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BIOMASS UTILIZATION CHALLENGES: POST RIO+20 AND WAY FORWARD

(Background Paper for Roundtable 2 of the Provisional Programme)

Final Draft

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Biomass Utilization Challenges: Post Rio +20 and way forward

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Introduction

"Biomass" is the term used for biological material, signifying organic carbon chains bonded with hydrogen, oxygen, nitrogen and other elements, sourced from living or recently living organisms. Plants or plant-derived materials are usually referred to as biomass but examples of biomass material include energy crops, agricultural residues and waste. Known as a renewable energy source, biomass is used directly or indirectly as biofuel to produce energy through thermal, chemical or biochemical conversion. Biomass is considered as one of the alternative energy sources for sustainable development.

The United Nations Conference on Sustainable Development was held in June 2012, exactly 20 years after the Rio Earth summit, earning it the abbreviation of Rio+20. The theme for Rio+20 was "green economy in the context of sustainable development and poverty eradication and the institutional framework for sustainable development with the objective of renewed political commitment for sustainable development". The conference addressed the role of biomass in sustainable development through the promotion of increased use of renewable energy sources and other low-emission technologies. The more efficient use of energy, greater reliance on advanced energy technologies, including cleaner fossil fuel technologies, and the sustainable use of traditional energy resources were also stressed upon[i].

According to the World Economic Forum, the sectors involved in biomass economy are chemical, oil, biotech forestry, agribusiness, fragrances producers, textiles, building trade and carbon trade with these industries' total net worth over 17 trillion dollars[ii]. Currently, the

fast emerging biomass trade are woodchips, sawdust and pallets could be shipping at least 19 million tons of biomass by 2015. Figure 1 shows the global fuel mix over the decade. It is forecasted that the use of biomass fuel will remain constant until 2040. In 2040, only 7% of the total energy used in Asia Pacific will be generated from biomass. This forecast was made after the meeting of Rio 20+, however the future outlook of biomass fuel is not very bright compared to nuclear and other renewable energy sources. However, it is estimated the biomass economy will be worth about 300 billion dollars by 2020 but the real figure may be as high as half a trillion dollars.[iii]

