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Wood energy will remain indispensable for a long time to come Making its sustainable production and use all the more important

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Generating energy from wood is considered to be an outdated and dirty business. This is because unsustainable production and inefficient use of wood energy have negative impacts on the environment, the climate and people. However, wood is the world's most important renewable energy source for cooking, and alternatives are often not available in developing countries. The Food and Agriculture Organization (FAO) estimates that almost 90 % of wood in Africa is used for firewood or charcoal. Combined with population growth, this will drive up the huge demand for timber – by an estimated 40 % by 2040 in sub-Saharan Africa alone. In light of this, there is no alternative but to counter the unsustainable production of wood energy and its inefficient use. Indeed, the sustainable production and efficient use of wood has a number of advantages for the environment, climate and people.

About 2.7 billion people – more than one third of the world's population – are still dependent on traditional energy sources, especially firewood and charcoal. This is particularly true in developing countries. For example, four out of five people in sub-Saharan Africa use firewood and charcoal to cook, heat or purify drinking water (IEA 2014). And many small companies in developing countries also use wood as their primary energy source, for example to dry tea, fruit and cocoa or to burn building materials such as bricks. In sub-Saharan Africa (excluding South Africa), wood accounts for more than 70 % of total final energy consumption (WBA 2016).

But it is not only in developing countries that wood energy still has a bad reputation because of its many harmful effects on the environment, the climate and people.

Environment and climate: Unsustainable timber extraction and charcoal production contribute to deforestation and forest degradation: in developing countries, this accounts

for 31 % of deforestation and forest degradation. In Africa, the amount is as high as 48 % (Hosonuma et al. 2012). This makes the soil susceptible to wind and water erosion, which gradually removes the fertile particles, thus destroying it. In addition, carbon dioxide (CO₂) is released through deforestation. Flue gases are generated when charcoal is inefficiently produced and inefficient stoves are used. All of this – from deforestation to burning – has a negative impact on the climate.

People: In Africa, cooking is usually done indoors over an open fire or with inefficient stoves. This produces toxic flue gases polluting the indoor air. According to the World Health Organization (WHO), the so-called “indoor air pollution” causes severe health problems, resulting in more than four million premature deaths per year. Women and girls in particular often spend many hours a day collecting wood – time that they could use more productively, for example for earning money or going to school.



Women cooking on open fire

Don't condemn wood energy

Despite these effects, wood energy as the most important primary energy source in Africa should not be condemned as a whole, but instead the problems associated with it should be addressed. In many areas there are no alternatives and the use of wood opens up numerous opportunities.

Electricity, kerosene and liquefied petroleum gas (LPG) would be alternative fuels to wood. Without economic incentives, they are too expensive for the poor inhabitants of cities. Acceptance of the new technology and suitable distribution systems in rural areas are also lacking. The same applies to solar modules, but their use in everyday life has additional limitations, as their output depends on the sun's rays and decreases to zero with darkness. In low-income countries in particular, the lack of available, accessible and affordable alternatives leads to wood energy dependence (FAO 2017).

Wood energy currently accounts for over 50 % of the national energy supply in 29 countries, mainly in sub-Saharan Africa (FAO 2017). Demand will increase in the future due to population growth and a lack of alternatives – and because there's money to be made in wood.



Quote

"People, especially in sub-Saharan Africa and South Asia, will continue to depend on wood for decades to come," says Klaus Gühr, head of the KfW Competence Centre Infrastructure and Natural Resources.

Producing biomass sustainably

On the other hand, modernising the

entire value chain of wood and charcoal offers social, ecological and economic potential.

Instead of logging wood at will, sustainable forest management improves the yields for wood energy production in the long term. Management plans are an important tool for this. They would define, for example, what measures are needed to restore degraded forests; or the maximum amount of wood that should be removed so that people can benefit in the long term from the products and ecosystem services of the forest.

In addition, farmers can integrate trees into their agriculture, in other words, engage in agroforestry. These trees can not only be used to generate wood energy, but also have other advantages: they provide shade, can reduce susceptibility to pests, increase agricultural yields, diversify production and improve both soil and resilience to negative climate impacts.

However, wood from sustainable management and agroforestry is often not sufficient to meet the enormous demand for wood energy. Furthermore, there is a high and growing demand for timber for construction purposes and for industrial applications. In addition, impoverished areas – meaning areas unsuitable for agriculture – can be afforested with energy forests. Their primary purpose is to provide wood for direct use as firewood or for the production of charcoal. For such areas, tree species should be selected that grow quickly despite poor nutrient supply in the soil, have strongly branched roots and are resistant to drought.

