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

**S2Biom Project Grant Agreement n°608622**

# D1.1

Draft structure of the S2BIOM database

## Version: 0.1

**1.06.2015**




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.

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SEVENTH FRAMEWORK PROGRAMME

## About this document

It has been prepared by:

| | |
|---|---|
| **Due date of deliverable:** | PM 17 |
| **Actual submission date:** | 2015-06-15 |
| **Start date of project:** | 2013-01-09 |
| **Duration:** | 36 months |

| | |
|---|---|
| **Work package** | 4 |
| **Task** | Central database |
| **Lead contractor for this deliverable** | DLO-Alterra |
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| 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 |
|---|---|---|---|---|
| 0.1 | 1/06/2015 | DLO | First version as database is further developed through the project with input from other WPs | Draft |
| | | | | |

*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.*

# 1 Executive summary

This report explains the overall structure of the central database for as far developed in this stage of the project. The database so far is strongly based on the data generated in WP1, 2 and 3 as these data have already been collected in draft in this stage of the project and viewing and extraction functionalities have been programmed in WP4 for these data.

The final database will consist of sub-databases which will be fully integrated by the end of project in one relational database.

The sub-databases to be distinguished are:

1) Biomass cost-supply database
2) Biomass conversion technology database
3) Biomass pre-treatment and logistics database
4) Database on the policy and regulatory framework of biomass delivery chains
5) Biomass demand and use database
6) Library incorporating all final reports and documents generated by the project

The challenge of the development of the database is especially to incorporate and integrate all information and relations between the different entries of the different databases to facilitate all functionalities of the viewing and full chain assessment tools to be developed in S2BIOM. To reach this challenging product the implementation of the database is gradual and becomes more sophisticated towards the end of the project.

## 2 Table of contents

# 3 Introduction

The central database in WP4 is to be designed in this WP 4, but populated in WP1,2,3, 5, 6 and 7. The main aim of the database design made in WP4 is to ensure that the data bases can be easily populated in the different WPs and that the central database can be linked to the tools developed in subtasks 4.1-4.5. The design of the database needs to be aligned to all the requirements of the different versions of these tools. The database structure follows the workflow of tool development and data collection in the different WPs. So its technical design is to be up-dated twice to follow the needs of the development of the other tools 4.1 to 4.5 and to ensure that all new data and information produced in the other WPs is incorporated in the final version of the toolset. In this Deliverable an overview is given of the technical implementation of the database and of the structure of the database for the data collected in WP1, 2, 3 and WP6 communicating with the viewing tools developed so far in the project. At the end of the report an overview is also given of the further database development to come in the remaining part of the project.

## 3.1 Overview of total database and links to tools

In the following Table 1 an overview is given of the different data generated in the project and the tools to be developed to be fed by the data from the central database generated in WP4 of the project, but populated in other WPs of the project.

Table 1 Overview of data, database requirements and tools to be developed

| Type of data | WP populating the data | Data input into tool: |
|---|---|---|
| Biomass cost supply | WP1 | 1) Biomass cost-supply data viewer<br>2) Biomass Matching tool<br>3) Full chain assessment tool at national level (BeWhere)<br>4) Full chain assessment tool at local level (LOCAgistics) |
| Biomass conversion technologies | WP2 | 1) Biomass conversion technology viewer<br>2) Biomass Matching tool<br>3) Full chain assessment tool at national level (BeWhere)<br>4) Full chain assessment tool at local level (LOCAgistics) |
| Biomass pre-treatment and logistical components | WP3 | 1) Biomass pretreament and logistical components viewer<br>2) Biomass Matching tool<br>3) Full chain assessment tool at national level (BeWhere)<br>4) Full chain assessment tool at |

| Type of data | WP populating the data | Data input into tool: |
|---|---|---|
| | | local level (LOCAgistics) |
| Biomass relevant regulations and policies | WP6 | 1) Biomass regulations and policies viewing tool |
| Biomass demand and use levels | WP7 | 1) Viewable through the General User Interface entry biomass demand.<br>2) Full chain assessment tool at national level (BeWhere) |
| All developed strategies, reports and other documents in the project | WP 1-11 | 1) Viewable through the General User Interface entry biomass demand. |

