



# Global Bioenergy Development: Success Stories, Challenges and Tools to Scale Up

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*IRENA GA – Bioenergy for Sustainable Development, Abu Dhabi*  
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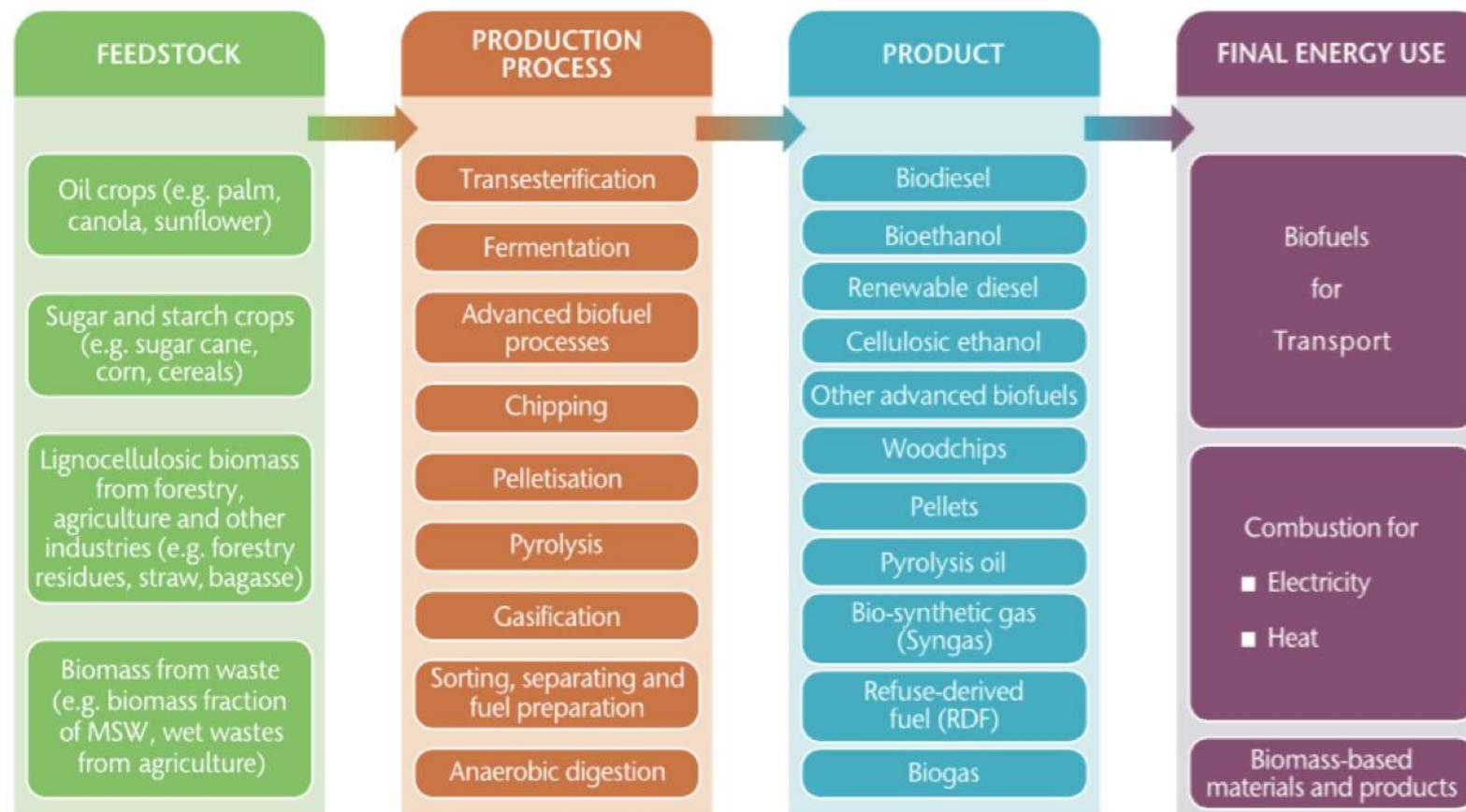


# Content

- Bioenergy
- Success Stories (Sweden, Lithuania, Brazil)
- Opportunities (Eastern Europe, East Asia)
- Challenges
- Tools to Scale Up
- Conclusion
- About WBA



# Bioenergy



Source- IEA



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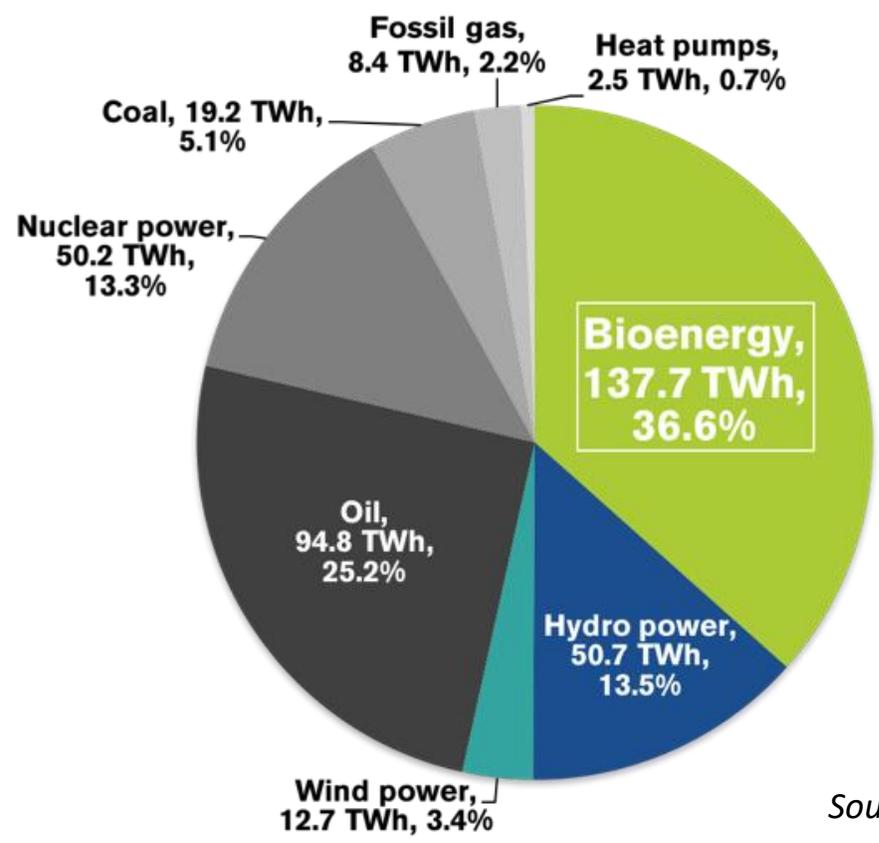
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# Success Stories – Sweden



