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Final Report

Please note that the contents of the Final Report can be found in the attachment.

4.1 Final publishable summary report

Executive Summary

The BEE - Biomass Energy Europe - project's overall objective was to increase the accuracy and reliability of biomass resource assessments for energy. The focus was on biomass from forests, energy crops, agricultural residues and organic waste. A team of 16 interdisciplinary partners from 9 European countries worked towards the objective by analysing studies on current biomass resource assessments, methodologies, datasets, policy background and user requirements, by formulating best practises, including simple and advanced methods, by actively involving stakeholders, entities and initiatives and by disseminating, networking during the development of the project findings.
In the first step, an assessment and analysis of the policy background and the requirements of the users and a comparative analysis focussing on approximately 150 selected biomass resource studies at the global, European, regional, and national scale was conducted and resulted in two comprehensive reports; one on the policy background and user needs and the other on a characterisation of existing assessments of the variation of their quantitative findings at European level and for selected countries including Germany, Finland, Macedonia (FYROM), Croatia and Ukraine. The studies showed a large variation in results for the same geographic entity, e.g. total potential study results for EU 27 for 2020 varied from 2,8 EJ (Exajoule)- 23,8 EJ. The main reasons that lead to these discrepancies are ambiguous and inconsistent definitions of potentials, a lack of consistent and detailed data on (current) biomass production and land productivity, varying methods of estimating (future) biomass production and availability and ambiguous and varying assumptions on system-external factors that influence potentials (such as land use and biomass production for food and fibre purposes).
Secondly, methodologies and datasets used in 28 selected major studies were analysed. This included a characterisation of the identified methods in: resource-focussed approaches, such as statistical analysis and spatially explicit analysis; demand-driven approaches, such as cost-supply analysis; energy-economics and energy-system model analysis and; finally, the integrated assessment modelling approach using integrated assessment model analysis. Advantages and disadvantages of methods and the data sets used are described in a compressive report.
Following the analysis, a two volume handbook was developed to promote harmonisation in the development of biomass resource assessments. In light of the overall objective, the handbook is a central result of the project. The first volume, Harmonization of Biomass Resource Assessments Volume I: Best Practices and Methods Handbook, provides best practice methods for determination of biomass resource potentials, and gives guidance for transparent presentation of results by providing terms and definitions needed for the execution and presentation of biomass resource assessments. The second volume, Harmonization of Biomass Resource Assessments Volume II: Data Sources Handbook, provides information on data sets needed to conduct a biomass resource assessment with the methodologies described in Volume I.
According to the harmonised methodology described in the handbook, certain elements were then applied to resource assessments on European and national scale to illustrate the feasibility of the developed approach. Both the corresponding illustration case reports and the methods handbook were positively evaluated by external reviewers.
Finally, recommendations for future improvements were identified and prioritised. This includes the urgent need for integrated studied on the bioenergy potential at EU and national level to cover all biomass categories, sustainability dimensions and considering economic and implementation issues, as well as the long term need for dedicated studies for method development and an evolution of data sources.

Summary description of project context and objectives

Policy and decision makers in the EU have put energy policy objectives high on the agenda, including the promotion of the use of biomass as an energy source. European Community policy aims for a strong increase of renewable energy in the EU's overall energy mix (from a little over 10

% today, to 20 % by 2020) and a considerable increase of the share of biofuels in the transport sector, with a target of 10 % of vehicle fuel by 2020.

To achieve this increase it is envisaged in the National Renewable Energy Action Plans, which has been compiled by the 27 EU countries, that the energy generated from biomass will nearly double to 2020. Although the relative importance of biomass in the renewables sector is expected to decrease slightly from about two thirds, it will nevertheless continue to play a very important role within the renewable sector.

Reliable knowledge of the biomass potentials for energy in Europe is therefore essential. In order to achieve the challenging European policy targets in the renewable energy sector, basic information is needed for both policy and industry. However, assessments of the biomass resource potential for energy for the same geographical entity differ largely from each other.

Within this context, the Biomass Energy Europe (BEE) project was initiated to harmonise methodologies for biomass resource assessments for energy purposes in Europe and its neighbouring countries. The harmonisation improves consistency, accuracy and reliability of biomass assessments for energy, which can serve the planning of a transition to renewable energy in the European Union.

The major focus of the project was on methodological and dataset harmonisations fostered by ongoing research of a multidisciplinary team of project participants, as well as the opportunities of utilising both earth observation and terrestrial data for biomass assessments and the integration of multiple data sources. The relevant sectors investigated were forestry, energy crops, residues from traditional agriculture and waste.

The BEE project was funded by the European Commission under the Framework Programme 7 within the "Energy Thematic Area" and contributes to "Harmonisation of biomass resource assessment" activities. The project was carried out during 2008 - 2010.

The overall objective of the BEE project was to improve the accuracy and comparability of future biomass resource assessments for energy by reducing heterogeneity, increasing harmonisation and exchanging knowledge.

The assessment of both single biomass categories and overall assessments including all categories, both at the supranational level (e.g. at the EU level) and at the national and local level, was subject to that harmonisation. Relevant methodologies and data issues per major estimation steps for each biomass category were analysed for improvement and harmonisation potential.

The work in the Biomass Energy Europe project was structured into 7 work packages (WPs). Two work packages ran from the beginning until the end of the project: WP1 Project Management and WP2 Dissemination and Networking. Since dissemination, the coordination of R&D and networking are closely linked, they were managed within one work package, and, since these activities were of essential importance in this project, a separate work package was devoted to this significant activity. Work packages 3 to 7 focused on a specific topic of thematic work and constitute a logical working sequence.

Within the working sequence of the BEE project, the first work package, "Status of Biomass Resource Assessments" (WP 3), covered two major pillars: (i) the assessment and analysis of the policy background and the requirements of the users of the information from resource assessments and (ii) a comparative analysis of existing biomass resource assessments at the global, European, regional, and national scale, with the aim of analysing the heterogeneity of the results, methodologies and data sources used.

In WP4 Analysis of Biomass Resource Assessments, the methodologies and datasets used in major studies identified in WP3 were analysed in order to identify common approaches, as well as important differences.

In WP5 Harmonisation of Biomass Resource Assessments, elements of a harmonised methodology were identified based on common methodological discussions, together with the identification and

specification of data requirements.

In WP6 Illustration Cases, elements of the harmonised methodology were applied in resource assessments on a Pan-European scale with a focus on EU-27, accompanied by single resource assessments at the national level to illustrate the feasibility of the developed approach.

The last WP of the sequence is WP7 Integration, Evaluation and Recommendation, where achievements were synthesised, summarised and critically reviewed, and recommendations for future improvements were identified and prioritised.

Description of main S & T results/foregrounds

1. Political Framework and User Requirements

In every EU member country there are already some stated targets for increased production of renewable energies. After the transition period of the Directive 2009/28/EC (i.e. by 5 December 2010), each Member State will have implemented the mandatory targets in their national legislation. However, the political framework to support the targets differs from country to country, ranging from strong financial incentives to no measures at all - or even political barriers. Policy measures, targets and choices have proven to be of vital importance for the success of bioenergy sector development. It should be ensured, that bioenergy is considered an integral part of energy, agriculture, forestry, waste and industrial policies. Such a holistic approach to biomass is much needed in order to avoid future conflicting developments and to maximize the benefits of bioenergy deployment.

Regarding the impact of the strategies, policies and support measures on biomass resource assessments, it can be concluded that their impact is not considerable - as long as the theoretical biomass potential is regarded. The technical biomass potential is the theoretical biomass potential limited by the demand for land for other purposes (e.g. food, feed and fibre production but also conservation areas) and based on assumed level of technology. However, as soon as economic profitability, social criteria or environmental constraints come into play, the resulting implementation potential is considerably affected by the political framework. Financial instruments, for example, can significantly increase economic profitability of certain biomass types or conversion technologies and thereby increase the (variable) economic biomass potential. As a consequence, biomass resource assessments displaying results for any other potential than the (constant) technical potential are hardly comparable. This is because they are often based on a huge range of scenarios concerning (future) policies, socio-economic parameters and the state of the environment.

