

The role of biogas in the global energy transition

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International Renewable Energy Agency

Introduction to IRENA

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Foundation: 26 January 2009 in Bonn

International Agency since April 2011

The only international RE agency worldwide

Scope: Hub, voice and source of objective information for renewable energy

Mandate: Sustainable deployment of the six forms of renewable energy resources

(Biomass, Geothermal, Hydro, Ocean, Solar, Wind)

Director-General: Adnan Z. Amin



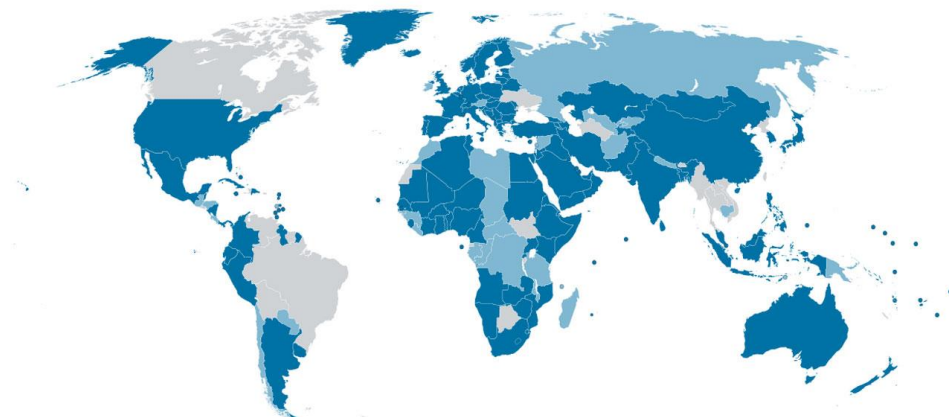
Structure and membership

Headquarters:

**Abu Dhabi,
United Arab Emirates**

Three Programmes:

- **Innovation and Technology Centre (IITC) in Bonn, Germany**
- **Knowledge, Finance and Policy Centre in Abu Dhabi (KPFC)**
- **Country Support Programme in Abu Dhabi (CSP)**



- Members of the Agency
- Signatories/applicants for membership

167 IRENA Parties

Full Members = 140 (139 countries + EU)

States in accession = 32

Role of Bioenergy and its impact

Biomass is a versatile energy source, which will play a significant role in doubling renewable energy by 2030.

Benefits

- Energy security
- Climate change mitigation
- Rural development
- Labor opportunity, income generation
- Avoid in house air pollution
- Mitigate the burden for fuel collection labor

Trade-offs

- Food security
- Biodiversity
- Life cycle emission increase through land use change, long distance trade
- Land grab, social equity

To enhance biomass' multi-dimensional role while mitigating the possible trade-offs associated with bio-energy deployment, an effective policy mix is needed rather than a single stand-alone policy or individual policy measures

- *To achieve above objective, support is required for improved data collection, resource assessment, technology evaluation, capacity building and policy guidance*
- *IRENA is trying to cover these area to collect / share information, exchange best practice, provide policy support*

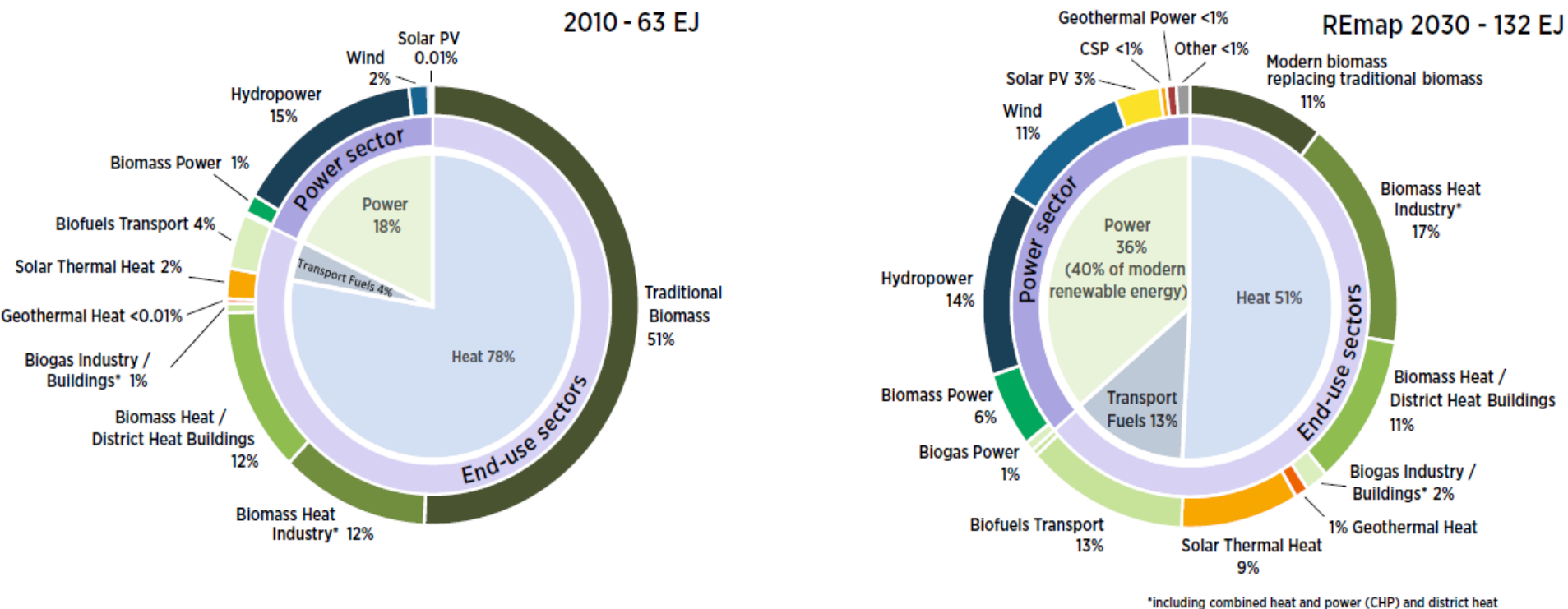
Bioenergy Activities of IRENA IRENA International Renewable Energy Agency

