

ENERGY

DIGGING FOR FUELS

Can alternative fuels save the planet? Some, such as tar sands, are obviously dirty. But growing biofuels takes lots of land, and they may not be as climate-neutral as once hoped.

Soils, and the rocks beneath them, harbour much energy. Biomass grows above; fossil fuels and geothermal reserves lie below; solar and wind farms are built on the surface. Worldwide, the rising demand for energy means that larger areas of land are needed to generate it. In the last 20 years, classical fossil fuels such as coal, oil and gas have been joined by tar sands, shale gas and biofuels.

In Canada, tar sands cover 15 million hectares, an area larger than England’s 13 million hectares. In 2012, they produced 1.9 million barrels of oil per day – a significant proportion of the world’s daily consumption of 90 million barrels. But extracting the oil requires a lot of land, energy and water, and results in widespread environmental destruction. The sands lie an average of 30 metres below the surface; to reach them, forests must be cleared and topsoil removed. Separating the oil from the sand produces four times more greenhouse gases than the refinement of conventional petroleum. Producing a barrel (159 litres) of oil creates 636 litres of toxic wastewater. The mined area ends up looking like a lunar landscape; its ecosystem utterly destroyed.

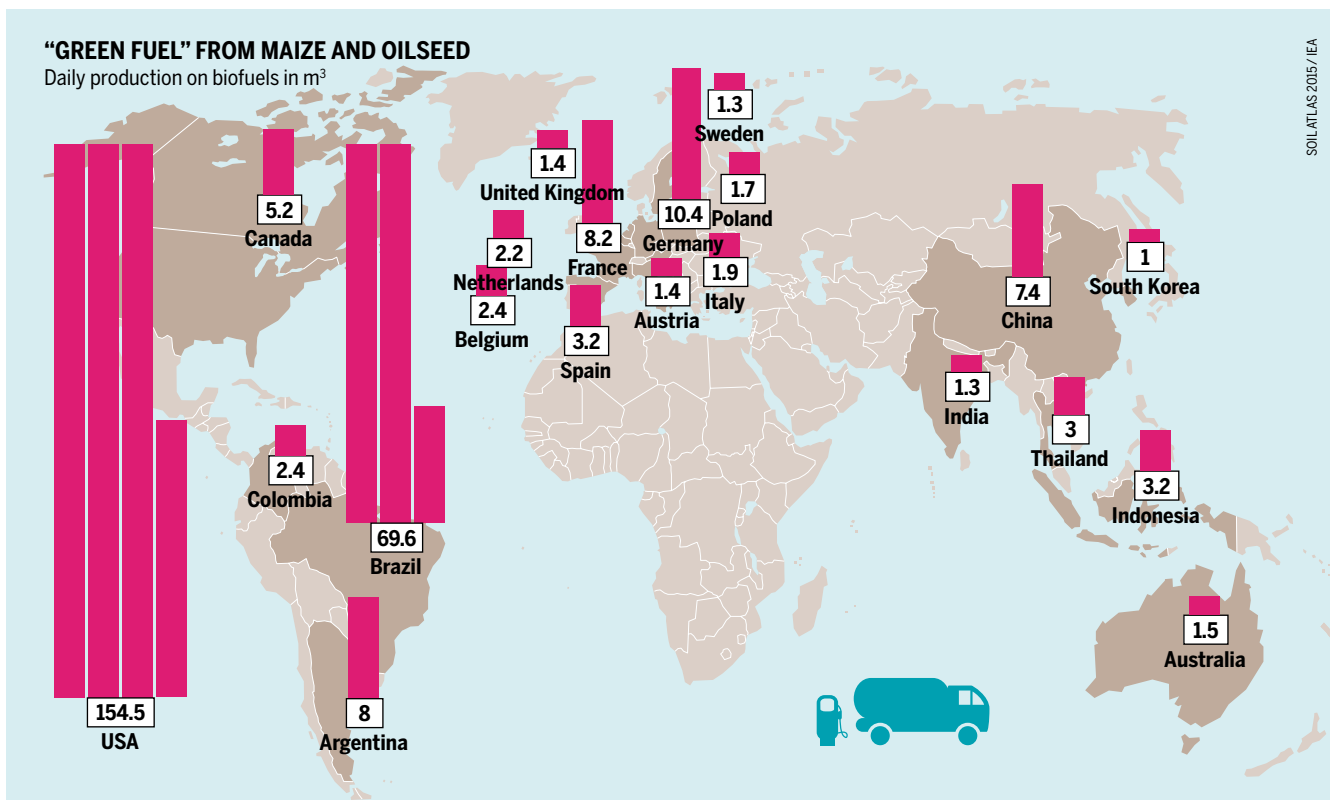
By 2010, oil shale accounted for 20 percent of the gas production in the United States. By 2035, it is forecast to reach

