

National Biomass Action Plan for Germany

Biomass and Sustainable Energy Supply

Foreword

Dear Reader,

Against the backdrop of dwindling fossil fuels and advancing climate change, we face the urgent task of making our energy supply more efficient and more environmentally sound. Energy from sustainable biomass production is thus a key resource we cannot and should not do without. When used as a source of energy, biomass has three major advantages: it spares fossil fuel reserves, helps mitigate the effects of climate change and fosters value creation and employment.

Bioenergy now meets almost five percent of Germany's primary energy demand. This share will increase significantly by 2020 as we implement the targets stipulated in the EU Climate and Energy Package announced in April 2009 and in the German government's Integrated Energy and Climate Change Programme launched in August 2007.

This Biomass Action Plan sets out the potential for the use of biomass in Germany, quantifies the biomass share in meeting current demand and identifies available reserves. It also describes the German government's strategies towards promoting bioenergy use in the heating, electricity and fuel sectors, and the measures it intends to take in implementing them.

The Biomass Action Plan is also of importance in an EU context, as there is also a need to identify biomass potential at Community level. Activities to this end are currently under way. Germany's action plan is designed to support these efforts.

Estimates show that, in theory, it would be possible to double the share of bioenergy in Germany's energy supply by 2020. It must be remembered, however, that imported biomass is playing an increasingly important role and meeting energy demand solely from domestic biomass is unrealistic for competitive reasons. When promoting bioenergy use, we must ensure that we do so without compromising the situation in other countries and particularly in developing countries where food shortfalls are critical. Sustainability is to be achieved at all levels and is thus paramount in this action plan.

The extent to which biomass use can be intensified will largely depend on prevailing economic conditions and innovation in German industry. The German government can only use available instruments to provide a legal framework and incentives. We hope these incentives will be well received and foster innovation.

For the plan to be a success, it must find social acceptance. The 'food or fuel' debate highlights the complex interrelationships and the very different interests involved. The Biomass Action Plan aims to foster a common understanding of current circumstances and available options, and will act as a bridge between the myriad standpoints. Given the many competing uses for biomass, the plan contains a package of measures that are designed to ease the situation.

Bioenergy is not, however, available in unlimited quantities. Hence, promotion of its use, as set out in this action plan, must be seen in the context of promoting use of all other renewable energy sources. And promotion of renewables must go hand-in-hand with great efforts towards reducing energy consumption and improving energy efficiency. Research and development provide the foundations for the innovation needed in this regard. R&D activities are supported by the government's High Technology Strategy, which promotes market entry and use of newly developed technologies and practices.

This means focusing on market needs from the outset.

In the longer term, use of biomass must be optimised in terms of its potential for reducing greenhouse gases and its energy efficiency. The action plan contains measures which point in this direction and place greater focus on fostering achievement of this common goal. This includes encouraging greater use of heat and subsidising biofuels relative to their net contribution in mitigating climate change.

Bioenergy in Germany is a success story in its own right. Germany's National Biomass Action Plan shows how we can build on that success and highlights the milestones that have already been reached in doing so. So let us grasp the opportunities bioenergy offers to achieve a climate-friendly, secure and sustainable energy supply, and use the economic advantages this brings for the benefit of all.

Ilse Aigner

Federal Minister of Food, Agriculture
and Consumer Protection

Sigmar Gabriel

Federal Minister for the Environment,
Nature Conservation and Nuclear Safety

Contents

1. Introduction	3
2. Bioenergy Use in Germany	4
3. Aims and Strategy	5
4. Promoting Bioenergy	8
4.1 Securing Sustainable Biomass Supply	8
4.2 Alleviating Conflict in Biomass Use	10
4.3 Biomass-Generated Heat	11
4.4 Biomass-Generated Electricity	12
4.5 Biofuels	13
4.6 Other Measures	14
5. Summary and Outlook	15

6	GERMANY'S NATIONAL BIOMASS ACTION PLAN
7	BIOMASS AND SUSTAINABLE ENERGY SUPPLY

1. Introduction

Mitigating the effects of climate change and securing sustainable energy and raw material supplies are two of the key challenges we face. Substituting finite fossil fuels with renewable energy is thus vital, as is improving energy efficiency and reducing energy consumption. Biomass is playing an increasingly important role in all of this: it is currently the only renewable energy source that can make a lasting contribution to securing our supply of electricity, heat and fuel. And greater use of biomass brings many new opportunities for industry and for rural development, both here in Germany and in other countries around the world.

In an effort to promote biomass-generated electricity, the EU Commission presented the EU Biomass Action Plan in December 2005 and called upon member states to draw up their own national biomass action plans.

The EU Biomass Action Plan holds to the original European Union target of increasing the share of renewable energy in primary energy use to 12 percent by 2010. Bioenergy represents the largest component at eight percent. A biofuel target of 5.75 percent of overall fuel demand was also set for 2010.

In line with the European Council's decisions from 9 March 2007, a binding EU-wide target of 20 percent renewables-generated electricity was set for 2020. Further 2020 targets are to reduce overall energy demand by 20 percent and to increase the share of renewable energy in fuel supply to 10 percent. The Council decisions expressly state that the 10 percent target is only binding if energy production is sustainable and second generation biofuels are available commercially. Announced on 23 January 2008, the EU Climate and Energy Package designed for use in implementing these goals has since been adopted.

The German government has made a clear commitment to promoting renewable energy sources and renewable raw materials. Its goals are largely a result of the EU Climate and Energy Package and also of the outcome of a special Cabinet meeting held in Meseberg.

The goals include:

- ó Increasing the share of renewable energy in electricity production to at least 30 percent by 2020.
- ó Using biofuels to achieve greater reductions in greenhouse gas emissions in the transport sector; from 2015, rather than being set relative to energy content, biofuel quotas will be based on net greenhouse gas reductions.
- ó Increasing the share of biofuels in overall fuel consumption to 7 percent of net greenhouse gas reductions by 2020 (equivalent to approximately 12 percent energy content).
- ó Increasing the share of renewables-generated heat from the current 6.6 percent to 14 percent by 2020.

Against this backdrop, the question arises as to how efficient, long-term socially and environmentally compatible promotion of biomass can be achieved while taking account of its availability and viability.

The aim of the National Biomass Action Plan is to provide an holistic concept to significantly increase the bioenergy share in Germany's energy supply while adhering to sustainability criteria. Bioenergy is an ideal choice in efforts to mitigate the effects of climate change, secure supply and promote economic development. It also serves in boosting domestic value creation – especially in rural areas.

