Chapter 1

Introduction

Sustainability Assessment of Biomass Utilisation in East Asia Working Group

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1. INTRODUCTION

1.1. Background

It is generally acknowledged that biomass energy can make a significant contribution to environmental improvement, energy supply diversity from fossil fuels and socio-economic development goals, both in the developed and developing world, owing to the following reasons. Firstly, biomass energy development offers the opportunity for enhanced energy security and access by reducing the dependence upon fossil fuels. Secondly, biomass energy has the potential to contribute to environmental benefits including greenhouse gas (GHG) emissions reduction. Thirdly, biomass energy development can create employment that will positively affect agricultural and rural incomes, poverty reduction and economic growth.

On the other hand, there is a rising concern vis-à-vis life cycle GHG reduction effects of biomass energy, food versus fuel issues and environmental disruption caused by the expansion of biomass resources production and use as energy. In view of these, there is also widespread recognition that biomass energy must be produced and used in a sustainable way, considering all the positive and negative effects from environmental, economic and social pillars of sustainability.

1.2. Review of Initiatives Related to Sustainability of Biomass Energy

There are various initiatives working to develop sustainability criteria and indicators

for biomass energy and their feedstocks. These initiatives include regulatory frameworks and voluntary standards. Prominent features of the major initiatives are summarised as follows.

In the Netherlands, sustainability criteria based upon principles and indicators are developed in the "Testing framework for sustainable biomass" (The project group "Sustainable production of biomass", 2007) to inform national policy-making. The framework addresses the sustainability of biomass production and processing for electricity, heat, transport fuel and raw material in chemistry and it covers both domestically-produced and imported biomass. The framework identifies six relevant themes: (1) GHG emissions; (2) competition with food and other applications; (3) biodiversity; (4) environment; (5) prosperity; and (6) social well-being. On these six themes, nine basic principles for biomass sustainability are formulated, including criteria, indicators with minimal requirements and reporting obligations.

In order to meet growing public and policy demand for sustainable production of biofuels and biomass, the German Federal Government has approved a national ordinance upon requirements regarding the sustainable production of biomass to be applied as biofuel in 2007. With this "Biomass Sustainability Ordinance – BioNach V" (German Federal Government, 2007), a series of minimum environmental sustainability requirements for the production of biofuels are defined. The ordinance addresses the following environmental dimensions: (1) sustainable land management; (2) protection of natural habitats; and (3) potential for GHG reduction.

The UK's Renewable Transport Fuel Obligation (RTFO) (UK DfT, 2008) was

introduced in 2008 in order to reduce CO_2 emissions from road transport by promoting the supply of renewable fuels. It imposes a legal obligation upon fossil fuel suppliers for road transport to produce Renewable Transport Fuel Certificates (RTFCs), which ensures that a certain amount of biofuel is supplied. In order to receive RTFCs, RTFO requires suppliers of fossil road transport fuel to provide reports on both the net GHG savings and the sustainability of the biofuels they supply. The sustainability reporting scheme, which focuses upon biofuel feedstock production, makes use of existing voluntary agri-environment and social accountability schemes, which have been benchmarked against the RTFO Biofuel Sustainability Meta-Standard. The Meta-Standard comprises seven principles: (1) carbon conservation – biomass production will not destroy or damage large above or below ground carbon stocks; (2) biodiversity conservation – biomass production will not lead to the destruction and damage of high biodiversity areas; (3) soil conservation – biomass production does not lead to soil degradation; (4) sustainable water use – biomass production does not lead to the contamination or depletion of water sources; (5) air quality – biomass production does not lead to air pollution; (6) workers' rights – biomass production does not adversely affect workers' rights and working relationships; and (7) land rights – biomass production does not adversely affect existing land rights and community relations. In addition to these principles, the RTFO Meta-Standard comprises a number of criteria and indicators to assess the extent to which feedstock produced in accordance with each qualifying scheme can be considered sustainable. Some of the criteria are compulsory, while others are simply recommended as best practices. Furthermore, the wider environmental and

social principles that are not within the control of the supply chain, including indirect land use change (LUC) and the competition with food prices, will also be monitored and reported.

In 2009, the Council of the European Union (EU) adopted a common set of sustainability criteria through Renewable Energy Directive (European Union, 2009) to achieve significant GHG savings and to prevent negative effects upon biodiversity by the use of biomass energy. The aim of this legislative act is to achieve a 20% share of energy from renewable sources in the EU's final consumption of energy and a 10% share of energy from renewable sources in each member state's transport energy consumption by 2020. According to the Directive, the sustainability criteria relate mainly to the following environmental aspects/issues: (1) biodiversity; (2) the protection of rare, threatened or endangered species and ecosystems; and (3) GHG emission saving. Regarding the socio-economic aspects of sustainability, the Directive required the European Commission to report every two years on the impact of EU biofuels policy on food prices, land rights, and compliance with International Labour Organisation conventions in developing countries.