In Madagascar, for example, around 26,000 hectares of smallholder energy wood afforestation will be realised by 2020 through German development cooperation. This improves the energy supply of participating farmers and reduces the pressure on the natural forest.

Converting wood efficiently

The urban population of Africa cooks primarily with charcoal. It has higher heating value and is easier to transport and trade than firewood. However, production in traditional kilns is

associated with high conversion losses: six tonnes of wood make just one tonne of charcoal. If, on the other hand, modern plants are used, the yield can be doubled or even quadrupled (Sepp et al. 2014).

Modern technologies can also greatly reduce the negative effects of using wood energy. Efficient cooking stoves require significantly less wood: between 30 and 60 % less fuel than conventional stoves. This not only saves wood, but also reduces work and expenses for households. Commercial plants require only 30 % of the original amount of fuel (GIZ 2016).



Facts and Figures

More than one third of the world's population – are still dependent on traditional energy sources, especially firewood and charcoal.

In sub-Saharan Africa wood accounts for more than 70 % of total final energy consumption.

Sustainable wood energy potential

If wood energy is produced sustainably and used efficiently, ecological, social and economic potentials result.

Environment and climate: Afforestation to obtain wood energy can restore depleted soils and increase their biodiversity. If they are placed between existing forests (e.g. in nature reserves), they can reduce the pressure on the natural forest. They can also network habitats in such a way that animals and plants can switch between them and eventually spread.

The sustainable management of forests also helps to avoid the loss of further ecosystem services and to halt the progressive degradation of soils. Experience from financial cooperation (FC) with Chile shows that sustainable forest management can maintain the productivity of the forest and at the same time offer the possibility of harvesting trees sustainably for various purposes, such as energy.

In addition, forests are essential carbon stores, in that if degraded forests

are restored or forest areas expanded and managed sustainably, more carbon is bound. Industrialised countries are already taking advantage of this positive climate effect and promoting the use of wood energy to reduce greenhouse gas (GHG) emissions and thus achieve their international climate targets. In the European Union in 2015, wood energy accounted for the largest share of the renewable energy mix at 45 %.

Users of charcoal produced with sustainably managed resources and improved technologies are also low net GHG emitters, helping to reduce the impact of climate change. Compared to non-sustainable wood energy and other fuels such as LPG and kerosene, sustainable wood energy scores best in terms of carbon dioxide emissions (including emissions from transport and production) (see Figure 1).

If modern technologies can be disseminated throughout the country, emissions can be reduced particularly quickly and effectively.

People: The promotion of sustainable wood energy improves energy supply. This is particularly important because people in developing countries depend on energy to cook and prepare drinking water, among other things. 90 % of staple foods must be cooked before they can be digested by humans. In addition, many households use wood energy to conserve food, such as by smoking or drying, which prolongs the supply of food in non-productive periods (FAO 2017). A better energy supply thus also promotes food security.

In addition, the highly negative health effects are reduced as improved cook stoves produce less smoke and CO₂ compared to open fires. According to FAO calculations, up to 63 % of GHG can be reduced in this way. It also reduces the risk of burns as compared to cooking on open fireplaces. Both have positive effects on human health.

Wood and charcoal are important economic goods in rural regions, especially in developing countries. The

harvesting and carbonisation of wood, as well as the transport and marketing of firewood and charcoal, generate additional income. 30 % of the income from forestry can be attributed to the production of wood energy (Angelsen et al. 2014).

If forests are actively and sustainably managed, this also secures these incomes. In Chile, the wood growth of sustainably managed forests was even up to 100 % higher than without management. This was due to thinning activities where individual trees were removed to give others more space to grow. Further income can be generated through the introduction and dissemination of more efficient cooking technologies – provided that the local population manufactures and sells the modern cook stoves themselves (GIZ 2016).

Challenges

Although sustainable wood energy offers many advantages, some challenges need to be overcome in order to realise this potential.

Competition issues: Afforestation for wood energy can compete with other forms of land use, such as the cultivation of food – and in the worst case displace them. The local population would then neither accept the afforestation nor support and care for it, which would directly endanger its sustainability.

