



**WORLD**  
BIOENERGY  
**ASSOCIATION**



# About WBA

The **World Bioenergy Association (WBA)** is the global organization dedicated to supporting the wide range of actors in the entire biomass to energy value chain.

**Mission:** To promote the sustainable development of bioenergy

Our members is **open for all** including companies, associations and individuals.

# Activities

## Knowledge

- Factsheets
- Data (Global Bioenergy Statistics)
- Mission reports
- Policy and position papers

## Events

- Study Trips
- General Assembly
- Webinars
- Working Groups

## Advocacy

- Observer Status (UNFCCC, IRENA)
- Membership (REN Alliance, Go100%RE)
- Partnership (GBEP, CPLC)



# Organization



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## Board Members

# Our Members



THE ENERGY FARM  
International Foundation



BUNDESVERBAND  
Bioenergie e.V.



Magyar Bioüzemanyag Szövetség



Energie Steiermark AG



CMBIOMASS

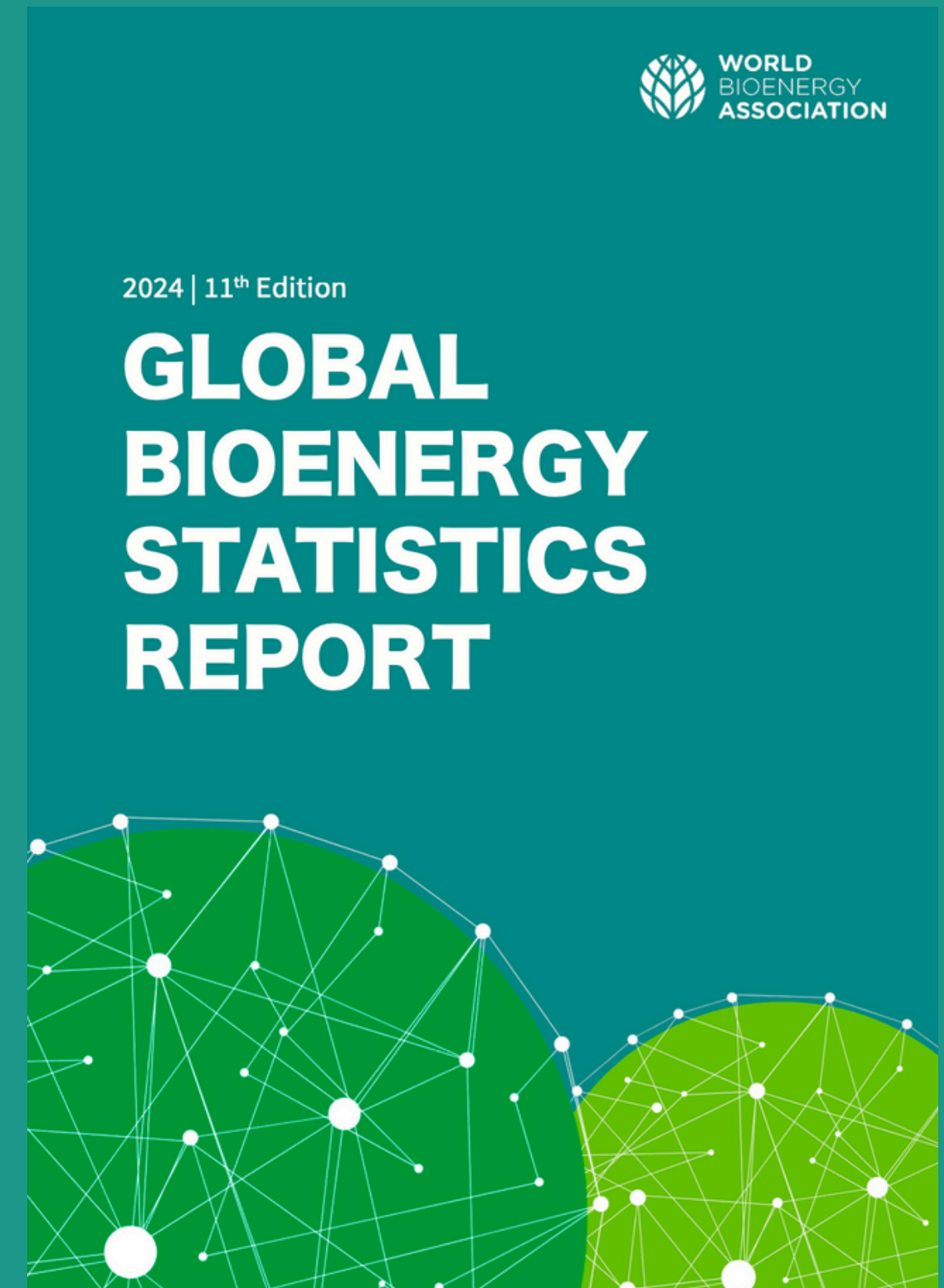


# Global Bioenergy Statistics Report (GBS)

The Global Bioenergy Statistics report is the main annual publication of WBA.

The report focusses on the **global development of biomass to energy** – supply, production and consumption.

The data is presented on different geographical levels – global, continental and regional levels. These reports are published since 2014 and have been downloaded by governments, financial institutions, universities and companies.



# Factsheets

WBA factsheets present a **fact based** overview of bioenergy technologies overview of bioenergy technologies and are a **guiding tool** for policy makers, researchers and companies.

The objective of drafting and publishing factsheets is to bring **rational arguments in the public discussion** and to **support the development of bioenergy.**

All factsheets are drafted along the same outline: summary, introduction, definitions, basic figures explaining technology, policy and economics, global statistics and a brief opinion of WBA on that subject.

## Bioenergy with Carbon Capture and Storage (BECCS)

WBA Factsheet

### SUMMARY

Bioenergy with Carbon Capture and Storage (BECCS) is an essential technology for reducing global greenhouse gas (GHG) emissions. BECCS is a multifaceted supply chain that has the advantage of enabling negative emissions whilst generating energy. Its versatility is illustrated by the possibility of using the full range of biomass feedstocks and many conversion pathways. BECCS is also a highly adaptable technology in that it can be applied to a variety of industries: power and heat plants, biofuel plants, waste-to-energy plants, biogas plants, and even heavy industry. Once the carbon dioxide (CO<sub>2</sub>) has been captured, it must then be transported and stored, or even