

**Malin Kotake and
Linus Karlsson**

**EPDs for the Botnia
Line and future
work with PCRs in
the transport
sector**



TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

**EPD stakeholder
conference
May 15, 2012**



The task of the Swedish Transport Administration

Trafikverket:

- is responsible for the long-term planning of the transport system for road traffic, rail traffic, maritime shipping, and air traffic
- is responsible for construction, operation and maintenance of the state road network and national railway network

The road network 98,400 km of state roads
41,000 km of municipal streets and roads
76,100 km of private roads with state grants

The railway network
11,900 km of railway line
90% electrified



Outline of presentation

- Part 1 EPD: s for the Botnia Line

- A vision, a decision, a result
- Benefits and fields of application
- Methodology and mode of operation
- Conclusions and result
- International outlook
- Moving on.....

Part 2 Future work with PCRs in the transport sector



The Vision

Information to passengers and transport buyers

**BOTNIABANAN AB** LKM9027I0001

Umeå Ö - Nyland **1 klass**
Denna biljett berättigar till en tur- och returresa längs hela Botniabanan.
1 Vuxen

Umeå Ö - Nyland Botniabanan

Avgång	Ankomst	Tåg
12.02	13.06	0001

Nyland - Umeå Ö 1 klass

Avgång	Ankomst	Tåg	Vagn	Plats	Salong
20.12	21.16	0002	01	01	Fönster

Giltig 2010 och 2011

00689107 Bet 6913. Uth 6913

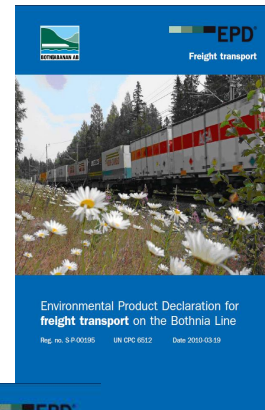
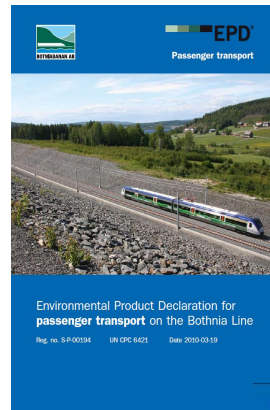


CO₂-emissions
Transport: 0,8 kg
Infrastructure: 5,0 kg
Total: 5,8 kg

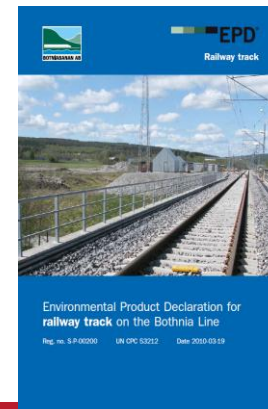
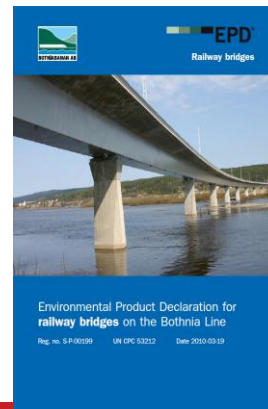
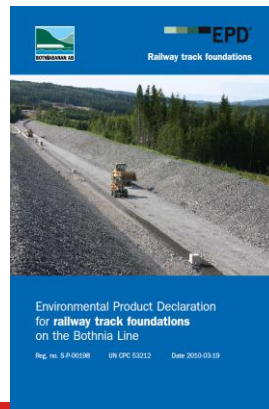
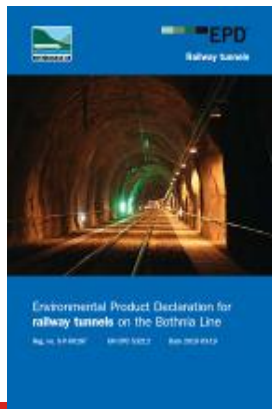
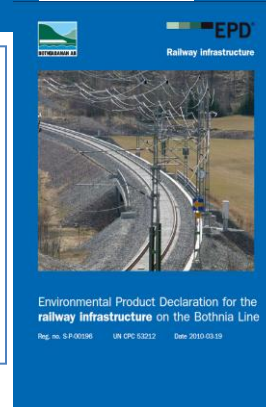
CO₂-fee 1,5 kr
(based on 24 EUR/tCO₂)