The following must be considered in pursuing this aim:

- Biomass demand for energy production competes with food crops and the many uses of biomass as a raw material; competition for biomass also occurs between the various types of energy production.
- Secondary products from bioenergy production play a key role in animal and human food supply.
- The various technologies involved in bioenergy use are only partially available on the market, are for the most part not yet competitive and harbour great potential for improved efficiency.
- Considerable research effort is needed in the bioenergy sector and is to be promoted under the German

- government's High Technology Strategy.
- Greater use of bioenergy must enjoy broader public acceptance.
 - Increased biomass production for energy supply can have both positive and negative, economic and social impacts. This applies to Germany and to the rest of the world.
 - An increasing number of developing countries are exporting bioenergy resources. Greater use of bioenergy in Germany must thus be seen in the context of sustainable development.

Raw material supplies come from the agricultural, forestry, food and waste management sectors, and also from manufacturing industry. While marine and other aquatic resources are only used to a marginal extent in energy production, great potential is seen in this area. Like the use of biomass for renewable raw materials, marine and other aquatic resources are not covered by this action plan. However, for reasons of improved efficiency and value creation, integrative models for biomass use in energy production and to supply raw materials are gaining in importance.

The basic data used in drawing up this National Action Plan are summarised in the technical annex (in the online publication).

2. Bioenergy in Germany

In 2007 bioenergy¹ (relative to overall energy consumption) provided 3.9 percent of the electricity used in Germany, 6.1 percent of total heat and 7.3 percent of total fuel consumption. Bioenergy thus made up 4.9 percent of overall primary energy consumption.

Available potential for further use of bioenergy is offered by the agricultural and forestry sectors, with a portion of Germany's 17 million hectares of farmland (approx. 12 million ha arable land and approx. 5 million ha grassland) and a portion of its 11 million ha forest land.

According to the results of the Federal Forestry Inventory in 2002, wood reserves of 3.4 billion m³ have accumulated² because annual timber growth exceeded annual cuts. In 2006, between 20 and 25 million m³ of forest timber was used for energy production in Germany. This represents somewhere in the region of 1.0 to 1.5 percent of Germany's primary energy demand.³ Model calculations produced by the Johann Heinrich von Thünen Institute have identified reserves to allow greater timber use without jeopardising sustainable forest management practices. Timber reserves for use in energy production (mostly deciduous wood and forest wastewood) are estimated at between 12 and 19 million m³/year (between 65 and 11 PJ, or between 0.5 and 0.8 percent of primary energy demand in 2007). The lower figure involves a projection of current forest management rules into the future, while the higher figure assumes a specific reduction in timber reserves and in felling age over a period of 20 years. Given the many efforts to promote use of timber in Germany and in the rest of Europe, use of forest wastewood for energy production will play an increasingly important role.

With regard to the biomass potential in farming land, most studies assume constant levels of food and fodder supplies and come to the conclusion that in 2020 somewhere between 2.5 and 4 million ha of arable land could be available for biomass crops for use as raw materials and in energy production.⁴ In 2007, some 1.75 million ha were used to grow energy crops. To step up bioenergy production, further limited potential could be unleashed, primarily by increasing land productivity and by amending current agricultural policy. Improved conversion processes will also serve better use of available potential. Significant additional potential is also seen in the use of agricultural by-products, waste materials and biogenic waste for energy production.

Given the significant increase in biomass use needed to achieve the targets, it can be expected that in the medium and longer term, competition will intensify between the various types of use for biomass and the limited availability of farming land. This can already be observed at regional level in Germany. Other land-use objectives such as species and habitat conservation and soil and water protection limit the scope for using biomass in electricity production.

Assuming that domestic biomass potential is actually available in the full amount stated, the

anticipated technological advancement (e.g. use of whole plants) is achieved and the biomass produced is used in more efficient energy generation (via heat generation and combined heat and power), Germany has the potential to meet between 8 and 12 percent of its current demand and between 11 and 15 percent of expected primary energy demand in 2020.

The extent to which this technological potential can actually be used largely depends on developments in technology and energy efficiency, the raw materials used, the prices charged for bioenergy on domestic and international markets, and the provision of subsidies for bioenergy.

Based on current energy efficiency achieved with all types of bioenergy use and assuming today's usage distribution between heat (45 percent), electricity (30 percent) and fuel (25 percent), in 2020 domestic biomass will only meet a small percentage of primary energy demand. Market prices will dictate whether domestic or imported biomass is used. At the moment, imported biomass can prove cheaper than domestically produced biomass.

- 1 Solid, liquid and gaseous biomass, landfill and sewage gas, and biogenic waste
- 2 Measured in standing volume
- 3 Primary energy demand in Germany, 2007: 13,842 petajoules (PJ)
- 4 The wide estimation range for the area of arable land results from different assumptions in studies and differing estimates regarding trends in relevant factors such as population size, food demand, technical advancement, and consideration of other land use claims for housing, transport and nature conservation. Depending on the conversion technology used, this amounts to between 360 and 800 PJ/year.

3. Aims and Strategy

To meet the targets agreed in Meseberg, the share of bioenergy in primary energy demand must rise significantly by 2020 compared with the figures for 2007. According to a study conducted by the German Environment Ministry, a rise from 792 petajoules (PJ) in 2007 to 1,309 PJ in 2020 is needed at minimum.

Greater use of biomass must be achieved in an efficient and sustainable manner. The following criteria apply:

- Contribution to reducing greenhouse gases.
- Contribution to other environment policy goals, e.g. biodiversity conservation, soil fertility and preventing water and air pollution.
- Protection of valuable landscapes like the Natura 2000 sites (in Europe), High Conservation Areas (international) and areas which enjoy protected status, particularly those that function as major carbon sinks.
- Contribution to securing energy supply.
- Viability.
- Contribution to employment and value creation, especially in rural regions.
- Contribution to socio-economic development in developing countries.
- Account taken of conflicting claims, not least food crop production and use of biomass as a raw material.

Biomass use today and the expansion scenario drawn up in line with the Integrated Energy and Climate Change Programme agreed at the special Cabinet meeting in Meseberg on 23 August 2007, the EU Renewables Directive and the German Environment Ministry study are illustrated in the table below:¹

Theoretically, bioenergy available from domestic sources is sufficient to supply the quantities needed, and doubling the share of bioenergy in Germany by 2020 appears possible. What must be remembered, however, is that significant quantities of biomass are imported from emerging economies and developing countries. Depending on how things develop regarding competition, efficiency in biomass use and the setting of sustainability criteria, it can be expected that these imports will continue to rise.

