

# Prospects of Biofuels in Bangladesh

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Keynote speech for webinar on prospects of biofuels in Bangladesh

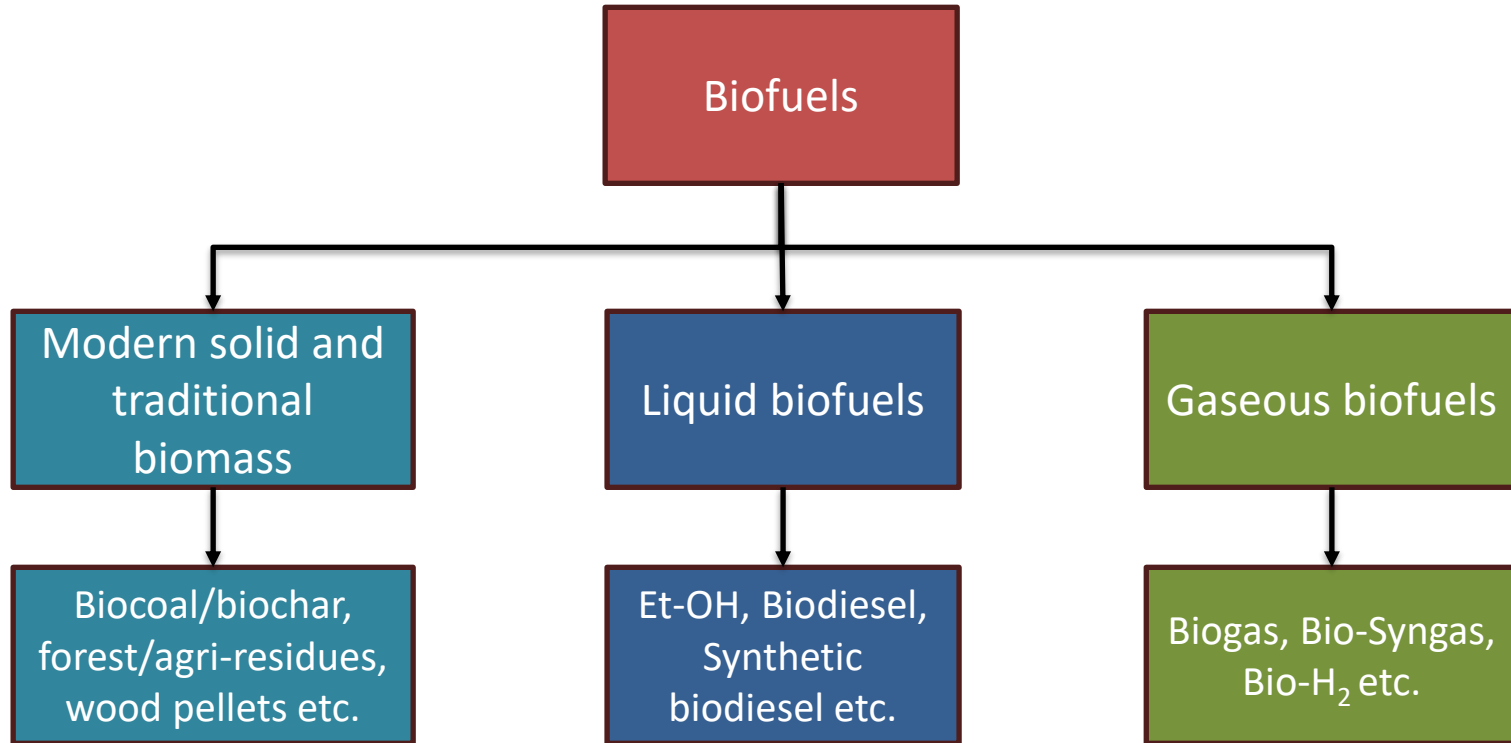
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# What is a biofuel?



# Why are biofuels important?



Overview   Tracking

## What is the role of biofuels in clean energy transitions?

Biofuels play a particularly important role in decarbonising transport by providing a low-carbon solution for hard-to-abate sectors such as trucking, shipping and aviation. They can often be used in existing engines with little to no modification.

## Where do we need to go?

In the Net Zero Scenario, the use of biofuels for transport rises significantly to 2030, with a much larger share produced from waste, residues and nonfood crops. Aviation biofuels, also known as biojet kerosene, would need to make the most dramatic strides between now and 2030 to align with the Net Zero Scenario.

## What are the challenges?

Most biofuel production currently uses so-called conventional feedstocks, such as sugar cane, corn and soybeans. Expanding biofuel production to advanced feedstocks is critical to ensuring minimal impact on land-use, food and feed prices and other environmental factors.

Moreover, it can contribute to the energy security if generated from native sources

