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THE EUROPEAN BITUMEN ASSOCIATION

Sustainability Assessment in the bitumen & asphalt industry

Mike Southern
Senior Technical Advisor

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Sustainability – Why ?

- Environmental Impact Assessment – an introduction
- What is the driver for environmental impact assessment?
- How is Eurobitume contributing?
  - the Eurobitume Life-Cycle Inventory
- Some Environmental Impact assessment models

Question: How to quantify sustainability?

- Which is best/worst for the environment??

Porcelain cup

LDPE Coated paper cup

Disposable polystyrene cup

Assumes 250 working days/y ~4 cups per day

Functional (or Declared) Unit;

The dispensing of 1000 units of hot drinks (tea/coffee/hot chocolate) from a vending machine or dispenser in an office or factory environment.

Source: Single-use cups or re-useable (coffee) drinking systems: an Environmental Comparison, TNO report 2006-A-R0246(E)/B

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Answer; It depends….

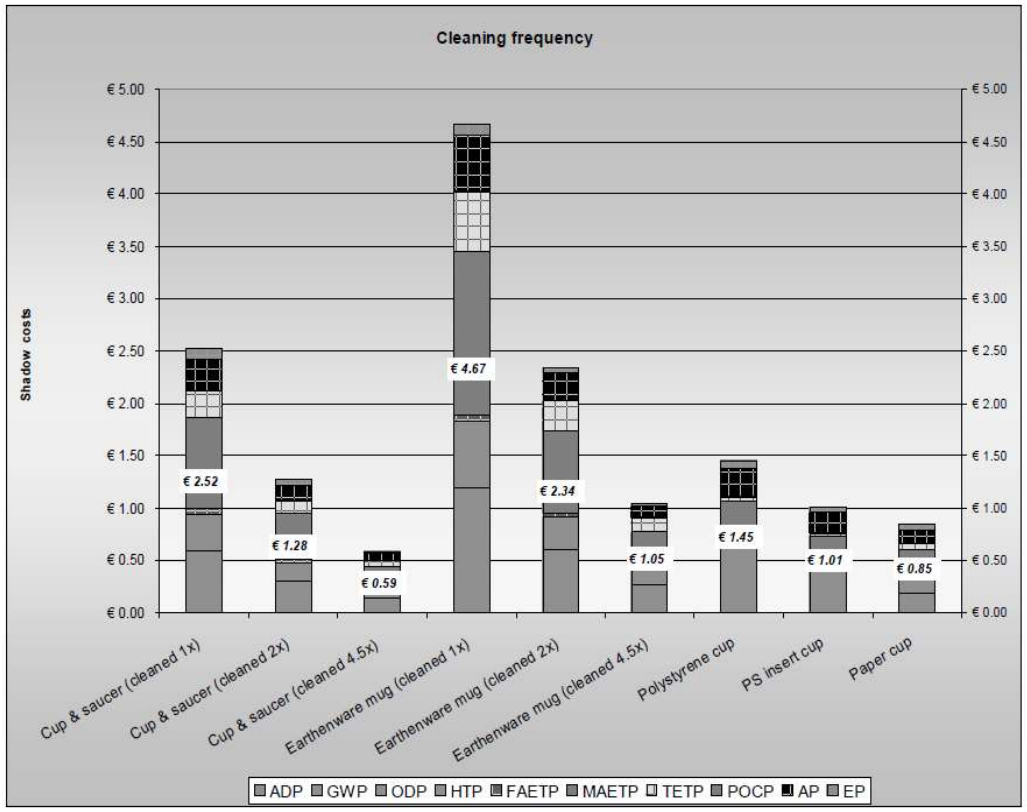

Figure 41 *Influence of the change in cleaning frequency of the reusable systems on the shadow costs. In the basic scenario, the reusable systems are cleaned each time after use. For the sensitivity analysis, (cleaned 2x) means cleaned each time after being used twice, (cleaned 4.5x) cleaned after being used 4.5 times on average*

Base assumptions are very important, e.g.;

- PO_4^{3-} = €9/kg (dishwasher powder)
- CO_2 = €0,05/kg

The shadow costs (€ 2.52) of the reusable porcelain cup and saucer are almost entirely (98%) determined by the user stage (see Table 38). The other stages make a negligible contribution.

During the user stage of the reusable porcelain cup and saucer, the energy consumption of the dishwasher determines the environmental burden of this system. The change in this energy use clearly influences the shadow costs (see Table 45).

The total shadow costs of € 1.42 for the disposable polystyrene cup is largely determined by the production of polystyrene and that of the cup itself (see Table 40). The end of life stage, which comprises collection of the used cups, recycling of the cup and processing of the waste, produces a net negative shadow cost.

The question "What is better for the environment, drinking coffee out of a disposable or reusable cup?" can therefore only be answered on the basis of the specific operating situation.

