Environmental Life Cycle Assessment
PSE 476/WPS 576/WPS 595-005

Lecture 15: Environmental Product Declarations

Authors:

Richard A. Venditti, Scott Stamey and Robert Radics

Fall 2016
Richard A. Venditti
Forest Biomaterials
North Carolina State University
Raleigh, NC 27695-8005

Richard_Venditti@ncsu.edu
Go.ncsu.edu/venditti
Environmental Product Declarations (EPDs):

• Ecolabels that disclose the environmental performance of products based on an environmental life cycle assessment (LCA).
  
  – Similar to nutrition labels disclose nutritional performance.
  
  – provide the consumer with a way to evaluate their choices.
ENVIRONMENTAL PRODUCT DECLARATION (EPD)

http://www.pe-international.com/topics/what-are-environmental-product-declarations/
EXAMPLE EPD:

Sample of Carbon footprint

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>KOKUYO S&amp;T Co.,Ltd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product of the</td>
<td>Pipe Type File, “EcoTwin-R”, (7-RT650B),</td>
</tr>
<tr>
<td>carbon footprint</td>
<td></td>
</tr>
<tr>
<td>Quantity</td>
<td>A4-size, Paper Capacity: 5cm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage</th>
<th>Material Production</th>
<th>Product Manufacturing</th>
<th>Transportation</th>
<th>Retailing</th>
<th>Usage</th>
<th>Disposition/Recycling</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG Emission g-CO₂/P</td>
<td>1003.8</td>
<td>27.3</td>
<td>50.9</td>
<td>155.9</td>
<td>0</td>
<td>99.5</td>
<td>1337</td>
</tr>
</tbody>
</table>

Calculation condition
- The GHG emission in Material Production Stage was calculated using design weight and secondary data prepared by the secretariat, where loss ratio of sheet type material was considered.
- The GHG emission in Retailing Stage was calculated using given value of GHG per sales price, which was prepared by the secretariat.
- The GHG emission in Usage Stage was identified as zero due to no energy consumption in this stage.
IMPORTANCE OF EPDs

• Today, every food item in your store has a food label. Soon, every product will have an EPD attached!

• Five million jobs are endangered by the new EU requirements in U.S. if Europe stops purchasing non-EPD type products.

• Potentially 67,000 new jobs and a better environment with the development of EPD systems.
Product Category Rules (PCRs)

- Are detailed instructions on how to perform the LCA for EPDs
- Assure that LCAs performed are done in the same way, so that an analysis of the same product will yield the same results no matter who does the analysis.
- Defines the product category
- Includes how to present the data
- Defines the required data quality

Product Category Rules (PCRs)

• **Program Operator** is the organization that coordinates stakeholders and ensures adherence to ISO standards.
  – Program Operator oversees creation of PCR.

• PCR proposed/reviewed by a team of experts that represent the industries that are affected and other interested parties.

• Third party review (independent experts) of the final rules is also required, as well as periodic review.
EPD Creation

Steps for EPD Creation:

1. **Program Operator** established (can be self-appointed)
2. Program operator defines **Product Category Rules**
3. Review and Comment of PCR
4. LCA performed and data used to create EPD (according to PCR and ISO methods).

Product Category Rules (PCRs)

• Defines
  – Functional unit
  – Allocation rules
  – Recommended data sources
  – Impact assessment methods
  – Additional relevant environmental information to be included
  – Generic factors to use when primary data is not available
  – Other items that must be present: manufacturing information, location of production
  – Period of validity of the PCR and any EPD based on the PCR
Product Category Rules (PCRs)

CPC Class 2211
Processed Liquid Milk
PCR 2010:12 Vs 1.0
2010-06-24,

excerpts from
Chapter 22 of Life Cycle assessment Handbook, Edited by Mary Ann Curran.