# 4 Technical implementation of the database

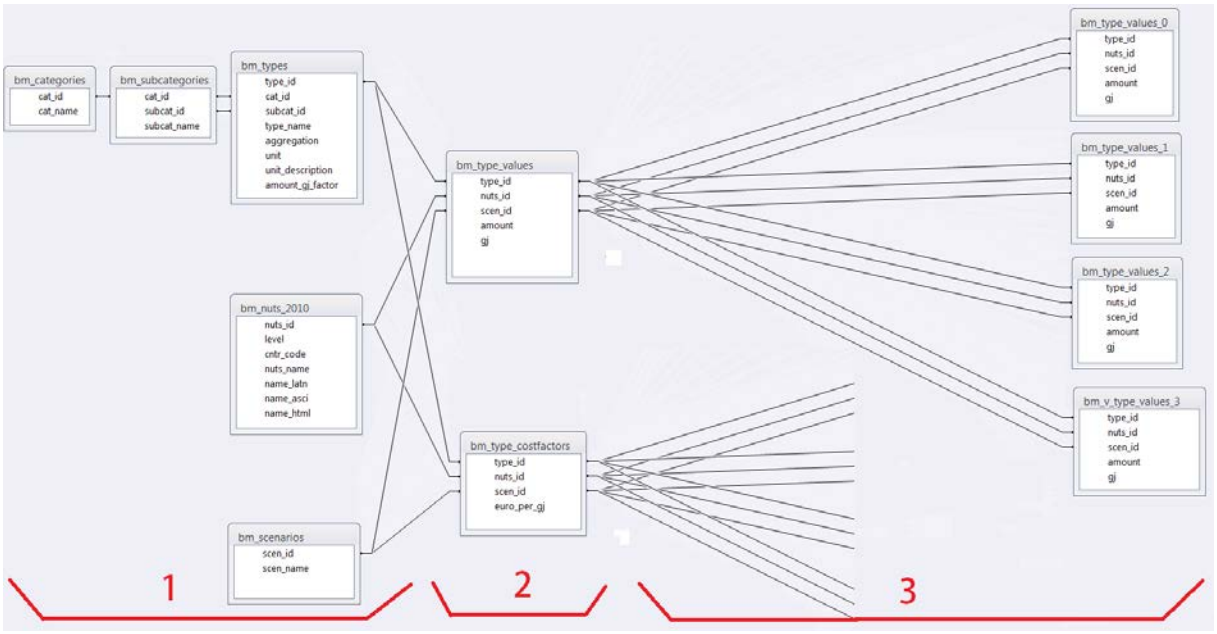
The database has been developed using the open source database software PostgreSQL 9.3, with the PostGIS2.0 geospatial extension. The database runs under Linux.

# 5 Description of the database

In the following different components of the dataase are described forming together the total S2BIOM dataase which is gradually growing. This description is not covering a full database yet as many components are still in a development stage and thir structure is not clear yet as the data has not been collected (completely) or the data has not yet been delivered to WP4 as it was not yet planned.

## 5.1 Database for biomass cost supply

The Entity-Relationship Diagram for the cost supply database looks like this:




On the left side we see the base tables (part 1). These define on which items cost and supply information have been collected. The information has been collected on 40 types of biomass, at various NUTS levels and for three types of potentials. The biomass types are divided into 9 categories with 15 subcategories. The overview of the biomass types is presented in Table 2.

Table 2 Overview of biomass cost-supply database

| type_id | cat_id | subcat_is | category | subcategory | short_name | name |
|---|---|---|---|---|---|---|
| 1111 | 11 | 111 | Primary forestry production | Stemwood from thinnings & final fellings | Final fellings from broadleaf trees | Stemwood from final fellings originating from broadleaf trees |
| 1112 | 11 | 111 | Primary forestry production | Stemwood from thinnings & final fellings | Final fellings from conifer trees | Stemwood from final fellings originating from conifer trees |
| 1113 | 11 | 111 | Primary forestry production | Stemwood from thinnings & final fellings | Thinnings from broadleaf trees | Stemwood from thinnings originating from broadleaf trees |
| 1114 | 11 | 111 | Primary forestry production | Stemwood from thinnings & final fellings | Thinnings from conifer trees | Stemwood from thinnings originating from conifer trees |
| 1121 | 11 | 112 | Primary forestry production | Stem and crown biomass from early thinnings | From broadleaf trees | Stem and crown biomass from early thinnings originating from broadleaf trees |
| 1122 | 11 | 112 | Primary forestry production | Stem and crown biomass from early thinnings | From conifer trees | Stem and crown biomass from early thinnings originating from conifer trees |
| 1211 | 12 | 121 | Primary forestry residues | Logging residues from final fellings | From broadleaf trees | Logging residues from final fellings originating from broadleaf trees |
| 1212 | 12 | 121 | Primary forestry residues | Logging residues from final fellings | From conifer trees | Logging residues from final fellings originating from conifer trees |
| 1221 | 12 | 122 | Primary forestry residues | Stumps from final fellings | From broadleaf trees | Stumps from final fellings originating from broadleaf trees |
| 1222 | 12 | 122 | Primary forestry residues | Stumps from final fellings | From conifer trees | Stumps from final fellings originating from conifer trees |
| 2111 | 21 | 211 | Primary production of lignocellulosic biomass crops | Energy grasses, annual & perennial crops | Sweet and biomass sorghum | Sweet and biomass sorghum (Annual grasses) |
| 2112 | 21 | 211 | Primary production of lignocellulosic biomass crops | Energy grasses, annual & perennial crops | Miscanthus | Miscanthus (Perennial grass) |
| 2113 | 21 | 211 | Primary production of lignocellulosic biomass crops | Energy grasses, annual & perennial crops | Switchgrass | Switchgrass (Perennial grass) |