Comparison- car
CO₂-emissions: 36 kg
CO₂-fee 8 kr

The result



EPD:s for the Botnia Line

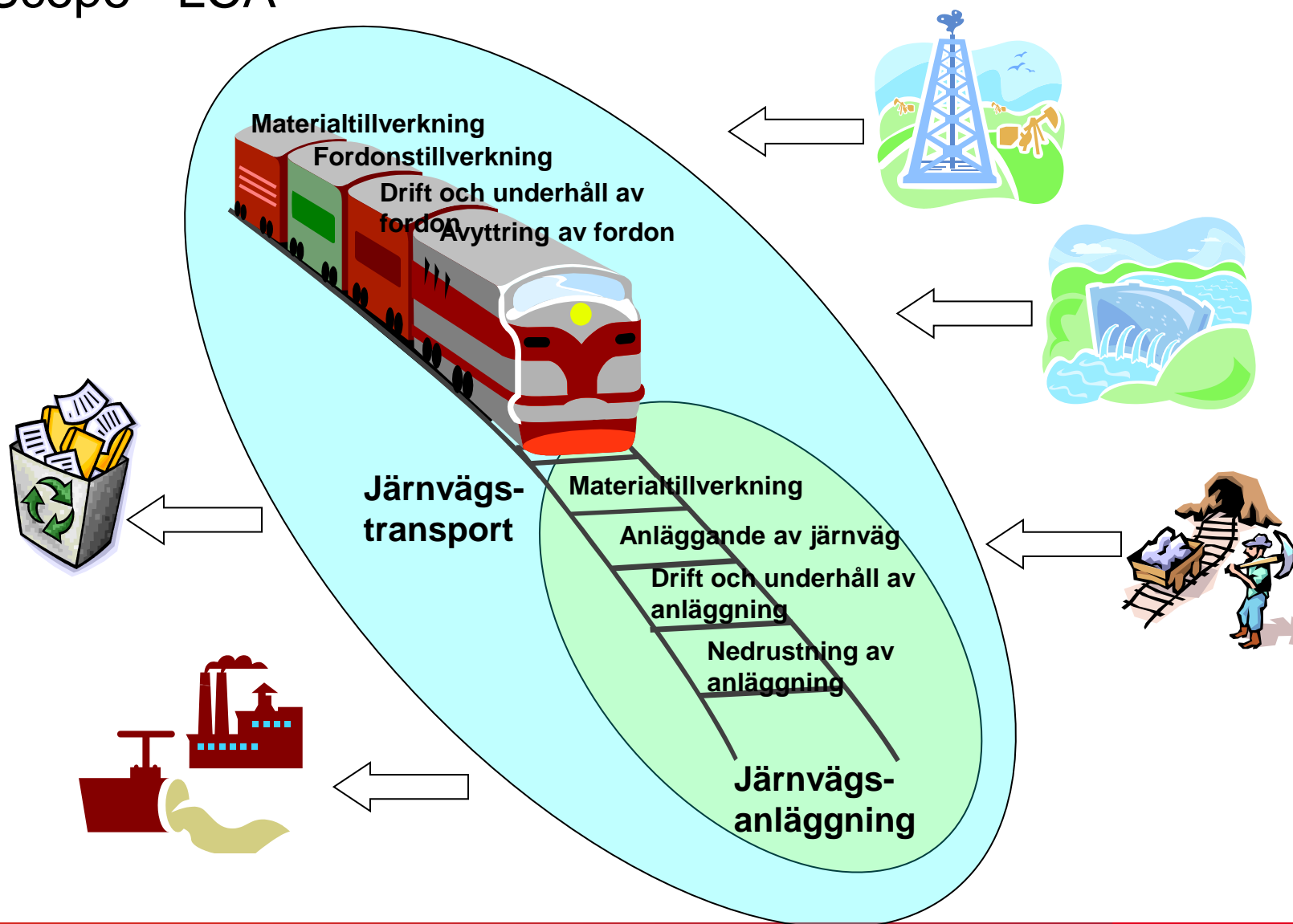


The Botnia Line – A part of the expanding European railway network

- 190 km new railway
- Single track with 20 meeting stations
- Heavy freight trains
- Fast passenger trains (250 km/h)
- ERTMS signalling system
- Building period 1999 – 2010
- 1,4 billion EUR



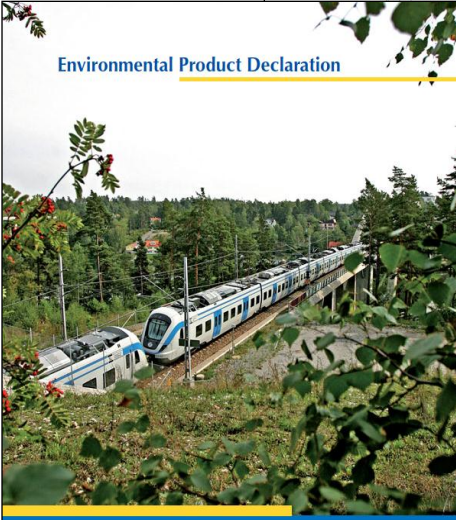
Scope - LCA



LCA for Botniabanan

We have used existing EPD:s for different parts of the system

Environmental Product Declaration



System Assembly

The information overview is based on a Life Cycle Assessment (LCA) of a fully mounted cabinet 2N550444-12. The assessment can be applied to the racks holding the central interlocking computers since these hold the same type of equipment in lower volumes than what is listed in an Object controller cabinet.

The LCA covers environmental aspects for the extraction and production of the raw materials used, transportation of major parts to the assembly plant, and energy consumption for final assembly (1 kWh) and the use phase (0.02 kWh). It also covers the end-of-life activities. No replacement of materials is expected during the lifetime.

end-of-life

Recyclability calculations are based on existing recycling processes that are commercially available and technically possible today. Energy recovery is included in the recyclability rate that is estimated to be 96%.

Recyclability (%)
100
100
98
100
100
35
96

end-of-life

Rail Control Solutions

A Presentation of Quantified Product Information on the Life Cycle of the

CORADIA LIREX Commuter Train for Stockholm/Sweden

ALSTOM

BOMBARDIER

Environmental Product Declaration

EBI Lock 950 – Interlocking System

Product description

EBI Lock 950 computer based interlocking systems supervise and control various objects such as signals, point machines and level crossing protection equipment. The interlocking system receives among others, route commands from traffic control centres or local control systems, and sends indications or status reports back. The interlocking system checks that conditions for the commands are fulfilled, locks routes, and releases them after the train passes.