- Description of the product – The PCR defines “processed liquid milk” including the types of animals from which the milk can be derived (e.g., cows, sheep, goats, etc.) and the treatment processes it will undergo.
- Functional unit – 1 liter of processed and distributed liquid milk.
- Content of materials and chemical substances – A minimum of 99% of all ingredients are to be listed in the EPD results, including nutritional information.
- System boundaries – Should include the upstream process of milk production including farm inputs and manure or enteric emissions, upstream packaging processes including materials and production, milk processing including pasteurization and packaging, and downstream processes including transportation, use phase and end of life fate. Use phase and end of life are listed as voluntary declarations. Further specifics on the temporal and geographical boundaries are included in the PCR.
- Data requirements – Site-specific data should be used for all core processes – milk processing and filling. If several facilities are included in the EPD, then site-specific data needs to include 90% representative data of these facilities.
Product Category Rules (PCRs)

CPC Class 2211
Processed Liquid Milk
PCR 2010:12 Vs 1.0
2010-06-24,

excerpts from
Chapter 22 of Life Cycle assessment Handbook, Edited by Mary Ann Curran.

- Allocation rules – Where co-products are produced in the same facility as the milk (e.g., cheese, yogurt) inputs and emissions should be distributed appropriately. This PCR suggests using mass allocation.
- Cut-off values – The PCR indicates a 99% by mass cut-off value.
- Inventory Indicators – The following indicators should be reported and divided into core and upstream processes: Non-renewable Material Resources, Non-renewable Energy Resources, Renewable Material Resources, Renewable Energy Resources and Water Use.
- Impact Indicators – The following indicators shall be reported and divided into core and upstream processes: Greenhouse gas emissions using IPCC 2007 characterization factors and a 100 year time horizon, Ozone-Depleting potential expressed in CFC 11-eqiva-
  lents and 20 year time horizon, Acidification potential expressed in SO2- equivalents, Ozone-creating Potential expressed in ethane equivalents, and Oxygen depletion in water expressed as PO4 3-.
- Other Indicators – Additional indicators that should be reported include Material recycled, Hazardous waste and Other waste.
- Additional Environmental Information – Ecological Footprinting and Virtual Water Content are listed as optional indicators for the EPD. Their methods are highlighted in the appendices of the PCR.
Three Types of Environmental labels and declarations per ISO 14020

- All based on ISO standards:

<table>
<thead>
<tr>
<th>Name</th>
<th>Unverified</th>
<th>Verified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Labels</td>
<td>14021 (Type II)</td>
<td>14024 (Type I)</td>
</tr>
<tr>
<td>Self-declared Environmental Claims</td>
<td>14021 (Type II)</td>
<td>-</td>
</tr>
<tr>
<td>Environmental Product Declarations</td>
<td>-</td>
<td>14025 (Type III)</td>
</tr>
</tbody>
</table>
Type I: **Environmental Labels** (ISO 14024)

- Multiple-criteria-based 3rd party program which awards a license for *environmentally preferable products meeting criteria*. 

![FSC](image1) ![Energy Star](image2) ![LEED](image3)
Type I: **Environmental Labels** (ISO 14024)

- Environmental labeling programs which award their environmental label to products which *meet a set of predetermined requirements*.

- The label thus identifies products which are determined to be environmentally preferable within a particular product category.
Type I: **Environmental Labels** (ISO 14024)

- Iterative procedure
  - Consultation with interested parties
  - Selection of product categories
  - Development review and modification of the environmental criteria
  - Identification of the product function characteristics
  - Establishment of the certification procedures and administration
Type 1: EU Ecolabel, www.ecolable.eu

The **Flower** is the official sign of ENVIRONMENTAL INTEGRITY recognised throughout Europe.

**Total Number of Licences Issued from 1992 to 2011**

The EU Ecolabel was launched in 1992 when the European Community decided to develop a Europe-wide voluntary environmental scheme that consumers could trust. Since then, the number of products and services awarded the EU Ecolabel has increased every year. By the end of 2011, more than 1,300 licences had been awarded, and today, the EU Ecolabel can be found on more than 17,000 products. A licence gives a company the right to use the EU Ecolabel logo for a specific product group.
Number of EU Ecolabelled products per Product Group Category (January 2012)

- Hard floor coverings: 356
- Indoor paints and varnishes: 372
- All purpose cleaners and cleaners for sanitary facilities: 264
- Tissue paper: 264
- Textile products: 1367
- Copying and graphic paper: 2469
- Televisions: 2115
- Soaps and shampoos: 2115
- Hand dishwashing detergents: 2115
- Tourist accommodation: 2115
- Laundry detergents: 2115
- Other: 2115
- Total: 6250

The numbers provided are indicative. The exact numbers are under validation and will be updated as soon as possible.
Type 1 Example: Energy Star

- ENERGY STAR is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect climate through superior energy efficiency.

