Green Chemistry Education Webinar

Introduction to Life Cycle & Alternatives Assessment

June 18th, 2015

GREEN CHEMISTRY & COMMERCE COUNCIL

Business Mainstreaming Green Chemistry

What is the GC3?

- Cross-sectoral, B2B network of over 70 companies and other organizations
- Formed in 2005
- Collaboratively advances green chemistry across sectors and supply chains

Today's Speakers

Ann Blake

Principal & Founder

Environmental & Public Health Consulting

Thaddeus Owen

Chief Engineer, Sustainability

Herman Miller

Tom Etheridge

Program Manager, LCA and CF

Hewlett-Packard

Ground Rules

- Due to the number of participants in the webinar, all lines will be muted
- If you have a question or comment, please type in the Q&A box located in the drop-down control panel at the top of the screen
- Questions will be answered at the end of the presentation

ANN BLAKE, Ph.D.
Environmental & Public Health Consulting

Introduction to Alternatives Assessment Practice

Green Chemistry & Commerce Council Webinar

June 18, 2015

Introduction to Alternatives Assessment Practice

- What is it?
  - Definition of alternatives assessment/ analysis
  - Why alternatives assessment?
- How do we do it?
  - Frameworks for AA and practical applications
  - Overview of available tools & approaches
- Current practice: evolution & continuing challenges
  - Exposure considerations
  - Decision-making
  - Data gaps

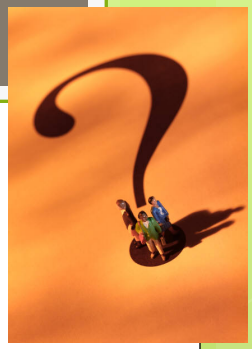
What's Our Goal?

- Safer chemicals, materials, processes, products
  - Increased supply chain transparency & communication
  - Fill data gaps for robust assessment
  - Improvement in human health and environment as well as the economy
- Triple Bottom Line: people, planet, prosperity

What is Alternatives Assessment?

- A process for identifying and comparing potential chemical and non-chemical alternatives that can be used as substitutes to replace chemicals or technologies of high concern
- Includes **assessment and evaluation**

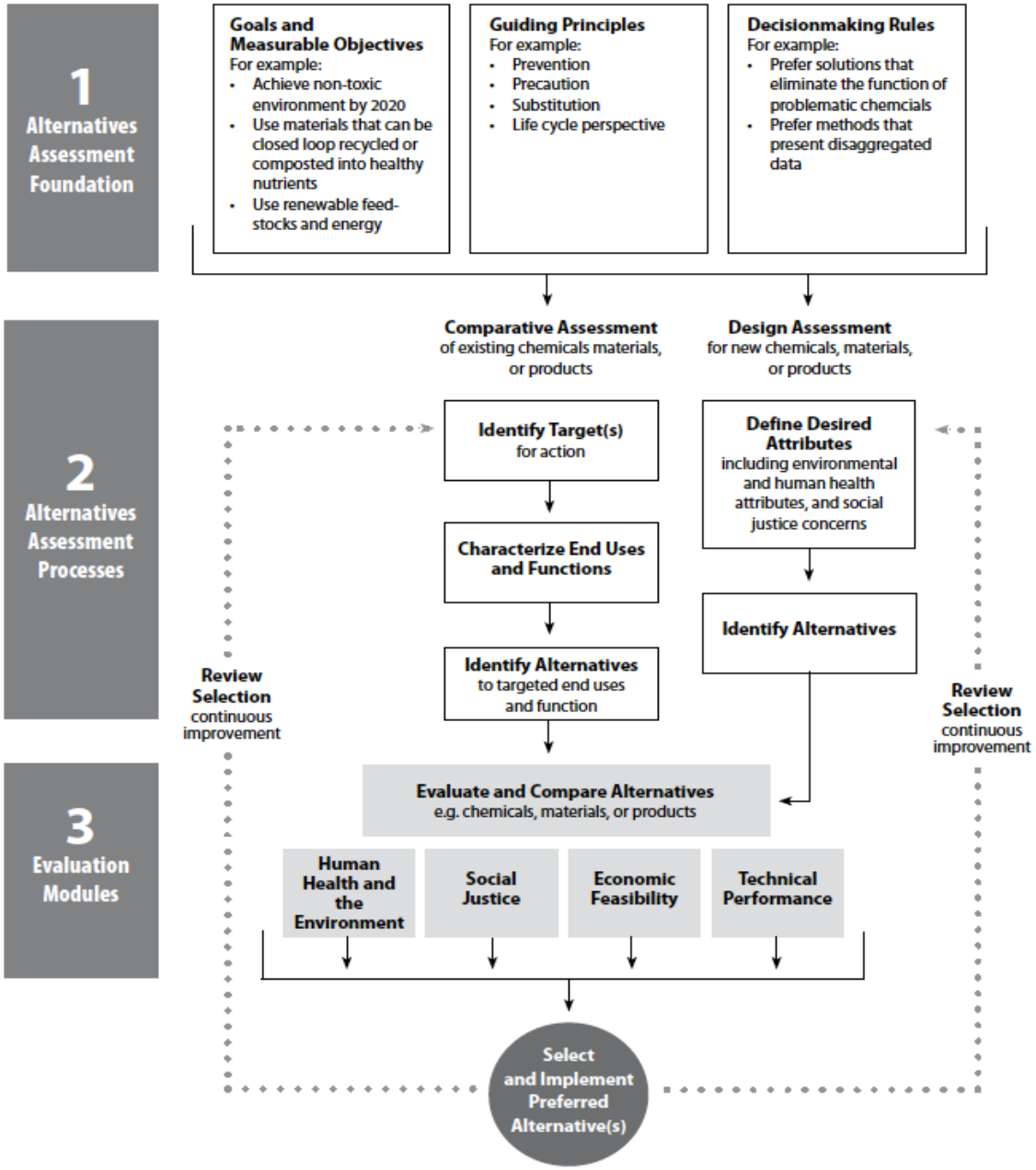
Lowell Center for Sustainable Production
UNIVERSITY OF MASSACHUSETTS LOWELL



LCA, Risk Assessment, AA: Answering Different Questions

- LCA helps to answer, "*What are the environmental impacts of a product throughout its life cycle?*"
- Risk assessment considers hazard, dose-response, and exposure and helps to answer, "*Is it safe enough?*"
- Comparative chemical hazard assessment helps to answer, "*Which alternative is safer?*"
- Alternatives assessment:
  - chemical hazard assessment, exposure assessment, other assessment approaches in a decision framework

Figure 1 **Alternatives Framework: Detailed Summary**



Lowell Center for Sustainable Production
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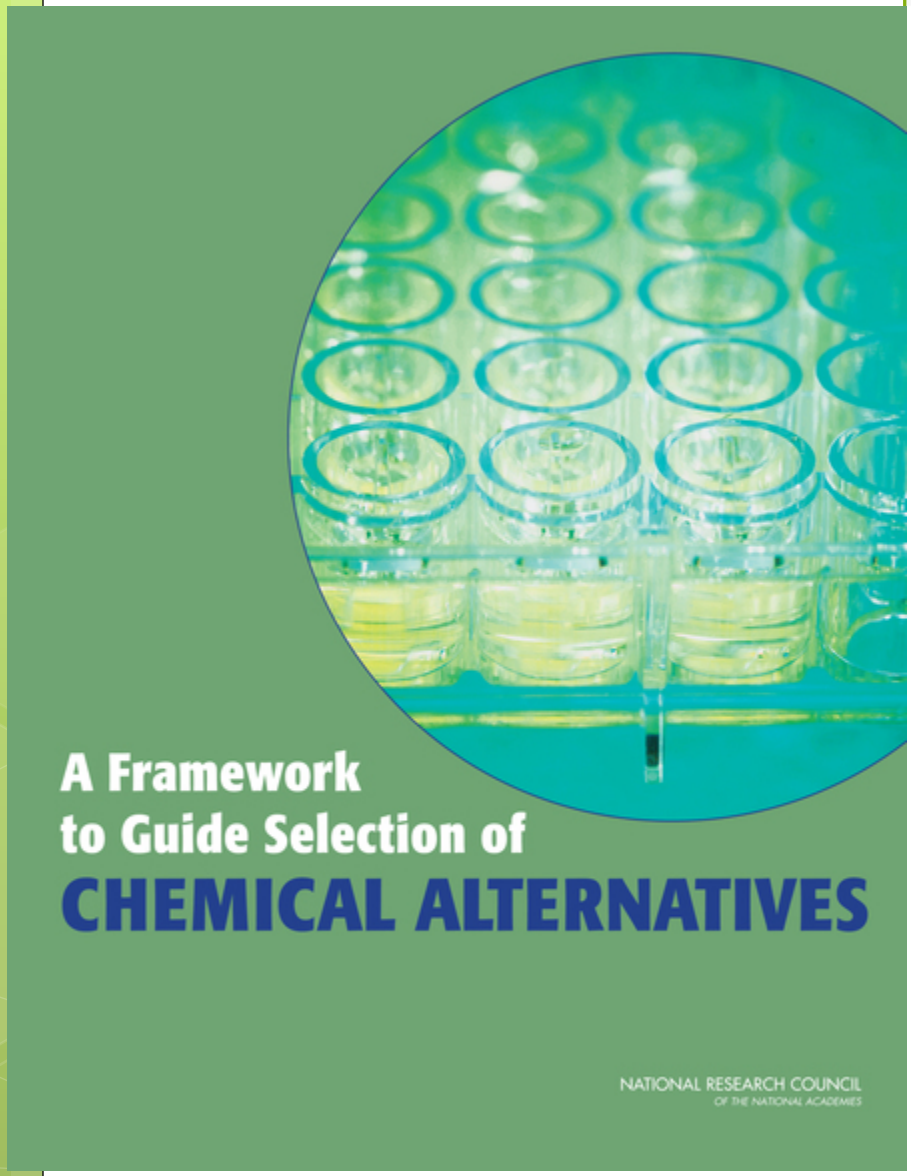
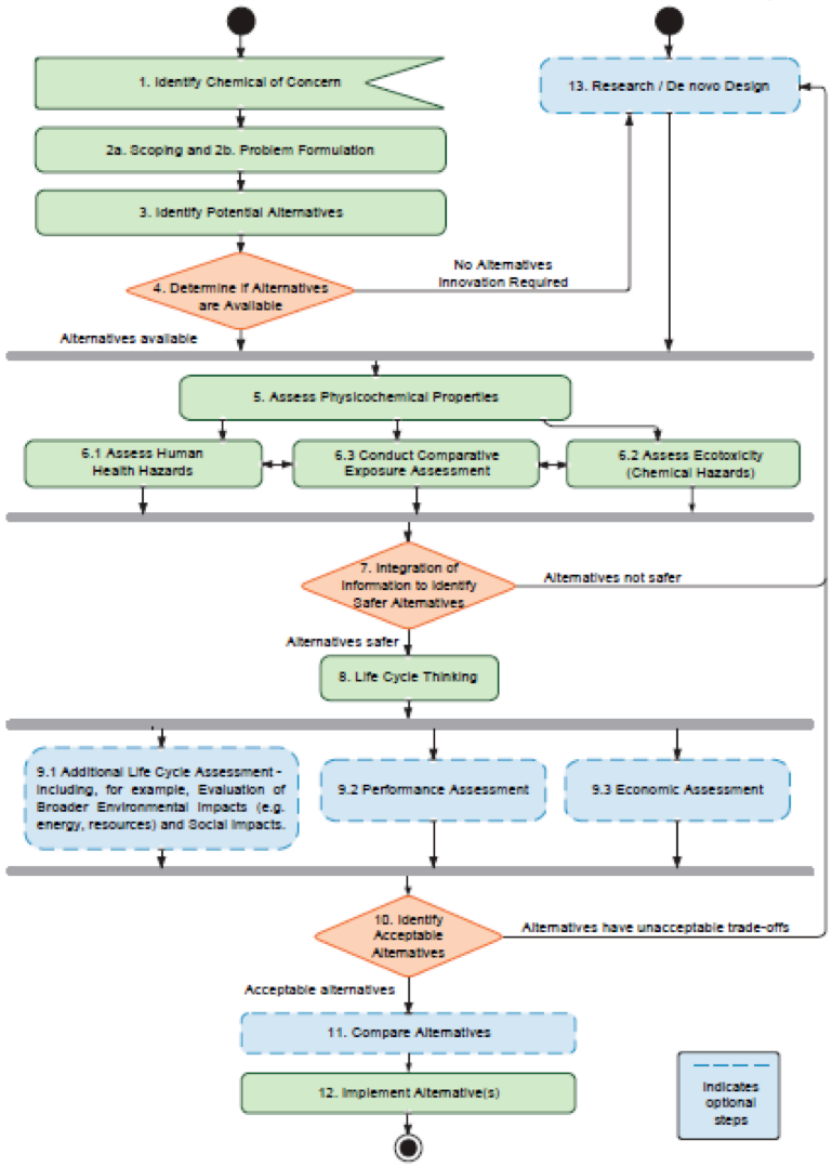

