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

S2Biom Project Grant Agreement n°608622

D1.2

Draft Spatial data base on sustainable biomass cost-supply of lignocellulosic biomass in Europe

Technical documentation

Version: 1.0

05.06.2015

SEVENTH FRAMEWORK PROGRAMME

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.

Project coordinator

FNR
Fachagentur Nachwachsende Rohstoffe e.V.

Scientific coordinator

Imperial College London

Project partners

About this document

It has been prepared by:

Due date of deliverable:	PM 18
Actual submission date:	**2015-06-05**
Start date of project:	2013-01-09
Duration:	36 months

Work package	1
Task	Sustainable biomass cost-supply
Lead contractor for this deliverable	ALU-FR
Editor	Matthias Dees
Authors	Pawan Datta, Matthias Dees (ALU-FR)
Quality reviewer	

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

Version	**Date**	**Author(s)**	**Reason for modification**	**Status**
1.0	05/06/2015	ALU-FR. LUKE and DLO	First version.	Final

European Union within the 7th Frame Programme. Grant Agreement n°608622. The sole responsibility of this publication lies with the author. The European Union is not responsible for any use that may be made of the information contained therein.

Executive summary

This report provides the technical specification of the D1.2 “Draft Spatial data base on sustainable biomass cost-supply of lignocellulosic biomass in Europe” to enable its technical utilisation.

The document should serve as an accompanying document which will be useful when working with the data which has been included in the draft database. It provides information about the structure of the database including the spatial extent and the spatial unit at which data has been collected. Explanations about the naming of the attributes, and the levels and types of data are also included. Further, the data collection level attribute IDs and the units of measurement for each of the considered biomass sources have been provided, and this will serve as a reference sheet for the users of the draft database.

The methods used to collect and prepare the lignocellulosic cost and supply data are presented in D1.3 “Spatial data base on sustainable biomass cost-supply of lignocellulosic biomass in Europe. Content, methods & data sources. Draft Version.”

The atlas of maps, based on data from this database, has been prepared as D1.4 “Draft atlas with regional cost supply biomass potentials in Europe”.

Table of contents

Executive summary **3**
Table of contents **4**
List of Figures **5**
List of Tables **5**
1 Introduction and Scope **6**
2 Database Structure Overview **6**
2.1 Spatial level 6
2.2 Coverage and extent 6
2.3 Reference system 10
2.4 Technical specifications 11
3 Database tables **13**
3.1 Introduction 13
3.2 Biomass category coding 16
3.3 Forestry based datasets 18
3.4 Agriculture based datasets 19
3.5 Other land use based datasets 20
3.6 Secondary residues based datasets 20
3.7 Tertiary residues based datasets 21

List of Figures

Figure 1: A representation of the countries included in S2biom project and form a part of the spatial database on lignocellulosic biomass cost and supply data 7
Figure 2: A generalized entity relationship model of the S2Biom draft spatial database and a screenshot of the database view 12
Figure 3: The different levels at which the lignocellulosic biomass data sets are included in the database. Each of the lowest level represents one data table. 13

List of Tables

Table 1: S2Biom countries and the administrative units which were used for this database 8
Table 2: List of countries and number of regional units per country included in the database 9
Table 3: The naming codes used in the S2Biom lignocellulosic biomass database 14
Table 4: List showing the category codes for all level 3 forestry categories included in the database 18
Table 5: List showing the category codes for all level 3 agricultural categories included in the database 19
Table 6: List showing the category codes for all level 3 other land uses categories included in the database 20
Table 7: List showing the category codes for all level 3 secondary residues categories included in the database 20
Table 8: List showing the category codes for all level 3 tertiary residues categories included in the database 21

1 Introduction and Scope

This document defines the content and structure of the S2Biom geospatial draft database prepared under the WP1 and corresponds to the deliverable D1.2. The database consists of a regional scale lignocellulosic biomass supply and cost data for EU28, western Balkans, Moldova and Turkey. This version of the database includes both current (2012) and future (2020 and 2030) lignocellulosic biomass supply potential datasets. The cost related datasets pertain to only current costs in this draft version of the database.

2 Database Structure Overview

2.1 Spatial level

The data which are included in this database correspond to the NUTS3 regional administrative units for the countries which have been included in the NUTS 2013 classification or earlier NUTS classifications. For other countries an attempt was made to adjust them to NUTS3 equivalent regions. This was done by using the variable levels of administrative unit boundaries for these countries in the EuroBoundaryMap version 9.0 (EBM v9.0). The data for the different biomass categories obtained at different levels of detail (national, regional, etc.) feature in this database in a disaggregated to a “NUTS3 equivalent” form.

2.2 Coverage and extent

This database consists of a total of 1486 “NUTS3 equivalent” regional units (polygons) and it is ensured that the lignocellulosic biomass datasets have been collected or disaggregated to this level. The regional administrative boundaries for all the regions for the countries included in S2Biom were obtained from EuroBoundaryMap (EBM v9.0) which is the European reference database of administrative units and boundaries established within the framework of EuroGeographics.

