BASIS

Deliverable 2.3 User Handbook

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1. Who is this tool for?

The BASIS project consortium includes a number of national bioenergy associations and has ensured that the results of the project are useful for the purposes of several actors along the woodchip-based bioenergy value chain from feedstock to final use.

1.1 Practitioners involved in several stages of the woodchip energy value chain

The first group includes stakeholders that are directly involved in identifying, planning, financing and executing projects for the generation of energy from woodchip.

i. Project developers (Either individual companies or partnerships comprising technical design, financial arrangements and logistics management)
ii. Plant technology providers of all scales
iii. Woodchip providers

1.2 Stakeholders involved in market configuration and support

The second group includes stakeholders that are involved in providing the conditions, legal framework and administrative arrangements that allow the market to function in each country.

i. Forestry managers (Private or public***)***
ii. Environmental policy makers
iii. Energy policy makers
iv. Regulatory enforcement agencies (In charge of monitoring, compliance, and administering incentives or penalties)

2. What does the BASIS project do?

2.1 Feedstock potential visualisation

BASIS enables market participants to identify the geographical areas across Europe that have either significant feedstock potential or that already display market saturation. It provides information that incorporates resource availability, which is related to resource density, i.e. the normalised number of tonnes available per km^2. Details about the information sources and modelling tools used in the calculation and representation of the potential are included under section 3.3.1.

The visualisation of feedstock potential is represented for the economic territorial units used in official European and international statistics as defined in the REGULATION (EC) No 1059/2003 of the European Parliament and of the Council of 26 May 2003 on the establishment of a common classification of territorial units for statistics (NUTS). NUTS is

the acronym derived from the French Nomenclature des Unités Territoriales Statistiques. The nomenclature subdivides the economic territory of the European Union into regions at three different levels (NUTS 1, 2 and 3, moving from larger to smaller territorial units, respectively). Above NUTS 1, there is the 'national' level of the Member States. One of the driving factors for the NUTS classification is population as shown on Table 1. Smaller administrative units are aggregated into the next level also considering relevant criteria such as geographical, socio-economic, historical, cultural or environmental circumstances.

Table 1 Population thresholds for the NUTS classification

Level	Minimum	Maximum
NUTS 1	3 million	7 million
NUTS 2	800 000	3 million
NUTS 3	150 000	800 000

The representative units used throughout the project to display potential availability of feedstock is at the level of NUTS 2 given its suitable characteristics for representing economic activity and realistic transport distances and because they are the basic regions for the application of regional policies and is also the level at which the cohesion report has been prepared according to Eurostat. Information on the nomenclature can be corroborated at: http://ec.europa.eu/eurostat/web/nuts/overview

2.2 Level of deployment of plants and actual geographical distribution

BASIS enables practitioners of the woodchip value chain as well as market-forming stakeholders to assess the development of their national and regional markets. The tool offers the visual information needed to evaluate the impact of incentives, regulations, transport infrastructure and forest management policies. Policy makers are able to see whether there is significant sustainable potential still unused or whether particular areas have substantial and healthy business activity or whether there are areas likely to reach saturation or in risk of surpassing sustainable feedstock supply levels. Overall, the tool enables a prioritisation of management efforts not only in policy, but importantly, also on infrastructural terms.

BASIS uses the data generated through the suite of resource models employed in the European project Biomass Futures to represent the overall feedstock potential. For data on the actual deployment of plants that demand the feedstock, BASIS uses live data collected

directly from the industry to geo-reference plants on the web-based visualisation tool. The information collected includes:

Woodchip-fired energy plants

- Plant details
  - name, address,
  - contact details
- Performance data
  - Wood input
  - Output types
  - Output quantities
  - Overall calculated wood demand (where needed)

Data sources included national industry reports, industry association directories, company reports and representatives, online presence, or published official administrative data such as the UK Office for Gas and Electricity Markets (Ofgem) records on the administration of the Renewable Heat Incentive (RHI). A fundamental strength of the BASIS approach is that key staff of national industry associations are part of the team collecting the data.

