The Forests Dialogue
Scoping Dialogue on Sustainable Woody Biomass for Energy
June 21-22, 2016 | Montpellier, France

BACKGROUND PAPER – Draft (June 14th 2016)

Prepared by James Griffiths[1]

INTRODUCTION - International Development, Climate and Renewable Energy priorities:

As global demand for energy grows and efforts to use more renewable energy accelerate, the opportunity for scaled-up deployment of renewable woody biomass for primary energy production seems self-evident. Recent international agreements and commitments appear to further strengthen the case for sustainable woody biomass energy, namely:

- Transformation of the sustainable development agenda by 2030 with specific goals for access to sustainable energy, climate change mitigation and sustainably managed forests under the Sustainable Development Goals (SDG) agreed to in September 2015,
- Global commitments for low carbon development and Greenhouse Gas (GHG) emissions neutrality by 2050 embedded in the Paris Agreement of the UN Framework Convention on Climate Change (UNFCCC), negotiated in December 2015.

Pressing national and regional energy security considerations, based on ready access to locally available or internationally traded renewable woody biomass resources, also enhances deployment prospects. Yet a variety of stakeholders including some researchers, civil society groups, industry, media commentators, government policy makers and regulators, point out this is not without risks associated with sustainable production and consumption factors (Creutzig[2]).

Given this international context and the current momentum of woody biomass deployment in key geographies and sectors (e.g. Europe for large scale power generation; in parts of Africa as the primary source of household energy), we can anticipate intensifying discussions on the:

- Expanding role of renewable energy, including woody biomass, as UNFCCC climate change commitments are made and operationalized under the Paris Agreement - on a 5 yearly cycle starting in 2020 with progressively deepening GHG emission reduction targets,
- Scaling up international development assistance initiatives and funding to achieve SDG outcomes that are woody biomass energy related,
- Formulation of regional and national level public policy energy frameworks and incentives to manage and mitigate supply risks associated with expanding woody biomass deployment - happening already in Europe and US,

[1] James Griffiths & Associates Sàrl – independent sustainability advisor based in Geneva Switzerland

[2] Felix Creutzig et al, *Bioenergy and climate change mitigation: an assessment*, Global Change Biology Bioenergy (2015)

- Launching of research programs and advocacy campaigns to inform and influence woody biomass public policy development, energy sector investments, supply chain business practices and societal attitudes.

The Forests Dialogue (TFD), supported by the Program for Forests (PROFOR) hosted by The World Bank, the World Business Council for Sustainable Development (WBCSD) and the Sustainable Biomass Partnership (SBP), is convening stakeholders for an inaugural scoping dialogue on the topic of *sustainable woody biomass for energy*. The objectives of this TFD background paper are to:

1. Provide dialogue participants with a brief baseline overview and understanding of concepts and contexts – Part 1
2. Stimulate discussion during the scoping dialogue on challenges and opportunities associated with increased use – Part ll.
3. Present a short listing of information resources as optional pre-reading for dialogue participants and a listing of key acronyms used in the background paper – Parts lll & lV

This background paper remains as draft throughout the dialogue. Participants are encouraged to send any comments or edits to James Griffiths griffithsjames007@gmail.com by close of business June 24th to supplement any additional perspectives provided during the dialogue. It will be finalized along with two TFD knowledge products – the Co-Chairs summary and a short social media article.

TFD will share these knowledge products with all dialogue participants as well as publish on www.theforestsdialogue.org at least one month after the Montpellier dialogue.

PART 1 – Context & Concepts:

Concepts – Global Energy and the role of Renewable Energy:

Renewable energy comes from resources that are not significantly depleted by their use including solar, wind, biomass, water and geothermal. According to the Renewable Energy Policy Network for the 21st Century[3] (REN21), renewables are gradually replacing conventional fossil fuels across four distinctive areas – electricity generation, heat and power, transport fuels and rural off-grid energy services.

Based on REN21's 2016 global report[4], renewables contributed annually 19.2 % of global energy consumption and 23.7 % of electricity generation. This energy consumption is divided as 8.9 % coming from traditional biomass, 4.2 % as heat energy (modern biomass, geothermal and solar heat), 3.9 % hydro and 2.2 % electricity from wind, solar, geothermal and biomass. Worldwide investments in renewable technologies are growing – in 2015 amounting to more than US$ 286 billion with countries like China and the US heavily investing in wind, hydro, solar and biofuels.

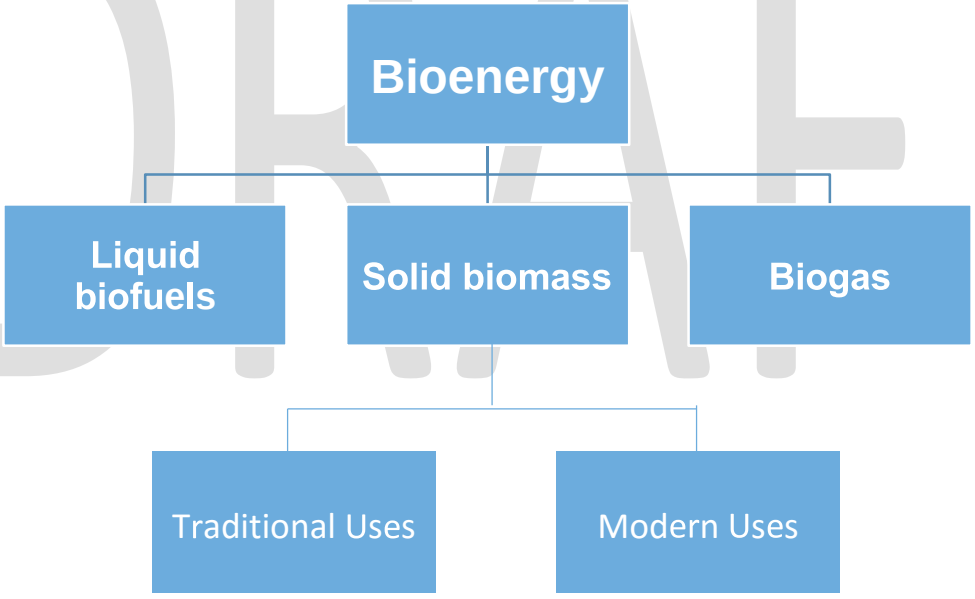
[3] REN21 is a global multi-stakeholder policy network that provides international leadership supporting a rapid transition to renewable energy. Established in 2004 the network is hosted by the UN Environment Program (UNEP).

[4] REN21, Renewables 2016 Global Status Report, web publication http://www.ren21.net/

Unlike fossil fuels, renewable energy resources exist over wide geographical areas. According to REN21, rapid deployment, in combination with energy efficiency initiatives, results in significant energy security, climate mitigation and economic development benefits and in many countries there is strong public opinion support for promoting renewable sources, especially solar power and wind power. At least 30 nations around the world already have renewable energy contributing more than 20 percent of energy supply and national and regional renewable energy markets are projected to continue to grow strongly in the coming decade and beyond.

Concepts – Woody biomass and the current and future role of Bioenergy:

The International Energy Agency[5] (IEA) defines *biomass* as any organic matter derived from plants or animals on a renewable basis, including wood and agricultural crops, herbaceous and wood energy crops and organic waste. *Bioenergy* is energy derived from the direct consumption of biomass as unprocessed or semi-processed *solid or woody biomass* or further processed into *liquids or gas biofuels.*



(The World Bank 2015)

Note that the primary "scope" of this TFD scoping dialogue is on solid woody biomass for energy developments sourced from forest-based systems and involving stakeholders focused on deployment issues across traditional and modern uses. Although sharing the same forest origin and sustainable production considerations, it does not encompass forest-derived industrial fuels such as lignin or black liquor. These and future "bio-economy" fuel developments can certainly be expected to place an increased demand on woody biomass overtime and could be include if any further TFD initiatives eventuate from the Montpellier dialogue.

