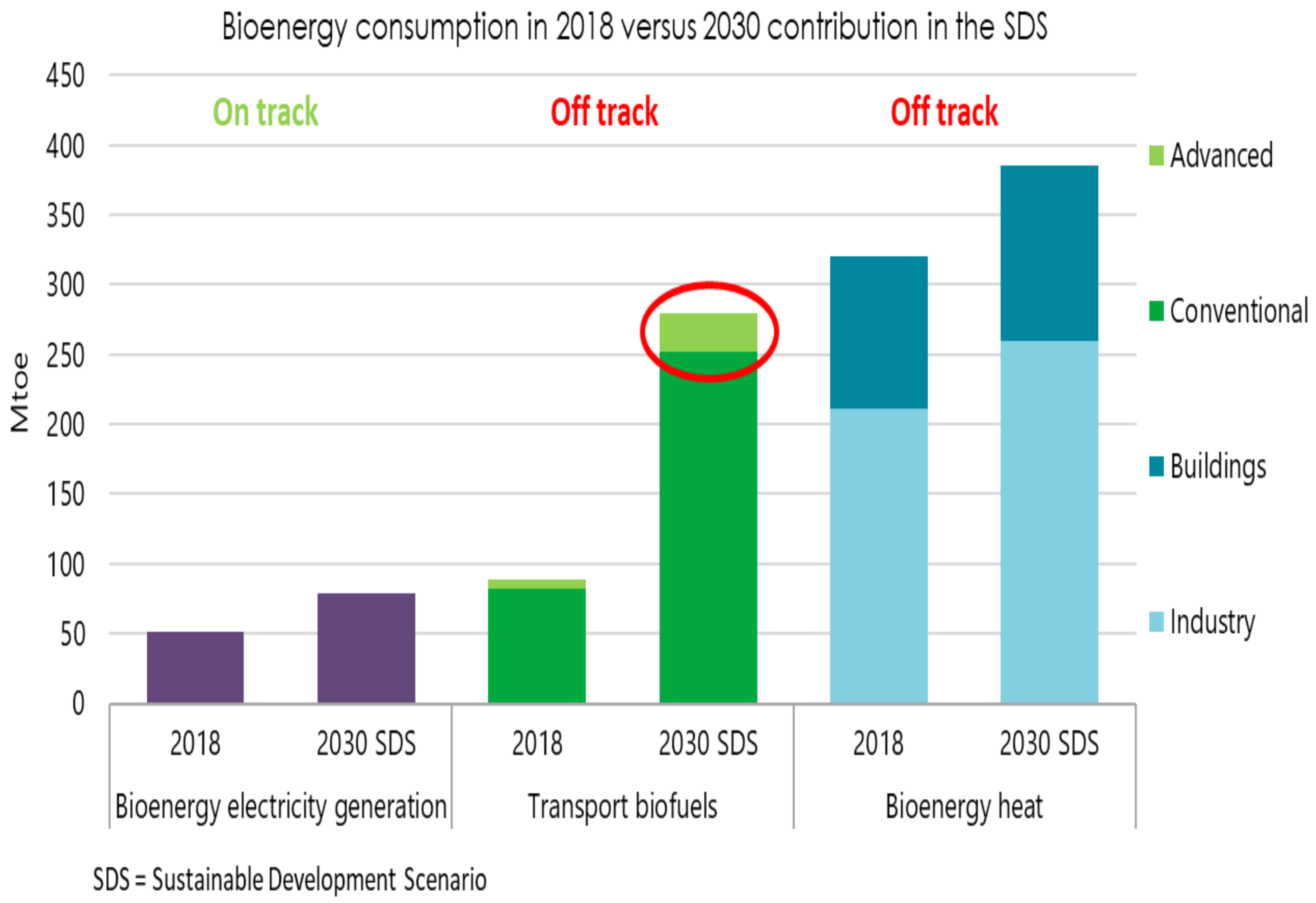
Increasing Role Of Advanced Biofuels, Focus On Long-haul Transport, 2DS



Notes: Conventional biodiesel refers to crop-based FAME biodiesel; advanced biodiesel refers to a range of advanced biofuels suitable for use in the diesel pool.