EBI Lock 950 systems comprise an interlocking and centrally held level with its own Object controller units computers in rack boards.

Modules have which used level with its own Object controller units computers in rack boards.

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end-of-life

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Rail Control Solutions

BOMBARDIER

Environmental Product Declaration

EBI Switch 2000

Product description

The Life Cycle Assessment (LCA) overview is based on the Eurobalise Clif. It covers environmental aspects for the extraction and production of the raw materials used, transportation of major parts to the assembly plant and the energy consumption for final assembly (12 kWh). It also covers the end-of-life activities. No maintenance or replacement of materials is expected during the lifetime. Bombardier Eurobalise are powered by passing trains and do not need an external power supply or batteries, thus the energy consumption during use phase is negligible.

end-of-life

Recyclability calculations are based on existing recycling processes that are commercially available and technically possible today. Energy recovery is included in the recyclability rate that is estimated to be 96%.

Rail Control Solutions

BOMBARDIER

Environmental Product Declaration

EBI Link 2000 – Eurobalise



System Assembly

The Life Cycle Assessment (LCA) overview is based on the Eurobalise Clif. It covers environmental aspects for the extraction and production of the raw materials used, transportation of major parts to the assembly plant and the energy consumption for final assembly (12 kWh). It also covers the end-of-life activities. No maintenance or replacement of materials is expected during the lifetime. Bombardier Eurobalise are powered by passing trains and do not need an external power supply or batteries, thus the energy consumption during use phase is negligible.

end-of-life

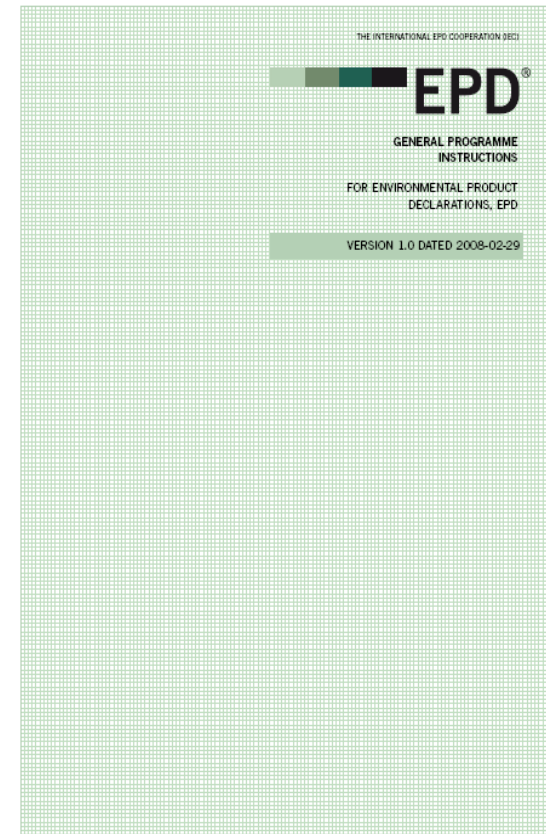
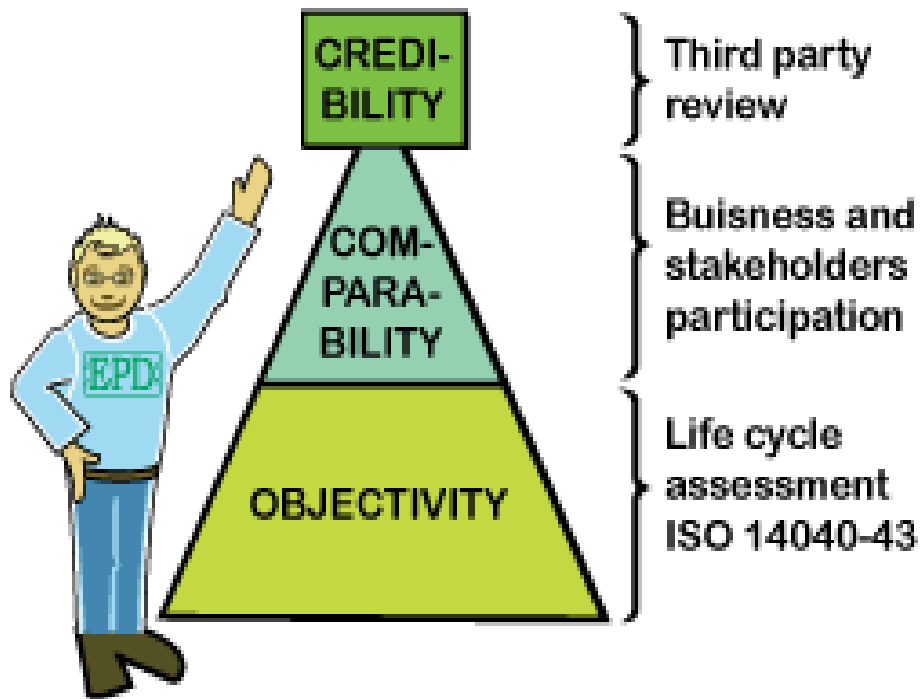
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Rail Control Solutions

International

EPD[®]-system

Based on ISO 14025





PRODUCT CATEGORY RULES (PCR)

for preparing an
Environmental Product Declaration (EPD)
for

Interurban railway transport services of passengers
UN CPC 6421,
Railway transport services of freight
UN CPC 6512
and
Railways
UN CPC 53212

PCR 2009:03

Version 1.0
2009-08-18

This PCR-document is in compliance with *GENERAL PROGRAMME INSTRUCTIONS for environmental product declarations, EPD* published by The International EPD Consortium (IEC), as a part of the EPD system.

