



**EFORWOOD**  
Sustainability Impact Assessment  
of the Forestry - Wood Chain



Project no. 518128

EFORWOOD

Tools for Sustainability Impact Assessment

Instrument: IP

Thematic Priority: 6.3 Global Change and Ecosystems

**Deliverable PD5.2.10**  
**Experiences from ToSIA Data Collection**

Due date of deliverable: Month 42 (Initial date postponed to Month 48)

Actual submission date: Month 51

Start date of project: 011105

Duration: 4 years

Organisation name of lead contractor for this deliverable: FCBA, France

Final version

<b>Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)</b>		
<b>Dissemination Level</b>		
<b>PU</b>	Public	
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	X
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	

**Summary:** Data collection related to the valuation of indicators, shares, split ratios and conversion factors was one of the main tasks within the EFORWOOD project. This document provides the return of experiences from this task by M5 partners. The project has allowed partners from several European institutes to collaborate together and to reach their main objectives in term of data collection. It has also enabled them to identify from all available sources key missing data. However some major challenges were faced by partners such as: communication and coordination; unexpected changes in the project; absence of guideline on data quality valuation; delays in case studies or the absence of a detailed common approach in indicators valuation for reference futures.

Summary: .....	2
1 Introduction .....	3
2 Level of data collection .....	4
3 Data sources .....	5
3.1 2005: .....	5
3.2 2015-2025: .....	5
4 Data quality .....	5
5 Experiences from data collection .....	5
5.1 Communication and coordination .....	6
5.2 Changes and adaptation .....	6
5.3 Delays in case studies .....	6
5.4 Inter-modules approach differences .....	6
5.5 ToSIA common understanding .....	6
5.6 M4-M5 solid wood products .....	7
5.7 Set of indicators .....	7
5.8 Data quality .....	7
5.9 Reference futures and scenarios .....	7
6 Specific methodologies .....	7
6.1 Transport tools .....	7
6.2 Fitting and house construction processes: how to measure economic indicators. ....	7
7 Conclusion .....	7
8 Annexes 1: Details on experiences from data collection per product category .....	9
8.1 Products covered: Bioenergy products in M5 .....	9
8.1.1 2005 .....	9
8.1.2 2015-2025 Reference future / Scenarios .....	10
8.2 Paper and board products in M5 .....	10
8.2.1 2005 .....	10
8.2.2 2015-2025 Reference future / Scenarios .....	11
8.3 Solid Wood product in M5 .....	12
8.3.1 Indicators 2005: .....	12
8.3.2 Fitting and house construction processes: how to measure economic indicators. 13	
8.3.3 Indicators 2015-2025 .....	14
8.3.4 Split ratios and shares .....	14
8.3.5 Conversion factors: .....	16

## 1 Introduction

Data collection was one of the main tasks in the EFORWOOD project. Even if a clear and detailed guideline was set up to enable data collection in a common way, some difficulties have been faced by data collectors. As such the number of indicators, conversion factors, shares and split ratios covered by the project is very large regarding to the scope (environment, economics and social), to the number of processes and the number of products. Additionally, data for these estimates were many times not available.

M5 is characterised by a large number of processes compared to the rest of the chain and the level of information about the distribution of final products (bioenergy, solid wood products, paper and carton board) coming from the forest wood chain is low. Partially because of this data collection has been very challenging for M5 partners. The aim of this document is to give feedback from experiences faced in this work. After a focus on the amount of data collected per product, the document focuses on the sources used. Then, the document describes the

good experiences and the difficulties faced by data collectors. The last point shows the specific methodologies which were used in this task.

## 2 Level of data collection

The level of data collection differs by products, chain (cases studies, EU-FWC), category (indicator, conversion factor & shares/split ratio). Coverage rates indicated in table 1 describes in detail these differences. Bioenergy products are covered by 100% if the focus is only on the short-listed list of indicators (“*selected sub-indicators for demonstration of EFORWOOD SIA approach in different ToSIA applications*” excel file) and indicators irrelevant in M5 are excluded. Regarding to wood products, the share equals 65% as it is not relevant to provide indicators for some processes (Ex: “Use of the house” or ‘use of furniture’...) or unfeasible<sup>1</sup>.