During the latest few years, the tendency has been to introduce strategies and policies with larger scope than previously, when most targets were set sector-wise giving a chance to overlapping resource assessments and competition between alternative uses of the same resources. The Biomass Action Plan, Renewable Energy Road Map and SET-Plan can be mentioned as examples of recent papers in which different uses of biomass resources (electricity, heating/cooling, transport) and their interaction have been taken into account. In the future, the introduction of biorefineries may bring an additional aspect to be considered.
Another recent trend has been to widen the scope and borderlines of a bioenergy system in consideration in such a way that the sustainability issues can better be taken into account, including indirect impacts such as indirect land use changes (iLUC). For example, the ambitious targets for transport biofuels have been questioned due to the fear of impacts on food availability and prices, as well as the loss of rainforests as consequences of increased demand and the ability of the biofuel industry to pay for the biomass.

Reliable knowledge of the biomass potentials for energy in Europe is essential basic information needed for both policy and industry to achieve the challenging European policy targets in the renewable energy sector. In addition to policy makers and authorities at different levels (local, national, EU, etc.) and industrial investors, there are other potential users of biomass resource assessments, such as research organizations, NGOs, etc. Different user groups - and even different single users - have different requirements on the assessments, depending on the intended use of the results. Different requirements appear in terms of, for example, biomass categories to be covered, time frame, geographical coverage, type of potential, etc.

The results of the study on user requirements showed that the Biomass Energy Europe project is definitely on the right track. The respondents have identified several aspects of biomass assessments that need more attention so that the assessments would be more useful and reliable in the future. Respondents suggested that the organizations preparing the assessment should work together more intensively to find better ways to harmonize the methodology and data sources used. This has been the main focus of the BEE project.

In order to really harmonize the biomass resource assessments, clear guidelines are needed. Different assessments are comparable only if source data and methods are consistent. More transparency is needed. It is essential to clearly describe the basic assumptions, limitations, and methods used. In addition, different users have different requirements and expectations for the assessments. When it comes to the units used, updating frequency, geographical coverage and level of detail, there are almost as many opinions as there are users. By providing sufficient information on how the assessment has been compiled, it is easier for users to decide if the assessments are appropriate for their needs. In order to provide more reliable, transparent biomass resource assessments, new kinds of co-operation between organizations preparing the assessments would help.

2. Status of Biomass Resource Assessments

Keeping in mind the ultimate aim of facilitating the rational use of bioenergy in Europe by providing standardised approaches to biomass resource assessments, the objective of this Status of Biomass Resource Assessments work package was to provide an in-depth insight into state-of-the-art biomass resource assessments at the global, regional, and national scale, with the aim of analysing the heterogeneity of the results, methodologies and data sources used. This first work package in the working sequence of the BEE project also provided a basis for the following packages in establishing a general baseline and principles.

Biomass categories and types of biomass

Biomass can be divided into several biomass categories. This subdivision can be based on different parameters. For the BEE project, the following broad subdivision is used: (i) woody biomass from forestry, (ii) woody and herbaceous energy crops from agriculture, and (iii) organic waste. This broad subdivision is then further detailed into further subcategories.

Types of biomass potentials

Looking at the use of biomass for energy, it is very important to know which biomass potentials we are actually talking about. Four types of biomass potentials are commonly distinguished: (i) theoretical potential, (ii) technical potential, (iii) economic potential and (i) implementation potential.

They are meant as an orientation and therefore obviously may not cover all approaches found in the numerous studies that has been analysed during this project. Moreover, the concept of a fifth type of potential 'the sustainable implementation potential' is introduced.

Theoretical potential

The theoretical potential is the overall maximum amount of terrestrial biomass which can be considered theoretically available for bioenergy production within fundamental bio-physical limits. The theoretical potential is usually expressed in joule primary energy, i.e. the energy contained in the raw, unprocessed biomass. Primary energy is converted into secondary energy, such as electricity and liquid and gaseous fuels. In the case of biomass from crops and forests, the theoretical potential represents the maximum productivity under theoretically optimal management taking into account limitations that result from soil, temperature, solar radiation and rainfall. In the case of residues and waste, the theoretical potentials equal the total amount that is produced.

Technical potential

The technical potential is the fraction of the theoretical potential which is available under the regarded techno-structural framework conditions with the current technological possibilities (such as harvesting techniques, infrastructure and accessibility, processing techniques). It also takes into account spatial confinements due to other land uses (food, feed and fibre production) as well as ecological (e.g. nature reserves) and possibly other non-technical constraints. The technical potential is usually expressed in joule primary energy, but sometimes also in secondary energy carriers.

Economic potential

The economic potential is the share of the technical potential which meets criteria of economic profitability within the given framework conditions. The economic potential generally refers to secondary bioenergy carriers, although sometimes also primary bioenergy is considered.

Implementation potential

The implementation potential is the fraction of the economic potential that can be implemented within a certain time frame and under concrete socio-political framework conditions, including economic, institutional and social constraints and policy incentives. Studies that focus on the feasibility or the economic, environmental or social impacts of bioenergy policies are also included in this type.

The classification in types of biomass potentials helps the reader to understand what information is presented. For instance, some biomass types show high technical potentials while their economic potential is rather limited due to the high costs of extraction and transport. Therefore, it is recommended that the type of potential is explicitly mentioned in every biomass resource assessment. In existing resource assessments, it is often difficult to distinguish between theoretical and technical potential and between economic and implementation potential. Technical and theoretical potential on the one hand, and the economic and implementation potential on the other, each form a pair of potential types. However, even more important than making this distinction in four types is the provision of insight into explicit conditions and assumptions made in the assessment.

Sustainable implementation potential

In theory, a fifth type of potential can be distinguished, which is the sustainable implementation potential. It is not a potential on its own but rather the result of integrating environmental, economic and social sustainability criteria in biomass resource assessments. This means that sustainability criteria act like a filter on the theoretical, technical, economic and implementation potentials leading in the end to a sustainable implementation potential. Depending on the type of potential, sustainability criteria can be applied to different extents. For example, when deriving the technical potential, mainly environmental constraints and criteria are integrated that either limit the area available and/or the yield that can be achieved. Applying economic constraints and criteria leads to the economic potential and for the sustainable implementation potential, additional environmental, economic and social criteria may be integrated.

There is a strong demand for inclusion of sustainability aspects in bioenergy potential. Especially after bioenergy, in general, and biofuels, in particular, lost some of their good reputation due to the food versus fuel debate and due to an increased awareness land use competition and land use changes, both industry and politics strive for more sustainable practises. The concept of sustainable biomass contains multiple environmental, economic and social aspects, while integrating these aspects may be complex.

Sectoral potentials

Figure 1 gives an overview of the span in potentials reported in the analysed studies at EU27 level. The largest contribution to the total biomass potential for energy comes from dedicated energy crops on agricultural and marginal land. However, the range of results for energy crops is considerable.

As expected, the range in estimated potentials is much greater for dedicated energy crops on agricultural land than that for residues from forestry and agriculture systems and organic waste. It is also noteworthy to mention that the span in potentials for dedicated crops increases substantially over time. In contrast, for the potentials from residues in forestry and agriculture there is no such clear trend over time. Particularly in the case of residues from forestry, the average of the reported potentials is relatively constant over time.

Total potentials

A numbers of studies which assess the total potential for biomass have also been analysed. Figure 2 gives a summary of the min-max values taking into account all scenarios in each of the studies.

Besides the great deviations in potentials at each point of time, it can also be noted that overall deviations increase over time, as is clearly seen in Figure 2. The biomass category mainly responsible for the increased deviation is dedicated energy crops, whose upper-limit potential increases drastically in some of the studies. In contrast, the potentials for residues from agriculture and forestry, and organic waste, do not exhibit any clear trend over time, and overall the deviations in potentials are smaller.

Possible reasons for variation in the results:

Depending on the goal and intended application of the study, these factors are defined in close collaboration with the author / executing institution and the initiator / funding institution, i.e. they are externally influenced:

- Biomass categories covered

- Type of potential

- Types of biomass considered

- Time frame

- Geographical coverage.