Resource Assessment	<ol style="list-style-type: none">1. Remap20302. Global Atlas3. Valo-BRES4. Resource assessment tool for municipality
Bioenergy Statistics	<ol style="list-style-type: none">5. IRENA Statistics Questionnaire6. RE Statistics Manual
Technology and Cost Assessment	<ol style="list-style-type: none">7. IRENA costing reports8. Technology briefs9. Project Navigator
Capacity building	<ol style="list-style-type: none">10. Capacity building for Entrepreneurs in Western Africa
Policy support	<ol style="list-style-type: none">11. Bioenergy How2Guide (IEA/IRENA/FAO)

- *IRENA's activity includes Resource Assessment (Global and local, current and future), Bioenergy Statistics (data collection, methodology improvement), Technology and Cost assessment (cost data collection & assessment, technology guidance for policy maker, project development support), Capacity building (local entrepreneurs support), and Policy support*

Current biogas application

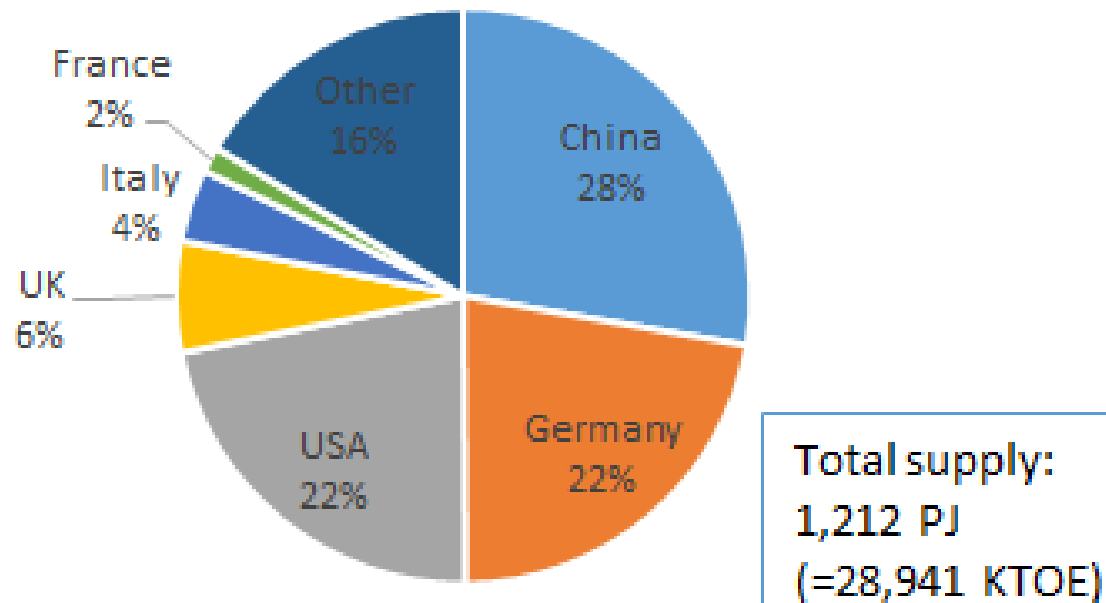
Global renewable energy use by technology and sector, 2010 and in REmap 2030



- *Currently, biomass accounts for over 80% of renewable energy use globally*
- *traditional use of biomass accounts for about half of all renewables*
- *Three key factors that characterize bioenergy are, flexibility in feedstock and end-use, storability, transferability*

