Delivery of sustainable supply of non-food biomass to support a "resource-efficient" Bioeconomy in Europe

S2Biom Project Grant Agreement n°608622

D1.8

Atlas with regional cost supply biomass potentials for EU 28, Western Balkan Countries, Moldavia, Turkey and Ukraine

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About S2Biom project

The S2Biom project - Delivery of sustainable supply of non-food biomass to support a "resource-efficient" Bioeconomy in Europe - supports the sustainable delivery of non-food biomass feedstock at local, regional and pan European level through developing strategies, and roadmaps that will be informed by a "computerized and easy to use" toolset (and respective databases) with updated harmonized datasets at local, regional, national and pan European level for EU28, Western Balkans, Moldova, Turkey and Ukraine. Further information about the project and the partners involved are available under www.s2biom.eu.

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About this document

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List of Acronyms and Abbreviations

ABC	Activity Based Costing
BP	Base potential
CAP	Common Agricultural Policy
CAPRI	Common Agricultural Policy Regionalised Impact model.
CEEC	Central and Eastern European Countries
EFISCEN	European Forest Information SCENario model See glossary of models
EFSOS	European Forest Sector Outlook Study
EPIC	EPIC (Environmental Policy Integrated Climate Model)
EU	European Union
FADN	Farn Accountancy Data Network
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Statistical service of FAO
FAWS	Forest available for wood supply
FYROM	Former Yugoslavian Republic of Macedonia
HNV	High Nature Value
HP	High potential
ILUC	Indirect land use change
MDF	Medium-density fibreboard
NPV	Net Present Value
NUTS	Nomenclature of Territorial Units for Statistics of the European Union
NUTS0, NUTS1, NUTS2, NUTS3	NUTS, the Nomenclature of Territorial Units for Statistics of the European Union structures the territorial units hierarchical, starting with the National level (= NUTS0), followed by NUTS1 and NUTS2 and NUTS3.
OECD	Organisation for Economic Co-operation and Development
OSB	Oriented strandboard
PCW	Post-consumer wood
RED	Renewable Energy Directive (EC, 2009)
SFR	Secondary forest residues
SOC	Soil Organic Carbon
SRC	Short rotation coppice
TP	Technical potential
UK	United Kingdom
UP / UDP	User defined potential
VAT	Value-added tax
WP	Work Package

1 Introduction

1.1 Scope and objectives of this report

Within the S2BIOM project, WP1 provides state of the art data on current and future sustainable lignocellulosic biomass cost and supply levels for EU28, Western Balkans, Ukraine, Turkey and Moldova.

This report provides an overview on the major results in form of maps, tables together with a brief explanation and interpretation. It complements the biomass supply tool[1] that allows interested parties to prepare their own customised tables, maps and cost-supply curves meeting their specific interests and requirements.

Potentials can be presented differing options in maps. An explanation on this issue is provided in Annex A7.

This report is based on the S2BIOM final data set that is described in S2BIOM report D1.5 (Datta et al. 2017) whereas the methods and data sets used to compile these data are described in S2BIOM report D1.6 (Dees et al. 2017).

The geographic scope, the spatial resolution and the thematic scope can be briefly described as follows.

Geographic scope:

- EU 28
- The Non- EU28 Western Balkans countries Montenegro, Macedonia (FYROM), Albania, Bosnia and Herzegovina, Serbia, Kosovo.
- Turkey, Moldova Ukraine

Spatial resolution:

- EU 28 – NUTS 3
- Other countries – equivalently defined administrative units

Main categories covered:

- Forestry – Wood production and primary forest residues (10 subcategories)
- Agriculture - Primary production of lignocellulosic biomass crops and primary agricultural residues (20 subcategories)
- Grassland - Unused grassland cuttings (1 category)
- Other land use – biomass from landscape maintenance & road side verges (4 categories)
- Secondary residues from wood industries (8 categories)
- Secondary residues of industry utilising agricultural products (4 categories)
- Wastes (4 categories)

[1] http://biomass-tools.eu

2 Biomass atlas

2.1 Dedicated biomass crops and primary residues from agriculture

An overview of the biomass categories covered for the agricultural sector are listed in Table 1. There are five types of perennial crops covered and three types of short rotation coppices for which trial and plantation experience is wide spread in Europe. For residues all straw and stubbles from cereals and most common rotational arable crops in Europe are included. The same applies for the woody residues form the most common and spatially significant permanent crops in Europe for which five categories are distinguished.

Table 1 Subcategories of first level category 1 "Agriculture"

Second level subcategories		Third level subcategories		Final level subcategories	
ID	Name	ID	Name	ID	Name
				2112	Miscanthus (Perennial grass)
				2113	Switchgrass (Perennial grass)
				2114	Giant reed (Perennial grass)
				2115	Cardoon (Perennial crop)
				2116	Reed Canary Grass (Perennial grass)
		212	Short rotation coppice (SRC)	2121	SRC Willow
				2122	SRC Poplar
				2123	SRC Eucalyptus
22	Primary residues from agriculture	221	Straw/stubbles	2211	Rice straw
				2212	Cereals straw
				2213	Oil seed rape straw
				2214	Maize stover
				2215	Sugarbeet leaves
				2216	Sunflower straw
		222	Woody pruning & orchards residues	2221	Residues from vineyards
				2222	Residues from fruit tree plantations (apples, pears and soft fruit)
				2223	Residues from olives tree plantations
				2224	Residues from citrus tree plantations
				2225	Residues from nuts plantations
23	Unused grassland cuttings	231	Unused grassland cuttings	2311	Unused grassland cuttings (abandoned grassland, managed grasslands not used for feed)

In the following, the estimated potential supply and its cost are presented in the form of graphs, maps and tables following the definitions of the potentials as specified in the methods report D1.6 comprising of technical, base and user defined potentials. The potentials quantified in this Atlas refer mostly to the base potentials, which can be defined as the sustainable technical potential, considering agreed sustainability standards in:

1) CAP (Common Agricultural Policy) for agricultural farming practices which include applying conservation of Soil Organic Carbon (SOC) (basically part of Cross Compliance issues of 'maintaining agricultural land in good farming and management condition') and avoiding soil erosion and Greening.

2) Legal restrictions for protected areas and sustainability restrictions from current legislation.
3) Further restrictions resulting from RED (Renewable Energy Directive) sustainability criteria including conservation of land of high biodiversity value, high carbon stock, avoidance of direct land cover changes, avoidance of indirect land use changes, avoidance of competition with food & feed production, and avoid negative impacts on soils and water resources.

In addition to the base potential cost supply data are also presented for the Technical potential and for User Defined potentials. See Table 2 how the different potentials are defined per biomass type.

Table 2 Overview of agricultural biomass potential types and considerations

	Area/ Basis	Yield, Growth	Technical & environmental constraints on the biomass retrieval (per area)	Consideration of competing use	Mobilisation
Technical (dedicated biomass crops)	All good and low productive agricultural land released between 2008-2012, 2008-2020 & 2008-2030, including released grassland and fallow land 2012, 2020 & 2030	No yield increase assumed in time. (Uncertainty range about attainable yield levels is already large enough. Adding a yield increase will only increase this uncertainty level and will make the results less transparent)	Maximum volume of land released, so no additional environmental considerations.	Yes, avoidance of competition with food, feed and urbanisation and indirect land use change.	None
Technical (straw & stubbles)	Area in 2012, 2020, 2030 with cereals, rice, sunflower, rape, corn maize	Growth based on regional growing conditions & management. Yield according to regional averages including expected developments in yield towards 2020 and 2030	Maximum volume of straw and stubbles that could be harvested in 2012, 2020 and 2030	None	None
Technical (prunings permanent crops)	Area in 2012, 2020, 2030 with fruit trees, vineyards, olive & citrus	Growth based on regional growing conditions & management.Fruit yield according to regional averages including expected developments in yield towards 2020 and 2030. Input pruning biomass yield averaged by country.	Maximum volume of prunings and cuttings that could be harvested in 2012, 2020 and 2030	None	None
Technical (sugarbeet leaves & tops)	Area in 2012, 2020, 2030 with sugar beet	Growth based on regional growing conditions & management. Yield according to regional averages including expected developments in yield towards 2020 and 2030	Maximum volume of sugar beet leaves and tops that could be harvested in 2012, 2020 and 2030	None	None
Base (dedicated biomass crops)	As in technical potential but excluding land released in HNV	No yield increase assumed in time. (Uncertainty range about attainable	Exclusion of protected areas (NATURA 2000) and HNV farmland and high carbon stock	Yes, avoidance of competition with food, feed and urbanisation and	None

	Area/ Basis	Yield, Growth	Technical & environmental constraints on the biomass retrieval (per area)	Consideration of competing use	Mobilisation
	farmland, NATURA2000, high carbon stock land & permanent grasslands	yield levels is already large enough. Adding a yield increase will only increase this uncertainty level and will make the results less transparent)	lands. No use of land released in permanent grasslands to avoid SOC loss. Adapt crop choice to availability of natural resources such as soil quality and water availability. Irrigation is allowed but only if depletion of fresh water resources is avoided.	indirect land use change.	
Base (straw & stubbles)	As for technical potential	As for technical potential	Only the biomass part can be removed that is not needed to keep the SOC stable. This is assessed according to carbon content that is removed with the residue and the SOC level in the soil that has to be maintained.	None	None
Base (prunings permanent crops)	As for technical potential	As for technical potential		None	None
Base (sugar beet leaves & tops)	As for technical potential	As for technical potential	Removal of leaves and tops from field is only allowed in Nitrate vulnerable zones where nitrogen surplus needs to be declined through removal of nitrogen rich biomass.	None	None
User potential (straw & stubbles)	As for technical potential	As for technical potential	As in base	In cereal straw a subtraction is applied according to demand for straw for animal bedding & feed . For rice straw, corn stover and sunflower and rape stubbles not competing uses are assumed.	None
Base (dedicated biomass crops)	As in base potential except for exclusion of fallow land up to 10% of arable land share. Fallow above the 10% share can be used for dedicated crops	As in Base	As in base, but additional requirements are for maintenance of at least 10% of arable land share in fallow and no use of irrigation allowed in dedicated cropping	As in Base	None
User potential (prunings & cuttings)-	As for technical potential	As for technical potential	All pruned material is available that is currently not used to maintain the SOC and fertility of the soil. So the part that is now removed to the side of the field for energy uses or that is burned with or without energy recovery is seen as potential. This follows the common treatment practices of prunings as assessed in the EuroPruning project.	None	The potential that is not used for SOC and fertility maintenance needs to be mobilised gradually as it requires a change in management; it becomes available from 50% in 2012 to 60% in 2020 and 70% in 2030.

2.1.1 Regional and country level results

Agricultural biomass potentials in EU and neighbouring countries have been assessed building strongly on the CAPRI baseline run 2008-2050, providing intermediate results for 2010, 2020, 2030 and 2050. This baseline run can be seen 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 as agreed until now and further specified in the *Trends to 2050* report (EC, 2013) for as far as affecting agriculture. CAPRI is the only available model which predicts (for 2010, 2020 and 2030) the EU markets and production responses at the regional level for the whole EU-28, western Balkans, Turkey and Norway.

For the assessment of residues (straw, stubbles and pruning residues) the CAPRI land use patterns for 2010 were extrapolated to 2012 using FSS farm structural data and calculating relative crop area (and livestock number) changes between 2010 and 2012 and using these to extrapolate the CAPRI base data 2010 to 2012.

Yields and changes in yield levels per region and country in CAPRI for the conventional crops delivering residues are already included in the baseline scenario of CAPRI.

For the assessment of biomass from dedicated crops the CAPRI input was the base for estimating the land no longer used for agriculture. It was assessed by comparing land in agricultural use in 2008 and in 2012, 2020 and 2030 respectively. The net land difference was then taken as the land basis. Only these unused lands are available for these crops and this is then combined with data generated in this project on biomass crop yield simulations and net present value cost calculations (see D1.6). The combination delivers the final biomass crop mix and potential. So, the land claim for these crops takes account of competing uses from other activities such as for food, feed, and urbanisation.

The potential primary agricultural biomass supply in the 37 countries in 2012 is estimated at 525 million tonnes dry matter (Table 8; Annex 1), according to the Base Potential. The potential is projected to decline to 479 million tonnes dm in 2020 and to 484 million tonnes dm in 2030. This implies a relative decline in agricultural potential between 2012 and 2030 of 8%. This is mainly because of a significant decrease in straw potential (-30%) while the dedicated cropping potential increases as the unused land resource is expected to increase (+60%). The decrease in straw potential cannot be offset completely by the increase in dedicated cropping potential. Prunings also decline by 6% between 2012 and 2030, but their amount is relatively small as compared to straw and dedicated crops.

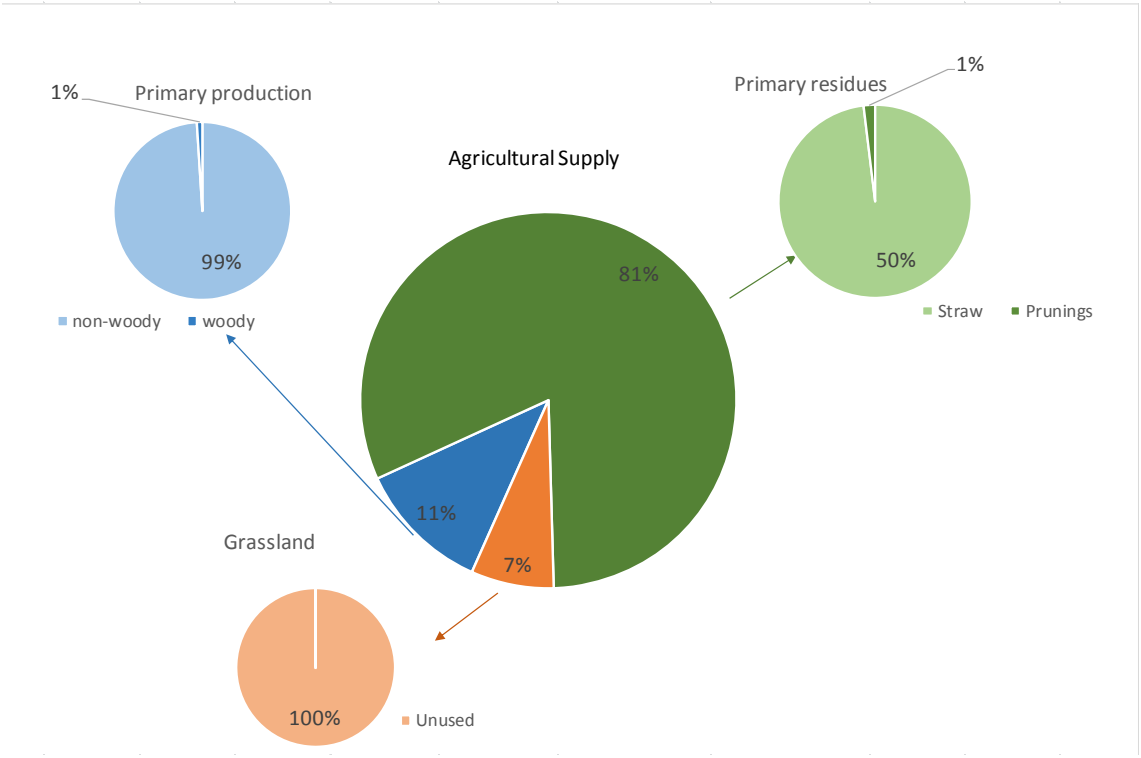


Figure 1 Relative supply from different primary agricultural biomass sources for all S2biom countries (2012)

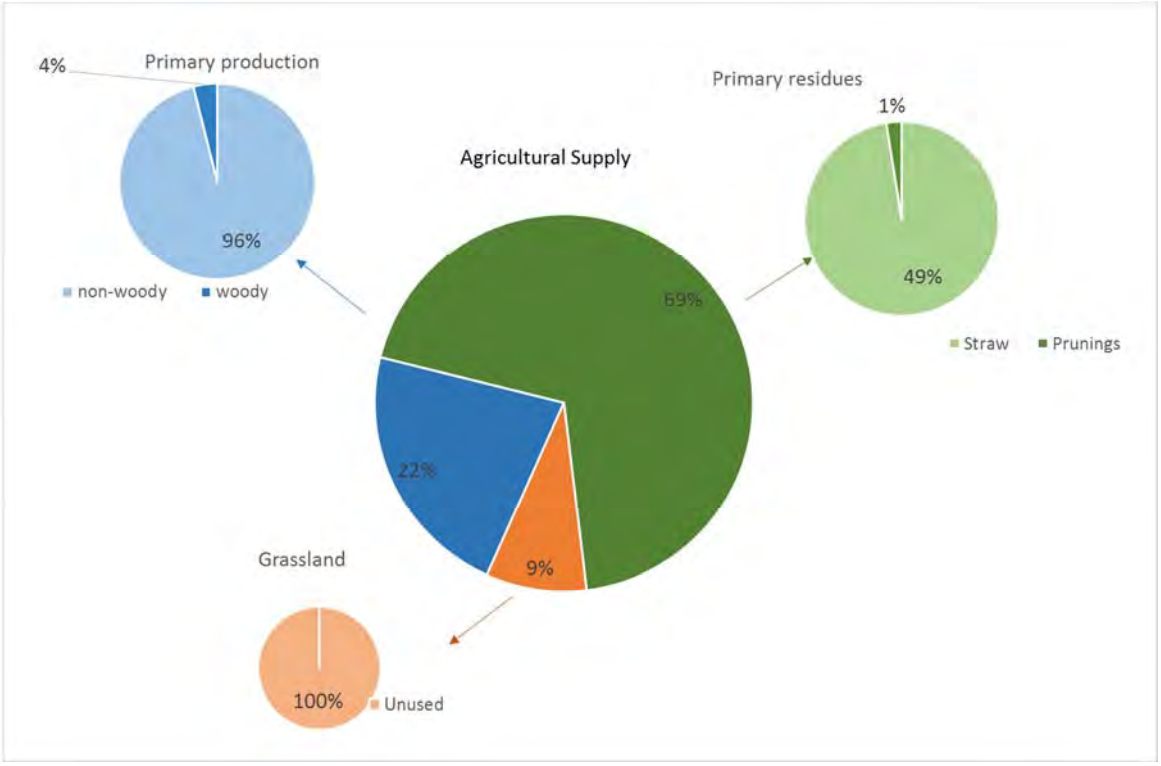


Figure 2 Relative supply from different primary agricultural biomass sources for all 2biom countries (2030)

For the agricultural residues it is clear that straw and stubbles are by far more important than the prunings from permanent crops. However, in certain countries like

Spain, Italy, Greece and some western Balkans these types of residues may add more significantly. Furthermore, the straw and stubbles show a decline in availability up to 2030 while the pruning residues remain relatively stable in time.

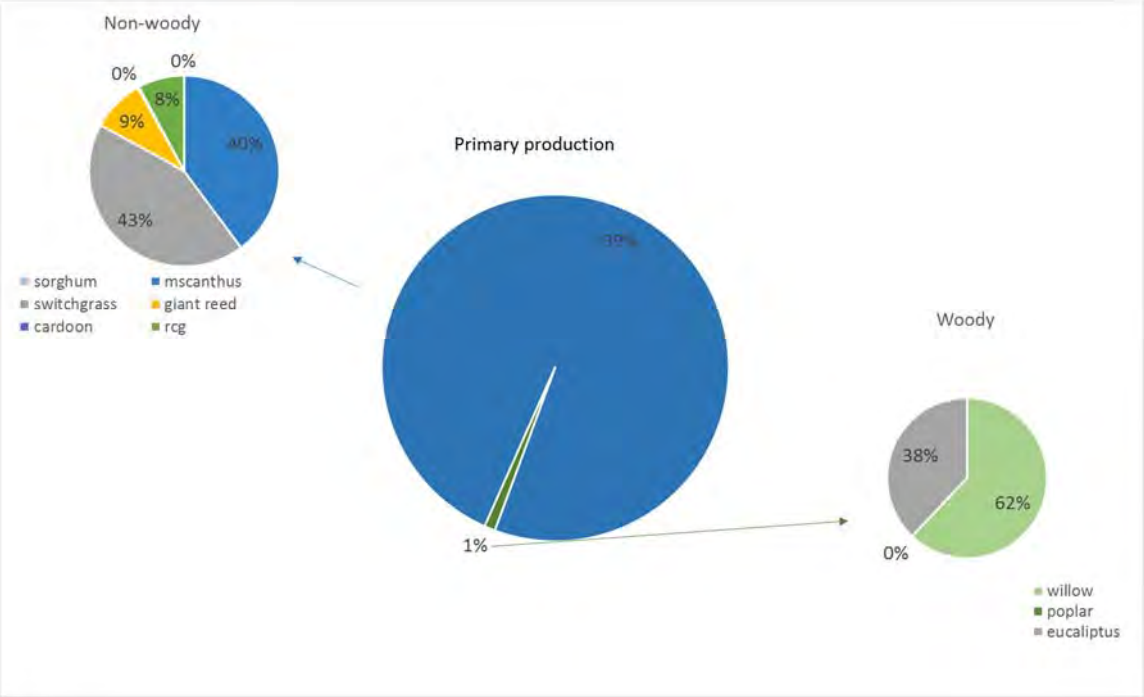


Figure 3 Relative supply from different dedicated biomass crops all S2biom countries (2012)

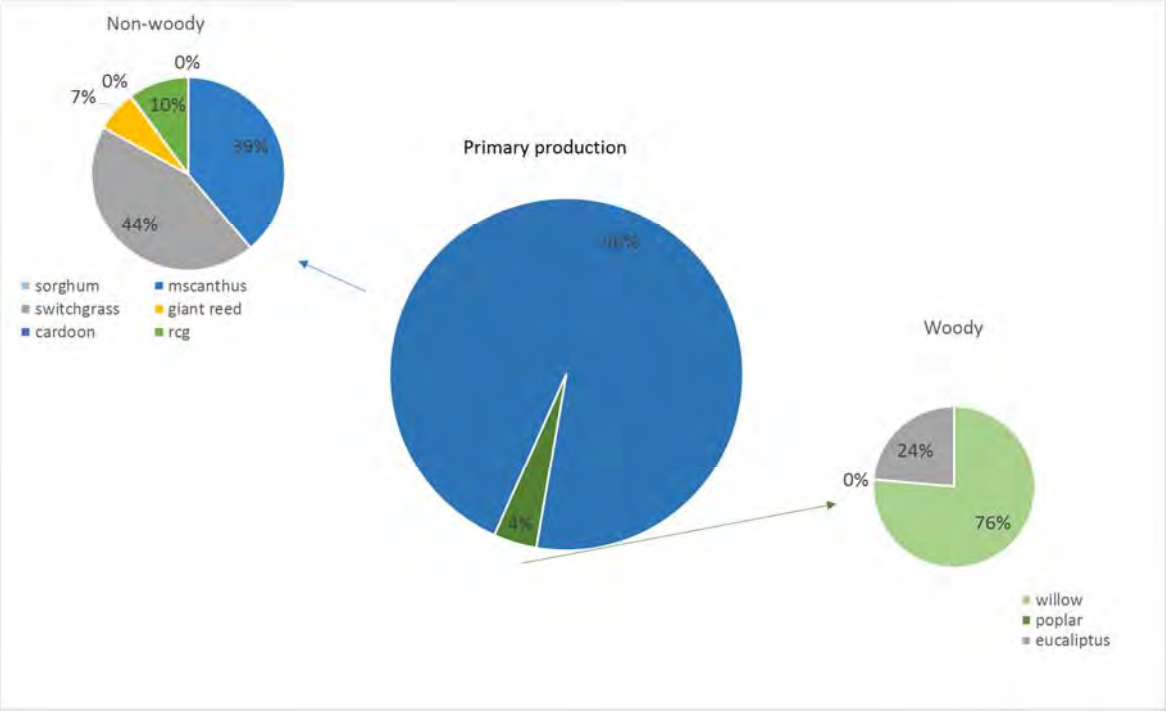


Figure 4 Relative supply from different dedicated biomass crops all S2biom countries (2030)

In Figure 3 and Figure 4 the relative crop mix of the dedicated crop potential in 2012 and 2030 is presented. It becomes clear that in the mix the lignocellulosic crops strongly dominate above the woody crop types which is related to suitability and cost levels of the crops in different regions. Lignocellulosic crops provide cheaper biomass in more places in Europe where agricultural lands go out of production then SRC species do. Toward 2030 there is also a relative increase in SRC crops expected which is related to increases in land releases in general and more specifically in regions where the suitability for SRC crops is better than for lignocellulosic crops. This is for example the case for countries like Austria, Germany, UK, France and Hungary.

The national distribution of primary agricultural biomass supply is shown in the Figure 1 and Figure 2. It becomes clear that the largest countries with a large surface area dominate such as France, Ukraine, Turkey, Spain and UK. Italy has a modest biomass supply in 2012 given the size of the country.

In 2012 the largest contribution to the supply is coming from straw and stubbles in most countries except for countries where the unused land resource is already large in 2012 (e.g. Turkey, Ukraine, Romania, Spain, most of western Balkans). Towards 2020 and 2030 the dedicated cropping resource starts to increase in more countries and straw and stubbles generally decline.

The grassland cuttings supply is typical for the UK, Ireland and France. It should be noted, that this resource was only analysed for the EU27, because of lack of data for the rest of the countries. It is based on a nutrient balance and shows the underutilization of grasslands that are (still) part of the farming area. On many (livestock) farms in UK, Ireland, France, Czech Republic, Romania and Poland there seems to be grassland production, which is not fully consumed by the livestock present, making it a biomass resources for non-food uses.

Declines in agricultural biomass supply are most prominent for countries where straw and stubbles are a major part of the potential in 2012 and where there is less unused land resource coming available towards 2020 and 2030 to compensate for the overall decline in residues. This is for example the case in Austria, Belgium, France and Germany.

From Figure 8 it becomes clear that not surprisingly the larger countries have a larger agri-biomass potential. Particularly a country like Ukraine has large potential both for residues and dedicated crops. In countries like France, Poland, Germany we see the same pattern of a serious decline in straw potentials towards 2030 which is largely compensated for by dedicated cropping potential. The UK has a particularly large potential because of the unused grassland cuttings resource. This category is also of great relevance in Ireland and France. It should be remembered however that this potential was only assessed for EU27. So, in the other countries this potential is missing, but it does not mean it is not there.

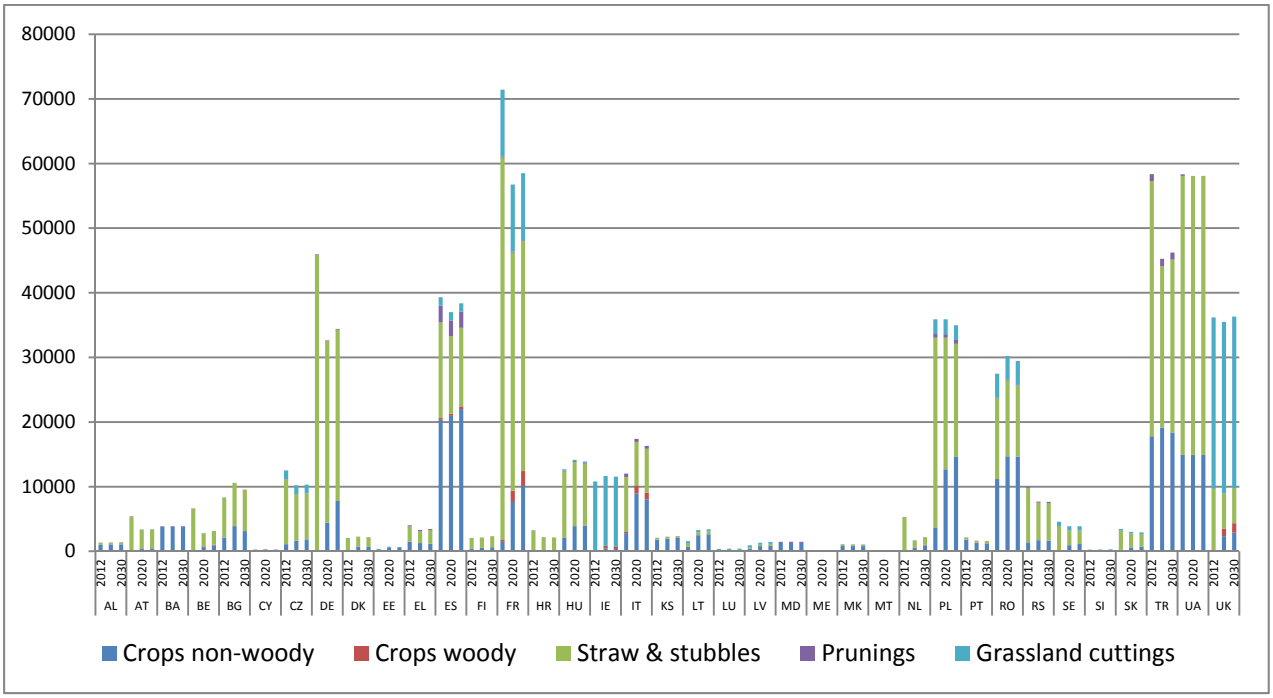


Figure 5 Total primary agricultural supply (kton dm) by country for the Base Potential in 2012, 2020 and 2030

2.1.2 Spatial distribution of biomass potentials from agriculture

In the following maps the primary agricultural biomass potential is displayed per administrative region (NUTS3 level) and the amount is expressed per unit of land.

The largest potentials of agricultural biomass that also have a high spatial concentration are especially found in regions in northern and central France, central Germany, Northern and middle Ukraine, and southeast England (see maps in Figure 8). There are also regions which in absolute values have large agricultural potentials, but the biomass is more spatially dispersed which is the case in central Turkey, Poland, Czech Republic, Bulgaria, Romania, Spain, southern Sweden and northern England and Scotland and Ireland.

The large amount of agricultural biomass is mostly coming from straw & stubbles from arable crops such as cereals, OSR, sunflower and grain maize as becomes clear from the maps in Figure 9. The largest straw concentration areas are indeed in Northern France, Northern Ukraine, central Germany and East Anglia.

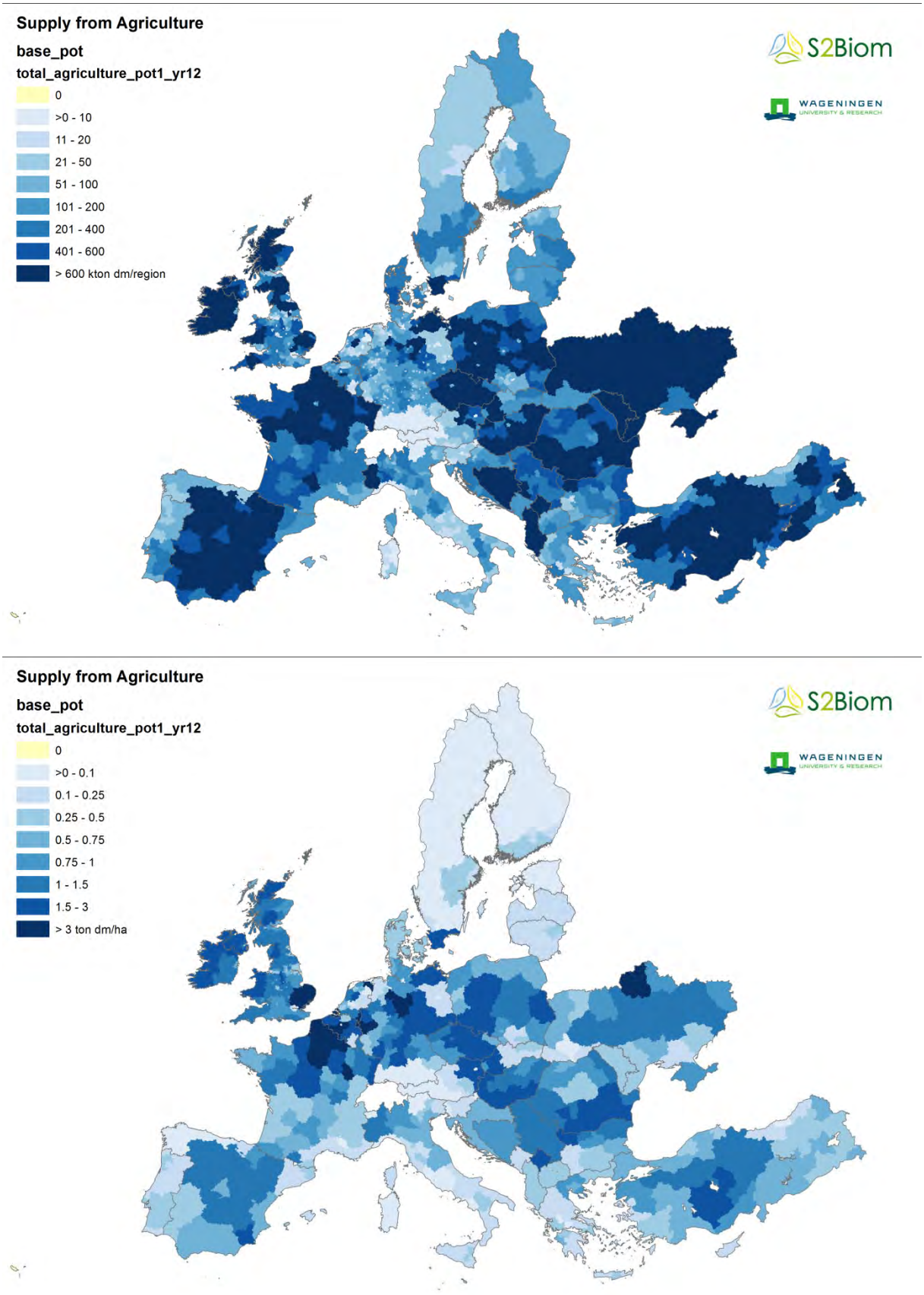
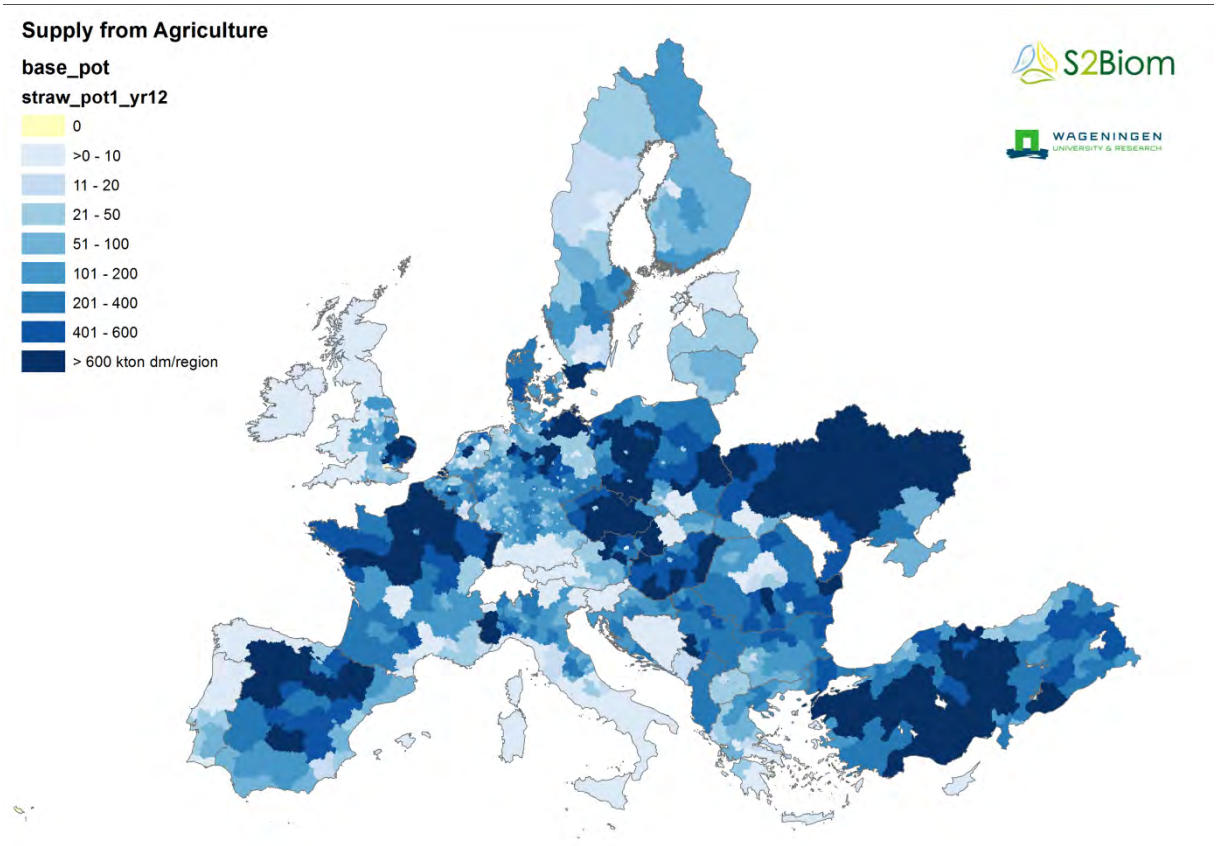


Figure 6 Total primary agricultural supply (categories 21, 22, 23; Table 1) at NUTS3 level for the Base potential in 2012 in absolute level (kton dm) (upper map) and in density (ton dm/ha land) (lower map)



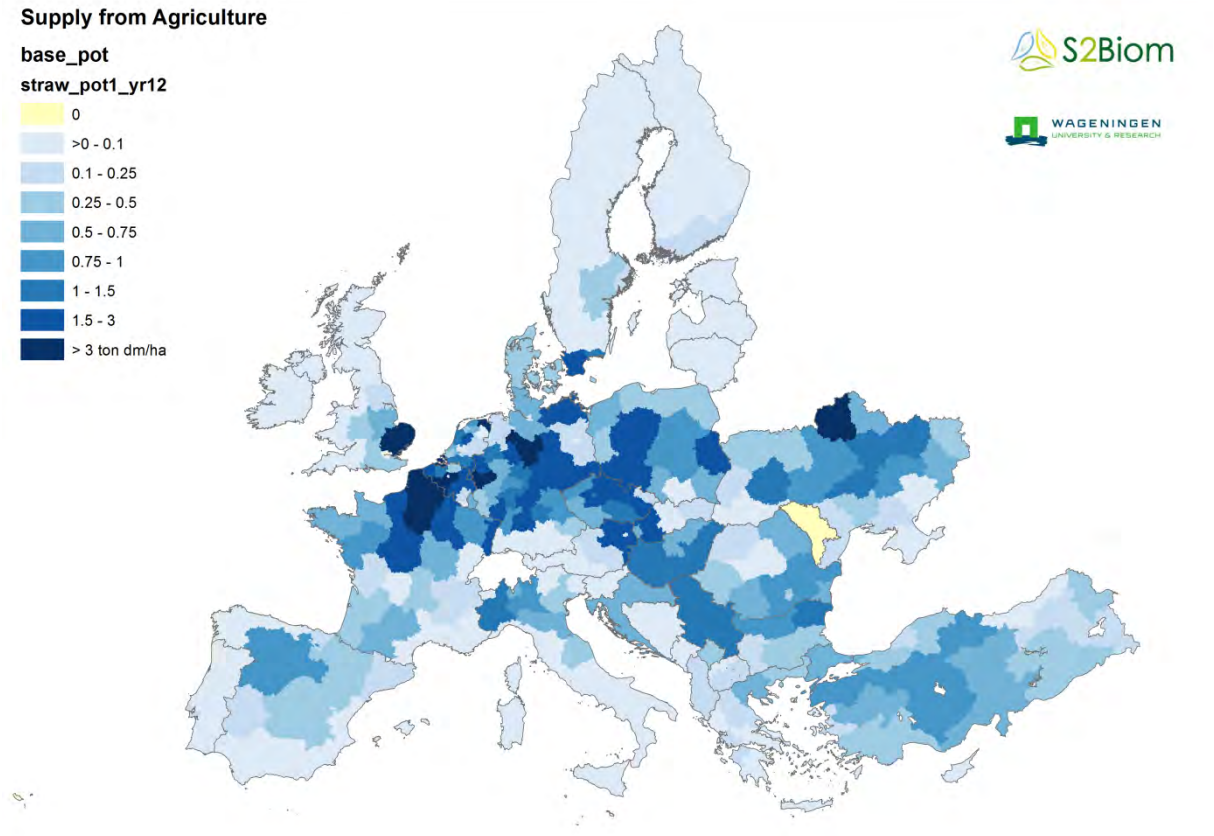
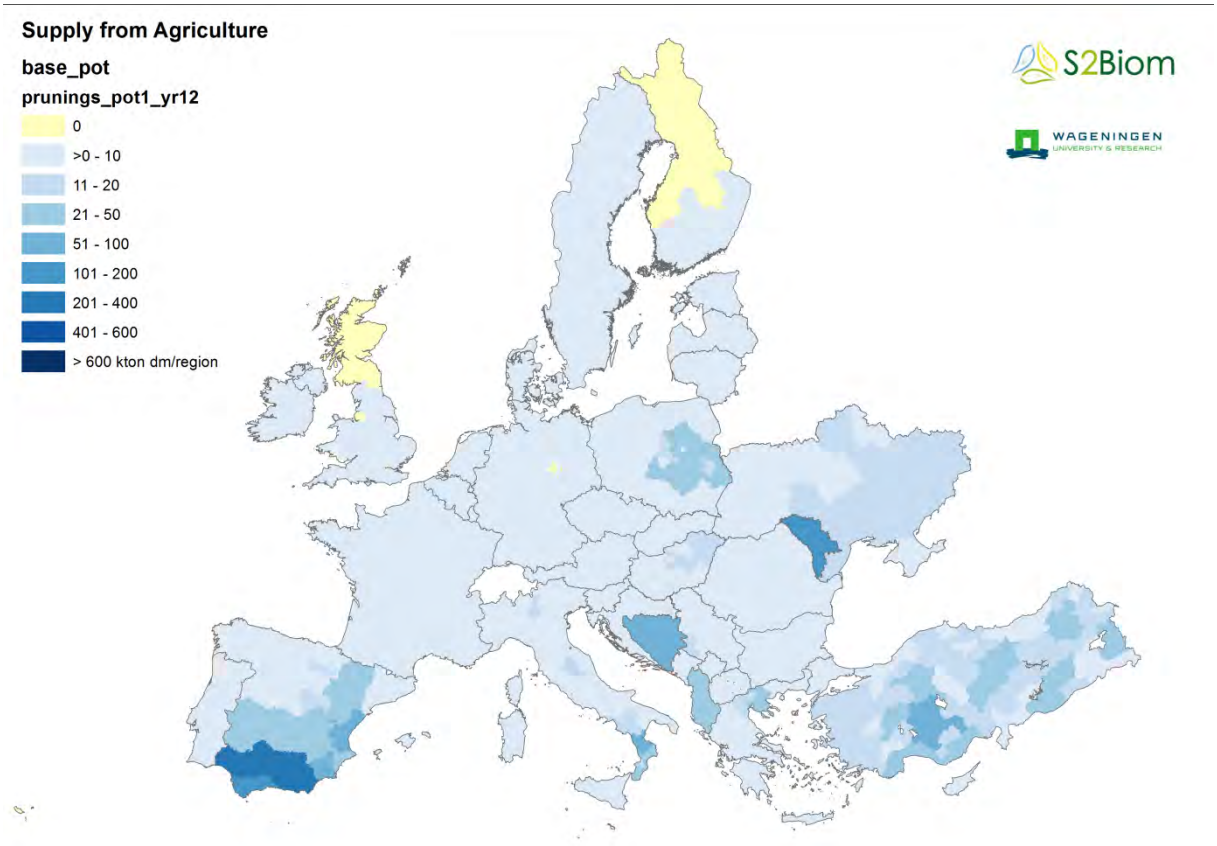