To implement bioenergy expansion, the policy framework and the promotional measures must be strategically structured:

a) Greater use of bioenergy will be fostered in the heat, electricity and fuel sectors

Biomass is a versatile energy source and, depending on the raw material used, is suited to a variety of technologies: wood is particularly well suited to heat generation, biogas to combined heat and power, and oil seed to producing biofuel to power stationary and mobile engines. This potential must be exploited. Also, new technologies emerging in the heat, electricity and fuel sectors (which in many cases are not fully developed) should not be dismissed prematurely. While the use of biofuels (including second generation fuels) promises lower energy output compared with the use of heat and combined heat and power, biofuels are currently the sole renewable alternative in the mobility sector when it comes to securing supply. Although it can be expected that intensified introduction of electrically powered vehicles that run on renewables-generated electricity and other renewable energy sources like wind power can be used in the transport sector, the market is extremely small and still in its teething stages. Thus, in achieving the targets set by the German government to foster use of renewable energy, bioenergy use is indispensable in all three sectors (heat, electricity and fuel). Storage and distribution issues such as biogas supply to the national gas grid play a key role.

b) Greater availability of market-ready technology

Efficient and broad use of biomass for energy production is only possible if an adequate range of suitable technologies is available and placed on the market. Some of these technologies still need to be developed (e.g. biomass condensing boilers, electricity-generating technologies for small-scale facilities, biomass to gas converters to provide biomethane for electricity and heat generation, and second generation biofuels). Research efforts must thus be stepped up. And in responding to climate change, the transfer of efficient, environmentally sound, adapted technologies to developing countries must be encouraged.

	2007		2020	
	Total Renewable Energy	Of which Bioenergy ²	Total Renewable Energy Meseberg ³ (EEG or EE-RL)*	Of which Bioenergy ⁴ as per Pilot Study 2008
Share of REN in overall primary energy consumption	6.7 %	4.9 %	16 %	11 %
Share of REN in overall end energy use ⁵	8.6 %	6.2 %	18 %	10.9 %
Share of REN in overall electricity consumption/electricity supply ⁶	14.2 %	3.9 %	minimum 30 %	8 %
Share of REN in overall renewables use of heat	6.6 %	6.1 %	14 %	9.7 %

* German Renewable Energy Sources Act or EU Renewable Energy Directive

1 Share of biofuel under EU Renewables Directive; 12 percent (2020)

2 Incl. biogenic solid fuels, biogas, sewage and landfill gas, liquid biomass and biogenic waste

3 According to the Cabinet decision reached in Meseberg on 23 August 2007

4 As per the BMU Pilot Study 2008 'Ausbau der erneuerbaren Energien' (Promoting Renewable Energy)

5 Electricity, heat and fuel

6 Reference: Gross electricity consumption

c) Biomass use boosted via increased generation and use of heat

Arguments in favour of biomass-generated heat supply include the sparing of fossil energy reserves, value creation in rural regions, low CO₂ avoidance costs and a decentralised supply structure. In the short and medium term, therefore, use of biomass in Germany to generate heat – by burning wood for example – can be highly beneficial in environmental, economic and structural terms. However, the necessary conditions must be in place: for example, to restrict combustion-related air pollution.

The legal provisions agreed in Meseberg, which in the meantime have largely been implemented, will promote greater use of biomass for heating. The measures adopted (the Renewable Energy Heat Act, the Combined Heat and Power Act, the Gas Grid Access Ordinance and the amended Renewable Energy Sources Act) contain things like obligations to use renewables-generated heat in the highly cost-effective new buildings sector. They also promote intensified combined heat and power activities with the accompanying district heat networks, govern integration of biogas plants into microgas grids and foster processing of biogas to match natural gas quality, its supply to the national grid and subsequent

use in vehicles. The actual impact of these new laws must be observed on an ongoing basis and where necessary the provisions amended to meet prevailing conditions.

d) Untapped biomass potential will be exploited and used, among other things, to alleviate potential land use conflict

To make bioenergy expansion economic and environmentally efficient while at the same time alleviating potential conflicts concerning its use, other types of potential must be exploited. This is especially the case as regards biomass potential that has not yet been exploited or which has only been exploited to a limited extent: forest waste, biomass from landscape maintenance, biomass from manufacturing industry (waste and secondary products) and waste. These include silage, straw and organic waste whose use in energy production results in relatively high net effects in emission reductions and in employment and value creation without sparking a contest for land. These are all taken into account in the new version of Germany's Renewable Energy Sources Act (EEG) and are reflected both in its bonus system (as with the silage and technology bonuses) and in the provision for facilities with combined biogas and composting systems. Account must be taken of how using this potential affects biodiversity, soil fertility, particle levels and indirect emissions of nitrous oxide. Further potential is seen in the use of straw and similar plant materials for energy production and growing timber on arable land, e.g. using short rotation plantations.

e) Biomass must be produced using sustainable practices

Agricultural and forestry biomass production must use sustainable management practices to avoid any adverse impacts on society and the environment. This is also important in nurturing public acceptance of intensified biomass use. The environmental impacts of biomass production must be observed along the entire process chain to ensure that positive impacts are not countered by negative ones (e.g. CO₂ savings from the use of energy crops on the one hand and methane and nitrous oxide release during crop-growing or fermentation, or water pollution problems on the other). Apart from avoiding CO₂ along the entire processing chain, valuable habitats with rich biodiversity and/or which store large quantities of carbon must also be protected.

To ensure that imported bioenergy sources used in Germany either for further processing or direct use are grown, processed and marketed under verifiable sustainable conditions, sustainability standards and a certification scheme which conform to WTO requirements are needed. Minimum social standards must also be taken into account (labour and social law, the right to food and preventing illegal land confiscation).

f) Environmental pressures must be limited via suitable rules and regulations

In Germany, the same environmental provisions apply to the production of biomass for use in energy production and as a raw material as to food and feed production. For example, the requirements for good farming practice as laid down in fertiliser and plant protection law must be complied with. Against this backdrop, the Federal Ministry of Food, Agriculture and Consumer Protection must regularly monitor good farming practice and adapt the requirements as needed. In the case of bioenergy, the same environmental standards apply as for other energy production activities. However, the use of biomass for energy production causes emissions of other pollutants. With the help of suitable rules and measures (e.g. the use of filter systems to limit emissions), it will be ensured that these negative impacts are avoided as far as possible. In the interests of soil and water protection, the requirements for facility operators who store and decant silage, solid manure and silage seepages will be extended to cover facilities where fermentation residues are stored.

g) Cultural landscapes, impacts of biomass crops on them and their consideration in the building of biomass facilities