If conversion factors are fully collected for bioenergy products in each case, solid wood products faces a common problem on the conversion factor to euro. Data are not available for the density of paper and cartonboard.

Regarding to shares and split ratios are fully collected whatever the chain or the product.

**Table 1 : Share of data collected**

Share of indicators collected :		BW case	Scandinavian case	Iberian Case	EU case
Economic	Bioenergy	100%	100%		100%
	Solid Wood	100%	65%		65%
	Paper & Cb	81%	81%	92%	98%
Social	Bioenergy	100%	100%		100%
	Solid Wood	63%	65%		65%
	Paper & Cb	81%	81%	92%	98%
Environmental	Bioenergy	100%	100%		100%
	Solid Wood	63%	65%		65%
	Paper & Cb	81%	81%	92%	98%

Share of conversion factors collected:		BW case	Scandinavian case	Iberian Case	EU case
From tonne to Euro	Bioenergy	100%	100%		100%
	Solid Wood	0%	0%		0%
	Paper & Cb	0%	0%	0%	0%
From tonne to m3	Bioenergy	100%	100%		100%
	Solid Wood	100%	100%		100%
	Paper & Cb	0%	0%	0%	0%
From tonne to t of C	Bioenergy	100%	100%		100%
	Solid Wood	100%	100%		100%
	Paper & Cb	100%	100%	100%	100%

Share of shares/split ratios collected		BW case	Scandinavian case study	Iberian Case	EU case
Shares	Bioenergy	100%	100%		100%
	Solid Wood	100%	100%		100%

<sup>1</sup> Data collection for only two processes was identified as unfeasible: « Waste management at recovery site » and “Destruction of the house”.

	Paper & Cb	100%	100%	100%	100%
Split ratios	Bioenergy	100%	100%		100%
	Solid Wood	100%	100%		100%
	Paper & Cb	100%	100%	100%	100%

### 3 Data sources

#### 3.1 2005

A large set of sources were used by data collectors. Both micro and macro data were used according to the bottom-up approach. Follow up routines from enterprises, market analysis data from experiments or scientific measurements (such as life cycles analysis) and branch statistics (Eurostat has been identified as the main data provider). When data were not available expert guesses were used. Indicators in transport processes were estimated using the “transport tools” and a “construction tool” was set up to estimate indicators for house construction processes.

#### 3.2 2015-2025

Data compiled by M1 (including EFI-GTM results) were used as a main source to estimate indicators for reference futures and scenarios. Also basic response functions were developed to support calculation and estimation of indicators in different scenario conditions.

### 4 Data quality

Data quality depends on the type of available data. Micro data are supposed to be of better quality as their level of detail is higher. However this argument is not obvious when chains are considered from a macro perspective. Can data collected in one enterprise be considered as representative of all companies with a similar activity in the same sector? Then for some partners, with good micro data, the level of aggregation of processes was too high to make them usable. Then it remains extremely difficult to have an objective judgement on the quality of data delivered by experts. As no guideline has been designed and provided to partners, the information provided on the quality of data can be easily criticised. Data quality was estimated individually by partners with their own criterion.

### 5 Experiences from data collection

Identifying processes, products and flows for the Scandinavian, the Baden Wurttemberg, Iberian and the EU FWC cases has been a long preliminary work involving all EFORWOOD partners. This first collaboration which has allowed a detailed description of the forest wood chain has also enabled partners to start the second main task of this project: the data collection and then the estimate of indicators, shares, split ratios and conversion factors. The success of ToSIA is directly related to this task. As such, the measure (and its estimates for 2015-2025 references futures) of the Forest Wood Chain sustainability impacts through ToSIA can only be done if data collection has been done with consistency for the whole chain, for each products through all processes. Regarding to M5, partners can argue that this objective has been reached, even if some limitations and imperfections exist. Collecting data from all available sources (and then harmonising and estimating them) in the approach developed by EFORWOOD and at a EU level was a first in the wood sector research.

