A WRM briefing paper

Tree plantations in the South to generate energy in the North

A new threat to communities and forests

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Swedish Society for Nature Conservation

Contents

Introduction

Biomass is the oldest source of energy humans have used, still important for a vast number of people concentrated in the global South. Especially in the past few centuries since the Industrial Revolution, people have used other energy sources, mainly fossil fuels. This consumption, however, has historically taken place in the global North.

But because of the climate crisis and the fact that fossil fuels will deplete somewhere in the near future, the last 10 to 15 years have seen a boom in the production and consumption of agrofuels, both ethanol and plant-based oils, especially in the global North. To obtain these fuels, there has been significant expansion in both the North and South of large-scale monoculture plantations of agricultural crops such as corn, soybeans and sugar cane, as well as plantations like oil palm and jatropha.

Numerous reports by NGOs and scientific researchers have warned of the serious consequences of this trend, including a surge in land grabbing and negative impacts on food sovereignty, along with the other social and environmental impacts inherent in the large-scale monoculture model of production, including increased carbon emissions and thus climate change.

In the past few years we have witnessed the start of another boom, especially in Europe but also in the United States and Canada: energy generation from woody biomass. While this was initially promoted as a type of recycling, taking advantage of wood residues like sawdust, an ever growing number of whole trees are being used and growing of trees in monoculture plantations is now being promoted specifically for this purpose in the global South. At the same time, more aggressive and destructive logging methods are spreading, including the removal of stumps, branches, twigs and leaves. For this new market, big industry is seeking to promote new types of wood-based commodities, such as wood chips and pellets, exclusively for energy production. Both the expansion of agrofuels and nowadays woody biomass plantations further expands industrial export-oriented monocultures over lands that could otherwise guarantee the livelihood of local communities.

The aim of this new WRM briefing paper is to raise awareness of this new trend. Above all, our goal is to demonstrate how the expansion of tree plantations to meet the new and recent demand for woody biomass -concentrated in the North- has serious consequences for rural communities, that depend on the access to land and local available biomass for their energy supply, and the conservation of forests and other ecosystems in the countries of the global South. We also present a number of projects that are already underway or being planned.

We hope that the information shared here will create greater awareness of this new problem among organizations in both the South and the North. We also believe that it is important to strengthen resistance struggles and alliances to curb this phenomenon, which is generating negative impacts primarily in the South but in the North as well.

While investing in biomass energy, the countries of the North are postponing the search for real, structural solutions to the climate and environmental crises, for which they are historical responsible, but whose consequences affect everyone on the planet. Those who are already suffering most from these consequences, in fact, are peasant, indigenous and other traditional communities in the South - the same communities who are confronting the new threat posed by the expansion of plantations in their territories to supply the North with biomass for energy production.

CHAPTER 1

Biomass, bioenergy and tree plantations

1.1 What are we talking about?

Biomass and bioenergy

Throughout history, humans have used the biomass found in abundance in almost every part of the planet as a source of energy, such as firewood used for heating and cooking, or vegetable and animal oils used as sources of light. Today, more than two billion people depend on wood as an energy source for cooking and heating, particularly in the countries of the global South.

Energy produced from biomass is called bioenergy. Bioenergy can be generated from biomass in solid form, such as firewood, woodchips and pellets; in liquid form, namely ethanol and plant-based oils; and in gas form, such as biogas.

As a result of the recent promotion of "renewable" energy sources, there are currently some 2,000 biomass energy plants operating in 50 countries around the world, including more than 1,000 active biomass plants in Europe alone[1]. Those range in size from very small plants to the world's biggest biomass power station, Tilbury B in England, which can burn pellets made from 7.5 million tonnes of wood a year. Globally, bioenergy accounts for 10% of the total global primary energy supply[2] today. Traditional biomass in the global South still accounts for the majority of this, however policies being pursued in Europe, North America and at the international level, for example through the Sustainable Energy for All[3] Initiative seek to reduce the use of traditional bioenergy and to replace it, including with fossil fuels - while boosting large-scale industrial bioenergy, including wood-based electricity and agrofuels. In the EU, the majority of the renewable energy targets is expected to come from biomass while the US government expects bioenergy to grow at a much faster rate than energies classed as renewable overall.

Agrofuels, not biofuels

In the 1970s, Brazil, and later the US, became the world's first countries to promote the large-scale use of so-called "biofuels" through their ethanol programme, respectively based on large-scale sugar cane and maize plantations. Over the last decade, it has been followed by a number of other countries, leading to yet another boom, this time in the use of "biofuels". The United States, Brazil, Germany, France and Argentina are currently the leading producers of these "biofuels". The raw material is supplied by monoculture plantations of crops such as corn and sugar cane, in the case of ethanol, and rapeseed, soybeans and oil palm, in the case of oil-based biodiesel.

For an idea of how rapidly this sector has expanded, consider that worldwide production of "biofuels" in the year 2000 was 16 billion litres, but had shot up to 100 billion litres by 2010.

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1 Power generation from biomass booms worldwide (http://www.energias-renovables.com/articulo/power-generation-from-biomass-booms-worldwide).

2 Primary energy is an energy form found in nature, from which energy can be directly generated. Examples include crude oil, coal, natural gas, biomass, wind energy, etc.

3 http://www.sustainableenergyforall.org/

4 Schneider, 2012

Its promoters typically claim that energy produced from biomass is sustainable and environmentally friendly - in a word, "green". But using the prefix "bio-" does not automatically make these types of fuel more ecologically sound or kinder to nature and its inhabitants. The large-scale expansion of monocultures for "biofuel" production has been driven by incentives and subsidies, which are not available for small-scale, diversified agriculture geared primarily to food production. This is one of the various reasons why small-scale peasant farmers movements, such as La Via Campesina, consider these types of fuel as a threat to peasant communities and food sovereignty. They determined that it would be more apt to refer to them as agrofuels instead of "biofuels", eliminating the prefix "bio", which means life. After all, agrofuels are above all a big business, dominated by big corporations, leading to ever increasing concentration of land ownership, in addition to other serious social and environmental impacts.

1.2 The use of monoculture tree plantations for bioenergy production

First generation agrofuels: oil palm and jatropha, and "advanced" agrofuels

Biodiesel, ethanol and plant oil, are also known as "first generation" or "conventional" agrofuels. This category includes agrofuels produced from monoculture plantations of oil palm, soya and jatropha, although widespread jatropha crop failure means that it has not actually been used for commercial agrofuels so far.[5]

The Finnish corporation UPM, the world's biggest paper producer, has invested in a refinery in Finland to produce "advanced" agrofuel through a technique that uses so-called "tall oil", a by-product of the manufacture of chemical wood pulp, as the raw material. The product obtained is called "advanced biodiesel". The refinery is scheduled to begin operation in 2014.[6]

Second/third generation agrofuels

So-called "second or third generation" agrofuels are those produced from solid biomass, with different technologies. Those technologies can be broadly divided into two approaches: ones which rely on heat and pressure (mainly gasification) and others which rely on bio-chemical methods that generally involve genetically engineered enzymes and microbes (such as cellulosic ethanol). So far second-generation agrofuels remain in the research and development stages rather than being commercially available - that is because their energy balance is extremely poor (i.e. it takes significantly more energy to produce second-generation biofuels than is released by burning them).

There are growing doubts about the long-term prospects of second-generation biofuels, with BP having pulled out of a large cellulosic ethanol scheme and various investments having ended in failure and even bankruptcy, due to the high current cost of investment in these technologies.[7]

5 *We refer to these types of plantations as tree plantations, although FAO, for example, classifies oil palm plantations as an agriculture crop.*

6 *Overbeek et al, 2012*

7 *Study casts doubt on alternative ethanol´s fuel viability (http://minnesota.publicradio.org/display/web/2011/10/03/study-development-lags-cellulosic-ethanol-fuel/)*

Bioenergy from woody biomass

The production of bioenergy from woody biomass, including wood waste, chips and pellets, is growing for both electricity generation and heating in the industrial and residential sectors.

The wood is sourced from natural forests, but also, to an ever greater extent, from so-called "secondary forests" in different scales, like in Europe, and also large-scale industrial tree plantations. European energy companies together with wood pellet producers and consultants are actively working to create -and capture- a large new global market in wood pellets[8] which were previously only being produced on a small scale and traded either domestically or within the EU.

1.3 Why is bioenergy being promoted?

The globalized economy is still based on fossil fuel energy; it depends on crude oil, natural gas and coal for the huge majority of its energy needs. It is believed that in recent years, the supply of ´easy oil´ has begun to decline while new oil and gas reserves have become accessible now applying new techniques that have made extraction of these reserves possible. Fears over 'energy security', namely access to cheap oil have featured prominently in EU and US support for targets and incentives for the use of bioenergy, which therefore has become of interest for the main energy companies.

At the same time, the burning of fossil fuels for energy production is also the main cause of climate change, resulting from the global warming provoked by excessive emissions of carbon dioxide since the Industrial Revolution, primarily in the countries of the North.

Faced with this situation, governments and corporations in the world's largest economies have supposedly joined forces to confront the long-announced end of the fossil fuel era with alternative energy sources that are claimed to reduce carbon dioxide emissions. For now, most government funding and policy support in the global North is driving so-called renewable energies like bioenergy (from biomass), wind energy and solar energy. However, much of this is additional production, not replacing fossil fuel use. Furthermore, scientific studies show that the climate impacts of industrial bioenergy, including agrofuels and bioenergy sourced from whole trees can be worse than that of the fossil fuels they replace

8 *http://www.laborelec.be/ENG/initiative-wood-pellet-buyers-iwpb/*

Box 1. Renewable versus fossil energy

What is renewable energy?
The World Energy Council[9] defines it as: "Energy made available as [a result] of permanent and natural energy conversion processes, economically profitable in present conditions or in the near future."[10] According to this definition, renewable energy comes in various forms, including bioenergy, wind power, hydropower, geothermal energy and tidal power.

Investments in renewable energy have more than doubled in the last five years, reaching over 260 billion dollars worldwide in 2011,[11] of which 187 billion dollars was invested in electricity generation. However, there are serious concerns about this broad definition of 'renewable energy' which includes unsustainable and high-carbon types of energy such as large-scale hydro dams, agrofuels and industrial biomass. After all, the lands and ecosystems destroyed for those are not 'renewable'.

What is fossil energy?
Fossil energy is produced from fossil fuels like crude oil, natural gas and coal. These three energy sources are actually biomass produced and accumulated through very slow processes over the course of millions of years. They are found beneath the earth's surface in highly concentrated form, and are the product of the remains of dead animal and plant organisms that settled to the bottom of the seas, lakes and swamps. Fossil fuels are not considered renewable sources of energy because they take millions of years to form, and reserves are being depleted far faster than they can be replaced. Every year we burn fossil fuels worth 400 years of plant and animal matter concentrated into fossil fuels over millions of years.[12]

1.4 What is behind the bioenergy boom?

First of all, it is important to note that energy consumption around the world is very unequal. The energy consumption per person in the United States is more than 11 times bigger[12] than in Africa, and in the EU, it is about five times bigger . While the countries in the North consume excessive amounts of energy, most of it from fossil fuels, the majority of people in the countries of the South cannot even cover their basic needs. There are more than 1.3 billion people in the world, the vast majority of them in the global South, who have no access to electricity at all.