- Objective: to identify and promote energy–efficient products and buildings

- Desired outcomes: to reduce energy consumption, improve energy security, and reduce pollution through voluntary labeling of products and buildings that meet the highest energy efficiency standards

<table>
<thead>
<tr>
<th>ENERGY STAR GHG Reductions Since 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG REDUCTIONS (MMTCO₂e)</td>
</tr>
<tr>
<td>GHGS Addressed: CO₂</td>
</tr>
<tr>
<td>KEY SECTORS: Residential, Commercial, Industrial</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>53.5</td>
</tr>
</tbody>
</table>

- http://www.energystar.gov/index.cfm?c=about.ab_index
Type 1 Example: Energy Star

<table>
<thead>
<tr>
<th>PRODUCT TYPE</th>
<th>NUMBER OF PRODUCT CATEGORIES</th>
<th>TOTAL NUMBER OF SPECIFICATIONS (NEW AND REVISED)</th>
<th>SPECIFICATION UPDATES IN THE LAST 3 YEARS*</th>
<th>SPECIFICATIONS THAT WENT INTO EFFECT IN 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Electronics</td>
<td>12</td>
<td>36</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Office Equipment</td>
<td>10</td>
<td>37</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>HVAC</td>
<td>9</td>
<td>30</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Commercial Food Service Equipment</td>
<td>9</td>
<td>14</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Lighting</td>
<td>6</td>
<td>21</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Building Envelope</td>
<td>3</td>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Appliances</td>
<td>7</td>
<td>20</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

[177x436] Type 1 Example: Energy Star

Type 1 Example: Energy Star

– 18,000 partners across every sector of the economy
– manufacturers and trade associations, to retailers and efficiency program providers, to home builders and small businesses.
– represent products in more than 65 different categories,
– carry EPA’s ENERGY STAR certification:
  • 4.5 billion products sold over the past 20 years.
  • More than 1.4 million new homes
  • more than 20,000 facilities

– 84% of households recognized the Energy Star Label
Type I Example: Forestry Stewardship Council

Mission and Vision:

1. The Forest Stewardship Council mission is to promote environmentally sound, socially beneficial and economically prosperous management of the world's forests.

2. Our vision is that we can meet our current needs for forest products without compromising the health of the world’s forests for future generations.
Type I Example: Forestry Stewardship Council

Certification types:

1. Forest Management certification is awarded to forest managers or owners whose management practices meet the requirements of the FSC US Forest Management Standard.

2. Chain-of-Custody certification applies to manufacturers, processors and traders of FSC-certified forest products. It ensures the validity of claims associated with all FSC-certified material and products throughout the production chain.
Type I Example: Forestry Stewardship Council

FSC: 10 Principles Audited:

Principle 1: Compliance with laws and FSC Principles
Principle 2: Tenure and use rights and responsibilities
Principle 3: Indigenous peoples’ rights
Principle 4: Community relations and worker's rights
Principle 5: Benefits from the forest

Principle 6: Environmental impact
Principle 7: Management plan
Principle 8: Monitoring and assessment
Principle 9: Maintenance of high conservation value forests
Principle 10: Plantations

Type I Example: Forestry Stewardship Council

- Forests are important
  - Forests cover 30% of global land area
  - 70% of terrestrial animals and plants live in forests
  - Currently the world’s forests store 283 billion tons of carbon in their biomass

- FSC Statistics, May 2013
  - 35.3 million acres certified in the US
  - 174.7 million acres certified in the US and Canada
  - 3,417 companies Chain-of-Custody certified in the US
  - 4,401 companies Chain-of-Custody certified in the US and Canada
Type I Example: Forestry Stewardship Council

Steps to Certification:

1. Choose from one of several FSC-accredited certification bodies.
2. Certification Audit
3. Audit Report
4. Certification awarded, or suggested changes issued
5. Valid for (5) years with annual surveillance audits.
Type I: **Environmental Labels** (ISO 14024)

- **Strengths:**
  - Simple, easy for consumers with no technical background to understand.
  - Can be applied across several countries e.g. Ecolabel
  - Selective – criteria is specific to a category and constantly reviewed
  - Can also extend to services