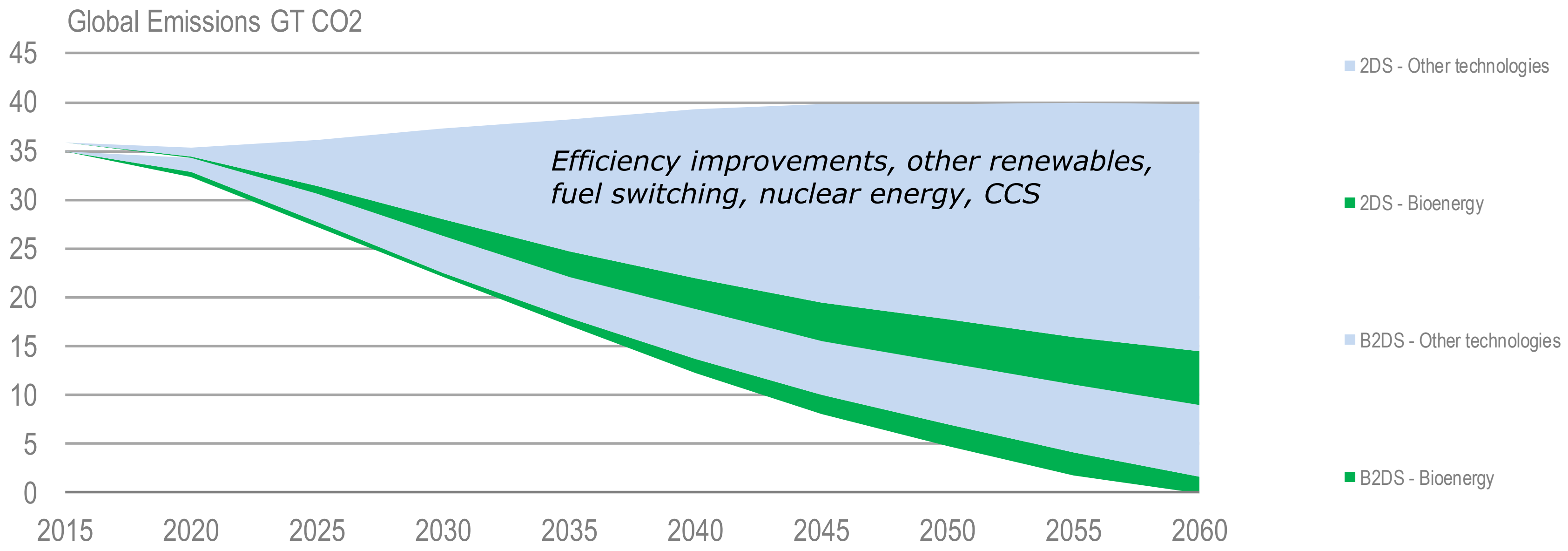
Source: IEA

Role of Bioenergy in SDS



Source: IEA

Role of Bioenergy in Decarbonisation Scenarios



Bioenergy to provide some 17% of cumulative carbon savings to 2060 in the 2DS and around 22% of additional cumulative reductions in the B2DS, including an important contribution from BECCS

RTS: Reference technology scenario
2DS: scenario with 50% change to stay below 2°C temperature rise by 2100
B2DS: beyond 2°C scenario (<1.75°C)
BECCS = bioenergy combined with carbon capture & storage

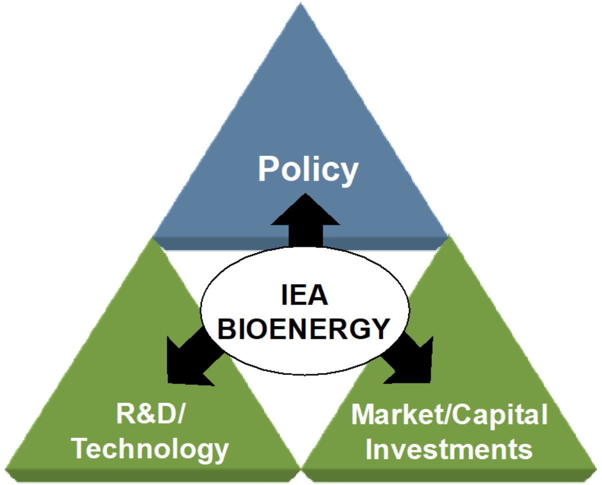
Source: IEA Technology Roadmap – Delivering sustainable bioenergy (2017)

IEA Bioenergy
Technology Collaboration Program

ASIA/OCEANIA/AFRICA
- India
- Japan
- Korea
- Australia
- New Zealand
- South Africa