Source- Svebio

- Sweden is a great success story for renewables and bioenergy
- 53.5% of final energy consumption is via renewable energy technologies – bioenergy, hydropower and wind power
- Success is led by bioenergy – largest energy source in Sweden

# Success Stories – Sweden



- **Biopower**

- Biopower 4<sup>th</sup> largest electricity producer in Sweden
- Produced predominantly from wood fuels
- Most of the production only in high efficient CHP plants
- Dispatchable power: continuous power generation, reliable and no need for balancing options



*Igelstaverket CHP plant in Sodertalje, Sweden – 2<sup>nd</sup> largest combined heat and power plant*



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# Success Stories – Sweden



## • Bioheat

- Largest and most common bioenergy use in Sweden
- Bioenergy accounts for more than half of heating in housing and service sectors
  - Direct use in boilers
  - Indirect use via production in combined heat and power plants
- Forest biomass predominantly used



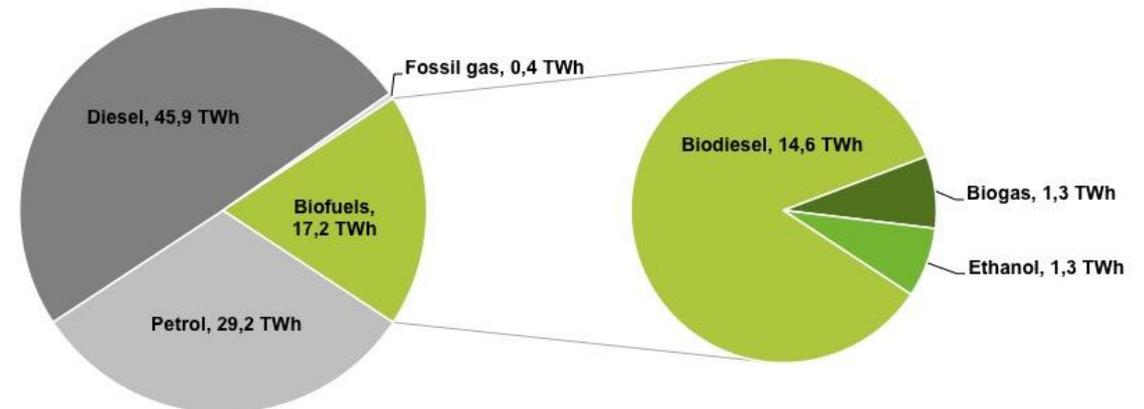
*Värtaverket plant in Stockholm – largest combined heat and power plant. 1.7 TWh heat and 680 GWh electricity. Fuel – wood chips  
Credit: Fortum Sverige*

# Success Stories – Sweden



## • Biofuels for Transport

- Biofuels are necessary to create a fossil free transport sector
- Sustainable biofuels provide great benefit to the climate
- Swedish production of biofuels creates jobs and strengthens the Swedish business- and rural sectors
- Placing requirements on emission reductions will favor climate-friendly biofuels
- In 2016, Biofuels contributed 18.6% of all fuel supplied.



Source: SCB, 2017 and Svebio, 2017

Share of biofuels in transportation in Sweden. Credit: Svebio



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# Success Stories – Stockholm

- **Heating**

- Use of renewables reduces carbon dioxide emissions by 650 000 tonnes per year
- 80% of the city is renewable based
- By 2030, all district heating will be 100% renewable

- **Transport**

- Ethanol, Biodiesel (FAME, HVO) Biogas and Electric dominant
- No fossil fuel in any public transport network in the city