Information about the EPD®system and registered EPDs:
www.environdec.com. Comments on the PCR-document: please use the Global PCR Forum.

PCR developed by:
Botnia Line AB
Trafikverket
Linköping University
Stakeholders

Scope of PCR:
Includes all direct and indirect
environmental load from rail
transport services

Possible to develop EPDs for:

- Transport service
- Infrastructure systems
- Parts of infrastructure

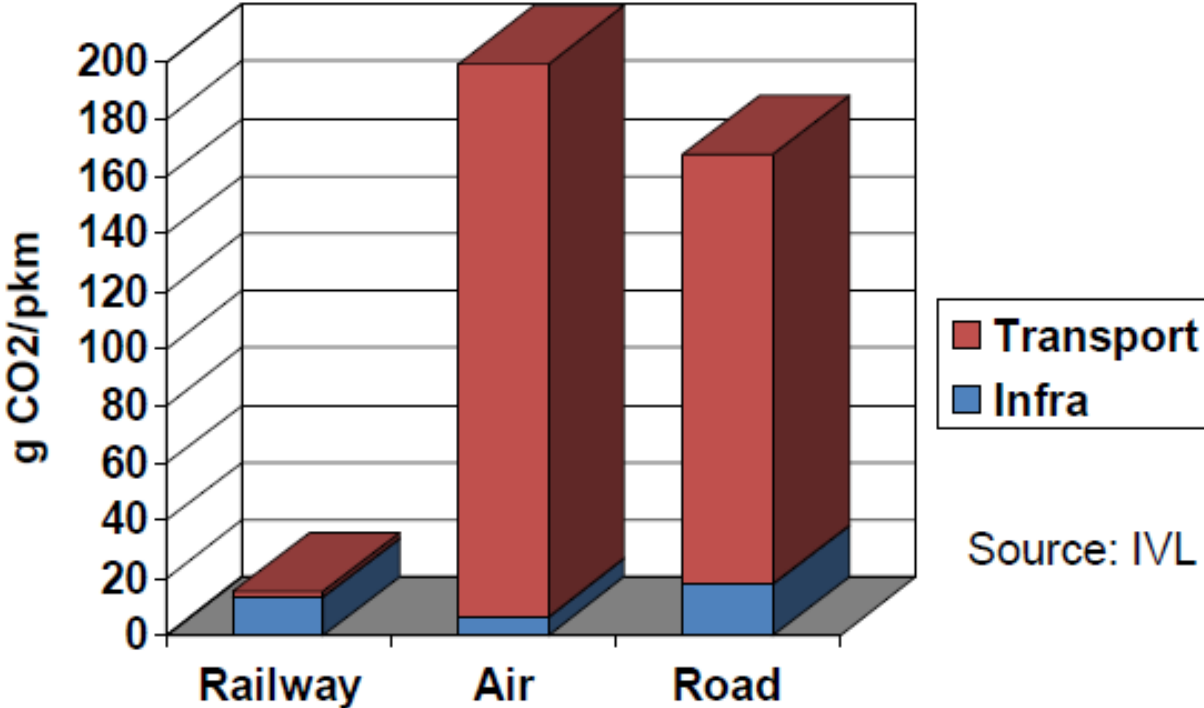
Benefits of EPD:s for infrastructure and transport services

- Overall picture – what is significant and what is not
- Focusing measures where most effective
- Tool for planning
- Followup/Accounting/Reporting
- Communication
- Fields of application EIA, Carbon footprint, Environmental management, CEEQUAL etc.



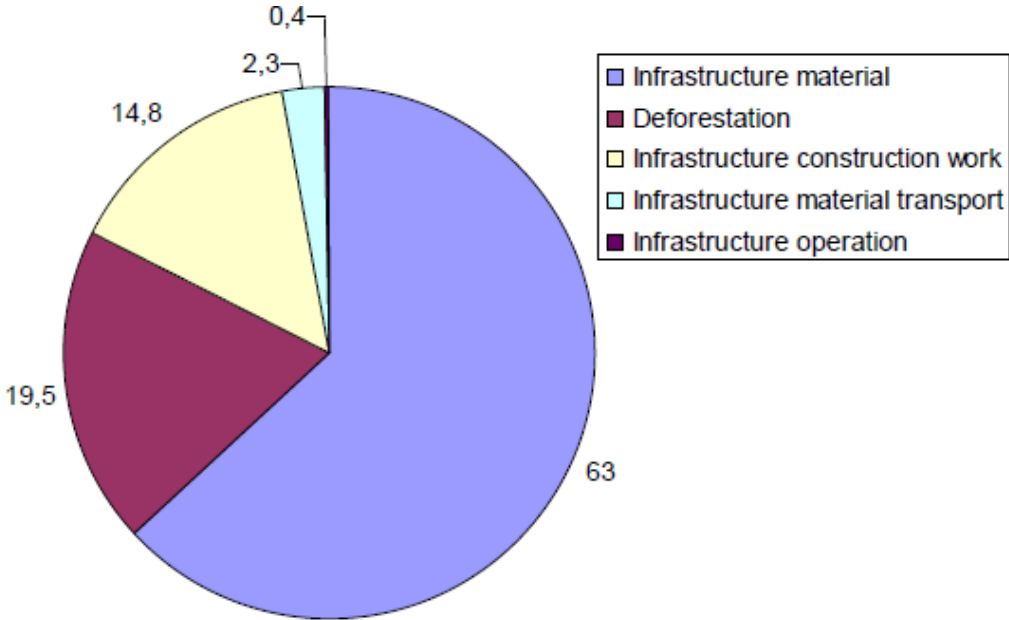
Reduce environmental impact – Improve environmental performance