The U.S. Environmental Protection Agency's Renewable Fuel Standard (RFS) Program aims at increasing national energy security by creating a market for renewable fuels as a substitute for conventional fuels. By incorporating incentives for investing in research and development of renewable fuels, the RFS program also seeks to accelerate the nation's progress towards energy independence. In addition, the RFS program helps to reduce the U.S.'s GHG emissions. The first RFS program (RFS1), created under the

Energy Policy Act of 2005 (EPAct), was revised to address the requirements of the Energy Independence and Security Act of 2007 (EISA) and currently implemented as RFS2 in 2010 (US EPA, 2010). There are two important features of RFS2: (1) it specifies the volumetric requirements for renewable fuels through 2020; and (2) it sets GHG emission thresholds for four biofuel types: advanced biofuel (a renewable fuel other than corn ethanol), cellulosic biofuel, biomass-based diesel and other renewable fuels.

In 2009, the Japanese government released a policy to increase the supply of biofuels under the law of 'Sophisticated Methods of Energy Supply Structure', which imposes the energy suppliers on introducing renewable energies including biofuels. In order to define and develop the sustainability standard for biofuels by verifying their contribution to CO_2 emissions reductions from a life cycle perspective (including the clearing of land for cultivation, feedstocks cultivation, biofuel production and transport) and assessing the impact upon competition with food and other aspects, the ministries have jointly organised the "Study Group on Sustainability Standards for the Introduction of Biofuel". The Study Group report that has been published in March 2010 (ANRE, 2010) highlights the following three aspects of biofuel sustainability: (1) contribution to CO_2 emissions reduction by 50% of the base fuel identified by LCA; (2) supply stability as a source of energy, which should meet at least 50% of biofuel requirements through domestic production as well as development and import from Asia; and (3) coping with competition with food by monitoring the impact of biofuel introduction, analysing the causes of competition to identify solutions and emphasising the development and dissemination of technologies for cellulosic biofuel.

The International Organization for Standardization (ISO) is also considering the development of “Sustainability criteria for bioenergy” by bringing together international expertise and state-of-the-art best practices to discuss the social, economic and environmental use of bioenergy, and identify criteria that could prevent it from being environmentally destructive or socially aggressive (ISO, 2010).

There are also international frameworks to discuss the sustainability of biomass energy.

The Roundtable on Sustainable Biofuels (RSB), a multi-stakeholder initiative hosted by the Energy Center of École Polytechnique Fédérale de Lausanne (EPFL), has developed a global sustainability standard and certification system for biofuel production since 2007. In August 2008, the RSB released its first draft of a generic standard for sustainable biofuels production. After the consultations for their “Version Zero” draft until April 2009, they released their “Version One” of international standard for better biofuel production and processing. In 2010, “Version One” was pilot tested in biofuel supply, namely in Germany, South Africa, Australia, Brazil, Guatemala and Peru, to identify areas in need of further refinement. Based upon this feedback and further consultation, the RSB approved “Version Two” in November 2010 (RSB, 2010). The RSB standard has now become a fully operational biofuel certification standard, which includes principles and criteria, an associated guidance document, detailed compliance indicators and the glossary of terms. The RSB standard is built around the following twelve principles: (1) legality; (2) planning, monitoring and continuous improvement; (3) GHG emissions; (4) human and labour rights; (5) rural and social development; (6) local

food security; (7) conservation; (8) soil; (9) water; (10) air; (11) use of technology, inputs, and management of waste; and (12) land rights.

The Global Bioenergy Partnership (GBEP), a forum where national governments, international organisations and other partners seek to facilitate effective policy frameworks and suggest rules and tools to promote sustainable biomass energy development through voluntary cooperation, has been working to develop a set of relevant, practical, science-based voluntary sustainability criteria and indicators under the Task Force on Sustainability since 2008. The criteria and indicators are intended to guide any analysis undertaken of biomass energy at the domestic level with a view to informing decision making and facilitating the sustainable development of biomass energy in a manner consistent with multilateral trade obligations. In May 2011, the GBEP Steering Committee endorsed a set of sustainability indicators for bioenergy defined by the Task Force (GBEP, 2011). A total of twenty-four indicators have been set out under the three pillars of sustainability (environmental, social and economic) and each sub-set of eight indicators is given under its respective pillar.