Top 3 countries account for over 70% of global biogas production

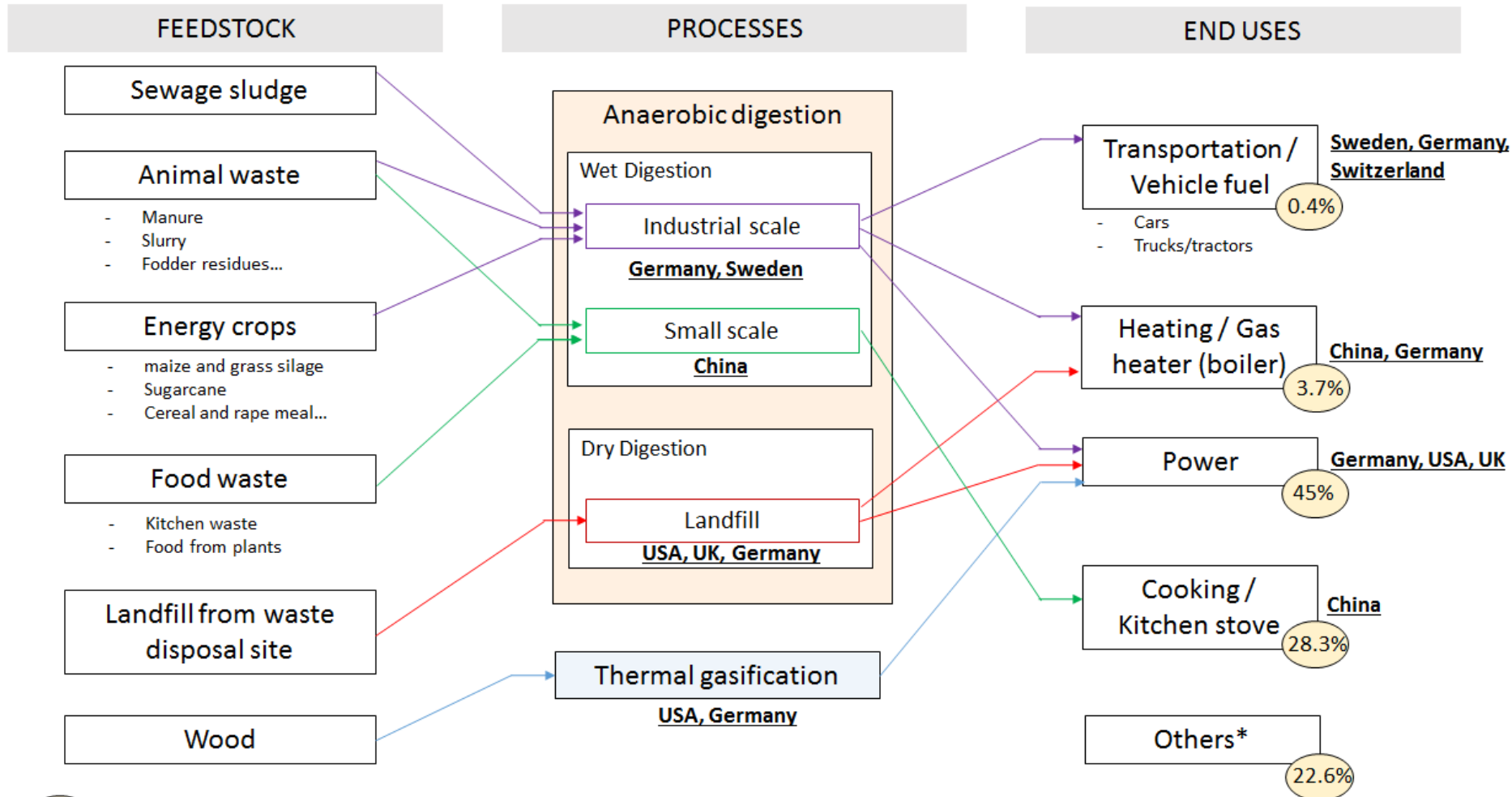
Biogas production by Country
(Primary supply, 2012)



- *Status of biogas application is strongly correlated with policy support (i.e. FIT in Germany, subsidy and technical support on small scale digester in China)*

Versatile capacity as energy source

Main producers of Biogas in 2012: China (28% of the global production), Germany (22.2%), USA (22%).

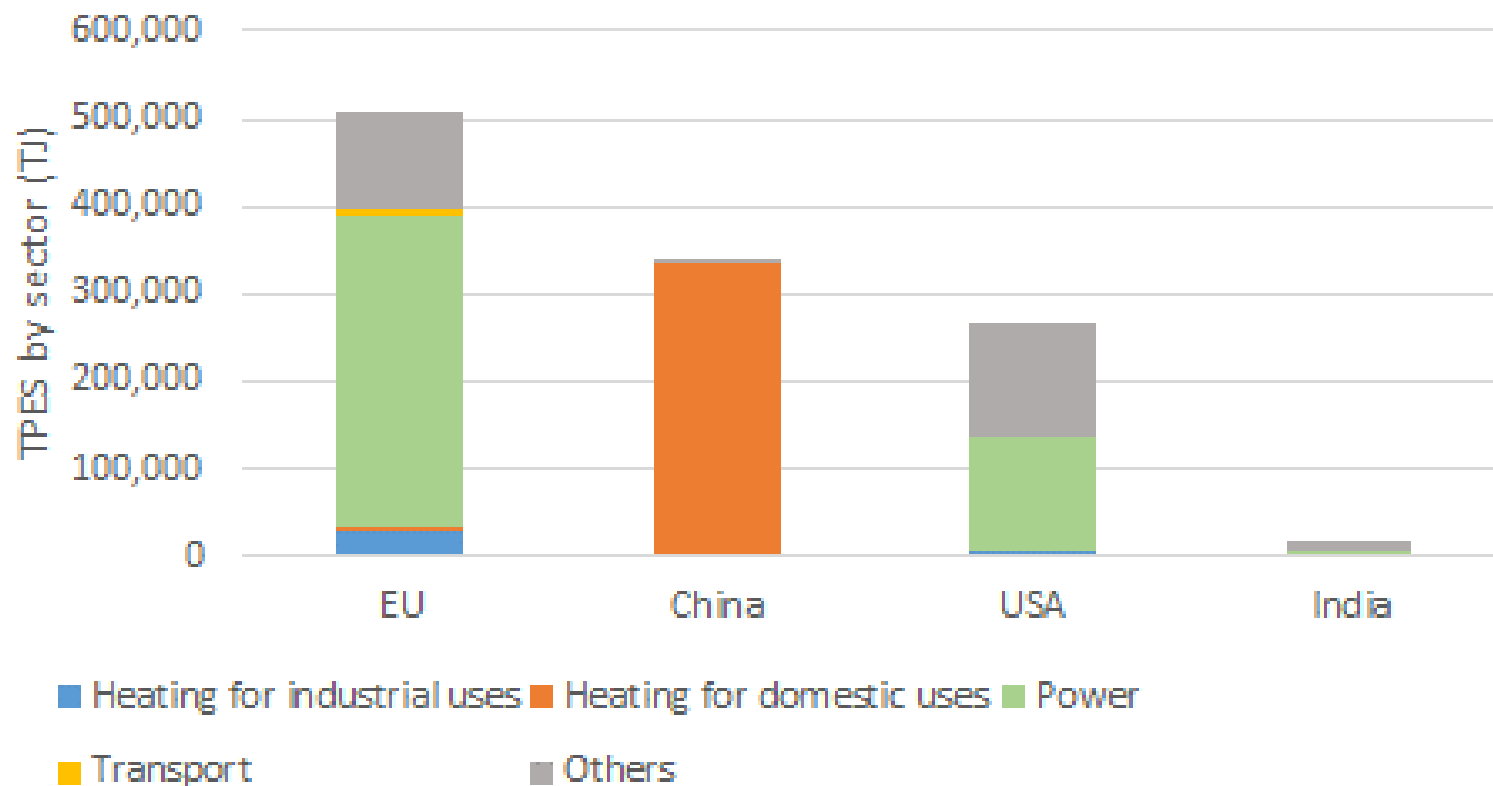


Percentages of biogas used for each application in 2011 (Total final consumption)

* Commercial and public services, industry uses ...