In contrast to the above mentioned reasons for variations in the results, there are a number of other factors which are mainly determined internally by the author / executing institution. These internally influenced factors are:

- Approach

- Method

- Systematisation and terminology

- Data sources

- Units and conversion factors

- Scenario assumptions and constraints.

The analysis has shown that different terminology and systematisation of categories as well as insufficient documentation of approaches and scenario assumptions makes comparison of results quite difficult. In general, the major reasons behind the disparities in estimated potentials are:

- Ambiguous and inconsistent definitions of concepts of potentials

- Lack of consistent and detailed data on (current) biomass production and land productivity

- Ambiguous and varying methods of estimating (future) biomass production and availability

- Ambiguous and varying assumptions on system-external factors that influence potentials (such as land use and biomass production for food and fibre purposes).

In cases with very large disparities between assessments, it is mainly the latter of these aspects (i.e. system-external factors) that explains the differences, since, for instance, land requirements for food production heavily influences the availability (and cost) of land for dedicated energy crops. A harmonisation of definitions, approaches and methods is needed to increase accuracy and comparability of results.

3. Methods for Biomass Resource Assessments

Existing biomass resource assessments use a broad variety of approaches, methodologies, assumptions and datasets that lead to different estimates of future biomass potentials. An overview of approaches, methodologies and datasets used in existing biomass assessments has been compiled and similarities and differences were evaluated for further details. In addition, the synergies achieved when combining various approaches methodologies and datasets have been identified, as well as remaining gaps in knowledge and data. The results formed a basis for the development of the harmonised approach and harmonisation measures that has been developed in later phases of the BEE project.

First, a database of circa 250 bioenergy potential assessments was compiled, out of which 28 studies were selected for detailed analysis. The 28 studies were chosen so that they, among others, cover the variability found in the literature with respect to the type of biomass, the type of bioenergy potential and the approach and methodology. Table 1 shows the categorisation of the approaches and methodologies that are distinguished in this study.

Three types of approaches can be distinguished:

1. Resource-focussed assessments investigate the bioenergy resource base and the competition between different uses of the resources, i.e. the focus is on the biomass energy supply side.

2. Demand-driven assessments analyse the competitiveness of biomass-based energy systems, in comparison to conventional fossil fuel based energy systems as well as other renewable energy systems and nuclear energy, or estimate the production and use of biomass required to meet exogenous targets on climate-neutral energy supply, i.e. the focus is on the biomass energy demand side.

3. Integrated modelling assessments use integrated assessment models (IAMs), which are designed to assess policy options for climate change. IAMs include mathematical correlations between the socio-economic drivers of economic activity and energy use, which leads to emissions and other pressures on the environment that lead to environmental changes, which lead to physical impacts on ecosystems, which in turn leads to socio-economic impacts and eventually return to cause changes in the socio-economic drivers.

The following methodologies are identified:

1. Statistical analysis. The least complicated studies estimate the energy potential based on assumptions concerning the yield per hectare, which is based on expert judgement, field studies or a literate review, in combination with assumptions concerning the fraction of land available for energy crops or the fraction of forest biomass available for energy production, which accounts for the use of land and biomass for other purposes and environmental or social barriers. Frequently, results from other studies are utilised, but several other studies also use scenario analysis. The potential of residues and waste is generally calculated based on projections of the production of food and wood, multiplied by residue and waste generation coefficients and multiplied by a factor that account for the fact that many residues and wastes cannot be collected in practice. Some studies also assess the use of residues for other purposes.

2. Spatially explicit analysis. The most advanced resource-focussed assessments include spatially explicit data on the availability of land and forests in combination with calculations of the yields of energy crops and forests. The yield calculations are based on data from crop growth models that use spatially explicit data on climate, soil type and crop management. The availability of agricultural land for energy crop production is estimated taking into account the use of land for the production of food and other purposes. The scenario analysis it's based on takes into account agricultural policies, technological development, population growth, income growth, and so forth. A type of land that has received special attention in this research is degraded and marginal land, since this type of land is partially or not suitable for conventional agriculture. Thus, the use of these types of areas does not lead to competition with food. The same approach is applied when estimating the potential of forestry and forestry residues, agricultural residues and organic waste.

3. Cost-supply analysis. The cost-supply analysis begins with a bottom up analysis of the potential, based on assumptions on the availability of land for energy crop production, including crop yields, or assumptions on the availability of forestry and forestry residues. The demand of land and biomass for other purposes and environmental and other (social, technical) limitations are included, ideally by scenario analysis. The resulting bioenergy cost-supply curves are than combined with estimates of the costs of other energy systems or policy alternatives, often with specific attention for policy incentives (e.g. tax exemptions, carbon credits, and mandatory blending targets).

Each approach and methodology has specific (dis)advantages, which are summarised in Table 2. Statistical analyses only offer very limited possibilities to account for environmental or social needs as they only can be included via a general reduction factor. This factor usually refers to the average and thus cannot reflect specific local conditions. Static spatially explicit analyses are more adequate to reflect a biomass potential that is adapted to local or regional circumstance, which makes it much easier to take into account environmental or social aspects. Here, different layers containing relevant and local soil, water and climate information can be combined. Crucial in these types of resource focussed assessments are the scenarios to evaluate the impacts of changes in technology on crops yield and thereby on the availability of surplus agricultural land for energy crop production. Static spatially explicit analyses, as statistical analyses, do not offer any possibility to include feedback mechanisms, trade-offs and synergies between the three sustainability dimensions. Furthermore, it is not possible to adequately account for the economic dimension, which is especially important when evaluating the feasibility of changes in technology and thus the availability of land for energy crop production. Several studies use partial or complete equilibrium models to estimate the contribution of biomass energy to the energy supply mix. The ideal energy model study has at least the following characteristics:

- It takes the fundamentals of energy demand into account, e.g. population growth, GDP development, and relates global energy demand to these factors in a way that deals with the possibility of improving energy efficiency by technological and other innovations.

- It includes all energy-related sectors and applications of feedstock, e.g. power generation, transport, heating (domestic as well as industrial) as well as feedstock applications for materials.

- It encloses all options for supplying energy-related services, e. g. conventional and advanced fossil options and all kinds of renewable options.

- It fills in projected energy demand per sector by economic rules, e.g. by choosing least-cost options

at given (external) constraints. Such constrains can be specific policies or explicit CO2 reduction targets, but other constraints will be inherent to the energy system (e.g. no unlimited introduction of intermittent power generation technologies without addressing costs for net balancing measures).

- Costs of the different energy supply options are assessed with dynamic (e.g. biomass applications) and interrelated cost-supply curves.

- These curves also particularly take into account technological learning of innovative options.

- It contains extensive analysis of the sensitivity of the outcomes to different scenarios or differences in the key assumptions on e.g. costs.

A key disadvantage of these types of studies is that the results are not validated with data about the availability and productivity of land for energy crop production. Moreover, energy models are especially suitable to investigate the costs and economic potential of biomass energy in relation to other energy sources but these models do not allow estimates of the impacts on food and fibre markets. However, to estimate impacts on food and fibre markets, agricultural economics models can be used. The ideal agricultural economics model study takes into account the effects on prices, production and markets of all other crops. The ideal study compares the net-return of all possible crops which a farmer can grow. The competition with other markets (food, feed) - determining the output prices of competing markets and crops - is decisive for the economic feasibility of biofuels. The ideal study is able to deal with the competing claims of food, feed and fuel on production factors in order to estimate a real economic feasible production of biomass for fuel. Ideally the agricultural economics models are linked with energy models and expanded with energy crops that are currently not produced on a large scale and are usually not included.

In theory, an integrated assessment model would be best suited to include all different aspects and facets of sustainability of biomass energy production, including all relevant feedback mechanisms as well as synergies and trade-offs. IAMs thereby allow for the use of multi-dimensional scenarios, whereby a large variety of assumptions on the different parameters (population growth, economic growth, food consumption, environmental policies, trade patterns etc.) are consistent. IAMs combine bottom up data on land use and productivity with energy models and agricultural economics models. As such, IAMs provide an appropriate framework to estimate the potential of biomass energy, the impacts on agricultural markets and food security, GHG emissions and land use. An important handicap is the complexity of these models, which makes these models relatively non-transparent, expensive to develop and user unfriendly in operation. Moreover, it has to be taken into account that with the integration of separate models, uncertainties due to data gaps or insufficient modelling will be transferred to the IAM.