In connection with nature conservation law provisions to prevent significant impacts on nature and the landscape, consideration of the impacts on the landscape plays an increasingly important role. The task here is to develop strategies which provide for better integration of energy crops into cultural landscapes that secure the productivity and functioning of natural ecosystems and into regional economies. This calls for local planning of bioenergy facilities and of land use in their vicinity to be better coordinated with spatial planning at state (Länder), regional and local land-use level and with landscape and agricultural development planning.

h) Imports of sustainably produced bioenergy sources will supplement domestic biomass production

For competitive purposes, Germany will in the medium term be reliant on supplies from other EU member states or third countries in order to meet its energy policy targets. It can thus be assumed that with further trade liberalisation, companies in future export countries will often be in a position to produce biomass at cheaper prices. Imports should also be subject to criteria for sustainable production

and processing of biomass. While use of bioenergy results in diversification of energy supply, it must be remembered that it could also bring new forms of dependency.

i) Intensified bioenergy use in Germany must not compromise food supply in developing countries

Production of bioenergy provides opportunities for developing countries. These must be supported in their efforts to use those opportunities in pursuing sustainable development. But in providing such support, care must be taken to ensure that intensified biomass production for energy generation in developing countries does not conflict with food security or the right to food in those countries.

j) Conflict between use for energy and use as a raw material: Economic and environmental solutions

Use of biomass as a raw material, for example in manufacturing industry, should be given priority. Such use generally promises greater value creation and, as it spares both the climate and resources, can also be of greater benefit compared with biomass use for energy production. Where possible, biomass use for energy production should only occur as the final stage in cascades of uses for renewable raw materials. When enacting legislation and introducing promotional measures, it must be ensured that use of biomass as a raw material is not jeopardised in any way. This approach serves to prevent market distortion.

k) Bioenergy viability must be improved to make it more competitive with fossil fuels

Cost savings are to be expected from increased energy yields per unit area and from enhanced technologies to allow biomass-derived energy production. Greater viability is striven for, particularly as regards crop breeding and further development of crop-growing and conversion methods. Interesting ways of increasing overall viability could include coupling differing energy and raw material usage pathways (e.g. cascade use and biorefineries). The German government supports industry in many ways, not least with its High Technology Strategy and promotion of intensified research and development. Given that, with few exceptions, bioenergy is not yet competitive, it is reliant on further subsidies.

l) Options for use with particularly high greenhouse gas emission reduction potential must be exploited

When using biomass for energy production, greater use must be made in future of the option to attain particularly large greenhouse gas (GHG) emission reductions, for example with heat use and cogeneration. And by selecting suitable sites with nearby heat customers, feeding biogas into the gas grid and efficiently using biogas in CHP plants to meet local heat demand or for biofuel can achieve measurable CO₂ reductions. For this purpose, the German government has decided to subsidise biofuels based on their net contribution to climate change instead of the prevailing energy quota.

According to current estimates, the GHG emission reduction potential with second generation biofuels is greater than with first generation biofuels. Development of suitable technologies to market maturity is thus a top priority. Second generation biofuels will not be available in large quantities before 2020, however.

m) Bioenergy serves economic development and value creation in rural regions

Greater use of bioenergy provides incentives for economic development and employment. Given the resulting benefits and opportunities for medium-sized enterprises in rural regions and for farming and forestry, decentralised use of biomass should be fostered where viable. Options include heat generation and combined heat and power (cogeneration). Also, export of bioenergy production facilities provides additional opportunities for German business. The use of high-efficiency facilities abroad also serves climate change mitigation.

4. Measures to Promote Bioenergy

4.1 Sustainable Biomass Production

Bioenergy offers great opportunities, but to protect nature and the environment it must be produced sustainably to the same extent as biomass grown for food and feed. Its global contribution to climate change mitigation and to biodiversity conservation are key criteria. Public debate centres on the impacts of biomass crops on tropical rainforests and competition between biomass use and food security. In Germany, acceptance of bioenergy is threatened by fears concerning negative outcomes of non-sustainable production (such as shortened crop rotation) leading to a loss of organic substances in the soil (humus depletion) and to biodiversity loss. There are thus legitimate calls for negative developments to be avoided in the quest for sustainable development.

a) Monitoring and enhancing good farming practice

In Germany, requirements for good farming practice already provide binding rules which if complied with will lead to sustainable production irrespective of the intended use of the crops grown. Good farming practice must be regularly monitored and adapted where necessary. Also, the clear sustainable forest management regulations contained in the Federal Forestry Act and in Länder-specific forestry laws provide for 'good forest management practices' while taking account of regional conditions.

b) Sustainability standards

The German government aims to ensure that domestic biomass is sustainably produced and used. This involves providing proof that biomass crops are grown using sustainable management practices, and that biomass-derived products are produced sustainably and used efficiently. It is thus assumed that sustainability standards and associated certification systems will be established nationally, at EU level and internationally. For liquid biomass, this is already provided for at EU level with the provisions contained in the Renewable Energy Directive and for biofuels with those of the Fuel Quality Directive (98/70/EC). These are binding for all member states and must be transposed into national law. As yet there are no internationally recognised systems in place.

Germany's Federal Immission Control Act and Energy Taxation Act provide the legal authority to link the obligation to fulfil quotas and tax concessions to biofuels that meet the following criteria:

- Where production of the biomass used can be verified as meeting specific requirements for sustainable management of arable land
- Certain requirements are met regarding habitat protection
- A specific amount of CO₂ avoidance potential is proven

The Renewable Energy Heat Act sets out sustainability requirements for the type of biomass used. For example, palm and soya oil produced under non-sustainable conditions may not be used to comply with the Act's obligations to use renewable energy. The Act refers in this connection to the sustainability rules under the Biofuels Quota Act. The amended Renewable Energy Sources Act (EEG) contains sustainability requirements for biomass and these must be further defined in a separate sustainability ordinance. The German government's draft sustainability standards for biofuels, which will finalise these requirements and govern monitoring activities, are now being reviewed in line with the EU Sustainability Directive. A cross-departmental proposal for a sustainability ordinance for biomass-generated electricity was presented in March 2009.

c) Development and rapid implementation of sustainability standards at international level

Global acceleration in bioenergy use is fostering international trade in bioenergy fuels. It also reduces the effectiveness of national regulations. The German government is therefore active at international level in drawing up sustainability criteria. It supports EU activities like the adopted directive to promote use of renewables-generated energy and the amended fuel quality directive which sets out similar sustainability requirements. The government also believes it is necessary to engage in global-level activities in various international forums. A key focus of its efforts involves the G8 Global Bioenergy Partnership Initiative. The German government believes cooperation within the partnership will help establish a globally applicable institutional framework whose sustainability requirements will enjoy international recognition.