- **Weaknesses**
  - Complex
  - Costly to obtain
  - Limited to products specifically included (20-30% of products)
  - *Does not differentiate between multiple products achieving label criteria*
  - Very rigid structure
Type II: **Self-Declared Environmental Claims** (ISO 14021)

- Self-certification and publication by a firm’s own products.
- Statement, symbol or graphics on products, labels, literature, advertising......
- Not independently verified, so there is a risk of "greenwashing", i.e. using claims to imply a product is more environmentally friendly than it is
- Per ISO, claim must be:
  - Clear and specific
  - Relevant to the product and its use
  - Careful and not misleading
- Not necessarily based on an LCA
Type II: **Self-Declared Environmental Claims**
(ISO 14021)

- Examples:

  Do you believe these claims? Why or Why Not?
Type II: **Self-Declared Environmental Claims**  
(ISO 14021)

- Commonly used terms in self declared environmental claims
  - Compostable
  - Degradable
  - Designed for disassembly
  - Extended life product
  - Recovered energy
  - Recyclable
  - Recycled content
  - Pre-consumer material
  - Post-consumer material
  - Recycled material
  - Recovered [reclaimed] material
  - Reduced energy consumption
  - Reduced resource use
  - Reduced water consumption
  - Reusable
  - Refillable
  - Waste reduction
Type II: **Self-Declared Environmental Claims**  
(ISO 14021)

- Commonly used terms in self declared environmental claims

---

7.3 Degradable

7.3.1 Usage of term

A characteristic of a product or packaging that, with respect to specific conditions, allows it to break down to a specific extent within a given time.

NOTE: Degradability is a function of susceptibility to changes in chemical structure. Consequent changes in physical and mechanical properties lead to the disintegration of the product or material.

7.3.2 Qualifications

7.3.2.1 The following qualifications refer to all types of degradation, including for instance biodegradation and photodegradation.

a) Claims of degradability shall only be made in relation to a specific test method that includes maximum level of degradation and test duration, and shall be relevant to the circumstances in which the product or packaging is likely to be disposed.

b) A degradable claim shall not be made for a product or packaging, or component of a product or packaging, that releases substances in concentrations harmful to the environment.

7.3.3 Evaluation methodology

Evaluation shall be undertaken in accordance with clause 6.
Type II: Self-Declared Environmental Claims (ISO 14021)

- Requirements
  - 6.1 Claimant is responsible for evaluation and provision of data for verification of the claim
  - 6.2 Ensure reliability of claim and provide documentation

- For comparative claims: Use appropriate comparison example and use same evaluation method for subject and baseline (10% less plastic)

- Verifiable: only if all information is provided or available upon request

- Documentation: test method, test results, if testing done by 3rd party, assurance that the claim is being updated
Type III: **Environmental Product Declarations**  
(ISO 14025)

Type III environmental declarations present quantified environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function.
Type III: **Environmental Product Declarations**
(ISO 14025)

- are provided by one or more organizations,
- are based on independently **verified life cycle assessment (LCA) data, life cycle inventory analysis (LCI) data or information modules in accordance with the ISO 14040 series of standards** and, where relevant, additional environmental information
- are developed using predetermined parameters
- are subject to the administration of a program operator
  - such as a company or a group of companies,
  - industrial sector or trade association,
  - public authorities or agencies
  - independent scientific body or other organization.
Type III: **Environmental Product Declarations (ISO 14025)**

- Overall goal is to communicate verifiable and accurate information about environmental aspects of products.
- Intent is to provide a basis of fair comparison of any product in a given category.
- Objective, comparable, and credible.
Type III: **Environmental Product Declarations (ISO 14025)**

- primarily intended for use in business-to-business communication
- but their use in business-to-consumer communication is not precluded.
- data are independently verified either internally or externally
- 3rd party required by ISO if business to consumer
- Product category rules (PCR) are encouraged between programs to meet the principle of comparability
If these countries impose EPD requirements on all products sold, US companies may be forced to create and issue EPDs to continue trade. French government has already passed legislation to require EPDs for all consumer goods.
Type III EPDs in the US

- Several individual, but no national Type III EPD system in the US.
- Type I and Type II eco-labeling much more common.
- First EPD program in the US was Earthsure, part of the Institute for Environmental Research and Education.
What should be in a Type III EPD?