reused. However, reuse can sometimes result in no negative emissions, as the CO<sub>2</sub> is released into the atmosphere in the short term. This chain involves extensive logistics and costs, which is important to be considered in the entire value chain. Incentives and supportive policies are essential to the development and sustainability of this technology. In a context where limiting global warming has become a matter of urgency, BECCS projects need to be encouraged and supported to ensure that they can continue to meet the challenges of the future.

### INTRODUCTION

Since the industrial revolution, with the exponential growth of (BECCS). On the other hand, carbon dioxide can also be used (instead of storing underground), for example in aviation fuel or beverages, in which case it is referred to as CCU. The technologies deployed for capturing CO<sub>2</sub> and the infrastructure needed for transporting and storing CO<sub>2</sub> are the same for CCS and BECCS. The major difference between the two is that BECCS not only removes CO<sub>2</sub> but also generates electricity. Since the Paris Agreement and the pressing need to limit global warming to below 1.5°C, interest in BECCS has been growing. It is a key technology for reducing emissions already in the atmosphere, which will be required until there is a 'balance between anthropogenic emissions by sources and removals by sinks'.

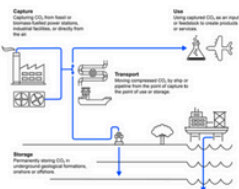


Figure 1: BECCS process. Source: IEA, link

Bioenergy with Carbon Capture and Storage (BECCS) | 1

## GLOBAL BIOMASS POTENTIAL TOWARDS 2035

WBA Factsheet

### SUMMARY

Climate change is the most significant challenge for humanity today. An important solution is replacement of fossil fuels with renewables and improved energy efficiency. Among renewables, biomass will play a major role in supplying the human energy needs. Biomass for energy originates from a variety of sources classified into forestry, agriculture and waste streams. Some of the potential sources include crop for animal energy grain, crop residues, energy biomass and residues, industrial by-products and municipal solid waste. Globally, in 2012, the largest share of land use for energy came from forests - about 41% out of a total area of 54.2 billion hectares. The current global energy supply is about 560 EJ. Land is an important basis for biomass production. The total potential biomass for energy depends on production of agricultural land, agricultural land, cropland, pasture, forest, and other land uses. The potential biomass for energy depends on production of agricultural land, cropland, pasture, forest, and other land uses. The potential biomass for energy depends on production of agricultural land, cropland, pasture, forest, and other land uses.