AMERICA'S
- Brazil
- Canada
- United States

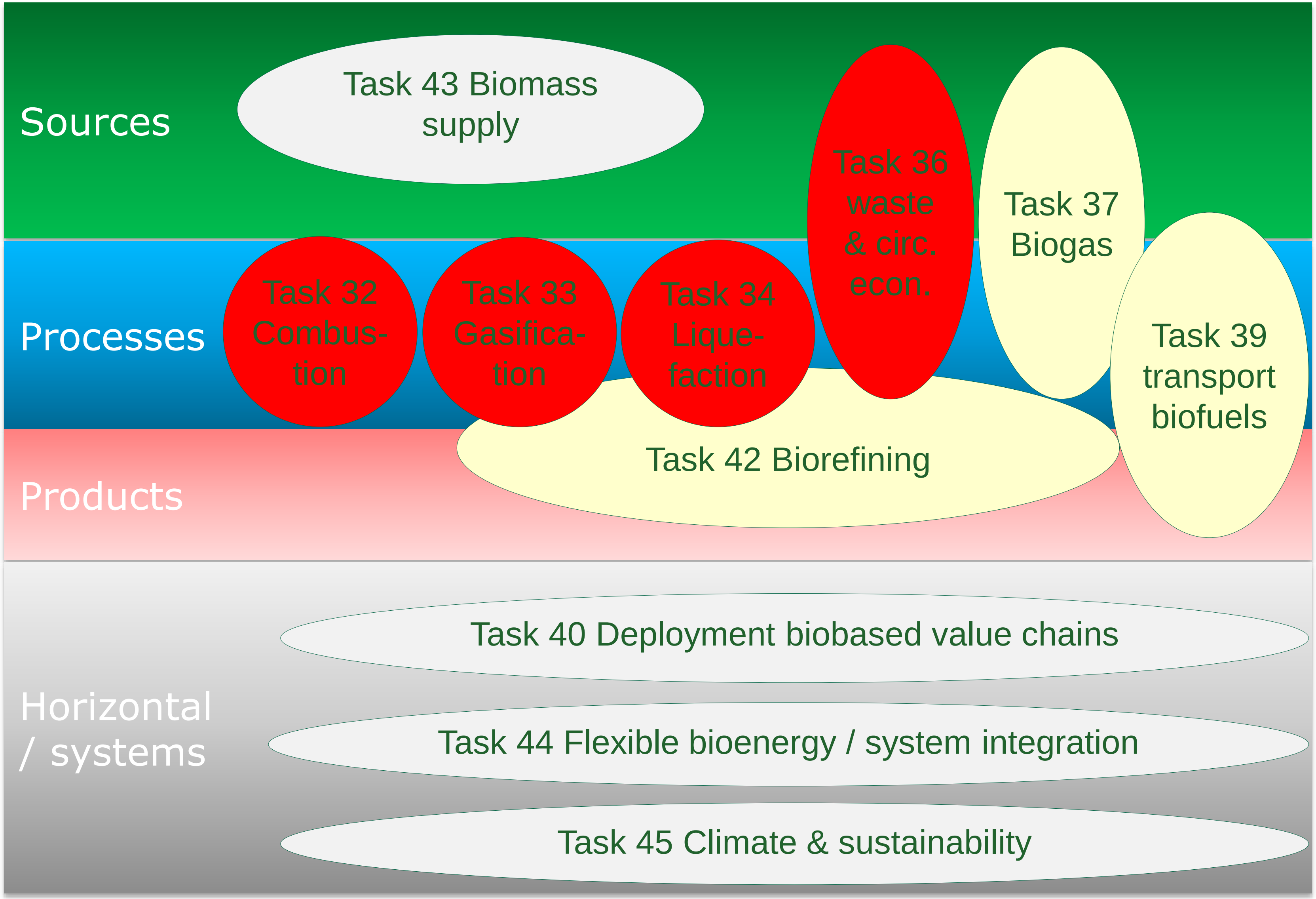
EUROPE:
- Austria
- Belgium
- Croatia
- Denmark
- European Commission
- Estonia
- Finland
- France
- Germany
- Ireland
- Italy
- Netherlands
- Norway
- Sweden
- Switzerland
- United Kingdom



25 Contracting Parties

Budget in 2019:
1,9 Million US$
Tasks: 11+ Specials Tasks
Participation: 106
Direct participation:
> 200 persons

Bioenergy TCP Tasks



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Inter-Task projects

<u>Completed, more work to continue</u>

- **Mobilizing** sustainable bioenergy supply chains *(2016)*
- State of Technology Review – **Algae Bioenergy** *(2017)*
- Fuel **pretreatment** of biomass residues in the supply chain for thermal conversion *(early 2019)*
- Measuring, governing and gaining support for **sustainable** bioenergy supply chains *(early 2019)*

<u>New</u>

- *The role of **bioenergy in a WB2/SDG world***
- ***Renewable gas** - deployment, markets and sustainable trade*
- *Bioenergy for **high temperature heat** in industry*

