LCA Informing Packaging Design – a case study of COMPASS

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discussion agenda

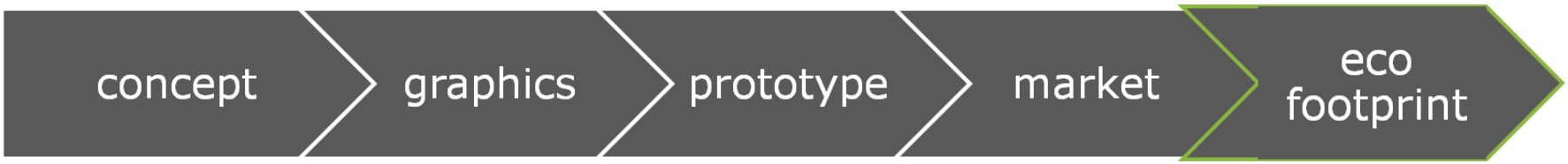
- Packaging design and LCA
- Introduce COMPASS – a streamlined packaging LCA tool
  - Data processing
  - Scenario testing
  - Web application
- Discussion – limitations, drivers and opportunities, etc.
- Evidence of progress in the industry
- Perform a simple design evaluation

packaging design and LCA

life cycle of packaging

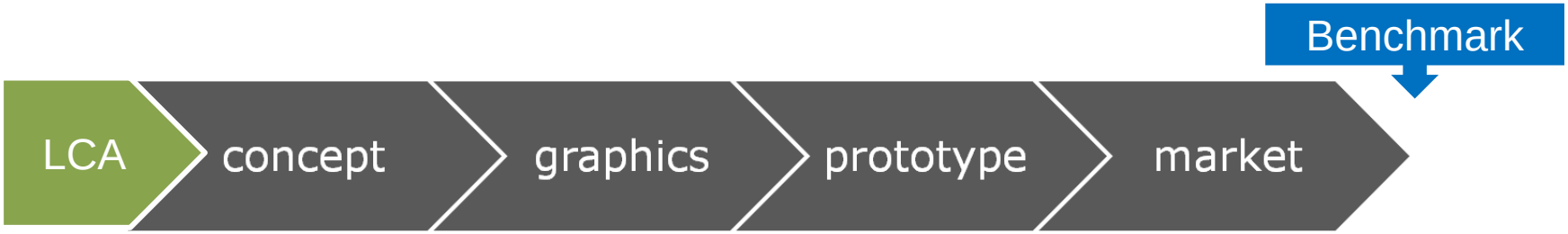
early market trend

- Post market eco-footprint, rank or score



shift to design evaluation

- Benchmarking of current packaging portfolio
- Use LCA to screen and optimize design choices



influence of design

(downstream) ➔

BRANDS
- image
- perception/loyalty

DISTRIBUTION
- transport efficiency
- product loss

RETAIL
- on shelf differentiation
- product shelf life
- safety

CONSUMER
- product appeal
- security
- satisfaction

WASTE DISCARD
- effective recovery
- reduce disposal

influence of design

← (upstream)

MARKET SIGNALS

- **demand for sustainable sourcing**
- **reduced energy intensity**
- **reduced impacts**
- **chain of custody**
- **transparency**

the LCA tools space

characteristics of LCA tools

- Tools for LCA practitioners
  - Traditional actors: SimaPro and GaBi
  - Up and coming: OpenLCA and Earthster…
  - Audience and uses
- Streamlined LCA tools for packaging
  - COMPASS, PIQET, PackageSmart, Quantis…
  - Characteristics
  - Audience and uses

COMPASS®

Comparative Packaging Assessment

COMPASS

GREENBLUE®

a **design-phase** web application that provides

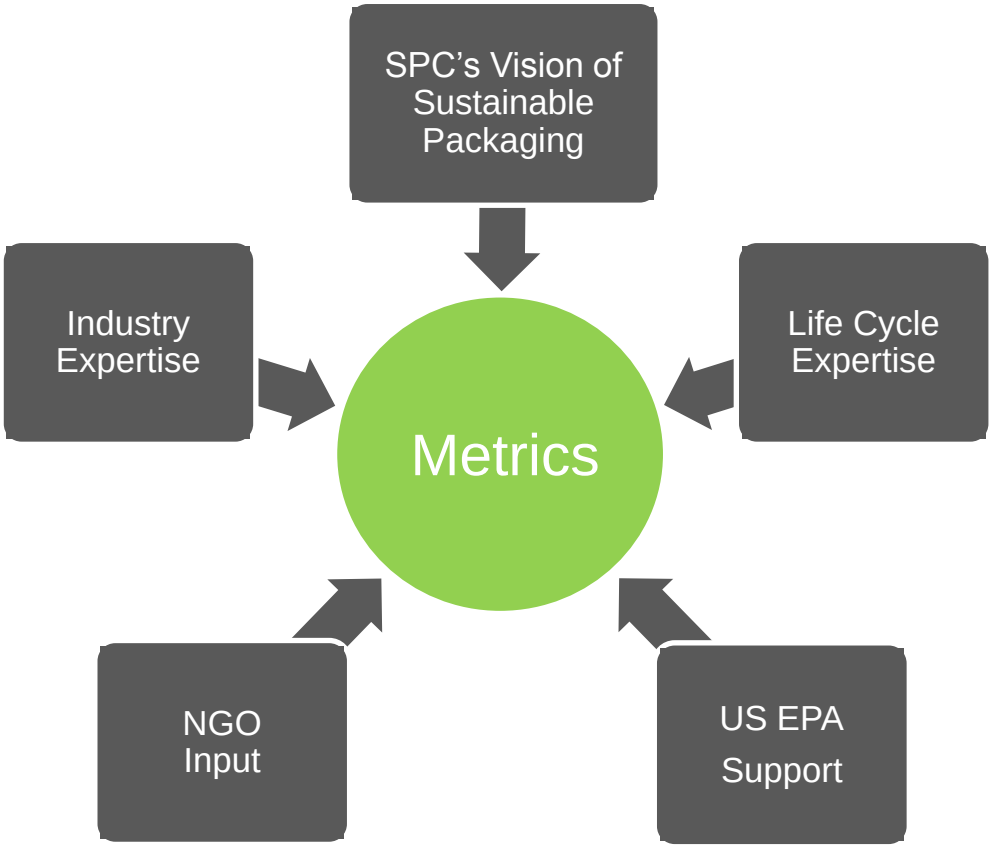
comparative **environmental profiles** of **packaging** alternatives