To prevent undesired and indirect changes in land use, the German government supports efforts to have certification of biomass for energy production supplemented by appropriate certification in other areas

where biomass is used. One example is the internationally recognised and widely-used sustainability certification for forests (e.g. FSC and PEFC). Key to the strategy towards bioenergy promotion is the timely and effective implementation in developing countries of the sustainability standards and certification systems currently being drawn up. This requires that standards and sustainability systems are developed in consultation with producers and other interest groups to ensure that the solutions arrived at are compatible with the conditions that prevail in developing countries. Small-scale farming structures in particular must be taken into account. Sustainability standards and certification schemes must aid implementation of international conventions on environment protection and nature conservation. They must also serve in fostering economic, social, cultural and socio-political human rights in developing countries.

d) Foster sustainability research and development

The German government actively promotes and conducts various types of research and development work on issues involving sustainable biomass use. These include crop-growing methods for energy crop production, broadening the scope for energy crop use, establishing sustainability standards and certification schemes, and biomass conversion. This work will be continued with high priority.

e) Consideration of production conditions in (future) biomass export countries

Growing demand for raw materials for use in bioenergy production and the resulting rise in market prices provide developing countries with new opportunities for economic development and poverty alleviation. Many developing countries anticipate currency savings, new export openings from a product that is in demand globally and solutions to domestic energy and transport problems. Growth in the agricultural sectors in emerging economies and developing countries can alleviate three times as much poverty and hunger than growth in any other sector (World Development Report 2008). Bioenergy production can thus serve in achieving the Millennium Development Goals.

At the same time, rising food prices and their impact on food security must be monitored. Hunger is largely caused by distribution problems and lack of purchasing power, and rising food prices can severely exacerbate the situation. The worst hit are poorer urban populations and marginalised rural communities who spend much of their income on food. The opportunities available to developing countries can only be taken up successfully if biomass production meets minimum social and environmental requirements and poses no risk to food security.

Funded by the German government (from the BMELV budget), the FAO Bioenergy and Food Security (BEFS) project aims to provide policymakers in Africa, Latin America and Asia with well-founded decisionmaking tools to assess the opportunities and risks involved in bioenergy use and rural development. The BEFS project is closely linked with the Bioenergy Impact Analysis (BIAS) initiative which forms a second pillar of the FAO's work on bioenergy. BIAS will analyse the environmental impacts of bioenergy use and integrate them into the sector.

4.2 Alleviating land use conflict

Growing competition for biomass and land on which biomass can be produced must be countered with the following measures (some of which have already been taken):

a) Increase yield per unit area in agriculture

- To achieve a sustainable increase in biomass yields on existing arable land, the German government promotes the development and optimisation of regionally adapted models for energy crop production.
- The breeding of plants with high energy yields per unit of land but minimal use of fertiliser and pesticides plays an increasingly important role. The government has thus made large amounts of research funding available.
- Further improvement of agricultural production.

b) Waste products and secondary products that do not compete with food production or other uses of biomass as a raw material

- Promote the use of straw through research, development and demonstration activities (the German government already funds associated projects)
- Incentives under the Renewable Energy Sources Act (EEG) should be used to foster greater use of silage and unused organic waste, including landscape maintenance waste (introduction of a silage bonus and landscape maintenance bonus, and increase the basic payments paid under the Renewable Energy Sources Act 2009 for facilities with capacities of up to 150 kW).

c) Exploit timber potential

- Assess the potential for more intensive use of sustainably produced raw materials.
- Simplify shared timber marketing through the establishment of forest owners' associations under the planned amendment to the Federal Forestry Act and increase efficiency in forest owners' associations marketing activities in line with the mobilisation bonus introduced with the Joint Task of Improving Agricultural Structures and Coastal Protection (GAK) programme.
- Implement further training and education measures to enhance professionalism among managers in forest owners' associations.

When mobilising timber reserves, the requirements of soil protection and nature conservation law (adequate quantities of deadwood, habitat protection for endangered species and biodiversity conservation) must be taken into account.

d) Simplify rules on short rotation plantations

- Remove short crop rotation plantations on agricultural land from the definition of forest when amending the Federal Forest Act (Bundeswaldgesetz). This would ensure that from a legal standpoint, the land remains agricultural land.
- Greater use of available promotional options for investment in short rotation plantations on agricultural land under the *Länder* programme on improving agrarian structures and coastal protection (GAK).
- Promote research and development.

e) Improve efficiency in biomass use

- Improve biomass to energy conversion processes using research, development and demonstration – particularly for processes that use the whole plant.
- Foster use cascades by promoting research, development and demonstration activities, and by creating an appropriate legal framework.
- Use research, development and demonstration activities to foster combined uses in which all components of the raw material are used, e.g. the biorefinery concept.
- Improve incentives for cogeneration in biomass-generated electricity under the Renewable Energy Sources Act (EEG). The CHP bonus contained in the Act was increased in 2009.

f) Review trade rules on the import of bioenergy sources

- Bioethanol and biodiesel are subject to varying import and customs controls.
- The German government is committed to creating a coherent customs system which, as opposed to the current system, will list biofuels in a standardised nomenclature.
- Biofuels produced overseas and for which no countervailing or anti-dumping duties are levied will in future be exempt from counting towards quotas and tax concessions.
- Creation of internationally recognised minimum standards (ISO) for biofuel quality.

g) Monitor markets

Rising energy prices and a significant increase in the use of renewable raw materials for energy production foster the link between energy and food markets. Crises in the energy sector and the associated rapid hike in prices (e.g. for crude oil and natural gas) can also impact on food prices. The relationship between land use, food supply and the energy sector must thus be monitored. The EU Renewables Directive contains an obligation for market players in the EU member states to document the production of biofuels and liquid organic fuels and also of the availability of food.

4.3 Heat from biomass

a) Renewable Energy Heat Act and the market incentives programme

Germany's Renewable Energy Heat Act (Erneuerbare-Energien-Wärmegesetz, or EEWärmeG) came into effect on 1 January 2009. Its provisions place owners of newly constructed buildings under obligation to use renewable energy to meet a portion of their heat requirements. Along with solar radiation and ambient heat, bioenergy and geothermal heat may also be used.

Under the Act, bioenergy may only be used if it is generated using highly efficient technology (e.g. liquid biomass for conversion to fuel and gaseous biomass in CHP plants). In place of renewables-generated heat, the provisions of the Act also allow building owners the option to use CHP and energy-saving measures and to obtain heat from district heating plants if the network is fed from a CHP plant or partially supplied with renewable energy.

In 2008, the German government made up to €350 million available for its Market Incentive Programme (MAP) to promote renewables-generated heat. This amount will be increased to as much as €500 million

for the period 2009 to 2012. MAP research activities will focus on investment in buildings to increase the share of renewable energy in overall heat supply.