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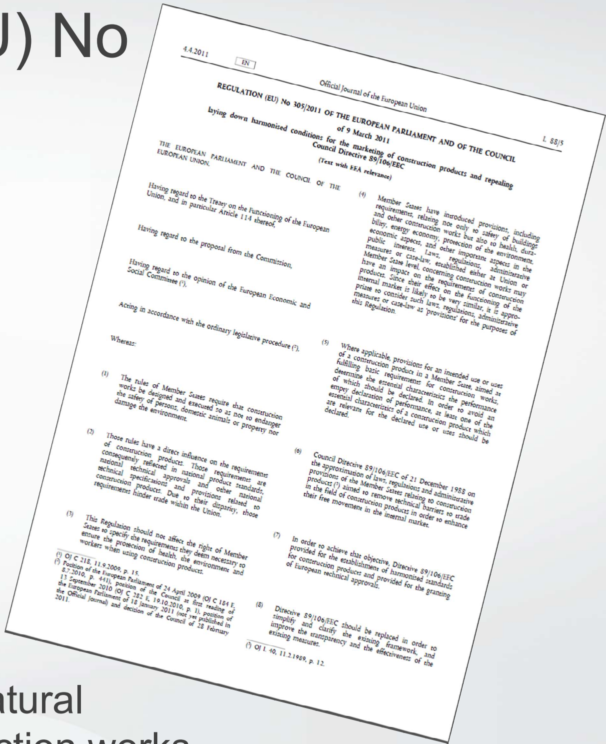
Regulatory Framework

- Construction Products Regulation (Regulation (EU) No 305/2011)
  - Establishes ‘Basic Work Requirements’ (BWR)
    - Mechanical resistance and stability
    - Safety in case of fire
    - Hygiene, health and the environment
    - Safety and accessibility in use
    - Protection against noise
    - Energy economy and heat retention
    - Sustainable use of natural resources;
      - The basic requirement for construction works on sustainable use of natural resources should notably take into account the recyclability of construction works, their materials and parts after demolition, the durability of construction works and the use of environmentally compatible raw and secondary materials in construction works.
  - The BWRs should be incorporated into product standards



4.4.2011 EN Official Journal of the European Union L 88/5

REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 9 March 2011

laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 114 thereof,

Having regard to the proposal from the Commission,

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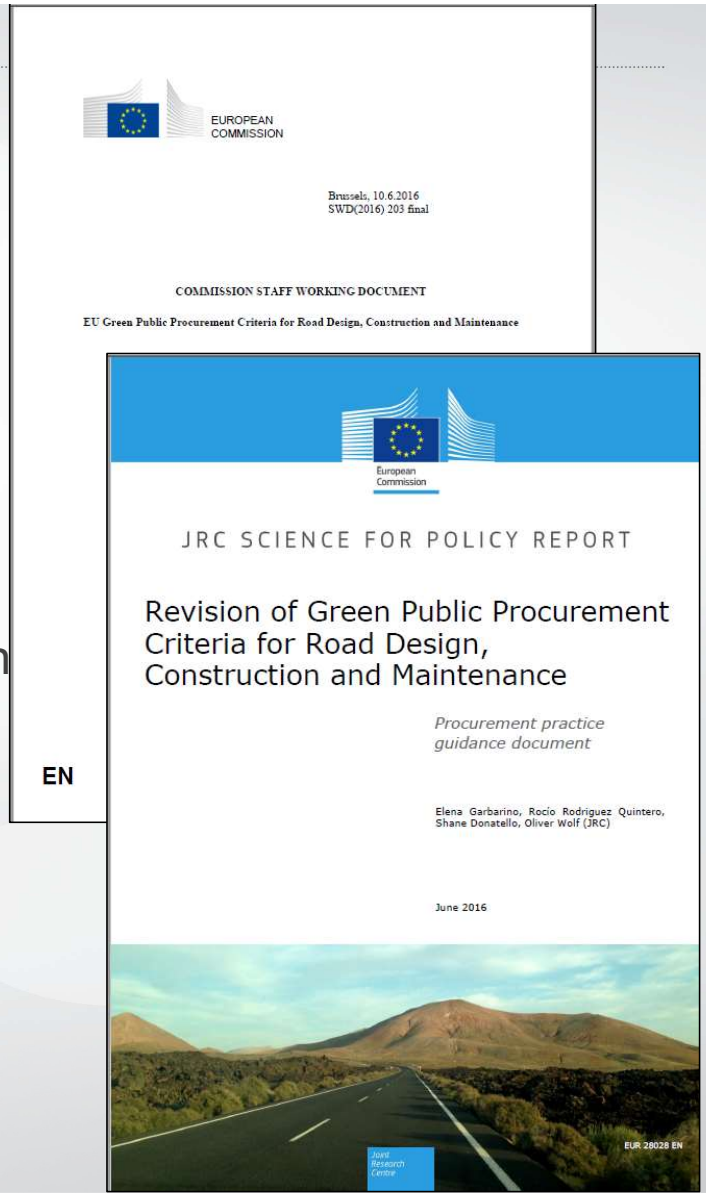
Green Public Procurement

European Commission

- Public authorities are major consumers
- GPP is a “voluntary instrument”, which means that Member States and public authorities can determine the extent to which they implement it
- The EU GPP criteria are developed to facilitate the inclusion of green requirements in public tender documents. While the adopted EU GPP criteria aim to reach a good balance between environmental performance, cost considerations, market availability and ease of verification, procuring authorities may choose, according to their needs and ambition level, to include all or only certain requirements in their tender documents.



