From Whence the Wood?

Supply Chain Transparency and the Origin of Solid Biomass for Electricity Generation in the Netherlands

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Colophon

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The Centre for Research on Multinational Corporations (SOMO) is an independent, not-for-profit research and network organisation working on social, ecological and economic issues related to sustainable development. Since 1973, the organisation investigates multinational corporations and the consequences of their activities for people and the environment around the world.

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Abbreviations

CSR	Corporate Social Responsibility
GGL	Green Gold Label
GHG	Greenhouse gas
IEA	International Energy Agency
ILO	International Labour Organisation
kt	Kilotonne (one thousand tonnes)
MEP	Milieukwaliteit van elektriciteitsproductie subsidy
MW	Megawatt (one million watt)
mt	Metric tonne, one thousand kilograms
OECD	Organization for Economic Co-operation and Development
RES-E	Electricity production from renewable energy sources
RES-H	Production of heat and cold from renewable energy sources
RES-T	Share of Renewable Energy in Transport
SOMO	Centre for Research on Multinational Corporations
UN	United Nations

Executive summary

The use of solid biomass as feedstock for electricity generation is becoming an increasingly prominent and controversial topic in the global debate about the transition to a sustainable system of energy provision and consumption. Increasing emissions of carbon dioxide (CO_2) from the combustion of fossil fuels such as coal, lignite, oil, and natural gas for electricity generation is currently the most significant driver of anthropogenic greenhouse gas (GHG) emissions and climate change. If produced under sustainable conditions, solid biomass can offer a potential path to addressing climate change by substituting fossil fuels and reducing GHG emissions. On the other hand, if produced and procured in an unsustainable manner, the use of biomass for electricity production can actually lead to an *increase* in CO_2 emissions and thus have a negative overall climate effect. The production of solid biomass for electricity generation also carries with it several other social and environmental risks related to issues such as forest degradation, loss of biodiversity, land tenure/rights violations, and human rights abuses. Detailed knowledge about the origin of the supply of solid biomass used for electricity generation is thus essential for determining whether biomass-based electricity generation is genuinely contributing to sustainable development. Given the potential direct and indirect social and environmental impacts of solid biomass production, it is crucial that civil society, regulators, consumers and companies themselves have sufficient and specific information about from where the biomass entering the Netherlands – one of the world's largest consumers of biomass – comes: where it is produced, what the feedstock is, and who is responsible for importing it. The question 'From whence (*i.e.* from where) the wood?' has never been more relevant.

The present report aims to improve the social and environmental conditions under which solid biomass is produced. By examining the degree of biomass supply chain transparency provided by the six largest individual consumers of solid biomass for electricity generation in the Netherlands – electric utilities E.ON, Eneco, EPZ (DELTA), GDF Suez, RWE/Essent, and Vattenfall/Nuon – the report aims to increase the public and political pressure on electricity companies to take responsibility for ensuring that minimum social and environmental standards are respected throughout the biomass supply chain. In order to achieve this aim, the present report has as its specific objective to gain further insight into the origin of the biomass imported into the Netherlands and used by electricity companies operating coal and biomass-fired power plants. The report seeks to raise awareness among Dutch and European politicians and the public by providing a thorough overview of all publicly available information on the origin of biomass used in Dutch power plants and identify critical gaps in public knowledge. Civil society organisations in the Global South and North will then be able to focus on those gaps in their efforts to further increase transparency and highlight actual and potential adverse impacts. In addition, the present report seeks to elevate the degree of supply chain transparency provided directly and structurally by companies so as to enable and facilitate continued improvements.

Wood pellets are the primary form of solid biomass used for electricity generation. Various types of feedstock are used to make the pellets, including sawmill residues (*e.g.* sawdust), agricultural residues from forest management (*e.g.* treetops, branches), dedicated tree plantations, and even commercial, full trees from forests when timber prices are low. Europe is the world's largest consumer of solid biomass for electricity generation with the most important individual importers being Denmark, the Netherlands, the UK and Italy. The largest producers of solid biomass are the United States (primarily the south-eastern states), Canada (primarily British Columbia), and Russia. Within Europe Germany and Sweden are the largest producers. Solid biomass production in the

US, Canada, and Russia is expected to grow rapidly in the coming years, with Canadian exports likely to double in the next decade. Countries in the Global South currently play a limited role in the global supply of solid biomass for electricity generation, but this is likely to change as demand for biomass rapidly increases. Though they are not likely to become major exporters in the next decade, based on initial 'scouting' investments countries that may eventually emerge as important source countries for the European market include Brazil, South Africa, Mozambique, Ghana, Liberia, and Tanzania. Brief surveys of three current solid biomass production projects in Liberia, Tanzania, and Ghana provide an indication of the challenges and potential adverse impacts of biomass production in developing countries for export to Europe.

The Netherlands is one of the world's largest consumers of solid biomass for electricity and also serves an important biomass import hub that plays a key role in supplying the rest of north-western Europe. The vast majority – approximately 80% – of the biomass used for electricity generation in the Netherlands is imported. The most important suppliers of biomass to the Netherlands in 2011 included the USA (21%), Canada(18%), Russia and the Baltic states (11%), Southern Europe (10%), Western Europe (excluding the Netherlands – 5%), Oceania (2%), South Africa (1%), and other countries (11%, including small shipments from Brazil and Ghana).

The largest consumers of solid biomass for electricity generation in the Netherlands are the electric utilities RWE/Essent (727,073 tonnes per year), GDF Suez (452,168 t/y), Eneco (319,000 t/y), E.ON (200,000 t/y), EPZ (191,000 t/y), and Vattenfall/Nuon (56,664 t/y). With the exception of Eneco, all of the companies co-fire the solid biomass in coal-fired power plants. Eneco operates the country's largest stand-alone biomass power plant. In recent years, the Dutch government has implemented a number of policy measures strongly encouraging biomass (co-firing) as a means of meeting renewable energy and climate targets. As a result, Dutch demand for solid biomass is expected to increase sharply in the coming years with RWE/Essent, GDF Suez, and E.ON planning new coal-fired plants with biomass co-firing capacity, and Vattenfall/Nuon converting a coal-only plant to enable it to co-fire biomass.

Of the six electric utilities examined, Eneco can be considered to the most transparent about its biomass consumption and procurement, followed by RWE/Essent and then GDF Suez. EPZ (DELTA) can be considered the least transparent. Interestingly, the degree of transparency the companies provide about the origin of the biomass they consume is generally higher than the degree of transparency they provide about the origin of the coal and – by far – uranium they use to generate electricity. That said, the overall degree of biomass supply chain transparency currently provided by electricity companies is insufficient to ensure that biomass consumption in Dutch power plants is not contributing or linked to adverse social and environmental impacts at biomass production facilities around the world. The degree of transparency provided is particularly low when it comes to specific suppliers and locations (*e.g.* forests, plantations, industrial facilities) from which biomass is procured. Also, reporting on specific feedstock types only happens sporadically using broad descriptions like 'wood pellets', 'wood chips', 'residues', or 'wood waste' without exactly the exact source/type of wood used to produce the pellets or chips. This is important as 'wood pellets' could come from a wide range of forest/plantation types, including native forest.

The overall low level of supply chain transparency provided by the electricity companies suggests that these companies are out of line with the leading international standards on supply chain transparency and responsibility. For example, the OECD Guidelines for Multinational Enterprises encourage companies to publicly disclose, rather than withhold, information about their relationships with suppliers and potential adverse impacts caused by those suppliers.

1. Introduction

1.1 Context and point of departure

The use of solid biomass as feedstock for electricity generation is becoming an increasingly prominent and controversial topic in the global debate about the transition to a sustainable system of energy provision and consumption. Increasing emissions of carbon dioxide (CO_2) from the combustion of fossil fuels such as coal, lignite, oil, and natural gas for electricity generation is currently the most significant drivers of anthropogenic greenhouse gas (GHG) emissions and climate change.[1] If produced under sustainable conditions, solid biomass can offer a potential path to addressing climate change by substituting fossil fuels and reducing GHG emissions. On the other hand, if produced and procured in an unsustainable manner, the use of biomass for electricity production can actually lead to an *increase* in CO_2 emissions and thus have a negative overall climate effect.[2] The production of solid biomass for electricity generation also carries with it several other social and environmental risks related to issues such as forest degradation, loss of biodiversity, land tenure/rights violations, and human rights abuses. [3] Detailed knowledge about the origin of the supply of solid biomass used for electricity generation is essential for determining whether biomass-based electricity generation is genuinely contributing to sustainable development. The question 'From whence (*i.e.* from where) the wood?' is thus now more relevant than ever.

Rising European and Dutch demand for solid biomass

Europe is currently the world's largest consumer of solid biomass as feedstock for electricity generation, and the demand is rapidly increasing.[4] In addition to its potential for reducing GHG emissions, the use of solid biomass for electricity generation is attractive to many companies because it is relatively easy to combine with existing large-scale, centralised electricity generation infrastructures and technologies. [5] In the European (and Dutch) electricity generation sector, solid biomass is primarily co-fired with coal in large coal-based power plants, but is also combusted in (generally smaller) stand-alone biomass-only power plants.

European demand for solid biomass is largely being driven by public policies stimulating its use in electricity generation. The European Union's *Renewable Energy Directive* aims to have 20% of the EU's energy consumption come from renewable sources by 2020.[6] The implementation of the directive in individual EU member states such as the Netherlands, Belgium, and the UK has led to

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1 IEA, CO_2 Emissions from Fuel Combustion. Paris: International Energy Agency, 2009, http://www.iea.org/co2highlights/co2highlights.pdf (24/10/2010).

2 Chum, H., A. Faaij, J. Moreira, G. Berndes, P. Dhamija, H. Dong, B. Gabrielle, A. Goss Eng, W. Lucht, M. Mapako, O. Masera Cerutti, T. McIntyre, T. Minowa, K. Pingoud, 2011: Bioenergy. In IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

3 See, e.g. N. Mainville, "Fuelling a BioMess – Why Burning Trees for Energy Will Harm People, the Climate and Forests", Greenpeace Canada, October 2011, http://www.greenpeace.nl/Global/canada/report/2011/10/ForestBiomess_Eng.pdf (20/02/2012).

4 Cocchi, M. *et al*., 'Global Wood Pellet Industry, Market and Trade Study', Task 40: Sustainable International Bioenergy Trade, Paris: International Energy Agency, December 2011, <http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf> (23 December 2012).

5 "Biomassa: Feiten, cijfers, observaties - Stand van zaken 2010", report by Pligrims Consultancy for E.ON, http://www.pilgrimsconsult.nl/uploads/file/Pamphlet%20Biomassa-feiten-cijfers-observaties.pdf (27/02/2013)

6 European Commission, Renewable Energy Directive (2009/28/EC), http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj:L:2009:140:0016:0062:en:PDF (03/04/2013).

a major increase in both demand for and supply of solid biomass in Europe. Political support for increased biomass consumption has been particularly strong in the Netherlands. Dutch legislation such as the *Milieukwaliteit Electriciteitsproductie* (Environmental Quality for Electricity Production – MEP), the *Stimuleringsregeling Duurzame Energie+* (Sustainable Energy Stimulation Mechanism – SDE+), and Green Deals – support agreements between the government and energy companies – have stimulated Dutch demand for solid biomass. In a December 2012 letter to Parliament, the Dutch Minister of Economic Affairs, Henk Kemp, stated that the government is exploring additional options to further stimulate biomass co-firing in coal-fired power plants in the Netherlands.[7]

These policies have had an impact. Five electricity companies – GDF Suez, E.ON, EPZ, RWE/Essent, and Vattenfall/Nuon – currently operate coal-fired power plants in the Netherlands in which they are co-firing large amounts of solid biomass. In 2011, these companies combusted a total amount of around 1.6 million tonnes of solid biomass in the Netherlands.[8] Three additional coal plants with co-firing capability – being constructed by GDF Suez, E.ON, and RWE/Essent – will become operational in the near future. Each of these three companies has used the biomass co-firing capacity of the new coal-fired power plants in their arguments in favour of the plants.[9] In addition to these three new plants, Vattenfall/Nuon is presently converting a coal-only plant to biomass co-firing capacity, while Eneco has recently opened a large-scale biomass-only (*i.e.* no coal) plant. When all power plants currently under construction become fully operational, biomass use in the Netherlands is expected to at least double.[10]

The demand is expected to continue to increase in the coming decades, particularly as Dutch and European policies incentivising increased biomass consumption can result in a 'lock-in effect'. Policies that incentivise consumption of biomass for electricity production encourage the construction of new coal-biomass co-firing power plants (which have a lifespan of 30+ years) the establishment of long-term supply contracts. This is likely to lead the profit-seeking electric utilities constructing and operating the power plans to continue to rely on coal as a fuel source and to less willingly consider investing in other forms of renewable energy production.

European/Dutch supply of solid biomass insufficient to meet demand; supply from abroad

The Netherlands is incapable of producing enough solid biomass to meet the domestic demand. Meeting Dutch solid biomass targets for 2020 purely through domestic production would require a plantation area 15 to 20% larger than the Netherlands itself.[11] As a result, approximately 80% of the Dutch demand for solid biomass is currently supplied from outside of the Netherlands, and largely outside of Europe altogether. Currently, a large portion of the biomass used in the Netherlands is produced in North America. However, given the steep rise in demand for biomass, countries in the Global South are expected to play an increasingly important role in supplying the Dutch market with biomass for electricity generation. Though North America is likely to remain an

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7 "Openstelling SDE+ 2013", letter from the Dutch Minister of Economic Affairs, Henk Kamp to the Dutch Parliament, 10 December 2012, http://www.rijksoverheid.nl/ministeries/ez/documenten-en-publicaties/kamerstukken/2012/12/10/openstelling-stimuleringsregeling-duurzame-energie-2013.html (15/02/2013)

8 For exact figures, see Table 6.

9 See e.g. "E-pact en biomassa", letter sent by Peter Terium, former CEO of Essent NV (currently CEO of RWE) to Henk Bleker, former State Secretary for Economic Affairs, Agriculture and Innovation, 18 November 2011, http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/brieven/2011/11/29/brief-over-de-productie-van-duurzame-energie-in-en-rondom-de-eemshaven/brief-over-de-productie-van-duurzame-energie-in-en-rondom-de-eemshaven.pdf

10 Predictions on future biomass use are hard to make, as it depends on a range of factors, including the (future) price of fossil fuels and European and Dutch legislation. For details, see paragraph 3.5.

11 "Biomassa: Feiten, cijfers, observaties - Stand van zaken 2010", report by Pligrims Consultancy for E.ON, http://www.pilgrimsconsult.nl/uploads/file/Pamphlet%20Biomassa-feiten-cijfers-observaties.pdf (27/02/2013)

important source of biomass, by as early as 2020, or at least by 2030, countries in Latin America and Africa, along with Russia, will also supply a significant amount of solid biomass to the Netherlands.[12] Countries with abundant biomass resources (such as forests and waste wood from other wood-related industries) including Brazil, South Africa, Mozambique, Liberia, Ghana and Russia are increasingly seeing these resources as a source of energy with rising economic value.

Social and environmental issues in solid biomass production

Even in highly industrialised and well-regulated countries like Canada, researchers have documented how biomass production for export to the Netherlands (and the rest of Europe) is contributing to forest degradation.[13] Though some biomass for electricity generation is produced from wood mill residues and logging debris, environmental organisations such as Greenpeace have highlighted the fact that whole trees and large forest areas are frequently cut down for energy generation purposes. In Canada, for example, recent national and provincial legislation have made biomass production possible from "unharvested, commercial, full trees in low wood market years".[14]

As production of solid biomass ramps up in countries in Latin America and Africa – often without strong regulation and enforcement– social and environmental risks are also likely to mount in both number and severity. In recent years, academics, civil society organisations and investigative journalists have documented adverse social and environmental impacts of solid biomass production. Such adverse social and environmental impacts include forest degradation, labour rights abuses, rising food prices (as a result of competition for land), and a loss of biodiversity. Furthermore, the issue of "carbon debt" has lately seen increased attention from academics. Carbon debt refers to the time period between the release of carbon emissions as a consequence of biomass extraction, transport, and combustion, and the moment that the same amount of carbon has been restored by newly grown forests. Scientific studies show that many decades – even centuries – can pass before this time gap is closed, i.e. until the same amount of carbon released during the energy production cycle is "reabsorbed" by living biomass.[15]

In addition to these direct impacts, researchers are beginning to document and map unintended and unaccounted-for indirect land use change (ILUC) associated with biomass production.[16] ILUC occurs when, for example, biomass production displaces other industries or land uses (such as agriculture or livestock production) forcing these activities to occupy and convert other land – like forests – for their purposes. ILUC is also a key factor for determining the degree to which using biomass to generate electricity actually contributes to a decrease (instead of an increase) in greenhouse gas emissions. Other factors, such as the species of trees used and whether the solid biomass is a waste product (*i.e.* residue) from another industry as opposed to being sourced from a

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[12] Cocchi, M. *et al*., 'Global Wood Pellet Industry, Market and Trade Study', Task 40: Sustainable International Bioenergy Trade, Paris: International Energy Agency, December 2011, <http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf> (23 December 2012).

[13] See e.g. FAO, "Assessing forest degradation: Forest Resources Assessment Working Paper 177", United Nations Food and Agriculture Organization, November 2011, http://www.fao.org/docrep/015/i2479e/i2479e00.pdf (15 -5-2013).

[14] N. Mainville, "Fuelling a BioMess – Why Burning Trees for Energy Will Harm People, the Climate and Forests", Greenpeace Canada, October 2011, pp. 7-10., http://www.greenpeace.nl/Global/canada/report/2011/10/ForestBiomess_Eng.pdf (20/02/2012)

[15] See e.g. IPCC, "Renewable Energy Sources and Climate Change Mitigation", Special Report of the Intergovernmental Panel on Climate Change (IPCC), 2012, p. 264., http://srren.ipcc-wg3.de/report/IPCC_SRREN_Full_Report.pdf and A. Agostini et al, "Carbon accounting of forest bioenergy – Conclusions and recommendations from a critical literature review", Joint Research Centre Technical Report, European Commission, 2013, http://iet.jrc.ec.europa.eu/bf-ca/sites/bf-ca/files/files/documents/eur25354en_online-final.pdf

[16] D. Laborde, "Assessing the Land Use Change Consequences of European Biofuel Policies", October 2011, International Food Policy Research Institute (IFPRI), prepared for the European Commission, <http://trade.ec.europa.eu/doclib/docs/2011/october/tradoc_148289.pdf> (15/10/2012).

dedicated forest or plantation.[17] For all of these reasons, knowing the specifics about where, how, and with what materials solid biomass is produced is critical for determining whether electricity generated with that biomass can be considered 'sustainable'.

Responsibility of electricity companies in the Netherlands in identifying, preventing, and mitigating adverse impacts in the solid biomass supply chain

Recent years have seen the development of an international consensus that electricity companies (or indeed, all companies) have a responsibility to ensure that minimum social and environmental standards are respected by all of their business partners and relations, including those in their supply chain. Two sets of recently-released, internationally-agreed upon normative guidelines and standards specify what is expected of companies with respect to supply chain responsibility. The Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises[18] and the United Nations (UN) Guiding Principles on Business and Human Rights provide recommendations to and guidance for companies, and can be used as a benchmark for their performance on supply chain responsibility and transparency. The standards insist that companies should – in a process called 'due diligence' – identify, prevent and mitigate negative social and environmental impacts in their supply chain.[19] This implies that companies must 'know' their supply chain and evaluate all of the potential risks associated with the activities of their business relationships. Companies are also expected to engage meaningfully with stakeholders throughout the supply chain.

Importance of transparency in the solid biomass supply chain

Supply chain transparency is a crucial element of the supply chain responsibility and meaningful stakeholder engagement that is expected of companies. Given the potential direct and indirect social and environmental impacts of solid biomass production, it is crucial that civil society, regulators, consumers and companies themselves have sufficient and specific information about from whence (*i.e.* from where) the biomass entering the Netherlands comes: where it is produced, what the feedstock is, and who is responsible for importing it. Transparency allows interested actors throughout the supply chain to identify actual or potential adverse impacts and enables them to direct that information or grievance toward the responsible parties along the chain. Civil society actors with specific information about where electricity companies source their biomass can help those companies that are willing to work to identify, prevent and mitigate adverse impacts (including potential impacts before they become full-fledged problems) linked to their operations. They can also put public and political pressure on those companies that are unwilling to do so. In addition to its value for ensuring that minimum social and environmental standards are being respected throughout the solid biomass supply chain, the companies are also expected to provide a high degree of supply chain transparency by the OECD Guidelines for Multinational Enterprises. These internationally endorsed standards encourage companies to disclose information about their relationships with suppliers.[20]

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[17] A. Agostini et al, "Carbon accounting of forest bioenergy – Conclusions and recommendations from a critical literature review", Joint Research Centre Technical Report, European Commission, 2013, http://iet.jrc.ec.europa.eu/bf-ca/sites/bf-ca/files/files/documents/eur25354en_online-final.pdf

[18] OECD, OECD Guidelines for Multinational Enterprises: 2011 Edition, 25 May 2011, http://www.oecd.org/daf/inv/mne/oecdguidelinesformultinationalenterprises.htm (01/12/2012).

[19] OECD, OECD Guidelines for Multinational Enterprises: 2011 Edition, Chapter II, paragraphs 10 and 12, 25 May 2011, http://www.oecd.org/daf/inv/mne/oecdguidelinesformultinationalenterprises.htm (01/12/2012).

[20] OECD, OECD Guidelines for Multinational Enterprises: 2011 Edition, Chapter III, paragraph 3e and Commentary paragraph 33, 25 May 2011, <http://www.oecd.org/document/28/0,3746,en_2649_34889_2397532_1_1_1_1,00.html> (1 December 2011).

The energy sector currently lags behind other industries when it comes to the degree of supply chain transparency provided by companies. For example, the consumer electronics sector has a much higher general level of supply chain transparency. Many electronics companies openly identify their first and even second-tier suppliers, and some electronics companies are now going so far as to identify specific mines in Africa and smelters in Asia from which the metals and minerals in their products are sourced. In this regard, companies in the electricity sector have much room for improvement. Addressing this challenge is taken as the point of departure for the report.

1.2 Aims and objectives

The primary aim of the present report is to improve the social and environmental conditions under which solid biomass is produced. By focussing on the (lack of) transparency in the supply chain of solid biomass for electricity generation in the Netherlands, the report aims to increase the public and political pressure on electricity companies that import biomass produced under sub-standard social and environmental conditions to take responsibility for improving those conditions. In order to achieve this aim, the present report has as its specific objective to gain further insight into the origin of the biomass imported into the Netherlands and used by electricity companies operating coal and biomass-fired power plants. The report seeks to raise awareness among Dutch and European politicians and the public by providing a thorough overview of all publicly available information on the origin of biomass used in Dutch power plants and identify critical gaps in public knowledge. Civil society organisations in the Global South and North will then be able to focus on those gaps in their efforts to further increase transparency and highlight actual and potential adverse impacts. In addition, the present report seeks to elevate the degree of supply chain transparency provided directly and structurally by companies so as to enable and facilitate continued improvements.

The research report is part of SOMO's on-going work on 'energy supply chains', which includes investigations into sustainable development and corporate social responsibility (CSR) aspects of energy commodities such as uranium, oil, biomass, and coal, as well as the supply chains of renewable energy technologies such as solar panels (photovoltaics).

1.3 Research questions

In order to achieve these specific objectives and the overall aim, this report seeks to answer the following research questions:

- How is the global market and supply chain for solid biomass structured, particularly in terms of type of biomass, major producing countries, and major consuming countries?
- What role does the Netherlands play in the global solid biomass market, and what is the role of biomass in the Dutch electricity generation sector? What are the quantities, types, and origins of solid biomass flowing into the Netherlands?
- Which major electricity companies operating in the Netherlands are involved in the import, resale, and/or usage of solid biomass?
- To what degree do the electricity companies operating in the Netherlands provide transparency about the origin of the biomass purchased and used in their power plants?
- Are there differences in the degree of transparency provided by individual companies?
- Is the degree of solid biomass supply chain transparency provided by electricity companies operating in the Netherlands in line with relevant international standards?
- Are there differences in the corporate supply chain responsibility policies of individual companies?

1.4 Target groups

The primary intended beneficiaries of this research report are the individuals and communities that work in and are impacted by the production of solid biomass for electricity generation. The report aims to provide them and civil society organisations that represent their interests with critical knowledge that can assist them in improving their living standards and livelihoods. The report also targets those actors able to most directly and quickly improve the overall poor degree of transparency in the biomass supply chain: managers of the electricity companies responsible for importing biomass into the Netherlands and Dutch and European policy makers. The recommendations based on the research findings are primarily addressed to these two target groups.

1.5 Scope and research methods

The research and drafting of this report was conducted in 2012 and 2013. In order to ensure comparability across companies, the report and findings are based on data and figures primarily from solid biomass flows and consumption in the fiscal year 2011. The scope of the research was focused on the operations of large electric utilities operating biomass-combusting (stand-alone or co-fired with coal) facilities with a nameplate electricity generation capacity of 50 MW or more that deliver electricity to the Dutch electricity grid. This parameter resulted in the scope of the research being limited to six electricity companies: Eneco, E.ON, EPZ (DELTA), GDF Suez, RWE/Essent, and Vattenfall/Nuon.

The research methods employed were various and included both a literature study and empirical research. The literature review involved analysis of publicly available data on company websites, corporate responsibility or sustainability reports, and procurement policies and procedures. Articles and reports produced by academic institutions, intergovernmental bodies, non-governmental organisations, trade unions, and media outlets were also used. Reports by the IEA Bioenergy Task 40 on international bioenergy trade were particularly relevant.[21] Company information databases were reviewed and analysed to provide further insight into the electricity companies' supply chain relationships and sourcing of biomass.

In addition to publicly available sources, empirical research involved a standardised questionnaire and semi-structured interviews with corporate managers. In June 2012, a standardised questionnaire requesting information on the procurement of biomass on the company-wide level and for Dutch operations was sent to sustainability or procurement managers at each of the six companies included in the research. All of the companies except EPZ (DELTA) responded to SOMO's request and provided some of the solicited information. EPZ (DELTA) indicated it would not participate in the research or provide information because the research is not within the company's strategic scope.[22] In addition to the electric utilities, researchers at Utrecht University's Copernicus Institute and Greenpeace Nederland were interviewed and provided comments on a draft of the report.

Finally, all six electricity companies profiled in this report were given the opportunity to review a draft of their company's profile and provide comments and corrections of factual errors. All

[21] For example, Cocchi, M. *et al*., 'Global Wood Pellet Industry, Market and Trade Study', Task 40: Sustainable International Bioenergy Trade, Paris: International Energy Agency, December 2011, <http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf> (23 December 2012).