Special projects

= initiative of 2 or more IEA Bioenergy member countries

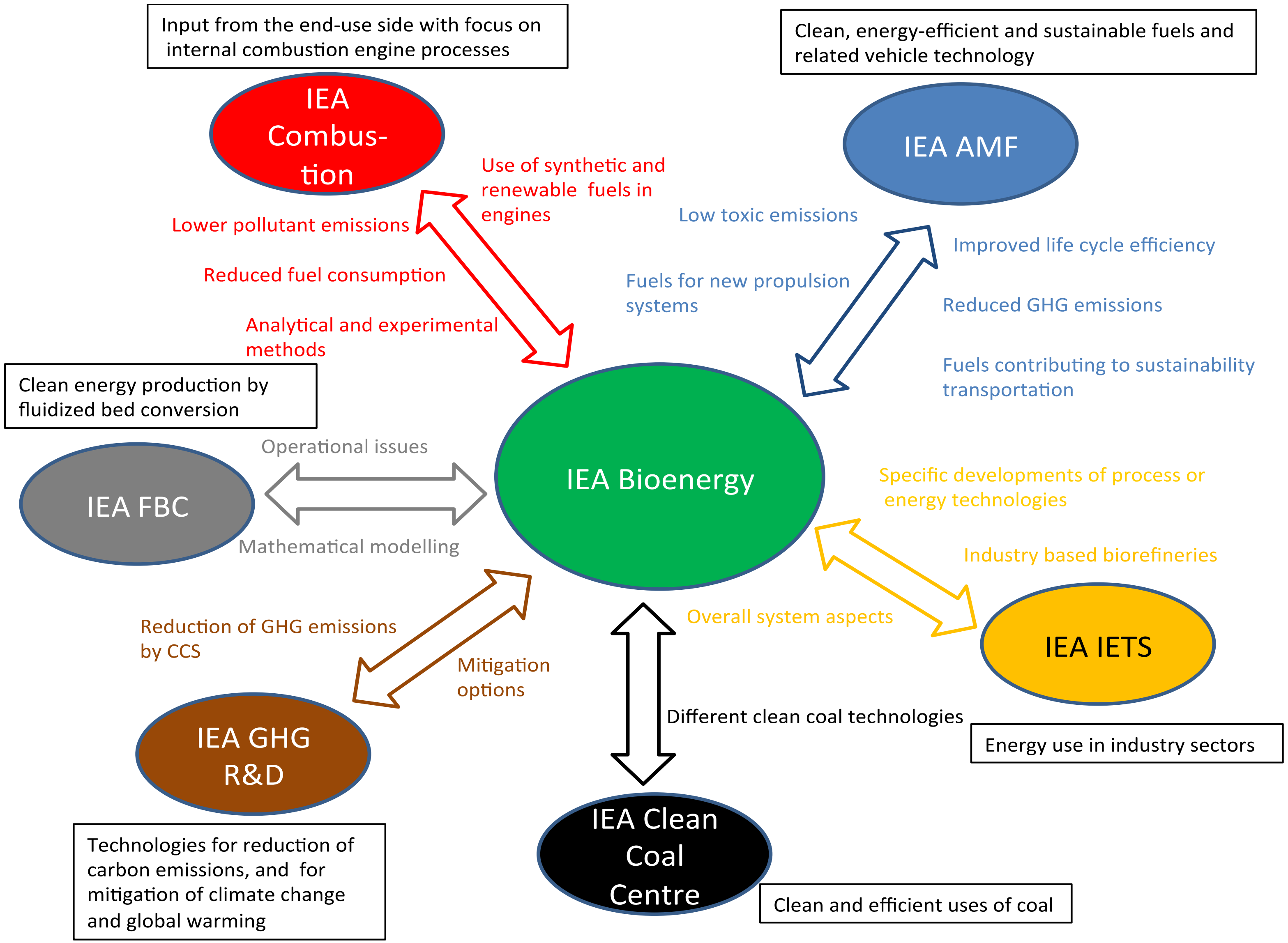
Completed, evolving

- **Bio-CCS and Bio-CCUS** in climate change mitigation and extended use of biomass raw material (*2018)*
- Bioenergy in **balancing the grid** and providing storage options *(2017)*
- Bioenergy **Renewable Energy Systems Hybrids** *(2017)*
- Contribution to IEA Technology **Roadmap** on Bioenergy *(2017)*

New

- *The potential for **cost reduction** for novel and advanced renewable and **low carbon fuels** (mid 2019)*
- *The contribution of Advanced Renewable Transport Fuels to **transport decarbonisation** in 2030 and beyond (early 2020)*