The following information shall be included in any Type III environmental declaration according to the PCR:

a) identification and description of the organization making the declaration;

b) description of product;

c) product identification (e.g. model number);

d) name of the programme and the programme operator's address and, if relevant, logo and website;

e) PCR identification;

f) date of publication and period of validity;

g) data from LCA, LCI or information modules (see 7.2.2);

h) additional environmental information (see 7.2.3);

i) content declaration covering materials and substances to be declared (e.g. information about product content, including specification of materials and substances that can adversely affect human health and the environment, in all stages of the life cycle);

j) information on which stages are not considered, if the declaration is not based on an LCA covering all life cycle stages;

k) statement that environmental declarations from different programmes may not be comparable;

l) information on where explanatory material may be obtained.

m) Information about the review process
What should be in a Type III EPD?

7.2.2 Data from LCA, LCI or information modules

a) data from life cycle inventory analysis (LCI), according to the PCR, including
   — consumption of resources, including energy, water and renewable resources, and
   — emissions to air, water and soil;

b) indicator results of life cycle impact assessment (LCIA), if applied, including
   — climate change,
   — depletion of the stratospheric ozone layer,
   — acidification of land and water sources,
   — eutrophication,
   — formation of photochemical oxidants,
   — depletion of fossil energy resources, and
   — depletion of mineral resources;

c) other data such as quantities and types of waste produced (hazardous and non-hazardous waste).
What should be in a Type III EPD?

7.2.3 Additional environmental information

a) information on environmental issues, such as
   1) impact(s) and potential impact(s) on biodiversity,
   2) toxicity related to human health and/or the environment, and
   3) geographical aspects relating to any stages of the life cycle (e.g. a discussion on the relation between the potential environmental impact(s) and the location of the product system);

b) data on product performance, if environmentally significant;

c) the organization’s adherence to any environmental management system, with a statement on where an interested party may find details of the system;

d) any other environmental certification programme applied to the product and a statement on where an interested party may find details of the certification programme;

e) other environmental activities of the organization, such as participation in recycling or recovery programmes, provided details of these programmes are readily available to the purchaser or user and contact information is provided;

f) information that is derived from LCA but not communicated in the typical LCI or LCIA based formats;

g) instructions and limits for efficient use;

h) hazard and risk assessment on human health and the environment;

i) information on absence or level of presence of a material in the product that is considered of environmental significance in certain areas [see ISO 14021:1999, 5.4 and 5.7 r];

j) preferred waste management option for used products;

k) potential for incidents that can have impact(s) on the environment.
Type III: EPD Example

Excerpts from Finsa (Spain) – EPD for plain MDF and Melamine-coated MDF. Issued 2010.
Plain medium density fibreboards (MDF) or melamine-coated fibreboards are panel-like products that comply with standards EN 622-1, EN 622-5 and EN 14322. They are considered reliable products used as raw material for the construction and furniture industry. MDF boards can easily be coated with decorative paper, by resorting to simple technologies.

<table>
<thead>
<tr>
<th>Product description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDF boards are homogeneous and provide good results in the most demanding machine work. They are stable, as they keep their form and dimensions despite the changes in environment humidity and temperature. The multiple possibilities they offer in terms of framing, coating and finishing imply a greater quality of the end product and provide greater rationalization in terms of work. With the appropriate coating, they are the ideal support for manufacturing doors, frames, home and office furniture, screens, wall coverings, false ceilings and so on. In smaller thicknesses, it is a high-density board, with good wrap behaviour, and which is very easily stapled and curved. They have great homogeneity and dimensional stability. These boards have become the strongest allies of different sectors: industrial electronics, backing of items of furniture, curved structures for furniture and for covering walls, complementary automotive industry, machine packaging, fruit boxes... In greater thicknesses, for architectural applications such as columns, pillars, vaulted passageways, etc. Other possibilities include: shelves, bed heads, steps, benches, interior doors with moulded faces, table legs, etc. They are also used as basic material for wood veneering and PVC coatings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Life Cycle Analysis (LCA) was carried out according to standards ISO 14025; ISO 14040; ISO 14044. Both specific data from the production of the product under analysis as well as the following data bases were used: Ecoinvent 2.1 and the U.S. Life Cycle Inventory (USLCI). The methods used for calculating the categories of impact were as follows: the EPD Method (2008); the Environmental Design of Industrial Products Method (EDIP) 2003, and the Method of Cumulative Energy Demand (CED) v.1.07. The life cycle analysis covers the production of raw materials and energy; the transportation of raw materials, and the actual manufacturing stage, all the way to the shipping stage. The functional unit under consideration is 1 m² of plain MDF and 1 m² of melamine-coated MDF.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scope of application of the LCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>In addition, the environmental product declaration also considers:</td>
</tr>
<tr>
<td>- That formaldehyde complies with standard EN 120/EN 717-1 (Aitlm Certification)</td>
</tr>
<tr>
<td>- CARB P2 Certification</td>
</tr>
<tr>
<td>- NAF Certification</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other evidence and verifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
</tr>
</tbody>
</table>
# Type III EPD Example (excerpts)