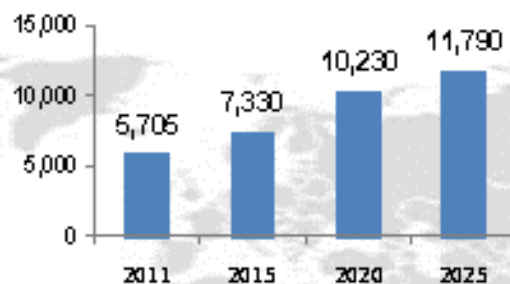
Biogas power is dominant in EU and USA, while domestic heat is majority in China

Biogas use by sector, by country (2012)

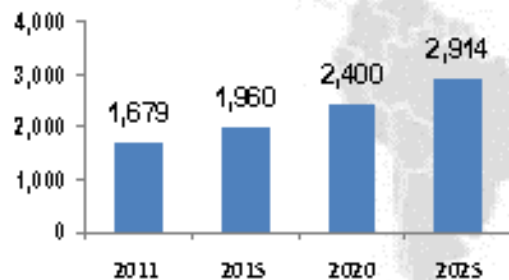


Biogas power: dominant in EU and USA

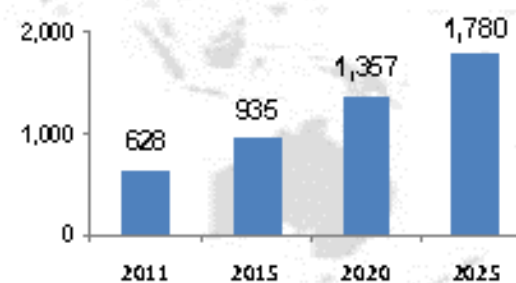
Europe



North America



Asia Pacific

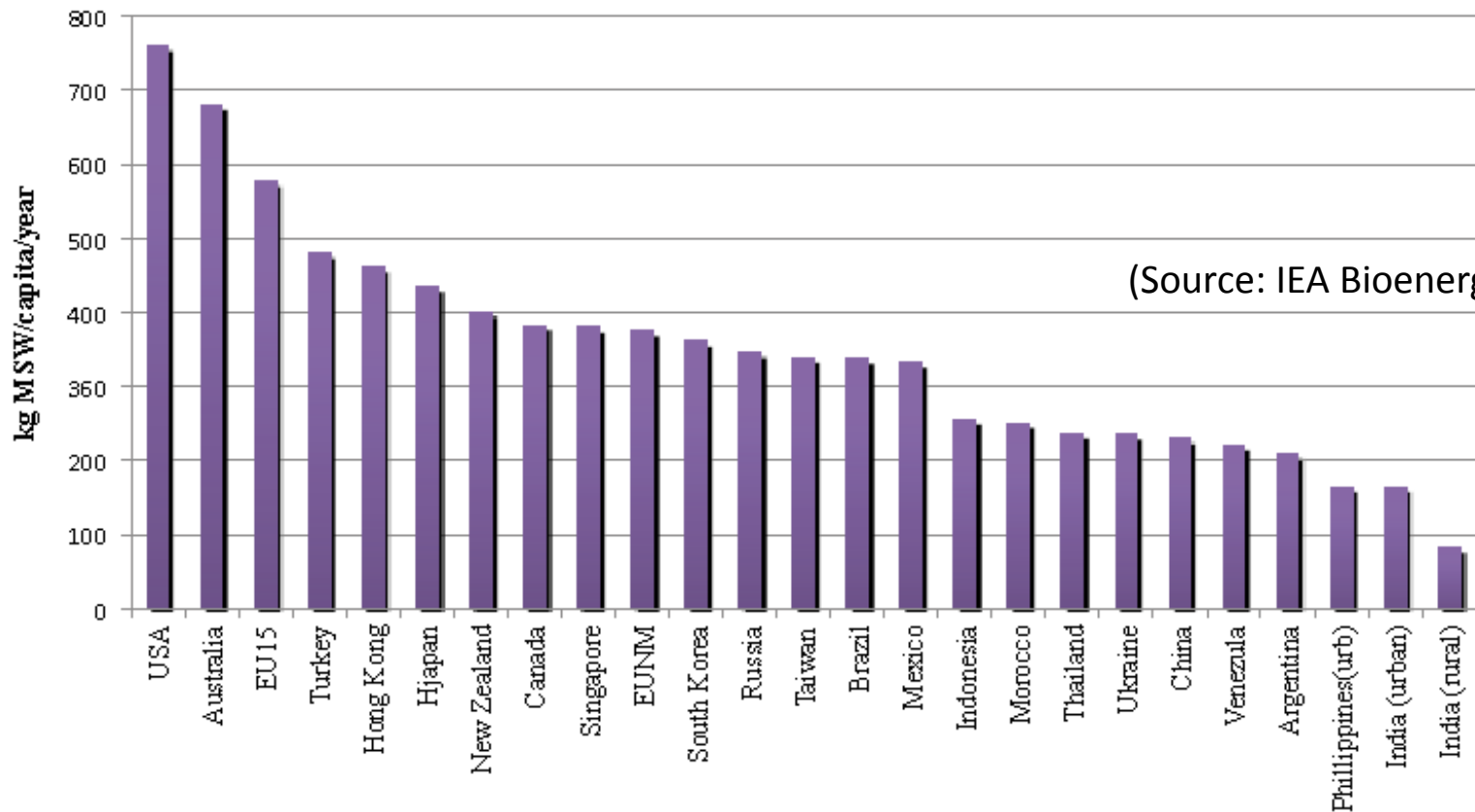


Source: GlobalData

Advantage of biogas

- Animal waste, municipal solid waste
- Sewage sludge
- Landfill from waste disposal site
- Energy crop
- Woody material (Thermal gasification)