Figure 7 Total straw and stubble supply (categories 221; Table 1) at NUTS3 level for the Base potential in 2012 in absolute level (kton dm) (upper map) and in density (ton dm/ha land) (lower map)



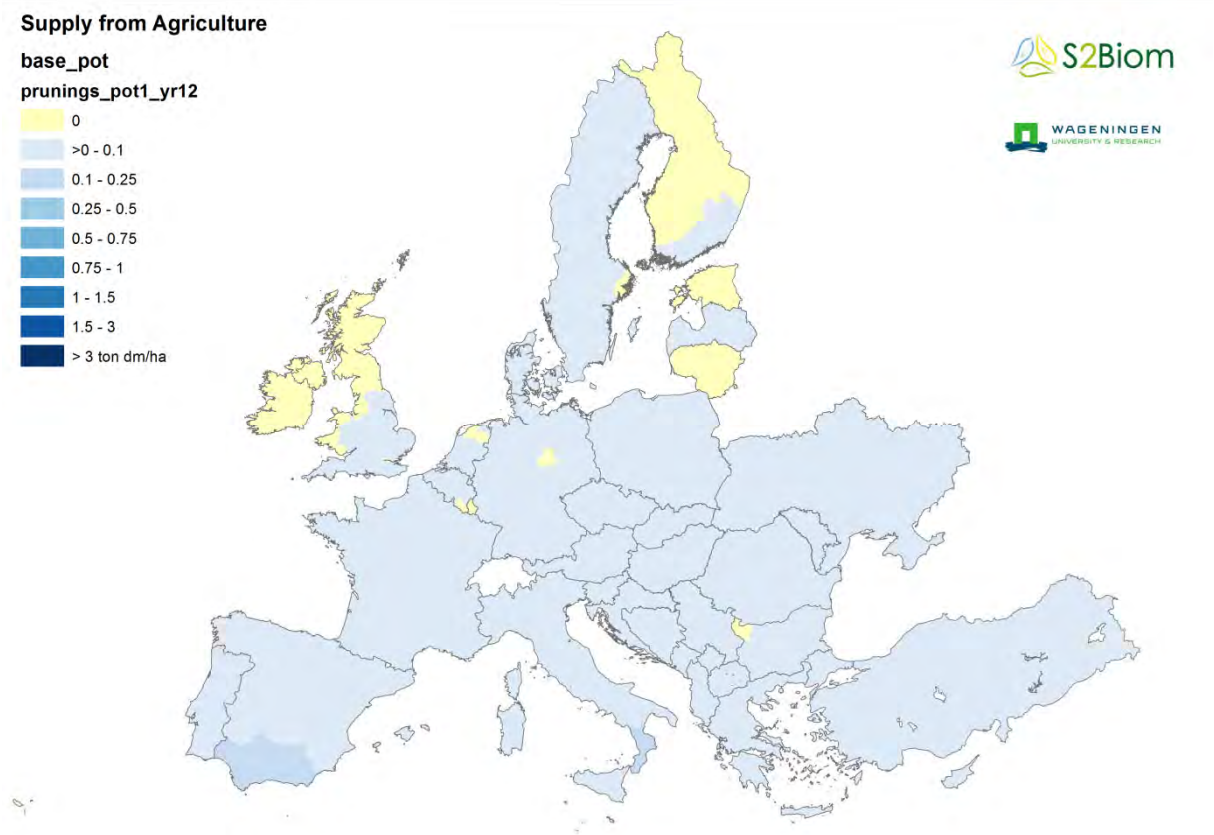
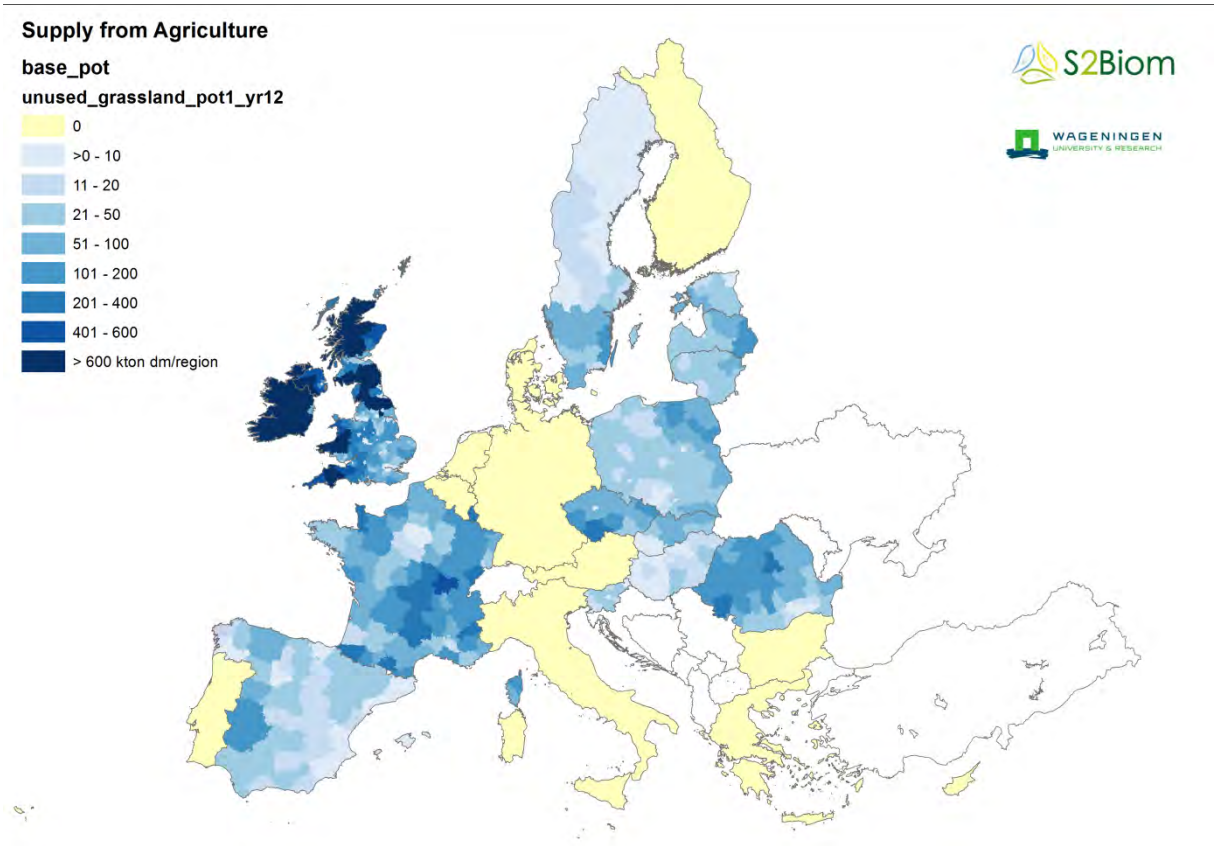


Figure 8 Total pruning supply (categories 222; Table 2) at NUTS3 level for the Base potential in 2012 in absolute level (kton dm) (upper map) and in density (ton dm/ha land) (lower map)



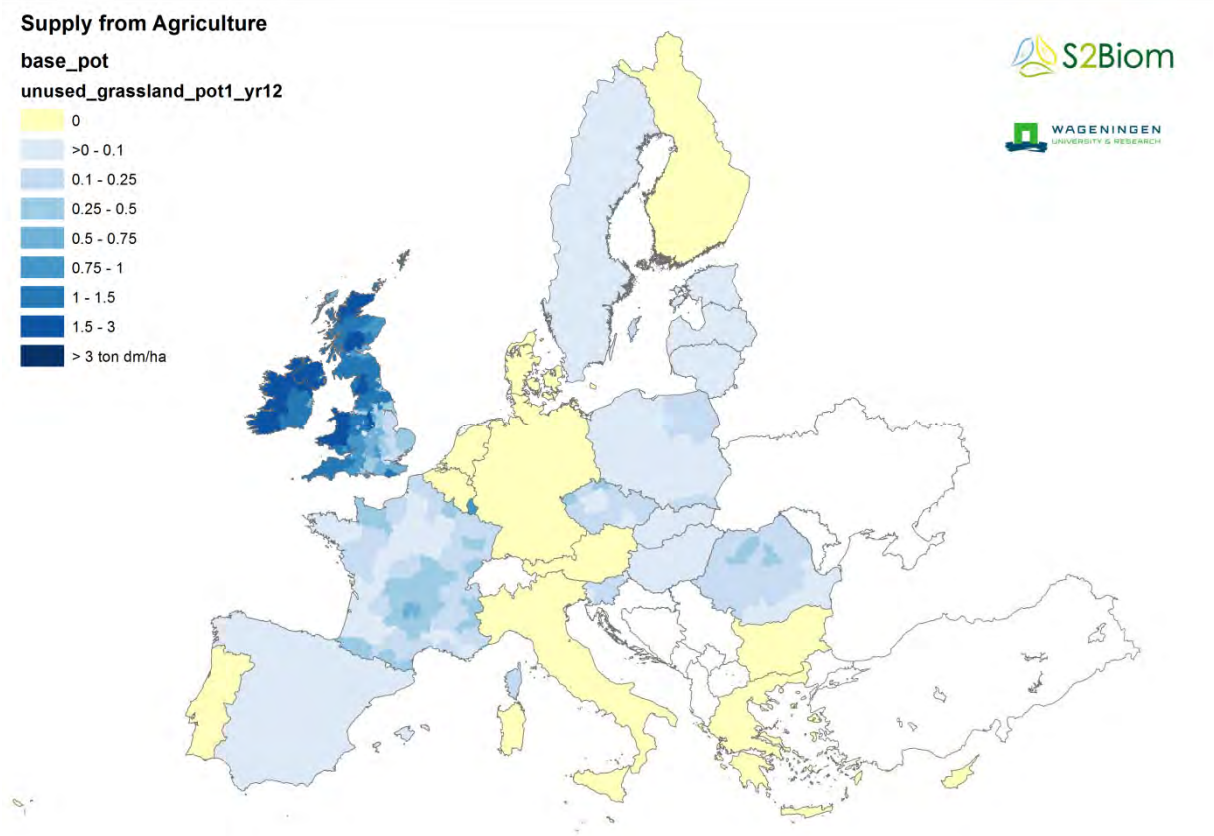


Figure 9 Total grassland cuttings supply (categories 231; Table 2) at NUTS3 level for the Base potential in 2012 in absolute level (kton dm) (upper map) and in density (ton dm/ha land) (lower map)

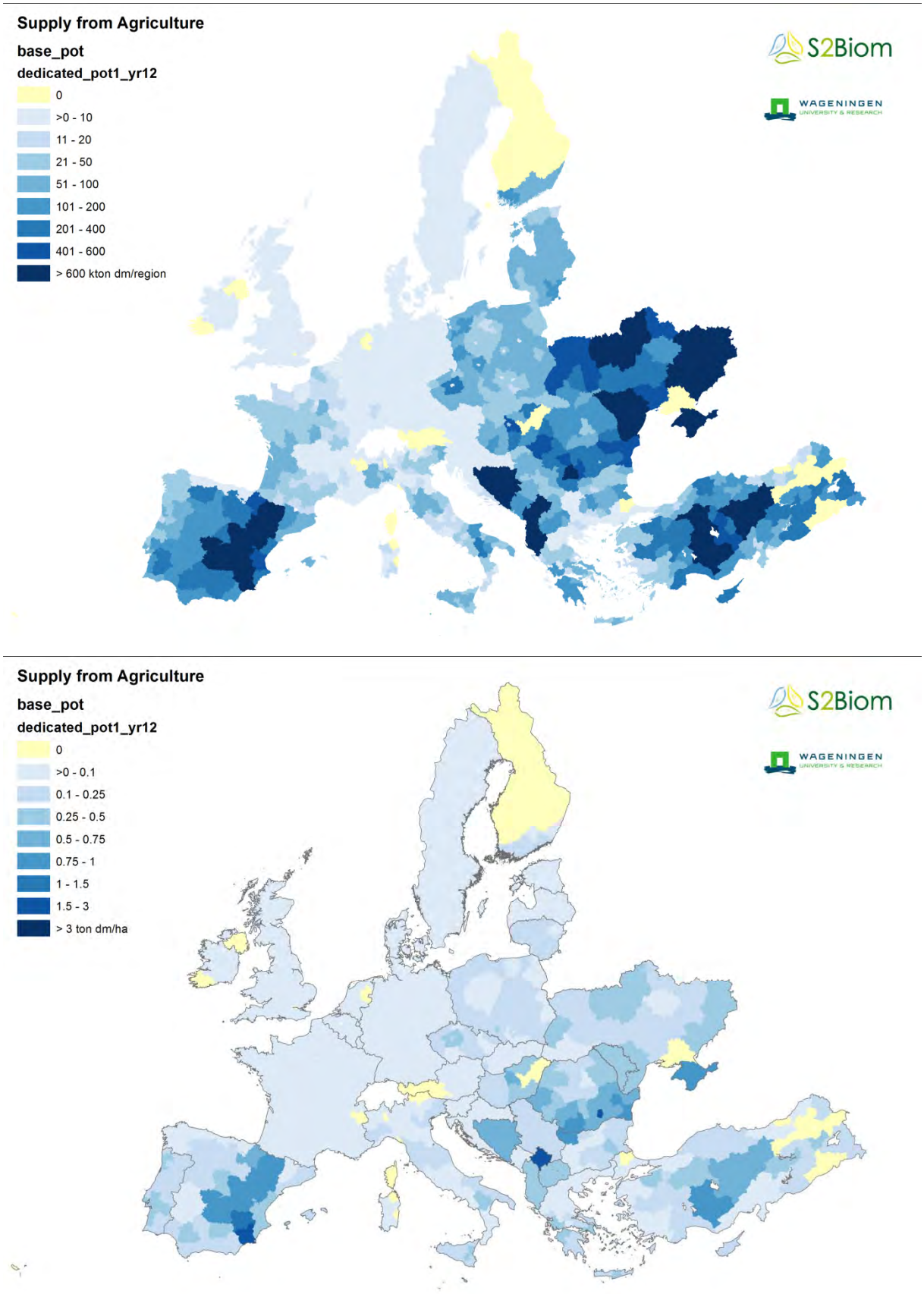


Figure 10 Total dedicated cropping supply (categories 21; Table 2) at NUTS3 level for the Base potential in 2012 in absolute level (Kton dm) (upper map) and in density (ton dm/ha land) (lower map)

The contribution of prunings to the total agricultural potential is very small as compared with straw, but in some southern European countries, particularly Spain this potential can have a meaningful level and spatial concentration (see Figure 10).

Another reason why the pruning potential is considerably smaller than the straw potential is the overall lower sustainable removal rates for prunings as compared to straw. In the base potential the sustainable removal rates require the maintenance of the soil carbon level at a stable state as was assessed through RothC and Miterra-Europe model applications (See S2BIOM Deliverable report D1.6) For straw, this results in a removal rate of around 60% in the Mediterranean countries, while this is only around 33% for prunings. In Atlantic countries the straw removal rates are around 60% while for prunings it is only around 20%.

The results obtained with RothC and Miterra-Europe models (D2Biom Deliverable report D1.7) cause the base potential of agricultural pruning to be about 35% of the technical potential as an average in Europe, some countries like Greece, Portugal or Slovenia show an even lower share. In general Mediterranean countries, where the annual rainfall is much smaller, show lower removal rates. In non-Mediterranean countries the relation between the base and the technical potential is in general much larger, averaging between 60% to 70%. The use of water and the low carbon content are limiting factors under rainfed conditions in Mediterranean countries. However, under irrigated regimes, both issues tend to improve. Therefore, the low base potential should be interpreted as an indicator of potential soil vulnerability for permanent crop plantations. A higher share of the base potential can be achieved, but the use of pruning wood should be accompanied with an examination of the soil conditions, and other agronomic practices leading to the maintenance or increase of the soil organic carbon.

Finally, it should also be realized that the pruning potentials only refer to the biomass that is removed through yearly conventional pruning activities in permanent crops. The biomass that can results from the clearing of a permanent crop plantation at the end of the life-time was not covered in the potential estimates.

An interesting category is also unused grassland cuttings (Figure 11). It should be remembered that this potential was only assessed for EU-27 countries (given data availability). It does not mean this potential is not available in many non-EU countries, but it could simply not be assessed. From the maps in Figure 11 it becomes clear that this potential is very high in Northern England, Scotland and Ireland but also interesting amounts should be available in several regions in France, Romania, Czech Republic and Austria.

Dedicated cropping potentials are largest in several regions in central Spain, Turkey, Bosnia, Bulgaria and Romania (see Figure 12). In these regions there is a large unused land resource already in 2012. The dedicated cropping potential is the most uncertain potential in the agricultural biomass group as it first requires setting up dedicated cropping plantations. The potentials shown for 2012 are basically only

pinpointing to the regions with a large unused land resource as assessed in this study based on the CAPRI land use requirements. It is more interesting to look at potentials for dedicated cropping in the intermediate future 2020 and 2030 (see Figure 13) as the trend is towards a large increase in unused lands towards 2020 and a slight decline again towards 2030. The largest dedicated copping potentials are mostly found in Spain, most CEEC countries, western Balkans, Turkey and Ukraine. These potential remain however most uncertain as they require serious collaboration and investments to bring abandoned agricultural lands in production again.

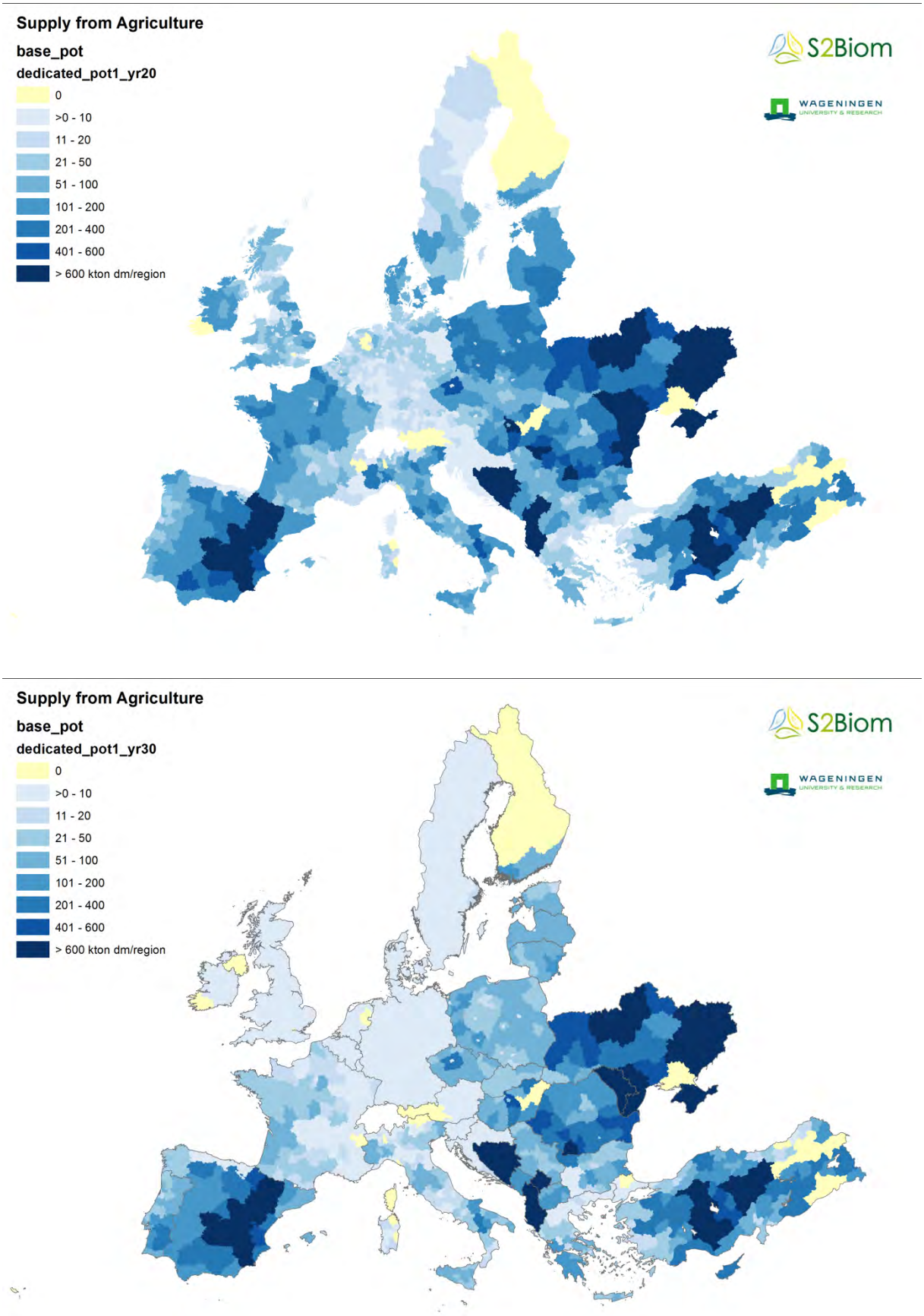


Figure 11 Total dedicated cropping supply (categories 21; Table 2) at NUTS3 level for the Base potential in 2020 (upper map) and 2030 (lower map) in absolute level (kton dm)

2.1.3 Cost levels & potentials

The supply costs were estimated only for the **road side cost**, so any cost made for transport and pre-treatment between the road side and the conversion plant gate.

All cost presented in the next maps for agricultural biomass types was calculated with the *Activity Based Costing* (ABC) model. The general purpose of this model is to provide minimum cost prices for the primary production of biomass feedstock at the road side. ABC generates the costs of different components based on specific input and output associated with the choice of the means of production, varying with the local conditions and cost of inputs (e.g. labour, energy, fertilisers, lubricants etc.). Since the production of most biomass is spread over several years, often long term cycles in which cost are incurred continuously while harvest only takes place once in so many years, the Net Present Values (NPV) of the future costs are calculated. Road side cost are presented as NPV per annum and expressed in € per ton dm.

The cost also allow for national differentiation of cost according to main inputs having national specific prices levels. National level price data (ex. VAT) included cover cost/prices for labour (skilled, unskilled and average), fuel, electricity, fertilizers (N, P2O5, K2), machinery, water, crop protection and land. Most of these data were gathered from statistical sources such as FADN (Farm Accountancy Data Network), Eurostat and OECD. Most cost levels were gathered for the year 2012.

In S2Biom only the costs specifically made to produce the biomass for the non-feed or -food markets are considered. This means that in cases where there is a crop production for human consumption or for feed involved, such as wheat, this production will be considered the main product and the biomass for non-feed or food (e.g. straw in case of wheat) the by-product. All costs of growing the crop are attributed to the main product and consequently these become sunken costs for the by-product and thus excluded. Only activities specifically dedicated to the by-product (e.g. harvesting the straw) add to the (minimum) cost level of the biomass feedstock.

In the case of straw these cost include harvesting, fertilization, because of nutrient removal with the straw, and baling and forwarding to the road side/farm gate. In the case of prunings this involves the cost for treatment and collection of the branches left on the soil, as shredded material to road side. It involves collection, shredding and forwarding to road side. In the case of dedicated biomass crops the cost structure is clear and all cost can be allocated to the final product which is the biomass. All cost should include the fixed and variable cost of producing the biomass including land, machinery, seeds, input costs and on field harvesting costs. In the case of unused grassland cuttings the cost consist of mowing, racking which is needed to dry the cuttings before baling, baling and collection and loading at the road side.

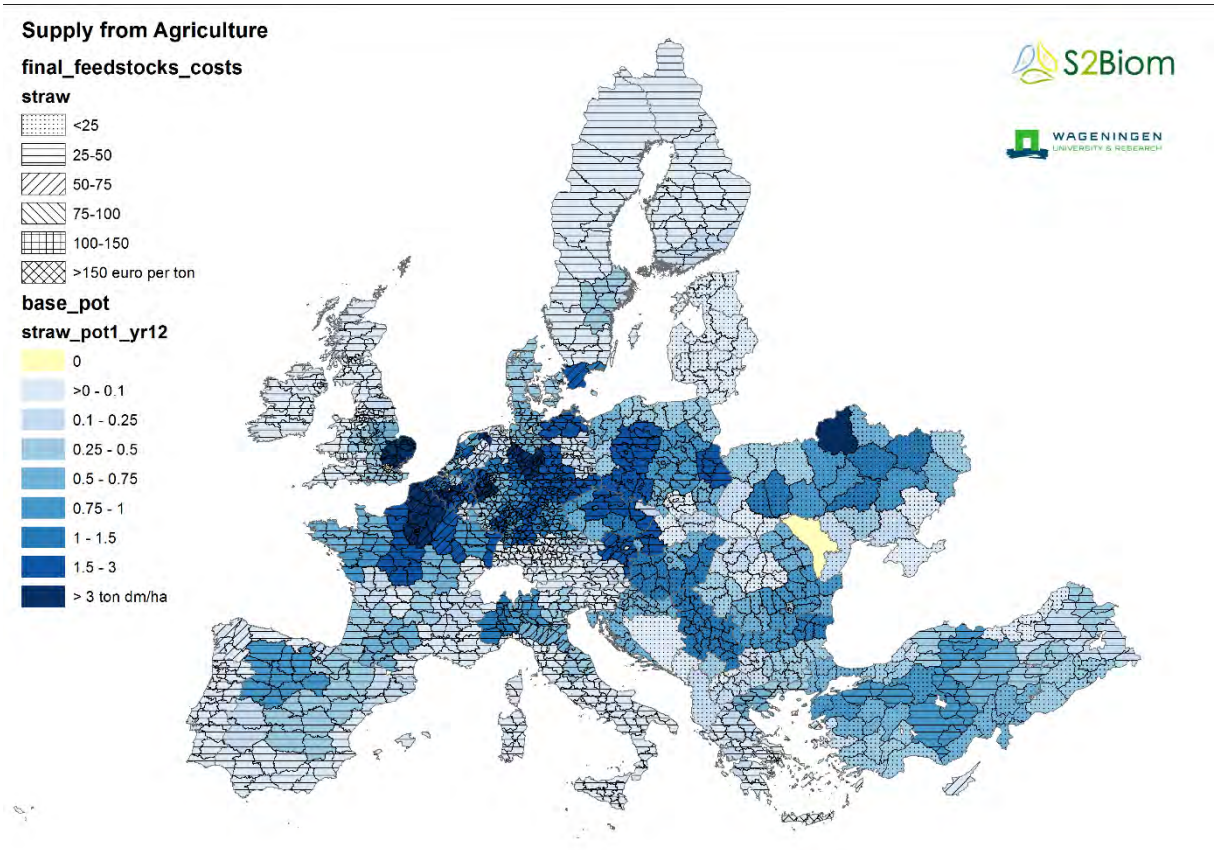


Figure 12 Cost and supply levels- for straw & stubbles

In Figure 12 the cost supply combination is given of all primary agricultural biomass. It shows that the lowest weighted average road-side cost (<25€/ton dm) for agricultural biomass are found in Ukraine and most western Balkan countries. Intermediate cost levels (25-50 €/ton dm) are particularly found in Hungary, Bulgaria, Romania, Croatia, Czech Republic, Estonia, Latvia, Lithuania, Slovakia and Turkey. The remaining countries have higher cost levels where the highest cost levels (>100 €/ton dm) are found in Austria, Finland, Germany, Sweden and Denmark.

The higher cost levels are especially related with high overall national price levels for inputs like labour and machinery. The mix of biomass types that builds up the weighted average cost levels is also very important. Overall lowest cost levels are for straw, followed by unused grassland cuttings. Biomass from dedicated crops in generally in the middle range, although differences in national cost levels are very large. The most expensive cost levels are for prunings. Small fields and small row distances between the crops can make the collection of this type of biomass very cost intensive as mechanisation of it is a challenge in small scale fields (see Figure 13).

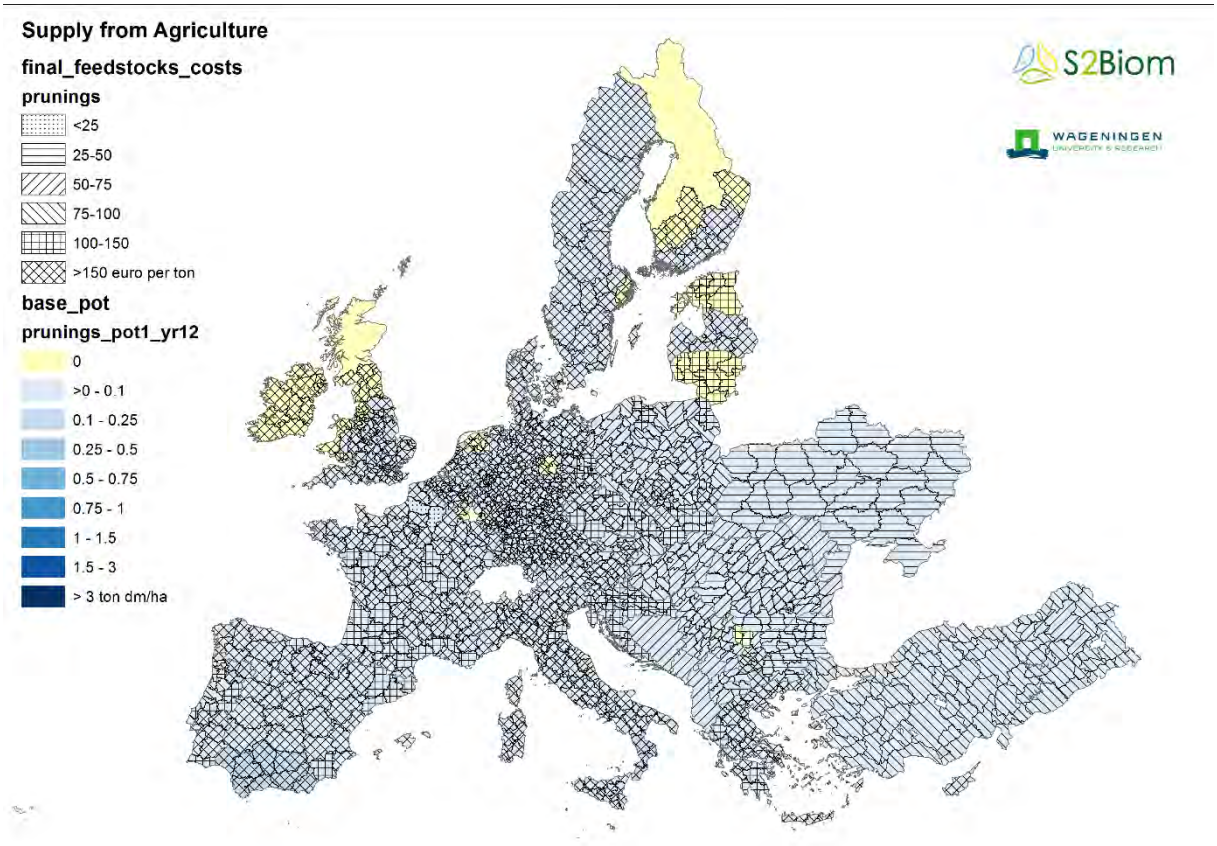


Figure 13 Cost and supply levels- for prunings

The only countries where cost for prunings are still within a reasonable range is Ukraine (around 40 €/ton dm) and in most Western Balkan countries (around 60 €/ton dm). On the other hand these pruning cost may be an over estimation in case farmers prefer to remove prunings from the field any way. A reason is that removal of pruning material should be seen as normal practice as it helps to decline the risk for pest. The organisation of the value chain may require that farmers internalise part of the costs for collection, shredding and forwarding of the pruning material: in other words, to understand that the use of pruning for energy is an alternative of the pruning management leading to potential savings in the overall exploitation costs of the plantation. Under this view farmers may accept to get less return for the pruning part collected for energy (see Figure 14).

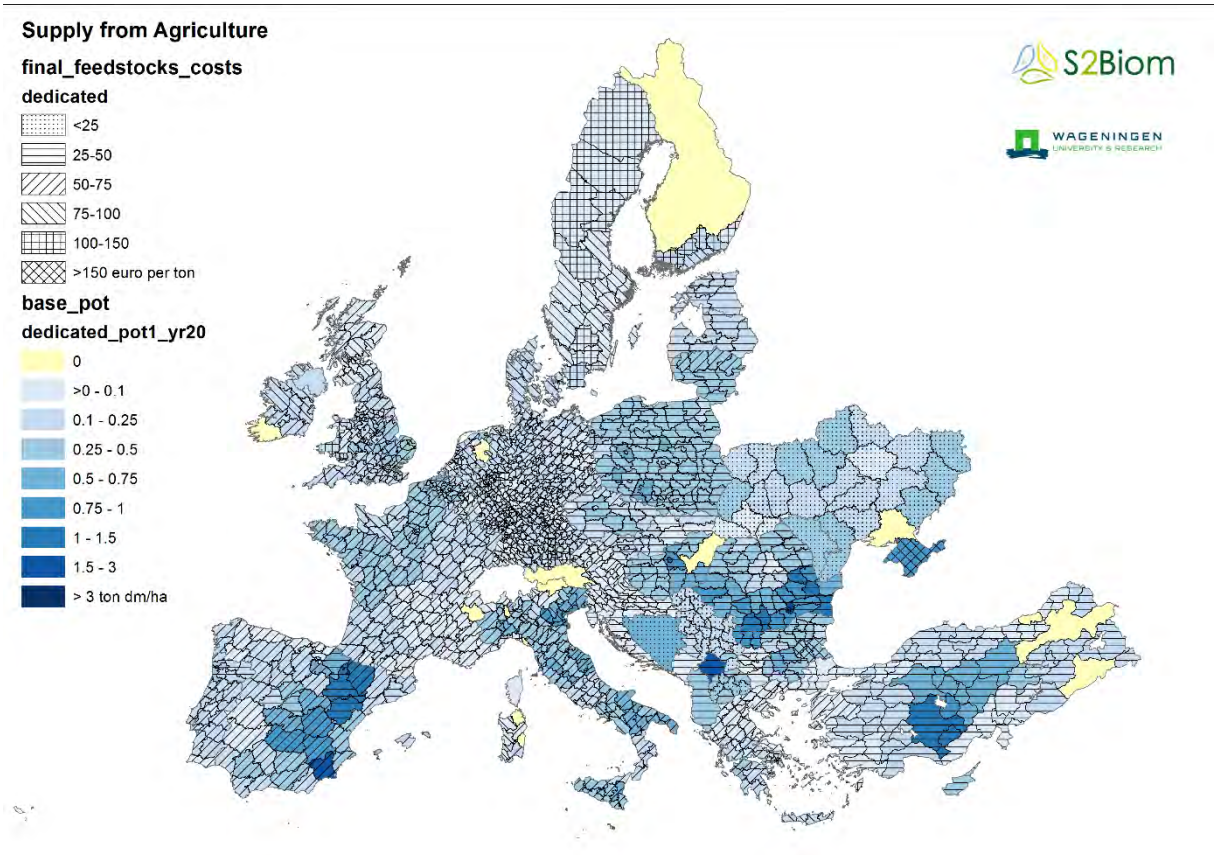


Figure 14 Cost and supply levels- for dedicated crops

Unused grassland cuttings are a not too expensive biomass resource as compared to other primary agricultural sources (see Figure 15). This resource may also be in relevance in the other non-EU countries where it could not be investigated because of data limitations. It is however a resource that needs further attention in new research. Countries that have a large resource such as UK, Ireland, but also some regions in France should investigate whether this resource can indeed be mobilised and what the environmental gains and risks are of exploiting it.

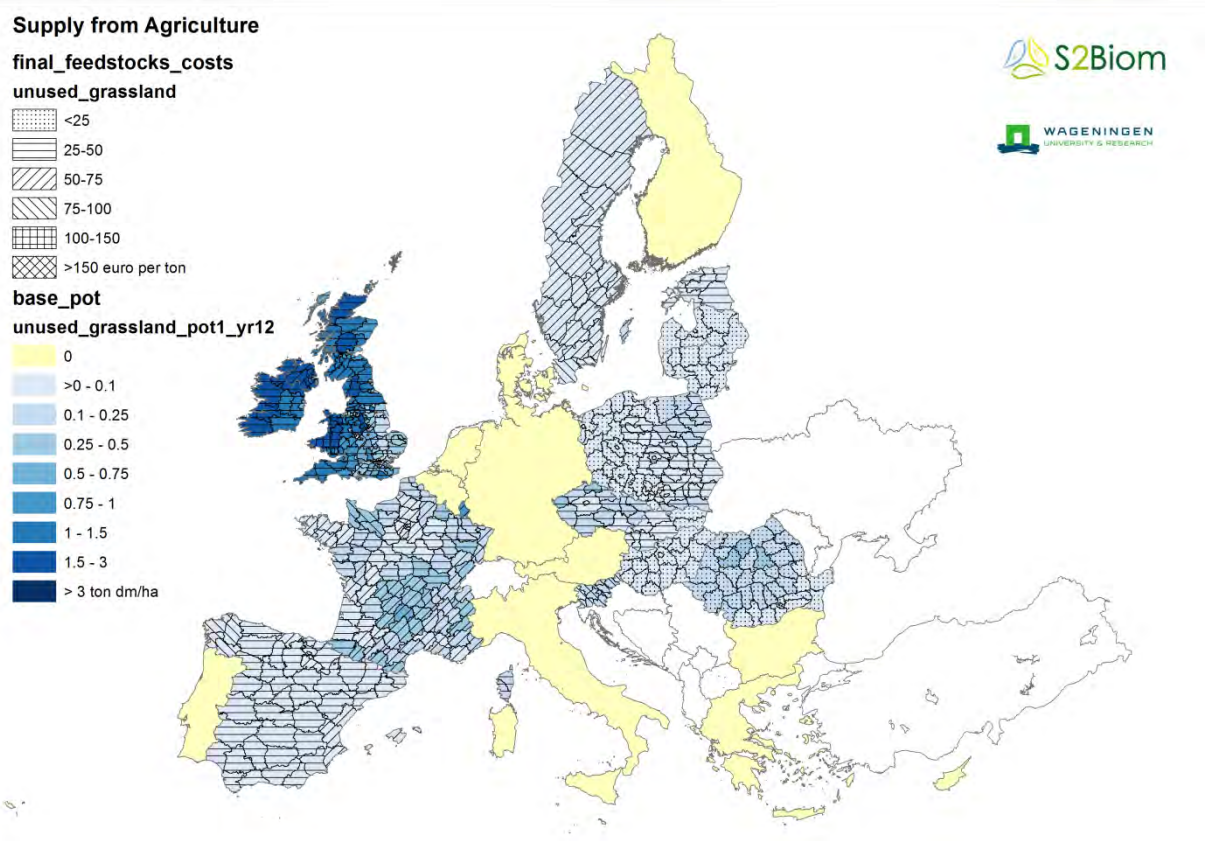


Figure 15 Cost and supply levels- for unused grassland cuttings

2.2 Wood production and primary residues from forests map

2.2.1 Introduction

Wood production and primary residues from forests comprises the categories presented in Table 3.