It was a good learning experience for all partners for several reasons:

- It enabled European institutes to collaborate together within a common project
- It gave the opportunity to partners to identify available data and their level of accuracy
- It allowed partners to identify gaps in relevant data and where new data should be collected.
- It allowed partners to set up methodologies in order to estimate indicators.

In order to have a good understanding of ToSIA results, it appears necessary to have in mind the difficulties faced during the data collection process. The following sub-sections describe the problem faced and how they can influence results received from ToSIA runs.

### ***5.1 Communication and coordination***

It seems that the lack of common understanding of several issues has mainly explained why data were collected partially after the initial deadline. As such, all partners got a common and clear comprehension of data relatively late in the project. Several issues such as the fact that all the indicators should be reported per ton of carbon or the differences and relations between process unit, product unit, shares, split ratios and conversion factors were understood by all partners rather late. As no detailed report explaining exactly how data were collected (sources, methodology...) were requested, it is almost impossible, even by post check, to insure that indicators were estimated in a uniform way. A higher efficiency of communication between partners on the methodology, the source of data, the assumptions through workshops, meeting presentations or internal reports could have secured the consistency of indicators in the M5 module.

### ***5.2 Changes and adaptation***

One issue mentioned by several partners is the fact that some changes of the topology, products and indicators units (due to the new definitions set up by the “Data collection protocol” document) appeared relatively late in the project. The consequence is that all partners have not been able to take these changes into consideration and then to update indicators values co-ordinately. This problem mainly concerns case studies.

### ***5.3 Delays in case studies***

Because of the delays in case studies data collection for some partners, it has not always been possible to fully benefit from case studies experiences in the EU-FWC case. For some partners the work of data collection for case studies and the EU-FWC started simultaneously preventing from any “learning by doing” effects.

### ***5.4 Inter-modules approach differences***

Because of different approaches in modelling between Modules and the level of detail used, it has been challenging to give general requirements. The accuracy of modelled structures varies greatly between modules.

### ***5.5 ToSIA common understanding***

The basic operational principle of ToSIA has not been and is not clear to all partners. This has resulted to a lot of confusion in the data collection several times during the project (e.g. correction factors, allowed process units, how to present processes that appear in the future to the chain).

### **5.6 *M4-M5 solid wood products***

M4 defined solid wood products going to M5 very late in the project (December 2008 for the European case). Topology design as well as a start in the collect of data took place then by the end of the year 2008.

### **5.7 *Set of indicators***

The number of indicators to collect per process was large and the selection of the main relevant ones was done relatively late in the project. The earlier large scope has generated some delays by avoiding a focus on the main relevant indicators. Reducing the number of indicators to collect decreases data collection timing. The set up of a shortlist earlier in the project may have made easier for partner to meet the initial deadlines.

### **5.8 *Data quality***

In the light of the previous section, it appears that a guideline on how to judge if data were of high, medium or low quality would have been helpful for both data collectors and ToSIA users.

### **5.9 *Reference futures and scenarios***

Reference futures indicator data was estimated using the data compiled by M1, including EFI-GTM model based drivers. However, little information was available on the assumptions behind the data provided. This is why some partners estimated indicators using their own approach or own assumption. The consequence is a doubt on the consistency of indicators between each other as they were not estimated uniformly. In addition, quantified drivers provided by M1 were not always relevant for M5. For instance, quantified drivers on labour productivity concerned the forest industry but could not be applied in distribution processes even if some productivity improvement in the distribution of FWC product can be expected in the future.

## **6 Specific methodologies**

Some specific tools have been designed in order to estimate several indicators.

### **6.1 *Transport tools***

Indicators related to transport processes have been estimated using the transport tools. Two types of transport processes exist: The first one (intra-national) deals with flows within countries and the second one deals with flows between countries (extra-nationals). These methodologies are developed in the PD3.3.4 and the PD3.3.6. They have been used for bioenergy, fibre and solid wood products.

### **6.2 *Fitting and house construction processes: how to measure economic indicators.***

As no data are available on this type of process, a tool was set up in order estimate indicators. A detailed description of the methodology, mainly based on working time and labour cost, is provided in Annexe 3.