| type_id | cat_id | subcat_is | category | subcategory | short_name | name |
|---|---|---|---|---|---|---|
| 2114 | 21 | 211 | Primary production of lignocellulosic biomass crops | Energy grasses, annual & perennial crops | Giant reed | Giant reed (Perennial grass) |
| 2115 | 21 | 211 | Primary production of lignocellulosic biomass crops | Energy grasses, annual & perennial crops | Cardoon | Cardoon (Perennial crop) |
| 2116 | 21 | 211 | Primary production of lignocellulosic biomass crops | Energy grasses, annual & perennial crops | Reed Canary Grass | Reed Canary Grass (Perennial grass) |
| 2121 | 21 | 212 | Primary production of lignocellulosic biomass crops | Short rotation coppice | SRC Willow | SRC Willow |
| 2122 | 21 | 212 | Primary production of lignocellulosic biomass crops | Short rotation coppice | SRC Poplar | SRC Poplar |
| 2123 | 21 | 212 | Primary production of lignocellulosic biomass crops | Short rotation coppice | Other SRC | SRC Other (incl. Eucalyptus) |
| 2211 | 22 | 221 | Agricultural residues | Straw/stubbles | Rice straw | Rice straw |
| 2212 | 22 | 221 | Agricultural residues | Straw/stubbles | Cereals straw | Cereals straw |
| 2213 | 22 | 221 | Agricultural residues | Straw/stubbles | Oil seed rape straw | Oil seed rape straw |
| 2214 | 22 | 221 | Agricultural residues | Straw/stubbles | Maize stover | Maize stover |
| 2215 | 22 | 221 | Agricultural residues | Straw/stubbles | Sugarbeet leaves | Sugarbeet leaves |
| 2216 | 22 | 221 | Agricultural residues | Straw/stubbles | Sunflower straw | Sunflower straw |
| 2221 | 22 | 222 | Agricultural residues | Woody prunning & orchards residues | Residues from vineyards | Residues from vineyards |
| 2222 | 22 | 222 | Agricultural residues | Woody prunning & orchards residues | Residues from fruit tree plantations | Residues from fruit tree plantations (apples, pears and soft fruit) |
| 2223 | 22 | 222 | Agricultural residues | Woody prunning & orchards residues | Residues from olives tree plantations | Residues from olives tree plantations |
| 2224 | 22 | 222 | Agricultural residues | Woody prunning & orchards residues | Residues from citrus tree plantations | Residues from citrus tree plantations |

| type_id | cat_id | subcat_is | category | subcategory | short_name | name |
|---|---|---|---|---|---|---|
| 2225 | 22 | 222 | Agricultural residues | Woody prunning & orchards residues | Residues from nuts plantations | Residues from nuts plantations |
| 2311 | 23 | 231 | Grassland | Currently unused grass land (grassland not used for feed) | Unused grassland cuttings | Unused grassland cuttings (abandoned grassland, managed grasslands not used for feed) |
| 3111 | 3 | 311 | Other land use | Biomass from other areas under landscape maintenance | Landscape care (grassy) | Grassy biomass from landscape maintenance (recreational and nature protection areas, dykes) |
| 3112 | 3 | 311 | Other land use | Biomass from other areas under landscape maintenance | Landscape care (woody) | Woody biomass from landscape maintenance (landscape elements) |
| 3121 | 3 | 312 | Other land use | Biomass from road side verges | Road side verges (grassy) | Grassy biomass from road side verges |
| 3122 | 3 | 312 | Other land use | Biomass from road side verges | Road side verges (woody) | Woody biomass from road side verges |
| 4111 | 41 | 411 | Secondary residues from wood industries | Saw mill residues | Sawdust | Sawdust from sawmills from conifers |
| 4112 | 41 | 411 | Secondary residues from wood industries | Saw mill residues | Other residues (conifers) | Sawmill residues: excluding sawdust, conifers |
| 4113 | 41 | 411 | Secondary residues from wood industries | Saw mill residues | Other residues (broadleafs) | Sawmill residues: excluding sawdust, broadleafs |
| 4121 | 41 | 412 | Secondary residues from wood industries | Other wood processing industry residues | Residues from industries producing semi finished wood based panels | Residues industries producing semi finished wood based panels |
| 4122 | 41 | 412 | Secondary residues from wood industries | Other wood processing industry residues | Residues from further woodprocessing | Residues from further woodprocessing |
| 4211 | 42 | 421 | Secondary residues of industry utilising agricultural products | By-products and residues from food and fruit processing industry | Olive-stones | Olive-stones |
| 4212 | 42 | 421 | Secondary residues of industry utilising agricultural products | By-products and residues from food and fruit processing industry | Other food processing residues | Other by-products and residues from food and fruit processing industry |
| 4221 | 42 | 422 | Secondary residues of industry utilising agricultural products | Other industry by-products utilising agricultural products | Cotton_acorn | Cotton_acorn |