The regional extents and the spatial boundary information in the database have been defined according to the latest EUROSTAT NUTS 2013 classification, which will replace the NUTS 2010 classification from 2015 onwards. For the countries which have not been included in the NUTS 2013 or earlier classifications, the regional boundary information was obtained from the EBM v9.0.

The countries which are covered by this database are presented in the following Figure 1 and an overview of the source and level of spatial datasets for different countries is presented in Table 1.

EU28

These are the countries which belong to the European Union as of March 2013. A well-defined NUTS categorization is available for each of these countries and will form the basis of defining the regional scope of these countries. The NUTS 2013 boundaries from the EBM v9.0 have been used in the current spatial database to define the regional borders for these countries.

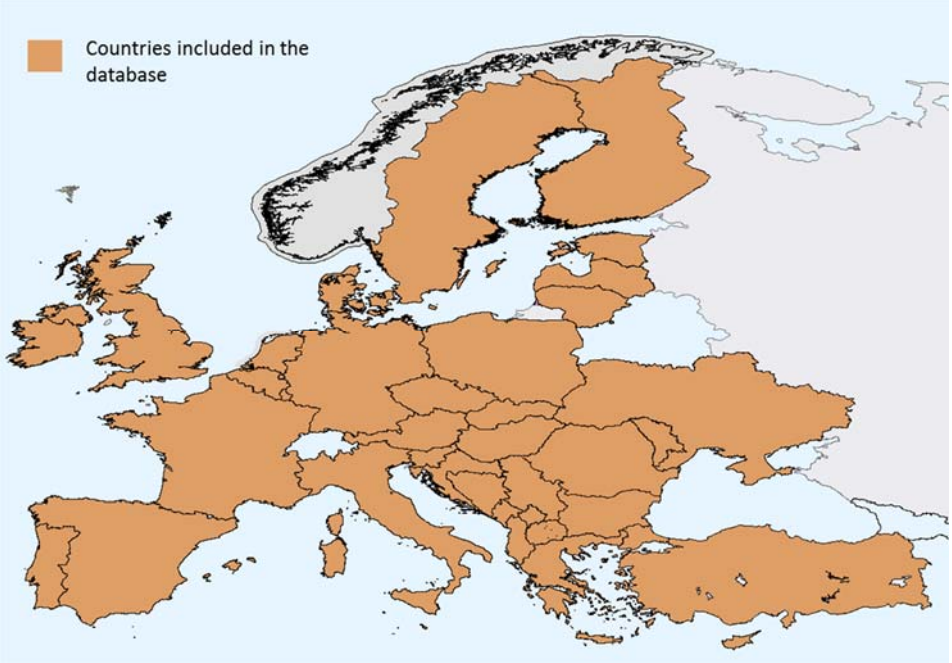

Figure 1: A representation of the countries included in S2biom project and form a part of the spatial database on lignocellulosic biomass cost and supply data

Candidate Countries included NUTS_2013

Serbia, The Former Yugoslav Republic of Macedonia

Both Serbia and The Former Yugoslav Republic of Macedonia (FYROM) are EU candidate countries and have been included in the NUTS 2013 regional classification system. For these countries, the NUTS 2013 boundaries from the EBM v9.0 have been used in the current spatial database to define the regional borders.

Candidate Countries in earlier NUTS:

Turkey

Turkey is an EU candidate country which does not feature in the NUTS 2013 classification, but was included in earlier versions. In this database the NUTS regional boundaries from an earlier version have been used.

Countries included in EBM_v9.0 but not NUTS classification system:

Ukraine, Moldova, Kosovo

These countries do not feature in the NUTS 2013 or earlier NUTS classifications. However all of them have been included in the EuroBoundaryMap v9.0. The relevant S2Biom NUTS3 equivalent boundaries from the EBM v9.0 were selected and used for the purpose of this database. Ukraine was divided into 25 regional units using the "oblast" level boundaries while Moldova and Kosovo were included as one national unit in this database.

Others:

Albania, Bosnia & Herzegovina, Montenegro

These are the countries which have been included in the EBM v9.0 only as one national entity and these national boundaries have been used for the purpose of this database.

An overview of spatial units per country is presented in Table 2.

Table 1: S2Biom countries and the administrative units which were used for this database

Category	Classification	Version	Data Source - Polygons	Administrative units used in S2Biom
EU 28	NUTS3 available for all countries	2013	EUROSTAT/ Eurogeographics	NUTS 3 level
Serbia, RS	NUTS3 available	2013	EUROSTAT/ Eurogeographics	NUTS 3 level (25 units)
FYROM,MK	NUTS3 available	2013	EUROSTAT/ Eurogeographics	NUTS 3 level (8 units)
Turkey, TR	NUTS3 available	2010, not included in NUTS 2013	EUROSTAT/ Eurogeographics	NUTS 3 level
Ukraine, UA	Administrative units available	2013	EUROSTAT/ Eurogeographics	24 Oblasts + 1
Moldova, MD	Administrative units available	2013	EUROSTAT/ Eurogeographics	1 national unit
Kosovo, KS	Administrative units available	2013	EUROSTAT/ Eurogeographics	1 national unit
Albania, AL	National Entity in EBM	2013	EUROSTAT/ Eurogeographics	1 national unit
Montenegro, ME	National Entity in EBM	2013	EUROSTAT/ Eurogeographics	1 national unit
Bosnia & Hezregovina, BA	National Entity in EBM	2013	EUROSTAT/ Eurogeographics	1 national unit