A Framework
to Guide Selection of
CHEMICAL ALTERNATIVES
NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES


1. Identify Chemical of Concern
2a. Scoping and 2b. Problem Formulation
3. Identify Potential Alternatives
4. Determine if Alternatives are Available
No Alternatives Innovation Required
Alternatives available
13. Research / De novo Design
5. Assess Physicochemical Properties
6.1 Assess Human Health Hazards
6.3 Conduct Comparative Exposure Assessment
6.2 Assess Ecotoxicity (Chemical Hazards)
7. Integration of Information to Identify Safer Alternatives
Alternatives not safer
Alternatives safer
8. Life Cycle Thinking
9.1 Additional Life Cycle Assessment - including, for example, Evaluation of Broader Environmental Impacts (e.g. energy, resources) and Social Impacts.
9.2 Performance Assessment
9.3 Economic Assessment
10. Identify Acceptable Alternatives
Alternatives have unacceptable trade-offs
Acceptable alternatives
11. Compare Alternatives
12. Implement Alternative(s)
Indicates optional steps

Trade offs and Regrettable Substitutions: A Rogues' Gallery

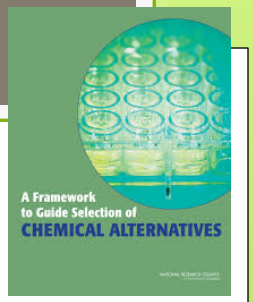
- From one environmental medium to another
  - MTBE as a fuel additive in place of lead
    - Goal: reduce air pollution by enhancing combustion
    - Contaminated surface water
- From one health impact to another:
  - Methylene chloride to nMP in paint strippers
- From the environment to workers
  - n-hexane replacing CFCs in aerosol brake cleaners
- From human health to the ecosystem
  - Copper in brake pads
  - Pyrethroids; improvement for human health; persistent in aquatic sediment
  - Neonicotinoids: better than OP's for humans, deadly for bees via plants; ng/l toxicity
    - Inappropriate ecotoxicity tests; water-soluble!

What Decision Do you Need to Make?

- Raw material/ component supplier
  - Provide information to downstream user, customer
- Manufacturer/Assembler/ OEM:
  - Choose safer alternative materials/ components for your product
- Retailer
  - Screen products for potentially hazardous chemicals
- Regulator
  - Regulatory framework to drive demand for safer alternatives
  - Find solutions to specific hazards (e.g. Maine deca-BDE AA)

Types of Available Tools

- Green Screen: benchmarking chemical hazards
- Emerging Hazard/ Alternatives Tools
  - ChemHAT
    - hazard and alternatives information for workers
- Sector tools:
    - CleanGredients, MIQ, Pharos
    - Retailer tools (see GC3 references)
    - Outdoor Industry Association's EcoIndex/ Higg Index
- GoodGuide
  - Safer product choices for consumers
  - Retailer buyer tool
- Company Ranking Tools
    - (GoodGuide)
    - B Corporation's Impact Assessment
- Regulatory Framework for Assessing Safer Alternatives
  - Maine, Washington, California, EU REACH
  - IC2 (Interstate Chemicals Clearinghouse) modular AA guidelines



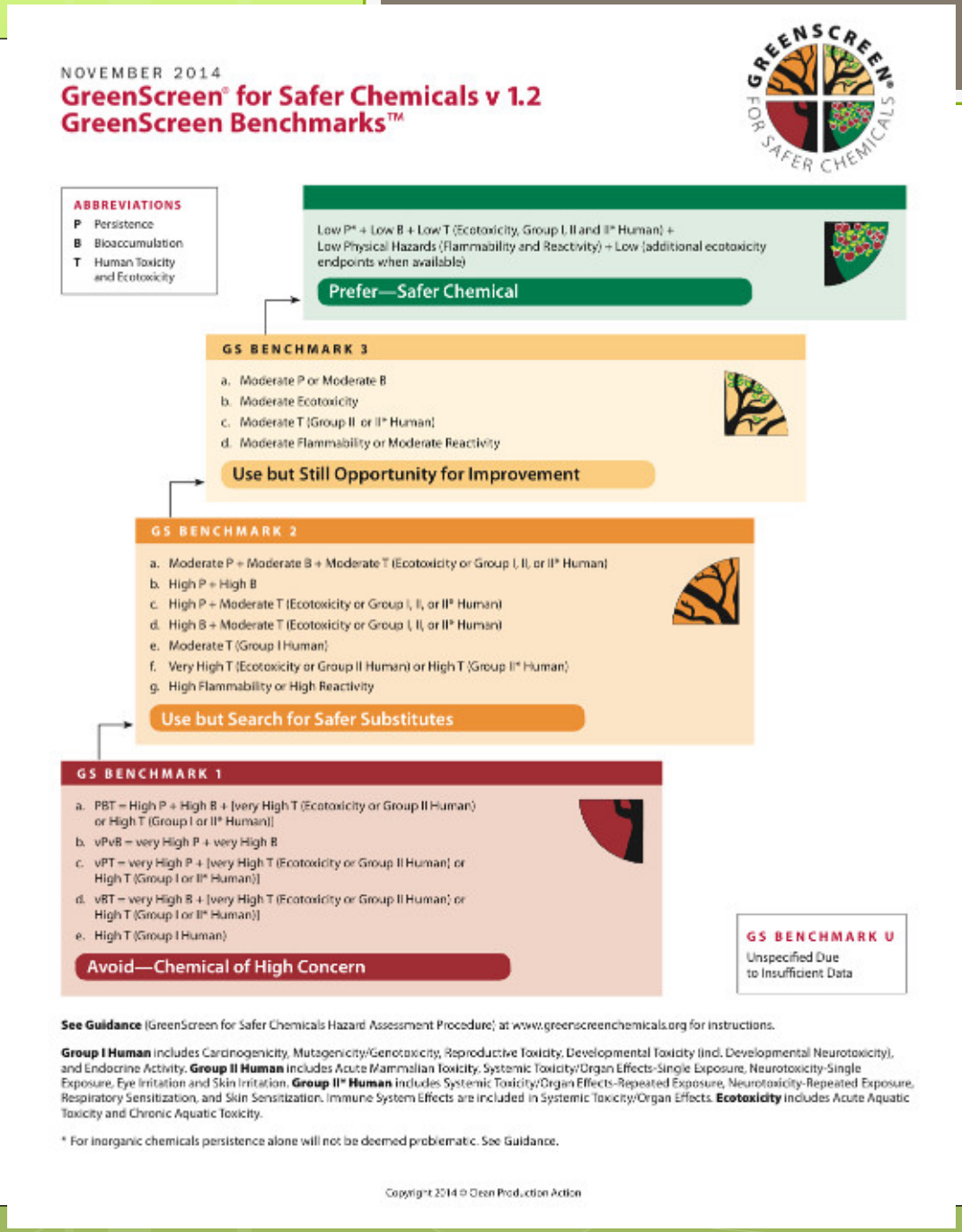
Challenges: Exposure Assessment

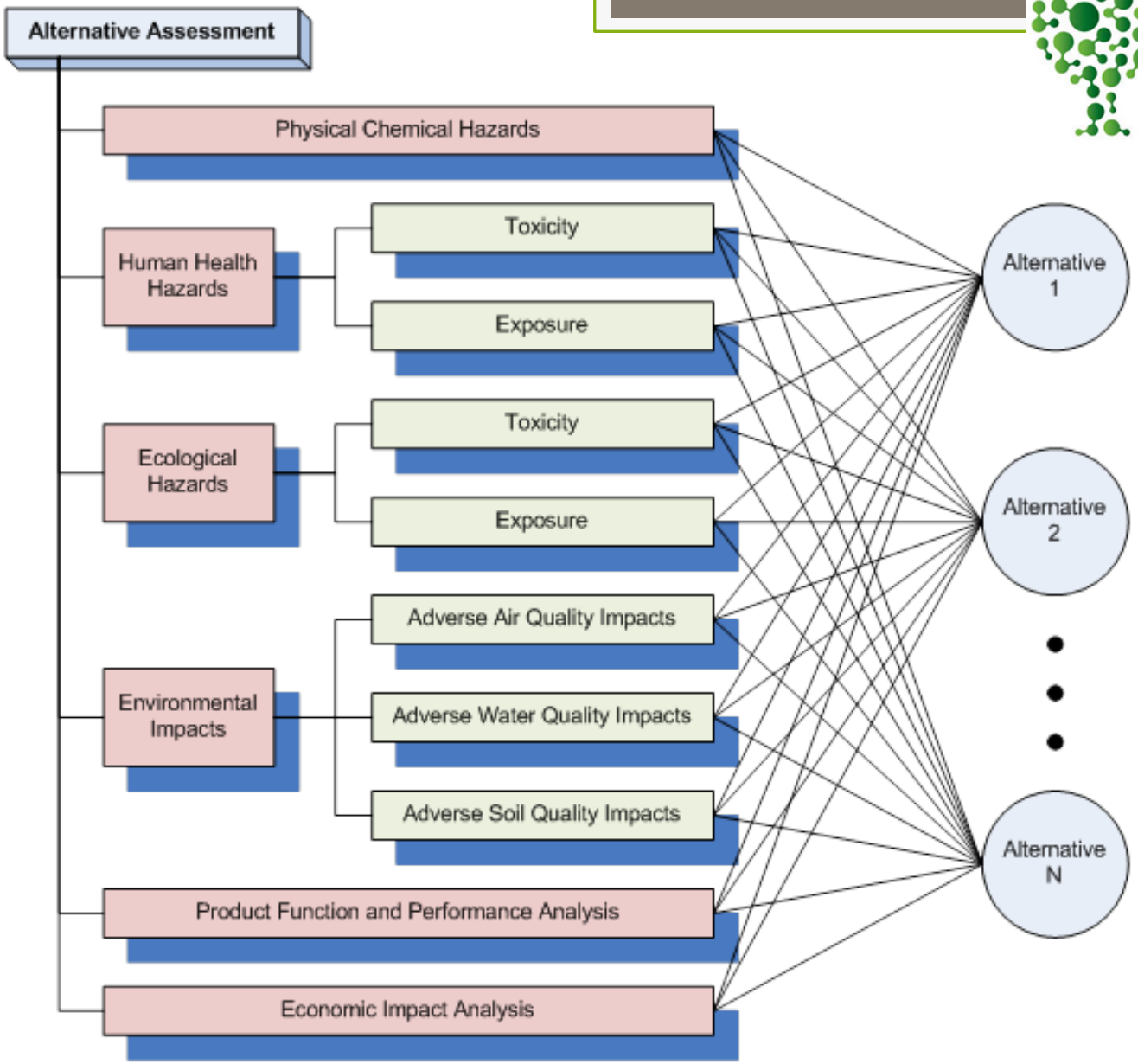
- The NAS report: Comparative Exposure Assessment
  - Consider the potential for reduced exposure due to inherent properties of the alternative chemicals;
  - Ensure that any substantive changes to the routes and any substantive increases to the levels of exposure are identified; and
  - Allow for consideration of the routes (dermal, oral, inhalation, etc.) , patterns (acute, chronic) and levels of exposure (irrespective of any exposure controls
  - When integrating the evidence related to human and ecological toxicity among alternatives

Decision-Making: You've got the Data, Now What?