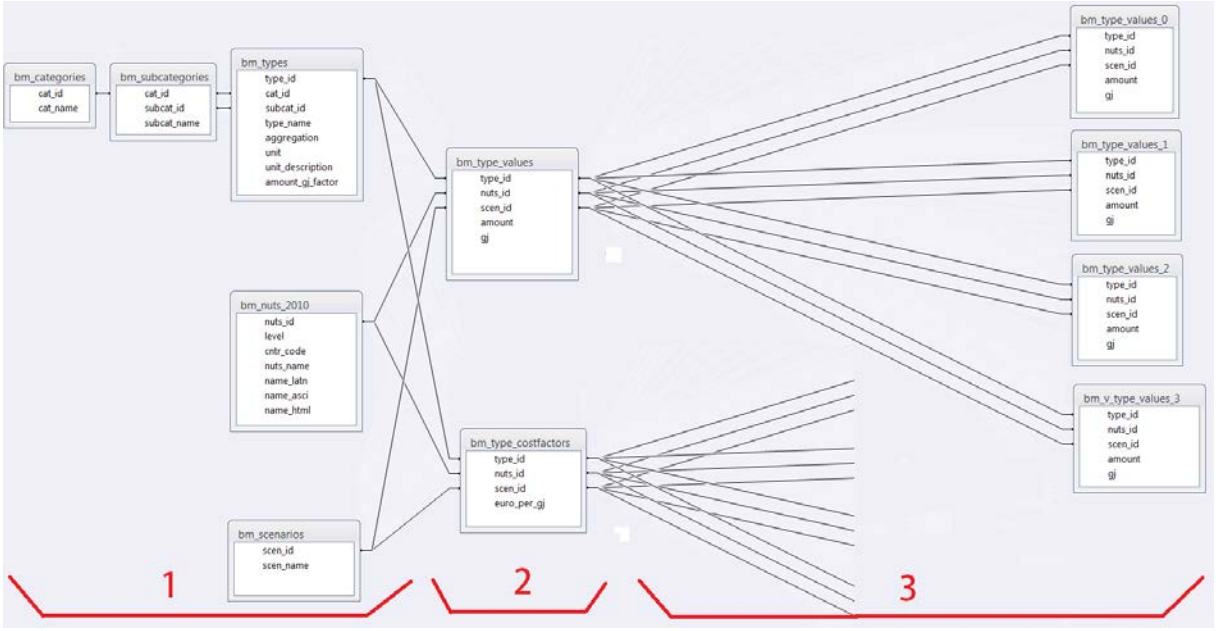
| type_id | cat_id | subcat_is | category | subcategory | short_name | name |
|---|---|---|---|---|---|---|
| 4222 | 42 | 422 | Secondary residues of industry utilising agricultural products | Other industry by-products utilising agricultural products | Other industrial residues | Other industry by-products utilising agricultural products |
| 5111 | 51 | 511 | Biodegradable municipal waste | Biodegradable waste | Biowaste unseparately collected | Biowaste as part of integrally collected municipal waste: Biodegradable waste of not separately collected municipal waste (excluding textile and paper) |
| 5112 | 51 | 511 | Biodegradable municipal waste | Biodegradable waste | Biowaste separately collected | Separately collected biowaste: Biodegradable waste of separately collected municipal waste (excluding textile and paper) |
| 5211 | 52 | 521 | Post consumer wood | Post consumer wood | Hazardous post consumer wood | Hazardous post consumer wood |
| 5212 | 52 | 521 | Post consumer wood | Post consumer wood | Non hazardous post consumer wood | Non hazardous post consumer wood |

The geographical information is organised by the 2013 NUTS regions. At the moment NUTS levels 0 to 3 are loaded into the database. This can be expanded if needed. Most information has been delivered at NUTS level 3.

The future expectations are divided into 3 or more types of potentials (or scenarios as named in the scheme underneath) and for 3 time periods:

| scenario | year | year | year |
|---|---|---|---|
| Technical potential | 2012 | 2020 | 2030 |
| Base Potential | 2012 | 2020 | 2030 |
| User defined potential A | 2012 | 2020 | 2030 |
| User defined potential B | 2012 | 2020 | 2030 |
| User defined potential C | 2012 | 2020 | 2030 |

For the user defined potentials; these are to bedefined specifically per biomass type and some times there are only 2 for biomass A, while there could be 4 for biomass type B.