## **7 Conclusion**

This document relating experiences from ToSIA data collection in the module 5, has shown that the objective of providing values for indicators, shares, split ratios and conversion factors has been reached even if some limitations and imperfection cannot be rejected. As such, several major challenges were faced by partners:

- The communication and the coordination between EFORWOOD partners (not only M5) appeared to be insufficient. This resulted a loss of common approach in the collection of indicators, conversion factors, shares and split ratios.
- Some changes which appeared lately in the project (products, topology, data collection protocol) could not be taken into account in data collection.
- The difficulty to set up general requirements for modelling regarding to module differences and detail levels.
- It appears that a guideline on data quality would have been helpful for data collectors.
- The delay in the case studies has prevented from improvements for the EU-FWC case.
- The lack of precision in the way to estimate indicators for reference futures has lead some partners to make their estimates using their “own approach” (even if they used the same inputs).
- Because of the lack of available data, it has been necessary to set up tools to be able to estimate indicators independently from field data.

However, Data collection has allowed partners from several European institutes to collaborate and work together. It also allowed them to get a good knowledge of available data and key missing data.



## **8 Annexes 1: Details on experiences from data collection per product category**

### **8.1 Products covered: Bioenergy products in M5**

#### **8.1.1 2005**

##### Data sources :

The following data sources were used: follow up routines from enterprises, data from experiments or scientific measurement and branch statistics. In addition expert opinions were used and in the reference future calculations and scenario calculations data compiled by M1 were used, including EFI-GTM results, as a base to our future projections. Expert opinions were used in processes/indicators where no other data was available on the level it was needed for the Forestry Wood Chain. Data compiled by M1 in reference future calculations and scenario calculations were used to get a consistent approach to calculations among partners. In transport processes the transport tool were used.

##### Problem faced :

There were several issues in the data collection assumptions. For example the fact that all indicator data should have been collected per incoming carbon was truly understood by different partners quite late in the run of the project. Similar complex issue was the relations between process unit, product unit, shares, split ratios and conversion factors. Despite of careful checking, it might be possible that some indicator values and other data points needed are not calculated in a consistent and uniform way. It is important to keep this in mind in the interpretation of the ToSIA runs.

The following issues are common to the whole Eforwood project and not just a issue in Module 5. Nevertheless, they have their effect in M5. The calculation of reference futures is based on the data compiled by M1. Information about all the assumptions behind the data provided were unavailable, e.g. different cross connections between drivers. Even that it was agreed that all partners use that data for the calculation of reference futures, it is absolutely not sure that everyone used the data in a similar way. Because of several reasons, the approach to the calculation of reference futures was not completely unified between partners. This results to a situation where the reference future data might be calculated with different assumptions.

Forest Wood chain indicator values are static and they don't change even if the output and input products of processes change. ToSIA is not dynamic and thus is not able to take automatically any changes in e.g. technology or quality in to account.

As coordination and communication was challenging, different products have been changed (even topology has been changed) at the end of the project. These changes could't be taken into account in all of our indicator calculations because of the late changes and thus the data quality has suffered.

Because of different approaches in modeling between Modules and the level of detail used, it has been challenging to give general requirements. The accuracy of modelled

structures varies greatly between the data different partners and modules. This has to be taken into consideration in the interpretation of the ToSIA runs.

The basic operational principle of TOSIA has not been and is not clear to all partners. This has resulted to a lot of confusion in the data collection several times during the project (e.g. correction factors, allowed process units, how to present processes that appear in the future to the chain).

In the latter phase of the project Data collection protocol document was edited changing e.g. indicator units. Because a great deal of the indicator data was already calculated or delivered into the database client it might be that some of the data in the model doesn't correspond to the instructions in the Data collection protocol or units presented in the Database Client. This issue is mainly present in the case studies (Baden Württemberg, Scandinavia and Iberia).

The quality of products is not taken into account in the data collection in a unified way. Cross linkages between processes and modules has not been taken into account in ToSIA. This results into a static system with no possibilities to change any assumptions etc.

