

A blurred image of a white high-speed train moving from left to right, enclosed within a red, rounded rectangular frame. The background consists of horizontal motion blur lines, suggesting speed.

Environmental Product Declarations at Bombardier Transportation

Dr. Kathy Reimann

EPD® stakeholder conference - 15 May 2012

BOMBARDIER

Bombardier Transportation

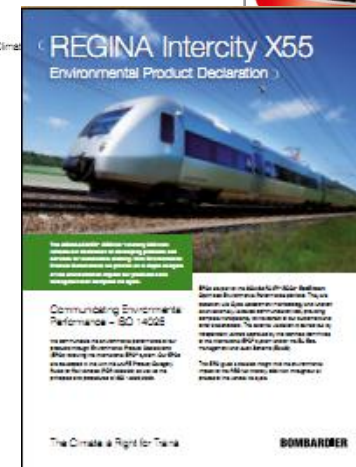
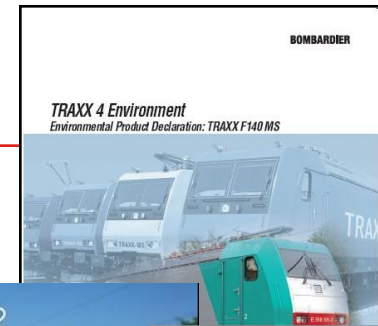
EcoEfficient Optimised Environmental Performance

- **Life Cycle Assessment (LCA) for less environmental impact over the life cycle**
 - According to ISO 14040
 - Carried out for vehicles as well as components
- **Transparent communication of environmental efficiency**
 - Environmental Product Declarations
 - According to ISO 14025 and Product Category Rules for Rail Vehicles (PCR 2009:05)
 - Externally validated
- **Maximising recyclability and recoverability**
- **Environmentally sound materials**
 - Control of materials
 - Specification of materials used
 - Elimination of hazardous substances



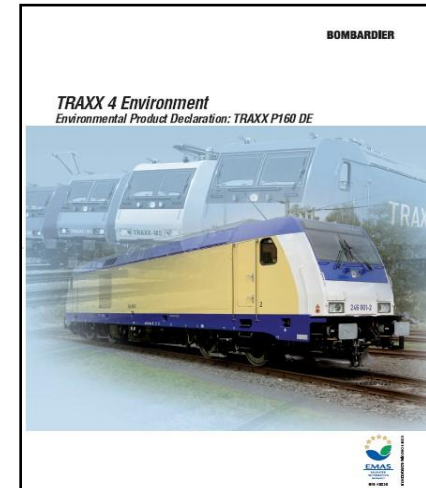
Why an EPD?

- Growing customer requirements
 - Many customers have requirements on reliable documentation on the products environmental performance
 - Many operators go beyond the ISO 14001 certification and are registered under EMAS
 - Many operators are signatories of the UITP Charter on Sustainable Development
- Summarizes environmental performance covering the whole life cycle
 - Reliably
 - Transparently



EPDs at Bombardier Transportation


- 1999: First in rail industry to release an EPD according to ISO 14021 / (ISO TR 14025)
- 2006: First in rail industry to release an EPD according to ISO14025
- Up to date eight EPDs have been published by Bombardier Transportation
- Environmental target
 - 1 EPD per product platform!



PCR for Rail Vehicles

- UNIFE Environmental Group initiated work on PCR for the Product Category “Rail Vehicles”
- Purpose: Ensuring uniform communication of environmental performance of rail vehicles
- Identifies and specifies the common rules and procedures to be applied

VERSION 1.1 - 2010 04 23



EPD[®]

**PRODUCT CATEGORY
RULES (PCR)**

for preparing an environmental product
declaration (EPD) for

rail vehicles

UNCPC CODE: 495
PCR 2009: 05

International EPD Consortium, IEC
Version 1.1
Guaranteed validity until 2014-12-01

This PCR document is in compliance with PROGRAMME REQUIREMENTS EPD[®] an international EPD system for environmental product declarations, published by the "Body managing the EPD system" as a part of the EPD[®] system.