[22] DELTA, personal communication (e-mail) with authors, 27 June 2012.

electricity companies except EPZ (DELTA) made use of the opportunity to review the draft and provided comments that have been incorporated into the final versions of the company profiles in Chapter 4. The company review procedure allowed SOMO to verify the national origin of the solid biomass being consumed by each electricity company, and the precise degree of supply chain transparency each company is willing to provide. In addition, all three biomass production companies profiled in section 2.5 were given the opportunity to review a draft of their company's profile and provide comments and corrections of factual errors. The profile of Buchanan Renewables is based on a larger research undertaking detailed in two previous reports by SOMO and research partners in Liberia and Sweden.[23] Buchanan Renewables full reaction to the research findings can be found in the methodology section of both reports.

1.6 Structure of the report

The remainder of this report is structured as follows. Chapter 2 provides a brief overview of the global market for solid biomass production and consumption for purposes of electricity generation. This includes a description of the various types of solid biomass, the main producing and consuming countries, and current and projected supply and demand. Chapter 3 delves into the role the Netherlands plays in the biomass supply chain, including the drivers behind the increasing Dutch consumption and the main corporate players in the Dutch market. Chapter 4 comprises profiles of each of these corporate players (electricity companies), including the (national) origin of the biomass each company procures for its operations and the degree of transparency each provides. Chapter 5 concludes by drawing lessons from the findings, answering the research questions, and presenting recommendations to decision-makers in companies and the government for improving supply chain transparency.

[23] T. Steinweg *et al.*, "Cut and run - Update on the impact of Buchanan Renewables' operations and Vattenfall's divestment", SOMO, March 2013, http://somo.nl/publications-en/Publication_3942; T. Steinweg & K. Racz, "Burning Rubber: Buchanan Renewables' Impact on Sustainable Development in Liberia", SOMO, November 2011, http://somo.nl/publications-nl/Publication_3715-nl.

2. The global solid biomass supply chain

This chapter provides a brief overview of the global market for solid biomass production and consumption for purposes of electricity generation. This includes a description of the various types of solid biomass, the main producing and consuming countries, a brief overview of the two most important origin countries for European biomass consumption – Canada and the United States – and information on biomass production in the Global South, including three brief, illustrative case studies. The chapter concludes with projections for future biomass supply and demand. The chapter aims to answer the research question related to how the global market and supply chain for solid biomass structured, particularly in terms of type of biomass, major producing countries, and major consuming countries.

2.1. Definition and types of solid biomass

Solid biomass can be used for large-scale electricity generation in power plants. In most cases, solid biomass is used as an additional fuel in coal-fired power plants in a process called co-firing. In other cases, stand-alone biomass power plants run exclusively on solid biomass.

For the purposes of the present report, solid biomass is defined as any solid, organic, non-fossil material of biological origin that may be used as fuel for electricity production.[24] Liquid biomass such as bio-ethanol used as a transport fuel is not included. Solid biomass can be divided into three categories. Firstly, there is primary biomass, which is the organic material used in its natural, harvested form. No processing other than cutting is needed prior to combustion. Wood chips, firewood, and industrial roundwood are examples of primary biomass. Secondary biomass is the fuel that is generated as a result of harvesting and processing of primary biomass. Processed biomass, such as wood pellets, is the most widely used type of biomass for electricity generation. Agricultural residues of maize or wheat processing or cacao husks are also categorized as secondary biomass.[25] Tertiary biomass is procured from (urban) waste streams such as demolition wood and recycled wood from municipal waste. [26] Tertiary biomass represents a minor fraction of biomass used for energy purposes.

[24] Definition based upon International Energy Agency Statistics, “Renewables information (2010 Edition)”, p.5. (http://books.google.nl/books?id=lCJwi7bEbOAC&pg=PA5&lpg=PA5&dq=sulphite+lyes+black+liquor&source=bl&ots=FBWjD0kYTI&sig=3YGW91wEk5kfJ4aaxOt8nY64HgI&hl=en&sa=X&ei=ReHqUL7cEomj0QWnjoGoAg&ved=0CEIQ6AEwAw#v=onepage&q=sulphite%20lyes%20black%20liquor&f=false)

[25] Sungrant bioweb website, “Secondary biomass”, http://bioweb.sungrant.org/Glossary/S/Secondary+biomass.htm (10/04/2013)

[26] Sungrant bioweb website, “Tertiary biomass”, http://bioweb.sungrant.org/Glossary/T/Tertiary+biomass.htm (10/04/2013)

Wood pellets
Wood pellets are produced by milling, drying and compacting woody vegetation. Production is performed in a pellet plant, often relatively close to the wood source. The raw material can be any woody material; it mainly consists of sawmill residues (sawdust). Other sources are energy crops, untreated wood, felled logs or other woody parts from nature management- and forestry practices.

In the production process, the woody material is dried and compacted into little cylindrical pellets, resulting in high density wood with relatively low moisture and high energy content and a homogenous composition. Wood pellets can be stored over long periods of time without rotting, reducing the costs for handling, transport, and storage.[27] Because of the physical features, wood pellets are suitable for co-firing in coal power plants. Wood pellets are produced with a variety of characteristics in, for example, size, density, and moisture content. Around 35% of all wood pellets produced globally is used in power plants and other medium and large-scale applications. The rest is used domestically and in small-scale systems.[28]

2.2. Biomass consumption and production

Nearly two thirds of the world's (liquid and solid) biomass is used for traditional cooking and heating applications in developing countries. Around one-third is used in industrialised countries for electricity generation purposes and for commercial and domestic heating.[29] Although biomass-based energy consumption plays a significant role in developing countries, e.g. in the form of open fires or cook stoves, in industrialised countries, bioenergy is comparatively small. The total amount of 280 TWh of electricity generated by biomass represented 1.5% of the global electricity production in 2010.[30] In Europe, the energy production from biomass and renewable waste has almost doubled in the past decade, from 59 million tonnes of oil equivalent (Mtoe) in 2000 to 108 Mtoe in 2011.[31]

Most of the electricity generated by biomass is obtained by using wood pellets. Figure 1 reveals that, globally, the most important pellet-producing producing countries are the US, Canada, Germany, Sweden and Russia, respectively. The biggest wood pellet consuming countries are Sweden, Denmark, the US, the Netherlands, and Italy.[32]

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27 M. Hansen & A. Jein, "Pellets@las: English handbook for wood pellet combustion", 2009, p. 5., http://www.pelletsatlas.info/pelletsatlas_docs/showdoc.asp?id=090313124119&type=doc&pdf=true (12/12/2012)

28 IEA Bioenergy Annual Report 2011, International Energy Agency, January 2012, p. 14., http://www.ieabioenergy.com/LibItem.aspx?id=7315 (04/04/2013)

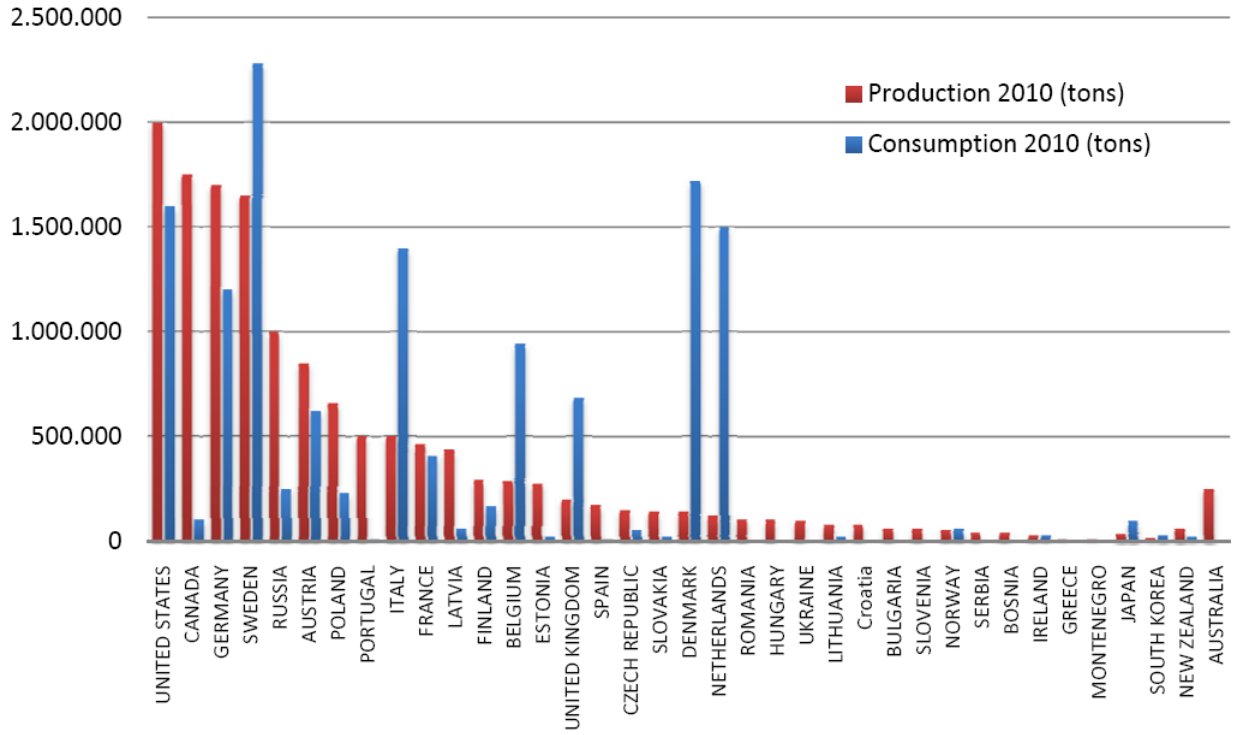
29 J. Heinimö & M. Junginger, "Production and trading of biomass for energy – An overview of the global status", 15th European biomass conference and exhibition, 11-17 May 2007, Berlin, Germany, http://igitur-archive.library.uu.nl/chem/2008-0506-201447/NWS-E-2007-49.pdf

30 International Energy Agency website, Topics, "Bioenergy", http://www.iea.org/topics/bioenergy/ (02/03/2013).

31 Figures refer to the total heat content of the produced biofuels or biogas and the heat produced after combustion during incineration of renewable wastes, for electricity generation and heating purposes. Eurostat, "Renewable energy primary production: biomass", http://epp.eurostat.ec.europa.eu/tgm/refreshTableAction.do;jsessionid=9ea7d07e30ea1a0b3f6ed15e421aab7dce0c44f40b16.e34OaN8Pc3mMc40Lc3aMaNyTaNmPe0?tab=table&plugin=1&pcode=ten00082&language=en (10/04/2013)

32 M. Cocchi et al, "Global Wood Pellet Industry, Market and Trade Study", commissioned by the International Energy Agency Bioenergy Task 40 Sustainable International Bioenergy Trade, December 2011, http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf (23/03/2013)

Figure 1: Wood pellet production and consumption by country, in tonnes, 2010

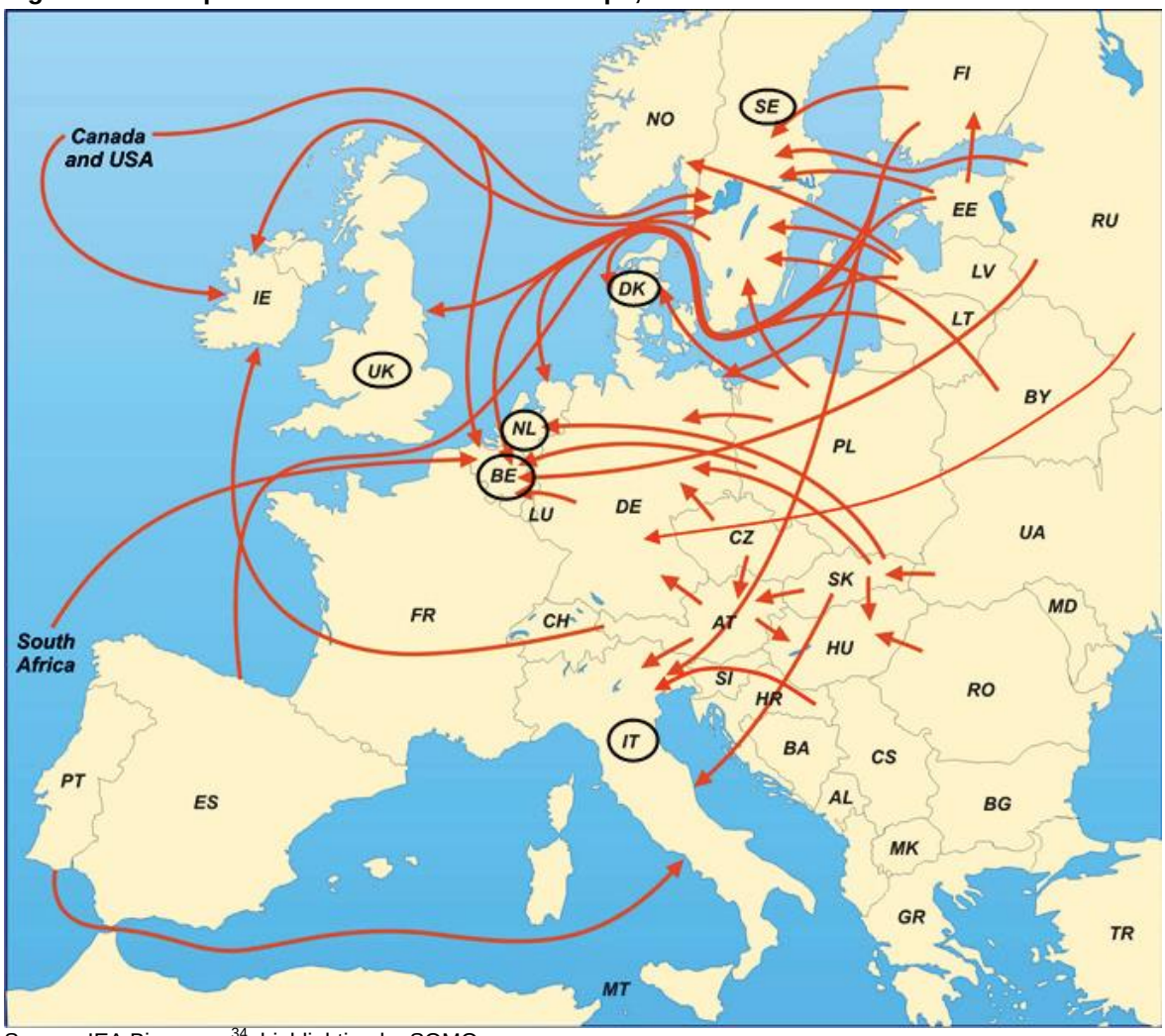


Source: IEA Bioenergy[33]

Notable in Figure 1 is the 'production-consumption gap' observable in countries such as Sweden, Italy, Belgium, the UK, Denmark and the Netherlands. This means that these countries are highly reliant on imports to meet their demand. Figure 2 illustrates the trade flow of wood pellets into Europe. The countries with the highest wood pellet import volumes are circled. The figure clearly reveals how Western Europe's demand is fed by Eastern Europe (including Russia), as well as Canada, the United States, and South Africa.

[33] M. Cocchi et al, "Global Wood Pellet Industry, Market and Trade Study", commissioned by the International Energy Agency Bioenergy Task 40 Sustainable International Bioenergy Trade, December 2011, p. 9., http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf (23/03/2013)

Figure 2: Wood pellet trade flows in and to Europe, 2010



Source: IEA Bioenergy[34], highlighting by SOMO

2.3. North American wood pellet markets

Canada and the United States are currently the countries with the largest production of wood pellets worldwide. These countries are also the two largest countries of origin for the biomass market in the Netherlands. The Canadian and US wood pellet markets are briefly described in this paragraph.

2.3.1. Canada

In 2011 there were 39 pellet plants operating in Canada with a total capacity of 3.2 million tonnes. More than half of this capacity is located on the West coast of the country in British Columbia.[35] The most important feedstock for the Canadian wood pellet industry are sawmill residues (saw

[34] IEA Bioenergy Annual Report 2011, International Energy Agency, January 2012, p. 15., http://www.ieabioenergy.com/LibItem.aspx?id=7315 (04/04/2013)

[35] M. Cocchi et al, "Global Wood Pellet Industry, Market and Trade Study", commissioned by the International Energy Agency Bioenergy Task 40 Sustainable International Bioenergy Trade, December 2011, p. 109., http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf (23/03/2013)

dust) and logging residues.[36] Pinnacle Pellet is the biggest wood pellet producer in the country, operating four plants in British Columbia.[37] Table 1 shows the 10 pellet plants with the highest annual production capacity in Canada. For a comprehensive list of all pellet plants in Canada, see the 2011 International Energy Agency study on the global wood pellet industry.[38] For a list of pellet plants under construction and facilities that are being planned in Canada, see the Annex.

Table 1: Top 10 pellet plants in Canada, 2011

Plant name	Location	Capacity (tonnes/year)
Pacific BioEnergy Corp	Prince George, BC	350,000
Pinnacle Pellet - B.L.	Burns Lake, BC	320,320
Pinnacle Pellet - H.	Houston, BC	240,240
Pinnacle Pellet - MB	Strathnaver, BC	220,000
Pinnacle Pellet - W.L.	Williams Lake, BC	200,200
Premium Pellet Ltd	Vanderhoof, BC	140,000
Trebio Inc.	Portage-du-Fort, QC	130,000
Woodville Pellet Corp	Merritt, BC	120,000
Granules LG	St. Felicien, QC	120,000
Engrex Pellet Fuel	Lac-Megantic, QC	120,000

Source: IEA Bioenergy[39]

With around 100,000 tonnes of wood pellets combusted domestically, the Canadian pellet market is significantly smaller than the two million tonnes produced for export.[40] According to the Wood Pellet Association of Canada, Canadian shipments of wood pellets to Europe totalled 1.2 million tonnes in 2011. The distribution of destination countries in 2011 was as follows: the UK 51%, the Netherlands 24%, Belgium 16%, Italy 6%, Denmark 2%, and Sweden 2%. Canadian wood pellets were mostly used for electricity production in Europe, with the exception of Italy, where the pellets were mainly used for heating.[41]

The 2011 International Energy Agency study on the global wood pellet industry predicts that the Canadian production capacity, domestic demand, as well as Canadian exports will increase significantly in the coming decade. [42] Table 2 presents the current and 2020 capacity, domestic demand and export figures for Canadian wood pellets.

[36] "Canadian Wood Pellet Export Outlook", presentation by Gordon Murray, Wood Pellet Association of Canada, 13 September 2012, http://www.pellet.org/images/17_Murray_-_WPAC.pdf (10/04/2013)
[37] M. Cocchi et al, "Global Wood Pellet Industry, Market and Trade Study", commissioned by the International Energy Agency Bioenergy Task 40 Sustainable International Bioenergy Trade, December 2011, p. 109., http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf (23/03/2013)
[38] Ibid.
[39] Ibid.
[40] Ibid., p.110.
[41] "Canadian Wood Pellet Export Outlook", presentation by Gordon Murray, Wood Pellet Association of Canada, 13 September 2012, http://www.pellet.org/images/17_Murray_-_WPAC.pdf (10/04/2013)
[42] M. Cocchi et al, "Global Wood Pellet Industry, Market and Trade Study", commissioned by the International Energy Agency Bioenergy Task 40 Sustainable International Bioenergy Trade, December 2011, p. 113, http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf (23/03/2013)

Table 2: Canadian wood pellet supply, in tonnes, 2011 & 2020

Year	2011	2020
Capacity	3,262,000	5,775,000
Domestic demand	100,000	2,300,000
Exports	1,972,000	3,475,000

Source: IEA Bioenergy[43]

2.3.2. United States

In the United States there are around 100 wood pellet plants operational with a total production capacity of around six million tonnes a year, making the US pellet market almost twice as big as the Canadian. Most pellet plants are located in the Northeastern, Southeastern and Northwestern states.[44] Feedstock for the pellet industry consists of sawmill residues, wood chips and roundwood from forestry. Table 1 shows the 10 pellet plants with the highest annual production capacity in the United States. With an annual production capacity of 750 kt, RWE's Georgia Biomass is the biggest pellet plant in North America. For a comprehensive list of all pellet plants in the US, see the 2011 International Energy Agency study on the global wood pellet industry.[45] For a list of pellet plants under construction and facilities that are being planned in the US, see the Annex.

Table 3: Top 10 pellet plants in the United States, 2011

Plant name	Location	Capacity (tonnes/year)
Georgia Biomass	Waycross, GA	750,000
New Gas Concepts	Selma, AL	454,000
Green Circle Bioenergy	Cottondale, FL	454,000
Corinth Wood Pellets	Corinth, ME	272,000
Maine Wood Pellets	Athens, ME	165,000
Renewafuels	Marquette, MI	136,000
Fram Renewable Fuels	Baxley, GA	132,000
Fiber Resources	Pine Bluff, AR	112,000
Bear Mountain Forest Prod	Brownsville, OR	104,000
New England Wood Pellet	Schuyler, NY	82,000

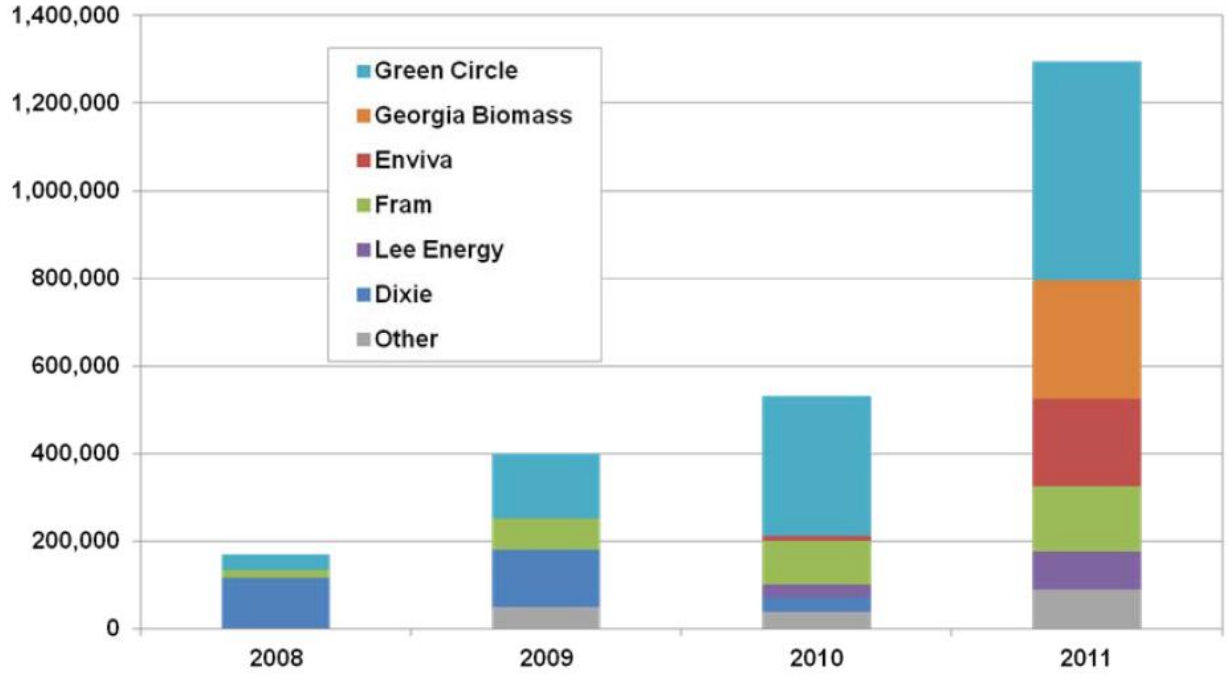
Source: IEA Bioenergy[46]

As opposed to the Canadian wood pellets market, the US market mainly produces for domestic consumption. In 2008 around 80% of the country's wood pellet production was used domestically, while 19% was exported to Europe.[47] Exports have since increased; in 2011 around 1.3 million and in 2012 approximately 1.5 million tonnes of wood pellets were exported, which is around 25% of the country's production capacity.[48] Most of the biomass exports in the US originate from the southern states. In 2011 the most important export companies were Green Circle, owned by the Swedish multinational energy company JCE Group,[49] RWE's Georgia Biomass and Enviva, which

[43] Ibid.
[44] Ibid., p. 115, 117, 122.
[45] Ibid., p. 109.
[46] Ibid., 119-121.
[47] Ibid., p. 124.
[48] "North American Wood Pellet Markets", presentation by Seth Walker, Associate Economist Bioenergy at RISI, http://pelletheat.org/wp-content/uploads/2010/01/Walker.pdf. The figure of 1.5 million tonnes is an estimate for the year 2012 by the North American Wood Fiber Review , "US surpasses Canada as top wood pellet exporter, report says", Renewable Energy Magazine, 19 October 2012, http://www.renewableenergymagazine.com/article/us-surpasses-canada-as-top-wood-pellet-20121019 (10/04/2013)
[49] Green Circle Bioenergy website, "JCE Group", http://www.greencirclebio.com/jcegroup.php (10/04/2013)

has signed a supply agreement with E.ON.[50] Figure 3 shows the increase in US wood pellet exports from southern states by company between 2008 and 2011.

Figure 3: Wood pellet exports by company from Southern US, in tonnes, 2008-2011



Source: RISI[51]

Although European exports are currently growing, it is not certain whether this growth trend will continue. Some reports[52] say that European exports may actually decrease in the future if the US domestic demand fuelled by US government policies continues to grow.

2.4. Biomass from the Global South

Over the last years several biomass projects have been set up in the Global South mainly by European and North American investors to produce solid biomass for electricity generation purposes in Europe.[53] Incentives for companies to procure their biomass from developing countries include low labour, land, and investment costs and tree growth rates that are significantly higher than in the Global North. Regarding growth rates, the differences between natural forests and plantation forests and between temperate or continental climate and tropical regions are substantial. “In natural temperate forests, growth rates range from 1 to 4 m³ per hectare, each year. In temperate and sub-tropical plantations of conifers such as pines, this range rises to 10–30 m³ per hectare, each year. Tropical pine plantations are faster still at 15–45 m³ per hectare, each year.

[50] Enviva website, News, “Enviva and E.ON sign multi-year biomass supply contract”, < http://www.envivabiomass.com/featured/enviva-e-on-sign-multi-year-biomass-supply-contract/> (28-8-2012)

[51] “North American Wood Pellet Markets”, presentation by Seth Walker, Associate Economist Bioenergy at RISI, http://pelletheat.org/wp-content/uploads/2010/01/Walker.pdf.

[52] M. Cocchi et al, “Global Wood Pellet Industry, Market and Trade Study”, commissioned by the International Energy Agency Bioenergy Task 40 Sustainable International Bioenergy Trade, December 2011, p. 128., http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf (23/03/2013)

[53] L. Cotula, et al, “Biomass energy: Another driver of land acquisitions?” International Institute for Environment and Development (IIED), August 2011, http://pubs.iied.org/pdfs/17098IIED.pdf

Fastest of all are tropical eucalypt plantations that can reach growth rates of up to 60 m³ per hectare, each year."[54]

2.4.1. Biomass exporters in the Global South

A total of fourteen projects in nine developing countries in the Global South were identified. From two of these countries, namely Brazil and Ghana, small 'test' amounts of biomass were exported to the Netherlands in 2011.[55]

Table 4 provides an overview of some of the biomass producers in Global South that are either confirmed or assumed to export to Europe. Production countries are mainly located in Africa and Southeast Asia. Note that the list is not exhaustive.