Comparing transport modes Källa: IVL



Source: IVL

Dominating processes for railway infrastructure



Percentages of total greenhouse gas emissions for 1 km Bothnia Line over 60 years
Total: 3 870 ton CO2-equivalents

Contribution to GWP from infrastructurematerial:

Material	Track	Tunnel	Bridge	Stations	Terrass	EST	Totalt
Stål	29%	4%	5%		3%	3%	43%
Cement	6%	10%	11%		5%	0%	32%
Byggnader				11%			11%
Aluminium						4%	4%
Spräng- medel	0%	2%			1%		3%
Plast	0%	1%			1%	1%	2%
Koppar						1%	1%
Totalt	35%	16%	16%	11%	10%	9%	97%

- Rail 26 %
- Cement for bridges and tunnels 21%

What effects can choice of steel supplier give?

Bothnia Line: 85 800 ton rail steel during 60 years (including reinvestments)

Rail supplier 1: 2,83 kg CO₂/kg steel (generic database data)

Rail supplier 2: 1,92 kg CO₂/kg steel (32 % less) (specific data)

Emissions supplier 1: 242 814 ton CO₂

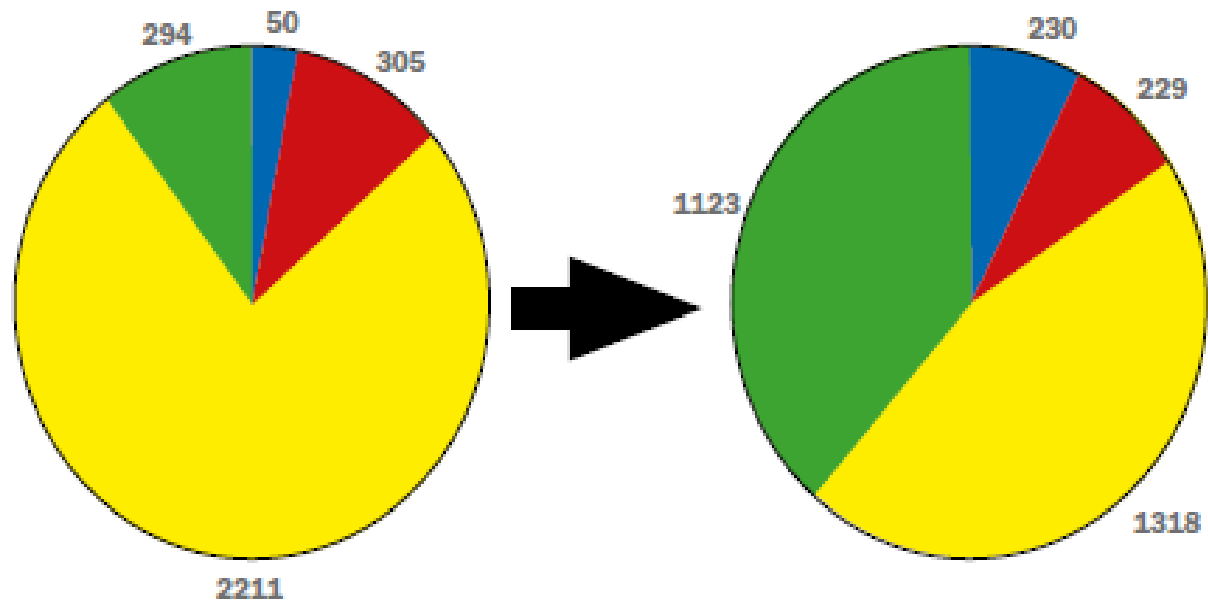
Emissions supplier 2: 164 736 ton CO₂

Difference: 78 078 ton CO₂ !!

Equals:

- 9 % of total CO₂-emissions from railway infrastructure over 60 years
- 9 700 rounds around the earth with car
- Total emissions from railway traffic in Sweden per year

Additional aspects - Biotopemethod



BIOTOPE AREAS BEFORE (HA)

BIOTOPE AREAS AFTER (HA)







The result of Trafikverkets first EPD

Projekt	CF (g CO ₂ /pkm)	Biotope (cm ² CB/pkm)	Noise (cm ² disturbed birdbiotope /pkm)	Socio- economic benefit	CF/SE
Botniabanan	13	+0,2	6,1	1,3	10
Citybanan					
Citytunneln					
Götalands- banan					
Hallandsås					
Oslo - Ski					
Förbifart Stockholm					

International outlook – a selection

- Environmental budget for Follobanan in Norway
- Carbon footprint of High speed railway infrastructure – UIC project
- Network rail – Carbon Assessment of existing railway network
- Carbon footprint of existing rail- and road network in Finland