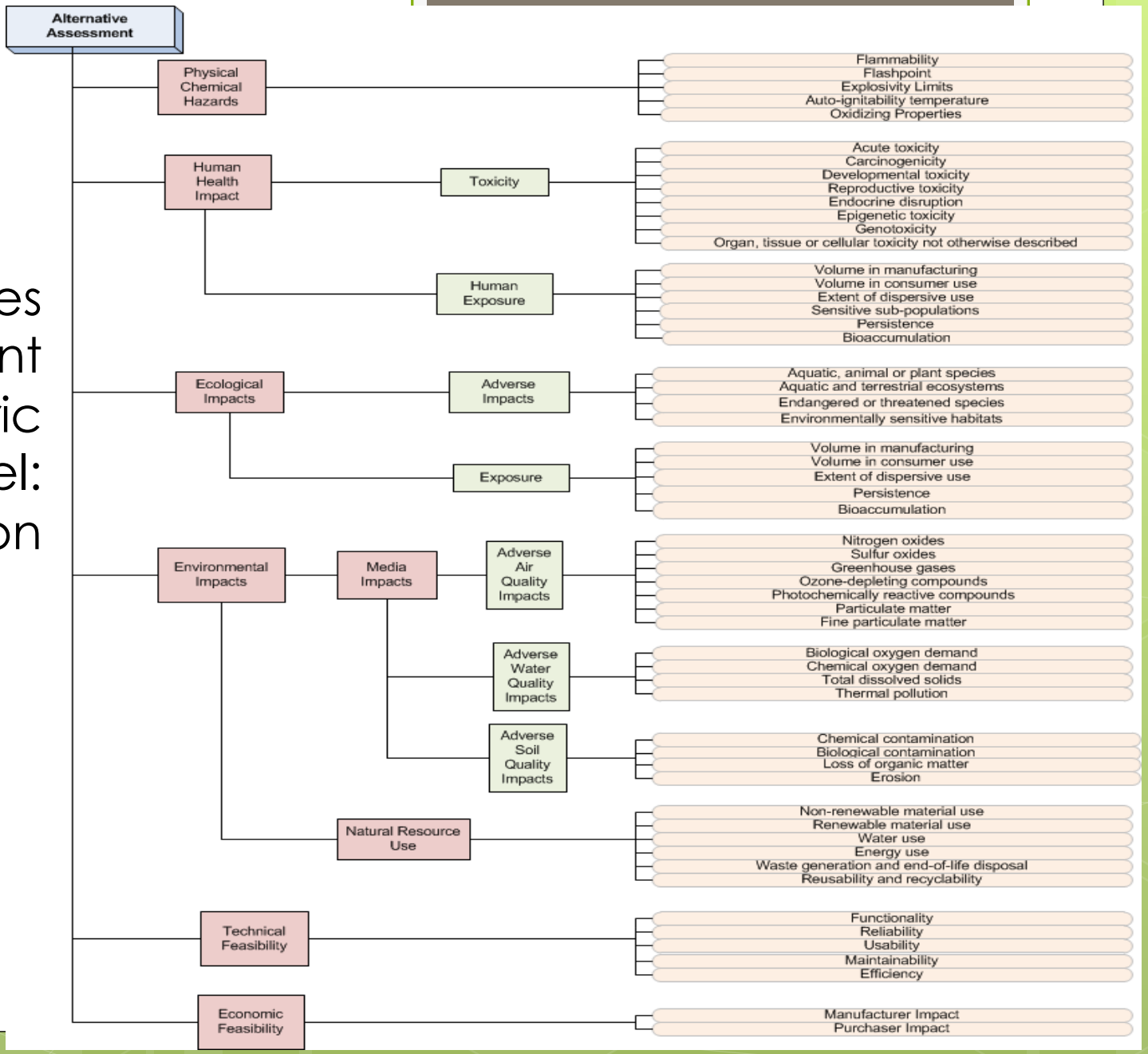
- Decision-Support Tools:
  - Green Screen for Safer Chemicals
- Decision-Making Frameworks:
  - Multi-Criteria Decision Analysis
    - As modeled for the California Safer Consumer Product Regulations
  - Biz-NGO Working Group Alternatives Assessment Protocol
    - Incorporates Green Screen, LCA, risk assessment
- IC2 Framework: allows for different decision processes

Green Screen Benchmarks




Alternative Assessment
Physical Chemical Hazards
Human Health Hazards
Toxicity
Exposure
Ecological Hazards
Toxicity
Exposure
Environmental Impacts
Adverse Air Quality Impacts
Adverse Water Quality Impacts
Adverse Soil Quality Impacts
Product Function and Performance Analysis
Economic Impact Analysis
Alternative 1
Alternative 2
Alternative N

Alternatives Assessment Generic Model: Final Version



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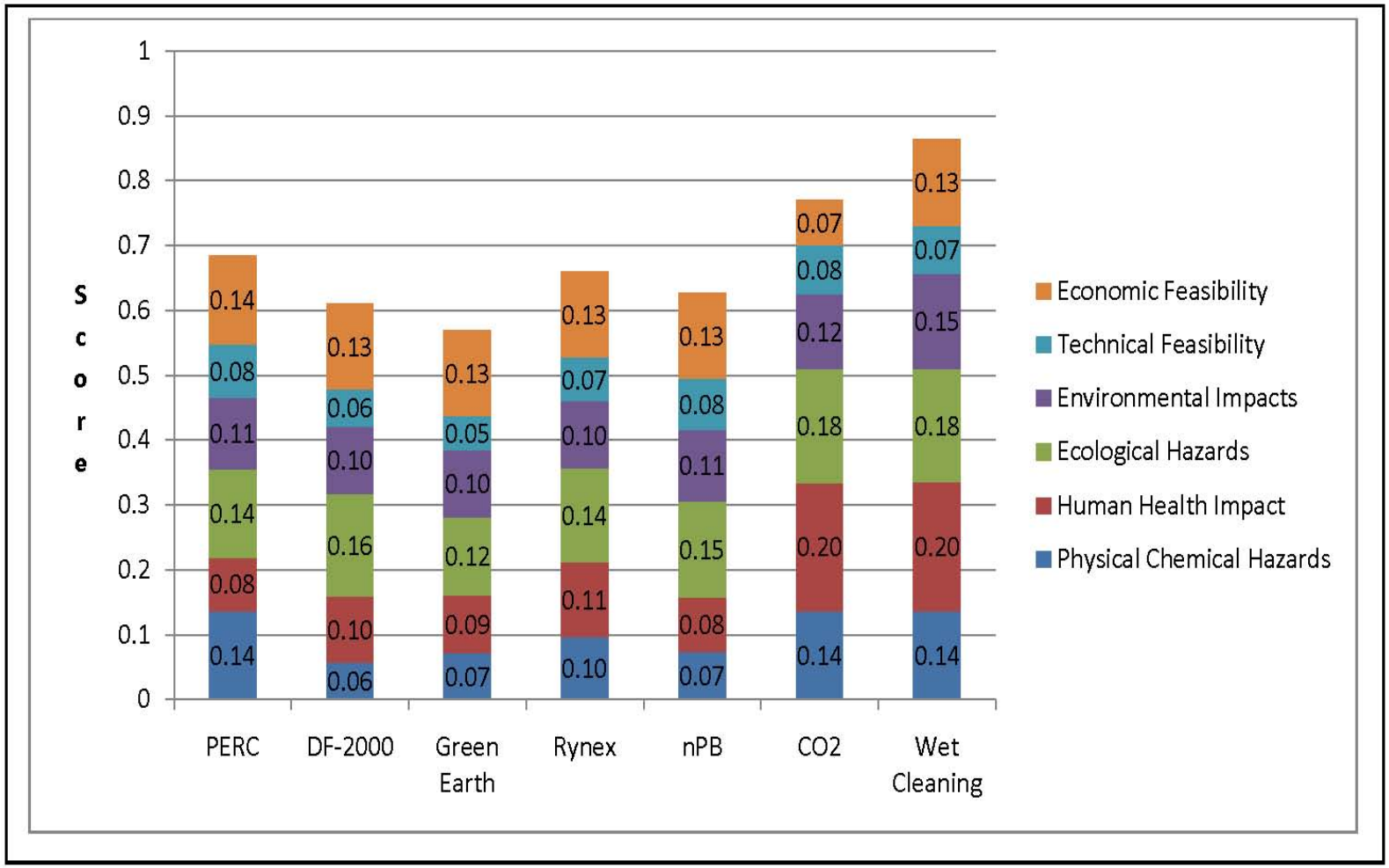
What's Driving the Decision?



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Materials Assessment And Alternatives Screening

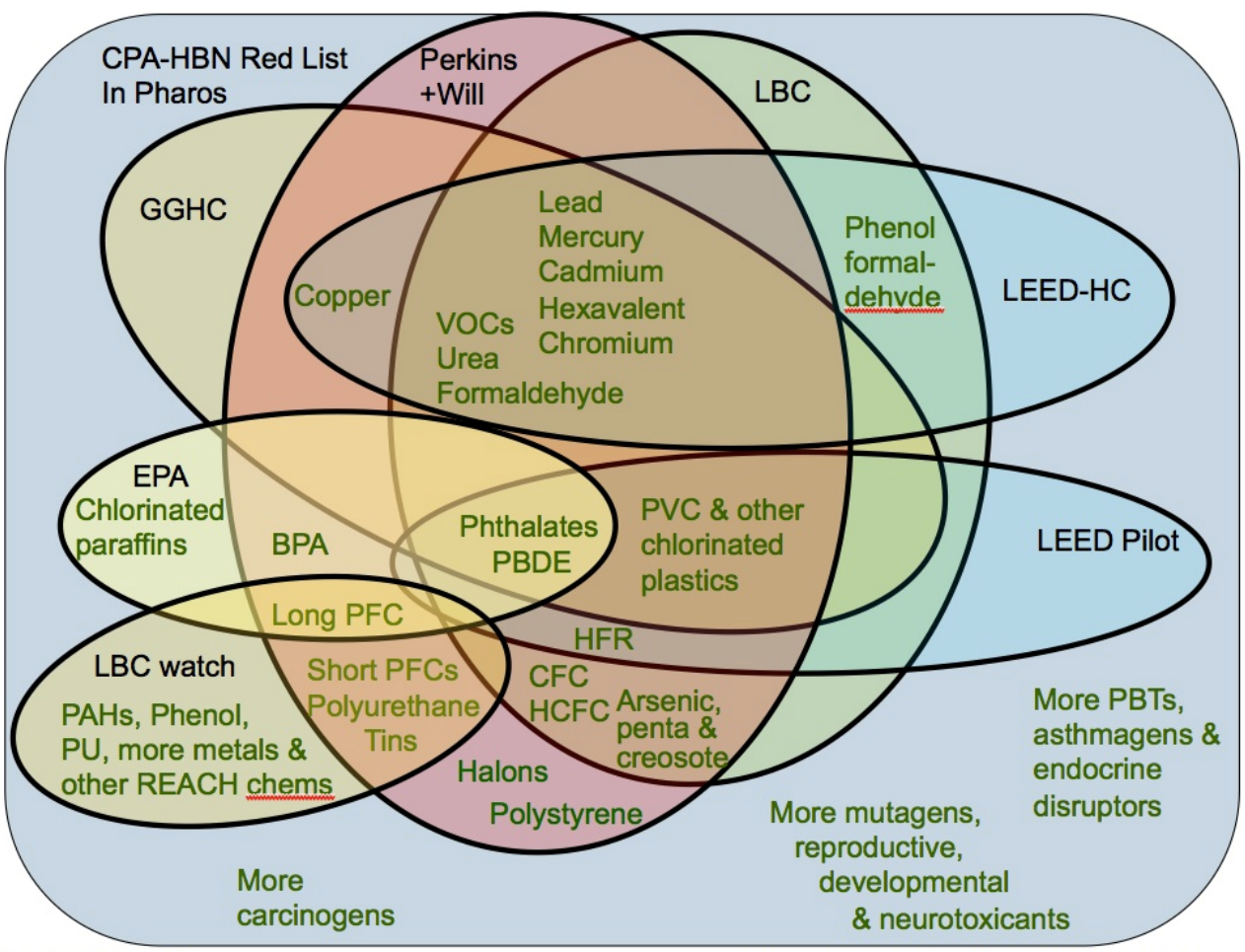
Herman Miller's Story

Thaddeus Owen Thaddeus_owen@hermanmiller.com

HermanMiller


Formaldehyde
BPA
PVC
Brominated
Flame
Retardants
Phthalates
PVC
Flame Retardants

Red Lists

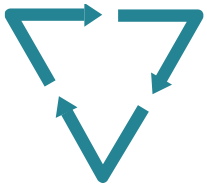

CPA-HBN Red List
In Pharos
Perkins
+Will
LBC
GGHC
Lead
Mercury
Cadmium
Hexavalent
Chromium
Copper
VOCs
Urea
Formaldehyde
Phenol
formal-
dehyde
LEED-HC
EPA
Chlorinated
paraffins
BPA
Phthalates
PBDE
PVC & other
chlorinated
plastics
LEED Pilot
Long PFC
HFR
LBC watch
Short PFCs
Polyurethane
Tins
CFC
HCFC
Arsenic,
penta &
creosote
PAHs, Phenol,
PU, more metals &
other REACH chems
Halons
Polystyrene
More PBTs,
asthmagens &
endocrine
disruptors
More mutagens,
reproductive,
developmental
& neurotoxicants
More
carcinogens
& More beyond!
Courtesy of Healthy Building Network