Table 3 Subcategories of first level category 1 "Forestry"

Second level subcategories		Third level subcategories		Final level subcategories	
ID	Name	ID	Name	ID	Name
11	Primary production from forests	111	Stemwood from final fellings & thinnings	1111	Stemwood from final fellings originating from non-conifer tree species
				1112	Stemwood from final fellings originating from conifer tree species
				1113	Stemwood from thinnings originating from non-conifer tree species
				1114	Stemwood from thinnings originating from conifer tree species
12	Primary residues from forests	121	Logging residues from final fellings & thinnings	1211	Logging residues from final fellings from non-conifer tree species
				1212	Logging residues from final fellings from conifer tree species
				1213	Logging residues from thinnings from non-conifer tree species
				1214	Logging residues from thinnings from conifer tree species
		122	Stumps from final fellings	1221	Stumps from final fellings originating from non-conifer tree species
				1222	Stumps from final fellings originating from conifer tree species

The results presented here highlight the categories "Forestry" "Production from forests" and "Primary residues from forests". The third and final level sub-categories are presented in the online tool only.

The estimated potential supply and its cost are presented here in form of graphs, maps and tables (Annex) in accordance with the definitions of the potential levels as specified in the methods report D1.6 comprising technical, base and user defined potentials. These potentials types are defined as shown in Table 4.

Table 4 Overview of the major woody biomass potential types used in S2BIOM

Name	Area/ Basis	Yield, Growth	Technical & environmental constraints on the biomass retrieval (per area)	Consideration of competing use	Mobilisation
TP - Technical	**Default:** Forest area available for wood supply. This excludes protected and protective areas, where harvesting is not allowed according to protection purpose.	**Default:** Growth based on regional to national growing conditions, including changes in biomass increment due to climate change. Yield according to regional management guidelines for age limits for thinnings and final fellings.	Maximum volume of stemwood that could be harvested annually during 50-year periods. Technical constraints on residue and stump extraction (recovery rate)	**Default:** None	**Default:** None
HP - High			As for technical potential, but considering additional constraints (but less stringent as compared to base potential) for residue and stump extraction: Site productivity -Soil and water protection: ruggedness, soil depth, soil surface texture, soil compaction risk -Biodiversity (protected forest areas) -Soil bearing capacity.		
BP - Base			**Default:** As for technical potential, but considering additional constraints (based on current biomass harvesting guidelines) for residue and stump extraction: -Site productivity -Soil and water protection: ruggedness, soil depth, soil surface texture, soil compaction risk -Biodiversity (protected forest areas) -Soil bearing capacity.		
UP1 - User potential - option 1	Reduction of FAWS by 5% (due to increased forest protection)	Default	Default	Default	Default
UP2 - User potential - option 2	Reduction of FAWS by 5% (due to increased forest protection)	Default	Increase in retained trees by 5%.	Default	Default
UP3 - User potential - option 3	Default	Default	No stump extraction.	Default	Default
UP4 - User potential - option 4	Reduction of FAWS by 5% (due to increased forest protection)	Default	Increase in retained trees by 5% plus no stump extraction	Default	Default
UP5 - User potential - option 5	Default	Default	Default	Total roundwood production for material use subtracted.	Default
UP6 - User potential - option 6	Default	Default	Default	Roundwood production for material use (excluding production of pulp and paper and board industry) subtracted.	Default
UP7 - User potential - option 7	Reduction of FAWS by 5% (due to increased forest protection)	Default	Increase in retained trees by 5% plus no stump extraction	Total roundwood production for material use subtracted.	Default
UP8 - User potential - option 8	Reduction of FAWS by 5% (due to increased forest protection)	Default	Increase in retained trees by 5% plus no stump extraction	Roundwood production for material use (excluding production of pulp and paper and board industry) subtracted.	Default

Note: the Base Potential contains all default assumptions, for which variations are assumed in the User Potentials. Default assumptions apply to all potential types, unless stated otherwise.

All potentials are defined in detail in S2BIOM deliverable 1.6. In the section below we mainly focus on the Base Potential (BP).

2.2.2 Regional and country level results

Woody biomass potentials from forests in the EU and neighbouring countries have been estimated using the EFISCEN forest resource model, as well as international forestry statistics. The potential supply of woody biomass in these 37 countries in 2012 is estimated at 379 million tonnes dry matter yr^{-1} overbark (or 817 million m^3 yr^{-1} overbark; Table 15 and Table 16.

in Annex 1), according to the Base Potential. The potential was projected to decrease by 2.1% to 370 million tonnes dry matter yr^{-1} overbark by 2030, but in general the potential was rather stable over time. This is mainly because the potential for each year is based on the average maximum harvest level that can be maintained throughout the next 50-year period. About 88% of the total potential is in stems, while logging residues and stumps represent 12% (Figure 16 and Figure 17). The majority of this potential is located within the 28 EU member states; the potential supply of woody biomass for the Base Potential from EU forests is estimated at 337 million tonnes dry matter yr^{-1} overbark (or 728 million m^3 yr^{-1} overbark).

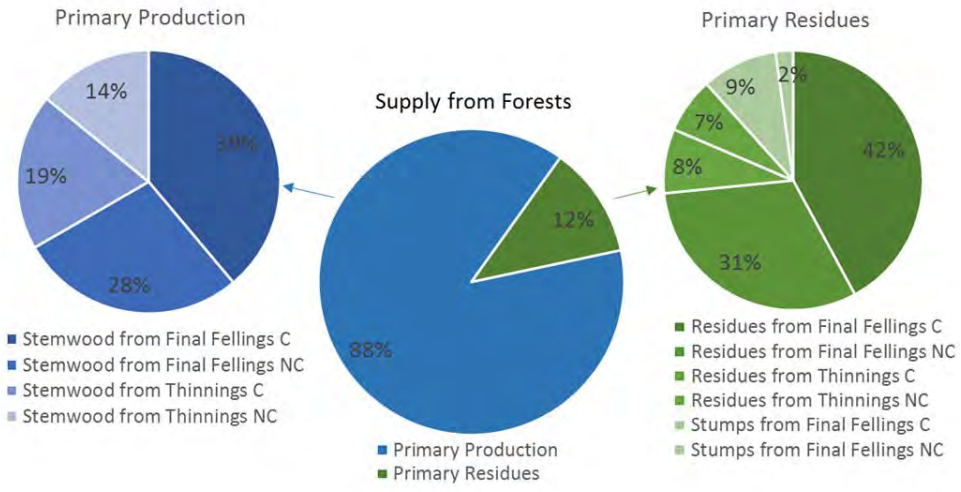


Figure 16 Proportions of supply from forestry- Base Potentials for all S2biom countries (2012)

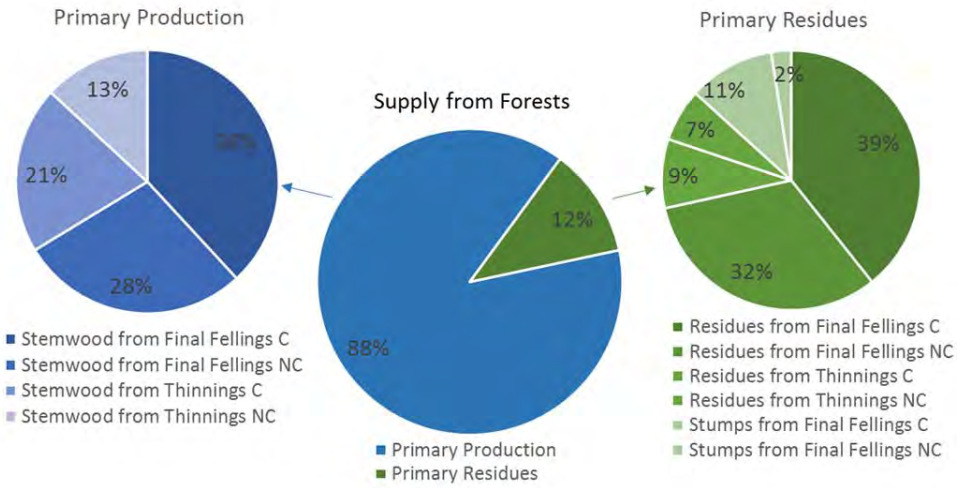


Figure 17 Proportions of supply from forestry - Base Potentials for EU28 (2012)

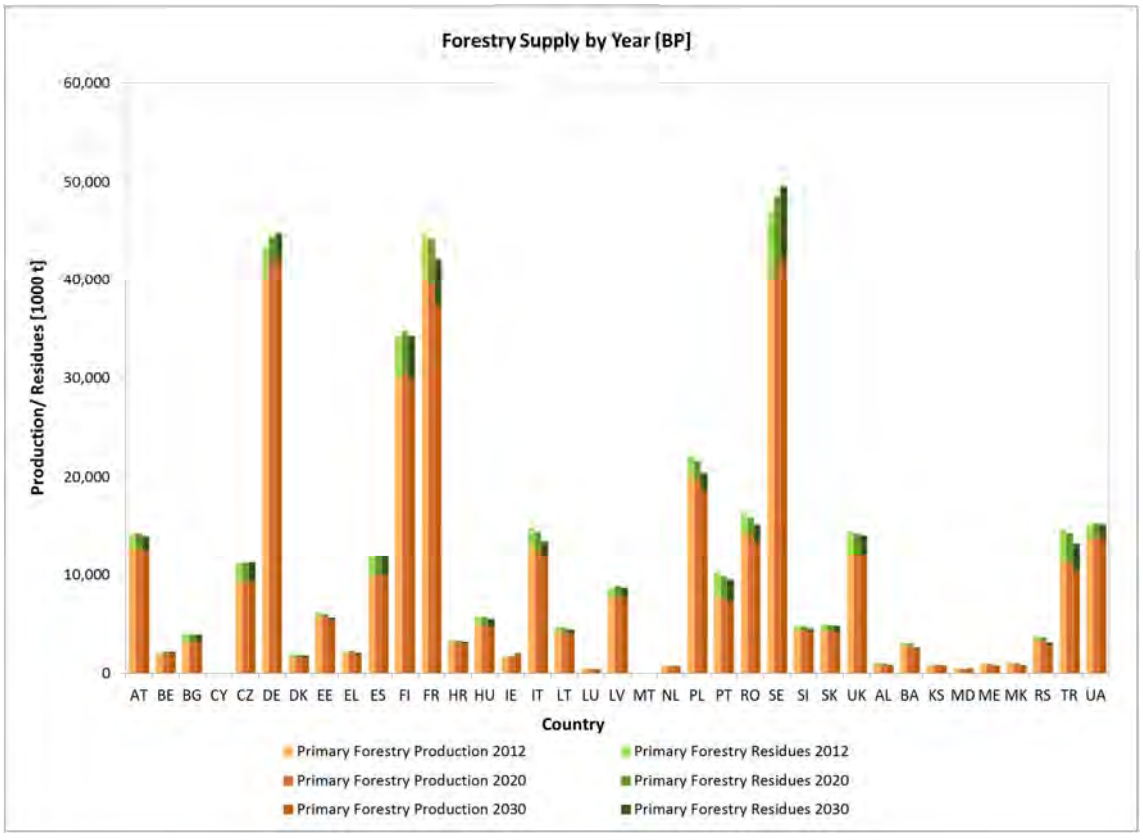


Figure 18 Total forestry potentials (categories 11 and 12; Table 3) by country for the Base Potential in 2012, 2020 and 2030

The woody biomass potentials are not equally distributed between the 37 countries Figure 18). The four countries that have the largest forest biomass potentials (Sweden, Germany, France and Finland) represent about 45% of the total potential supply of the study area. The large potentials for these countries are related to the extent of their forest areas.

The potential supply of woody biomass according to other forestry potential types (i.e. when assuming other constraints that reduce the potential supply) are shown in Figure 19, Figure 20 and Figure 21. The Technical Potential, High Potential and Base Potential vary only in terms of potential availability of primary residues (i.e. logging residues and stumps) from forests. Only for the User Potentials there are differences in the amount of stemwood as compared to the Base Potential, due to assumptions on increases of the protected forest area and retention trees and on the uses of wood.

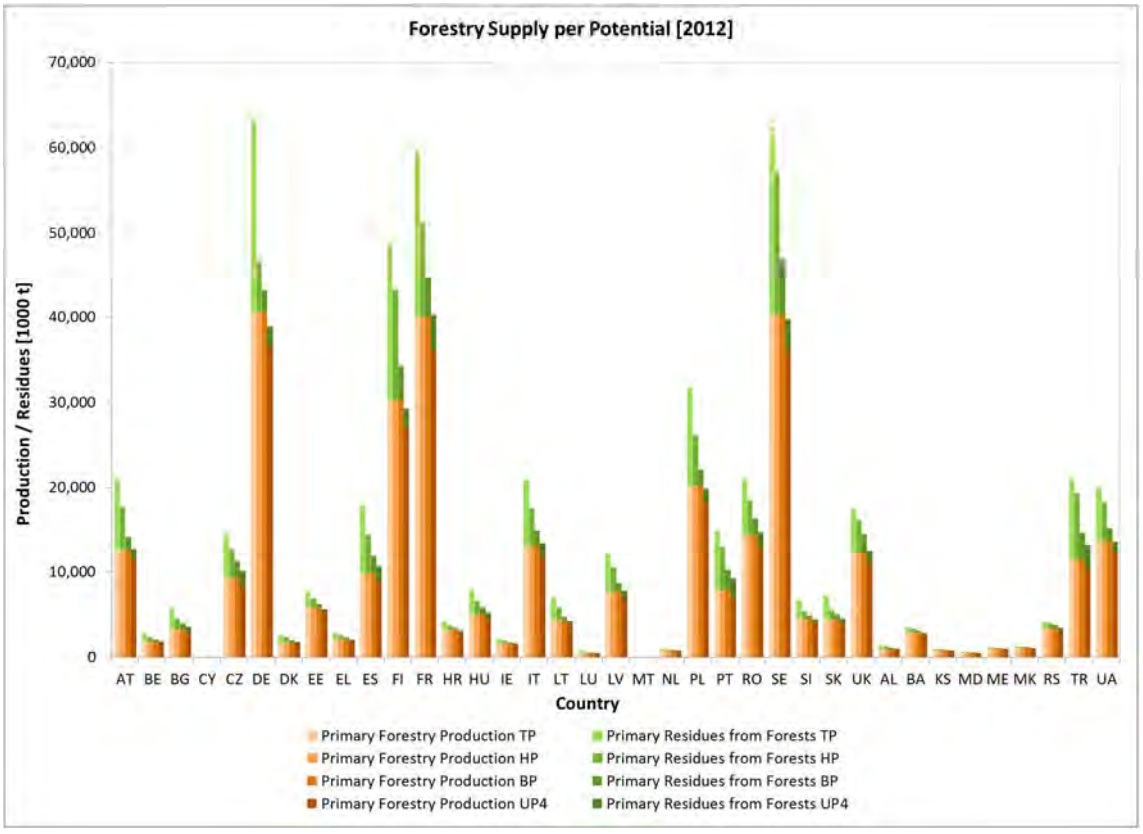


Figure 19 Total forestry potentials (categories 11 and 12; Table 3) by country for the Base Potential (BP), High Potential (HP), Technical Potential (TP) and User Potential 4 (UP4) in 2012

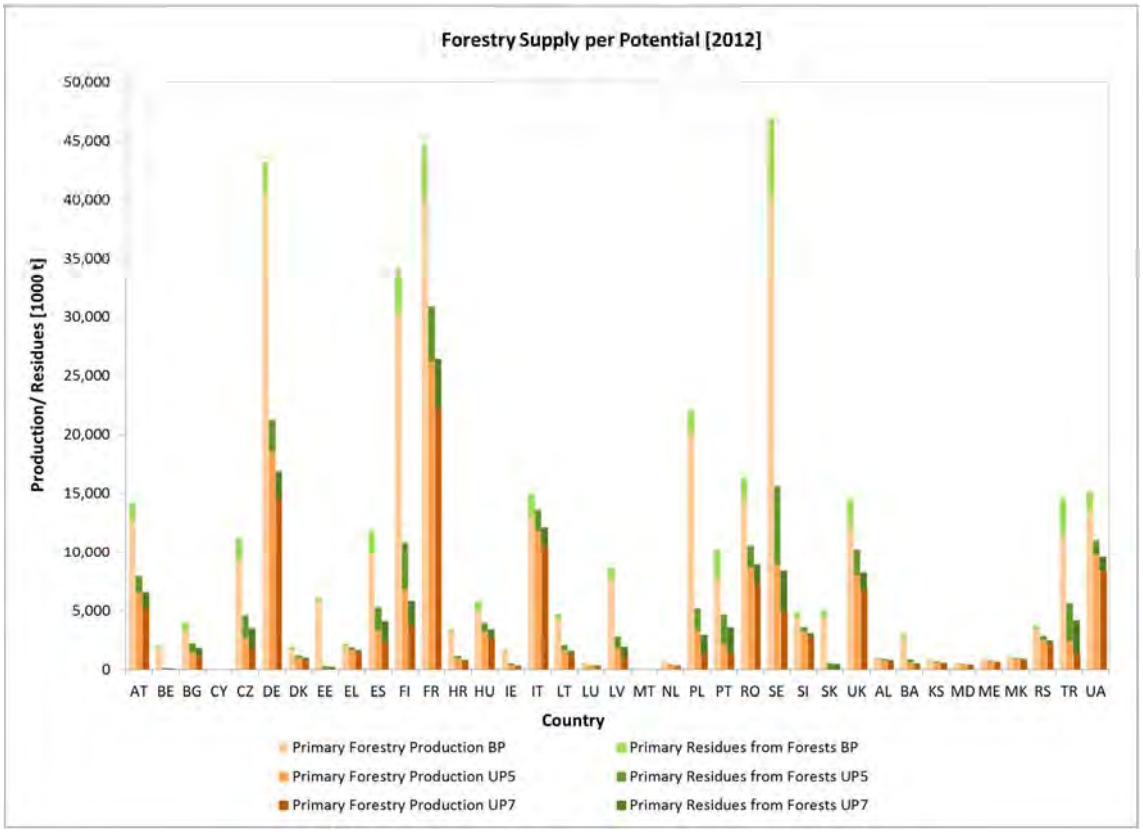


Figure 20 Total forestry potentials (categories 11 and 12; Table 3) by country for the Base Potential (BP) and User Potentials 5 and 7 (UP5, UP7) in 2012[2]

[2] The view occurring negative values (see Annex A4) are set to zero in this figure.)

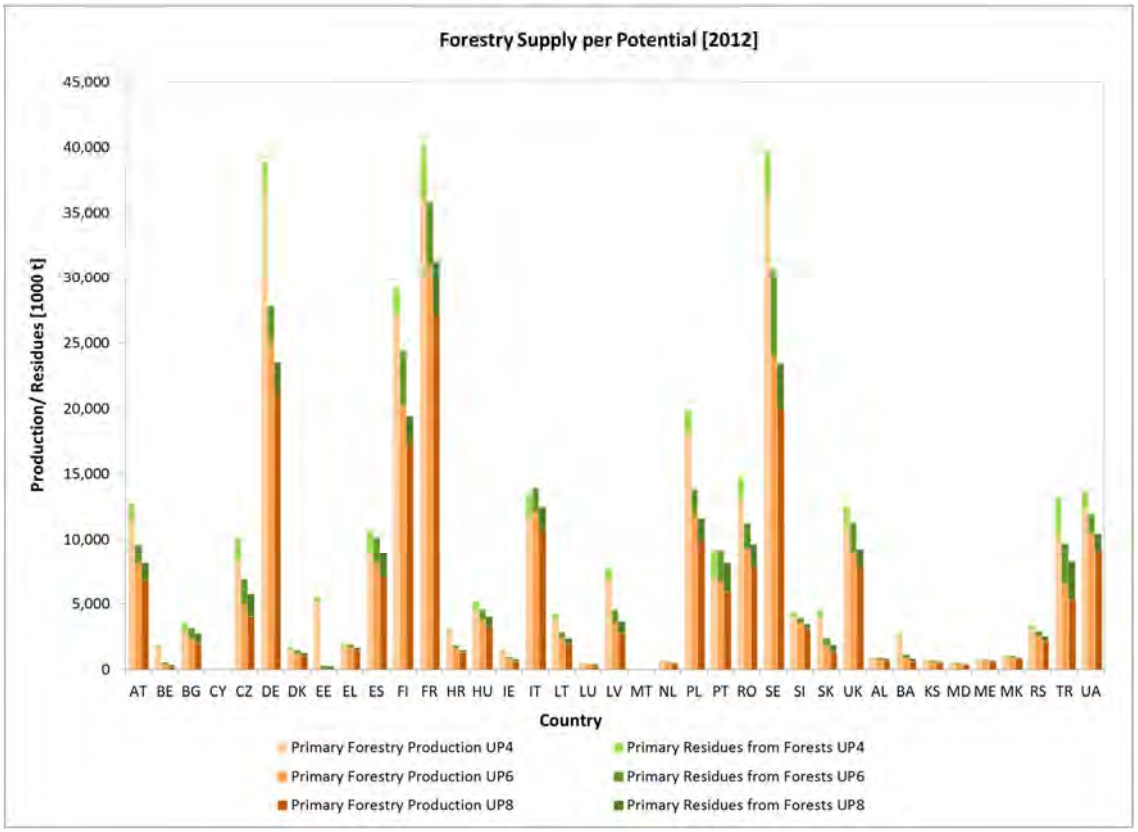


Figure 21 Total forestry potentials [primary forestry production plus primary residues from forests] (categories 11 and 12; Table 3) by country User Potentials 4, 6 and 8 (UP4, UP6 and UP8) in 2012

2.2.3 Spatial distribution of biomass potentials from forests

To gain insight into the spatial distribution of these potentials, the maps in Figure 22 to Figure 26 show biomass potentials for administrative regions (NUTS-3 level). To be able to compare potentials between regions and with potentials from other sources (e.g. agriculture, other land uses) potentials are displayed per unit of land.

The largest potential supply of woody biomass per unit of land can be found in Northern Europe (southern Finland and Sweden, Estonia and Latvia), Central Europe (Austria, Czech Republic, and Southern Germany), southwest France and Portugal. The forest biomass potentials per unit of land (Figure 17) are generally highest in Central and Northern Europe, due to higher forest productivity (mainly Central Europe, southwest France and Portugal) and a higher forest cover ratio (mainly Northern Europe). Conversely, the biomass potentials per unit of land are generally low in Southern European countries due to lower productivity of the forest resources, as well as in countries that have only a low share of forest cover (Denmark, Ireland, the Netherlands, and United Kingdom).

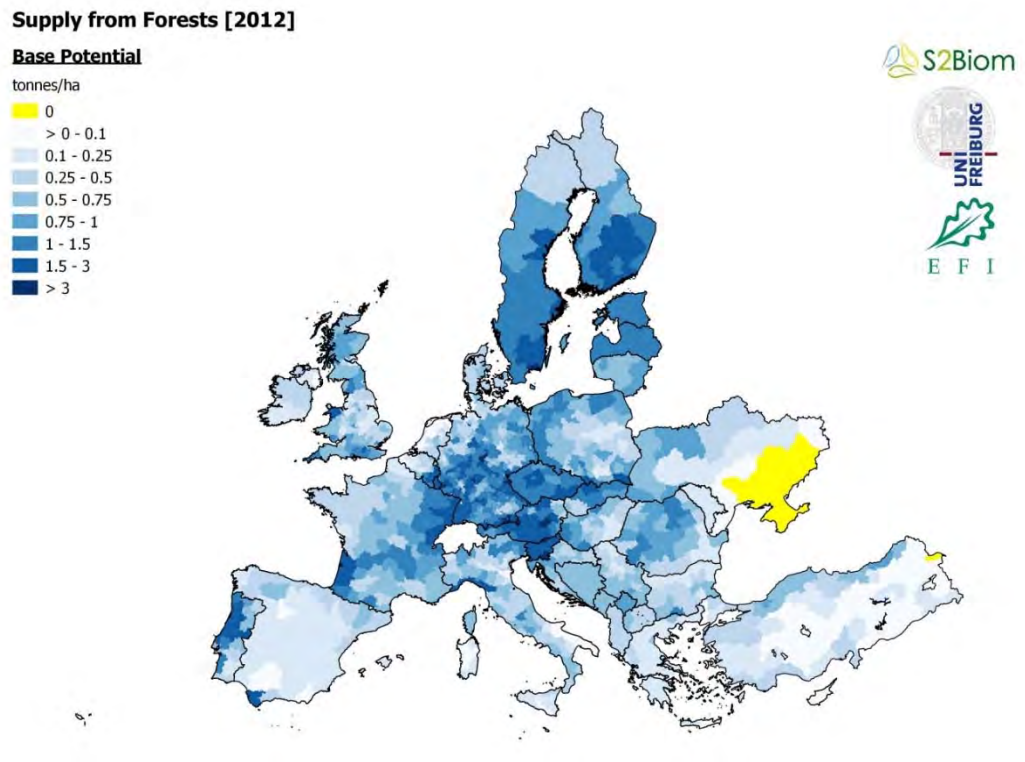


Figure 22 Total forestry supply potential (categories 11 and 12; Table 3) per ha of land at NUTS-3 level for the Base potential in 2012

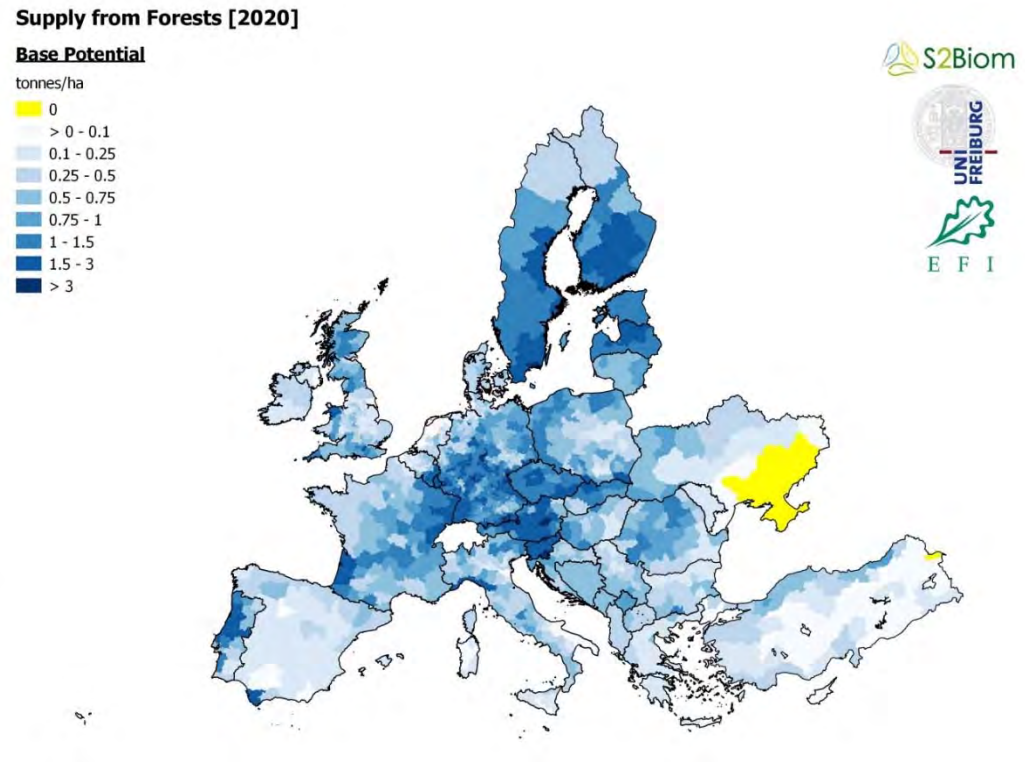


Figure 23 Total forestry potential (categories 11 and 12; Table 3) per ha of land at NUTS-3 level for the Base potential in 2020

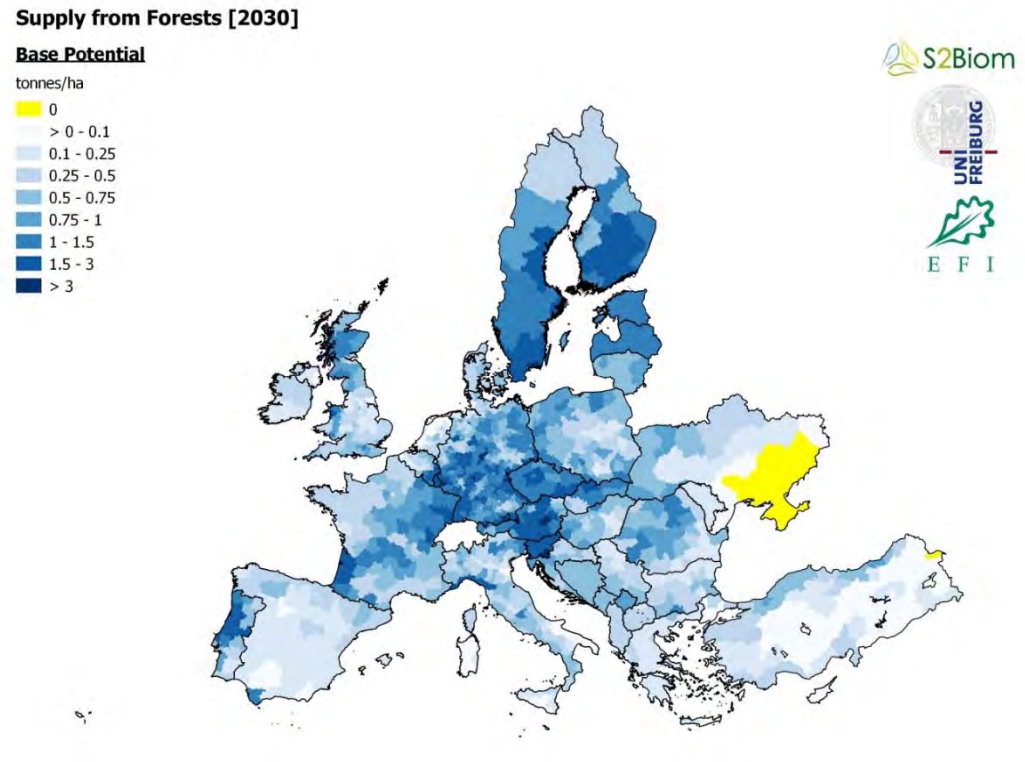


Figure 24 Total forestry potential (categories 11 and 12; Table 3) per ha of land at NUTS-3 level for the Base potential in 2030

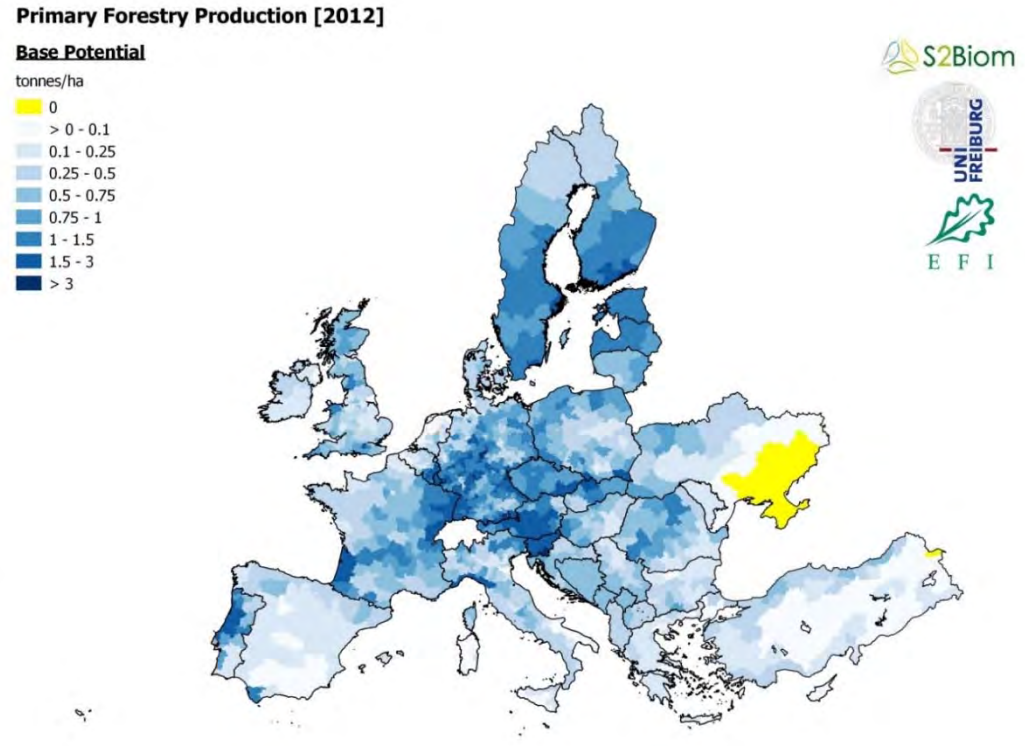


Figure 25 Potential from primary forestry production potential (i.e. stemwood; category 11; Table 3) per ha of land at NUTS-3 level for the Base potential in 2012

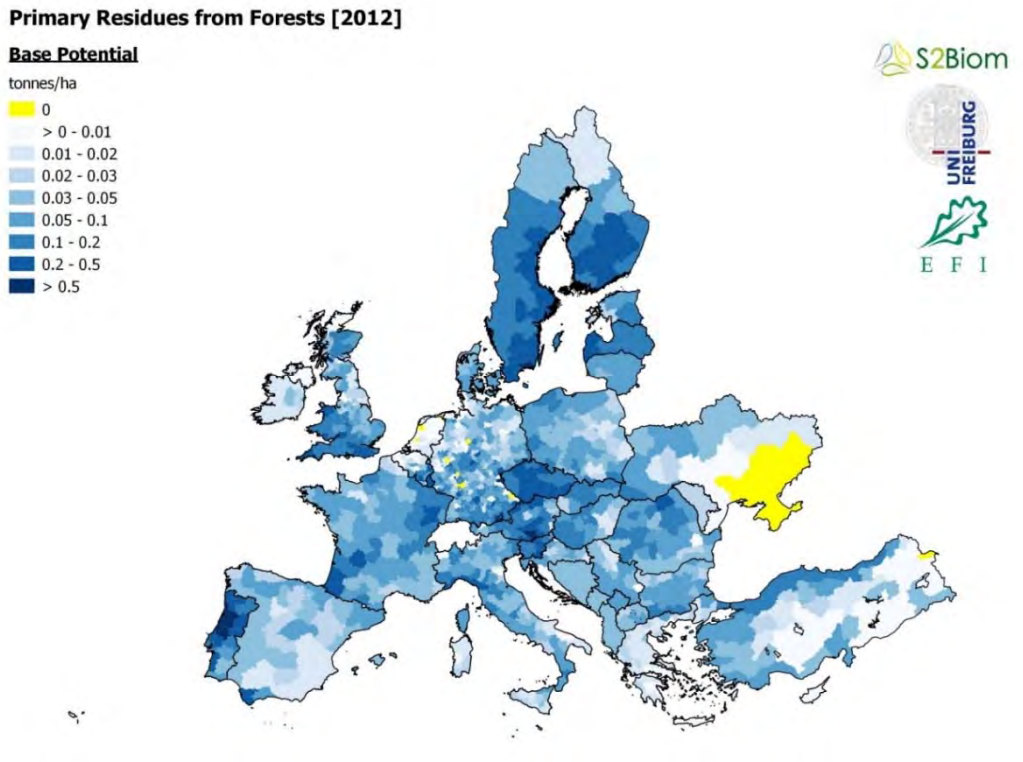


Figure 26 Potential from primary residues (i.e. logging residues and stumps, category 12; Table 3) per ha of land at NUTS-3 level for the Base potential in 2012^

2.2.4 Cost levels & potentials

The supply costs were estimated up to the roadside including chipping or crushing, but excluding road transport and production costs. The methodology of cost estimation consists of two main components: 1) the estimation of hourly machine costs, and 2) the estimation of work productivity. In order to enable better comparison of costs between regions, supply chains were standardised. The dominant supply chain for stemwood in Europe is the chain based on roadside chipping. In the chain felling and bunching are carried out by a harvester, off-road transport by a forwarder and chipping by a mobile chipper. For logging residues the chain is otherwise similar except for the missing felling phase. Instead, piling of logging residues by the harvester is considered to belong to logging residue supply chain. Stumps are extracted by an excavator, forwarded to roadside and crushed by a mobile grinder.

In the estimation of machine costs both machine-level and country-level input data were used as explanatory variables in the costing model applied in the study. The machine-level data included, e.g., fuel consumption and the country-level data variables like purchase price, fuel cost and labour cost.

In the estimation of productivity a set of productivity models were selected for the following work phases: mechanized felling and bunching, integrated bunching while felling with a harvester, forwarding, chipping, stump lifting, and crushing. Subsequently, data describing the operating environment were collected and used as explanatory variables for the productivity models. Examples of such data included the intensity of harvesting on a felling area, average size of the removed trees and slope.

All the cost estimations pertain to the cost level of 2012. For a complete description of the methodology see Dees et al. (2017).

As Figure 27 to Figure 34 show, generally, the supply costs in Eastern Europe tend to be lower than elsewhere in the study area. Further work would be needed to thoroughly analyse which of the explanatory variables are the most influential to the costs. However, the lower costs in Eastern Europe can – at least to a certain extent – be explained by lower investment, fuel and especially labour costs.

In Western Europe Denmark, Italy and Ireland stand out from the neighbouring countries with respect to the supply cost of stemwood from final fellings (Figure 27). This might be due to the small tree size, relatively long forwarding distances and – in Italy – steep terrain. The supply costs of logging residues from final fellings seem to be especially high in Romania, Greece and Italy, possibly owing to the long forwarding distances. Furthermore, small tree size explains the exceptionally high supply cost of non-conifer stemwood from thinnings in Ukraine and in Latvia.