Conclusions

- Lifecycle perspective is essential in the planning- and buildingprocess of infrastructure
- EPD – gives knowledge and an overall picture
- Enables informed and aware choices in the longterm perspective
- Reduces both environmental impact and costs
- Source for communication of environmental performance
- Patience and endurance
- Circles on the water.... – lots going on in other countries



Ambitions and challenges 2012 and forward

- Implement LCA/EPD-method in other projects
- Improve LCA-models and develop tools
- Input to CEEQUAL - sustainability and assessment awards in the construction sector
- Integrate knowledge from LCA in LCC
- Include environmental demands in procurement
- Implement reward systems to stimulate the market
- Synchronise road/railway – PCR infrastructure and PCR road



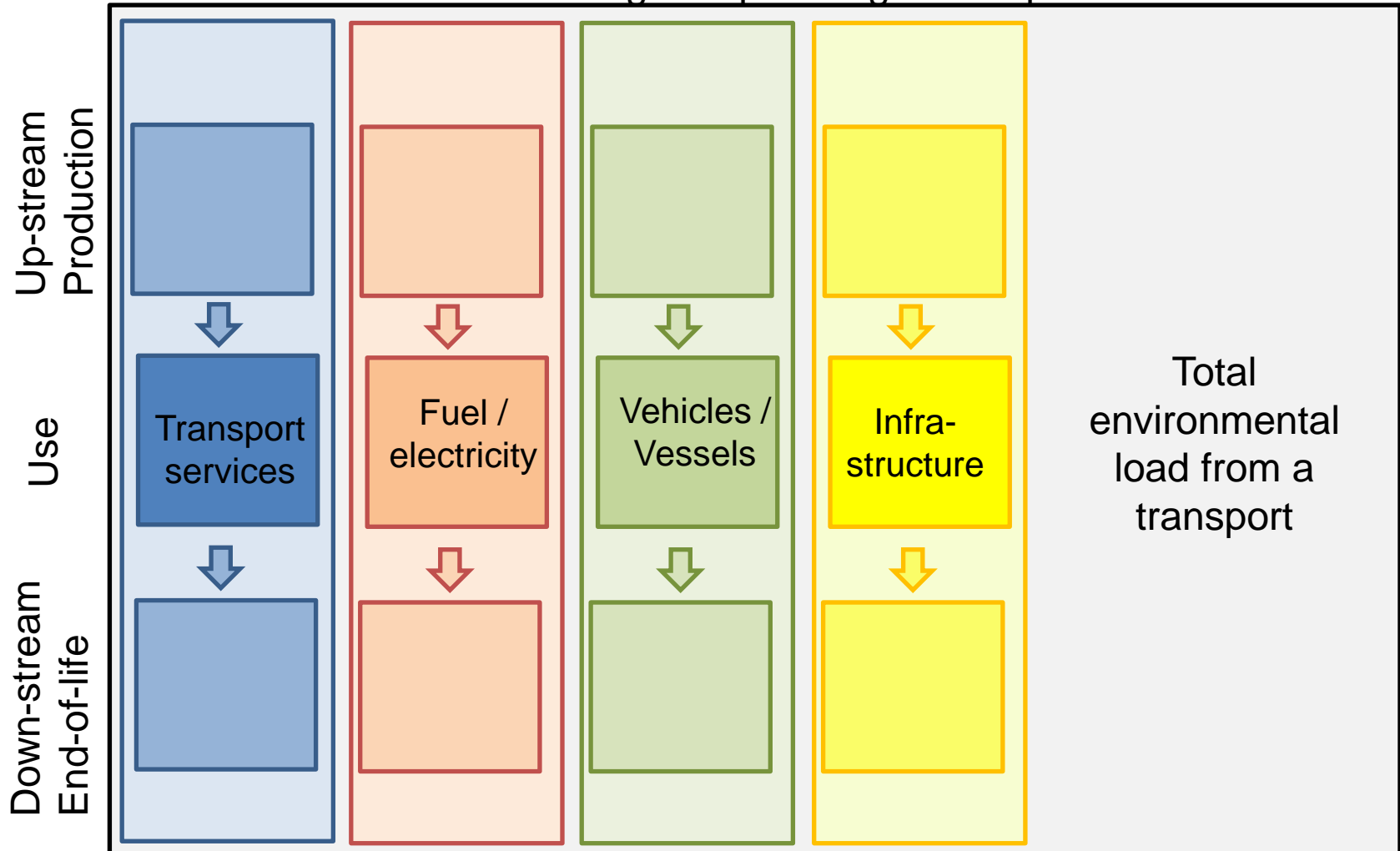
Future work with PCRs in the transport sector

- Development of PCRs for Transport infrastructure



"Map" of Transport System

All traffic modes – Freight or passenger transport



Existing PCR:s/EPD:s in the transport sector

	Infrastructure	Transport service	Vehicles & Vessels
Railway	Yes (Botnia Line)	Yes (Botnia Line) Under development	Existing in some extent
Road	No	Under development	No
Shipping	No	Under development	No
Air	No	Under development	No

Why EPDs on transport infrastructure?