Environmental Product Declarations (EPD)

- The rule book is based upon “Product Category Rules” (PCR)
  - Establishes the playing field to enable an impact assessment and, potentially, comparison between one system and another.

EUROPEAN STANDARD **EN 15804**

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2012

ICS 91.010.99

English Version

Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

Contribution des ouvrages de construction au développement durable - Déclarations environnementales sur les produits - Règles régissant les catégories de produits de construction

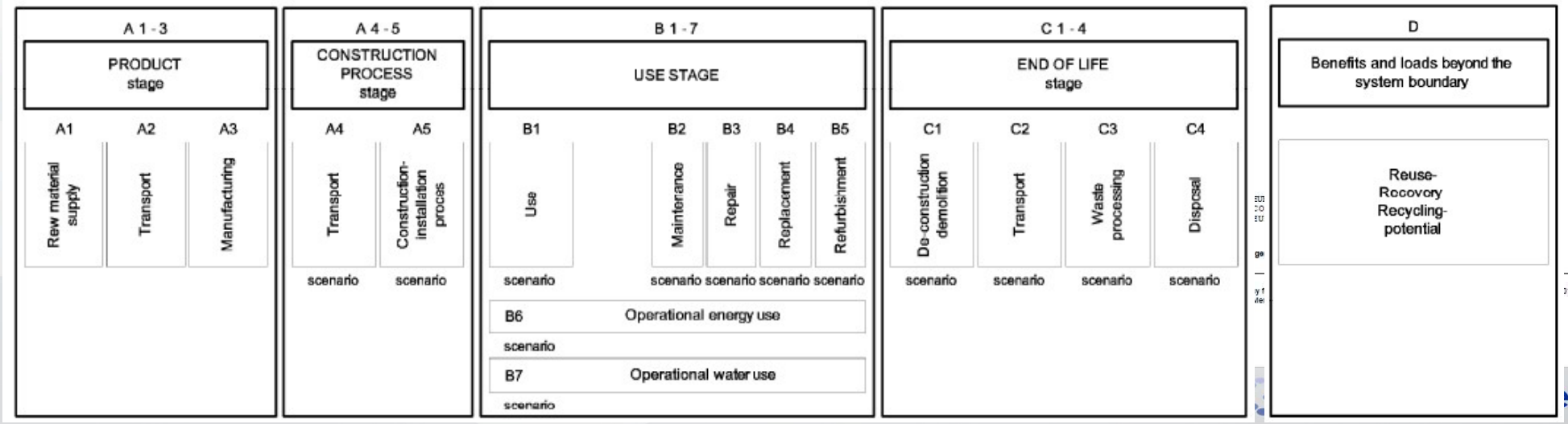
Nachhaltigkeit von Bauwerken - Umweltproduktdeklarationen - Grundregeln für die Produktkategorie Bauprodukte

This European Standard was approved by CEN on 13 November 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



Which system to use?

EN15804 +A1

- Currently used for vertical construction EI systems;
  - will continue to be used up to 2022
- 17 indicators;
  - 7 principal indicators

EN15804 +A2

- Currently not widely used in EI Assessment models
- 19 indicators
  - Some indicators are different to those in +A1;
  - Allows differentiation between fossil-derived and biogenic materials
  - 13 principal indicators

- Other EI Assessment systems also available;
  - Product Environmental Footprint (PEF)
  - ReCipE (research tool)
  - Environdec® EPD system
  - …
  - Most have similar, but different, EI endpoints