[5] IEA is an autonomous organization hosted by OECD which works to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA has four main areas of focus: energy security, economic development, environmental awareness and engagement worldwide www.iea.org

IEA notes that bioenergy, including woody biomass, is the single largest renewable energy source available today providing some 50 Exajoules[6] (EJ), about 10 % of the world's annual primary energy supply, more than all other renewable sources combined. In the case of solid woody biomass this reflects its use across two contexts – *traditional* or household mainly in Developing countries and *industrial* or modern in Developed countries. Note that some stakeholders feel this historical distinction is an artificial construct, becoming blurred and less relevant as overall renewable woody biomass energy use expands.

Woody biomass - also referred to as *wood energy* – is primarily derived from production or "working" forests, intensively managed planted forests, agroforestry systems as well as trees outside forests (TOF[7]). Woody biomass provides primary energy in a variety of overlapping fuel formats across both use contexts, including:

- Fire or fuel wood e.g. household cooking and heating
- Charcoal e.g. household cooking and heating and commercial scale use in urban areas
- Forest slash, wood chips, bark and wood processing residues such as sawdust e.g. long established industrial scale use as the primary energy source in pulp, paper, sawn timber and panel production, but also other sectors including food processing, cement production, chemicals industry
- Wood pellets and torrefied pellets e.g. large-scale power generation, district heating, combined heat and power applications

IEA's Technology Road Map Bioenergy for Heat and Power[8] envisages world total primary bioenergy supply increasing to 160 EJ by 2050 to meet expanding global energy demand. This model predicts growth across all sectors utilizing woody biomass, with 100 EJ of this from the large scale generation of heat and power.

The World Bank attributes this significant growth to a number of core demand drivers operating across many geographic and end use contexts:

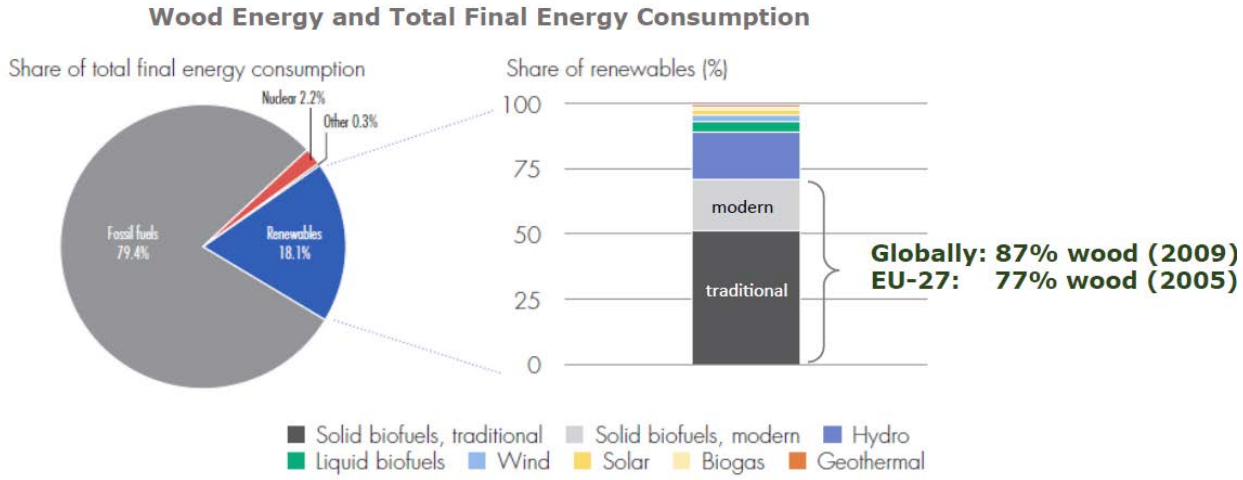
- Household use – population growth and urbanization in many developing countries, often with low purchasing power,
- Commercial use – readily and locally available alternative to other energy sources, like bottled gas or kerosene, across a variety of applications including catering, food processing and dry cleaning operations, mainly in developing countries,
- Industrial use – renewable energy source and substitute for fossil fuel for low-carbon industrial production across a wide range of sectors, in developed and developing countries,

[6] EJ are used to describe very large scale energy units. 1 EJ is equal to 10^{18} Joules (J). 1 J is the amount of energy required to light a 1 watt LED light for 1 second. Another large energy unit often used is Petajoule (PJ) which is equivalent to 10^{15} J.

[7] The world has billions of trees not included in the Food & Agriculture Organization's (FAO) definitions for forests and woodlands upon with its global Forest Resources Assessments are made (see note 10). TOF exist in industrialized and developing countries - on farms in rural areas as well as urban situations. TOF providing a wide range of functions and services (e.g. shade and wind shelter, soil protection, livestock fodder) including as a primary source of fuelwood in many developing countries.

[8] IEA, *Technology Roadmap: Bioenergy for Heat and Power*, IEA website (2012)

- Utility use – increasing the renewable energy mix for large scale power and heat generation in developed countries in line with climate commitments and energy security considerations; and as a primary fuel in off-grid or mini-grid energy development, especially in rural areas of developing countries, in line with sustainable development and climate related outcomes.



(The World Bank 2015)

Within the UNFCCC, the role of forests as carbon sinks, stores or sources has been a long term focus under the themes of Land Use, Land Use Change & Forestry (LULUCF) and Reducing Emissions from Deforestation and Forest Degradation (REDD+). In terms of lower carbon energy sources, relative to fossil fuels, bioenergy, including woody biomass, is generally recognized as a lower carbon intensive energy solution alongside other renewable energy options of hydro, solar and wind power.

The Intergovernmental Panel on Climate Change's (IPCC) 4th Assessment report released in 2007 stated a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber or *energy* from the forests, will generate the largest sustained climate mitigation benefit. This finding has been reconfirmed in subsequent IPCC assessments, although some environmental advocacy groups, like the Natural Resource Defence Council[9] (NRDC), have strong reservations with the actual on-the-ground implications of such intergovernmental recommendations.

To conclude this section, global forest statistics compiled by the Food & Agriculture Organization of the UN[10] (FAO), further confirm the current global significance of woody biomass as a primary source of energy – with wood fuel production accounting for 57 % (1.8 billion m3) of the annual global harvest, compared to industrial round wood production at 43 % (1.6 billion m3).

[9] NRDC *Wood Pellet Issue Brief*, web publication (2015)

[10] FAO is the UN system's main technical organization on forests and forestry. Regular collection and analysis of comprehensive statistical forest data from Member States is a primary and important task, including global Forest Resources Assessments.

Context – Household and Commercial use in Developing Countries

Using wood as fuel for heating and cooking is one of humankind's oldest, traditional practices. An estimated one-half of the world's population, primarily in non-OECD[11] countries, depend on woody biomass in the form of fuelwood and charcoal to meet their daily energy needs. Population growth, economic development and the unconnected nature of energy supply grids in many developing countries means that demand for fuelwood and charcoal will continue to expand.

Traditional use of woody biomass for heating and cooking in the form of fuel wood and charcoal is vast and varied and generally tends to have low energy conversion efficiency. In addition to household use, businesses – ranging from bakeries, restaurants, breweries, and brick factories, and iron and aluminium forges – depend on fuelwood or charcoal for their daily operations.