Further information is available on: www.environdec.com

Participating Companies:

- Bombardier Transportation
- Alstom
- Siemens
- Talgo
- AnsaldoBreda
- Knorr-Bremse
- Saft Batteries
- CAF
- UNIFE

Ongoing update of PCR, regarding e.g.:

- Description of system boundaries
- Declaration of recyclability and recoverability figures
 - Based on new UNIFE recycling calculation methods

Published EPDs

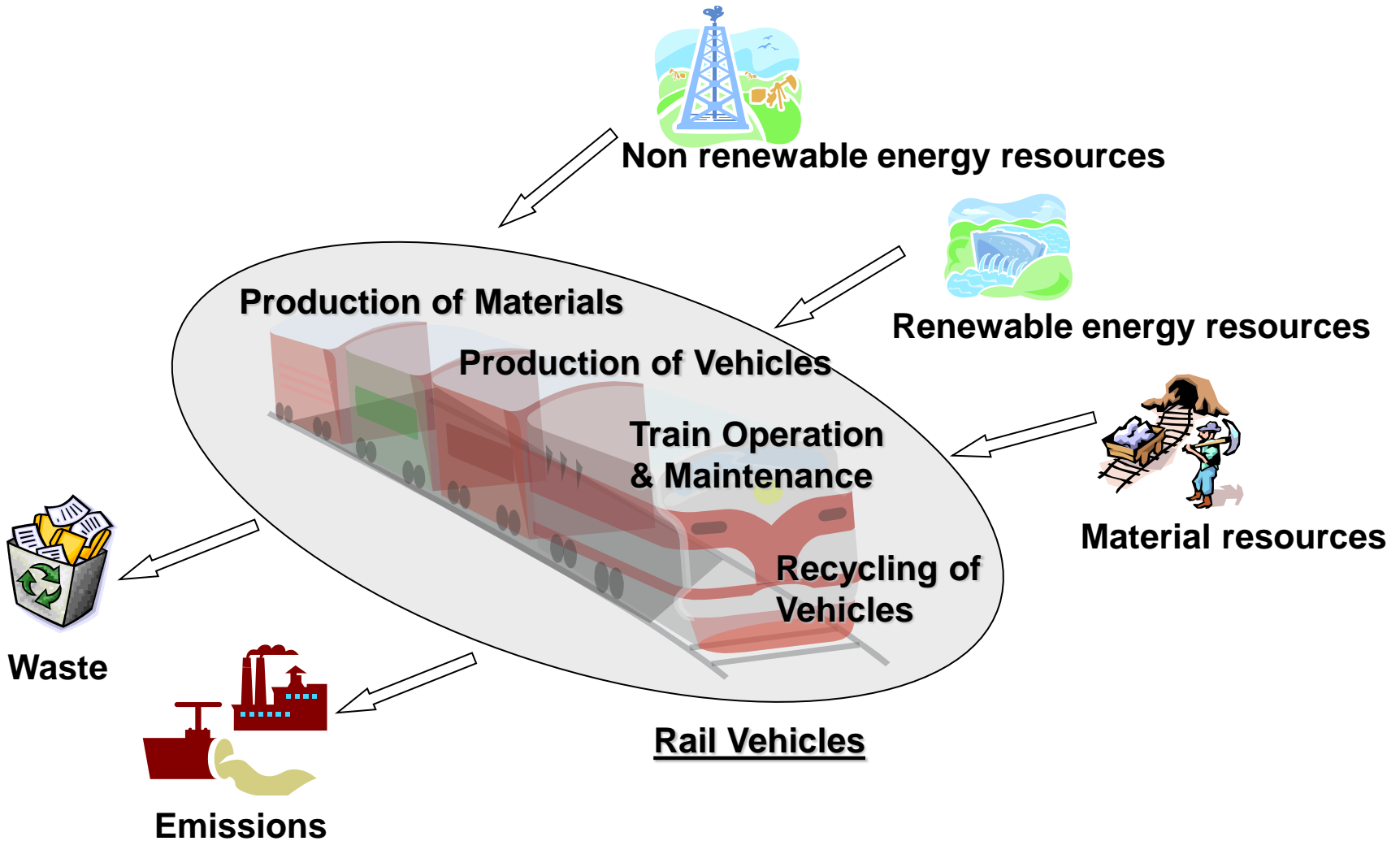
- Currently six EPDs based on PCR 2009:05 have been publicly released
 - Bombardier
 - Spacium
 - INNOVIA ART 200
 - REGINA Intercity X55
 - Ansaldo Breda
 - Metro Roma Line C
 - Metrobus Brescia
 - CAF
 - Tram Zaragoza

