BioTrade2020plus

Supporting a Sustainable European Bioenergy Trade Strategy

Intelligent Energy Europe
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Deliverable 2.2

Guidelines for the sustainability assessment of biomass resources to conduct the SWOT analysis and to develop the interactive tool of WP 4.

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The BioTrade2020plus Project

Objectives

The main aim of BioTrade2020plus is to provide guidelines for the development of a **European Bioenergy Trade Strategy for 2020 and beyond** ensuring that imported biomass feedstock is sustainably sourced and used in an efficient way, while avoiding distortion of other (non-energy) markets. This will be accomplished by analysing the potentials (technical, economical and sustainable) and assessing key sustainability risks of current and future lignocellulosic biomass and bioenergy carriers. Focus will be placed on wood chips, pellets, torrefied biomass and pyrolysis oil from current and potential future major sourcing regions of the world (Canada, US, Russia, Ukraine, Latin America, Asia and Sub-Saharan Africa).

BioTrade2020plus will thus provide support to the use of stable, sustainable, competitively priced and resource-efficient flows of imported biomass feedstock to the EU – a necessary pre-requisite for the development of the bio-based economy in Europe.

In order to achieve this objective close cooperation will be ensured with current international initiatives such as IEA Bioenergy Task 40 on "Sustainable International Bioenergy Trade - Securing Supply and Demand" and European projects such as Biomass Policies, S2BIOM, Biomass Trade Centres, DIA-CORE, and PELLCERT.

Activities

The following main activities are implemented in the framework of the BioTrade2020plus project:

- Assessment of **sustainable potentials of lignocellulosic biomass** in the main sourcing regions outside the EU
- Definition and application of sustainability criteria and indicators
- Analysis of the **main economic and market issues of biomass/bioenergy imports** to the EU from the target regions
- Development of a dedicated and **user friendly web-based GIS-tool** on lignocellulosic biomass resources from target regions
- **Information to European industries** to identify, quantify and mobilize sustainable lignocellulosic biomass resources from export regions
- **Policy advice on long-term strategies** to include sustainable biomass imports in European bioenergy markets
- **Involvement of stakeholders** through consultations and dedicated workshops

More information is available at the BioTrade2020plus website: **www.biotrade2020plus.eu**

About this document

This report corresponds to D2.1 of BioTrade2020+.

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Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services):	
CO	Confidential, only for members of the consortium (including the Commission Services)	X

Version	**Date**	**Reason for modification**	**Status**
0.1	14/05/2015	Link with other deliverables that needed to be finished earlier	Draft to be reviewed after D4.1 is finished
0.2	01/06/2015	Final version	Complete

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SUMMARY

The increasing use of biomass for different uses (e.g. electricity, transport, combined fuel/electricity supply, etc.) makes it necessary to consider sustainability issues to avoid market distortions. Sustainability risks of bioenergy production can be assessed in a holistic approach, applicable at the European level.

In WP 2 of the Biotrade2020plus project a report was produced (D2.4) on how to consider sustainability issues and assess these through the implementation of indicators to the available biomass resources in the selected case studies. A risk assessment through a SWOT analysis will also be included in the online BioTrade2020plus tool developed in WP4 of the project (see D4.3 report). The SWOT will incorporate the sustainability issues identified in WP2 enabling an integrated assessment of potential biomass export flows from the case study regions towards three of the main harbours of Europe (ARA), as well as governance issues. This report presents the general guidelines on what to consider in this SWOT analysis.

Six principles to be covered in the SWOT were selected:

1) Biomass availability;
    a. Sustainable availability
    b. Exportable availability
2) Biomass mobilisation and security of supply
3) Biomass cost
    a. Cost to road side
    b. Collection & pre-treatment cost up to harbour
    c. Transport cost long distance
4) Environmental sustainability
5) Social sustainability
6) Governance

Each principle has to be covered in the SWOT through the evaluation of an indicator or a criterion.

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1. Introduction

The increasing use of biomass for different uses (e.g. electricity for transport, combined fuel/electricity supply, etc.) makes it necessary to consider a wide number of issues to make biomass delivery chains sustainable and economically feasible while avoiding market distortions. A SWOT approach enables an integrated assessment of biomass delivery chains in a more holistic perspective integrating the evaluation of sustainability risks and challenges to overcome for building real business cases for biomass delivery chains.

In WP 2 of the Biotrade2020plus project a report was produced (D2.4) on how to consider sustainability issues and assess these through the implementation of indicators to the available biomass resources in the selected case studies. A risk assessment through a SWOT analysis will also be included in the online BioTrade2020plus tool developed in WP4 of the project (see D4.3 report). The SWOT will incorporate the sustainability issues identified in WP2 enabling an integrated assessment of potential biomass export flows from the case study regions towards three of the main harbours of Europe (ARA). This report presents the general guidelines on what to consider in this SWOT analysis and how to implement it in the evaluation of biomass delivery chains based on biomass imported from overseas to the EU-28.

