Sustainable Purchasing Using Life Cycle Assessment and the PIE (Purchasing Impact Estimator)

Houston, Texas

12 August 2008

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Our Mission

- Life Cycle Assessment
  - What is it?
  - How does it work?
  - What can it do for me?
  - What's happening these days that I might care about?
- The Purchasing Impact Estimator (PIE)
  - What is it?
  - How does it work?
  - What can it do for me?
  - What's happening these days that I might care about?
- Your additional requirements for this workshop to be worthwhile for ***you:***

Additional Requirements for a Worthwhile Workshop

- What are other health care centers doing?

Some Environmental Impact Categories

- Climate change
- Ozone depletion
- Eco-toxicity
- Depletion of resources
  - Fossil fuels
  - Minerals
  - Renewable resources
  - Water
- Acid rain
- Eutrophication
- Human health impacts of air and water pollution
- Land use / habitat loss

What about...

- Recycleable
- X% recycled content
- Biodegradable
- Renewable
- ...

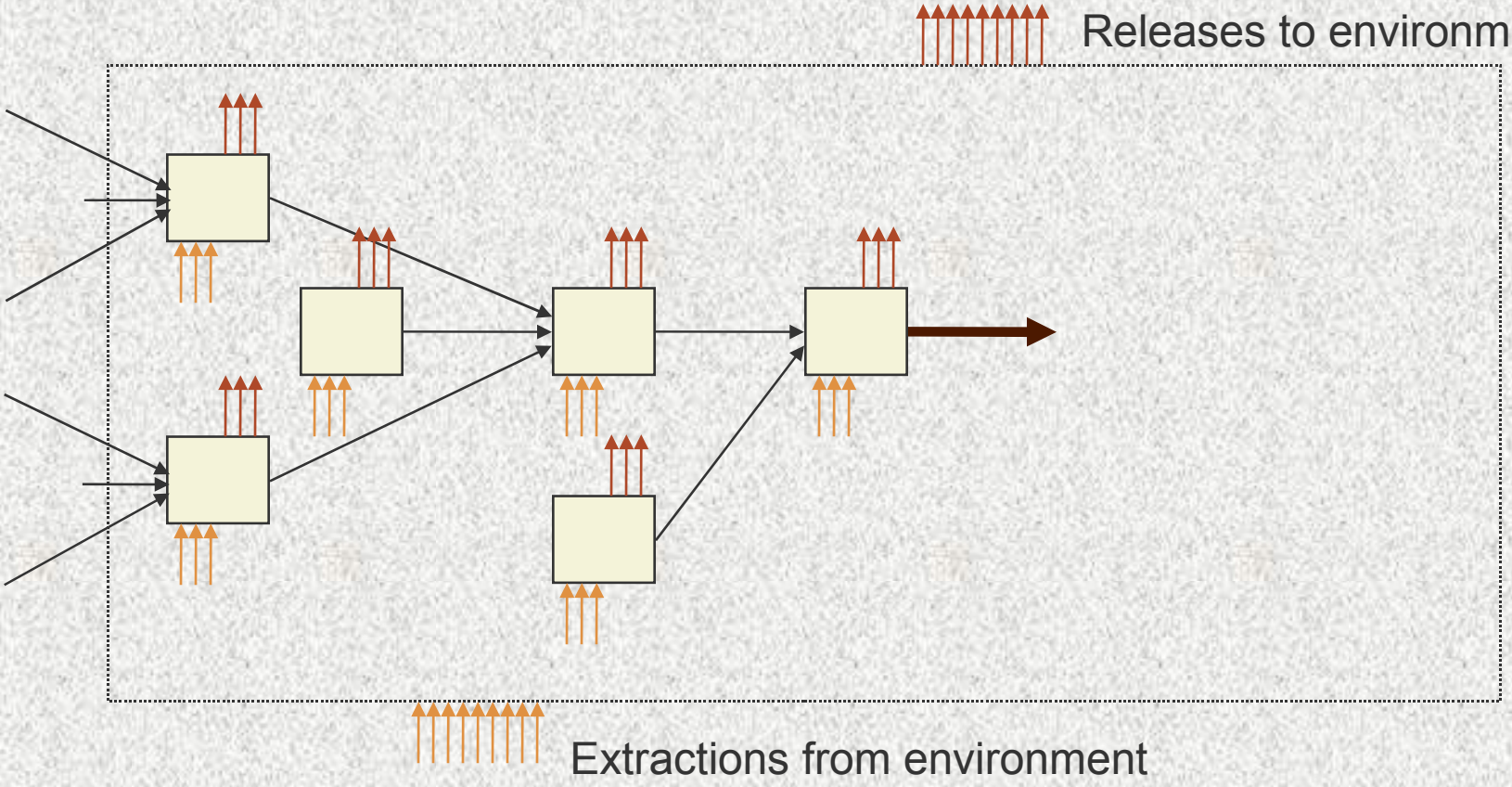
Thus we have...