Nevertheless, governments and large private corporations in the North have no plans to reduce their levels of consumption. Instead, their intention is to supplement fossil fuels with other energy sources, which is why they are investing in so-called renewable energies, and especially bioenergy.

9 *The World Energy Council is a network of 93 national committees and represents over 3,000 member organizations including governments, industry and so-called expert institutions.*
10 *World Energy Council, 1992. Dictionary of Energy.*
11 *McCrown, 2012*
12 *http://www.monbiot.com/archives/2005/12/06/worse-than-fossil-fuel/*
13 *http://en.wikipedia.org/wiki/List_of_countries_by_energy_consumption_per_capita*

The promotion of bioenergy benefits major economic sectors like the forestry, agriculture and energy sectors - for example, through the expansion of monoculture plantations to produce raw materials, or the development of all of the infrastructure and technology needed to harvest, transport and store biomass and to convert it into bioenergy. It is leading to new and powerful alliances, for example between agribusiness, biotech and oil companies (for agrofuels) and energy and timber companies (for wood-based biomass). Above all, it incentivises a vast new corporate land and resources grab. Biomass can take the form of products with the potential to be turned into commodities, such as sugar cane ethanol or wood pellets, and to be transported and sold globally as is the case today with crude oil, natural gas and coal. This means that global bioenergy markets can be developed for investors and transnational corporations, providing them with major business opportunities, which are especially welcome during the current worldwide financial-economic crisis, especially in the global North.

Moreover, bioenergy, in broader terms, opens up other business opportunities, such as the conversion of biomass not only into bioenergy but also industrial products like so-called bioplastics or biofertilizers, through chemical and biotechnological processes, which is of high interest to corporations and policy-makers . Finally, bioenergy is one of the pillars of the so-called "green economy" or "bioeconomy", pushed forward by big capital as the ideal solution to continue with business as usual, reaping profits through the promise of a sustainable future.

Oil palm seedlings. Photo: EIA/ Telapak

CHAPTER 2

Bioenergy from wood

2.1 Why is there so much growth in wood-based bioenergy?

Most of the biomass used for heat and electricity is wood, with smaller contributions coming from agricultural residues (such as palm oil and sugar cane residues or straw) and (to a far smaller extent) from 'short rotation coppicing', i.e. fast growing plantations for example of willow or miscanthus. Some countries also classify various types of waste incineration as 'biomass'.

Various factors have contributed to the current boom in wood-based bioenergy, which is expected to become a major driver of the expansion of monoculture tree plantations.

Wood-based bioenergy is being promoted through a range of subsidies and in some cases mandatory targets in Europe and North America. Those include renewable energy subsidies set up by EU member states to meet the overall 20% renewable energy target by 2020, co-firing mandates such as those announced in the Netherlands, biomass inclusion into Renewable Portfolio Standards in 30 US States, and tax incentives in the US.

The expansion of monoculture plantations of agricultural crops for agrofuel production has been widely criticized, due to the environmental and social impacts of these plantations. Their expansion has not only been condemned by social movements and environmental organizations, who point to their negative impact on the food sovereignty of countries and continents, but also by authorities like the former UN special rapporteur on the right to food, Jean Ziegler, who declared in 2007 that the conversion of food crops into biofuel is a "crime against humanity". In addition, monoculture plantations of oil palm, used to produce biodiesel, have been harshly criticized as a direct cause of deforestation, especially in Indonesia and Malaysia, the two main producer countries. These criticisms led the European Commission to publish, in October 2012, a proposal that would limit land conversion for agrofuel production. Commissioner for Climate Action Connie Hedegaard stated: "For biofuels to help us combat climate change, we must use truly sustainable biofuels. We must invest in biofuels that achieve real emission cuts and do not compete with food."[14] However, the proposal does not mean a real limit to biofuel crop expansion; moreover, "truly sustainable" biofuels will always need fertile lands and water and therefore "any plant species - whether a food crop or a potentially invasive non-food plant such as Jatropha or Castor Oil - grown to produce agrofuels, will have much the same impact on food sovereignty". [15]

Bioenergy produced from wood biomass has been publicized by companies and governments who promote its use as a way of taking advantage of *waste wood and forestry residues*, and claim that residue removals from logged forests and plantations will provide 'benefits' such as avoiding CO_2 and methane emissions from decomposing biomass, as well as preventing forest fires. However, this argument is faulty: removing forest residues for bioenergy use negatively affects the nutrient cycling of the forest's soil, depletes soil carbon, erodes and compacts soils and thus affects their ability to hold water, reduces future tree growth and

14 *EC press release: new commission proposal to minimize the impacts of biofuel production (http://europa.eu/rapid/press-release_IP-12-1112_en.htm)*

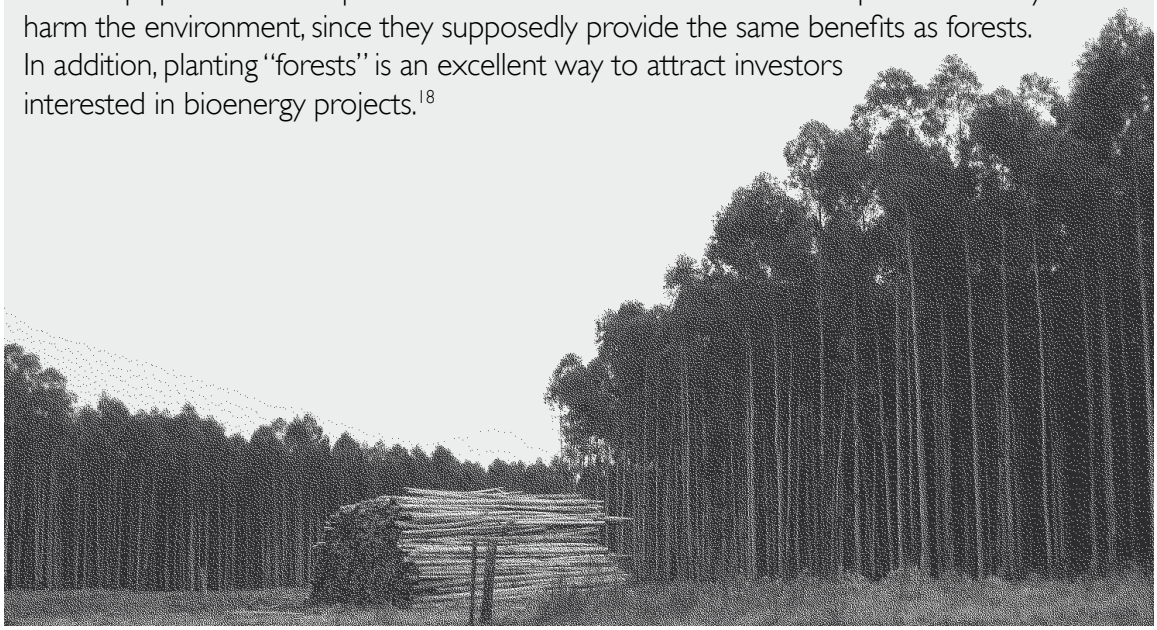
15 *http://peopleforestsrights.wordpress.com/2012/10/19/the-food-fuel-conundrum-have-we-been-bio-fooled/*

decimates biodiversity. Increasingly, aggressive logging methods such as whole tree harvesting (involving the removal of all parts of the tree from forests) and stump harvesting are used, both in existing tree plantations and in biodiverse forests. Moreover, forest residues, whether logging or sawmill residues cannot even come close to covering the current - let alone the projected future - demand for woody biomass. Companies are therefore increasingly resorting to burning woodchips and pellets made from trees felled for this purpose, whether in the US or in the UK.[16]

Another factor that promotes the use of woody biomass is the fact that trees are not food crops, so it is a way to appear to avoid the ethical dilemma posed by the conversion of food crops to agrofuel– even though eucalyptus plantations displace food production in exactly the same way as using land to grow wheat or corn for ethanol does. What's more, monoculture tree plantations are promoted as a "good" thing, since they are defined as "forests" by FAO,[17] and are also touted as a way to "restore" supposedly "degraded" land.

Box 2. Monoculture tree plantations are not forests

FAO's definition of "forest" basically classifies any area of land with a certain number of trees as a forest. This is largely influenced by the close links between FAO and the forestry industry, and particularly the pulp and paper industry. By legitimizing these plantations as "forests", FAO helps plantation companies to convince the authorities and the public that they do not harm the environment, since they supposedly provide the same benefits as forests. In addition, planting "forests" is an excellent way to attract investors interested in bioenergy projects.[18]



Eucalyptus plantation in Uruguay. Photo: Grupo Guayubira

16 *See for example www.dogwoodalliance.org/2012/11/new-report-discredits-uk-energy-company-claims-that-pellets-come-from-wood-waste/, and this picture of a Scottish biomass power station: www.mottmac.com/projects/?id=66058*

17 *United Nations Food and Agriculture Organization*

18 *Overbeek et al., 2012*

Studies by consultants and specialist institutions that present future scenarios in which there is both a certain "need" or "demand" for as well as a significant future supply of wood- based and other biomass also serve to promote the sector. For example, the International Energy Agency (IEA), which is financed by the governments of the economies that consume most energy and is heavily influenced by energy companies, envisages in its "roadmap" for the future that by 2050, bioenergy will meet 7.5% of the world´s electricity demand. As such, between five and seven billion tons of dry biomass (wood) will be needed for heat and power generation in 2050, along with another three to four billion tons for biofuel production. According to the IEA, studies indicate that in order to meet this demand, waste wood and forestry and sawmill residues will need to be supplemented by "purpose grown energy crops" (likely mostly tree plantations, although plantations of usually invasive grasses such as switch grass and miscanthus are also being promoted).

Based on data from a number of sources -including FAO- on future land demand for agriculture, the IEA suggests that around 300 million hectares of pasture land, grassland and woodland "with good suitability for (energy) crop cultivation" could be available in 2050, particularly in East Africa, South America and Eastern Europe. Overall, some 500 billion dollars will need to be invested in bioenergy electricity generation.[19] Other studies suggest an even greater potential of land that could be converted to bioenergy crops.[20]

Studies like these, in turn, are being used by industry to lobby governments for incentives and subsidies, which are viewed as necessary for biomass targets to be met. Obviously, the potential for receiving subsidies is yet another factor that motivates companies to get involved in the bioenergy business, it rather is a condition to invest in it.