Table 2: List of countries and number of regional units per country included in the database

CODE	Country	Instances (regional units) in the database
AT	Austria	35 NUTS3 2013 polygons
BE	Belgium	44 NUTS3 2013 polygons
BG	Bulgaria	28 NUTS3 2013 polygons
HR	Croatia	21 NUTS3 2013 polygons
CY	Cyprus	1 NUTS3 2013 polygon
CZ	Czech republic	14 NUTS3 2013 polygons
DK	Denmark	11 NUTS3 2013 polygons
EE	Estonia	5 NUTS3 2013 polygons
FI	Finland	19 NUTS3 2013 polygons
FR	France	100 NUTS3 2013 polygons
DE	Germany	402 NUTS3 2013 polygons
EL	Greece	53 NUTS3 2013 polygons
HU	Hungary	20 NUTS3 2013 polygons
IE	Ireland	8 NUTS3 2013 polygons
IT	Italy	110 NUTS3 2013 polygons
LV	Latvia	6 NUTS3 2013 polygons
LT	Lithuania	10 NUTS3 2013 polygons
LU	Luxembourg	1 NUTS3 2013 polygon
MT	Malta	2 NUTS3 2013 polygons
NL	Netherlands	40 NUTS3 2013 polygons
PL	Poland	72 NUTS3 2013 polygons
PT	Portugal	25 NUTS3 2013 polygons
RO	Romania	42 NUTS3 2013 polygons
SK	Slovakia	8 NUTS3 2013 polygons
SI	Slovenia	12 NUTS3 2013 polygons
ES	Spain	59 NUTS3 2013 polygons

CODE	Country	Instances (regional units) in the database
SE	Sweden	21 NUTS3 2013 polygons
UK	United kingdom	173 NUTS3 2013 polygons
ME	Montenegro	1 Country polygon
MK	FYROM	8 NUTS3 2013 polygons
AL	Albania	1 Country polygon
TR	Turkey	81 NUTS3 polygons
UA	Ukraine	25 NUTS3 equivalent polygons
BA	Bosnia and Herzegovina	1 Country polygon
RS	Serbia	25 NUTS3 2013 polygons
KS	Kosovo	1 Country polygon
MD	Moldova	1 Country polygon
Total		1486 Polygons

2.3 Reference system

EuroBoundaryMap data, on which the spatial structure of this database has been developed, is stored in two-dimensional geographical coordinates, degrees (longitude, latitude) with decimal fraction. The spatial reference system used in the EBM v9.0 is the European Terrestrial Reference System 1989 (ETRS89) which is a geodetic Cartesian reference frame defined for Eurasian Plate. This reference system has negligible differences compared to the widely used World Geodetic System 1984 (WGS 84).

The EBM v9.0 is provided without any specific map projection. So, the NUTS3 2013 and NUTS3 equivalent administrative boundary polygons for the regions included in this database were projected to the Lambert Azimuthal Equal Area projection (LAEA) proposed by INSPIRE and suggested by the EBM v9.0 specifications.

2.4 Technical specifications

A dedicated open source long-term support (LTS) Ubuntu 12.04 class server was set up to host the:

S2biom web server - for the biomass chains web tools (www.biomass-tools.eu)

S2biom draft geospatial database – on lignocellulosic biomass cost and supply data

The S2biom draft geospatial database is a PostgreSQL open source object-relational database. The geospatial extender PostGIS provides the support for integrating the database into a Geographic Information System (GIS). In addition, the database has been linked to MSAccess for easing the data entry tables and to QGIS for GIS processing and mapping support.

In the database the regional polygons are linked to the data tables by using the polygon ids as primary keys as shown in the entity relationship diagram in Figure 2. The tables which are now linked to the geographic objects can be handled and manipulated using PostgreSQL compatible GIS tools.

The biomass data in the current draft version of the database is available at the NUTS3_2013/ NUTS3_equivalent level. The spatial aggregation to NUTS2, NUTS1 and country level is possible by creating the specific level views in the database as per the requirements.