based on **life cycle** assessment **metrics** and **attributes**

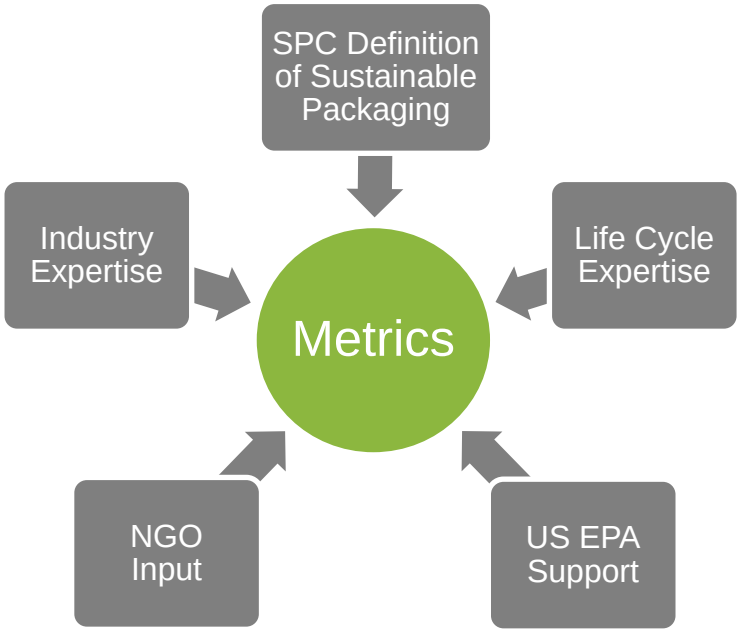
background

- Starting points:
  - SPC member driven initiative for a science based design evaluation tool
  - MERGE™ (Managing Environmental Resources, Guidance and Evaluation)
- Data assessment
  - GreenBlue, USEPA, and Walmart
  - EPA funding for transparent LCI data

consensus based development



metrics relevant to packaging



CONSUMPTION METRICS
- FOSSIL FUEL
- WATER
- BIOTIC RESOURCES
- MINERAL RESOURCES

EMISSION METRICS
- GREENHOUSE GASES
- HUMAN HEALTH
- AQUATIC TOXICITY
- EUTROPHICATION

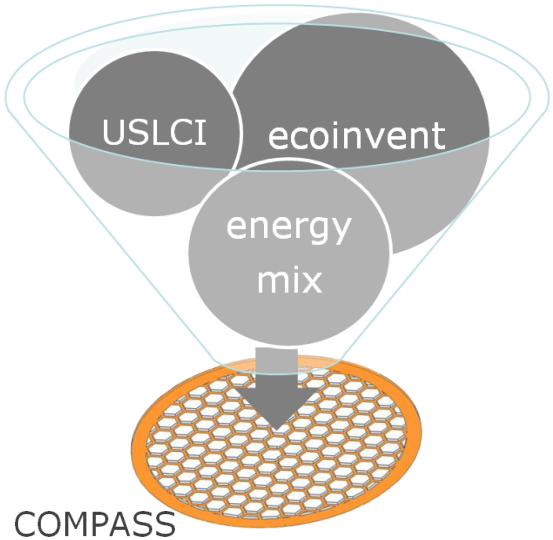
PACKAGING ATTRIBUTES
- CONTENT
- SOURCE
- SOLID WASTE

MATERIAL HEALTH

LCIA: IPCC 2007, CEN/TR 14980, TRACI, USEtox

life cycle data processing

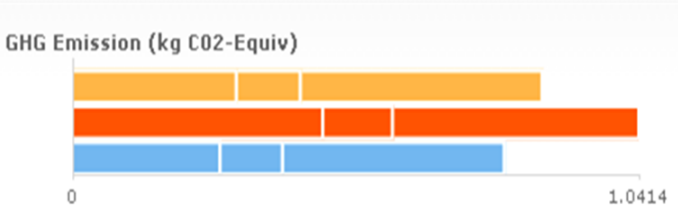
Data Processing



COMPASS

- Materials
- Conversions
- Distribution
- End of Life

Design Assessment



data

- Consistent background data modeling for common packaging materials and processes
- Apples to apples comparisons based on common functional unit
- Region specific solid waste profiles
- Verified by industry and external reviewers

data sets

- Data sets for U.S., Canada, Europe
  - México and China (coming soon!)
  - Background data from ecoinvent and USLCI
- End of Life (EoL) treatments for packaging
  - Landfill, WtE, compost, incineration, litter
- EoL solid waste profile
  - Regional recover and discard information from USEPA, EuroStat, StewardEdge Canada