### 8.1.2 2015-2025 Reference future / Scenarios

Our calculations of reference futures and scenarios are based on the data compiled by M1, including EFI-GTM model data. 2005 data were used as a base for the reference future calculations and calculated the new values with the help of the data from M1. This approach is used in all reference futures (A1, B2) and in those scenarios where data from M1 was available. In other scenarios data collection were based on the scenario descriptions and used expert opinions.

## 8.2 Paper and board products in M5

### 8.2.1 2005

#### Data sources :

Indicators:	BW case study	Scandinavian case study	Iberian Case	EU case
Economic	e. g. Bransch statistics		e. g. Bransch statistics	e. g. Bransch statistics
Social	e. g. Swedish statistics for employment and accidents.		e.g. Eurostat	e.g. Eurostat
Environmental	e. g. LCI databases		e. g. LCI databases	e. g. LCI databases

Conversion factors:	BW case study	Scandinavian case study	Iberian Case	EU case
From tonne to Euro	No data collected	No data collected	No data collected	No data collected
From tonne to m3	n.a.	n.a.	n.a.	n.a.
From tonne to t of C	Estimation of 50% for all products in all case studies, decided/approved by all experts.			

Shares/split ratios	BW case study	Scandinavian case study	Iberian Case	EU case
Shares	Intelligent expert judgements			
Split ratios				

Expert guesses:

Regarding to paper and cartonboard products, guesses were from in house experts of which data delivered were considered as valuable.

Problem faced:

Data collection for M5 processes were difficult since the level of aggregation was very high, compared to M3 and M4 which had more specific processes both in location and activity. (Compare “paper production at paper mill” with “reading a newspaper”.) Some whole processes were considered to be “not feasible”, e. g. “packaging used at retail”, others were considered “not applicable” e.g. “reading”.

In general it was difficult to find country specific data, and Swedish data were often used as a qualified estimation for indicators in processes located in Spain and Germany. It was also difficult to collect reliable data for separation and sorting.

Important to keep this in mind in the interpretation of the ToSIA runs that there were several assumptions made during the data collection process, many data collectors were involved during data collection process, which made it hard to keep in track all the assumption that were made.

Specific approach used conversion factors:

It was jointly decided in the EFORWOOD project that all paper products would have 50% carbon content in order to facilitate the calculations.

*8.2.2 2015-2025 Reference future / Scenarios*

For M5 paper products, the reference futures and scenarios were based on the calculation sheet made by EFI-GTM model data. This approach is used in all reference futures (A1, B2) and in those scenarios where EFI-GTM data was available, with some small adaptations for M5 specific issues. The transport tool from FCBA was also used.

Reference future A1

- Indicators: More than 70% of the indicators were not applicable in the EU case.
- Shares/Split Ratios: not many split ratios in M5. Face some difficulties with inputs and output id.names.
- Conversion factors: faced some problems to convert to Euros

Reference future B2

- More than 70% of the indicators were not applicable in the EU case
- Shares/Split Ratios: not many split ratios in M5. Face some difficulties with inputs and output id.names.
- Conversion factors: faced some problems to convert to Euros

Consumption scenario

- More than 70% of the indicators were not applicable in the EU case. Data collection was based on the scenario descriptions and used expert opinions.

- Shares/Split Ratios: not many split ratios in M5. Face some difficulties with inputs and output id.names.
- Conversion factors: faced some problems to convert to Euros

### 8.3 Solid Wood product in M5

The same overall methodology was used to estimate indicators, shares, split ratios and conversion factors in the Scandinavian, the Baden-Wurttemberg and the EU-FWC case studies. This document will mention differences between case studies only when substantial changes were observed in the way to collect data.

#### 8.3.1 Indicators 2005:

Most of processes in the distribution of solid wood products are related to transport. Indeed three types of other processes exist:

- Retail
- Waste management
- Incineration
- House construction

#### Expert guesses:

In term of solid wood products almost no expert guesses were used.