Eco-inspired Design Goals

Every product is sustainable

100% Safe Chemistry

100% Recycled/Bio-based Materials



100% Closed-Loop Systems

100% Life Cycle Assessment

10 YEAR GOALS
100% DfE Approved Products
100% level 3 Certified Products
Takeback 125,000 tons of product

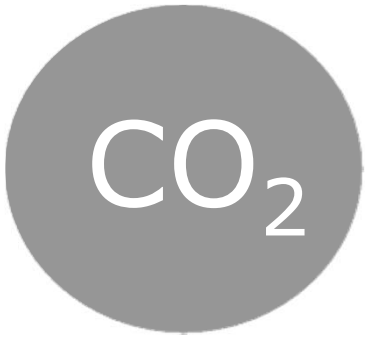
Eco-Inspired Design

Chemistry

Disassembly

Recyclability

Chemical of Concern List



Life Cycle Assessment

Start with the Product

Generate a Bill of Material (BOM)

Bill of Materials

BOM Level	Product Part Number	Revisio	QTY	Material Description	Material – Print	Material ID#	Material –Finish	Tier 1 Supplier	Wt (g.)
	DF.100		1.00	XXX Table Veneer Top					0 g.
1	1CCCS		1.00	ETG Assy				Supplier A	0 g.
2	1BBDD3		1.00	Base Assy					0 g.
3	1B98C6	F	1.00	Base Extrusion	6105 T5 Extruded Aluminum	2559	Polished (no coating applied)	Supplier A	5,008 g.
3	1B9H34	D	2.00	Foot Casting Small	Die Cast 380 Aluminum From Gordon MFG	456	Polished, 91 and 98 white and BK black powder coat	Supplier A	3,112 g.
			2.00	Foot	HDPE Dupont X123	555	None	Supplier A	13 g.
3	1B8PST	F	2.00	Post Extrusion	6061 T6 Aluminum Extrusion	384	Polished, 91 white and BK black powder coat	Supplier A	1,296 g.
3	1B8ZJR	E	2.00	Weldment			Bright Zinc	Supplier B	
4	1B8PXF	E	1.00	Plate connector end	1008/1010 CRS	229	Bright Zinc RoHS Compliant	Supplier B	537 g.
4	1B8YCK	D	1.00	Support plate	1008/1010 CRS	229	Bright Zinc RoHS Compliant	Supplier B	173 g.
4	1B8YCN	E	1.00	washer plate	1008/1010 CRS	229	Bright Zinc RoHS Compliant	Supplier B	36 g.
3	1B89S9	D	4.00	Threaded rod	1018/1020 Steel	598	RoHS Compliant, Zinc coated	Supplier B	526 g.
3	*302818146	AC	8.00	Set Screw	4037 Steel	2598	Black Zinc RoHS Compliant	Supplier B	16 g.
3	*7482031	AK	4.00	Cap	BASF XX123 PP 22% GF	3432	none	Supplier B	11 g.
	1B8PX9	F	4.00	Glide adjustment screw	1008/1010 CRS	229	Bright Zinc RoHS Compliant	Supplier B	

- Raw material information needed
  - Datasheets
  - MSDS
  - Full chemical composition disclosure
  - RoHS Compliance

HermanMiller

Contact Information

A)	Supplier Company Name:	
B)	Material Manufacturer: *(if not 'Supplier Company')*	
C)	Material Trade Name:	
D)	Contact Person:	
E)	Contact Information:	

Materials

Please provide the following data for all substances/mixtures contained in the product at a concentration of at least 100 ppm (0.01%), including any catalysts, dyes, colorants or residual monomers. Please copy and attach additional sheets, if necessary to outline the complete formulation. For purchased materials/mixtures, please identify the supplier and their product name. For raw materials, please provide CAS data.

#	Substance/mixture identifier (e.g., trade name; product number)	CAS number (Chemical Abstract Service)	Concentration or concentration range (0-1%, 1-5%, 5-15%, 15-50%, 50%+)	Function (within material)	Supplier name (if applicable)	Contact person and contact information
Ex:	*C.I. Pigment Blue 15*	*147-14-8*	*0.50%*	*colorant*	*Acme Products*	*John Doe, (555)555-1234, jd@acme.net*
1)						
2)						
3)						
4)						
5)						
6)						

RSL ATTESTATIONS

Minimum requirement from material suppliers

HermanMiller Form - Ver 1.0

This document is a declaration of the Annex B chemicals used within the manufacturers product.

Instructions: Complete all of the required fields (*) on this form per the product being evaluated for BIFMA Level Certification.

Upon completion, please return the form to the requester.

Some field names contain pop-up help boxes with further instructions. Pop-up boxes will appear when you mouse-over the field name and disappear upon leaving the field.

Please review the BIFMA Annex B (attached) and list the chemicals in the manufacturers formulation that are at a concentration greater than 1,000 PPM.

If a product contains chemcials that are on the Annex B list, please list those chemical, CAS#'s and % of the formulation in the chart below.

If the product does not contain any chemicals on the Annex B List, please list this as a note in the comment section of this document.

If applicable, please make comments in the "Comments" field.

Data Submittal Date*	

Supplier Information

Company Name*	
Company Product Description*	
Company Postal Address*	
Contact Name*	
Contact Phone*	
Contact Email*	
Contact Fax	
Contact Postal Address*	

Additional Information

Comments

Substance Information

Please Report Substance Information Below

Annex B Chemical *	CAS # * (where available)	% of total material * (up to 3 decimal places)	Description of Use

BANNED CHEMICALS OF CONCERN		
Chemical	Group	CAS No.
Bis(tributyltin)oxide (TBTO)	OT	56-35-9
Short chain chlorinated Paraffins	HFR	85535-84-8 108171-26-2
Di(2-ethylhexyl) phthlate (DEHP)	Phth	117-81-7
Di-isobutyl phthalate (DIBP)	Phth	84-69-5
Di-n-butyl phthalate (DBP)	Phth	84-74-2
Butyl Benzyl Phthalate (BBP)	Phth	85-68-7
MethyleneDianiline (MDA)		101-77-9
C.I.Pigment Yellow 34		1344-37-2
Tris (2-Choloroethy) phosphate (TCEP)	HFR	115-96-8
2,4 Dinitrotoluene		121-14-2
HBCD (HBCDD)	HFR	25637-99-4
Trichloroethylene		79-01-6
Phthalates	Phth	
Lead Compounds	Pb	
Chrome VI Cmpds	Chr	
Halogenated FRs	HFR	1163-19-5
Bis(2-methoxyethyl) phthlate (DEMP)	Phth	117-82-8
Di-n-octyl phthalate (DnOP)	Phth	117-84-0
Di-n-pentyl phthalate (DnPP)	Phth	131-18-0
Asbestos		1332-21-4
tris (1,3 dichloro-2-propyl)phosphate (TDCP)	HFR	13674-87-8
Lead (II) bis (methanesulfonate)	Pb	17570-76-2
Diisononyl phthalate (DINP)	Phth	28553-12-0 68515-48-0
HBCD	HFR	3194-55-6
Halogenated FRs	HFR	32534-81-9
Halogenated FRs	HFR	32536-52-0

... | Banned Substances | HMI RSL | Annex B Chemical List | CA Prop 65 | REACh | ⊕

Materials and Mechanical Properties Database

Compare | Return to Search | Exit

Detail	Color Score	Print Specification
	Yellow	PUR - Foamex Natural
	Yellow	PUR - High Density Polyurethane -
	Yellow	TPU - rene
	Yellow	TPU - Lar n 385S
	Yellow	TPU - La 185
	Orange	PUR - 2082 Isocyanate
	Red	Adhesive - polyurethane reactive easy adhesive)200
	Red	PUR - 5538R/ 5116T
	Red	PUR - 4
	Red	PUR - Specialty Composites Isc
	Red	TPU - way Polyurethanes TPU
	Not Assessed	Adhesive - olyurethane Multipurpose Adhesive), white
	Not Assessed	Adhesive - Polyurethane Reactive Adhesive TS-115 HGS
	Not Assessed	Adhesive - (TM) Polyurethane Reactive (PUR) Easy 250 Adhesive EZ250120
	Not Assessed	Adhesive - Diversitak CI-6631 Two Component water Based Spray Adhesive
	Not Assessed	FR- Gulbrandsen CP2 Fire Retardant Additive
	Not Assessed	Finish - Superior Finishes Sequoia 444-Clear-XX WB Polyurethane Clear Coat
	Not Assessed	Finish - ICA OP385 Polyurethane Black for Noguchi Topcoat
	Not Assessed	Finish - ICA PC34 Paste for Polyurethane Black for Noguchi Topcoat
	Not Assessed	ISO- Bayer Mondur TD Isocyante PUR component
	Not Assessed	Iso - BASF Lupranate T80 Type 1 (TDI)

DfE 2.0

Material Chemistry

Green
Little or no hazard; acceptable for use; reviewed by MBDC. No Banned RSLs.

Yellow
Low to moderate hazard; acceptable for use; reviewed by MBDC. No Banned RSLs,

Purple
Full formulation and RSL/BIFMA Annex B attestations. Internal review. No Banned RSLs.

Red
High hazard; should be phased out as soon as possible.

Orange
Incomplete data; no indication it is problematic but a complete assessment is not impossible

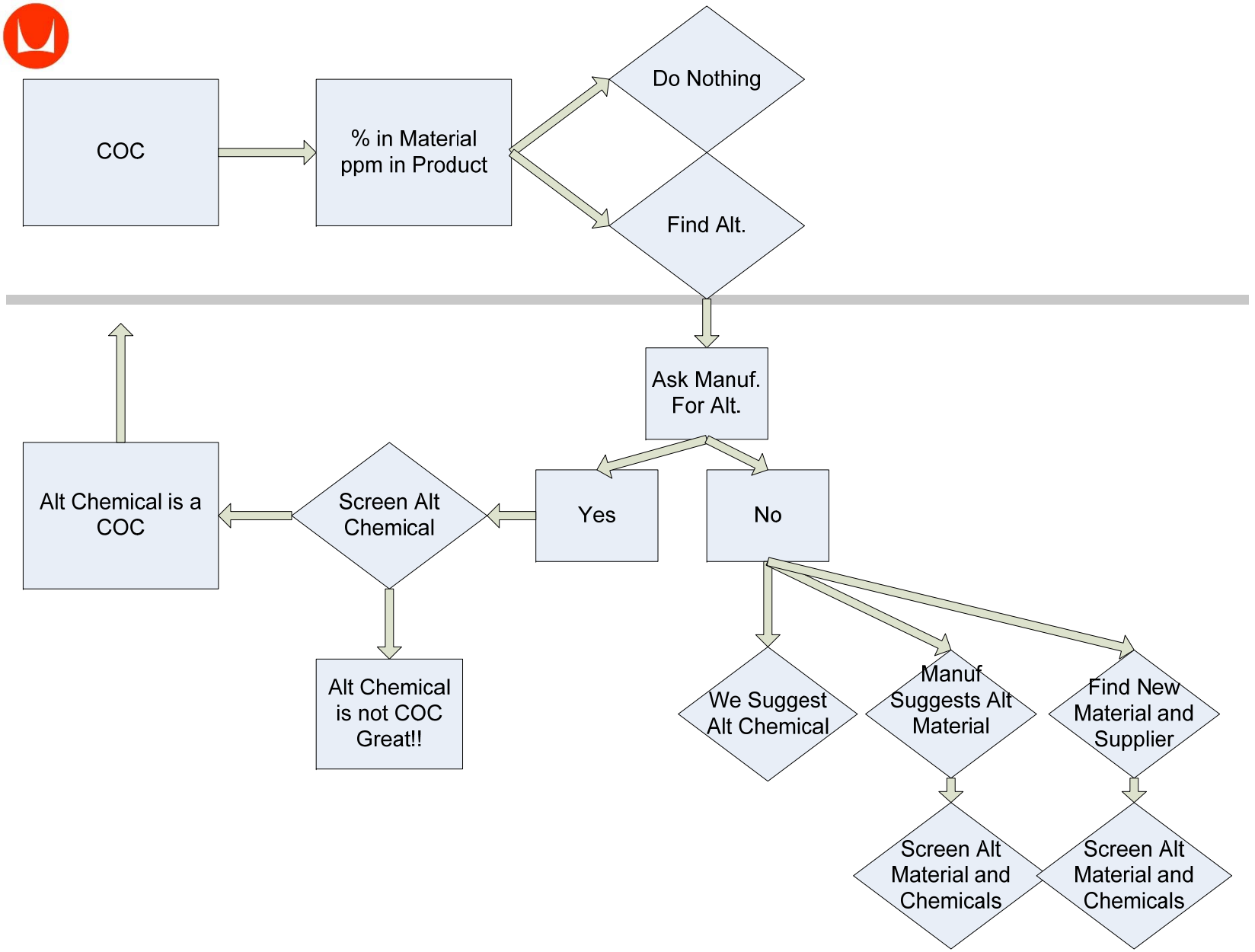
Material Description	Material – Print	Material ID#
XXX Table Veneer Top		
ETG Assy		
Base Assy		
Base Extrusion	6105 T5 Extruded Aluminum	2559
Foot Casting Small	Die Cast 380 Aluminum From Gordon MFG	456
Foot	HDPE Dupont X123	555
Post Extrusion	6061 T6 Aluminum Extrusion	384
Weldment		
Plate connector end	1008/1010 CRS	229
Support plate	1008/1010 CRS	229
washer plate	1008/1010 CRS	229
Threaded rod	1018/1020 Steel	598