Table 4: Biomass projects in the Global South with possible exports to Europe

Biomass producer	Production country	Location investors	Importing country	Feedstock	Product	Acquisition area (ha)	Production capacity (kt/y)
EC Biomass[56]	South Africa	South Africa	Denmark, Scandinavia	Wood waste from sawmill	Wood pellets		80-240
Biofuel Ghana[57]	Ghana	Denmark		Wood waste	Wood pellets		
Africa Renewables (AfriRen) [58]	Ghana	Denmark	Denmark, Northwestern Europe	Old rubber trees	Wood chips	13,000	1,350
Ghana Biomass[59]	Ghana	UK	UK*	Cacao husks	Wood pellets		350 (fresh husks)
MAGForestry (MAGIndustries) [60]	Republic of Congo	Canada		Eucalyptus	Wood chips	68,000	500
GF Energy (Zebra Pellets Ltd.) [61]	South Africa	Netherlands	Netherlands*		Wood pellets		80

[54] Ibid.

[55] M. Junginger and C.S. Goh, assistant professor and researcher at the Copernicus Institute, Utrecht University, e-mail, 8 June 2012.

[56] "Africa as a rising biomass exporter to Europe", Biomass-energy website, 25 July 2011, http://www.biomass-energy.org/2011/07/africa-as-a-rising-biomass-exporter-to-europe/; "South Africa: New bio fuel plant launched at Coega", Energy 4 Africa website, 31 January 2007, http://energy4africa.net/news/viewnews.php?ID=217 (10/12/2012); EC Biomass website, http://www.ecbiomass.co.za/; "EC Biomass reached critical mass", 1 March 2008, http://www.grindrod.co.za/Uploads/Documents/7/01%20March%202008,%20EC%20Biomass%20reached%20critical%20mass%20pg1.%20Wood%20Southern%20Africa%20&%20Timber%20times.pdf ; S. Khanyile, "Coega could add 480MW renewables to grid", 20 December 2010, http://www.energy-resource.co.za/content/energy-resource/ejournal/item/901-coega-could-add-480mw-renewables-to-the-grid.html

[57] Biofuel Ghana website, http://biofuelghana.com/profile.html (11/07/2012).

[58] "Increasing foreign investment in developing world biomass plantations", Biomass-energy website, 13 September 2011, http://www.biomass-energy.org/2011/09/increasing-foreign-investment-in-developing-world-biomass-plantations/ ; L. Gibson, "Rubber tree chips to fuel Danish power plant", Biomass Magazine, 26 October 2011, http://biomassmagazine.com/articles/5890/rubber-tree-chips-to-fuel-danish-power-plant; "Africa Renewables Ltd. – Connecting Africa to the green energy economy", Africa Renewables presentation, February 2011, http://www.slideshare.net/medinagomez/afriren-teaser-feb2011; Africa Renewables website, "What we do", http://www.afriren.com/en/what-we-do (11/12/2012)

[59] Ghana Biomass website, "About us", http://ghanabiomass.com/about_us.htm#products (11/12/2012)

[60] L. Cotula, et al, "Biomass energy: Another driver of land acquisitions?" International Institute for Environment and Development (IIED), August 2011, http://pubs.iied.org/pdfs/17098IIED.pdf; "Congo, Republic: Thousands of hectares of land for eucalyptus, oil palm and mining", World Rainforest Movement, WRM bulletin Nº 120, July 2007, http://www.wrm.org.uy/bulletin/120/CongoR.html; "MagIndustries Provides Update of the Company's Activities", MagIndustries press release, 7 January 2010, http://www.magindustries.com/news.aspx?newsid=40&pageid=3 (10/12/2012).

[61] "Africa as a rising biomass exporter to Europe", Biomass-energy website, 25 July 2011, http://www.biomass-energy.org/2011/07/africa-as-a-rising-biomass-exporter-to-europe/; GF Energy website, Wood pellet production, "South Africa", http://www.gfenergy.eu/productie/our-wood-pellet-plant-in-south-africa.html (11/12/2012). Owner is a Dutch BV,

United company for land reclamation[62]	Egypt	Egypt			Wood pellets		50
Clenergen[63]	Guyana	US	US, UK	Paulownia genus, Bamboo and Meliaceae	Wood pellets	2,000	
Green resources[64]	Tanzania and Mozambique	Norway	Norway*	Eucalyptus and pinus	Plans for wood pellet facility	610,000	
DPS Co. Ltd[65]	Vietnam	Vietnam		Cajuput, Acacia, Eucalyptus	Wood pellets		24
Buchanan Renewables[66]	Liberia	Liberia/ Canada	Germany*	Old rubber trees	Wood chips	2,000	100
Medco[67]	Indonesia	Indonesia		Eucalyptus, Acasia	Wood chips and pellets	170,000	5,000
Biotech Fuels[68]	South Africa		EU		Wood pellets		65

* Importing relation has not been verified, assumptions are based on the investor origin and the foreseen increase in biomass demand in the respective country.

Countries with current possible potentials of biomass export to Europe which were identified are Ghana, South Africa, the Republic of Congo, Tanzania, Mozambique, Liberia, Egypt, Indonesia, Vietnam and Guyana. Though they are not likely to become major exporters in the next decade, based on initial 'scouting' investments these countries may eventually emerge as important source countries for the European market.

No biomass producers with exporting operations to the EU have been found in Brazil, although the country is seen as one of the most important developing countries with export potential for Europe in the future (for more detail, see paragraph 2.7). There are a number of eucalyptus plantations

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which is managed by a trust office in the Netherlands. "Zebra Pellets - next plant in South Africa", Bioenergy International, No 35, 6, December 2008, p. 25., http://www.novator.se/bioint/BioInt35/BioInt35.pdf; GF Energy BV annual accounts 2010, as deposited at the Dutch Chamber of Commerce.

62 "Africa as a rising biomass exporter to Europe", Biomass-energy website, 25 July 2011, http://www.biomass-energy.org/2011/07/africa-as-a-rising-biomass-exporter-to-europe/; United Company for Land Reclamation and Agro-Industries website, "About us", http://www.ucegypt.com/About.html (11/12/2012)

63 L. Cotula, et al, "Biomass energy: Another driver of land acquisitions?" International Institute for Environment and Development (IIED), August 2011, http://pubs.iied.org/pdfs/17098IIED.pdf; Cleanergen website, Clean Energy, "Commercial projects", http://www.clenergen.com/clean-energy/commercial-projects (10/12/2112)

64 "Increasing foreign investment in developing world biomass plantations", Biomass-energy website, 13 September 2011, http://www.biomass-energy.org/2011/09/increasing-foreign-investment-in-developing-world-biomass-plantations/; AND Green Resources website, Plantations, "Idete", http://www.greenresources.no/Plantations.aspx#Idete (14/03/2013)

65 Woodpellets Vietnam website, http://www.woodpellets.com.vn/modules.php?name=News&op=viewst&sid=20 (11/06/2012)

66 "Buchanan Renewables – Group overview", Buchanan Renewables presentation, November 2011, http://www.buchananrenewables.com/assets/pdf/Buchanan-Renewables-GroupOverview-May2012.pdf (11/06/2012)

67 "Wood-based bioenergy: the green lie - The impact of wood-based bio-energy on forests and forest dependent people", Global Forest Coalition, May 2010, http://www.globalforestcoalition.org/wp-content/uploads/2010/10/briefing-paper-bioenergy_final_1.pdf; T. Wright, "Indonesian Firm Picks Green Fuel Not Mill", Wall Street Journal, 18 December 2009, http://online.wsj.com/article/SB10001424052748704238104574601613833960636.html; S. Park, "LG International Corp to Operate Afforestation Business in Indonesia", MK Business News, 29 September 2009, http://news.mk.co.kr/english/newsRead.php?rss=Y&sc=30800011&year=2009&no=509508 (11/06/2012)

68 "Pellets from South Africa", Bioenergy International, No 35, 6, December 2008, p. 25., http://www.novator.se/bioint/BioInt35/BioInt35.pdf; "Case study" Biotech Group, http://biotechgroup.com/casestudy.pdf (11/06/2012)

which are set up for the specific purpose of producing biomass for electricity generation in Brazil. These companies include Ramires Reflorestamento, Usina Rio Pardo, Suzano Energia Renovável, GMR Forestal, Bertin Group, Grupo Orsa and Duratex.[69]

2.4.2. Local impact of biomass exports in the Global South

The Global South is experiencing a shift from residue-driven production for domestic use towards plantation-driven production for export to industrialised countries (for more, see paragraph 2.7). The increased export of biomass from developing countries and the subsequent emergence of a bioenergy industry in these countries has several consequences. Positive effects include job creation, improved access to (sustainable) energy and low carbon emissions. However, there are also serious concerns about the effects of biomass production in these countries.

Civil society organisations such as Greenpeace[70], Global Forest Coalition[71] and Biofuelwatch[72] believe that large-scale biomass production in developing countries has harmful effects on local populations and the environment. First of all, the rising demand for woody biomass energy is likely to push the global price for wood, thus creating incentives for developing country governments and decision makers to see their forests and other ecosystems as an economic good rather than an environment to protect.

As biomass feedstock plantations require large amounts of land and often irrigation as well, the risk of "land grabbing" or "water grabbing" exists. In several African countries land is formally owned by the state, and, as such, decisions about biomass plantations are taken by central government agencies. "People that may have used land for generations and see it as their own tend to have weak and undocumented land rights, little capacity to exercise these rights, and are marginalised in decision making."[73] Local populations face the risk of losing land on which they depend for their survival. Although local jobs are created by a new industry, it may not generate enough jobs for all affected people. With regards to "water grabbing", some plantations, such as those with eucalyptus which draws large amounts of water from the soil, can cause substantial declines in local ground-water levels. This can deprive local communities of their water resources harming their customary water rights, which is of special concern during periods of drought. Biomass plantations often also compete with food crops for the best, most fertile pieces of land. This is of special concern in developing countries with weak jurisdictions where bioenergy contracts often fail to specify the exact geographic location of land concessions, and where bioenergy companies use the most suitable location for their plantations based on their own feasibility studies.[74] Furthermore, in several African and Southeast Asian countries populations have a high dependence on wood-based energy (for example, fuel wood and charcoal). When woody biomass is destined for export and is no longer available for local use, it can threaten local energy security.

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69 L. Couto et al, "Short rotation eucalypt plantations for energy in Brazil", IEA Bioenergy Task 43, 2011, http://142.150.176.36/task43/library/promisingresources/IEA_Bioenergy_Task43_PR2011-02.pdf

70 N. Mainville, "Fuelling a BioMess – Why Burning Trees for Energy Will Harm People, the Climate and Forests", Greenpeace Canada, October 2011, p. 3., http://www.greenpeace.nl/Global/canada/report/2011/10/ForestBiomess_Eng.pdf (20/02/2012)

71 "World's Largest Wood Power Station Approved in the UK will Threaten Climate and Forests", Global Forest Coalition, 31 March 2011, <http://globalforestcoalition.org/1486-worlds-largest-wood-power-station-approved-in-the-uk-will-threaten-climate-and-forests>, (28/08/2012)

72 A. Ernsting, "Sustainable Biomass: A Modern Myth", BiofuelWatch UK, http://www.biofuelwatch.org.uk/2012/biomass_myth_report/ (17/12/2012)

73 L. Cotula, et al, "Biomass energy: Another driver of land acquisitions?" International Institute for Environment and Development (IIED), August 2011, http://pubs.iied.org/pdfs/17098IIED.pdf

74 "Impact of EU Bioenergy Policy on Developing Countries", briefing paper by Ecologic Institute for the European Parliament's Committee on Development, March 2012, http://www.ecologic.eu/4644 (15/03/2013)

Besides the socio-economic effects mentioned, biomass production in the Global South can have significant environmental impacts as well. These include a) deforestation and forest degradation in countries where effective governance structures for forest conservation and sustainable forest management practices hardly exist; b) biodiversity loss associated with turning natural forest into plantation forest; c) indirect land use change (ILUC) caused by increased food crop plantations on pristine lands as a consequence of biomass production elsewhere; d) environmental damage due to the increased use of fertilisers and pesticides on monoculture plantations; and e) other often yet unknown effects of the use of genetically modified tree species.[75]

Some case studies of biomass projects in the Global South are described in more detail in paragraph 2.5 below.

2.5. Case studies from the Global South

As an illustration of the challenges and the potential adverse impacts of biomass production in the Global South as described in paragraph 2.4.2 above, three case studies in respectively Liberia, Tanzania, and Ghana are discussed below. The cases of Buchanan Renewables, Green Resources and Biofuel Ghana are also included in the overview of biomass projects in the Global South with possible exports to Europe (Table 4). The adverse impacts identified in these three case studies provide a warning as to the types of problems biomass producers and consumers are increasingly likely to encounter if demand continues to grow and production shifts to the 'South' without an improvement in the transparent monitoring and verification of sustainability criteria.

2.5.1. Buchanan Renewables

Buchanan Renewables (BR) is involved in the production, export and sale of wood chips from old, non-productive rubber trees in Liberia. In addition to its biomass production activities, the company is also planning to build a 35 MW biomass-fuelled power plant near the capital, Monrovia. Rubber trees are sourced from smallholder rubber plantations as well as large rubber estates in the country. The company agrees to clear the old trees from the smallholder farms, then replant new seedlings from the company's own nursery and provide maintenance for the first seven years until the trees are mature.[76] In May 2012, the BR Group reported a revenue of USD 100 million through long-term export contracts with European utilities. As of May 2012, 370 kt of wood chips had been exported to Europe.[77] Electric utility Vattenfall was the company's minority shareholder and its biggest customer until the first quarter of 2012 when it announced the sale of its shares in BR.[78]

Buchanan Renewables' activities have caused numerous problems for rubber producers in Liberia, especially the smallholder farmers from whom the company sources its biomass. Some of the smallholder rubber farmers now live in poverty due to lower payments for felled trees than expected or agreed upon. Also, in some cases, farmers cannot access parts of their plantation due to old rubber trees left behind by the company. Furthermore, on most of the smallholder rubber farms the proper maintenance of the plantation has not been carried out by the company. As a consequence, the farms are overgrown with weeds, which causes retardation in the growth of the trees or, in some cases, completely chokes the rubber trees. Some farmers have also complained

[75] Ibid.
[76] T. Steinweg & K. Racz, "Burning Rubber: Buchanan Renewables' Impact on Sustainable Development in Liberia", (SOMO, Amsterdam, November 2011).
[77] "Group overview May 2012", Buchanan Renewables presentation, <http://www.buchananrenewables.com/assets/pdf/Buchanan-Renewables-GroupOverview-May2012.pdf> (5 July 2012).
[78] Vattenfall Q1 2012 Interim Report, http://www.vattenfall.com/en/file/Q1-2012-Report_20590608.pdf

about the dumping of rotten wood chips on their farms, which often pollute the local drinking water sources and have attracted stinging ants to their farms. Immediately after the divestment of Vattenfall in May 2012, Buchanan Renewables terminated the contracts with most of the smallholder rubber farms leaving the farmers to deal with the abovementioned problems on their own.[79]

2.5.2. Green Resources

Green Resources is a Norwegian forestry company growing plantations to generate carbon credits and produce timber for local building materials and wood derivatives for energy production. Green Resources has operations in Tanzania, Mozambique, Uganda and South Sudan. It owns 22,000 ha of forest and in addition owns 300,000 ha of land for future planting. [80] The company's Idete plantation in Tanzania, which has been FSC certified, grows trees for carbon storage and to construct forestry products such as transmission poles that are produced in the company's Sao Hill sawmill.[81] Residues, wood chips, and sawdust are planned to be transformed into charcoal for the local market and wood pellets for the global energy market.[82] When the carbon credits generated from the project have been sold, the company is planning an "aggressive expansion" of the project.[83]

Various civil society organisations and researchers have criticised the company's operations in East Africa. Timberwatch, a coalition of South African non-governmental organisations working on the impacts of industrial tree plantations that the company's projects in Tanzania have been "rolled out to full scale before the impacts and long term effects have been properly assessed". [84] More specifically, the company's adverse impacts on sustainable development are alleged to include the following issues:

- Working conditions: With salaries under 2 USD/day, workers are paid around or less than the Tanzanian minimum wage and below the median poverty line for developing countries as defined by the World Bank.[85] Temporary workers are denied sick leave, maternity leave, healthcare benefits, and severance pay. Workers perform their jobs without protective gear and have no access to adequate healthcare. Drinking water quality is below acceptable levels for consumption causing abdominal pains for the workers at the plantations. Also, the company has not comprehensively addressed sexual harassment, and discrimination against handicapped and ill workers has been asserted repeatedly by workers. Company procedures lack a proper grievance mechanism. Housing conditions for workers are below acceptable standards.[86]

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79 "Cut and run - Update on the impact of Buchanan Renewables' operations and Vattenfall's divestment", SOMO, March 2013, http://somo.nl/publications-en/Publication_3942

80 Green Resources website, <http://www.greenresources.no/>, (13 July 2012).

81 Green Resources website, Plantations, "Idete", http://www.greenresources.no/Plantations.aspx#Idete (14/03/2013)

82 Green Resources website, Business Strategies, "Energy", http://www.greenresources.no/Company/BusinessStrategies/tabid/113/tid/9/Default.aspx (10/11/2012)

83 Green Resources website, Plantations, "Idete", http://www.greenresources.no/Plantations.aspx#Idete (14/03/2013)

84 K. Karumbidza & W. Menne, "CDM carbon sink tree plantations in Africa: A case study in Tanzania", (The timberwatch coalition, 2011), <http://unfccc.int/resource/docs/2011/smsn/ngo/293.pdf>, (17 August 2012), p. 67.

85 T. Refesth, "Norwegian Carbon Plantations in Tanzania: Towards Sustainable Development?" (Norway, Msc Thesis in development, May, 2010), <http://brage.bibsys.no/umb/bitstream/URN:NBN:no-bibsys_brage_15397/4/Refseth-2010.pdf>, (17 August 2012), p. 81.

86 K. Salcito, "Human Rights Impact Assessment Green Resources Harvesting Transition and HCP Power Plant Project", (Denver: prepared for Global Human Rights, 2009), <http://nomogaia.org/HRIA/Entries/2009/10/29_Green_Resources_-_HRIA_Sample_files/Green%20Resources%20HRIA%20and%20Monitoring.pdf> (17 August 2012).

- Land acquisitions: some villages in the Green Resources project areas have lost more than 33% of their land – the limit under the 1999 Village Land Act. This, combined with population growth, has created shortages in land for the local population.[87] [88]
- Carbon credits: Green Resources has promised to give 10% from the sale of carbon credits to the respective villages. No transparent plan is provided on the amounts villages can expect from the project's carbon credits.[89]
- Biodiversity loss: A loss of biodiversity occurs within grassland ecosystems as a consequence of the establishment of plantation forests. The biodiversity loss is attributed, among others to the method of tree planting, the use of herbicides and the construction of infrastructural works.[90]

2.5.3. Biofuel Ghana

Biofuel Ghana operates a wood pellet factory in Mim, Ghana. The company was set up by the Danish Scanstyle Biofuel Mim Ltd. and Scanstyle Ghana Ltd. Scanstyle operates a furniture production company in the same municipality. The pellet factory uses the sawdust from the furniture company as feedstock for pellet manufacturing. Wood pellets produced by Biofuel Ghana are mainly intended for export to the European market.[91] The pellet plant began its operations in 2009.[92]

Ghanaian media reported that management of Scanstyle Ghana had refused to recognise around 200 workers as staff of the company and denied them access to the company premises even though they had not been served with any letters of termination.[93] Also, according to local media, the company has disobeyed the verdict of the National Labour Commission (NLC) to recall workers of the company who were sacked by the management for embarking on a five day strike, to demonstrate against irregular payment of their salaries and the seizure of their severance package and to demand better working conditions.[94]

2.6. Biomass sustainability guidelines and certification schemes

There are currently no mandatory regulations in place in the Netherlands to ensure that solid biomass production for electricity generation is sustainable and does not contribute to adverse social and environmental impacts. Several private initiatives, however, have created certification

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87 Ch. Lang, "Green Resources' carbon plantations in Tanzania. Curse or cure?", REDD-Monitor website, <http://www.redd-monitor.org/2012/05/02/green-resources-carbon-plantations-in-tanzania-curse-or-cure/> (17 August 2012).

88 T. Refesth, "Norwegian Carbon Plantations in Tanzania: Towards Sustainable Development?" (Norway, Msc Thesis in development, May, 2010), <http://brage.bibsys.no/umb/bitstream/URN:NBN:no-bibsys_brage_15397/4/Refseth-2010.pdf> (17 August 2012), p. 66.

89 Ch. Lang, "Green Resources' carbon plantations in Tanzania. Curse or cure?", REDD-Monitor website, <http://www.redd-monitor.org/2012/05/02/green-resources-carbon-plantations-in-tanzania-curse-or-cure/> (17 August 2012).

90 K. Karumbidza & W. Menne, "CDM carbon sink tree plantations in Africa: A case study in Tanzania, (The timberwatch coalition, 2011), <http://unfccc.int/resource/docs/2011/smsn/ngo/293.pdf>, (17 August 2012), p. 67.

91 Ibid

92 "Africa as a rising biomass exporter to Europe", Biomass-energy website, 25 July 2011, http://www.biomass-energy.org/2011/07/africa-as-a-rising-biomass-exporter-to-europe/ (05/12/2012)

93 S. Boadi, "Aggrieved scanstyle workers threaten Mayhem", Modern Ghana website, 30 July 2010, http://www.modernghana.com/news/286883/1/aggrieved-scanstyle-workers-threaten-mayhem.html and "(GOASO) ASUNAFO NORTH : Workers petition President over dismissal", Ghana Districts website, no date, http://ghanadistricts.com/news/?read=31362 (26/02/2013)

94 M. Boateng, "Scanstyle defies labour commissions order to recall dismissed workers", Modern Ghana website, 15 September 2009, http://www.modernghana.com/news/238647/1/scanstyle-defies-labour-commissions-ordersto-recal.html (26/02/2013)

schemes that encompass various criteria. Most wood pellets used in the Netherlands are certified via these schemes. Certification types include NEN NTA 8080, the Green Gold Label, ENPlus, the Forest Stewardship Council (FSC), the Sustainable Forestry Initiative (SFI), the Programme for the Endorsement of Forest Certification (PEFC), the Drax Biomass Sustainability Implementation Process and the Canadian Standard Association (CSA). While most of these certification types focus on sustainable forest management, NEN NTA 8080, ENPlus, and the Green Gold Label certifications are also applied to biomass for electricity generation. Several of these initiative are detailed further here.

Green Gold Label

Green Gold Label (GGL) is a certification system for biomass that was founded in 2002 by Essent and Skal International (now Control Union Certifications). The system provides certification for production, processing, transport, and final energy conversion of biomass. GGL provides certification for specific parts of the biomass supply chain and companies are audited on compliance with the standard on an annual basis. Currently, 25 biomass producers are GGL certified mainly in the US, Canada, Portugal, Scandinavia and the Baltic countries.[95] The GGL system works with several, individually applicable standards:

- GGLS1 – Chain of Custody and Processing – Producer or Trader
- GGLS2 – Agricultural Source Criteria
- GGLS4 – Transaction and Product Certificate
- GGLS5 – Forest Management Criteria
- GGLS6 – Power Company Criteria
- GGLS7 – Conservation Stewardship Criteria.
- GGLS8 – Greenhouse Gasses and Energy Balance Calculation Standard
- CRM1 – Chain of Custody and Processing Standards
- CRM2 – Transaction Certificate

Although the standards are separately applicable, they are also interlinked, as to fully comply with GGLS1, for example, one also has to be fully compliant with GGLS8.[96] Utilities using biomass can also be GGL certified, in the Netherlands RWE/Essent's Amer plant is GGLS6 certified.[97]

According to a research report by the Biomass Technology Group (BTG), GGL "criteria can be regarded as quite mild, as also an approved pre-scope certificate of one of the endorsed certification systems is allowed, as well as the not so strict GGL agricultural criteria and GGL forest management criteria".[98] Also, GGL does not have any criteria for ensuring worker rights, community relations and dealing with tenure disputes. Furthermore, the financing of the standard by a single company – Essent – raises questions about its independence.[99]

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95 Green Gold Label website, "Home", http://www.greengoldcertified.org/site/pagina.php?id=51, "GGL certification", http://www.greengoldcertified.org/site/pagina.php?id=16, "Certified companies", http://www.greengoldcertified.org/site/pagina.php?id=17 (01/02/2013).