- Most Highway administrations focused only on GWP

Definitions: LCI, LC(I)A

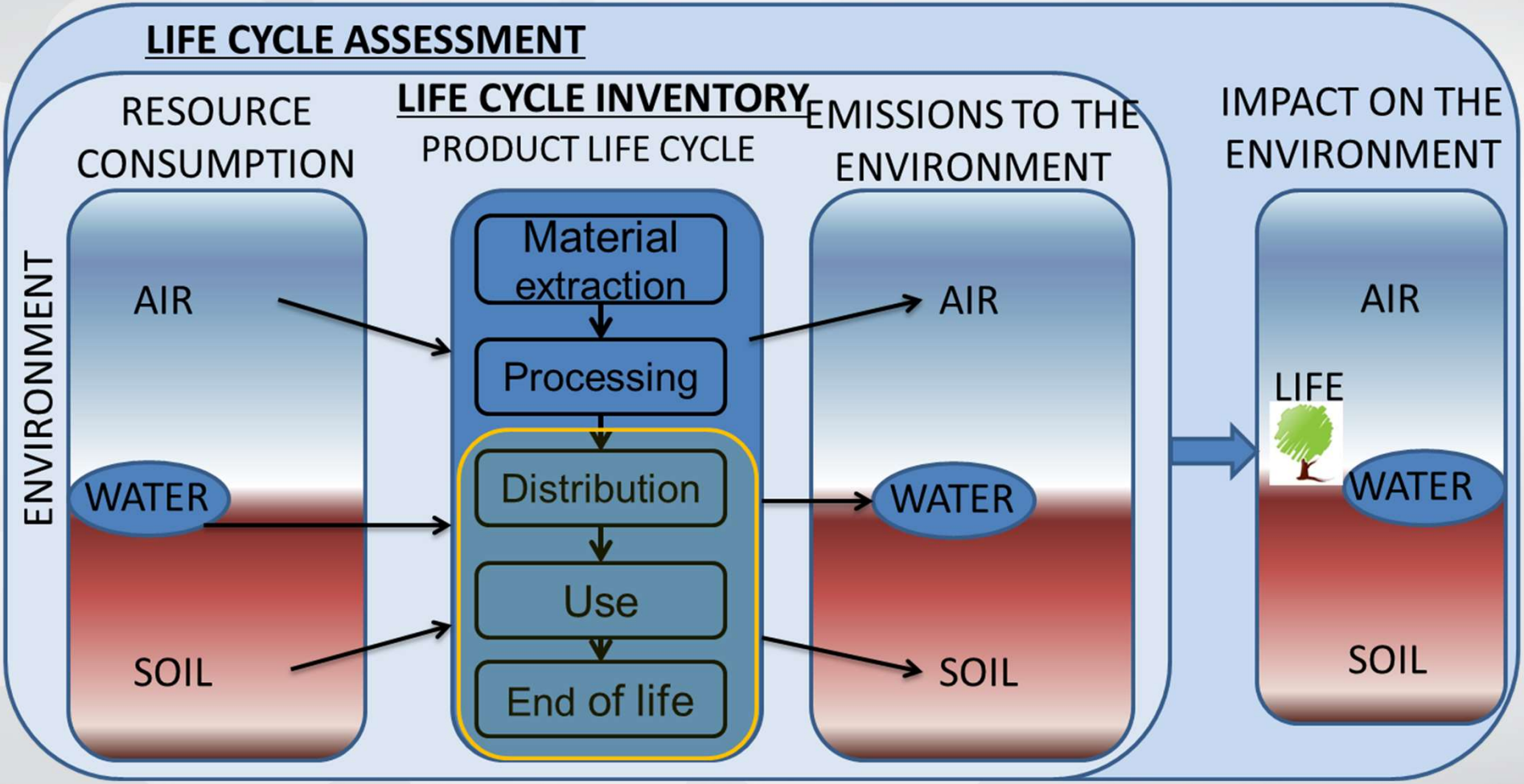
Life-Cycle Inventory:

- An inventory of flows from and to nature for a product system.
- Includes inputs of water, energy and raw materials, and releases to air, land and water
- Related to a defined **functional** (or **declared**) unit

Life-Cycle (Impact) Assessment:

- a technique to assess environmental impacts associated with all the stages of a product's life;
- from raw material extraction, materials processing, manufacture, distribution, use, repair and maintenance, …
- …and disposal or recycling/re-use.