### INTRODUCTION

Climate change has become a global development led by the excessive use of fossil fuels. The rapid replacement of fossil fuels by renewable energy is the best strategy against climate change. Biomass is currently the dominating renewable energy source for multiple uses in heat, power and transportation fuels. A step-by-step substitution of fossil fuels by renewable energies in the coming decades requires the rapid growth of all renewable energy sources such as wind, solar, hydro, geothermal and biomass.



Figure 1: Biomass production and energy conversion. Source: WBA

As a renewable energy source, biomass can play an important role in the transition to a new energy system based on renewable energy.

As a renewable energy source, biomass can play an important role in the transition to a new energy system based on renewable energy.

March 2016

## CLEAN AND EFFICIENT BIOENERGY COOKSTOVES

WBA Factsheet

### SUMMARY

Globally, more than 2 billion people rely on traditional use of biomass for cooking and hot water use. This is an urgent need for developing clean and efficient cookstoves and fuels. Currently, the cookstoves sector is growing rapidly with a 20% increase in annual sales during 2012 - 2013. The growth is expected to continue further.

### INTRODUCTION

Milliards, represent a billion people are burning solid fuel, including biomass, agricultural residues and charcoal. The dirty cooking fuel. This is a challenge as inefficient systems of cooking have a major impact on health, environment and even more (1). Biomass emissions released during the process of traditional cooking are one of the world's major public health challenges, and result in more premature deaths (2). Biomass emissions released during the process of traditional cooking are one of the world's major public health challenges, and result in more premature deaths (2). Biomass emissions released during the process of traditional cooking are one of the world's major public health challenges, and result in more premature deaths (2).



Figure 1: A woman preparing her food on a traditional biomass stove. Source: WBA

including improvements in both the supply and the environment. The UN's Sustainable Development Goals (SDGs) have a 'National Action Plan for Clean Cooking Solutions', including both cookstoves and fuels, on its agenda, explaining that high impact opportunities for improved cooking systems for building clean prosperity (3). The successful adoption, use and repair of clean cookstoves will not be limited to this fact sheet. This has long-term, it is to reduce the greenhouse effect and the warming of the atmosphere. The UN's SDG 7 aims to

clean cookstoves (CACS) is a pilot project and is working with the same approach towards a goal of zero million households adopting clean and efficient cookstoves and fuels by 2025 (4).

The most successful traditional stove in the world is the high quality 'improved' stove. It is a challenge to reduce these emissions and to provide a cooking pot over the fire that is better than the current one.

## ROLE OF BIOENERGY IN A CLIMATE NEUTRAL ENERGY SYSTEM

WBA Factsheet

### SUMMARY

Climate change today is what's happening here and now. Transition to a climate neutral energy system has multiple pathways, but fundamentally is underpinned by renewables, energy efficiency and conservation, electrification, hydrogen and its derivatives, and carbon capture and storage. Biomass as a versatile renewable source, with improved appliances and technologies, can facilitate this process through direct supply of green electricity, heat and fuel, indirect electrification in terms of conversion between biomethane and hydrogen, and carbon sequestration with biochar and BECCS equipment. In the power and heat sector, biomass functions as the best replacement for fossil fuels to provide grid flexibility, and feedstock blending can share the existing infrastructure while reducing the emissions intensity. In transport sectors, biofuel will keep being the major renewable substitute and blend for fossil fuels before the extensive electrification, then gradually shift and take up a large share in shipping and aviation. In industry sector, biomass will play an active part in circular economy by managing industrial waste, providing process heat and feedstock for chemical production. In building sector, biomass will enable the wide public access to green residential heating and clean cooking, and help improve the socioeconomic and health conditions of rural residents.

### INTRODUCTION

Human activities have induced unprecedented change across our climate system, and it is no longer just an image about a blue slowly melting into the distant polar ice. Increasingly, the occurrence of extreme weather events, such as heat and cold waves, droughts and heavy precipitation, wildfires and tropical systems, especially their compound, have led to be increasingly frequent and intense. The 10th Assessment Report (AR10) Working Group I (WG1) issued by the United Nations' Intergovernmental Panel on Climate Change (IPCC) in August made it clear that over the region and globally we are facing 'Unprecedented, rapid, and large-scale' actions can be taken to drastically cut emissions 1.5°C or less, and prevent the worst impacts of climate change.