96 Green Gold Label, "GGLS1 – Chain of Custody and Processing Standard – Producer or Trader", http://www.greengoldcertified.org/data/docs/ggls1%20-%20coc%20and%20processing%20standard%20v.2013.1.pdf

97 Essent Energie Productie BV GGLS6 certification, http://www.greengoldcertified.org/data/docs/essent%20geertruidenberg%20(ggls6%20certificate)%20copy.pdf

98 M.W. Vis et al, "Sustainability Criteria & Certification Systems for Biomass Production", Biomass Technology Group, February 2008, http://www.rpd-mohesr.com/uploads/custompages/sustainability_criteria_and_certification_systems.pdf

99 "Jacqueline Cramer chairperson of the Green Gold Label Foundation", Essent press release, 30 January 2012, http://www.essent.eu/content/about_essent/news/archive/jacqueline_cramer_chairperson_of_the_green_gold-label_foundation.html

ENplus

ENplus is a certification system based on the European Committee for Standardisation's EN standards prEN 14961-2 (Product standard for wood pellets) and prEN 15234-1 (Quality assurance). ENplus is the certification scheme of the European Pellet Council and it is implemented by the national pellet associations in Europe. The certification scheme covers producers, traders and retailers of biomass, and pellets can only be ENplus certified if all these actors in the chain have individually been certified.[100] ENplus is a quality certification scheme with three categories (A1, A2 and B) and relies on forestry management practices and environmental sustainability criteria from other certification schemes like FSC or PEFC.[101]

NTA 8080

NTA 8080 is the sustainability scheme for biomass by the Netherlands Standardisation Institute NEN. The certification scheme was formally set up in 2009 when the so-called Cramer criteria on sustainable biomass were formalised in the NTA 8080 scheme.[102] The certification standard is applicable to producers, processors, traders and end-users of biomass, and in addition to solid biomass (wood chips and pellets) the standard also covers gas and liquid biomass. Currently around 25 companies in the Netherlands have NTA 8080 certification.[103] The criteria for the certification scheme are not known, but the Cramer criteria cover a wide variety of principles ranging from soil conservation, biodiversity and food protection to human rights, social and labour conditions.[104] The NTA 8080 scheme is currently being revised and extended. The extension includes the issues of carbon debt, indirect land use change (ILUC), biodiversity, and cascading of biomass.[105] NTA 8081 describes the certification scheme, or "rules" for obtaining certification according to the requirements of NTA 8080.[106]

Initiative Wood Pellet Buyers (IWPB)

The Initiative Wood Pellet Buyers (IWPB) is an initiative set up by utilities GDF Suez, RWE, E.ON, Vattenfall, Drax Plc and Dong, as well as certifying companies SGS, Inspectorate, and Control Union in 2010. The stated aim of IWPB is to "enable the trading of industrial wood pellets among the partnering companies".[107] IWPB is based on nine principles, mostly derived from various other certification/legislation schemes, such as the criteria for liquid biofuels in the EU's Renewable Energy Directive.[108] The principles include environmental criteria (soil, water and air quality), a greenhouse gas balance versus fossil fuels, socio-economic indicators and an ethics principle on basic human rights. Verification of compliance with the principles is performed once a year by one of the certifying companies of the initiative.[109] To date, no biomass producer, trader or consumer

[100] ENplus website, "About ENplus", http://www.enplus-pellets.eu/about-enplus/; M. Bentele , "ENplus- a new European pellet quality certification system", Pellet Process website, http://www.pelletprocess.de/?p=301&lang=en (10/12/2012)
[101] "Handbook for the Certification of Wood Pellets for Heating Purposes", European Pellet Council, 3 May 2011, http://www.enplus-pellets.eu/wp-content/uploads/2012/01/ENplus-handbook-3.5.11.pdf (26/02/2013)
[102] "Cramer criteria for sustainable biomass formalized", NEN press release, 3 March 2009, http://www.sustainable-biomass.org/publicaties/4001&details=true
[103] NTA 8080 website, "Register", http://www.sustainable-biomass.org/publicaties/3999
[104] "Testing framework for sustainable biomass", Final report from the project group "Sustainable production of biomass" chaired by Jacqueline Cramer, February 2007, http://www.sustainable-biomass.org/dynamics/modules/SFIL0100/view.php?fil_Id=857
[105] "Standard for sustainable biomass revised and extended to bio-based products", NTA 8080 press release, 27 March 2013, http://www.sustainable-biomass.org/publicaties/5158&details=true (06/05/2013)
[106] "NTA 8081 – Certification scheme for sustainably produced biomass for energy purposes (Version 1.4)", NEN, April 2012, Delft, http://www.sustainable-biomass.org/dynamics/modules/SFIL0100/view.php?fil_Id=1217
[107] Laborelec website, "Initiative Wood Pellets Buyers (IWPB)", no date, http://www.laborelec.be/ENG/initiative-wood-pellet-buyers-iwpb/ (09/04/2013)
[108] For the criteria for liquid biomass, see website European Commission, Energy, Renewable energy, Biofuels, "Sustainability Criteria", http://ec.europa.eu/energy/renewables/biofuels/sustainability_criteria_en.htm (06/05/2013)
[109] "Proposal for Sustainability Principles for Woody Biomass Sourcing and Trading", IWPB Working Group on

has been IWPB certified, as the initiative is currently still in a draft phase. The principles, in their current form, have been criticized by sustainability advocates for being weak on avoiding adverse environmental impacts. For example, according to the IWPB harvesting from forests, wetlands, and peatlands is acceptable if the activities do not lead to a loss in carbon stock, meaning that it is acceptable to transform natural forest into plantation forest. Also, the IWPB scheme lacks criteria on carbon debt, and it is an industry-only initiative; no NGOs or other stakeholders are involved. Biofuelwatch, a civil society organisation campaigning for sustainable biofuel production, also raises doubts about the transparency and independence of IWPB: the scheme has "no transparency rules or avenues for appealing […] furthermore, standards [such as IWPB] are based upon business contracts between companies and their chosen consultancy firms, paid to provide allegedly "independent" verification, which can ensure nothing other than that a company has ticked the right boxes".[110]

The **International Organisation for Standardisation** (ISO) is currently in the process of developing guidelines[111] on sustainable bioenergy. There are no publicly available documents on these guidelines, as the process is in a draft phase.

In 2010 the **European Commission** (EC) presented a report on sustainability requirements for the use of solid biomass and biogas in electricity, heating and cooling.[112] The report makes recommendations on sustainability criteria to be used by Member States. These are, however, recommendations, not mandatory guidelines.

2.7. Future developments in global biomass markets

Considering the trend of increasing biomass consumption in Europe (as described in paragraph 2.2), securing reliable sources of wood pellets will be a key issue for European utilities in the near future. The business case for electricity generation from biomass will largely depend on the nature of policy incentives on a national and European level, as well as other factors, such as fossil fuel prices. Expected increases in fossil fuel prices and decreases in the production costs of biomass to fall, combined with the EU's 2020 renewable energy targets, will likely create incentives for European utilities to expand their range of sourcing countries. The EU will not be able to produce the amount of biomass it consumes, and the US, Canada and Russia will therefore continue to play an important role as key suppliers of biomass to Europe.[113]

Although today developing countries do not play a significant role as suppliers for the European biomass demand, there are several indications that this is likely to change in the future. In addition

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Sustainability, 5 June 2012, http://www.laborelec.be/ENG/wp-content/uploads/2012/08/2012-06-05-IWPB-Initiative_Wood_Pellets_Buyers-Sustainability_principles_Report1_Public_draft-v2.pdf and "Annex to the Contract - Sustainability Principles and Criteria to be considered", 6 August 2012, http://www.laborelec.be/ENG/wp-content/uploads/2012/08/2012-08-06-IWPB-Initiative_Wood_Pellets_Buyers-AnnexContract-Sustainability-draft-v2.pdf

110 Biofuelwatch, "Sustainable Biomass: A Modern Myth – Executive Summary", 12 September 2012, http://www.biofuelwatch.org.uk/wp-content/uploads/Biomass-Sustainability-Myths-Executive-Summary.pdf

111 ISO website, "TC 248 Project committee: Sustainability criteria for bioenergy", <http://www.iso.org/iso/iso_technical_committee?commid=598379> (20/06/2012).

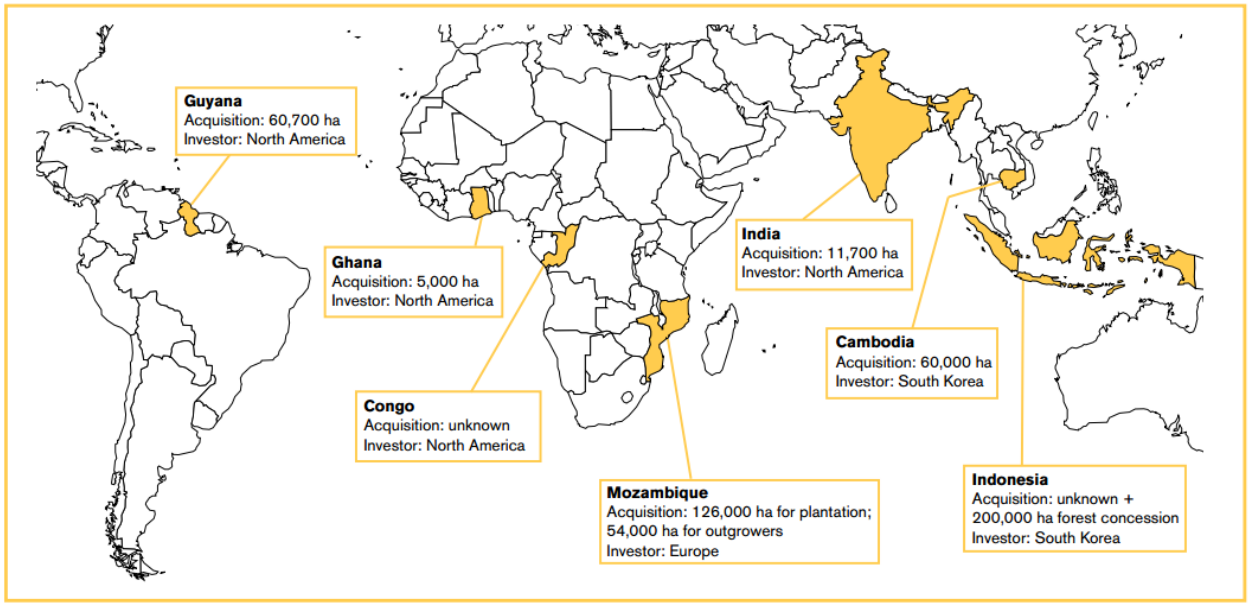
112 European Commission website, "Bioenergy - Sustainability Criteria", <http://ec.europa.eu/energy/renewables/bioenergy/sustainability_criteria_en.htm>, (20/06/2012).

113 See for example, J. Hewitt, "Flows of biomass to and from the EU: An analysis of data and trends 2010", FERN, July 2011, http://www.fern.org/sites/fern.org/files/Biomass%20imports%20to%20the%20EU%20final_0.pdf and S. Wunder et al, "Impact of EU Bioenergy Policy on Developing Countries", briefing paper by Ecologic Institute for the European Parliament's Committee on Development, March 2012, http://www.ecologic.eu/4644 (15/03/2013)

to the arguments mentioned above (rising fossil fuel prices and European renewable energy targets), developing countries are seen as promising opportunities for wood pellet production by utilities, as tree growth rates are substantially higher, and labour, land and investment costs lower than in the Global North, and developing countries are perceived as relatively abundant in land.

As a consequence of rising demand for woody biomass in developed countries on the one hand and increased opportunities in the Global South on the other, several large-scale plantations for energy crops are being set up in developing countries. A 2011 study by the International Institute for Environment and Development (IIED) has identified land areas that are fully or partially set up for biomass feedstock production in the Global South of at least 517,000 ha. [114] Figure 4 shows these land acquisitions per country.

Figure 4: Land areas wholly or partially set up as plantations for biomass feedstock production in the Global South

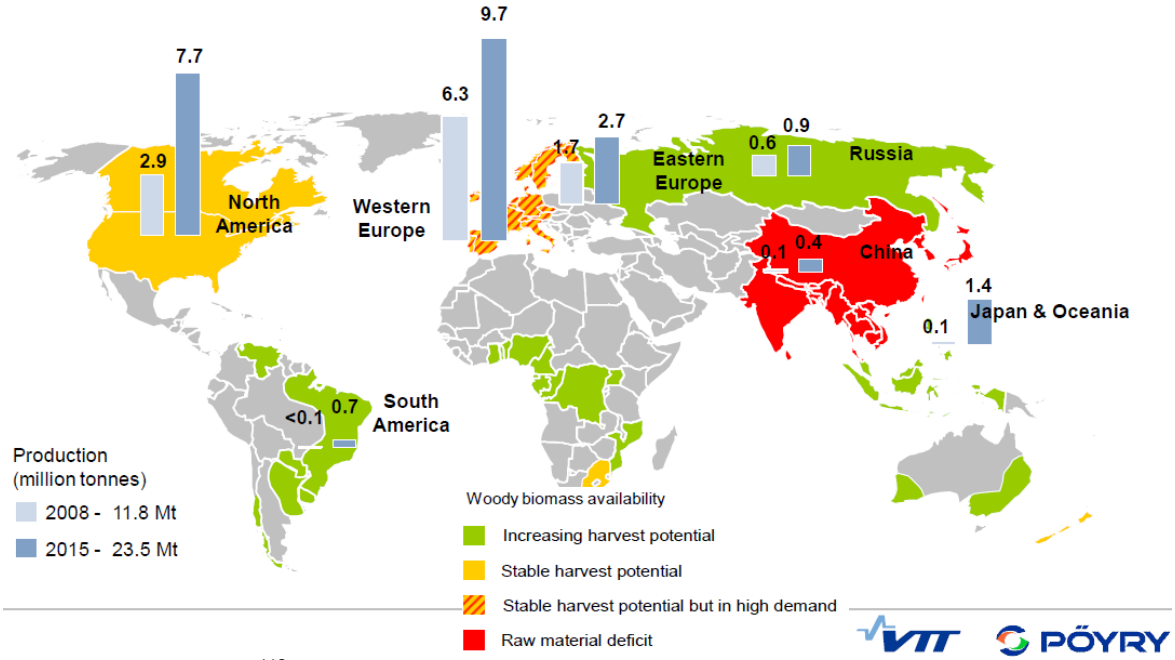


Source: IIED[115]

A study by the Ecologic Institute[116] shows that current sourcing countries for the European biomass market, Canada and the US will still have stable harvesting potentials in 2015. Also, that besides Russia, which is already an important source country for European biomass use, West and Central Africa, as well as South America and Southeast Asia have an increasing harvesting potential for wood pellets in the future. Europe as well as emerging nations like China and India on the other hand have or will have a high or growing demand for wood pellets in the future.[117] Figure 5 shows these trends for different regions and continents.

[114] L. Cotula, et al, "Biomass energy: Another driver of land acquisitions?" International Institute for Environment and Development (IIED), August 2011, http://pubs.iied.org/pdfs/17098IIED.pdf
[115] Ibid.
[116] S. Wunder et al, "Impact of EU Bioenergy Policy on Developing Countries", briefing paper by Ecologic Institute for the European Parliament's Committee on Development, March 2012, http://www.ecologic.eu/4644 (15/03/2013)
[117] Ibid.

Figure 5: Production and availability of wood pellets

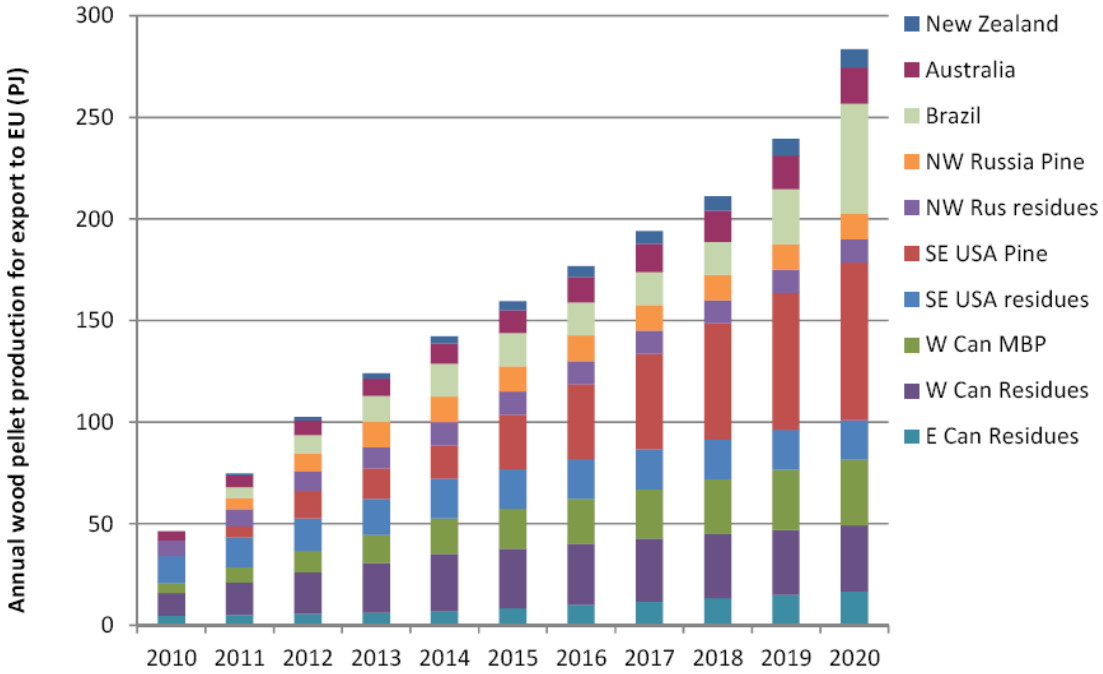


Source: Ecologic Institute[118]

Another study commissioned by the International Energy Agency (IEA) distinguishes between two potential scenarios for the future global biomass trade.[119] In its "business as usual scenario", which is based on past and current import trends, industry expectations, press releases of individual companies, expert opinions and scenario studies, the only developing country with increasing biomass production and significant biomass supply by 2020 for exports to the EU is Brazil. In its "high import scenario" however, other developing countries besides Brazil will also play an important role in the EU's wood pellet imports. This scenario is based on the assumptions that the rapid growth of the biomass demand in the EU would trigger investments in additional pellet plants and a strong development of short rotation crops and energy plantations (namely eucalyptus). Based on this scenario, West African countries, Uruguay, Mozambique and Russia will also be important source countries for Europe's biomass use. Both scenarios are depicted in Figure 6 and Figure 7 below.

[118] Ibid.
[119] M. Cocchi et al, "Global Wood Pellet Industry, Market and Trade Study", commissioned by the International Energy Agency Bioenergy Task 40 Sustainable International Bioenergy Trade, December 2011, http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf (23/03/2013)

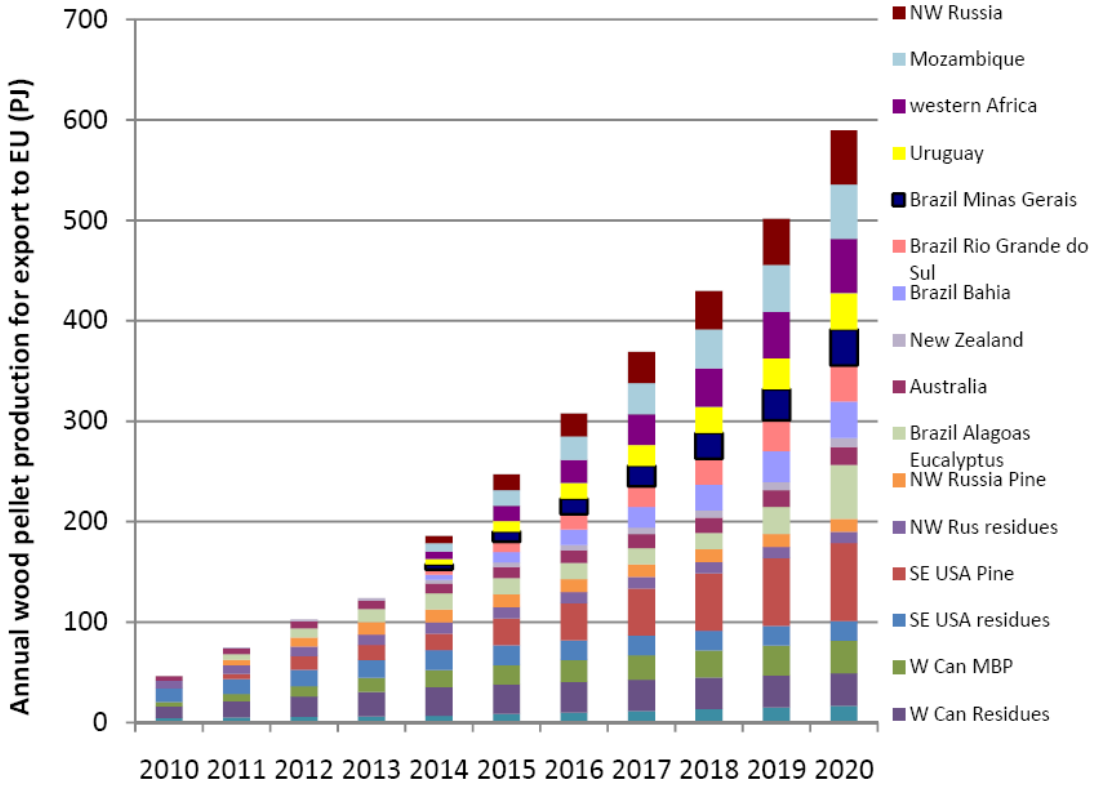
Figure 6: IEA's "business as usual scenario" for future wood pellet exports to the EU



Residues: woody residues (e.g. sawdust)
MPB: mountain pine beetle affected wood
Source: IEA[120]

[120] Ibid.

Figure 7: IEA's "high import scenario" for future wood pellet exports to the EU, 2010-2020



Residues: woody residues (e.g. sawdust)
MPB: mountain pine beetle affected wood
Source: IEA[121]

More recent figures reveal that the "high import scenario" is less likely to occur before 2020,[122] which means that there will likely be a less rapid growth of the biomass supply from the Global South than shown in Figure 7. However, if the growth trends of wood pellet imports to the EU from the "business as usual scenario" keep on increasing at a pace similar to that between 2010 and 2020, then there will inevitably be a point where imports of biomass from developing countries will play a significant role in Europe's biomass supply.

[121] Ibid.
[122] M. Junginger, Utrecht University, presentation at biomass conference "Biomassa op hete kolen", 4 April 2013, The Hague, Netherlands.

3. Biomass production and consumption in the Netherlands

Dutch demand for solid biomass has grown strongly in recent years, making the Netherlands one of the largest consumers of solid biomass for electricity generation worldwide. This chapter presents figures on and policies that stimulate biomass use in the Netherlands, discusses domestic production as well as imports and looks at possible future developments in the sector. The chapter aims to answer the research question related to the role played by the Netherlands in the global solid biomass market, and the role of biomass in the Dutch electricity generation sector. Specific information is provided about the quantities, types, and origins of solid biomass flowing into the Netherlands and the major electricity companies operating in the Netherlands that are involved in the import, resale, and/or usage of solid biomass.

3.1. Biomass in the Dutch fuel mix for electricity generation

In 2011, renewable electricity had a 10.9% share in the national electricity production mix, about 6% of which originated from biomass (solid and liquid) [123]. With 60% of all electricity production, natural gas is the most important feedstock in the electricity sector in the Netherlands. In 2011, 24,228 million m^3 of natural gas was used by power plants[124]. The usage of thermal coal, the second most important fuel type with an approximate 18% share in Dutch electricity production, was estimated at 7,876 kt in 2010.[125] In the same year, 2,065 kt[126] of biomass was combusted, while in 2011 this amount decreased to an estimated 1,646 kt.[127] This decline is most likely due to the ending *Milieukwaliteit Electriciteitsproductie* (MEP) subsidies for solid biomass use (see paragraph 3.2 below). According to the Dutch National Renewable Energy Action Plan, the consumption of solid biomass is likely to increase again over the coming years towards an annual import of around 3,750 kt in 2020.[128] Electricity production from biomass is almost exclusively done using solid biomass (99.9% share); liquid biomass only accounted for 0.01% of the production figures in 2011.[129] Figure 8 shows the fuel types used for electricity production in the Netherlands in percentages.

[123] CBS Stateline database website, “Elektriciteit; productie naar energiebron”, http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=80030NED&D1=1-3,5&D2=0&D3=0,2-4,7-12&D4=l&HDR=T&STB=G1,G2,G3&VW=T (02/04/2013)

[124] The 24,228 m^3 figure refers to natural gas used by utilities and companies supplied by the main gas transport network combined. CBS Stateline database website, “Aardgasbalans; aanbod en verbruik” http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=00372&D1=7&D2=318-320,335-336&HDR=G1&STB=T&VW=T (03/04/2013)

[125] CBS Stateline database website, “Coal, production and consumption in the Netherlands 2010”, <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=37621&D1=5&D2=271&HDR=G1&STB=T&VW=T>, (27/06/2012)

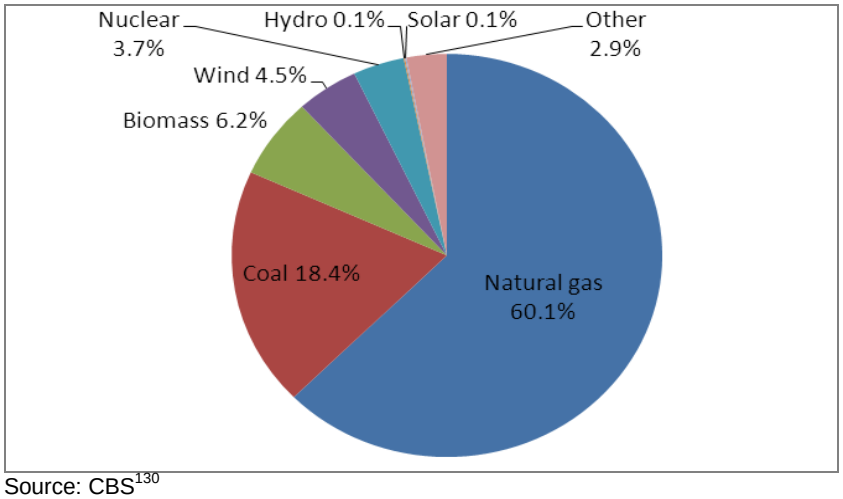
[126] C.S. Goh, et al. “IEA Bioenergy Task 40 Country report for the Netherlands 2011”, (Utrecht: Science, Technology and Society, Utrecht University, ISBN 978-90-8672-053-8, December 2011), p. 40.

[127] Figure is based on company responses to SOMO questionnaire and information from company websites,see also Table 6.

[128] Rijksoverheid, “Nationaal actieplan voor energie uit hernieuwbare bronnen Richtlijn 2009/28/EG”, (Rijksoverheid, 2010).<http://www.agentschapnl.nl/sites/default/files/bijlagen/Nationaal_actieplan_voor_energie_uit_hernieuwbare_bronnen_tcm24-338435.pdf> (20 February 2012).

[129] C.S. Goh, et al. “IEA Bioenergy Task 40 Country report for the Netherlands 2011”, (Utrecht: Science, Technology and Society, Utrecht University, ISBN 978-90-8672-053-8, December 2011), p. 40.

Figure 8: Electricity production in the Netherlands, by fuel type, 2011



Source: CBS[130]

3.2. Policies stimulating biomass use

The Council of the European Union adopted the goal of the 2009 Directive that until 2020, 20% of the final energy consumption of the EU as a whole should originate from renewable sources. In the national action plans all 27 EU member states have defined their relative contribution to this 2020 target. In 2009 for the Netherlands a national target of 14% was agreed to supply its primary energy demand from renewable energy sources (RES) by 2020. This target has since then been increased to 16%.[131] The term 'renewable energy' is divided into renewable production of electricity (RES-E), energy related to transport (RES-T) and the production of heat and cold (RES-H). In order to reach the national target of 16% of the renewable energy in 2020, electricity production (RES-E) should originate for 42% from renewable sources by 2020.[132] In 2011, the share of renewable electricity production (RES-E) was 10.9%.[133] Given the current political climate in the Netherlands, as well as the technical and economic realities for other renewable technologies, an important part of this 42% is likely to be generated by biomass.

In order to achieve the 2020 target, the Dutch government started the subsidy program *Milieukwaliteit Electriciteitsproductie* (MEP) in 2003. This subsidy scheme was initiated to stimulate the production of renewable energy by providing feedstock subsidies for, among others, solid and liquid biomass usage in power plants. MEP subsidies are allocated at a fixed rate per produced kWh of electricity produced using renewable feedstock (such as solid biomass).[134] This scheme

[130] CBS Stateline database website, "Elektriciteit; productie naar energiebron", http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=80030NED&D1=1-3,5&D2=0&D3=0,2-4,7-12&D4=l&HDR=T&STB=G1,G2,G3&VW=T (02/04/2013)

[131] Rijksoverheid, "Nationaal actieplan voor energie uit hernieuwbare bronnen Richtlijn 2009/28/EG", 2010, p. 20., http://www.agentschapnl.nl/sites/default/files/bijlagen/Nationaal_actieplan_voor_energie_uit_hernieuwbare_bronnen_tcm24-338435.pdf ; Energie Nederland, "Financial and economic impact of a changing energy market", 25 March 2013, p. 1., http://www.energie-nederland.nl/wp-content/uploads/2013/04/PwC-Financial-and-economic-impact-of-a-changing-energy-market-Executive-Summary.pdf .