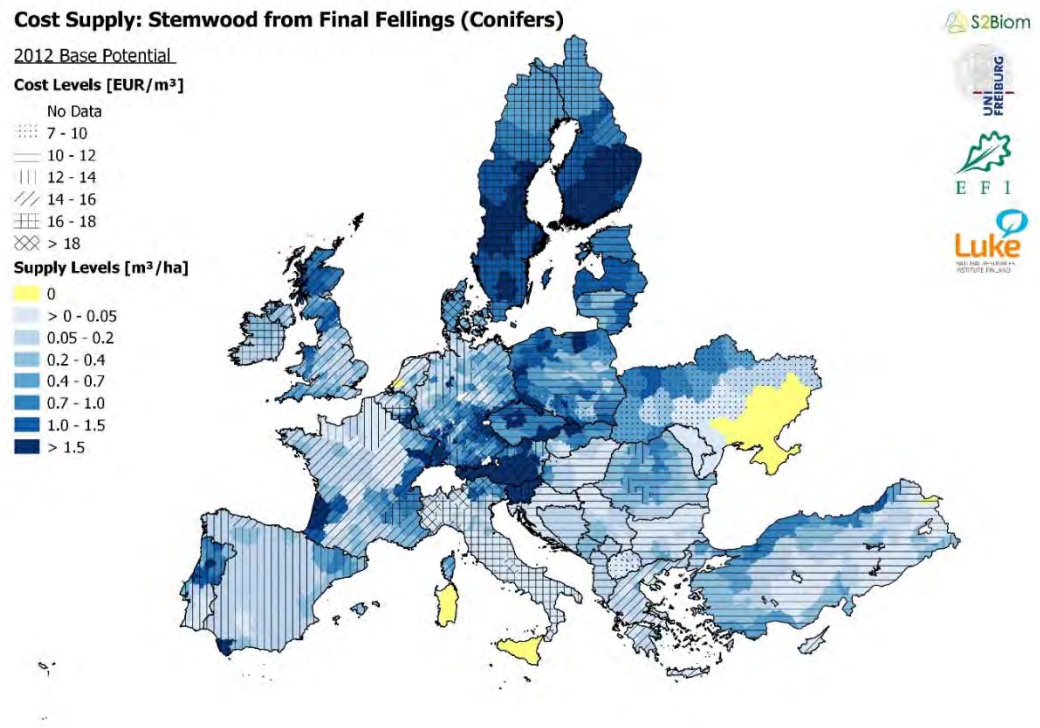


Figure 27 Cost and supply levels- Stemwood from final fellings (conifer)

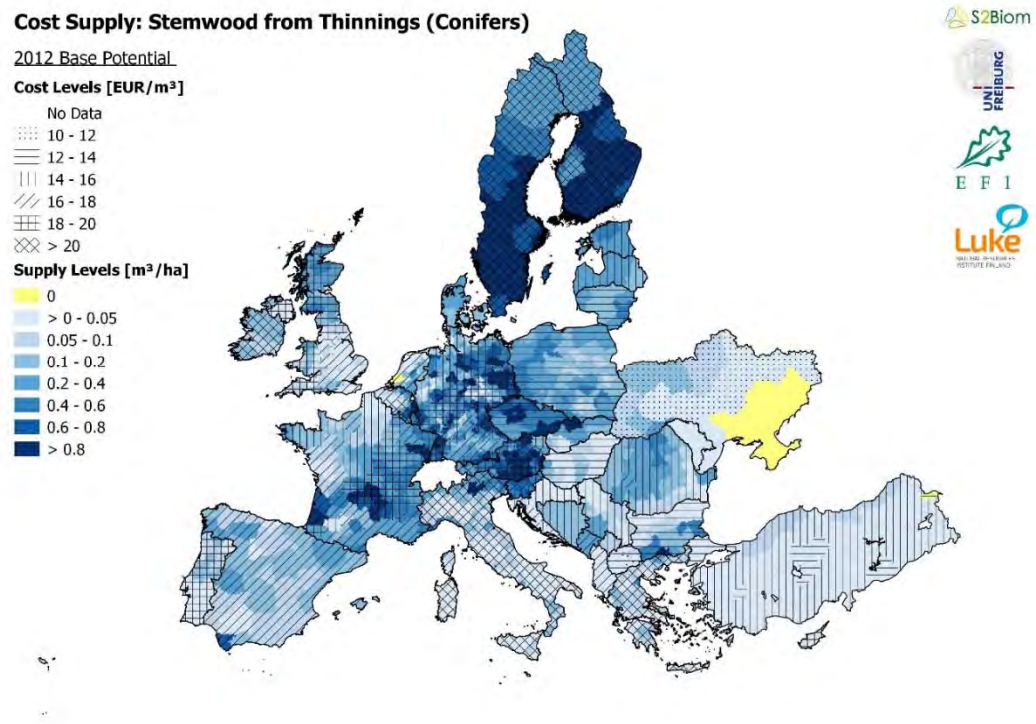


Figure 28 Cost and supply levels- Stemwood from thinnings (conifer)

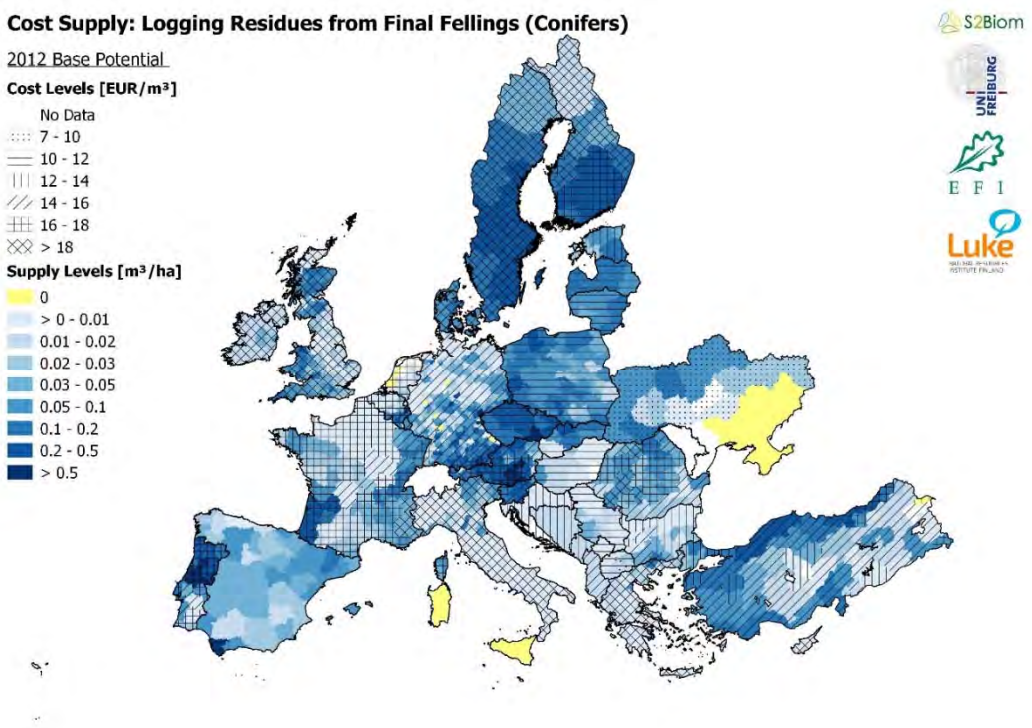


Figure 29 Cost and supply levels- Residues from final fellings (conifer)

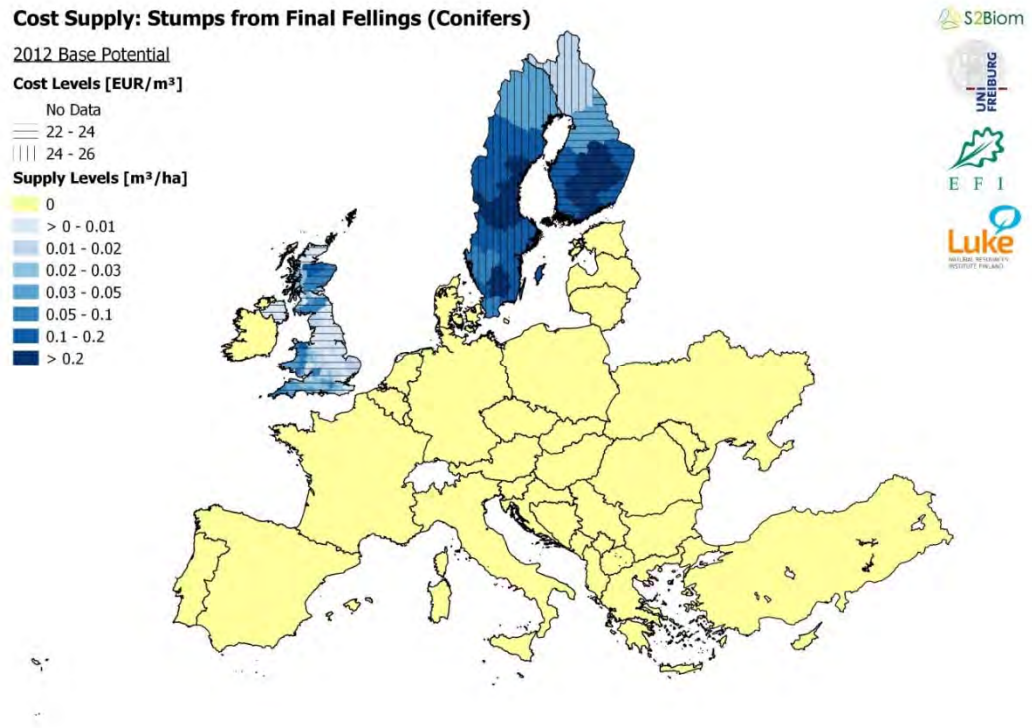


Figure 30 Cost and supply levels- Stumps from final fellings (conifer)

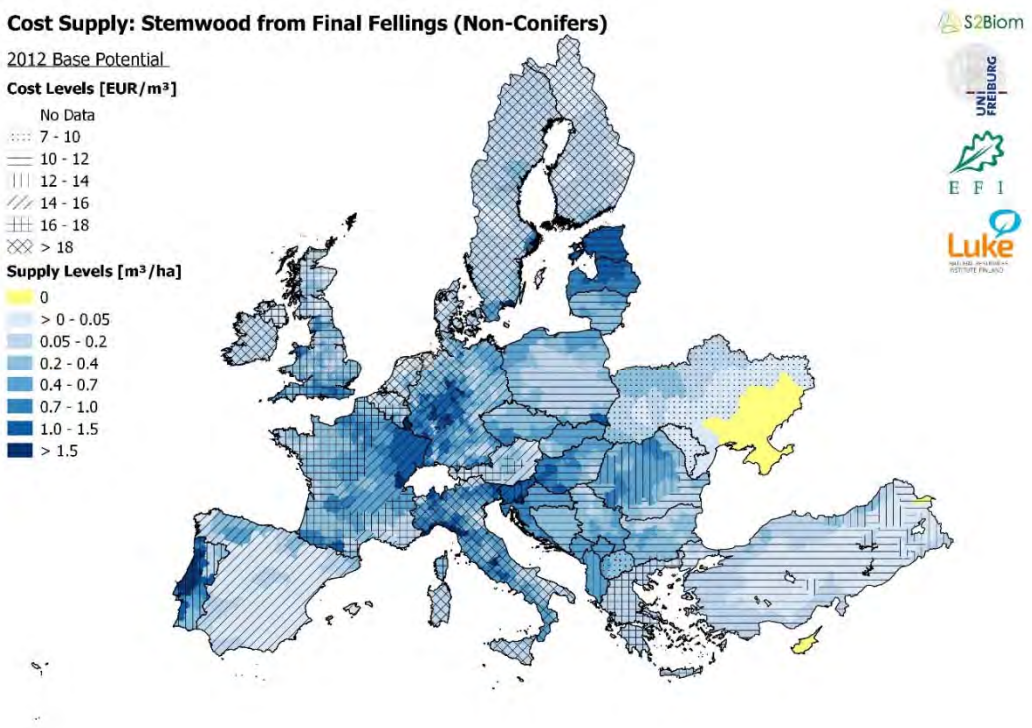


Figure 31 Cost and supply levels- Stemwood from final fellings (non-conifer)

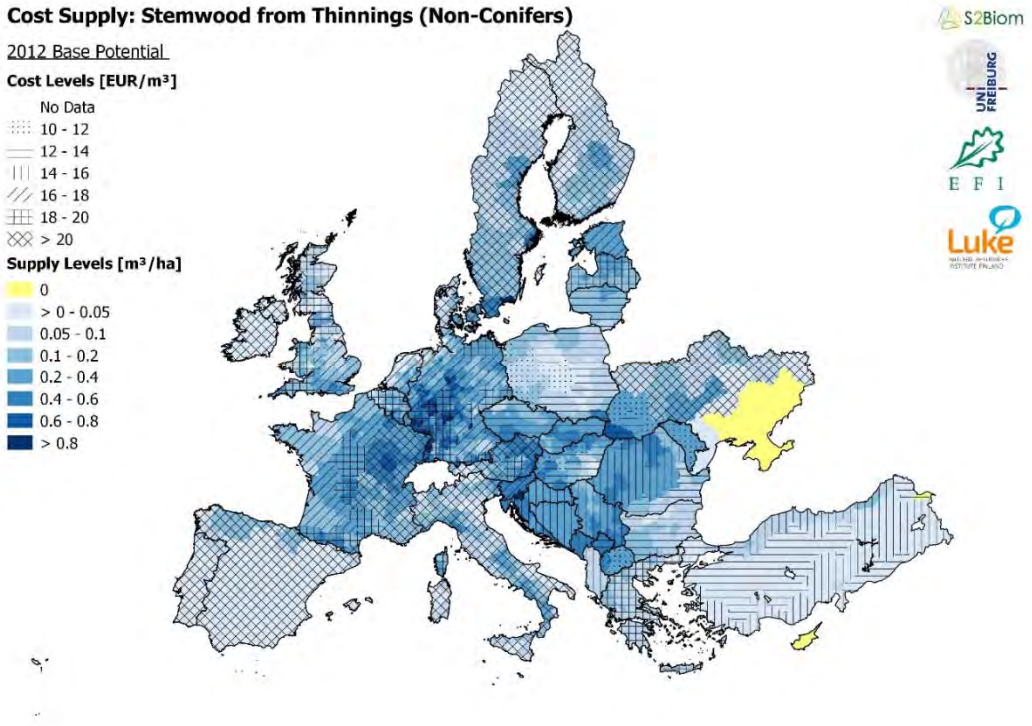


Figure 32 Cost and supply levels- Stemwood from thinnings (non-conifer)

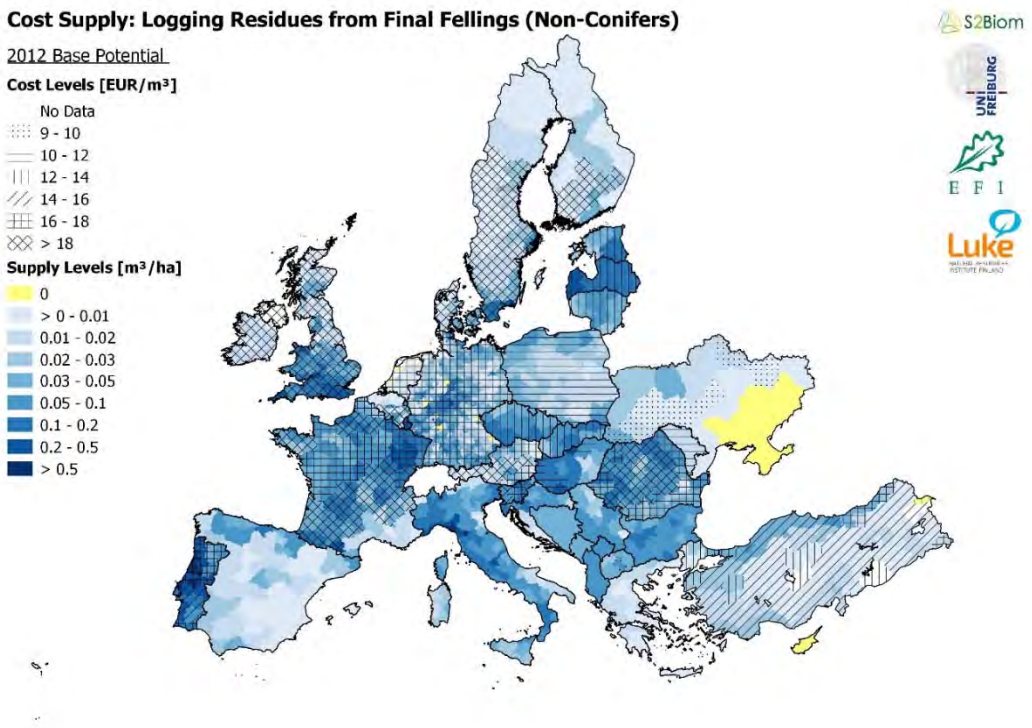


Figure 33 Cost and supply levels- Residues from final fellings (non-conifer)

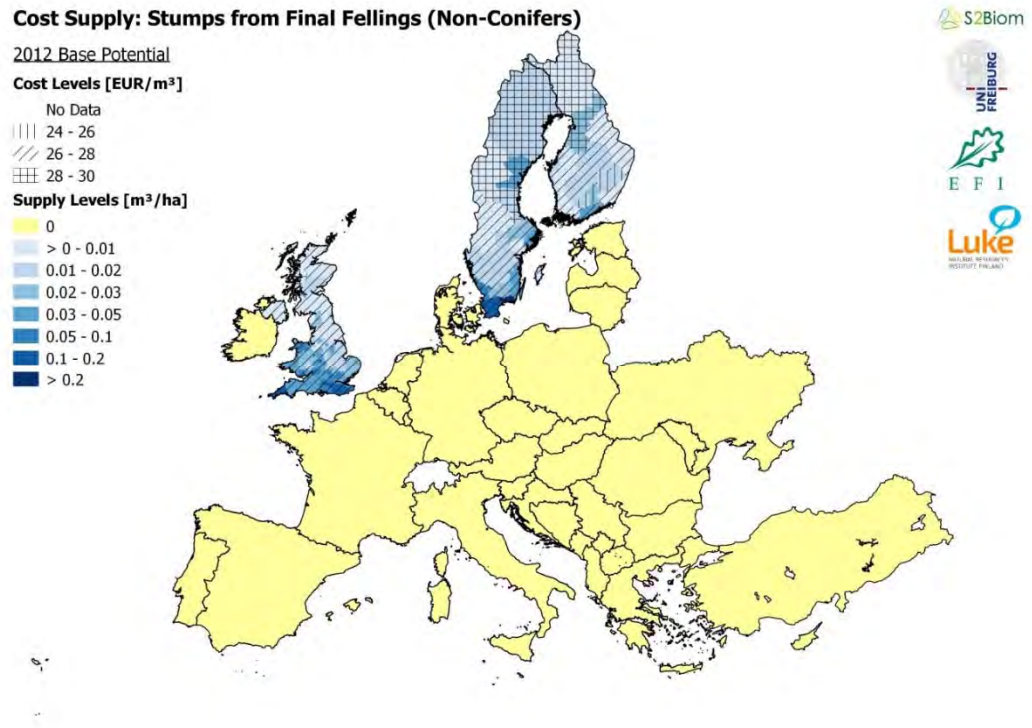


Figure 34 Cost and supply levels- Stumps from final fellings (non-conifer)

2.3 Other land use

The biomass category covered for ‘other land use’ is the road side verge grass.

Table 5 Subcategories of biomass from other land use

Second level subcategories		Third level subcategories		Final level subcategories	
ID	Name	ID	Name	ID	Name
		312	Biomass from road side verges	3121	Grassy biomass from road side verges

It’s distribution over Europe is quite even, but the spatial concentration is rather low as compared to other biomass types like straw or primary forest residues.

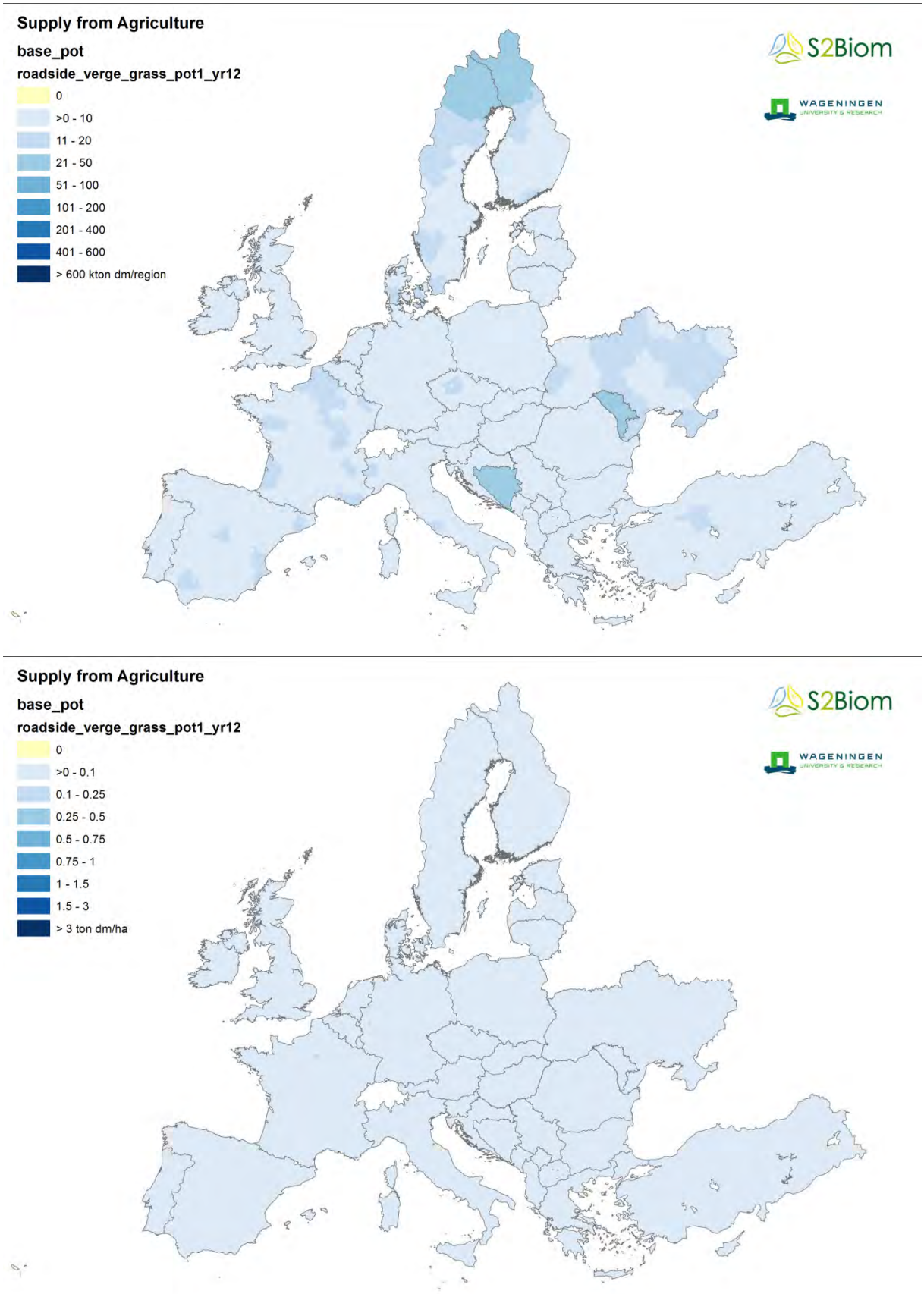


Figure 35 Potential from road side verge grass (category 312; Table 5) at NUTS-3 level for the Base potential in 2012 in absolute level (Kton dm) (upper map) and in density (ton dm/ha land) (lower map)

2.3.1 Cost levels other land uses

The cost level of road side verge grass have also been assessed with the ABC model and the cost allocated consist of mowing, racking, baling and collection and loading. Although the cost for mowing is part of normal road side management we still allocate these cost to the cuttings because we expect higher mowing frequency if cuttings have a use. Collection and loading at the road side can be a time consuming activity because it needs to be done along a road, where traffic can be busy and space to work limited. The cost levels are in the range of 25 to 100 €/ton dm over Europe (See Figure 36).

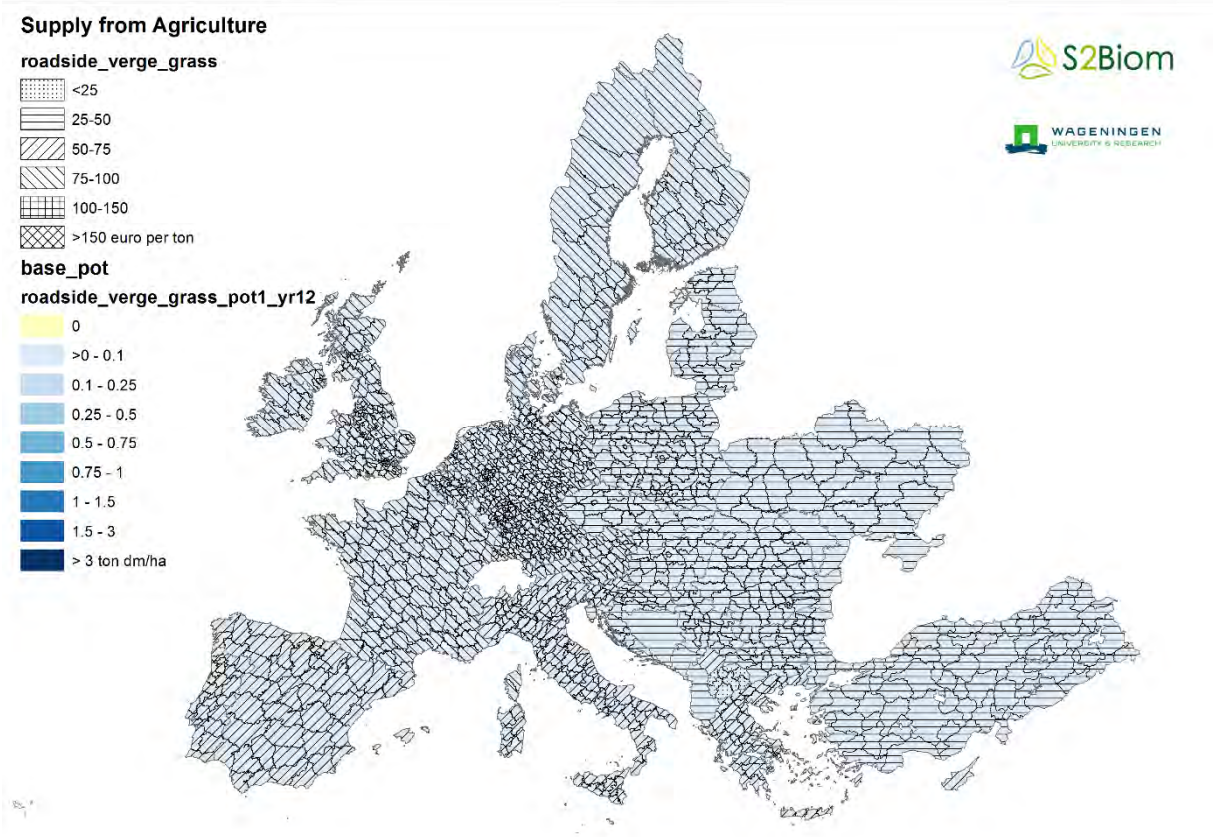


Figure 36 Cost and supply levels- from road side verge grass

2.4 Secondary residues from wood industry

2.4.1 Introduction

Secondary forest residues (SFR) comprise residues from saw mills, from pulp and paper industry and from other wood processing sectors. The full list of subcategories considered is presented in Table 6.

Table 6 Subcategories of Secondary residues from wood industries

SFR subcategories	SFR final level subcategories
Saw mill residues	Sawdust from sawmills from conifers
	Sawdust from sawmills from nonconifers
	Sawmill residues: excluding sawdust, conifers
	Sawmill residues: excluding sawdust, nonconifers
Other wood processing industry residues	Residues from industries producing semi -finished wood based panels
	Residues from further wood processing
Secondary residues from pulp and paper industry	Bark residues from pulp and paper industry
	Black liquor

The potentials have been derived mainly from production data, factors on round wood input and share of residues. The technical and the base potential are identical since no further than technical constraints have been considered in the base potential definition.

In addition two user defined potential levels have been determined. For the user defined potential option 1 “UP1” residues from saw mill industry that are utilised by other wood industry sectors, board and pulp and paper namely, are not considered since they are used there for product generation for material use. This potential thus allows the determination of the potential of SFR for the utilisation for energy and new biobased materials production. The user defined potential option 2 “UP2” differs in the scope of industrial sectors that can share this potential in completion. It is defined for the determination of the potential form forestry *plus* SFR for the sectors energy, new biobased materials production, pulp and paper, and board production, when user defined potentials from forestry, that are accordingly defined are utilised. It excludes residues from the pulp paper and the board industry. The residues from further wood processing are not considered either, since they partly originate from the board industry.

More on the methods applied to determine SFR are provided in the S2BIOM Deliverable 1.6 (Dees et al. 2017).

The general shares of the main residue streams within SFR are shown on the example of the base potential in 2012 for all S2BIOM countries in Figure 37 and for EU28 in Figure 38. Residues from sawmill industry are dominating with over 40%, followed by pulp and paper residues with over 30% whereas other wood processing residues built the smallest but still considerable fraction with over 20%.

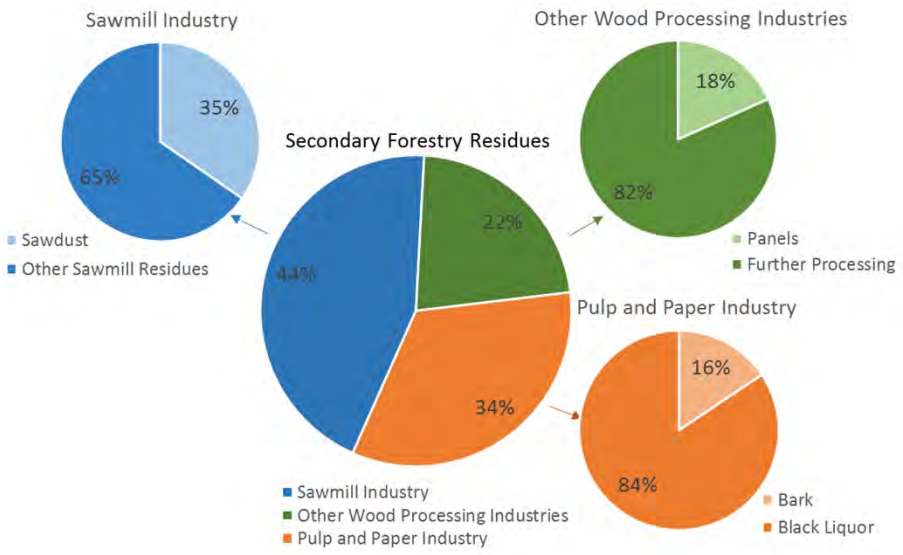


Figure 37 Proportions of supply from secondary forestry residues- base potentials for all S2BIOM countries (2012)

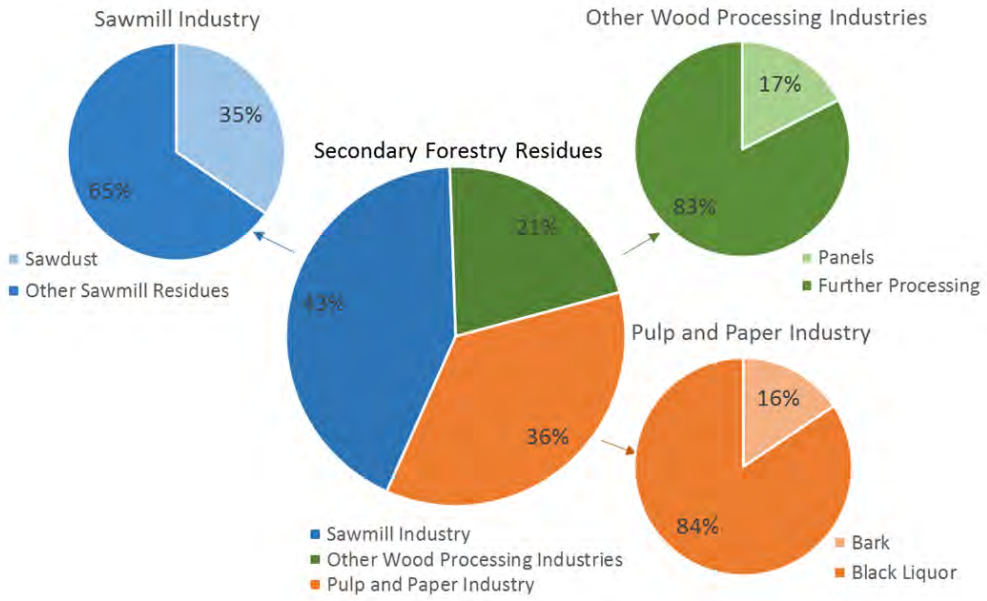


Figure 38 Proportions of supply from secondary forestry residues- base potentials for EU28 (2012)

Detailed results per major category per country and time scale are provided in the tables in the Annex of this report and are as well available via the online tool.

2.4.2 Regional and country level results

The availability of SFR is depending on the production of the wood industry per country. This gets visible in Figure 39 that shows the SFR potentials from saw mill residues, other wood processing industries and from pulp and paper industry for 2012 to 2030.

The highest amounts are available in Sweden, Finland and Germany (together these countries provide nearly 50% of the potential of EU28) followed by Poland, France and Austria (together these six countries provide about 2/3 of the potential of EU28), this in accordance with their well established wood industry sectors. Figure 39 further clearly shows the high impact of the existence and strength of the pulp and paper industry on the availability of SFR per country.

The expected development per sector is based on the base scenario predictions in the study EFSOS II, except for the pulp and paper sector that is assumed to remain stable. The growth differs per country in accordance with the EFOSOS II projections (Figure 39) and is in single countries negative. Still, in total there is in EU28 for 2020 an increase by 3.6% vs. 2012 and for 2030 by 6.3 % vs. 2012. In the non EU-countries there is a stronger increase towards 2020 by 10.6% and towards 2030 by 20.0%. Figure 40 illustrates the difference between the potential levels that show the highest differences in countries with a high pulp and paper industry.

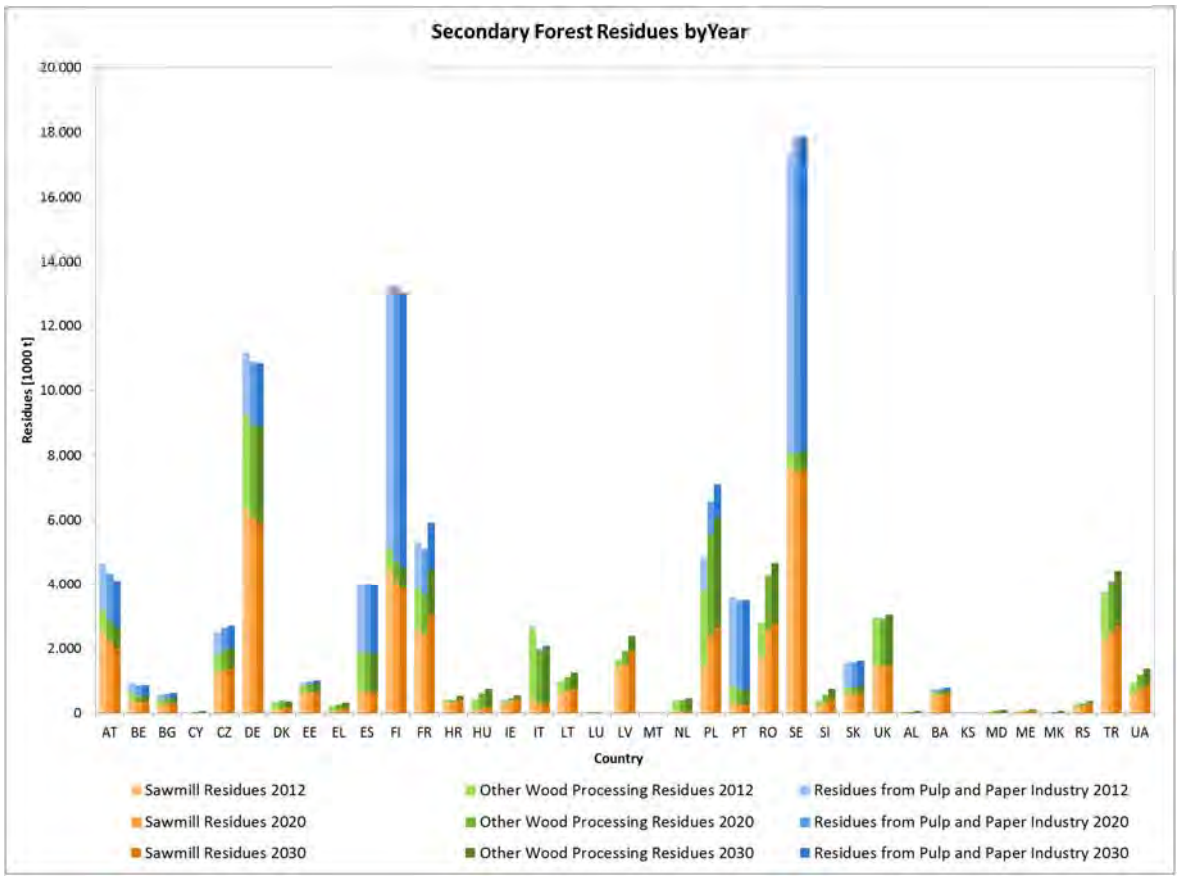


Figure 39 Wood industry base potentials by country for 2012, 2020 and 2030

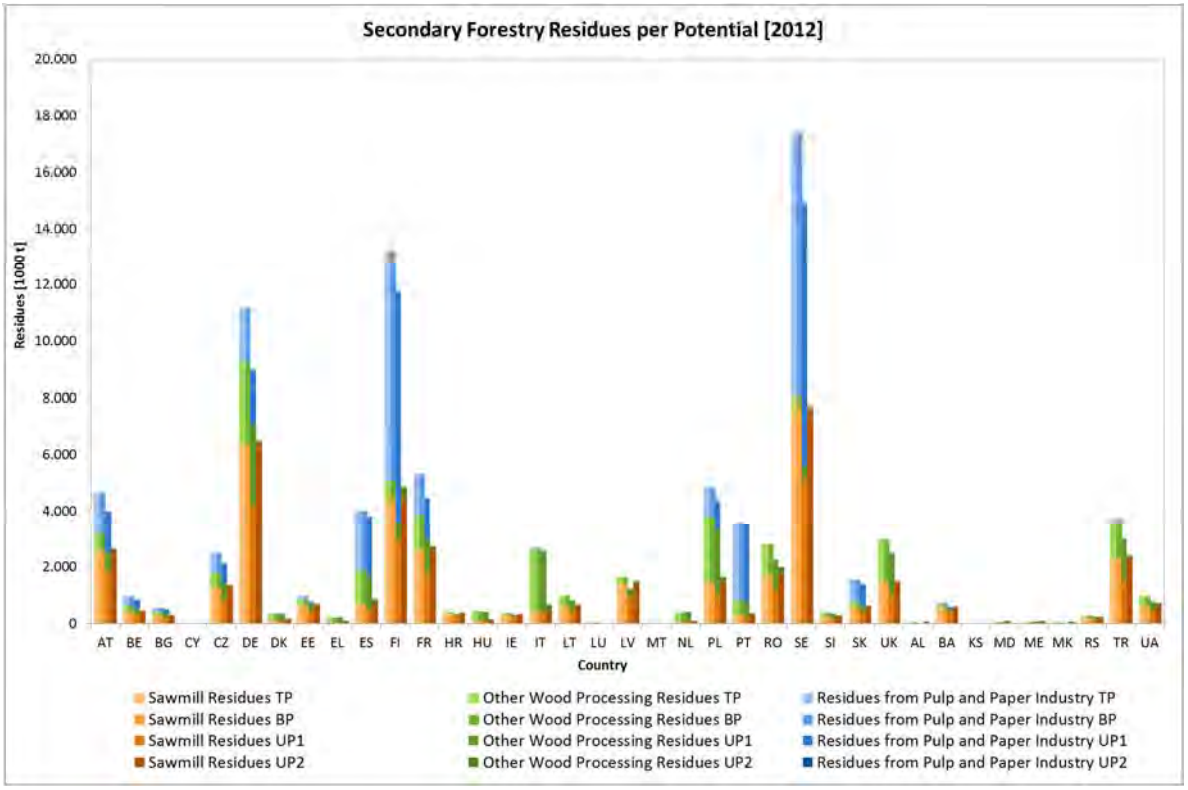


Figure 40 Wood industry potentials by country for 2012, all potential levels in comparison

2.4.3 NUTS3-Maps

As already mentioned for the country totals there is only a slight increase from 2012 towards 2030 and that gets visible in the maps on the SFR total potential in Figure 41, Figure 42 and Figure 43. The spatial distribution in these figures shows that the dominating countries and regions are in the Nordic Countries and Central Europe.

The figures by major origin of SFR show that for sawmill industries the highest density of SFR are available in the Nordic countries, Germany, Poland and Austria (Figure 44). A relative similar spatial distribution can be observed for pulp and paper industry residues with a clear concentration at administrative units, where pulp and paper mills are located (Figure 45). Figure 46 shows a high impact of the population density since further wood processing industries are by the methodology assumed to be related to the population density and these *further* wood processing residues within *other* wood processing industries contribute to the total on average a share larger than 80%.