Collaboration with other TCPs



Producing drop-in biofuels through co-processing of bio-oil

- Tasks 34 and 39

Photo: Courtesy of Pacific Northwest National Laboratory, USA

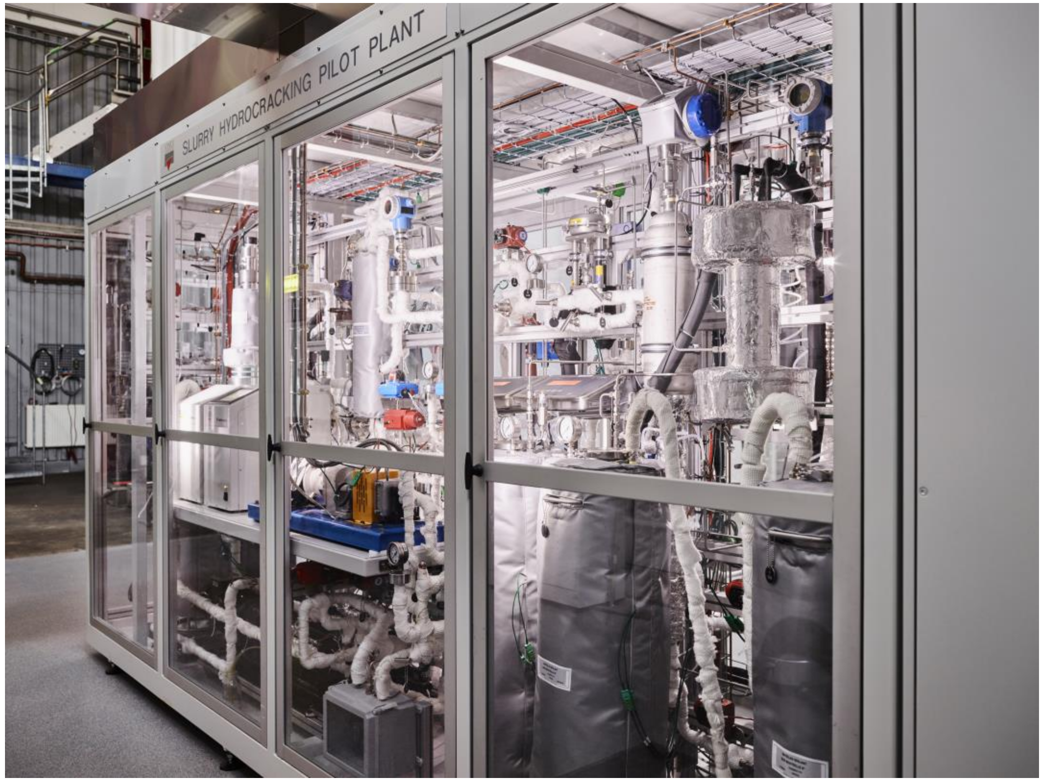
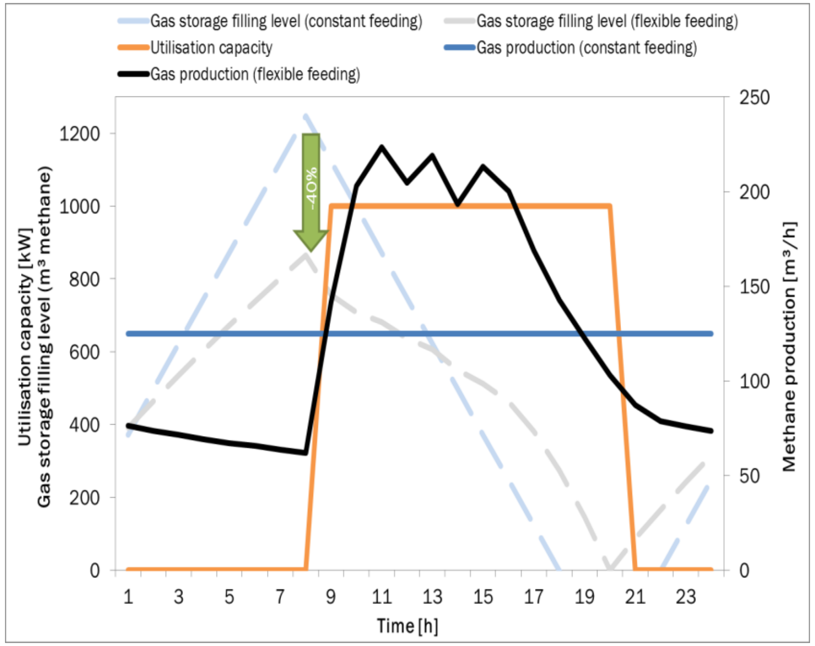


Photo: Courtesy of RISE Energy Technology Center, Sweden

Flexibility of biogas systems to facilitate increasing levels of intermittent renewables in the energy system