In the middle we see the bm_type_values and bm_type_costfactors tables (part 2). Inside these the tables the actual values for supply and cost are stored, by NUTS region and by scenario (= type of biomass potential). The NUTS region can be at any level, as long as the region is defined inside the table bm_nuts_2013. At the moment the table bm_type_values holds 27359 entries. Table bm_type_costfactors holds 32868 values, but currently an up-date of the database is in process which will lead to at least 3 times the amount of current entries.

On the right we see some derived tables, to make the informaton available on all NUTS levels (part 3). If supply values on a lower NUTS level are provided, the values at a higher level can be calculated by taking the sum of the amounts at the lower level. We only do so if the value on the higher NUTS level has not been provided

separately. So if no value has been provided for a NUTS region, we look if values are available at lower lowels and sum them up. These values are stored in the derived tables: we have a derived table at any availabe NUTS level.

A similar approach is taken for the costfactors, with the difference that this works in the opposite direction. If a cost factor is provided for a country, this cost factor gets assigned to lower NUTS levels within the country in case there is no cost factor provided for these NUTS regions. Again there is are derived tables for any available NUTS level (these are not in the picture for convenience).

A further extension of the cost supply database is currently in process adding additional values per type of biomass in relation to the physical and chemical composition of the biomass and meta information on the way the potential for this type of biomass is assessed and what main input data were used to calculate the potential X for that specific type of biomass. The compositional data on the biomass are crucial for the biomass matchin tool to be developed in WP4. The meta information is crucial for the end-user of the data and information produced in the project and should be made accessible throuh the biomass cost-supply data viewer.

## 5.2 Database for biomass conversion technologies

An overview of available conversion technologies and their properties is stored in he conversions table and related tables. The related tables are one-to-many subtables for output capacity and for additional input that might be needed for the conversion process. Finally there are domain tables to store possible values for selected attributes.

At the moment there are 42 conversion technologies stored inside the database, but this number is growing.

The properties collected for conversion technologies belong to several categories:

1. General properties.

**View details of Dry Batch Digestion (MSW)**

**GENERAL PROPERTIES**

| | | | |
|---|---|---|---|
| Name | Dry Batch Digestion (MSW) | Level of commercial application | Commercial large scale |
| Main category | Anaerobic digestion | Important pilots and EU projects | Only to develop innovations |
| Subcategory | Plug flow digester | Expected Developments | Mainly in biogas upgarding and in efficiency improvement |
| Image url | | Current Technology Readiness Level in 2014 | Level 9, System ready for full scale deployment |
| Year of first implementation | 1900 | Expected Technology Readiness Level in 2030 | Level 9, System ready for full scale deployment |
| Estimated number of systems in operation | 100 | Justify expected Level in 2030 | System is commercial - Innovations implemented |

Main operating principle:

Mainly used for Municipal Solid Waste (MSW). MSW or comparable substaret is digested over a 2 to 4 week period in a closed area. It is a batch process. Temperature can be between 30 and 60C.

2. Technical properties.

## View details of Dry Batch Digestion (MSW)

**TECHNICAL PROPERTIES**

**Capacity of outputs (typical values)**

| | | | | | |
|---|---|---|---|---|---|
| **Power** (MWe) 1 | | | | | |
| **Conversion efficiencies:** net returns electricity(GJ/GJ biomass input) | typical: 0.2 | min: 0.1 | max: 0.4 | typical in 2020: | typical in 2030: |
| **Biogas** (m3/hour) 700 LHV (GJ / $m^3$) 19.7 | | | | | |
| **Conversion efficiencies:** net returns fuel(GJ/GJ biomass input) | typical: 0.5 | min: 0.2 | max: 0.90 | typical in 2020: | typical in 2030: |
| **Methane** (m3/hour) 420 LHV (GJ / $m^3$) 32.8 | | | | | |
| **Conversion efficiencies:** net returns fuel(GJ/GJ biomass input) | typical: 0.5 | min: 0.2 | max: 0.9 | typical in 2020: | typical in 2030: |

Data sources used to define conversion efficiencies in 2014:

Depends on biomass input type!