Figure 1: Climate change and the resulting disasters. Source: WBA

Energy transition, given the objectives above, can mainly be factored into renewable, energy efficiency and conservation, electrification, hydrogen and its derivatives, carbon capture and storage (CCS). In a variety of ways, biomass facilitates this process. As the main constituent of renewable mix today, biomass is chosen for its capability to supply electricity and heat and fuels directly without using carbon neutrality, while providing flexibility as fossil fuel power plants at a lower cost. Equipped with improved cookstoves, boilers or combustion, the efficiency of generation can be further enhanced. This production can even be carbon negative (i.e., BECCS). Biomass is interchangeable with hydrogen by water, and power to gas is essentially an alternative to biomass as a means of energy storage. During these conversions, CO<sub>2</sub> can be captured either into biomethane or into solid carbon for industrial and agricultural uses. In terms of another IPCC, methane, better management of agricultural residues and waste streams will significantly reduce its emissions, as well provide feedstocks for biomass in different forms. Before substituting biomass on these alternative fuels, we can first utilize the status quo, which can first utilize the status quo, which can first utilize the status quo.

bioenergy in the energy system today.

March 2016

# White Papers

WBA white papers offer a comprehensive **overview of the bioenergy sector**, encompassing the latest data on bioenergy development, policy frameworks, financing trends, and insightful **case studies** specific to **targeted countries or regions**.

These papers go beyond conventional reports by adopting a commentary format, presenting a **nuanced qualitative analysis** infused with the **first-hand experiences** of WBA within the respective countries of study.



## INDIA: THE NEXT BIG BIOENERGY REVOLUTION

WBA White Paper

**Authors:**

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*Design by LÍzia Branco*



# Position Papers

WBA frequently issues position papers to **inform the bioenergy and wider energy community** about the opinion of WBA on various technologies, policies and debates surrounding bioenergy.

These are issued either by WBA or jointly with other leading organizations.



**WORLD BIOENERGY ASSOCIATION**

## Pellet cookstoves

### An affordable and sustainable modern clean cooking solution

Christian Rakos, Paul Prauhart

**Executive summary**

In the debate on clean cooking, traditional cooking solutions such as open fire cooking or cooking in traditional charcoal stoves are contrasted to "transitional" solutions such as improved cookstoves for firewood or charcoal and "modern cooking solutions" such as LPG, electric cooking, ethanol cookstoves or biogas. This paper argues that pellet fired gasifying cookstoves should be considered as modern cooking solution that has particular advantages in terms of affordability, use of local resources and sustainability and given more attention when advocating clean cooking.

Gasification technology allows pellet-fired cookstoves to achieve Tier 4 to Tier 5 levels of emissions and efficiencies of ISO voluntary performance standards making them a clean and highly efficient cooking solution.

There is ample scientific evidence, that pellet cooking has particular advantages in terms of affordability. Taking into account the high efficiency of pellet cookstoves cooking costs are both lower compared to improved charcoal stoves and much cheaper than LPG cooking or electric cooking with few exceptions such as the use of electric pressure cookers.

The International Energy Agency estimates in their Access for All scenario that USD 40-55 billion per year in subsidies would be needed to bring down the cost of LPG and electricity to affordable levels for all households that have switched by 2030. As pellet cooking does not need to be subsidized, building a pellet supply infrastructure can reduce the demand for subsidies significantly.

The investment needed to build adequate pellet production capacities amounts to around USD 20 per person. A tier 4 electricity supply able to support cooking also in rural areas would require investments estimated at over USD 400 per person. The economic and social sustainability of a pellet based modern cooking system is underpinned by the fact, that no foreign exchange is needed for fuel imports and job loss in the traditional charcoal and firewood economy can be replaced by work associated to raw material supply to the pelleting plants, pellet production, packaging, distribution, stove manufacturing, and maintenance and even ash and char utilization. Significantly reduced safety hazards, short supply chains and independence of volatile global markets and disadvantageous exchange rates are other advantages.