The current growth in the use of wood for bioenergy is partly reflected in the production of wood pellets. Between 2006 and 2011, worldwide wood pellet production grew from around six to seven million tons to 14.3 million tons. Installed production capacity is greatest in North America (the United States and Canada), followed by Germany, Russia and Sweden. The southern US is currently the biggest pellet producer worldwide. The biggest consumers of wood are currently Belgium, the Netherlands, the UK, Sweden and Denmark.[21]

2.2 The European Union (EU)

The EU Renewable Energy Directive,[22] adopted in 2009, is a key piece of legislation promoting the use of bioenergy in Europe. The directive is aimed at diversifying the energy supply, and sets a target to reach a 20% share of energy from renewable sources by 2020. In the EU, biomass is included in the definition of renewable energy sources.[23]

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19 OECD/IEA, 2012

20 Berndes, G. et al, 2003. The contribution of biomass in the future global biomass supply: a review of 17 studies. Biomass & Bioenergy, volume 25.

21 http://www.enplus-pellets.eu/wp-content/uploads/2012/04/Industrial-pellets-report_PellCert_2012_secured.pdf

22 Directive 2009/28/CE of 23 April 2009. It forms part of the EU Energy and Climate Change Package (CCP). (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF)

23 Directive 2003/54/CE of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC defines "renewable energy sources" as renewable non-fossil energy sources (wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases).

It is expected that by 2020, 12% of energy consumption in the EU will be supplied by bioenergy[24] -that is, energy produced from biomass[25]- compared with 5.4% in 2005, which means that production will more than double, and that the EU renewable energy target will be primarily met from bioenergy.

Woody biomass is increasingly burned in large power stations -both through co-firing with coal (and increasingly through the conversion of coal power station units to biomass) and in dedicated biomass power stations. Some countries, such as Germany, also promote the large-scale use of wood in combined heat and power plants.

The member countries of the EU are implementing the Renewable Energy Directive at different paces.[26] Nevertheless, the consumption of wood pellets increased by 43.5% between 2008 and 2010, reaching 11.4 million tons, which represented almost 85% of worldwide demand. Government incentives have especially stimulated the overall demand for woody biomass use in the Netherlands, Belgium, Denmark and, more recently, the United Kingdom.[27]

Box 3.
Agrofuels and oil palm plantations for electricity and heat generation

The EU has a target of 10% for renewable transport fuels by 2020. In practice, this target is being met through the use of agrofuels, since there is practically no other source of renewable energy that is sufficiently developed to cover the current demand. Nor will there be in the next few years. Reducing demand by 10% to fulfil the target is not being considered in the suit of options.

Agrofuels can also be burned to generate heat and electricity if governments choose to subsidise this use. Palm oil is the prime feedstock because it is by far the cheapest type of plant oil available in large quantities. In previous years, very substantial amounts of palm oil were burned in power stations and combined heat and power plants in the Netherlands and Germany. Following protest campaigns by environmental organisations over the social and environmental impacts of palm oil production in the South, both Governments decided to phase out subsidies for heat and electricity from agrofuels. This eliminated agrofuels burning in this sector in the Netherlands and reduced it to a small fraction of what it used to be in Germany. It is understood that substantial amounts of palm oil continue to be burned in power stations in Italy (subsidised through 'green energy credits'), although no current figures are available. The UK Government has recently proposed to guarantee long-term subsidies for electricity from agrofuels which, if proposals go ahead, could lead to overall UK palm oil imports doubling. In the US, unknown amounts of

24 *Atanasiu, 2010*

25 *The EU Renewable Energy Directive defines "biomass" as "the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste."*

26 *National renewable energy action plan data from member states (http://www.eea.europa.eu/data-and-maps/figures/national-renewable-energy-action-plan) y http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52010DC0639:EN:HTML:NOT*

27 *Overbeek et al, 2012*

agrofuels are being blended with heating oil and burned in power stations. Most of those are sourced from US-grown soya, however, in 2011, very substantial amounts of palm oil from South-east Asia were burned in two large power stations in Hawai'i. If the company involved (HECO) was to resume or even increase this level of palm oil burning then they could become one of the biggest palm oil importers in the US.

By far the greatest share of imported agrofuels is used for road transport fuel in the EU. In 2011, one fifth of the agrofuels consumed in the EU had to be imported.[28] However, the evidence shows that the biggest impacts which EU agrofuels have had on oil palm plantations so far have been indirect impacts: With the EU using two-thirds of rapeseed oil production for agrofuels, the food, cosmetic and chemical industries have switched to using palm oil instead. Also in 2011, biodiesel was the agrofuel used most for transportation in the EU, accounting for a 70% share of the biofuel market, compared to 28% for ethanol and 2% for pure vegetable oil. Additionally, by 2020, the European aviation industry plans to use two million tons of biokerosene a year[29]. A number of airlines have already conducted test flights. Neste Oil is the only company with capacity for producing palm oil biofuel. This company is already the world's biggest producer, with a large enough capacity to produce significant amounts of agrofuels suitable for use in aircraft engines in the near future. Therefore palm oil is expected to be the main future feedstock for airlines.

Subsidies and incentives

The EU's "green" energy targets and subsidies entail definitive support for big agroindustry, the forestry industry and bioenergy production, because they contribute to market trust and stability.[30] And support is not lacking. Biomass and biofuel production receive an average of 75% of subsidies for renewable energy sources in the EU, while the remaining 25% are divided among the other sources.[31] This results in a major imbalance, with two thirds of energy classed as renewable in the EU sourced from biomass, while only a third is generated from all other renewable sources combined: solar energy, wind power, hydropower, etc.

Subsidies are determined at the national level, which means they vary among different countries, where each government establishes concrete measures to achieve its energy goals.[32]

28 *Global Agricultural Information Network Gain Report, realizado por técnicos del Departamento de Agricultura de Estados Unidos USDA, http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_The%20Hague_EU-27_6-22-2011.pdf*

29 *FOE Europe, 2011*

30 *See, for example, The European wood pellet markets: current status and prospects for 2020 (http://robins.ee/wp-content/uploads/2011/12/2011-Wood-Pellets-market-trends.pdf)*

31 *www.biofuelwatch.org.uk*

32 *Renewable energy: Action plans and forecasts (http://ec.europa.eu/energy/renewables/action_plan_en.htm)*

Box 4.
The Common Agricultural Policy and incentives for "energy crops"

One common element among the EU countries is the Common Agricultural Policy (CAP), which signified the end of traditional agriculture in Europe. The expansion of "energy crops" is currently one of the most ambitious objectives within EU policies on renewable energy. CAP promotes forestry, including the conversion of farmland into tree plantations and the processing and marketing of 'forest' products. It also foresees possible subsidies for the afforestation of farmland.

In 2005, an estimated 3.6 million hectares of agricultural land in the EU was devoted to biomass production for energy use. According to projections, 19 million hectares of agricultural land in Europe will be exclusively devoted to bioenergy production in 2030, which will both have an impact on biodiversity as well as on food production and food sovereignty in general, increasing food and feedstock imports.[33]

Ensuring the supply of raw material

Projections of the demand for biomass for bioenergy production in the EU, driven up by EU targets and incentives, indicate that growing amounts of raw material will need to be imported to meet this demand.

The European wood panel industry estimated in 2010 that in order to achieve the biomass targets in different EU member states for 2020, 700 million cubic metres of wood would need to be imported for burning annually.[34] It should be kept in mind that, according to European estimates, there are only 800 million cubic metres of wood (from harvesting and recycling) available annually, and the bulk of this is devoted to other uses such as construction, furniture manufacturing and pulp and paper production. These uses require up to 500 million cubic metres of wood annually. When this is added to the demand for wood as biomass, the resulting total demand is 1.2 billion cubic metres. In accordance with these estimates, which coincide with those of FAO, there will be a shortfall of 400 million cubic metres in the EU by 2020.[35]

For its part, an analysis of data and trends conducted in 2011[36] estimated that the use of wood for fuel in the EU will increase by between 100 and 200 million cubic metres, and that in most EU member states, the currently existing area of productive woodland and forest is unlikely to be large enough to meet the substantial increases in the volume of woody biomass required. However, those figures could prove to be serious underestimates given the more recent trend towards coal-to-biomass power station conversions and massively increased co-firing by several European energy companies.

33 *European Environment Agency, 2010.*
34 *El sector de la madera secunda mañana el paro europeo para cuestionar las primas a la biomasa (http://www.evwind.com/2010/10/29/el-sector-del-tablero-secunda-manana-el-paro-europeo-para-cuestionar-las-primas-a-la-biomasa/)*
35 *Holzwerkstoffindustrie protestiert morgen gegen Holzverbrennung zur reinen Energiegewinnung (http://www.presseportal.de/pm/79403/1707252/holzwerkstoffindustrie-protestiert-morgen-gegen-holzverbrennung-zur-reinen-energiegewinnung)*
36 *Hewitt, 2011*

The available supply of wood waste today is already insufficient to meet bioenergy production needs, leading to an ever greater demand for whole trees and quality wood for this purpose.[37] This has served as an incentive for the expansion of monoculture tree plantations for energy production in the EU, Canada, Russia, the United States, Latin America, Africa and Asia, as well as increased pressure on natural forests. In Canada, exports of wood pellets to Europe had grown by 700% in less than eight years as of 2010, reaching almost one million tons.[38]

The demand for wood pellets in the EU has significantly outstripped the domestic supply since 2008, with more than three million metric tons imported in 2011. Studies foresee the use of wood pellets primarily for the co-generation of electricity in large-scale plants, in addition to household use.[39]

The same studies predict major expansion of monoculture plantations of fast-growing trees in the South for export to the EU by 2020. One potential scenario foresees a total of close to 15 million tonnes of wood pellets produced, much of it in the South, such as in Brazil, Uruguay, Mozambique and western Africa.[40] Given recent announcements by European energy companies about their biomass plans, the real figure could be much higher. 15 million tonnes of wood pellets would require at least 450,000 hectares of plantations, in the case of eucalyptus for biomass in Brazil, which has a short rotation cycle of two to three years and a much higher per hectare yield than other sources.[41]

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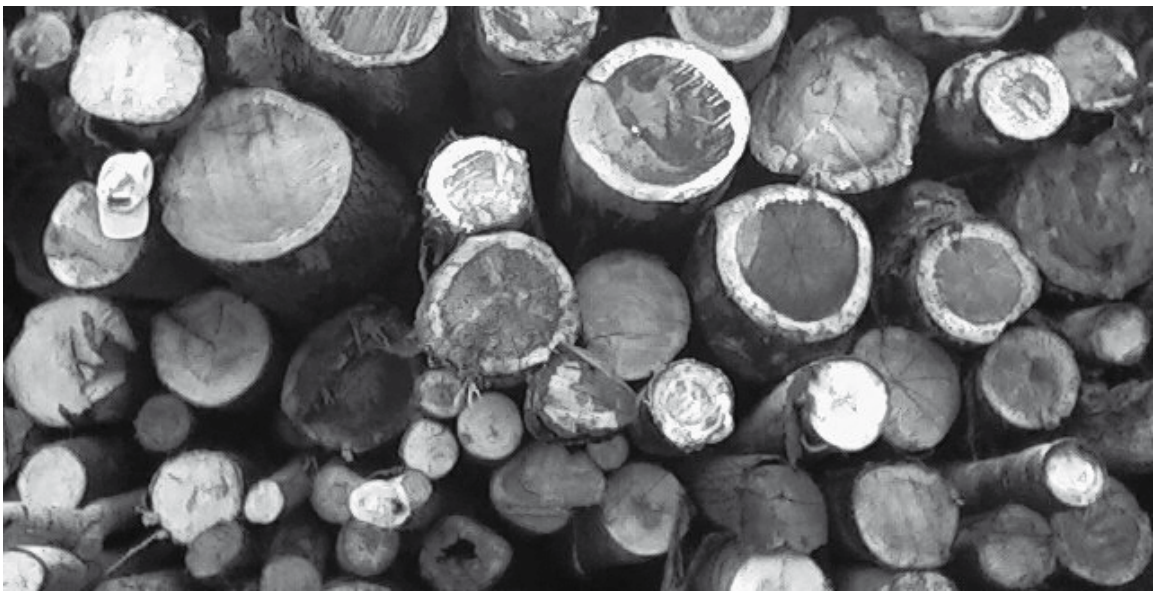
37 Ernsting, 2012