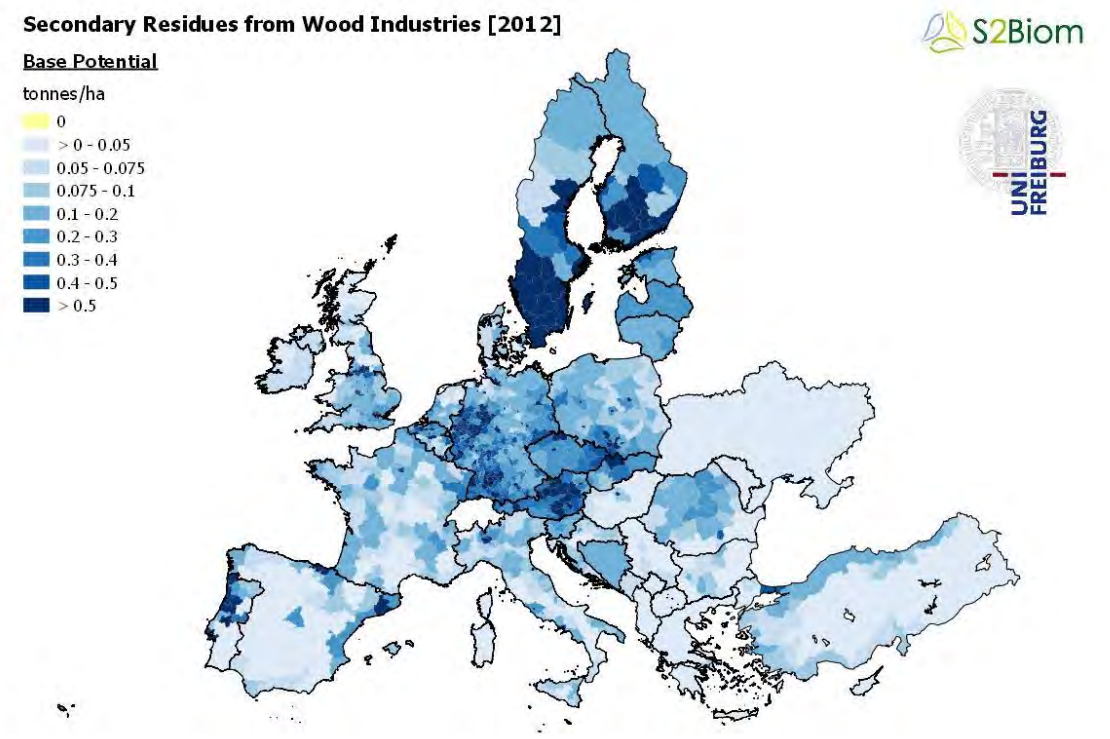


Figure 41 Secondary residues from wood industries per ha of land at NUTS-3 level for the Base potential in 2012

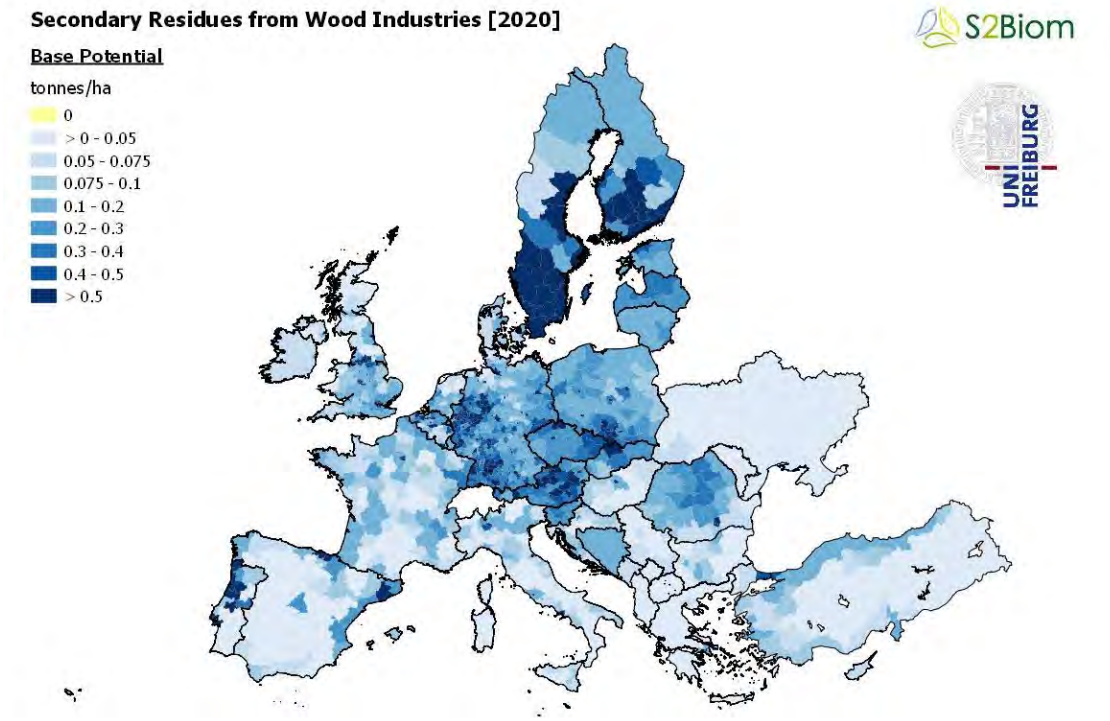


Figure 42 Secondary residues from wood industries per ha of land at NUTS-3 level for the Base potential in 2020

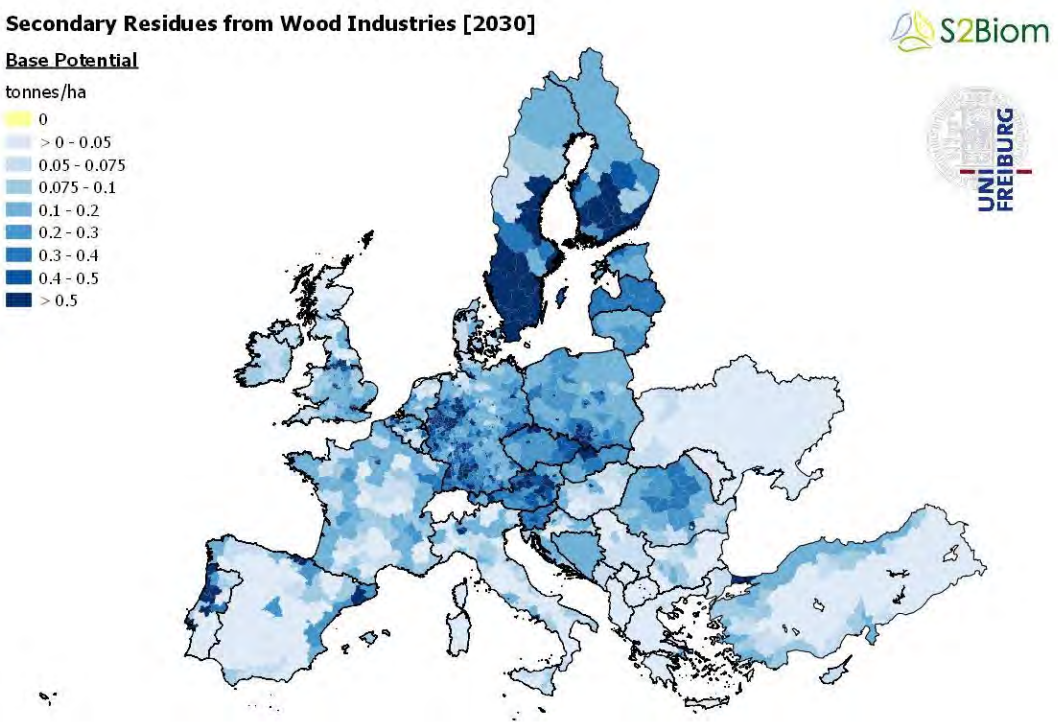


Figure 43 Secondary residues from wood industries per ha of land at NUTS-3 level for the Base potential in 2030

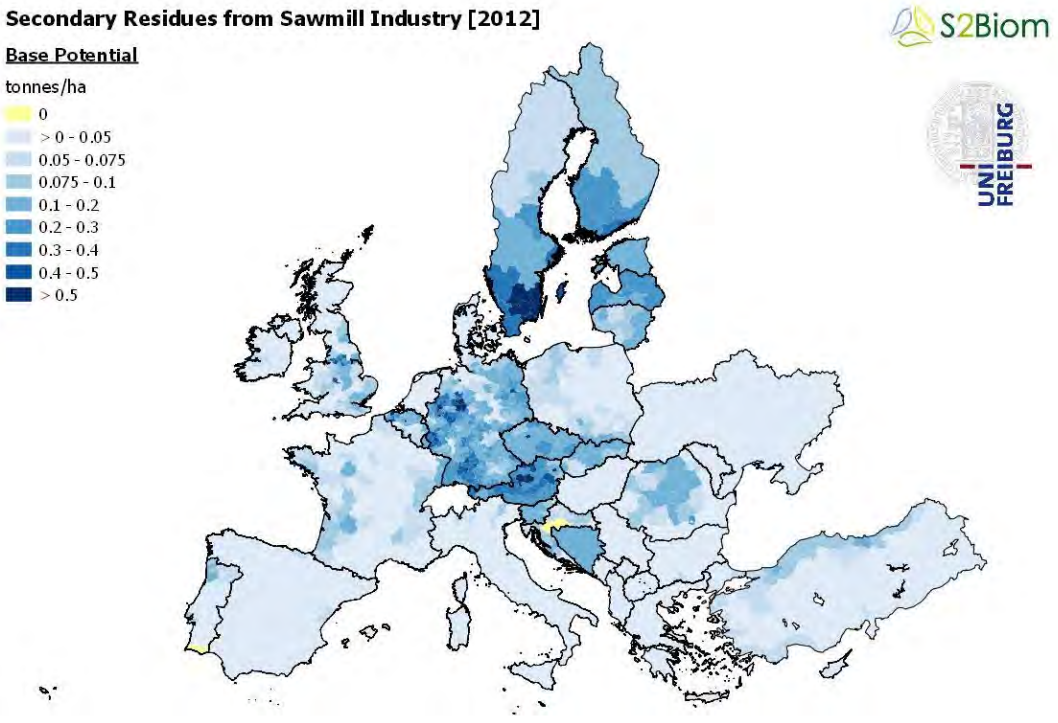


Figure 44 Secondary residues from saw mill industry per ha of land at NUTS-3 level for the Base potential in 2012

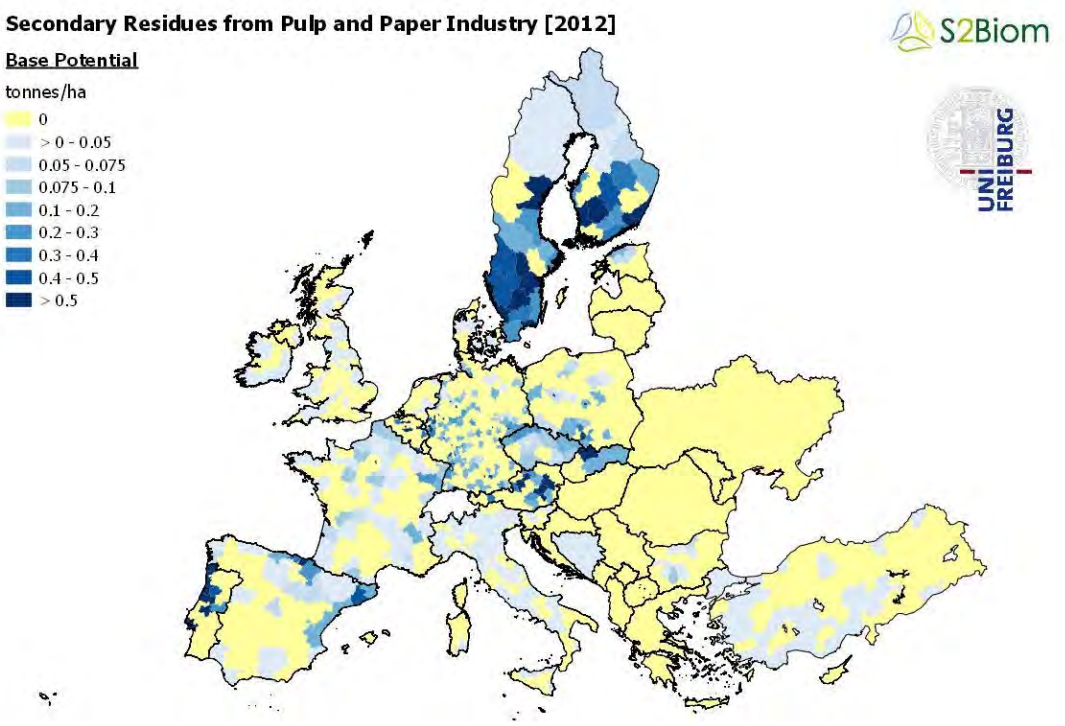


Figure 45 Secondary residues from pulp and paper industry per ha of land at NUTS-3 level for the Base potential in 2012

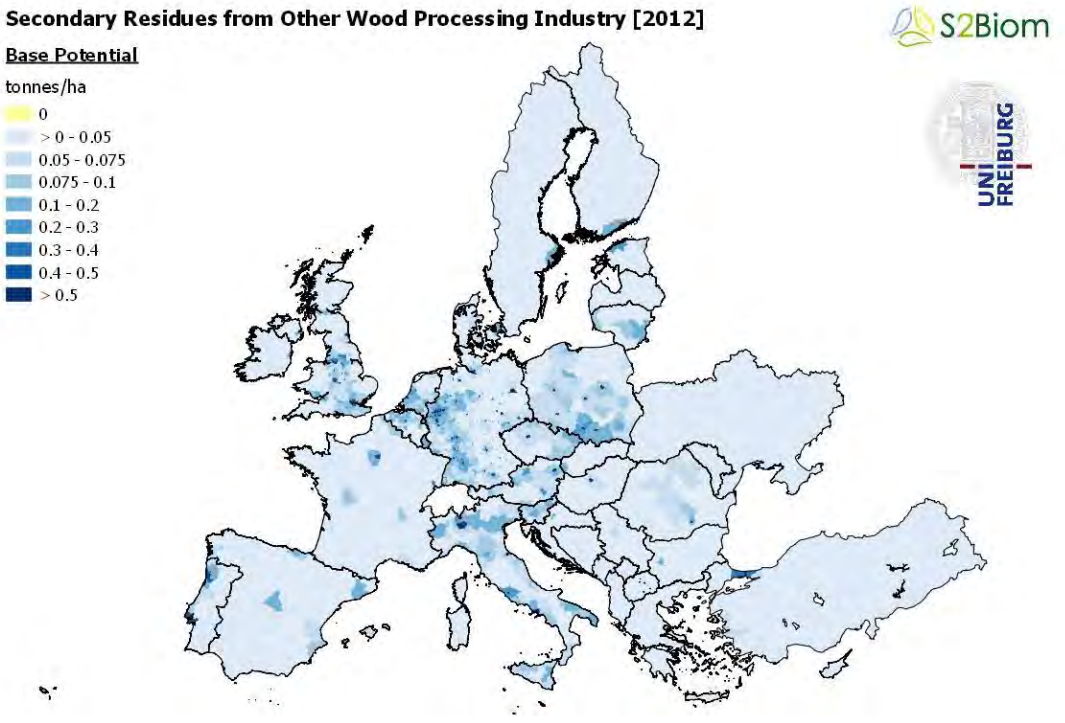


Figure 46 Secondary residues from other wood processing industries per ha of land at NUTS-3 level for the Base potential in 2012

2.5 Secondary residues of industry utilising agricultural products

For secondary agro-industrial residues four types of biomass have been covered as presented in Table 7. Only one type of potential was assessed for these residues which can both be seen as the technical and the base potential.

Their total in Europe amounts to almost 35,000 Kton dm. The lion share comes from cereal bran, which is not surprising given that the bran comes from both domestically grown and imported cereals processed in Europe.

Table 7 Subcategories of secondary agricultural residues

Second level subcategories		Third level subcategories		Final level subcategories	
ID	Name	ID	Name	ID	Name
42	*Secondary residues of industry utilising agricultural products*	421	By-products and residues from food and fruit processing industry	4211	Olive-stones
				4213	Rice husk
				4214	Pressed grapes residues
				4215	Cereal bran

Since more than 90% of the agri-industrial residues are made up of cereal bran the mapped potentials are only presented for this biomass types in Figure 47. As becomes clear, the overall agro-industrial residues spatial concentration is limited, but there are regions, particularly large port regions where large domestic and imported cereal grains are processed. Rice husk concentrations are found in northwest Italy and southern Spain, the main rice producing areas in Europe. Pressed grape dregs are where there is wine production, but overall amounts are small. The same applies to olive pits of course found where olives are produced. The processing of olive usually takes place in the region where the olives are produced, so it implies a rather large spatial dispersion of its residues.

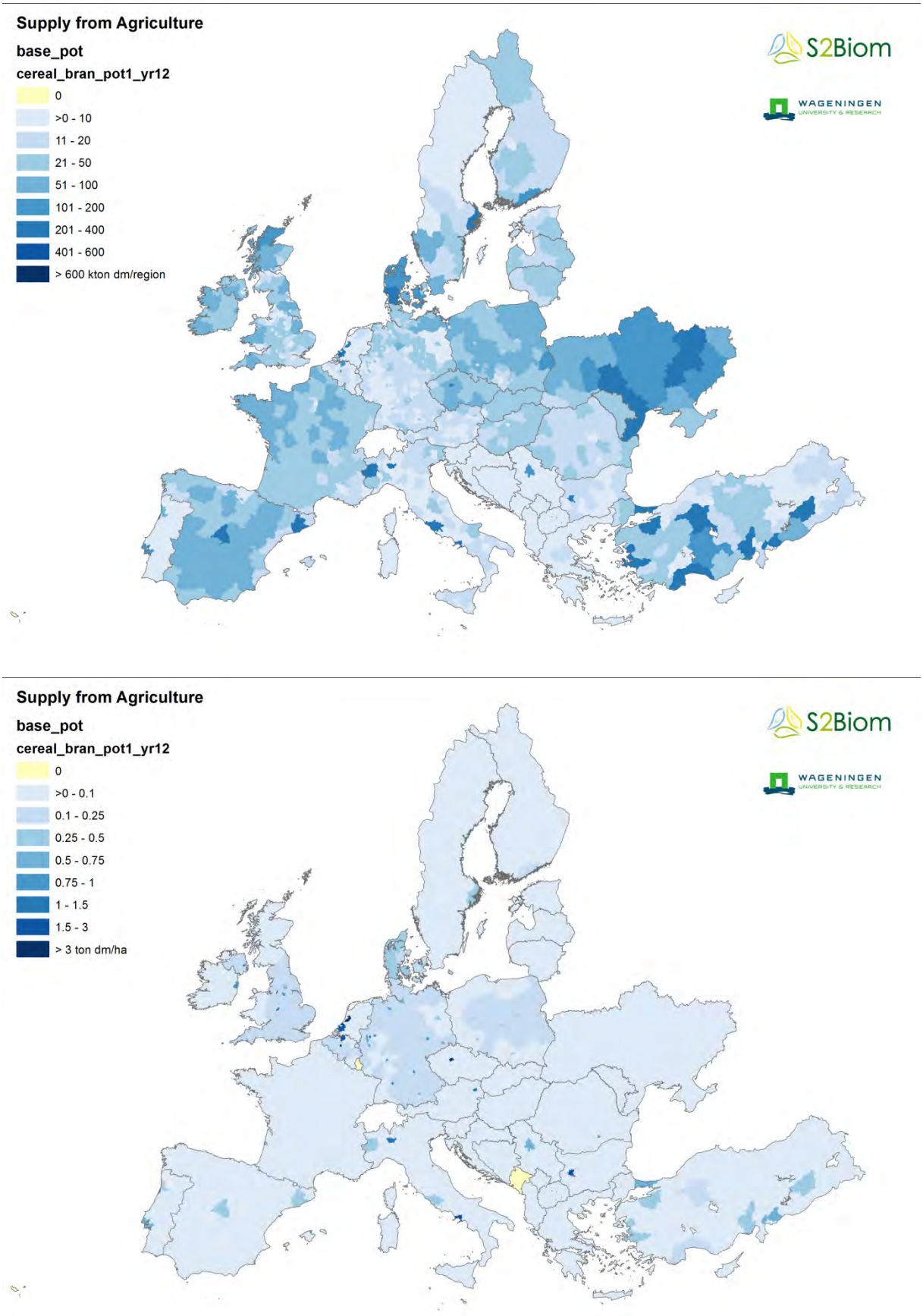


Figure 47 Cereal bran potential in absolute value (Kton dm) (upper map) and in density (Kton/ha of land) (lower map) at NUTS-3 level for the Base potential in 2012

2.6 Waste collection/ tertiary residues

2.6.1 Introduction

Biowaste and post-consumer wood are the most relevant lignocellulosic tertiary waste streams. Figure 48 and Figure 49 show that mass distribution between biowaste and post-consumer wood and their fractions in all the S2BIOM countries and the EU28, respectively. In this section both potentials are shortly introduced, presented and discussed.

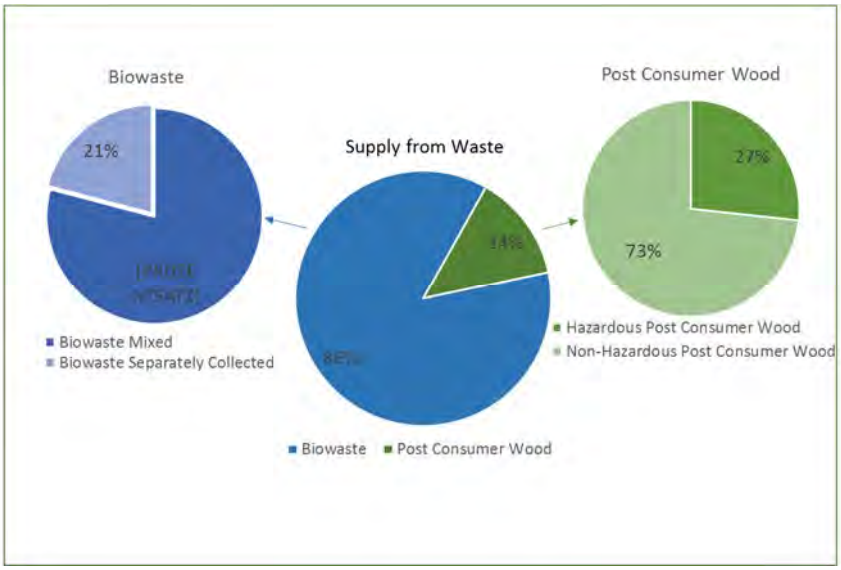


Figure 48 Pie Chart showing the total waste (biowaste and post consumer wood) supply distribution from base potentials (2012) for all S2biom countries (mass based)

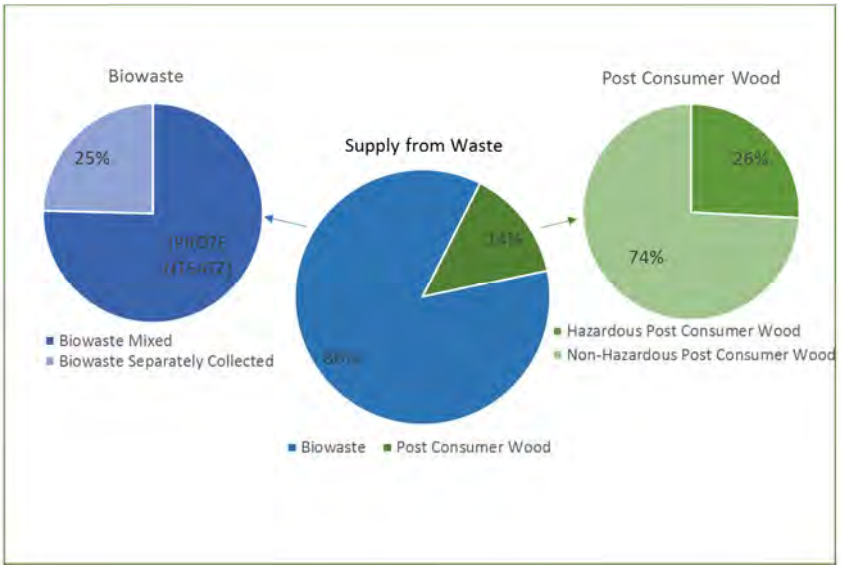


Figure 49 Pie Chart showing the total waste (biowaste and post consumer wood) supply distribution from base potentials (2012) for EU28 (mass based)

2.6.2 Regional and country level results

Biowaste

Biowaste is defined as “biodegradable garden and park waste, food and kitchen waste from households, restaurants, catering and retail premises and comparable waste from food processing plants” (Waste Framework Directive (2008/98/EC)). Biowaste is part of biodegradable municipal waste, but it excludes textile and separately collected paper and paperboard. Biowaste can be separately collected or be part of integrally collected municipal waste. Separately collected biowaste can generate energy by anaerobic digestion followed by composting. Integrally collected biowaste can be incinerated with energy generation, or part of the biowaste can be separated as part of “refuse derived fuel” and subsequently combusted in a bioenergy plant. The choice for separate or integral collection of biowaste strongly depends on the waste policy of the EU country, which can be either more directed to separate collection and composting (plus option for digestion) or to integral collection and processing (including combustion). Both are accepted options as long as the material is not incinerated without energy generation or being landfilled.

Because of this strong link between waste collection system and energy potential (separate collection & anaerobic digestion versus integral collection & combustion/incineration) only one energy potential is provided linked to the current and expected future waste management practises of the countries as analysed in Arcadis and Eunomia (2009) and population growth. Figure 50 shows the production of biowaste per year in the different European countries. The expected growth or decline in biowaste production is linked with the population growth in these countries, and is rather stable.

No difference has been made between the technical potential and base potential as all collected waste is in principle available for energy generation. No user-defined potential has been defined as options to optimise for energy generation are limited. For instance, it does not make sense to assume a potential level in which all countries change from a separate collection to an integral collection scheme, just for the sake of energy generation and abolishing composting.

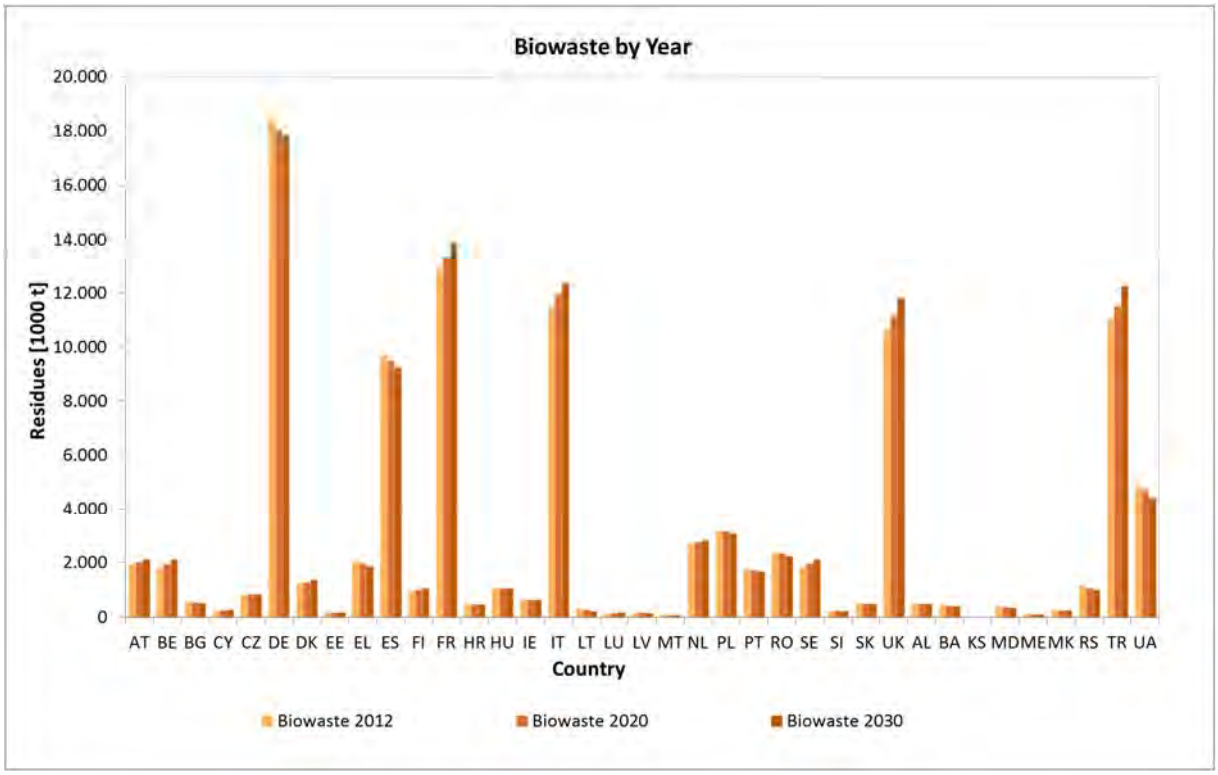


Figure 50 Biowaste production in 2012, 2020 and 2030

Post-consumer wood

Post-consumer wood (PCW) includes all kinds of wooden material that is available at the end of its use as a wooden product ("post-consumer" or "post-use" wood). Post-consumer recovered wood mainly comprises packaging materials (e.g. pallets), demolition wood, timber from building sites, and fractions of used wood from residential (municipal waste), industrial and commercial activities. Post-consumer wood is a tertiary raw material, which should be collected, sorted and re-utilised or recycled and finally used for energy production.

Figure 51 shows that the (base) potential of post-consumer wood rises in most countries between 2012 and 2030. The growth rates are based on projections made in the EU wood project (EU27)[3] and EFSOS II (other European countries)[4].

[3] Mantau U et.al.; EUwood, Real potential for changes in growth and use of EU forests, Methodology report June 2010

[4] UNECE (United Nations Economic Commission for Europe), FAO (Food and Agricultural Organization of the United Nations) 2011: The European Forest Sector Outlook Study II; Geneva

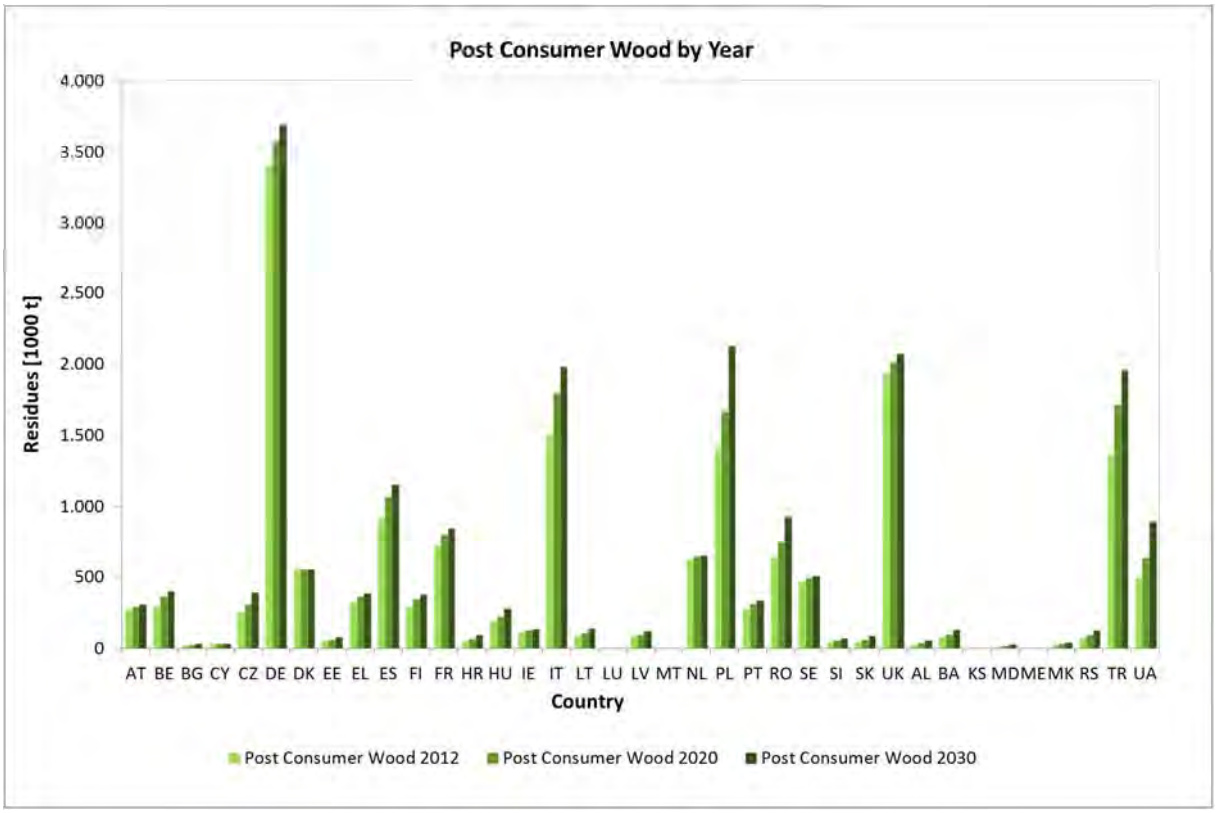


Figure 51 The development of the supply of post-consumer wood in 2012, 2020 and 2030 (base potential)

The technical, base and user-defined potentials of post-consumer wood of 2020 and 2030 are presented in Figure 52 and Figure 53, respectively.

The *technical potential* assumes that all collectable post-consumer wood can be collected used for energy generation. About 5% of available post-consumer wood cannot be recovered for technical reasons.

The *base potential* shows the potential for energy generation, taking into account the current use of post-consumer wood for material applications, currently mainly particleboard production. Obviously, the base potential is in most cases much lower than the technical potential, as the latter does not take into account current material use of post-consumer wood.

The *user-defined potential* shows how much wood would remain available for energy if increased cascading use in 2020 and 2030 is respected. The Circular Economy Package proposes a target of 75% of material recycling of packaging wood in 2030, this will be a challenge but the quality of packaging waste (mainly clean sawn wood) is suitable for recycling. The other waste wood fractions are more difficult to recycle; there are not too many options to recycle used panels (particle board, MDF, OSB, plywood). Recycling rates of other wood (besides packaging) are not expected to exceed 50%. This results in an overall material application of non hazardous post-

consumer wood of 49.2%[5] in 2020 and 61.5%[6] in 2030. Moreover, all hazardous waste wood is assumed to be available for energy generation. The difference between the user-defined scenario of increased cascading use of wood and the base scenario base potential depends on the historical shares of energy, material and disposal of post-consumer wood on country level:

- In Denmark, Germany and Sweden the used defined potential is lower than the base potential because these countries have currently a high energy utilisation of post-consumer wood, which would be reduced in the user-defined scenario with increased material application of wood in 2020 and 2030.
- In countries like Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Romania and Slovenia currently much wood is still disposed, which is in case of the user-defined scenario will be partly allocated to material application in 2020 and 2030. This results in a lower user-defined potential compared to the base scenario, in which all currently disposed wood is allocated to energy use.
- In case of a tradition of high material utilisation and a low disposal rate, the difference between base potential and user-defined potential is zero. In this case the base potential (that takes into account current material application) meets already the assumptions on increased material consumption of the user-defined potential. This is the case in countries like Austria, France and Italy.

[5] Assuming 60% material application of used packaging wood and 40% of the other wood in 2020.
[6] Assuming 75% material application of used packaging wood and 50% of the other wood in 2030.

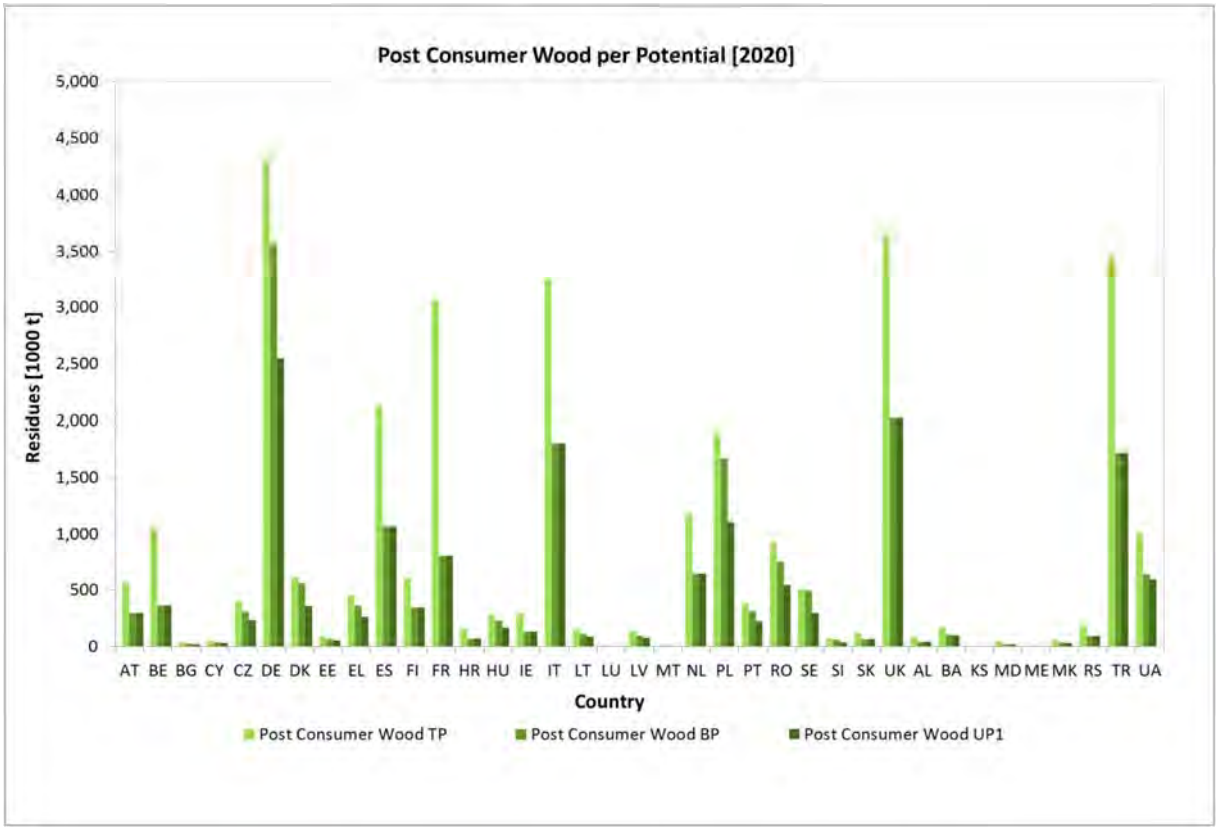


Figure 52 Technical, base and user-defined potential of post-consumer wood in 2020

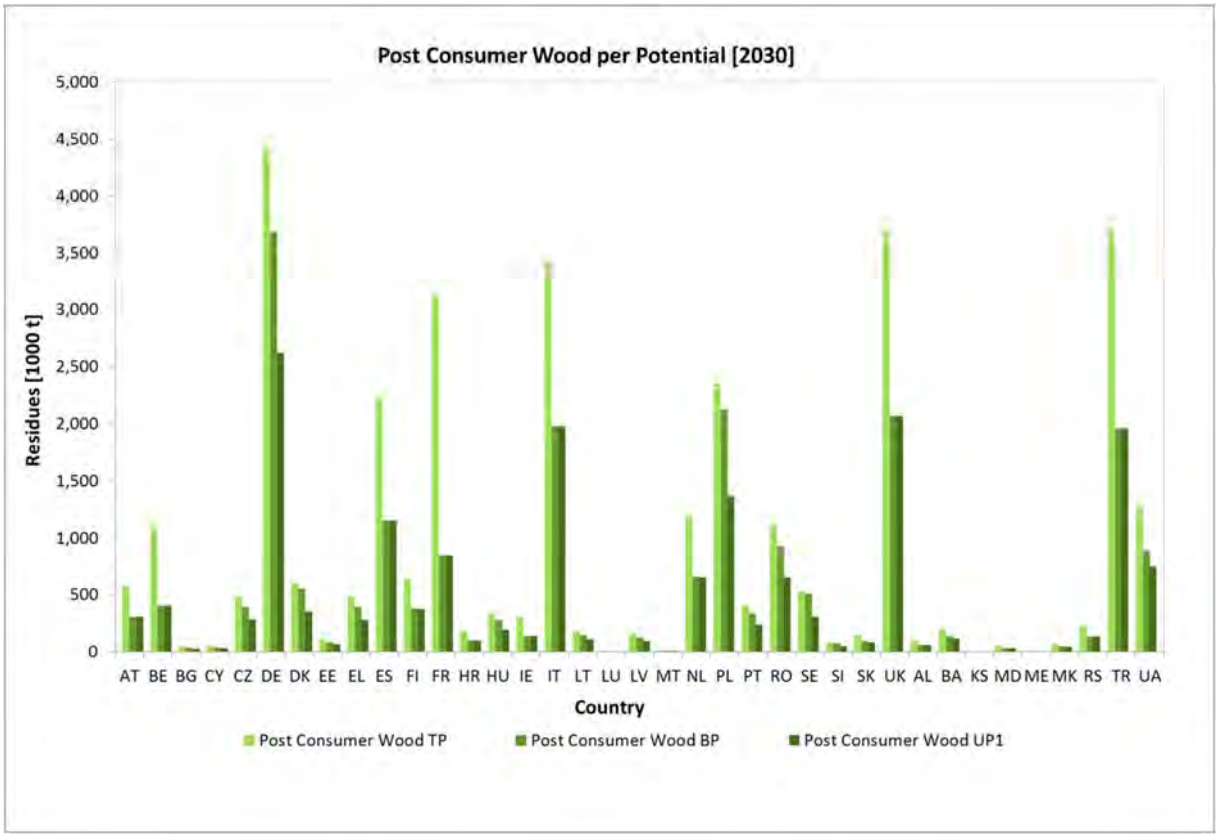


Figure 53 Technical, base and user-defined potential of post-consumer wood in 2030

Figure 54 shows the development of the user-defined potential in time, showing that despite the increased material consumption assumed in this scenario, in most countries the energy potential increases compared to the baseline scenario in 2012[7], due the growth of post-consumer wood production as forecasted in EFSOS II and EUwood. Main exceptions are the countries with both a high energy utilisation and high recovery rate of post-consumer wood such as Germany and Sweden. However, in general this scenario shows that despite increased cascading use (UD1 scenario), biomass availability for energy will grow in most countries in 2020 and 2030 compared to 2012. Moreover, this scenario does not take into account that after its lifetime in the material sector post-consumer wood comes back to the energy sector for energy generation. Therefore, after some decades the availability of post-consumer wood for energy would increase even more.

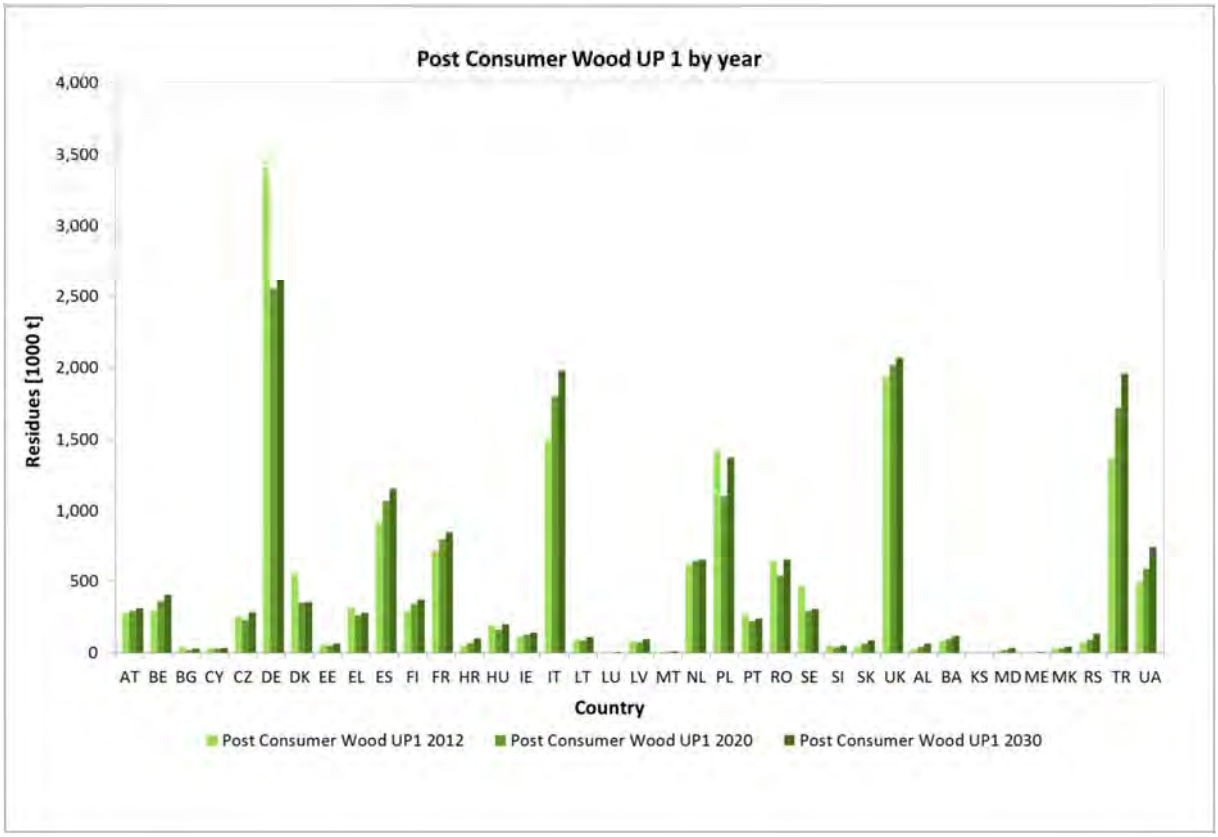


Figure 54 User-defined potential in 2012, 2020 and 2030

[7] Note that the User Defined potential is defined only for 2020 and 2030; this means that UP1 2012 equals the base scenario BP 2012.