Data sources used to define conversion efficiencies in 2020:

Data sources used to define conversion efficiencies in 2030:

General data sources for technical properties:

**External inputs (not generated by the biomass in the conversion process)**

| | |
|---|---|
| Power | (kW): 1000 |
| Heat (useful, not process steam) | (kW): 1000 |

| | |
|---|---|
| Indication: experience based data | Yes |
| Number of possible full load hours per year (hours) | 5000 |
| Number of typical full load hours per year (hours) | 3500 |
| Typical Lifetime of Equipment (years) | 15 |

3. Biomass input specifications

## View details of Dry Batch Digestion (MSW)

**BIOMASS INPUT SPECIFICATIONS**

| | |
|---|---|
| Biomass input, common for the technology used: | HH MSW, Household waste; NACE MSW, Waste not from households; NACE Vegetal, Waste not from households; Grass, Abandoned grassland; Grass, Biomass (roadside Verges); |
| Biomass input, technically possible but not common: | Cardoon, Energy Grasses, Annual Crops, Perennial Crops; Sorghum, Energy Grasses, Annual Crops, Perennial Crops; Reed Canary Grass, Energy Grasses, Annual Crops, Perennial Crops; Maize, Straw/stubbles; |

| | |
|---|---|
| Traded form | Other (Black liquor, BMW, PO etc.) |
| Dimensions | Not applicable |

| | | |
|---|---|---|
| Moisture content | (% wet basis) typical 50 | max 70 |
| Minimal bulk density | ($kg/m^3$, wet basis) 500 | |
| Maximum ash content | (% dry basis) 40 | |
| Minimal ash melting point (= initial deformation temperature) | (°C) | |
| Volatile matter (only for thermally trated material, torrefied or steam explosed) | (VM%) | |

Maximum allowable contents

| | | |
|---|---|---|
| Nitrogen, N (wt%, dry) | Sulphur, S (wt%, dry) | Chlorine, Cl (wt%, dry) |

**Optional attributes**

| | | |
|---|---|---|
| Net caloric value | (MJ/kg) min | max |
| Gross caloric value | (MJ/kg) min | max |
| Biogas yield | ($m^3$ gas/ton dry biomass) 50 | % methane 50 |
| Cellulose content | (g/kg dry matter) min 0 | max 100 |
| Hemicellulose content | (g/kg dry matter) min | max 100 |
| Lignin content | (g/kg dry matter) min 0 | max 100 |
| Crude fibre content | (g/kg dry matter) min 0 | max 100 |
| Starch content | (g/kg dry matter) min 0 | max 100 |
| Sugar content | (g/kg dry matter) min 0 | max 100 |
| Fat content | (g/kg dry matter) min 0 | max 100 |
| Protein content | (g/kg dry matter) min 0 | max 100 |
| Acetyl group content | (g/kg dry matter) min 0 | max 100 |

4. Financial and economic properties.

## View details of Dry Batch Digestion (MSW)

**FINANCIAL AND ECONOMIC PROPERTIES**

| | | | | | | |
|---|---|---|---|---|---|---|
| Investments costs | in 2014 (€): 5000000 | expected in 2020 (€): | expected in 2030 (€): | Labour needed | Operators (FTE): 1 | Staff and engineering (FTE): 1 |

## 5.3 Database for logistical concepts

Logistical components as storage, pre-treatment and transportation technologies that are available to handle biomass are accumulated in the logistics table and related tables. The related tables are domain tables to store possible values for selected attributes. At the moment there are 220 logistic components stored inside the database, but their number is still growing. The properties collected for logistic components belong to several categories:

1. General properties.

**View details of Doppstadt DZ 750 Kombi**

**GENERAL PROPERTIES**

| | | | |
|---|---|---|---|
| Commercial name | Doppstadt DZ 750 Kombi | Level of commercial application | Sold in Germany. |
| Main category | Communition (size reduction) | Year of first implementation in practice | |
| Subcategory | Shredding | Estimated number of systems in operation since introduction | |
| Image url | http://bfw.ac.at/fmdb/maschinen.web?kat=1929 | Current Technology Readiness Level in 2014 | Level 9, System ready for full scale deployment |
| Most common/suitable applications | Pre-treatment of wood. | Expected Technology Readiness Level in 2030 | Level 9, System ready for full scale deployment |
| Main operating principle: | | References: | |
| Trailer platform with own diesel engine. The power requirement is 450 kW. The available data for the input processing capacity are in unit nm3/h therefore we took the converter: 1nm3 = 0.4 m3 (Source: Kakovostna lesna goriva za vsakogar, Slovenian Forestry Institute - in Slovenian). | | http://www.woodybiomass.org/PagesRS/www.woodybiomass.org/userfiles/files/Microsoft%20Word%20-%20TOR-Annex%203_WE%20Technology_report_Krajnc.pdf and http://bfw.ac.at/fmdb/maschinen.web?kat=1929. | |

2. Technical properties.

**View details of Doppstadt DZ 750 Kombi**

**TECHNICAL PROPERTIES**

| | | | | | |
|---|---|---|---|---|---|
| Energy demand | (MJ/t) | | Number of full load hours per year | (h) | 1800 |
| Type of energy needed | | Diesel | Maximum load volume of transport system | ($m^3$) | 165 |
| Other input demand | | | Maximum load weight of transport system | (t) | |
| Pre-treatment efficiency | (output/input) | | Typical lifetime of equipment | (years) | 5 |
| Input processing capacity | ($m^3$/h) | 80 | Labour requirements pre-treatment | (h/t) | |
| Storage capacity for input | (t) | | Labour requirements storage | (h/t) | |
| Storage capacity for output | (t) | | Labour requirements transport | (h/t) | |
| | | | Transportability | | Mobile |