Globally, traditional biomass is often associated with hazardous indoor air pollution and health effects. In many contexts, there is a gender component as well, with women and children spending a disproportionate amount of their time collecting fuel wood and higher exposure rates when cooking. This sector employs significant amounts of labour in supply chains that service urban areas, often on an informal basis.

A 2015 study on the carbon footprint of traditional use estimated that as much as one third of wood fuel harvesting was unsustainable, with large geographic variations. Affecting some 275 million people living in depletion "hotspots" concentrated in Southeast Asia and East Africa, the report suggests these geographies become priority areas for REDD+ interventions and note that the successful deployment of and utilization of energy efficient stoves would deliver major emissions reductions alongside many social and economic co-benefits (Bailis[12]).

In some parts of the developing world, traditional woody biomass use has peaked or is in decline, while other regions, such as Sub-Saharan Africa (SSA), are projected to experience significant growth in biomass use over the next 15 years and could account for as much as 75 % of total residential energy by 2030. In some localities, woody biomass extraction is not driving deforestation, while in others it is perceived as a primary source of forest loss, although location-specific evidence for this is weak. Some developing countries certainly do acknowledge fuelwood as a deforestation driver, hence renewable biomass energy is a feature in REDD+ readiness plans (RPP) and REDD+ strategies.

Extrapolating to the whole of Sub-Saharan Africa, the World Bank[13] estimates indicate that the charcoal industry in SSA was worth more than US$8 billion in 2007, with more than seven million people dependent on the sector for their livelihoods. In line with consumption predictions of the IEA, the economic value of the charcoal industry in SSA may exceed US$12 billion by 2030, employing almost 12 million people. Modernizing the woody biomass energy sector has the potential of significantly increasing the revenue base of most SSA countries, unlocking resources urgently needed for investments in natural resources and other key areas for sustainable economic development and green growth. For example, in Kenya, government revenue losses from clandestine charcoal production and trade are estimated at around

[11] The Organization for Economic Co-operation and Development (OECD) is a grouping of the wealthiest, industrialized Developed Countries with the mission of developing policies that improve the economic and social well-being of people around the world. Currently with 34 member countries, its scope includes energy

[12] Robert Ballis et al, *The carbon footprint of tradional woodfuels*, Nature Climate Change on-line publication (2015)

[13] World Bank, *Wood-based Biomass Energy Development for Sub-Sahara Africa*, AFREA (2011)

US$65 million (2007), while in Tanzania, this amount is estimated to be around US$100 million (2009). Indirect value-added, such as employment for government officials or taxes charged on production inputs, such as the use of mobile telephones or tools, are not even considered.

The World Bank notes that more than half of the SDG have wood energy relevance and a growing body of research based evidence suggests substantial co-benefits associated with modernization in production, processing, distribution and consumption throughout the traditional value chain. These include efficiency advances in stoves, kilns and processing systems which can be achieved through interventions in forest governance, taxation, regulation and technology (Owen[14]). Some examples provided by the World Bank[15] include:

- SDG Goals 3 (health) and 5 (gender) – enhance access to clean cooking and heating technology and appliances to reduce health impacts, improved agroforestry practices to reduce collection burdens
- SDG Goal 7 (energy) – wood energy as off-grid/mini-grid solution, increasing use of renewable energy in commercial and industrial processes.
- SDG 8 (economic growth & employment) – modernization of the wood energy sector, which is often informal, as a higher priority economic growth sector expanding the tax revenue base and generating new opportunities for business and employment.
- SDG 13 (climate change) and 15 (forests) – modernized wood energy sector as drivers of locally controlled tree management systems, vibrant wood energy markets make forests competitive to other land-uses and incentivize re and afforestation investments, wood energy as a low carbon development option.

To conclude with this context, the Center for International Forestry Research[16] (CIFOR) is currently undertaking a systematic review of local development, energy and forestry regulatory frameworks in SSA. Looking at wood energy supply and demand and forest management impacts, it is seeking to assess if this should be a far higher priority for international and national development strategies that can deliver significant socio-economic benefits while mitigating environmental impacts.

Context – Industrial and Modern uses

Woody biomass for energy is often seen as a developing country traditional use issue, but in reality this is far from the case.

Forest and forestry industry statistics from FAO and the United Nations Economic Commission for Europe[17] (UNECE), which covers Europe, North America and the Russian Federation (CIS), confirm its significance throughout these countries with wood as the single most important source of renewable

[14] Matthew Owen et al*, Can there be energy policy in Sub-Saharan Africa without biomass?* Energy for Sustainable Development (2012)
[15] Paula Caballero, *The potential role of wood energy in the post-2015 development agenda,* The World Bank presentation at The World Forestry Congress, High-Level Event on Wood Energy (8 September 2015)
[16] Paolo Omar Cerutti et al, *The socio-economic and environmental impacts of wood energy value chains in Sub-Saharan Africa: a systematic map protocol*, CIFOR Environmental Evidence (2015)
[17] FAO UNECE, *Forest Products Annual Market Review 2014-2015, Chapter 9 Wood Energy* (FPAMR 2015)

energy (contributing 46 % of total). Despite the recent faster pace of solar and wind energy development, wood energy consumption still grew by 4.8 % p.a. in the UNECE region over the period 2011-2013.

Industrial scale use of woody biomass to generate energy is a long, well-established and integrated part of the production of pulp and paper, sawn timber and panels and associated wood mobilization supply chains across the UNECE region, and the forest based industry at 43.9 % is the largest consumer of wood energy.

Other significant and expanding wood energy use includes residential heating (35.8 %), particularly significant in some countries like Italy, and industrial scale combined heat and power applications (17.3 %). In Europe, large scale district home heating networks, with woody biomass as the primary energy source, are also in place (e.g. Germany, Denmark) and will further develop, with forest-rich countries like Sweden leading on the utilization of woody biomass energy.

Within the UNECE region, public policy developments relating to large scale utilization of woody biomass for direct power generation have gained prominence, driven by a mix of climate change and energy security considerations.

In response to the European Union's Renewable Energy Directive (RED) target of 20% renewable energy consumption by 2020, some European Member States are currently incentivizing power utility companies to switch from coal to woody biomass as a primary energy source, primarily in the UK, Denmark, the Netherlands and Belgium.

The US Environmental Protection Agency (EPA) is developing rules on carbon accounting which will be important in determining future national utilization of biomass in power generation including woody biomass. While the EPA Framework is still under review, draft guidance is provided on how to assess carbon values across production and consumption cycles[18].

Significant public policy developments and business investments to support woody biomass mobilization for use in power generation are also evident in Japan and South Korea.

One outcome of these public policy developments has been rapidly expanded investments in the production and regional and international trade of wood pellets, although wood pellets is a small part of the overall forest products industry, which remains very much dominated by traditional paper and wood-based products. As with many rapidly expanding business sectors, this has included new plant openings but also some closures and consolidations of business units in the North American and Baltic wood pellet sectors.