[132] Energie Nederland, "Financial and economic impact of a changing energy market", 25 March 2013, p. 1., http://www.energie-nederland.nl/wp-content/uploads/2013/04/PwC-Financial-and-economic-impact-of-a-changing-energy-market-Executive-Summary.pdf

[133] 10.9% is the share of biomass, hydro, wind, and solar energy combined in the total Dutch electricity production mix. CBS Stateline database website, "Elektriciteit; productie naar energiebron", http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=80030NED&D1=1-3,5&D2=0&D3=0,2-4,7-12&D4=l&HDR=T&STB=G1,G2,G3&VW=T (02/04/2013)

[134] "Plafonnering en middelenverdeling in de MEP", ECN, March 2007, p. 11., <http://www.ecn.nl/docs/library/report/2006/c06040.pdf>, (28/06/2012)

came to an end in 2006 after what the Ministry of Economic Affairs called “uncontrollable overspending” of the available MEP budget.[135] Between 2003 and 2006, five utilities received a total of €591 million in subsidies for large-scale (>50 MW) biomass use in the Netherlands. With 41% of the total MEP budget of €1,456 million, large-scale biomass was the biggest recipient of the subsidy scheme.[136] The MEP subsidy schemes can have duration periods of a maximum of 10 years, meaning that several utilities are still receiving subsidies from this program.[137] Almost all solid biomass that is currently combusted in the Netherlands is subsidised through the MEP programme, making the scheme the main driver behind the use of solid biomass in the Netherlands.

With the MEP subsidies coming to an end in the coming years, the Dutch government has initiated another policy tool for stimulating renewable energy production: the Green Deals. Green Deals are covenants between the national government and the private sector, local administration or civilians. In October 2011 a Green Deal was signed between the Ministry of Economic Affairs and Energie-Nederland, the representative body of the Dutch energy sector.[138] With this covenant the energy sector commits itself to keep on co-firing at least 10% biomass in the period 2012-2015 without government subsidies. In 2011, the average co-firing rate in coal plants in the Netherlands was 13%, which is above the 10% agreed in the Green Deal.[139] In October 2012 the Green Deal “Reporting on solid biomass sustainability for energy use” was signed between the Ministry of Infrastructure and Environment and the Dutch energy sector on the reporting obligations of solid biomass use by utilities.[140] The signatories, which included representatives of all utilities mentioned in this report, agreed that utilities will report to Agentschap NL on their annual biomass use with the following indicators: name of the biomass supplier, type of biomass, amount, country of origin, feedstock type, name of the power plant where biomass is combusted, energy value, certification type, CO_2 reduction, and purpose of use (electricity or heat generation). However, the Green Deal states that of the data provided by utilities, only aggregate figures would be made publicly available by Agentschap NL.

[135] Tweede Kamer der Staten-Generaal, Subsidieregeling «Milieukwaliteit Elektriciteitsproductie» (MEP), BRIEF VAN DE ALGEMENE REKENKAMER, 15 May 2007, p. 10., <http://www.google.nl/url?sa=t&rct=j&q=toekenning+MEP+591&source=web&cd=1&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.rekenkamer.nl%2Fdsresource%3Fobjectid%3D67923%26type%3Dorg&ei=yyFgUPeDGOfD0QX524GoDA&usg=AFQjCNGBZpTclDQ34sxhEnZGRLtM5VNjrQ&cad=rja>, (24-9-2012)

[136] Tweede Kamer der Staten-Generaal, Subsidieregeling «Milieukwaliteit Elektriciteitsproductie» (MEP), BRIEF VAN DE ALGEMENE REKENKAMER, 15 May 2007, p. 61., <http://www.google.nl/url?sa=t&rct=j&q=toekenning+MEP+591&source=web&cd=1&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.rekenkamer.nl%2Fdsresource%3Fobjectid%3D67923%26type%3Dorg&ei=yyFgUPeDGOfD0QX524GoDA&usg=AFQjCNGBZpTclDQ34sxhEnZGRLtM5VNjrQ&cad=rja>, (24-9-2012)

[137] EPZ will receive MEB subsidies until 2013, Essent until 2014-2015 for co-firing solid biomass, I. Kleijne, “EPZ overweegt sluiten van kolencentrale”, 24 November 2011, <http://www.energeia.nl/news.php?ID=47735>, (28-6-2012)

[138] Energie-Nederland website, “Green Deal tussen Energie-Nederland en Rijksoverheid”, <http://www.energie-nederland.nl/wp-content/uploads/2011/10/Green-Deal-Energiesector.pdf> , (27-8-2012)

[139] “Statusdocument bio-energie 2012”, Agentschap NL, 2013, p. 20 & 38., https://www.agentschapnl.nl/sites/default/files/Statusdocument%20bio-energie%202012%20printversie.pdf

[140] “Green Deal Rapportage Duurzaamheid Vaste Biomassa voor Energie”, 2012, Agentschap NL, http://www.agentschapnl.nl/sites/default/files/Green%20Deal%20Duurzaamheid%20vaste%20biomassa%202012.pdf; and letter from W. J. Mansveld, State Secretary of Infrastructure and Environment to the Dutch parliament, 5 December 2012, https://zoek.officielebekendmakingen.nl/kst-30196-188.html (21/05/2013)

3.3. Domestic biomass production for electricity generation

The Netherlands is amongst the biggest consuming countries of solid biomass for generating electricity.[141] The country however, only has a minor biomass production industry. Hence, most of the biomass used has to be imported. Although estimations on the amount of land needed to produce biomass for electricity generation are hard to make (it depends on various factors like origin and type of biomass and forest management plans used), a study commissioned by E.ON indicates that if the Dutch biomass targets for 2020 would have to come from biomass production in the Netherlands, a plantation with an area that is 15 to 20% larger than the Netherlands itself would be needed.[142]

In 2011 around 21% of the biomass that was used for electricity generation in the Netherlands was sourced domestically.[143] For details, see Figure 9. Whereas the internationally sourced biomass almost exclusively consists of wood pellets, the domestic biomass is composed of roughly four different product types: wood pellets, wood chips, wood waste and non-wood biomass coming from the agro-processing industry. Facilities and utilities of which is known that they combust domestically produced solid biomass are E.ON (200 kt/year), RWE/Essent (72 kt), GDF SUEZ (25kt) and Vattenfall/Nuon (5 kt). For details, see chapter 4.
Most of the domestic biomass in the Netherlands comes from the agro-processing industry in the form of agricultural residues (non-woody biomass).[144] In addition, residues from the cacao processing industry, olive residues, wheat husks, disapproved cattle feed, fruit pulp and bone meal have been and are being used as feedstock in the Netherlands. Although many of these products are classified as domestic, most are sourced internationally and become classified as domestic waste products after processing in the Netherlands.

Wood derivatives (pellets, bio-coal, chips and wood waste) are produced and collected by several companies and consist mostly of secondary wood products[145]. Feedstock types are mainly locally sourced sawmill and nature management/forestry residues; hard as well as softwood species are both used. There are several wood pellet producing companies in the Netherlands. Some of them only produce pellets for wood pellet stoves for heating residential or industrial spaces. [146] Others, such as Energy Pellets Moerdijk[147], also produce wood pellets for electricity generation. The

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[141] International Energy Agency, "Global Wood Pellet Industry, Market and Trade Study", Task 40: Sustainable International Bioenergy Trade, December 2011, p.9, <http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf> (23 December 2012).

[142] "Biomassa: Feiten, cijfers, observaties - Stand van zaken 2010", report by Pligrims Consultancy for E.ON, http://www.pilgrimsconsult.nl/uploads/file/Pamphlet%20Biomassa-feiten-cijfers-observaties.pdf (27/02/2013)

[143] The information is based on SOMO questionnaires sent out to utilities in the Netherlands. For more information, see the paragraph on methodology. A study by the Utrecht University's Copernicus Institute came roughly to the same conclusions regarding the domestic production of biomass for electricity generation purposes: according to the study, around 24% of the total biomass used in power plants in the Netherlands was of domestic origin. C.S. Goh & M. Junginger, "Sustainable biomass and bioenergy in the Netherlands: Report 2012", research report by Copernicus Institute (Utrecht University) for Agentschap NL, December 2012, http://www.agentschapnl.nl/sites/default/files/Sustainable%20biomass%20flows%20final%20draft%20120113.pdf and e-mail correspondence with M. Junginger, assistant professor at the Copernicus Institute, Utrecht University, 8 June 2012.

[144] C.S. Goh & M. Junginger, "Sustainable biomass and bioenergy in the Netherlands: Report 2012", research report by Copernicus Institute (Utrecht University) for Agentschap NL, December 2012, http://www.agentschapnl.nl/sites/default/files/Sustainable%20biomass%20flows%20final%20draft%20120113.pdf

[145] Primary wood products are those which are directly produced from trees. Secondary wood products use the primary products as raw material and can include a wide variety of goods ranging from wooden furniture to paper products and more.

[146] See e.g. Novus Energy Systems, http://www.houtpellets.info/houtpellets.html and Plospan Bio-energie, http://www.houtpelletsdirect.nl/welkom

[147] Energy Pellets Moerdijk website, http://www.labeegroup.com/energy-pellets/producten.html; M. Junginger & R. Sikkema, "Pellets@las – Pellet market country report: The Netherlands", University Utrecht, April 2009, p. 7., http://pelletsatlas.info/pelletsatlas_docs/showdoc.asp?id=090520125602&type=doc&pdf=true (03/04/2013)

production of torrefied biomass, also known as bio-coal, is also found in the Netherlands[148]; however, the industry has not yet reached the scale of producing large amounts suitable for co-firing purposes. There are studies that indicate that the large scale commercial production of torrefied biomass is to be expected in the Netherlands as well.[149]

3.4. Biomass imports

The largest part of the biomass used for electricity generation in the Netherlands is imported: around 79% of the total amounts used in 2011.[150]. In 2011 approximately 99% of the imported biomass consisted of wood pellets. [151] In that year around 1,330 kt of wood pellets were imported in the Netherlands.[152] If calculated with a commodity value of 137 EUR/tonne, the estimated value of total biomass imports equals to around €182 million. Compared to the value of other major fuel types used for electricity generation like thermal coal or natural gas, the market value of biomass is around one sixth of the other two commodities. See Table 5 for details.

Table 5: Value indication of commodities used for electricity generation in the Netherlands in 2011

Commodity	Unit	Imported/used	Commodity value (€/t or €/m^3)	Total estimated value
Wood pellets[153]	kt	1,330	€ 137.00	**€ 182,210,000**
Thermal Coal[154]	kt	7,399	€ 127.49	**€ 943,298,510**
Natural gas[155]	Million m^3	8,652	€ 128.30	**€ 1,110,051,600**

The most important origin countries for biomass used in the Netherlands were by far the United States and Canada, respectively. These two North American countries accounted for

[148] See e.g. Stramproy Green Coal, http://www.stramproygreen.nl/coolcoal/; Topell Energy, http://www.topellenergy.com/; and Torr Coal, http://www.torrcoal.com/.

[149] C.S. Goh, et al., "IEA Bioenergy Task 40 Country report for the Netherlands 2011", Utrecht University, Copernicus Institute, December 2011 (updated August 2012), p. 52., http://www.bioenergytrade.org/downloads/iea-task-40-country-report-2011-the-netherland.pdf

[150] The information is based on SOMO questionnaires sent out to utilities in the Netherlands. For more information, see the paragraph on methodology. A study by the Utrecht University's Copernic Institute came roughly to the same conclusions regarding biomass imports for electricity generation purposes: according to the study, around 76% of the total biomass used in power plants in the Netherlands was imported. C.S. Goh & M. Junginger, "Sustainable biomass and bioenergy in the Netherlands: Report 2012", research report by Copernicus Institute (Utrecht University) for Agentschap NL, December 2012, http://www.agentschapnl.nl/sites/default/files/Sustainable%20biomass%20flows%20final%20draft%20120113.pdf and e-mail correspondence with M. Junginger, assistant professor at the Copernicus Institute, Utrecht University, 8 June 2012.

[151] C.S. Goh & M. Junginger, "Sustainable biomass and bioenergy in the Netherlands: Report 2012", research report by Copernicus Institute (Utrecht University) for Agentschap NL, December 2012, http://www.agentschapnl.nl/sites/default/files/Sustainable%20biomass%20flows%20final%20draft%20120113.pdf. In 2010 biomass imports also mainly consisted of wood pellets, see C.S. Goh, et al., "IEA Bioenergy Task 40 Country report for the Netherlands 2011", Utrecht University, Copernicus Institute, December 2011 (updated August 2012), p. 4., http://www.bioenergytrade.org/downloads/iea-task-40-country-report-2011-the-netherland.pdf

[152] Figure derived from SOMO data, see Table 6.

[153] Pellets data: SOMO research. Commodity value: Spot CIF price for Northwestern Europe, "Argus biomass markets", Argusmedia report, October 2011, <http://www.argusmedia.com/Bioenergy/~/media/Files/PDFs/Samples/Argus-Biomass.ashx> (28 August 2012).

[154] Coal data: CBS Stateline database website, "Hard coal consumption in the Netherlands in 2011", <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=37621&D1=5&D2=288&VW=T>, (28 August 2012) Commodity value: Index Mundi website, Coal, Australian thermal coal daily prices, FOB Newcastle/Port Kembla, US$ per metric ton October 2011, <http://www.indexmundi.com/commodities/?commodity=coal-australian&months=120>, (28 August 2012).

[155] Natural gas data: CBS Stateline database website, "Natural Gas consumption in the Netherlands in 2011", <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=00372&D1=7&D2=337&VW=T>, (28 August 2012) Commodity value: Index Mundi website, Gas, Natural Gas, Natural Gas spot price at the Henry Hub terminal in Louisiana, US Dollars per thousand cubic meters of gas, < http://www.indexmundi.com/commodities/?commodity=natural-gas>, (28 August 2012).

approximately 40% of the total biomass supply in the Netherlands. Other origin countries were the Baltic states and Russia and some Southern European countries, most notably Portugal. For details, see Table 6. Due to the fact that SOMO could not identify the origin of biomass used at the EPZ plant, the biomass figures for this utility are included in the category "other/unknown".

Table 6: Origin of biomass supply for utilities in the Netherlands, in tonnes, 2011

Country of origin	Vattenfall	GDF SUEZ	RWE	E.ON	EPZ	Eneco	Total
USA	8,960	53,158	288,092				**350,210**
Netherlands	5,788	25,609	72,319	200,000		19,000	**321,716**
Canada	7,789	41,962	248,807				**298,558**
Portugal	3,841	107,727	45,833				**157,401**
Latvia		64,847	13,095				**77,942**
Estonia		54,135					**54,135**
Russia		31,631	19,643				**51,274**
Germany		37,666					**37,666**
Australia		7,788	26,190				**33,978**
France	22,653						**22,653**
South Africa		6,313	13,095				**19,408**
Spain	3,275	5,919					**9,194**
Belgium		8,697					**8,697**
Lithuania		6,716					**6,716**
UK			6,548				**6,548**
New Zealand	1,691						**1,691**
Norway	1,497						**1,497**
Other / unknown	1,170				191,000		**192,170**
Total	**56,664**	**452,168**	**727,073***	**200,000**	**191,000**	**19,000**	**1,645,905**

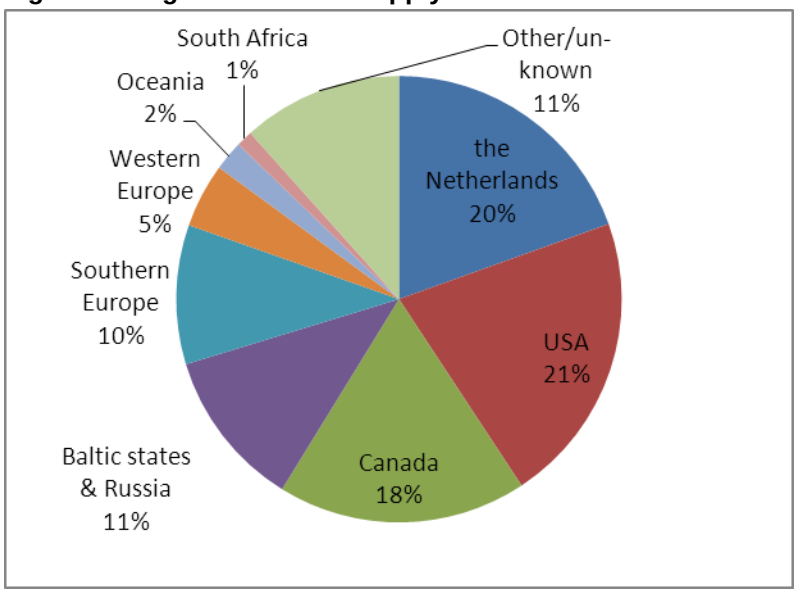
* In the case of RWE, the sum of all individual amounts in the table does not exactly add up to the total amount shown (727,073) due to the rounding off of numbers.
Source: company responses to SOMO questionnaires[156]

Figure 9 shows the origin countries of biomass used for electricity generation in the Netherlands. Percentages are calculated using the figures in Table 6 above.[157]

[156] All utilities except EPZ replied to SOMO's questionnaire on the origin of biomass use. For more information, see paragraph 1.5 on methodology.

[157] A study by the Utrecht University's Copernic Institute came roughly to the same conclusions regarding origin countries/regions for biomass used for electricity generation in the Netherlands: the Netherlands 24%, USA 23%, Canada 19%, Baltic states & Russia 12%, Southern Europe 11%, Western Europe 6%, Oceania 3%, South Africa 2%, Others 0.1%. C.S. Goh & M. Junginger, "Sustainable biomass and bioenergy in the Netherlands: Report 2012", research report by Copernicus Institute (Utrecht University) for Agentschap NL, December 2012, http://www.agentschapnl.nl/sites/default/files/Sustainable%20biomass%20flows%20final%20draft%20120113.pdf and e-mail correspondence with M. Junginger, assistant professor at the Copernicus Institute, Utrecht University, 8 June 2012.

Figure 9: Origin of biomass supply for utilities in the Netherlands, in %, 2011



Source: company responses to SOMO questionnaires[158]

Table 7 shows the producers that were identified as supplying the Dutch biomass market in 2011. All companies that could be identified are based in the United States or Canada, with the exception of one biomass producer from Australia and Eneco's Dutch suppliers. It has to be noted that the list is far from exhaustive, as most of the utilities described in the research were reluctant to give out the names of their suppliers. Exceptions are RWE/Essent and Eneco, which gave out names of some of its North American and Dutch suppliers, respectively.

[158] Baltic states & Russia: Latvia, Estonia, Lithuania, and Russia; Southern Europe: Spain and Portugal; Western Europe: Germany, France, Belgium, the UK and Norway; Oceania: Australia and New Zealand. Percentages were calculated using the figures in Table 6.

Table 7: Identified suppliers of biomass for utilities in the Netherlands, 2011

Supplier	Capacity (kt/y)	Country	Customer in the Netherlands	Import in 2011 (kt)
Pinnacle Renewable Energy Group[159]	1,140	Canada	RWE/Essent	n/a
Premium Pellet[160]	140	Canada	RWE/Essent	n/a
Pacific BioEnergy[161]	180	Canada	RWE/Essent	n/a
Shaw Resources (Nova Scotia, New Brunswick)[162]	90	Canada	RWE/Essent	n/a
Georgia Biomass RWE[163]	750	US	RWE/Essent	118
Enviva[164]	750	US	E.ON	0
Bowergy[165]	n/a	the Netherlands	Eneco	n/a
Bruins en Kwast[166]	n/a	the Netherlands	Eneco	n/a
Van Gansewinkel[167]	n/a	the Netherlands	Eneco	n/a
Plantation energy [168]	250[169]	Australia	n/a	n/a
Trebio Inc.[170]	130	Canada	n/a	n/a
Green Circle BioEnergy[171]	500	US	n/a	76
Farm renewables[172]	n/a	US	n/a	53
Zilkha Biomass Energy[173]	275[174]	US	n/a	6

n/a= Not available

3.5. Origin of the future Dutch biomass supply

The future demand for solid biomass in the Netherlands will depend on several economic and political circumstances. The sector already foresees an increasingly important role for solid biomass with the development of several new coal-fired power plants with biomass co-firing. Table 8 shows the current capacity of coal plants in the Netherlands and their co-firing utilisation rates as well as future capacities and the planned co-firing rates for the power plants that are currently under construction. The only exception is Eneco, which does not operate coal plants, but does have and is constructing stand-alone biomass plants. When the new projects become operational, the total installed capacity of coal plants using biomass will be doubled, hence the use and import of biomass will also increase significantly. Furthermore, as in the newly built power plants the co-firing rate will also be higher than in the currently operational plants, biomass use is expected to at

[159] RWE/Essent response to SOMO Questionnaire on the origin of solid biomass, 22 June 2012.
[160] Ibid
[161] Ibid
[162] Ibid
[163] Ibid
[164] In early 2012, Enviva and E.ON signed a contract for biomass supply. Actual supply was set to begin in early 2013. Enviva Biomass website (2012), News, "Enviva and E.ON sign multi-year biomass supply contract", < http://www.envivabiomass.com/featured/enviva-e-on-sign-multi-year-biomass-supply-contract/> (28-8-2012); "Wood Pellet Biomass: North American Production & European Consumption", research report by Borealis Centre for Environment and Trade Research, prepared for Greenpeace, 31 March 2012.
[165] Response of Eneco to a draft version of this report, 12/03/2013.
[166] Ibid.
[167] Ibid.
[168] Anonymous biomass trader, interview with authors, 2012.
[169] Pantation Energy website, "Operations", http://www.plantationenergy.com.au/ (31/01/2013)
[170] Confidential information from biomass trader.
[171] N. Mainville, "Fuelling a BioMess – Why Burning Trees for Energy Will Harm People, the Climate and Forests", Greenpeace Canada, October 2011, http://www.greenpeace.nl/Global/canada/report/2011/10/ForestBiomess_Eng.pdf (20/02/2012) ; "Wood Pellet Biomass: North American Production & European Consumption", research report by Borealis Centre for Environment and Trade Research, prepared for Greenpeace, 31 March 2012.
[172] Ibid.
[173] Ibid.
[174] "Bioenergy from Forest", Zilkha Biomass presentation, 28 August 2012, http://www.zilkha.com/2012/08/28/bioenergy-from-forest-zilkha-biomass-presentation/ (31/01/2013)

least double. It has to be noted that the utilisation of this new biomass capacity will strongly depend on the regulatory framework in the Netherlands in the form of subsidies and other stimulating tools. For more information on policies, see paragraph 3.2. Also the prices for fossil fuels like coal and natural gas will play an important role in determining the rate of future biomass use in the Netherlands.

Table 8: Current and future biomass figures per utility in the Netherlands, 2011

Utility	Installed coal capacity (MW)	Co-firing realisation in 2011 (%)	Current biomass use (kt)	New projects (MW)	Maximum co-firing capacity (%)
E.ON	1,040	10%	200	1,070	30%
Eneco*	1	100%	19	49	100%
EPZ	426	18%	191	-	-
GDF Suez	590	25%	452	800	50%
RWE/Essent	1,245	35%[175]	727	1,600	50%
Vattenfall/Nuon	253	8%	57	630**	28%
Total	**3,555 MW**		**1,646 kt**	**4,149 MW**	

* Eneco figures refer to the company's current and future stand-alone biomass plants. The company does not operate coal plants in the Netherlands, hence the figures under "co-firing realisation" (100%) indicate full biomass capacity.

** The 630 MW Nuon plant is not a new plant to be constructed, but an existing coal plant (Hemweg 8) that will be converted for biomass co-firing.

Source: company responses to SOMO questionnaires[176]

Currently, most of the biomass used in the Netherlands is imported from North America and Europe. In the future it is likely that North American imports will increase, as there is an abundance of feedstock, especially in Canada. Also, with RWE's the Waycross biomass plant in Georgia (US) and E.ON's long-term supply contract with US wood pellet producer Enviva, the United States will continue to play an important role as origin country. Biomass from the Global South currently only constitutes a small part of Dutch imports. However, with the increased use of co-firing in the Netherlands it is likely that developing countries will also supply part of that increased need for biomass. In 2011 two small shiploads from Brazil (700 tonnes) and Ghana (400 tonnes) entered the Netherlands, which were probably related to quality testing for possible future purchases.[177]

[175] Realized in one of the two boilers of the Amer power plant.

[176] All utilities except EPZ replied to SOMO's questionnaire on the origin of biomass use. For more information, see the paragraph on methodology. June 2012.

[177] M. Junginger and C.S. Goh, assistant professor and researcher at the Copernicus Institute, Utrecht University, e-mail, 8 June 2012.

4. Biomass procurement and consumption by individual electricity companies in the Netherlands

Most of the electricity produced in the Netherlands originates from facilities owned by five large utilities: E.ON, EPZ, GDF Suez, RWE/Essent, and Vattenfall/Nuon. In 2011, there were five large (>50 MW) production facilities where solid biomass was used to produce electricity for the Dutch electricity market. All involved the co-firing of solid biomass in coal-fired power stations. As an exception, Eneco operated a small stand-alone biomass plant, and is currently constructing the Netherlands' largest (49 MW) stand-alone biomass plant. This chapter presents a profile of each of the six electricity companies operating biomass-fuelled power stations in the Netherlands. Each profile includes an analysis of the company's total (*i.e.* company-wide) biomass procurement activities, the use and origin of their biomass *in the Netherlands*, and the companies' supply chain responsibility policies. The chapter aims to answer the research questions related to the degree of transparency provided by the electricity companies operating in the Netherlands with regard to the origin of the biomass purchased and used in their power plants. Differences in the degree of transparency provided by individual companies as the relevant international standards are discussed.

4.1. E.ON

E.ON SE – headquartered in Düsseldorf, Germany – is a major utility with operations throughout Europe, Russia and North America. In 2011, the E.ON group had a worldwide generation capacity of 69 GW. Feedstock composition is, as with most of the other utilities discussed in this report, dominated by hard coal, natural gas and uranium. Renewable energy is mainly generated with wind and hydro installations and represents a 12.8% share, or 8.9 GW, of the total installed capacity.[178] In one of its online corporate presentations, the company has formulated the aim to convert some of its existing fossil fuel plants to dedicated biomass plants or to biomass co-firing installations. The company plans to do so with two to four installations until 2020 in its focus countries the UK, France, Italy and Belgium.[179]

In the Netherlands, E.ON operates through its wholly-owned subsidiary E.ON Benelux, and has multiple gas-fired power plants and one coal plant with biomass co-firing. The total installed capacity of power plants operated by E.ON in the Netherlands is 1,899 MW.