Furthermore, there are general bottlenecks when evaluating the availability of biomass for energy production and there is food versus bioenergy issues:

- Integration of modelling efforts of the various arenas included in this assessment, in particular macro-economic/market models that are interlinked with integrated assessment tools and bottom-up analyses of agricultural, livestock and biomass production systems.

- Improved understanding of marginal and degraded lands and potential biomass production systems with their respective performance and impacts. None of the key studies specifically investigated the biomass energy potential of crops grown on degraded land. Yet, various datasets are potentially useful when evaluating the potential of energy crops from degraded land. However, a crucial limiting factor and therefore a key target for future research is the availability of reliable data about soil degradation and the impact on crop yields.

- Improved databases are required for soil quality and land-use functions & categories; such basic data are an important prerequisite for more reliable model outcomes.

- More detailed, preferably on the level of water basins, analysis of the impacts of changed land use and vegetation patterns on water use. Such analyses should also include improved understanding of ways to limit water use via improved (crop) management or vegetation strategies.

- Improve the understanding of how agricultural and forest management and efficiency can be improved and via what strategies. This should be studies for a wide variety of settings, covering subsistence farming systems in Africa up to the more intensive farming systems in e.g. Eastern Europe.

- Concrete case studies on the full range of impacts (ecological and socio-economic) and performance (production levels, costs) of biomass production (and supply) systems in concrete settings, in particular covering more difficult circumstances, such as the use of degraded lands.

Furthermore, the results also show that sustainability aspects are inadequately taken into account in existing biomass potential assessments. There is no study that includes all three dimensions of sustainability (environmental, social, and economic) nor is there a study that covers all relevant aspects of one dimension. Generally, environmental factors are overrepresented whereas social and economic aspects are taken into account far less frequently. Regarding the environmental dimension, biodiversity and climate aspects are included more often than soil and water aspects.

Crucial environmental aspects that are insufficiently taken into account in existing studies are the impacts on biodiversity and climate change.

An ideal study of biodiversity effects takes into account all relevant biodiversity aspects and scales and should not only show local effects, such as irrigation, fertilizer and pesticide use, former land-use and landscape structure, but also possible shifts and trade-offs to other locations. Such studies ideally estimate the net impact of energy crop production on biodiversity by summing up the impact on:

- The change of land use, where the focus is on the short-term land-use dynamics, with and without bioenergy. The cultivation of natural areas typically leads to significant biodiversity loss. In the case of the cultivation of abandoned land, the effect in time depends on the restoration time of biodiversity values. The values of cultivated land depend on management practices and crop type.

- The total net change in GHG emissions (and consequently climatic change), whereby a comparison of climate change mitigation policies is needed for (1) with and without bioenergy and (2) different applications of the same biomass. The net GHG emissions of bioenergy systems depend largely on the technology, soil characteristics, climate, and particularly on the direct and indirect changes in land use that are induced by energy crop production.

- Other direct and indirect environmental impacts, whereby ideally a comparison is needed of scenarios and climate change policies, with and without bioenergy. Typically, most environmental impact assessment of biomass energy production and use focus on the absolute impact and ignore climate change or evaluate the relative impact compared to reference land use types. This approach probably leads to an overestimation of the environmental impacts of bioenergy. This means that integral, global impacts of bio-energy in a life cycle-approach, comparing the effects of biofuels and fossil fuels over the whole production chain on greenhouse gas emissions, land-use and biodiversity effects is required.

For climate change similar conclusions can be drawn. The impacts of land use changes are (potentially) crucial due to the direct and indirect changes in above and below ground biomass and soil organic matter. These are, however, uncertain. Ideally, these direct and indirect changes in land use are assessed using agricultural economic models that included a land use component. Furthermore, the net GHG emissions of bioenergy systems depend largely on the technology, soil characteristics and climate. Technical learning, i.e. the increased efficiency of production, is also an aspect that is often insufficiently taken into account. Other crucial variables are the fertilizer induced emissions of nitrous oxide and the choice of methodology used to account of co-products.

Another major point of discussion is the availability of water. Most studies focus on the water use at a field/plot scale, e.g. by considering only rain fed crop production. However, these effects cannot be extrapolated indiscriminately to higher scale, because 'water losses' upstream are available for use downstream. When water use upstream increases, there may be less water available downstream. To estimate water availability for energy crop production it is best to carry out a scenario analysis at a

water basin level. The availability of accurate, spatially explicit data is, however, a key limiting factor.

Regarding the social dimension, many studies account for the competition of biomass and land with food, which is always given priority. Although many studies assess economic aspects, only a few calculate the impact of bioenergy production on crop and food prices by integrating bioenergy production in the whole market system.

4. Harmonisation of Methodologies for Biomass Resource Assessments

Existing biomass resource assessments use a broad variety of approaches, methodologies, assumptions and datasets that lead to different estimates of future biomass potentials. The overall objective of the Biomass Energy Europe (BEE) project has been to improve the accuracy and comparability of future biomass resource assessments for energy by reducing heterogeneity of terms and definitions, increasing harmonisation of data and calculations and exchanging knowledge on methods and approaches.

In light of the overall objective, a two volume handbook has been developed to promote harmonisation in the development of biomass resource assessments. The first volume, Harmonization of Biomass Resource Assessments Volume I: Best Practices and Methods Handbook, provides best practice methods for determination of biomass resource potentials, and gives guidance for transparent presentation of results by providing terms and definitions needed for the execution and presentation of biomass resource assessments. The second volume, Harmonization of Biomass Resource Assessments Volume II: Data Sources Handbook, provides information on data sets that are needed to conduct a biomass resource assessment with the methodologies described in Volume I. The handbook focuses on methods that can be applied in national and European level biomass resource assessments. If data source availability allows it, the methods can be used at a more local level and outside Europe as well.

The handbook serves multiple functions, it:

- Can be used as a reference work on the use of terminology in the field of bioenergy resource assessments.

- Provides an overview of best practice methods in the range of relatively straightforward resource-focussed biomass assessments to complex integrated assessments.

- Presents a detailed overview of sustainability themes, criteria and parameters that are relevant for biomass resource assessments and shows how they could be implemented in future biomass resource assessments.

Methods are provided for four categories of biomass types: forest biomass, energy crops, agricultural residues and organic waste. Furthermore, five types of methods are identified: statistical methods, spatially explicit methods, cost-supply methods, energy-economics and energy system model methods, and integrated assessments, see Table 3 for a detailed overview. For each of the before-mentioned biomass types, the handbook shows how these methods can be applied. Moreover, the handbook provides a detailed overview of sustainability aspects, that can be implemented in future biomass assessments.

Each method has its own merits and costs. The handbook seeks to provide guidance to policy makers and companies that that need to specify their need for biomass resource assessments. In parallel, it serves scientists and consultants in providing detailed descriptions of methods and a large selection of useful data sources for the performance of biomass resource assessments.

With the BEE Methods and Data Sources Handbook, a first contribution towards a harmonisation of methods, data and consequently on results is made. Still it is clear that in many aspects further development is necessary, this with focus on integrating more accurate empirical data, more

constraints and technological developments.

Since there is clearly no uniform methodology, it is of high importance in biomass potential assessments for energy to clearly document all methods and data used. Moreover, it is of special importance not only to characterise the type of potential that is assessed, but to provide clear information on methodological choices and constraints, describe the scope of the study and state which data sets that has been used etc. Only such clear documentation will increase the comparability of future biomass assessments for energy.

5. Illustration of Methodologies for Biomass Resource Assessments

The BEE Method and Data Sources Handbooks summarises approaches and methods and harmonises assumptions on biomass resource assessments based on existing studies. It does not propose just a single method to fit all purposes but rather describes and documents various alternative approaches and methods in a comparative way.