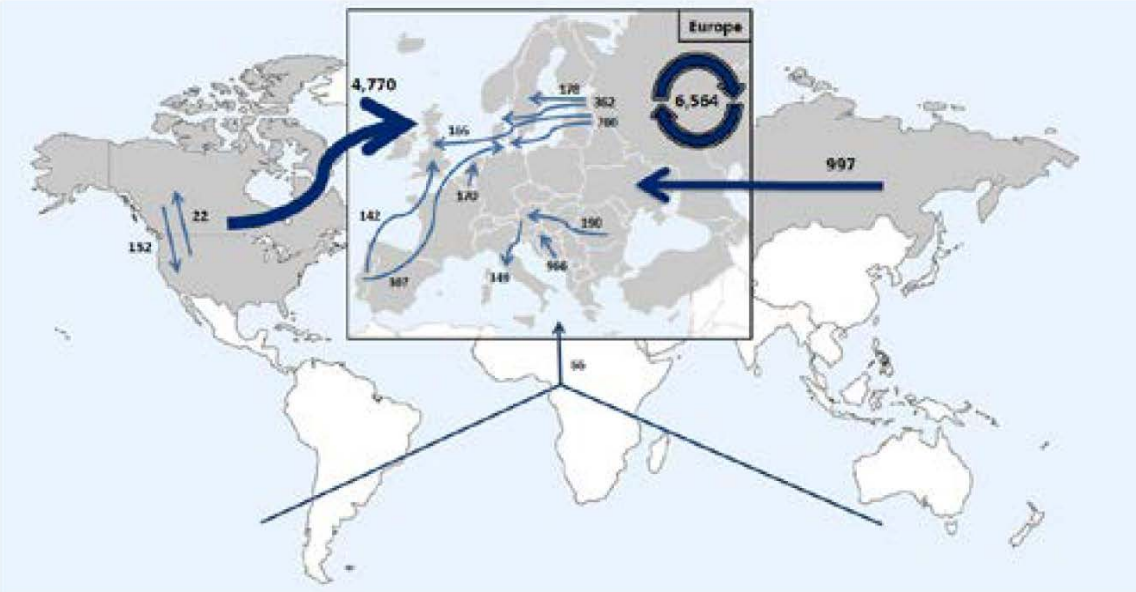
The truly dynamic development of the industrial wood pellet sector over the past decade has transcended the business-as-usual supply limitations of "local" wood-baskets areas, enabling rapid expansion of regional and international wood pellet supply chains to service markets with expanding wood energy demand, primarily in Europe.

[18] FAO UNECE FPAMR (2015) notes that under these draft EPA rules carbon neutrality of all biomass sources is not assumed automatically.

According to Hawkins Wright[19], Europe will continue to dominate the industrial wood pellet trade with total projected demand in 2015 at 11.3 million tonnes (compared to the world total of 13.7 million tonnes), rising to a peak European demand of 22.15 million tonnes in 2019 (compared to world total 27.3 million tonnes). Thereafter, demand growth is expected to plateau reflecting completion of major coal-to-wood pellet power plant conversion projects in the UK, Denmark, Netherland and Belgium.

FIGURE 9.2.1

Global main trade flows of wood pellets, 2013 (thousand tonnes)



Note: The map highlights major trade flows.

(FPAMR 2014-2015, FAO UNECE)

This current scale of European market development and the speed of supply chain expansion, especially in the forest-rich US southeast states which has emerged as a major woody biomass supply and pellet manufacturing region, has heightened public policy, supply chain and civil society stakeholder interest, focus and actions. A range of sustainability challenges has been raised, primarily by civil society groups, including the:

- Carbon benefits associated with increased use of woody biomass substitution for fossil fuels in large scale power generation,
- Impacts on forests in the US southeast of industrial wood pellet supply chains[20],
- Eco-efficiency of direct conversion of logs given high value use options,
- Level of public subsidy associated with large scale biomass for energy development relative to other

[19] Hawkins Wright, *The Outlook for Wood Pellets*, on-line publication. Trends largely support by Q 2 2015 industrial pellet market research by Pöyry

[20] The Dogwood Alliance is actively campaigning on overall impacts but has particular concerns about the use of logs for direct conversion into wood pellets – see website https://www.dogwoodalliance.org/wetland-investigation-3-16/

renewable energy options which are considered to be less carbon intensive e.g. solar, hydro, wind,
- Strong preference for Forest Stewardship Council (FSC) certification as an independent verification option.

As part of this dynamic, the Sustainable Biomass Partnership[21] (SBP) has been established by European utility companies to specifically provide an assurance framework for forest management to woody energy utilization supply chains to certify performance against EU Member State sustainability regulations. SBP's certification scheme, which is purpose built for wood pellets and chips used in industrial large-scale energy production, leverages existing forest management and chain-of-custody certification provided by the FSC, the Programme for the Endorsement of Forest Certification (PEFC) and the Sustainable Forestry Initiative (SFI). Currently, the Danish and UK regulators have recognized that SBP certification satisfies their verification requirements.

Stakeholder differences and conflicting views are certainly evident within the European Commission process now underway to develop its sustainability bioenergy policy 2020-2030 to support Europe's GHG emissions reduction target of 40 % relative to 2005, with a target of 27 % of the EU's energy to come from renewable resources, up from the 20 % RED target. This regulatory process will include the development of a sustainable biomass policy to maximize resource-efficient use, deliver robust and verifiable GHG savings, ensure fair competition between biomass use sectors, encompass sustainable land use and forest management and address indirect land-use change (ILUC) or leakage effects[22].

To conclude this context section, the development of the Dutch renewable energy sector provides an additional and current national level illustration of how these sustainability concerns play out via the design of public policy energy and subsidy programs, NGO advocacy initiatives and corporate actions.

In response to the EU RED, the 2013 Dutch National Energy Accord (SDE+) set out a subsidy scheme for co-firing solid biomass up to 25 PJ/year under strict conditions that extensive and prescriptive sustainability criteria would apply. In the absence of European Union level sustainability standards for forest management (forests remains as area of Member State competency) or woody biomass energy (although EU sustainability standards do exist for liquid biofuels) this national level process included extensive consultations between Dutch environment groups and utility companies.

The Dutch process has generated a very detailed set of sustainability requirements for biomass feedstock for co-firing and large scale heat production for any utilities accessing the SDE+ program. These requirements cover 7 feedstock categories with around 50 principles across criteria for sustainable forest management, GHG balance, carbon debt, ILUC, soil quality, compliance with legislation and chain-of-custody. To date, no Dutch utility company has moved ahead with any co-firing projects, while some supply chain actors are unsure if access to the Dutch wood pellet for energy market is feasible given these complexities[23].

[21] See SBP website http://www.sustainablebiomasspartnership.org/
[22] European Commission on-line public consultation documentation
[23] Dutch Biomass Certification Foundation workshop, Rotterdam, May 25th 2016

It is very likely that as other countries develop policy frameworks for large scale utilization these same tensions around sustainability will manifest themselves, with the potential to generate considerable inertia in the deployment of woody biomass as a significant renewable energy solution.

