ABOUT THE AUTHOR

Rachel Smolker is a codirector of Biofuelwatch. She has researched, written, and organized extensively on the threats to forests, biodiversity, people, and the climate from biofuels. She has a PhD in ecology from the University of Michigan, worked previously as a field biologist, and is author of To Touch a Wild Dolphin.
Since humans first learned to manipulate fire, people have used local biomass—including wood, other plant matter, and dried animal dung—for heat and for cooking. Billions of people continue to do so. But now, in addition to these traditional uses there is an unprecedented push for large-scale industrial/commercial bioenergy. This new trend includes refining plant materials (corn, wheat and other grains, sugarcane, soy and palm oil) to make liquid biofuels for transportation and burning plant materials (wood, agricultural residues, municipal waste, etc.) for heat and electricity. Less widely known is the development of plant-based petroleum substitutes for use in bioplastics, biochemicals, inks, fabrics, pharmaceuticals, and other products. Proponents refer to a new “bioeconomy” featuring massive biorefineries that take in millions of tons of plant biomass and convert them into all manner of energy and materials.

But two important questions are often overlooked in the rush toward bioenergy: Where will all that plant biomass come from, and what will the consequences be on ecosystems, wildlife, agriculture, human rights, climate, water, and soil?

TRANSPORT FUELS

Biofuels for transportation—ethanol and biodiesel—have been enthusiastically embraced as “green” alternatives to petroleum fuels, with claims that they would reduce greenhouse gas emissions while reviving domestic fuel production. Brazil is the model country, having already made considerable progress toward replacing petroleum fuels with sugarcane ethanol nationwide. In the United States, ethanol from corn is supported with generous subsidies. Mandated targets for biofuel use have been signed into law in the United States, Europe, and elsewhere.

The negative impacts of this rush to biofuels are already apparent. Brazil’s sugarcane ethanol industry is converting vast parts of the delicate Cerrado savanna ecoregion into industrial sugar monocultures—cleared, plowed, sprayed with chemicals, and repeatedly burned over. The appalling work conditions of “sugar slaves” have also been documented. In the United States, expanding corn production for ethanol has resulted in the increased use of synthetic fertilizers (visible in the expanding dead zone in the Gulf of Mexico), former conservation lands being planted with corn, and depletion of freshwater aquifers. Increased demand for corn has also shifted U.S. production away from soybeans, causing production in Brazil and elsewhere to expand to fill the void, often at the expense of tropical rainforests. This sort of “indirect land use change” has been a topic of heated debate, and industry has fought to exclude it from consideration—because when indirect land use is taken into consideration, virtually all

A new, global rush to embrace biofuels—for transport, heat, and electricity—is a growing threat to ecosystems, wildlife, human health, and the climate. The trend poses the danger of increased commodification of forests, greater competition between food and energy markets, and even more pressure on the world’s rural poor that depend upon local biomass for their energy needs.
biofuels result in more greenhouse gas emissions than does petroleum.

The “poster child” for negative impacts from biofuel production is palm oil biodiesel. Given the recent rate of deforestation and widespread investment in oil palm plantations and biodiesel, it has been estimated that 98 percent of the forest on Borneo and Sumatra—among the most diverse on Earth—could be cut down and replaced by oil palm monocultures by 2022. Emissions from the conversion of Asia’s lowland peat forest into palm oil plantations are astronomical, accounting for nearly 8 percent of the global total. The expansion of palm oil is at the root of many human rights abuses in Colombia, Ecuador, and other Latin American countries, as campesinos are violently expelled from their lands or even murdered to make way for industrial plantations. Ironically, palm oil plantations are, by U.N. definitions, considered “forests” and increasingly rewarded with carbon finance intended for forest protection.

Public opinion toward biofuels has soured over the years. This shifting attitude was aided especially by a leaked World Bank memo in 2008 that noted how the diversion of food crops into ethanol was a major factor in driving up food prices. With more than a billion people living with chronic malnourishment, U.N. Special Rapporteur on the Right to Food Jean Zeigler in 2007 called the conversion of corn, soybean, cassava, wheat, vegetable oils, and other food into fuel for automobiles, a “crime against humanity.” In 2010, the United States nonetheless put nearly a third of its corn crop into ethanol production.

**BIOMASS FOR HEAT AND ELECTRICITY**

Around the globe, initiatives to reduce greenhouse gas emissions have frequently morphed into policies supporting biomass combustion as it is viewed as the least costly and most adaptable alternative. Electric utilities find it easier to convert large coal-burning facilities to burn a mix of coal and wood chips than to shift to wind or solar power production. Wood is readily available in many locations year-round, and can provide reliable baseload power that can be distributed on the current grid.