#### Transport:

Indicators related to transport processes have been estimated using the transport tool. Its methodology is developed in the D3.3.4. Then, the following document will only deal with the assumption used to estimate these indicators.

#### Assumptions:

Transport processes for the supply of solid wood product form the production site to the retail/warehouse or the construction site:

It is assumed that average national modal distribution is used as well as the average distance for transport of wood and cork.

In the topology, there is a distinction between the specialist and the generalist distribution channels (the specialist includes a transport from the production site to the warehouses (see assumption above) and a transport from the warehouse to consumer place by van (distance=25km).

In the “generalist” chain the consumer goes by himself to the retail. In this case, only environment indicators are measured.

**Tableau 2/ Assumption used for transport processes**

Type of process		Modal distribution	Distance	Vehicle used (road)	Emptybackhaulage	Tonnage
Specialist distribution:	Production site - warehouse	National average	National average	40T	National Average	Vehicle limit
Retail	Warehouse - Consumer	road only	25km	2,7T	National Average	Vehicle limit
Transport and fitting						

	Transport furniture to generalist retail	National average	National average	40T	National Average	Vehicle limit
	Transport of construction elements	National average	National average	40T	National Average	Vehicle limit
	Transport of joinery to construction site	National average	National average	26T	National Average	5,3T
	Transport of recyclable wood waste to M4 as a raw material	National average	National average	40T	National Average	Vehicle limit
	Transport of wood waste to Municipal incinerator	road only	0,25*Nat Average	5T	National Average	Vehicle limit
	Transport to of used furniture to recovery site	road only	0,25*Nat Average	13T	National Average	Vehicle limit
	Transport to recovery site	road only	0,25*Nat Average	13T	National Average	Vehicle limit
	Generalist retail of furniture	road only	7,5km	2,7T	100%	0,0384T

### Retail:

As no data or study exist allowing the estimation of indicators related to retail processes, data were not collected for these processes.

### Waste management:

Only environmental Spanish data were collected for waste management processes.

Incineration: These indicators were covered by Poyry who used a specific model to estimate indicators values.

### 8.3.2 *Fitting and house construction processes: how to measure economic indicators.*

A tool has been specifically set up to estimate the value of house construction indicators.

3 steps:

- Estimation of the process labour cost
- Estimation of the process production cost
- Estimation of values added and other costs

Process labour cost (lc):

hlc Hourly labour cost in the construction sector (Source Eurotat).

### ***Estimation of the process labour cost, lc:***

$$lc = \text{hourlylabour cost} \times \text{Fitting\_time\_ (equivalent\_of\_1ton\_of\_product)}$$

Fitting time source : LCA, Expert guesses and own calculation.

### ***Estimation of the process production cost, pc:***

Sc: Cost distribution is known (Source: French ministry of equipment).

c = 1 (labour), 2 (energy), 3 (non-productive), 4 (other productive).

pc: Process Production Cost

$$pc = \frac{lc}{S_1}$$

### ***Estimation of other costs:***

Using cost distribution figures and process production costs, other costs can easily be estimated.

*e*: Process Energy Cost

$$e = pc \times S_2$$

Aggregated data (Source: EU-KLEMS) provide data on the value added, *V* and the production cost, *P*. Then, the value added can be estimated at the process level, *v*:

$$v = pc \times \frac{V}{P}$$

Social indicators are based on Eurostat data and the time spent to fit 1 ton of wood.

Environmental indicators are based on Life Cycle Analysis (Source: FCBA).

**Tableau 3 : Process labour cost (lc):**

Fitting time for an external wall (in hours) *	Fitting time for a window (in hours) **	Fitting time for a gluelam (in hours) *
0,3	2	0,17

\*LCA data (FCBA)

\*\*Own Estimation based on TRYBA figures

**Tableau 4 : Cost distribution**

	Joinery cost distribution
2.1 - Production cost	100,00%
2.1.2 - Raw material from FWC	12,29%
2.1.2 - Raw material from outside FWC	17,61%
2.1.3 - Average cost - labour costs	48,45%
2.1.4 - Average cost - energy costs	0,00%
2.1.5 - Other productive costs	4,12%
2.1.6 - Non-productive costs	17,53%

(Source: Equipement.gouv.fr)

### 8.3.3 Indicators 2015-2025

Transport: Assumptions are similar to 2005 ones. Changes, mainly in term of distance, modal distribution and energy efficiency, are widely described in the the D3.3.4.