In the cases where wood input data were unavailable the project team applied the following calculation guidelines to obtain the estimated consumption.

Step i.
Maximum Capacity [in MW] * Availability [h/y] * load [%] = Energy production [MWh/y]

Step ii.
Energy production[MWh/y] / Efficiency [%] = fuel consumption [MWh/y]

Step iii.
Biomass consumption[MWh/y] / 5.2 MWh/odt = biomass consumption [odt/y]

In the case of co-firing: apply the % of biomass co-firing in the [MWh/y] fuel

In the case of CHP plants: make the same calculation on the main output (electricity or heat driven CHP). In cases where it is not know which is the driving output, calculate the biomass consumption for both electricity and heat production and take the larger biomass consumption.

In turn, the calculation of the efficiency of a bioenergy plant is derived by using the following formula:

$$Plant\ efficiency = \frac{Final\ energy\ in\ the\ form\ of\ heat\ or\ electricity\ in\ MWh}{Wood\ chip\ fuel\ input\ in\ MWh}$$

The information provided by BASIS is designed to be complementary to the service provided by the project Crossborder-bioenergy (http://www.crossborderbioenergy.eu/). The results and visualisation tool developed under Crossborder bioenergy show market attractiveness by country and by bioenergy sector, for example District Heating in Italy. Therefore, the heating and CHP sectors are evaluated and presented at national level across Europe.

2.3 Visual representation of sustainability related protected areas

The other important consideration for market actors is the continued sustainability of proposed projects. Sensitive areas are displayed through the use the most relevant and authoritative sources and dedicated maps for biodiversity hotspots and other protected or monitored areas under schemes such as:

- The Programme for the Endorsement of Forest Certification (PEFC).
- The Forest Stewardship Council (FSC) certification system for forestry management

The subcategories of sensitive areas that have been identified within the project and are displayed on the online visualisation tool are:

- Strict Nature Reserve
- National park: protected area managed mainly for ecosystem protection and recreation
- Natural Monument: protected area managed mainly for conservation of specific natural features
- Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems
- Habitat/Species Management Area: protected area managed mainly for conservation through management intervention
- Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation

3. What are the BASIS Building Blocks?

3.1 Woodchip energy plant deployment and infrastructure

3.1.1 Woodchip energy plants.

The core element of the project and its original contribution is the mapping of bioenergy plants using wood chips, containing all plants with installed thermal capacity higher than 20 MW, most of the plants higher than 5 MW and a significant number of plants with an installed capacity higher than 1 MW across the whole Europe. Such detailed statistics of existing plants, giving a very comprehensive picture of European woodchip bioenergy are intended to satisfy the information needs of all relevant stakeholders, in particular

companies and public bodies. In the case of plants with installed thermal capacity of 20MW or greater, factsheets are in most cases provided with details of location and capacity.
Examples of sources consulted to collect these data are: national industry reports, industry association directories, company reports, representatives and online presence, the plants through direct contact or published official administrative data such as the UK Office for Gas and Electricity Markets (Ofgem) records on the administration of the Renewable Heat Incentive (RHI). A fundamental strength of the BASIS approach is that key staff of national industry associations are part of the team collecting the data.

The rigour of the BASIS approach was ensured by the involvement of leading, national bioenergy industry associations in the data collection itself. Examples are the German (BBE), Spanish (Avebiom), French (FBE), Italian (AIEL), Swedish (SVEBIO), Danish (DI) and Austrian (Biomasseverband) industry associations. This phase of data collection performed directly by and within the industry provides a suitable supplement to the demand and supply scenarios obtained from modelling work from complementary European projects. The main result is the geographical visualisation of all plants larger than 1MW installed thermal capacity.

The project provides policy makers and potential investors with a comprehensive overview of the biomass use in medium and large scale plants all over Europe which can be combined with detailed insight on sustainability aspects influencing future biomass supply.

3.1.3 Harbours

A significant kind of infrastructure that can influence the availability of feedstock is that of ports, harbours and their on-land connections. The tool aims to display most ports in partner countries that have the capability to trade in woodchip or similar wood materials.