Municipal waste production in selected countries



- MSW can provide stable feedstock at minimal cost
- Long term supply is assured and supply chain is developed by local government
- Landfill is common option, but incineration, thermal gasification can also be an alternative

- One of the important concern about bioenergy is “land use change” as crop or wood based biomass use finite land resource for its production
- This can cause several issue such as GHG emission, food-energy competition, biodiversity loss
- As most of biogas digester use waste / residue as feedstock, it can avoid land use change issue in many case

- Heat and electricity by CHP
- Biomethane for transport fuel
- Feedstock for chemical / pharmaceutical industry
- Household cooking fuel in developing country
- By-product: Biogas-slurry, useful as liquid fertilizer

- GHG emission can be negative or positive by number of factor in entire supply chain
- Feedstock difference
- Transport feedstock, distribution of biogas
- CH₄ leakage through supply chain
- CO₂ from biogas combustion is biogenic and does not affect overall GHG emission

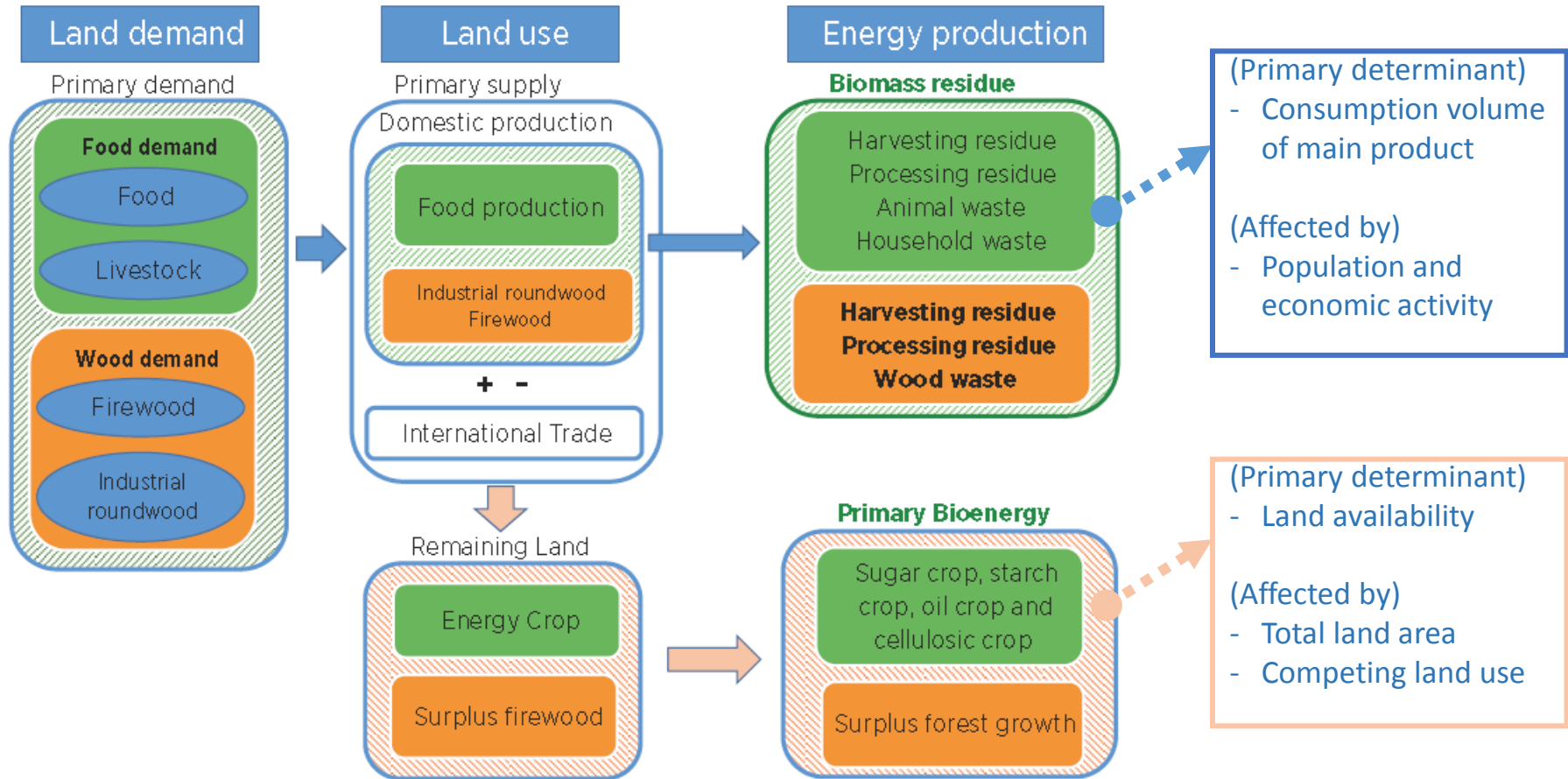
Health impact by replacing traditional biomass heat application

- Women and children in developing countries are exposed to indoor air pollution from cooking smoke, up to 20 times higher than WHO recommended level
- Time and labor saving for fuel collection
- The number of household biogas digester installations exceeded 40 million in 2010, represents 98% of world installed capacity