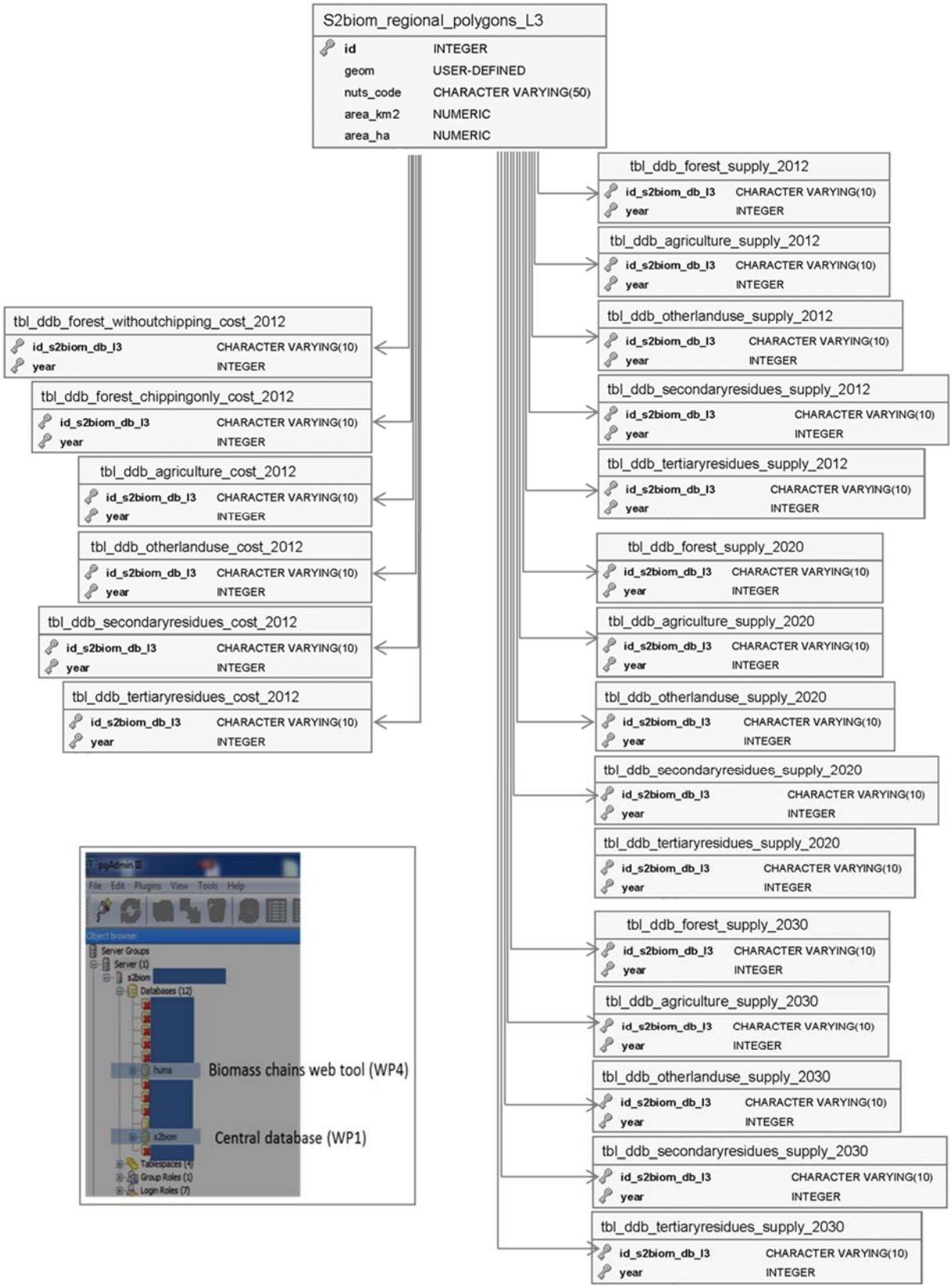

Figure 2: A generalized entity relationship model of the S2Biom draft spatial database and a screenshot of the database view

3 Database tables

3.1 Introduction

The lignocellulosic biomass cost and supply data in the draft database has been been arranged into different tables which have been separated based upon:

- type of data - whether it is cost data or supply data.
- reference year to which the data belong to (the cost data are available for 2012 while the supply data are available for 2012, 2020 and 2030 reference years)
- source from which the lignocellulosic biomass has been collected (forestry, agriculture, other landuse, secondary or tertiary residues respectively).

The general structure of the database tables has been presented in Figure 3.