- Infrastructure can be a "module" in a EPD for a Transport
- Declare environmental impact of infrastructure



Project participants and time plan

Moderator

- Swedish Transport Administration

Product Category Stakeholder Consultation Group

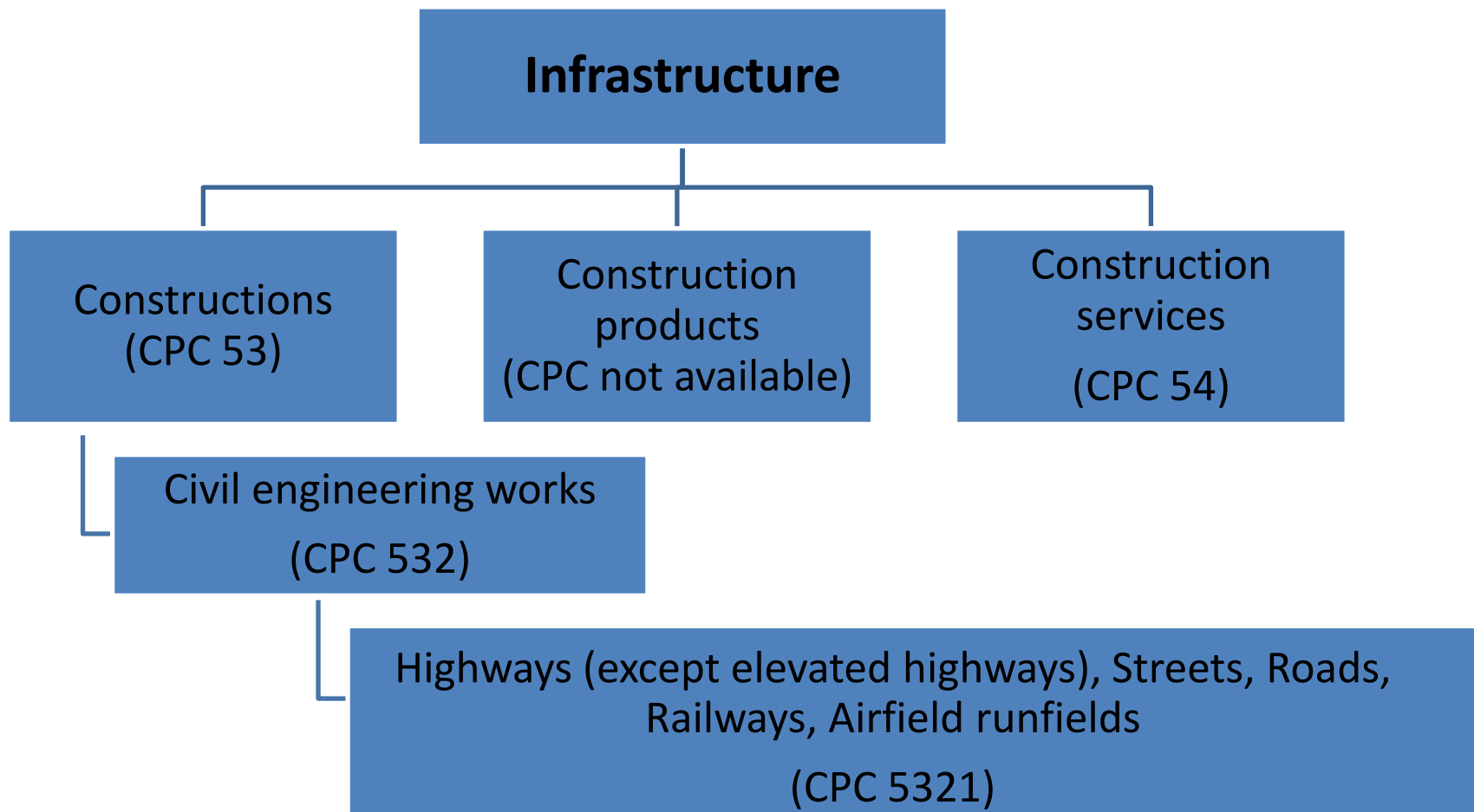
- Norwegian Road Administration
- Norwegian Railway Administration
- WSP
- MiSA
- Tyréns
- Asplan VIAK
- VTI