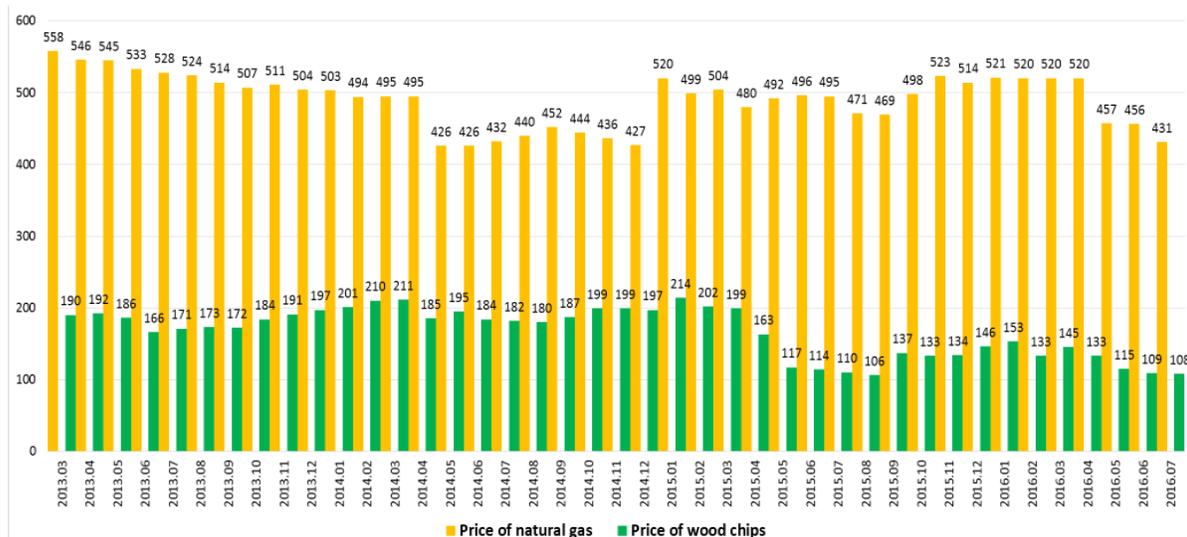
- **Electricity**

- Less than 10% dependence on fossil fuels

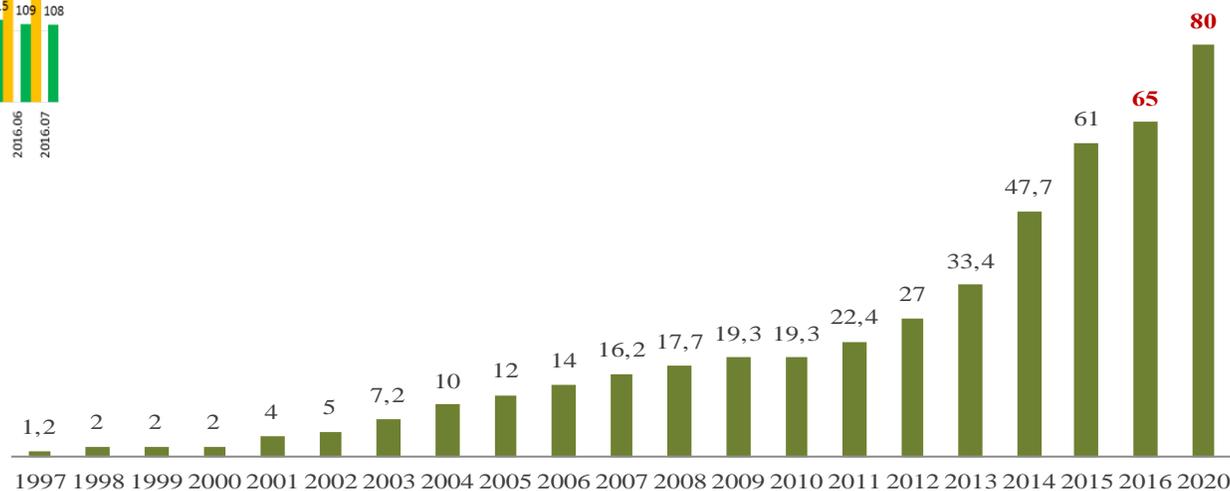
# Success Stories – Lithuania



The comparison of price for natural gas and biomass (Eur/toe)

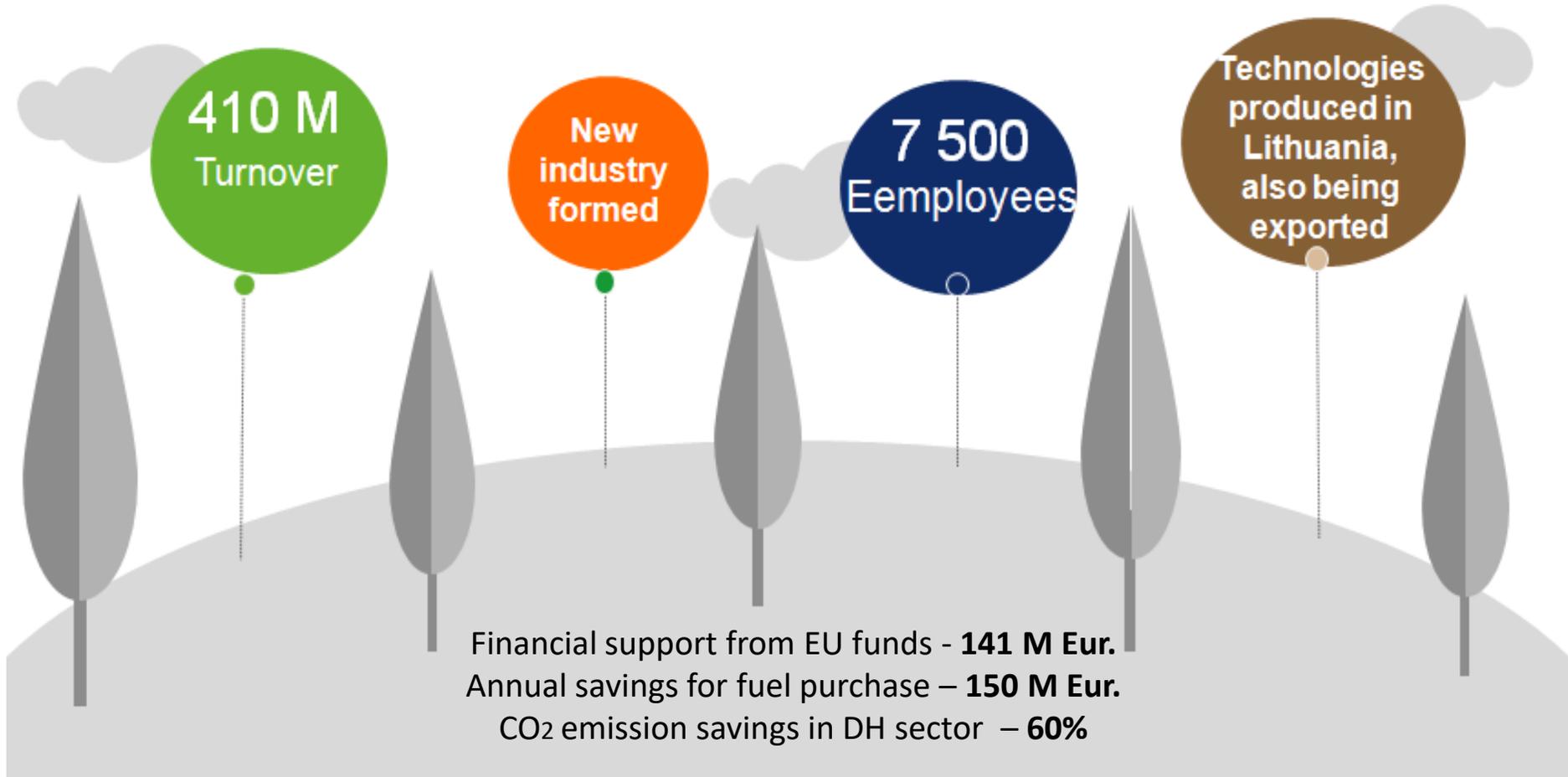


The use of biomass for energy production in the DH sector (%)