Along with the obligation contained in Germany's Heat Act, further measures are needed in respect of new buildings. Large-scale heat storage units, facilities which process biogas to achieve natural gas quality, district heating plants fed with renewable energy and biogas supply lines have been promoted since 2008. Particularly innovative technologies like large-scale solar-thermal facilities and large-scale, low-emission biomass facilities are finding increasing favour. The prevailing promotional policy is regularly adapted to reflect market conditions and has no cut-off date.

b) Promotion under the Joint Task of Improving Agricultural Structures and Coastal Protection

Generation of electricity using biomass produces a significant amount of heat which as yet has been underutilised. To fully exploit the energy produced in biomass use, it often makes sense to transport the heat or the biogas itself to the site where the heat will be used. This makes promotion of district heat and biogas networks all the more important.

Thus, since 2008 investment in such supply systems has been promoted by the German government and Länder under legislation on the Joint Task of Improving Agricultural Structures and Coastal Protection (GAK), with funding provided under the heading of integrated rural development. The federal government provides 60 percent of the funding for GAK measures. Applying for and coordinating promotional measures is a Länder responsibility. Where GAK measures serve implementation of policy to promote rural development as defined in the EAFRD Regulation, federal and Länder funding can be supplemented by the European Commission under cofinancing arrangements provided for in the EAFRD Regulation. GAK also provides for bioenergy advisory services which are currently under review with regard to expanding their scope.

c) Restricting emissions

To restrict and reduce the risks from pollutants released during biomass-generated heat production, the planned amendment to the regulations on small and medium-sized combustion plants (1. BImSchV) provides for emissions standards for small-scale combustion plants to be made more stringent and for available technology to be improved. This will make it easier to place new technologies on a broader market. The amendment will also make it possible to use energy crops as regular fuel in small combustion facilities.

Research promotion will further improve biomass combustion plants in terms of emission reductions (and will also improve viability, reliability and ease of use).

d) Fuel and Assessment Standards

Fuel and testing standards have been developed for biogenic fuels to provide targeted optimisation of:

- The fuel preparation process
- The boilers in small-scale facilities

The ultimate aim is to establish a coordinated EU approach.

4.4 Electricity from Biomass

a) New Renewable Energy Sources Act

The amended Renewable Energy Sources Act (EEG) which came into force on 1 January 2009 provides for numerous changes in the biomass-generated electricity sector. It comes in response to prevailing market trends and the cost of raw materials. The most important new provisions involve incentives to foster greater energy efficiency and for greater use of biogenic waste and waste substances. The CHP bonus has been significantly increased and the Act contains ambitious new requirements for the use of heat generated during electricity production. For new facilities with capacities in excess of 5 MW, the entitlement to grid-feed payments under the EEG now only applies to electricity generated in CHP plants. This will ensure that more biomass-generated electricity is produced using cogeneration and that biomass plays a greater role in climate change mitigation and resource management. The use of agricultural waste in biogas facilities has been made easier in that selected plant-derived secondary products may be used together with agriculturally produced renewable raw materials. This alleviates conflict between use of agricultural raw materials for energy production and for food and feed production, and gives facility operators greater scope for flexibility. One particularly welcome provision is the climate balance for biogas production from silage. Given that far too little of the silage produced in Germany has been used to generate electricity in biogas facilities, a 'silage bonus' was introduced to provide a special incentive for silage use. Another new incentive to foster the use of waste comes in the form of a technology bonus for fermentation of organic waste in combination with subsequent composting of fermentation waste. Thus, use of organic waste for electricity production can be combined with its use as a raw material. The Renewable Energy Sources Act 2009 (EEG 2009)

authorises the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) in cooperation with the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) to prescribe sustainability requirements regarding the production of the biomass used and the emission reductions achieved when producing electricity from biomass. Once these regulations on sustainable biomass-generated electricity have been introduced, grid-feed payments under the EEG will only be granted if proof is provided that the requirements have been complied with.

b) Simplified biogas feed-in into the natural gas grid

The opportunities to feed prepared biogas (biomethane) into the gas grid must be improved in order to exploit efficient ways of using biogas. Biomethane can be transported via the gas grid to supply heat or fuel, and can also be used in CHP plants and in the transport sector. For this purpose, Germany's Gas Grid Access Ordinance (GasNZV), Gas Grid Payment Ordinance (GasNeV) and Incentives Ordinance (AregV) have been amended accordingly. These amendments entered into force on 12 April 2008. The most significant changes involve:

- The setting of a 6 percent target for 2020 and a 10 percent target for 2030 for Germany's gas demand to be met with biomethane
- Optimisation of the gas grid access regulations for biomethane (obligation on the part of gas network operators for priority access and priority grid-feed and priority transport)
- Greater transparency in the modalities for grid connections
- The setting of a lump sum for avoided charges for use of the grid
- Breaking down barriers in biomethane grid-feed via special provisions in the Gas Grid Access Ordinance and the Gas Grid Payment Ordinance, and by adapting the Incentives Ordinance (e.g. uniform quality standards, longer balance periods, greater scope for flexibility and special terms).

c) Research in line with the High Technology Strategy

- Improve efficiency and reduce costs by means of improved processes
- Further development of liquid-to-gas processes to provide for efficient use of ligno-cellulose biomass in medium-sized facilities
- Research to develop new, efficient combined heat (refrigeration) and power technologies for biomass use

Existing approaches for innovative technologies also harbour huge developmental potential.

4.5 Biofuels

Back in 2004, the German government developed a fuel strategy with a time horizon of 2020. It takes a dual approach: promoting innovation to increase the energy efficiency of generic engine technology and to place energy supply for transport on a broader base for the longer term. Biofuels play a key role in all of this. The fuel strategy is subject to ongoing change, including promotion and development of biofuels. Its implementation has already paved the way for significant activity, for example with the introduction of a minimum quota for biogenic fuels.