3. Biomass input specifications

**View details of Doppstadt DZ 750 Kombi**

**BIOMASS INPUT SPECIFICATIONS**

| | | | | | |
|---|---|---|---|---|---|
| Acceptable biomass input groups | Wood; | | | Moisture content input (%, wet base) | Minimum Maximum |
| Received (intermediate) biomass | Log wood, firewood | | | Bulk density input (kg/$m^3$, wet base) | Minimum Maximum |
| Minimum particle size input | length (mm) | width / diameter (mm) | height (mm) | Maximum input level of contamination with exogenous material (%, dry base) | |
| Maximum particle size input | length (mm) | width / diameter (mm) 400 | height (mm) | Maximum ash content input (%, dry base) | |

4. Biomass output specifications

**View details of Doppstadt DZ 750 Kombi**

**BIOMASS OUTPUT SPECIFICATIONS**

| | | | |
|---|---|---|---|
| Indication of follow up process(es) | Transport; | Moisture content output (%, wet base) | Minimum Maximum |
| Delivered (intermediate) biomass | Wood chips | Bulk density output (kg/$m^3$, wet base) | Minimum Maximum |
| Dimensions | P300: 3,15 mm < P < 300 mm Fine fraction F05: < 5 % | Maximum output level of contamination with exogenous material (%, dry base) | |
| | | Maximum ash content output (%, dry base) | |

5. Financial and economic properties

**View details of Doppstadt DZ 750 Kombi**

| FINANCIAL AND ECONOMIC PROPERTIES | | | |
|---|---|---|---|
| Specific investment costs of equipment, included auxiliaries | (€) | Transport costs per kilometer | (€/km) |
| Operation and maintenance costs | (€/t) | Transport costs per tonne | (€/t) |
| - Calculation method | Effective operation time | Transport costs per load | (€) |
| Storage costs | (€/t) | Transport costs fixed | (€) |
| Loading costs | (€/t) | Infrastructure needed | None |
| Unloading costs | (€/t) | | |

## 5.4 Database for biomass matching tool

The database for the Biomass Matching tool will consist of the 3 database described in the former, additional compositional information on the physical and cemical composition of the iomass and an additional knowledge database providing the rules according to which a biomass type matches with a biomass conversion technology and/or with a pre-treatment technology to adapt the physical composition of the biomass to the requirements of a specific conversion technology.

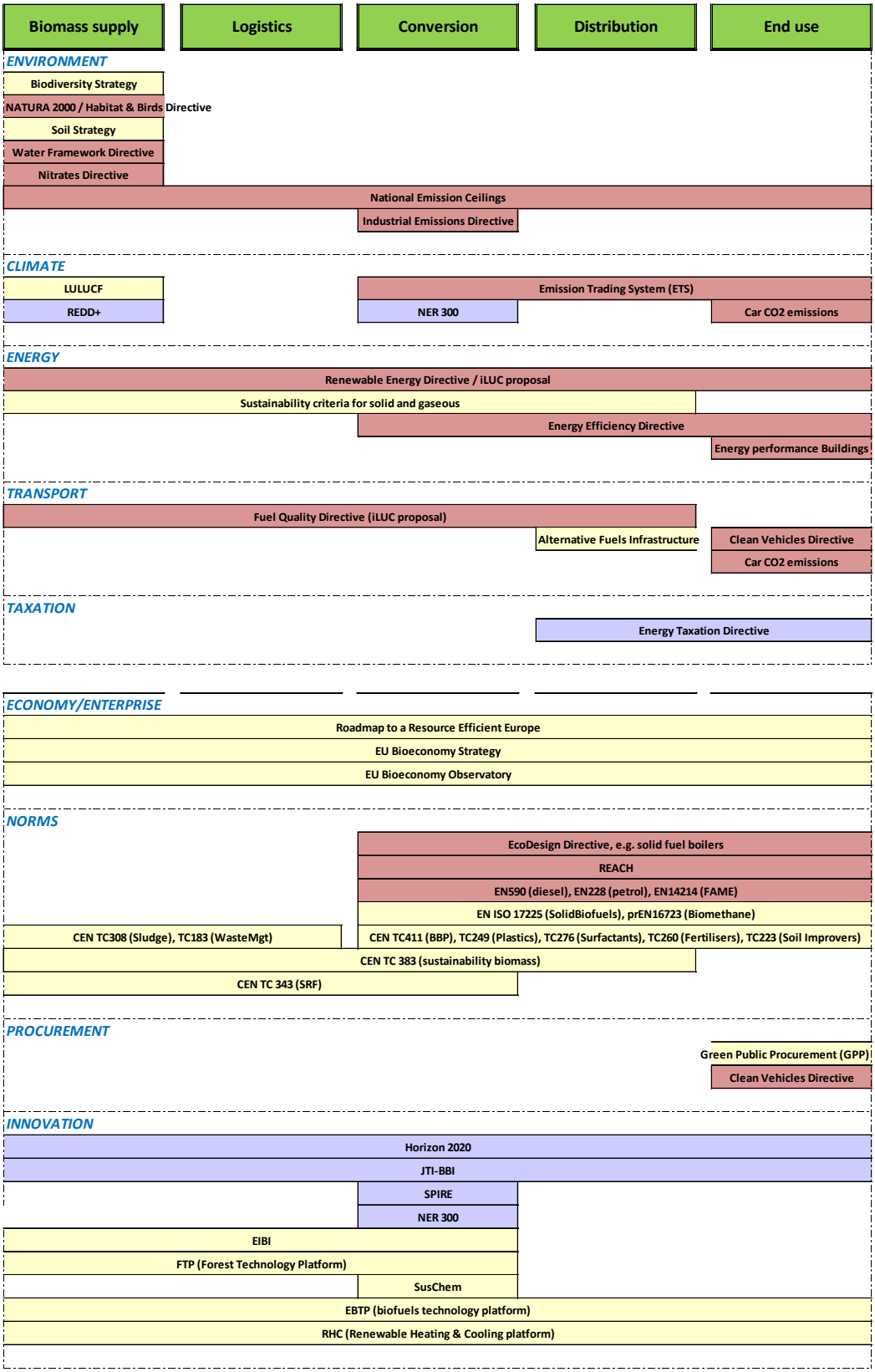
The further design of this database particularly in relation to the biomass composition and the knowledge database on the matching of biomass to conversion and pre-treatment technologies is currently in process and the final structure of these databases cannot be displayed at this stage.