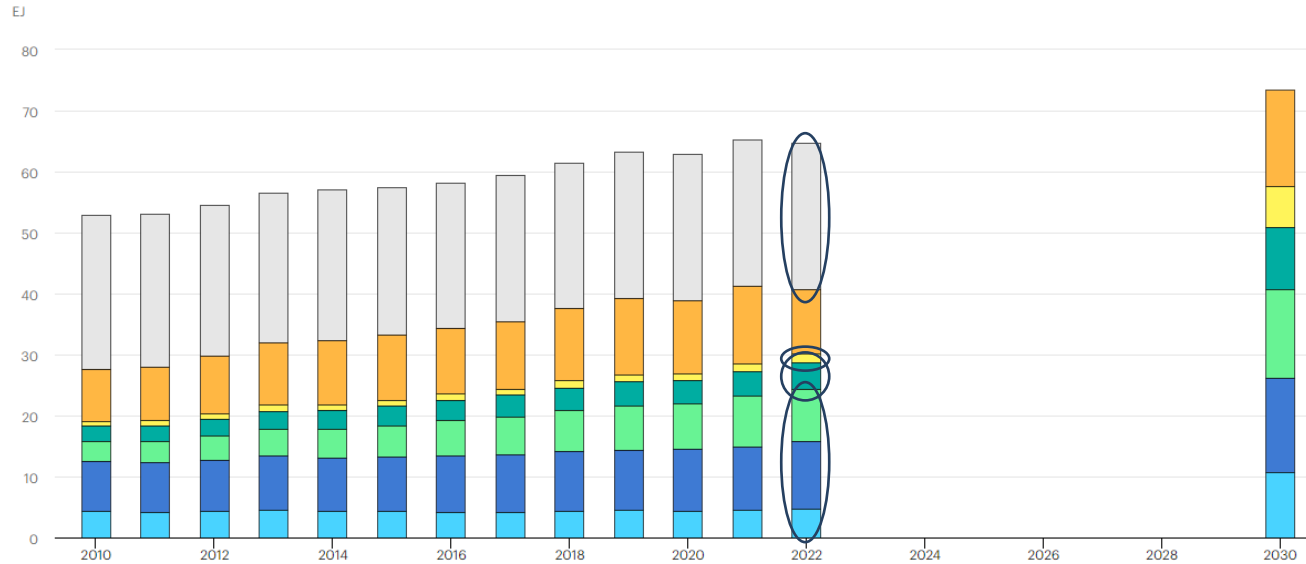
Source: International Energy Agency



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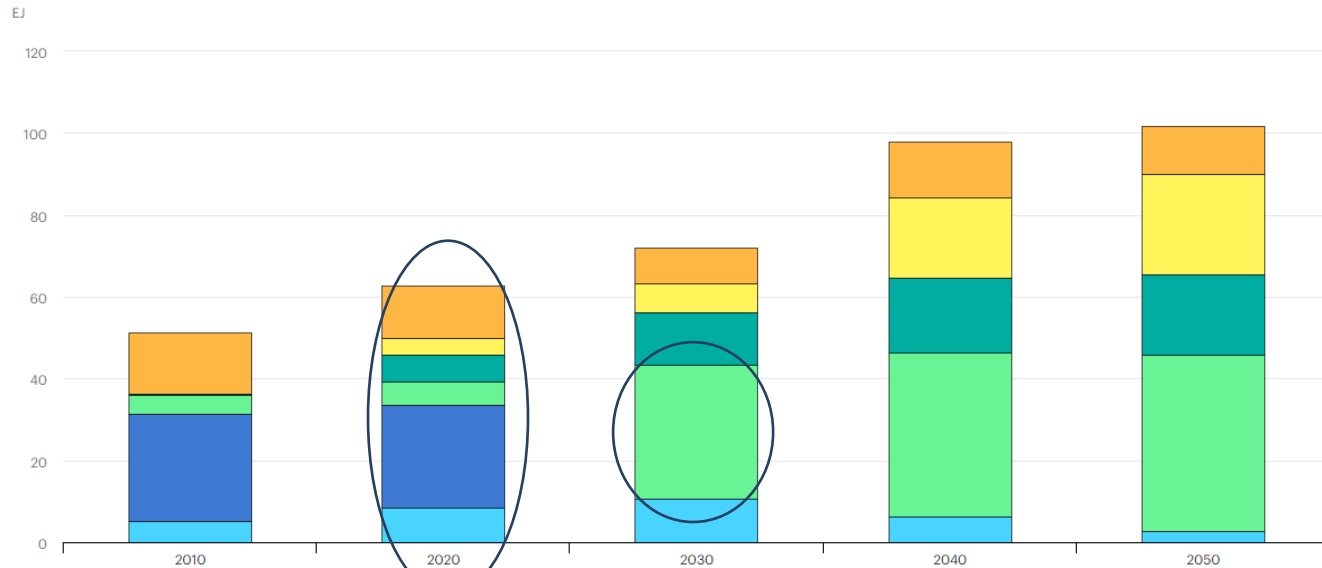
# Global Bioenergy Consumption (2030 projection)



IEA, Licence: CC BY 4.0

- Modern solid bioenergy: buildings and agriculture
- Modern solid bioenergy: industry
- Modern solid bioenergy: electricity and heat
- Liquid biofuels
- Biogases
- Conversion losses
- Traditional use of biomass

# 2050 zero carbon scenario (biomass sources)

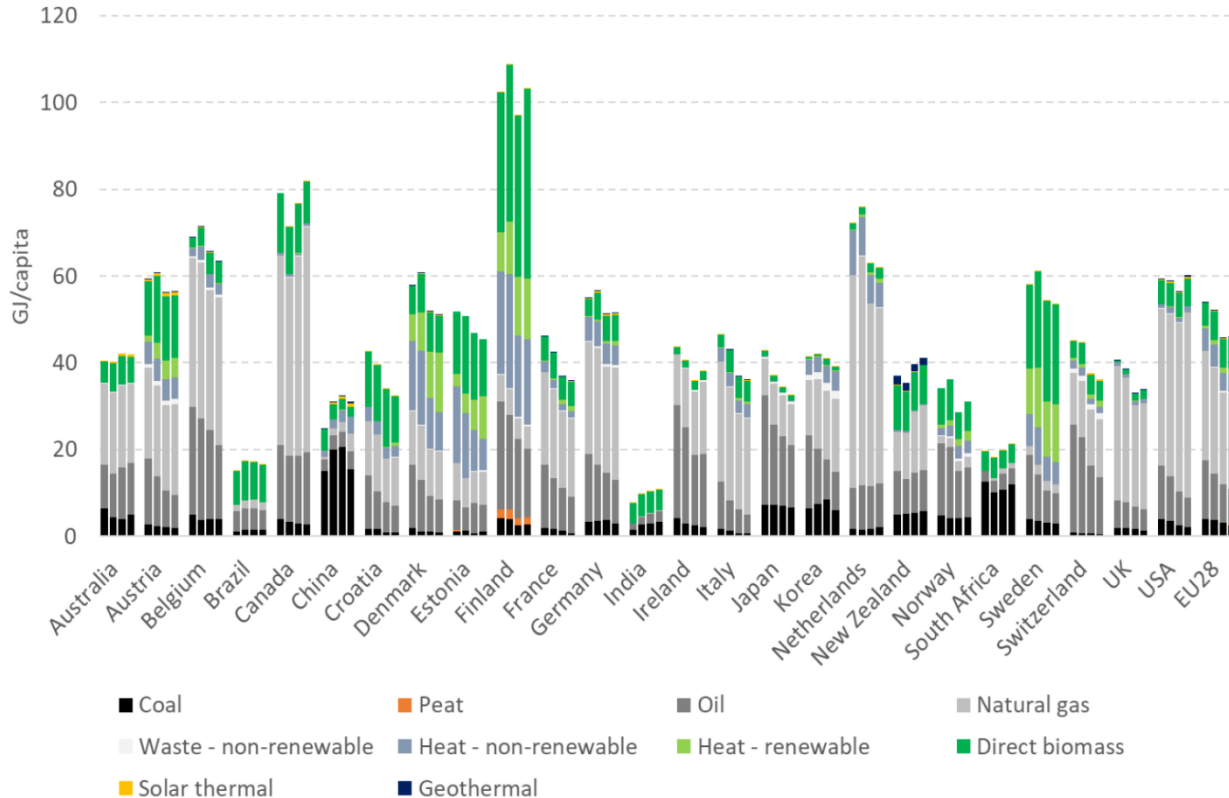


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● Conventional bioenergy crops ● Traditional use of biomass ● Organic waste streams ● Forest and wood residues ● Short-rotation woody crops ● Forestry plantings

# Modern solid and traditional biomass uses

Heat/fuel consumption (2005-2010-2015-2019)

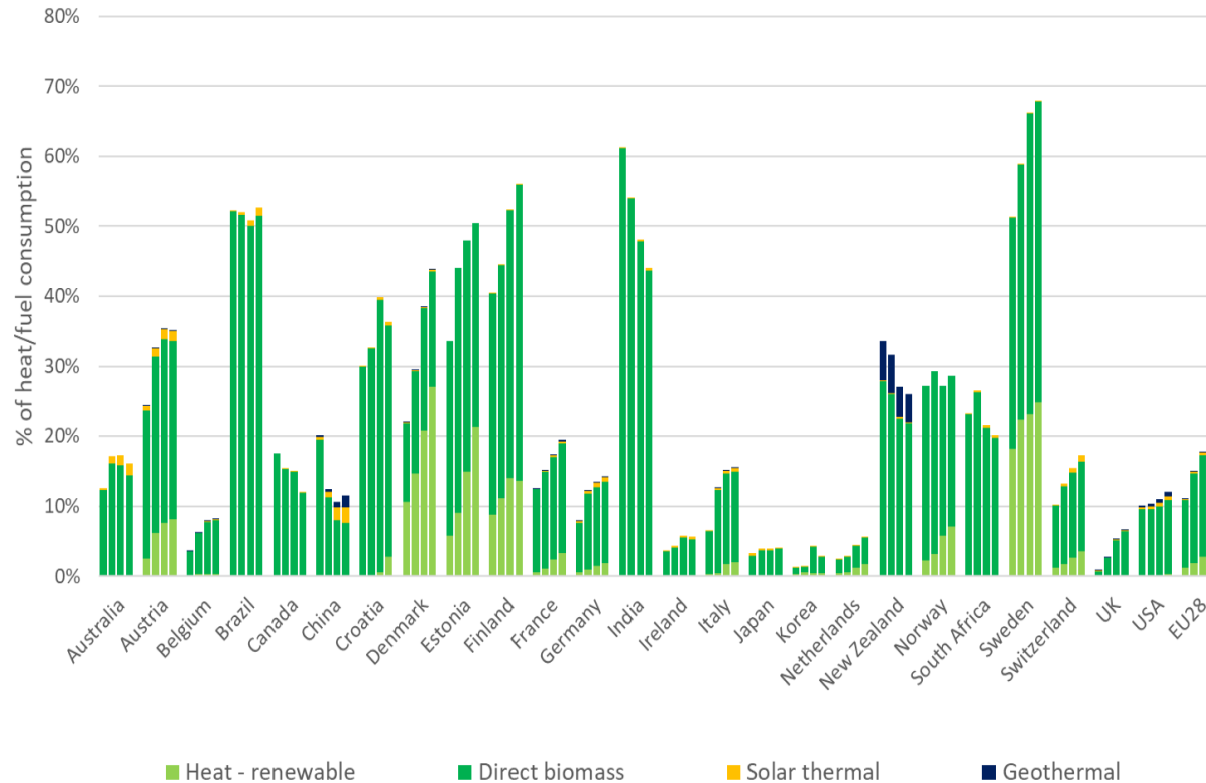


Source: [www.ieabioenergy.com](http://www.ieabioenergy.com)