# Success Stories – Lithuania

## Bioenergy sector in numbers



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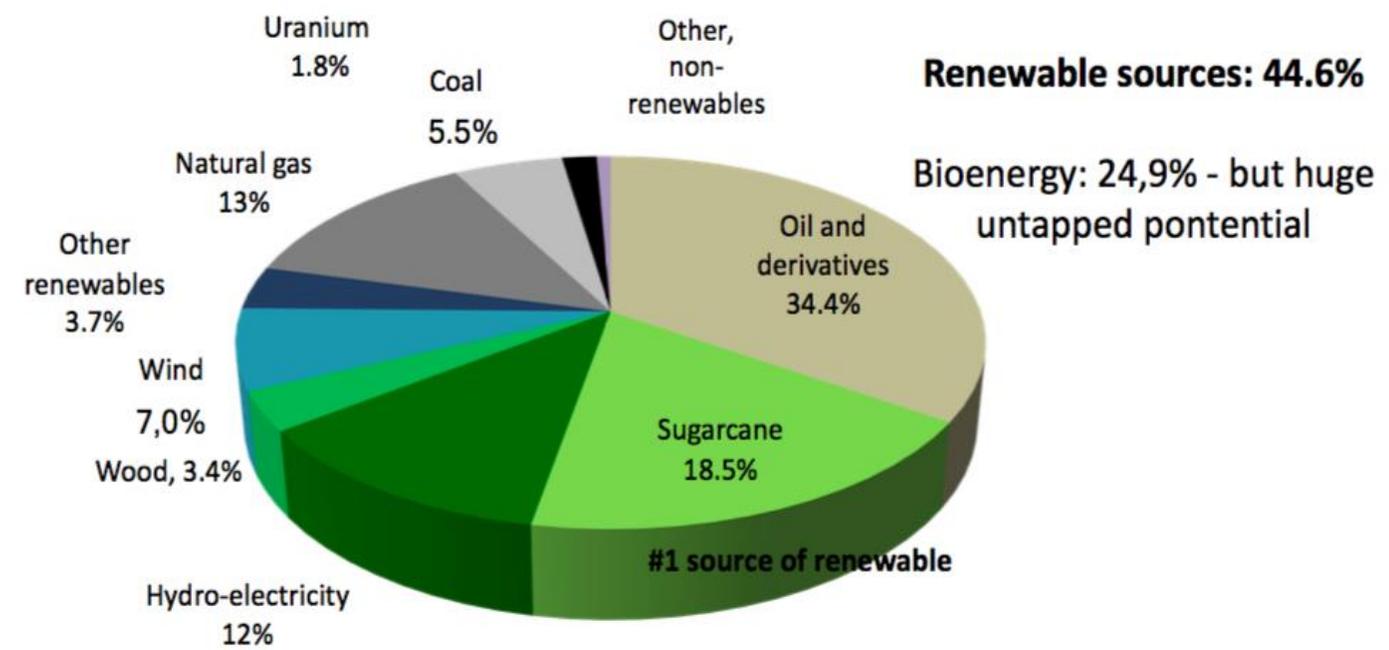


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# Success Stories – Brazil

- One of the world's top 3 producers of sustainable biomass
- Renewables account for 45% of all energy in Brazil: Bioenergy accounts for 1/4<sup>th</sup> of all energy
- Sugarcane biomass is the largest source of renewable energy in Brazil – almost 15 TWh annually.



Brazil energy mix. Credit: UNICA

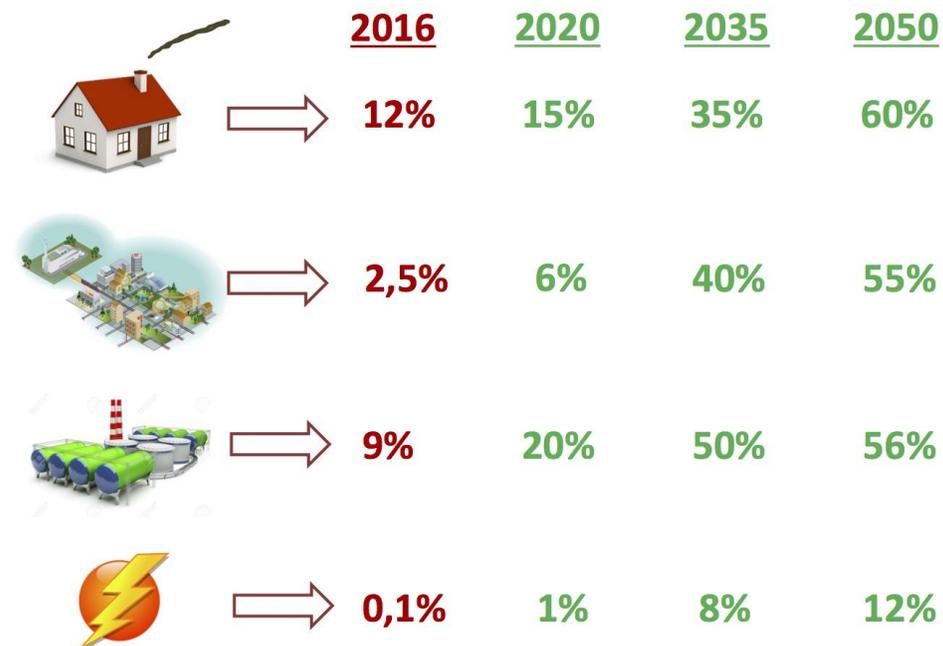
# Opportunities – East Europe



## • Ukraine

- Well developed district heating (DH) network
- More than 30 000 boiler houses to be replaced
- Perfect market for biomass to replace natural gas
- Target for biomass use
  - 2020: 5.8 Mtoe (38% annual increase)
  - 2035: 11 Mtoe

**Biomass Utilization for Energy Production in Ukraine (by sectors)**



Ukraine energy targets. Source: UABIO

# Opportunities – East Asia



## • Japan

- Great possibilities for development of biomass in industrial sector
- Lot of biomass resources: 70% of country covered by the forest
- High FiT: Forest residues: 32 – 40 JPY/kWh (0.2 – 0.3 Euro/kWh)
- Main opportunities
  - Heat sector
  - Biomass Co Firing
  - Small Scale CHP