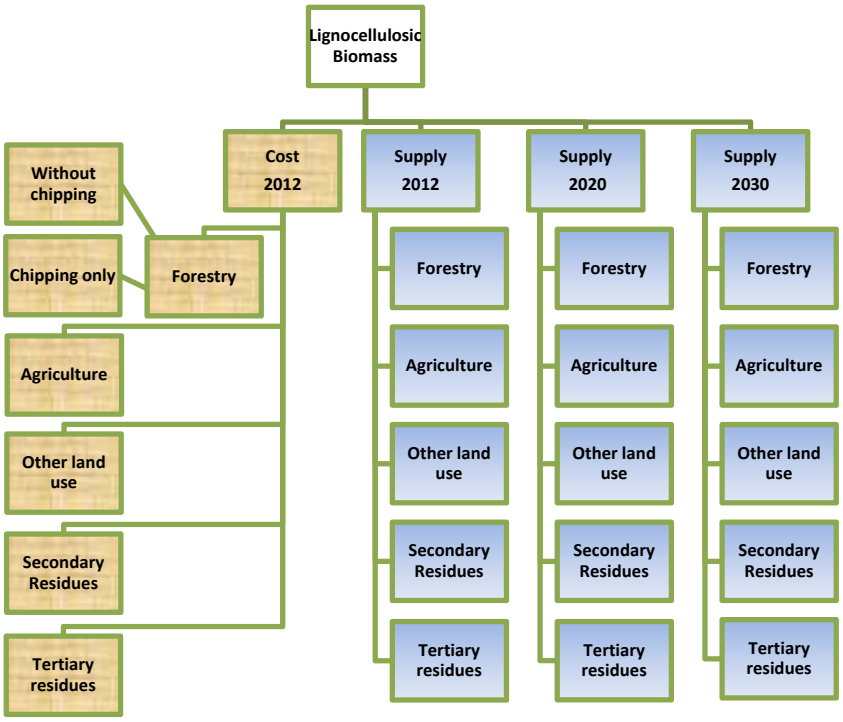

Figure 3: The different levels at which the lignocellulosic biomass data sets are included in the database. Each of the lowest level represents one data table.

The cost supply draft database in S2Biom consists of a total of 21 data tables which have been named using the biomass origin (e.g., forestry), data type (e.g., supply) and the reference year (e.g., 2012). Table 3 lists the names of all the data tables included in the database.

Table 3: The naming codes used in the S2Biom lignocellulosic biomass database

Origin	Database Table Names
1. Forestry	1. tbl_ddb_forest_withoutchipping_cost_2012
	2. tbl_ddb_forest_chippingonly_cost_2012
	3. tbl_ddb_forest_supply_2012
	4. tbl_ddb_forest_supply_2020
	5. tbl_ddb_forest_supply_2030
2. Agriculture on arable land & grassland	6. tbl_ddb_agriculture_cost_2012
	7. tbl_ddb_agriculture_supply_2012
	8. tbl_ddb_agriculture_supply_2020
	9. tbl_ddb_agriculture_supply_2030
3. Other land use	10. tbl_ddb_otherlanduse_cost_2012
	11. tbl_ddb_otherlanduse_supply_2012
	12. tbl_ddb_otherlanduse_supply_2020
	13. tbl_ddb_otherlanduse_supply_2030
4. Secondary residues	14. tbl_ddb_secondaryresidues_cost_2012
	15. tbl_ddb_secondaryresidues_supply_2012
	16. tbl_ddb_secondaryresidues_supply_2020
	17. tbl_ddb_secondaryresidues_supply_2030
5. Tertiary residues (Wastes)	18. tbl_ddb_tertiaryresidues_cost_2012
	19. tbl_ddb_tertiaryresidues_supply_2012
	20. tbl_ddb_tertiaryresidues_supply_2020
	21. tbl_ddb_tertiaryresidues_supply_2030

In each table basic attributes are included which are described below:

Attribute id: **id_s2biom_db_l3**
Definition: This is the NUTS3_2013 and equivalent code of the polygon representing the regions included in the database
Attribute id: **year**
Definition: The reference year of the data
Attribute id: **area_polygon_km2**
Definition: The total area of the polygon in square kilometers
Attribute id: **area_stats_km2**
Definition: The total statistical area of the regional unit represented by the polygon
Attribute id: **total_cats**
Definition: The total number of level 3 biomass categories
Attribute id: **total_empty_cats**
Definition: The total number of level 3 biomass categories which have no data

In addition, there are some additional attributes which are included in the tables for specific biomass origins.

Forestry:

Total forest area (in percent) **area_forest_percent**

Total forest available for wood supply (in percent) - **area_faws_percent**

Agriculture:

Total agricultural area (in percent) - **area_agriculture_percent**

Total energy crop area (in percent) - **area_energycrop_percent**

Other land uses:

Total area under other land uses (in percent) **area_total_olu_percent**

Tertiary residues:

Total population - **population**

The thematic attributes on biomass supply and cost are structured as explained in the following chapters.

3.2 Biomass category coding

The coding sequence of the biomass attribute IDs has been done using the following information:

- origin of data (forestry, agriculture, other landuse, secondary residues or tertiary residues)
- level of the data (to which aggregation/disaggregation level does the particular attribute belong to).

An example from the forestry supply database table has been given below to clarify the coding scheme:

Database Table: **tbl_ddb_forest_supply_2012**
Attribute id: **mf1**
Definition: The total supply potential of lignocellulosic biomass from forestry (in *Kilotonnes*) which is the sum of corresponding level 1 categories, namely, **mf1_1** and **mf1_2**
Attribute id: **mf1_1**
Definition: The total supply potential of lignocellulosic biomass from primary production (in *Kilotonnes*) which is the sum of corresponding level 2 categories, namely, **mf1_1_1** and **mf1_2_2**
Attribute id: **mf1_1_1**
Definition: The total supply potential of lignocellulosic biomass available as stemwood from thinnings and final fellings (in *Kilotonnes*) which is the sum of corresponding level 3 categories, namely, **mf1_1_1_1_bleaf**, **mf1_1_1_2_conifer**, **mf1_1_1_3_bleaf** and **mf1_1_1_4_conifer**