Retail: No data

Waste management: No data

Fitting and house construction processes: The same tool as in 2005 was used to estimate indicators. Changes were based on quantified drivers (wages) and EU 25 Construction Sector Extrapolation 1995-2005 (Source: EU-Klems) for labour productivity changes.

### 8.3.4 Split ratios and shares

Export and Imports shares:

These shares have been determined using EUROPROMS data. Even if EUROPROMS is the only database covering the flows of products on which we focused, there are very few data on volume. On the other side the coverage in value is almost full. Then, to estimate share and split ratios, an assumption has been used: The value of unit produced in the country, exported imported is assumed to be similar.

House construction: What is the share of gluelam, window and planed sawn wood in the construction of one house?

Procedure: how to estimate shares of wood coming from window production and external wall production for the construction of a house.

*Assumption:* the distribution of solid wood product per house is similar across country (same amount of wooden window per m<sup>3</sup> of external wall).

Available information:

French market estimations have been made for the residential market. From MSI sources:

<b>2006</b>	<b>Volume in 1000m<sup>3</sup></b>
Gluelam	1017,6
Planed Sawn wood	10,6
Panel	1933

Estimation of wooden window volume sold in 2006.

From Tryba it is known that 1856000 windows were sold in France in 2006

From LCA assumption (FCBA) and own calculation, each window equals 0.1m<sup>3</sup>. Then it is possible to know the amount of wood in volume sold in 2006.

Then it is possible to have the following distribution:

<b>BW- CWS countries (Externall wall +Joinery) – volume (thousand of m<sup>3</sup>)</b>	
	2203 (thousand of m <sup>3</sup> )
External wall	87,73%
Window	12,27%

<b>CWS countries</b>	2118,6 (thousand of m <sup>3</sup> )
Panel	91,24%
Window	8,76%

<b>Scand (Gluelam+Planed Sawn good) – volume (thousand of m<sup>3</sup>)</b>	1263 (thousand of m <sup>3</sup> )
Gluelam	80,55%
Planed Sawn wood	19,45%

<b>Nordic countries</b>	1446 (thousand of m <sup>3</sup> )
Gluelam	70,91%
Planed goods	16,25%
Window	12,83%

External wall = Panel

Gluelam = Carpentry + I Beam + Gluelam Beam

Joinery = Wooden Window

Planed sawn wood = Parquet + Cladding + Wainscot

These ratios are used as an input share in the house construction process.

Waste management:

No specific data available. Use of OECD data on waste distinguishing waste going to incinerator and to landfill. Recycling is assumed to equal zero (no information).

8.3.5 Conversion factors:

Conversion		Source
Product unit to EURO		No Data
Product unit to ha		
Product unit to m3	Kitchen Furniture	LCA (FCBA), FCBA memento & own calculation
	Gluelam	
	Joinery	
	Planed sawn timber	
Product unit to ton		The reporting unit is 1 tonne
Product unit to tons of C		FCBA Memento

Estimation of the joinery conversion factor from tonne to m3:

From LCA that 1m<sup>2</sup> of a maritime pine window weights 9.4kg of wood. The main assumption is that a 1m<sup>3</sup> "of window" contains 10 windows of 1m<sup>2</sup> size.

Then:

$0.0094 * 10 = 0.094$  tonnes of window per m<sup>3</sup>"

Estimates of conversion factors from m3 to tonne of C:

The conversion factor from dried ton of wood to ton of C is known to be 0.5. Secondary conversion products are considered to be dried.

Then :

$\text{Conv. Fact. m3 to tonne of C} = \text{Conv. Fact. M3 to tonne} * \text{Conv. Fact tonne to tonne of C.}$
---

Some figures got from this methodology were modified in order to get coherent conversion factors with M4.