38 Briefing: First biofuels, now biomass: is the EU driving another BioMess (http://www.greenpeace.org/belgium/Global/belgium/report/2011/biomass.pdf)

39 Cocci, 2011

40 Cocci, 2011

41 Based on statements by André Dorf, director of Suzano Renewable Energy, who says that 30,000 hectares of fast-growing eucalyptus trees with rotation cycles of two to three years are needed to produce one million tons of wood pellets a year. (http://www.dci.com.br/Suzano-investe--US$-1_3-bilhao-na-producao-de-biomassa7-336378.html)



Whole logs before being turned into wood chips. Photo: Josh Schlossberg, Biomass Monitor and Energy Justice Network

2.3 Biomass projects in European countries

Biomass plants in the United Kingdom (UK)

The UK is at the forefront of the expansion of industrial bioenergy production in Europe. According to Biofuelwatch, the UK biomass industry plans to burn more than 90 million green tons of wood for electricity a year,[42] which is nine times as much as the UK's total annual wood production.[43] The UK government provides significant subsidies[44] for solid biomass, leading to unprecedented development of large-scale biomass energy production.

Generous subsidies are the main driver for fast-growing industry investments in biomass electricity. If the ambitious plans announced by industry so far are realized, they will attract at least three billion pounds sterling in subsidies every year.[45]

The key aim of the UK government's Bioenergy strategy is to encourage the conversion of coal power stations to biomass. The biomass capacity of one of these plants, the Tilbury B power station owned by RWE Npower, is substantially larger than that of any other biomass-burning power stations in the world and will require 7.5 million green tons of wood a year. So far, energy companies have announced plans to convert 5 coal power stations in the UK to biomass, which altogether will require pellets made from around 63 million tonnes of wood -a figure that does not include the wood required for a large number of proposed new-build biomass power stations.[46]

Three power stations, planned by Forth Energy in Scotland, would burn 3.5 million tonnes of wood. MGT Power is hoping to start construction of a 300 MW biomass power station which is to be supplied primarily with wood pellets made from Brazilian eucalyptus. They have also indicated plans for another mega-power station of the same size.

Biomass energy in Germany

Germany is another example of a country whose own wood resources do not come close to meeting the national demand. If all of the wood available in Germany were used for energy purposes, it would barely cover 4% of the country's primary energy consumption. And although some 56 million cubic metres of wood have been harvested annually from its forests and tree plantations, the German government is seeking to mobilize much more wood for energy purposes.

The use of biomass in Germany has been regulated since 2003 by the Renewable Energy Act (EEG). There are major subsidies for electricity and heating plants fuelled by biomass in the form of plantations cultivated for this purpose and waste from industrial livestock facilities. These subsidies are up to 21 cents of a euro per kWh of electricity produced, guaranteed for 20 years, while those for hydropower are 12.7 cents/kWh and for wind power, 9.4 cents/kWh.[47] As a result, 62% of renewable energy in Germany is produced from biomass.

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42 Green tons include the amount of moisture which wood has when it is taken from a forest or plantation. The heating value of green wood is 9.5 MJ/kg while that of pellets is 19.8 MJ/kg. (http://www.forestbioenergy.net/training-materials/fact-sheets/module-5-fact-sheets/fact-sheet-5-8-energy-basics)

43 Ernsting, 2012

44 In the form of Renewable Obligation Certificates (ROCs). According to the Wood Panel Industries Federation, these UK subsidies amount to £75 per ton of wood burned, a crucial factor in the expansion of biomass plants in the UK. (Carbon Trade Watch, 2012)

45 Ernsting, 2012

46 Biofuelwatch biomass power station map (http://www.biofuelwatch.org.uk/wp-content/maps/uk-biomass.html)

47 Vergütungssätze, Degression und Berechnungsbeispiele nach dem neuen Erneuerbare-Energien-Gesetz (EEG) vom 04. August 2011 ('EEG 2012') (http://www.bmu.de/files/pdfs/allgemein/application/pdf/eeg_2012_verguetungsdegression_bf.pdf)

Biomass currently accounts for 8% of total energy production in the country, but the German government aims to almost triple this share to 23% by 2050. There are around 1,000 solid biomass (i.e. wood-burning) plants in the country, as well as 7,700 biogas plants that primarily use corn, grown on an area of almost one million hectares. In 2012, energy crops had already come to occupy 21% of the country's agricultural land, or 2.5 million hectares, and continue to expand. There are also 11.1 million hectares of forests and tree plantations that also contribute to the biomass supply.

The growing use of bioenergy is leading to the displacement of other crops and other crop uses, such as food and animal feed production. It is also leading to an increase in wood imports. In other words, land around the world is being used to feed German energy consumption, as demonstrated by the case of the energy company Vattenfall.

Box 5: Saving the climate with Vattenfall

The Swedish state-owned multinational Vattenfall is Europe's fifth largest energy producer. It is one of the EU's three biggest emitters. Its affiliate Vattenfall Europe, based in Berlin, is one of the four biggest companies in the German energy market. Although its energy production is primarily fuelled by coal (65%) and nuclear power (26%), the company has also branched out into the use of wood. According to their website, Vattenfall has 22 biomass plants in Europe and calls itself "one of the world's leading companies in the sector." They claim to burn more than three million tons of biomass annually, although this figure includes an unspecified proportion of peat, which is not bioenergy as defined by the EU and UN.

Community in the department of Paysandú (Uruguay) surrounded by eucalyptus plantations. Photo: Grupo Guayubira

Whole logs before being turned into wood chips. Photo: Josh Schlossberg, Biomass Monitor and Energy Justice Network

Wood chips being loaded into a biomass incinerator. Photo: Josh Schlossberg, Biomass Monitor and Energy Justice Network

Tree plantation after harvesting. Photo: Josh Schlossberg, Biomass Monitor and Energy Justice Network

Biomass incinerator. Photo: Josh Schlossberg, Biomass Monitor and Energy Justice Network

Whole logs waiting to be turned into wood chips. Photo: Josh Schlossberg, Biomass Monitor and Energy Justice Network

Biomass plant. Photo: Chris Matera, Massachusetts Forest Watch

In 2009, Vattenfall Europe and the Senate of Berlin signed a "Climate Protection Agreement" aimed at a 20% reduction in CO_2 emissions in the German capital by 2020.[48] According to the agreement, biomass plays a key role in this strategy, by "helping the city to fulfil its commitments to protecting the climate." At least on paper. For the multinational, it represents a highly profitable business, since biomass burning is subsidized in Germany under the Renewable Energies Act. At the time Vattenfall planned to build two biomass power plants in Berlin with a total capacity of 222 MW. They also planned to incorporate biomass use in four existing coal-fired plants, contributing an additional 260 MW. According to the company, this would have required a supply of 1.3 million tons of biomass annually. Although Vattenfall's biomass commitments have been partly delayed and scaled back since then[49], they continue to plan biomass power stations in both Berlin and Hamburg. In Berlin and the federal state of Brandenburg, which surrounds the city, there are already 42 biomass power plants, which means it would have been impossible to acquire all of this biomass in the region to meet Vattenfall's 2009 plans. The available wood is already in high demand by the timber, wood pellet and pulp and paper industries. Vattenfall therefore claimed that it would primarily use wood waste products such as Christmas trees, the residues from pruning trees in urban parks, etc. In addition, it has suggested the establishment of plantations of fast-growing trees, and has identified some 300,000 hectares around Berlin for potential use for this purpose. South of the city there are already vast industrial monoculture pine plantations.

In the spring of 2010, Vattenfall announced an agreement to purchase one million tonnes of rubber tree wood chips from Liberia. In this African country, Buchanan Renewables, founded in 2008 by North American investors, was harvesting old rubber trees and exporting them as wood chips. Vattenfall AB of Stockholm reported that it had acquired a 20% share in Buchanan Renewables for 20 million euro, while the Swedish state-owned risk capital fund for development, Swedfund, had acquired a 10% share.[50]

However, following international protests spearheaded by Rainforest Rescue and other organizations, denouncing the impacts of the Buchanan Renewables project, Vattenfall and Swedfund withdrew from Liberia in May 2012.[51] The multinational announced the sale of its shares in Buchanan Renewables, claiming that the wood was too expensive and that there was not a sufficient supply in Liberia.

Now, instead of tropical timber, Vattenfall plans to harvest forests and promote tree plantations in Canada and the United States, where the company is negotiating new contracts, according to Vattenfall spokesman Hannes Hönemann.

48 *Klimaschutzvereinbarung mit der Vattenfall Europe AG(http://www.berlin.de/sen/umwelt/klimaschutz/aktiv/vereinbarung/vattenfall/index.shtml)*

49 *http://www.tagesspiegel.de/wirtschaft/berliner-klimapakt-vattenfall-verschiebt-kraftwerksbauten/7117062.html*

50 *Vattenfall press & news(http://www.vattenfall.com/en/press-kit-biomass.htm?WT.ac=search_success)*

51 *Vattenfall: Proteste stoppen Tropenholz aus Liberia (http://www.regenwald.org/erfolge/4293/vattenfall-proteste-stoppen-tropenholz-aus-liberia)*

Poland: Europe's largest dedicated biomass plantation

International Paper (IP), the world's biggest paper producer, and GreenWood Resources (GWR), both based in the United States, announced in March 2012 that they had signed an agreement to establish a biomass short-rotation tree plantation in Poland that would be the largest of its kind in Europe.[52] The biomass will be used to replace coal in existing power and steam boilers at IP's paper mill in Kwidzyn, Poland. According to a company press release, "Current supplies of biomass in Poland are not sufficient to support the increasing demand from industry due to EU energy policy targets, while existing Polish state policy limits the amount of forest fiber than can be used for biomass."

The IP-GWR agreement is for 12 years. The two companies had previously carried out a pilot project in Poland using fast-growing, short-rotation hybrid poplar as the biomass crop. The planned size of the plantation, to be established in Pomerania, is 10,000 hectares. It is expected to produce 300,000 green tonnes of biomass per year, based on a four-year crop rotation. The land for this "energy tree farm" will be leased from local landowners and farmers.