PART II – Challenges and Opportunities for a sustainable woody biomass future

Renewable Woody Biomass Energy Facts

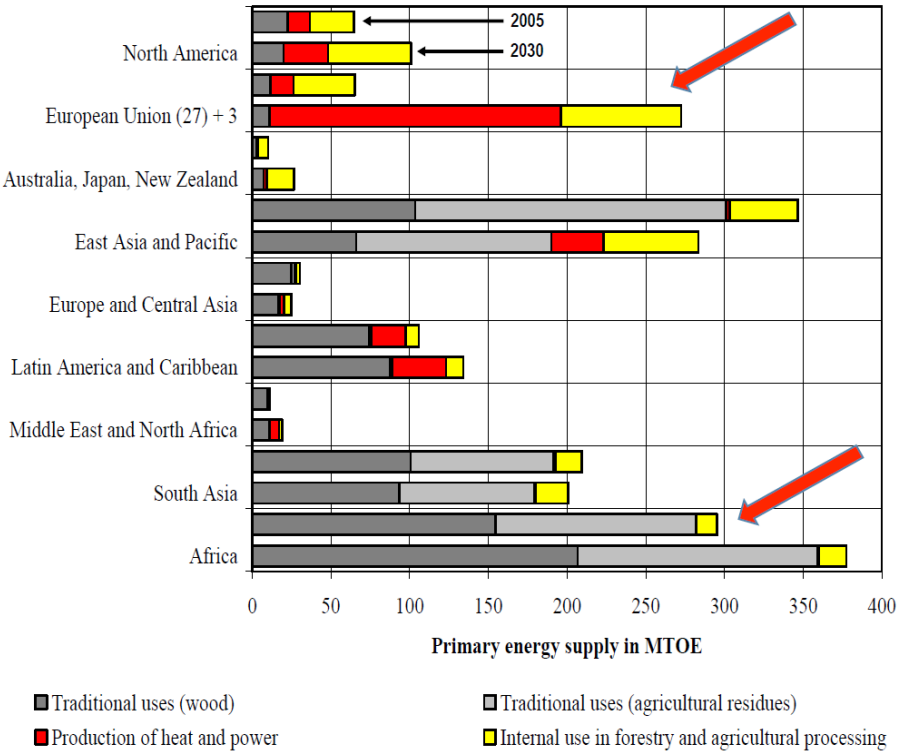
Two woody biomass for energy *facts* are self-evident:

1. *Current use* is *significant* across both traditional and industrial contexts in developing and developed countries to meet *existing* energy demand, including home heating, commercial and industrial use through to large-scale heat and power production.

2. *Future use* as a key renewable energy resource will *increase* in many geographies to meet *growing* energy demand with deployment influenced by a combination of sustainable development, climate change, low-carbon growth, renewable energy and energy security considerations – as illustrated by these World Bank projections.

Total Primary Energy Supply from primary solid biomass by region and type in 2005 and 2030

- 2.8 billion people will depend on traditional fuels in 2030
- How much wood is that? Impact on forests/trees?

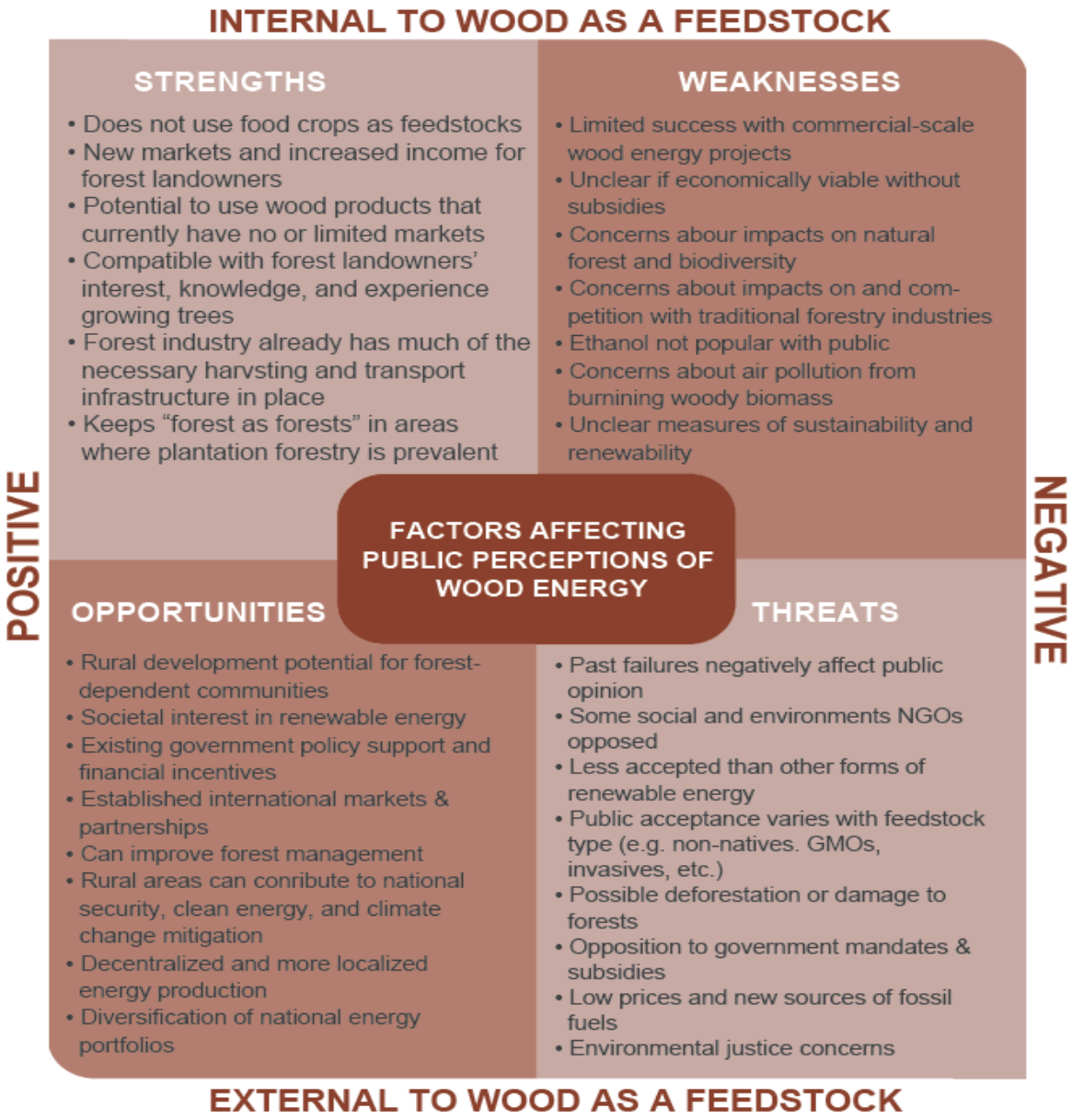


(The World Bank 2015)

Public Perception and Public Policies – introducing diverse perspectives

Public perceptions and public policies interact over time and this holds true for wood energy policy frameworks and market development. This makes public opinion research one useful way of identifying and categorizing conflict issues, or fracture lines, associated with woody biomass for energy use.

Research in the US and Europe by Hitchner[24] provides the following illustrative summary of external and internal factors affecting public perceptions relating to wood energy, both positive and negative.



[24] Sarah Hitchner et al, *Public opinion and wood energy*, condensed summary published as *Public Perceptions of Bioenergy*, Southeastern Partnership for Integrated Biomass Supply Systems (2015)

Factors on the right side of this matrix are representative of key *fracture lines* in the sustainable woody biomass for energy debate.

These public perceptions both *impact on* and are *impacted by* public policy frameworks in a circular pattern, either *preventing and delaying* wood energy deployment or *enabling and accelerating* developments.

Woody biomass for energy fracture lines

The literature surveyed[25] for the dialogue indicates that deployment of woody biomass at the levels envisaged by IEA and REN21 to meet expanding global energy demand will be impacted and influenced by many of these challenges, symptomatic of the existence of a number of fracture lines between different stakeholder groups.

These fracture lines are significant and warrant focused dialogue, discussion and, if possible, resolution. Drawing from this literature these fracture lines have been clustered below under five categories, each concluding with a series of questions that might provide a discussion focus for dialogue participants:

1. Forests and Land Use
2. GHG Neutrality and Carbon Balance
3. Resource Efficiency
4. Regulatory Frameworks
5. Technology

1. <u>Forest and Land Use Impacts</u>

The potential for direct and indirect forest and land use change, primarily driven by expanding woody biomass energy development, appears to be the paramount concern of many stakeholders.