3.2. Competing uses of wood

3.2.1 Information on the largest consumers of wood for material use

In order to provide a fuller picture of the market for wood chips, the tool will also display the sites of the largest consumers of wood that could be suitable for woodchip production but is used for purposes other than energy which are:

i. Particle board manufacturing plants
ii. Pulp mills
iii. Pellet manufacturing plants

The tool aims at presenting a combination of location and annual wood demand information which will enable the user to assess the viability of each location for a future woodchip bioenergy plant.

Note that competing uses of wood are only reported without applying any assumptions, they represent stand-alone information that users can consider when making their own evaluations.

3.3. Biomass potential (biomass futures)

In order to examine the viability of a future investment it is crucial to know the biomass potential as a source of feedstock.

3.3.1 Available wood suitable for woodchip production

Woodchip can be produced from a variety of feedstocks in different parts of Europe. Detailed modelling of the sources, productive areas, constraints and yield estimations was achieved through the combination of powerful, internationally renowned models within the Biomass Futures (http://www.biomassfutures.eu/) and Biomass Policies (http://www.biomasspolicies.eu/) projects. BASIS established a link between the outputs of the modelling suite used in those *Intelligent Energy Europe* projects and the BASIS visualisation tool. This reflects the sustainable potential calculated for every NUTS 2 region in Europe including the constraints for protected areas, uneconomic or inaccessible biomass. The resulting potential is displayed on the visualisation tool in different shades of green. For ease of use, the darkest shade of green represents the highest sustainable potential.

The most relevant woodchip production feedstocks included in the calculation of the potential are:

- Additionally harvestable wood
- Primary forest residues
- Landscape care wood
- Secondary forest residues (e.g. saw mill by products)
- Tertiary forestry residues,
- Lignocellulosic energy crops

The underlying assumptions deployed in the modelling suite for these feedstocks are described briefly below.

The data on primary residue potential included are the result of the interaction of recognised models, data and specific assumptions relating to potential arising from forest and non-forestry based sources of wood. The calculation method can be summarised as follows.

Forestry-related potential

The EFISCEN model is used to calculate the level of roundwood extraction that can be sustained for a prolonged period, resulting in the data for potentially harvestable stemwood, also referred to as Roundwood (kTonne) and residues. The input data for

running the EFISCEN model is the national forest inventory data providing as detailed information as possible on 'forest available for wood supply' specifying data on area in hectares (ha); growing stock volume (m^3/ha overbark); if available, net annual increment (m^3/ha/yr overbark); if available, gross annual increment (m^3/ha/yr overbark) and annual mortality (m^3/ha/yr overbark).

For both the stemwood and the residues there is a competition between the use for energy (and other unknown biobased uses) and known material use. The material use for roundwood is taken from the EFI-GTM calculations used in EFSOS. These results are at country level, and are downscaled proportionally to the potentially harvestable stemwood.

The residue potential is a direct result of the roundwood extraction rate determined by the demand for it for known material use. The extraction rates for roundwood and related residue potentials for 2020 and 2030 are therefore kept constant. Part of the residues are currently used for other material uses, but many residues still remain in the forest because there is no demand for them, although they can be sustainably removed.
It should be realised that the potential for primary residues provided (iii. in figure 3.1) is a conservative estimate as it entirely relates to current roundwood extraction levels. More optimistic scenarios like the one in EFSOS assume increased demand for roundwood and mobilisation, which would lead to additional extraction of roundwood and therefore also to an increase in available residues (ii and iv in figure 3.1).
S1 Early Thinning Stems incl fuelwood
S2 Early Thinnings Crown incl fuelwood
S3 Logging residues final fellings incl fuelwood
S4 Logging residues Thinnings incl fuelwood
S5 Stump extraction final fellings incl fuelwood
S6 Stump extraction Thinnings incl fuelwood.