*WBA and Renewable Energy Institute meeting, Tokyo, Japan*



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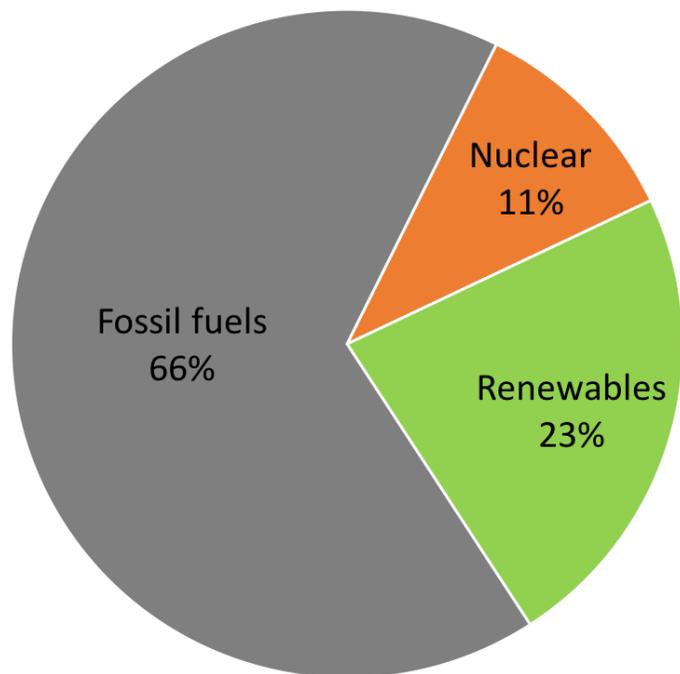
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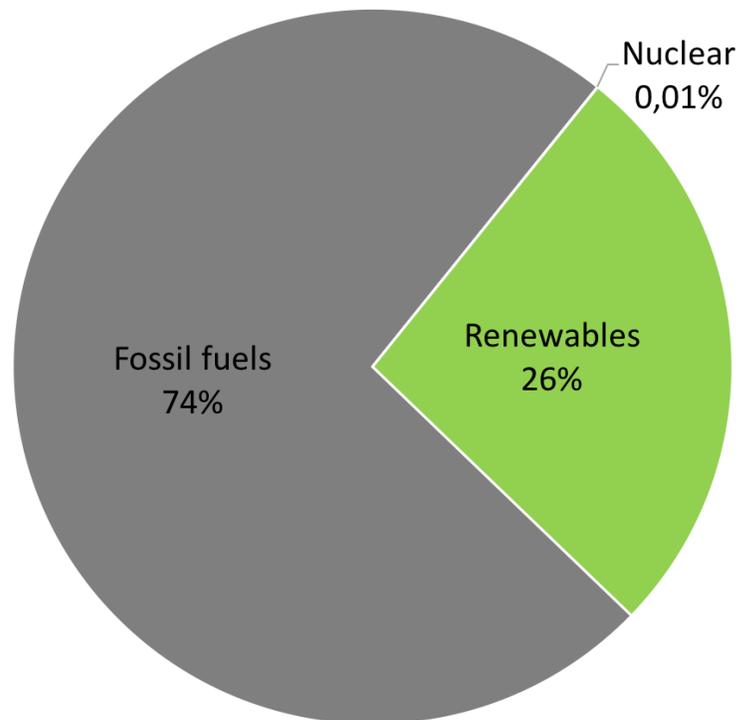
# Challenges - Transport sector