materials and processes

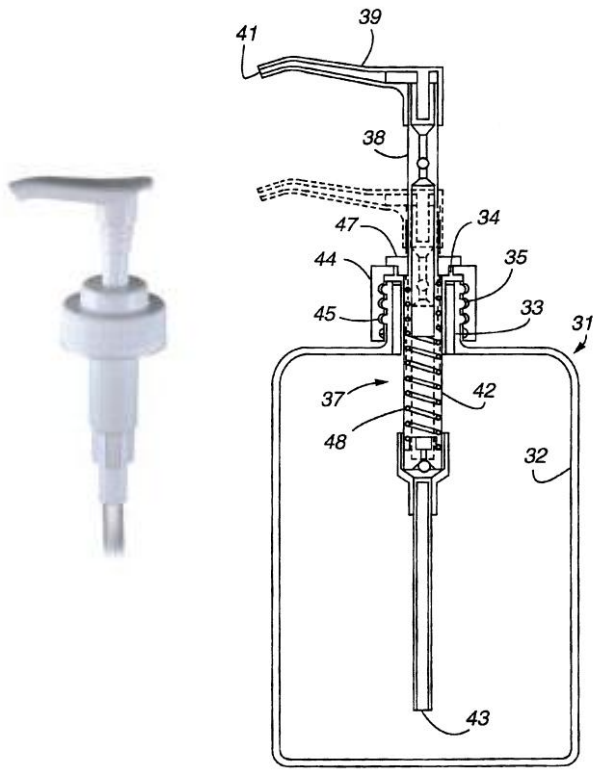
- Polymers
  - HDPE, LDPE, LLDPE, PET, PP, PS, EPS, PVC, PVDC, PLA, EVA, Nylon 6, PC, Modified starch (Mater-bi)
- Fibers
  - Solid Bleached and unbleached Sulfate Board (SBS and SUS), Recycled Folding Boxboard, Corrugated, Supercalendered Paper, Bleached and Unbleached Kraft Paper, Liquid Packaging Board
- Metals
  - Steel and aluminum
- Container glass

- Polymers
  - Blow molding
  - Extrusion, plastic film
  - Foaming, expanding
  - Injection molding
  - Stretch blow molding
  - Thermoforming, with calendaring
- Fibers
  - Production of paper bags
  - Production of carton
  - Production of corrugated boxes
  - Cutting
- Metals
  - Sheet rolling
  - Production of steel can

the model

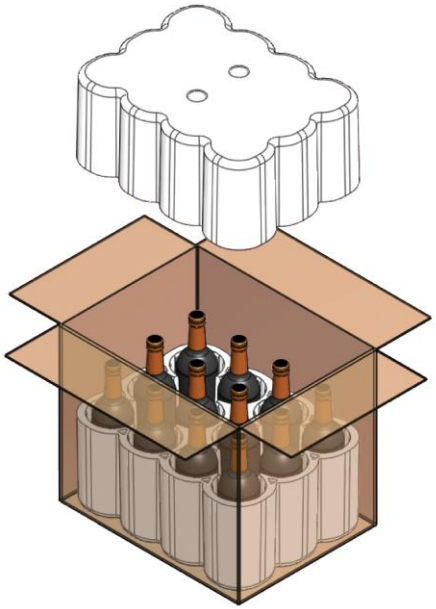
build scenarios using components

SIMPLE COMPONENTS



COMPOSITE COMPONENTS

packaging system

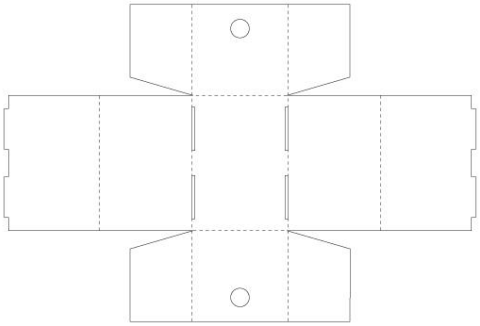


PRIMARY PACKAGE

SECONDARY PACKAGE

PACKAGING SYSTEM

multipack scenario



COMPONENT A **x 6**
- Bottle
- Label
- Cap

COMPONENT B **x 1**
- Carry case

reuse scenario

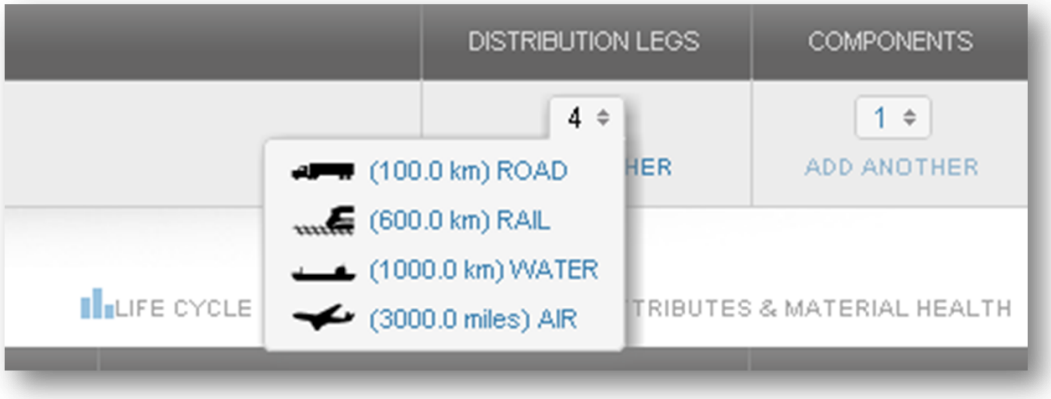
Waste Reduction Model
The entire package is reused and is refilled from another package (forms and capacity can vary).

