The Purchasing Impact Estimator (PIE)

What is it and what is it worth?

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Presentation goals

1. Share my passion: Life Cycle Thinking
2. Introduce the PIE-tool
3. Explain Life Cycle Assessment (LCA)
4. Present two approaches
   - IO-LCA
   - Process-LCA
5. Introduce Hybrid-LCA
6. Show the potential of the PIE-tool approach
7. Tell you where the U.S. stands

Life Cycle Thinking =

- No trade-offs in life cycles
  - It is not only your factory of office, its is where supplies come from and end up too
- No trade-offs in different aspects of Sustainability
  - One-issue thinking forgets other issues
- **Making informed decisions by everybody involved**
  - What dashboard do you need?

Why is this essential?

If it is tempting to simplify environmental decision making into questions and answers that relate to one specific environmental issue, for one specific life cycle phase of a product, service or policy, for one specific material, emission or waste flow…

…then what framework do we need to design for decision makers to assist them in preventing trade-offs to other life cycle phases or environmental issues?

Introducing the PIE-tool

Goal
to prioritize purchasing decisions based on environmental impacts

Use
Evaluate current purchasing mix
Compare (future) purchasing scenario's
Compare products

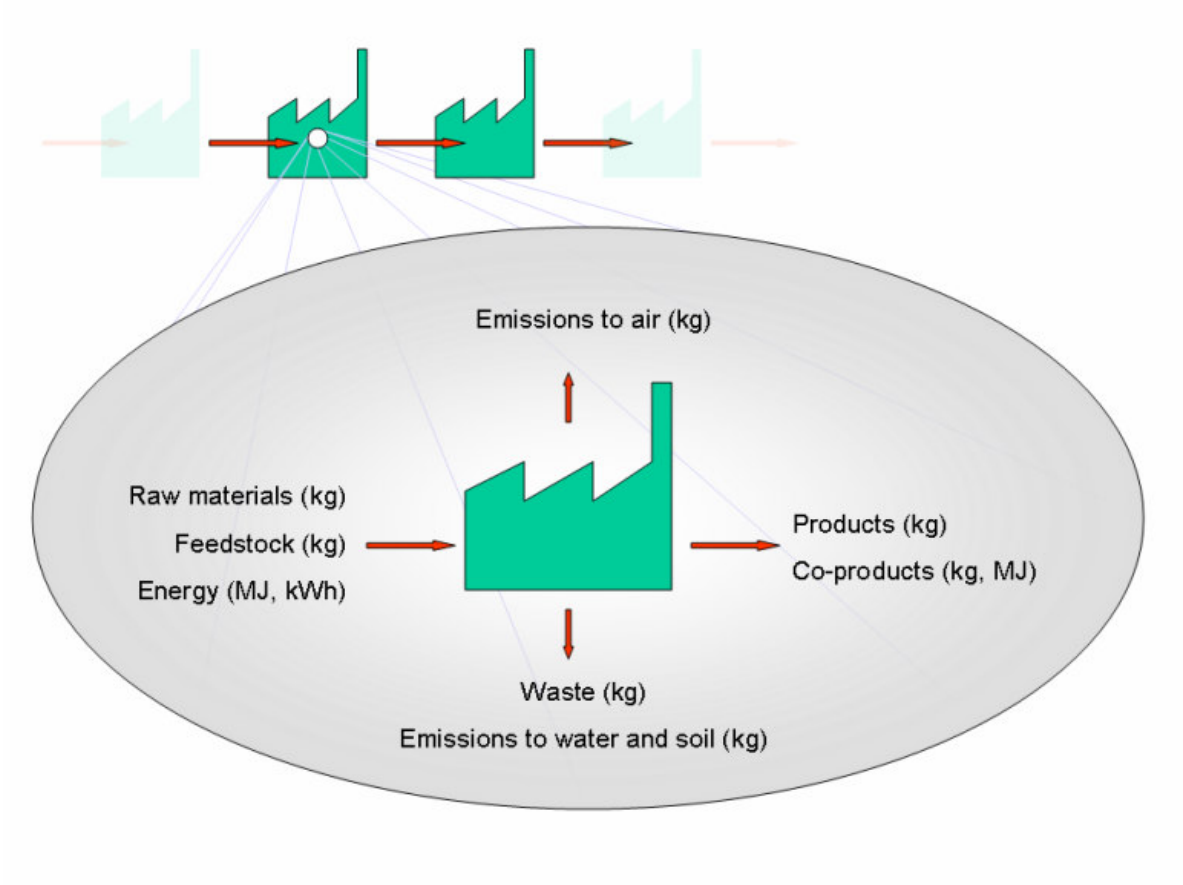
Scenarios are
Products I want to buy & how much ($ or % of total)