As part of the project, some of the methodological recommendations for biomass resource potential for energy are illustrated and validated in their applicability by implementing the proposed methods to specific cases. A total of five illustration cases were carried out at different geographic scales: (i) pan European (individual EU27 plus a few non-EU countries), (ii) Croatia, (iii) Finland, (iv) Ukraine and (v) FYR Macedonia.

Each illustration case assesses the potential for a set of biomass types in combinations with specific methods. Table 4 lists these combinations. The main illustration case is implemented at the European level and provides estimates for individual EU27 and a few additional countries. All types of biomass for bioenergy are analysed at this level. This case study covers not only different biomass types at one time but also applies alternative assessment methods. This makes comparisons across methods, potentials and biomass types possible. Illustration cases at the national level are targeting specific biomass categories. For Croatia there is a focus on willow as an energy crop. The focus of Finland is on advanced spatially explicit methods for estimating biomass potentials from forestry and forestry residues. Finally, the case of Ukraine covers all biomass sources in a country under economic transition and with low actual use of biomass for energy. An example of a country which lacks basic statistical information for carrying out biomass assessments is FYR Macedonia, a BEE illustration case that highlights data needs and issues of data consistency.

These illustration cases provide not only information on European and national biomass potentials, but also demonstrate how a biomass resource assessment using a harmonised approach can be performed. Thus, regional differences in data availability and access, as well as the latest methodological achievements are considered.

Figure 3 summarises the results of the European illustration case at the level of biomass types and sources and the type of potential. The data were averaged over different assessment methods if estimated by more than one.

It is striking that for different biomass types the differences between potential levels vary. When summing over all countries and averaging over all methods, some basic relationships can be observed. Table 5 displays the percentage share of the theoretical potential for the technical and economic potential for different biomass types and sources. The numbers have to be interpreted with care as the estimates for the same level of potential differ significantly between methods. For energy crops, in general, a reduction of one order of magnitude can be expected when going from the theoretical to the technical potential. For forestry the reduction is less severe. Potentials are reduced to about one third or fourth on average going from theoretical to technical potential and halved again for the economic potential. However, for fellings, large variability due to alternative definition of potential types were observed. Here the technical potential can be very close to the economic potential.

The illustration case results were validated by parties outside of the BEE consortium (e.g. ministries

and research institutes on national and EU level); parties which were selected based on their expertise in evaluating biomass potentials.

Nearly without exception, the feedback on the BEE Methods Handbook and the illustration cases was positive. The reviewers of the European illustration positively recognized that the cross-sectorial handling of the potentials (i.e. forestry, agriculture and energy crops) enables a comparison between potentials. Moreover, it was acknowledged that the demonstration of the applicability of the methods in the European illustration case can be regarded as a step forward towards more harmonized assessments. The general opinion amongst the nine reviewers was that the handbook can be seen as a reference for future work on assessments of biomass potentials.

6. Recommendations

With reference to the work and experiences of all analysis and assessments performed as part of the Biomass Energy Europe project, general recommendations regarding future bioenergy assessments and development of methodology and data are presented with a focus on the need to achieve reliable and harmonised, i.e. comparable, potential assessments of the sustainable implementation potential of biomass for energy utilisation both on national and EU level.

New bioenergy assessments at EU and national level

Given the high relevance of bioenergy for the European Community, there is a strong and urgent need for new and comprehensive studies at the national and EU level that fully address, in an integrated manner, the sustainable implementation potential. National level studies would, at the same time, assist future updates of the National Renewable Energy Action Plans. For both types of studies a solid description of methods, data sources and recommendations exist within the BEE Methods and Data sources Handbook.

These urgently needed new studies at national and EU level should specifically consider:

- All land use sectors and uses for biomass (i.e. energy, food, feed and material uses) in an integrated manner, taking into account both global and local dynamics

- All three pillars of sustainability should be covered: (i) environment, (ii) society and (iii) economy.

- Economic and implementation potentials

- New and improved data as they become available

Due to their importance for climate mitigation and energy policy, both EU and national level bioenergy assessments should be:

- Regularly updated

- Comparable amongst each other

- Interlinked with each other (e.g. EU level studies could use results or interim results from national level studies).

It is therefore recommended that permanent links between entities working on national and EU level assessments in a dedicated network be established. The BEE Methods Handbook could serve as a baseline for such a network and get the status of a reference work for biomass resource assessment methods.

Recommendations for methodology development

From our analyses it is quite clear that integrated assessments are needed, especially when striving to assess the sustainable implementation potential. Key advantages with integrated assessments are that the multitude of interlinkages, correlations and parameters affecting the biomass potential may be captured in a single modelling framework. Furthermore, sustainability criteria can be taken into consideration, including feedback mechanisms that allow reproduction of the complexity of sustainability in a more realistic way.

Six important areas have been identified for the development of a methodology for estimating bioenergy potential:

- Integrated modelling of biomass potential and use;

- Advanced integration of remote sensing and earth observation data;

- Improved methodology for estimating net climate benefits of bioenergy;

- Improved methodology for estimating the environmental effects of intensive and large-scale bioenergy systems;

- Increased understanding of the social acceptance of large-scale bioenergy systems;

- Increased understanding of conflicts between different goals for bioenergy use.

Recommendations for data development

There is a strong need for further development of data for biomass resource assessments, as well as data on current biomass use, to facilitate the identification of biomass resources still available for energy. Three levels of data development needs have been identified:

- Data assessing the current production and use of biomass and bioenergy;

- Data needed to perform assessments of the current and future potential of biomass for energy;

- Data & data development pertaining to Earth Observation (EO) techniques.

Three overarching areas of data pertaining to biomass and bioenergy need to be augmented and improved:

- Supply: including forestry, agriculture and organic waste and biomass processing industries;

- Demand: including the main demand sectors, i.e. heat and power generation (both domestic and large scale), saw mills and the pulp and paper industry and biofuel production;

- Trade: including imports and exports of all kinds of biomass and biofuels.

Potential impact and main dissemination activities and exploitation results

The BEE project contributed to a clear overview on the expansion capacities of renewable biofuel production in Europe by:

1. Contributing to a better understanding and classification of the potential of biomass use for bioenergy in the EU and on national level by analysing existing studies and conducting of the illustration case studies

2. Producing a handbook that contributes to a harmonisation of biomass resource assessments at EU and national level

3. Analysing existing approaches and describing adequate methodologies in the handbook to support better monitoring of sustainability and competitiveness aspects

4. Indirectly contributing to a more efficient use of the available biomass feedstock, since such use requires sound knowledge on sustainable implementation potentials.

The analytical findings of the BEE project that contribute to these four major aspects were intensively disseminated and are available in the following reports on the BEE website (www.eu-bee.com):

- D 3.5 Political Framework and User Requirements of Biomass Resource Assessments for Energy Version 3. This report provides an assessment and analysis of the policy background and the requirements of the users.

- D 3.6 Status of Biomass Resource Assessments Version 3. This report provides a comparative analysis focussing on approximately 150 selected biomass resource studies at the global, European, regional, and national scale.

- D 4.5 & 4.6 Methods & Data Sources for Biomass Resource Assessments for Energy Version 3. This report includes an analysis of the methodologies and datasets used in 28 selected major studies.

- D 5.3 Harmonization of biomass resource assessments: Volume I Best Practices and Methods Handbook. This report provides best practice methods for determination of biomass resource potentials, and gives guidance for transparent presentation of results by providing terms and definitions needed for the execution and presentation of biomass resource assessments.

- D 5.4 Harmonization of biomass resource assessments: Volume II Data Sources Handbook. This report provides information on data sets needed to conduct a biomass resource assessment with the methodologies described in "D 5.3 Harmonization of biomass resource assessments: Volume I Best Practices and Methods Handbook".

- D 6.1 Summary Report on Illustration Cases. This report and related annexes provide information on the application of methodologies and data stets described in "D 5.3 Harmonization of biomass resource assessments: Volume I Best Practices and Methods Handbook" and "D 5.4 Harmonization of biomass resource assessments: Volume II Data Sources Handbook".

- D 7.1 Executive Summary, Evaluation and Recommendations. This report provides a summary of the project findings and conclusions.