Extended Life Model
A critical component(s) is reused while the reset of the components are discarded and replaced with a refill package.

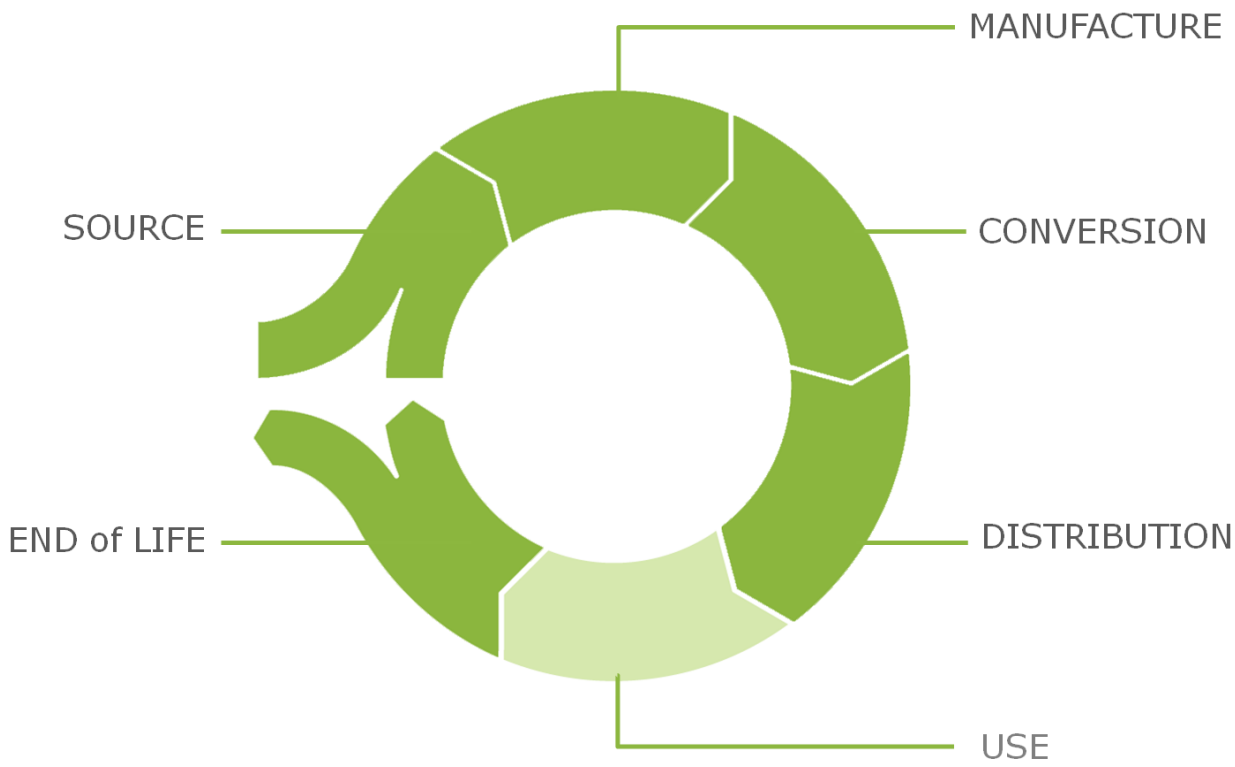
Refill scenarios requiring washing or industrial cleaning are excluded.

distribution

MODE	VEHICLE	DISTANCE: km and m
Road Rail Sea Air	- relevant trucks to the region - freight train - barge and transoceanic freight ship - cargo plane	**FUEL:** diesel, gasoline, kerosene , other as available **DATA:** USLCI and ecoinvent



life cycle coverage in COMPASS



the web application

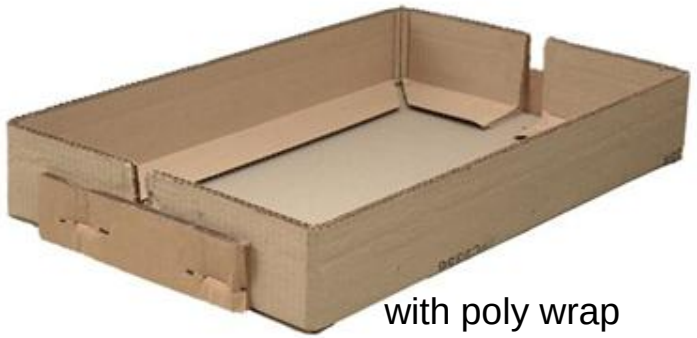
key features

- Compare up to four scenarios simultaneously
- View impact of components in relation to the package
- Assess life cycle consumption and emission metrics and key attributes
- Include distribution impacts
- Capture pertinent details in spreadsheet format
- Easy to use secure web-based application
- Assessment transparency with full documentation
- Detailed video tutorials