El-Lakany[26] indicates that central to all forest based supply strategies are embedded concepts of multi-functional landscapes, integrated landscape design and resilience in the face of climate changes yet to come, and points to the need for fundamental research to better quantify socio-ecological costs, advantages and tradeoffs of bioenergy development.

WWF's Living Forest Model[27] has a vision that by 2050 100% of the world's energy will come from sustainable renewable resources. Within this, depending on how bioenergy including woody biomass is deployed, it could be either be a significant *threat* (e.g. forest conversion, increased emissions, food production displacement) or *solution* (e.g. biodiversity is conserved and zero net deforestation achieved; well-managed bioenergy production supporting energy security, rural development, emissions reduction and provides incentives for good forest stewardship).

[25] Much of this surveyed literature was suggest by the TFD Advisory Group set up to develop and guide this dialogue – some 15 stakeholders representing different sustainable woody biomass interest groups
[26] Hosny El-Lakany, *The forestry, agriculture, bioenergy nexus*, UBC branchlines (Winter 2015)
[27] WWF International, *Living Forests Report – Forests and Energy (Chapter 2)*, web publication (2011)

Some civil society groups in Europe and the US are advocating that the scale and pace of European woody biomass for energy supply chains are significantly impacting forest management practices in the US southeast, accelerating harvest levels, encouraging whole-of-tree conversions and undermining biodiversity conservation[28].

Research reports by Galik[29] and Forest2Market[30] counter these assertions - indicating that US southeast forest inventories are not decreasing or carbon storage capacity diminishing as a result of the significant growth in wood pellet production and trade to Europe. These reports contend the development of woody biomass markets in fact helps provide additional incentives to forest owners, who in this region are mainly private landowners with small holdings, to maintain forests and improve management practices. These points were reconfirmed very recently by US Forest Service (USFS) Chief Tom Tidwell in his speech at a European Commission hosted bioenergy stakeholder conference[31].

Key questions:

- Can the capacity of woody biomass for energy production systems in key supply areas service expanding demand on a sustainable basis without compromising ecosystem service delivery, contributing to forest conversion and loss of biodiversity?

- What is the appropriate role of intensively managed planted forests, agroforestry and TOF systems to meet expanding demand without contributing to further forest conversion and associated emissions?

- Can these more managed land use options be adapted to contribute to landscape restoration (e.g. the rehabilitation and recovery of degraded land) and sustainable livelihoods?

- What are the natural capital opportunity costs of production intensification and increased harvesting compared to keeping forests in-tact and ensuring ecosystem service generation?

2. <u>GHG neutrality/Carbon balance</u>

A key tension point in the current debate on sustainability of woody biomass is the claimed climate benefits of biomass production and consumption relative to fossil fuels and other renewables. This becomes particularly significant and polarizing in the context of publically funded large scale subsidy programs for woody biomass energy use.

In addition to the land use change emissions impacts commonly considered under LCAs, are the emissions when the woody biomass is consumed. Whilst some view these carbon emissions as essentially neutral if

[28] Patterson Clark and Joby Warrick, *Cutting trees to fight climate change?* Energy & Environment (2015)
[29] Christopher Galik and Robert Abt, *Sustainability guidelines and forest market response: an assessment of European Union pellet demand in the southeastern United States*, Global Change Biology Bioenergy (2015)
[30] Forest2Market, *Wood Supply Market Trends in the US South 1995-2015*, Forest2Market Inc. report (2015)
[31] USFS, *prepared remarks for European Commission Stakeholder conference – A sustainable bioenergy policy for the period after 2020*, Brussels, May 12th 2016

sourced from a sustainably manged forests[32], the relatively small emissions of methane and nitrous oxide created in the burning process are not reabsorbed into the standing and growing forests. So while woody biomass from sustainably sources are considered by some stakeholders as carbon neutral, broad based GHG neutrality claims cannot be made. A counter position is taken by some researchers[33] who query the emissions accounting systems used when significant carbon benefits are claimed, particularly relating to woody biomass, and see biomass energy as a "high" carbon renewable energy options compared to solar and wind.

LCA is a one widely accepted tool for assessing the impact of products or services resulting from short term industrial processes, including GHG emissions and is primarily used to identify input and output "hot spots" and reduction potential. It assists decision making by comparing and benchmarking the product or service in questions with alternatives or by exploring different product or service use scenarios.

IEA's Bioenergy Task Group 43[34] indicate that the LCA assessment of biomass supply chains is not straightforward when applied to long term forest production systems which are based on many natural factors like sunlight, water and nutrients. To better assess environment aspects including emissions, the Task Group recommends inclusion of a number of additional non-standard impact categories like land use and land use change, water use, carbon stocks, soils and biodiversity. With regard to GHG emissions, it points out the need to distinguish between carbon emissions resulting from biomass consumption which can be considered neutral if the forest, including its carbon stock, is sustainably managed and the carbon which is emitted when fossil fuel is combusted.

Gaudreault[35] points to the need for using LCA, complemented by site and region specific studies, as an additional tool in forest biomass harvesting assessments. These can help prevent shifting environmental problems, such as land use impacts that contribute to biodiversity loss, across the supply chain as a result of very localized land management decisions.

Miner[36] offers several research-based insights to better understand forest bioenergy and "carbon debts" in the context of US bioenergy policy, including (1) if wood producing land remains in forests, long-lived wood products and bioenergy reduce fossil fuel use and long term carbon emission impacts (2) increased demand for wood can trigger investments that increase forest area and forest productivity and reduce impacts associated with increased harvesting (3) the carbon debt concept emphasises short term emissions, although it is long term cumulative emissions that are correlated with peak global temperature, and these cumulative emissions are reduced by substituting forest bioenergy for fossils fuels.

[32] WBCSD NCASI, *Recommendations on Biomass Carbon Neutrality*, WBCSD website (2015)
[33] As an illustration see video clip featuring William Moomaw, Tufts University and IPCC author https://eubioenergy.com/2015/11/20/bioenergy-is-not-carbon-neutral-says-ipcc-author-william-moomaw/ posted on EU Bioenergy website hosted by Birdlife Europe, European Environmental Bureau and Transport & Environment (2015)
[34] IEA Bioenergy Task 43, *Assessing the environmental performance of biomass supply chains*, Report 2015:TR01 (2015)
[35] Caroline Gaudreault et al, *Addressing Biodiversity Impacts of Land Use in Life Cycle Assessment of Forest Biomass Harvesting,* Wiley On-Line Library (2016)
[36] Reid Miner et al, *Forest Carbon Accounting Considerations in US Bioenergy Policy*, Journal of Forestry (2014)

IEA's Bioenergy Task Group[37] has also considered the timing aspects of forest-based bioenergy emissions, noting the importance of understanding the full climate effects of bioenergy from existing forests (e.g. climate forcing factors). Rather than focusing on more immediate aspects, such as the timing of differences between emissions and sequestration, the Task Group advises that it is more relevant to focus on assessing the contribution that bioenergy from existing forests may make to the establishment of renewable energy systems that will provide GHG-friendly energy supply into the future.