The screenshot displays the EPD website interface. At the top, there is a navigation bar with tabs for 'Using EPDs', 'Creating EPDs', and 'PCR'. Below this is a search bar and a 'Site search' button. The main content area is titled 'RAIL VEHICLES' and contains a 'PCR INFORMATION' section. This section includes a note that the PCR is currently being updated and a description of the document's purpose. Below the information is a 'DETAILED INFORMATION' section with a table of key data points:

Name:	Rail vehicles
CPC Code:	495
CPC name:	Railway and tramway locomotives and rolling stock, and parts thereof
Approval date:	2009-12-01
Registration No.:	2009:05
Valid until:	2014-12-01
GPI version:	GPI 1.0
Based on:	Passenger vehicles Transport equipment
Contributor(s):	Alstom, Siemens, AnsaldoBreda, Facon-Bremer, CAF Breda, UNIFE
Prepared by:	Bombardier
PCR moderator(s):	Sara Palsson Bombardier

At the bottom of the page, there is a section titled 'EPDs BASED ON THIS PCR' which features a row of small images representing various rail vehicles.

PCR Rail Vehicles Scope

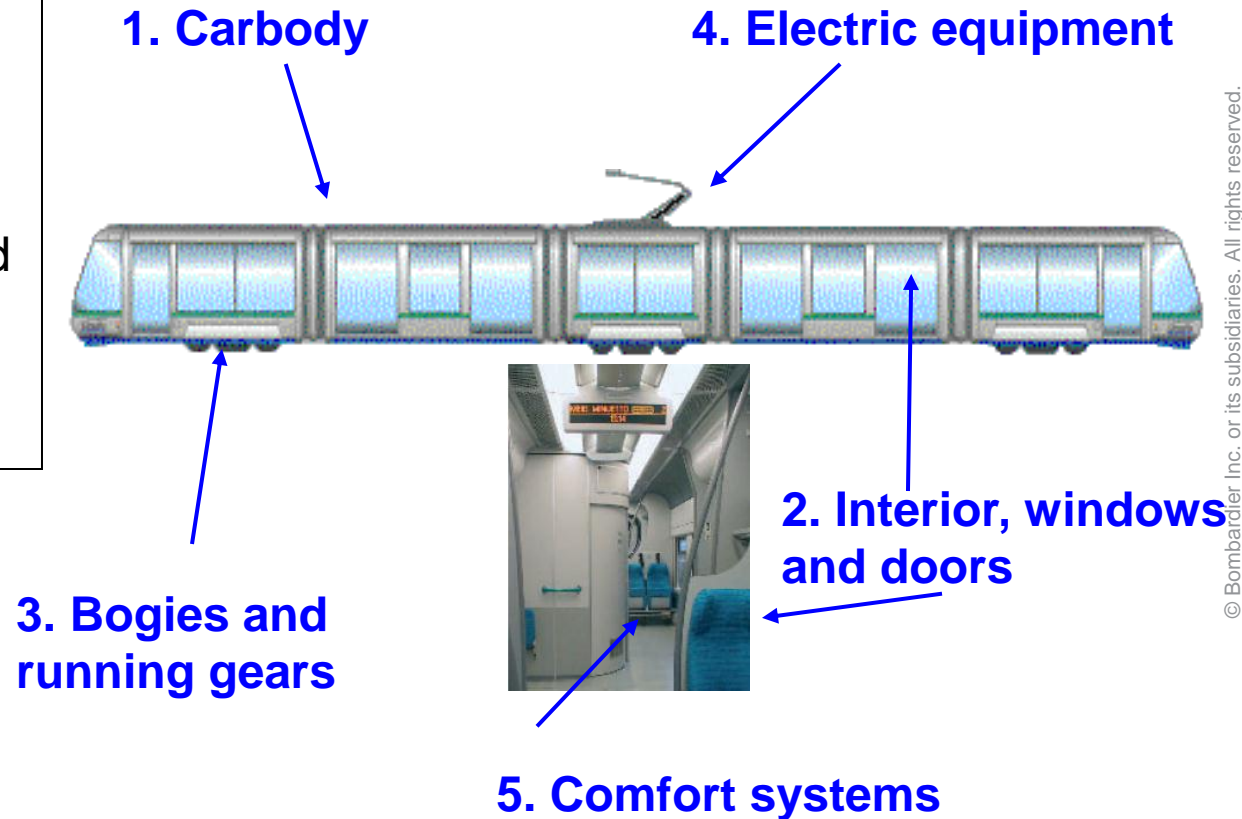


PCR Rail Vehicles

Service types

- Passenger transport:
 - Urban
 - Suburban
 - Regional
 - Intercity
 - High / Very high speed
- Freight transport:
 - Mainline