Time plan

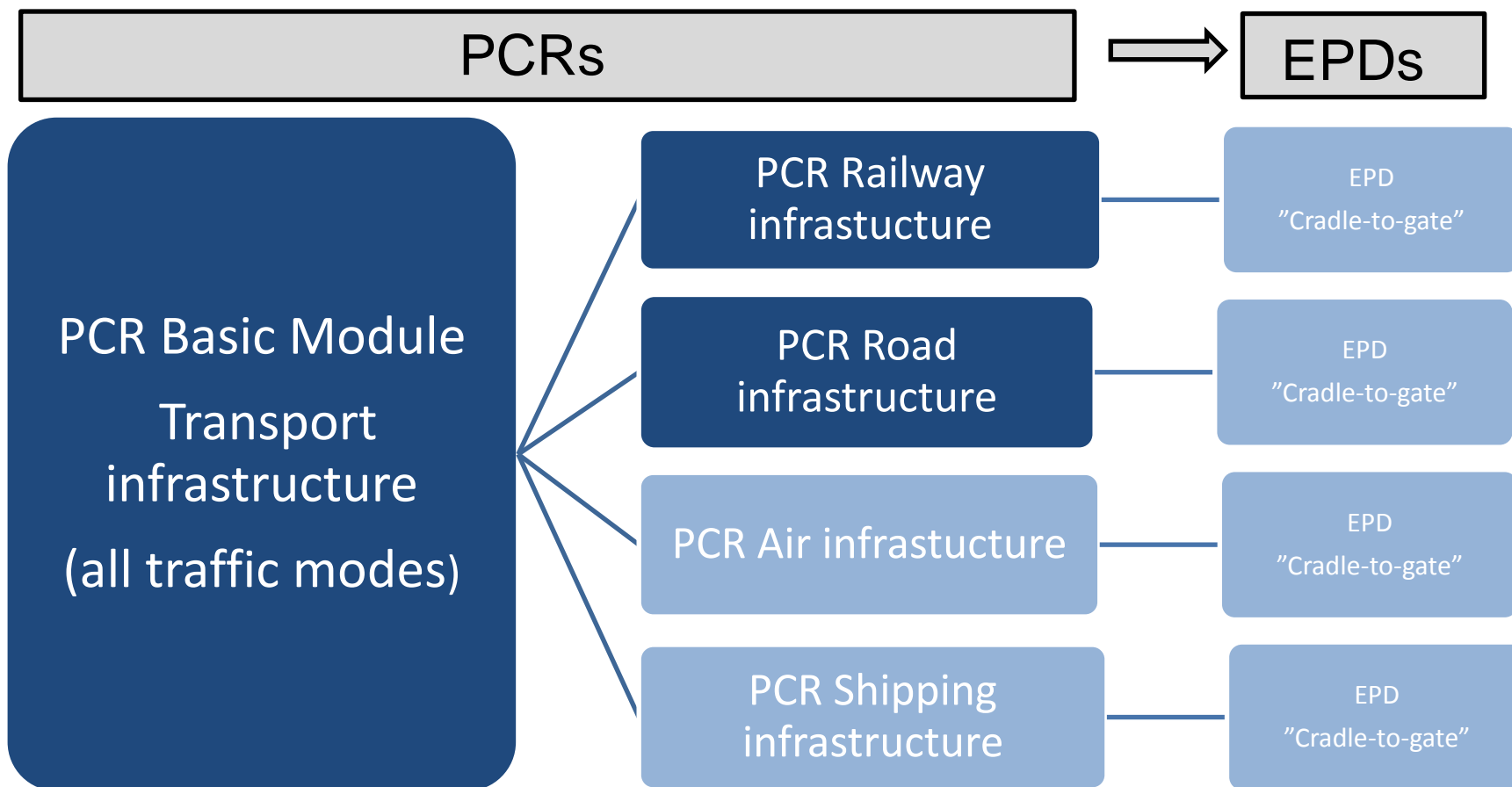
Open consultation	September / October 2012
PCRs approved and published	December 2012



CPC codes and existing PCR



Aim: Create 3 PCRs



Crucial problems and challenges

- Life time

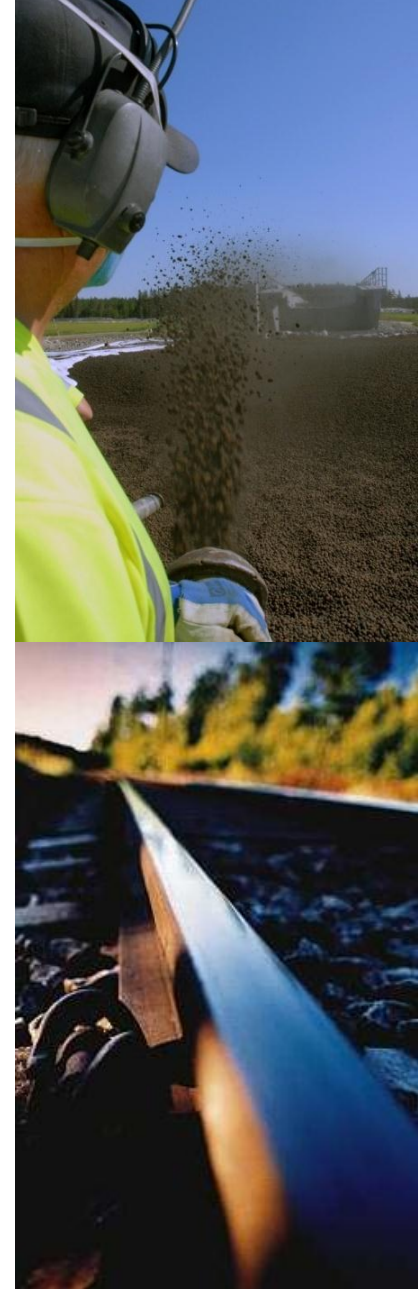


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Total environmental load for infrastructure per km infrastructure and year

Crucial problems and challenges

- **Cut of rules**
 - 10 % instead of 1 %
- **Additional environmental information**
 - Not part of the LCA but important environmental information shall be declared. E.g.:
 - Impact on biodiversity
 - Land use
 - Management of materials and substances
 - Noise




Expectations of the International EPD system


- Support
- Function as a platform
- Aim for compliance with other existing systems and standards



Thanks for your attention!




EPD
Passenger transport




Environmental Product Declaration for
passenger transport on the Bothnia Line

Reg. no. S-P-00194 UN CPC 6421 Date 2010-03-19



EPD
Freight transport



Environmental Product Declaration for
freight transport on the Bothnia Line

Reg. no. S-P-00195 UN CPC 6512 Date 2010-03-19

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