2.6.1 NUTS3-Maps

The data on biowaste and post-consumer wood has been collected on country level. The disaggregation of the results at NUTS3 (municipal) level has been performed based on the population of these regions, as population is the best indicator for waste generation. However, within the limits of this study it was not possible to distinguish between rural and urban areas or between regions with more or less construction with wood within countries. Therefore, the NUTS3 maps give just an indication of the biowaste and post-consumer wood available within the regions. The biomass densities in the maps show a strong correlation with the population density in the different areas of Europe (Figure 55 to Figure 59).

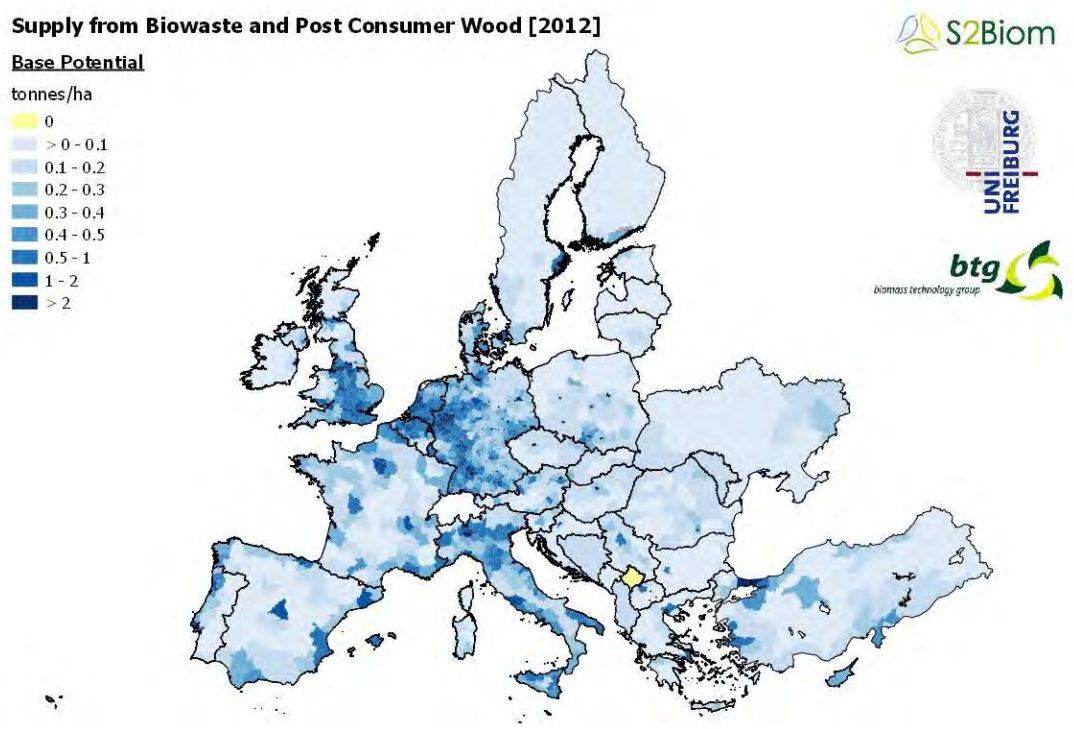


Figure 55 Waste (Biowaste and Post Consumer Wood), Base potential 2012

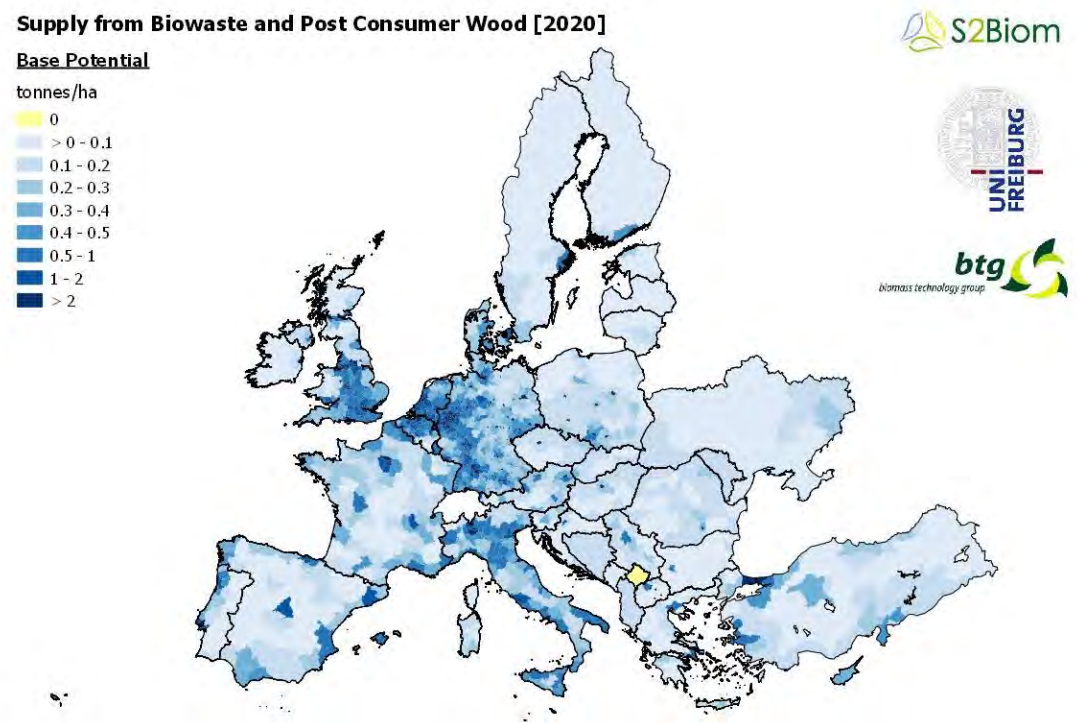


Figure 56 Waste (Biowaste and Post Consumer Wood), Base potential 2020

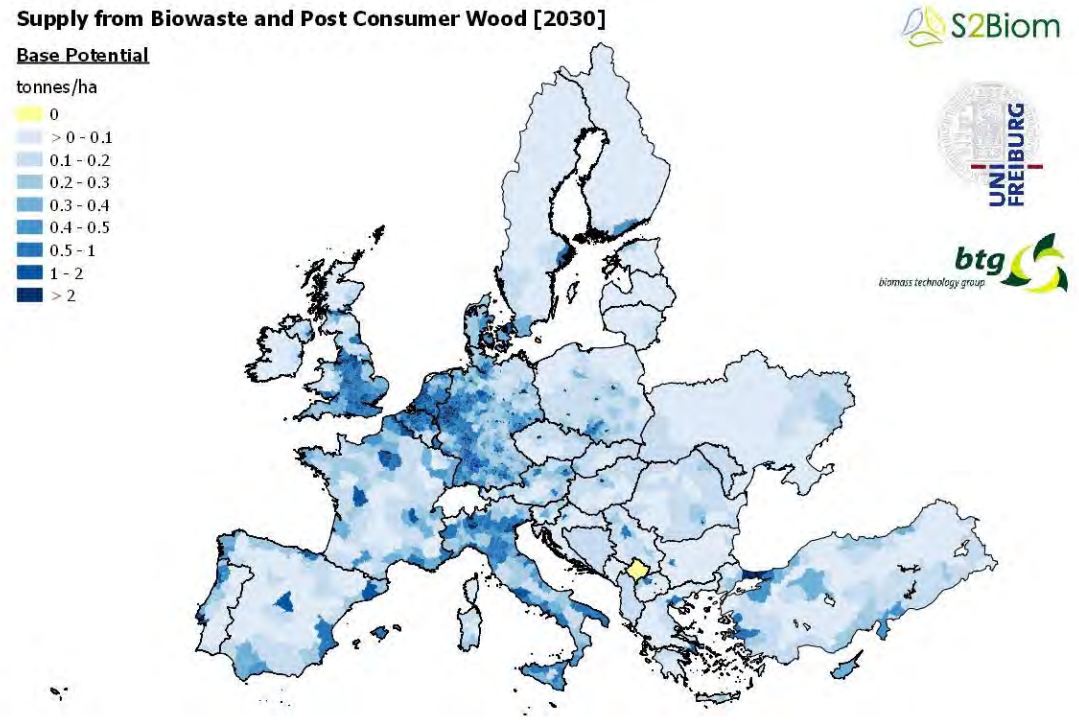


Figure 57 Waste (Biowaste and Post Consumer Wood), Base potential 2030

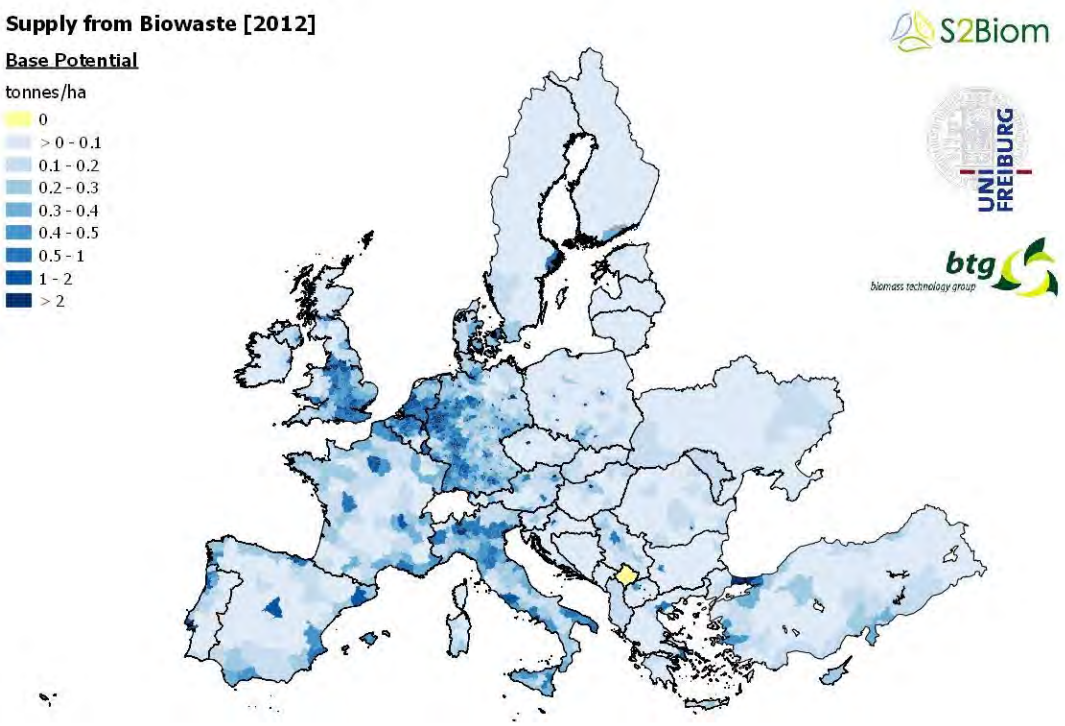


Figure 58 Biowaste, Base potential 2012

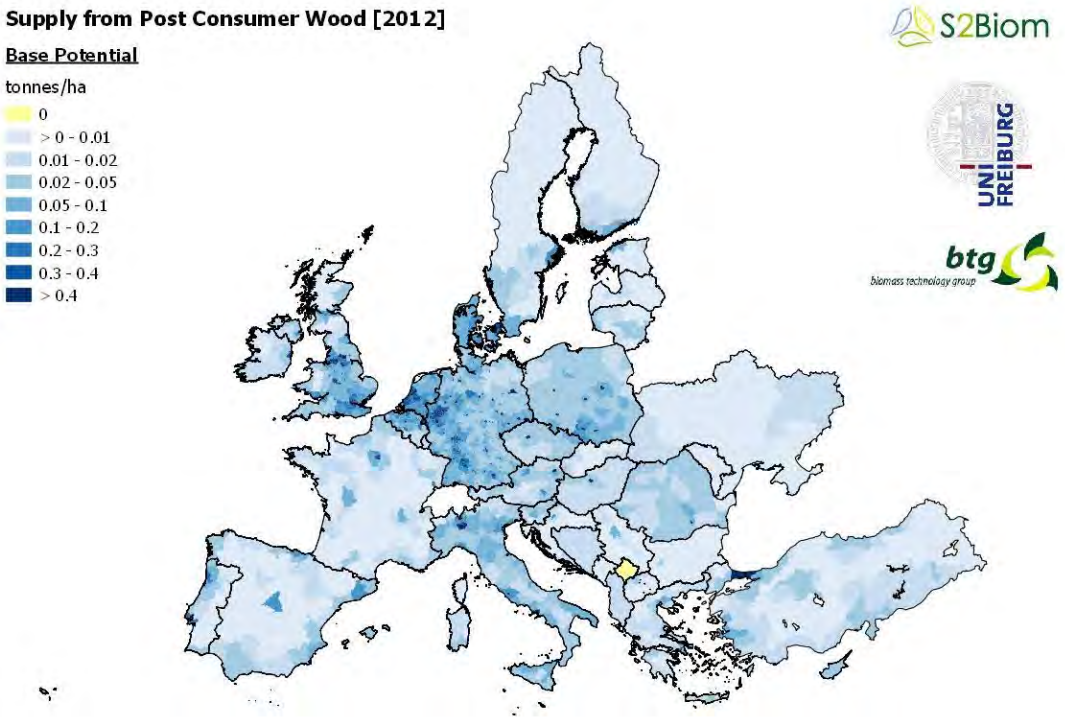


Figure 59 Post Consumer Wood, Base potential 2012

2.7 Import of biomass resources

2.7.1 Introduction

For import of biomass resources, the import potential is here presented in the form of cost supply curves. One set of cost supply curves define how much biomass can be imported to Europe from the rest of the world for bioenergy purposes (mainly heat and electricity), and one curve define the potential import of biofuels. Though the two cost supply curves differ in terms of the end use of biomass that is imported, they are both defined in terms of the amount of biomass that could in the future be imported for a specific cost.

Note that the methodology as applied for producing the estimates is detailed in S2BIOM report D1.6: Spatial data base on sustainable biomass cost-supply of lignocellulosic biomass in Europe. Content, methods & data sources.

2.7.2 Cost and supply potential

The final cost supply curves were estimated for 2010, 2020, and 2030. In term of the cost supply curve for bioenergy, the import potential is shown in Figure 60, where the potential is shown in aggregate terms covering both import of wood chips and wood pellets. As shown in Figure 60, the import potential to EU from the rest of the world of wood chips and wood pellets is substantial.

In terms of the cost supply curve for biofuel, the import potential is shown in Figure 61 where the potential is shown for the three main categories of biofuels: 1st generation ethanol from wheat, corn and sugar cane; 2nd generation ethanol from woody biomass; and biodiesel from rape, sunflower, soya and palm oil.

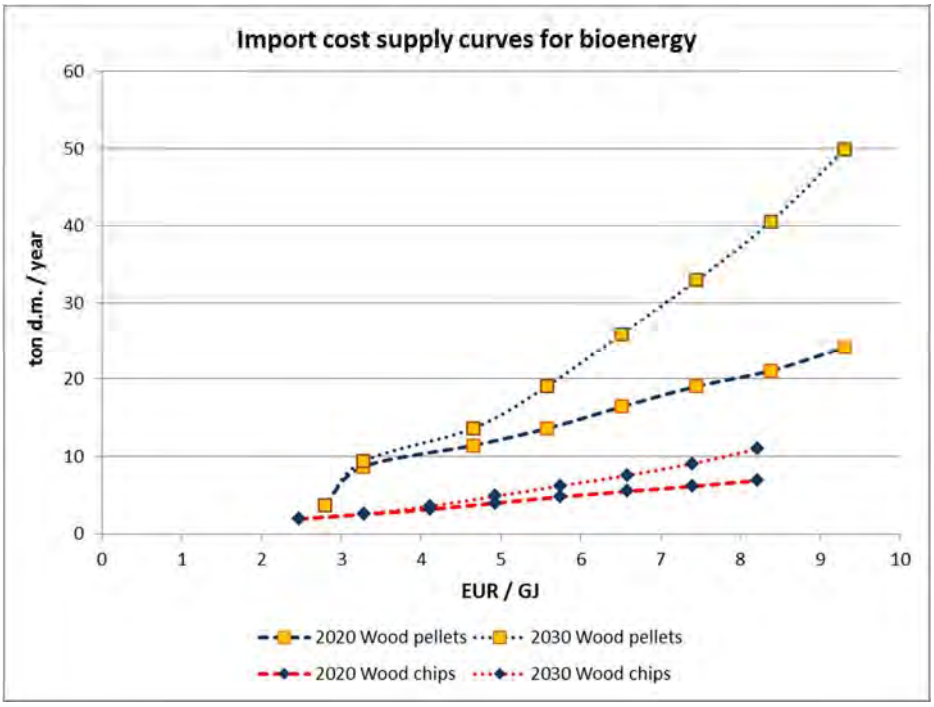


Figure 60: The estimated cost supply curves in 2020 and 2030 for bioenergy. The import potential is defined in terms of import of wood chips and wood pellets [ton dry mass per year], while the price is defined in terms of the cost that a consumer needs to pay for the feedstock [EUR per GJ].

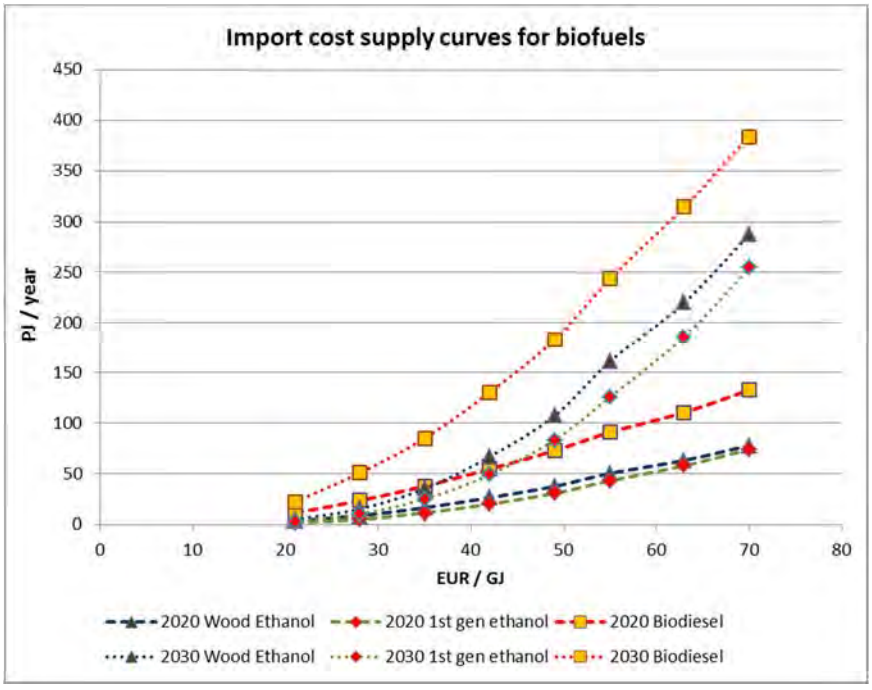


Figure 61: The estimated cost supply curve in 2020 and 2030 for biofuels. The potential is defined in terms of import of specific biofuels [PJ per year], while the price is defined in terms of the cost that a consumer needs to pay for the commodity [EUR per GJ].

3 Literature

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Annex: Country level data (A1-A6) & Information on map types (A7)

A1 Dedicated biomass crops and primary residues from agriculture

Table 8 Total agricultural biomass potential in EU and neighbour countries [Kton dm] for the Base (BP) in 2012, 2020 and 2030

	Straw& stubbles			Prunings			Unused grassland cuttings			Dedicated crops			Agro-industrial residues			Total		
Kton	2012	2020	2030	2012	2020	2030	2012	2020	2030	2012	2020	2030	2012	2020	2030	2012	2020	2030
Austria	5,384	2,843	2,894	33	54	51	0	0	0	16	445	445	404	386	406	5,930	3,824	3,894
Belgium	6,556	2,037	2,094	38	32	33	0	0	0	56	745	1,027	705	749	758	7,455	3,666	4,016
Bulgaria	6,171	6,660	6,396	13	7	8	0	0	0	2,143	3,907	3,126	497	317	307	8,903	10,972	9,920
Cyprus	0	0	0	4	5	6	0	0	0	219	286	260	11	9	10	239	305	281
Czech Republic	10,039	7,210	7,112	35	32	31	1,347	1,347	1,347	1,100	1,633	1,829	753	747	773	13,349	11,047	11,170
Germany	45,727	28,038	26,482	95	149	144	0	0	0	126	4,433	7,789	4,681	4,621	4,857	51,314	37,945	39,987
Denmark	2,027	1,516	1,483	1	1	1	0	0	0	1	726	689	1,108	1,090	1,045	3,207	3,403	3,289
Estonia	0	0	0	0	0	0	158	158	158	217	534	497	76	84	130	472	797	807
Greece	2,340	1,825	2,073	204	199	216	0	0	0	1,475	1,267	1,169	591	665	710	4,709	4,058	4,273
Spain	14,792	11,949	12,161	2,634	2,475	2,507	1,284	1,284	1,284	20,606	21,307	22,417	3,762	3,858	3,970	43,420	41,226	42,697
Finland	1,603	1,604	1,700	1	2	2	0	0	0	434	516	619	402	519	513	2,577	2,783	2,978
France	59,154	36,864	35,573	162	151	126	10,374	10,374	10,374	1,740	9,358	12,422	3,538	3,773	3,978	75,692	61,263	63,229
Croatia	3,107	2,084	2,033	34	35	37	0	0	0	101	74	70	115	124	130	3,405	2,366	2,319
Hungary	10,278	9,927	9,571	142	131	134	203	203	203	2,073	3,885	3,992	477	511	482	13,254	14,740	14,467
Ireland	0	0	0	0	0	0	10,799	10,799	10,799	2	844	749	382	415	430	11,230	12,106	12,026
Italy	8,391	6,747	6,760	532	473	446	0	0	0	3,090	10,181	9,099	2,910	2,813	2,748	15,314	20,617	19,463
Lithuania	532	477	457	0	0	0	312	312	312	714	2,490	2,634	193	196	276	1,795	3,521	3,725
Luxembourg	156	140	124	0	0	0	201	201	201	1	54	76	0	0	0	366	402	409
Latvia	202	234	234	0	0	0	297	297	297	419	791	905	112	122	163	1,067	1,483	1,638
Malta	0	0	0	0	0	0	0	0	0	12	10	12	2	2	2	14	13	14
Netherlands	5,250	1,097	1,147	31	27	23	0	0	0	19	577	1,026	1,058	1,210	1,211	6,479	3,035	3,533
Poland	29,325	20,360	17,503	577	549	593	2,282	2,282	2,282	3,707	12,690	14,596	3,093	2,977	3,115	39,225	39,106	38,341
Portugal	324	272	336	2	0	0	0	0	0	1,816	1,345	1,243	445	436	477	2,669	2,139	2,143
Romania	12,460	11,726	11,018	141	113	89	3,710	3,710	3,710	11,166	14,682	14,634	738	796	645	28,342	31,157	30,230
Sweden	3,849	2,283	2,108	4	3	2	645	645	645	60	949	1,111	647	515	562	5,385	4,579	4,616
Slovenia	0	0	0	3	3	3	241	241	241	1	24	63	42	58	60	307	348	388
Slovakia	2,913	2,140	1,995	11	13	12	245	245	245	278	596	679	220	175	186	3,725	3,228	3,178
United kingdom	9,500	5,443	5,431	26	21	18	26,528	26,528	26,528	141	3,513	4,336	2,727	2,758	3,246	39,297	38,648	39,949
EU 28	240,079	163,476	156,684	4,722	4,474	4,483	58,626	58,626	58,626	51,732	97,862	107,514	29,690	29,928	31,190	389,142	358,776	362,980
Albania	314	232	247	38	49	64				1,005	1,072	1,072	9	11	13	1,377	1,374	1,407
Bosnia and Herzegovina	0	0	0	69	88	109				3,813	3,811	3,755	8	13	14	3,922	3,945	3,912

	Straw& stubbles			Prunings			Unused grassland cuttings			Dedicated crops			Agro-industrial residues			Total		
Kton	2012	2020	2030	2012	2020	2030	2012	2020	2030	2012	2020	2030	2012	2020	2030	2012	2020	2030
Kosovo	287	261	279	3	3	3				1,788	1,975	2,056	3	2	2	2,089	2,250	2,349
Moldova	0	0	0	154	154	154				1,303	1,303	1,303	22	23	24	1,499	1,501	1,502
Montenegro	13	8	8	7	7	7				125	131	128	1	1	1	155	157	155
FYROM	254	217	219	31	38	44				815	791	790	31	32	33	1,145	1,093	1,100
Serbia	8,343	5,783	5,814	155	169	169				1,407	1,723	1,653	247	235	241	10,217	7,977	7,945
Turkey	39,482	25,024	26,724	1,060	1,108	1,093				17,813	19,127	18,395	4,540	4,402	4,527	63,148	49,921	51,003
Ukraine	43,170	43,170	43,170	250	0	0				14,910	14,910	14,910	2,945	2,945	2,945	61,510	61,267	61,271
Non EU countries	91,249	74,193	75,927	1,495	1,316	1,306				34,944	36,552	35,748	7,763	7,613	7,745	136,020	120,258	121,320
EU 28 & Non EU countries	331,328	237,669	232,611	6,217	5,790	5,789				86,676	134,414	143,262	37,453	37,541	38,936	525,162	479,034	484,300

Table 9 Total biomass from straw & stubbles in EU and neighbour countries [Kton dm] for the Base (BP) in 2012, 2020 and 2030

	2012						2020						2030					
Kton	Rice	Cereal	OSR	Grain maize stover	Sugarbeet leaves & tops	Sunflower	Rice	Cereal	OSR	Grain maize stover	Sugarbeet leaves & tops	Sunflower	Rice	Cereal	OSR	Grain maize stover	Sugarbeet leaves & tops	Sunflower
Austria	-	1,771	115	947	2,472	78	-	1,581	84	904	165	109	-	1,551	79	936	157	171
Belgium	-	1,633	37	386	4,500	-	-	1,151	105	494	288	-	-	1,318	13	412	351	-
Bulgaria	58	3,088	158	943	-	1,924	60	3,062	151	1,220	148	2,020	50	2,996	192	1,217	144	1,798
Cyprus	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-
Czech Republic	-	5,237	1,010	568	3,134	91	-	5,088	847	921	246	108	-	5,139	940	676	254	102
Germany	-	22,063	3,888	1,326	18,383	66	-	21,624	3,584	1,724	1,016	89	-	20,945	2,684	1,844	949	61
Denmark	-	1,434	108	-	485	-	-	1,389	90	-	37	-	-	1,367	86	-	30	-
Estonia	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-
Greece	188	968	-	579	476	129	142	796	-	627	96	164	162	897	-	699	94	222
Spain	417	10,094	11	1,345	2,133	792	363	9,058	59	1,050	353	1,065	330	9,036	54	1,244	363	1,135
Finland	-	1,304	78	-	220	0	-	1,540	40	-	24	0	-	1,644	27	-	28	0
France	61	25,397	3,066	6,076	23,411	1,144	67	24,327	3,290	6,303	1,298	1,579	103	23,119	2,744	6,218	1,316	2,073
Croatia	-	747	31	1,241	1,011	76	-	676	38	1,201	93	76	-	575	40	1,240	93	85
Hungary	11	3,964	469	3,932	706	1,197	9	3,525	475	4,476	83	1,360	9	3,244	508	4,517	111	1,183
Ireland	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-
Italy	1,536	2,066	16	3,171	1,457	144	1,304	1,717	3	3,266	261	196	1,177	1,544	97	3,320	382	241
Lithuania	-	369	63	5	95	-	-	371	68	7	31	-	-	346	65	10	36	-
Luxembourg	-	122	17	1	16	-	-	95	42	2	1	-	-	108	13	1	2	-
Latvia	-	173	29	-	-	-	-	193	33	-	8	-	-	190	29	-	15	-
Malta	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-
Netherlands	-	924	7	125	4,192	1	-	790	3	90	213	1	-	739	13	160	227	7
Poland	-	16,973	1,833	1,288	9,225	6	-	16,582	1,222	1,744	771	41	-	14,289	1,254	1,157	743	60
Portugal	102	112	-	96	4	10	78	69	-	72	8	46	125	95	-	77	3	36
Romania	64	5,605	772	4,523	388	1,109	59	4,599	800	4,851	135	1,281	60	4,155	1,146	4,302	131	1,224
Sweden	-	2,316	173	3	1,358	-	-	2,056	108	5	114	-	-	1,877	120	4	106	-
Slovenia	-	0	0	0	-	-	-	0	0	0	-	-	-	0	0	0	-	-
Slovakia	-	1,114	205	506	916	171	-	1,143	184	559	69	184	-	1,080	207	540	71	96
United kingdom	-	5,191	675	-	3,634	1	-	4,497	640	-	304	1	-	4,275	744	-	410	1
EU 28	2,437	112,664	12,760	27,064	78,215	6,939	2,080	105,931	11,868	29,515	5,761	8,320	2,015	100,530	11,054	28,573	6,017	8,496
Albania	-	165	-	127	20	2	-	137	-	88	5	2	-	154	-	85	6	2
Bosnia and Herzegovina	-	0	0	0	-	0	-	0	0	0	-	0	-	0	0	0	-	0
Kosovo	-	234	0	50	1	2	-	237	0	23	0	1	-	251	0	27	0	2
Moldova																		
Montenegro	-	5	0	7	0	0	-	3	0	5	0	0	-	4	0	5	0	0
FYROM	12	184	2	47	5	4	10	163	1	40	-	3	9	164	3	38	0	4

	2012						2020						2030					
Kton	Rice	Cereal	OSR	Grain maize stover	Sugarbeet leaves & tops	Sunflower	Rice	Cereal	OSR	Grain maize stover	Sugarbeet leaves & tops	Sunflower	Rice	Cereal	OSR	Grain maize stover	Sugarbeet leaves & tops	Sunflower
Serbia	-	1,457	21	3,716	2,716	434	-	1,420	30	3,611	270	451	-	1,557	50	3,518	264	425
Turkey	505	23,707	106	2,116	11,670	1,377	627	19,845	154	2,259	944	1,194	613	21,489	149	2,495	881	1,097
Ukraine	9	13,743	644	10,470	5,299	13,005	9	13,743	644	10,470	5,299	13,005	9	13,743	644	10,470	5,299	13,005
Non EU countries	526	39,092	773	16,349	19,690	14,820	646	35,171	829	16,381	6,514	14,653	631	36,953	845	16,521	6,445	14,531
EU 28 & Non EU countries	2,963	151,756	13,532	43,413	97,905	21,758	2,726	141,102	12,697	45,896	12,274	22,973	2,647	137,483	11,899	45,094	12,461	23,027

Table 10 Total biomass from prunings in permanent crops in EU and neighbour countries [Kton dm] for the Base (BP) in 2012, 2020 and 2030

	2012				2020				2030			
Kton	Vineyards	Seed and soft fruit	Olives	Citrus	Vineyards	Seed and soft fruit	Olives	Citrus	Vineyards	Seed and soft fruit	Olives	Citrus
Austria	18	15	-	-	39	15	-	-	36	15	-	-
Belgium	-	38	-	-	-	32	-	-	-	33	-	-
Bulgaria	0	13	-	-	0	7	-	-	0	8	-	-
Cyprus	0	0	0	4	0	0	0	5	0	0	0	6
Czech Republic	-	35	-	-	-	32	-	-	-	31	-	-
Germany	10	85	-	-	67	82	-	-	66	78	-	-
Denmark	-	1	-	-	-	1	-	-	-	1	-	-
Estonia	-	0	-	-	-	0	-	-	-	0	-	-
Greece	10	105	70	18	5	102	77	14	3	109	91	14
Spain	11	153	2,338	132	16	129	2,207	123	13	113	2,250	131
Finland	-	1	-	-	-	2	-	-	-	2	-	-
France	31	130	0	0	52	98	1	0	52	72	1	0
Croatia	9	16	5	5	9	19	4	4	8	20	4	4
Hungary	0	142	-	-	0	131	-	-	0	134	-	-
Ireland	-	0	-	-	-	0	-	-	-	0	-	-
Italy	119	175	223	15	72	177	214	11	69	146	220	11
Lithuania	-	0	-	-	-	0	-	-	-	0	-	-
Luxembourg	0	-	-	-	-	-	-	-	-	-	-	-
Latvia	-	0	-	-	-	0	-	-	-	0	-	-
Malta	0	0	0	0	0	0	-	0	0	0	-	-
Netherlands	0	31	-	-	-	27	-	-	-	23	-	-
Poland	0	577	-	-	-	549	-	-	-	593	-	-
Portugal	0	1	0	0	0	0	0	0	0	0	0	0
Romania	5	136	-	-	3	110	-	-	2	88	-	-
Sweden	-	4	-	-	-	3	-	-	-	2	-	-
Slovenia	0	3	0	-	0	3	0	-	0	3	0	-
Slovakia	0	11	-	-	0	13	-	-	0	12	-	-
United kingdom	-	26	-	-	-	21	-	-	-	18	-	-
EU 28	215	1,697	2,636	174	263	1,551	2,503	157	249	1,501	2,566	167
Albania	3	27	9	0	4	37	8	0	4	51	8	0
Bosnia and Herzegovina	2	67	-	0	3	85	-	0	3	105	-	0
Kosovo	0	3	-	-	0	3	-	-	0	3	-	-
Moldova	32	123	-	-	32	123	-	-	32	123	-	-
Montenegro	1	6	0	0	1	6	0	0	1	6	0	0
FYROM	6	24	1	-	5	33	1	-	4	39	1	-

	2012				2020				2030			
Kton	Vineyards	Seed and soft fruit	Olives	Citrus	Vineyards	Seed and soft fruit	Olives	Citrus	Vineyards	Seed and soft fruit	Olives	Citrus
Serbia	13	142	-	-	15	154	-	-	13	156	-	-
Turkey	179	667	206	7	152	779	172	6	125	767	197	3
Ukraine	16	233	-	-	-	-	-	-	-	-	-	-
Non EU countries	214	1,066	207	7	171	966	173	6	142	963	198	3
EU 28 & Non EU countries	429	2,763	2,843	182	434	2,518	2,676	163	392	2,463	2,764	170

Table 11 Total biomass from dedicated biomass crops in EU and neighbour countries [Kton dm] for the Base (BP) in 2012, 2020 and 2030

	2012								2020								2030							
Kton	Miscan-thus	Switch-grass	Giant reed	Cardoon	RCG	SRC willow	SRC poplar	SRC eucalyptus	Miscan-thus	Switch-grass	Giant reed	Cardoon	RCG	SRC willow	SRC poplar	SRC eucalyptus	Miscan-thus	Switch-grass	Giant reed	Cardoon	RCG	SRC willow	SRC poplar	SRC eucalyptus
Austria	5	7	-	-	4	-	-	-	144	199	-	-	102	-	-	-	144	199	-	-	102	-	-	-
Belgium	12	23	1	-	14	6	-	-	148	308	17	-	179	93	-	-	203	425	23	-	247	130	-	-
Bulgaria	1,341	772	-	-	30	-	-	-	2,409	1,412	-	-	86	-	-	-	1,918	1,139	-	-	69	-	-	-
Cyprus	56	89	74	-	-	-	-	-	74	116	97	-	-	-	-	-	67	105	88	-	-	-	-	-
Czech Republic	348	521	-	-	231	-	-	-	522	679	-	-	432	-	-	-	584	773	-	-	472	-	-	-
Germany	49	53	-	-	24	-	-	-	1,790	1,835	-	-	808	-	-	-	3,148	3,221	-	-	1,420	-	-	-
Denmark	0	1	-	-	0	-	-	-	255	325	-	-	145	-	-	-	243	309	-	-	138	-	-	-
Estonia	69	103	-	-	44	-	-	-	171	255	-	-	108	-	-	-	159	237	-	-	100	-	-	-
Greece	360	528	587	-	-	-	-	-	314	467	485	-	-	-	-	-	288	428	453	-	-	-	-	-
Spain	5,734	8,084	6,411	-	118	180	-	79	6,074	8,253	6,497	-	125	187	-	172	6,421	8,700	6,761	-	124	185	-	225
Finland	-	434	-	-	-	-	-	-	-	516	-	-	-	-	-	-	-	619	-	-	-	-	-	-
France	538	789	16	-	117	171	-	108	3,023	3,843	40	-	736	1,228	0	488	4,023	5,061	46	-	985	1,667	0	639
Croatia	32	49	-	9	10	-	-	-	24	36	-	7	7	-	-	-	22	34	-	7	7	-	-	-
Hungary	683	1,015	-	-	375	-	-	-	1,281	1,904	-	-	701	-	-	-	1,316	1,956	-	-	720	-	-	-
Ireland	-	1	-	-	1	1	-	-	-	221	-	-	184	439	-	-	-	196	-	-	163	390	-	-
Italy	896	1,077	797	-	43	161	-	115	3,123	3,252	2,345	-	220	686	-	556	2,796	2,922	2,119	-	191	588	-	482
Lithuania	230	344	-	-	139	-	-	-	803	1,201	-	-	487	-	-	-	850	1,270	-	-	515	-	-	-
Luxembourg	0	0	-	-	0	-	-	-	17	26	-	-	11	-	-	-	24	36	-	-	16	-	-	-
Latvia	135	201	-	-	83	-	-	-	254	380	-	-	157	-	-	-	291	435	-	-	179	-	-	-
Malta	6	2	4	-	-	-	-	-	5	2	3	-	-	-	-	-	6	2	4	-	-	-	-	-
Netherlands	8	7	0	-	1	3	-	-	274	196	19	-	21	67	-	-	482	348	35	-	38	123	-	-
Poland	1,334	1,732	-	-	642	-	-	-	4,471	6,062	-	-	2,157	-	-	-	5,115	6,982	-	-	2,498	-	-	-
Portugal	486	749	500	-	22	-	-	58	363	552	345	-	21	-	-	64	336	509	316	-	19	-	-	63
Romania	5,080	5,064	-	-	1,022	-	-	-	6,765	6,614	-	-	1,302	-	-	-	6,722	6,598	-	-	1,315	-	-	-
Sweden	13	29	-	-	17	-	-	-	287	454	-	-	208	-	-	-	329	536	-	-	246	-	-	-
Slovenia	1	0	-	-	0	-	-	-	15	6	-	-	3	-	-	-	39	17	-	-	7	-	-	-
Slovakia	89	133	-	-	56	-	-	-	193	274	-	-	130	-	-	-	220	310	-	-	149	-	-	-
United kingdom	7	59	0	-	27	48	-	-	520	1,292	15	-	504	1,183	-	-	658	1,589	19	-	614	1,455	-	-
EU 28	17,514	21,867	8,390	9	3,021	571	-	360	33,319	40,679	9,863	7	8,831	3,883	0	1,279	36,403	44,957	9,865	7	10,335	4,538	0	1,409
Albania	576	429	-	-	-	-	-	-	614	458	-	-	-	-	-	-	614	458	-	-	-	-	-	-
Bosnia and Herzegovina	2,190	1,623	-	-	-	-	-	-	2,189	1,622	-	-	-	-	-	-	2,157	1,598	-	-	-	-	-	-
Kosovo	1,027	761	-	-	-	-	-	-	1,135	840	-	-	-	-	-	-	1,181	875	-	-	-	-	-	-
Moldova	431	642	-	-	230	-	-	-	431	642	-	-	230	-	-	-	431	642	-	-	230	-	-	-
Montenegro	72	53	-	-	-	-	-	-	75	56	-	-	-	-	-	-	73	55	-	-	-	-	-	-
FYROM	441	354	-	-	20	-	-	-	428	343	-	-	20	-	-	-	427	343	-	-	20	-	-	-
Serbia	479	686	-	-	242	-	-	-	586	840	-	-	297	-	-	-	562	806	-	-	285	-	-	-
Turkey	10,444	6,702	20	189	438	20	-	-	11,246	7,223	17	182	435	24	-	-	10,622	7,198	14	168	366	27	-	-
Ukraine	4,151	7,318	-	-	3,441	-	-	-	4,151	7,318	-	-	3,441	-	-	-	4,151	7,318	-	-	3,441	-	-	-
Non EU countries	15,514	15,060	20	189	4,142	20	-	-	16,411	15,725	17	182	4,192	24	-	-	15,763	15,665	14	168	4,111	27	-	-
EU 28 & Non EU countries	33,028	36,927	8,410	199	7,163	590	-	360	49,730	56,404	9,880	189	13,024	3,907	0	1,279	52,165	60,621	9,879	175	14,446	4,565	0	1,409

Table 12 Total biomass from straw & stubbles in EU and neighbour countries [Kton dm] for the Technical, Base (BP) and User defined (UD) potentials in 2012, 2020 and 2030