Screening - 1st Look for Banned Substances

- RSL Attestation signed
- No Banned restricted substance groupings
  - Halogenated Flame Retardants (HFRs)
  - Heavy Metals (Arsenic, Cadmium, Cobalt, Chrome VI, Mercury, Lead)
  - Phthalates

Screen Against Lists

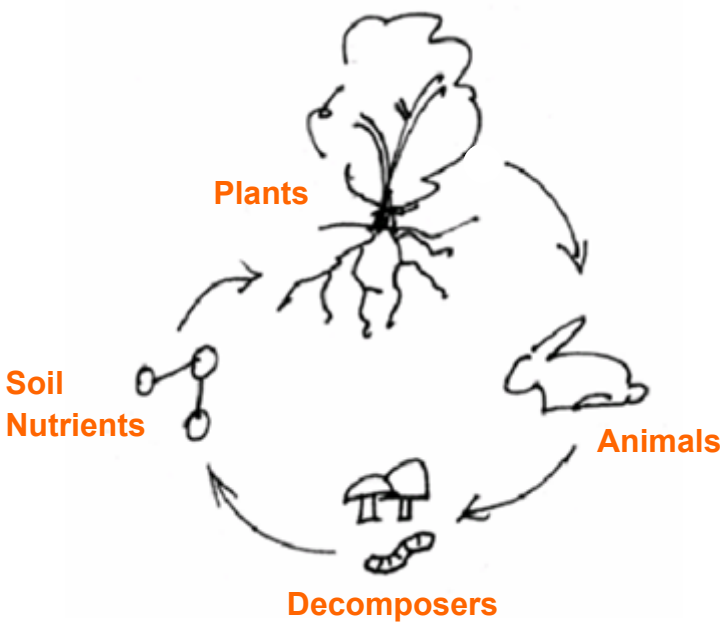
Screen with 3rd Party Assessors – Optional

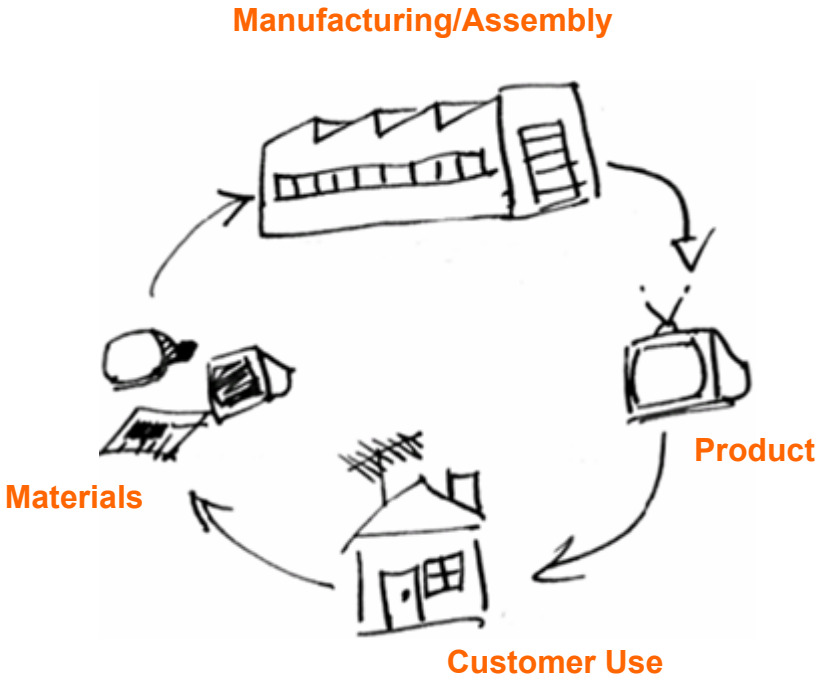

COC
% in Material
ppm in Product
Do Nothing
Find Alt.
Ask Manuf.
For Alt.
Yes
No
Screen Alt
Chemical
Alt Chemical is a
COC
Alt Chemical
is not COC
Great!!
We Suggest
Alt Chemical
Manuf
Suggests Alt
Material
Find New
Material and
Supplier
Screen Alt
Material and
Chemicals
Screen Alt
Material and
Chemicals

Decisions

- Based on risk and exposure process
- Based on knowledge
- Based on feedback from Consultants
- Based on BIFMA Chemical of Concern risk/exposure study

Products Designed “Free Of” Not Enough





Source: GreenBlue

Fiberglass

Products Made to Last

A Modular Approach to LCA: The Process and Results Applied to HP's Imaging Products

Tom Etheridge, PhD
WW LCA and CF Program Manager, HP

The Motivation

Why assess environmental impacts of HP's Imaging Products Portfolio?

1. Product Improvement

- Help HP scientists focus development on environmental performance early in the design process with guidance from environmental analysis that spans the product line

2. Produce EPDs

3. Earn 3 critical EPEAT 1680.2 optional points

4. Proactive approach to potential regulatory and ecolabel requirements

5. Customer demand

- Match customer needs with the appropriate printing devices
- Understand how optimizing printing habits can lower personal environmental impacts (duplex printing, reduced power consumptions, etc.)

The Challenge

How to get solid environmental information that spans HP's multi-billion dollar Imaging portfolio?

Breadth of portfolio

- 10,000+ Imaging products from consumer-level InkJet printers to department class, high-speed LaserJet multifunction devices.

Complexity

- Ever evolving portfolio due to customer and regulatory demand. Complex devices, sold in more than 100 countries with global supply-chain of components.

Expense

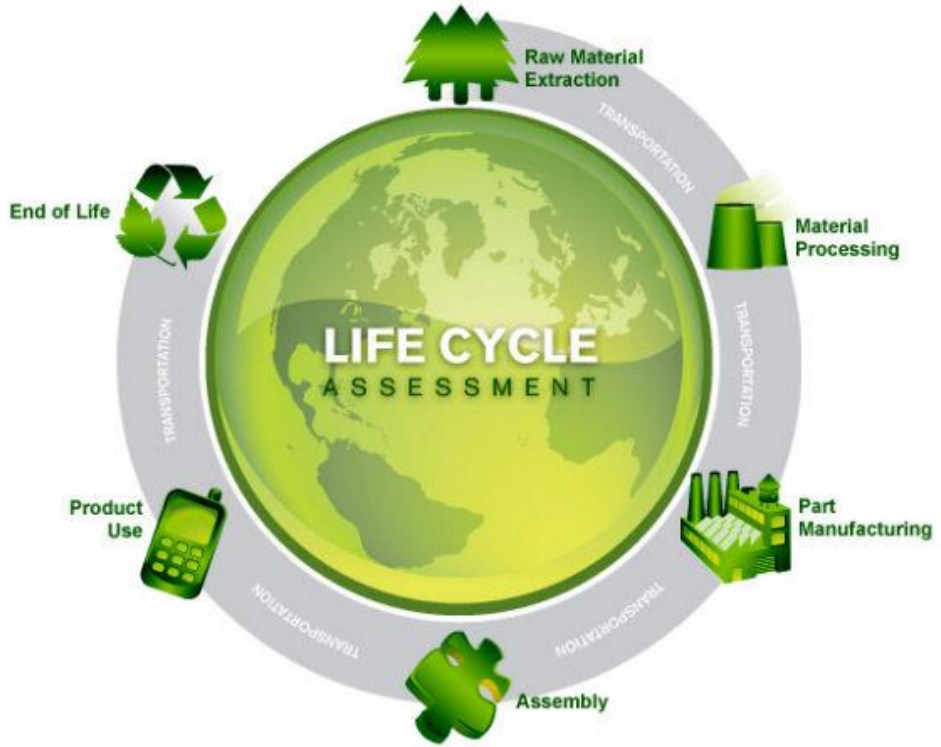
- Prohibitively expensive to do an LCA from scratch for even a representative cross-section of the portfolio.

Leverage

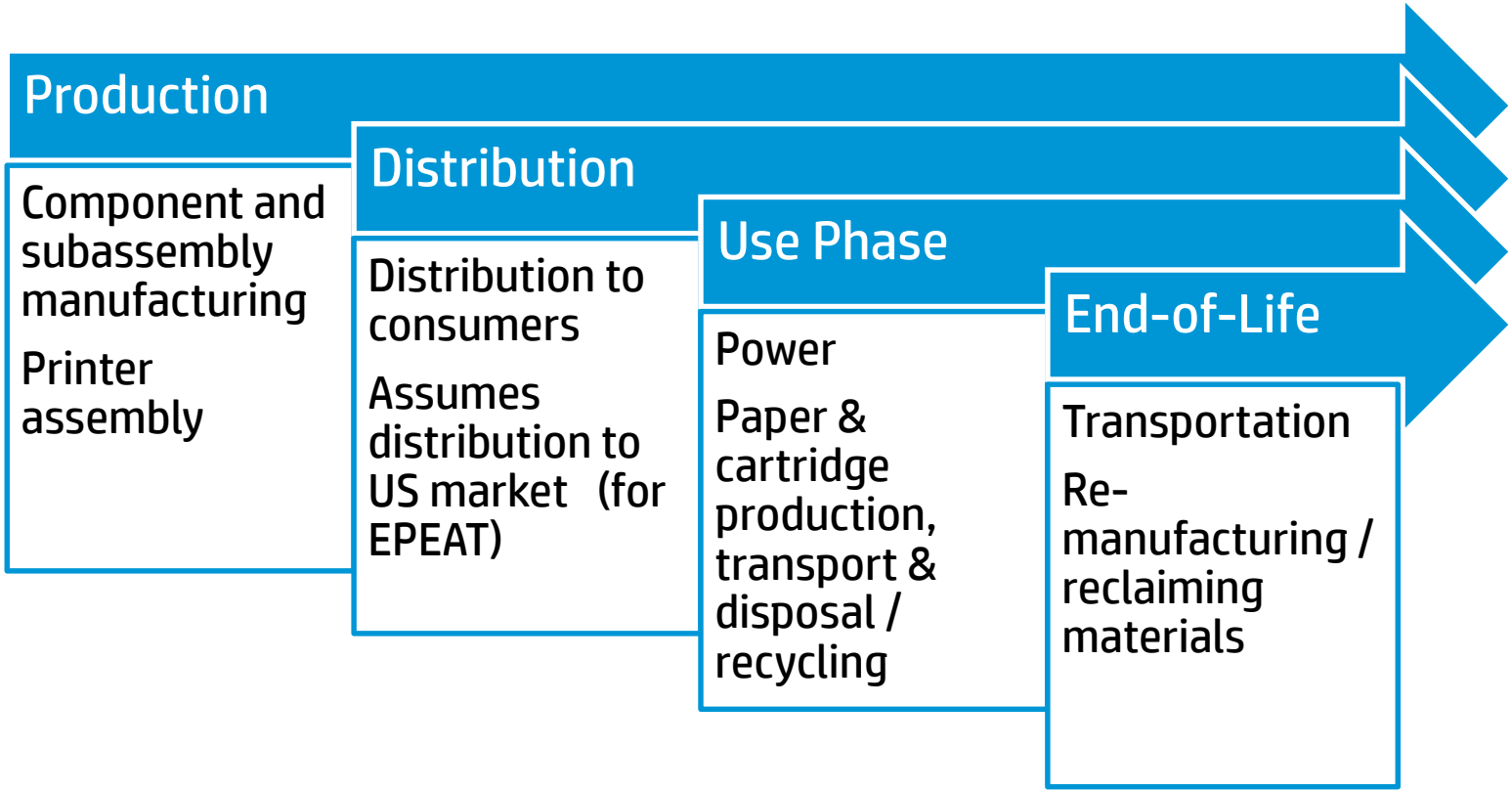
- Need a flexible and modular model that could cover other imaging products (e.g., InkJet and scanners).