- **Task 37 and 44**



Hydrogen injection to the gas grid at Falkenhagen

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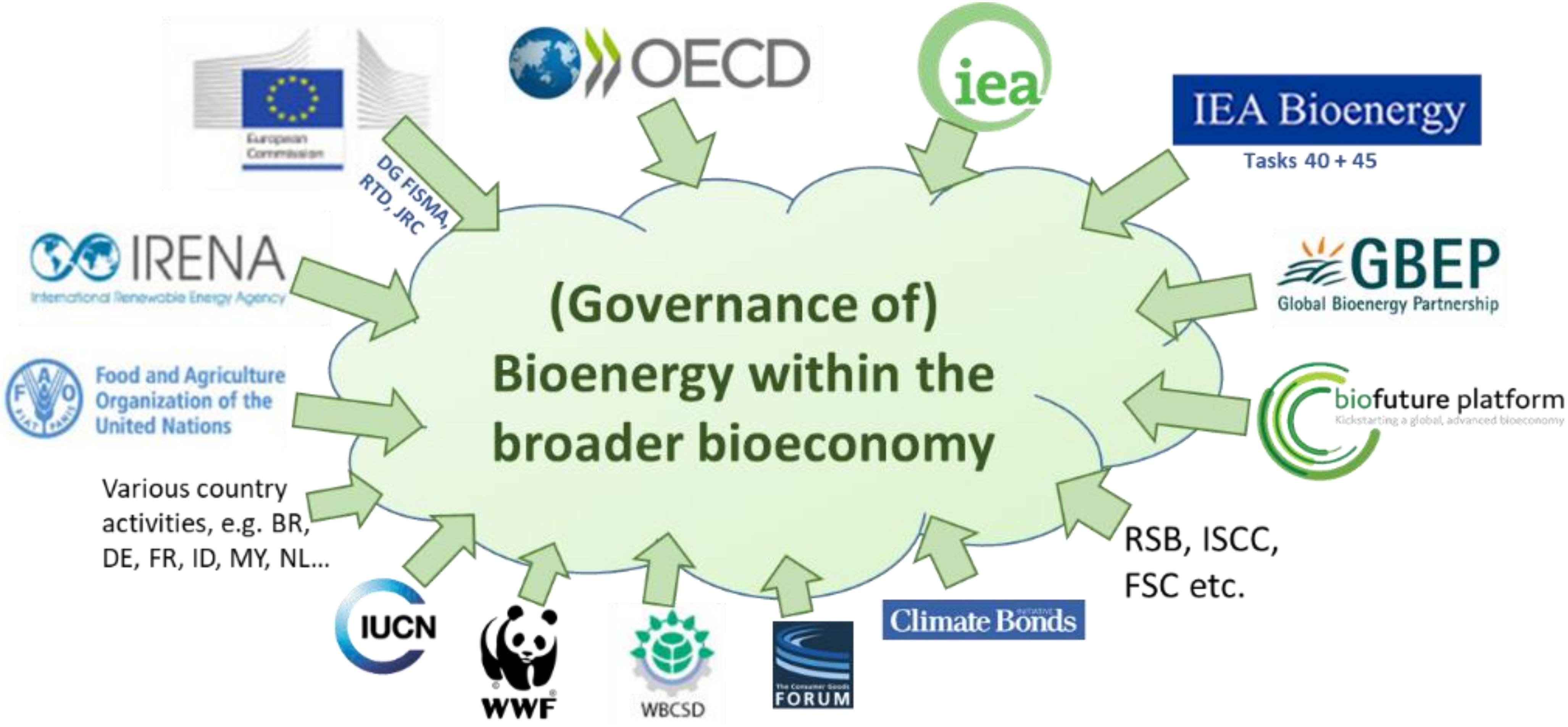
The role of bioenergy in a world targeting climate change and sustainable development

- Task 45
- **Identifying synergies between bioenergy deployment and Sustainable Development Goals (SDG) implementation**
- Example
  - Optimal balance between carbon storage in forests and biomass harvest to support GHG-intensive materials such as aluminum, cement, and steel

Governing Sustainability In Biomass Supply Chains, IEA Bioenergy workshop, Utrecht (Netherlands), 23 May 2019



International contributors to sustainable bioeconomy governance (more to be involved). Source: IINAS