Introducing the PIE-tool

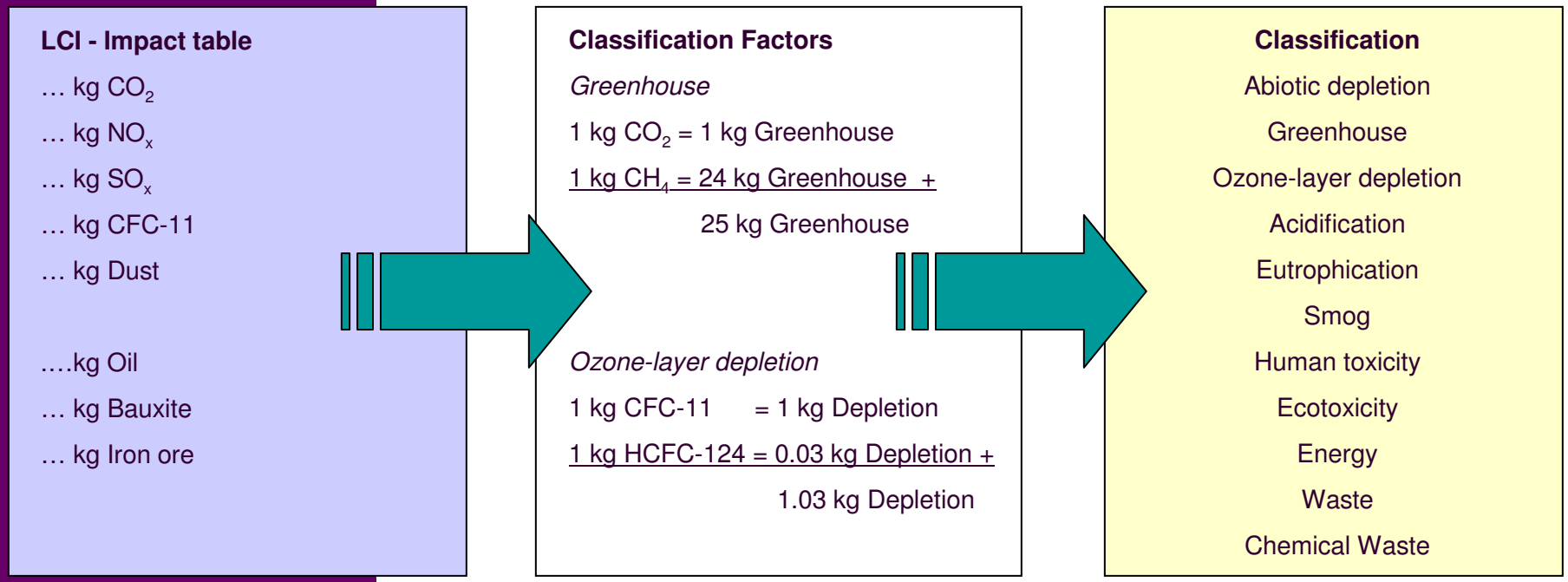
Based on

- Input/Output database for economic sectors
- based on NIGP and BEA codes for 1998
- Environmental database based on EPA/EIA data for CO_2, N_2O and CH_4, criteria pollutants (CO, NO_x, SO_2, PM, O_3 and Pb) from the NET/NTI/NEI, all based around 2002, VOC and ammonia from NET, toxicity, land use from USDA, resource use from EIA and USGS for fossil fuels, iron, copper, sand and gravel translated into environmental profiles using LCA techniques based on the Eco-Indicator 99 methodology
- With the potential to include product LCA data