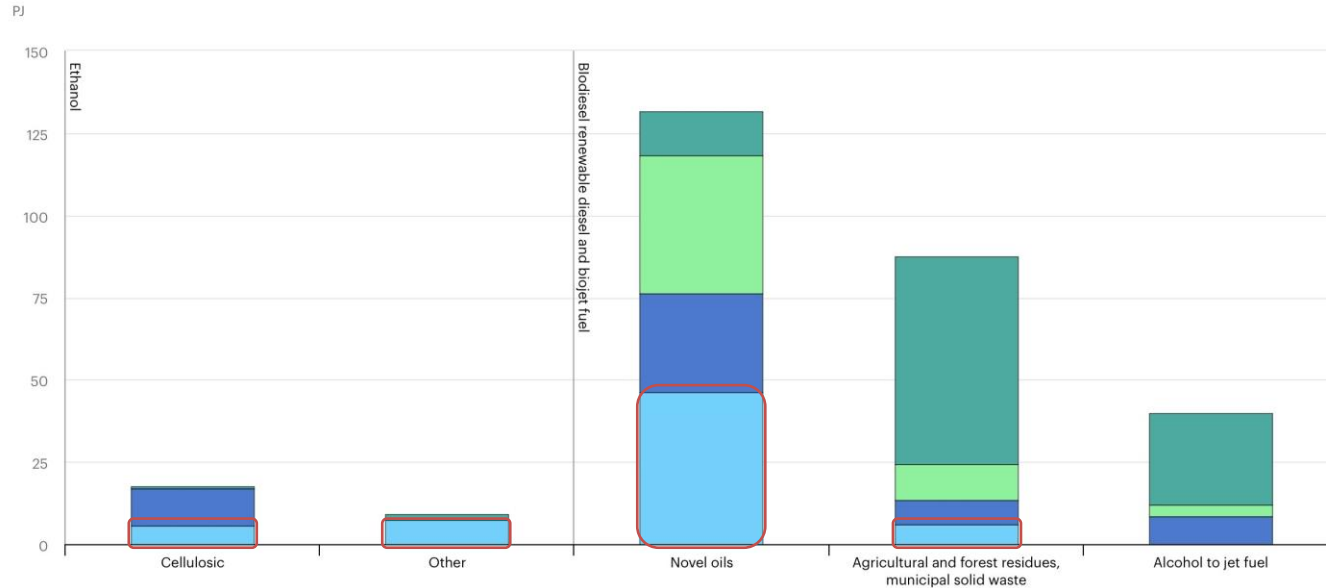
# Modern solid and traditional biomass uses

Renewable heat/fuels (2005-2010-2015-2019)



Source: [www.ieabioenergy.com](http://www.ieabioenergy.com)

# Worldwide liquid biofuel production



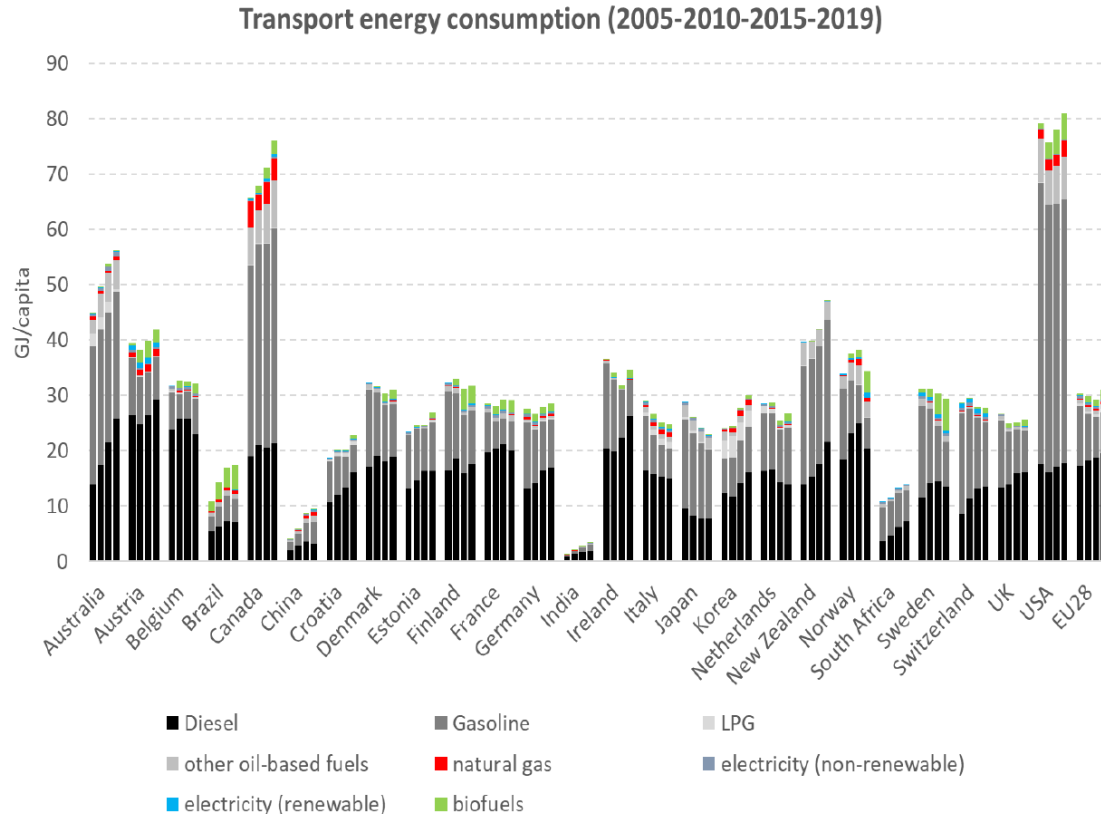
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● Existing ● Under construction ● Projects ● Under consideration