The interaction between the models employed to derive the forestry-related potential is depicted in Figure 3.1

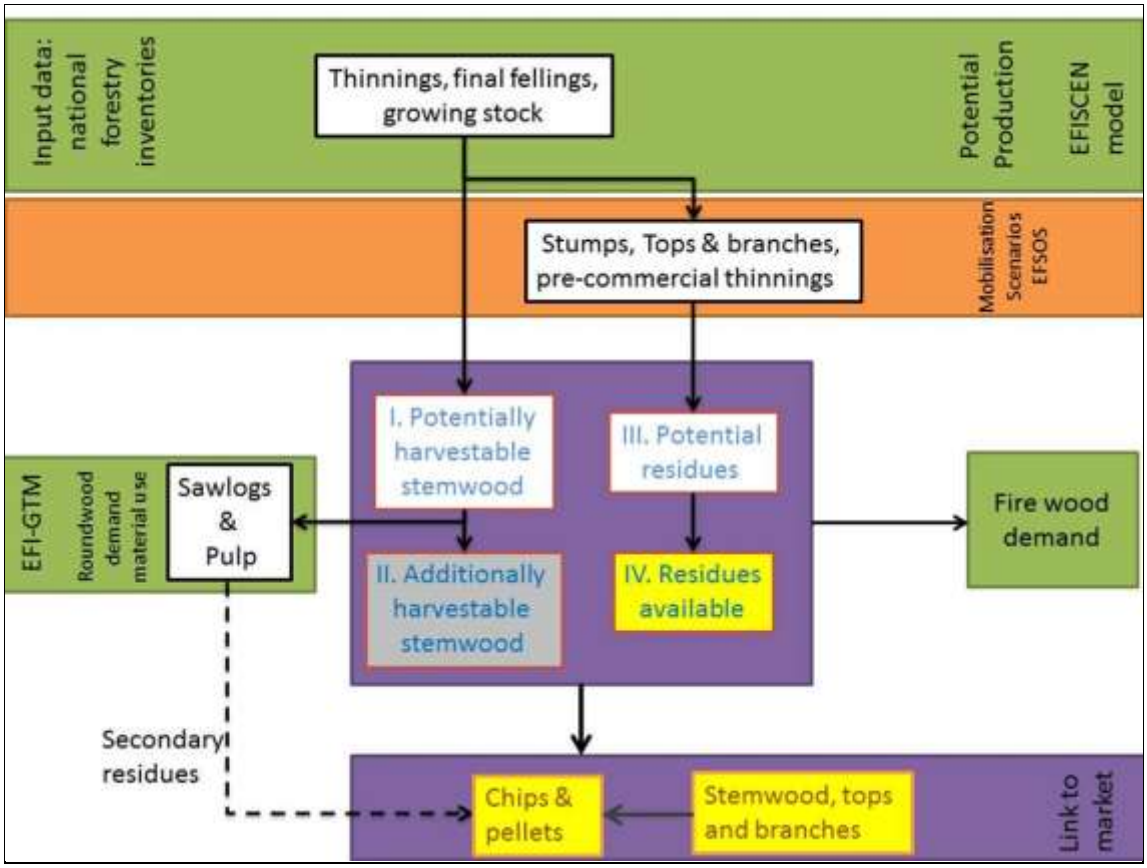

Figure 3.1 Interaction of models to derive forestry-related potential

Non-forestry-related potential

The assessment of all pertinent agro-residues was achieved using the baseline run of the economic partial equilibrium model CAPRI, which is the starting point for assessment of all agro-residues and future land release for dedicated cropping in the specialised literature (referenced at the end of this sub-section).

The use of the CAPRI results is very logical, as it is the only available model which predicts the EU agricultural markets and production responses at the regional level for the whole EU-28, western Balkans, Turkey and Norway. It is therefore the only source of information available that gives a plausible overview taking account of the specific diverse regional circumstances in the EU, of what land-use changes can be expected by 2020. CAPRI forecasts future land use and livestock production changes in the EU-28 including land demand for domestic biofuels.

