PROJECT SPONSOR:

USAID
FROM THE AMERICAN PEOPLE

SUSTAINABLE BIOMASS GUIDELINES & RISK ASSESSMENT TOOL

PROJECT OWNER:

INSTITUTE FOR Sustainable Communities

EXECUTIVE SUMMARY

23rd of August – Final version

Prepared for: Institute for Sustainable Communities (ISC)

Prepared by: ERM – Siam Co, Ltd

1. INTRODUCTION

The fashion industry represents an important contributor to the global energy use and greenhouse gases (GHG) emissions. Due to lengthy supply chains and energy-intensive production methods, the fashion industry (not including footwear) generated approximately 2**%** of global carbon emissions (based on data from 2019 from Global Carbon Emissions of Apparel Sector). Without mitigation solutions and if the fashion industry continues developing on the same trend, GHG emissions from production are set to rise **60% by 2030** compared to 2019[], up to an estimated 1.6 billion tons of CO_2. In this context, a target of 45% reduction as defined by the apparel industry of GHG by 2030 compared to 2019 emissions baseline.

Already widely produced in most parts of the globe – particularly in Southeast Asia, biomass has played for a long time an important role in terms of primary energy supply particularly in the developing and under development countries. Due to the carbon captured during its lifecycle, biomass can be considered as a low carbon transition energy source to produce hot water and steam generation, in substitution of fossil fuels such as coal, oil or natural gas required in system processes, such as textile production and the manufacturing of clothes. Nevertheless, while representing an alternative solution for phasing out of fossil fuels, biomass production, transportation and utilization can also generate direct and indirect negative environmental and social impacts such as deforestation, air pollution from biomass combustion or competing use between food and energy purposes. Therefore, defining and assessing the sustainability of biomass sources needs to be done properly along the supply-chain until final utilization and waste disposal.

These guidelines have therefore been prepared with the objectives to:

- Gain understanding on the different types of biomass and the environmental and social risks that may occur through the supply chain.
- Support key decision-makers in selecting biomass types that are acceptable or can be acceptable with certain risk mitigation action plans and in screening biomass suppliers providing the necessary references and tools related to E&S risks screening analysis.

The Sustainable Biomass Guidelines have been developed in priority for key personnel of factories that are **Tier 1 and Tier 2 suppliers** for the **fashion industry (clothing and footwear),** including factory decision-makers, technical officers, and procurement officers. However, as the specificities of the fashion industry are only marginally tackled in the assessment, the guidelines can be utilized by any stakeholder from different industries looking at sourcing biomass for its energy use.

Building on the context of Southeast Asia, these guidelines are developed with the aim of global application and are supplemented with a user-friendly Risk Assessment Tool (RAT) to perform the first screening of sustainability profile of various biomass sources, from production to utilization, to support the decisions-making of biomass technology and supplier selection.

The Sustainable Biomass Guidelines and the Biomass Sustainability Risk Assessment Tool can be used at different stages: when a factory is only considering biomass as an alternative energy source, at the stage of supplier selection, or for biomass being already in use to understand possible environmental and social (E&S) risks and develop a risk mitigation and alternative sourcing plan.

2. BIOMASS CATEGORIZATION & SUSTAINABILITY DRIVERS DEFINITION

Biomass, in the energy context, is an energy source derived from biological material, also called bioenergy. Biomass can originate from various feedstock and may need to be transformed through various chemical, mechanical, and thermal processes to produce the final biomass product in the form of a solid, liquid or gas biofuel. Given their diversity on a global scale and based on criteria such as

origin, technical characteristics and sustainability risks, **five biomass feedstock categories** have been defined as follow:

- **Category 1: Solid wood and other products extracted from forest**, such as wood from natural forests or wood production forests;
- **Category 2: Primary products from crops used for food and/or energy**, such as sugar and cereal or oil crops used notably to produce bioethanol or biodiesel;
- **Category 3: Solid agricultural waste**, such as risk husk, palm kernel, wheat straw, wood waste from fruit/rubber plantations;
- **Category 4: Animal manure as residue from livestock processes** such as cows, sheep, pig or poultry manure used notably to produce biogas; and
- **Category 5: Organic waste from industries and municipal solid waste (MSW)**, such as food waste from restaurants, or generally from the food industry, and residue from industries using wood as main raw material.

In order to screen the sustainability (i.e., potential environmental and social risks) of the various biomass options, five main **sustainability drivers** have been identified covering environmental and social criteria, namely (i) climate change, (ii) conservation and natural resources, (iii) air quality, (iv) human rights and labor practices and (v) social development and local food security.