Attribute id: **mf1_1_1_1_bleaf**[12]
Definition: The total supply potential of lignocellulosic biomass available as stemwood from final fellings originating from broadleaf trees (in *Kilotonnes*)
Attribute id: **mf1_1_1_2_conifer**[12]
Definition: The total supply potential of lignocellulosic biomass available as stemwood from final fellings originating from conifer trees (in *Kilotonnes*)
Attribute id: **mf1_1_1_3_bleaf**[12]
Definition: The total supply potential of lignocellulosic biomass available as stemwood from thinnings originating from broadleaf trees (in *Kilotonnes*)
Attribute id: **mf1_1_1_4_conifer**[12]
Definition: The total supply potential of lignocellulosic biomass available as stemwood from thinnings originating from conifer trees (in *Kilotonnes*)
[1] *This is the biomass category level 3 at which the data has been collected for each of the S2Biom regional polygons*
[2] *An additional attribute column has been included for each of the level 3 biomass categories in the data tables which determines the original level (country or NUTS1 or NUTS2 or NUTS3) of data collection. As an example for the category 1.1.1.1* - stemwood from final fellings originating from broadleaf trees, the attribute ID **f1_1_1_2_conifer_nuts** *represents the original level of data collection.*

In the same way for data on volumes (which is an important unit when dealing with forestry based biomass), the corresponding attributes in supply database have been coded by replacing the prefix **m** for mass with **v** for volume in each of the attribute IDs. The naming of attributes for all the other lignocellulosic biomass sources is done in a similar way.

The biomass data is always collected at the most detailed category level (e.g. **mf1_1_1_1_bleaf, mf1_1_1_2_conifer** and then other higher levels (e.g. **mf1_1_1**) are filled by summing up the totals from corresponding more detailed levels.

3.3 Forestry based datasets

The current version of the database includes forestry supply data from 35 European countries, namely Austria, Belgium, Bulgaria, Croatia, Czech republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United kingdom, Montenegro, FYROM, Albania, Turkey, Ukraine, Bosnia and Herzegovina, Serbia, Kosovo, Moldova. The cost data is included for all the 37 S2biom countries.

Table 4: List showing the category codes for all level 3 forestry categories included in the database

Forestry Category – Level 3	Database Attribute ID	Units Supply; Cost
1.1.1.1 Stemwood from final fellings originating from broadleaf trees - mass	mf1_1_1_1_bleaf	Ktonnes; EUR/t
1.1.1.1 Stemwood from final fellings originating from broadleaf trees - volume	vf1_1_1_1_bleaf	1000m^3; EUR/m^3
1.1.1.2 Stemwood from final fellings originating from conifer trees - mass	mf1_1_1_2_conifer	Ktonnes; EUR/t
1.1.1.2 Stemwood from final fellings originating from conifer trees - volume	vf1_1_1_2_conifer	1000m^3; EUR/m^3
1.1.1.3 Stemwood from thinnings originating from broadleaf trees - mass	mf1_1_1_3_bleaf	Ktonnes; EUR/t
1.1.1.3 Stemwood from thinnings originating from broadleaf trees - volume	vf1_1_1_3_bleaf	1000m^3; EUR/m^3
1.1.1.4 Stemwood from thinnings originating from conifer trees - mass	mf1_1_1_4_conifer	Ktonnes; EUR/t
1.1.1.4 Stemwood from thinnings originating from conifer trees - volume	vf1_1_1_4_conifer	1000m^3; EUR/m^3
1.1.2.1 Stem and crown biomass from early thinnings originating from broadleaf trees - mass	mf1_1_2_1_bleaf	Ktonnes; EUR/t
1.1.2.1 Stem and crown biomass from early thinnings originating from broadleaf trees - volume	vf1_1_2_1_bleaf	1000m^3; EUR/m^3
1.1.2.2 Stem and crown biomass from early thinnings originating from conifer trees - mass	mf1_1_2_2_conifer	Ktonnes; EUR/t
1.1.2.2 Stem and crown biomass from early thinnings originating from conifer trees - volume	vf1_1_2_2_conifer	1000m^3; EUR/m^3
1.2.1.1 Logging residues from final fellings originating from broadleaf trees - mass	mf1_2_1_1_bleaf	Ktonnes; EUR/t
1.2.1.1 Logging residues from final fellings originating from broadleaf trees - volume	vf1_2_1_1_bleaf	1000m^3; EUR/m^3
1.2.1.2 Logging residues from final fellings originating from conifer trees - mass	mf1_2_1_2_conifer	Ktonnes; EUR/t
1.2.1.2 Logging residues from final fellings originating from conifer trees - volume	vf1_2_1_2_conifer	1000m^3; EUR/m^3
1.2.2.1 Stumps from final fellings originating from broadleaf trees - mass	mf1_2_2_1_bleaf	Ktonnes; EUR/t
1.2.2.1 Stumps from final fellings originating from broadleaf trees - volume	vf1_2_2_1_bleaf	1000m^3; EUR/m^3
1.2.2.2 Stumps from final fellings originating from conifer trees - mass	mf1_2_2_2_conifer	Ktonnes; EUR/t
1.2.2.2 Stumps from final fellings originating from conifer trees - volume	vf1_2_2_2_conifer	1000m^3; EUR/m^3

3.4 Agriculture based datasets

The current version of the database includes agriculture based supply and cost data from 28 European countries, namely Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United kingdom.