4.1.1. Company-wide solid biomass procurement

The global procurement of biomass is coordinated by the company's division E.ON Climate & Renewables.[180] E.ON does not report on solid biomass usage and origin for the company as a

[178] E.ON Interim Report II/2012, p. 21., http://www.eon.com/en/about-us/publications/interim-report/archive.html (10/01/2013)
[179] "We make clean energy better - An overview of our business activities - Q3/2012", E.ON presentation, 2012, p. 12,18&34., http://www.eon.com/content/dam/eon-content-pool/eon/ECR_Company_Presentation_%202012-Q3.pdf (16/01/2013)
[180] E.ON Sustainability Report 2011, p. 29., http://www.eon.com/content/dam/eon-com/Nachhaltigkeit/E.ON_SustainabilityReport2011.pdf?fromSearchResult=true

whole. For the company's only stand-alone biomass plant in the UK, Steven's Croft, E.ON procures a part of the plant's fuel from Canada.[181]

4.1.2. Quantities and origins of biomass consumed in the Netherlands

E.ON operates one coal-fired power plant with biomass co-firing in the Netherlands, the 1,040 MW Maasvlakte 1 & 2 plant. The plant uses different types of biomass, all sourced locally in the Netherlands. In 2011 the plant combusted 200,000 mt of biomass.[182] It is possible that in the future E.ON will source (part of its) biomass from the United States where in 2012 it signed a 240,000 tonne/year wood pellet supply agreement with biomass producer Enviva.[183] E.ON is currently constructing a new 1,070 MW coal plant with biomass co-firing at the same site as the Maasvlakte 1 & 2. For details on the Maasvlakte power plants, see Table 9.

Table 9: Current and planned E.ON plants in the Netherlands combusting biomass, 2011

Power plant	Maasvlakte 1 and 2	MPP3 Maasvlakte[184]
Location	Rotterdam	Rotterdam
Operational since	1973	under construction, operational in 2013
Total installed capacity	1,040 MW	1,070 MW
Feedstock	Coal with biomass co-firing	Coal with biomass co-firing
Biomass co-firing realisation	10%[185]	up to 30%
Biomass use per year (tonnes)	200,000	n/a
Biomass origin	the Netherlands	n/a
Types of biomass used	▪ Clean wood (e.g.wood pellets, wood residue) ▪ Agricultural residue (e.g. cacao and coffee processing residues) ▪ Clean industrial residue (e.g. sewage sludge, biogas)	n/a

Degree of transparency provided on origin and suppliers of biomass

E.ON provides some degree of transparency regarding its biomass use for electricity generation. In publicly available documentation, such as corporate reports and websites, the company does not provide information on quantities, types or origin countries for its biomass supply. By filling out SOMO's questionnaire, the company did indicate the origin and quantities of biomass used in its Maasvlakte power plant. E.ON does not share any information on its suppliers.

4.1.3. Biomass supply chain responsibility policies

E.ON has a Responsible Procurement Policy that lays out the minimum standards for the CSR performance of the company's business partners, suppliers and their sub-contractors. The policy is based on the ten principles of the UN Global Compact.[186] For the procurement of biomass the company uses a specific amendment, the Biomass Purchasing Amendment, which is attached to

[181] E.ON response to SOMO Questionnaire on the origin of solid biomass, 29 June 2012.
[182] Ibid.
[183] Enviva website, News, "Enviva and E.ON sign multi-year biomass supply contract", < http://www.envivabiomass.com/featured/enviva-e-on-sign-multi-year-biomass-supply-contract/> (28-8-2012)
[184] E.ON website, Activiteiten, "MPP3 – een nieuwe centrale", <http://www.eon.nl/corporate/Activiteiten/mpp3-een-nieuwe-centrale> (28 August 2012).
[185] E.ON website, Organisatie, "Energieopwekking", <http://www.eon.nl/corporate/organisatie/energieopwekking> (27 August 2012).
[186] E.ON Responsible Procurement Policy, http://www.eon.com/content/dam/eon-com/de/downloads/e/E.ON_Responsible_Procurement_Policy.pdf

all biomass procurement agreements.[187] To ensure compliance with the company's procurement policies, E.ON carries out "risk reviews of all suppliers and joint venture partners in accordance with its procurement and biomass guidelines, conducts audits locally and makes these guidelines an integral part of all contracts".[188]

The Biomass Purchasing Amendment lays out the conditions under which the company procures its biomass for power generation. These conditions include the following: biomass use will be undertaken in such a manner as to significantly reduce CO_2 emissions relative to fossil fuels; the production process of biomass shall be designed in a way that relevant stakeholders are involved and that it contributes to the social and economic development of local, rural and indigenous peoples and communities, and it will not compete with food crops; and that production shall avoid negative impacts on biodiversity and that it will not violate land rights. E.ON can undertake internal or external audits and site visits to monitor and control the compliance with its Biomass Purchasing Amendment, and non-compliance with these standards can lead to sanctions.[189] According to the company, in 2011 all suppliers that delivered biomass to E.ON Benelux were visited and checked by E.ON's technical and commercial staff to assess their fulfilment of the requirements E.ON has defined.[190]

Although the procurement of the biomass used in E.ON's Maasvlakte 1 and 2 power plant is not certified as such, in practice the company does comply with the NTA 8080 standard, since all sourcing is from local Dutch origin, using residues only.[191] The company is a member of the Initiative Wood Pellets Buyers (IWPB).[192]

4.2. Eneco

The Eneco Group – headquartered in Rotterdam, the Netherlands – consists of four companies: the electric utility Eneco, grid operators Stedin and Joulz, and energy consultancy Ecofys.[193] Eneco produces, trades, and sells electricity, gas, and heat. The company is active in the Netherlands, Belgium, France, Germany, and the UK. In 2011 the group had a total installed capacity of 2,613 MW (consisting of its own power plants and plants on long-term lease) and sold 27 TWh of electricity.[194] In the Netherlands, the company uses gas, wind, biomass, and solar power to generate electricity. Eneco's shareholders comprise 55 municipalities in the Netherlands.[195]

4.2.1. Quantities and origins of solid biomass consumed in the Netherlands

In 2011, Eneco owned approximately 10 MW of installed biomass-fired electricity generation capacity (primarily located in Belgium) and had contracted another 72 MW on long-term lease, for a

[187] "Biomass Purchasing Amendment to the E.ON Responsible Procurement Policy", E.ON, 31 October 2009, http://www.eon.com/content/dam/eon-com/en/downloads/e/EON_Biomass_Procurement_Amendment.pdf
[188] E.ON Sustainability report 2011, p. 80., http://www.eon.com/content/dam/eon-com/Nachhaltigkeit/E.ON_SustainabilityReport2011.pdf
[189] "Biomass Purchasing Amendment to the E.ON Responsible Procurement Policy", E.ON, 31 October 2009, http://www.eon.com/content/dam/eon-com/en/downloads/e/EON_Biomass_Procurement_Amendment.pdf
[190] E.ON response to SOMO Questionnaire on the origin of solid biomass, 29 June 2012.
[191] E.ON response to SOMO Questionnaire on the origin of solid biomass, 29 June 2012.
[192] Laborelec website, "Initiative Wood Pellets Buyers (IWPB)", no date, http://www.laborelec.be/ENG/initiative-wood-pellet-buyers-iwpb/ (09/04/2013)
[193] Eneco corporate website, Organisatie, "Eneco Groep", http://corporatenl.eneco.nl/Organisatie/Eneco-groep/Pages/Default.aspx (23/01/2013)
[194] Eneco Holding N.V. Jaarverslag 2011, pp. 14, 16&17., http://jaarverslag2011.eneco.nl/verslag-rvb (23/01/2013)
[195] Eneco Holding N.V. Jaarverslag 2011, p. 16. and response of Eneco to a draft version of this report, 01/03/2013.

total of 82 MW.[196] The company's own biomass-fired capacity in the Netherlands consists of one small-scale (690 kW) biomass co-digester in Putten (see Table 10) and a 1.8 MW landfill gas facility in Dordrecht.[197] Of the 72 MW long-term lease capacity, around 5 MW is located in the Netherlands and the rest in Belgium.[198] There is no information available on the origin of biomass used at these facilities. Eneco has recently finished constructing a 49 MW stand-alone biomass plant in the Dutch port of Delfzijl.[199] When fully operational, the plant will be the largest stand-alone biomass facility in the Netherlands and combust approximately 300,000 tonnes of biomass a year. Biomass for the power plant will be procured from the Netherlands, Belgium, Germany, and the UK.[200] In addition, Eneco is seeking permission to build an 80 MW stand-alone biomass plant in Utrecht called "Groene Weide".[201] Details on Eneco's Putten plant and the proposed Golden Raand plant are provided in Table 10.

Table 10: Eneco's biomass power plants in the Netherlands, 2013

Power plant	Putten[202]	Golden Raand
Location	Putten	Delfzijl
Operational since	2012	April 2013[203]
Total installed capacity	690 kW	49 MW
Feedstock	100% biomass	100% biomass
Biomass use per year (tonnes)	19,000	300,000
Biomass origin	the Netherlands	the Netherlands, Belgium, Germany, and the UK
Types of biomass used	manure, energy maize, glycerine, several residuals	Wood chips and wood waste

Source: Eneco[204]

Eneco had been planning to set up a biomass project in Vietnam, but these plans were abandoned in 2012.[205] Wood residue from the local furniture industry would have been used as feedstock for wood pellet manufacturing. The project was intended to have a production capacity of 150,000 tonnes per year for export to the Netherlands.[206] During the development of the project the

196 Eneco Holding N.V. Jaarverslag 2011, p. 27 & 35. and response of Eneco to a draft version of this report, 01/03/2013.
197 Eneco response to SOMO questionnaire on the origin of biomass, 27 May 2011.
198 S. de Boer, "Analyse PPA's Eneco EET", Eneco corporate documentation, 3 April 2011, e-mail received 22/04/2013.
199 "Eneco Bio Golden Raand komt op stoom", Eneco press release, 24 April 2013, http://projecten.eneco.nl/Eneco-Bio-Golden-Raand/Nieuws/persberichten/Pages/BGR-komt-op-stoom.aspx (02/05/2013).
200 Eneco Holding N.V. Jaarverslag 2011, p. 27.; Eneco corporate website, Organisatie, Aandeelhouders, Nieuws voor aandeelhouders, "Eneco bouwt grote bio-energiecentrale in Delfzijl", http://corporatenl.eneco.nl/Organisatie/aandeelhouders/Nieuwsbrief-ADH/Pages/eneco-bouwt-grote-bio-energiecentrale-in-delfzijl.aspx (23/01/2013) and response of Eneco to a draft version of this report, 01/03/2013.
201 Vattenfall/Nuon has submitted similar plans for a stand-alone biomass plant at the same location, despite the fact that there is place for only one plant in the area. As there is no information available regarding the future use and origin of the biomass at the Groene Weide project, it has not been included in Table 10. M. van Splunder, "Nuon en Eneco in de race voor enige Utrechtse biomassacentrale", Energeia, 18 March 2013, http://www.energeia.nl/news.php?ID=51366 (21/03/2013)
202 Eneco response to SOMO questionnaire on the origin of biomass, 27 May 2011 and response of Eneco to a draft version of this report, 01/03/2013.
203 "Eneco Bio Golden Raand komt op stoom", Eneco press release, 24 April 2013, http://projecten.eneco.nl/Eneco-Bio-Golden-Raand/Nieuws/persberichten/Pages/BGR-komt-op-stoom.aspx (02/05/2013).
204 Eneco Holding N.V. Jaarverslag 2011, p. 27.; Eneco corporate website, Organisatie, Aandeelhouders, Nieuws voor aandeelhouders, "Eneco bouwt grote bio-energiecentrale in Delfzijl", http://corporatenl.eneco.nl/Organisatie/aandeelhouders/Nieuwsbrief-ADH/Pages/eneco-bouwt-grote-bio-energiecentrale-in-delfzijl.aspx (23/01/2013) and response of Eneco to a draft version of this report, 01/03/2013.
205 Response of Eneco to a draft version of this report, 01/03/2013.
206 "Sustainable biomass projects at NL Agency", Agentschap NL publication, no date, p. 22., http://www.agentschapnl.nl/sites/default/files/bijlagen/All%20projects%20sustainable%20biomass%20NPSB_0.pdf and "Biomass Business Opportunities Viet Nam", Agentschap NL publication, no date, p. 51., http://www.agentschapnl.nl/sites/default/files/bijlagen/NL%20Agency%20-%20Biomass%20Opportunities%20Viet%20Nam.pdf (23/01/2013).

company decided to cease the venture as the project "did not fit in Eneco's strategic framework and that the capital could better be deployed for other Eneco renewable energy projects".[207]

Degree of transparency provided on origin and suppliers of biomass

Eneco provides a relatively high degree of transparency on the origin of the biomass it consumes in the Netherlands. For its recently finished Golden Raand plant, the company publishes information on origin countries, types, and the aggregate amounts of biomass that will be combusted when the plant is fully operational. Eneco does not publish information on the origin of the (small amount of) biomass used in its Putten plant on its website or in corporate materials, but the company did provide the information to SOMO when requested in the questionnaire.

With regard to transparency on biomass suppliers, Eneco does not publish the identity of any of its suppliers on its website or in corporate materials. However, in response to the SOMO questionnaire, Eneco did provide the names of three of its biomass suppliers: Bowergy, Bruins en Kwast, and Van Gansewinkel.[208] These producers supply Eneco's recently finished Golden Raand plant. Biomass production at these suppliers takes place in the Netherlands, Belgium, Germany and the UK.[209] Beyond these three suppliers, Eneco offered to share the names of all its other biomass suppliers with SOMO – and in fact with any interested non-commercial stakeholder – on the condition that the names of the suppliers not be made public. This degree of transparency can be considered best practice among the six electricity companies examined in this report. By sharing the names of its suppliers when requested, Eneco facilitates external monitoring and verification of conditions in its supply chain by interested stakeholders. At the same time, not providing or allowing public disclosure of the identity of most suppliers limits the possibilities local stakeholders have (who may be impacted by a biomass supplier's operations but unaware of the fact that that company is supplying Eneco) to alert Eneco to potential adverse impacts in its supply chain and work toward improvements.

4.2.2. Biomass supply chain responsibility policies

Eneco has developed a detailed Sustainability Charter on Biomass. The Charter defines the sustainability criteria Eneco employs in its procurement of biomass for trade and own use.[210] Those sustainability criteria – based on NTA 8080 (see boxed text in section 2.6) – take into account aspects such as living conditions for local stakeholders, food and land availability, and fair trade.[211] The Biomass Charter was approved by Eneco's Board of Directors in April 2012 and will be evaluated over the course of 2013. The Charter is not yet publicly available, but the company has indicated its willingness to share it with all interested stakeholders.[212]

One of the stated aims of the Eneco Sustainability Charter on Biomass is that "the origin of the applied biomass shall be traceable throughout the entire supply chain".[213] The Charter also highlights the importance of local stakeholders and civil society in ensuring high social and environmental standards throughout its supply chain. For "international trade and upstream

[207] Response of Eneco to a draft version of this report, 22/04/2013.
[208] See Bowergy website, http://www.bowergy.nl/nl/contact/; Bruins en Kwast website, http://www.bruinsenkwast.nl/contact; and Van Gansewinkel website, http://www.vangansewinkelgroep.com/over-ons/onze-markten.aspx.
[209] Response of Eneco to a draft version of this report, 22/04/2013.
[210] Eneco Sustainability Charter on Biomass, Article 2, Goal.
[211] Eneco online annual report 2011, Sustainable operations, CO2 neutral business operations, "Sustainable purchasing", http://annualreport2011.eneco.com/sustainable-operations/co2-neutral-business-operations/sustainable-purchasing (24/01/2013)
[212] Response of Eneco to a draft version of this report, 01/03/2013.
[213] Eneco Sustainability Charter on Biomass, Article 4, Chain of custody, f).

projects in biomass for energy production […] an Eneco project risk assessment shall be undertaken to evaluate the transparency, proportionality and commitment of (local) stakeholders and Non-Governmental Organisations".[214] To assess compliance with the Charter, the company uses the Eneco Partner Check, a questionnaire for business partners regarding their professional and reputational track record, their impact on the environment, and their socio-economic record. Compliance with the NTA 8080 criteria and Eneco criteria is achieved through the Eneco Feedstock Tool, and potential supplier countries are evaluated using the Eneco Country Risk Assessment.[215] For potential non-EU supplier countries, the analysis consists of issues such as good governance, forest management, and corruption.[216] Eneco has a Sustainability Officer who advises top management on issues relating to compliance with the Biomass Charter.[217]

4.3. EPZ

The Elektriciteits-Produktiemaatschappij Zuid-Nederland (EPZ) is a Dutch utility owned by Delta energy B.V. (70% of shares) and Energy Resources Holding B.V. (30%), a subsidiary of RWE.[218] In the southern province of Zeeland, the company operates a coal plant with biomass co-firing, a wind park and the only nuclear power plant in the Netherlands. EPZ has a total installed capacity of 965 MW and produced 6.6 TWh of electricity in 2011.[219]

4.3.1. Quantities and origins of solid biomass consumed in the Netherlands

EPZ does not report on the origin and type of feedstock used to co-fire in its Borssele coal plant. In 2011, the company combusted 191,000 mt of biomass in Borssele. In its annual report, as well as in a publicly available manifesto[220], EPZ states that it is planning to convert its current coal plant to a stand-alone biomass plant. Once the conversion is complete, with its installed capacity of 350 MW, the Zeeland bio-energy power plant would be the biggest stand-alone biomass plant in the Netherlands by far.[221] However, no time frame is given, as according to the company, the conversion would depend on favourable electricity prices and stable governmental policies regarding subsidies, which both are lacking at the moment.[222] Recent news in Dutch media suggest that Delta is planning to make use of the Dutch subsidy scheme SDE+ to fund the conversion of its coal plant to a stand-alone biomass plant.[223] Table 11 provides details on the Borssele coal plant.

[214] Eneco Sustainability Charter on Biomass, Article 3, Scope, a) and Article 7, Check origin and risk profile, c).
[215] Eneco Sustainability Charter on Biomass, Article 1, Definitions, k), l), and m).
[216] Annex Eneco Sustainability Charter on Biomass, 5.1.1, Landenbeoordeling.
[217] Eneco Sustainability Charter on Biomass, Article 11, Sustainability Officer.
[218] EPZ Jaarverslag 2011 and RWE Annual Report 2011, p. 47.
[219] EPZ Jaarverslag 2011, p. 14., http://www.epz.nl/temp/839178857/EPZ_jaarverslag_2011.pdf
[220] "Manifest Bio-energiecentrale Zeeland", manifesto by Delta, EPZ, Province of Zeeland, Municipality of Borssele, ZMf, DOW Benelux, Zeeland Seaports, and BZW Zeeland (VNO-NCW), http://epz.nl/system/files/20130115_bio-energiecentrale_manifest-1-1359552063913777188.pdf
[221] "Bio-energiecentrale Zeeland", Delta position paper, 10 January 2013, http://epz.nl/sites/default/files/files/20130115_Bio-energiecentrale_-_Position_paper.pdf
[222] EPZ Jaarverslag 2011, p. 15., http://www.epz.nl/temp/839178857/EPZ_jaarverslag_2011.pdf
[223] M. Persson, "Delta wil miljard subsidie voor houtverbrander", Volkskrant, 9 April 2013, http://www.volkskrant.nl/vk/nl/2664/Nieuws/article/detail/3422639/2013/04/09/Delta-wil-miljard-subsidie-voor-houtverbrander.dhtml (09/04/2013).

Table 11: EPZ plant in the Netherlands combusting biomass, 2011

Power plant	Borssele coal plant
Location	Borssele
Operational since	1988
Total installed capacity	426 MW
Feedstock	Coal & biomass
Biomass co-firing realisation	18%
Biomass use per year (tonnes)	191,000
Biomass origin	n/a
Types of biomass used	n/a

Degree of transparency provided on origin and suppliers of biomass

EPZ provides a very limited amount of transparency regarding its biomass procurement in the Netherlands. The company discloses the amount of biomass it combusts in its Borssele plant. Information on the origin of biomass, the types used and the name of its suppliers are not provided. EPZ choose not to respond to SOMO's questionnaire on the origin of biomass.

4.3.2. Biomass supply chain responsibility policies

EPZ has a General Purchasing Policy, in which all rights and requirements for suppliers are laid down.[224] Under *corporate social responsibility*, the document states that suppliers should act in a "socially responsible manner". What this entails however is not elaborated. In its annual report, the company has formulated ten principles of corporate conduct that are in line with the ten principles of the UN Global Compact.[225] Regarding policies for its biomass procurement, the document states that EPZ "only uses clean biomass and that sustainability criteria are used when purchasing biomass".[226] What sustainability criteria these are, is not revealed.

4.4. GDF Suez

GDF Suez – headquartered in Paris, France – operates in 70 countries worldwide and claims to be the top independent power producer in the world.[227] The company's revenues reached €90.7 billion in 2011, and it commanded a total installed electricity generation capacity of 118.2 GW worldwide. With a global installed capacity of 16.1 GW, renewable energy production represents around 14% of the company's total energy production portfolio. [228]

GDF Suez combines all its energy-related activities within the Netherlands through the fully-owned GDF Suez Energie Nederland. The company uses the name Electrabel for the consumer retail market. The utility is the second largest producer of electricity in the Netherlands. In addition to electricity production, GDF Suez is active in other utility segments and public services in the Netherlands: technical services (through subsidiary Cofely), oil and gas exploration (GDF Suez E&P), water management (Ondeo Industrial Solutions), and waste processing (SITA). GDF Suez

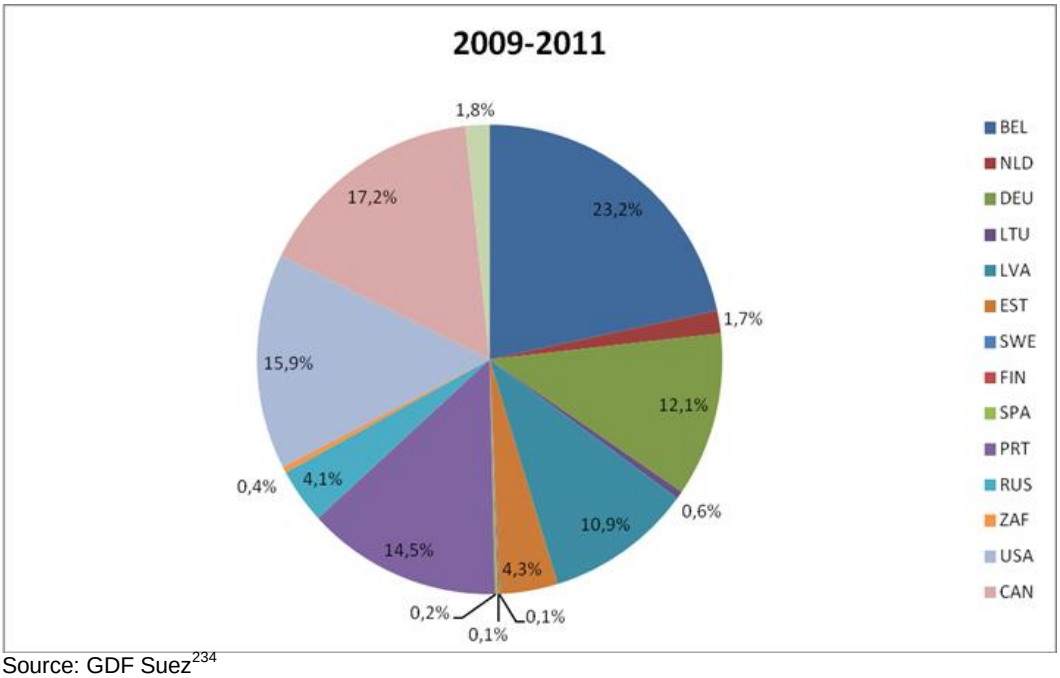
[224] "EPZ Algemene inkoopvoorwaarden", EPZ, 5 September 2012, http://www.epz.nl/temp/839178900/EPZ_Alg_Inkoopvoorwaarden_5_-_09_-_2012.pdf
[225] EPZ Jaarverslag 2011, pp. 22-25., http://www.epz.nl/temp/839178857/EPZ_jaarverslag_2011.pdf
[226] EPZ Jaarverslag 2011, p. 23., http://www.epz.nl/temp/839178857/EPZ_jaarverslag_2011.pdf
[227] GDF Suez Activities Report 2011, p. 1., http://www.gdfsuez.com/wp-content/uploads/2012/08/POD_GDFSUEZ_RA11_EN_REV01_bd.pdf
[228] GDF SUEZ website, About the group, Summary, http://www.gdfsuez.com/en/group/summary (26/02/2013) and GDF SUEZ response to a draft version of this report, 21/02/2013.

owns and operates 5,103 MW of electricity generation capacity in the Netherlands, and is responsible for approximately 20% of the Dutch electricity supply.[229]

4.4.1. Company-wide solid biomass procurement

In 2011, biomass-fired electricity generation comprised only 1% of the total company-wide electricity generation.[230] For its biomass-fired electricity generation, GDF Suez consumed approximately 1.7 million tonnes of solid biomass – 10% of the global wood pellet market – in over 50 power plants around the world.[231] The types of biomass GDF Suez uses ranges from fresh and recycled wood chips and wood dust to straw, sunflower and olive cake, and wood pellets. [232] As is illustrated in Figure 10, the wood pellets were produced primarily in Belgium, Canada, the US, Portugal, Germany, and Latvia. GDF Suez is in the process of developing new types of solid biomass to be co-fired in coal-based power plants. Such new types of biomass include rice straw from Southeast Brazil, cactus from the Chilean Atacama desert, and bamboo from Mozambique.[233]

Figure 10: Countries of origin for wood pellets consumed by GDF Suez, 2009-2011



Source: GDF Suez[234]

4.4.2. Quantities and origins of solid biomass consumed in the Netherlands

GDF Suez currently has one coal-fired power plant with biomass co-firing capacity in the Netherlands: the Gelderland plant in Nijmegen. The Gelderland plant has a total installed capacity

[229] GDF Suez website, Activiteiten, "Onze centrales", http://www.gdfsuez.nl/activiteiten/onze-centrales.aspx (13/12/2012)
[230] GDF Suez Registration Document 2011, p.13., http://www.gdfsuez.com/wp-content/uploads/2012/05/POD_GDFSUEZ_DR2011_EN_REV01_bd.pdf
[231] GDF Suez website, GDF Suez activities, Biomass, <http://www.gdfsuez.com/en/activities/our-energies/biomass/biomass-a-remodelled-energy > (23/12/2012).
[232] "Sustainable biomass for large scale power plants", GDF Suez presentation, 24 September 2012, http://www.laborelec.be/ENG/wp-content/uploads/2012/10/LBE-YR-Sustainable_biomass_for_large_scale_power_plants-v2-24SEP2012.pdf (13/12/2012)
[233] Ibid.
[234] "Sustainable biomass for large scale power plants", GDF Suez presentation, p. 4., 24 September 2012, http://www.laborelec.be/ENG/wp-content/uploads/2012/10/LBE-YR-Sustainable_biomass_for_large_scale_power_plants-v2-24SEP2012.pdf (13/12/2012). E-mai correspondence with GDF Suez, 4 June 2013.

of 590 MW and is capable of a maximum of 30% biomass co-firing. In 2011, 25% co-firing was realised. With consumption at approximately 450,000 tonnes of solid biomass a year, the Gelderland plant alone combusts approximately one-quarter of GDF Suez's total global biomass demand. In addition to the Gelderland plant, GDF Suez is currently constructing a new 800 MW coal and biomass-fired power plant in Rotterdam (Maasvlakte). The Maasvlakte plant is expected to be capable of co-firing up to 50% biomass. Table 12 provides operational details on the (biomass consumption in the) Gelderland and Maasvlakte.