On 22 October 2008, the German government presented draft legislation to change how biofuels are promoted, the aim being to adapt the provisions on biofuel quotas in the Federal Immission Control Act and the tax concessions for biofuels contained in the Energy Taxation Act.

a) EU Fuel and Biofuel Directive

- In December 2008, agreement was reached between the European Parliament, the European Council and the European Commission on the biofuel and renewable energy directives. These provisions will largely decide the policy framework (especially regarding the sustainability ordinance) and must be implemented by the member states.

b) Fuel standards

- The amended 10th Ordinance under the Federal Immission Control Act (10. BImSchV) currently allows diesel to contain up to 7 percent biodiesel (B7) and petrol up to 5 percent bioethanol (E5). In implementing the EU Fuel Directive, a grade of petrol containing up to 10 percent bioethanol (E10) must be approved and licensed. In addition, E5 must remain available throughout the EU for vehicles that cannot run on E10. As soon as a national E10 standard and a compatibility declaration from vehicle manufacturers are available, the German government will revisit the matter of including E10 in the 10th BImSchV.

c) Greater use of biofuels and improved efficiency

- Research on use of first generation biofuels will make the use of biofuels easier, e.g. with studies on the compatibility of modern engines with higher biofuel quantity mixes and the emissions produced by the engines.
- As part of the reporting requirements under the Energy Taxation Act on the placement on the market of biofuels and price trends for biomass and crude oil, a check must be made whether the tax rates for biofuels should be adjusted in the event of over-compensation.

d) Greater promotion of second generation biofuels

- Projects on producing synthetic fuels from biomass using differing processes will be conducted to find ways to produce second generation fuels in pilot and in industrial quantities. The projects will help in evaluating technologies and answering unresolved issues regarding environmental and economic impact assessments.

e) Promotion based on net contribution to climate change mitigation efforts

- To reduce greenhouse gases, biofuels should in line with the EU Directive only be promoted in connection with quota requirements and tax legislation if the GHG emissions they save compared with fossil fuels amount to:
 - a) For new facilities, at least 35 percent (applies from April 2013 to existing facilities which were in operation on or before January 2008)
 - b) At least 50 percent from 2017
 - c) At least 60 percent for facilities taken into operation from 2017
- Instead of a fixed percentage of energy, biofuels counted towards the quota from 2015 should be rated by their respective net contribution to greenhouse gas reductions, with the outcome that biofuels with a favourable greenhouse gas balance receive a higher calculation factor under the quota regulation and are thus favoured in place of other biofuels.

f) Biomethane as a fuel

- In line with the draft legislation to amend promotion of biofuels, it will be possible in future to count biomethane towards both the petrol and the overall quota.
 - Use of biomethane in the transport sector will be further promoted. This will spark new impetus in the preparation and feeding of biomethane into the grid.
 - The requirements for feeding biomethane into the grid will be improved in line with the biogas grid-feed regulation shown in Section 4.4.

g) Hydrated plant oils

- To make it easier to comply with the biofuel quota, biogenic oils which are hydrated together with mineral oil-derived oils in refinery processes will be counted towards biofuel quotas for compliance purposes. The fuels produced in this way are of excellent quality. Counting hydrated oils for compliance is possible on the condition that the oil crops are grown and used under sustainable conditions and a minimum of 7 percent biodiesel is placed on the market (based on the overall quantity of diesel plus the biofuel). The share of hydrated biogenic oils will be limited to 3 percent.

4.6 Other Measures

a) Research, development and demonstration projects

- Much research is needed before we can achieve optimal use of bioenergy. Thus, new research approaches are to be explored for sustainable production of vegetable biomass as defined in the German government's High Technology Strategy. This will be done by combining expertise from science and industry to develop a set of common, strategic goals. Research is needed on use of the latest methodological trends, particularly in the plant breeding, biotechnology and biomass conversion sectors. This will help achieve a huge increase in efficiency in production and use of agricultural raw materials, which is necessary to effect a substantial rise in the share of energy from domestic biomass and to foster competition at international level.
- In February 2008, the German government opened the German Biomass Research Centre (DBFZ) which will be developed into a centre of excellence for bioenergy research. This will take place in connection with public research in agriculture, forestry, energy and environment, among others with the BMELV research department, the Helmholtz research centres, the Länder-based research institutes, universities and technical colleges, and other German, European and international institutions who conduct biomass research. The DBFZ has the task of performing applied research and development on the use of agricultural and forest biomass for energy production, and is intended to assume a coordinating role in this field. Research activities will range from conditioning, to biomass conversion to electricity, heat and fuel. The DBFZ receives its basic funding in the amount of €4 million from the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV). Additional project and

cooperation-related funds are provided by other ministries.

- The German government will continue to promote high-level research, development and demonstration projects.

b) Promotion under the Climate Change Initiative

Since early 2008, funds accrued from the sale of emissions trading certificates have been used to finance a climate change mitigation initiative. Some €400 million was available in 2008. The initiative comprises a national section and an international section. The aim is to exploit existing potential for emission reductions with cost-effective measures and in broader scope, and to promote model projects. Promotion focuses on climate change activities which serve to increase energy efficiency, foster use of renewable energy and optimise biomass use in energy, heat and fuel production. This involves projects and facilities for biogenic waste, system studies and international cooperation activities, biomass-to-gas technologies, biomethane imports and sustainable bioenergy sources.

c) International cooperation

The German government actively cooperates with international institutions and committees, notably with the International Energy Agency in Paris. It also supports the activities of the Global Bioenergy Partnership (GBEP), a G8 initiative launched in 2005. The GBEP is currently the largest internationally organised group of states to tackle issues such as sustainable management of biomass. It provides opportunities to establish internationally applicable criteria for sustainable use of bioenergy and promotes memoranda of understanding to ensure that biomass is produced under sustainable conditions. In addition, memoranda of understanding are to be encouraged in order to ensure that biomass is produced sustainably.

The huge importance of bioenergy around the world will also receive adequate consideration from the newly founded International Renewable Energy Agency (IRENA). IRENA will implement suitable measures to promote the use of bioenergy worldwide.

d) Informing the public and forming networks

- Bioenergy use touches on many areas of life. It is thus vital to step up public relations work which targets biomass producers, industry and trade, consumers and others interested in this subject.
- As part of the Bioenergy Regions competition launched in 2008, some 25 model regions were chosen to demonstrate how bioenergy use can be promoted by involving the public and linking the actors involved. By calling for sustainable bioenergy structures, promotion will focus on things like locally adapted bioenergy projects: for example, use of biomass in decentralised heating plants in conjunction with district heating supply.
 - Establishment of permanent, industry-funded networks whose members include non-governmental organisations.

e) Supporting industry

- The development of modern processes and technologies for efficient and environmentally sound use of bioenergy is a prerequisite in increasing the share of bioenergy in Germany's energy supply. Under its High Technology Strategy, the German government funds numerous research, development and demonstration activities which focus on renewable raw materials and combine efforts from industry and science. Industry, for its part, must intensify its research and development efforts and create innovative projects to market suitable technologies and services. State assistance can only ever play a supporting role.
- The German government promotes export opportunities, for example with its Renewable Energy Export Initiative and its Energy Efficiency Export Initiative.

f) Developing countries

- Advising partner countries as part of development cooperation endeavours to develop and implement strategies for sustainable biomass production.
- Support with demonstration projects.
- Support in the development and implementation of standards and certification schemes.
- Support in the development of large-scale land use plans.
- Advising on the implementation of policy instruments which allow evaluation of the conservation value of available land.
- Advising on the development and dissemination of decentralised/local energy supply using bioenergy.
- Advising on the impacts of bioenergy production on the food situation in developing countries and support in linking national biomass strategies with securing food supplies and combating poverty.
- Transfer of knowledge and technology: training of specialists from developing countries at German

universities, via vocational education and training in industry for employment in their home countries and in joint research and development projects.