What is LCA

- **LCA is a robust, rigorous, ISO-recognized tool for assessing the environmental impact of a product over its entire lifecycle**
- **Incorporates input from all stages of a product's life**
  - Materials
  - Manufacturing processes
  - Distribution routes
  - Energy consumption
  - Consumables
  - Disposal
- **Requires defining a Functional Unit**
  - For HP's imaging products the functional unit is 1000 printed pages



Model Structure – From Cradle to Grave



One LCA to Rule Them All

Completed an extensive LCA that defines the process for all printers

Hewlett-Packard

LCA of LaserJet Printers for EPEAT Verification

Background report

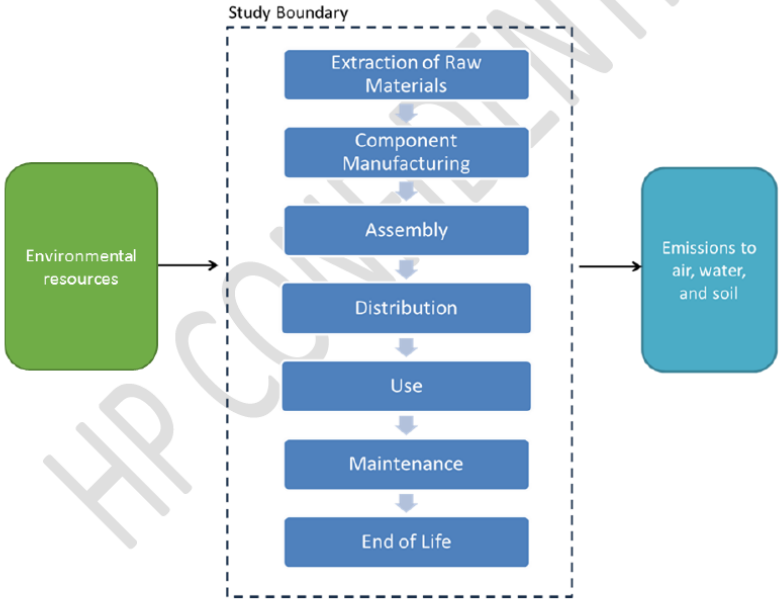


Figure 2-3: LaserJet LCA Study Boundary

The Challenge at the Printer Level: Product Complexity

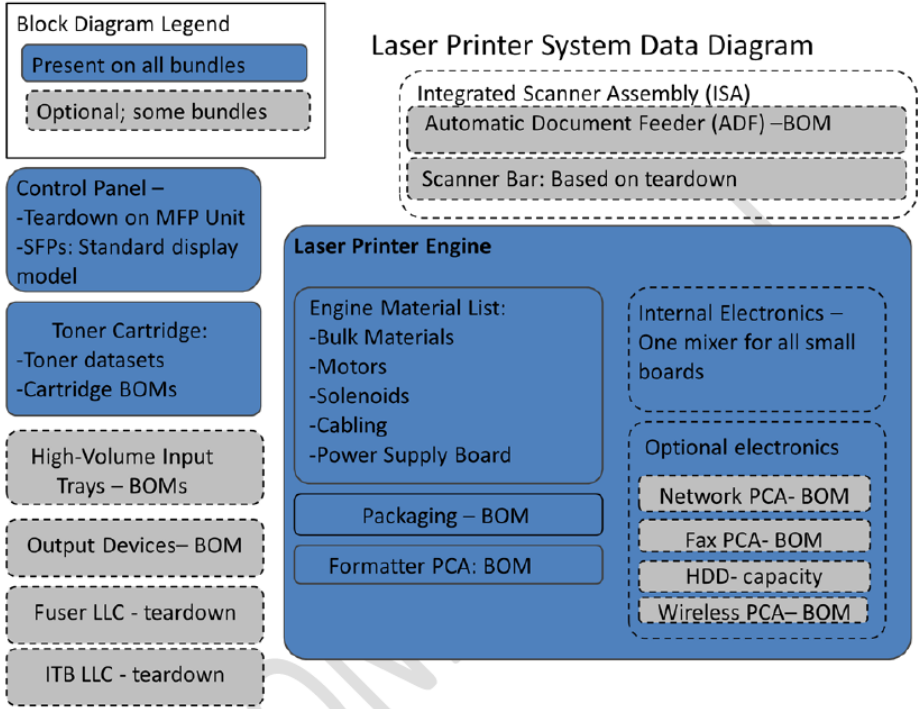


Figure 3-1: GaBi Model Overview of Printer Life Cycle System

The Solution = A Modular Approach

Initial Models Built for LaserJets

Hardware

LES Print engine
Skins
Paper handling
Scanner
Fax
Wireless
Power supply
Keypad
Document feeder
PC boards
Etc.

Consumables

Paper
Cartridges
Fuser
ITB
Energy

Other

Transport (all nodes)
Packaging
End-of-life
Functional Unit
LCA-specific life phases

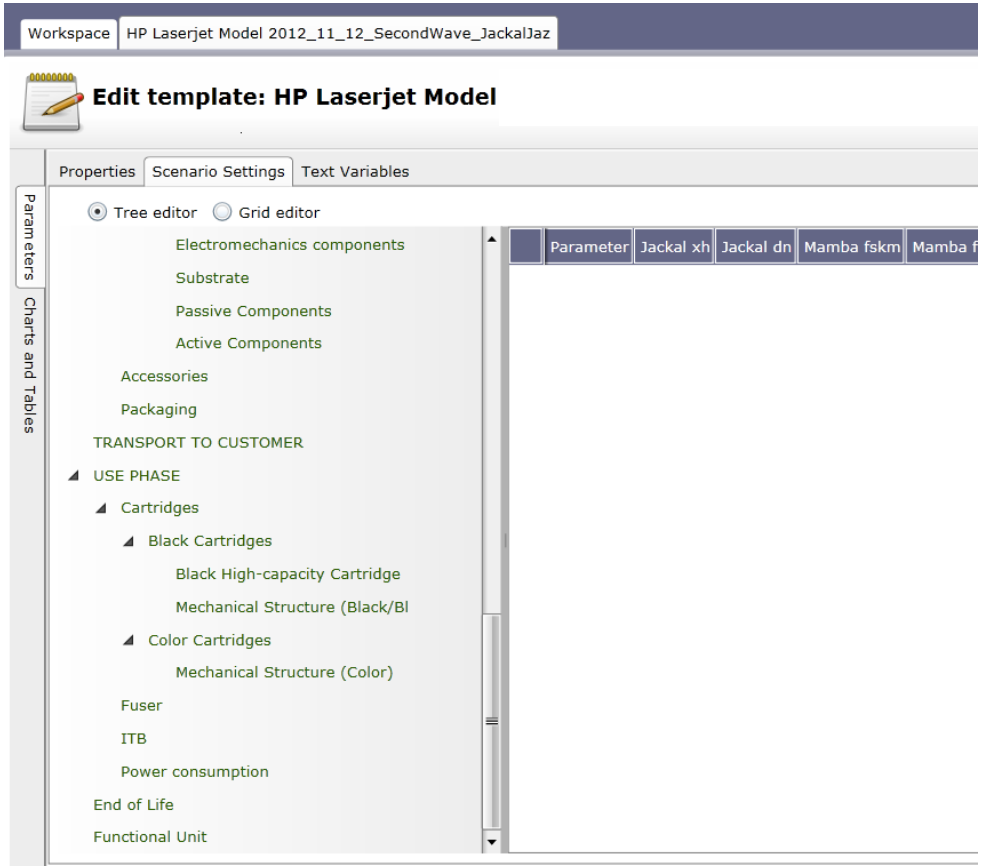
Models Added for InkJets

Printheads
Cartridges
Printbar (Pagewide Array)
Printhead assembly
Ink delivery system

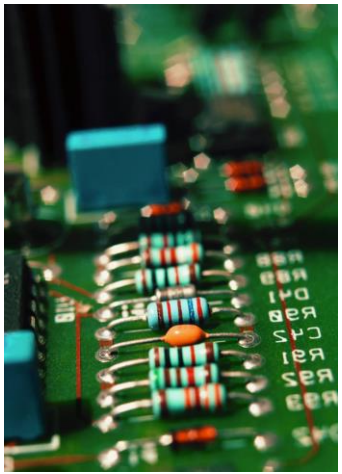
The GaBi Envision Tool: Design for Environment

A web-based tool that allows the user to modify input parameters for all components

- Covers all printer components, consumables & inputs
- Includes all LCA phases
- Generates ISO-compliant Environmental Product Declarations (EPDs)
- Flexible! Allows modules to be added for future products



Model – Best available background data



- Collection of BOM information on
  - Mechanical parts
  - Electrical components
  - Electro-mechanical systems
- Mapping of observed components to existing datasets
- Modeling with representative components (127 datasets) based on size, materials and production processes

The Environmental Product Declaration (EPD)

A document that summarizes the LCA output in a standardizes format

Reports 9 ReCiPe (H) midpoints

Results presented graphically and in tabular form

Life cycle phases are broken out in the appendix

Intended to allow relatively quick comparison among products

ENVIRONMENTAL PRODUCT DECLARATION

Page 2
Issued on March 22, 2013

Hewlett Packard
Laser Printer M775z+

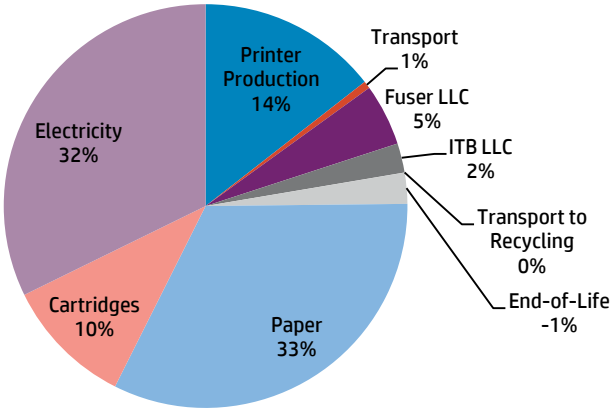
Declaration 11CA41590.157.1
According to ISO 14025

Product Description

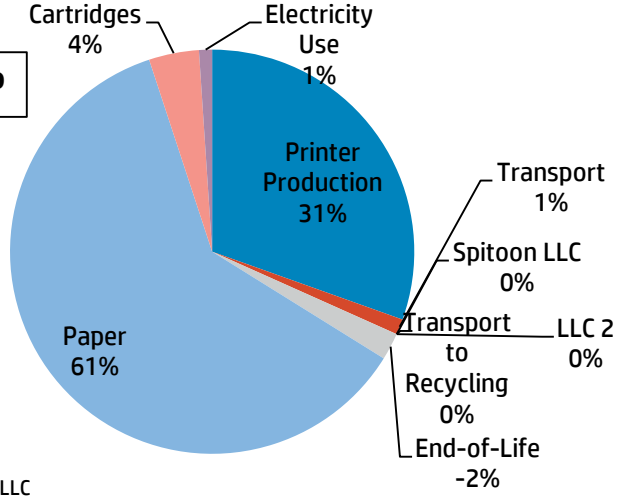
Product Type	Multi-function color laser printer for large departments
Print Speed (mono)	30 ppm
Intended use	Office Use
Product Lifetime	5 years
Range of applications	High-volume printing and faxing of documents in color
Product Specifications	NA
Introduction Date	11/1/2012
Functional Unit	The functional unit has been defined as printing 1000 pages in accordance with the Energy Star Typical Electricity Consumption test procedure and the reference PCR.
Scope of Validity / Applicability	The EPD is representative for the HP laser printer model M775z+ sold as a stand-alone unit (not as part of managed print services), and reflecting default out-of-box settings for duplexing, energy savings, and print quality. This EPD and the reference PCR are applicable for printer sale and use in the North American market. Differences between product environmental product declarations are not guaranteed as valid basis for comparison between products of different manufacturers.
Product System Description	This EPD describes the lifetime use of the laser printer, including production of all materials and components, assembly in the final configuration, delivery to the customer, use of the product, and expected end-of-life scenarios. All packaging, in-box accessories, and all consumables (paper, toner cartridges, replacement parts) are considered, including associated end-of-life treatment. Printing is considered the main function of the product, and the impacts of other functions (scanning, copying, etc.) are not considered.