Finally, a sustainable cooking fuel supply needs to be based on renewable energy and should not lead to the emission of carbon from fossil fuel resources. Utilizing biomass residues that would otherwise be burned or landfilled as well as fast-growing grasses is an efficient and sustainable use of local and renewable resources that needs to be part of the energy system of the future.

1



**RENALLIANCE**  
renewables working together

## Joint statement on Renewables working together

### Building Back Better through a Green Recovery

The renewable industries will work together to deliver 100% renewable energy. This can only be achieved through renewable energy integration. Together, the renewable energy technologies are greater than the sum of their parts. A significant increase of investment in renewables will fuel economic growth, create employment and contribute to a climate-safe future. To ensure this, we call for the following:

- **Accelerated deployment across all sectors, especially in heating, cooling and transport sectors, also by connecting the sectors.** The uptake of renewables in heating, cooling and transport remains slow, even though these sectors account for over three fourths of total final energy demand. Policy attention in this area is still lacking.
- **Substantial financial incentives for renewables to create competitive advantage for end-users and encourage self-supply.** The deployment of renewables in the energy sector still faces multiple barriers. Further policy support is needed to advance the achievement of a 100% renewable energy future. Policies ranging from pricing instruments to financial and fiscal incentives, quotas, and obligations, are needed to support clean, efficient and renewable energy projects.
- **Consider additional benefits and services of renewables when designing market mechanisms, not just lowest price.** The socio-economic benefits of the transition to a 100% renewable energy future is of vital importance. Mitigating climate change through the deployment of price competitive renewable energy need to be considered to future-proof our economy and society.
- **Broader policy frameworks devoted to a just and inclusive energy transition.** Renewable energy technologies lie at the heart of the energy transformation. This transition should focus on deployment, enabling and integrating policies that attract the full variety of investors, from individuals, communities, SMEs up to larger companies to participate and invest.
- **Development of green skills and renewable jobs offered to communities.** Incentives for education and training are needed to match the future skills demand for the energy transition. These incentives should address social and gender equity.
- **Mapping and promotion of health benefits of a green energy-based economy.** Replacing fossil fuels with renewable energy technologies is a positive force for climate, health and society.

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**WORLD BIOENERGY ASSOCIATION**

## WBA POSITION ON COVID-19: IMPACTS AND OUTLOOK FOR BIOENERGY

**BIOENERGY AS ESSENTIAL SERVICE.** Bioenergy (including solid biomass, liquid biofuels and biogas) has provided clean, on demand energy and its role in meeting end use of electricity, heating and transport fuels should be recognized as essential product and service in times of crisis.

**A BIOENERGY FUTURE.** Policy makers should assure investors and the wider bioenergy community of their support to bioenergy and its crucial role in reducing fossil fuel use, generating jobs, local economic development and combating climate change.

**DIS-INCENTIVIZE FOSSIL FUELS.** Low oil prices, low cost of renewable energy sources and the momentum towards a clean energy future provide the opportunity for policy makers to disincentivize fossil fuels development by eliminating subsidies, implementing carbon pricing policies and developing fossil fuel exit strategies.

**BUILD BACK BETTER WITH BIOENERGY.** Recognizing the crucial role of bioenergy in the global energy mix, governments should include support to sustainable bioenergy technologies and pathways as key themes at the centre of economic recovery packages. No more fossil fuel support.

**TIME FOR AMBITION AND ACTION.** Recognizing that we face a climate urgency, national governments must increase their climate ambition by setting long term, ambitious and stable targets for bioenergy and renewable energy.

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June 2020



## 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 obtain them using local 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 lifestyle or technical equipment today, but to help them make the right choices and investments for the future.

**Background and theory**

**Popular Pays Principle and Carbon Dioxide Tax**  
Internalizing environmental costs: According to Popular 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 internalized and made a part of the total cost of the polluting activity.

**Carbon content of the fuel as basis:** The Carbon tax should be related 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.

**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 adapted 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.



The Swedish example: Sweden introduced carbon tax in 1990. Since then Sweden has experienced rapid economic growth and decreased carbon emissions. GDP increased by 84 percent in real terms. Greenhouse gas emissions decreased by 39 percent 1990-2014, and the use of bioenergy doubled. The diagram shows a sharp drop in CO<sub>2</sub> emissions in 1990.