- Boost local agricultural education and training and advisory services in cooperation with non-governmental organisations.

5. Summary and Outlook

Bioenergy covers almost 5 percent of Germany's primary energy needs. This spares fossil fuel resources and makes a significant contribution to climate change efforts. It also boosts value creation and fosters the creation of large numbers of jobs. This share is to be increased significantly in the period up to 2020 in attempts to achieve the targets contained in the EU package of measures announced in April 2009 and in Germany's Integrated Energy and Climate Change Programme of August 2007.

Important measures in promoting bioenergy use in Germany have largely been implemented with the package adopted by the Cabinet on 5 December 2007 as part of the government's Integrated Energy and Climate Change Programme. Key legislative provisions are contained in the Renewable Energy Heat Act (EEWärmeG), the amended Renewable Energy Sources Act (EEG), the special rules contained in the Gas Grid Access Ordinance (GasNZV, GasNEV and AregVO) and the draft Sustainable Biomass Ordinance (BioNachV). But these are only some of the measures that need to be taken. The Biomass Action Plan highlights both the strategies that must be followed if we are to promote more efficient, sustainable bioenergy production and the action that is needed in doing so. The following issues are of particular importance:

Germany's agriculture, forestry and waste management sectors harbour vast bioenergy production potential. To exploit this potential, great efforts and the involvement of many and varied actors are necessary. In particular, the availability of marketable technologies must be increased and an infrastructure created to allow their broad use. While in theory, domestic biomass can meet the biomass demand calculated in the roll-out scenarios, there are already signs that for reasons of availability and locational advantage, the bioenergy market is becoming increasingly more internationalised and Germany will be forced to import a growing share of bioenergy sources. This means that global issues such as the worldwide potential and the impacts of intensified bioenergy use must be taken into account in current and future bioenergy export states. Available resources must be managed wisely to ensure their long-term availability and to prevent their use conflicting with other policy objectives like environment protection, nature conservation and food security.

Intensified bioenergy use will foster competition for land and for certain raw materials. The Action Plan comprises an entire package of measures which will be further defined in a next step. The package aims to prevent or at least minimise conflict concerning biomass.

It is equally important to keep an eye on the wide variety of social needs and to take legitimate interests into account. Acceptance of intensified bioenergy use can only be achieved if we are successful in explaining complex interrelationships and in fostering public participation. Finding the right public relations approach and providing the necessary information and guidance are thus a top priority. Model projects are a key element in such efforts because they enable local people to get involved in activities close to home.

The extent to which intensified biomass use can be achieved will largely depend on prevailing economic conditions (e.g. energy price trends and the markets for food and feed), on technological advancement and on the innovative prowess of German industry. The German government can only use available policy instruments to create the necessary legal framework and provide incentives, the reason being that, in many cases, bioenergy is likely to remain uncompetitive for the foreseeable future. This makes ongoing promotion and subsidisation a necessity. Of particular interest is that in promoting biomass use, each of the three sectors – heat, electricity and fuel production – must be adequately considered and market distortions prevented. But in terms of the usage pathways and the technologies used, the markets will regulate themselves to a great extent. Despite the limited availability of biomass as dictated by nature, focus will not be placed on promoting any one sector because biomass promotion is designed to provide all three sectors with the greatest possible technological and economic opportunities to achieve successful implementation of all planned objectives and targets. While diversity in technologies and markets provides the necessary foundation, it should not be forgotten that the market will favour the most efficient ways of using biomass.

In the longer term, use of biomass must be optimised as regards its GHG emission reduction

potential and its energy efficiency. The Action Plan contains measures to foster such efforts and structure promotional activities towards achieving this common goal. This includes promoting greater use of heat and linking subsidisation of biofuels to their net contribution to climate change.

Research, development and demonstration are vital in promoting biomass use. The German government has stepped up its efforts significantly in this regard. The aim is to accelerate technological advancement and expand the scope for biomass use. Research will also broaden available knowledge on the environmental impacts of biomass use, for example to allow more accurate calculation and more targeted use of available emissions reduction potential.

Intensified bioenergy use can only be successful if production occurs under sustainable conditions. The legal framework is now being established at EU level and in Germany, although efforts at international level are still in their teething stages. There is thus an urgent need for international standards and certification schemes to ensure that bioenergy traded on international markets is produced sustainably. The German government champions these issues in relevant international bodies. It also intends to support developing countries in drawing up their own biomass strategies. In terms of their general economic development and in the fight against poverty, the opportunities offered by the production of bioenergy in these countries should be used without it impacting on food security in those countries. Measures for development assistance and technology transfer are planned.

Greater use of bioenergy, as described in this Action Plan, must be seen in the context of promoting all types of renewable energy and must go hand in hand with huge efforts to cut energy consumption and improve energy efficiency. The Biomass Action Plan will be integrated into the Renewable Energy Action Plan which the German government must present by June 2010 to comply with the requirements of the EU Renewable Energy Directive.

Photos:

Brigitte Hiss/BMU (Title); Frank Ossenbrink (4); Thomas Stephan/BLE (4); DigitalVision (6); Matthias Lüdecke (7); BMELV (8); BMELV (9); blickwinkel/MCPHOTO; BMELV (11); Bernd Müller/BMU (12); BMELV (13); Bernd Müller/BMU (14); dpa/Picture-Alliance (15); Lineair/Das Fotoarchiv (17); Roland Hottas (18); die bildstelle/MCPHOTO (19); DigitalVision (20); dpa/Picture-Alliance (15); Anja Kessler/Das Fotoarchiv (26 left); Herbert Scholz/Keystone (26 right); Stefan Kiefer (27 left); Michael Reichel/air (27 right); Ulrich Baumgarten/vario images (28); Holger Spiering/Westend61 (29)

Publisher's information

Publisher

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU)
11055 Berlin, Germany
Internet: www.bmu.de

Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz (BMELV)
11055 Berlin
Internet: www.bmelv.de

Editor

BMU, Referat KI III 2, BMELV Referat N2

Design

design_idee, buero_fuer_gestaltung, Erfurt

Status:

April 2009

Printed by:

BMELV