Comparison of OJ Pro X576dw With Comparable Laser Printers: Fractional View Assuming 100k page life

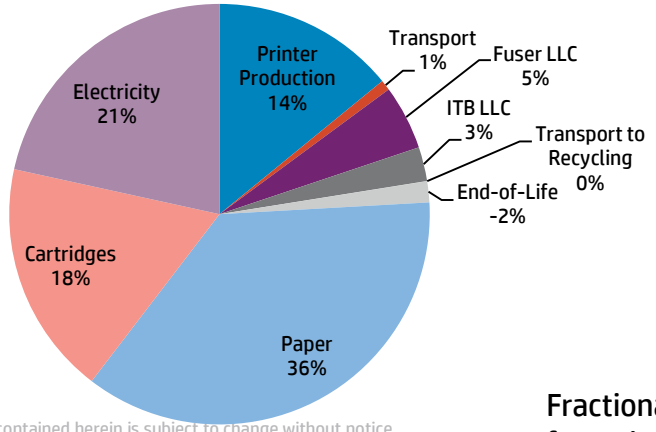
M570dn Color Laser MFP



OJ Pro X576dw Color Ink MFP



M551dn Color Laser SFP

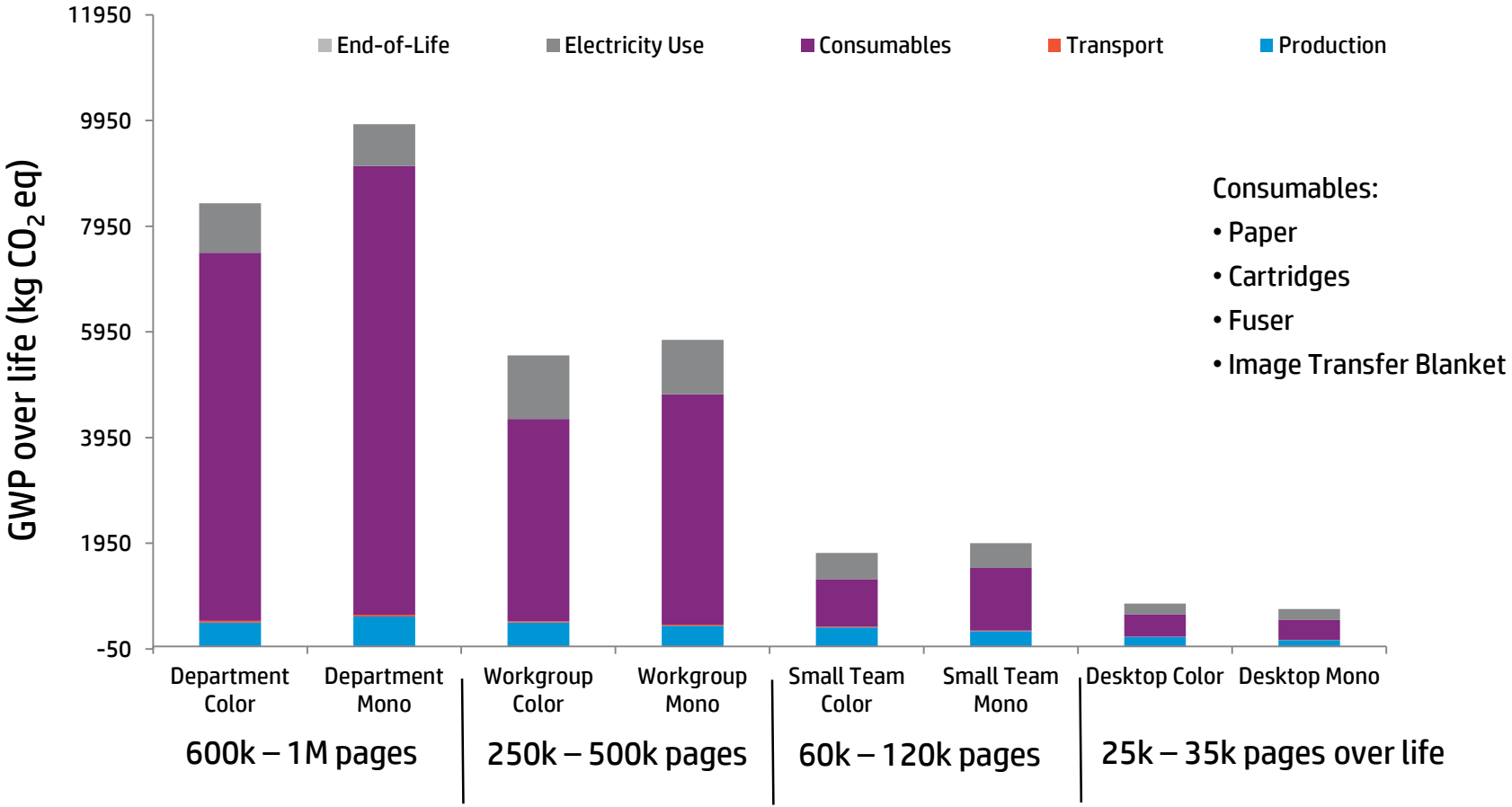


Bottom Line

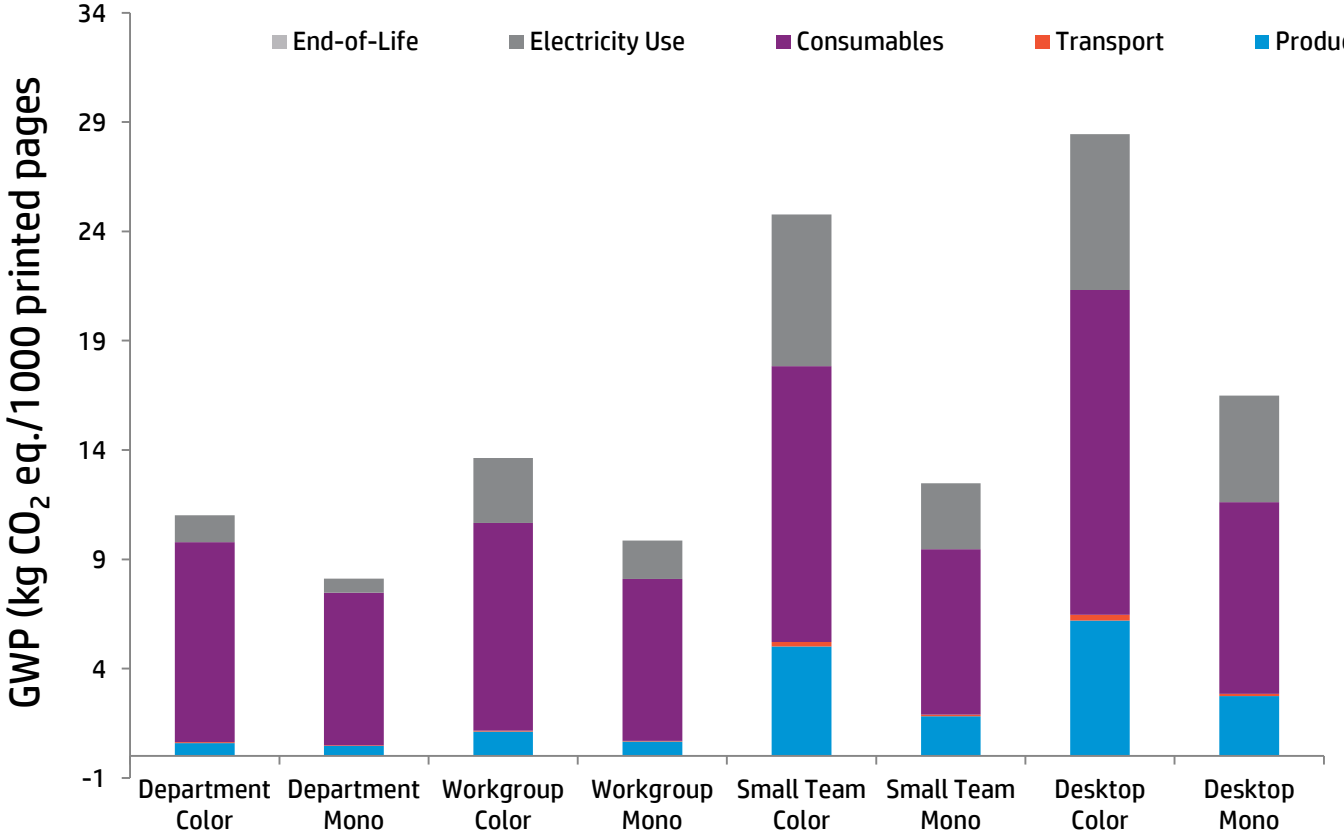
The printing contribution for the comparable LES products remains at least 64% of the total carbon footprint of the page

Fractional contribution to carbon footprint per 1000 pages printed

Results – Lifetime GWP for LaserJet Portfolio



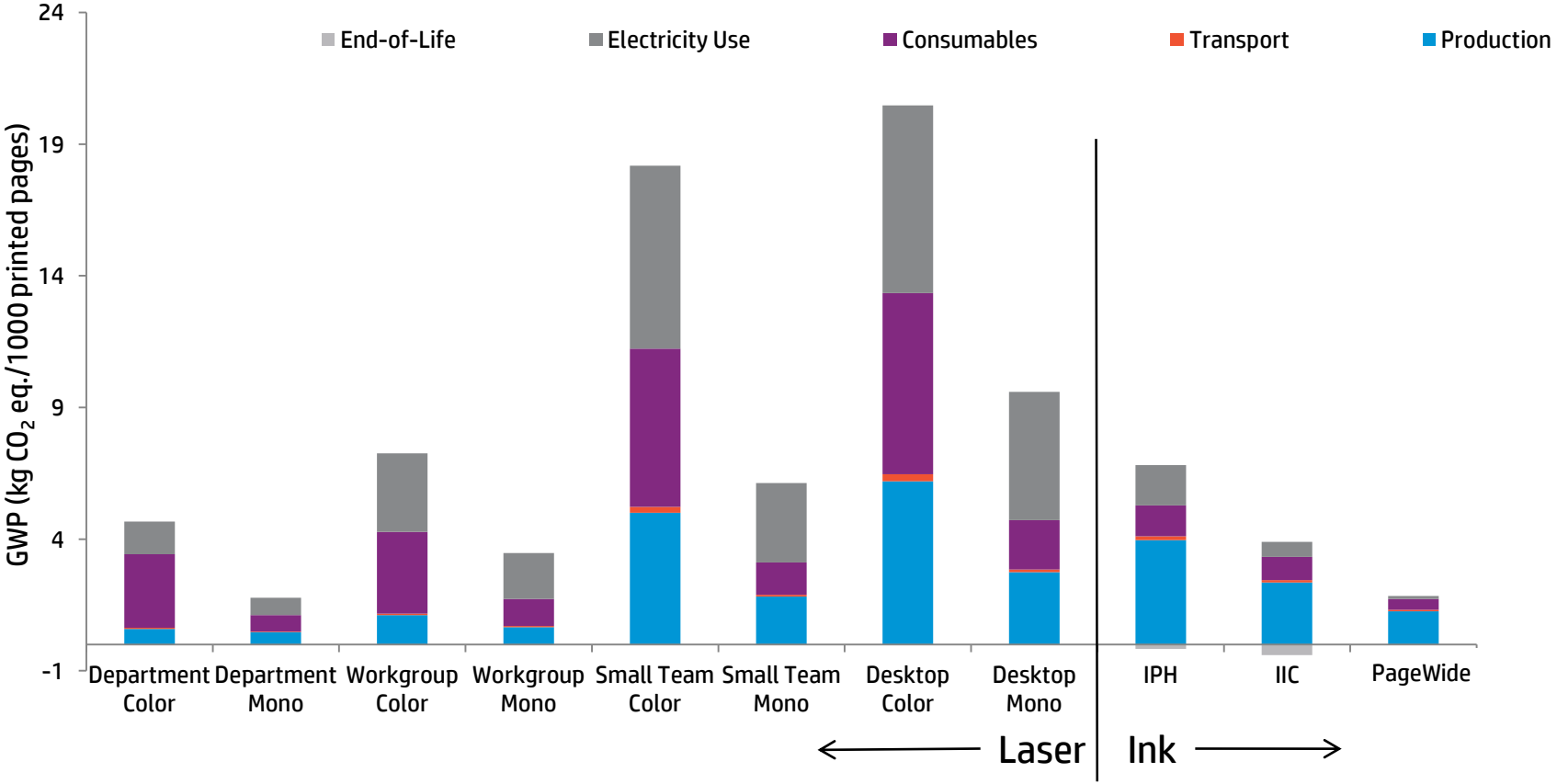
Results – GWP per 1000 Printed Pages for LaserJet