compare read-to-eat soup packaging

- Can body
- Pull tab
- Paper label

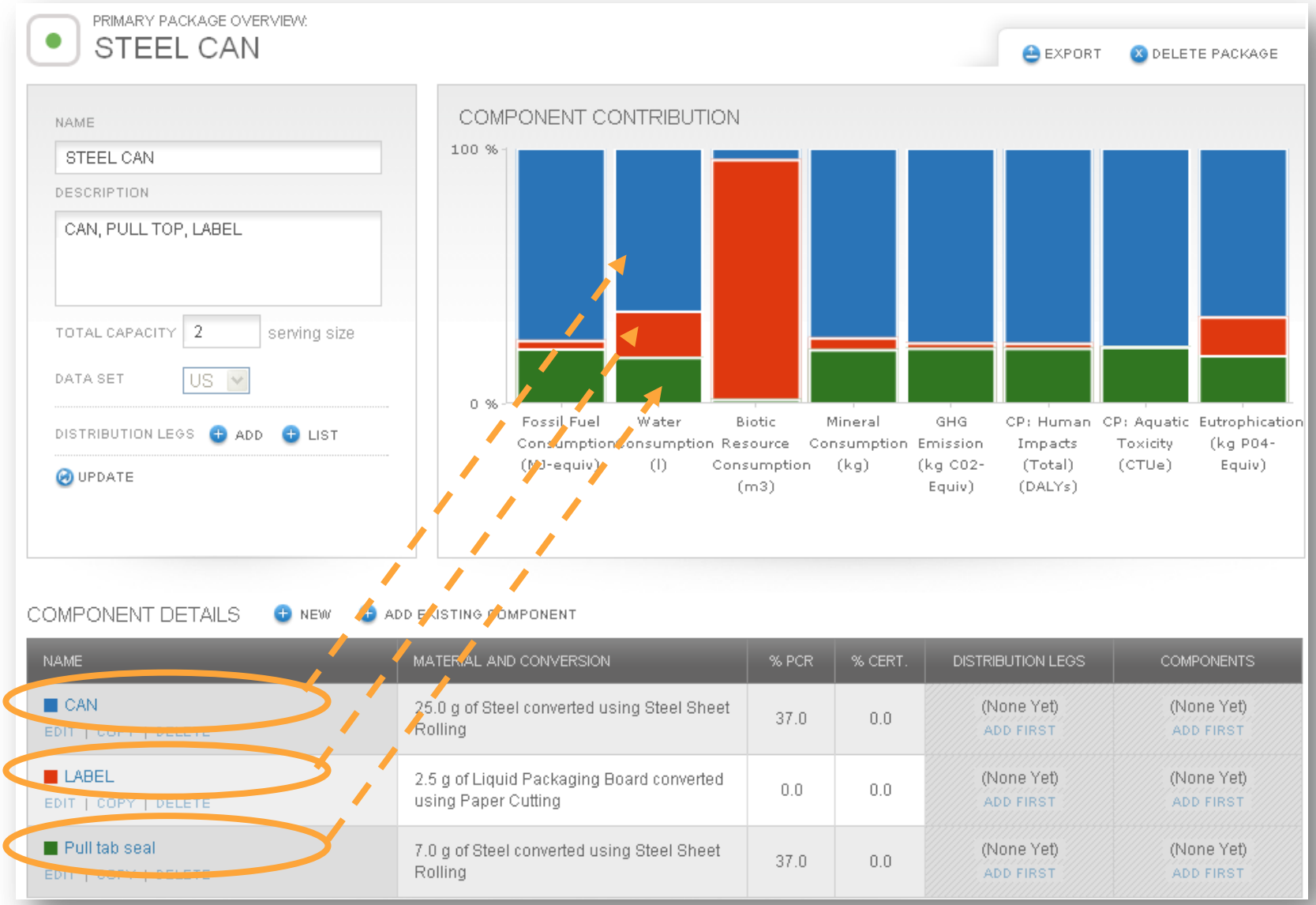
Primary Packages



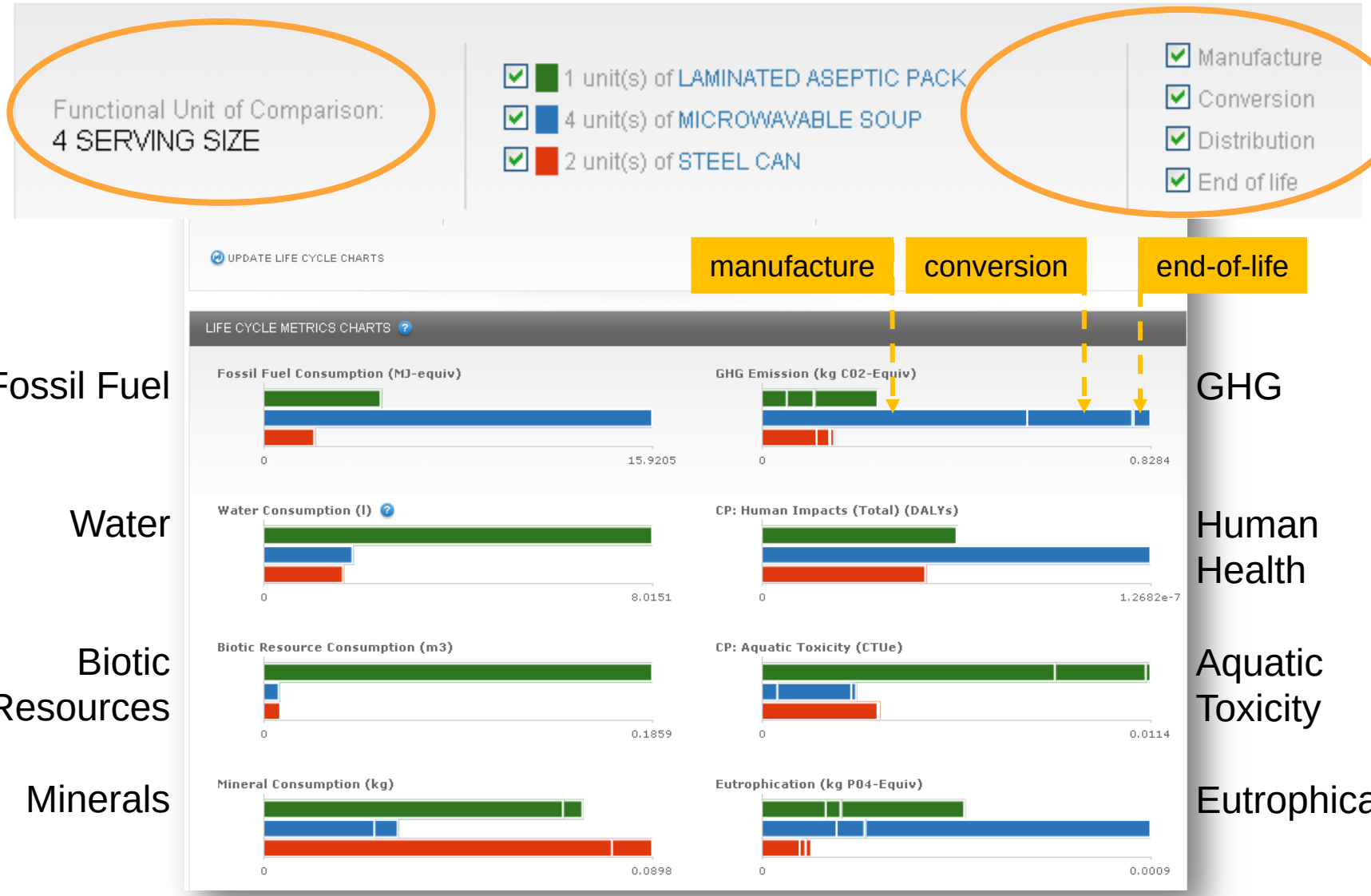
with poly wrap

Secondary Packages

components in relation to package