The baseline run of CAPRI is the main input for the post-model assessment of land availability for dedicated biomass cropping. The baseline can be plausibly regarded as the most probable future simulating the European agricultural sector under status-quo policy and including all future changes in policy already foreseen in the current legislation. It also assumes all policy regarding bioenergy targets agreed until now and further specified in the

Trends to 2050 report (EC, 2013) so far as affecting agriculture. Further details on this aspect and also other technical details of the CAPRI model, the "CAPRI Coco database" and the incorporation of bioenergy crops can be found in Britz and Witzke (2012).

Types of residues included in the potential and explanatory notes

Apples_and_ pears:
Prunning and tree clearing potential from apple and pear orchards calculated using the areas (ha) from the CAPRI model for 2010, 2020 & 2030.

Note: The potential is calculated using the pruning ratio of 2.15 ton of dry matter per hectare per year (DM/ha per year) of which 40% is assumed to be harvested (the remaining 60% is assumed to be left in the field). The final potential amounts to 40% of the harvested potential.

Cherries_and_other_soft_fruit:
Pruning and tree clearing potential from soft fruit orchards calculated using the areas (ha) from CAPRI for 2010, 2020 & 2030.

Note: The potential is calculated using the pruning ratio of 2.15 ton DM/ha per year of which 40% is assumed to be harvested (the remaining 60% is assumed to be left in the field). The final potential amounts to 40% of the harvested potential.

Vineyards:
Pruning and clearing potential from vineyards calculated using the areas (ha) from CAPRI for 2010, 2020 & 2030.

Note: The potential is calculated using the pruning ratio of 2.85 ton DM/ha per year of which 40% is assumed to be harvested (the remaining 60% is assumed to be left in the field). The final potential amounts to 40% of the harvested potential.

Olives:
Pruning and tree clearing potential from olives calculated using the areas (ha) from CAPRI for 2010, 2020 & 2030.

Note: The potential is calculated using the pruning ratio of 1.77 ton DM/ha per year of which 40% is assumed to be harvested (the remaining 60% is assumed to be left in the field). The final potential amounts to 40% of the harvested potential.

Citrus:
Pruning & tree clearing potential from citrus calculated using the areas (ha) from CAPRI for 2010, 2020 & 2030.

Note: The potential is calculated using the pruning ratio of 2.75 ton DM/ha per year of which 40% is assumed to be harvested (the remaining 60% is assumed to be left in the field). The final potential amounts to 40% of the harvested potential.

Residual_fuelwood:

This concerns the fuelwood potential (logs for decentral stoves and small boilers, cooking) from residues (e.g. thinnings, tops, branches, stumps where allowed) only. The amount of residues available is directly related to the amount of roundwood fellings

Note: It is assessed by applying a factor (total residues production) derived from FAO statistics on the amount of wood used as traditional fuel wood. This 2010 fuel use amount is kept stable towards 2020 and 2030.

Residues included cover:

S1 Early Thinning Stems
S2 Early Thinnings Crown
S3 Logging residues final fellings
S4 Logging residues Thinnings
S5 Stump extraction final fellings (only relevant in Finland & Sweden)
S6 Stump extraction thinnings (only relevant in Finland & Sweden)

Residues_chips_pellets:

This concerns all primary forest residue potential that depends on the extraction rate of the main product, which is the roundwood fellings. It does NOT include the residues going to traditional fuel uses, as this is separately specified.

Note: It is assessed by assuming the known material demand for wood and an additional demand for roundwood on top of the known material uses, but limited by the mobilisation constraints (see above for residue types included).

Sawmill_byproducts_excl_saw_dust:

This concerns the woody by-products from saw-mills.

Note: This potential was assessed in the EUwood study and has been further allocated to nuts 2 regions based on the roundwood felling potential per region.

Saw_dust:

This concerns the saw-dust by-products from saw-mills.

Note: This potential was assessed in the EUwood study and has been further allocated to nuts 2 regions based on the roundwood felling potential per region.

Other_industrial_residues:

This concerns the secondary forest residues from wood processing industries (other than saw-mills).