# Biofuels share in overall transport

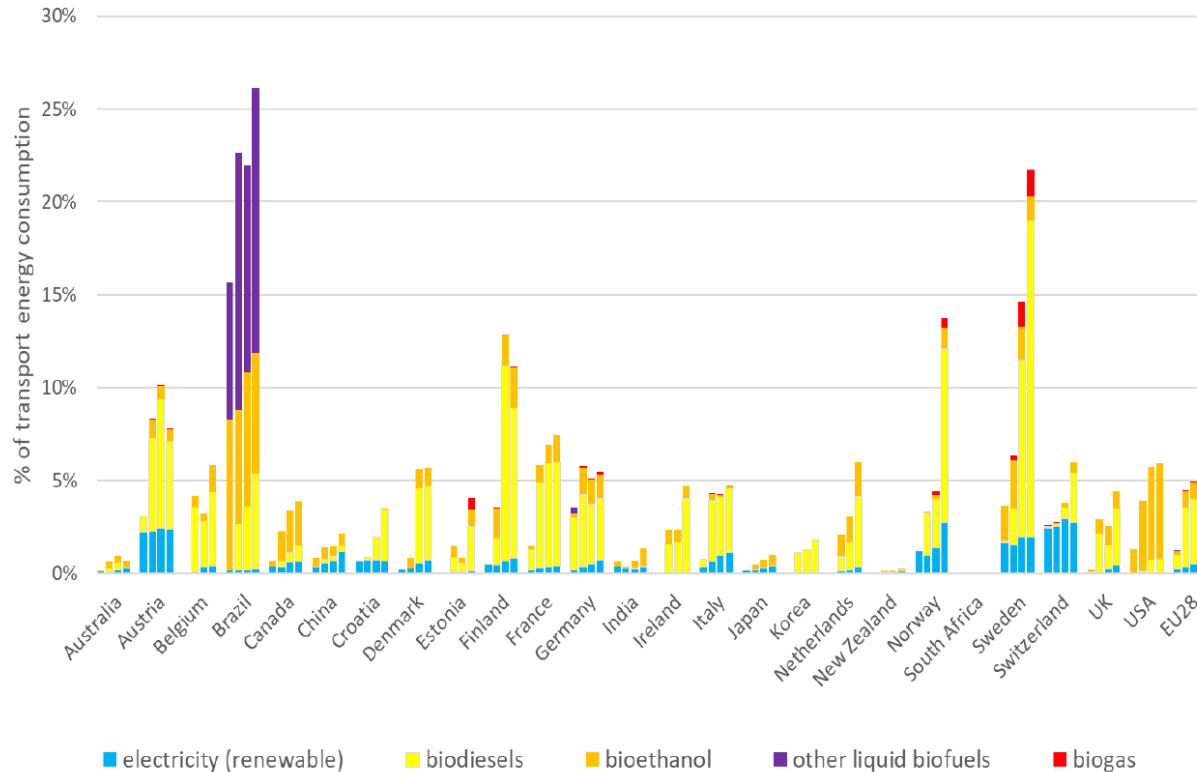


Source: [www.ieabioenergy.com](http://www.ieabioenergy.com)



# Renewables share in transport sector

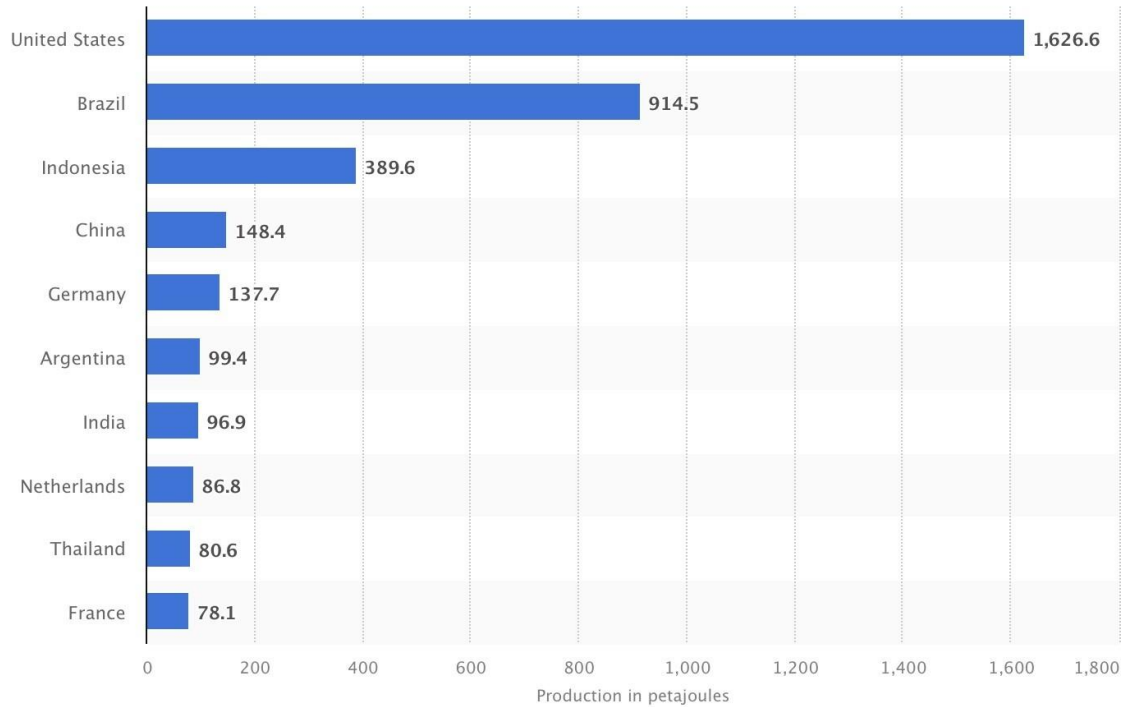
Share of renewable energy in transport (2005-2010-2015-2019)



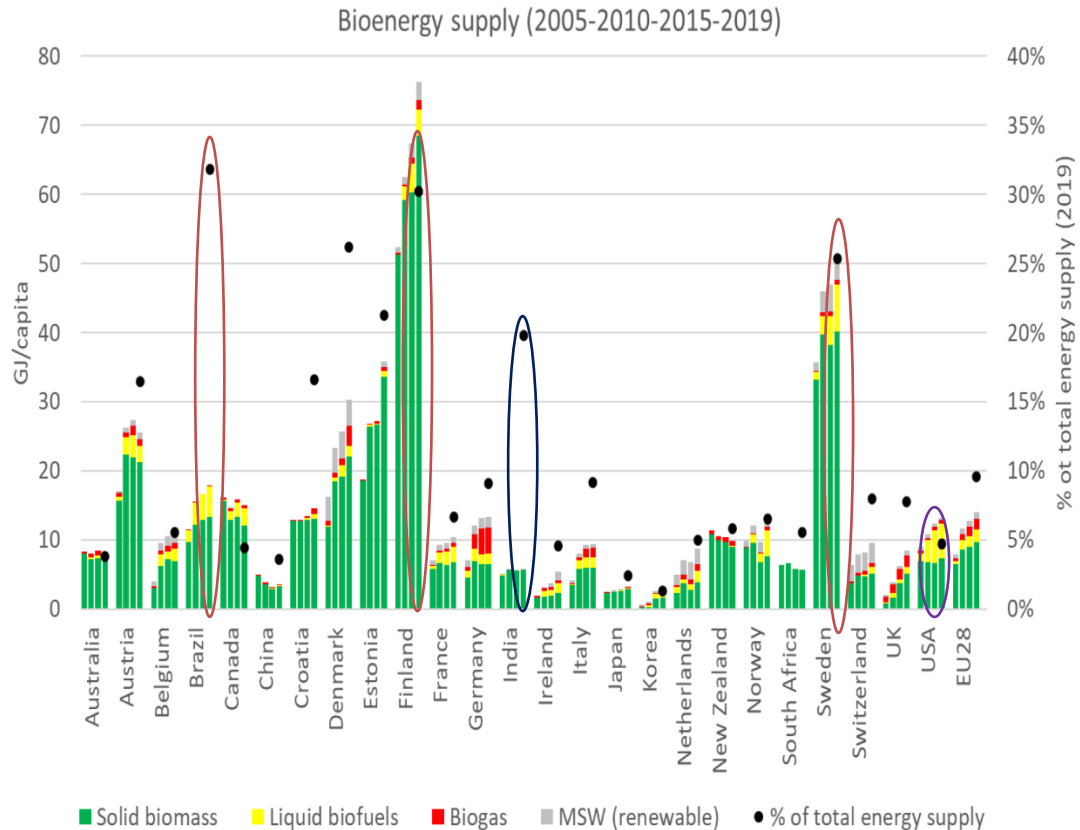
Source: [www.ieabioenergy.com](http://www.ieabioenergy.com)