life cycle impacts profile



Fossil Fuel

Water

Biotic Resources

Minerals

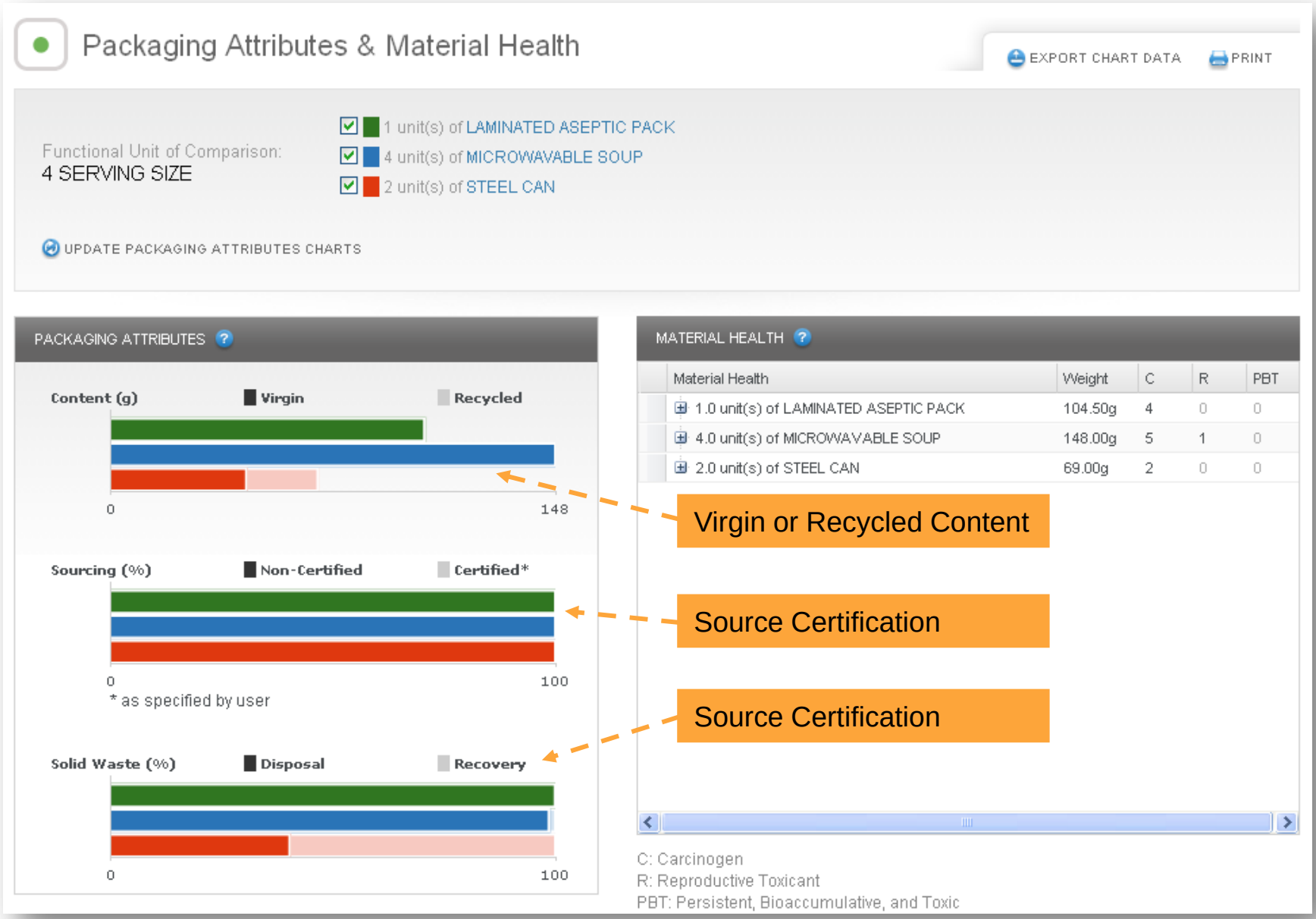
GHG

Human Health

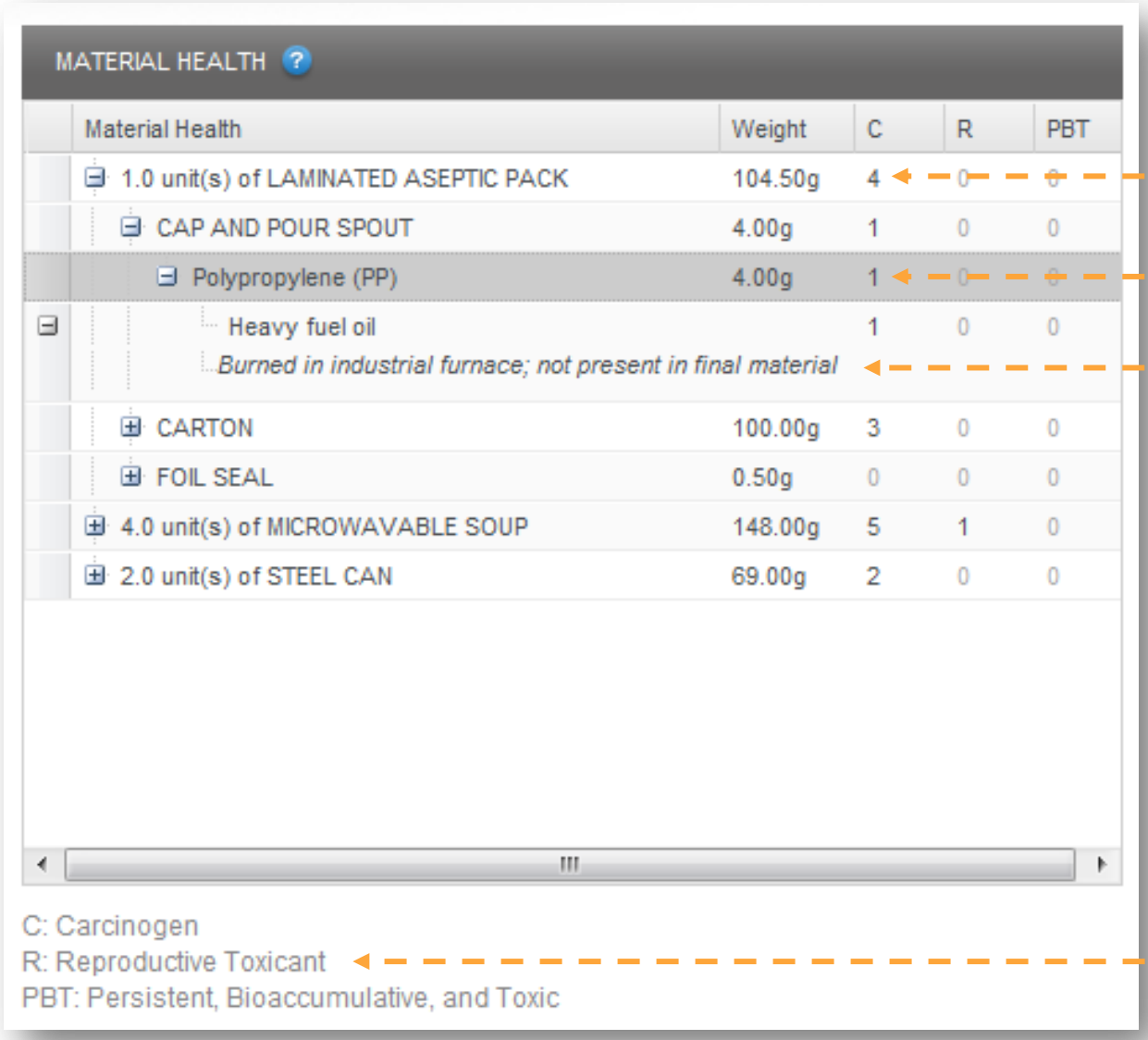
Aquatic Toxicity

Eutrophication

packaging attributes



material health



Match for known carcinogens

One within PP process

Substance of concern and its Material health story

Based on known lists of substances of concern from U.S. (TSCA and Cal. Prop. 65) and Europe (REACH)