- **Attributes of product**
  and/or attributes of manufacturing **processes**

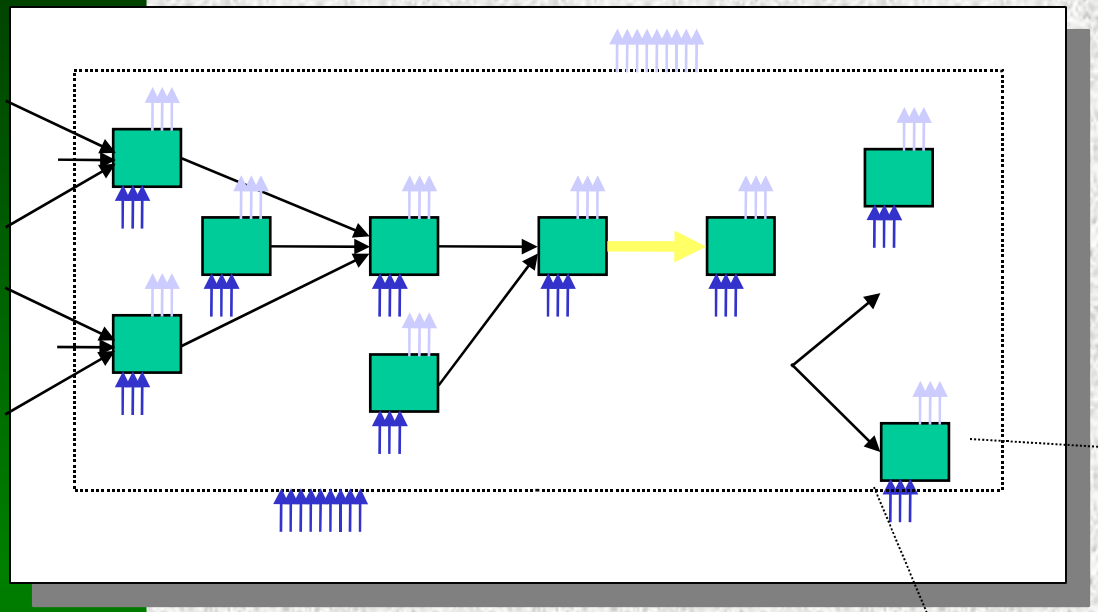
- **Impacts of...**
  - Product **manufacturing?**
  - Product **use?**
  - Product **disposal?**

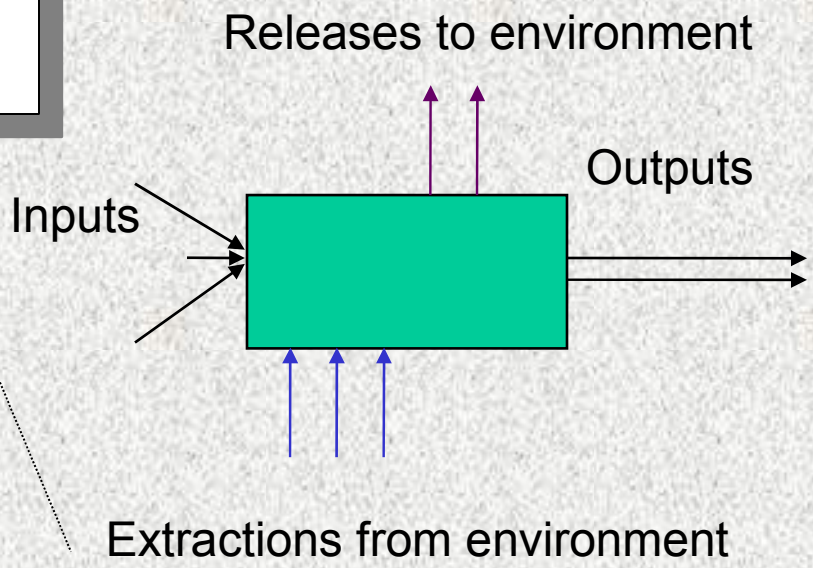
What do we mean: “product manufacturing”