46 percent. One-tenth of the surface area of the United States may be suited for fracking. The land is scarred by production facilities, petrochemical infrastructure and pollution; the ground is left contaminated because the chemicals injected into the rocks do not degrade.

Conventional sources of energy also harm the soil; 40 percent of Germany’s open-cast lignite mines are flooded and are only of interest to water sports enthusiasts. Efforts to reclaim the mined-over land usually fail because of the costs; the original ecosystem and soil quality cannot usually be restored.

Renewable sources of energy such as biofuels, receive a lot of political support. They supposedly mitigate climate change and reduce dependency on non-renewable resources. A European Union directive requires that by 2020, at least 10 percent of transport fuels must come from renewable sources. A renewable energy law in Germany supports the use of biomass and biogas to produce heat and electricity. The necessary biomass comes from energy-rich crops such as maize and rape. But in terms of the land used, these biofuel crops are an inefficient way of saving the climate. Compared to wind farms or solar panels, they harvest only one-tenth of the energy per square metre.

Field crops produce almost 300 million cubic metres of biofuels a day. At the same time, almost 800 million people go hungry



GROUND GOBBLERS AND JUICE PRODUCERS

Alternative energy sources and renewable fuels compared

■ Square metres needed to light a 20 W lightbulb for a year

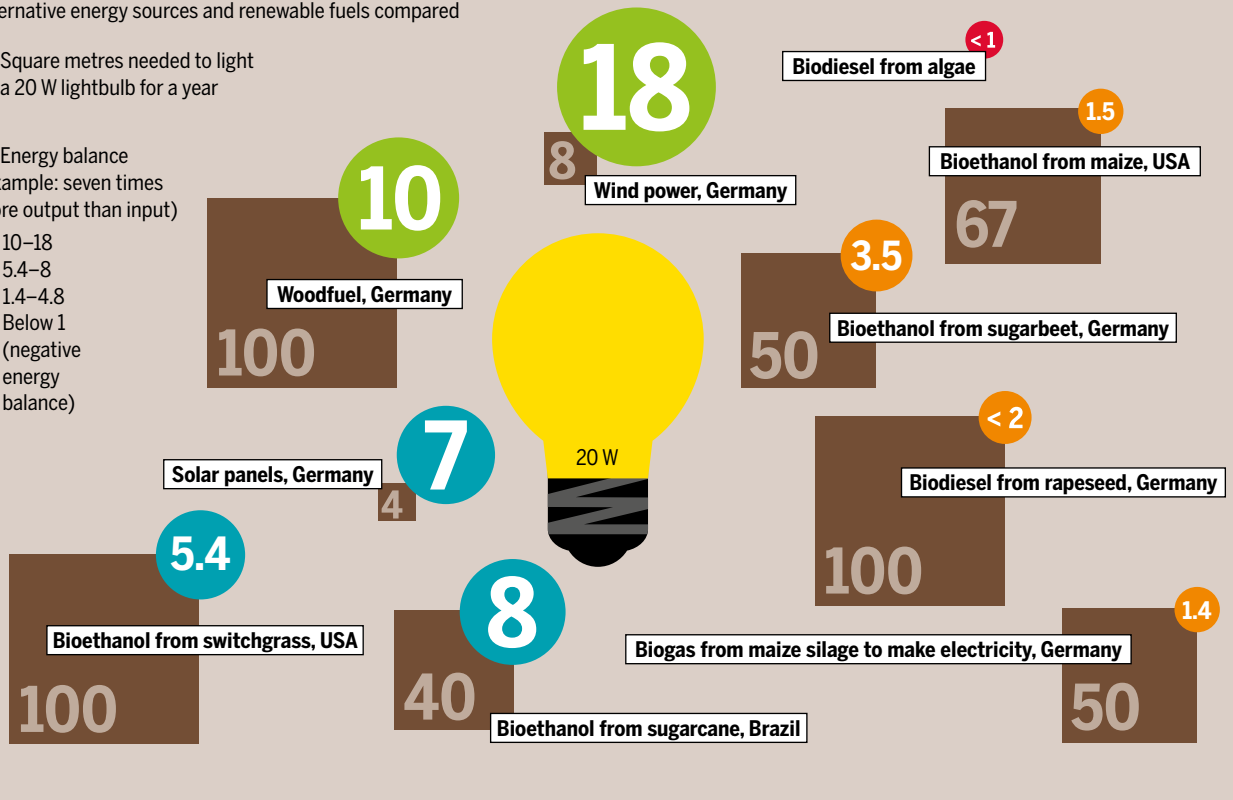
⑦ Energy balance (Example: seven times more output than input)