<table>
<thead>
<tr>
<th>Variable under assessment</th>
<th>Plain MDF boards (per m³)</th>
<th>Coated MDF boards (per m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission of Greenhouse gases</td>
<td>kg CO₂/ m³</td>
<td>kg CO₂/ m²</td>
</tr>
<tr>
<td>Potential depletion of the ozone layer (PDO)</td>
<td>4.3E-5</td>
<td>1.9E-7</td>
</tr>
<tr>
<td>Potential acidification (PA)</td>
<td>4.68</td>
<td>2.07E-2</td>
</tr>
<tr>
<td>Potential eutrophication (PE)</td>
<td>0.335</td>
<td>1.5E-3</td>
</tr>
<tr>
<td>Potential formation of photochemical oxidants (PFPO)</td>
<td>0.621</td>
<td>2.7E-3</td>
</tr>
<tr>
<td>Primary energy, non renewable</td>
<td>11044</td>
<td>51,37</td>
</tr>
<tr>
<td>Primary energy, renewable</td>
<td>4919</td>
<td>22,63</td>
</tr>
<tr>
<td>Electricity consumption</td>
<td>501</td>
<td>225</td>
</tr>
</tbody>
</table>
### Table 2: Consumption of primary energy for manufacturing 1 m² of MDF and 1 m² of melamine-coated MDF.

<table>
<thead>
<tr>
<th>Variable under assessment</th>
<th>Plain MDF board (per m²)</th>
<th>Unit</th>
<th>Total</th>
<th>Coated MDF board (per m²)</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-renewable primary energy with energy contents</td>
<td>MJ/m³</td>
<td>9.327</td>
<td></td>
<td>MJ/m³</td>
<td>42.07</td>
<td></td>
</tr>
<tr>
<td>Renewable primary energy with energy contents</td>
<td>MJ/m³</td>
<td>4.566</td>
<td></td>
<td>MJ/m³</td>
<td>21.03</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: Waste generation

<table>
<thead>
<tr>
<th>Variable under assessment</th>
<th>Plain MDF boards (per m³)</th>
<th>Unit</th>
<th>Total</th>
<th>Coated MDF boards (per m³)</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-hazardous Waste</td>
<td>kg</td>
<td>20.29</td>
<td></td>
<td>kg</td>
<td>9.02E-2</td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste</td>
<td>kg</td>
<td>0.03</td>
<td></td>
<td>kg</td>
<td>1.6E-4</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4: Categories of impact for manufacturing 1 m³ of plain MDF board and 1 m³ of melamine-coated MDF board.