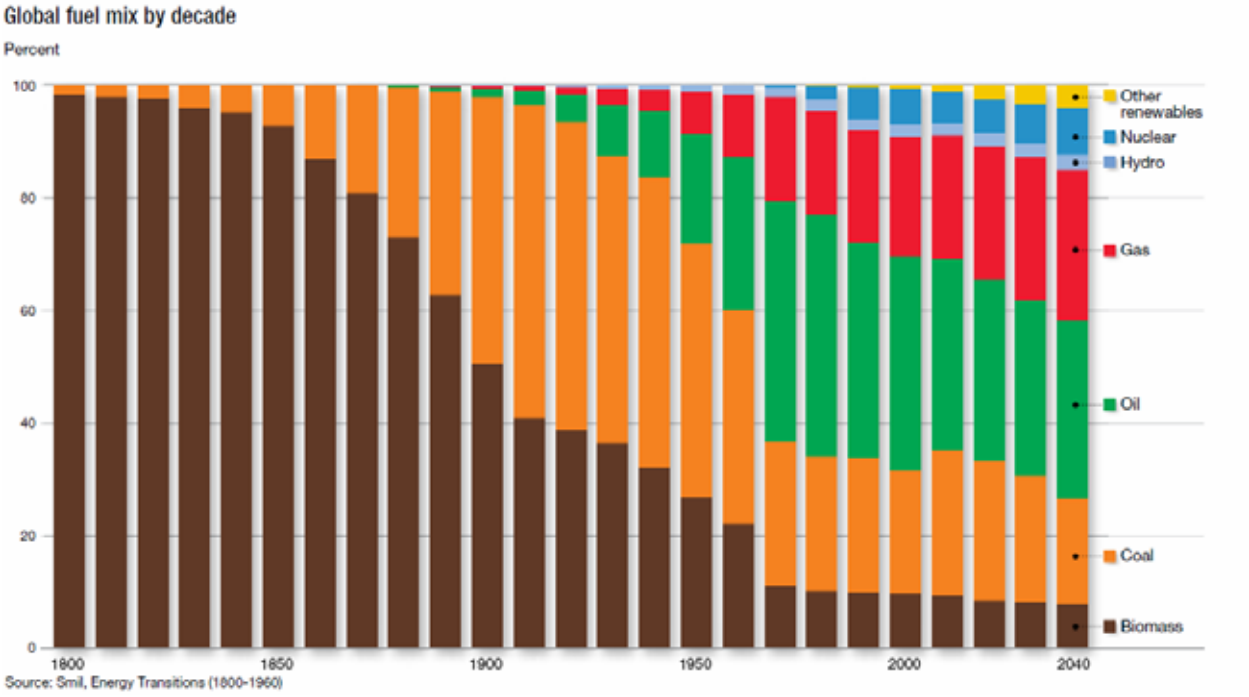

Figure 1: Global Fuel Mix by Decade[iv]

Table 1: Asia Pacific Energy Demand[v]

Energy Demand (Quadrillion BTUs unless otherwise indicated)						Average Annual Change			% Change			Share of Total		
Regions	1990	2000	2010	2025	2040	2010-2025	2025-2040	2010-2040	2010-2025	2025-2040	2010-2040	2010	2025	2040
ASIA PACIFIC														
Primary	90	125	201	289	316	2.5%	0.6%	1.5%	44%	10%	58%	100%	100%	100%
Oil	28	43	56	77	88	2.2%	0.9%	1.5%	39%	14%	58%	28%	27%	28%
Gas	6	12	22	42	57	4.5%	2.1%	3.3%	94%	36%	164%	11%	14%	18%
Coal	32	42	89	118	102	1.9%	-0.9%	0.5%	33%	-13%	15%	44%	41%	32%
Nuclear	3	5	6	14	27	5.9%	4.3%	5.1%	136%	89%	345%	3%	5%	9%
Biomass/Waste	19	21	23	25	23	0.7%	-0.5%	0.1%	11%	-7%	3%	11%	9%	7%
Hydro	1	2	4	6	8	3.5%	1.5%	2.5%	69%	25%	110%	2%	2%	2%
Other Renewables	0	1	2	6	11	7.2%	3.8%	5.5%	184%	74%	394%	1%	2%	3%
End-Use Demand (including electricity)														
Total End-Use	76	98	151	213	228	2.3%	0.5%	1.4%	41%	7%	52%	100%	100%	100%
Residential/Commercial	29	33	42	54	58	1.7%	0.5%	1.1%	30%	7%	39%	28%	26%	26%
Transportation	11	18	26	42	53	3.1%	1.6%	2.4%	59%	27%	102%	17%	20%	23%
Industrial	36	47	82	117	117	2.3%	0.0%	1.2%	41%	0%	42%	55%	55%	51%
Memo: Electricity Demand	7	12	24	43	54	3.9%	1.6%	2.7%	77%	27%	125%	16%	20%	24%
Electricity Generation Fuel	23	41	77	122	146	3.2%	1.2%	2.2%	60%	19%	90%	38%	42%	46%
CO_2 Emissions, Billion Tons	5.3	7.4	13.2	18.2	18.1	2.2%	-0.1%	1.1%	38%	-1%	37%			

The post Rio+20 stressed on increased use of renewable energy sources[vi]; it is evident that the use of biomass usage will increase. One of the leaders in this endeavour is the European Union where plans to promote the replacement of fossil fuels with biomass under a bio-economy policy is evident[vii]. Some may argue that biomass derived energy may release as much CO_2 as fossil fuels but the biomass burning does not release "new carbon" into the atmosphere while the CO_2 released from fossil fuels are from carbon that were fixed millions of years ago in the hydrocarbon of fossil fuels. While every time a new plant grows, carbon dioxide is actually removed from the atmosphere, thus, biomass would be able to reduce the CO_2 that is released into the air as the net emission of carbon dioxide will be zero as long as plants continue to be replenished for biomass energy purposes[viii]. However, there have been negative feedbacks as soon as the plans were announced. It is feared that this plan can lead to land grabs, the destruction of rainforests, and severe food shortages may be caused when land is used to grow fuel instead of food[ix]. Another point to note would be that these problems can be reduced if the biomass used would only utilize non-food and

non-forest based biomass materials that already exist such as waste, landfill gasses, biogas, and others[5].