Finland, world capital of the forestry industry

Finland is perhaps the country with an economy most heavily based on "sustainable forest management" and the forest products industry - both within the country, given the large number of pulp mills, for example, and abroad, through multinationals like Stora Enso, the world's second biggest paper producer, and Poyry, a leading "consulting" firm in the forest industry sector, especially in the global South.

Finland has a large "reservoir" of wood in forests and plantations that occupy a good part of the country, and it has used wood for energy purposes for a considerable time. But now it plans to significantly increase its use of wood fuel. By the year 2020, Finland aims to produce 38% of its energy from renewable energy sources, mainly through the use of wood, especially forest residues. It has also set the goal of a 20% share of biofuels in transport by 2020, primarily through investments in bio-refineries that would produce transport fuels from wood, especially wood chips.[53]

Projections of future wood availability indicate that forests in Finland should be able to provide a sufficient supply to meet its 2020 targets. However, beyond 2020, there are serious doubts whether forests in the country will be able to meet the needs of the Finnish forestry and energy sector plus the possible energy needs of other European countries. Moreover, the harvesting of energy wood and its particular characteristics as stump removal and the intensification of forestry practices including the removal of dead wood and logging residues, as well as the increased use of forest areas that are not yet exploited, have the risk to exacerbate further the already declining biodiversity of Finnish forests. It should also be noted that the law to promote the use of biofuels in transportation recognizes that the 20% target would initially have to be met with imported palm oil.[54]

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52 *International Paper & GreenWood Resources to Develop Europe's Biggest Biomass Plantation (http://www.internationalpaper.com/documents/EN/Media/EMEAPL_BiomassPlanta.pdf) and Poland: US investors to develop Europe´s largest biomass plantation http://www.news2biz.com/article/2012/4/23/poland_us_investors_to_develop_europe_s_largest_biomass_plantation)*

53 *Eräjää, Sini, 2012*

54 *Eräjää, Sini, 2012*

2.4 Other relevant countries

In addition to the EU, according to the consulting firm Poyry and others, there will be a major demand for wood pellets in east Asia (Japan, South Korea and China), estimated at some five to ten million tons by 2020.[55] This could result in the growth of tree plantations for this specific purpose in southeastern Asian countries.

Meanwhile, the United States, along with the EU, is the world's main consumer of solid biomass. In 2011, US power plants used renewable energy sources to generate about 13% of the country's electricity, and biomass accounted for the third largest share of renewable energy, after hydroelectric power and wind power.[56] The biomass sector is forecast to grow by 8% a year between now and 2040, compared to a much slower rise of energy classed as renewable of 3% a year.[57]

The growing use of bioenergy in the United States from wood biomass depends to an ever smaller extent on sawmill residues and to a growing extent on wood from forests, including whole trees. New plants for the large-scale production of bioenergy from wood are being built and a large increase in biomass co-firing with coal is forecast by the US government.[58]

As well as a massive increase in domestic demand for biomass, the US is increasingly exporting pellets and woodchips to the EU, with companies such as RWE, Enova and Enviva investing in large pellet plants for export.

Box 6. The case of RWE: A European company investing in the US

In 2011, the German energy multinational RWE opened one of the world's largest wood pellet plants in the U.S. state of Georgia. The plant produces some 750,000 tons of wood pellets (from 1.5 million green tons of wood from whole trees) annually for use in Europe.[59] "Unlike Europe, the US has substantial unused wood resources," says RWE. For RWE, which has millions of permanent customers, undertaking this project in the United States offers maximum security, since the country guarantees the political and legal stability the company seeks for its investments. Moreover, in the state of Georgia, there was no need for the large investment required to establish new plantations, thanks to the already existing plantations. According to Scot Quaranda of the Dogwood Alliance,[60] an US NGO working on forest issues, an alarming new trend is taking place in the Southern US: "wood from our forests is turned into pellets which are then shipped to Europe and burned for electricity by big utility companies to meet short sighted EU climate requirements. Currently there are 25 operational export pellet mills in the region with approximately 15 more planned across the South. Essentially, we are destroying our Southern forests so Europe can burn them to meet its climate goals".

Nevertheless, at the same time, U.S. companies are also seeking raw materials from abroad, as will be seen in Chapter 3.

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55 *Cocci, 2011*
56 *Renewable & Alternative Fuels (http://www.eia.gov/renewable/)*
57 *http://www.marketwatch.com/story/biomass-power-consumption-projected-to-grow-through-2040-in-the-us-2012-12-10*
58 *Energy Information Authority, Annual Energy Outlook 2013*
59 *RWE, 2011. Biomass pellet factory Waycross/Georgia (http://www.rwe.com/web/cms/en/522380/rwe-innogy/sites/power-from-biomass/usa/waycross-georgia/)*
60 *http://www.dogwoodalliance.org/2012/10/tour-of-destruction-following-the-trail-of-the-newest-threat-to-southern-forests/*

2.5 Impacts and resistance in the North

There is growing opposition to biomass power stations, especially in the UK, US and Australia. In the UK and US, that opposition is led by community groups concerned primarily about the serious impact of biomass combustion on public health. Biomass power stations cause similarly high levels of air pollution as coal power stations and many are proposed in close vicinity to residential areas. In many cases, community groups have become aware of the serious impacts on forests, lands and climate change too and have linked up with other national and local campaign groups. Community opposition has contributed to several applications in the US and UK having been withdrawn or rejected.[61]

According to the U.S. Environmental Protection Agency, burning "clean" wood to produce energy emits 79 different pollutants, which are linked to respiratory disease, heart disease, birth defects and cancer.[62] The risks are even greater in the case of chemically treated waste wood, whereas risks also exist in the case with wood from monoculture plantations where agrochemical products are widely used.

Research commissioned by the UK government in 2009 showed that the "ambitious" plans to scale up biomass power plants in the UK will lead to between 340,000 and 1.75 million life years being lost in 2020 due to the impacts of this pollution. The government argues that air pollution threats to the population are addressed in existing environmental policies, but Biofuelwatch and other groups warn that these policies are grossly inadequate.[63]

61 *Carbon Trade Watch, 2012*
62 *Ernsting, 2012*
63 *Ernsting, 2012*

CHAPTER 3

Tree plantations in the South for bioenergy production

3.1 Why is the South needed?

As shown in Chapter 2, the demand for woody biomass is and will continue to be so great that the North will no longer be able to meet its own biomass needs. This is the first reason for looking towards the South. For the moment, most of the woody biomass imported for energy production in the EU, currently the largest market, comes from Russia, Canada and the United States. Wood pellet exports from Canada and the United States combined rose from 0.8 million tons in 2008 to 1.6 million tons in 2010. However, according to Hakan Ekstrom, a spokesman for Wood Resources International, "As demand increases over the next 10 years, (energy producers) can't get all the volumes locally, so they'll have to go elsewhere, including Australia, Africa, South America and Asia."[64]

Over the last 30 to 40 years, monoculture tree plantations have expanded to an ever greater extent in the countries of the South because of what they offer to companies, especially pulp and paper producers: cheap labour, cheap land, less stringent environmental standards, and generally high per-hectare productivity. Southern countries like Brazil, Chile, Uruguay and Indonesia can produce eucalyptus hardwood at rates of 20-44 m3/ha/year, as compared to rates of 4-6 m3/ha/year on plantations in Northern countries with wood-based industries, like Sweden and Finland. However, for local communities, industrial tree plantations of any kind, as is the case with other large-scale monoculture plantations, usually mean incalculable losses and bitter conflicts.[65]

3.2 Plans and projects

In response to the growing demand, plans and projects are being developed for the establishment of tree plantations for energy production in Asia, Africa and Latin America. Here we will consider a number of projects that have been announced, in which their promoters clearly state that the plantations are specifically aimed at the production of biomass for export. It should be kept in mind that the future price per ton of wood for bioenergy will have to be competitive with the price for other uses; otherwise, the wood could end up, for example, supplying raw material for a pulp mill.

Asia

In Asia, at least five biomass energy plantation projects have been announced by companies based in Japan and South Korea:

1. In **Cambodia**, in 2008, South Korean electricity giant Kenertec was granted a concession for a total of 60,000 hectares of land by the Council for the Development of Cambodia, an area which is six times the area allowed under Cambodia's land law. Besides mining activities, the company plans to plant rubber trees, cassava and jatropha and develop a complex to process the wood.[66] Local contacts from Cambodia told WRM that the

64 *http://www.renewableenergyworld.com/rea/news/article/2011/03/eus-renewable-goals-driving-wood-pellet-growth*
65 *Overbeek et al, 2012*
66 *Kenertec develops a bio-complex in Cambodia (2008) (http://www.kenertec.co.kr/english/relations/whatsnew_read.asp?page=2&num=12)*

concession area granted to Kenertec for the biomass project is in the Prey Long forest area. The Prey Lang Forest, spanning Preah Vihear, Kompong Thom, Kratie, and Stung Treng provinces in northern Cambodia, are inhabited by nearly 350,000 indigenous people, primarily of Kuy descent. As such, the Prey Lang forest area is the last large contiguous area of indigenous peoples' land remaining in Cambodia.[67]

2 In the **Philippines**, on the outskirts of the city of Butuan, the Japanese company EJ Business Partners Co., Ltd. is developing a project involving both tree plantations and a biomass power plant with a capacity of 10 MW. It is aiming to begin operations in 2017.[68]

3. In **Indonesia** there are a number of woody biomass plantation projects, adding further to the growing area of land occupied by plantations geared towards energy production.

   In 2009, through a memorandum of understanding between the Korea Forest Service and the Forest Ministry of Indonesia, South Korea was granted a 99-year lease on 200,000 hectares of land in the Central Kalimantan region to establish plantations for the production of wood pellets.[69] Of the total area 180,000 were to be developed by the private sector. Based on information from WRM's local partners, the land was allocated to Korindo and it established monoculture tree plantations in Kotawaringin Barat and Lamandau, Central Kalimantan to feed the Korindo Pulp Mill in Kerawang (West Java). No further news on this project is available.

   In 2011 it was announced that two South Korean companies were planning "to develop wood pellet industries in West Sulawesi in a bid to produce biomass energy as the country starts to gradually shift from coal-based energy."

   According to the available information,[70] the Ministry of Forestry gave permits to two South Korean firms PT Bara Indoco and PT Bio Energy Indoco to open up a 200,000 ha of industrial forest estate in West Sulawesi to support the planned wood pellet industries.

   Another South Korean firm, PT Solar Park Energy has also made similar investments in Wonosobo, Central Java, partnering with the state-owned company Perhutani, developing a 200,000 ton per year wood pellet industry.