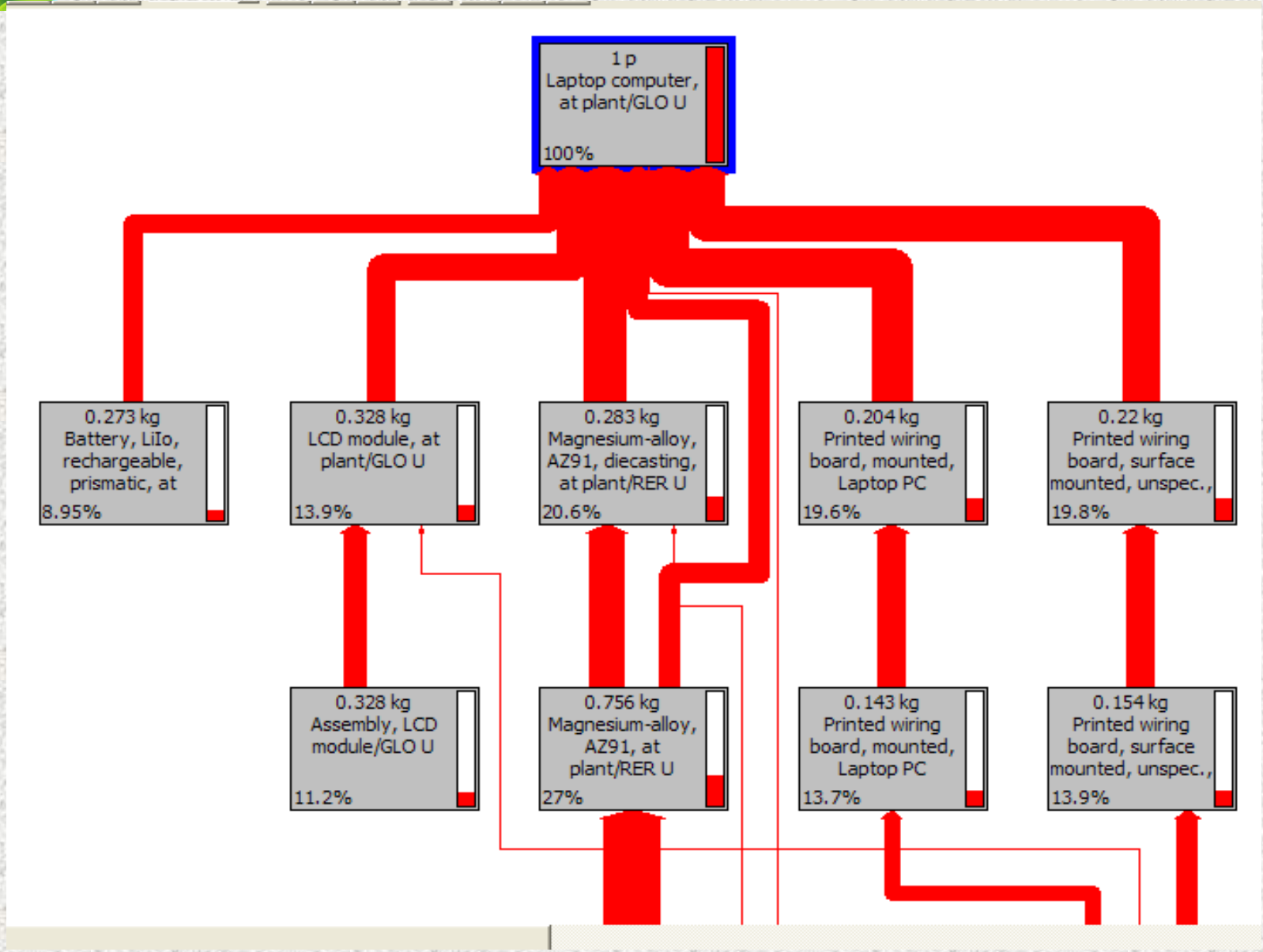
Manufacturing and its Supply Chain



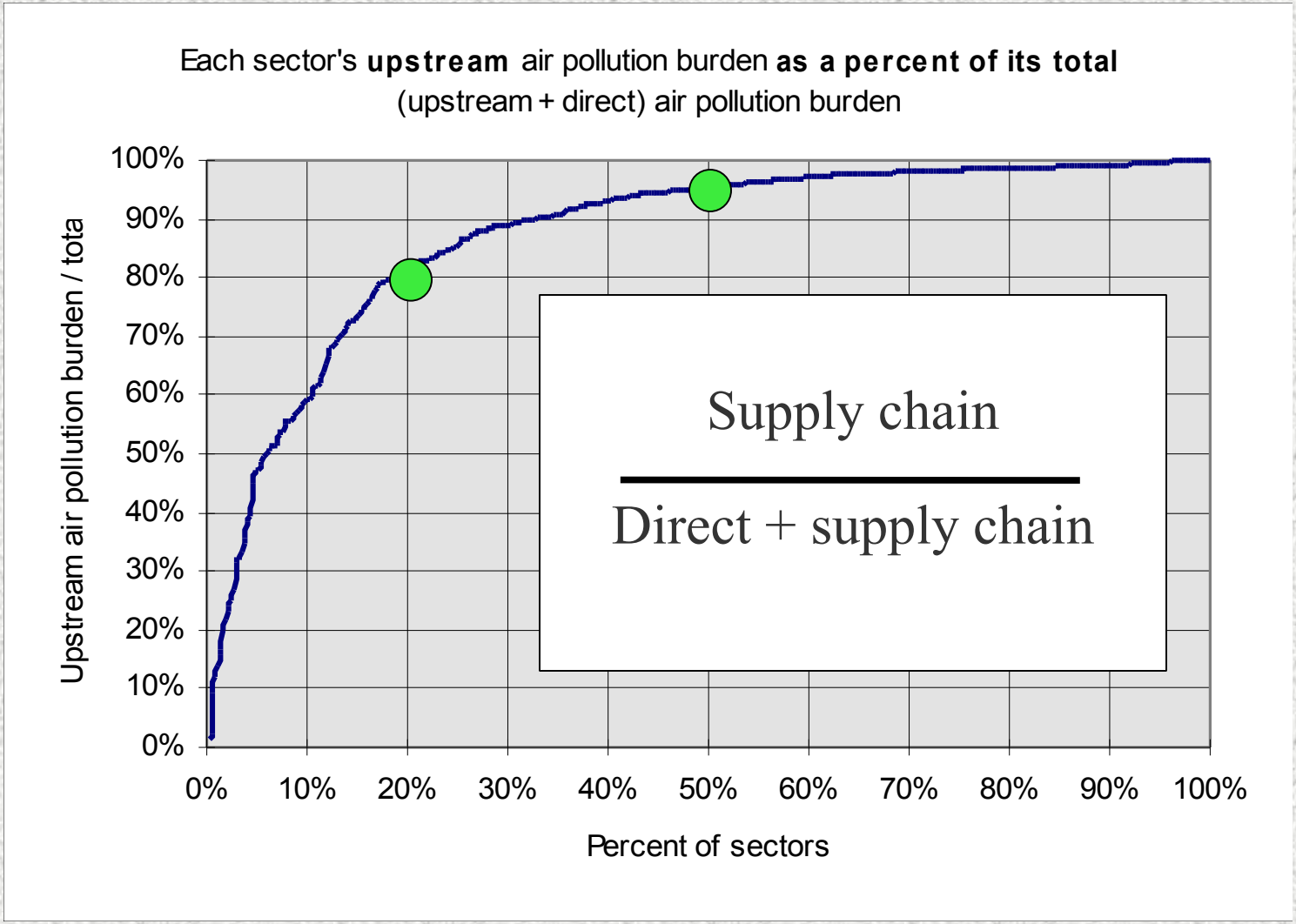
Life Cycle Inventory Analysis



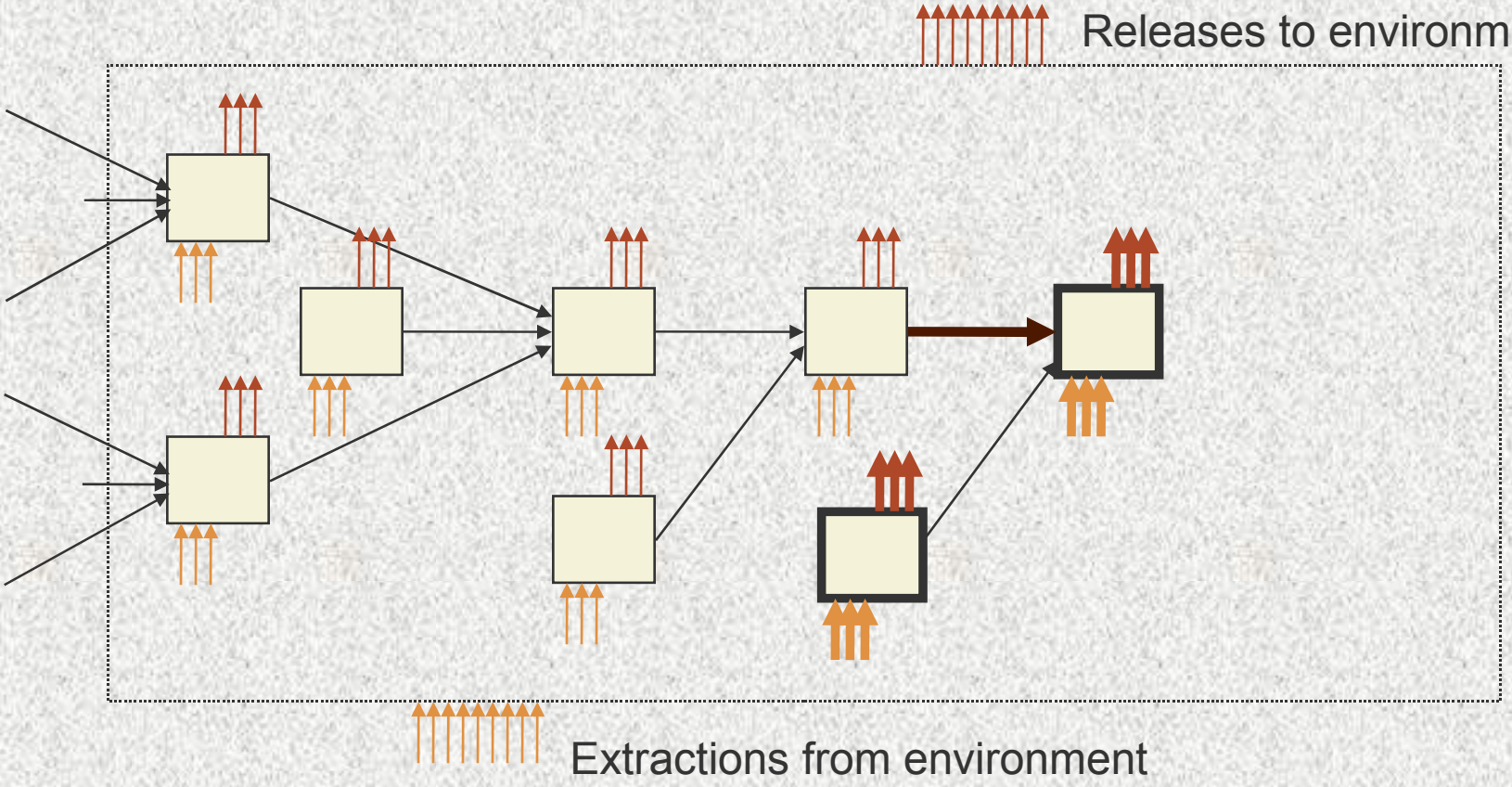



1 p
Laptop computer, at plant/GLO U
100%
0.273 kg
Battery, LiIo, rechargeable, prismatic, at
8.95%
0.328 kg
LCD module, at plant/GLO U
13.9%
0.283 kg
Magnesium-alloy, AZ91, diecasting, at plant/RER U
20.6%
0.204 kg
Printed wiring board, mounted, Laptop PC
19.6%
0.22 kg
Printed wiring board, surface mounted, unspec.,
19.8%
0.328 kg
Assembly, LCD module/GLO U
11.2%
0.756 kg
Magnesium-alloy, AZ91, at plant/RER U
27%
0.143 kg
Printed wiring board, mounted, Laptop PC
13.7%
0.154 kg
Printed wiring board, surface mounted, unspec.,
13.9%