Europe, having accepted emissions reduction targets under the Kyoto Protocol, already provides about two-thirds of its so-called renewable energy from biomass—indeed, it accounts for 80 percent of the growth in renewables between 1990 and 2005. The European Commission estimates that 14 percent of the European Union’s total energy will be generated from burning biomass by 2020. In the United States, state renewable portfolio standards and regional agreements to reduce emissions similarly favor biomass combustion, and a slew of federal subsidies intended to develop renewable energy are largely directed to biomass burning. Hundreds of new biomass-burning facilities are proposed or under construction around the country, in addition to plans for converting both large coal-burning facilities—and also many small-scale facilities such as schools and hospitals—to biomass energy.

What will they burn? Definitions of “biomass” vary geographically and across different policies, but it can include wood and other plant materials, animal manures, slaughterhouse remains, sewage sludge, municipal solid waste, construction debris, even tires and plastics—virtually anything of remotely biological origin. The bulk of what is burned as biomass, however, is wood, followed by vegetable oils.

Biomass generally has a low “energy density,” far less than conventional fossil fuels, and thus it takes far more wood, for example, than coal, to generate equivalent energy. On average (depending on facility efficiency and wood moisture levels), it takes approximately 1.5 tons of wood to generate just a megawatt-hour of electrical power. The demand for wood is therefore huge, even for a moderately sized 50-megawatt facility, and will be ongoing for the lifetime of the facility. Biomass plants generally operate at only 25–30 percent efficiency, meaning that for every four trees burned, the energy content of only one is actually retrieved. Smoke from all four burned trees (or animal remains, or municipal waste) is emitted into the air, however, posing a public health threat. Nitrous oxides, sulphur dioxides, and volatile organic compounds are emitted, along with large quantities of particulates. The U.S. Environmental Protection Agency regulations restrict
but do not wholly prevent emissions of all particulates, particularly “fine particles,” of 2.5 microns and smaller. Emerging science indicates these are extremely dangerous because they can lodge deeply in the lungs, enter the bloodstream, and result in numerous negative health effects, especially cardiopulmonary disease and cancer.

When communities oppose biomass facilities it is usually due to concerns about plant emissions, but the impact on forests may ultimately pose the greater risk to human health. Forests are essential to maintaining life on Earth, and as we face the consequences of climate change, they are one of our best defenses—sequestering carbon, harboring biodiversity, and helping regulate hydrological cycles. Human activities have already resulted in a massive loss of forest cover in modern times, but instead of restoring and protecting forests we are rapidly escalating the pace of destruction, now in the name of producing “renewable energy.”

In the state of Massachusetts, activists battled proposed biomass facilities that would have burned, in total, at least 2.4 million tons of wood per year, hauled in on 600 logging truck trips per day, to increase the state’s generation capacity a mere 1.2 percent. Like other thermoelectric facilities, these facilities would require millions of gallons of cooling water, much of which would be lost as vapor, and the rest (heated and contaminated) dumped back into the waterways. The state is revising its regulations in response to fierce opposition.

Ohio recently considered (and at least partly rejected) a whopping 2,400 megawatts of biomass-generated electricity capacity, mostly through cofiring with coal in nine different power plants. Just one of the facilities, First Energy’s Burger plant, would have burned more than 3 million tons of wood per year, double the current 1.7 million tons produced annually by the state’s timber industry. Based on data and projections from the Energy Information Agency, if the United States were to adopt a Renewable Energy Standard mandating 25 percent renewable energy by 2025, as has been proposed, biomass energy production would expand to require the equivalent of clear-cutting 50 million acres of forest by 2030.

The premise that burning biomass is clean, green, and carbon neutral (the carbon neutral myth enables developers to cash in on subsidies and credits) is simply false. Burning biomass releases more carbon dioxide per unit of electricity generated than does burning coal or natural gas. Additional emissions result from logging operations, soil disturbance, and biomass transportation. Trees may eventually regrow and resequester carbon, but only after many years or even decades—a “carbon debt” time frame that is hardly meaningful if we are to address global warming. Most scientists believe we need to reduce greenhouse gas emissions immediately, not increase emissions above and beyond even what would occur if we continued burning coal, in hopes that trees of the future will reabsorb that extra carbon dioxide. Moreover, many forests are already diminished from previous overcutting, and they are now declining due to the impacts of climate change.

WOOD CHIPS AS GLOBAL ENERGY COMMODITY

A new and rapidly expanding international trade in wood chips and pellets has sprung up, in large part to satisfy growing European demand. As an example, energy company RWE’s Tilbury facility in the United Kingdom was recently approved to convert from coal to biomass. This facility alone will burn more than 7 million tons of (mostly imported) wood pellets per year. In combination with other existing and proposed biomass facilities, demand within the U.K. would rise to over 60 million tons per year, more than six times annual U.K. production of wood.