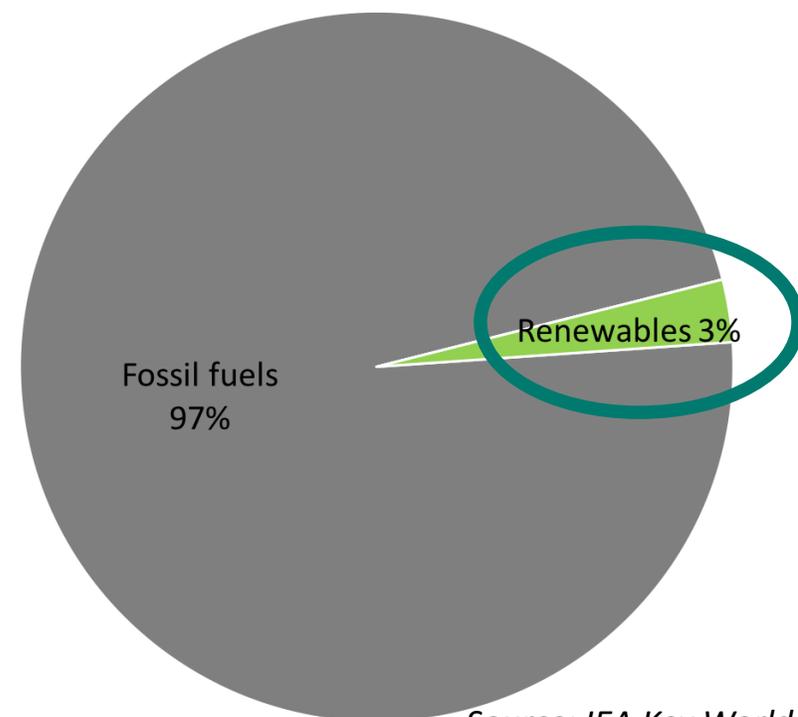
## Global Electricity Sector



## Global Heat Sector



## Global Transport Sector

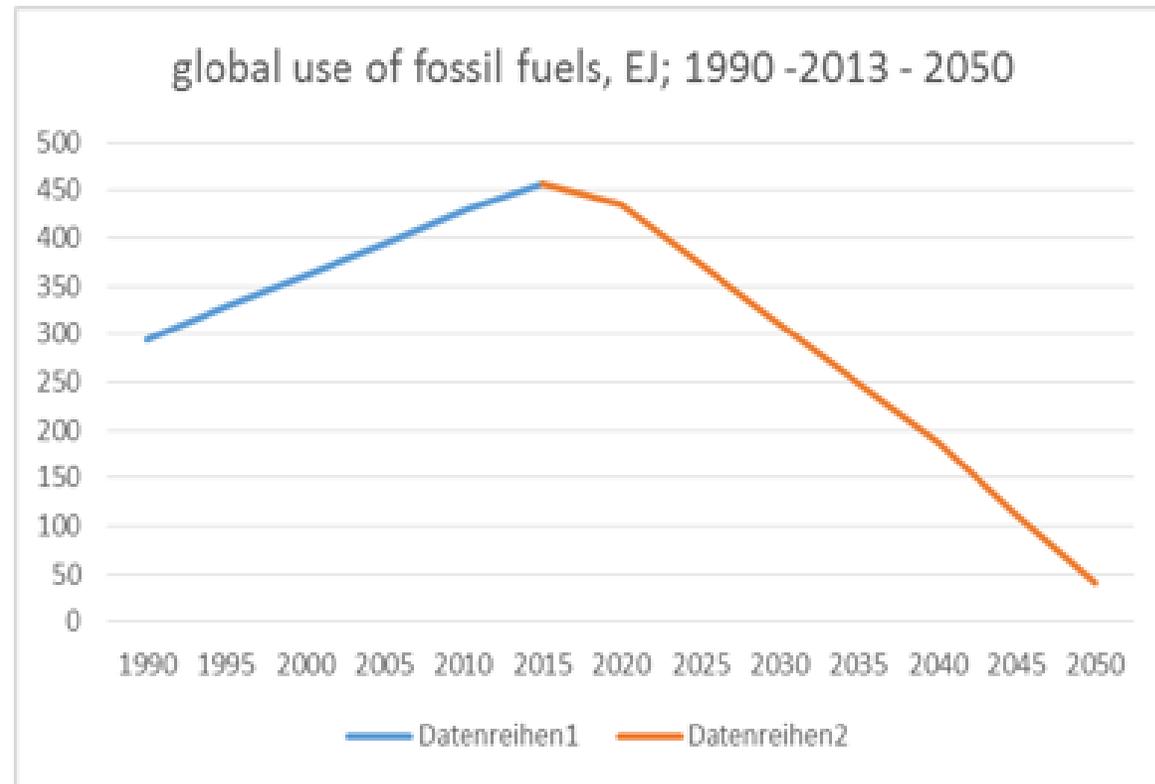


Source: IEA Key World Energy Statistics

# Tools to scale up – Fossil Exit Strategy



- World needs an exit strategy to leave fossil fuels, step by step, year by year
- A minimum reduction path would be to near zero by 2050
- Each country also needs a strategy for fast deployment of renewable energy
- Rapid mobilization of biomass from all sectors
- No new investments in fossil fuels



# Tools to scale up– Carbon Tax

- Carbon tax - key instrument for energy transition
- Benefits
  - Easy to apply and calculate
  - Tax neutral
  - Efficient
- Global efforts undergoing to apply carbon tax

## Carbon tax – key instrument for energy transition!

Global warming is the most challenging problem facing humanity today due to the excessive use of fossil fuels. Carbon tax (carbon dioxide tax) is a simple and efficient way to reduce the use of fossil fuels, improve energy efficiency, and make renewables more competitive. It can be tax neutral, as reducing other taxes will complement carbon tax implementation. It is a smart move to a more sustainable lifestyle and investment for the future. Therefore, the carbon taxes are an indispensable tool for rapid transition to a climate compatible energy system using less fossil fuel and more renewables.

### • Easy to apply

All countries already have some kind of energy taxation and it is administratively easy to introduce the carbon tax in all countries at a low level.

### • Easy to calculate

The tax is easy to calculate based on the carbon content of the fuel and the importers or big energy producers can easily estimate and pay the tax.

### • Tax neutral

Carbon tax must not lead to higher taxation in general. The Carbon tax can be raised at the same time as other tax is reduced.

### • Economic

The Carbon tax will make it more profitable to use fossil fuels efficiently, switch to renewable energy sources or to abstain from using fossil energy altogether. For countries with large fossil fuel imports, the carbon tax can stimulate the internal economy and improve terms of trade.

### • Efficient

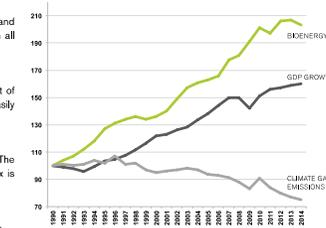
The purpose of carbon taxation is not to punish people for their life style or technical equipment today, but to help them make the right choices and investments for the future.

### Background and theory

#### Polluter Pays Principle and Carbon Dioxide Tax

**Internalising environmental costs:** According to Polluter Pays Principle (PPP), emitters of CO<sub>2</sub> should pay a Carbon tax for their emissions and in this way pay for current and future costs caused by the emission. Hence, the environmental costs (external costs) are internalised and made a part of the total cost of the polluting activity.

**Carbon content of the fuel as basis:** The Carbon tax should be in relation to the emission of CO<sub>2</sub> by the different fossil fuels. This is well known, and in direct relation to the carbon content of each fuel.