LCI & LCA



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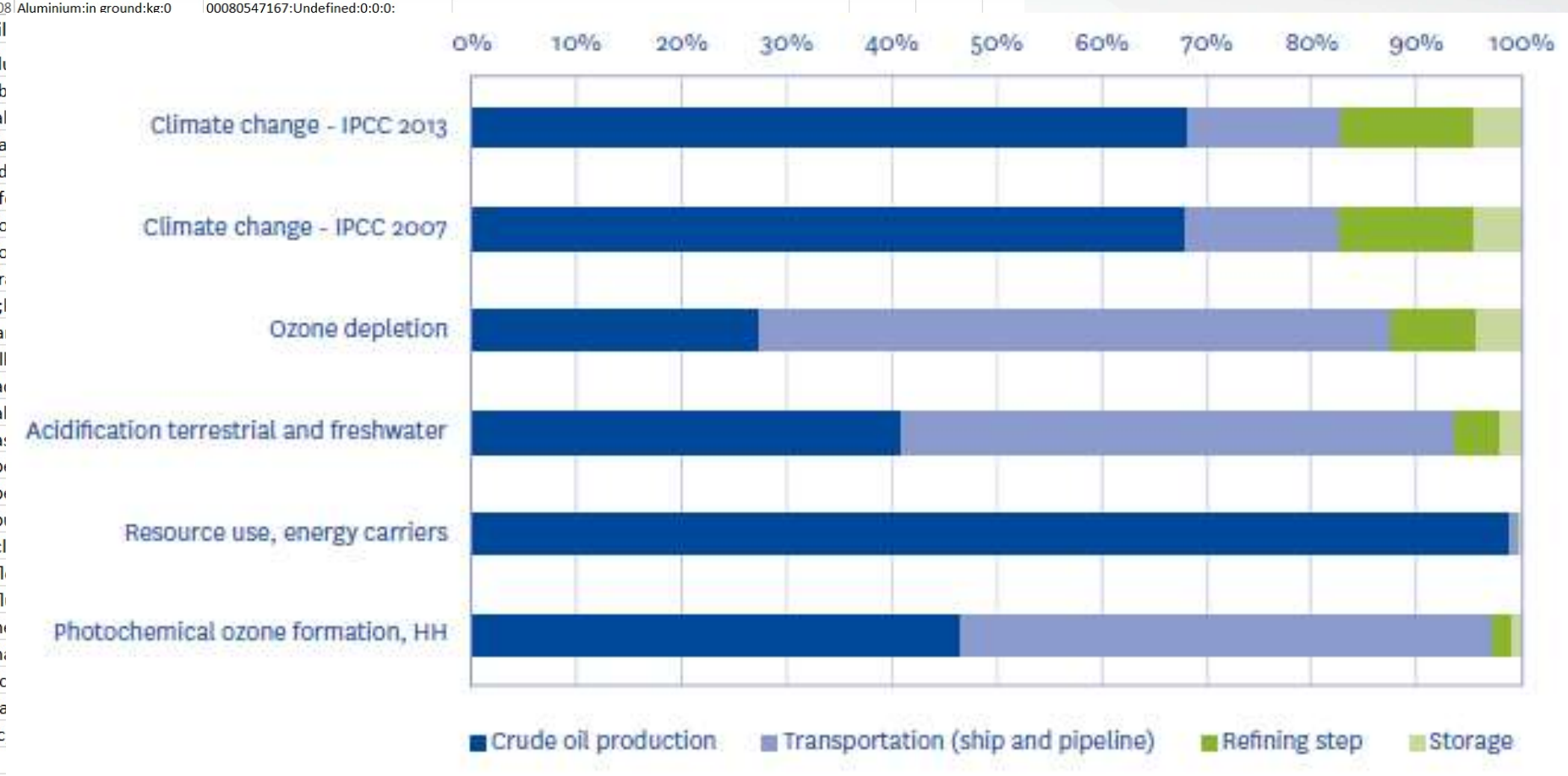
LCI and LCIA



Eurobitume_LCI_v0.2

LCI: Important considerations

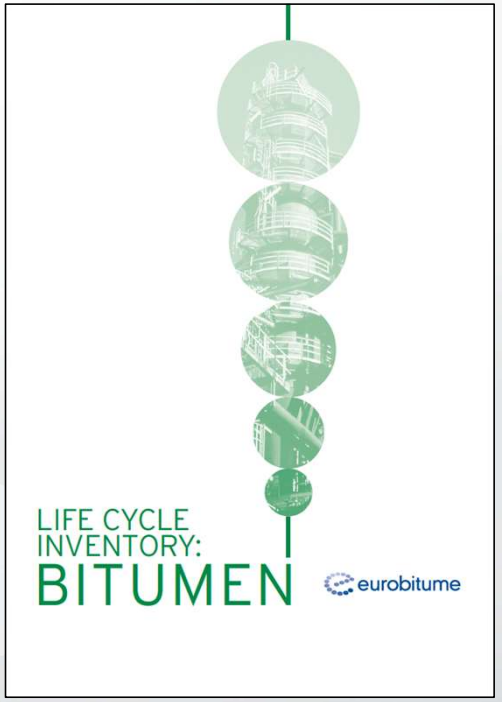
- System Boundaries
  - Define what is considered within the scope of an LCI (and what is not!)
  - System definition is critical if the intention is comparability with other LCIs
  - Ground rules not yet fully established!

- Allocation Methodologies
  - Used to partition environmental load when several products are included in the same process
  - **Caution**; Avoid double counting!
    - Or not counting at all!

Eurobitume Bitumen Life-Cycle Inventory

- The LCI is based upon a hypothetical refinery, based in the ARA* region and running a typical crude diet used for bitumen production.
  - The **declared unit is 1 tonne** of paving bitumen, (EN 12591)
- The LCI data are valid for bitumen produced and loaded in a European refinery.
  - it is a “cradle to gate” study.

- The LCI is representative as an average value applicable to bitumen produced in **any** refinery in Europe.
- Transport to customer and/or depot is **not** included in the LCI



* Amsterdam, Rotterdam, Antwerp

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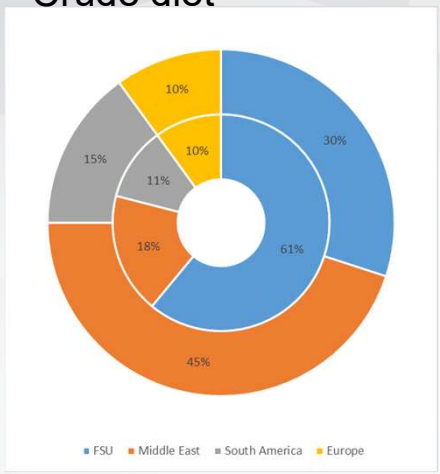
Why use the Eurobitume LCI?