   Also in Indonesia, but in the region of West Papua, there are two major projects involving tree plantations for bioenergy. One is being undertaken by the UK company Carbon Positive, which is establishing 160,000 hectares of tree plantations. The second is being undertaken by the Indonesian company Medco with investment from the Korean company LG International, and involves the development of a million hectares of tree plantations for wood pellet and woodchip production.[71]

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67 http://unsr.jamesanaya.org/cases-2010/08-cambodia-cambodia-land-laws-and-policies-and-the-situation-concerning-development-in-and-around-the-prey-lang-forest

68 Biomass power generation by Japonese companies in Asia (http://www.asiabiomass.jp/english/topics/1209_02.html)

69 Indonesia, South Korea Collaborates on Wood Biomass Energy (2009) (http://www.biofuelshub.com/component/content/article/1-news/987-indonesia-south-korea-collaborates-on-wood-biomass-energy)

70 South Korean firms develop wood pellet industry in Indonesia, http://perumperhutani.com/en/2011/07/south-korean-firms-develop-wood-pellet-industry-in-indonesia/

71 Overbeek et al, 2012

South America

In South America, Brazil stands out as one of the main potential suppliers of wood for energy production in the North. Since the 1970s, Brazil has had over a million hectares of eucalyptus plantations, concentrated in the state of Minas Gerais, which are specifically geared to energy generation. The eucalyptus trees are harvested and used to produce charcoal, for use in some 200 iron and steel mills that primarily produce pig iron. Their biggest market is the automotive industry. The history of these plantations over the last 30 to 40 years has been marked by dramatic impacts, including the expulsion of hundreds of *geraizeiro* communities (traditional inhabitants of the Cerrado biome), the destruction of the native vegetation of the Cerrado tropical savannah biome, and the use of slave labour for charcoal production.

Tree plantations are now being established in Brazil for the specific purpose of producing wood for power generation, including to meet the growing demand in Europe.[72] Since 2005, experiments have been carried out with eucalyptus trees planted more densely to determine potential yield in terms of biomass per hectare. In 2007, a pilot project was initiated in the state of São Paulo involving a plantation of densely planted trees to supply energy for an ethanol refinery. In 2009, in the state of Tocantins, GMR Florestal established its first pilot plantation with eucalyptus clones to produce 33 MW of electricity. Today the same company plans to expand its plantations in the region to a total of 350,000 hectares. Also in 2009, in the state of São Paulo, Grupo Bertim began pilot tests with eucalyptus clones for biomass production.

Technicians from Uruguay, Chile, Mexico, Nicaragua and Guatemala have already visited the region, which clearly demonstrates the interest of the forest industries in those countries in developing these types of plantations.

Among recent developments are the plans announced by Suzano Papel e Celulose[73] to establish large-scale eucalyptus plantations for wood biomass production in northeastern Brazil. Suzano is a private company that was founded 85 years ago. It is the world's second largest producer of eucalyptus wood pulp, with five pulp mills in Brazil, located in the states of São Paulo and Bahia, which produced 2.7 million tons of pulp and paper in 2008. It currently controls 722,000 hectares of land including 324,000 hectares of eucalyptus plantations in the states of Bahia, São Paulo, Espirito Santo, Minas Gerais, Tocantins and Maranhão.

Suzano has even more ambitious plans: to invest in a new type of plantation, namely biomass plantations. In mid-2010 the Suzano Group created a new company called Suzano Energia Renovável (Suzano Renewable Energy) to pursue this goal. The proposed investment amounts to 1.3 billion US dollars, and includes five wood pellet plants, with a total production capacity of five million tons per year . The first phase involves land acquisitions and the construction of three wood pellet plants, producing one million tons each, which would start operating in 2013. Suzano expects a liquid income of 500 million dollars in 2014, and already has guaranteed sales contracts for 2.7 million tons. A memorandum of understanding was signed between Suzano and the UK company MGT Power Ltd. in August 2010.

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72 Based on information from the Brazilian Network of Biomass for Energy.

73 Overbeek, 2011

Field trials with eucalyptus and acacia were carried out in the northeastern Brazilian states of Piauí and Maranhão in 2009. The company's director, André Dorf, declared in 2010, "The lands have already been prospected and the acquisition process will continue this year." He also stressed that the company preferred the northeast "because of the proximity of major ports which facilitate the flow of production, since our aim is to supply the European continent." According to recent local news reports, Suzano has chosen the region of Baixo Parnaíba for the establishment of its biomass plantations and the construction of wood pellet plants.[74]

Biomass plantations are very different from wood pulp plantations. The rotation cycle is two to three years instead of the usual seven years, and the trees are planted more densely. Unlike plantations for pulp and paper production, which aim for high cellulose content and low amounts of lignin (the "glue" of the tree), "energy plantations" aim for the highest possible lignin content. According to Dorf, around 30,000 hectares of land are needed to produce one million tons of wood pellets. Considering Suzano's goal of producing five million tons of wood pellets, the company will require a total of 150,000 hectares.

Land acquisitions for the establishment of eucalyptus plantations for pulp production are already causing serious problems in northeastern Brazil. In this region, for example, *quilombola* communities -established by descendants of escaped African slaves- are still fighting for official recognition of their rights over their traditional lands. Inaldo Serejo, a coordinator with the Pastoral Land Commission in Maranhão, warned in an interview that "companies like Suzano Papel e Celulose have been buying up vast tracts of land, currently occupied by traditional communities, to plant eucalyptus trees." It can only be expected that these problems will increase with the expansion of the new biomass plantations.

Uruguay and **Argentina**, another two countries where the impacts of industrial tree plantations have already been problematic, are also emerging as potential suppliers of wood for energy production, which would entail the further expansion of tree plantations in both countries.[75]

In Guyana, the U.S. company Clenergen has reportedly leased 2,000 hectares of land (with the option to lease an additional 58,000 hectares), hoping to export wood chips to the United States and the United Kingdom. The company also intends to establish plantations in Madagascar, Mozambique and Tanzania to export wood chips for biomass power to Southern Africa and India. It also has projects underway in the Philippines and Ghana.[76]

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74 Overbeek et al, 2012

75 Corrientes busca atraer inversores forestales de Suecia y Finlandia (http://www.misionesonline.net/noticias/28/10/2012/corrientes-busca-atraer-inversores-forestales-de-suecia-y-finlandia)

76 Clenergen (http://www.clenergen.com/clenergen-corporation)

África

In Africa numerous countries have been investing in tree plantations for energy production for a number of years. Green Resources, a private company based in Norway, has been operating in **Mozambique, Tanzania, Uganda** and **South Sudan** since 1995. Their website states that its business activities focus on the establishment of tree plantations as "carbon sinks", as well as the production of forest products and renewable energy.[77] The company currently holds more than 300,000 hectares of land in the countries where it operates, including 22,000 hectares of forest, and it aims to establish over 100,000 hectares of plantations to serve the rising regional and global demand for wood products. Its business strategy is based on growing wood for both traditional uses and for a burgeoning new sector: *bioenergy*.[78] It is currently establishing two large-scale plantations in Mozambique and Tanzania.

In Mozambique, tree plantations have already sparked numerous conflicts in the areas where they are expanding. One of the areas that have seen the greatest expansion, as well as the worst conflicts, is the province of Niassa, where Green Resources operates through the Malonda Foundation, of which it forms part. Companies promoting large-scale pine and eucalyptus monoculture plantations began moving into Niassa in 1995. These companies are drawn by the fact that Niassa is the largest province in Mozambique, offers large stretches of level, fertile land, and has a relatively small population of one million people.

However, although the population is small, it is 70% to 80% rural. Since 2007, when these companies began planting trees, Mozambique's largest peasant organization, the National Union of Peasant Farmers (UNAC), has repeatedly denounced and opposed the planting of eucalyptus trees on lands that belong to peasant communities, a practice that reduces their access to land for planting crops. According to UNAC, this poses a serious threat to the food security and sovereignty of both the local communities and the region as a whole.[79]

In Tanzania, Green Resources has three main tree plantations in the southern highlands. In total, the company has been allocated more than 100,000 hectares of land in the region in various stages of the land acquisition process, including 34,000 hectares of titled land.

The company's activities here have already caused serious impacts on the local population. According to a 2011 report from Timberwatch,[80] these include: "land being lost by displaced communities, poor working conditions, the destruction of biodiversity on which communities rely for food, fuel and medicines; reduced water availability, as well as many other direct and indirect effects that impact negatively on the livelihoods of the affected communities."

Blessing Karumbidza, co-author of the Timberwatch report, describes the Green Resources project as "land grabbing, a form of neo-colonialism supported by the Norwegian authorities." He told the Norwegian news publication BT, "This area has been grassland as long as people in the area can remember. Now we have a plantation that is not forest, but a monoculture without biodiversity."

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77 *Green Resources (http://www.greenresources.no/Home.aspx)*

78 *Press release: Green Resources' extensive plantation assessments and audits (www.greenresources.no/Portals/0/Green%20Resources%20assessments%20and%20audits%20October%202012.pdf)*

79 *Overbeek, Winfridus, 2010. The expansion of Tree Monocultures: Impacts on local communities in the Province of Niassa. World Rainforest Movement. (http://wrm.org.uy/countries/Mozambique/book.pdf)*

80 *Karumbidza y Menne , 2011*

Tonje Refseth of the Department of International Environment and Development (Noragric) wrote her 2010 Master's thesis on Green Resources' plantations in Tanzania. She found that some villages in the Green Resources project areas have lost more than 33% of their land - the limit under the 1999 Village Land Act. One village, Uchindile, lost 60% of its land to Green Resources.

Villagers have in effect lost the land. The company has acquired renewable land leases for 99 years. In return villagers receive employment and community projects (such as schools). But workers told Refseth that salaries were not adequate. She found that the majority were being paid less than the minimum wage set by the government.[81]

Further towards the centre of Africa, in the **Republic of Congo**, a wood chipping plant for biomass production has been in operation for several years.

Between 1991 and 2001, Shell Renewables, a division of Shell Oil International, established plantations of fast-growing cloned eucalyptus trees here with the aim of establishing a high-yield source of biomass for future energy generation.[82]

Shell later sold its plantations. MagForestry - the forestry division of MagIndustries, a Canadian company involved in industrial and energy projects in Central Africa (particularly in the Republic of Congo and the Democratic Republic of Congo) - took over control of Shell's 68,000-hectare eucalyptus plantation through the acquisition of all the shares of Eucalyptus Fibre Congo S.A. (EFC), the lease holder of the industrial plantation.[83]

Other divisions of MagIndustries are operating a potash mine (MagMining) and building a potash plant (MagMinerals) on the same land granted as a forest concession.

MagForestry has been allocated the forest concession by the Congolese government until 2075. Currently, 70% of the land is being used to grow fast-growing eucalyptus clones. The company has also begun planting on another 20,000 hectares.

In 2006, MagForestry began construction of a wood-chipping plant in the Atlantic port city of Pointe-Noire, with the aim of supplying the growing market for wood biomass in Europe and North Africa. Built with an investment of 36.7 million dollars, the plant went into operation in 2008, and has a production capacity of 500,000 tons of wood chips a year.

The company's ultimate goal was to produce 25 m3 of biomass per hectare per year. Based on a rotation cycle of seven years, this would mean harvesting 175 m3 of biomass per hectare during that period. The company also planned to increase its production from the current 500,000 tons to 1.5 million tons of wood chips annually by 2018.