1.3. Research Activities of ERIA WG on "Sustainability Assessment of Biomass Utilisation in East Asia"

Although there is high biomass energy potential in East Asia, most of the countries in this region are heavily dependent upon fossil fuel imports to meet their energy needs. Governments in this region are looking for various energy alternatives and in this regard biomass energy has emerged on the forefront, which may assure social benefits due to

employment generation through its development as well as GHG reduction and energy security.

At the 2nd East Asia Summit (EAS) held in January 2007 at Cebu, the Philippines, the delegates (10 ASEAN members as well as China, Japan, New Zealand, India, South Korea and Australia) signed the "Cebu Declaration on East Asian Energy Security" (ASEAN, 2007), which outlined the potential energy challenges the region could face in the future driven by a number of factors including: the limited global reserves of fossil energy; fluctuating world fuel oil prices; worsening energy related environmental and health issues; and the urgent need to address climate change. To deal with these issues, the EAS leaders agreed to create a working group on energy cooperation, namely the Energy Cooperation Task Force (ECTF), to follow up on the outcomes of the 2nd EAS. Three work streams are established under the EAS ECTF: Energy Efficiency and Conservation (chaired by Japan); Energy Market Integration (co-chaired by Singapore and Australia); and Bio-fuels for Transport and Other Purposes (co-chaired by the Philippines and India).

To support the work of the ECTF, the Japanese government contributed to the Economic Research Institute for ASEAN and East Asia (ERIA) towards energy related research for a few years. For the bio-fuels work stream, ERIA has been running two projects since 2007; an expert Working Group (WG), which has been formed under the support of ERIA to deal with one of the projects, has been conducting research to assess the sustainability of biomass utilisation. The progress of this WG in the previous years can be briefly summarised as follows:

- 2007-2008: Through the reviews of the triple bottom line methods and case studies in East Asian countries, the WG extracted issues to be concerned for sustainability assessment on biomass utilisation and compiled a WG report entitled “Sustainable Biomass Utilisation Vision in East Asia” (Sagisaka, 2008) that played an important role for scientific backup for adoption of “Asia Biomass Energy Principles” endorsed in the “Second Meeting of EAS Energy Ministers of East Asia Summit” in 2008 (ASEAN, 2008).
- 2008-2009: From the discussions on methodology and indices, the WG developed a methodology to evaluate sustainability of biomass utilisation for energy production from environmental, economic and social pillars. The WG prepared a report entitled “Guidelines to Assess Sustainability of Biomass Utilisation in East Asia” (Sagisaka, 2009) in which the methodology developed and data required for sustainability assessment of biomass utilisation were addressed.
- 2009-2010: In order to investigate the differences of biomass utilisation in the EAS region and to field-test the methodology developed, the WG conducted pilot studies in four selected countries (India, Indonesia, Thailand and the Philippines). The evaluation results of sustainability of biomass energy projects utilising various feedstocks were summarised in the WG report “Sustainability Assessment of Biomass Energy Utilisation in Selected East Asian Countries” (ERIA, 2010).

The WG recognises that the advantages of the WG’s milestone project towards other ongoing or existing biomass sustainability initiatives can be addressed as follows: (1) Although the major initiatives of biomass sustainability are mainly led by developed

countries, the WG is aiming at developing a sustainability evaluation method for biomass that is suitable for the EAS region where socio-economic situations are quite diverse and biomass resources are abundant. (2) Not only has the WG developed through the discussions a methodology to assess sustainability of biomass utilisation in EAS region but also field-tested the methodology through pilot studies in 2009-2010, which only a few initiatives have experienced.

In the previous report (ERIA, 2010), the WG suggested that the "Guidelines to Assess Sustainability of Biomass Utilisation in East Asia" (Sagisaka, 2009) were robust enough for studies at community, regional and national levels and they might be applied to each country in the East Asian region with minor location-specific modifications. Accordingly in the fourth phase of the WG in 2010-2011, the WG activity aimed at upgrading the WG methodology to assess biomass sustainability in the East Asian context by reflecting on experiences and lessons learned from the four pilot studies conducted in 2009-2010.

Chapter 2 outlines the WG methodology to assess sustainability of biomass utilisation and provides a brief summary of the four pilot studies carried out in selected East Asian countries during 2009-2010. This is followed by the lessons learned from the four pilot studies in Chapter 3. The WG discussions to adjust the methodology to assess sustainability of biomass utilisation as energy both at macro (national/state/province) and micro (community/project) levels and presentation of results for each pillar of sustainability are summarised in Chapters 4 and 5. Conclusions and recommendations derived from this report are summarised in Chapter 6.