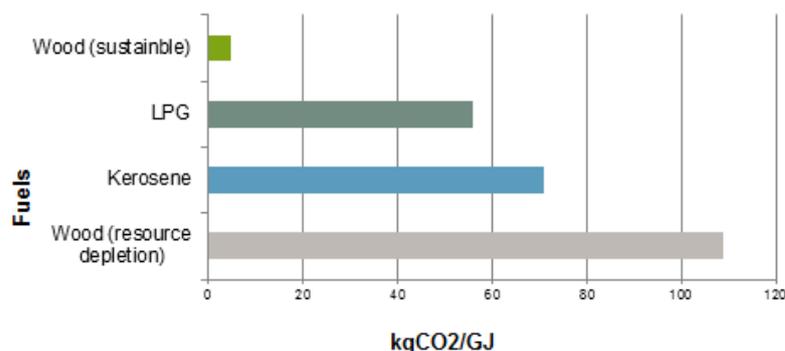
Therefore, afforestation should only take place on depleted land that is not used by the local population. Measures should also be planned and implemented with the population to

ensure that they complement existing forms of land use rather than compete with them. The clarification of land tenure is also an important aspect in ensuring sustainability. Only if the forest farmer can actually profit from the harvest will future income from afforestation and management be guaranteed.

Price issues: Introducing efficient cooking stoves requires immense commitment. According to World Bank estimates, half of households in sub-Saharan Africa cannot afford to buy either firewood or charcoal. Instead, people collect wood themselves. If people cannot even afford to pay for fuel, they will surely not be able to afford a modern cook stove. Even low-priced products are still beyond the reach of many households. As long as wood is otherwise available, it will be difficult to switch to modern technologies. In the past, programs to introduce efficient cooking stoves have been successful in areas where the price of wood energy or the time to collect enough biomass was high (Sepp et al. 2014).

Changes in the design and manufacture of cook stoves – along with economic incentives – can reduce the purchase price. Those who, despite everything, cannot afford a one-off payment can be supported by FC through grants and microfinance programmes. At the same time, there is a need to provide clear information and for the new technology to be designed to suit regional eating and cooking habits so that the population actually accepts it.

Figure 1



Source: adapted after Quaschnig 2013; EUSTAFOR 2010

Tax issues: In developing countries, wood energy is largely produced, transported and traded informally and illegally. Corruption and negligent monitoring of checkpoints allow for tax evasion and cost savings. There are competitive disadvantages for official sellers who have to charge higher prices in order to make a profit. High-ranking entrepreneurs and civil servants are often involved in this process (GDI 2016). African national budgets thus lose annual tax revenues of USD 1.5 to 3.9 billion (UNEP 2014).

Subsidies for afforestation and increased taxes on non-sustainable wood energy can promote sustainably produced wood energy. They are justified because of their positive effects on the climate – a public good – and the reduced pressure on natural forests. These offset the additional costs of this energy compared to informally produced wood energy. Incentives can also be created by returning part of the taxes on sustainably produced wood energy to the municipalities. In general, formalisation harms those who produce, transport and trade wood energy informally.

In both the forestry and biodiversity sectors, German development cooperation projects should support the introduction of appropriate incentive systems to promote sustainable wood energy. This should be accompanied by effective forest controls and appropriate training for forest and municipal workers.

Concurrently, research, development and market introduction of affordable, holistic CO₂-free energy technologies and applications should be promoted.

KfW Development Bank plans to investigate how the sustainable production and efficient use of wood energy can be promoted in East African countries (Kenya, Tanzania, Uganda, Rwanda, Ethiopia, Burundi, Democratic Republic of Congo). It is also examining whether and how the dissemination of modern technologies to protect the health, environment and supply of the poorest sections of the population can be economically viable – and what concrete contribution KfW could make.

Conclusion

Wood energy is and will remain sub-Saharan Africa's most important primary energy source for the long term in the coming decades. It is therefore all the more important to make its production sustainable and its use efficient. The introduction of sustainable production methods and efficient use technologies for wood energy combines favourable environmental and climate aspects with benefits for people. It not only reduces the impact on climate and nature, but also increases access to energy and food. Afforestation of energy forests and its sustainable management can bind more CO₂ and produce more biomass for renewable energies.



Literature and link selection

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Photos

P. 1: KfW Photo Archive, Bernhard Schuria

P. 2: KfW Photo Archive, Bärbel Högner



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