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81 Green Resources' carbon plantations in Tanzania. Curse or cure? (http://www.redd-monitor.org/2012/05/02/green-resources-carbon-plantations-in-tanzania-curse-or-cure/)

82 WRM, 2001. Congo, R.: Shell's eucalyptus plantations now provide even fewer jobs. WRM Bulletin 46. (www.wrm.org.uy/bulletin/46/Congo.html)

83 WRM, 2007. Congo, Republic: Thousands of hectares of land for eucalyptus, oil palm and mining. WRM Bulletin 120. (http://www.wrm.org.uy/bulletin/120/CongoR.html)

For the moment, however, those plans have been frustrated by illegal logging on the eucalyptus plantations, beginning in 2011. There are different versions regarding those responsible for the logging and their motives. A newspaper article on a visit by government authorities to the area in August 2011 lays the blame on local communities. At that point, 7,750 hectares had been cleared, resulting in economic losses estimated at 22 billion CFA francs (around 42 million US dollars).[84] The illegal logging continued in 2012, when another newspaper article reported that "the bulk of this business is being shared among a large number of big landowners with the support of networks that involve the military, police, judges and high-ranking officials." For its part, the trade union representing EFC workers maintained that the destruction of the plantations endangered the 390 jobs provided by the company.[85]

In West Africa, there are woody biomass projects in both **Liberia** and **Ghana**.

In **Liberia**, Buchanan Renewables Fuel (BR Fuel) is one of the lead players in this sector. BR Fuel is owned by Pamoja Capital, a Swiss-based private investment firm.

BR Fuel produces wood chips from rubber trees in Liberia and exports them to Europe. The company was initially supposed to build and operate a biomass-powered plant to supply electricity in Liberia, but these plans have yet to materialize.

After years of dictatorship and two civil wars, Liberia is currently one of the poorest countries in the world. There are approximately 260,000 hectares of industrial rubber tree (*Hevea brasiliensis*) plantations in the country, including the largest rubber tree plantation in the world, run by the Japanese-U.S. multinational Bridgestone-Firestone. Reports by local NGOs like SAMFU[86] and the United Nations[87] describe disastrous working and social conditions on the plantations, especially those run by Bridgestone-Firestone. There are charges of, among other abuses, child labour, violence and a general absence of legality.

Initially, BR Fuel produced wood chips with trees harvested from the smallholdings of peasant farmers. Many of them had planted rubber trees along the borders of their farms to demarcate their landholdings, a common practice in a country where the land rights of rural communities are still not fully recognized.

The company's harvesting of trees gave rise to numerous problems and discontent among the local population. The business was conducted primarily on the basis of rather unclear verbal agreements, and conflicts arose over arbitrariness in terms of the species and volume of trees harvested, destruction of neighbouring fields of crops, and lack of payment. This led BR Fuel to begin mechanized harvesting on the Bridgestone-Firestone industrial rubber tree plantations near Kakata.

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84 Foresterie: le massif ´d´eucalyptus fibre congo´ menacé de disparition para des abattages sauvages (2011) (http://nerrati.net/infopage-congo/index.php?option=com_content&view=article&id=728&catid=2&Itemid=36)

85 EFC déplore la destruction de son massif d'eucalyptus à Pointe-Noire (2012) (http://www.mtm-news.com/article/4400/efc-deplore-destruction-son-massif-d-eucalyptus-pointe-noire); y Les syndicats de la société Eucalyptus fibre du Congo s'insurgent (http://www.dailymotion.com/video/xohsyk_les-syndicats-de-la-societe-eucalyptus-fibre-du-congo-s-insurgent-contre-l-abattage-sauvage-d-eucaly_news)

86 SAMFU, 2008

87 UN Mission in Liberia, 2006

In Liberia, the population's primary energy sources are firewood and charcoal. According to the United Nations Development Programme (UNDP), 99.5% of households cook with firewood. The rainforests, mangroves and old rubber trees are the main sources of this wood. The supply is primarily met by thousands of informal firewood collectors and small-scale sellers.

The Ministry of Energy of Liberia stated in its 2007 Renewable Energy Action Plan that "scarcity of firewood is becoming a serious problem in most parts of Liberia, especially in Montserrado County [around the capital, Monrovia]."[88] Nevertheless, BR Fuel has been exporting rubber tree wood chips to Europe for electricity production there since 2009, while the Liberian people remain without electricity and with serious difficulties in meeting their energy needs.

In **Ghana**,[89] the U.S. company Clenergen – which is also operating in Guyana – has reportedly acquired a 49-year lease on 5,000 hectares of land through an agreement with the traditional chief in the area of Bole. The land would be used to establish bamboo plantations for the production of wood chips for biomass power plants. However, Clenergen's website gives no indication that they have planted any bamboo so far.

Also in Ghana a deal has been reported between the Danish utility Verdo Group that has contracted with U.K.-based Africa Renewables Ltd. (AfriRen) for 826,700 tons of wood chips over five years, produced from rubber trees in Ghana, West Africa.[91]

3.3 The impacts of biomass plantations for energy production

Today in the global South there are approximately 60 million hectares of land occupied by industrial tree plantations.[92]

There is not a single country in the South where industrial tree plantations have been established and that have not sparked land conflicts. Tree plantations lead to the displacement of local communities from their territories, often through violent methods, and/or the partial or total occupation of lands that local communities have traditionally used for their survival.[93]

The loss of land and subsequent establishment of large-scale tree plantations brings about countless impacts that negatively affect the lives and livelihoods of local communities. The replacement of local ecosystems with industrial monoculture plantations results in the loss of biodiversity, a shortage of land for agriculture, problems with the supply of water, the contamination of water resources, the destruction of sacred areas, the loss of traditional knowledge. Although the promoters of tree plantations argue that plantations are established on "degraded lands", these are often precisely the lands used by local communities

88 *Ministry of Lands, Mines and Energy, 2007. Renewable Energy and Energy Efficiency Policy and Action Plan. (http://www.molme.gov.lr/doc/Microsoft%20Word%20-%20RE%20_%20EE_Policy_Liberia.pdf)*
89 *IIED, 2011*
90 *http://www.clenergen.com/ghana/projects/republic-of-ghana*
91 *http://biomassmagazine.com/articles/5890/rubber-tree-chips-to-fuel-danish-power-plant*
92 *Overbeek et al, 2012*
93 *Overbeek et al, 2012*

to grow crops, or lands that have been left fallow after being farmed for a certain period of time. Even forest areas that have been degraded by logging activity are often recovered by local communities, and the secondary forest growth provides them with numerous benefits, such as medicinal plants, protein from hunting, fruit and other foods, areas for spiritual retreat, etc. At the same time, the promises of job creation and improved living conditions for local communities do rarely materialize; the reality turns out to be quite the opposite.

In addition to these impacts, biomass energy plantations have become another driver of the growing problem of "land grabbing", which is generating conflicts and further negative impacts by threatening local communities' use and control of their lands in Latin America, Africa and Asia. Indeed a 2012 European Union Parliament report states: "*The developing countries most likely to export woody biomass to feed Europe's demand are west and central African countries as well as Latin American countries. While clear links between the increasing EU demand for wood for energy generation and impacts in developing countries, both negative and positive, need to be drawn on a project level, the additional demand for biomass worldwide will have macro effects. The rising demand for woody biomass energy is likely to raise the global price for wood, thus adding pressure on forests and other ecosystems and driving land use conflicts. More specific risks include deforestation when natural forests are replaced by monoculture plantations and long term impacts on local food and energy security*."[94]

In Brazil, the creation of plantations specifically geared to the production of wood pellets and chips, using densely planted eucalyptus trees with a rotation cycle of two to three years, is still in its initial stages. It is therefore difficult to assess the differentiated impacts of this type of plantation, compared to "conventional" eucalyptus plantations with cycles of six to seven years. Nevertheless, one can assume that the shorter cycles will increase the pressure on available soil nutrients and water resources even more than the 6-7 year growing cycle does.

One can also assume that shorter rotations of two to three years will lead to increased use of toxic chemical herbicides to prevent competition from other plants and thus foster the growth of the trees. This in turn will exacerbate the problems caused by the use of these products.

The use of genetically modified trees

Another troubling aspect of this new type of plantation is the use of genetically modified trees. The biotech company FuturaGene recently announced that its genetically modified eucalyptus trees can grow five metres a year -40% faster than normal- with 20% to 30% more mass than a normal eucalyptus. According to company chief executive Stanley Hirsch, all that is needed now for the trees to be grown commercially are permissions from governments and backing from conservation groups and certification bodies. The company has tested the trees on trial plantations in Brazil, China and Israel, and is currently in the final stages of obtaining authorization for commercial planting in Brazil.[95]

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94 Impact of EU Bionenergy Policy on Developing Countries http://www.ecologic.eu/files/attachments/Publications/2012/2610_21_bioenergy_lot_21.pdf

95 En base a información publicada por el periódico The Guardian, artículo escrito por John Vidal, disponible en http://www.climatecentral.org/news/firm-claims-gm-trees-a-fuel-industry-game-changer-15251

Genetic modification is also being used to develop resistance to the toxic agrochemical most frequently used on monoculture eucalyptus plantations: glyphosate.[96]

It should come as no surprise that since 2010, FuturaGene has been fully owned by none other than Brazilian pulp and paper giant Suzano.

3.4 3.4 Certification of tree plantations for bioenergy production

Biofuelwatch recently published a report[97] that reviews the standards, criteria and schemes used to certify the "sustainability" of industrial wood-based biomass, for bioenergy production. The study overviews both the use of existing certification schemes like the FSC and the development of new schemes and mandatory standards as announced in the UK and discussed across the EU.

The Forest Stewardship Council (FSC), created in 1993, has for many years been considered by big environmental NGOs such as the World Wildlife Fund (WWF) and Greenpeace to be the most "credible" certification scheme for monoculture tree plantations. It is supposed to be a transparent system, with civil society participation. However, the FSC has been heavily criticized by local communities and NGOs like the World Rainforest Movement (WRM) for having certified around eight million hectares of monoculture tree plantations, none of which could be considered "sustainable" by any standard. While certification may "mitigate" some of the negative impacts of some plantations, its fundamental function has been to "license" the indefinite expansion of plantations at the cost of local communities. This has seriously discredited the FSC and led several important Northern NGOs involved in the defence of forests and the rights of forest communities like Robin Wood, and also to a large extent FERN, to withdraw their membership.[98]

Those who benefit directly from the certification of industrial tree plantations include the consulting companies accredited to grant certification, such as SGS, SCS and Imaflora. Most of these companies also grant certification under other schemes that have more openly industry-friendly standards than the FSC, such as the Program for the Endorsement of Forest Certification (PEFC).