Key questions:

- Is there scope for convergence between stakeholder groups that have taken very different positions on the carbon neutrality of woody biomass for energy?
- Can a more harmonized approach around forest carbon accounting methodology support more aligned stakeholder viewpoints on GHG benefits as well as better informing public policy frameworks and investments in sustainable woody biomass for energy developments?
- Can different perspectives on the time horizons for accounting for woody biomass for energy emissions be narrowed or reconciled? Is Life Cycle Assessment (LCA) a useful or adaptable tool in assessing GHG balance of woody biomass energy? In particular, can the accounting scope for woody biomass emissions across both production and consumption cycles be agreed?

3. Resource eco-efficiency and cascading use

A civil society coalition of 10 organizations coordinated by BirdLife Europe submitted, as one of its key policy recommendations on the European Union's post 2020 climate and energy policy, that to ensure the efficient and optimal use of biomass resources, the cascading principle should apply so biomass is used to make materials and products first and then recover the energy content[38]. Similar recommendations have been made by civil society groups – including WWF[39] – during the current public consultation process for EU level sustainable biomass standards.

A coalition of six European trade associations coordinated by the European Biomass Association[40] (AEBIOM) has a counter position outlined in a joint statement on the cascade use of wood, making the case that it was not feasible to legislate for higher use and that sustainable wood mobilization to meet expanding demand was a more feasible and impactful approach.

IEA Bioenergy Task Group 40[41] has recently released a working paper on the cascading of woody biomass. Its findings note there is considerable uncertainty about what cascading actually entails, implementation would be complex (e.g. allocating different material type between alternative use assortments) and it was unclear how it could support the policy goal of expanding renewable energy and the role of woody

[37] IEA Bioenergy, *On the Timing of Greenhouse Gas Mitigation Benefits of Forest-Based Bioenergy*, IEA ExCo (2013)
[38] NGO coalition recommendations, *Pitfalls and Potentials: The role of bioenergy in the EU climate and energy policy post 2020,* Birdlife Europe website (2014)
[39] WWF, *A sustainable bioenergy policy for the period after 2020*, EU on-line public submission (2016)
[40] AEBIOM et al, *Joint statement on cascade use of wood*, AEBIOM website (2013)
[41] IEA Bioenergy TASK 40, *Cascading of woody biomass: definitions, policies and effects on international trade*, Working Paper (2016)

biomass within this. It advises that policy makers should avoid artificial constraints to mobilizing biomass resources given only 65 % of Europe's annual growth increment is currently harvested. Further, a focus on resource mobilizing is a more productive way of meeting EU aspirations for development of a bio-based economy.

A supply chain actor perspective suggests that the market realities of low value international trade commodities like wood pellets relative to higher value products like wooden building materials, paper and packaging, ensures that the primary feedstocks for wood pellet will predominately remain lower value pulp logs, forest slash, cuttings and waste and wood residues from sawmilling. For some stakeholder groups, however, logs deemed to be of low economic value may be considered of high conservation and ecological value when from natural forest systems.

Key questions:

- Is scaled-up use of woody biomass for energy the optimal use of valuable natural resources in situations when alternative longer life and reuse options are available e.g. wood based products; pulp, paper and paper-based packaging?

- Why is woody energy considered the lowest value option under the cascading principle given the priorities now placed on sustainable development, low carbon emissions and energy security including increasing renewable energy use?

4. Regulatory frameworks and governance capacity building, including the role of independent verification

Thiffault[42] warns of the challenges of developing transboundary governance mechanisms like the European Union's RED without a deeper understanding of sustainable forest management frameworks and practices in key supply regions. The lack of a uniform definition for sustainable forest management and significant national differences in land definitions, delineation and reporting make the implementation of supra-national sustainability schemes complex, requiring an open and multi-stakeholder approaches to reduce or eliminate pitfalls.

Lamers[43] also reviews and notes the challenges and opportunities associated with developing stainability standards at a national level for forest biomass when there is a strong regional and international trade dimension, due to the complexities associated with different national approaches and forest circumstances.

The role of existing voluntary forest certification systems to verify woody biomass energy products has also been the subject of a number of reviews. Sikkema[44] found that some (e.g. legality, sustainable

[42] Evelyne Thiffault et al, *Sustainability of forest bioenergy feedstock supply chains: Local, national and international policy perspectives*, Biofuels, Bioprod. Bioref. (2015)
[43] Patrick Lamers at al, *Challenges and opportunities of sustainability standards for forest biomass designated for International trade*, Chapter in Mobilization of forest bioenergy in the boreal and temperate biomes (2016)
[44] Richard Sikkema et al, *Legal Harvesting, Sustainable Sourcing and Cascaded Use for Bioenergy: Their Coverage through Existing Certification Frameworks for Sustainable Forest Management*, Forests (2014)

harvest rates, no deforestation) but not all (e.g. GHG harvest emissions, forest carbon stocks) existing EU requirements could be verified by FSC and PEFC forest management certification, while existing risk based approaches under FSC and PEFC provided lower levels of assurance.

The report made a number of suggestions to strengthen the verification role of existing voluntary forest certification schemes including mass balance requirements, tracing and tracking, mutual recognition between systems and efforts to expand certification uptake in some regions (US southeast) through group certification. Note that the need for carbon accounting outlined is this report, has been acted on by PEFC which is developing an Emission Data Transfer Standard. Note also that during the current transition period for the Dutch SDE+ sustainability requirements, both FSC and PEFC endorsed standards are recognized as verifiers for sustainable forest management and sustainable management of residues.

Stupak[45] surveyed stakeholders on views and experience for systems needed to govern the sustainability of bioenergy. The survey revealed significant support along the supply chain for legislation which uses market-based certification systems to demonstrate compliance. The development of meta-standards to bridge divergent views emerged as a promising approach and the need to adapt some standards for specific bioenergy needs was noted e.g. to deal with issues like Indirect Land Use Change (ILUC). More research was recommended to better understand differences between existing schemes including costs, inclusiveness, quality of substantive and procedural rules and subsequent on-the-ground effectiveness.

In its submission to the European Commission on post 2020 sustainable bioenergy policy, the SBP recommended an efficient and pragmatic approach to the sustainability verification of woody biomass used in large scale heat and electricity production in Europe. This should include development of a high-level clear and simple set of criteria integrating EU and Member State requirements, which certification schemes and assurance frameworks, such as SBP, can then incorporate within standards[46].

The CIFOR[47] review of wood energy priorities in Sub-Sahara Africa currently underway, is looking at socio-economic and environmental supply and demand impacts as well as public policy options that could ensure an enabling environment for sustainable wood energy use and livelihoods. Bailis[48], in identifying potential areas of wood fuel-driven degradation or deforestation in South Asia and East Africa, is seeking to inform the ongoing development of REDD-based approaches to climate mitigation and recommend improving interventions and research around charcoal as a key renewable energy option.

Owen[49] calls for an urgent need to recast with national policy makers the current and future role of biomass energy in Sub-Sahara Africa to generate employment, support urban-rural revenue flow, strengthen energy security and drive green economic development. The World Bank[50] also recognizes

[45] Inge Stupak et al, *A global survey of stakeholder views and experiences for systems needed to effectively and efficiently govern sustainability of bioenergy*, WIREs Energy Environ (2016)
[46] SBP submission to European Commission post 2020 public consultation (2016)
[47] See earlier
[48] See earlier
[49] See earlier
[50] Elizabeth Cushion et al, *Bioenergy Development: Issues and Impacts for Poverty and Natural Resource Management*, The World Bank Agriculture and Rural Development (2013)

the significant current role and a much more promising future for woody biomass based energy development within many developing countries.

Key questions:

- How will public policies currently emerging in Europe and the US constrain or enable sustainable woody biomass energy developments internationally? How will growing interest in tradable woody biomass products from Japan and Korea impact the debate? Will these Developed Country processes seek to include or exclude Developing Country supply opportunities?