	Technical potential			Base potential			UD potential		
Kton	2012	2020	2030	2012	2020	2030	2012	2020	2030
Austria	6,603	3,525	3,595	5,384	2,843	2,894	5,149	2,620	2,677
Belgium	6,645	2,179	2,127	6,556	2,037	2,094	6,081	1,635	1,664
Bulgaria	7,761	8,218	8,157	6,171	6,660	6,396	5,994	6,555	6,252
Cyprus	66	62	61	0	0	0	-	-	-
Czech Republic	11,015	7,818	7,726	10,039	7,210	7,112	9,831	7,031	6,953
Germany	59,509	38,240	35,507	45,727	28,038	26,482	43,567	25,981	24,474
Denmark	9,741	6,970	6,650	2,027	1,516	1,483	1,271	799	763
Estonia	857	841	976	0	0	0	0	0	0
Greece	4,370	3,877	4,226	2,340	1,825	2,073	1,958	1,483	1,712
Spain	23,107	19,479	19,974	14,792	11,949	12,161	12,706	9,990	10,151
Finland	3,644	3,439	3,581	1,603	1,604	1,700	1,447	1,459	1,555
France	78,415	54,833	53,044	59,154	36,864	35,573	56,181	33,969	32,663
Croatia	3,813	2,558	2,495	3,107	2,084	2,033	2,980	1,957	1,896
Hungary	12,635	12,160	11,741	10,278	9,927	9,571	10,080	9,762	9,415
Ireland	1,638	1,561	1,566	0	0	0	0	0	0
Italy	18,961	14,661	14,968	8,391	6,747	6,760	7,536	5,872	5,909
Lithuania	3,808	3,136	3,022	532	477	457	424	371	348
Luxembourg	160	143	127	156	140	124	130	114	100
Latvia	1,592	1,863	1,821	202	234	234	143	183	182
Malta	8	11	9	0	0	0	-	-	-
Netherlands	6,642	1,531	1,563	5,250	1,097	1,147	4,891	725	776
Poland	34,922	24,185	20,950	29,325	20,360	17,503	28,256	19,349	16,492
Portugal	979	852	959	324	272	336	212	204	242
Romania	17,349	16,187	16,103	12,460	11,726	11,018	11,906	11,148	10,604
Sweden	5,971	3,624	3,452	3,849	2,283	2,108	3,621	2,070	1,904
Slovenia	452	489	446	0	0	0	0	0	0
Slovakia	3,916	3,128	2,947	2,913	2,140	1,995	2,864	2,104	1,956
United kingdom	24,185	16,663	18,101	9,500	5,443	5,431	8,652	4,659	4,668
EU 28	348,764	252,234	245,893	240,079	163,476	156,684	225,883	150,040	143,356
				-	-	-	-	-	-
Albania	657	485	518	314	232	247	149	95	93
Bosnia and Herzegovina	873	849	817	0	0	0	0	0	0
Kosovo	352	321	343	287	261	279	238	220	236
Moldova	-	-	-	-	-	-	-	-	-
Montenegro	17	11	12	13	8	8	7	5	5
FYROM	532	455	458	254	217	219	191	155	155
Serbia	10,239	7,097	7,136	8,343	5,783	5,814	8,000	5,493	5,556
Turkey	60,475	38,329	40,933	39,482	25,024	26,724	37,282	22,940	24,412
Ukraine	69,852	69,852	69,852	43,170	43,170	43,170	42,511	42,511	42,511
Non EU countries	142,997	117,398	120,068	91,862	74,694	76,462	88,378	71,418	72,968
				-	-	-	-	-	-
EU 28 & Non EU countries	491,762	369,632	365,961	331,941	238,170	233,146	314,262	221,458	216,323

Table 13 Total biomass from prunings from permanent crops in EU and neighbour countries [Kton dm] for the Technical, Base (BP) and User defined (UD) potentials in 2012, 2020 and 2030

	Technical potential			Base potential		
Kton	2012	2020	2030	2012	2020	2030
Austria	45	58	56	33	54	51
Belgium	38	32	33	38	32	33
Bulgaria	148	117	112	13	7	8
Cyprus	67	67	72	4	5	6
Czech Republic	36	32	31	35	32	31
Germany	106	168	162	95	149	144
Denmark	5	4	4	1	1	1
Estonia	4	2	1	0	0	0
Greece	1,507	1,543	1,637	204	199	216
Spain	5,428	4,874	4,984	2,634	2,475	2,507
Finland	4	5	5	1	2	2
France	1,120	1,036	993	162	151	126
Croatia	116	110	114	34	35	37
Hungary	263	231	227	142	131	134
Ireland	2	2	1	0	0	0
Italy	3,171	2,760	2,695	532	473	446
Lithuania	23	11	8	0	0	0
Luxembourg	0	0	0	0	0	0
Latvia	11	5	2	0	0	0
Malta	4	2	2	0	0	0
Netherlands	31	27	23	31	27	23
Poland	609	577	621	577	549	593
Portugal	835	670	763	2	0	0
Romania	442	333	279	141	113	89
Sweden	4	3	3	4	3	2
Slovenia	30	30	26	3	3	3
Slovakia	24	20	18	11	13	12
United kingdom	36	33	31	26	21	18
EU 28	14,107	12,752	12,901	4,722	4,474	4,483
Albania	95	114	136	38	49	64
Bosnia and Herzegovina	113	142	170	69	88	109
Kosovo	5	5	5	3	3	3
Moldova	335	335	335	154	154	154
Montenegro	16	16	17	7	7	7
FYROM	60	69	77	31	38	44
Serbia	305	323	323	155	169	169
Turkey	2,742	2,762	2,783	1,060	1,108	1,093
Ukraine	400	0	0	250	0	0
Non EU countries	4,071	3,765	3,845	1,767	1,617	1,644
EU 28 & Non EU countries	18,178	16,518	16,746	6,489	6,091	6,126

Table 14 Total biomass from dedicated woody and lignocellulosic biomass crops in EU and neighbour countries [Kton dm] for the Technical, Base (BP) and User defined (UD) potentials in 2012, 2020 and 2030

	2012						2020						2030					
Kton	Technical woody	Base woody	UD woody	Technical ligno-cellulosic	Base ligno-cellulosic	UD ligno-cellulosic	Technical woody	Base woody	UD woody	Technical ligno-cellulosic	Base ligno-cellulosic	UD ligno-cellulosic	Technical woody	Base woody	UD woody	Technical ligno-cellulosic	Base ligno-cellulosic	UD ligno-cellulosic
Austria	0	0	0	26	16	6	0	0	0	774	445	443	0	0	0	775	445	440
Belgium	9	6	3	56	50	23	122	93	91	738	652	632	169	130	129	1,017	897	888
Bulgaria	0	0	0	2,973	2,143	1,473	0	0	0	5,609	3,907	3,163	0	0	0	4,495	3,126	2,454
Cyprus	0	0	0	338	219	204	0	0	0	443	286	270	0	0	0	402	260	243
Czech Republic	0	0	0	1,281	1,100	565	0	0	0	1,872	1,633	1,209	0	0	0	2,087	1,829	1,290
Germany	0	0	0	151	126	57	0	0	0	5,248	4,433	4,425	0	0	0	9,223	7,789	7,771
Denmark	0	0	0	2	1	1	0	0	0	761	726	725	0	0	0	723	689	688
Estonia	0	0	0	235	217	108	0	0	0	580	534	425	0	0	0	539	497	396
Greece	0	0	0	2,981	1,475	1,262	0	0	0	2,457	1,267	1,135	0	0	0	2,357	1,169	1,010
Spain	374	259	86	31,046	20,347	16,594	526	358	239	31,907	20,948	18,033	600	411	284	33,495	22,006	19,224
Finland	0	0	0	467	434	408	0	0	0	555	516	324	0	0	0	666	619	592
France	313	280	132	1,756	1,461	655	1,905	1,717	1,552	8,996	7,641	6,799	2,562	2,306	2,165	11,892	10,116	9,433
Croatia	0	0	0	201	101	50	0	0	0	147	74	30	0	0	0	140	70	29
Hungary	0	0	0	2,580	2,073	1,340	0	0	0	4,758	3,885	3,035	0	0	0	4,896	3,992	3,250
Ireland	1	1	0	2	2	1	465	439	439	428	405	405	412	390	389	380	359	359
Italy	368	276	115	3,771	2,814	1,405	1,693	1,241	1,102	11,813	8,940	7,515	1,460	1,071	958	10,614	8,029	6,705
Lithuania	0	0	0	791	714	328	0	0	0	2,758	2,490	2,170	0	0	0	2,917	2,634	2,369
Luxembourg	0	0	0	1	1	0	0	0	0	69	54	54	0	0	0	97	76	76
Latvia	0	0	0	464	419	188	0	0	0	876	791	570	0	0	0	1,002	905	699
Malta	0	0	0	13	12	7	0	0	0	11	10	5	0	0	0	13	12	6
Netherlands	3	3	1	17	16	7	74	67	67	572	510	507	135	123	80	1,012	903	587
Poland	0	0	0	4,690	3,707	1,609	0	0	0	15,891	12,690	11,536	0	0	0	18,221	14,596	13,675
Portugal	77	58	51	3,258	1,758	1,428	84	64	59	2,309	1,281	1,041	83	63	38	2,095	1,181	665
Romania	0	0	0	15,081	11,166	9,578	0	0	0	19,673	14,682	12,083	0	0	0	19,754	14,634	12,144
Sweden	0	0	0	64	60	26	0	0	0	1,013	949	944	0	0	0	1,188	1,111	1,093
Slovenia	0	0	0	3	1	0	0	0	0	67	24	24	0	0	0	174	63	62
Slovakia	0	0	0	368	278	123	0	0	0	756	596	479	0	0	0	862	679	567
United kingdom	49	48	23	96	93	44	1,234	1,183	1,108	2,444	2,330	2,229	1,517	1,455	1,386	3,022	2,881	2,797
EU 28	1,193	931	411	72,713	50,801	37,490	6,103	5,163	4,656	123,526	92,700	80,210	6,939	5,948	5,429	134,058	101,566	89,511
Albania	0	0	0	2,011	1,005	946	0	0	0	2,144	1,072	1,009	0	0	0	2,144	1,072	1,009
Bosnia and Herzegovina	0	0	0	7,626	3,813	3,589	0	0	0	7,622	3,811	3,587	0	0	0	7,511	3,755	3,534
Kosovo	0	0	0	3,576	1,788	1,683	0	0	0	3,950	1,975	1,859	0	0	0	4,113	2,056	1,935
Moldova	0	0	0	2,606	1,303	1,303	0	0	0	2,606	1,303	1,303	0	0	0	2,606	1,303	1,303
Montenegro	0	0	0	250	125	118	0	0	0	262	131	123	0	0	0	256	128	120
FYROM	0	0	0	1,629	815	767	0	0	0	1,582	791	745	0	0	0	1,579	790	743
Serbia	0	0	0	2,813	1,407	579	0	0	0	3,447	1,723	710	0	0	0	3,305	1,653	681
Turkey	39	20	8	35,587	17,793	15,253	48	24	10	38,207	19,103	16,521	53	27	11	36,737	18,369	15,918
Ukraine	0	0	0	29,820	14,910	14,635	0	0	0	29,820	14,910	14,635	0	0	0	29,820	14,910	14,635
Non EU countries	39	20	8	85,917	42,959	38,872	48	24	10	89,639	44,819	40,491	53	27	11	88,072	44,036	39,879
EU 28 & Non EU countries	1,233	950	419	158,631	93,760	76,362	6,151	5,187	4,666	213,165	137,519	120,701	6,992	5,975	5,440	222,130	145,602	129,390

A2 Wood production and primary residues from forests

Table 15 Total forestry potential (categories 11 and 12; Table 3) in EU and neighbour countries [1000 t] for the Base (BP) and User-defined potentials (UP4, UP5, UP7) in 2012, 2020 and 2030

	2012	2012	2012	2012	2020	2020	2020	2020	2030	2030	2030	2030
Country	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7
Austria	14222	12800	7992	6570	14380	12942	7874	6436	14003	12603	6666	5266
Belgium	2071	1864	-76	-283	2266	2040	155	-72	2239	2015	223	-1
Bulgaria	4002	3601	2261	1861	4000	3600	2215	1815	4016	3615	2166	1764
Cyprus	16	15	3	13	18	16	15	13	18	16	15	13
Czech Republic	11246	10122	4640	3516	11302	10171	3855	2725	11364	10228	4111	2974
Germany	43216	38895	21221	16899	44438	39994	20668	16224	44828	40345	19309	14827
Denmark	1976	1779	1277	1079	1884	1696	1225	1036	1850	1665	1068	883
Estonia	6222	5600	-7118	-7740	6072	5464	-9672	-10279	5691	5122	-10685	-11254
Greece	2288	2059	1936	1707	2340	2106	1893	1659	2136	1923	1656	1442
Spain	11873	10686	5348	4160	12086	10878	5391	4182	11992	10793	5497	4298
Finland	34269	29257	10895	5883	34746	29629	9991	4875	34322	29165	9615	4458
France	44749	40274	30882	26407	44253	39828	29999	25573	42152	37936	23260	19045
Croatia	3426	3083	1225	882	3395	3056	1175	836	3264	2938	1096	770
Hungary	5796	5216	4032	3452	5739	5165	3189	2615	5555	4999	2988	2432
Ireland	1740	1566	566	392	1787	1608	187	9	2101	1891	113	-97
Italy	14970	13473	13678	12181	14484	13036	12891	11443	13489	12140	11183	9834
Lithuania	4757	4281	2113	1638	4650	4185	1866	1401	4469	4022	1362	915
Luxembourg	559	503	421	365	535	481	399	346	480	432	351	303
Latvia	8680	7812	2851	1983	8899	8009	3296	2406	8748	7874	1834	960
Malta	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	811	730	433	352	780	702	431	353	758	683	372	296
Poland	22105	19894	5213	3002	21648	19483	2751	586	20492	18443	1803	-246
Portugal	10278	9250	4682	3654	9913	8921	4558	3567	9542	8588	3573	2618
Romania	16395	14756	10619	8979	16019	14417	7526	5924	15240	13716	6508	4984
Sweden	46962	39747	15641	8426	48573	41078	16561	9067	49604	41855	14848	7098
Slovenia	4870	4383	3649	3162	4824	4342	3212	2730	4580	4122	2169	1711
Slovakia	5024	4522	598	96	4913	4422	649	158	4859	4373	555	69
United kingdom	14566	12547	10310	8291	14300	12352	9825	7877	14111	12239	9377	7505
EU 28	337089	298714	155291	116928	338242	299622	142128	103507	331907	293742	121032	82867
Albania	1082	974	973	865	1046	942	931	826	949	854	820	726
Bosnia and Herzegovina	3114	2803	889	578	3090	2781	725	417	2685	2417	67	-202
Kosovo	874	787	730	642	937	843	783	689	885	797	715	627
Moldova	572	515	541	484	487	438	454	405	602	542	565	505
Montenegro	1028	925	808	705	1003	903	770	669	828	745	569	486
FYROM	1155	1039	1075	959	1102	992	1017	906	850	765	756	671
Serbia	3798	3418	2909	2530	3695	3326	2751	2382	3211	2890	2166	1844
Turkey	14691	13222	5661	4192	14353	12918	5057	3621	13319	11987	4192	2860
Ukraine	15199	13679	11124	9604	15333	13800	10742	9208	15236	13712	10795	9271
Non EU countries	41513	37362	24710	20559	41047	36942	23229	19124	38566	34709	20645	16788
EU 28 & Non EU countries	378603	336076	180002	137487	379289	336564	165357	122631	370472	328451	141678	99656

Table 16 Total forestry potential (categories 11 and 12; Table 3) in EU and neighbour countries [1000 m³] for the Base (BP) and User-Defined potentials (UP4, UP5, U7) in 2012, 2020 and 2030

	2012	2012	2012	2012	2020	2020	2020	2020	2030	2030	2030	2030
Country	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7
Austria	32759	29483	18167	14891	33031	29728	17793	14490	31904	28713	14723	11533
Belgium	4580	4122	-205	-663	5042	4538	337	-168	4925	4432	433	-60
Bulgaria	8132	7318	4419	3605	8167	7350	4359	3542	8224	7401	4278	3455
Cyprus	39	35	7	31	42	38	36	32	43	39	36	32
Czech Republic	24900	22410	9493	7003	25055	22550	7691	5185	25181	22663	8267	5749
Germany	92576	83318	42825	33567	95207	85687	41454	31933	96123	86511	38434	28822
Denmark	4372	3935	2795	2358	4198	3778	2711	2291	4065	3658	2300	1893
Estonia	12761	11485	-15809	-17085	12488	11239	-21229	-22478	11773	10596	-23303	-24481
Greece	4760	4284	3960	3484	4867	4381	3854	3367	4444	4000	3353	2909
Spain	26424	23782	13182	10540	27078	24370	13492	10784	27015	24314	13834	11132
Finland	80226	68471	26896	15141	81084	69127	24613	12656	79445	67520	23105	11181
France	92364	83127	62079	52843	91144	82030	60019	50905	86748	78073	45506	36831
Croatia	6324	5691	2075	1443	6271	5644	1986	1358	6030	5427	1845	1243
Hungary	10988	9889	7559	6460	10891	9802	5935	4846	10601	9541	5612	4552
Ireland	3799	3419	991	611	3939	3545	116	-278	4876	4388	130	-357
Italy	28914	26022	26170	23279	27954	25159	24571	21775	26040	23436	21142	18538
Lithuania	10217	9195	4563	3541	9991	8992	4035	3036	9491	8542	2844	1895
Luxembourg	1095	985	815	705	1063	956	787	681	988	889	725	626
Latvia	18054	16249	5438	3633	18266	16439	6140	4313	17882	16094	2918	1129
Malta	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	1682	1514	855	687	1634	1471	871	708	1591	1432	747	588
Poland	49222	44300	11555	6633	48275	43447	6138	1311	45703	41132	4030	-540
Portugal	20691	18622	9739	7669	19764	17787	9283	7306	19160	17244	7475	5559
Romania	33229	29906	21293	17970	32700	29430	15151	11881	31249	28124	13204	10079
Sweden	108460	91779	34870	18188	111976	94696	36767	19486	113893	96134	32242	14484
Slovenia	10354	9318	7646	6611	10263	9237	6686	5660	9750	8775	4401	3425
Slovakia	10543	9489	1167	113	10260	9234	1230	204	10140	9126	1020	7
United kingdom	30943	26666	20826	16549	30939	26726	20304	16091	31135	26982	19887	15735
EU 28	728407	644816	323370	239807	731588	647379	295129	210921	718417	635187	249189	165959
Albania	2081	1873	1868	1660	2012	1811	1786	1585	1816	1635	1566	1385
Bosnia and Herzegovina	6195	5576	1314	694	6146	5531	959	345	5341	4807	-403	-937
Kosovo	1652	1487	1378	1213	1771	1594	1480	1303	1674	1506	1351	1184
Moldova	1054	949	992	887	897	807	831	741	1108	997	1035	924
Montenegro	2050	1845	1571	1366	2001	1801	1492	1292	1652	1487	1088	923
FYROM	2175	1958	2010	1792	2076	1868	1900	1692	1601	1441	1406	1246
Serbia	7308	6577	5614	4883	7111	6400	5311	4600	6179	5561	4186	3568
Turkey	32828	29545	13484	10202	31997	28798	12083	8883	29607	26646	10062	7101
Ukraine	32864	29578	23855	20568	33034	29731	22882	19578	32702	29432	22883	19613
Non EU countries	88208	79387	52086	43265	87044	78339	48723	40019	81679	73511	43175	35008
EU 28 & Non EU countries	816615	724204	375457	283073	818632	725719	343853	250940	800096	708698	292364	200967

Table 17 Primary Forestry Production (category 11; Table 3) in EU and neighbour countries [1000 t] for the Base (BP) and User-Defined potentials (UP4, UP5, UP7) in 2012, 2020 and 2030

	2012	2012	2012	2012	2020	2020	2020	2020	2030	2030	2030	2030
Country	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7
Austria	12762	11486	6531	5255	12894	11605	6387	5098	12542	11287	5205	3951
Belgium	1891	1702	-255	-444	2070	1863	-42	-249	2042	1838	26	-178
Bulgaria	3219	2897	1479	1157	3211	2890	1426	1105	3240	2916	1390	1066
Cyprus	13	12		10	14	13	12	10	15	13	12	11
Czech Republic	9362	8425	2756	1819	9384	8446	1937	999	9366	8430	2113	1176
Germany	40628	36565	18632	14569	41778	37600	18008	13830	42161	37945	16642	12426
Denmark	1731	1558	1032	859	1646	1481	987	822	1616	1455	834	672
Estonia	5882	5294	-7458	-8046	5738	5164	-10005	-10579	5378	4840	-10998	-11536
Greece	2064	1858	1712	1505	2111	1900	1665	1453	1927	1735	1447	1254
Spain	9876	8889	3351	2363	10064	9058	3369	2363	9931	8938	3436	2443
Finland	30224	27201	6850	3827	30550	27495	5795	2740	29896	26906	5189	2199
France	40082	36074	26215	22207	39588	35629	25334	21375	37584	33825	18693	14934
Croatia	3229	2906	1028	705	3198	2878	978	659	3076	2768	908	601
Hungary	4997	4497	3233	2733	4942	4448	2392	1898	4790	4311	2222	1743
Ireland	1611	1450	437	276	1650	1485	51	-114	1941	1747	-47	-241
Italy	13152	11837	11860	10545	12707	11437	11114	9844	11809	10628	9502	8321
Lithuania	4313	3882	1670	1239	4209	3788	1424	1003	4045	3640	938	533
Luxembourg	491	442	353	304	470	423	335	288	423	381	294	252
Latvia	7684	6915	1854	1086	7854	7068	2251	1465	7721	6949	807	35
Malta												
Netherlands	785	707	407	329	755	679	406	330	734	660	347	274
Poland	20240	18216	3347	1323	19820	17838	923	-1059	18759	16883	70	-1806
Portugal	7836	7052	2240	1457	7599	6839	2245	1485	7288	6559	1318	589
Romania	14450	13005	8673	7228	14074	12667	5581	4174	13435	12091	4703	3359
Sweden	40283	36255	8963	4934	41572	37415	9561	5403	42175	37958	7419	3201
Slovenia	4501	4051	3281	2830	4459	4013	2847	2401	4230	3807	1818	1395
Slovakia	4437	3993	11	-433	4331	3898	68	-366	4254	3828	-51	-476
United kingdom	12327	11094	8070	6837	12242	11018	7767	6543	12294	11064	7559	6330
EU 28	298069	268263	116272	86476	298931	269038	102816	72923	292670	263403	81796	52529
Albania	941	847	832	738	909	818	793	702	827	744	698	616
Bosnia and Herzegovina	2875	2587	650	362	2852	2567	488	203	2479	2231	-140	-387
Kosovo	790	711	645	566	847	762	693	608	800	720	630	550
Moldova	495	446	464	415	421	379	388	346	518	466	482	430
Montenegro	979	881	759	661	956	860	722	627	789	710	530	451
FYROM	1052	947	972	867	1004	904	919	818	774	697	680	603
Serbia	3425	3083	2537	2194	3333	2999	2389	2055	2896	2606	1851	1561
Turkey	11511	10360	2481	1329	11264	10137	1967	841	10448	9403	1321	276
Ukraine	13830	12447	9756	8373	13961	12565	9369	7973	13848	12463	9406	8021
Non EU countries	35899	32309	19096	15506	35546	31991	17728	14174	33379	30041	15458	12120
EU 28 & Non EU countries	333968	300572	135367	101982	334477	301029	120544	87096	326049	293444	97254	64649

Table 18 Primary Forestry Production (category 11; Table 3) in EU and neighbour countries [1000 m³] for the Base (BP) and User-Defined potentials (UP4, UP5, UP7) in 2012, 2020 and 2030

	2012	2012	2012	2012	2020	2020	2020	2020	2030	2030	2030	2030
Country	BP	U4	U5	U7	BP	U4	U5	U7	BP	U4	U5	U7
Austria	29353	26418	14761	11825	29575	26617	14336	11379	28531	25678	11350	8497
Belgium	4176	3758	-609	-1027	4597	4137	-108	-568	4485	4037	-7	-455
Bulgaria	6551	5896	2838	2183	6566	5910	2759	2102	6652	5987	2706	2041
Cyprus	32	29		24	35	31	28	25	35	32	29	25
Czech Republic	20629	18566	5221	3158	20702	18631	3337	1267	20644	18579	3729	1665
Germany	86938	78244	37187	28494	89420	80478	35667	26725	90329	81296	32640	23607
Denmark	3825	3442	2247	1865	3661	3295	2174	1808	3547	3192	1782	1427
Estonia	12047	10842	-16523	-17728	11784	10606	-21933	-23111	11108	9997	-23968	-25079
Greece	4278	3850	3478	3050	4375	3938	3362	2924	3995	3595	2904	2504
Spain	21962	19766	8720	6523	22526	20274	8940	6688	22336	20102	9154	6921
Finland	70700	63630	17370	10300	71246	64122	14776	7651	69215	62293	12875	5954
France	82791	74512	52507	44228	81621	73459	50496	42334	77428	69685	36186	28444
Croatia	5957	5361	1708	1113	5903	5313	1618	1028	5679	5111	1495	927
Hungary	9460	8514	6030	5084	9364	8428	4409	3472	9124	8211	4135	3222
Ireland	3516	3164	708	356	3636	3273	-187	-551	4502	4051	-244	-694
Italy	25425	22883	22682	20139	24547	22092	21163	18709	22819	20537	17921	15639
Lithuania	9248	8323	3594	2669	9025	8122	3069	2166	8574	7717	1927	1070
Luxembourg	962	866	682	586	935	841	659	566	871	784	608	521
Latvia	15995	14395	3379	1779	16133	14520	4007	2394	15793	14214	829	-751
Malta												
Netherlands	1628	1466	802	639	1581	1423	818	660	1539	1385	694	540
Poland	45000	40500	7333	2833	44134	39721	1998	-2416	41774	37597	102	-4076
Portugal	15597	14038	4645	3085	14990	13491	4509	3010	14471	13024	2786	1339
Romania	29274	26347	17338	14411	28703	25832	11153	8283	27526	24773	9482	6729
Sweden	92946	83652	19356	10061	95765	86189	20556	10979	96819	87137	15169	5487
Slovenia	9545	8591	6838	5883	9462	8516	5886	4939	8980	8082	3630	2732
Slovakia	9310	8379	-66	-997	9046	8141	16	-889	8872	7985	-247	-1134
United kingdom	26340	23706	16223	13589	26608	23947	15973	13312	27185	24467	15938	13220
EU 28	643485	579137	238449	174128	645939	581345	209480	144886	632831	569548	163603	100320
Albania	1806	1625	1593	1412	1744	1569	1518	1343	1580	1422	1330	1172
Bosnia and Herzegovina	5725	5152	843	271	5679	5111	493	-75	4936	4442	-808	-1302
Kosovo	1494	1345	1220	1071	1601	1441	1310	1150	1513	1362	1191	1040
Moldova	912	821	850	759	775	697	709	631	953	858	880	785
Montenegro	1955	1759	1476	1280	1909	1718	1400	1209	1576	1418	1012	854
FYROM	1976	1778	1810	1612	1885	1697	1709	1521	1454	1309	1259	1114
Serbia	6585	5926	4891	4232	6407	5766	4608	3967	5567	5011	3574	3018
Turkey	25530	22977	6186	3633	24923	22431	5008	2516	23057	20751	3512	1206
Ukraine	29829	26846	20820	17837	29994	26995	19842	16843	29635	26672	19817	16853
Non EU countries	75810	68229	39689	32108	74916	67425	36596	29104	70271	63244	31767	24740
EU 28 & Non EU countries	719296	647366	278137	206235	720855	648770	246076	173991	703102	632792	195370	125060

Table 19 Primary Residues (category 12; Table 3) from Forests in EU and neighbour countries [1000 t] for the Base (BP) and User-Defined potentials (UP4, UP5, UP7) in 2012, 2020 and 2030

	2012	2012	2012	2012	2020	2020	2020	2020	2030	2030	2030	2030
Country	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7
Austria	1461	1315	1461	1315	1486	1338	1486	1338	1461	1315	1461	1315
Belgium	180	162	180	162	197	177	197	177	197	177	197	177
Bulgaria	782	704	782	704	790	711	790	711	776	699	776	699
Cyprus	3	3	3	3	3	3	3	3	3	3	3	3
Czech Republic	1885	1696	1885	1696	1918	1726	1918	1726	1998	1798	1998	1798
Germany	2588	2330	2588	2330	2660	2394	2660	2394	2667	2401	2667	2401
Denmark	245	220	245	220	238	214	238	214	234	210	234	210
Estonia	340	306	340	306	333	300	333	300	313	282	313	282
Greece	224	201	224	201	229	206	229	206	209	188	209	188
Spain	1997	1797	1997	1797	2022	1820	2022	1820	2061	1855	2061	1855
Finland	4045	2055	4045	2055	4196	2135	4196	2135	4426	2259	4426	2259
France	4667	4201	4667	4201	4665	4199	4665	4199	4568	4111	4568	4111
Croatia	197	177	197	177	197	177	197	177	188	169	188	169
Hungary	799	719	799	719	797	717	797	717	765	689	765	689
Ireland	129	116	129	116	136	123	136	123	159	144	159	144
Italy	1818	1636	1818	1636	1777	1599	1777	1599	1680	1512	1680	1512
Lithuania	443	399	443	399	442	398	442	398	424	382	424	382
Luxembourg	68	61	68	61	65	58	65	58	57	51	57	51
Latvia	996	897	996	897	1045	940	1045	940	1027	925	1027	925
Malta												
Netherlands	26	23	26	23	25	23	25	23	25	22	25	22
Poland	1865	1679	1865	1679	1828	1645	1828	1645	1733	1560	1733	1560
Portugal	2442	2197	2442	2197	2313	2082	2313	2082	2255	2029	2255	2029
Romania	1945	1751	1945	1751	1945	1750	1945	1750	1805	1625	1805	1625
Sweden	6679	3492	6679	3492	7001	3664	7001	3664	7429	3897	7429	3897
Slovenia	369	332	369	332	365	328	365	328	350	315	350	315
Slovakia	587	529	587	529	582	524	582	524	606	545	606	545
United kingdom	2240	1453	2240	1453	2058	1334	2058	1334	1817	1175	1817	1175
EU 28	39020	30452	39020	30452	39312	30584	39312	30584	39237	30339	39237	30339
Albania	141	127	141	127	137	124	137	124	122	110	122	110
Bosnia and Herzegovina	240	216	240	216	238	214	238	214	207	186	207	186
Kosovo	84	76	84	76	90	81	90	81	85	77	85	77
Moldova	77	69	77	69	66	59	66	59	84	75	84	75
Montenegro	49	44	49	44	47	43	47	43	39	35	39	35
FYROM	103	92	103	92	98	88	98	88	76	68	76	68
Serbia	373	335	373	335	363	326	363	326	315	284	315	284
Turkey	3180	2862	3180	2862	3089	2780	3089	2780	2871	2584	2871	2584
Ukraine	1368	1232	1368	1232	1372	1235	1372	1235	1389	1250	1389	1250
Non EU countries	5614	5053	5614	5053	5501	4951	5501	4951	5187	4668	5187	4668
EU 28 & Non EU countries	44634	35504	44634	35504	44813	35535	44813	35535	44423	35007	44423	35007

Table 20 Primary Residues from Forests (category 12; Table 3) in EU and neighbour countries [1000 m³] for the Base (BP) and User-Defined potentials (UP4, UP5, UP7) in 2012, 2020 and 2030

	2012	2012	2012	2012	2020	2020	2020	2020	2030	2030	2030	2030
Country	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7	BP	UP4	UP5	UP7
Austria	3406	3066	3406	3066	3456	3111	3456	3111	3373	3036	3373	3036
Belgium	404	363	404	363	445	400	445	400	440	396	440	396
Bulgaria	1580	1422	1580	1422	1600	1440	1600	1440	1572	1415	1572	1415
Cyprus	7	6	7	6	8	7	8	7	8	7	8	7
Czech Republic	4272	3845	4272	3845	4354	3918	4354	3918	4538	4084	4538	4084
Germany	5638	5074	5638	5074	5787	5209	5787	5209	5794	5214	5794	5214
Denmark	548	493	548	493	537	483	537	483	518	466	518	466
Estonia	715	643	715	643	703	633	703	633	665	599	665	599
Greece	482	433	482	433	492	443	492	443	450	405	450	405
Spain	4462	4016	4462	4016	4552	4096	4552	4096	4679	4212	4679	4212
Finland	9526	4841	9526	4841	9837	5005	9837	5005	10230	5227	10230	5227
France	9573	8615	9573	8615	9523	8571	9523	8571	9320	8388	9320	8388
Croatia	367	330	367	330	367	331	367	331	351	316	351	316
Hungary	1529	1376	1529	1376	1527	1374	1527	1374	1477	1330	1477	1330
Ireland	283	255	283	255	303	273	303	273	374	337	374	337
Italy	3488	3139	3488	3139	3407	3067	3407	3067	3222	2899	3222	2899
Lithuania	969	872	969	872	966	870	966	870	917	825	917	825
Luxembourg	133	119	133	119	128	115	128	115	117	106	117	106
Latvia	2060	1854	2060	1854	2133	1920	2133	1920	2089	1880	2089	1880
Malta												
Netherlands	53	48	53	48	53	48	53	48	53	47	53	47
Poland	4222	3800	4222	3800	4140	3726	4140	3726	3928	3535	3928	3535
Portugal	5094	4585	5094	4585	4774	4296	4774	4296	4689	4221	4689	4221
Romania	3955	3560	3955	3560	3998	3598	3998	3598	3723	3350	3723	3350
Sweden	15514	8127	15514	8127	16211	8507	16211	8507	17074	8997	17074	8997
Slovenia	808	727	808	727	801	721	801	721	771	694	771	694
Slovakia	1233	1110	1233	1110	1215	1093	1215	1093	1268	1141	1268	1141
United kingdom	4603	2960	4603	2960	4331	2779	4331	2779	3949	2515	3949	2515
EU 28	84922	65680	84922	65680	85649	66034	85649	66034	85586	65639	85586	65639
Albania	275	248	275	248	268	241	268	241	237	213	237	213
Bosnia and Herzegovina	470	423	470	423	467	420	467	420	405	365	405	365
Kosovo	158	142	158	142	170	153	170	153	161	144	161	144
Moldova	142	128	142	128	122	110	122	110	155	139	155	139
Montenegro	95	85	95	85	93	83	93	83	76	69	76	69
FYROM	200	180	200	180	191	172	191	172	147	133	147	133
Serbia	723	651	723	651	704	633	704	633	611	550	611	550
Turkey	7298	6569	7298	6569	7074	6367	7074	6367	6550	5895	6550	5895
Ukraine	3035	2732	3035	2732	3040	2736	3040	2736	3067	2760	3067	2760
Non EU countries	12398	11158	12398	11158	12127	10915	12127	10915	11409	10268	11409	10268
EU 28 & Non EU countries	97319	76837	97319	76837	97777	76949	97777	76949	96994	75907	96994	75907

A3 Other land use

Table 21 Residues from road side verge grass in EU and neighbouring countries [1000 t]

	Road side verges		
Kton	**2012**	**2020**	**2030**
Austria	93	96	97
Belgium	101	103	105
Bulgaria	79	81	83
Cyprus	5	5	5
Czech Republic	75	77	78
Germany	686	704	716
Denmark	69	71	72
Estonia	21	22	22
Greece	100	102	104
Spain	343	352	358
Finland	138	142	144
France	724	743	756
Croatia	48	49	50
Hungary	81	83	85
Ireland	46	47	48
Italy	392	402	409
Lithuania	44	45	46
Luxembourg	7	7	8
Latvia	38	39	39
Malta	0	0	0
Netherlands	121	124	127
Poland	242	248	252
Portugal	83	85	86
Romania	127	130	132
Sweden	179	184	187
Slovenia	20	21	21
Slovakia	58	60	61
United kingdom	375	385	391
EU 28	4,294	4,410	4,483
Albania	10	10	10
Bosnia and Herzegovina	32	33	33
Kosovo	8	8	8
Macedonia	15	15	15
Moldova	20	21	21
Montenegro	9	9	10
FYROM	94	96	98
Serbia	65	67	68
Turkey	253	260	264
Ukraine	235	242	246
Non EU countries	647	665	676
EU 28 & Non EU countries	4,941	5,075	5,159

A4 Secondary forestry from wood industry

Table 22 Secondary Residues from Wood Industry in EU and neighbouring countries [1000 t]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	BP	UP1	UP2	BP	UP1	UP2	BP	UP1	UP2
Austria	4693	3996	2641	4361	3742	2356	4113	3562	2115
Belgium	969	831	443	878	761	379	847	737	354
Bulgaria	580	494	287	612	516	314	618	523	315
Cyprus	39	39	1	48	48	2	53	52	2
Czech Republic	2512	2100	1347	2654	2213	1448	2690	2243	1468
Germany	11168	8964	6486	10884	8781	6196	10835	8782	6061
Denmark	357	317	157	394	344	183	340	289	172
Estonia	971	761	676	1003	786	697	1008	796	692
Greece	219	198	74	285	250	111	315	275	128
Spain	4027	3791	850	4029	3802	836	3958	3749	784
Finland	13240	11779	4842	13256	11896	4504	13038	11760	4284
France	5336	4459	2734	5135	4317	2559	5910	4889	3173
Croatia	431	322	369	424	321	350	520	395	428
Hungary	440	402	141	626	573	199	745	687	227
Ireland	380	281	311	461	338	387	512	373	434
Italy	2710	2565	647	1997	1903	456	2075	1976	475
Lithuania	1009	801	665	1135	901	750	1245	999	797
Luxembourg	55	46	28	48	40	24	46	39	22
Latvia	1665	1204	1497	1943	1435	1707	2364	1737	2088
Malta	9	9	0	9	9	0	9	9	0
Netherlands	408	385	70	414	390	72	430	404	77
Poland	4854	4381	1648	6586	5810	2608	7098	6241	2871
Portugal	3612	3507	349	3505	3411	310	3480	3393	293
Romania	2814	2241	1991	4287	3437	2995	4661	3758	3220
Sweden	17384	14907	7688	17816	15382	7576	17874	15437	7594
Slovenia	405	331	267	583	474	391	726	589	488
Slovakia	1576	1375	610	1598	1393	621	1611	1411	613
United kingdom	2988	2493	1500	2936	2456	1454	3033	2548	1472
EU 28	84854	72976	38320	87906	75729	39486	90154	77652	40646
Albania	50	41	27	52	43	29	61	51	35
Bosnia and Herzegovina	754	573	589	765	582	598	776	590	605
Kosovo	19	30	10	20	19	11	23	22	13
Moldova	80	78	7	85	82	7	97	94	9
Montenegro	80	58	69	84	61	73	100	73	88
FYROM	43	34	27	45	36	28	53	42	34
Serbia	300	234	228	316	246	240	373	289	287
Turkey	3738	2979	2381	4108	3275	2612	4396	3508	2788
Ukraine	972	766	731	1200	956	885	1362	1082	1009
Non EU countries	6037	4794	4069	6676	5301	4483	7242	5751	4866
EU 28 & Non EU countries	90891	77770	42389	94582	81030	43969	97396	83403	45513

Table 23 Secondary Residues from Wood Industry in EU and neighbour countries [1000 m³]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	BP	UP1	UP2	BP	UP1	UP2	BP	UP1	UP2
Austria	10383	8812	5947	9641	8247	5306	9086	7844	4762
Belgium	2082	1783	963	1890	1636	823	1823	1586	768
Bulgaria	1223	1038	621	1289	1085	678	1302	1098	680
Cyprus	80	80	3	99	97	4	107	106	5
Czech Republic	5439	4521	3001	5740	4757	3224	5815	4820	3270
Germany	24257	19328	14506	23628	18925	13858	23501	18911	13554
Denmark	725	642	332	799	695	386	691	584	361
Estonia	2107	1643	1494	2174	1698	1541	2185	1716	1529
Greece	427	386	147	554	487	220	612	534	253
Spain	8606	8112	1802	8608	8132	1774	8462	8026	1666
Finland	29618	26317	10928	29650	26577	10165	29156	26270	9667
France	11285	9454	5738	10865	9159	5372	12472	10342	6656
Croatia	786	588	671	775	589	639	951	724	781
Hungary	856	787	272	1219	1122	384	1454	1347	441
Ireland	846	621	703	1027	748	874	1141	828	981
Italy	5348	5054	1359	3948	3758	962	4101	3902	1003
Lithuania	2014	1592	1358	2267	1792	1530	2485	1986	1628
Luxembourg	115	96	55	101	85	47	97	82	44
Latvia	3531	2551	3196	4120	3041	3651	5013	3682	4463
Malta	16	16	0	16	16	0	16	16	0
Netherlands	805	756	147	815	766	150	846	794	160
Poland	10098	9064	3612	13665	11970	5713	14716	12844	6288
Portugal	7893	7664	761	7671	7468	676	7620	7430	640
Romania	5689	4513	4139	8668	6923	6234	9424	7570	6709
Sweden	38911	33318	17358	39840	34345	17107	39961	34458	17147
Slovenia	857	696	585	1233	995	854	1535	1237	1067
Slovakia	3384	2960	1289	3425	2995	1312	3449	3028	1295
United kingdom	6270	5157	3372	6154	5075	3269	6350	5258	3310
EU 28	183650	157549	84357	189883	163182	86754	194371	167019	89128
Albania	90	75	51	95	79	53	112	92	64
Bosnia and Herzegovina	1558	1184	1221	1580	1200	1240	1601	1217	1254
Kosovo	37	56	21	39	36	22	45	42	26
Moldova	153	148	13	160	156	14	184	179	17
Montenegro	164	119	145	173	125	153	206	149	184
FYROM	81	64	52	85	68	55	100	80	66
Serbia	562	439	427	592	462	450	698	542	537
Turkey	7522	5966	4906	8266	6559	5382	8845	7024	5746
Ukraine	2050	1615	1553	2533	2019	1884	2873	2284	2146
Non EU countries	12217	9666	8390	13522	10703	9254	14666	11609	10040
EU 28 & Non EU countries	195867	167215	92747	203405	173885	96008	209036	178628	99168