Table 5: List showing the category codes for all level 3 agricultural categories included in the database

Agricultural Category – Level 3	Database Attribute ID	Units Supply; Cost
2.1.1.1 Sweet and biomass sorghum (Annual grasses) - mass	ma2_1_1_1_sweetandbiomasssorghum	t/ha; EUR/t
2.1.1.1 Sweet and biomass sorghum (Annual grasses) - volume	va2_1_1_1_sweetandbiomasssorghum	m³/ha; EUR/m³
2.1.1.2 Miscanthus (Perennial grass) - mass	ma2_1_1_2_miscanthus	t/ha; EUR/t
2.1.1.2 Miscanthus (Perennial grass) - volume	va2_1_1_2_miscanthus	m³/ha; EUR/m³
2.1.1.3 Switchgrass (Perennial grass) - mass	ma2_1_1_3_switchgrass	t/ha; EUR/t
2.1.1.3 Switchgrass (Perennial grass) - volume	va2_1_1_3_switchgrass	m³/ha; EUR/m³
2.1.1.4 Giant reed (Perennial grass) - mass	ma2_1_1_4_giantreed	t/ha; EUR/t
2.1.1.4 Giant reed (Perennial grass) - volume	va2_1_1_4_giantreed	m³/ha; EUR/m³
2.1.1.5 Cardoon (Perennial crop) - mass	ma2_1_1_5_cardoon	t/ha; EUR/t
2.1.1.5 Cardoon (Perennial crop) - volume	va2_1_1_5_cardoon	m³/ha; EUR/m³
2.1.1.6 Reed Canary Grass (Perennial crop) - mass	ma2_1_1_6_reedcanarygrass	t/ha; EUR/t
2.1.1.6 Reed Canary Grass (Perennial crop) - volume	va2_1_1_6_reedcanarygrass	m³/ha; EUR/m³
2.1.2.1 Willow - mass	ma2_1_2_1_willow	t/ha; EUR/t
2.1.2.1 Willow - volume	va2_1_2_1_willow	m³/ha; EUR/m³
2.1.2.2 Poplar - mass	ma2_1_2_2_poplar	t/ha; EUR/t
2.1.2.2 Poplar - volume	va2_1_2_2_poplar	m³/ha; EUR/m³
2.1.2.3 Other (incl. Eucalyptus) - mass	ma2_1_2_3_otherdedicatedcrops	t/ha; EUR/t
2.1.2.3 Other (incl. Eucalyptus) - volume	va2_1_2_3_otherdedicatedcrops	m³/ha; EUR/m³
2.2.1.1 Rice straw - mass	ma2_2_1_1_ricestraw	t/ha; EUR/t
2.2.1.1 Rice straw - volume	va2_2_1_1_ricestraw	m³/ha; EUR/m³
2.2.1.2 Cereals straw - mass	ma2_2_1_2_cerealsstraw	t/ha; EUR/t
2.2.1.2 Cereals straw - volume	va2_2_1_2_cerealsstraw	m³/ha; EUR/m³
2.2.1.3 Sunflower straw - mass	ma2_2_1_3_sunflowerstraw	t/ha; EUR/t
2.2.1.3 Sunflower straw - volume	va2_2_1_3_sunflowerstraw	m³/ha; EUR/m³
2.2.1.4 Oil seed rape straw - mass	ma2_2_1_4_oilseedrapestraw	t/ha; EUR/t
2.2.1.4 Oil seed rape straw - volume	va2_2_1_4_oilseedrapestraw	m³/ha; EUR/m³
2.2.1.5 Maize stover - mass	ma2_2_1_5_maizestover	t/ha; EUR/t
2.2.1.5 Maize stover - volume	va2_2_1_5_maizestover	m³/ha; EUR/m³
2.2.2.1 Residues from vineyards - mass	ma2_2_2_1_vineyardresidues	t/ha; EUR/t
2.2.2.1 Residues from vineyards - volume	va2_2_2_1_vineyardresidues	m³/ha; EUR/m³
2.2.2.2 Residues from fruit tree plantations - mass	ma2_2_2_2_fruittreeplantation	t/ha; EUR/t
2.2.2.2 Residues from fruit tree plantations - volume	va2_2_2_2_fruittreeplantation	m³/ha; EUR/m³
2.2.2.3 Residues from olive tree plantations - mass	ma2_2_2_3_olivetreeplantation	t/ha; EUR/t
2.2.2.3 Residues from olive tree plantations - volume	va2_2_2_3_olivetreeplantation	m³/ha; EUR/m³