- Once upgraded, biogas can be stored, transferred through natural gas grid system
- This increase the applicability of biogas significantly such as, filling peak electricity demand in combination with other renewables (wind, solar)

Potential and Barrier

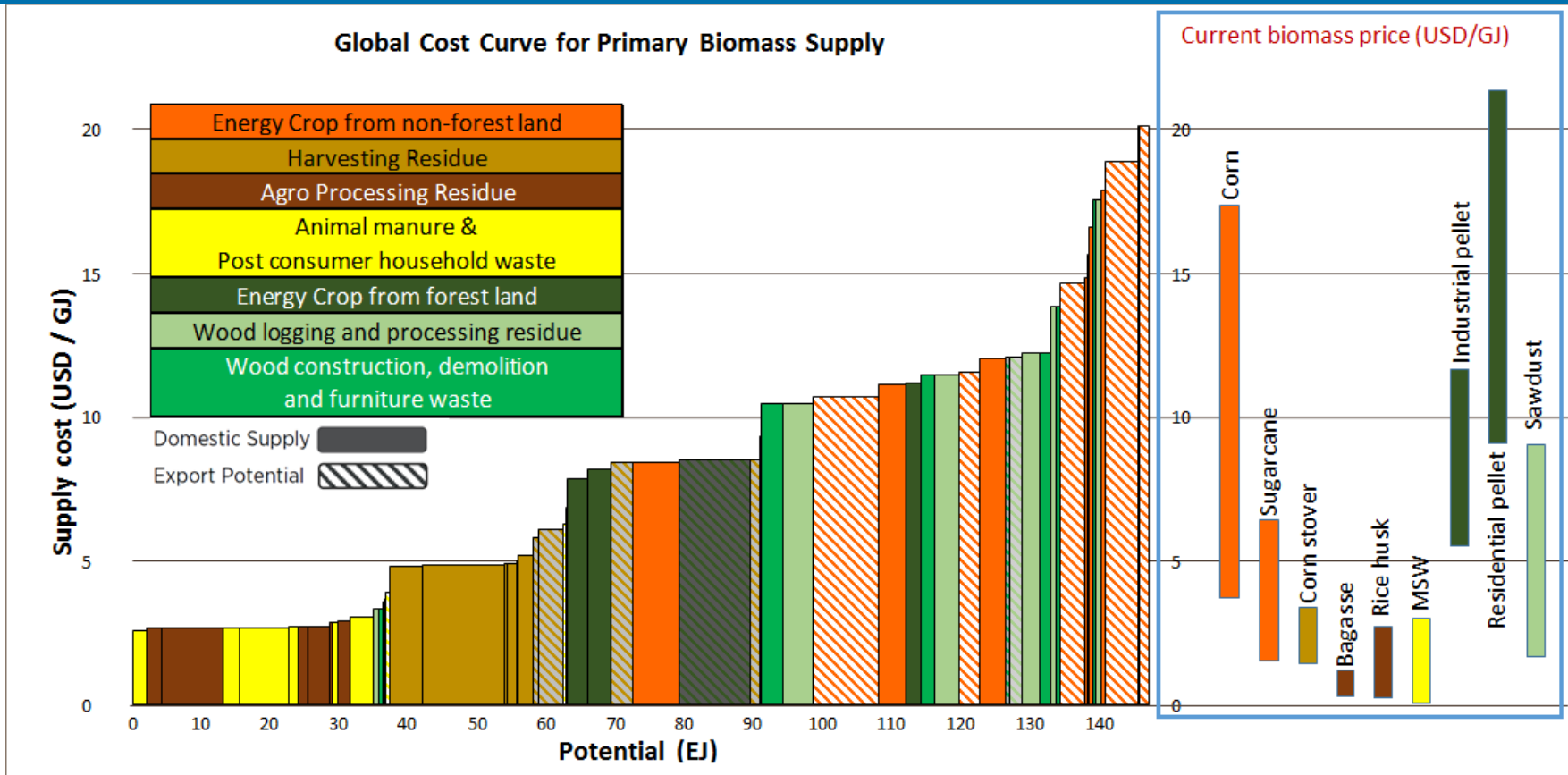
Key factors to determine biomass feedstock supply



Supply potential for primary bioenergy feedstocks is estimated by grouping different kinds of biomass into two major categories, namely “primary bioenergy” and “biomass residues & waste”