export

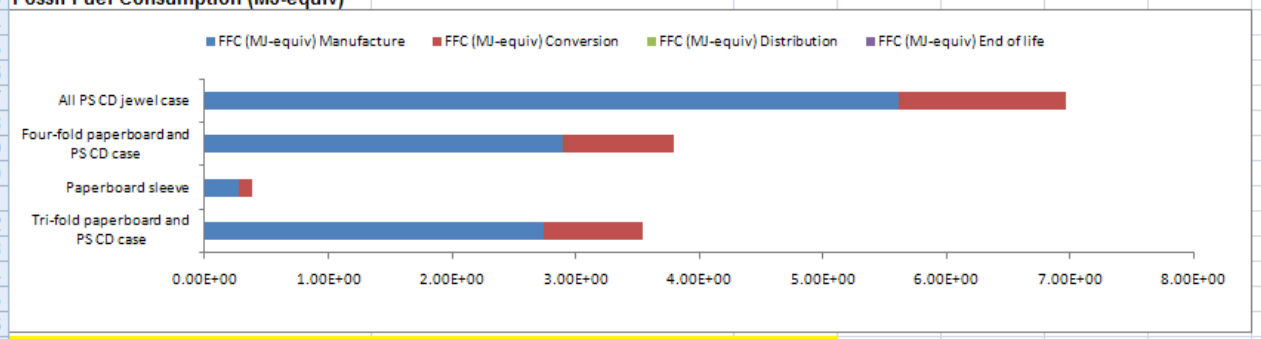
Project Info

Package Info

Summary Charts
-LC
-Attributes
-Components

Detail Sheets

	A	B
1	**Project Name**	Compact Disk Case Comparison
	Description	CD case
2		
3	**Package Type**	PrimaryPackage
4	**Functional Unit of Comparison**	1 item count
5	**Exported**	Wed Jun 30 15:35:22 EDT 2010
6	**User**	MTM
7		
8	**Package Summaries**	
9	**Name**	**Description**
10	**All PS CD jewel case**	all PS construction case (liner notes not included)
11	**Four-fold paperboard and PS CD case**	printed paperboard case (liner notes printed on), clear PS CD tray, and shrink wrap
12	**Paperboard sleeve**	printed paperboard sleeve and shrink wrap
13	**Tri-fold paperboard and PS CD case**	printed paperboard case (liner notes
14		
15	**Phases included:**	
16	Manufacture	
17	Conversion	
18	End of life	
19		
20		
21	**Life Cycle Metric Charts**	
22		
23	**Fossil Fuel Consumption (MJ-equiv)**	



37	**Negative values were excluded from the chart. See Life Cycle Metrics sheet for details
38	
39	**Water Consumption (l)**

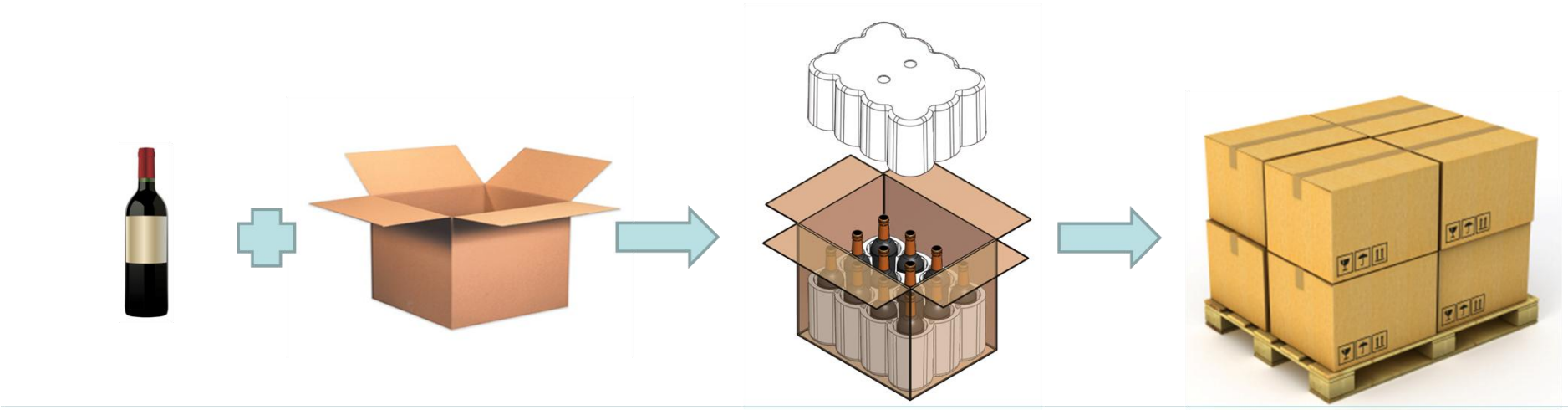
Summary Report | Life Cycle Metrics | Packaging Attributes | P1 | P2 | P3 | P4

Summary

Analysis sheets

Scenarios

transport model (being developed)



PRIMARY PACKAGE

SECONDARY PACKAGE

PACKAGING SYSTEM

TRANSPORT PACKAGE

Add distribution related transport for components, packages and shipping the system to the DC

limitations and opportunities

discussion

- Limitations
  - Current and representative life cycle inventory (LCI)
  - Data transparency and uncertainty
  - Impact categories: water, human and eco-toxicity, land use
- Drivers
  - Retailer and corporate scorecards
  - Global Packaging Protocol for Sustainability (GPPS)
  - The Sustainability Consortium (TSC)
- Opportunities
  - Measurements ≠ Sustainability
  - Use LCA to improve environmental performance of package and product, DfE and/or DfR, not for making claims
  - Informing public policy

evidence of progress

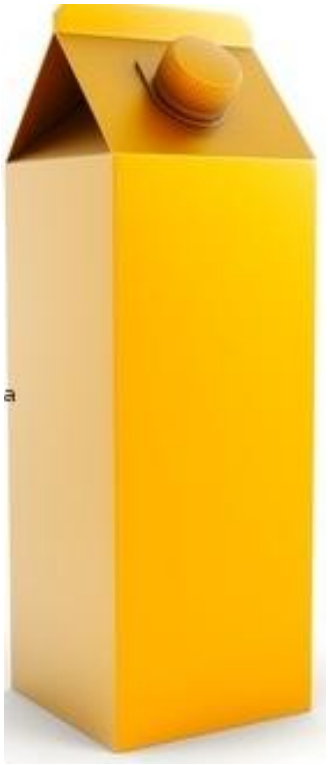
- Emphasis
  - Material selection based on key environmental indicators
  - EoL outcome of design
- Corporate sustainability agenda
  - Baseline of packaging portfolio
  - Informing procurement policies
  - Material input efficiency and waste reduction
  - Environmental indicators as SOP
- Educational emphasis on design and LCA
  - RIT, MSU, Univ. of Florida
- International developments

pause for a quick demo

task: deliver 12 oz of juice product

Glass

aluminum



liquid paperboard

composite

plastic

SUSTAINABLE PACKAGING COALITION®

A PROJECT OF GREENBLUE

COMPASS: https://design-compass.org
SPC: www.sustainablepackaging.org
GreenBlue: www.greenblue.org

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