Note: This potential was assessed in the EU wood study and has been further allocated to nuts 2 regions based on the roundwood felling potential per region.

Landscape_care_wood:

This concerns the cutting residues from management of landscape elements.

Note: This potential was assessed in in the Biomass Futures project and has been allocated to Nuts 2 level using the roundwood felling potential as a distribution factor.

Relevant literature for calculation of potentials:

Britz and Witzke, 2012. CAPRI model documentation 2012. http://www.capri-model.org/docs/capri_documentation.pdf
Elbersen, B.S., Fritsche, U.R, Petersen, J-E, Lesschen, J-P, Böttcher, H., Overmars, K. (2013). Assessing the effect of stricter sustainability criteria on EU biomass crop potential Biofuels, Bioproducts & Biorefining (Biofpr) Journal. Article first published online: 19 MAR 2013 | DOI: 10.1002/bbb.1396.

ETC/SIA (2013). Review of the EU bioenergy potential from a resource efficiency perspective. Background report to EEA study. Alterra, Wageningen.

Elbersen, B.S.; Staritsky (2012). Spatially detailed and quantified overview of EU biomass potential taking into account the main criteria determining biomass availability from different sources. Report for Task 3 in Biomass Futures project. IEE 08 653 SI2. 529 241.

Scarlat, N., Martinov, M., Dallemand J.F. (2010), Assessment of the availability of agricultural crop residues in the European Union: Potential and limitations for bioenergy use. Waste Management 30 (2010) 1889–1897.

3.3.2 Sustainability safeguards

The BASIS consortium is producing downloadable documents with details of sustainability safeguard, rules and schemes by country and by European regions. These documents will be posted at: http://www.basisbioenergy.eu/publications/basis.html

3.3.3 Other aspects of biomass potential

The results available through the BASIS website provide only guidance on the physical availability of feedstock and the competition for it, i.e. assessment of the likely level risk for viable biomass supply. An investment decision, however, should also be based on insights from resources such as the Cross-border bioenergy project (http://www.crossborderbioenergy.eu/), which helps to evaluate market attractiveness, for instance through market support or policy incentives and investment ratings by country.

4. Business-to-business information and matching service

4.1 The Cross-border bioenergy project

The market pre-selection enabled by the indicators, the adjustable weights and geographical comprehensiveness build a strong link to the Business-to-business platform, through which the users can contact potential distributors, partners, suppliers and, especially, clients.

The management of the Database and the Business-to-Business platform have also been engaged in the development of the methodology by forming the Core Methodology Group. WP4 representatives ensured adherence to feasibility and relevance; WP5 representatives ensured workability of the template for the subsequent communication and query-intensive phases.

4.2 The B2B Market Place

In the process of evaluating an investment in different countries it is important to build the right contacts. Intelligent Energy Europe aims to facilitate the business-to-business exchange of information for companies to promote their offers of services or requests for services. The B2B platform created in Crossborder Bioenergy and maintained in BASIS provides a forum to connect more easily market participants along bioenergy value chains. An increasing number of companies are already benefitting from this promotion and matching service throughout Europe and they include:

i. Service providers
ii. Biomass providers
iii. Technology providers
iv. Project developers
v. Consultancy firms

The B2B platform can be directly accessed at: www.b2bbioenergy.eu/b2b/ and signing up to participate is a quick and simple process requiring only main company details.

5. Conditions of use

Use of the geographical information services provided by BASIS is free of cost and there is also no fee associated with the interactive components of the service such as the B2B platform. The BASIS project consortium provides these services and the underlying modelling and source data in good faith for the sole process of informing one aspect of investment or project decision making.

6. Disclaimer

In addition to the insight provided by the BASIS project, investment decisions must also be based on complementary information on commercial conditions at specific sites and the BASIS team cannot accept any liability for the conclusions that the user may derive from the data.

7. Questions and Feedback

As a service dedicated to foster international business development in the European bioenergy sector, the BASIS team welcomes questions regarding its data or services and looks forward to the feedback from different users and stakeholders in the sector.

8. Contact details

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