## 5.5 Database for the regulatory and policy framework

Currently all data on regulations are collected through an excel database in WP6. These excel data have been loaded in a central access database. The data in the access database needs to be transferred to a new PostgreSQL 9.3 database, with the PostGIS2.0 geospatial extension, to make it available to be interactively displayed in a viewing and download tool.

Currently the access database contains field per regulation and policy organised geographically and most interestingly according to place in the biomass delivery chain that it impacts on (see Figure underneath). In the viewing tool the data request can be taken from these different perspectives of biomass delivery chain positions. The PostgreSQL database that is to be populated with the access data will enable access to the data in a viewing tool taking at least 16 different perspectives ranging from geographic, the 5 positions in the chain (from supply to end-use) and according to the 9 issues (from environment to innovation).

Figure 1 Organisation of the regulation and policy database



## 5.6 Biomass demand and use database

The data in this database will be generated by the ReSolve energy model run in WP7 for the 3 main scenarios in the project. The ReSolve model will generate output at country level on bioenergy demand and use mixes and the level of use of domestic and imported biomass for reaching the different bioenergy demand levels per scenario. The modelled output organised per scenario will be made accessible to end-users through viewing functions which need to be accommodated by a database organised according to the information that needs to be displayed.

A key organisational principle in relation to the database design will be the relative presentation of biomass demand and consumption levels per scenario and per type of biomass. This database is still in design and cannot be presented further as the output of the resolve runs have not been generated yet in this stage of the project.

# 6 Next steps for database design and construction

Currently the database on cost-supply of biomass is further revised and populated to facilitate the display of this information in the up-dated biomass cost-supply viewing tool. This up-date will be demonstrable and testable as from September 2015.

The design of the databases on conversion technologies and logistical concepts will not be altered anymore except that relational information will be added to all these databases to facilitate the biomass type conversion and pre-treatment links further to be displayed in the iomass matching tool that is currently in development. A further attractive view for users of the conversion, pre-treatment and logistical information incorporated in the databases should be available to end-user for testing by December 2015. The same applies to first matching solutions between technologies and biomass types which will also be testable for end-users by the end of 2015.

The policy and regulation tool should be available to be accessed by end-users by the end of 2015 which implies that the relational database should be ready by November 2015 to facilitate the viewing functionalities.

The biomass demand and use database will be developed in the beginning of 2016 when runs of Resolve are performed and output is generated to populate the database.

First versions of the full chain assessments tools are planned to be tested by spring 2016 which will derive input from the different databases. The full chain assessment tools will also require information at hiher spatial resolution for a selection of countries and regions for which case studies are implemented in the project. For these tools extensions of the developed databases to higher spatial resolution information are planned. These will be implemented until spring 2016.

The full S2BIOM database is planned to be ready by June 2016. After that is will be stabilised and only minor updates and adaptations are possible. For the final fully integrated database a user guideline will be written explain the full structure and facilitating any future up-dates.