For each sustainability driver, **evaluation indicators** have been selected aiming at reflecting the main sustainability risks related to the production and use of biomass resources for energy. These evaluation indicators and sustainability drivers have been identified based on several references, including the United Nations' Sustainable Development Goals and the RSB's Standards and Principles and will be assessed through the **Biomass Sustainability Risk Assessment Tool**. The list of the five sustainability drivers and the evaluation indicators can be seen in the table below**.**

Table 1: List of sustainability drivers and Evaluation Indicators

Sustainability drivers	Evaluation indicators
Climate change	• GHG emissions from biomass production, transportation and storage (upstream) • GHG emissions from biomass utilization (combustion) • Impact on carbon sinks (such as deforestation)
Conservation and natural resources	• Loss of natural habitats causing loss of biodiversity (such as deforestation) from land-use change (LUC) and indirect land-use change (ILUC) • Loss of biodiversity due to increased use of chemicals (e.g., pesticides, herbicides, etc.) • Water consumption for biomass production • Water and soil contamination
Air quality	• Open field burning of agricultural waste and wildfires • Air contaminants emissions during production processes • Air contaminants emissions from biomass combustion
Human rights and labor practices	• Land rights • Community (Public) health and safety • Decent remuneration and compensation for workers • Occupational health and safety • Human rights, Child Labor & Slavery
Social development and local food security	• Impact on food availability and price • Increased and equitable share of revenues and employment opportunities for local communities' development

3. GUIDELINES FOR ADOPTING SUSTAINABLE BIOMASS & BIOMASS ACCEPTABILITY

To gauge stakeholder willingness to use biomass energy in their operations, an assessment approach is proposed, with a first review on biomass source acceptability based on the categories and sustainability drivers defined in the previous section.

Biomass categories' acceptability

Based on the potential sustainability risks pre-identified for the different biomass categories from best practices, a preliminary hierarchy of biomass acceptability is developed to help decision-makers select biomass types for conducting an E&S assessment from a potential wide panel of available options in a given geography and market. The biomass acceptability categorization is detailed as follows:

- Acceptable categories:
  - Solid agricultural waste (Category 3), e.g., rice husk, rice straw, coconut shell, cashew nutshell, wheat straw, corn stover, and palm kernel shell (certified by the Roundtable on Sustainable Palm Oil (RSPO)).
- Acceptable categories with mitigation plans:
  - Wood waste from plantations and wood industry (Category 3), e.g., saw dusk from furniture mill, wood waste from cashew, rubber, and mango plantations.
  - Animal manure as residues from livestock processes (Category 4), e.g., as used for biogas production.
  - Organic waste from Industries and Municipal Solid Waste (Category 5)
- Unacceptable categories:
  - Solid wood and other products extracted from forests (Category 1), e.g., including wood from the forests and plantation for fuel (grow to burn).
  - Primary products from crops used for food and/or energy (Category 2), e.g., direct combustion or biodiesel/bioethanol directly produced from 1st generation biomass such as corn, sugarcane, wheat, cassava, oil crops, switchgrass, jatropha, etc.

Note: This biomass acceptability categorization is provided as a basis for initial screening. Local considerations as well as individual initiatives from apparel brands shall be further checked to assess whether stricter rules apply regarding the acceptability of specific biomass types.

In addition to the feasibility of the biomass use, additional principles should be considered regarding the legality and relevance of using biomass over other technologies and ensuring that the biomass utilization serves purposes compatible with sustainability targets and development goals.

The Key principles include:

- **Legality and compliance** of biomass production and utilization with local regulations.
- **Responsible production and consumption**, referring to "the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations".
- **Cascading use** aimed to maximize resource effectiveness by using biomass in products that create the most economic value over multiple lifetimes.
- **Energy efficiency and clean energy solutions** aimed to use best practices and technologies of the highest standards in terms of energy savings and energy efficiency for biomass conversion equipment as well as the manufacturing of machines in order to limit the amount of energy and biomass input for one unit of the final product.
- **Waste management** aiming to limit environmental and social impacts as well as promoting 3R principles (Reduce, Reuse, Recycle) and material and/or energy recovery, where possible.

4. BIOMASS SUSTAINABILITY RISK ASSESSMENT METHODOLOGY AND TOOL

The Biomass Sustainability Risk Assessment Tool (RAT) is developed in a spreadsheet format and aimed to assist in the biomass sustainability risk assessment process as described previously.

The key steps and following methodology on how to apply the RAT are briefly described below:

Step 0: User information

Step 1: Scope identification

The user will select the main details about the biomass option to be screened including type of biomass fuel, type of treatment processes and biomass feedstocks.

Step 2: Risk screening

Based on the previous answers, the assessor will be guided to different levels of assessment:

- **Biomass Pre-Screening** – Level 1 (if biomass origin is not defined and no supplier is identified):
- **Basic Assessment** – Level 2 (if no specific supplier is identified yet or if there are only limited information and data available):
- **Detailed Assessment** – Level 3 (if one or several suppliers have already been identified and/or a more detailed assessment is required):

Step 3: Risk analysis and result

The sustainability risk heat map is generated based on the answer provided in step 2, displaying indicators and the level of risk (high, medium and low) determined from the assessment. Based on the level of risk (required for indicators with high risk and recommended for indicators with medium risk), the opportunity is given to select mitigation options from a predefined list provided in the tool. As per the Pre-assessment and Basic & Detailed Assessment Results sheets, the tool determines the level of acceptability of the biomass option based on the answers provided in the previous steps and the risk level estimation.

Step 4: Verification

In order to ensure quality of the information and strengthen the accuracy of the assessment, verification of the results from the Biomass Sustainability Risk Assessment should be applied