● 10–18

● 5.4–8

● 1.4–4.8

● Below 1 (negative energy balance)



SOIL ATLAS 2015 / LEOPOLDINA

At first sight, using biomass for energy appears climate-neutral; the crops pull carbon dioxide from the atmosphere by photosynthesis, and the same amount of greenhouse gas is released when the biomass is converted to energy. But this ignores three issues:

- Additional energy is needed to produce the biomass – for growth, harvesting, processing and transport. Applying manure as a fertilizer releases lots of methane, a greenhouse gas 25 times more potent than carbon dioxide. Using synthetic nitrogen fertilizer releases nitrous oxide, with 300 times the potency. These emissions must be counted against the biomass when comparing the energy budgets of different sources.
- Biofuel production generally replaces some other type of land use. Converting land can generate new emissions, for example when woodland is cleared or pastureland is ploughed. It is not yet clear how much extra greenhouse gas this produces.
- Biofuels also affect biodiversity, water resources and soil quality. These areas have not yet been adequately researched. Throughout the world, monocultures are spreading and new, environmentally damaging trade flows are arising – for wood pellets, biodiesel and ethanol. Where the crops are grown, biodiversity suffers while the use of water and agrochemicals rises. Land used to grow biofuels cannot be used to grow food. This poses an ethical dilemma while 800 million people continue to go hungry.

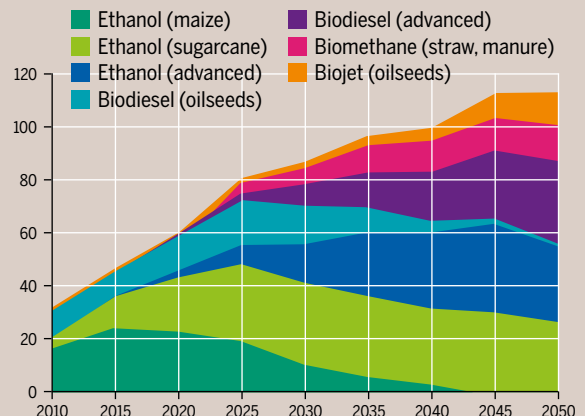
In 30 years, the area needed to grow biofuels will more than double. Novel sources will become more important than maize and sugarcane – today's biggest burners

Regardless of the criteria used, bioenergy is an inefficient way to produce power

It is possible to use biomass in a way that makes sense in terms of energy – if crop residues and waste are used. Because of the number of people who still go hungry, the Food and Agriculture Organization of the United Nations (FAO) and the World Bank recommend that government support for biofuel crops be stopped. Support for the production of biomass as a source of energy entails perverse incentives. It should therefore be radically changed to avoid further social and ecological harm. ●

FUTURE DEMAND

Land for biofuels, in million hectares



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