Life Cycle Assessment (LCA)



Life Cycle Assessment (LCA)



About LCA

Further reading

ISO 14040 series on Life Cycle Assessment

ISO 14020 series on Environmental labeling

http://therightenvironment.net/LCA.htm >>

UNEP: why take a life cycle approach?

http://therightenvironment.net/UNEPLCAapproach.pdf

I/O approach

- Economic categorization through sector indices. Using IO-tables as a starting point for analysing interrelationships in an economy and the importance of different product groups is known as Input-Output Analysis (IOA)
- IO-tables are supplemented with environmental data for each industry, "IO-LCA"
- Top-down
- Follow the money: results expressed in $ value
- (Partly) developed to estimate missing information for product-LCA's

I/O approach - Advantage

- cover the complete economy, including services. This means that when using IO-databases, it is not necessary to make cut-offs, i.e. to exclude part of the product system. As a “top-down” approach it allows a complete allocation of all activities to all products; good insight in supply chain management
- consistent data collection: same completeness; geography, time period, technology
- monetized data enables easy link up to life cycle costing

I/O approach - Disadvantage

- processes, services and materials are aggregated into sectors: difficult to use for detailed studies for individual producers or products
- linear relation between economy and environment
- Not all environmental statistics are available: environmental adequate information may be missing.
- things that are not monetized in current society are not included, even with environmental relevance
- IO usually covers cradle-to-gate. It usually does not incorporate resource use, product use, final consumption, and end-of-life options

LCA approach

- Process database for Life Cycle Assessment
- “bottom-up” process analysis, based on linking the specific processes in a supply chain
- A significant advantage of such process analysis is exactly its capability for detail.
- individual industries, processes and materials
- impacts in relation to the goal and scope of the study
- follow the material and energy
- Tree-modeling: system has boundaries and are specific for the goal and scope of the study

LCA approach - Disadvantage

- Systemboundaries: ‘’Risk’’ that important parts of the product systems are left out of the analysis, simply because it is a comprehensive task to follow the entire supply chain in detail.
- Relatively labor intensive
- It is possible to have an inventory for different parts of the life cycle that have a different completeness

LCA approach - Advantage

- Specific for a product or service
- Pin point improvement options
- Awareness from producers/owner/users of their contribution

Hybrid approach

Combining process-based LCA and IOA in what has become known as “hybrid analysis” can yield a result that has the advantages of both methods (i.e. both detail and completeness). The name hybrid analysis refers to the combination of process-based LCA and Environmental IOA.

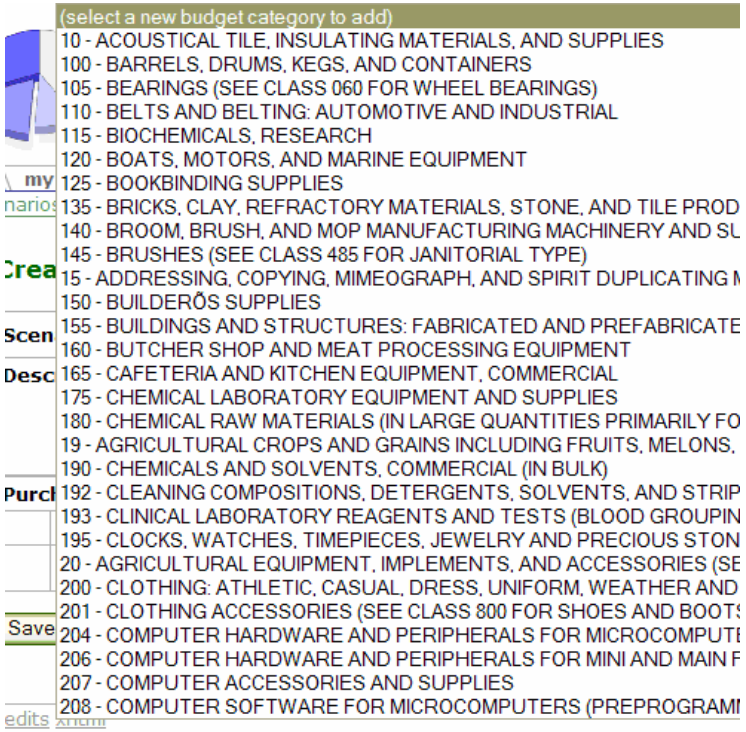
It combines the specificity of product-LCA’s and genericity of sector-based IO-LCA.