In Rio+20, a commitment was made for generation of sustainable energy and making it available for the masses. This was targeted towards eradicating poverty thereby leading to sustainable development and global prosperity, while maintaining the healthy functioning of the Earth's ecosystems. "The Global Bioenergy Partnership" is another stakeholder and was present at the Rio+20 conferences. Its main concern was food security. The Global Bioenergy Partnership aimed at promoting a smooth transition from unsustainable and traditional way of generating energy to a more sustainable means of producing energy from biomass and other modern bioenergy sources. The prerequisite for sustainable development would be to provide a clean and affordable energy to small and local communities through biomass utilization. The generation of biofuel and biogas from agricultural wastes should be encouraged as opposed to the traditional practice of energy generation through the combustion of wood or other such carbon sources. Examples of biomass projects include power plants utilizing sugar cane bagasse and wood waste, bio gasification plants from waste, energy generated from landfill gas, bioethanol production from algae and many more[x].

The post Rio+20's goal towards biomass utilization would promote incentives in favour of energy efficiency, and the diversification of the energy mix and should also include promotion of research and development in all countries, including developing countries. Another step would be the removal of government subsidies for fossil fuels in one hand, and on the other to increase the incentives for renewable energy generation including energy generation from biomass[xi]. Studies have shown that biomass utilization for energy is very sustainable and environmental friendly provided it is done at a small scale for local communities. Large scale utilization of biomass for energy generation may lead to food security problems and also cause climate change.

Biomass as a source of renewable energy has its benefits and drawbacks. However, for most developing countries biomass would be one of the most cost effective choices as compared to other sources of renewable energy. Other renewable energy sources are community-level solar, wind, hydro and tidal energy, however they would require huge installation cost.

In the context of bio-economies proposed by EU during the Rio 20+ meeting, by replacing fossil fuel with biomass will provide a solution for climate change. People have misunderstood that biomass is low carbon emission activity; the fact is biomass produced more carbon than most fossil fuels during burning process (Fig 2). However, the carbon emitted when plants are burnt is equal to that absorbed during growing, it seems self-evident that biomass is a zero carbon fuel.[xii] The concept leads to the proposal of replacing fossil fuel with biomass.

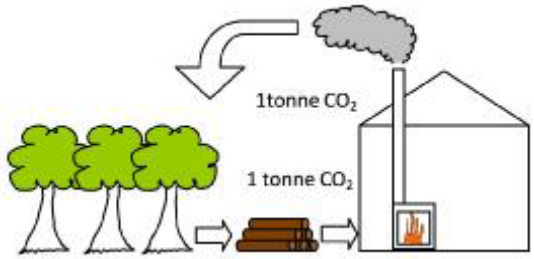

Figure 2: Burning biomass as carbon neutral

Many NGOs do not agree with the proposal of replacement of fossil fuel with biomass, as this will increase the demand for biomass and will in turn have severe impact on forests and food production. Some other criticisms of the use of biomass are concerning issues of pollution such as NOx and carcinogenic particulates emission, sustainability of timber resource, and soil carbon balance.

Many raised the issue of tree farming for fuel purpose is not practical. They however have overlooked the opportunities of utilising the left over biomass waste as a means of replacing fossil fuel. Malaysian case study of utilising agriculture biomass generated from palm oil

production has proved to be quite beneficial. Oil palm production generates large amount of empty fruit bunch (EFB) which is considered as wastes from the operation and may be utilised for generation of energy. Therefore the argument that replacing of fossil fuel with biomass will cause negative impact on forest is not completely true. In the Rio 20+ conference EU proposed sequential elimination of fossil fuels by processing of biomass-based feedstock primarily sourced from crops, forests and the sea through biotechnology and, nanotechnology and synthetics biology for generation of energy. The concern of some NGOs and the general public is that this will lead to consumption of food products like soya, groundnut, etc., which are part of the staple diet in some regions. However, if strictly agricultural waste products/ residue are used as biomass source for generation of energy then this problem can be effectively solved.