The project findings provide a solid baseline for future potential studies and include recommendations for necessary steps for further improvements.

With respect to Western Balkan and Eastern European countries that are outside the EU but have also been subject to analysis and dissemination and networking, these achievements will help develop new policies and contribute to a mobilisation of biomass with positive effects for the use for bioenergy in the EU.
Considering the nature of the BEE project, being a Coordination Action, it was of great importance that the project results are widely disseminated among the stakeholders. The main stakeholder groups of the project results included the European Commission services, research bodies dealing with biomass potential estimations, industries and investors, national ministries and associated authorities, statistics offices, as well as international organisations and processes with mandates of data collection and analysis.
One example of a direct utilization of BEE results

The following dissemination activates were carried out in the course of the project:

- Direct Dissemination

Representatives from major stakeholders at the European level were contacted directly. At the national level, major stakeholders were contacted directly in the home countries of participants. They were well informed on the project; four newsletters were sent to continuously inform interested

representatives on project progress.

- Project Web Site and Web Portal (www.eu-bee.com)
A project website was established in the beginning of the project to provide a wide dissemination of the results about the project on the internet. All newsletters, main deliverables and further information on the subject are made available on the site. The website was the main source for project publications that were aimed towards a wider community. The public website was used intensively and has reached up to 10 000 visitors with more than 250 document downloads per month. The website included services needed to support internal exchange of information between partners and stakeholders.

- Dissemination material
Common dissemination material, including brochures in 15 languages, newsletters and posters, were prepared and disseminated by the partners at different events, seminars etc. All material was published in English and, when necessary, the material was also translated into other languages, such as Russian, to ensure that all the stakeholders had access the results.

In order to also achieve the necessary impact on the realisation of biomass potentials in neighbouring regions of the EU-27, the dissemination includes also Eastern Europe and Central Asia, and Western Balkan Counties.

- Dedicated dissemination in Eastern Europe and Central Asia

The following countries were addressed: Ukraine, Russia, Belarus, Moldova in Europe, as well as the following countries from central Asia: Kazakhstan, Azerbaijan, Armenia, Georgia.
Dissemination material and a website was made available in Russian (http://www.biomass.kiev.ua/index.php?page=projects&project=pr01_08_ru&lang=ru). Two regional project related workshops/seminars were held during the International Conference on Biomass for Energy in Kiev.

- Dedicated dissemination in Western Balkan Counties

The following countries were addressed: Albania, Bosnia-Herzegovina, Croatia, Macedonia, Montenegro, and Serbia. A regional workshop was held in Macedonia. Dissemination materials in national languages in Macedonia and Croatia were prepared and disseminated to regionally interested parties and various regional events including the workshop held in 4 November 2010, Skopje, Macedonia. Workshop proceedings were produced and disseminated via CD Rom.

- Presence at major stakeholder and scientific events

The project was disseminated through presentations and promotional material at major events, not only at international conferences on biomass, e.g. the European Biomass Conference & Exhibition and the International Conference on Biomass for Energy, but also at conferences in the sectors forestry, agriculture and waste and energy:

"Assessment of biomass potential in Ukraine", 6th International Conference on Biomass for Energy, 14-15 September, 2010, Kiev Ukraine

"Biomass Energy Europe - Project presentation & results so far", The 2nd Nordic Wood Biorefinery Conference, 2-4 September 2009, Helsinki, Finland

"EC FP7 project Biomass Energy Europe", 4th International Conference on Biomass for Energy, 22-24 September 2008, Kiev, Ukraine

"Bioenergy for Europe - Supply scenarios", European Forest Week, 21 - 24 October 2008, Rome, Italy

"BEE", EC Bioenergy Contractors Conference, 15 - 16 October 2008, Brussels, Belgium

"Estimating forest biomass potentials with biomass maps and GIS analysis", Precision Forestry Symposium, 1 - 3 March 2010, Stellenbosch, South Africa

"Erfassung des Potentials von forstlicher Biomasse für die Energiegewinnung - Analyse existierender Studien mit Schwerpunkt auf Deutschland und Europa und Vorstellung einer Initiative zur Harmonisierung der Potentialabschätzungen", Forstwissenschaftliche Tagung 2008, 24. - 27.09.2008, Freiburg, Germany

"The EC Approach to Forest Biomass Monitoring", GEO Forest Monitoring Symposium, 4 - 7 November 2008, Foz do Iguaçu, Brazil

Distribution of printed BEE material, Wood Energy Solutions 2008, 3 - 6 June 2008, Koli, Finland

"Forests of Ukraine in Context of Global Ecological and Energetic Issues Solution", Earth Biological resources: Social, Biological, Food and Energy Challenges, 3 - 7 November 2008, Ukraine

"Biomass Energy Europe - Project overview", Workshop Solid Biomass for Energy: EU Policy Implementation, Planning, Supply Chains & Market Intelligence, 8-9 December 2009, Brussels, Belgium

"Overview of European studies of biomass resource assessment", JRC Workshop "Biomass resource assessment for biofuels/bioenergy and competition with other biomass uses", 8 - 9 December 2009, Eberswalde, Germany

"Integration of sustainability criteria into biomass resource assessments", JRC Workshop "Biomass resource assessment for biofuels/bioenergy and competition with other biomass uses", 8 - 9 December 2009, Eberswalde, Germany

"BEE project", Workshop on Sustainable Energy, 14 - 15 January 2009, Copenhagen, Denmark

"BEE project", Seminar on Biomass: Connecting Dutch and Ukrainian Business Partners, 17 November 2009, Kiev, Ukraine

"BEE project", Ukrainian-French Seminar "Biomass and Energy", 28 - 30 October 2009, Orleans, France

"BEE project", Seminar on Swedish-Ukrainian Energy Efficiency Business Initiative 2009, 26 August 2009, Stockholm, Sweden

- Organisation of dedicated workshops and conferences (more information on these events is available at the BEE website www.eu-bee.com).

Most important stakeholders were invited to workshops following regular project meetings. In addition, national workshops were held in Ukraine and Macedonia (FYROM) and open international workshops were organised:

Joint public BEE/CEUBIOM session, Harmonisation of biomass resource assessment, March 14, 2008, Freiburg, Germany

Joint public BEE/CEUBIOM session, Harmonisation of biomass resource assessment, March 31, 2009, Budapest, Hungary

Joint BEE/CEUBIOM workshop; International bioenergy symposium, April 15, 2010, Brussels, Belgium

BEE workshop within the 6th International Conference on Biomass for Energy, 14-15 September 2010, Kiev, Ukraine

Biomass energy potential assessments, 8 November 2010, Brussels, Belgium

West Balkan workshop on Harmonization of methodologies for estimation and sustainable incorporation of biomass and other RES in municipal and national strategies for energy development, 4 November 2010, Skopje, Macedonia (see www.eu-bee.com).

Joint BEE/CEUBIOM conference; Biomass energy potential assessments, 8 Nov, 2010, Brussels, Belgium

The final joint BEE and CEUBIOM conference was held on the 8th of November 2010 in Brussels. It was organised by the BEE project, and in addition to BEE and CEUBIOM speakers had other specialists dealing with global or EU wide bioenergy potential studies. The event was held at the premises of Club of the University Foundation. The aim of the conference was to give picture about European and global perspectives about biomass potentials and also show the final results of the BEE and CEUBIOM projects. The conference had more than 70 participants from 23 countries throughout the Europe.

- Cooperation with related projects and scientific groups:

An intensive cooperation with the projects CEUBIOM, Aquaterrre and Biomass Futures, as well as a cooperation with the timber section at UNECE-FAO, Geneve was established.