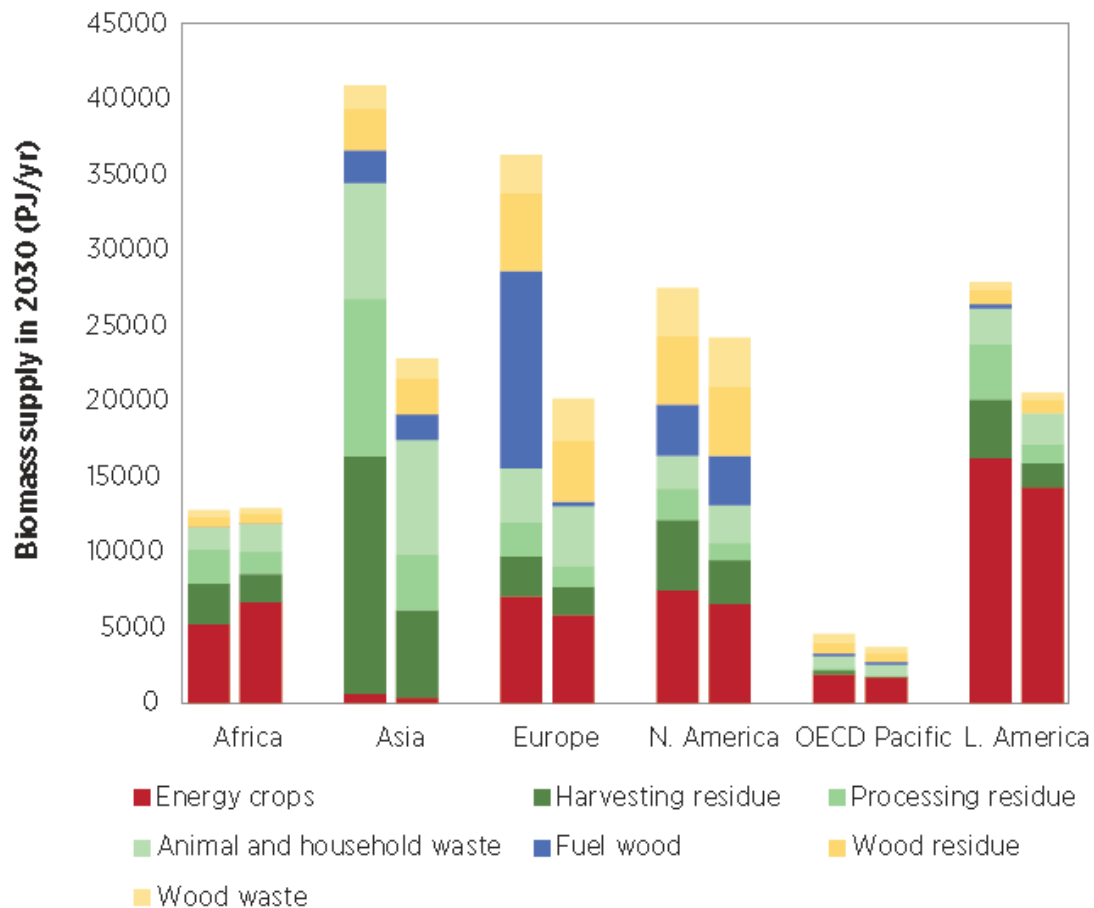
Primary supply potential is based on “total land area and competing land use” and biomass residue & waste is based on the developments in “population and economic activity”

Biomass supply potential and cost for 2030



- There are significant amount of biomass feedstock available (100-150EJ) to meet increasing demand of bioenergy
- Supply cost ranges from as low as 2 USD/GJ to over 20 USD/GJ depending on biomass type and region
- Residue and waste represents around 40% of biomass potential with low supply cost 2 – 5 USD/GJ

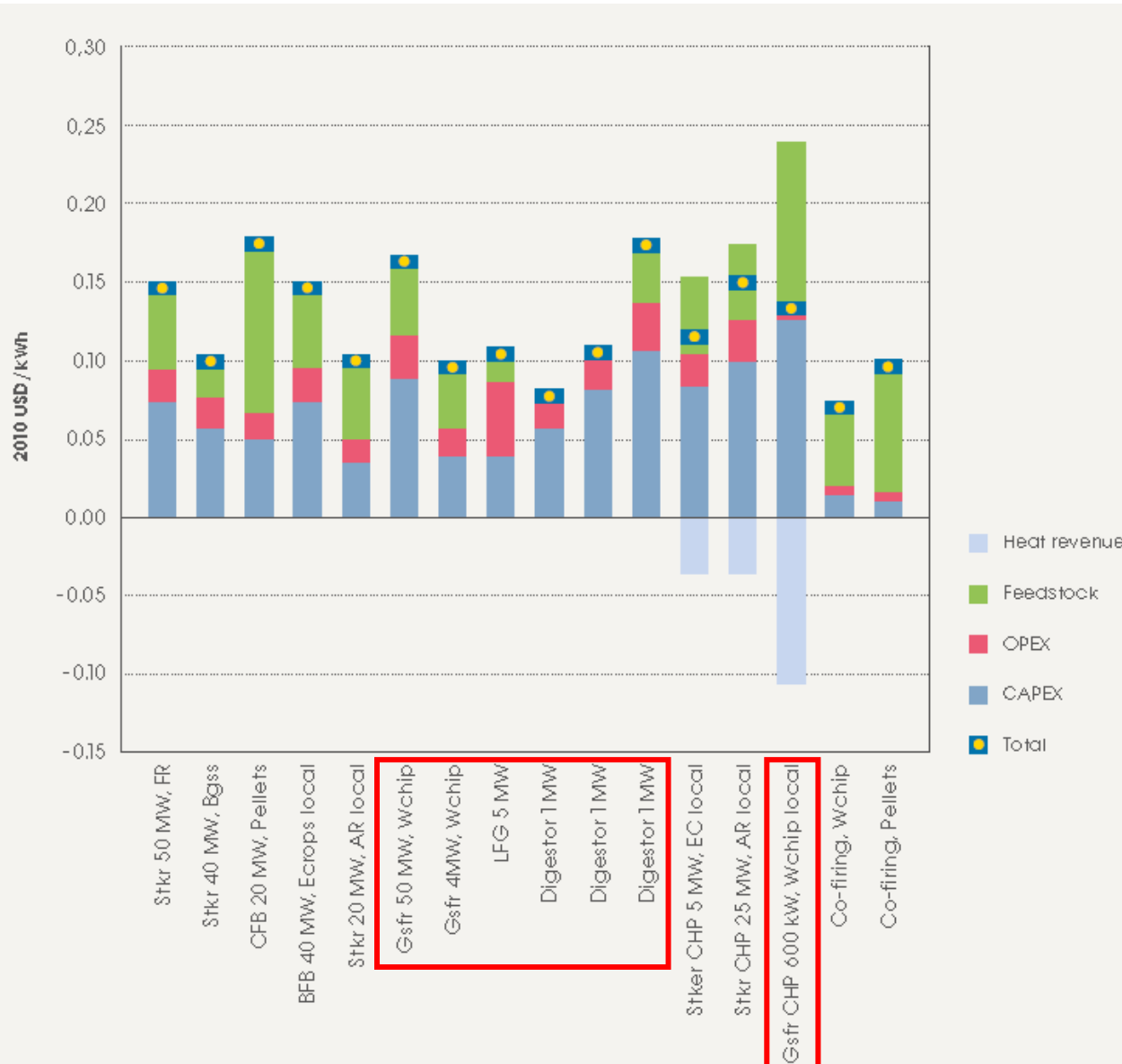
Biomass supply potentials by feedstock and region in 2030