Sustainability Impact Example

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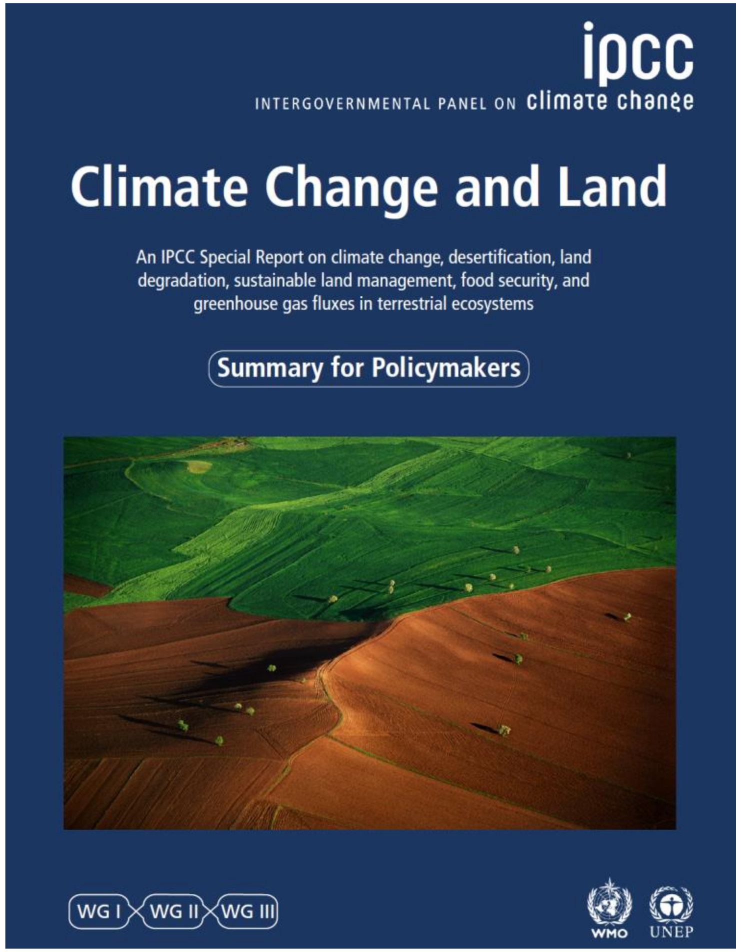
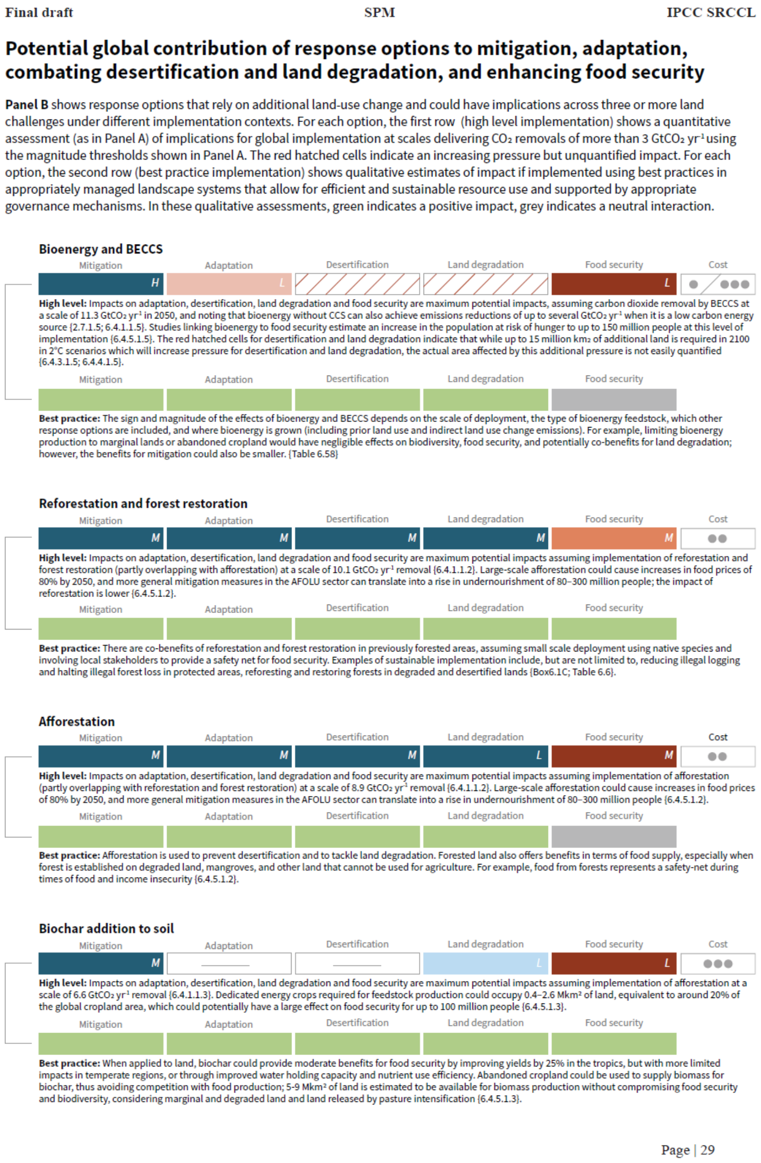
Detailed insight into Integrated Assessment Modeling assumptions and structures enabled a better communication and ultimate request for differentiation based on scientific evidence

https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf



SPM.3 Panel B



Final draft SPM IPCC SRCCL

Potential global contribution of response options to mitigation, adaptation, combating desertification and land degradation, and enhancing food security

Panel B shows response options that rely on additional land-use change and could have implications across three or more land challenges under different implementation contexts. For each option, the first row (high level implementation) shows a quantitative assessment (as in Panel A) of implications for global implementation at scales delivering CO_2 removals of more than 3 $GtCO_2$ yr^{-1} using the magnitude thresholds shown in Panel A. The red hatched cells indicate an increasing pressure but unquantified impact. For each option, the second row (best practice implementation) shows qualitative estimates of impact if implemented using best practices in appropriately managed landscape systems that allow for efficient and sustainable resource use and supported by appropriate governance mechanisms. In these qualitative assessments, green indicates a positive impact, grey indicates a neutral interaction.

Bioenergy and BECCS

Mitigation	Adaptation	Desertification	Land degradation	Food security	Cost
H	L			L	● / ●●●

High level: Impacts on adaptation, desertification, land degradation and food security are maximum potential impacts, assuming carbon dioxide removal by BECCS at a scale of 11.3 $GtCO_2$ yr^{-1} in 2050, and noting that bioenergy without CCS can also achieve emissions reductions of up to several $GtCO_2$ yr^{-1} when it is a low carbon energy source {2.7.1.5; 6.4.1.1.5}. Studies linking bioenergy to food security estimate an increase in the population at risk of hunger to up to 150 million people at this level of implementation {6.4.5.1.5}. The red hatched cells for desertification and land degradation indicate that while up to 15 million km_2 of additional land is required in 2100 in 2°C scenarios which will increase pressure for desertification and land degradation, the actual area affected by this additional pressure is not easily quantified {6.4.3.1.5; 6.4.4.1.5}.