Address of project public website and relevant contact details

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http:// www.eu-bee.info

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4.2 Use and dissemination of foreground

Section A (public)

Publications (peer reviewed)

LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES										
No.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Date of publication	Relevant pages	Permanent identifiers (if applicable)	Is open access provided to this publication?
1	A review and harmonisation of biomass resource assessments	Edward Smeets	Proceedings of the European Biomass Conference and Exhibition in Hamburg	29 June - 3 July 2009	ETA Florence	Firenze, Italy	01/10/2009	11	ISBN 978-88-89407-56-5	Yes
2	HARMONISATION OF THE ESTIMATION OF THE POTENTIAL OF BIOMASS FOR ENERGY	Dees, Matthias	Proc. of the W.-Balkan Works. on harmonization of methodologies for estimation ... of biomass ...	November 4, 2010	Macedonian Geothermal Association – MAGA	Skopje, Macedonia (FYROM)	15/11/2010	12-23		Yes
3	THE ENERGY POTENTIAL OF THE BIOMASS IN THE REPUBLIC OF MACEDONIA WITH A SPECIAL ACCENT ON THE FOREST BIOMASS	ARMENSKI, Slave	Proc. of the W.-Balkan Works. on harmonization of methodologies for estimation ... of biomass ...	November 4, 2010	Macedonian Geothermal Association – MAGA	Skopje, Macedonia (FYROM)	15/11/2011	58-67		Yes
4	Assessment of energy potential of biomass in	Tetiana Zheliezna	Proc. of the 6th Int. Conf. on Biomass for	September 14-15, 2010	SEC Biomass	Kiev, Ukraine	30/09/2011	17		Yes

	Ukraine. BEE project of FP7		Energy							
5	Comparison of the planned utilisation of biomass for energy in Europe between 2010 and 2020 according to the National Renewable Energy Action Plans (NREAP) with the findings of biomass for energy potential studies	Dees, Matthias	Proc. of the 6th Int. Conf. on Biomass for Energy	September 14-15, 2010	SEC Biomass	Kiev, Ukraine	30/09/2011	32		Yes
6	Assessment of the technical potential of forest biomass in Ukraine	Lakyda, Pedro	Proc. of the 6th Int. Conf. on Biomass for Energy	September 14-15, 2010	SEC Biomass	Kiev, Ukraine	30/09/2011	18		Yes
7	Assessment of the competitive economic potential of biomass for energy production in Europe	Ramos, Ivie	Proc. of the 6th Int. Conf. on Biomass for Energy	September 14-15, 2010	SEC Biomass	Kiev, Ukraine	30/09/2011	20		Yes

LIST OF DISSEMINATION ACTIVITIES

No.	Type of activities	Main Leader	Title	Date	Place	Type of audience	Size of audience	Countries addressed
1	Web sites/Applications	VALTION TEKNILLINEN TUTKIMUSKESKUS (VTT)	BEE project website	01/05/2008	www.eu-bee.com	Scientific community (higher education, Research) - Industry - Policy makers	9999	EU and beyond

2	Workshops	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	International bioenergy symposium	15/04/2010	Brussels, Belgium	Scientific community (higher education, Research) - Industry - Policy makers	130	EU & Eastern Europe
3	Workshops	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	Biomass energy potential assessments	08/11/2010	Brussels, Belgium	Scientific community (higher education, Research) - Industry - Policy makers	70	EU & Eastern Europe
4	Workshops	MACEDONIAN GEOTHERMAL ASSOCIATION (MAGA)	West Balkan workshop on Harmonization of methodologies...	04/11/2010	Skopje, Macedonia	Scientific community (higher education, Research) - Industry - Policy makers	25	West Balkan Countries
5	Presentations	SCIENTIFIC ENGINEERING CENTRE "BIOMASS" LTD	6th International Conference on Biomass for Energy	14/09/2010	Kiev, Ukraine	Scientific community (higher education, Research) - Industry - Policy makers	100	Eastern Europe
6	Posters	EUROPEAN FOREST INSTITUTE.	ForestSat 2010	07/09/2010	Lugo, Spain	Scientific community (higher education, Research) - Industry - Policy makers	500	EU
7	Presentations	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	5th Biomass for Energy: EU Policy Implementation, Planning, Supply Chains & Market Intelligence	09/12/2009	Brussels, Belgium	Scientific community (higher education, Research) - Industry - Policy makers	50	EU
8	Presentations	VALTION TEKNILLINEN TUTKIMUSKESKUS (VTT)	The 2nd Nordic Wood Biorefinery Conference	02/09/2009	Helsinki, Finland	Scientific community (higher education, Research) - Industry - Policy makers	500	EU
9	Posters	UNIVERSITEIT	17th European	29/06/2009	Hamburg, Germany	Scientific	500	EU

		UTRECHT	Biomass Conference and Exhibition - From Research to Industry and Markets			community (higher education, Research) - Industry - Policy makers		
10	Conference	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	Joint public BEE/CEUBIOM session - Harmonisation of biomass resource assessment	31/03/2009	Budapest, Hungary	Scientific community (higher education, Research) - Industry - Policy makers	80	EU & Eastern Europe
11	Presentations	SCIENTIFIC ENGINEERING CENTRE "BIOMASS" LTD	4th International Conference on Biomass for Energy - “EC FP7 project Biomass Energy Europe”	22/09/2008	Kiev, Ukraine	Scientific community (higher education, Research) - Industry - Policy makers	100	Eastern Europe
12	Flyers	VALTION TEKNILLINEN TUTKIMUSKESKUS (VTT)	Project brochure 1 (in 15 languages)	01/05/2008	www.eu-bee.com	Scientific community (higher education, Research) - Industry - Policy makers	2000	EU and beyond
13	Flyers	VALTION TEKNILLINEN TUTKIMUSKESKUS (VTT)	Project brochure 2 (in English)	01/11/2010	www.eu-bee.com	Scientific community (higher education, Research) - Industry - Policy makers	500	EU & Eastern Europe
14	Publication	EUROPEAN FOREST INSTITUTE.	Newsletter 1	01/12/2008	www.eu-bee.com	Scientific community (higher education, Research) - Industry - Policy makers	150	EU
15	Publication	EUROPEAN FOREST INSTITUTE.	Newsletter 2, joint with CEUBIOM	01/09/2009	www.eu-bee.com	Scientific community (higher education, Research) - Industry - Policy makers	170	EU
16	Publication	EUROPEAN FOREST	Newsletter 3, joint with CEUBIOM	01/09/2010	www.eu-bee.com	Scientific community (higher	200	EU

		INSTITUTE.				education, Research) - Industry - Policy makers		
17	Publication	EUROPEAN FOREST INSTITUTE.	Newsletter 4	17/02/2011	www.eu-bee.com	Scientific community (higher education, Research) - Industry - Policy makers	220	EU
18	Presentations	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	European Forest Week - “Bioenergy for Europe – Supply scenarios”	21/10/2008	Rome, Italy	Scientific community (higher education, Research) - Industry - Policy makers	70	EU
19	Presentations	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	EABCB Bioenergy Contractors Conference	15/10/2008	Brussels, Belgium	Scientific community (higher education, Research) - Policy makers	50	EU
20	Presentations	INSTITUT FUER ENERGIE UND UMWELTFORSCHUNG HEIDELBERG GMBH	JRC Workshop: Biomass resource assessment for biofuels/bioenergy and competition ...	09/12/2009	Eberswalde, Germany	Scientific community (higher education, Research) - Policy makers	50	EU
21	Presentations	METSANTUTKIMUSLAITOS	Precision Forestry Symposium Conference - “Estimating forest biomass potentials with biomass maps.."	01/03/2010	Stellenbosch, South Africa	Scientific community (higher education, Research) - Industry	100	Global
22	Presentations	UNIVERSITEIT UTRECHT	Workshop on Sustainable Energy	14/01/2009	Copenhagen, Denmark	Scientific community (higher education, Research) - Industry - Policy makers	30	EU
23	Presentations	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	Forstwissenschaftliche Tagung 2008	24/09/2008	Freiburg, Germany	Scientific community (higher education, Research)	60	Germany