2.2.2.4 Residues from citrus tree plantations - mass	ma2_2_2_4_citrustreeplantation	t/ha; EUR/t
2.2.2.4 Residues from citrus tree plantations - volume	va2_2_2_4_citrustreeplantation	m³/ha; EUR/m³
2.2.2.5 Residues from nuts plantations - mass	ma2_2_2_5_nutsplantation	t/ha; EUR/t
2.2.2.5 Residues from nuts plantations - volume	va2_2_2_5_nutsplantation	m³/ha; EUR/m³
2.2.2.6 Grass biomass from various types of plantations - mass	ma2_2_2_6_grassfromplantations	t/ha; EUR/t
2.2.2.6 Grass biomass from various types of plantations - volume	va2_2_2_6_grassfromplantations	m³/ha; EUR/m³

3.5 Other land use based datasets

The current version of the database includes other land use based supply and cost data from 28 European countries, namely Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United kingdom.

Table 6: List showing the category codes for all level 3 other land uses categories included in the database

Other Land uses Category – Level 3	Database Attribute ID	Units Supply; Cost
3.1.1 Biomass from road side verges - mass	mo3_1_1_roadsidevergesbiomass	t/ha; EUR/t
3.1.1 Biomass from road side verges - volume	vo3_1_1_roadsidesvergesbiomass	m³/ha; EUR/ m³
3.1.2 Biomass from other areas under landscape maintenance - mass	mo3_1_2_landscapemaintenancebiomass	t/ha; EUR/t
3.1.2 Biomass from other areas under landscape maintenance - volume	vo3_1_2_landscapemaintenancebiomass	m³/ha; EUR/ m³

3.6 Secondary residues based datasets

The current version of the database includes secondary residues based supply and cost data from 28 European countries, namely Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United kingdom.

Table 7: List showing the category codes for all level 3 secondary residues categories included in the database

Secondary Residues Category – Level 3	Database Attribute ID	Units Supply; Cost
4.1.1.1 Saw dust, chips, veneer cores etc. (residues of stemwood) - mass	mr4_1_1_1_allsawmillbyproducts	t/ha; EUR/t
4.1.1.1 Saw dust, chips, veneer cores etc. (residues of stemwood) - volume	vr4_1_1_1_allsawmillbyproducts	m³/ha; EUR/ m³
4.1.2.1 Residues from other wood industries - mass	mr4_1_2_1_otherwoodindustrybyproducts	t/ha; EUR/t
4.1.2.1 Residues from other wood industries -	vr4_1_2_1_otherwoodindustrybyproducts	m³/ha; EUR/ m³

volume		
4.2.1.1 Olive stones - mass	mr4_2_1_1_olivestones	t/ha; EUR/t
4.2.1.1 Olive stones - volume	vr4_2_1_1_olivestones	m³/ha; EUR/ m³
4.2.1.2 Other by-products and residues from food and fruit processing industry - mass	mr4_2_1_2_otheragindustrybyproducts	t/ha; EUR/t
4.2.1.2 Other by-products and residues from food and fruit processing industry - volume	vr4_2_1_2_otheragindustrybyproducts	m³/ha; EUR/ m³
4.2.2.1 Cotton acorns - mass	mr4_2_2_1_cottonacorns	t/ha; EUR/t
4.2.2.1 Cotton acorns - volume	vr4_2_2_1_cottonacorns	m³/ha; EUR/ m³

3.7 Tertiary residues based datasets

The current version of the database includes tertiary residues based supply data from 36 European countries, namely Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United kingdom, Montenegro, FYROM, Albania, Turkey, Ukraine, Bosnia and Herzegovina, Serbia, Moldova. The cost data for the tertiary residues have been assumed to be zero.

Table 8: List showing the category codes for all level 3 tertiary residues categories included in the database

Tertiary Residues Category – Level 3	Database Attribute ID	Units Supply; Cost[1]
5.1.1.1 Biowaste (Separately collected biodegradable municipal waste, excluding textile and paper) - mass	mt5_1_1_1_biowaste	Ktonnes; EUR/t
5.1.1.1 Biowaste (Separately collected biodegradable municipal waste, excluding textile and paper) - volume	vt5_1_1_1_biowaste	1000m³; EUR/m³
5.1.1.2 Biowaste in mixed waste (Not separately collected biodegradable municipal waste, excluding textile and paper) - mass	mt5_1_1_2_biowastemixed	Ktonnes; EUR/t
5.1.1.2 Biowaste in mixed waste (Not separately collected biodegradable municipal waste, excluding textile and paper) - volume	vt5_1_1_2_biowastemixed	1000m³; EUR/m³
5.2.1.1 Non-hazardous post-consumer wood - mass	mt5_2_1_1_nonhazardouspcw	Ktonnes; EUR/t
5.2.1.1 Non-hazardous post-consumer wood - volume	vt5_2_1_1_nonhazardouspcw	1000m³; EUR/m³
5.2.1.2 Hazardous post-consumer wood - mass	mt5_2_1_2_hazardouspcw	Ktonnes; EUR/t
5.2.1.2 Hazardous post-consumer wood - volume	vt5_2_1_2_hazardouspcw	1000m³; EUR/m³

[1] Costs assumed to be Zero