Table 12: GDF Suez's Dutch biomass (co-firing) power plants (existing and under construction), 2011

Power plant	Gelderland	Maasvlakte
Location	Nijmegen	Rotterdam
Operational since	1981	under construction, operational in 2013
Total installed capacity	590 MW	800 MW
Feedstock	Coal with biomass co-firing	Coal with biomass co-firing
Biomass co-firing realisation	25%[235]	Plans: up to 50%
Biomass use per year (tonnes)	452,168	n/a
Biomass origin	See Table 13 below	n/a
Types of biomass used	wood pellets[236]	n/a

Source: GDF Suez[237]

As is revealed in Table 13, the origin profile of the biomass consumed at the Gelderland plant is similar to the origin profile of the company's overall biomass consumption. In 2011, the Gelderland plant consumed wood pellets produced in 13 different countries. The five most important supplier countries are Portugal, Latvia, Estonia, the USA, and Canada. Also notable is that a significant amount (31.6 kt, 7%) of the biomass combusted in the Gelderland plant in 2011 came from Russia and that a small amount (6.3 kt) originated in South Africa. GDF Suez claims that all wood pellets are certified by its Laborelec/SGS sustainability audit system.[238]

Table 13: Origin of biomass used at the GDF Suez Gelderland plant, 2011

Country of origin	Amount used, in tonnes	Percentage
Portugal	107,727	24%
Latvia	64,847	14%
Estonia	54,135	12%
USA	53,158	12%
Canada	41,962	9%
Germany	37,666	8%
Russia	31,631	7%
the Netherlands	25,609	6%
Belgium	8,697	2%
Australia	7,788	2%
Lithuania	6,716	1%
South Africa	6,313	1%
Spain	5,919	1%
Total	**452,168**	**100%**

Source: GDF Suez[239]

[235] GDF Suez website, GDF Suez positie biomassa, <http://www.gdfsuez.nl/over-ons/waar-wij-voor-staan/de-mix-aan-energiebronnen/biomassa.aspx> (14 May 2012).
[236] GDF Suez website, Activiteiten, Onze centrales, "Centrale Gelderland", http://www.gdfsuez.nl/activiteiten/onze-centrales/centrale-gelderland.aspx (03/04/2013).
[237] Ibid.
[238] GDF Suez response to SOMO Questionnaire on the origin of solid biomass, 18 June 2012.
[239] GDF Suez response to SOMO Questionnaire on the origin of solid biomass, 18 June 2012.

Degree of transparency provided on origin and suppliers of biomass

GDF Suez provides some degree of transparency regarding the origin of the biomass it consumes for electricity generation. On a company-wide level, GDF Suez reports publicly on the volumes, types, and countries of origin for its biomass supply. For its operations in the Netherlands, GDF Suez publicly discloses information on the aggregate amount of biomass used in its Gelderland plant. The company does not publicly report on the origin of biomass consumed in the Gelderland plant, but it did disclose this information in response to the SOMO questionnaire. The company does not provide any information on the identity of its solid biomass suppliers.

4.4.3. Biomass supply chain responsibility policies

To ensure solid biomass is procured in a responsible manner, GDF Suez employs an Ethics Charter, which is part of its "Ethics in Practice" guide. GDF Suez has a "Guide to ethics in supplier relations"[240], and all suppliers have to sign a "Corporate Social Responsibility Commitment Statement" declaring that they commit to acting in accordance with the Ethics Charter.[241] The Commitment Statement makes reference to the UN Universal Declaration of Human Rights, ILO core labour standards, the OECD Guidelines for Multinational Enterprises, the UN Convention Against Corruption, and the UN Global Compact. GDF Suez also has a specific policy document on sustainability criteria for solid biomass, in which it elaborates on the need for harmonised European criteria for biomass.[242] According to GDF Suez, important components of such a scheme should be higher CO_2 reduction requirements for biomass production, criteria to protect the soil quality, and a clear definition of biomass residues (as formulated in the NTA 8080 criteria).[243] The company conducts internal audits of suppliers to ensure compliance with the abovementioned standards, but it does not make any information about the audits or outcomes public. GDF Suez is a member of the Initiative Wood Pellets Buyers (see section 2.6).[244]

4.5. RWE/Essent

RWE is a major corporate player in the European energy sector. RWE is the third largest power company in Europe by electricity sales.[245] RWE is involved in the full electricity value chain, from the extraction and exploration of fuels to electricity production, trading, grid services, and distribution.[246] Renewables sources of energy (such as biomass, onshore and offshore wind, and hydro power) comprised 5.6% of the RWE Group's total installed capacity in 2010. RWE Innogy, part of the RWE group, was established in 2008 to bundle RWE's renewable energy activities. RWE Innogy also handles the company's wood pellet production.[247]

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[240] "Guide to ethics in supplier relations", GDF Suez, October 2009, http://www.gdfsuez.com/wp-content/uploads/2012/06/12pethanglais.pdf (10/04/2013)

[241] GDF Suez website, Understand our commitments, Responsible Purchasing, Our Responsible Purchasing Policy, "Corporate Social Responsibility Commitment Statement", http://www.gdfsuez.com/en/commitments/responsible-purchasing/responsible-purchasing-policy/corporate-social-responsibility-commitment-statement/ (09/04/2013)

[242] "Duurzaamheidscriteria voor vaste en gasvormige biomassa" GDF Suez , February 2012, http://www.gdfsuez.nl/~/media/GdfSuez/Standpunten/Duurzaamheidscriteria%20vaste%20biomassa_feb2013.ashx (09/04/2013).

[243] "Duurzaamheidscriteria voor vaste en gasvormige biomassa" GDF Suez , February 2012, http://www.gdfsuez.nl/~/media/GdfSuez/Standpunten/Duurzaamheidscriteria%20vaste%20biomassa_feb2013.ashx (09/04/2013).

[244] Laborelec website, "Initiative Wood Pellets Buyers (IWPB)", no date, http://www.laborelec.be/ENG/initiative-wood-pellet-buyers-iwpb/ (09/04/2013)

[245] RWE Annual Report 2010, p.56., http://www.rwe.com/web/cms/en/110822/rwe/investor-relations/reports/

[246] RWE website, RWE in the Netherlands, < http://www.rwe.com/web/cms/nl/582244/> (04-04-2012)

[247] RWE Annual Report 2011, p. 35., http://www.rwe.com/web/cms/mediablob/en/1299140/data/10122/10/rwe/about-rwe/RWE-annual-report-2011.pdf

In the Netherlands, RWE operates through its fully-owned subsidiary Essent NV, which it acquired in 2009. RWE/Essent is the second largest distributor of electricity in the Netherlands, with Dutch sales reaching 22.4 TWh of electricity in 2010.[248] In 2011, RWE/Essent produced 14.3 TWh of electricity in 13 gas-powered plants, one hydro plant, one coal plant with biomass co-firing, and one stand-alone biomass power plant on Dutch soil.[249]

4.5.1. Company-wide solid biomass procurement

In addition to procuring biomass from biomass suppliers, RWE itself produces biomass for its own consumption and for sale to third parties. In 2011, RWE produced 393,000 tonnes of wood pellets.[250] In the same year, the company's trading division, RWE Supply & Trading (RWEST), procured a total of 1.2 million metric tonnes of wood pellets for the company's own use, mainly from the US and Canada. Table 14 provides details on the origin, quantities, and types of solid biomass procured by RWEST in 2011.

Table 14: Solid biomass procurement by RWEST, 2011

Country of origin	Quantity (tonnes)	% of total procurement	Type of biomass	Feedstock type	Known suppliers (not exhaustive)
USA[a]	528,000	44%	Wood pellets	Round wood	Georgia Biomass RWE
Canada[b]	456,000	38%		Sawmill residues, forestry residues	▪ Pinnacle Renewable Energy Group ▪ Premium Pellet ▪ Pacific BioEnergy ▪ Shaw Resources
Portugal	84,000	7%			
Australia	48,000	4%			
Russia	36,000	3%			
Latvia	24,000	2%			
South Africa	24,000	2%			
UK	12,000	1%			
Total[c]	**1,200,000**	**100%**			

a = mainly Southeast US; b = mainly British Columbia, Prince George area; c = the sum of all individual amounts in the table does not exactly add up to the total amount shown (1,200,000) due to the rounding off of numbers.
Source: RWE/Essent[251]

The company's local divisions in various European countries (namely RWE/Essent in the Netherlands, RWE npower in the UK, RWE Hungaria in Hungary, and RWE Deutschland in Germany) also procure biomass independently of RWEST for co-firing in the company's hard coal and lignite-fired power stations in those countries.[252] The RWE Group's facilities worldwide consumed 2,144,769 tonnes of biomass in 2011.[253] Table 15 provides details on solid biomass consumption by the various RWE divisions in Europe.

[248] RWE Annual Report 2010, p. 76., http://www.rwe.com/web/cms/en/110822/rwe/investor-relations/reports/
[249] "Productie- en emissieoverzicht Essent", Essent publication, 2011, <http://www.essent.nl/content/Images/86028_Productie_en_emissieoverzicht_Essent.pdf> (28 August 2012).
[250] RWE online CR Report 2011, CR Areas for Action, Supply Chain, "Biomass", http://www.rwe.com/web/cms/en/1284066/cr-report-2011/cr-areas-for-action/supply-chain/biomass/ (15/01/2013)
[251] RWE/Essent response to SOMO Questionnaire on the origin of solid biomass, 22 June 2012.
[252] RWE online CR Report 2011, CR Areas for Action, Supply Chain, "Biomass", http://www.rwe.com/web/cms/en/1284066/cr-report-2011/cr-areas-for-action/supply-chain/biomass/ (15/01/2013)
[253] RWE/Essent response to SOMO Questionnaire on the origin of solid biomass, 22 June 2012.

Table 15: Biomass use by different RWE divisions in Europe, 2011

RWE division (country)	Power plant	Origin of biomass	Quantity (tonnes)	Type of biomass
RWE/Essent (NL)	Amer	See table for RWEST above	654,754	Wood pellets, see table for RWEST above
		the Netherlands	72,319	Wood chips, waste wood
RWE npower (UK)	Tilbury	See table for RWEST above	21,510	Wood pellets, see table for RWEST above
RWE npower (UK)	Aberthaw	UK	68,960	Wood chips, forest residues, sawdust, short round wood
RWE Innogy[254]	Small and medium CHP in Germany	Germany	592,251	Forest residues, organic production residues
RWE Deutschland (D)[255]	Small and medium CHP in Germany	Germany	388,426	Wood pellets, wood chips, organic production residues
RWE Hungaria (HU)	Matra	Hungary	346,549	Organic production residues
Total			**2,144,769**	

Source: RWE/Essent[256]

RWE owns one of the world's largest wood pellet factories in Waycross, Georgia (USA). Operational since 2011, the plant has an annual production capacity of 750,000 tonnes of wood pellets. In order to produce this quantity of pellets, the facility processes 1.5 million tonnes of green wood.[257] The primary destination for the biomass from the Waycross plant is the coal and biomass co-firing Amer power plant in the Netherlands and the Tilbury stand-alone biomass plant in the UK.[258] With an installed capacity of 750 MW, the Tilbury plant is the largest stand-alone biomass plant in the world.[259] Once fully operational, the plant will consume approximately 2.7 million tonnes of biomass per year, which is more than all of RWE's other plants combined.[260]

4.5.2. Quantities and origins of solid biomass consumed in the Netherlands

In the Netherlands, RWE/Essent currently has one coal-fired power plant capable of co-firing biomass. The Amer plant, with a total installed capacity of 1,245 MW, is capable of 35% biomass

[254] RWE Innogy and GWE Deutschland are both supplying the RWE Group's German market (with the exemption of RWE Innogy's 17 MWel/90 MWth plant "Nachod" in Czech Republic in 2011). The two divisions are covering two different accounting circles of the RWE group. These accounting circles have no common cut-set, hence the figures for the two divisions together make up the total biomass use of RWE in Germany. Personal communication with RWE, e-mail received 23 April 2013.

[255] Ibid.

[256] RWE/Essent response to SOMO Questionnaire on the origin of solid biomass, 22 June 2012.

[257] RWE Innogy website, Technologies, Biomass, Procurement International, Waycross Georgia, "Biomass pellet factory Waycross/Georgia", http://www.rwe.com/web/cms/en/522380/rwe-innogy/technologies/biomass/procurement-international/waycross-georgia/ (15/01/2013)

[258] RWE Innogy website, Technologies, Biomass, "Procurement International", http://www.rwe.com/web/cms/en/1630858/rwe-innogy/technologies/biomass/procurement-international/ (15/01/2013) and RWE Annual Report 2011, p. 47.

[259] O. Vukmanovic, "RWE's Tilbury plant restarts after fire", Reuters website, <http://uk.reuters.com/article/2012/06/21/uk-tilbury-biomass-idUKBRE85K16Y20120621> (11 July 2012); T. Probert, "Coal plants switch to bioenergy in the UK", Renewable energy world website, <http://www.renewableenergyworld.com/rea/news/article/2012/02/coal-plants-switch-to-bioenergy-in-the-uk> (11 July 2012).

[260] RWE npower website, About us, Our businesses, Power generation, Tilbury, "Tilbury Biomass Power Station", http://www.rwe.com/web/cms/en/1763234/rwe-npower/about-us/our-businesses/power-generation/tilbury/tilbury-biomass-power-station/ (03/04/2013)

co-firing (one of the two units at the Amer is able to achieve this ratio).[261] The company is planning to increase the ratio of biomass co-firing to 50% or even 80% in the future.[262] With a current annual consumption of approximately 730,000 tonnes of solid biomass, RWE/Essent's Amer plant accounts for nearly half of the total Dutch demand for solid biomass.
In addition to its Amer plant, RWE/Essent is currently constructing a 1,600 MW coal-fired power plant with biomass co-firing in the Eemshaven area in the Netherlands. The Eemshaven plant is expected to become operational in 2014, at which time it will become the largest electricity plant in the country with a minimum co-firing rate of 10%.[263] The exact maximum ratio of potential biomass co-firing is unknown, the company will only say that the amount of biomass co-firing will be "substantial".[264]

Table 16 provides an overview of the biomass-related operational details of the Amer and Eemshaven plants.

Table 16: RWE/Essent's Dutch biomass (co-firing) power plants (existing and under construction), 2011

Power plant	Amer	Eemshaven
Location	Geertruidenberg	Eemsmond
Operational since	1980 (unit 8), 1993 (unit 9)	under construction, operational 2014[265]
Total installed capacity	1,245 MW	1,600 MW
Feedstock	Coal with biomass co-firing	Coal with biomass co-firing
Biomass co-firing realisation	35%	n/a ("substantial")
Biomass use per year (tonnes)	727,073	n/a
Biomass origin	See Table 17 below	n/a
Types of biomass used	wood pellets and wood waste	n/a

As is revealed in Table 17, the Amer plant's biomass was produced primarily in the US and Canada, with a small but not insignificant amount originating in South Africa.[266] RWE Innogy has a stake in Topell Energy, a torrefied biomass production company with a biomass plant in Duiven (Gelderland, Netherlands) with an annual production capacity of 60,000 tonnes.[267] It is therefore expected that both the Amer and Eemshaven plants will source a part of their biomass from Topell Energy in the future.

[261] Response of RWE/Essent to a draft version of this report, 21/02/2013. Essent website, Over Essent, Activiteiten, Biomassa, "Essent en biomassa", http://www.essent.nl/content/overessent/activiteiten/biomassa/essent_en_biomassa.html (15/01/2013)
[262] Essent Corporate Responsibility Report 2011, p. 49., http://www.rwe.com/web/cms/mediablob/de/1510224/data/1510216/1/rwe/verantwortung/berichterstattung-und-fakten/aktuelle-berichte/PDF-version.-English-summary.pdf; and "Opknapbeurt Amercentrale Essent is mega-operatie", Essent press release, 30 March 2011, http://www.essent.nl/content/overessent/actueel/archief/2011/opknapbeurt_amercentrale_essent_is_mega-operatie.html (21/05/2013).
[263] Ibid.
[264] Response of RWE/Essent to a draft version of this report, 21/02/2013. Essent website, Over Essent, Nieuws & Pers, Werk in uitvoering, "Energiecentrale Eemshaven", <http://www.essent.nl/content/overessent/actueel/werkinuitvoering/centrale_eemshaven/index.html> (5 April 2012).
[265] RWE/Essent, written comment on a draft version of this report, 21/02/2013.
[266] E.g. in 2012 46,933 mt of wood pellets arrived in Amsterdam with the supramax mv Egret Bulker which was loaded in Vancouver for RWE. OBA Newsletter, September 2012, http://www.oba-bulk.nl/oba/files/c7/1178_Newsletter_Septe.pdf (23/01/2013)
[267] Topell Energy website, Company, "Topell Nederland", http://www.topellenergy.com/company/topell-nederland/ (03/04/2013)

Table 17: Quantities, types, and origins of biomass used at RWE/Essent's Amer plant, 2011

Country of origin	Type	Quantity (tonnes)	% of total	Known suppliers (not exhaustive)
USA	Wood pellets	288,092	39%	Georgia Biomass RWE
Canada	Wood pellets	248,807	34%	▪ Pinnacle Renewable Energy Group ▪ Premium Pellet ▪ Pacific BioEnergy ▪ Shaw Resources
the Netherlands	Waste wood	72,319	10%	
Portugal	Wood pellets	45,833	6%	
Australia	Wood pellets	26,190	4%	
Russia	Wood pellets	19,643	3%	
Latvia	Wood pellets	13,095	2%	
South Africa	Wood pellets	13,095	2%	
UK	Wood pellets	6,548	1%	
Total		**727,073***	**100%**	

* The sum of all individual amounts in the table does not exactly add up to the total amount shown (727,073) due to rounding off percentages. Source: RWE/Essent[268]

Degree of transparency provided on origin and suppliers of biomass

RWE/Essent provides a relatively high degree of supply chain transparency regarding the origin of the solid biomass it consumes. The company publishes information on aggregate quantities of biomass sourcing for its different national divisions, and the countries of origin and the quantities per origin country for its biomass use in the Netherlands. In addition, RWE/Essent (along with Eneco) was one of only two companies in the present study willing to disclose the identity of some (five) of its solid biomass suppliers in North America (see Table 17).

4.5.3. Biomass supply chain responsibility policies

RWE has a biomass procurement policy that is applicable to all companies within the RWE Group. The policy makes reference to global initiatives and guidelines such as the UN Global Compact and the Universal Declaration of Human Rights. The policy also refers to RWE's Code of Conduct and the company's Corporate Responsibility report, which in turn state that the company conducts its business according to the OECD Guidelines for Multinational Enterprises and ILO core labour standards. Regarding the cultivation and production of biomass, either by the company itself or by a third party supplier, the biomass procurement policy states that RWE is committed to only use biomass that "does not jeopardise the local food supply, endangered ecosystems, local prosperity and well-being, regional water supplies, and does not cause permanent damage to the environment, specifically soil quality, water quality and air quality". RWE commits itself to uphold these criteria within "its own sphere of influence".[269]

RWE daughter Essent has developed a certification system for sustainable biomass, the Green Gold Label (GGL). GGL covers the whole biomass value chain from production and processing to transport and final energy conversion. GGL provides standards for tracking and tracing the origin of the biomass, but it does not include high standards for public disclosure and transparency of the

[268] RWE/Essent response to SOMO Questionnaire on the origin of solid biomass, 22 June 2012. Percentages in the table deviate slightly from the information published by Essent in its 2011 CR Report, as the Netherlands is also accounted for in the table. Essent Corporate Responsibility Report 2011, p. 34., http://www.rwe.com/web/cms/mediablob/de/1510224/data/1510216/1/rwe/verantwortung/berichterstattung-und-fakten/aktuelle-berichte/PDF-version.-English-summary.pdf

[269] RWE website, Responsibility, Sustainable governance, Biomass Procurement policy, "Principles for Procurement and Use of Biomass in the RWE Group", http://www.rwe.com/web/cms/en/1115804/rwe/responsibility/sustainable-governance/guidelines/biomass-procurement-policy/ (15/01/2012)

supply chain.[270] According to the company, 99% of the biomass procured by RWE Supply & Trading was certified "in conformity with the GGL or comparable standards" in 2011.[271] In the Netherlands, 96% of all biomass combusted at the Amer power plant was certified by the GGL or comparable standards. The company aims to have a 100% certification for imported wood pellets by 2015.[272] RWE is also a member of the Initiative Wood Pellets Buyers (IWPB).[273]

4.6. Vattenfall/Nuon

The Dutch utility Nuon is since 1 July, 2009, part of the Swedish utility Vattenfall. The Vattenfall Group is active in Germany, Denmark, the Netherlands, the UK, Finland and France. The parent company, Vattenfall AB, is fully owned by the Swedish state.[274] The company produces electricity using a fuel mix of hydro power, lignite, nuclear power, gas, hard coal, oil, wind power, biomass and waste (in decreasing order of installed capacity).[275] The total installed capacity of the Vattenfall group was 37.4 GW and the company generated 178.9 TWh of electricity in 2012.[276]
In the Netherlands, Nuon operates a total of 22 units for electricity production: eight gas-fired power plants, two coal plants with biomass co-firing, and 12 wind turbine parks. The total electricity production capacity of power plants operated by Nuon in the Netherlands is around 3,700 MW.[277] The company is the biggest producer of electricity in the Netherlands, with 13.7 TWh produced in 2012.[278]

4.6.1. Company-wide solid biomass procurement

The use of (solid) biomass and biogenic waste represents 1% in the share of the company-wide electricity generation. A total of 3.4 million metric tonnes of biomass was used by Vattenfall in 2010 as feedstock for electricity and heat generation,[279] around 50% of which consisted of biogenic waste, sourced from municipalities and used mainly in plants in Sweden and Germany. Processed wood products such as pellets represent about 25% of the biomass use, sourced mainly locally, according to the company. Unprocessed, "fresh" woody residues are the third source, accounting for 25%.[280] Until May 2012, the company was involved in the production of wood chips made from old rubber trees through the Liberian biomass company Buchanan Renewables.[281] The company is planning to increase its biomass supply from Europe, Canada (and elsewhere in North America) as well as South America.[282]

4.6.2. Quantities and origins of solid biomass consumed in the Netherlands

Vattenfall/Nuon publishes little information on quantities, types and origin of its biomass use on its corporate website or its annual reports. The company did fill in SOMO's questionnaire on biomass

[270] Green Gold Label website, "The standards", <http://www.greengoldcertified.org/site/pagina.php?id=11>, (19 July 2012).
[271] RWE CR Report 2011, p. 74.
[272] Ibid.
[273] Laborelec website, "Initiative Wood Pellets Buyers (IWPB)", no date, http://www.laborelec.be/ENG/initiative-wood-pellet-buyers-iwpb/ (09/04/2013)
[274] Vattenfall Annual Report 2011, p. 7., http://www.vattenfall.com/en/file/2011_Annual_Report.pdf_20332206.pdf
[275] Vattenfall Annual Report 2011, p. 132., http://www.vattenfall.com/en/file/2011_Annual_Report.pdf_20332206.pdf
[276] Response of Vattenfall to a draft version of this report, 18/02/2013.
[277] Vattenfall website, Vattenfall power plants in the Netherlands, <http://powerplants.vattenfall.nl/#/countries/netherlands/sort/capacity/view/list> (13 April 2012)
[278] Response of Vattenfall to a draft version of this report, 18/02/2013.
[279] Vattenfall response to SOMO Questionnaire on the origin of fuels, 8 June 2011.
[280] Vattenfall response to SOMO Questionnaire on the origin of fuels, 8 June 2011.
[281] Vattenfall Annual Report 2010, p. 2., http://www.vattenfall.com/en/file/2010_Annual_Report.pdf_17546144.pdf
[282] Vattenfall Annual Report 2011, p. 32.; Nuon Energy Annual Report 2011, p. 46., http://www.nuon.com/Images/Nuon%20Energy%20Annual%20Report%202011%5Bi%5D_tcm185-248863.pdf

sourcing and usage, the answers of which are incorporated in this paragraph and the next. Table 18 shows Vattenfall's two plants in the Netherlands that use or will use biomass for electricity generation. Today, with around 57,000 tonnes, it is the Willem-Alexander plant that consumes the most biomass of the company's plants in the Netherlands. In March 2013 the company communicated that in April 2013 it will close down the Willem-Alexander plant due to deteriorating market conditions and that the company can no longer make the plant profitable, even with biomass co-firing.[283] The company is testing biomass co-firing at the Hemweg 8 plant, where it is planning to achieve a biomass usage of 800,000 tonnes per year.[284] Nuon has submitted plans to local the local authorities in the Province of Utrecht to build an 80 MW stand-alone biomass plant in Utrecht called "Groene Weide".[285] Despite the fact that there is place for only one plant in the area, Eneco has submitted similar plans for the same location. As there is no information available regarding the future use and origin of the biomass at the Groene Weide project, it has not been included in Table 18 below. In addition to its plants for electricity generation, Vattenfall also operates a stand-alone biomass plant in Lelystad for the production of heat. The plant has a thermal capacity of 7 MWth and uses around 22,000 tonnes of biomass per year, which mainly consists of wood from local trees.[286] The Lelystad plant has not been included in Table 18, as it is not used for electricity generation purposes.

Vattenfall mainly imports its biomass from France, the US and Canada, while Portugal, Spain and Norway are the smaller supplying countries. Surprisingly, the company ships a small fraction of its biomass from New Zealand (see Table 19). In its 2011 annual report, the company states that "Vattenfall is currently looking into opportunities to secure its access to biomass in Europe and North and South America".[287]

Table 18: Vattenfall/Nuon plants in the Netherlands using biomass (current and future)

Power plant	Willem-Alexander[288]	Hemweg 8*
Location	Buggenum	Amsterdam
Operational since	1993	1994
Total installed capacity	253 MW	630 MW
Feedstock	Coal with biomass co-firing	Coal with biomass co-firing in the future
Biomass co-firing realisation	8%[289]	Future projection: max 28%[290]
Biomass use per year (tonnes)	56,664 (see Table 19 below)	Future projection: max 800,000[291]
Solid biomass origin	see Table 19 below	-
Types of biomass used	Wood pellets[292]	Wood pellets

* The Hemweg 8 plant is currently being prepared for future biomass co-firing.