Mitigation | Adaptation | Desertification | Land degradation | Food security

Best practice: The sign and magnitude of the effects of bioenergy and BECCS depends on the scale of deployment, the type of bioenergy feedstock, which other response options are included, and where bioenergy is grown (including prior land use and indirect land use change emissions). For example, limiting bioenergy production to marginal lands or abandoned cropland would have negligible effects on biodiversity, food security, and potentially co-benefits for land degradation; however, the benefits for mitigation could also be smaller. {Table 6.58}

Reforestation and forest restoration

Mitigation	Adaptation	Desertification	Land degradation	Food security	Cost
M	M	M	M	M	●●

High level: Impacts on adaptation, desertification, land degradation and food security are maximum potential impacts assuming implementation of reforestation and forest restoration (partly overlapping with afforestation) at a scale of 10.1 $GtCO_2$ yr^{-1} removal {6.4.1.1.2}. Large-scale afforestation could cause increases in food prices of 80% by 2050, and more general mitigation measures in the AFOLU sector can translate into a rise in undernourishment of 80–300 million people; the impact of reforestation is lower {6.4.5.1.2}.

Mitigation | Adaptation | Desertification | Land degradation | Food security

Best practice: There are co-benefits of reforestation and forest restoration in previously forested areas, assuming small scale deployment using native species and involving local stakeholders to provide a safety net for food security. Examples of sustainable implementation include, but are not limited to, reducing illegal logging and halting illegal forest loss in protected areas, reforesting and restoring forests in degraded and desertified lands {Box6.1C; Table 6.6}.

Afforestation

Mitigation	Adaptation	Desertification	Land degradation	Food security	Cost
M	M	M	L	M	●●

High level: Impacts on adaptation, desertification, land degradation and food security are maximum potential impacts assuming implementation of afforestation (partly overlapping with reforestation and forest restoration) at a scale of 8.9 $GtCO_2$ yr^{-1} removal {6.4.1.1.2}. Large-scale afforestation could cause increases in food prices of 80% by 2050, and more general mitigation measures in the AFOLU sector can translate into a rise in undernourishment of 80–300 million people {6.4.5.1.2}.

Mitigation | Adaptation | Desertification | Land degradation | Food security

Best practice: Afforestation is used to prevent desertification and to tackle land degradation. Forested land also offers benefits in terms of food supply, especially when forest is established on degraded land, mangroves, and other land that cannot be used for agriculture. For example, food from forests represents a safety-net during times of food and income insecurity {6.4.5.1.2}.

Biochar addition to soil

Mitigation	Adaptation	Desertification	Land degradation	Food security	Cost
M	—	—	L	L	●●●

High level: Impacts on adaptation, desertification, land degradation and food security are maximum potential impacts assuming implementation of afforestation at a scale of 6.6 $GtCO_2$ yr^{-1} removal {6.4.1.1.3}. Dedicated energy crops required for feedstock production could occupy 0.4–2.6 Mkm^2 of land, equivalent to around 20% of the global cropland area, which could potentially have a large effect on food security for up to 100 million people {6.4.5.1.3}.

Mitigation | Adaptation | Desertification | Land degradation | Food security

Best practice: When applied to land, biochar could provide moderate benefits for food security by improving yields by 25% in the tropics, but with more limited impacts in temperate regions, or through improved water holding capacity and nutrient use efficiency. Abandoned cropland could be used to supply biomass for biochar, thus avoiding competition with food production; 5-9 Mkm^2 of land is estimated to be available for biomass production without compromising food security and biodiversity, considering marginal and degraded land and land released by pasture intensification {6.4.5.1.3}.

Page | 29

IEA Bioenergy:
Working with International Organizations

Policy debate, country ownership, advanced bioeconomy — biofuture platform

Sustainability, capacity building, cooperation — GBEP Global Bioenergy Partnership

Agricultural and biomass practices — FAO

Scientific and Technical collaboration — IEA Bioenergy

The Biofuture Platform can help articulate concerted effort by countries and stakeholders

iea — Energy analysis, knowledge

IRENA International Renewable Energy Agency — Renewable energy deployment, development cooperation

MISSION INNOVATION Accelerating the Clean Energy Revolution — Research and innovation promotion, colaboration

below50 — Private sector link

THE WORLD BANK IBRD · IDA | WORLD BANK GROUP — Finance, green bonds

Source: Biofuture Platform

IEA Bioenergy Communications

- Central website http://www.ieabioenergy.com/
- Bi-monthly webinars
- Summaries of Technical Reports
- Searchable library
- Position papers
- Twitter (@IEABioenergy)
- Cooperation with other international organizations
- Logo and Website re-design in next 6 months
- Communication specialist hired to update/improve our communication strategy and aid implementation

A Call to Collaborate

- IEA Bioenergy – will continue to expand cooperation
  - IEA Secretariat, the BioFuture Platform, IRENA, FAO, GBEP, Mission Innovation, SEforAll/Below50, and more

- Our Invitation to Industry/Academia/NGOs
  - Thermal conversion
    - Combustion, gasification, thermochemical liquefaction
  - Advanced Transportation
  - System Integration with evolving future energy systems
  - Sustainability and Governance
  - Communications

IEA Bioenergy

Thanks for your consideration

IEA Bioenergy

Energy Technology Network

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