# Country-wise production (liquid biofuels)



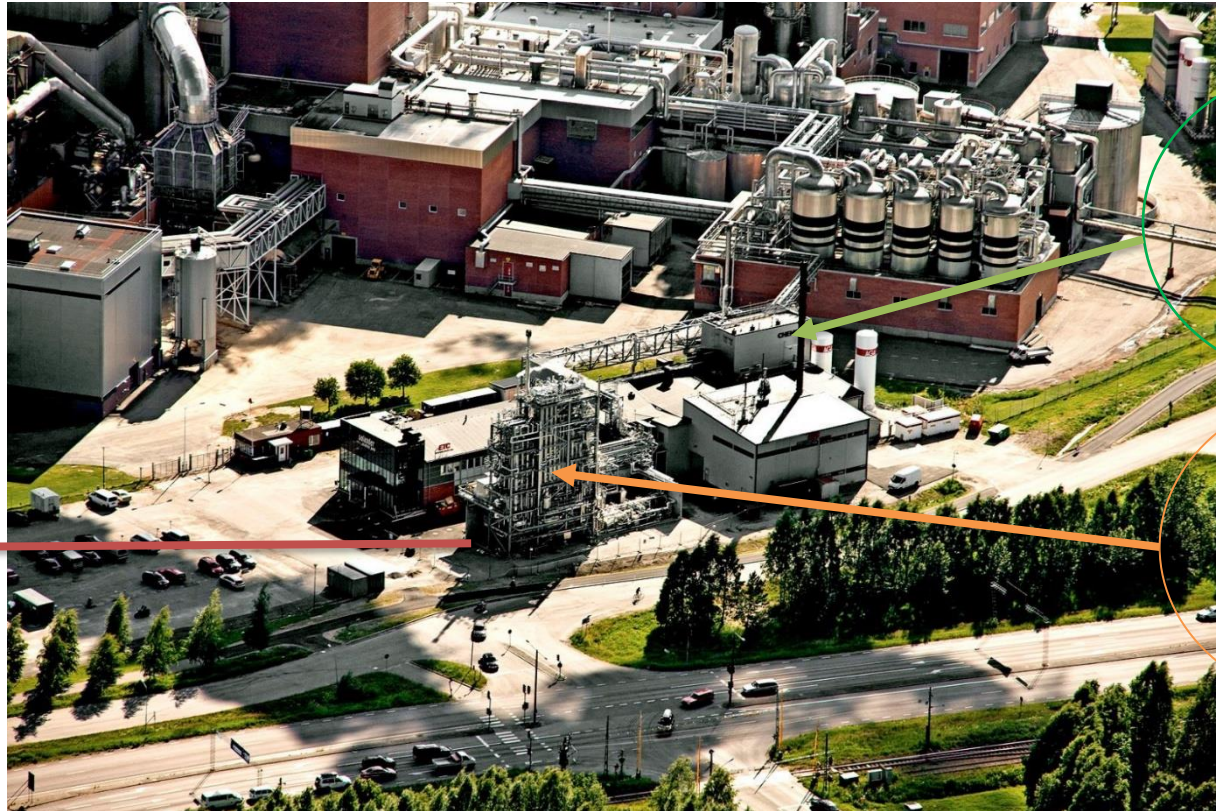
# Bioenergy supply (country-wise)



Source: [www.ieabioenergy.com](http://www.ieabioenergy.com)



# An example of successful biofuel project in Sweden



Volvo trucks

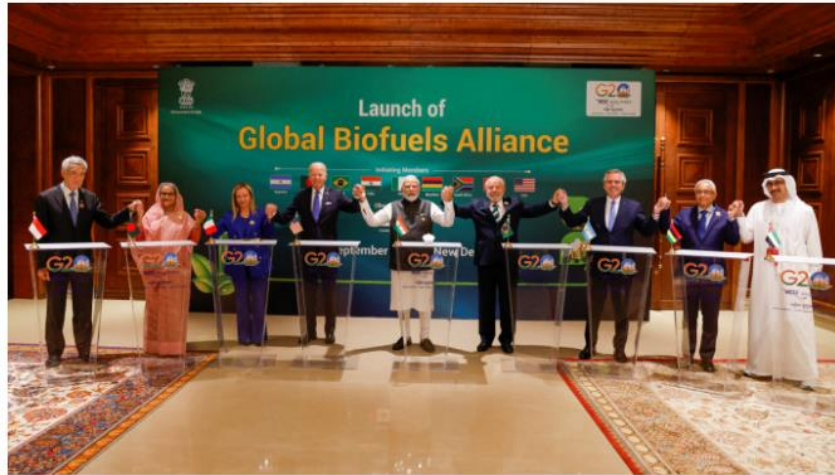
Gasification of waste biomass

Conversion to synthetic biofuel – Dimethyl ether



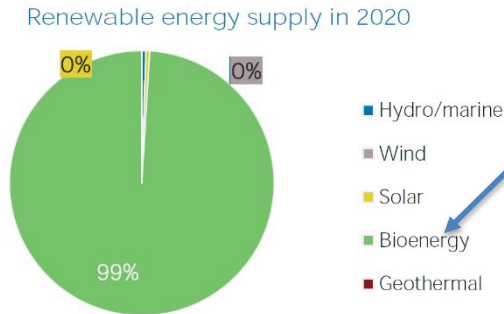
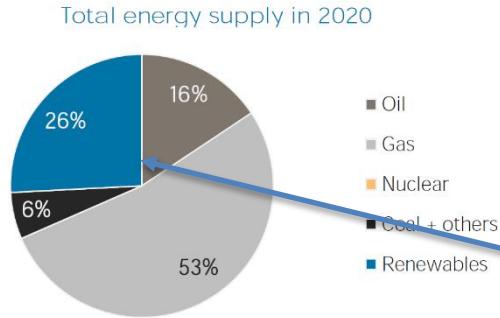
# A timely step

## PM Hasina joins G20 leaders in launching Global Biofuels Alliance



Singapore Prime Minister Lee Hsien Loong, Bangladesh Prime Minister Sheikh Hasina, Italian Prime Minister Giorgia Meloni, US President Joe Biden, Indian Prime Minister Narendra Modi, Brazilian President Luiz Inacio Lula da Silva, President of Argentina, Alberto Fernandez, Mauritius Prime Minister Pravind Kumar Jugnauth and Foreign Minister of United Arab Emirates, Sheikh Abdullah bin Zayed Al Nahyan attend the launch of the Global Biofuels Alliance at the G20 summit in New Delhi, India, September 9, 2023. REUTERS/Evelyn Hockstein/Pool

# Current situation in Bangladesh



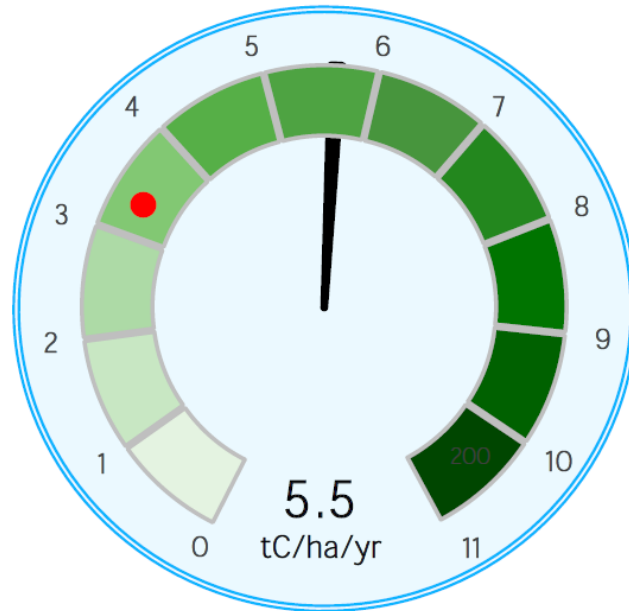
This bioenergy is mainly from the traditional use of solid biomass