[283] "Nuon sluit centrale Buggenum", Nuon press release, 18 March 2013, http://nieuws.nuon.nl/nuon/nuon-sluit-centrale-buggenum (21/03/2013).
[284] Nuon Energy Annual Report 2011, p. 40., http://www.nuon.com/Images/Nuon%20Energy%20Annual%20Report%202011%5Bi%5D_tcm185-248863.pdf; "WABO 24-08-2012 Nuon Power Generation BV Petroleumhavenweg 1 te Amsterdam", Gemeente Amsterdam, omgevingsvergunning Nuon voor bijstook biomassa, 23 August 2012, <http://www.noord-holland.nl/web/Actueel/Bekendmakingen/Bekendmaking.htm?dbid=15126&typeofpage=82116> (28/08/2012)
[285] M. van Splunder, "Nuon en Eneco in de race voor enige Utrechtse biomassacentrale", Energeia, 18 March 2013, http://www.energeia.nl/news.php?ID=51366 (21/03/2013)
[286] Vattenfall Power Plants website, "Lelystad", http://powerplants.vattenfall.com/powerplant/lelystad (03/04/2013)
[287] Vattenfall Annual Report 2011, p. 32.
[288] Nuon website, kernactiviteiten: centrale Buggenum, <http://www.nuon.com/nl/het-bedrijf/kernactiviteiten/opwekken-energie/centrales/buggenum.jsp> (13 April 2012).
[289] Nuon Energy Annual Report 2011, p. 45., http://www.nuon.com/Images/Nuon%20Energy%20Annual%20Report%202011%5Bi%5D_tcm185-248863.pdf
[290] "WABO 24-08-2012 Nuon Power Generation BV Petroleumhavenweg 1 te Amsterdam", Gemeente Amsterdam, omgevingsvergunning Nuon voor bijstook biomassa, 23 August 2012, <http://www.noord-holland.nl/web/Actueel/Bekendmakingen/Bekendmaking.htm?dbid=15126&typeofpage=82116> (28/08/2012)
[291] Ibid.
[292] Nuon Energy Annual Report 2011, p. 40., http://www.nuon.com/Images/Nuon%20Energy%20Annual%20Report%202011%5Bi%5D_tcm185-248863.pdf

Biomass used at the Willem-Alexander plant consists exclusively of wood, predominantly supplied in the form of industrial wood pellets. Nuon occasionally uses smaller volumes of enhanced wood pellets and char.[293] Table 19 shows the origin of biomass at the Willem-Alexander plant in more detail.

Table 19: Origin of biomass used at the Nuon Willem-Alexander plant in 2011

Country of origin	Amount of biomass used, in tonnes	Percentage
the Netherlands	5,788	10%
France	22,653	40%
USA	8,960	16%
Canada	7,789	14%
Portugal	3,841	7%
Spain	3,275	6%
New Zealand	1,691	3%
Norway	1,497	3%
Other	1,170	2%
Total	**56,664**	**100%**

Source: Vattenfall[294]

Degree of transparency provided on origin and suppliers of biomass

Vattenfall provides a limited degree of transparency regarding the origin of biomass it uses for electricity generation. Vattenfall reports on the most important origin countries in its annual report, although a full list of sourcing countries was only disclosed by filling out SOMO's questionnaire. Aggregate quantities and quantities per origin country were also provided through the questionnaire. The company does not disclose the types of biomass it uses and no information was provided on the names of its suppliers either.

4.6.3. Biomass supply chain responsibility policies

Vattenfall uses a "Code of conduct for suppliers", which is based on the 10 principles of the UN Global Compact.[295] The company states that it "assesses environmental, social and ethical performance when selecting suppliers, contractors and business partners".[296] However, it is not clear on what criteria these assessments are based. According to the company, Vattenfall is currently developing specific criteria to assess its biomass supply chain.[297] Nuon states in its 2011 Annual Report that "social and environmental aspects are taken into account in the area of biomass procurement".[298] The company does this by making use of sustainability certification schemes such as FSC or PEFC. According to the company, "where such certification schemes are not (yet) available, Nuon will ensure the sustainability of the origin through alternative means. Thereby the sustainability information will, in addition to the checks performed by Nuon, be verified by an independent third party using a risk-based approach."[299] The Willem-Alexander plant's

[293] Nuon Energy Annual Report 2011, p. 40., http://www.nuon.com/Images/Nuon%20Energy%20Annual%20Report%202011%5Bi%5D_tcm185-248863.pdf
[294] Vattenfall response to SOMO Questionnaire on the origin of solid biomass, 18 September 2012; Nuon Energy Annual Report 2011, p. 40., http://www.nuon.com/Images/Nuon%20Energy%20Annual%20Report%202011%5Bi%5D_tcm185-248863.pdf
[295] Vattenfall Code of Conduct for Suppliers, http://www.vattenfall.com/en/code-of-conduct-for-suppliers.htm
[296] Vattenfall website, Environment, "Environmental policy", <http://www.vattenfall.com/en/environmental-policy.htm> (11 May 2012).
[297] Vattenfall response to SOMO Questionnaire on the origin of solid biomass, 18 September 2012.
[298] Nuon Energy Annual Report 2011, p. 40. http://www.nuon.com/Images/Nuon%20Energy%20Annual%20Report%202011%5Bi%5D_tcm185-248863.pdf
[299] Vattenfall response to SOMO Questionnaire on the origin of solid biomass, 18 September 2012.

biomass supply from France has been FSC or PEFC certified, while 67% of the supply from the US has been certified by the Green Gold Label.[300] This means that in 2011 around 50% of the plant's total biomass supply had been certified. The company is a member of the Initiative Wood Pellets Buyers (IWPB).[301]

[300] Ibid.
[301] Laborelec website, "Initiative Wood Pellets Buyers (IWPB)", no date, http://www.laborelec.be/ENG/initiative-wood-pellet-buyers-iwpb/ (09/04/2013)

5. Conclusions

Based on the findings and analysis presented above, the following conclusions can be drawn with regard to each of the study's research questions, listed again here for clarity.

5.1. Global biomass market and supply chain

- How is the global market and supply chain for solid biomass structured, particularly in terms of type of biomass, major producing countries, and major consuming countries?

Wood pellets are the primary form of solid biomass used for electricity generation. Various types of feedstocks are used to make the pellets, including sawmill residues (*e.g.* sawdust), agricultural residues from forest management (*e.g.* treetops, branches), dedicated tree plantations, and even commercial, full trees from forests when timber prices are low.

Europe is the world's largest consumer of solid biomass for electricity generation with the most important individual importers being Denmark, the Netherlands, the UK and Italy.

Currently, the largest producers of solid biomass are the United States (primarily the south-eastern states), Canada (primarily British Columbia), and Russia. Within Europe Germany and Sweden are the largest producers. Solid biomass production in the US, Canada, and Russia is expected to grow rapidly in the coming years, with Canadian exports likely to double in the next decade. US exports will grow as well, but the US domestic market for biomass is also expanding, which will temper export volumes. Countries in the Global South currently play a limited role in the global supply of solid biomass for electricity generation, but this is likely to change as demand for biomass rapidly increases. Brazil has an important biomass production industry, but currently the majority of production is destined for the domestic market. The research identified numerous investments in wood chip and wood pellet facilities and plantation forests in Africa and Southeast Asia. Though they are not likely to become major exporters in the next decade, based on initial 'scouting' investments countries that may eventually emerge as important source countries for the European market include Brazil, South Africa, Mozambique, Ghana, Liberia, and Tanzania. The brief surveys of three projects in Liberia, Tanzania, and Ghana discussed in section 2.5 of the present report provide an indication of the challenges and potential adverse impacts of biomass production in developing countries for export to Europe.

5.2. Origin of biomass in the Netherlands

- What role does the Netherlands play in the global solid biomass market, and what is the role of biomass in the Dutch electricity generation sector?
- What are the quantities, types, and origins of solid biomass flowing into the Netherlands?
- Which major electricity companies operating in the Netherlands are involved in the import, resale, and/or usage of solid biomass?

Currently, approximately 6% of the electricity produced in the Netherlands is generated by combusting solid biomass. In order to reach the EU's renewable energy targets, by 2020 electricity production should originate for 42% from renewable sources in the Netherlands. Given the current

political climate in the Netherlands, as well as the technical and economic realities for other renewable technologies, a significant part of this 42% is likely to be generated by (co-firing) biomass. In recent years, the Dutch government has implemented several policies stimulating biomass-generated electricity.

Of all the solid biomass used by utilities to generate electricity in the Netherlands, approximately one-fifth is of domestic origin. This biomass primarily consists of agricultural residues (*i.e.* non-woody biomass). In addition, residues from the cacao processing industry, olive residues, wheat husk, disapproved cattle feed, fruit pulp, and bone meal have been and are being used as feedstock in the Netherlands. Although many of these products are classified as 'domestic' because they are residues of processing facilities located in the Netherlands, most of the original products / raw materials are sourced from abroad, often from the Global South. Domestic biomass production is not expected to grow significantly in the future.

The vast majority – approximately 80% – of the biomass used for electricity generation in the Netherlands is imported. As indicated in Figure 9 above, of the total biomass supply to the Netherlands in 2011, **21% came from the US, 18% from Canada, 11% from the Baltic states and Russia, 10% from Southern Europe, 5% from Western Europe (excluding the Netherlands), 2% from Oceania, 1% from South Africa, and 11% from other countries or regions**. In 2011, two small shiploads of biomass from Brazil and Ghana entered the Netherlands, probably related to quality testing and which might indicate possible future purchases from these countries. The Netherlands is already heavily dependent on biomass imports for its co-firing activities, and this dependency will rise in the coming years. Electricity giants E.ON, GDF Suez and RWE/Essent are all constructing new coal-fired plants with biomass co-firing capability in the Netherlands. Vattenfall is upgrading one of its coal-only plants to give it co-firing capability, and Eneco has just completed the Netherland's largest stand-alone biomass power plant. With domestic biomass production unlikely to grow, this additional 4,000 MW of nameplate electricity generation capacity will mean that even more biomass will have to be imported from abroad. As mentioned above, countries such as the US, Canada, Russia, and potentially Brazil are likely to supply this increased demand in the coming years, with other countries in Africa, South America, and Southeast Asia playing a more important role in the longer term should demand continue to rise.

The largest consumers of solid biomass for electricity generation in the Netherlands are the electric utilities RWE/Essent (727,073 tonnes per year), GDF Suez (452,168 t/y), Eneco (319,000 t/y), E.ON (200,000 t/y), EPZ (191,000 t/y), and Vattenfall/Nuon (56,664 t/y). With the exception of Eneco, all of the companies co-fire the solid biomass in coal-fired power plants. Eneco operates the country's largest stand-alone biomass power plant. Dutch demand for solid biomass is expected to increase sharply in the coming years with RWE/Essent, GDF Suez, and E.ON planning new coal-fired plants with biomass co-firing capacity, and Vattenfall/Nuon converting a coal-only plant to enable it to co-fire biomass.

5.3. Degree of transparency provided by utilities in the Netherlands

- To what degree do the electricity companies operating in the Netherlands provide transparency about the origin of the biomass procured and consumed in their power plants?
- Are there differences in the degree of transparency provided by individual companies?
- Is the degree of solid biomass supply chain transparency provided by electricity companies operating in the Netherlands in line with relevant international standards?

The degree of transparency provided by each of the electricity companies operating large-scale biomass-firing power plants can be analysed and assessed along the lines of four distinct elements:

1. The aggregate quantities and types of biomass consumed
2. The countries of origin of the biomass
3. A specification of the quantities of biomass procured per country of origin
4. The identities of and relationships with specific biomass suppliers.

All utilities provide information on the **aggregate quantities and types of biomass** used in their power plants. Eneco, EPZ, GDF Suez, and RWE/Essent publicly disclose this information on their website or in their annual reports. E.ON and Vattenfall/Nuon do not publish information on aggregate amounts and types of biomass, but did provide the figures in response to SOMO's questionnaire.

When it comes to providing information on **countries of origin and specific quantities imported per country of origin**, the degree of transparency is more diverse among utilities. RWE/Essent publicly reports on the countries of origin and specifies the quantities per origin country for biomass consumption in the Netherlands. So does Eneco, although in 2011 quantities per origin country could not yet be reported on, as the company's only biomass power plant with significant installed capacity (49 MW), the Golden Raand plant only became operational in April 2013.[302] GDF Suez reports publicly about the countries of origin and quantities on a company-wide level, but not for its Dutch operations. It did, however, provide this information when requested by SOMO. Vattenfall/Nuon reports on the quantities from its most important source countries, but not all countries. It too provided the missing information to SOMO upon request. E.ON does not report publicly on its countries of origin, but did fill out SOMO's questionnaire. EPZ does not report on countries of origin, nor did it provide the information when requested by SOMO.

Overall, utilities are least transparent about their **relationships with specific biomass suppliers**. E.ON, EPZ, GDF Suez, and Vattenfall/Nuon did not disclose any information about the identities of any of their biomass suppliers. Though not publishing any information about supplier identities on their website or in annual reports, Eneco and RWE/Essent did provide some information when requested by SOMO. Both Eneco and RWE/Essent provided SOMO with the names of a limited number of suppliers and agreed to allow SOMO to publish those names. Eneco went a step further by offering to disclose the identities of all of its suppliers with interested stakeholders, though on the condition that this information not be published.

Of the six electric utilities examined, Eneco can be considered to the most transparent about its biomass consumption and procurement, followed by RWE/Essent and then GDF Suez. EPZ (DELTA) can be considered the least transparent. Table 20 provides an overview of the degree of transparency provided by utilities regarding the consumption and origin of biomass used for electricity generation.

[302] Eneco's current biomass operations in the Netherlands consist of two stand-alone biomass plants: the 690 kW Putten plant and the 49 MW Golden Raand plant. The company's Putten plant combusts 19,000 tonnes of biomass annually, which makes the plant significantly smaller than any of the other utilities' biomass plants analyzed in this research. For the sake of comparability only the company's Golden Raand plant (with a biomass use of 300,000 tonnes/year), has been taken into consideration for the company's scores in Table 20.

Table 20: Degree of transparency in biomass consumption and procurement by utility, 2011

Element of transparency related to biomass use/procurement	E.ON	Eneco*	EPZ	GDF Suez	RWE/ Essent	Vattenfall/ Nuon
Aggregate quantities and types						
Countries of origin						
Quantities per country of origin		n/a				
Information on suppliers						

* Eneco's scores are based on the company's Golden Raand power plant, which was not yet operational in 2011, but for which Eneco had already provided some information on biomass quantities and countries of origin.
Legend: Green = publicly available information. Yellow = information provided through questionnaire/interview. Red = no information provided. n/a = not applicable because Eneco's Golden Raand plant was not operational in 2011.

Interestingly, the degree of transparency the companies provide about the origin of the biomass they consume is generally higher than the degree of transparency they provide about the origin of the coal[303] and – by far – uranium they use to generate electricity. That said, the overall degree of biomass supply chain transparency currently provided by electricity companies is insufficient to ensure that biomass consumption in Dutch power plants is not contributing or linked to adverse social and environmental impacts at biomass production facilities around the world. The degree of transparency provided is particularly low when it comes to specific suppliers and locations (*e.g.* forests, plantations, industrial facilities) from which biomass is procured. Also, reporting on specific feedstock types only happens sporadically using broad descriptions like 'wood pellets', 'wood chips', 'residues', or 'wood waste' without exactly disclosing the source/type of wood used to produce the pellets or chips. This is important as 'wood pellets' could come from a wide range of forest/plantation types, including native forest.

The OECD Guidelines for Multinational Enterprises[304] and the UN Guiding Principles on Business and Human Rights[305] encourage companies to disclose information about their relationships with suppliers and to report publicly on how potential negative impacts in their supply chain and among their business relations are identified. The electric utilities examined in the present research do not do this, and it can therefore be concluded that the current degree of biomass supply chain transparency provided by most utilities operating in the Netherlands is out of line with international normative standards for supply chain transparency.

Though Eneco's offer to provide any interested stakeholder with the names of its suppliers on the condition of non-disclosure can certainly be considered to be current best practice among utilities in the Netherlands, it is not ideal. By not actively making the information completely public, communities or other relevant stakeholders adversely impacted by the activities of a biomass supplier remain unaware of the identity of the supplier's customers and therefore unable to raise concerns or grievances with the end-users of the biomass.

[303] J. Wilde-Ramsing et al. "The Black Box: Obscurity and transparency in the Dutch coal supply chain", January 2012, Amsterdam, SOMO, http://somo.nl/publications-en/Publication_3737 (15-5-2013).
[304] OECD, OECD Guidelines for Multinational Enterprises: 2011 Edition, Chapter III, paragraph 3e and Commentary paragraph 33, 25 May 2011, <http://www.oecd.org/document/28/0,3746,en_2649_34889_2397532_1_1_1_1,00.html> (1 December 2011).
[305] "Guiding Principles on Business and Human Rights: Implementing the United Nations 'Protect, Respect and Remedy' Framework", UN Human Rights Office of the High Commissioner, New York and Geneva, 2011, paragraph 17, http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf

5.4. Biomass supply chain responsibility policies

- Are there differences in the corporate supply chain responsibility policies of individual companies?

There are notable differences in the depth, specificity, and scope of the various utilities' policies for ensuring that social and environmental standards are upheld in the biomass supply chain. Almost all companies refer to one or more international sustainability standards or guidelines, with the most commonly referenced instrument being the UN Global Compact. Other standards referenced by the utilities include the OECD Guidelines for Multinational Enterprises, the UN Universal Declaration of Human Rights, and the ILO core conventions. E.ON, Eneco, and RWE/Essent have very specific corporate policies on biomass procurement such as a biomass purchasing amendment, a sustainability charter on biomass, or a biomass procurement policy. Other utilities (EPZ, GDF Suez, and Vattenfall/Nuon) use more general company policies such as a code of conduct for suppliers, a CSR commitment statement, or general purchasing agreements.

Eneco's supply chain responsibility policy on biomass procurement is the most elaborate of all the utilities covered by this research. The company's 'Biomass Charter' has the most detailed description of the steps taken to assess a biomass supplier's compliance with Eneco's principles. Eneco has thus far only shared the Charter with interested stakeholders, but is planning to make it public. E.ON and RWE/Essent also have an explicit biomass procurement policy stating, for example, that the biomass used for electricity generation shall not compete with food crops, have any negative spill-over effects on local socio-economic development, or affect local environmental quality. Other companies (GDF Suez and Vattenfall) are less specific when it comes to how they prevent adverse social and environmental impacts linked to their biomass supply, though they do proclaim that they take environmental, social, and ethical criteria into account when procuring biomass. EPZ provides little information on its policies and procedures for biomass procurement.

There are currently no mandatory regulations in place in the Netherlands to ensure that solid biomass production for electricity generation is sustainable and does not contribute to adverse social and environmental impacts. Several private initiatives, however, have created certification schemes that encompass various criteria. Many of the electricity companies make use of the various schemes to varying degrees (see the individual company profiles). In addition to these certification schemes, one biomass sustainability initiative that is touted by several of the electricity companies (E.ON, GDF Suez, RWE/Essent, and Vattenfall/Nuon) is the Initiative Wood Pellet Buyers. As noted in section 2.6 above, the IWPB – which is still in the start-up phase – has been criticized for being an industry-only initiative that lacks transparency and is weak on avoiding adverse environmental impacts.

6. Recommendations

The overall analysis of supply chain transparency and the origin of solid biomass for electricity generation in the Netherlands generates a number of significant implications and lessons for various stakeholder groups involved or interested in the sustainability of biomass-based electricity generation, as well as supply chain transparency, non-financial disclosure, and corporate accountability in general. Based on the above conclusions and implications, recommendations to the following stakeholder groups are provided:

Recommendations for electricity companies:

- In line with the OECD Guidelines and the UN Guiding Principles on Business and Human Rights, conduct risk-based human rights due diligence to identify all solid biomass suppliers and the potential social and environmental impacts associated with their activities and report publicly on this process.
- Meaningfully engage relevant stakeholders in the due diligence process. This entails actively providing stakeholders with information about the specific types and quantities of feedstock per country of origin of all biomass consumed, the names of biomass suppliers, any identified social or environmental risks associated with their activities, and steps taken to prevent or mitigate adverse impacts.
- Conduct periodic audits of all suppliers, ensuring that audits are conducted by independent, third-party auditors, and that they engage local civil society organisations. Be transparent about the results of the audits.
- Develop a biomass-specific supply chain responsibility policy or supplier code of conduct that recognises the importance of supply chain transparency and references the relevant international standards on transparency.

Recommendations for the Dutch government:

- Ensure that the OECD Guidelines for Multinational Enterprises are implemented and that Dutch companies and other multinationals active in the Netherlands are operating in line with the Guidelines.
- In order to do so, develop and implement legislation that requires electricity companies to disclose information about their supply chain, including disclosing and reporting regularly on their suppliers and the origin of their raw materials.
- To enhance supply chain transparency in the solid biomass industry, make detailed figures on biomass origin publicly available. Under the ‘Green Deal’ related to “Reporting on solid biomass sustainability for energy use’, beginning in 2013 electric utilities operating in the Netherlands are required to provide AgentschapNL with information on the biomass they consume. The information provided to AgentschapNL by the utilities will include the name of the biomass supplier, type of biomass, amount, country of origin (including region/plantation), feedstock type, name of the power plant where biomass is combusted, certification type, CO2 reduction, and purpose of use (electricity or heat generation). AgentschapNL should make this information available to the public on a company-specific (i.e. not aggregated for the whole Netherlands) level.
- Insist that companies identify, prevent, and mitigate potential adverse impacts caused by suppliers and that companies be transparent about their management processes designed to do so.

Recommendations for the European Commission:

Given the fact that most of the electricity companies examined in this report are multinational corporations that are active in multiple European countries, it is crucial that the European Commission take up the issue of transparency in energy (including biomass) supply chains. The European Commission should ensure that legislation on non-financial disclosure includes requirements related to supply chain transparency. For example,

- Require large enterprises to disclose information on their supply chain and CSR-issues (e.g. labour rights, human rights, the environment) and their management of the supply chain (including their processes for conducting due diligence).
- Require traceability throughout supply chains.
- Introduce right to information for consumers and civil society organisations regarding the origin of key raw materials and conditions of production.

Recommendations to consumers of electricity in the Netherlands, including large industrial consumers and the Dutch government as a consumer of electricity:

- Urge your electricity supplier to take their supply chain responsibility seriously and provide more transparency into the origin of their raw materials. The Dutch government, in its role as a large consumer of electricity, should lead by example and apply sustainability criteria to its procurement of electricity. This includes requiring companies contracted to provide electricity to be transparent about their supply chain.

7. Annex 1: Planned wood pellet production facilities in Canada and the US

The following tables give an overview of wood pellet plants which are under construction and which are being planned in Canada and the US. The information has been gathered and published by the International Energy Agency.[306]

Table 21: Pellet plans under construction in Canada, 2011

Plant Name	Location	Capacity (tons/y)
Lhtako Energy Corp.	Quesnel, BC	
Whitesand First Nations	Armstrong, ON	60.000
Atikokan Renewable Fuels	Atikokan, ON	140.000
Direct Pellet Industries Inc.	Haliburton, ON	16.000
Pellagri Energy	Hartsville, H.R., PEI	n.a.
Woodville Pellet Corp. (2of2)	Kirkfield, ON	n.a.
Granules LG International Inc.	Mashteuiatsh, QC	80.000
Survey Total of Under Construction		296.000

[306] M. Cocchi et al, "Global Wood Pellet Industry, Market and Trade Study", commissioned by the International Energy Agency Bioenergy Task 40 Sustainable International Bioenergy Trade, December 2011, http://www.bioenergytrade.org/downloads/t40-global-wood-pellet-market-study_final.pdf (23/03/2013)

Table 22: Proposed pellet plants in Canada, 2011

	Name	City	Province	Capacity	Status
1	General Biofuels Canada	Terrace	BC	500,000	2011
3	Pacific Bioenergy	Kitwanga	BC		
4	Pelltiq't Energy	Kamloops	BC	175,000	2010
5	Shulus Power	Merritt	BC		
6	Tahtsa Lumber	Burns Lake	BC		
7	Dansons & Sundance Forest	Edson	AB	30,000	2010
8	Winnipeg Forest Prod	Winnipeg	Man	10,000	
9	Canadian Biofuel	Tillsonburg	ON	27,000	
10	Fibre Brain	Sault Ste Marie	ON	32,000	
11	Kenora Forest Prod	Kenora	ON		
12	Nipissing First Nation	Nipissing	ON	24,000	
13	White River Forest Prod	White River	ON	100,000	
15	Woodville Pellet	Kawartha Lakes	ON	75,000	
16	Granulco	Sacre-Coeur	QC		
17	York Energy	Nackawic	NB		

Table 23: Pellet plants under construction in the US, 2011

Plant Name	Location	Capacity (tons/y)
RWE Innogy	Waycross, Ga	750,000
Enviva	Ahoskie, NC	350,000
Westervelt Renewable Energy	Aliceville, Al	250,000
		1,350,000

* RWE's Waycross plant has been operational since 2011.

Table 24: Proposed pellet plants in the US, 2011

	Name	City	State	Capacity	Status
1	**Point Bio Energy**	Baton Rouge	La	400,000	2012
2	**German Pellets**	Tyler	Tx	550,000	2012
3	**Enviva LP**	Cortland	Va	454,000	2013
4	**F.E. Wood & Sons**	Baldwin	Ma	350,000	2013
5	**Enviva LP**	Northhampton	Nc	440,000	2012
6	**Fram Renewables**	Lumber City	Ga	350,000	2012
7	**Mt. Taylor Machine**	Milan	NM	25,000	2012
8	**MTM**	Albuquerque	NM	25,000	2012
9					
				2,594,000	

From Whence the Wood?

Supply Chain Transparency and the Origin of Solid Biomass for Electricity Generation in the Netherlands

The use of solid biomass as feedstock for electricity generation is becoming an increasingly prominent and controversial topic in the global debate about the transition to a sustainable energy system. Increasing emissions of carbon dioxide (CO_2) from the combustion of fossil fuels such as coal, lignite, oil, and natural gas for electricity generation is currently the most significant drivers of anthropogenic greenhouse gas (GHG) emissions and climate change. If produced under sustainable conditions, solid biomass can offer a potential path to addressing climate change by substituting fossil fuels and reducing GHG emissions. On the other hand, if produced and procured in an unsustainable manner, the use of biomass for electricity production can actually lead to an increase in CO_2 emissions and thus have a negative overall climate effect. The production of solid biomass for electricity generation also carries with it several other social and environmental risks related to issues such as forest degradation, loss of biodiversity, land tenure/rights violations, and human rights abuses. Detailed knowledge about the origin of the supply of solid biomass used for electricity generation is thus essential for determining whether biomass-based electricity generation is genuinely contributing to sustainable development. The question 'From whence (i.e. from where) the wood?' has thus never been more relevant.

The Netherlands is one of the world's largest consumers of solid biomass for electricity generation. The present report examines the degree of biomass supply chain transparency provided by the six largest individual consumers of biomass in the Netherlands – electric utilities E.ON, Eneco, EPZ (DELTA), GDF Suez, RWE/Essent, and Vattenfall/Nuon. By gaining further insight into the origin of the biomass imported into the Netherlands, the report aims to increase the public and political pressure on electricity companies to take responsibility for ensuring that minimum social and environmental standards are respected throughout the biomass supply chain.