Table 24 Secondary Residues from Sawmill Industry in EU and neighbour countries [1000 t]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	BP	UP1	UP2	BP	UP1	UP2	BP	UP1	UP2
Austria	2552	1855	2552	2264	1646	2264	2018	1466	2018
Belgium	422	284	422	359	242	359	334	225	334
Bulgaria	266	180	266	293	198	293	292	197	292
Cyprus	1	1	1	2	1	2	2	1	2
Czech Republic	1266	854	1266	1356	915	1356	1373	926	1373
Germany	6362	4157	6362	6068	3965	6068	5924	3871	5924
Denmark	123	83	123	154	104	154	158	107	158
Estonia	634	424	634	652	436	652	641	428	641
Greece	64	43	64	103	69	103	121	81	121
Spain	709	473	709	683	456	683	626	418	626
Finland	4427	2966	4427	4121	2761	4121	3872	2594	3872
France	2616	1738	2616	2437	1619	2437	3043	2021	3043
Croatia	360	250	360	337	235	337	412	287	412
Hungary	112	74	112	157	104	157	172	114	172
Ireland	311	212	311	387	263	387	434	295	434
Italy	444	299	444	288	194	288	301	203	301
Lithuania	625	417	625	705	470	705	739	493	739
Luxembourg	28	19	28	24	16	24	22	15	22
Latvia	1399	938	1399	1541	1033	1541	1900	1274	1900
Malta	0	0	0	0	0	0	0	0	0
Netherlands	70	47	70	72	48	72	77	51	77
Poland	1465	992	1465	2402	1626	2402	2652	1795	2652
Portugal	317	212	317	282	188	282	265	177	265
Romania	1748	1175	1748	2595	1744	2595	2757	1853	2757
Sweden	7654	5177	7654	7520	5086	7520	7531	5093	7531
Slovenia	229	155	229	338	229	338	423	286	423
Slovakia	594	393	594	603	398	603	590	390	590
United kingdom	1500	1005	1500	1454	974	1454	1472	986	1472
EU 28	36296	24419	36296	37197	25019	37197	38150	25648	38150
Albania	27	19	27	29	20	29	34	24	34
Bosnia and Herzegovina	579	398	579	587	404	587	593	408	593
Kosovo	10	21	10	10	9	10	13	11	13
Moldova	7	4	7	7	5	7	9	6	9
Montenegro	68	47	68	72	49	72	86	59	86
FYROM	27	18	27	28	19	28	34	23	34
Serbia	213	146	213	224	154	224	269	185	269
Turkey	2305	1545	2305	2528	1695	2528	2698	1809	2698
Ukraine	630	423	630	744	500	744	853	573	853
Non EU countries	3865	2622	3865	4230	2855	4230	4589	3098	4589
EU 28 & Non EU countries	40161	27041	40161	41426	27874	41426	42739	28746	42739

Table 25 Secondary Residues from Sawmill Industry in EU and neighbour countries [1000 m³]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	BP	UP1	UP2	BP	UP1	UP2	BP	UP1	UP2
Austria	5749	4178	5749	5101	3707	5101	4545	3303	4545
Belgium	914	615	914	779	524	779	725	488	725
Bulgaria	572	387	572	631	426	631	629	425	629
Cyprus	2	2	2	4	3	4	5	3	5
Czech Republic	2819	1902	2819	3021	2038	3021	3057	2062	3057
Germany	14228	9298	14228	13572	8869	13572	13248	8658	13248
Denmark	257	174	257	322	218	322	331	223	331
Estonia	1401	937	1401	1439	963	1439	1416	947	1416
Greece	126	84	126	202	135	202	237	159	237
Spain	1486	993	1486	1433	957	1433	1313	877	1313
Finland	10001	6700	10001	9310	6237	9310	8747	5860	8747
France	5472	3642	5472	5099	3393	5099	6366	4236	6366
Croatia	652	453	652	611	425	611	746	519	746
Hungary	206	137	206	289	192	289	317	210	317
Ireland	703	479	703	874	595	874	981	668	981
Italy	904	611	904	586	396	586	614	415	614
Lithuania	1268	846	1268	1429	954	1429	1500	1001	1500
Luxembourg	55	37	55	47	31	47	44	29	44
Latvia	2977	1998	2977	3280	2201	3280	4044	2714	4044
Malta	0	0	0	0	0	0	0	0	0
Netherlands	147	98	147	150	101	150	160	107	160
Poland	3204	2170	3204	5252	3556	5252	5800	3927	5800
Portugal	691	462	691	613	410	613	576	386	576
Romania	3597	2422	3597	5341	3595	5341	5675	3820	5675
Sweden	17283	11690	17283	16981	11486	16981	17005	11502	17005
Slovenia	499	338	499	737	499	737	922	624	922
Slovakia	1254	830	1254	1272	842	1272	1245	824	1245
United kingdom	3372	2259	3372	3269	2190	3269	3310	2217	3310
EU 28	79840	53739	79840	81645	54943	81645	83556	56204	83556
Albania	50	34	50	53	36	53	63	43	63
Bosnia and Herzegovina	1198	823	1198	1216	835	1216	1227	843	1227
Kosovo	20	39	20	21	19	21	25	22	25
Moldova	13	9	13	14	9	14	17	11	17
Montenegro	143	98	143	150	103	150	181	124	181
FYROM	51	35	51	54	37	54	65	45	65
Serbia	394	271	394	415	285	415	499	343	499
Turkey	4736	3180	4736	5195	3488	5195	5544	3722	5544
Ukraine	1329	894	1329	1569	1056	1569	1799	1211	1799
Non EU countries	7934	5383	7934	8687	5868	8687	9421	6365	9421
EU 28 & Non EU countries	87774	59122	87774	90332	60812	90332	92977	62569	92977

Table 26 Secondary Residues from Other Wood Processing Industries in EU and neighbour countries [1000 t]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	BP	UP1	UP2	BP	UP1	UP2	BP	UP1	UP2
Austria	645	645	89	631	631	92	630	630	97
Belgium	226	226	22	200	200	20	193	193	20
Bulgaria	164	164	22	170	170	21	177	177	23
Cyprus	38	38	0	47	47	0	50	50	0
Czech Republic	554	554	81	610	610	91	629	629	95
Germany	2886	2886	125	2877	2877	128	2973	2973	137
Denmark	234	234	34	239	239	29	182	182	13
Estonia	238	238	42	252	252	45	269	269	51
Greece	155	155	10	181	181	8	194	194	7
Spain	1178	1178	141	1218	1218	153	1203	1203	158
Finland	668	668	415	617	617	383	649	649	412
France	1259	1259	119	1245	1245	122	1414	1414	130
Croatia	71	71	9	87	87	13	108	108	16
Hungary	328	328	29	469	469	42	573	573	56
Ireland	69	69	0	74	74	0	78	78	0
Italy	2206	2206	204	1651	1651	169	1715	1715	174
Lithuania	384	384	40	431	431	45	506	506	57
Luxembourg	27	27	0	24	24	0	24	24	0
Latvia	266	266	98	401	401	166	463	463	188
Malta	9	9	0	9	9	0	9	9	0
Netherlands	334	334	0	338	338	0	349	349	0
Poland	2357	2357	183	3158	3158	206	3420	3420	219
Portugal	531	531	31	473	473	28	466	466	29
Romania	1066	1066	243	1693	1693	400	1905	1905	463
Sweden	413	413	34	560	560	56	608	608	64
Slovenia	169	169	38	238	238	53	296	296	65
Slovakia	199	199	16	216	216	18	241	241	22
United kingdom	1469	1469	0	1463	1463	0	1543	1543	0
EU 28	18142	18142	2024	19572	19572	2289	20866	20866	2496
Albania	23	23	0	24	24	0	27	27	0
Bosnia and Herzegovina	89	89	11	92	92	11	97	97	12
Kosovo	9	9	0	10	10	0	11	11	0
Moldova	74	74	0	77	77	0	89	89	0
Montenegro	12	12	1	12	12	1	14	14	1
FYROM	16	16	0	17	17	0	19	19	0
Serbia	88	88	15	92	92	16	104	104	17
Turkey	1428	1428	76	1575	1575	84	1693	1693	91
Ukraine	342	342	101	456	456	141	508	508	155
Non EU countries	2079	2079	204	2354	2354	254	2561	2561	277
EU 28 & Non EU countries	20222	20222	2228	21926	21926	2543	23427	23427	2774

Table 27 Secondary Residues from Other Wood Processing Industries in EU and neighbour countries [1000 m³]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	BP	UP1	UP2	BP	UP1	UP2	BP	UP1	UP2
Austria	1295	1295	198	1270	1270	205	1271	1271	217
Belgium	450	450	48	399	399	44	386	386	44
Bulgaria	317	317	48	326	326	47	340	340	51
Cyprus	78	78	0	95	95	0	102	102	0
Czech Republic	1076	1076	182	1184	1184	204	1222	1222	213
Germany	5743	5743	278	5728	5728	286	5925	5925	306
Denmark	467	467	75	476	476	64	359	359	30
Estonia	485	485	93	515	515	101	549	549	113
Greece	301	301	21	351	351	17	375	375	16
Spain	2343	2343	316	2424	2424	341	2397	2397	352
Finland	1436	1436	927	1327	1327	855	1397	1397	920
France	2548	2548	265	2522	2522	273	2862	2862	290
Croatia	135	135	20	164	164	28	205	205	35
Hungary	650	650	65	930	930	95	1137	1137	125
Ireland	142	142	0	153	153	0	160	160	0
Italy	4310	4310	455	3232	3232	376	3357	3357	389
Lithuania	746	746	90	838	838	101	985	985	128
Luxembourg	59	59	0	54	54	0	53	53	0
Latvia	554	554	218	840	840	370	969	969	419
Malta	16	16	0	16	16	0	16	16	0
Netherlands	649	649	0	656	656	0	678	678	0
Poland	4590	4590	408	6123	6123	461	6626	6626	489
Portugal	1031	1031	70	919	919	63	906	906	64
Romania	2091	2091	542	3327	3327	893	3750	3750	1035
Sweden	830	830	76	1128	1128	126	1225	1225	142
Slovenia	341	341	86	480	480	117	597	597	145
Slovakia	382	382	36	415	415	41	464	464	50
United kingdom	2854	2854	0	2844	2844	0	2999	2999	0
EU 28	35919	35919	4517	38735	38735	5109	41312	41312	5572
Albania	40	40	1	42	42	1	48	48	1
Bosnia and Herzegovina	167	167	24	172	172	25	181	181	27
Kosovo	17	17	1	17	17	1	20	20	1
Moldova	139	139	0	146	146	0	167	167	0
Montenegro	21	21	3	22	22	3	25	25	3
FYROM	29	29	1	31	31	1	35	35	1
Serbia	168	168	34	177	177	35	199	199	38
Turkey	2772	2772	169	3058	3058	187	3288	3288	202
Ukraine	721	721	225	963	963	315	1074	1074	347
Non EU countries	4076	4076	456	4629	4629	567	5039	5039	619
EU 28 & Non EU countries	39994	39994	4973	43364	43364	5676	46350	46350	6191

Table 28 Secondary Residues from Pulp & Paper Industry in EU and neighbour countries [1000 t]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	BP	UP1	UP2	BP	UP1	UP2	BP	UP1	UP2
Austria	1496	1496	0	1465	1465	0	1465	1465	0
Belgium	321	321	0	319	319	0	319	319	0
Bulgaria	150	150	0	149	149	0	149	149	0
Cyprus	0	0	0	0	0	0	0	0	0
Czech Republic	692	692	0	688	688	0	688	688	0
Germany	1921	1921	0	1939	1939	0	1939	1939	0
Denmark	0	0	0	0	0	0	0	0	0
Estonia	100	100	0	98	98	0	98	98	0
Greece	0	0	0	0	0	0	0	0	0
Spain	2140	2140	0	2129	2129	0	2129	2129	0
Finland	8145	8145	0	8518	8518	0	8518	8518	0
France	1462	1462	0	1453	1453	0	1453	1453	0
Croatia	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0
Italy	60	60	0	59	59	0	59	59	0
Lithuania	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0
Latvia	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0
Netherlands	4	4	0	4	4	0	4	4	0
Poland	1032	1032	0	1026	1026	0	1026	1026	0
Portugal	2764	2764	0	2750	2750	0	2750	2750	0
Romania	0	0	0	0	0	0	0	0	0
Sweden	9318	9318	0	9735	9735	0	9735	9735	0
Slovenia	7	7	0	7	7	0	7	7	0
Slovakia	783	783	0	779	779	0	779	779	0
United kingdom	19	19	0	19	19	0	19	19	0
EU 28	30415	30415	0	31138	31138	0	31138	31138	0
Albania	0	0	0	0	0	0	0	0	0
Bosnia and Herzegovina	87	87	0	86	86	0	86	86	0
Kosovo	0	0	0	0	0	0	0	0	0
Moldova	0	0	0	0	0	0	0	0	0
Montenegro	0	0	0	0	0	0	0	0	0
FYROM	0	0	0	0	0	0	0	0	0
Serbia	0	0	0	0	0	0	0	0	0
Turkey	6	6	0	6	6	0	6	6	0
Ukraine	0	0	0	0	0	0	0	0	0
Non EU countries	93	93	0	92	92	0	92	92	0
EU 28 & Non EU countries	30508	30508	0	31230	31230	0	31230	31230	0

Table 29 Secondary Residues from Pulp & Paper Industry in EU and neighbour countries [1000 m³]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	BP	UP1	UP2	BP	UP1	UP2	BP	UP1	UP2
Austria	3340	3340	0	3270	3270	0	3270	3270	0
Belgium	717	717	0	712	712	0	712	712	0
Bulgaria	334	334	0	332	332	0	332	332	0
Cyprus	0	0	0	0	0	0	0	0	0
Czech Republic	1544	1544	0	1536	1536	0	1536	1536	0
Germany	4287	4287	0	4328	4328	0	4328	4328	0
Denmark	1	1	0	1	1	0	1	1	0
Estonia	222	222	0	220	220	0	220	220	0
Greece	0	0	0	0	0	0	0	0	0
Spain	4777	4777	0	4751	4751	0	4751	4751	0
Finland	18181	18181	0	19013	19013	0	19013	19013	0
France	3264	3264	0	3244	3244	0	3244	3244	0
Croatia	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0
Italy	134	134	0	131	131	0	131	131	0
Lithuania	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0
Latvia	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0
Netherlands	9	9	0	9	9	0	9	9	0
Poland	2304	2304	0	2291	2291	0	2291	2291	0
Portugal	6170	6170	0	6138	6138	0	6138	6138	0
Romania	0	0	0	0	0	0	0	0	0
Sweden	20798	20798	0	21731	21731	0	21731	21731	0
Slovenia	17	17	0	16	16	0	16	16	0
Slovakia	1748	1748	0	1739	1739	0	1739	1739	0
United kingdom	43	43	0	41	41	0	41	41	0
EU 28	67891	67891	0	69503	69503	0	69503	69503	0
Albania	0	0	0	0	0	0	0	0	0
Bosnia and Herzegovina	194	194	0	193	193	0	193	193	0
Kosovo	0	0	0	0	0	0	0	0	0
Moldova	0	0	0	0	0	0	0	0	0
Montenegro	0	0	0	0	0	0	0	0	0
FYROM	0	0	0	0	0	0	0	0	0
Serbia	0	0	0	0	0	0	0	0	0
Turkey	14	14	0	13	13	0	13	13	0
Ukraine	0	0	0	0	0	0	0	0	0
Non EU countries	207	207	0	206	206	0	206	206	0
EU 28 & Non EU countries	68098	68098	0	69709	69709	0	69709	69709	0

A5 Secondary residues of industry utilising agricultural products

Table 30 Residues from agro-industries in EU and neighbouring countries [1000 t dm]

	Olive stones			Rice husk			Pressed grapes dregs			Cereal bran		
Kton dm	2012	2020	2030	2012	2020	2030	2012	2020	2030	2012	2020	2030
Austria	-	-	-	-	-	-	7	6	6	397	380	400
Belgium	-	-	-	-	-	-	-	-	-	705	749	758
Bulgaria	-	-	-	13	13	11	5	5	4	471	289	283
Cyprus	3	3	3	-	-	-	0	0	0	9	7	9
Czech Republic	-	-	-	-	-	-	2	2	2	751	746	771
Germany	-	-	-	-	-	-	32	35	34	4,649	4,586	4,823
Denmark	-	-	-	-	-	-	-	-	-	1,108	1,090	1,045
Estonia	-	-	-	-	-	-	-	-	-	76	84	130
Greece	222	241	267	49	51	57	11	10	10	326	394	428
Spain	696	644	660	208	191	184	83	91	84	2,693	2,852	2,931
Finland	-	-	-	-	-	-	-	-	-	402	519	513
France	9	10	12	28	28	37	176	159	155	3,312	3,562	3,752
Croatia	5	5	5	-	-	-	6	5	5	106	114	120
Hungary	-	-	-	2	1	1	7	5	4	467	503	475
Ireland	-	-	-	-	-	-	-	-	-	382	415	430
Italy	338	308	322	354	297	274	177	139	127	1,832	1,838	1,803
Lithuania	-	-	-	-	-	-	-	-	-	193	196	276
Luxembourg	-	-	-	-	-	-	0	0	0	-	-	-
Latvia	-	-	-	-	-	-	-	-	-	112	122	163
Malta	-	-	-	-	-	-	-	-	-	2	2	2
Netherlands	-	-	-	-	-	-	0	-	-	1,058	1,210	1,211
Poland	-	-	-	-	-	-	-	-	-	3,093	2,977	3,115
Portugal	111	85	102	40	36	53	27	17	18	301	321	319
Romania	-	-	-	14	13	14	10	8	6	705	766	614
Sweden	-	-	-	-	-	-	-	-	-	647	515	562
Slovenia	0	0	0	-	-	-	3	3	2	38	55	58
Slovakia	-	-	-	-	-	-	1	1	0	219	174	186
United kingdom	-	-	-	-	-	-	0	0	0	2,727	2,758	3,246
EU 28	1,386	1,296	1,373	708	631	631	546	485	457	26,782	27,225	28,421
Albania	10	10	10	-	-	-	0	0	0	4	4	4
Bosnia and Herzegovina	-	-	-	-	-	-	0	0	0	8	13	14
Kosovo	-	-	-	-	-	-	0	0	0	3	2	2
Macedonia	1	1	1	4	4	3	4	3	3	18	20	22
Moldova	-	-	-	-	-	-	-	-	-	22	23	24
Montenegro	0	0	0	-	-	-	1	1	1	-	-	-
FYROM	11	11	11	4	4	3	5	5	4	55	63	67
Serbia	-	-	-	-	-	-	1	1	1	246	234	240
Turkey	165	211	242	193	239	234	1	1	1	4,097	3,870	3,975
Ukraine	-	-	-	-	-	-	-	-	-	2,945	2,945	2,945
Non EU countries	176	222	253	197	243	237	7	6	6	7,343	7,113	7,227
EU 28 & Non EU countries	1,562	1,518	1,626	905	873	869	553	491	462	34,125	34,337	35,647

A6 Supply potentials from waste

Table 31 Supply from Waste (biowaste and post-consumer wood) in EU and neighbour countries [1000 t]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	TP	BP	UP1	TP	BP	UP1	TP	BP	UP1
Austria	2468	2205	2205	2565	2302	2302	2687	2424	2424
Belgium	2820	2122	2122	2999	2301	2301	3210	2512	2512
Bulgaria	634	622	622	613	601	596	580	568	560
Cyprus	320	300	300	328	308	304	337	317	314
Czech Republic	1192	1100	1100	1253	1161	1086	1348	1256	1146
Germany	22479	21743	21743	22341	21605	20582	22262	21526	20456
Denmark	1882	1830	1830	1922	1870	1668	1983	1931	1730
Estonia	285	260	260	290	264	251	294	269	249
Greece	2457	2366	2366	2434	2343	2244	2346	2255	2146
Spain	11672	10611	10611	11630	10569	10569	11452	10391	10391
Finland	1541	1281	1281	1628	1367	1367	1707	1446	1441
France	15913	13649	13649	16399	14136	14136	16985	14722	14722
Croatia	639	556	556	648	564	564	663	579	579
Hungary	1354	1298	1298	1371	1315	1253	1410	1354	1270
Ireland	943	784	784	959	799	799	959	800	800
Italy	14438	12994	12994	15178	13733	13733	15773	14328	14328
Lithuania	462	421	421	447	406	384	429	388	352
Luxembourg	142	135	135	166	160	160	204	198	198
Latvia	314	281	281	315	283	259	317	284	250
Malta	107	103	103	113	109	107	118	114	112
Netherlands	3876	3335	3335	3952	3412	3412	4030	3490	3487
Poland	4811	4590	4590	5049	4828	4263	5436	5215	4459
Portugal	2127	2057	2057	2106	2036	1946	2068	1998	1899
Romania	3195	3014	3014	3262	3081	2875	3365	3184	2901
Sweden	2331	2315	2315	2468	2453	2256	2650	2634	2431
Slovenia	305	296	296	316	308	287	331	323	295
Slovakia	623	570	570	640	587	587	658	605	597
United kingdom	14242	12613	12613	14791	13162	13162	15476	13847	13847
EU 28	113573	103451	103451	116182	106059	103453	119079	108956	105895
Albania	597	554	554	591	548	548	612	569	568
Bosnia and Herzegovina	619	553	553	607	541	536	619	554	535
Kosovo	0	0	0	0	0	0	0	0	0
Moldova	459	435	435	439	415	415	431	408	407
Montenegro	120	119	119	115	115	113	115	114	112
FYROM	337	314	314	332	308	307	341	318	312
Serbia	1348	1250	1250	1271	1174	1174	1258	1160	1160
Turkey	14139	12387	12387	14972	13221	13221	15976	14224	14224
Ukraine	5757	5378	5378	5721	5342	5298	5682	5303	5150
Non EU countries	23376	20991	20991	24048	21663	21610	25035	22650	22469
EU 28 & Non EU countries	136949	124442	124442	140230	127722	125063	144114	131606	128365

Table 32 Biowaste in EU and neighbouring countries [1000 t]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	TP	BP	UP1	TP	BP	UP1	TP	BP	UP1
Austria	1927	1927	1927	2005	2005	2005	2114	2114	2114
Belgium	1827	1827	1827	1936	1936	1936	2109	2109	2109
Bulgaria	598	598	598	573	573	573	532	532	532
Cyprus	264	264	264	272	272	272	281	281	281
Czech Republic	842	842	842	852	852	852	863	863	863
Germany	18342	18342	18342	18033	18033	18033	17836	17836	17836
Denmark	1272	1272	1272	1311	1311	1311	1375	1375	1375
Estonia	202	202	202	196	196	196	185	185	185
Greece	2045	2045	2045	1979	1979	1979	1865	1865	1865
Spain	9692	9692	9692	9499	9499	9499	9235	9235	9235
Finland	986	986	986	1021	1021	1021	1068	1068	1068
France	12922	12922	12922	13332	13332	13332	13871	13871	13871
Croatia	501	501	501	493	493	493	480	480	480
Hungary	1099	1099	1099	1087	1087	1087	1074	1074	1074
Ireland	664	664	664	667	667	667	659	659	659
Italy	11493	11493	11493	11931	11931	11931	12346	12346	12346
Lithuania	328	328	328	294	294	294	243	243	243
Luxembourg	133	133	133	156	156	156	194	194	194
Latvia	194	194	194	181	181	181	157	157	157
Malta	96	96	96	100	100	100	104	104	104
Netherlands	2709	2709	2709	2766	2766	2766	2834	2834	2834
Poland	3170	3170	3170	3158	3158	3158	3087	3087	3087
Portugal	1782	1782	1782	1723	1723	1723	1661	1661	1661
Romania	2371	2371	2371	2331	2331	2331	2251	2251	2251
Sweden	1845	1845	1845	1958	1958	1958	2124	2124	2124
Slovenia	242	242	242	246	246	246	246	246	246
Slovakia	521	521	521	521	521	521	511	511	511
United kingdom	10676	10676	10676	11144	11144	11144	11775	11775	11775
EU 28	88743	88743	88743	89764	89764	89764	91081	91081	91081
Albania	520	520	520	504	504	504	507	507	507
Bosnia and Herzegovina	467	467	467	436	436	436	416	416	416
Kosovo	0	0	0	0	0	0	0	0	0
Moldova	418	418	418	392	392	392	374	374	374
Montenegro	115	115	115	110	110	110	108	108	108
FYROM	283	283	283	271	271	271	270	270	270
Serbia	1174	1174	1174	1077	1077	1077	1028	1028	1028
Turkey	11017	11017	11017	11502	11502	11502	12266	12266	12266
Ukraine	4881	4881	4881	4704	4704	4704	4404	4404	4404
Non EU countries	18875	18875	18875	18995	18995	18995	19372	19372	19372
EU 28 & Non EU countries	107619	107619	107619	108758	108758	108758	110453	110453	110453

Table 33 Post-consumer Wood in EU and neighbouring countries [1000 t]

	2012	2012	2012	2020	2020	2020	2030	2030	2030
Country	TP	BP	UP1	TP	BP	UP1	TP	BP	UP1
Austria	541	279	279	560	297	297	573	310	310
Belgium	993	295	295	1064	366	366	1101	403	403
Bulgaria	36	24	24	40	28	24	49	36	28
Cyprus	56	36	36	56	36	33	56	36	33
Czech Republic	350	258	258	401	309	234	485	393	283
Germany	4137	3401	3401	4308	3572	2550	4426	3690	2620
Denmark	609	557	557	610	558	356	607	555	355
Estonia	84	58	58	93	68	54	109	84	64
Greece	412	321	321	455	364	266	480	390	281
Spain	1979	919	919	2131	1071	1071	2216	1156	1156
Finland	556	295	295	607	346	346	639	378	373
France	2991	727	727	3067	804	804	3114	851	851
Croatia	139	55	55	154	70	70	182	99	99
Hungary	255	199	199	284	228	166	336	280	196
Ireland	279	119	119	292	132	132	300	140	140
Italy	2946	1501	1501	3247	1802	1802	3427	1982	1982
Lithuania	134	93	93	153	112	89	186	145	109
Luxembourg	9	3	3	10	3	3	10	4	4
Latvia	120	87	87	135	102	79	160	127	93
Malta	11	7	7	13	9	7	14	10	8
Netherlands	1167	627	627	1186	646	646	1196	656	653
Poland	1641	1420	1420	1891	1670	1104	2349	2128	1372
Portugal	346	276	276	383	313	224	407	337	238
Romania	824	643	643	931	749	543	1114	933	651
Sweden	485	469	469	511	495	298	526	510	307
Slovenia	62	54	54	70	62	41	85	77	50
Slovakia	102	49	49	119	66	66	147	93	86
United kingdom	3566	1937	1937	3647	2018	2018	3701	2072	2072
EU 28	24829	14707	14707	26418	16296	13690	27998	17875	14815
Albania	77	34	34	87	44	44	106	62	62
Bosnia and Herzegovina	151	86	86	171	106	100	204	138	119
Kosovo	0	0	0	0	0	0	0	0	0
Moldova	41	17	17	47	24	24	58	34	34
Montenegro	5	4	4	6	5	3	7	6	4
FYROM	54	31	31	60	37	35	71	48	42
Serbia	174	76	76	195	97	97	230	132	132
Turkey	3121	1370	1370	3470	1719	1719	3710	1959	1959
Ukraine	876	497	497	1017	637	594	1278	899	746
Non EU countries	4501	2116	2116	5053	2668	2615	5663	3278	3097
EU 28 & Non EU countries	29331	16823	16823	31471	18964	16305	33661	21154	17912

A 7 Map types & attribute classification

Biomass potentials can be presented in relative or total amounts. Using the base potential for forestry for 2012 as an example, the map series below illustrate the general options to display quantities in maps. Major options are:

- Quantity per land area (Figure 62)
- Quantity per forest area available for wood supply (Figure 63)
- Total per NUSTS3 area (Figure 64)

The standard option in this atlas for maps to present the quantities is the option per land area (Figure 62). This option shows best the regional availability of biomass and the totals are implicitly indicated as well as via coloured size classes. This option also allows for summation of biomass potentials from multiple categories and sectors.

Biomass potentials can also be estimated per unit of area of a land use type. For example, Figure 63 shows forestry potentials per unit of forest area available for wood supply.

The classification of the quantitative attributes can follow different objectives. The upper map of Figure 63 has a legend where quantities are classified as in Figure 62 supporting a direct visual comparison. The lower map of Figure 63 shows a legend that is optimised to enable a better visualisation of the variability within the map. The latter is the standard option used in this atlas.

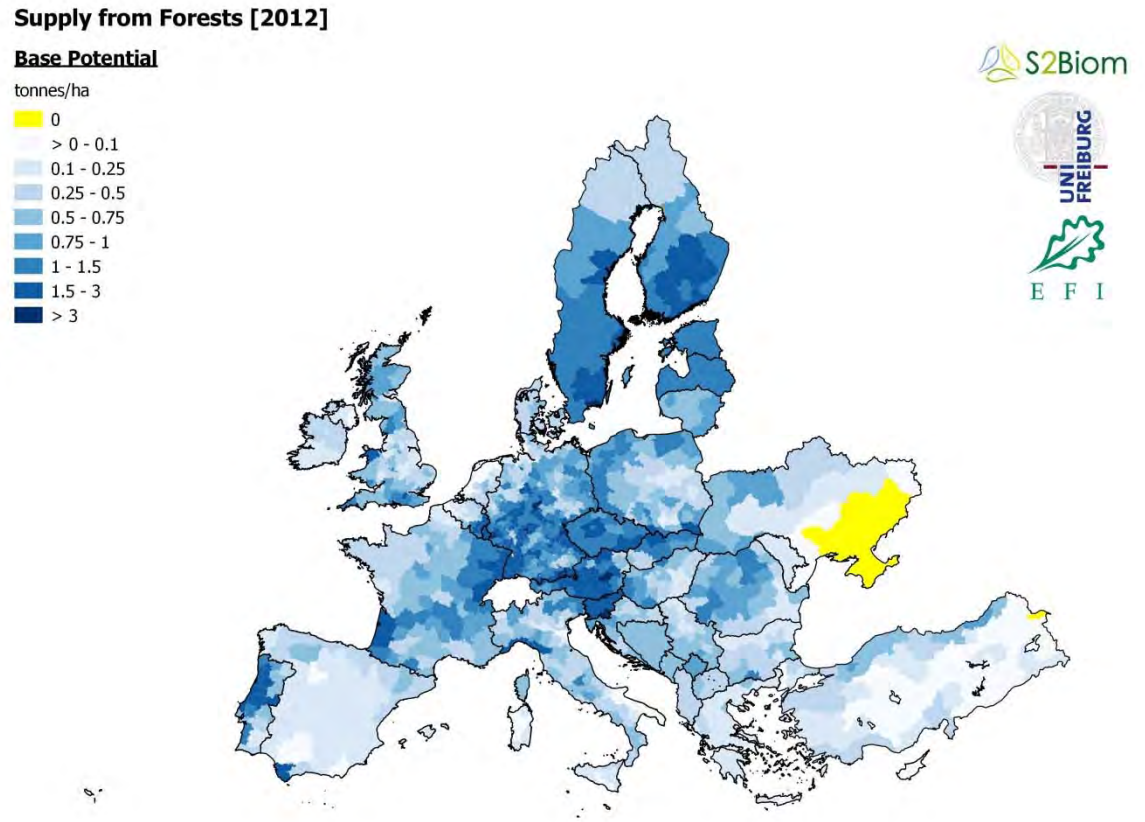
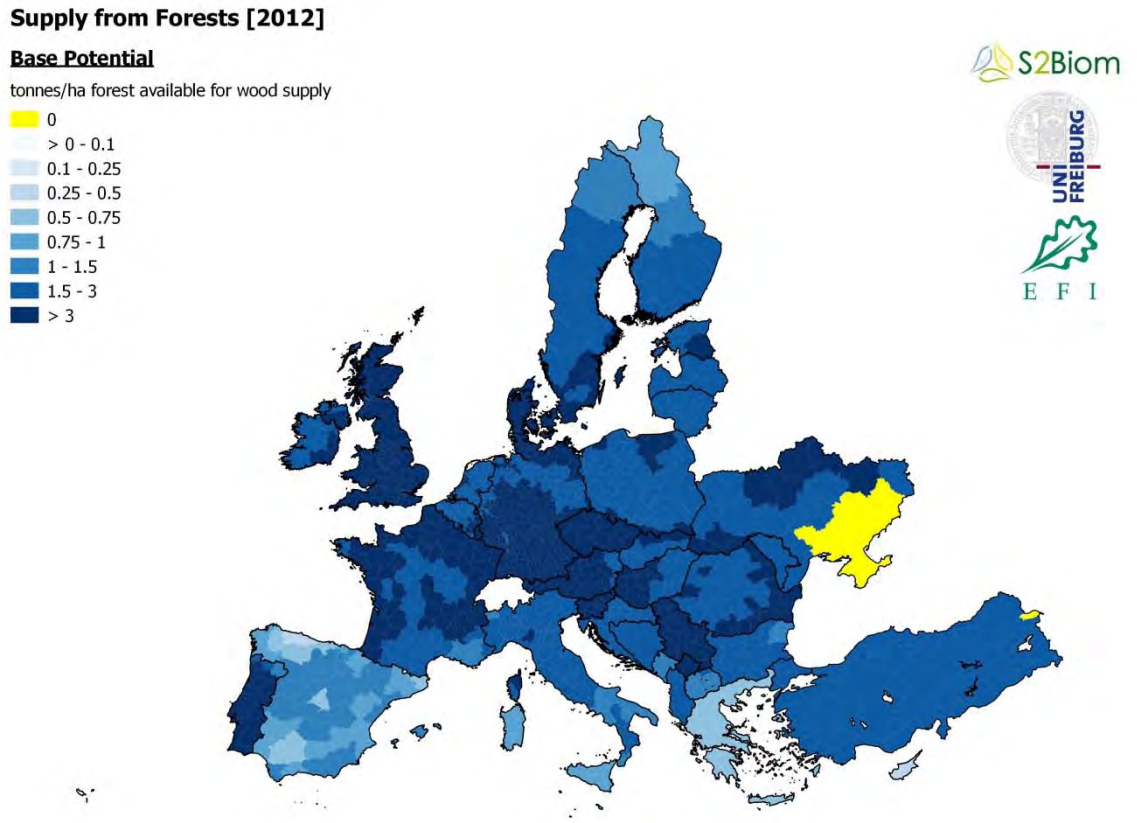


Figure 62 Map of forestry potentials – Base potential 2012 –Quantities per land area



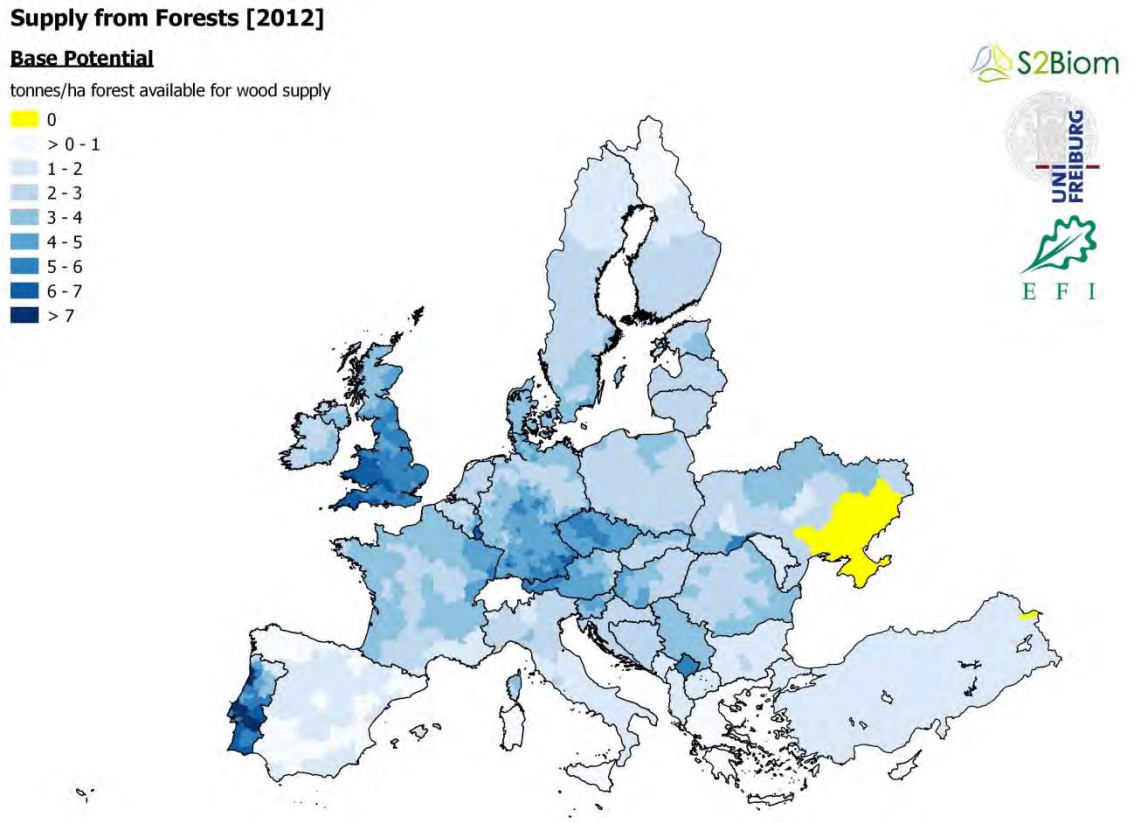


Figure 63 Map of forestry potentials – Base potential 2012 – Quantities per forest area available for wood supply, illustrating the effect of different legends.

The biomass density maps (Figure 62, Figure 63) provide information about the spatial distribution of the biomass, which are indicative for the logistical efforts one has to make to collect all the biomass needed. The map of Figure 64 shows the potential in absolute numbers. This representation can be potentially misleading in the interpretation when spatial units differ considerable in size.

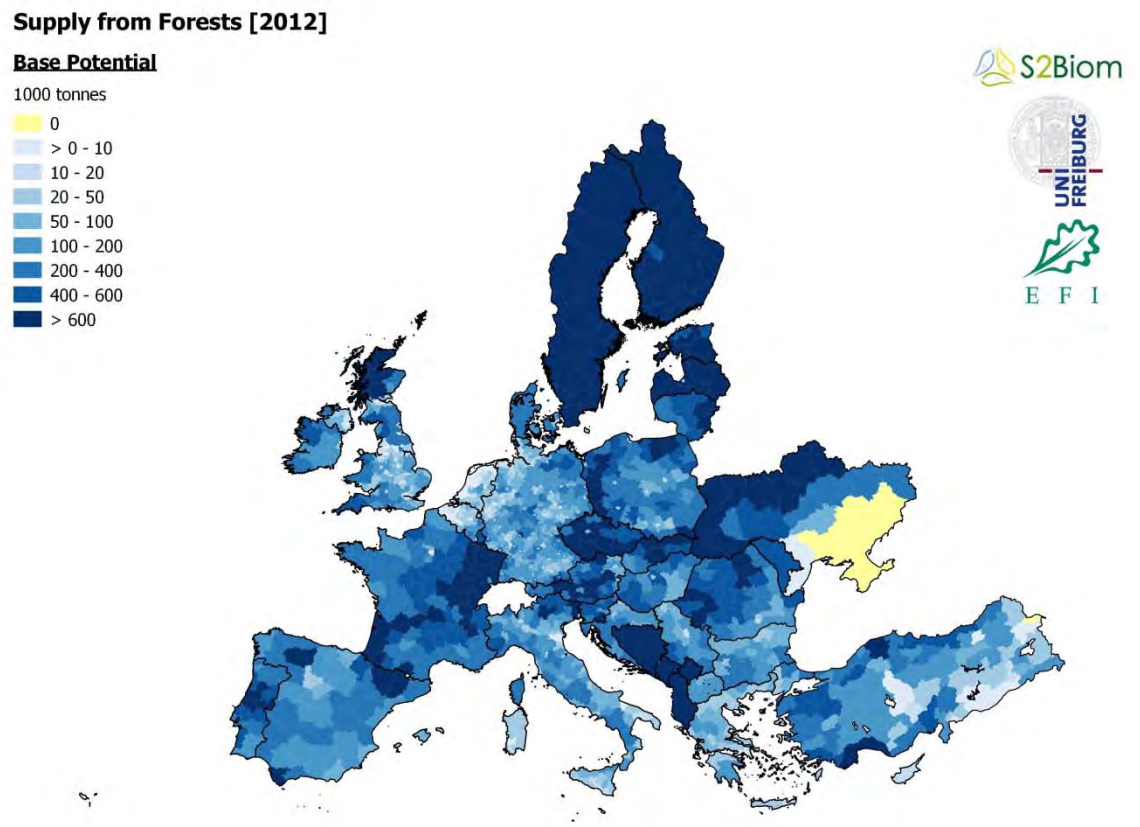


Figure 64 Map of forestry potentials – Base potential 2012 –Map of totals per NUTS3 area