Areas of focus:

1. Consumables for all classes
2. Power for Small Team and Desktop Classes
3. Production for Small Team and Desktop color models

The HP Printing Fleet (excluding paper)



Benefits – Progress and Learning To Date

Progress

- **Completed LCAs:**
  - 156 LaserJet products spanning the entire portfolio
  - 18 InkJet products spanning the entire print engine portfolio
  - 5 Scanner products spanning the entire portfolio

Learning

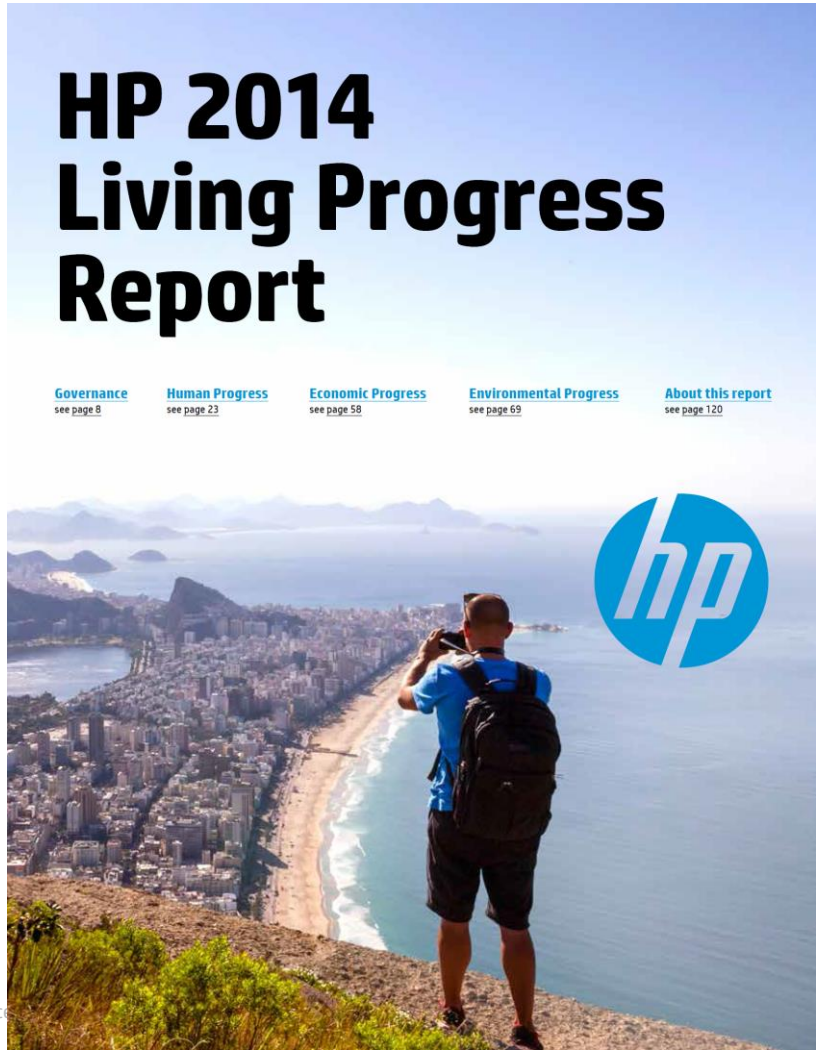
- **Consumables remain the greatest source of environmental impact for printing**
  - Work with customers to help them print more efficiently - duplexing
  - Work to reduce cartridge impacts through material design and reduction where practical
- **Power consumption and production are still significant impacts for lower-end LaserJet products**
- **InkJet portfolio has lower impact than LaserJet overall**

Benefits Overall

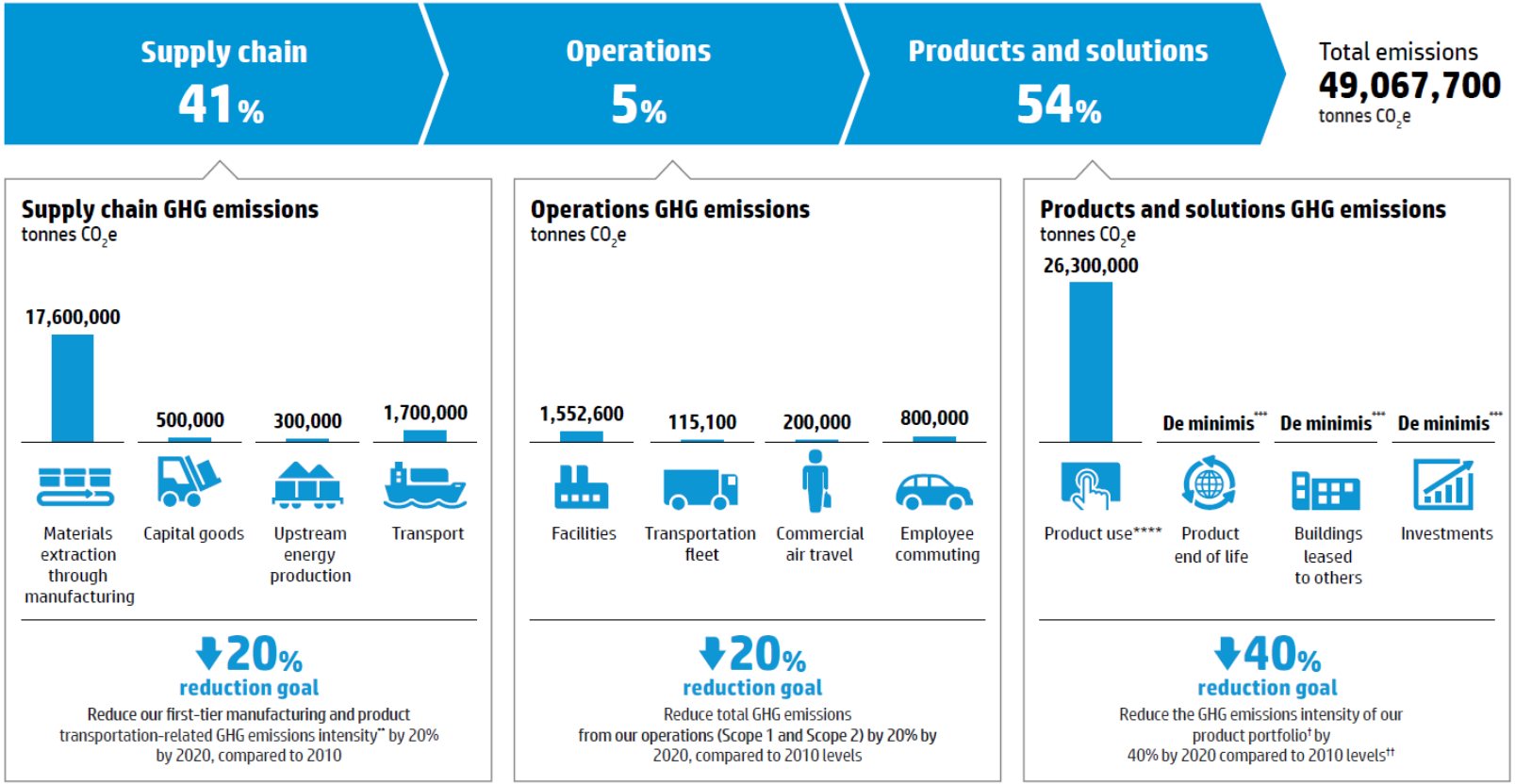
- LCAs enabled HP to become the first IT company to publish its complete carbon footprint
- Opens the door to comprehensive design for the environment
- Cut cost and time to produce EPDs and earn EPEAT credits with modular approach
- Meet customer demand

Corporate-Level Environmental Reporting

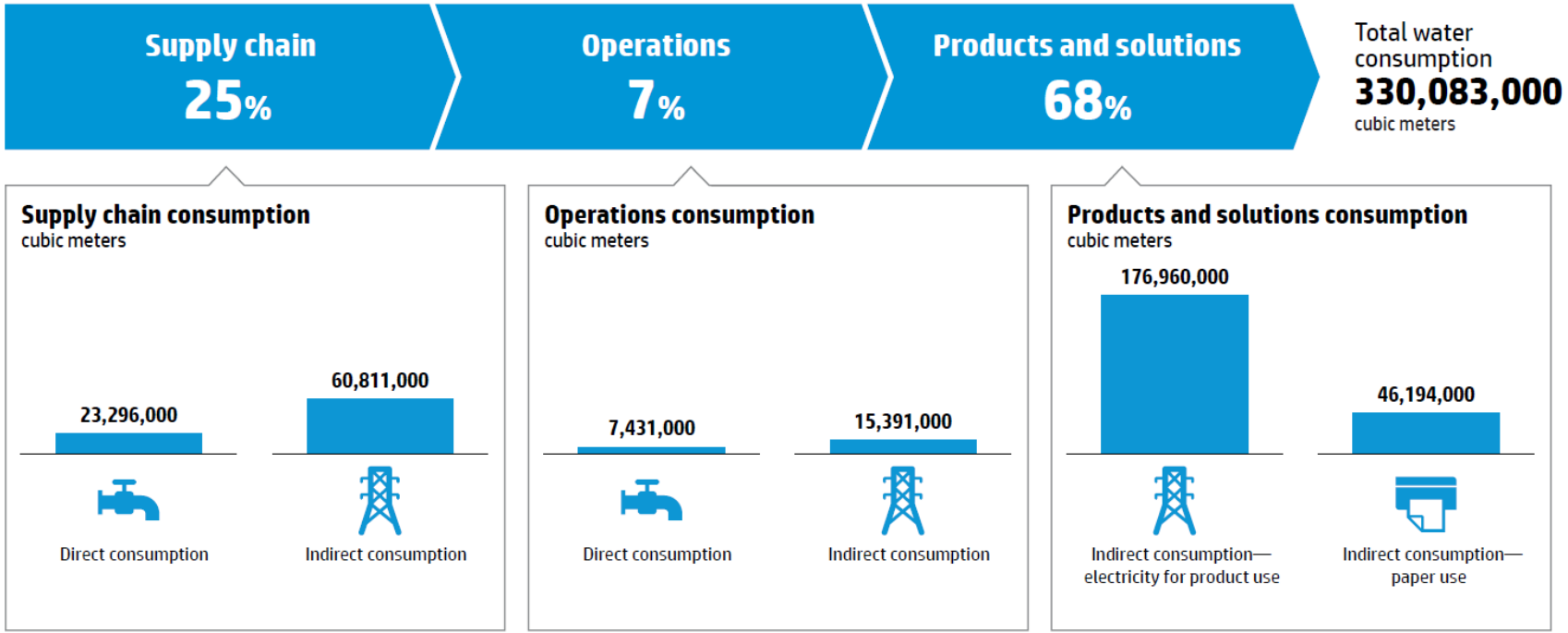
http://www8.hp.com/us/en/hp-information/global-citizenship/reporting.html



Our Carbon Footprint, 2014



Our Water Footprint, 2014



Thank you

Tom Etheridge
tom.etheridge@hp.com

Thanks for joining us!

For more information about the GC3:
www.greenchemistryandcommerce.org

GC3 GREEN CHEMISTRY & COMMERCE COUNCIL
Business Mainstreaming Green Chemistry

Upcoming Events

WEBINAR

Advancing Green Chemistry: Barriers to Adoption & Ways to Accelerate Green Chemistry in Supply Chains
Thursday, July 23, 2015 | 12:00 PM EDT

GC3 INNOVATORS ROUNDTABLE

11th Annual GC3 Innovators Roundtable
May 24-26, 2016 | Burlington, VT

For more information about the GC3:

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