The PIE-tool aims at hybrid analysis starting from the IO-LCA point of view

PIE-tool: example

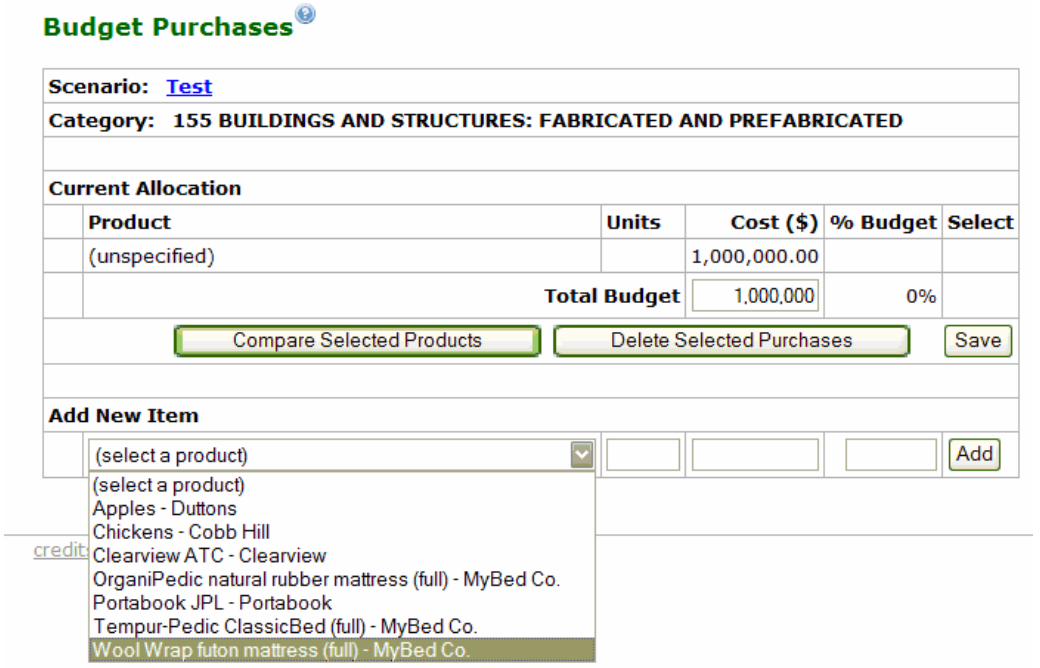
PIE-tool: example

Select sectors of interest



PIE-tool: example

Build scenarios



PIE-tool: example

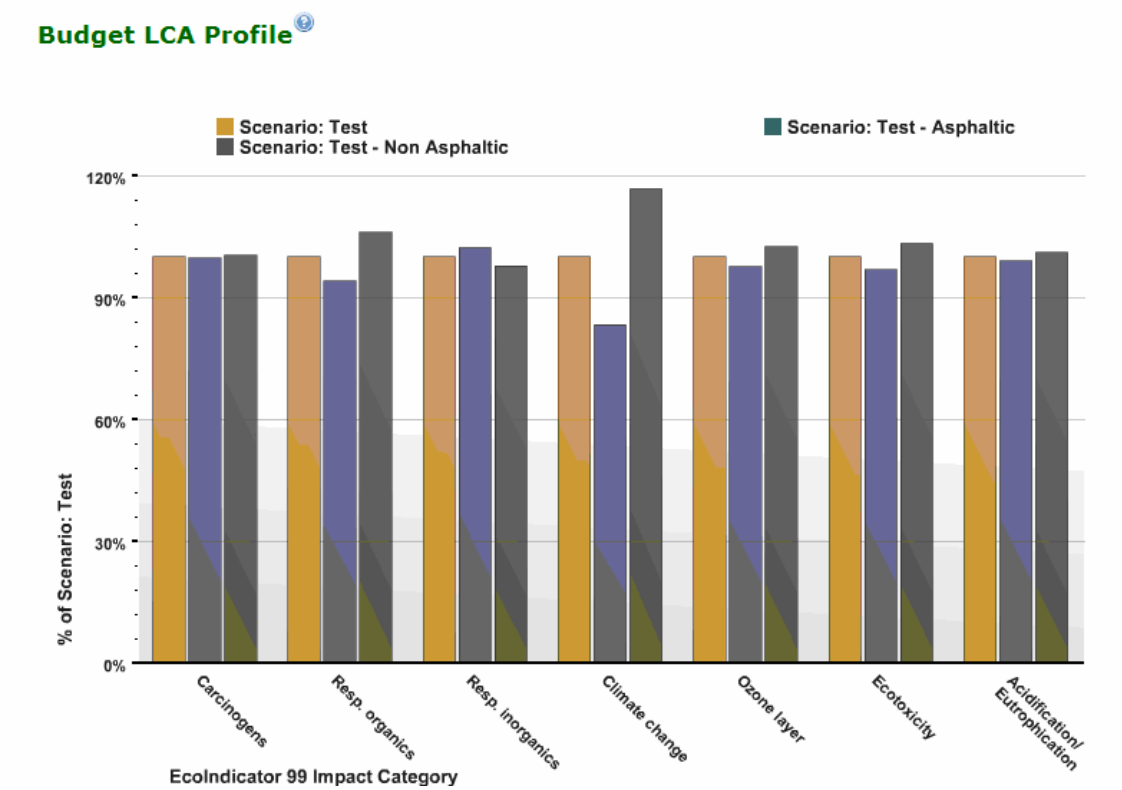
Scenarios

Scenario Budgets

Categories	Scenarios			Impact Assessment
	Test	Test - Asphaltic	Test - Non Asphaltic	Compare scenarios, all categories
155 BUILDINGS AND STRUCTURES: FABRICATED AND PREFABRICATED	1,000,000.00	1,000,000.00	1,000,000.00	vs. U.S. Average (per USD) Compare across scenarios
750 ROAD AND HIGHWAY BUILDING MATERIALS (NOT ASPHALTIC)	1,000,000.00		2,000,000.00	vs. U.S. Average (per USD) Compare across scenarios
745 ROAD AND HIGHWAY BUILDING MATERIALS (ASPHALTIC)	1,000,000.00	2,000,000.00		vs. U.S. Average (per USD) Compare across scenarios
Scenario Total	3,000,000.00	3,000,000.00	3,000,000.00	vs. U.S. Average (per USD) Compare across scenarios