- Should the Precautionary Principle be more central in public policy considerations when designing subsidy and regulatory frameworks that will generate substantial increased use of woody biomass?

- In public policy design, how should supply or demand "caps" be best deployed? Are caps flexibility enough to respond to market dynamics and business investment cycles?

- Shouldn't public subsidy program be better balanced to incentivize deployment of a broader mix of renewable options (e.g. solar, tidal, hydro) and energy efficiency outcomes, rather than mainly prioritize woody biomass developments?

- Can independent forest certification frameworks provide, on a cost effective basis, sufficient assurance on forest management practices in key source areas (e.g. forest carbon stocks, no conversion or controversial stocks) and chain of custody control, and support GHG accounting through the value chain? Can other measurement, reporting and verification (MRV) options also provide the necessary level of assurance, such as the MRV systems being developed for REDD+?

- Given current use and future potential, should woody biomass energy be a higher priority for national and international development assistance finance and strategies in particular to build local wood energy governance, management and project implementation capacity in Developing Countries?

5. Technology

WBCSD's Low Carbon Technology Partnerships initiative (LCTPi)[51] prepared for the UNFCCC Paris conference included key proposals to "scale-up" deployment of forest-based climate solutions with significant bioenergy and technological dimensions. These included expanding sustainable forest management; increasing the production of forest products, including bioenergy, as the basis for the bio-economy with 50 % of all materials made from forest-based renewable resources by 2050, as well as an increased share of forest-based biomass residues in the energy mix; and the deployment of resource use and energy efficiency breakthrough technologies throughout operations and supply chains[52].

[51] WBCSD*, Low Carbon Technology Partnerships initiative: Forests and Forest Products as carbon Sinks,* WBCSD website (2015); Fibria, *Future Forest Industry – Results of an on-line survey*, on-line publication (2016)

[52] As indicated earlier, forest biomass biofuels are outside the scope of this particular dialogue. Note that WBCSD's LCTPi includes a range of initiatives and targets associated with expanding production of biomass source biofuels. As the diversity of these fuels increases over time, certain desirable attributes of wood biomass for biofuel production will be sought. LCTPi anticipates this will lead to the selected certain tree species and deployment of intensively managed tree fuel crops.

Owen[53] articulates the need in many developing countries for the modernization of traditional biomass for energy production, processing, distribution and consumption processes, capitalizing on the significant and currently available technological advances in stoves, kilns, processing systems and means of salvaging waste energy sources for productive use. Bailis calculates that the successful deployment of 100 million improved stoves in wood fuel dependent countries could reduce current emissions by 11-17 %, generating avoided GHG emissions worth over US $ 1 billion a year[54].

Key questions:

- How to adapt intensive forest and tree management practices to manage carbon sequestration and stocks while meeting expanding demand from established timber, pulp & paper markets as well as additional wood energy to achieve the carbon and other societal benefits associated with fossil fuel substitution?

- What is the role of technologies in scaling up the deployment of sustainable woody biomass energy throughout the supply chain covering production, conversion and consumption phases?

- Is the future development of bio-based technologies, contributing to a global bio-economy, a more useful framework within which consider challenges and opportunities associated with the sustainable production and consumption of renewable woody biomass energy solutions?

Creating a framework for future dialogue:

In discussing the fracture lines outlined above, participants might also want to also reflect on the following points relating to future multi-stakeholder initiatives that could emerge from the Montpellier scoping dialogue:

1. *Will* dialogue on these (and other) facture lines contribute to a more *compelling vision* for a sustainable woody biomass for energy future - across multiple geographic and end-use contexts - that is *collectively shared* across stakeholder groups?

2. *Can* stakeholders agree on any *guiding principles or standards* to "safeguard" the deployment of sustainable wood energy supply outcomes that are environmentally sustainable, economically viable and socially equitable in response to growing energy demand and the need to reduce GHG emissions?

3. *How* can sufficient *consensus* be built between stakeholder groups to *collectively support* the design of current and future public policy frameworks to accelerating deployment of woody biomass energy solutions that help achieve sustainable, low-carbon and bio-economy based development?

4. *What* initial steps can be taken to start *building* a sustainable woody biomass for energy *consensus* within the SDG's 2015-2030 process now under way and ahead of the 2020-2050 timeframe of the UNFCCC Paris Agreement?

[53] Bailis - see earlier

[54] Bailis - see earlier. GHG value illustration calculated using a price of US$ 11 per tonne of carbon dioxide

PART III – Some suggested pre-reading resources:

In preparation for the dialogue, participants are invited to review some of these on-line resources on sustainable woody biomass for energy.

Overviews – development, energy and sectors:

- FAO UNECE Forest Products Annual Market Review 2014-2015 – chapter 9 on wood energy
- World Bank Bioenergy Development – Issues and impacts for poverty and natural resource management
- REN21 Renewables 2016 Global Status Report

Research articles:

- Robert Bailis et al, The carbon footprint of traditional woodfuels, Nature Climate Change (2015)
- Felix Creutzig et al, Bioenergy and climate change mitigation: an assessment, Global Change Biology Bioenergy (2015)
- IEA Bioenergy, On the Timing of Greenhouse Gas Mitigation Benefits of Forest-Based Bioenergy, IEA ExCo (2013)
- Richard Sikkema et al, Legal harvesting, Sustainable Sourcing and Cascaded Use of Wood for Bioenergy: Their coverage through Existing Certification Frameworks for Sustainable Forest Management, Forests (2014)
- Inge Stupak et al, A global survey of stakeholder views and experiences for systems needed to effectively and efficiently govern sustainability of bioenergy, John Wiley & Sons (2015)
- Sarah Hitchner et al, Public Perceptions of Bioenergy, IBSS (2015)

Civil Society Groups:

- WWF International – Living Forest Report: Chapter 2 Forests and Energy
- Pitfalls and Potentials: The role of bioenergy in the EU climate and energy policy posts 2020

Industry Associations:

- USIPA wood pellet information and resources
- AEBIOM European Bioenergy Outlook – 2015 statistical report

PART IV – List of woody biomass and stakeholder acronyms used in the background paper

AEBIOM	European Biomass Association
CIFOR	Center for International Forestry Research
EJ	Exajoules
EPA	US Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization of the UN
FSC	Forest Stewardship Council
GHG	Greenhouse Gas
IEA	International Energy Agency
ILUC	In Direct Land Use Change
IPCC	Intergovernmental Panel on Climate Change
J	Joule
LCA	Life Cycle Assessment
LCTPi	Low Carbon Technology Partnership initiative
LULUCF	Land Use, Land Use Change & Forestry
NGO	Non-governmental Organizations
NRDC	Natural Resource Defence Council
OECD	Organization for Economic Co-operation and Development
PEFC	Programme for the Endorsement of Forest Certification
PJ	Petajoules
PROFOR	Program for Forests hosted by The World Bank
RED	European Union Renewable Energy Directive
REDD+	Reducing Emissions from Deforestation and Forest Degradation
REN21	Renewable Energy Policy Network for the 21st Century
SBP	Sustainable Biomass Partnership
SDE+	Dutch National Energy Accord
SDG	Sustainable Development Goals
SFI	Sustainable Forestry Initiative
SSA	Sub-Saharan Africa
TFD	The Forests Dialogue
TOF	Trees Outside Forests
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
USFS	United States Forest Service
WBCSD	World Business Council for Sustainable Development
WWF	WWF International