Another concern of biomass fuel is the transport of biomass from their source to the power plants, as most biomass are bulky and during transport more fuel is used which release higher amount of carbon in the process. In the writer's point of view, the biomass transport within a certain region, for example of Malaysia biomass project, the EFB generated is used back in the operating facilities to generate heat for the boiler. This has directly saved the cost of transportation.

Biomass Case Study in Malaysia: the success story

21st November 2012, a new National Biomass Strategy 2020: New wealth creation for Malaysia's palm oil industry was launched by Malaysian Prime Minister Datuk Seri Najib Razak[xiii]. Malaysia currently generates about 11 per cent of GNI from agricultural sector. This process had generated significant amount of biomass, and palm oil sector is identified to generate the largest amount of biomass, estimated at 80 million dry tonnes in 2010. This is expected to increase to about 100 million dry tonnes by 2020, primarily driven by increase in yield.[xiv] Government has launched the 1Malaysia Biomass Alternative Strategy (1MBAS) Initiative in conjunction with the new biomass strategy in March 2012 with the aim of

generating new income and create more employment opportunities in the sector.[xv] It is said that the positive impact of biomass-powered renewable energy will mitigate climate change, as its greenhouse gas (GHG) emissions is minimal, compared to conventional fossil fuel energy.

Two example of oil palm biomass energy plants under CDM project as listed below (Tables 2, 3 & 4):

- Project 0501: Bentong Biomass Energy Plant in Malaysia (Credit period: 01 Jan 08 - 31 Dec 14)
- Project 0502: ENCO Biomass Energy Plant in Malaysia (Credit period: 15 Sep 06 - 14 Sep 13)

Table 2: Baseline and CDM Project Scenarios of Bentong Biomass Energy Plant[xvi]

Characteristics	**Baseline Scenario**	**Project Scenario**
Operating Boilers	Three units of 16 T/h, 12Barg, Two units of 12 T/h, at 10 Barg, 180ºC	Two units of 32 T/h, 25 Barg, 226ºC
Fuel Input	Fuel Oil	Biomass (EFB)
Electricity Input	Electricity grid system	Steam turbine and generator (1.2 MW for own use), electricity grid system

Table 3: Baseline and CDM Project Scenarios of ENCO Biomass Energy Plant in Malaysia[xvii]

Characteristics	**Baseline Scenario**	**Project Scenario**
Operating Boilers	Two units of 10.5 T/h, at 16 Barg, 200ºC	Two units of 10.5 T/h, 16 Barg, 200ºC
Fuel Input	Mesocarp Fibres and wood waste	Biomass (EFB)
Electricity Input	Electricity grid system	Electricity grid system

Table 4: Estimated amount of emission reductions over the chosen crediting period

	Bentong Biomass Energy Plant	**ENCO Biomass Energy Plant in Malaysia**
Total estimated reductions (tonnes of CO_2 e)	2,666,537	492,210
Total number of crediting years	7 Years	7 Years
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	380,934	70,316

Economic Benefit to Malaysia

Biomass energy plants support local industry and businesses and will also encourage new investment in rural communities, in addition to create new job opportunities directly and indirectly for the local people[xviii]. Malaysia has identified biofuel production from biomass as an attractive business option. The conversion of lignocellulose biomass into sugars and the development of a bio-based chemical industry have the potential to create RM 7–9 billion (US 2.2 - 2.9 billion) in GNI impact and more than 11,000 new jobs. In addition, the mobilisation of an additional 20 million tonnes of biomass has the potential to generate significant benefits, including 27,000 additional jobs[xix].

Conclusion

After the meeting of Rio+ 20, many have felt disappointed with the outcome. Most environmental activist and NGOs have labelled the conference as one which produced little output with no commitment towards preserving the sustainability of this world. However, the conference was not a failure as an agreement was reached to preserve the climate, the biodiversity of the world and its oceans. There is a need of more commitments from the stakeholders during and after the United Nations Conference on Sustainable Development (Rio+20). Dedicated commitment should come from world leaders in order to find a balance between economic, environmental and social sustainability.

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