The SWOT approach presented here is to be applied in the project on exportable biomass potentials identified in the case study countries selected in the project: Brazil, Colombia, Indonesia, Kenya, the United States and Ukraine.

2. Approach to SWOT analysis

A strength-weakness-opportunities-threat analysis is to be done per feedstock-case study area combination. This SWOT [1]analysis will be performed for every case study region. The SWOT analysis will be made available through the BioTrade2020+ tool. For every case study area biomass potential combination a baseline SWOT analysis will be included. The users of the tool are provided with the possibility to add arguments to the SWOT analysis if preferred, in order to allow for new or changed viewpoints.

In the following paragraph a description is given of the SWOT approach as a guideline for implementing the SWOT for every case study region biomass type combination and as the basis for integration of the SWOT into the integrated BioTrade2020+ tool.

The starting point for the SWOT is as follows:

- A SWOT is to be done per feedstock-case study combination.
- Scenarios to be developed in the project guide the SWOT. This implies that the Business as Usual scenario application to the case study (BAU) is guiding especially for the formulation of the strength and weaknesses and the alternative (optimistic) scenario helps to formulate the opportunities and threats.

[1] Strengths, weakness, opportunities and threats

- The SWOT should be defined from the EU perspective mainly as the focus in the project is on finding sustainably available biomass potentials from overseas to source the EU for reaching bioenergy targets and other bioeconomy goals.

For this, six principles need to be covered in the SWOT assessment as follows:

1. Biomass availability;
    a. Sustainable availability
    b. Exportable availability
2. Biomass mobilisation and security of supply
3. Biomass cost
    a. Cost to road side
    b. Collection & pre-treatment cost up to harbour
    c. Transport cost long distance
4. Environmental sustainability
5. Social sustainability
6. Governance

Each principle has either an indicator or a criterion to consider for the SWOT. These are not the same indicators as in the sustainability assessment but considerations derived from them.

The following section explains what should be considered in each one of these principles. A full SWOT is not included in it as it needs to be assessed through the participation of project partners and stakeholders identified in the regions. This will be conducted through a workshop and teleconferences and will be strongly based on the information and knowledge derived from the case study work performed in the project. Therefore the results of the SWOT assessment will be presented in a separate report.

3. Risk Assessment of sustainability principles

3.1 Biomass availability

The first aspect to be covered in the SWOT is the biomass availability where a distinction needs to be made between:

a. Sustainable availability
b. Exportable availability

In order to specify the SWOT dimensions for both types of availabilities the aspects to be covered will include:

1) Overall total available biomass taking account of all sustainability aspects covered by the sustainability indicators formulated and described in D2.4 specific per biomass type
2) Overall total available sustainable biomass that is exportable i.e. the part of the sustainable biomass that has no direct local use and therefore does not compete with local uses. The latter amount could be limited in a BAU, but could become much larger in the more optimistic scenario situation but the risks need to be considered.

Absolute quantities of biomass making it worthwhile to be shipped to Europe should be large enough to put the positive effects of economies of scale in place. A minimal threshold is difficult to determine but setting up a whole logistical biomass delivery chain to ARA ports (Amsterdam, Rotterdam and Antwerp) in Europe will only be attractive if secure biomass flows of at least 400-500 Kton D.M. per year[2] can be guaranteed for a longer period of time (>5 years). This secure and large enough amount will also translate in a competitive biomass price in the ARA ports. Only if the price is competitive the biomass delivery chain is likely to be set up in the near future.

The sustainable availability can only be determined after evaluating the technical biomass against the sustainability indicators for biomass availability as defined in D2.4 (Iriarte et al, 2015). This aspect will be further addressed under point 5.

3.2 Biomass mobilisation and security of supply

A crucial aspect to be covered well in the SWOT is the aspect of likeliness that the biomass can be mobilised and that the availability of large quantities of biomass can be guaranteed for exports over a longer period of time. In the SWOT the following aspects needs to be specified as follows (table 1).