# Possibilities for Bangladesh

Biomass potential: net primary production

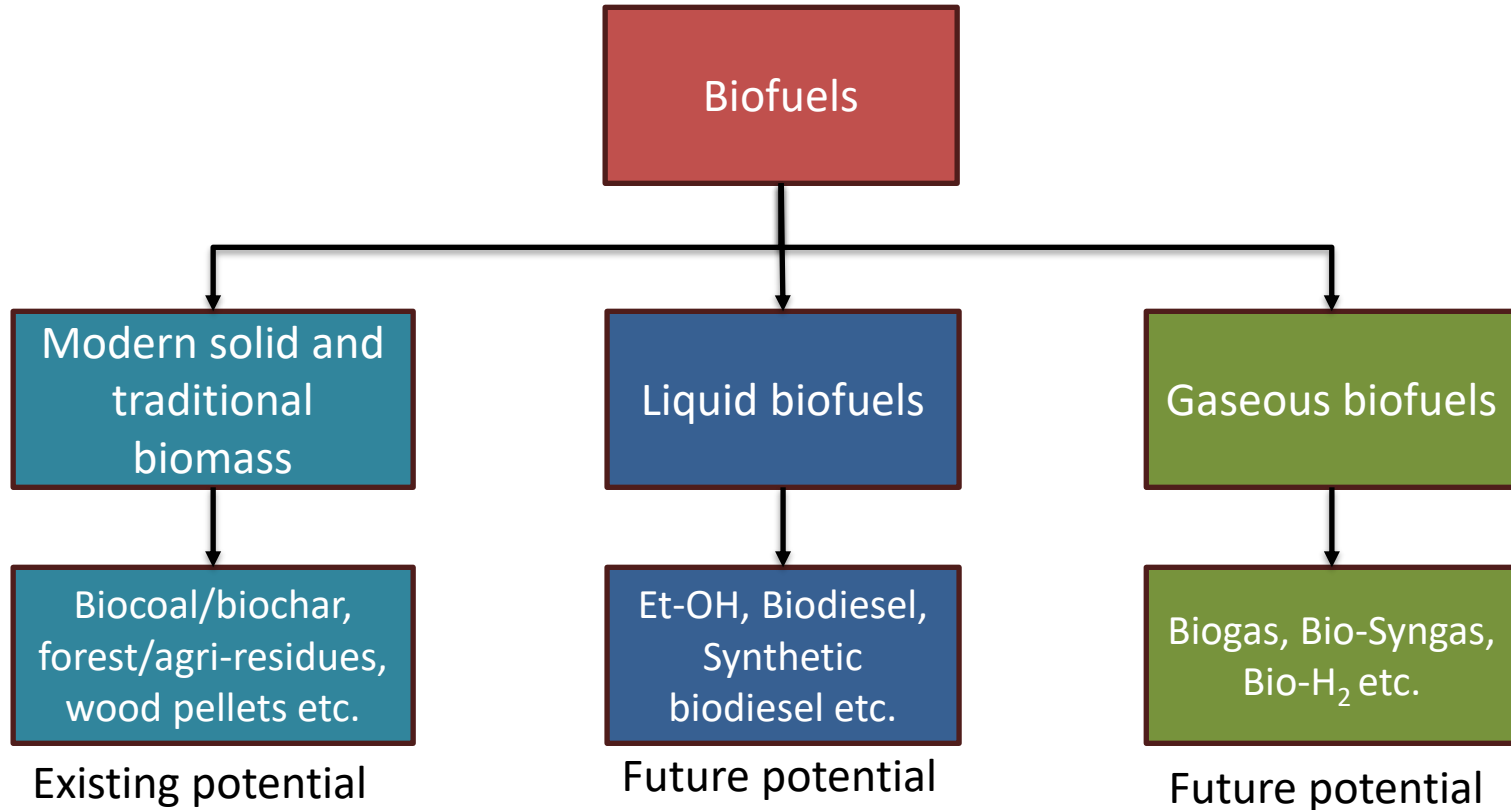


● = Global average of 3-4 tC/ha/yr





# Possibilities for Bangladesh



# Modern biofuels in Bangladesh

- InConSolE – an ongoing project on modern uses of solid biomass waste (nationally funded)
- ReHyCaRe – an ongoing project on Bio-Hydrogen (internationally funded)



# Background



**PROJECTS THAT WENT NOWHERE**

- **6,000** waste bin project
- World Bank-funded project to build secondary transfer stations failed to start due to **Rajuk's faulty planning**
- 2 waste-based power station were not constructed as bid winning Italy-based firm **lacked funds**
- The 3R method – Reduce, Reuse, Recycle - was not implemented due to a **lack of awareness** and **poor waste management system**

**Dhaka ranks 137th among 140 cities in Global Liveability Ranking 2017**

**Every day, 4,500 tons of household waste is produced in Dhaka**

**THE RUBBISH PROBLEM**

- Household waste and refuse from construction and demolition sites and road digs still **dumped on the side of roads**
- Authorities **yet to fix** waste management and drainage system
- Citizens often **do not** follow the law
- Designated spots for garbage disposal are **ignored**

Source: Dhaka Tribune



# Municipal solid waste in Megacity

## Dhaka North City Corporation

- Amount of Waste generation 3433 ton/day
- Waste collection (FY 2019-20) 1 million ton
- Waste collection percentage 80%
- Average waste disposal in landfill 2750 ton/day
- Landfill operation cost 244.41 BDT/ton

## Dhaka South City Corporation

- Amount of Waste generation 3256 ton/day
- Waste collection (FY 2019-20) 0.9 million ton
- Waste collection percentage 78%
- Average waste disposal in landfill 2540 ton/day
- Landfill operation cost 426 BDT/ton

### Negative impacts of current practice

- Water pollution
- GHG emission
- Inefficient disposal of waste in terms of energy



# Unwanted side-effects



Air quality matters!



Millions of masks distributed



Source: BBC News, November 4, 2019 and Ranking source: 2018 World air quality report





# MSW Landfill in Dhaka



# MSW characterization

## MSW revealed some important features –

- It contains more than 82% biodegradable matter
  - Among which it contains more than 70% of food waste
  - It can contain high amount of water (up to 85% during rainy season)

Component	Percentage (%)	LHV	Unit
OFMSW (organics)	74.2	10.1679MJ/kg	
Paper	4.57	18.4162MJ/kg	
Plastic	11.8	31.5065MJ/kg	
Textile/Wood	7.97	15.48MJ/kg	
Leather/rubber	0.08	19.6414MJ/kg	
Metal	0	0MJ/kg	
Glass	0	0MJ/kg	
Other	1.38	0MJ/kg	
Total	100	13.3535MJ/kg	



# In search of an appropriate solution

Incineration/Pyrolysis/Gasification are proposed, but wet waste handling is a challenge –

- High water content penalizes the energy efficiency
- Organic wastes are decomposing quickly to produce GHG
- Metal in ash breaks down Pyrolysis oil into unusable product

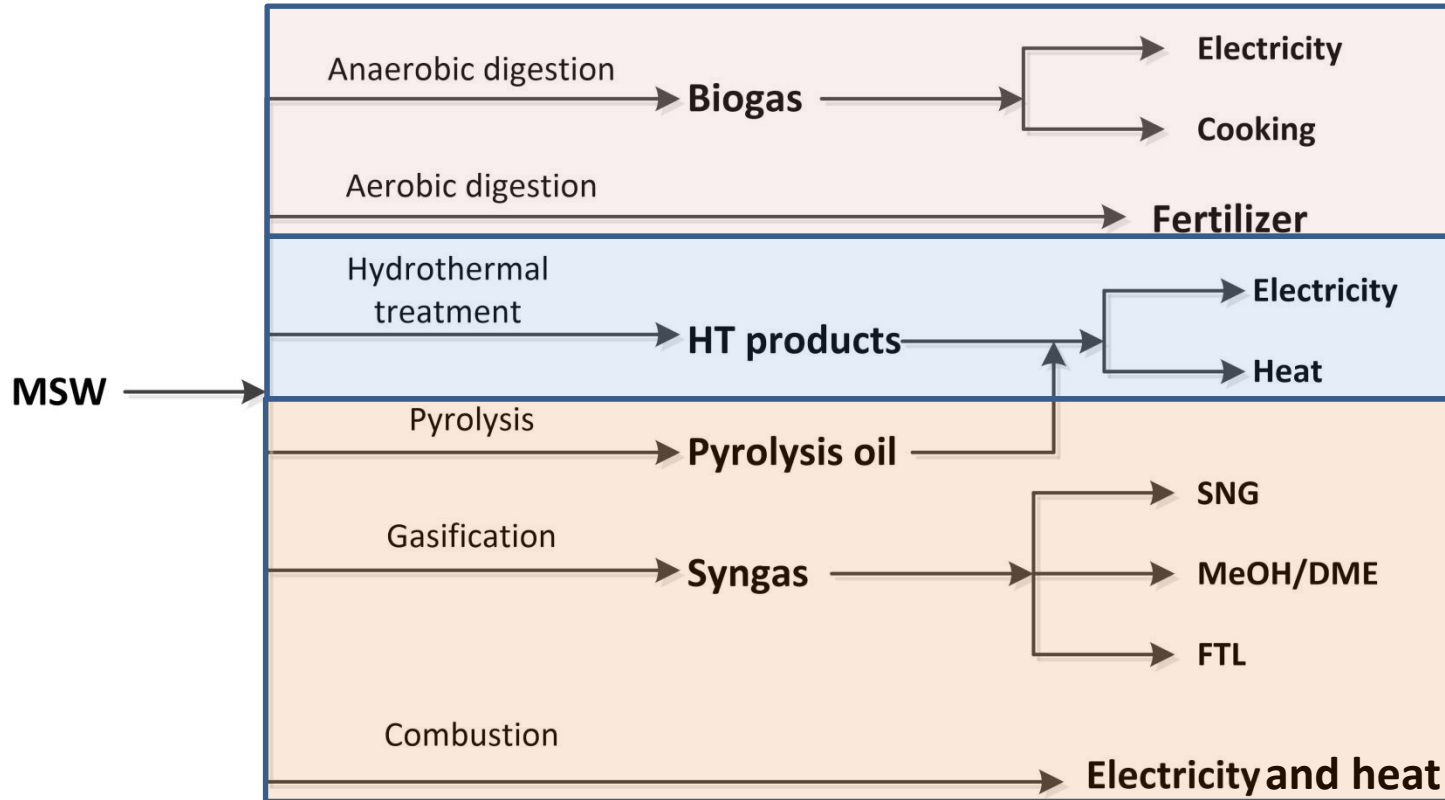
There are few alternative that might work –