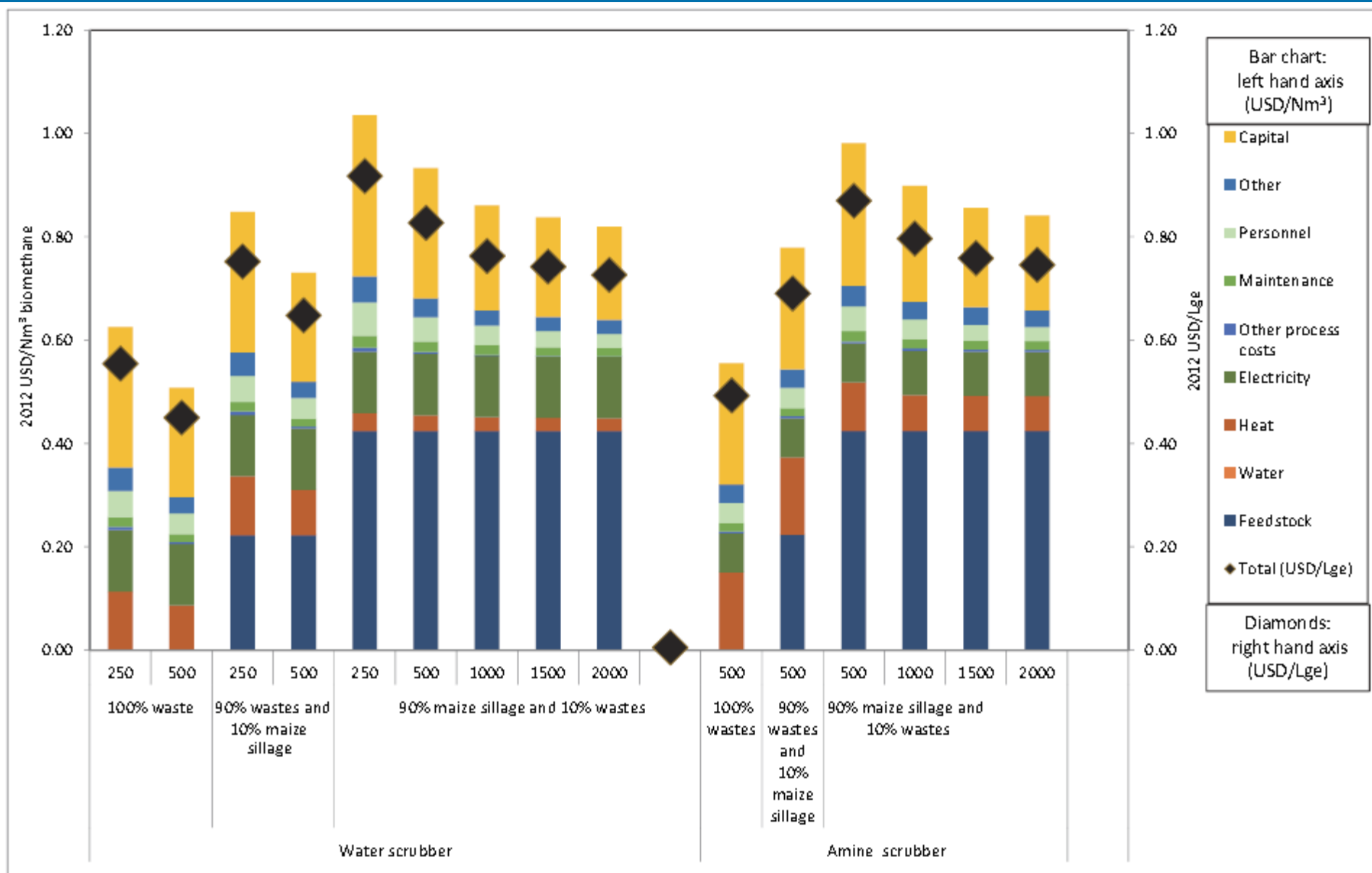
Key feedstock in each regions are:

Africa: energy crops (5-7 EJ); Asia: residues & waste (15-32 EJ); North America: energy crops (7 EJ) and fuel wood (3 EJ); Latin America: energy crops (16 EJ); Europe: fuel wood (0.3-13 EJ) and energy crops (7 EJ)

Biomass power generation cost for different technology



Cost of biomethane for transport by upgrader type and size



Barriers for biogas promotion

- Sustainable supply of feedstock at affordable cost
- Efficient supply / distribution chain development
- Storage system for feedstock and biogas
- Sustainability – GHG, land use change, eutrophication, health impact, etc.
- High production cost

Policy options to be considered for further promotion of biogas

- Prioritize accelerated deployment of sustainable residues and waste biomass in a cost-effective manner
- Develop sustainable feedstock supply markets and explore the issue of land use, infrastructure for collection, handling and transport with a view of ensuring sufficient quantities of feedstock at affordable price
- Promote the uptake of good practices that foster sustainable agricultural intensification
- Deploy sustainability assessment methods, guidelines, standards and labels more widely and put in place risk mitigation and monitoring and evaluation mechanisms based on ongoing initiative such as GBEP sustainability indicator
- Continue to support development of innovative biomass applications including advanced biofuels and biomaterials with a view of economically viable applications
- Design incentive measure to support early stage of market penetration while adjusting the level of support to improve economic competitiveness

Thank you

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