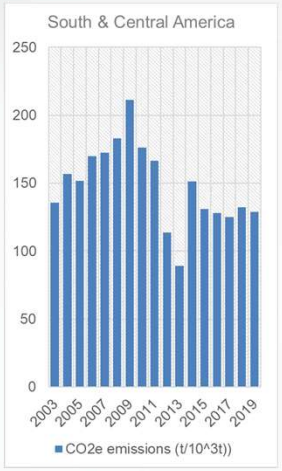
- Other LCI databases are available (e.g. EcoInvent, GaBi, ESU), but…
- Eurobitume has selected reliable, publicly available foreground data sources for the life-cycle stages;
  - International Oil & Gas Producers Association for crude oil extraction
  - Actual ship data for transportation
    - Emission factors from International Maritime Organisation
  - Concawe (European oil refiners association) for refinery data
  - Background data from EcoInvent
- Database is available in Excel format for importing into LCI software (e.g. SimaPro)

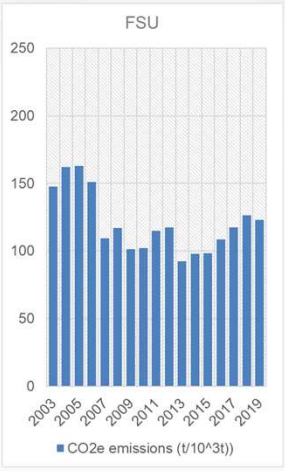
What changed from 2012?

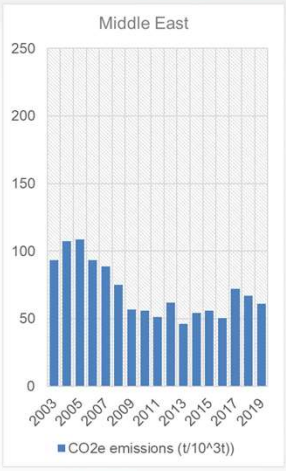
Crude diet

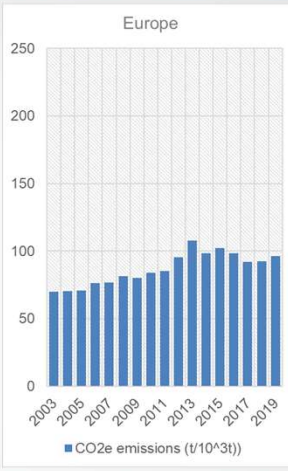


5-year rolling average for Crude oil extraction data





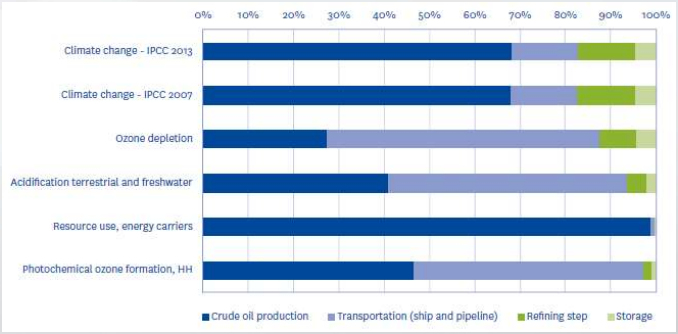




New Ship

Refinery allocation methodology

LCIA



Next steps

- Updated crude extraction data
- Revision of shipping data to include IMO 2020 regulations
- Output data to be made available for inclusion in EPD format
  - According to EN 15804 +A1 and +A2

Sustainability – Why ?

What is the driver for environmental impact assessment?

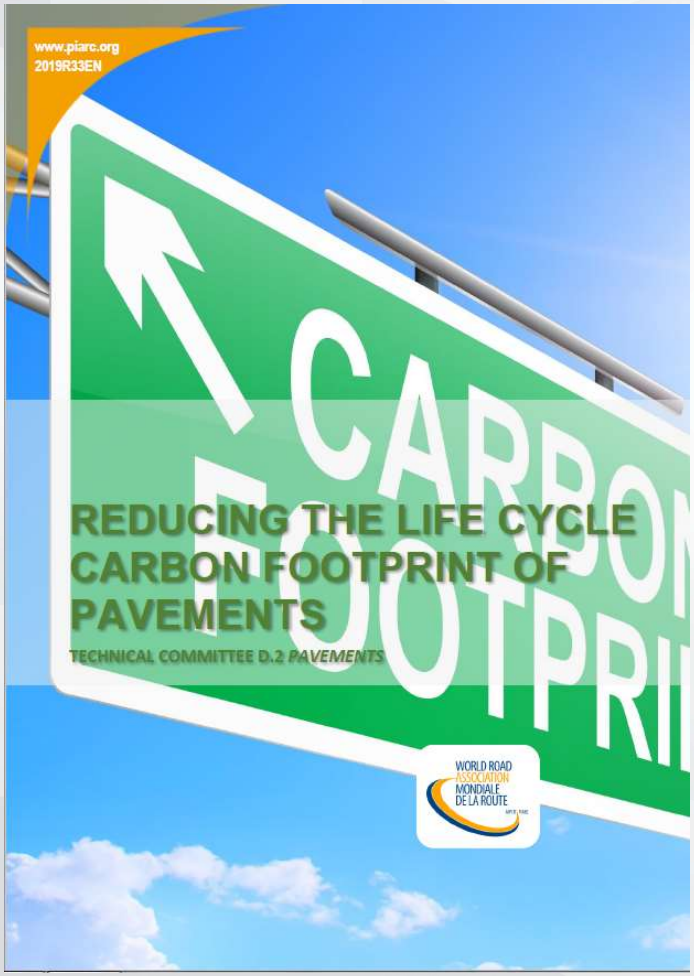
- Construction Products Regulation requires sustainability assessment;
  - Environmental Product Declarations are the vehicle for this activity