[2] To determine the minimal threshold size of the biomass exploitation we build on a couple of references.
As for wood pellets the IEA-task 40 (Vakkilainen et al, 2013) conducted a survey on all pellet mills and pellet producing countries. It showed that there are 21 pellet producing countries producing together 40 mln Ktons of pellets a year, which implies an average per country production of around 100 Kton pellets a year, but the largest fifteen countries produce more than 300 Kton. This confirms that commercial stage for pellet productions starts at around 100 Kton a year.
Furthermore, considering a production of second generation bioethanol as an important target market for imported biomass between now and 2020, it is possible to take the yearly requirement for biomass as a minimal size threshold. To identify the minimal size threshold the first commercial 2G bioethanol plant in the world, the POET-DSM advanced fuel plant in IOWA was taken as a reference (see: http://poet-dsm.com/pr/first-commercial-scale-cellulosic-plant). This plant has the capacity of converting 770 tons DM of biomass a day which is almost 300 Kton of lignocellulosic biomass a day.
Another commercial biorefinery plant, also based on 2G technology developed (using plantfiber, or cellulosic biomass) by Abengoa (Bioenergy Biomass of Kansas (ABBK)) located in Hugoton (US-Kansas), needs 1100 ton of DM biomass a day, which amounts to more than 400 Kton of biomass a year (see: http://www.abengoabioenergy.com/web/en/2g_hugoton_project/).

Table 1. Aspects to be considered for SWOT of biomass mobilisation

SWOT principle	Indicator/criterion	Strength	Weakness	Opportunity	Threat
Mobilisation opportunities	*Options to mobilise the production/ harvest of biomass for exports*	High interest among owners of land/biomass to mobilise it. Technically possible with current technologies to mobilise the production/harvest of the biomass at large quantities/ Limited investments necessary / logistically (pre-treatment & transport) feasible and within acceptable price to bring biomass to sea harbour	Limited interest among owners of land/biomass to mobilise it Technically complex to mobilise the production/ harvest of the biomass at large quantities/ No interest to make investments / logistically (pre-treatment & transport) complex and expensive to bring biomass to sea harbour	In future scenario opportunities for mobilisation of the biomass will increase.	In future scenario opportunities for mobilisation of the biomass will decline
Security of supply	*Stable amount of exportable biomass available over next 10 years*	Large amounts (> 500 kton/year) very likely to be available over next 5-10 years given factors like strong concentration of biomass in limited number of companies/land owners with which long term contracts can be set.	Uncertain access to biomass given wide dispersion of biomass over land owners/ small holders. Limited opportunities for contracting large amounts for long-term contracts.	Opportunities for concentration of exportable biomass production and harvest in accessible locations involving limited number of parties will increase.	Opportunities for local use of biomass will increase declining the amount of biomass available for exports.

3.3 Biomass cost

The interest of parties to import biomass to the EU will depend strongly on the cost of production and the related price at which it can be sourced in one of the ARA harbours in Europe. This cost-price will need to be lower than the price of EU biomass otherwise there is no reason to import it. The cost of exported feedstock has 3 cost components:

a. Cost to road side
b. Collection & pre-treatment cost up to sea-harbour
c. Overseas transport cost long distance to ARA harbours

Table 2. Biomass cost swot considerations

SWOT principle	Indicator /criterion	Strength	Weakness	Opportunity	Threat
Cost of biomass in ARA ports	*€/ton DM and €/GJ*	Costs are low which implies cost of imported biomass in ARA harbour is lower than that of a similar EU biomass feedstock.	Costs are high which implies cost of imported biomass in ARA harbour is higher than that of a similar EU biomass feedstock.	Costs of exportable biomass feedstock will decline given opportunities for technical improvements in biomass delivery chain	Future prices of exportable biomass feedstock will increase because of increased competition with local uses

This implies that the at-road cost of the biomass need to be low to still compensate for the additional cost to be made for local logistics, including pre-treatment to ensure conservation and densification of the biomass, and overseas transport. The total cost will need to compete with the cost of EU biomass for which the transport cost are likely to be lower. Tariff will need to be considered.

3.4 Environmental sustainability

Importers of biomass can review environmental sustainability issues through recognised certification schemes, bilateral agreements, international conventions/agreements or Memorandum of Understanding (MoUs). It is more difficult to verify compliance with environmental criteria if it is not done through established systems and chains of custody verifications and audits (see D 2.3).

Table 3. Environmental sustainability considerations.

SWOT principle	Indicator/ criterion	Strength	Weakness	Opportunity	Threat
Environmental issues (air, water, biodiversity and soil) are not negatively affected	Feedstock production does not affect negatively local environmental conditions	Feedstock production complies with local regulations and best practices as well as international conventions and agreements	Lack of measures to review compliance of this	Implementation of best practices in absence of enforcement or compliance	Feedstock production leads to negative impacts on environmental issues. Increased production may have cumulative negative impacts
Life cycle GHG emissions incl. direct LUC	GHG LCA assessment in agreement with IPCC guidelines along the supply chain	The feedstock production and supply chains shows savings in GHG in comparison with fossil alternatives	The feedstock production and supply chains shows no savings in GHG in comparison with fossil alternatives	The feedstock production and supply chains shows improved savings in GHG in comparison with fossil alternatives	The feedstock production and supply chains are negative for GHG in comparison with fossil alternatives

If recognised systems (either certification systems, or approved schemes) can verify best practices as well, will make the imports of biomass done in a more efficient and transparent form.