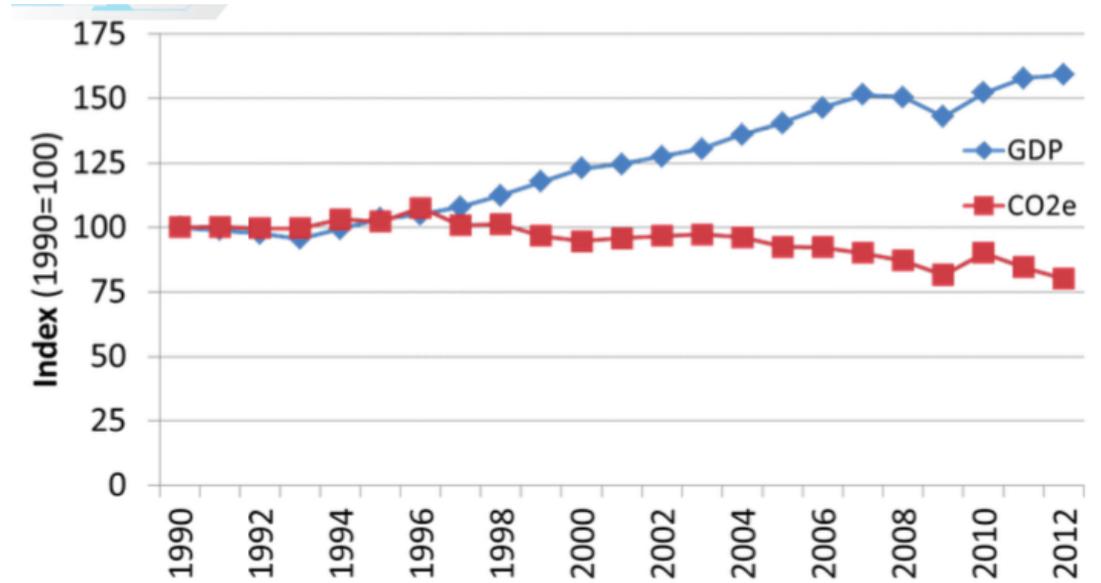
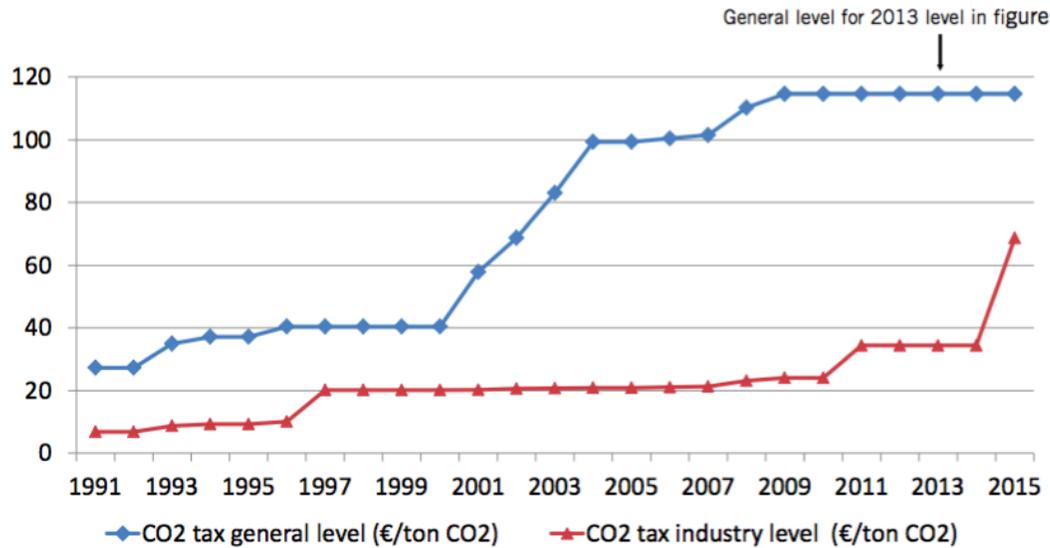
**The Swedish example:** Sweden introduced carbon tax in 1990. Since then Sweden has experienced rapid economical growth and decreased carbon emissions. GDP increased by 60 percent in real terms. Greenhouse gas emissions decreased by 25 percent 1990–2014, and the use of bioenergy doubled. The diagram shows changes from 1990 (1990 = 100 percent).

**Applied to all sectors:** The Carbon tax should be introduced in all sectors of society. If cap and trade is used for certain sectors, Carbon taxes should be adopted for other sectors and in the long run, it should replace cap and trade system.

**General acceptance needed:** Initially, the level of the Carbon tax is not the main issue. More important is to get a general acceptance. Once the tax is introduced, it can be raised gradually to make it possible for companies and individuals to take action to reduce their use of fossil fuels.

**A green tax shift:** The purpose of the tax is not to increase taxation, but to steer the economy in a sustainable direction. Other taxes can be lowered to compensate for the raised Carbon tax, in a "green tax shift". If the tax shift is not applied, incomes from the Carbon tax can be used for research and development of renewable energy technologies or for adaptation and compensation for people affected by the emissions. »

# Carbon Tax: Example of Sweden



Source: Ministry of Finance, Sweden



# Conclusion

- Bioenergy is the largest renewable energy source and will continue to grow
- Nordic countries and Europe have benefited with biomass development
- New markets in Eastern Europe and East Asia are developing for biomass
- Carbon pricing is an effective instrument for transition to renewables

World Bioenergy Association

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# WBA Activities (1)

- **Global Bioenergy Statistics**

- Annual publication focusing on development of bioenergy on a global and regional level.

- **Bioenergy Equipment Directory**

- Online technology transfer platform for connecting bioenergy equipment manufacturers with clients globally

- **Organizing/attending events**

- Bioenergy mission to Japan
- Biofuels mission to Brazil



*Ilzuna biomass power plant,  
Nagano, Japan*



*Raizen biofuel plant, Sao Paulo,  
Brazil*

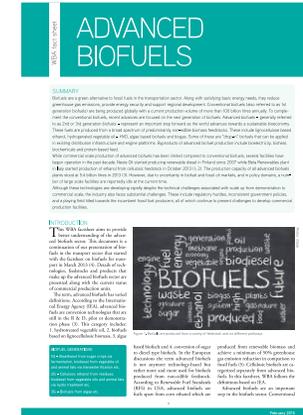
# WBA Activities (2)

- **Factsheets**

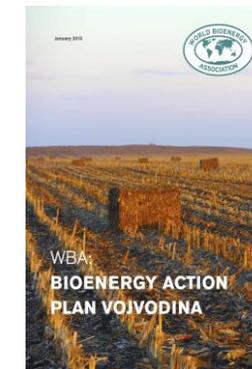
- Latest natural science based factsheets on latest bioenergy technologies and processes (e.g. *advanced biofuels, pellets, biogas, liquid biofuels, combined heat and power, waste to energy*)

- **Reports**

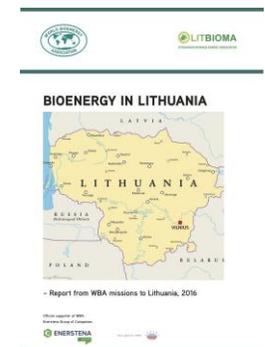
- Role of Bioenergy in European Cities
- Bioenergy Action Plan for Vojvodina
- Country mission reports