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**AEBIOM**

## We call upon governments to take the low price of oil as a window of opportunity to act against fossil carbon emissions!

There has rarely been such an opportunity for the global community to take action against fossil carbon emissions and global warming as there is now, in January 2015. The North Sea Brent oil price has plummeted from 110 USD per barrel last summer to around 50 USD now, a fall of more than half, which will dramatically affect energy markets. All users of oil products at market prices around the world will now perceive their diesel, petrol and fuel oil as cheap.

This gives us a unique opportunity to introduce and raise fees and taxes on carbon dioxide emissions in all countries, keeping it painless for citizens. It represents also a chance to abolish subsidies for fossil fuels in countries with governmentally guaranteed fuel prices. The best strategy would of course be to agree a minimum carbon emission fee in the UN, but it is difficult to reach consensus by negotiation between so many countries. Therefore every government should consider urgently acting on its own, not waiting for global agreement. There are three types of country that should take action as soon as possible:

1. Countries that already have carbon fees or taxes should take the opportunity to raise these. As an example, in Sweden, petrol and diesel prices have decreased by over 2 SEK per litre (20 euro cents) and there is a clear opportunity to raise fuel duty by up to half that amount, without much consumer reaction. The situation is similar in all European countries, many urgently need to strengthen their state budgets by increasing revenues. Higher carbon fees, duties or a tax is one way to do it.
2. Countries with no fees or taxes on carbon emissions should introduce such measures now, both on fossil transport fuels and on fossil fuels for heating. They can introduce such taxes at a lower level, but with the current drastic fall in oil prices, even relatively high carbon dioxide fees may be accepted by consumers. The important thing is to act now, before oil prices climb again.
3. Finally, countries with fixed and state-guaranteed prices on fuels, many of which are oil-producing nations, should take away the guarantees. Guaranteed prices vary between country, but total subsidies are very high at the global level. When world market prices for oil were climbing some years ago this resulted in budget problems for many countries. One example is Nigeria, where President Goodluck Jonathan tried to abolish the country's fixed fuel prices, resulting in protests and rioting. Now, these countries have a chance to abolish such policies and even introduce a low carbon fee. When oil prices start to climb again, it will mainly be attributed to market prices.

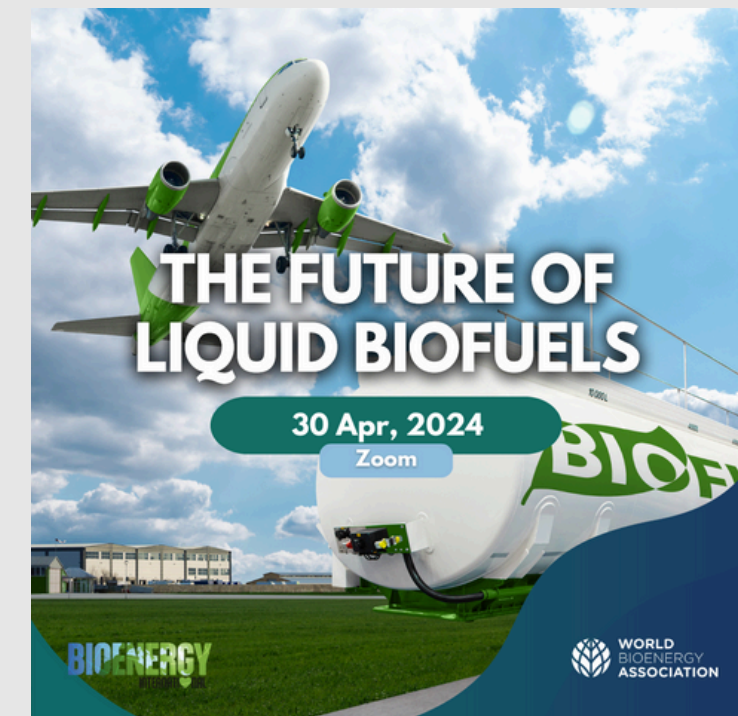
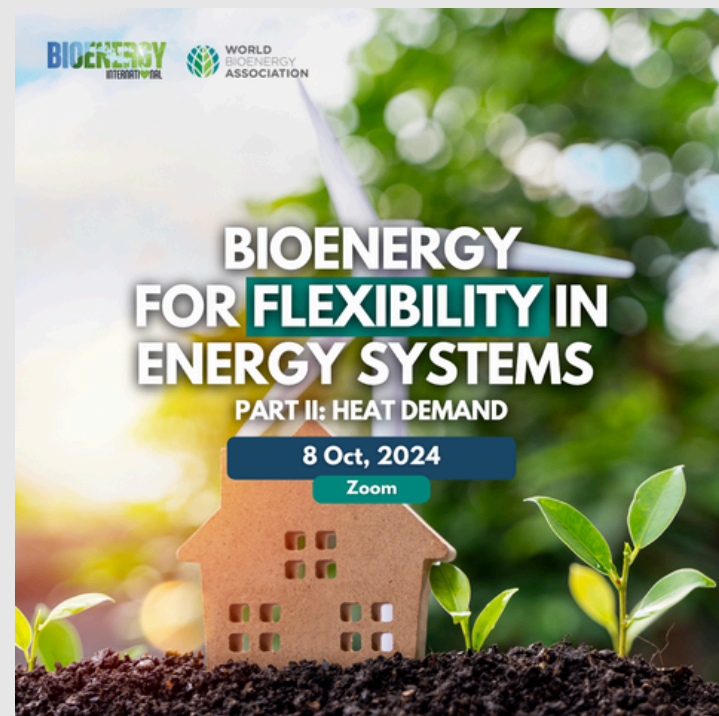
There is convincing research showing that carbon emission fees are the most efficient general method to combat climate change. The main reasons why carbon fees are so efficient are:

- Carbon dioxide fees raise the price of fossil emissions and thereby penalise fossil fuels for their negative effects on the climate. Consequently carbon dioxide fees also favour renewables and energy efficiency.
- Carbon dioxide fees are fair and logical because they are proportional to the actual emissions. Increased costs on emissions thus help individuals and enterprises to make better decisions for our common future. They can calculate new profitable investments or change behaviour to improve their economy, e.g. buy a more efficient car, insulate the house, take the bike instead of the car, or use public transport. Businesses can develop new products that can be competitive on a market where more efficient products are in demand, etc.



# Webinars

WBA organizes multiple webinars annually on a wide range of bioenergy topics. The webinar speakers come from leading experts from organizations - typically WBA members - who showcase the latest developments in technologies, policies and markets. Recordings and presentations are available on demand.



# pro pellets africa



We believe Africa is going to be the next very large market for pellet production and use and we can see rapidly growing numbers of inquiries and projects emerging.

Because of the enormous potential and the relevance of pellet cooking for sustainable development and climate protection the World Bioenergy Association has set up the **website** [www.propellets.africa](http://www.propellets.africa) to **support African developers of pellet plants**. This website includes a section that **lists all relevant suppliers**. We have a specific **working group on advanced biomass cooking** that open for all members interested in the subject.

# “Bioenergy Horizons”

Building on the success of “Bioenergy for the Future,” we are excited to announce the launch of our **new digital documentary series, “Bioenergy Horizons”**—a collaborative effort between the **World Bioenergy Association** and **BlackRook Media**.

“Bioenergy Horizons” will combine **evidence-based journalism** with compelling storytelling to present **cutting-edge innovation** and adoption across the globe.

The series will draw on the expertise of WBA members and the broader **bioenergy community**, sharing authentic, powerful stories from the heart of companies, associations, and individuals driving vital progress toward a safer, more sustainable world.





# General assembly

The WBA General Assembly is the annual gathering of our members and the wider bioenergy community. It is an opportunity for the stakeholders including private sector, associations, researchers, and civil society to discuss and debate the challenges and opportunities for the growth of the bioenergy sector.