- Anaerobic/Aerobic digestion
- Hydrothermal treatment



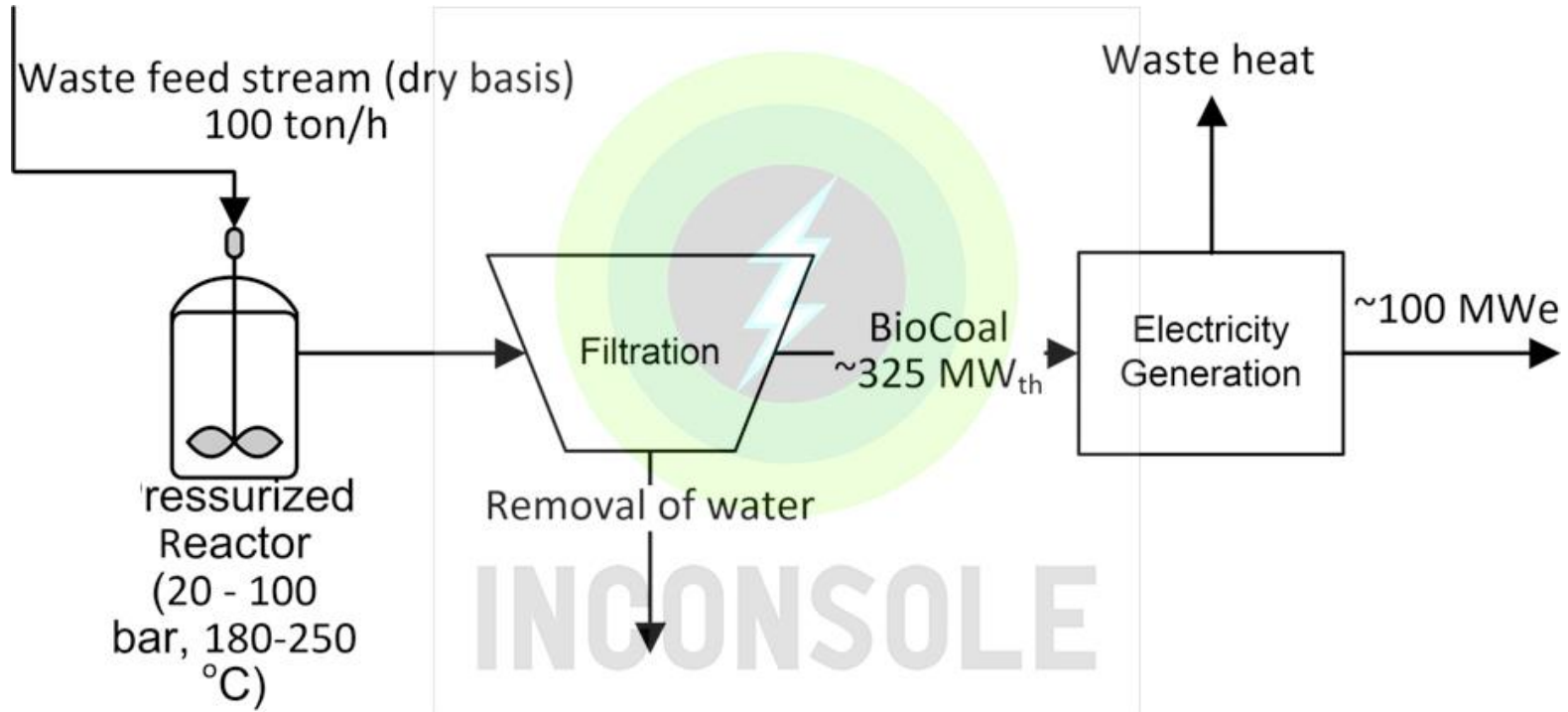


# Probable solutions





# InConSolE Concept





# Pilot demonstration at Aminbazar





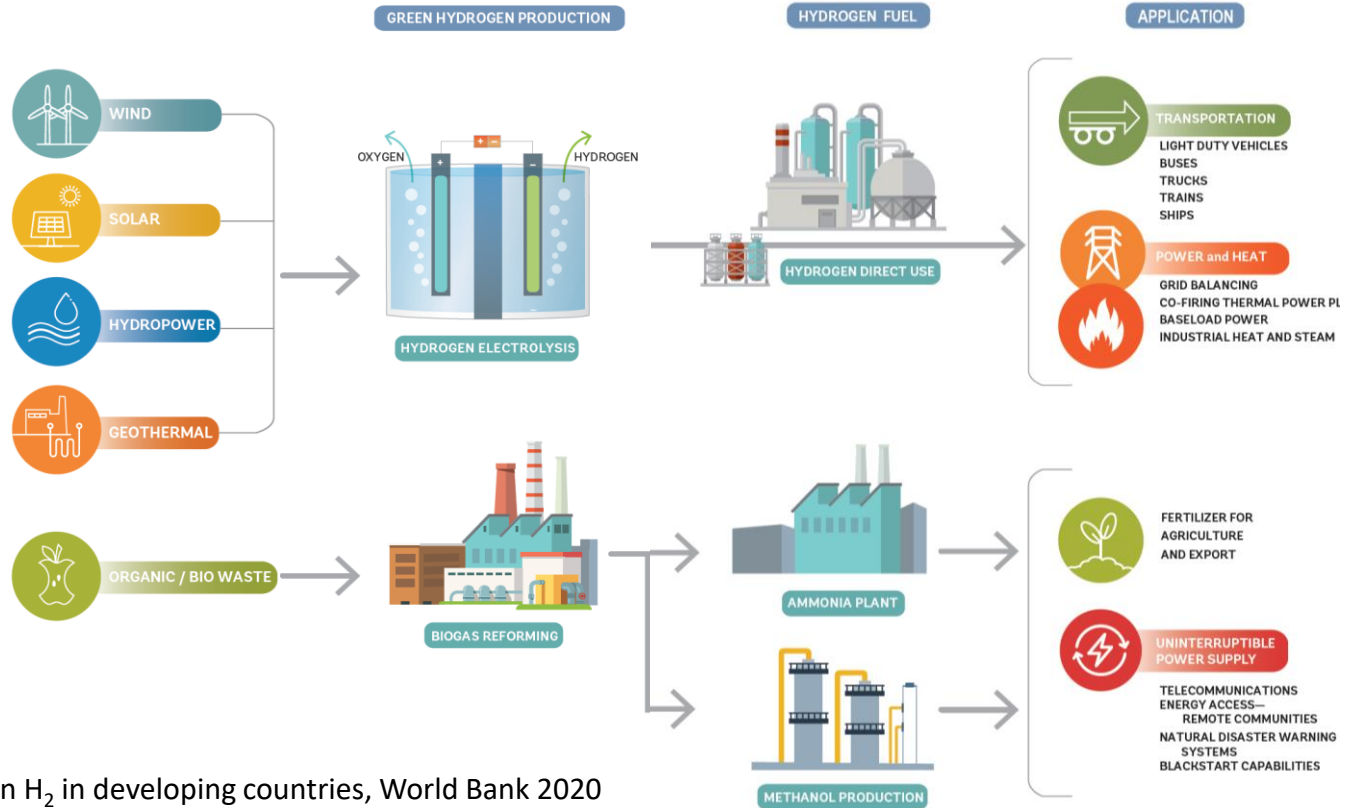
# InConSolE Pilot Demonstration



HTC

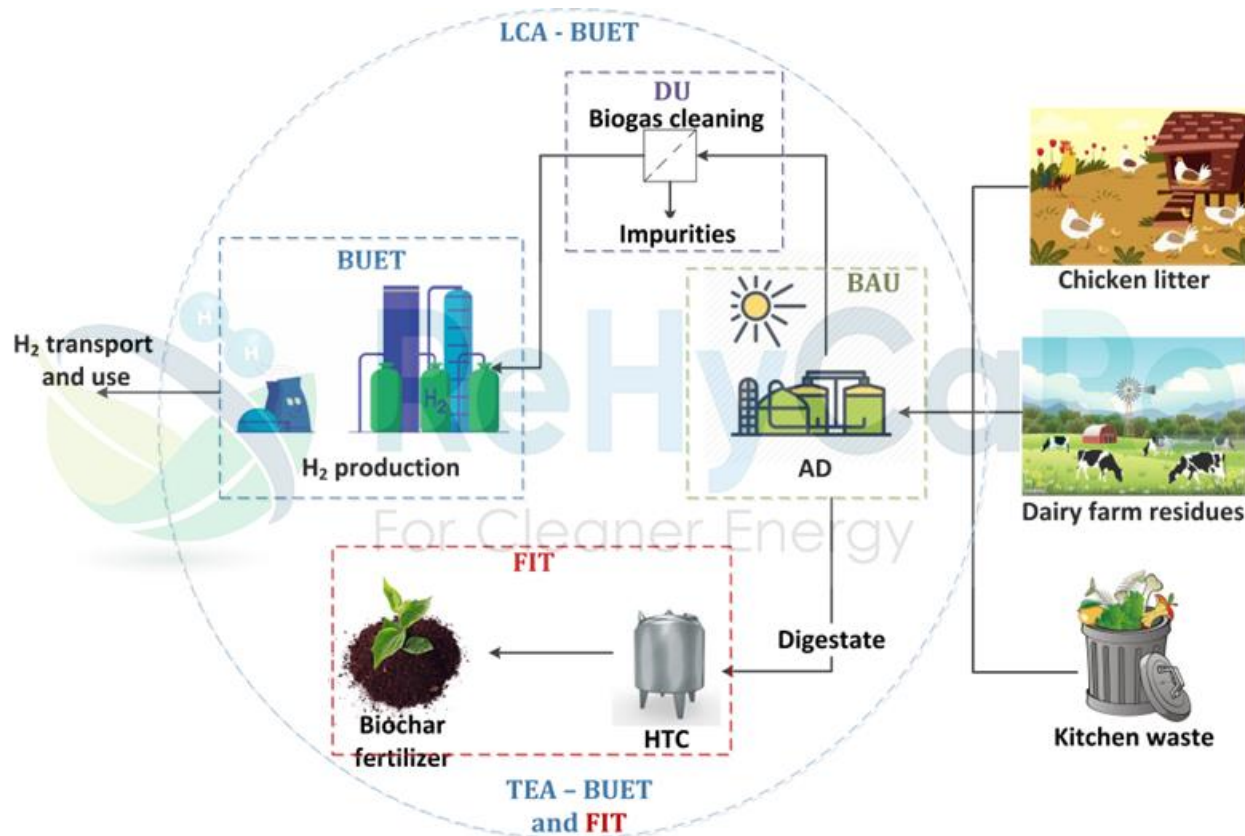


# Background of ReHyCaRe (for bio-hydrogen)



Green H<sub>2</sub> in developing countries, World Bank 2020

# ReHyCaRe concept



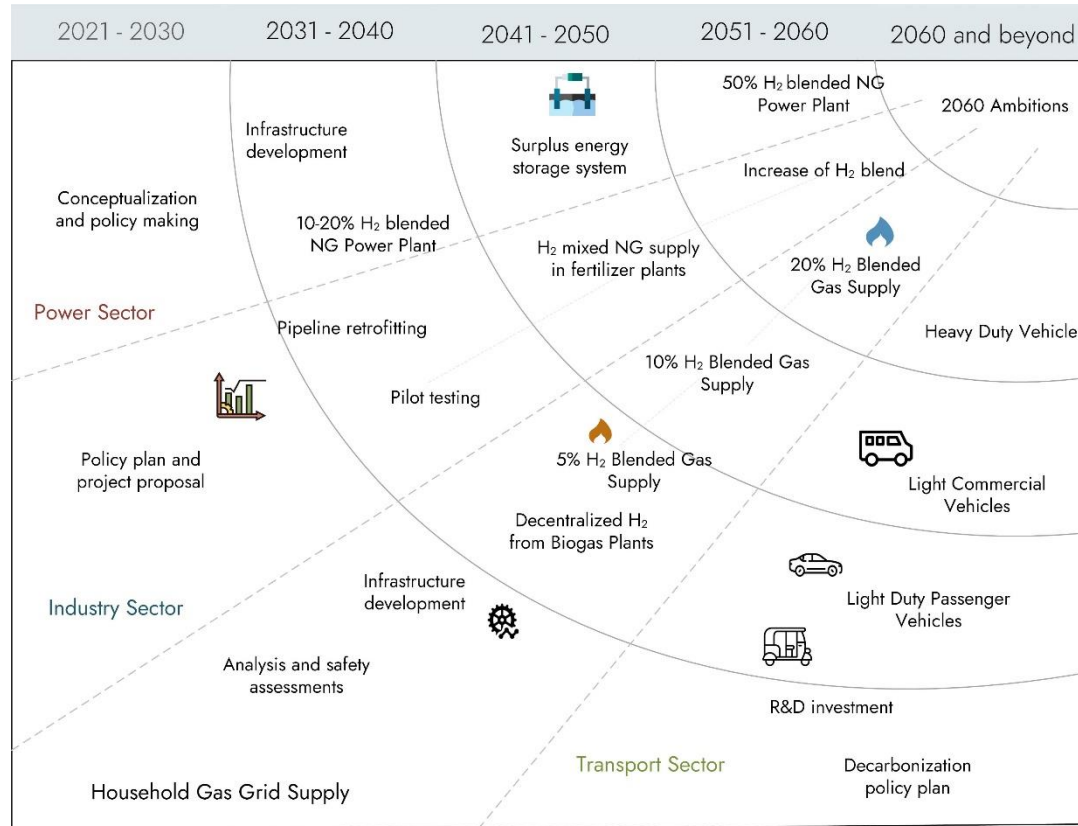


# ReHyCaRe consortium

- Department of Chemical Engineering, Bangladesh University of Engineering and Technology (BUET), Bangladesh (**Leading Institution**)
- Department of Farm Power and Machinery, Bangladesh Agricultural University (BAU), Bangladesh (Partner)
- Department of Applied Chemistry and Chemical Engineering, University of Dhaka (DU), Bangladesh (Partner)
- Department of Biomedical and Chemical Engineering and Sciences, Florida Institute of Technology (FIT), USA (USG-Supported Partner)



# A potential hydrogen roadmap for Bangladesh



\* Hossain et al. (2023), International Journal of Hydrogen Energy 48 (54), 20588-20612





# Acknowledgements



INTEGRATED  
CONCEPT FOR CONVERTING  
SOLID WASTE TO  
ENERGY

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