PIE-tool: example

Compare



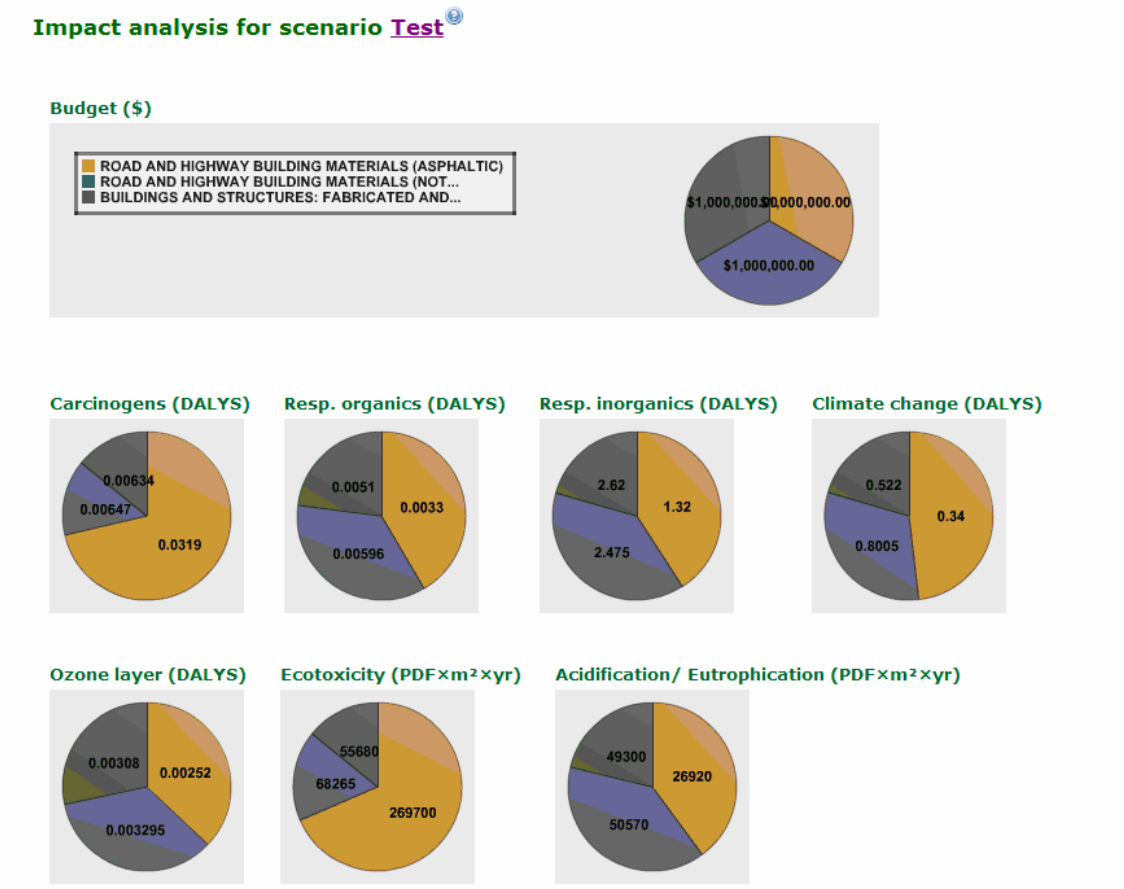
PIE-tool: example

Comparative Impact of All Scenarios

Scenario		Human-Health					Ecosystem Quality	
Budget Category	Budget Amount($)	Carcinogens	Resp. organics	Resp. inorganics	Climate change	Ozone layer	Ecotoxicity	Acidification/ Eutrophication
		DALYS	DALYS	DALYS	DALYS	DALYS	PDF×m²×yr	PDF×m²×yr
Test								
155 BUILDINGS AND STRUCTURES: FABRICATED AND PREFABRICATED	$1,000,000.00	0.0319	0.0033	1.32	0.34	0.00252	269700	26920
745 ROAD AND HIGHWAY BUILDING MATERIALS (ASPHALTIC)	$1,000,000.00	0.00634	0.0051	2.62	0.522	0.00308	55680	49300
750 ROAD AND HIGHWAY BUILDING MATERIALS (NOT ASPHALTIC)	$1,000,000.00	0.00647	0.00596	2.475	0.8005	0.003295	68265	50570
Total Scenario:	$3,000,000.00	0.04471	0.01436	6.415	1.6625	0.008895	393645	126790
Test - Asphaltic								
155 BUILDINGS AND STRUCTURES: FABRICATED AND PREFABRICATED	$1,000,000.00	0.0319	0.0033	1.32	0.34	0.00252	269700	26920
745 ROAD AND HIGHWAY BUILDING MATERIALS (ASPHALTIC)	$2,000,000.00	0.01268	0.0102	5.24	1.044	0.00616	111360	98600
Total Scenario:	$3,000,000.00	0.04458	0.0135	6.56	1.384	0.00868	381060	125520
Test - Non Asphaltic								
155 BUILDINGS AND STRUCTURES:	$1,000,000.00	0.0319	0.0033	1.32	0.34	0.00252	269700	26920