Brazil, 2024



China, 2023



India, 2022



Austria, 2021



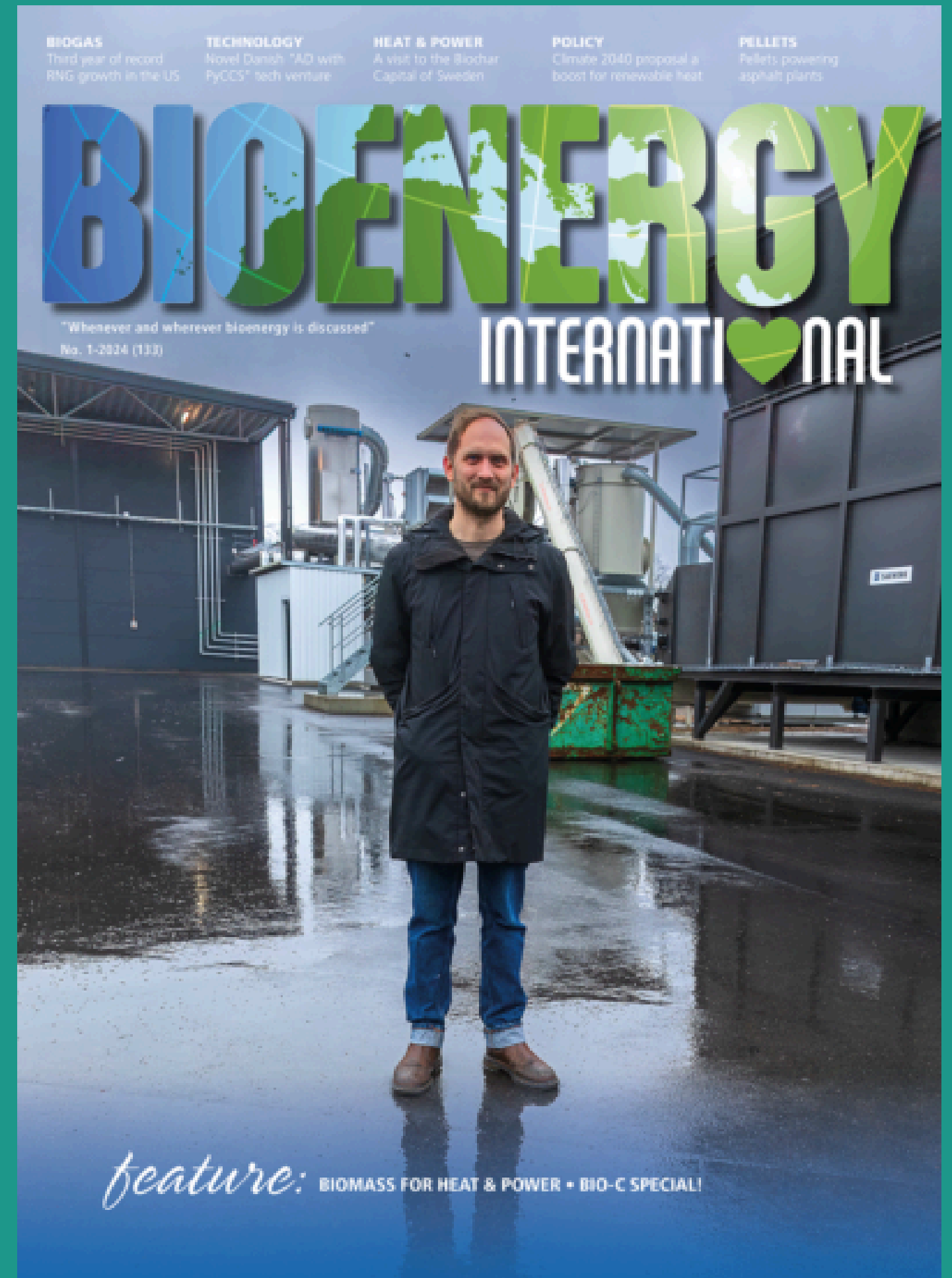
Sweden, 2019

# Bioenergy International

Bioenergy International is an **English** language subscription-based **trade publication** with allied **web platform** and is focused on the **biomass-to-energy value chains; solid, liquid or gas.**

Founded in 2001 it is based in Stockholm, Sweden and owned by SBSAB, a wholly-owned subsidiary of the Swedish Bioenergy Association, SVEBIO.

Bioenergy International is also the **official magazine of the World Bioenergy Association.**



# Partnerships and Advocacy

- Observer (UNFCCC)
- Observer (Green Climate Fund)
- Observer (IRENA)
- Observer (Global Bioenergy Partnership)
- Member (IRENA Coalition for Action)
- Member (Go100%RE)
- Steering Committee/Member (REN21)
- Partner (Carbon Pricing Leadership Coalition)





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