Certification companies are already moving into the market for certifying biomass plantations. For example, SGS states on its company website: "We are pioneers in the development of verification and certification systems that recognize biomass sustainability. (…) Our biomass verification and certification services allow you to take advantage of international markets recognizing your biofuel as sustainable."[99]

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96 A chemical herbicide that is widely used and heavily promoted as "harmless" by multinational corporations like Monsanto, which sells it under the trade name Roundup. Nevertheless, there are a growing number of studies demonstrating serious impacts caused by glyphosate on the environment and human health. The use of genetically modified trees would likely increase applications of the product, despite industry claims to the contrary. For example, after "Roundup Ready" (i.e. glyphosate-resistant) soybeans were introduced in Brazil, the use of Monsanto's Roundup apparently increased even more. (Overbeek et al., 2012)

97 Ernsting, 2012

98 Overbeek et al, 2012

99 SGS Biomass Certification (http://www.sgs.com/en/Sustainability/Environment/Energy-Services/Biomass-Certification.aspx)

In the UK, sustainability standards for both agrofuel and wood biomass production will become mandatory in October 2013, thus creating an additional incentive for the "certification industry".

According to Biofuelwatch, the sustainability standards announced by the UK government for wood biomass and discussed as a potential for an EU-wide policy lack credibility not least because they rely entirely on self-reporting by energy companies with the only required 'verification' coming from their own chosen consultants. FSC, PEFC and other voluntary forestry certification will be accepted in the UK as evidence but not be required.

The EU biofuel sustainability standards, introduced together with the 10% biofuel target for transport, also lack any independent and credible verification and are basically restricted to flawed land-use/land-conversion and greenhouse gas criteria. They do not address indirect impacts on land conversion, nor do they take social or human rights criteria into account. As a result, palm oil from plantations in Bajo Aguán, Honduras, will meet the EU's sustainability criteria despite the dozens of peasant farmers killed in land conflicts between local communities and the large landowners who control the plantations.[100]

There are also a number of "voluntary" certification initiatives designed by companies themselves. For example, Drax, currently the company burning the largest volume of biomass for energy in the UK, engaged the services of TerraVeritas to draft a set of "sustainability principles". Compliance with these principles will be determined by requiring suppliers to fill out a form, which TerraVeritas will then analyse. However, there is no indication that field visits will be conducted to the tree plantations or forests where the biomass is harvested to verify the information provided by suppliers. Nevertheless, Drax states that it "hope(s) to foster environmental leadership... [and] participate with applicable regulatory and policy initiatives to share experience."

This and other examples lead Biofuelwatch to conclude, "Biomass standards are thus not a credible means to address the serious adverse impacts of bioenergy."[101]

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100 Palm oil in the Aguan Valley, Honduras: CDM, biodiesel and murders (http://www.biofuelwatch.org.uk/2011/palm-oil-in-the-aguan-valley-honduras-cdm-biodiesel-and-murders/)

101 Ernsting, 2012

CHAPTER 4

Bioenergy: A real solution for the energy and climate crises?

4.1 Do agrofuels help to solve the energy crisis?

If local sources of biomass are used to produce bioenergy on a small scale for local consumption, this means of generating energy could be implemented in an environmentally friendly way and as a local, sustainable and ecological resource, although in the global North this would require major reductions in existing demand for wood products, especially for paper.

But it is unlikely that bioenergy will come to replace a significant share of the excessive and large-scale consumption of fossil fuels in the countries of the global North, or supply the big globalized markets.

The first problem is the enormous amount of land that would be required if plant biomass would be used to substitute fossil fuels. Today, coal, oil and gas supply the equivalent of phytomass from well over 1.25 billion hectares, while using a land area of only three million hectares (the area taken up by the global extraction, processing and transportation of fossil fuels, together with the generation and transmission of thermal electricity).[102]

Hartmut Michel, director of the Max Planck Institute in Germany and a Nobel laureate for his research on plant photosynthesis, explains the main reason for this: plants are very inefficient in converting the energy from solar radiation into biomass compared with the energy efficiency of fossil fuels, especially petroleum.[103] Only around 0.5% of solar energy[104] is captured by plants in the form of biomass.[105] And the cultivation, harvesting and processing of biomass require a large amount of fossil fuel energy, which would need to be subtracted from this percentage.

Based on a rough calculation we can estimate that the generation of one MW of electricity a year requires as much as 13,000 green tons of wood. Based on this estimate, a 50 MW power plant would burn around 650,000 tons of wood annually (50 x 13,000). In Brazil, whose eucalyptus plantations have the world's highest wood productivity rates (44 m3/ha/year), 14,700 hectares of land would be needed to produce this amount of wood. In Sweden, with a wood productivity rate of 6 m3/ha/year, it would take around 108,300 hectares.[106] Considering that electricity consumption in the United Kingdom totalled 1,636 TWh in 2010,[107] if this demand were to be met with wood pellets from tree plantations, even in the case of the highly productive eucalyptus plantations of Brazil a whopping 55 million hectares would be needed.

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102 Smil, 2010 in Overbeek et al, 2012

103 Michel, Hartmut, 2012

104 By comparison, a modern solar panel converts solar energy with an efficiency of 15%.

105 The total amount of solar energy that annually reaches the earth's surface with vegetation (100 x 1012 m2) and that is absorbed is around 0.5 x 1024 J (roughly 170 W/m2 on average based on 365 days and 24 hours a day, including periods of cloud cover). Of this energy, only approximately 0.5% (2.2 x 1021 J) is captured globally by plants and converted to biomass (60 x 109 t C yr-1).

106 Overbeek et al, 2012

107 Análisis del sector de energías renovables del Reino Unido (http://www.al-invest4.eu/minisite/renovables_port/uk/k4.1.html)

A recent report, "Bioenergy: Chances and Limits",[108] present the findings of more than 20 expert scientists who researched the potential of bioenergy in Germany for close to two years. They reached the conclusion that "in quantitative terms, bioenergy plays a minor role in the transition to renewable, sustainable energy sources in Germany at the present time and probably in the future," and consequently issued a call in July 2012 to the German government and the EU to correct their policies.

To back up their conclusion, they argue that bioenergy requires more surface area, is associated with higher greenhouse gas emissions and is more harmful to the environment than other renewable energy sources, in addition to potentially competing with food crops. They also expose how Germany -a pioneer in environmental initiatives- is greenwashing its image at the expense of others, given the ever growing amounts of raw materials that need to be imported from abroad, such as soy biodiesel from Argentina, sugar cane ethanol from Brazil, and more and more wood pellets from North America.

4.2 Do agrofuels and wood-based biomass help to curb climate change?

Trees fix carbon dioxide (CO_2) from the atmosphere as they grow and convert it into biomass. To promote bioenergy, the EU claims that burning biomass releases the *same* amount of CO_2 that the trees have fixed, which means it is "carbon neutral", or at least *fewer* carbon emissions are released. This premise is erroneous and is based on partial or incomplete calculations.[109]

Throughout the bioenergy production cycle, enormous amounts of resources are required, such as water, fertilizers and pesticides, which are heavily used on monoculture plantations. Bioenergy production also involves intensive use of fossil fuels for harvesting, transportation, storage and industrial processing to convert biomass into wood chips, wood pellets, biofuel or biogas.

To determine the real impact of agrofuels on the climate, the calculations would have to account for the use of all of these resources and the emissions produced through all of these processes, along with their direct and especially indirect impacts, particularly on land use change. Once all of these factors are added up, the supposed benefits for the climate disappear. Plantations for agrofuel production are taking over forested areas and other ecosystems like grasslands that have stored carbon for thousands of years. When these ecosystems are destroyed, enormous amounts of carbon dioxide are released into the atmosphere.

As a result, actual CO_2 savings are minimal and often negative. For example, studies by experts commissioned by the EU conclude that agrofuels are far from being carbon neutral. Their use can even result in higher CO_2 emissions than those released by burning fossil fuels. For example, using palm oil as agrofuel leads to 25% more CO_2 emissions than fossil fuel diesel.[110] And to produce 1 MWh from burning wood-based biomass releases around 50%

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108 German National Academy of Sciences Leopoldina, 2012: Leopoldina issues a critical statement on the use of bioenergy (http://www.leopoldina.org/en/press/news/leopoldina-critical-towards-use-of-bioenergy/)

109 Biomass burning is not "carbon neutral" (http://www.saveamericasforests.org/Forests%20-%20Incinerators%20-%20Biomass/Documents/Carbon%20Emissions%20-%20Pollution/Carbon%20Neutrality%20Myth.pdf).

110 Euractive, 2012: Biodiesels pollute more than crude oil, leaked data show (http://www.euractiv.com/climate-environment/biodiesels-pollute-crude-oil-lea-news-510437)

more CO_2 than generating the same from coal. Even in the optimistic case that future trees will regrow and absorb carbon as quickly and efficiently as thus cut down to be burnt, it can take decades or centuries for that carbon to be absorbed again.[111]

When all of the effects of the production, sale and use of agrofuels are factored in, it is clear that these do very little to reduce emissions of the greenhouse gases that lead to climate change.

4.3 Final considerations

This report demonstrates that woody biomass as a so-called "renewable" energy source is neither genuinely renewable nor a real solution to the climate crisis. The increase in industrial monoculture tree plantations in the South for bioenergy production is leading to an increase in social, environmental and climate injustice. The promotion of bioenergy based on large-scale monocultures, and the attempt to legitimize this activity through certification schemes, not only confuses the public, but also comes at an extremely high cost: it even further delays the adoption of the structural measures needed to truly confront the social, energy and climate crises.

However, particularly in the European Union, which is currently the biggest consumer of woody biomass, there is another possible course of action that could be pursued instead of using bioenergy as a substitute for fossil fuels. This report aims to serve as a further incentive for the urgently needed change in the patterns of excessive energy consumption and production that is overly dependent on imported energy sources - formerly fossil fuels, and now increasingly also biomass.

Until governments adopt the measures needed to curb the expansion of so-called energy plantations in the South, and also in the North, it is up to civil society and social movements in the South and North to work together to confront this dangerous new trend, and to continue the struggle to ensure that land use is geared to meeting the needs of local populations, to contributing to food sovereignty, and above all, to building a more just world.

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111 http://www.rspb.org.uk/Images/biomass_report_tcm9-326672.pdf

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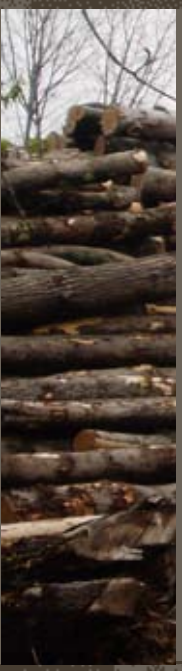

In the past few years we have witnessed the start of a new "boom", especially in Europe but also in the United States and Canada: energy generation from woody biomass. While this was initially promoted as a type of recycling, taking advantage of wood residues like sawdust, an ever growing number of whole trees are being used, and the growing of trees in monoculture plantations is now being promoted specifically for this purpose in the global South. For this new market, big industry is seeking to promote new types of wood-based commodities, such as wood chips and pellets, exclusively for energy production.

Tree plantations for biomass production further expand the model of industrial export-oriented monocultures over lands that are or could otherwise be used to guarantee the livelihood of local communities. The aim of this new WRM briefing paper is to raise awareness of this new trend.

World Rainforest Movement

The World Rainforest Movement (WRM) is an international organization that, through its work on forest and plantation related issues, contributes to achieving the respect of local peoples' rights over their forests and territories.