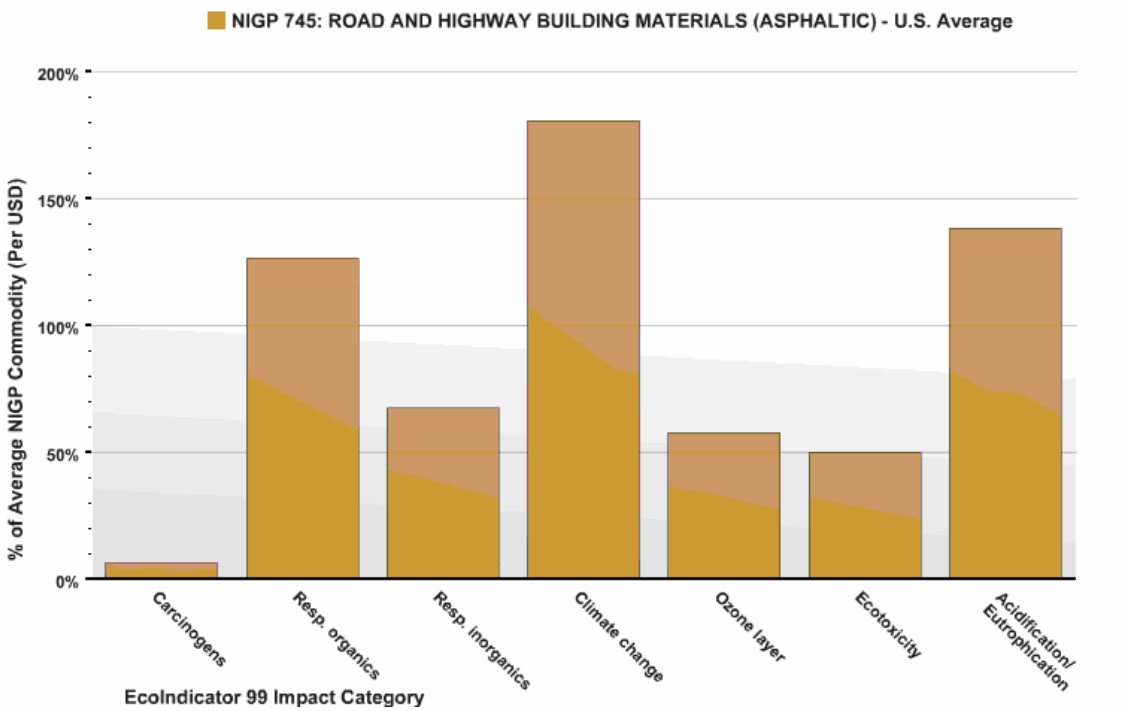
Gereed Internet

PIE-tool: example



PIE-tool: example

Normalization



Potential of the PIE-tool

The used IO-database is (almost) the best available.
An update is available and can be included soon.

The product-LCA part is starting through Earthster

A few example products are included

A procedure for producers to include their data is being developed

Producer participation will be key for its acceptance and sustainability

Value of the PIE-tool

- Since the IO-database is the current core, puchasing scenarios are more general than specific
- It can identify the relative impact of different groups (economic sectors) of products
  - Example: computers vs office supplies vs office furniture
  - Use: starting point to identify most relevant sectors
- It currently has a limited use for decision making within economic sectors (different product options and producers)
  - Example: 1 supplier vs another
  - Example: 1 solution vs another
  - Use: improvement options/benchmarks within sectors

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