Role of bioenergy in European cities



Bioenergy Action Plan – Vojvodina



Bioenergy in Lithuania – Mission Report



# WBA Activities (3)

- **Projects**

- Biofuels Working Group 2035
- NGO Outreach
- Setting up bioenergy associations

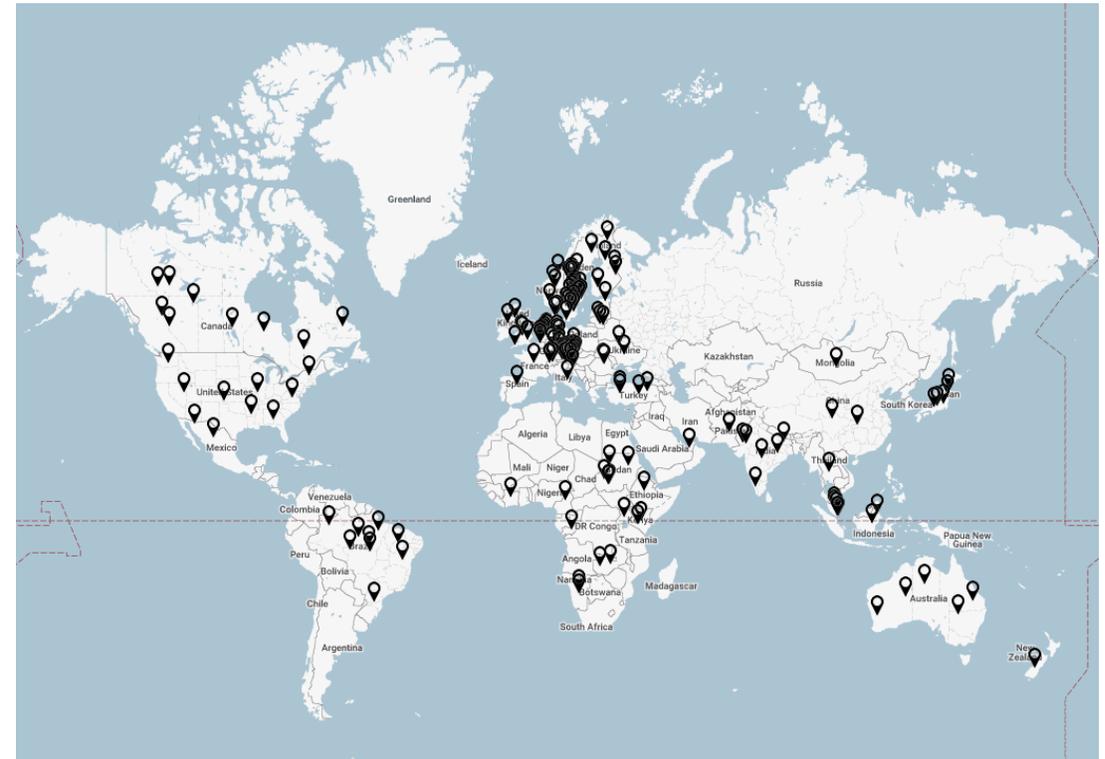
- **Sustainability Certification Scheme**

- **WBA Branch Offices**

- China. Singapore - Indonesia. Mexico. Canada. Australia. Brazil

# WBA Membership

- More than 240 Members
- Representing more than 50 countries worldwide
- Various international, regional, national and local members
  - Bioenergy companies
  - Associations in the bioenergy sector
  - Individuals



# Join WBA!

- Membership

- 3 Tier System

- Full Members: Associations
    - Associated Members: Companies
    - Individual Members: Individuals

- Fees

- 300 – 5000 Euros/Year

- Benefits

- Access to WBA network
  - Access to latest bioenergy information
  - Invitation to events
  - Possibilities for project collaboration



## Membership fees

The fees depend on the size and specific situation of a member and vary between 300 and 5 000 Euro per year. Individuals pay 50 Euro. The fee of future members is set by the board in accordance to the following table.

Form of membership	Characteristics of the member working in the area of bioenergy	€/year
<b>Full members</b>	Large international bioenergy associations	5 000
	Medium sized international bioenergy associations	3 000
	Large national bioenergy associations	1 200
	National bioenergy associations	300
<b>Associated members</b>	Bioenergy associations at the beginning of their work	5 000
	Large global companies	3 000
	Medium sized companies	2 000
	Energy agencies, research institutes, think tanks in general and organisations in relation to agriculture and forestry	1 200
	Small companies	300
<b>Individual members</b>	Energy agencies, research institutes, think tanks in developing countries	50
	Consultants, startups, companies with less than 50 employees	50

Send your application online on [www.worldbioenergy.org](http://www.worldbioenergy.org), or fill in this form:

### APPLICATION FORM

- I would like to sign up as a **Full Member** of the World Bioenergy Association  
I suggest the following fee: \_\_\_\_\_ €/year
- I would like to sign up as an **Associated Member** of the World Bioenergy Association  
I suggest the following fee: \_\_\_\_\_ €/year
- I would like to sign up as an **Individual Member** of the World Bioenergy Association  
50 €/year

Applications for membership shall be submitted to the Board. The Board reserves the right to admit or refuse an application for membership. In case of a refused application, the applicant may apply to the General Assembly for a reversal of the decision.

Company/Organisation: \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Country: \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_ Website: \_\_\_\_\_

Date and signature: \_\_\_\_\_

### SEND THIS FORM TO:

Mr Bhanudewi Kummamuru, World Bioenergy Association  
Hölländergatan 17, SE 111 40 Stockholm, Sweden  
E-mail: [info@worldbioenergy.org](mailto:info@worldbioenergy.org)  
Phone: +46 8 441 70 84

[worldbioenergy.org](http://worldbioenergy.org) »

*Fill out the Join WBA Membership Flyer and hand it over to WBA representative or send a scanned copy by email to [info@worldbioenergy.org](mailto:info@worldbioenergy.org)*



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# Contact us!



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