Europe’s forests are already severely over-exploited, so most wood chips and pellets are imported from around the world. For example, MagForest, a Canadian company operating in the Republic of Congo, will soon ship 500,000 tons of wood chips annually to Europe. IBIC Ghana Ltd. claims it can ship 100,000 tons of tropical hardwood and softwood a month from Ghana for bioenergy. Sky Trading, a U.S. company, is offering to supply up to 600,000 tons of wood chips for biomass from the United States or Brazil. Green Energy Resources, based in Nevada, has stated a goal of “supplying 20 percent of
the European demand for wood chips by 2015.” Brazil’s International CMO Business Biomass says it is dedicated to reducing coal use and can obtain wood chips from Brazil, Chile, Uruguay, and Argentina to supply the European energy market.

This huge new demand for woody biomass is also spurring the creation of more industrial tree monocultures. For example, a South Korean company has applied for a 200,000-hectare concession in Indonesia to produce wood pellets for “green energy.” The U.K. firm Carbon Positive has entered a joint venture to develop 160,000 hectares of tree plantations for bioenergy in Indonesia, including in West Papua. Conservation International is helping the Indonesian company Medco to develop plantations for wood pellets—up to 300,000 hectares, mainly in West Papua. In the United States, Arbogen is developing genetically engineered tree varieties claiming they will provide “more wood on less land.” As the chief executive officer of a German energy company has said: “Wood is very quickly becoming an important part of the energy mix and in a few years will be a global commodity much like oil.”

The threat to forests is dire. In the United States, industry groups are calling for more access to public and private lands for biomass extraction. They claim that harvesting biomass will “protect” forests by ensuring they remain profitable to landowners. Others call for access to beetle-damaged forests, claiming that it is better to “make good use” of the dead and dying trees rather than allowing them to decay; but harvesting from these damaged forests can worsen their condition and risks spreading the beetles. Developers of new biomass-burning plants often claim they will use “only wastes and residues” (i.e., from past logging operations), even though competition for these materials is already great. Maps of the sourcing areas for many proposed and existing biomass burners show them overlapping with one another, indicating there will be fierce competition for scarce wood supplies, far beyond what “wastes and residues” can supply. Some biomass boosters advocate for removing more woody material from logging sites, taking tops and limbs that would “otherwise decompose.” But removing so much material is akin to mining forest soils; without large quantities of organic material left to decompose on the forest floor after harvest, soils are stripped of nutrients and left exposed to erosion. Finally, the claim is often made that many forests in the United States need to be thinned in response to insect damage, to prevent burning and protect homes from wildfire damage. But studies have indicated that forest thinning results in more light penetration, drying out soils and vegetation and making forests more—not less—vulnerable to fires.

All of these are thinly veiled excuses that have little to do with protecting forests or public health, or even providing “green jobs.” At base they are about getting access to the massive amounts of wood needed for this lucrative, heavily subsidized forest incineration industry.

THE NEW BIOECONOMY

In addition to biofuels for transportation and biomass combustion for electricity and heat, proposals abound for developing plant-based alternatives to petroleum for a host of applications, including products such as plastics and chemicals. One such example is a recent partnership between Dow Chemical and Japan’s Mitsui to construct a large facility in Brazil that will use sugarcane ethanol to produce bioplastics for packaging. Along similar lines, Dow has partnered with Brazil’s Crystalsev to develop a large facility to produce bio-based polyethylene. All of these initiatives require large amounts of plant material, water, and land.

In the end, the push to replace fossil fuel energy with plant biomass is fueling the fires of injustice and inequality. Billions of people around the world rely entirely on firewood for cooking, and on animals for energy and transportation. The vast majority of residents in these traditional, biomass-dependent communities do not own cars capable of burning ethanol, or have electricity in their homes, yet they are now under siege as the new bioeconomy creates new demands for land, water, soils, and biomass. Assessments of “global biomass availability” portray vast areas—largely in the Global South, where
growing conditions are favorable—as “marginal” and available for growing and extracting biomass. In reality, peasant farmers, pastoralists, and others on the margins of the global economy are dependent on those lands. And they are already facing eviction and violence in the face of increasing pressure for access to their lands—in the name of renewable energy.
ENDNOTES


We have reached a point of crisis with regard to energy... The essential problem is not just that we are tapping the wrong energy sources (though we are), or that we are wasteful and inefficient (though we are), but that we are overpowered, and we are overpowering nature.
— from the Introduction, by Richard Heinberg

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