24	Presentations	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	GEO Forest Monitoring Symposium	04/11/2008	Foz do Iguaçu, Brazil	Scientific community (higher education, Research) - Policy makers	120	Global
25	Posters	INTERNATIONALES INSTITUT FUER ANGEWANDTE SYSTEMANALYSE	World Forestry Congress	06/10/2009	Buenos Aires, Argentina	Scientific community (higher education, Research) - Policy makers	500	Global
26	Flyers	EUROPEAN FOREST INSTITUTE.	Wood Energy Solutions 2008 - brochure distribution	03/06/2008	Koli, Finland	Scientific community (higher education, Research) - Industry - Policy makers	100	EU
27	Press releases	EUROPEAN FOREST INSTITUTE.	EFI News 16 (2), Announcement of BEE	02/06/2008	EFI News 16 (2)	Scientific community (higher education, Research) - Industry - Policy makers	1000	EU
28	Presentations	NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE	Conference Earth Biological resources: Social, Biological, Food and Energy Challenges	03/11/2008	Ukraine	Scientific community (higher education, Research) - Policy makers	100	Ukraine, Eastern Europe
29	Presentations	SCIENTIFIC ENGINEERING CENTRE "BIOMASS" LTD	Seminar on Biomass: Connecting Dutch and Ukrainian Business Partners	17/11/2009	Kiev, Ukraine	Scientific community (higher education, Research) - Industry	20	Ukraine, the Netherlands
30	Presentations	SCIENTIFIC ENGINEERING CENTRE "BIOMASS" LTD	Ukrainian-French Seminar “Biomass and Energy”,	28/10/2009	Orleans, France	Scientific community (higher education, Research) - Industry	20	Ukraine, France
31	Presentations	SCIENTIFIC ENGINEERING CENTRE "BIOMASS" LTD	Seminar on Swedish-Ukrainian Energy Efficiency Business Initiative 2009	26/08/2009	Stockholm, Sweden	Scientific community (higher education, Research) - Industry	20	Ukraine, Sweden

32	Web sites/Applications	SCIENTIFIC ENGINEERING CENTRE "BIOMASS" LTD	Website in Russian	01/09/2008	http://www.biomass.kiev.ua/index.php?page=projects&project=proj_08_ru&lang=ru	Scientific community (higher education, Research) - Industry - Policy makers	9999	Eastern Europe
33	Flyers	NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE	Assessment of biomass potential for energy in Ukraine	01/12/2010	Kiev, Ukraine, www.nubip.edu.ua	Scientific community (higher education, Research) - Policy makers	200	Ukraine, Eastern Europe

Section B (Confidential or public: confidential information marked clearly)

LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS,UTILITY MODELS, ETC.					
Type of IP Rights	Confidential	Foreseen embargo date dd/mm/yyyy	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant(s) (as on the application)

OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND								
Type of Exploitable Foreground	Description of Exploitable Foreground	Confidential	Foreseen embargo date dd/mm/yyyy	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use or any other use	Patents or other IPR exploitation (licences)	Owner and Other Beneficiary(s) involved

ADDITIONAL TEMPLATE B2: OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND	
Description of Exploitable Foreground	Explain of the Exploitable Foreground

4.3 Report on societal implications

A. Ethics

1. Did your project undergo an Ethics Review (and/or Screening)?	No
If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final reports?	

2. Please indicate whether your project involved any of the following issues :

RESEARCH ON HUMANS

Did the project involve children?	No
Did the project involve patients?	No
Did the project involve persons not able to consent?	No
Did the project involve adult healthy volunteers?	No
Did the project involve Human genetic material?	No
Did the project involve Human biological samples?	No
Did the project involve Human data collection?	No

RESEARCH ON HUMAN EMBRYO/FOETUS

Did the project involve Human Embryos?	No
Did the project involve Human Foetal Tissue / Cells?	No
Did the project involve Human Embryonic Stem Cells (hESCs)?	No
Did the project on human Embryonic Stem Cells involve cells in culture?	No
Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	No

PRIVACY

Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	No
Did the project involve tracking the location or observation of people?	No

RESEARCH ON ANIMALS

Did the project involve research on animals?	No

Were those animals transgenic small laboratory animals?	No
Were those animals transgenic farm animals?	No
Were those animals cloned farm animals?	No
Were those animals non-human primates?	No

RESEARCH INVOLVING DEVELOPING COUNTRIES

Did the project involve the use of local resources (genetic, animal, plant etc)?	No
Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	No

DUAL USE

Research having direct military use	No
Research having potential for terrorist abuse	No

B. Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific manager	1	
Work package leader	6	
Experienced researcher (i.e. PhD holders)	10	
PhD student	0	
Other	12	

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	9
Of which, indicate the number of men:	3

C. Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project ?	No

6. Which of the following actions did you carry out and how effective were they?	
Design and implement an equal opportunity policy	Not Applicable
Set targets to achieve a gender balance in the workforce	Not Applicable
Organise conferences and workshops on gender	Not Applicable
Actions to improve work-life balance	Not Applicable
Other:	

7. Was there a gender dimension associated with the research content - i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?	No
If yes, please specify:	

D. Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?	No
If yes, please specify:	

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?	No

E. Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?	
Main discipline:	
Associated discipline:	4.1 Agriculture, forestry, fisheries and allied sciences (agronomy, animal husbandry, fisheries, forestry, horticulture, other allied subjects)
Associated discipline:	5.2 Economics

F. Engaging with Civil society and policy makers

11a. Did your project engage with societal actors beyond the research community? (if	Yes

'No', go to Question 14)	
11b. If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?	Yes, in communicating /disseminating / using the results of the project
11c. In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	No
12. Did you engage with government / public bodies or policy makers (including international organisations)	Yes- in framing the research agenda
13a. Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?	Yes - as a secondary objective (please indicate areas below - multiple answer possible)
13b. If Yes, in which fields?	
Agriculture	Yes
Audiovisual and Media	No
Budget	No
Competition	No
Consumers	No
Culture	No
Customs	No
Development Economic and Monetary Affairs	No
Education, Training, Youth	No
Employment and Social Affairs	No
Energy	Yes
Enlargement	No
Enterprise	No
Environment	No
External Relations	No
External Trade	No
Fisheries and Maritime Affairs	No
Food Safety	No
Foreign and Security Policy	No
Fraud	No
Humanitarian aid	No
Human rightsd	No
Information Society	No

Institutional affairs	No
Internal Market	No
Justice, freedom and security	No
Public Health	No
Regional Policy	No
Research and Innovation	No
Space	No
Taxation	No
Transport	No
13c. If Yes, at which level?	European level

G. Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?	0
To how many of these is open access provided?	0
How many of these are published in open access journals?	0
How many of these are published in open repositories?	0
To how many of these is open access not provided?	0
Please check all applicable reasons for not providing open access:	
publisher's licensing agreement would not permit publishing in a repository	No
no suitable repository available	No
no suitable open access journal available	No
no funds available to publish in an open access journal	No
lack of time and resources	No
lack of information on open access	No
other	
If other - please specify	
15. How many new patent applications ('priority filings') have been made? ("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).	0

16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).

Trademark	0
Registered design	0
Other	0

17. How many spin-off companies were created / are planned as a direct result of the project?	0
Indicate the approximate number of additional jobs in these companies:	0

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:	Increase in employment, None of the above / not relevant to the project

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:	15Difficult to estimate / not possible to quantify

H. Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?	No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?	No

22. Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?	
Press Release	No
Media briefing	No
TV coverage / report	No
Radio coverage / report	No
Brochures /posters / flyers	Yes
DVD /Film /Multimedia	No
Coverage in specialist press	Yes
Coverage in general (non-specialist) press	No
Coverage in national press	No
Coverage in international press	Yes
Website for the general public / internet	Yes
Event targeting general public (festival, conference, exhibition, science café)	Yes

23. In which languages are the information products for the general public produced?	
Language of the coordinator	Yes
Other language(s)	Yes
English	Yes

Attachments	BEE_FIGURES_SECTION_S_and_T_Results.pdf, BEE_extra_promotional_material.pdf, BEE_partner_logo_and_contact.doc, BEE_partner_logo_and_contact.pdf, BEE_extra_promotional_material.doc, BEElogo.jpg
Grant Agreement number:	213417
Project acronym:	BEE
Project title:	Biomass Energy Europe
Funding Scheme:	FP7-CSA-CA
Project starting date:	01/03/2008
Project end date:	30/11/2010
Name of the scientific representative of the project's coordinator and organisation:	Prof. Barbara Koch ALBERT-LUDWIGS-UNIVERSITAET FREIBURG
Name	
Date	28/01/2011

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