- European Commission providing EU Member states with Green Public Procurement Criteria;
  - Some member states already incorporating these into the bid process

How is Eurobitume contributing?

- Eurobitume has prepared a 'Cradle to Gate' LCI (and LCIA) to be useable for preparation of Environmental Product Declarations

PIARC reports on pavement sustainability



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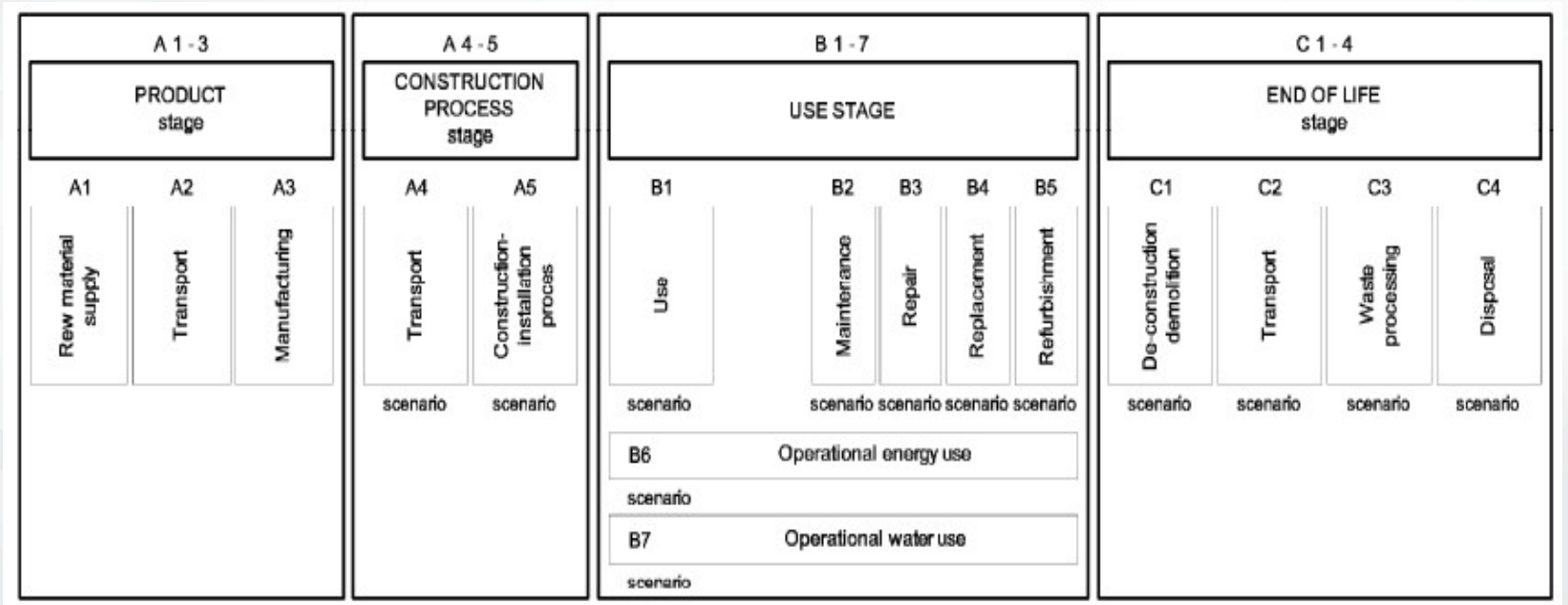
Environmental Product Declarations



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PIARC report - Reducing the life cycle carbon footprint of pavements

Studied carbon footprint tools are:

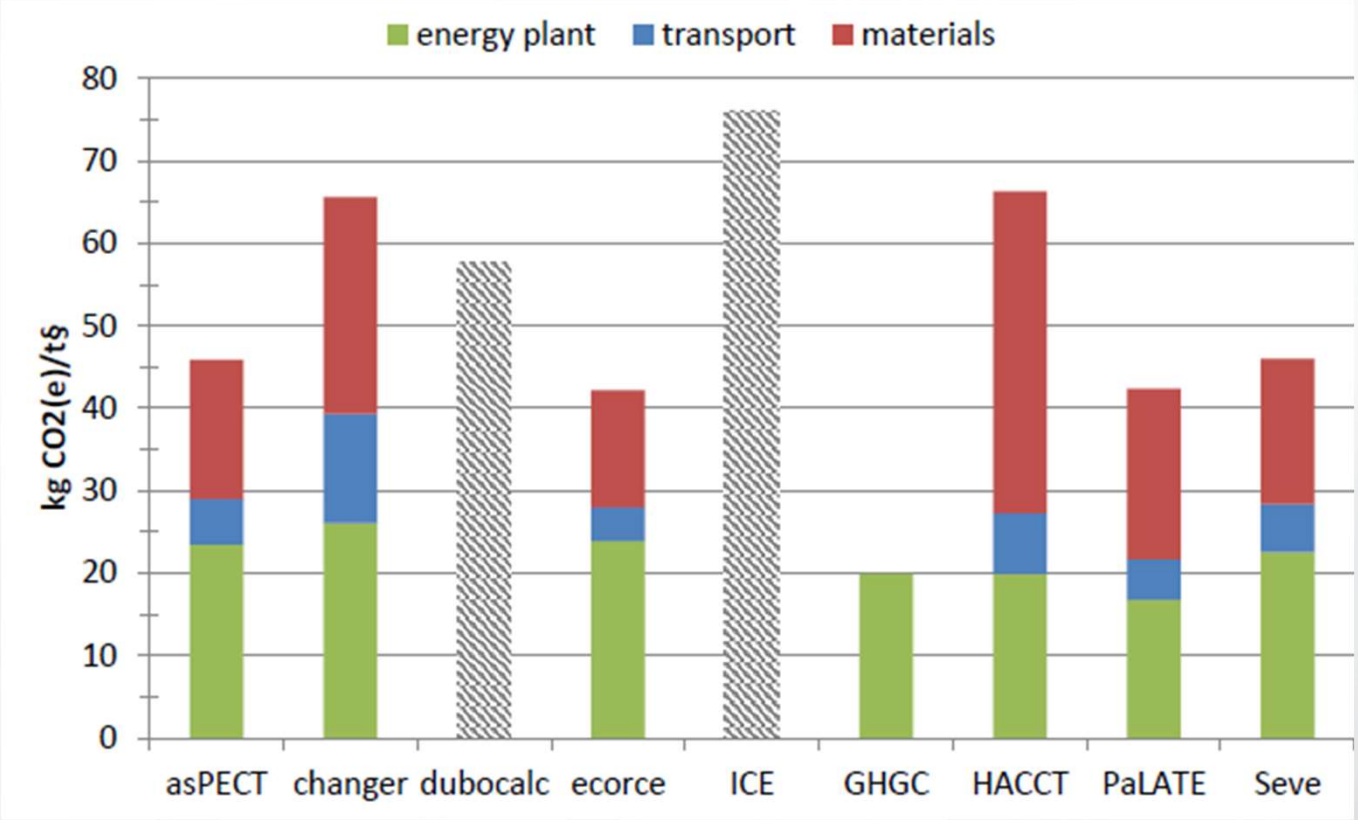
- *AsPECT*
- *CHANGER*
- *CEREAL*
- *DUBOCALC*
- *ECORCE*
- *GHGC*
- *HACCT*
- *PALATE*
- *SEVE*
- *EKA*
- *TAGG Carbon Gauge Calculator tool*

	Production stage			Construction stage		Use stage		End-of-life				beyond system boundaries
asPECT	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
CHANGER	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
DUBOCALC	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
ECORCE	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
GHGC	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
HACCT	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
PALATE	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
SEVE	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
EKA	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D
CGCT	A1	A2	A3	A4	A5	B1	B2-4	C1	C2	C3	C4	D

Key; dark blue = covered in detail, light blue = covered more superficially, white = not covered

Table 2 presents a comparison of the output flows provided by the different models. This demonstrates that some models consider sustainability endpoints other than CO_2e

Different model outputs for same input data



Source; PIARC report - Reducing the life cycle carbon footprint of pavements

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Summary

- Environmental Impact Assessment is complex
  - Numerous endpoints; difficult to compare
  - Numerous different systems; difficult to provide information in a form that can be used for all
  - Principal focus for most models is Global Warming Potential (GWP)
    - Other indicators are also important, but not always taken into account
- Eurobitume LCI
  - Uses publicly available data for foreground flows
  - Being updated to provide input for EPDs according to EN 15804 +A1 & +A2
- Numerous different pavement EI Assessment models
  - Input data for raw materials varies
  - Life-cycle stages included in the models vary
  - Important to consider comparability of models if comparability of results is required

Thanks for your attention

Questions? Comments?