<table>
<thead>
<tr>
<th>Variable under assessment</th>
<th>Plain MDF boards (per m³)</th>
<th>Unit</th>
<th>Total</th>
<th>Coated MDF boards (per m³)</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission of green house gases</td>
<td>kg CO²/m³</td>
<td>-818(1)</td>
<td></td>
<td>kg CO²/m³</td>
<td>-3.48</td>
<td></td>
</tr>
<tr>
<td>Potential depletion of the ozone layer (PDO)</td>
<td>kg R11 eq./m³</td>
<td>4.3E-5</td>
<td></td>
<td>kg R11 eq./m³</td>
<td>1.9E-7</td>
<td></td>
</tr>
<tr>
<td>Potential acidification (PA)</td>
<td>kg SO²/m³</td>
<td>4.68</td>
<td></td>
<td>kg SO²/m³</td>
<td>2.07E-2</td>
<td></td>
</tr>
<tr>
<td>Potential eutrophication (PE)</td>
<td>kg phosphate eq./m³</td>
<td>0.335</td>
<td></td>
<td>kg phosphate eq./m³</td>
<td>1.8E-3</td>
<td></td>
</tr>
<tr>
<td>Potential formation of photochemical oxidants (POF)</td>
<td>kg ethylene eq./m³</td>
<td>0.621</td>
<td></td>
<td>kg ethylene eq./m³</td>
<td>2.7E-3</td>
<td></td>
</tr>
<tr>
<td>Primary energy, non renewable</td>
<td>MJ/ m³</td>
<td>11044</td>
<td></td>
<td>MJ/ m³</td>
<td>51.37</td>
<td></td>
</tr>
<tr>
<td>Primary energy, renewable</td>
<td>MJ/ m³</td>
<td>4919</td>
<td></td>
<td>MJ/ m³</td>
<td>22.63</td>
<td></td>
</tr>
<tr>
<td>Electricity consumption</td>
<td>kWh/m³</td>
<td>501</td>
<td></td>
<td>kWh/m³</td>
<td>2.25</td>
<td></td>
</tr>
</tbody>
</table>

### 9. Validity of the declaration

The validity established for the environmental declaration for medium density fibreboards (MDF), both plain and melamine-coated, is 3 years (until December 2013) as the sensitivity of former years has been tested and there are no variations over 5% regarding the environmental effects in any of the categories of impact.

### 10. Verification

The present declaration has been developed according to standards ISO 14025, ISO 14045, and ISO 14044.

<table>
<thead>
<tr>
<th>Independent verification according to ISO 14025:</th>
<th>internal</th>
<th>x external</th>
</tr>
</thead>
</table>

Validation of the present declaration by:

Anxo Moureille Álvarez
Type III EPD Example (excerpts)

- Can you tell if this is a “good” product or not?
- If not, how could you use the data to decide?
- Why might the Greenhouse gases value be negative?

<table>
<thead>
<tr>
<th>Variable under assessment</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission of Greenhouse gases</td>
<td>kg CO2/ m³</td>
<td>-818(1)</td>
</tr>
<tr>
<td>Potential depletion of the ozone layer (PDO)</td>
<td>kg R11 eq/ m³</td>
<td>4,3E-5</td>
</tr>
<tr>
<td>Potential acidification (PA)</td>
<td>kg SO2/ m³</td>
<td>4,68</td>
</tr>
<tr>
<td>Potential eutrophication (PE)</td>
<td>kg phosphate eq/ m³</td>
<td>0,335</td>
</tr>
<tr>
<td>Potential formation of photochemical oxidants (PFPO)</td>
<td>kg ethylene eq/ m³</td>
<td>0,621</td>
</tr>
<tr>
<td>Primary energy, non renewable</td>
<td>MJ/ m³</td>
<td>11044</td>
</tr>
<tr>
<td>Primary energy, renewable</td>
<td>MJ/ m³</td>
<td>4919</td>
</tr>
<tr>
<td>Electricity consumption</td>
<td>Kwh/ m³</td>
<td>501</td>
</tr>
</tbody>
</table>

Excerpts from Finsa (Spain) – EPD for plain MDF and Melamine-coated MDF. Issued 2010.
Strengths and Weaknesses of Type III EPDs

• Strengths
  – Transparent
  – Quantified Data – no vague claims
  – Directly comparable with other EPDs performed within the same category
  – Verified and credible
  – Same data could possibly be used in obtaining a Type I eco-label
Strengths and Weaknesses of Type III EPDs

Several different assessment tools for buildings:

<table>
<thead>
<tr>
<th>Name</th>
<th>Developer</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATHENA™ Environmental Impact Estimator</td>
<td>ATHENA Sustainable Material Institute; Canada</td>
<td>ATHENA Institute (2003); ATHENA™; DOE (1996/2006); Trusty and Meil (2002a,b)</td>
</tr>
<tr>
<td>BEAT 2002</td>
<td>Danish Building Research Institute (SBI), Denmark</td>
<td>BEAT (2002); Forsberg and von Malmborg (2004); Hansen (2005); IEA Annex 31 (2001); Petersen (2002a,b)</td>
</tr>
<tr>
<td>BeCost</td>
<td>VTT, Finland</td>
<td>BeCost; CRISP (2004); IEA Annex 31 (2001)</td>
</tr>
<tr>
<td>BEES 4.0</td>
<td>U.S. National Institute of Standards and Technology (NIST), USA</td>
<td>BEES 4.0; DOE (1996/2006); IEA Annex 31 (2001); Lippiatt (2002); Trusty (2003)</td>
</tr>
<tr>
<td>BREEAM</td>
<td>Building Research Establishment (BRE), UK</td>
<td>BREEAM; BREEAM fact file; CRISP (2004); Grace (2000); IEA Annex 31 (2001)</td>
</tr>
<tr>
<td>EcoEffect</td>
<td>Royal Institute of Technology (KTH), Sweden</td>
<td>CRISP, EcoEffect; Forsberg and von Malmborg (2004); Glaumann (2000); IEA Annex 31 (2001)</td>
</tr>
<tr>
<td>EcoProfile</td>
<td>Norwegian Building Research Institute (NBI), Norway</td>
<td>Boonstra and Petersen (2003); IEA Annex 31 (2001); Petersen (2000a,b); Petersen et al. (2000)</td>
</tr>
<tr>
<td>Eco-Quantum</td>
<td>IVAM, the Netherlands</td>
<td>CRISP, EcoQuantum; IEA Annex 31 (2001); Peupotier and Putzeys (2005)</td>
</tr>
<tr>
<td>Envest 2</td>
<td>Building Research Establishment (BRE), UK</td>
<td>DOE (1996/2006); CRISP; Envest 2; IEA Annex 31 (2001); Peupotier and Putzeys (2005)</td>
</tr>
<tr>
<td>Environmental Status Model (Miljostatus)</td>
<td>Association of the Environmental Status of Buildings, Sweden</td>
<td>Boonstra and Petersen (2003); Environmental Status Model; Carlson (2000); Carlson and Lundgren (2002)</td>
</tr>
<tr>
<td>EQUER</td>
<td>École des Mines de Paris, Centre d’Énergétique et Procédés, France</td>
<td>DOE (1996/2006); EQUER; IEA Annex 31 (2001); Nibel and Rialhe (2000); Peupotier and Putzeys (2005)</td>
</tr>
<tr>
<td>ESCALE</td>
<td>CTSB and the University of Savoie, France</td>
<td>ESCALE; Gerard et al. (2000); IEA Annex 31 (2001)</td>
</tr>
<tr>
<td>LEGEP® (previously known as Legoc)</td>
<td>University of Karlsruhe, Germany</td>
<td>IEA Annex 31 (2001); Kohler et al. (2005); LEGEP; Peupotier and Putzeys (2005)</td>
</tr>
<tr>
<td>PAPOOSE</td>
<td>TRBU, France</td>
<td>IEA Annex 31 (2001); Nibel and Rialhe (2000); PAPOOSE</td>
</tr>
<tr>
<td>TEAM™ a</td>
<td>Ecobilan, France</td>
<td>IEA Annex 31 (2001); Nibel and Rialhe (2000); TEAM™</td>
</tr>
</tbody>
</table>

Developed for specific purposes (old, new, refurbished, single family, multi-unit)

EPDs cannot be compared if they are provided by different tools.
Strengths and Weaknesses of Type III EPDs

• Weaknesses
  – Focused more on business-to-business than business-to-consumer. Purchaser must have some technical knowledge of product being purchased, and time to compare EPDs.
  – Can be prohibitively expensive and time-consuming if specific data (recommended over generic data) is used.
  – Currently, no universal standard for EPDs (even within specific categories), so EPDs from different countries may not be comparable.
Homework

1. Download (2) EPDs for energy production:
   a) http://gryphon.envirodec.com/data/files/6/7562/epd144en_v2.pdf

2. Use the data in the introductory summary table, prepare a table comparing the environmental impacts of the 2 forms of power production.

3. Based only on the data, which form of power has less environmental impact?

4. Choose (3) other categories from the tables in section 3.3 “Ecoprofile” and add them to the table.

5. What other factors not quantified in the EPD might affect which form of power is preferable?

6. Is it fair to compare these EPDs? Why or why not?
Vocabulary

• Environmental Product Declaration
• Program Operator
• Third Party
• Verified/Unverified
• Product Category Rule
• Environmental Label (Type I)
• Self-Declared Environmental Claim (Type II)
• Greenwashing
• Environmental Product Declaration (Type III)