Product Groups



EPD - Content

- **Company Introduction**
- **Product Information**
- **Environmental Management System**
- **Environmental Performance**
 - Use of resources
 - Waste generation
 - Impact categories (GWP, ODP etc.)
- **Technical performance**
 - Energy consumption
 - Noise emissions
 - Recyclability and recoverability
 - Exhaust gas emissions (if Diesel)
- **Other information**



Life cycle assessment as basis for an EPD - Example

Goal and Scope

- Main goal: life cycle impact of an electrical train as basis for further improvements
- Functional unit: transportation of 1 passenger over 100km
- Considered life cycle stages:
 - Upstream module (raw material extraction, component production)
 - Core module (final assembly)
 - Downstream module (use and end-of-life)
- Operational lifespan assumed to be 32 years
- Cut-off rules as defined by PCR
- Generic as well as site/product specific data
- CML2001 impact assessment method

The screenshot displays the SimaPro software interface for a Life Cycle Assessment (LCA) of an electrical train. The main window shows a parameter table for 'LCA' with columns for Name, Unit, Amount, Factor, and E-Profile/Impact. Below this, there are two tables: 'Outputs' and 'Inputs', both with columns for Name, Quantity, Amount, Factor, and E-Profile/Impact. The 'Outputs' table lists various emissions such as CO2e, SO2, and NOx, while the 'Inputs' table lists resources like electricity and water. The software interface also includes a tree view on the left and a top menu bar.

Name	Unit	Amount	Factor	E-Profile/Impact
Param_C02_e	kg	1	1	kg CO2e
Param_SO2	kg	1	1	kg SO2
Param_NOx	kg	1	1	kg NOx

Name	Quantity	Amount	Factor	E-Profile/Impact
CO2e [kg]	1	1	1	kg CO2e
SO2 [kg]	1	1	1	kg SO2
NOx [kg]	1	1	1	kg NOx

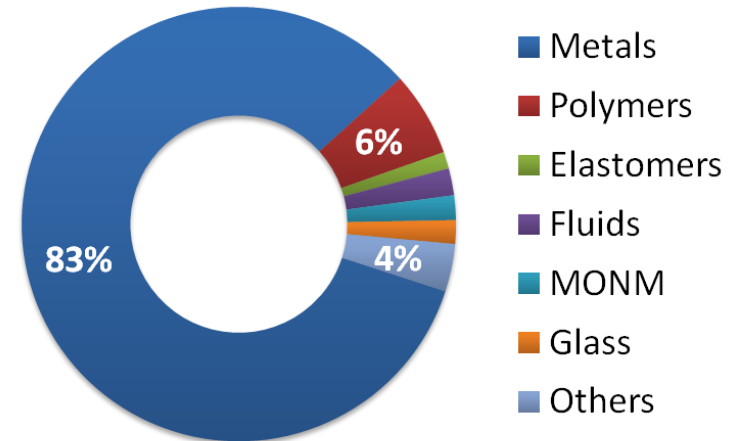
Name	Quantity	Amount	Factor	E-Profile/Impact
Electricity [kWh]	1	1	1	kWh
Water [m3]	1	1	1	m3

Life cycle assessment as basis for an EPD - Example

Life Cycle Inventory results

- Material composition including materials used during production and maintenance for 32 years of operation
- Resources used over the life cycle without regenerative braking