3.5 Social sustainability

Importers of biomass can review social sustainability issues through recognised certification schemes, bilateral agreements, international conventions/agreements or MoUs. It is more difficult to verify compliance with environmental criteria if it is not done through established systems and chains of custody verifications and audits (see D2.3).

Table 4. Social sustainability considerations.

SWOT principle	Indicator/ criterion	Strength	Weakness	Opportunity	Threat
Social issues are not negatively affected	Feedstock production does not affect negatively local social conditions	Feedstock production complies with local regulations and best practices and improves local social conditions	Lack of measures to review compliance of this	Implementation of best practices in absence of enforcement or compliance	Feedstock production leads to negative impacts on social issues

If recognised systems (either certification systems, or approved schemes) can verify best practices as well, will make the imports of biomass done in a more efficient and transparent form.

3.6 Governance

There is no global consensus on the definition of governance. Here is considered as the policies and regulations in a country and how they are implemented (see definition by Kauffman et al, 2011)[3]. If a country has policies and regulations (regarding the feedstock production through the whole supply chain), and implements and enforces international agreements and conventions, (e.g. ILO and CBD) governance will be in place. In the absence of certification schemes and standards, good governance helps to promote good practices which can be adopted in the feedstock production. The report D5.2 presents a database of relevant policies (EU, MS, outside EU) impacting biomass imports to the EU.

[3] "The traditions and institutions by which authority in a country is exercised. This includes (a) the process by which governments are selected, monitored and replaced; (b) the capacity of the government to effectively formulate and implement sound policies; and (c) the respect of citizens and the state for the institutions that govern economic and social interactions among them" (Kauffman et al, 2011).

Table 5. Governance considerations.

SWOT principle	Indicator/ criterion	Strength	Weakness	Opportunity	Threat
Governance	Existence of policies and regulations to regulate feedstock production. Implementation/ Enforcement of national, local regulations as well as relevant international convention	the existence of local policies and regulations and the implementation/enforcement of such regulations as well as of relevant international conventions	absence of local policies and regulations to regulate feedstock production and/or poor implementation/enforcement of local regulations and of relevant international conventions	enactment and enforcement of new local regulations, which further improve environmental and social conditions. Signing new relevant international conventions	retreat of local polices/regulations. Retrocession in terms of implementation/enforcement mechanisms

4. Integration

The six principles and suggested criterion will be discussed in three work packages. WP2 as it prepared the sustainability principles; WP3 because it prepared the specific case studies with the scenarios assessment and WP as it assessed the policies and regulations in each country. The SWOT analysis will be implemented in the tool as an instrument to be used for integrated evaluation of Biomass delivery chains based on imported biomass. The SWOT applied to the case study-biomass combinations will need to be developed in the project as part of the case study collection and evaluation work and the results of the SWOT will be included in the tool to be further evaluated by users of the tool.

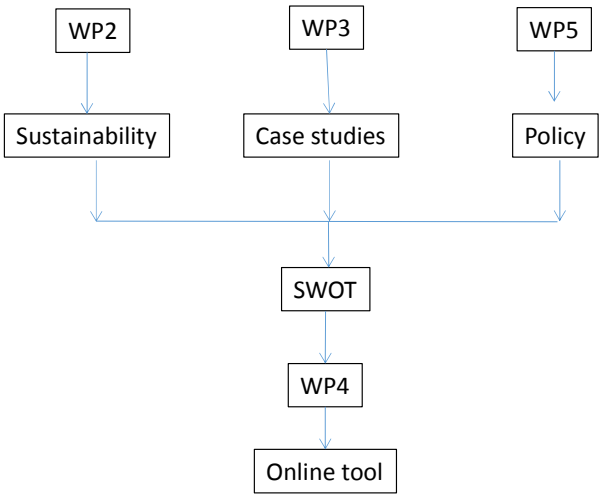

Figure 1. Integration of WPs in the SWOT analysis.

As stakeholders and the Advisory board will be consulted, wider statements may be integrated in the SWOT. This will be done after month 24 and the SWOT guidelines will be

updated and implemented for the six case studies per biomass feedstock type regarded as sustainable for export to Europe.

5. References

Iriarte L, Fritsche U and Diaz-Chavez R. 2015. BIOTRADE2020PLUS Approach to Sustainability. D2.4 of the Biotrade2020+.

Kaufmann D, Kraay A and Mastruzzi M. 2011. The Worldwide Governance Indicators: Methodology and Analytical Issues. Hague Journal on the Rule of Law, 3, pp 220-246 doi:10.1017/S1876404511200046

Vakkilainen E, Kuparinen K and Heinimö J. 2013. Large Industrial Users of Biomass. IEA Bioenergy Task 40. Sustainable International Bioenergy Trade.

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