Material composition of the train

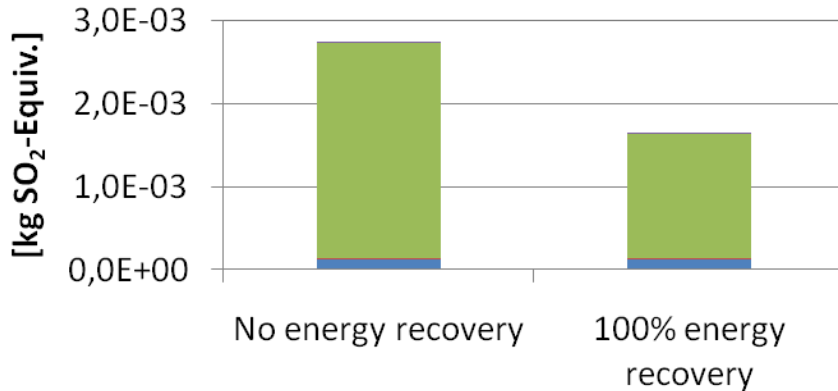


	Upstream module	Core module	Downstream module		Total
			Use	EoL	
Non-renewable resources					
Material [Kg/pass.100km]	0.55	0.33	32.5	0.007	33.4
Energy [MJ/pass.100km]	0.29	0.23	29.2	0.003	29.7
Renewable resources					
Material [Kg/pass.100km]	0.38	0.24	25.6	0.006	26.3
Energy [MJ/pass.100km]	0.03	0.01	4.8	0.0001	4.8

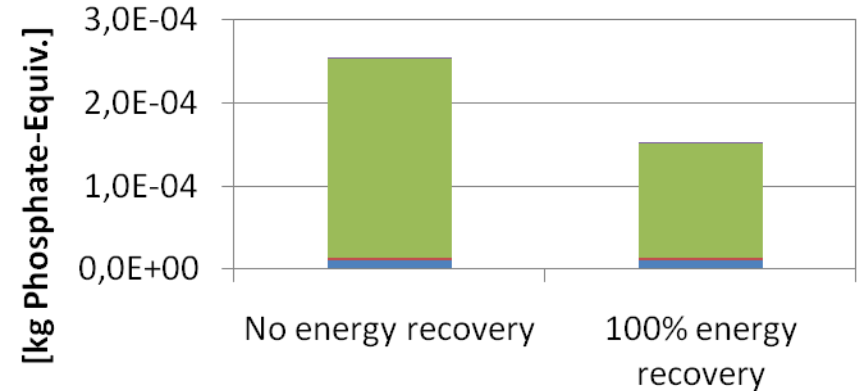
Life cycle assessment as basis for an EPD - Example

Life Cycle Impact Assessment

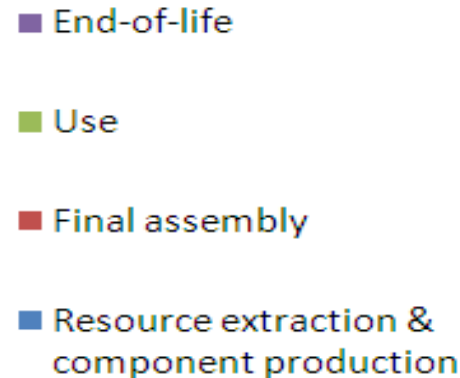
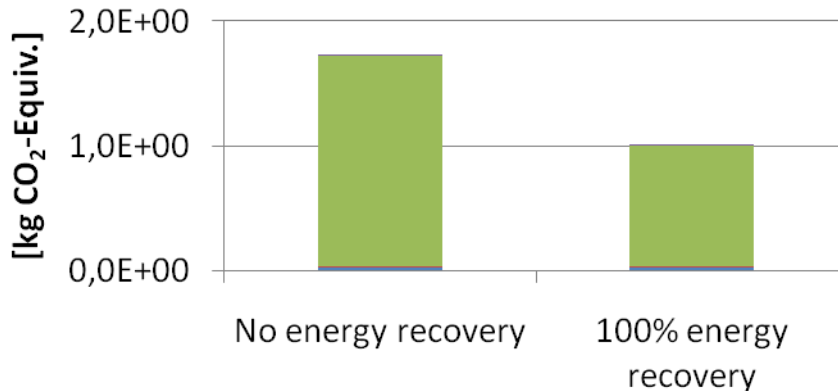
Acidification potential



Eutrophication Potential



Global Warming Potential



Conclusions based on LCA and EPD (1/2)

- **Environmental impact dominated by the use phase for all studied impact categories**
- **Most significant impact is by secondary emissions resulting from energy production for operation**
 - high potential for improvement associated with energy consumption
 - Reduction of amount of energy used
 - Reduction of the emissions caused by energy production and consumption

Conclusions based on LCA and EPD (2/2)

- **Phase of raw material extraction (including component production) also shows a significant impact for most considered impact categories**
 - additional focus on material selection
- ⇒ **LCA and EPD deliver key environmental performance drivers – considered in future projects.**

Every project benefits from the experience gained in the previous one and helps to continuously improve the overall environmental performance of Bombardier products.

Thank you for your attention!



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