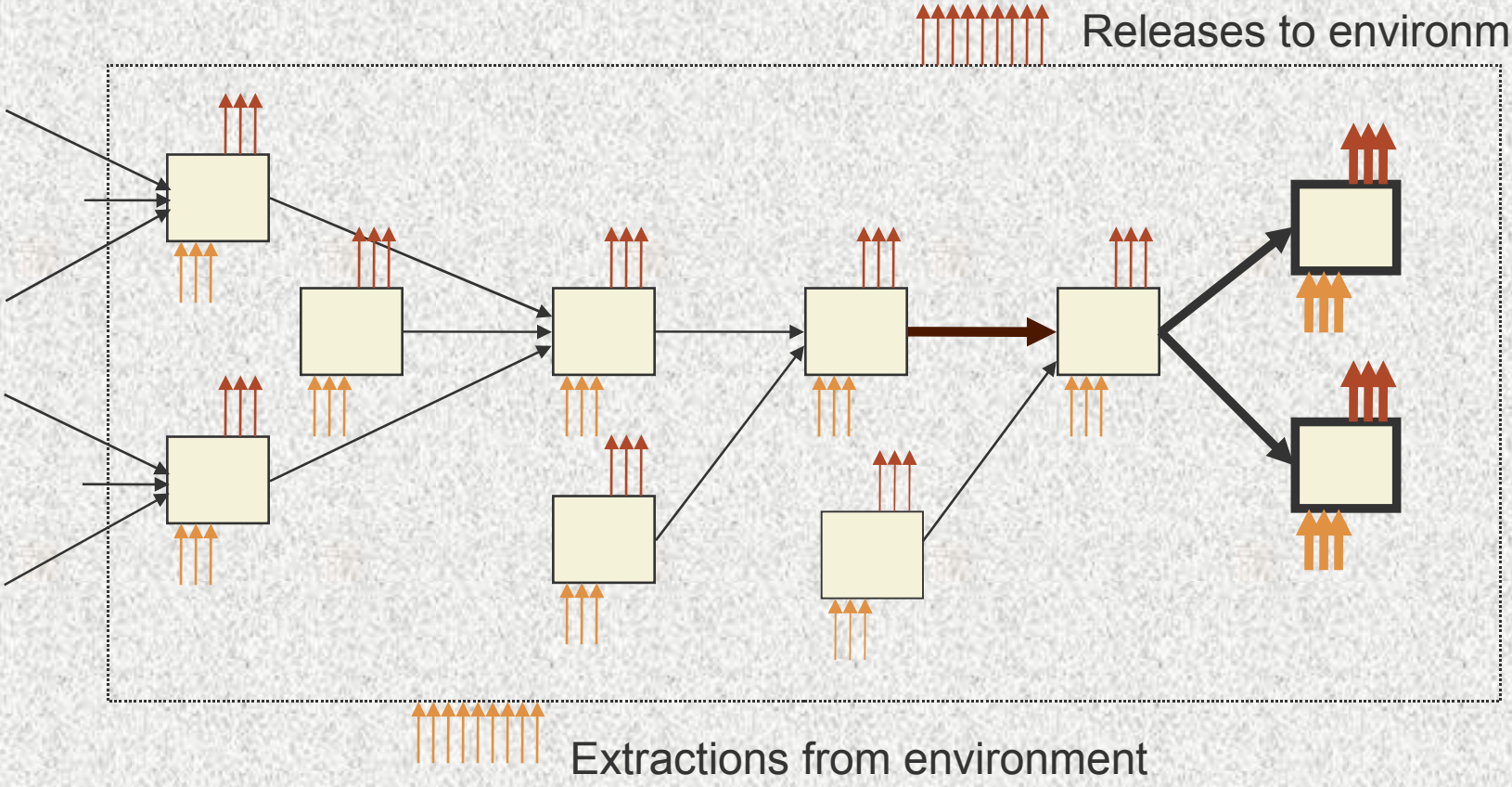
Buyer power, and the 80-80 Rule



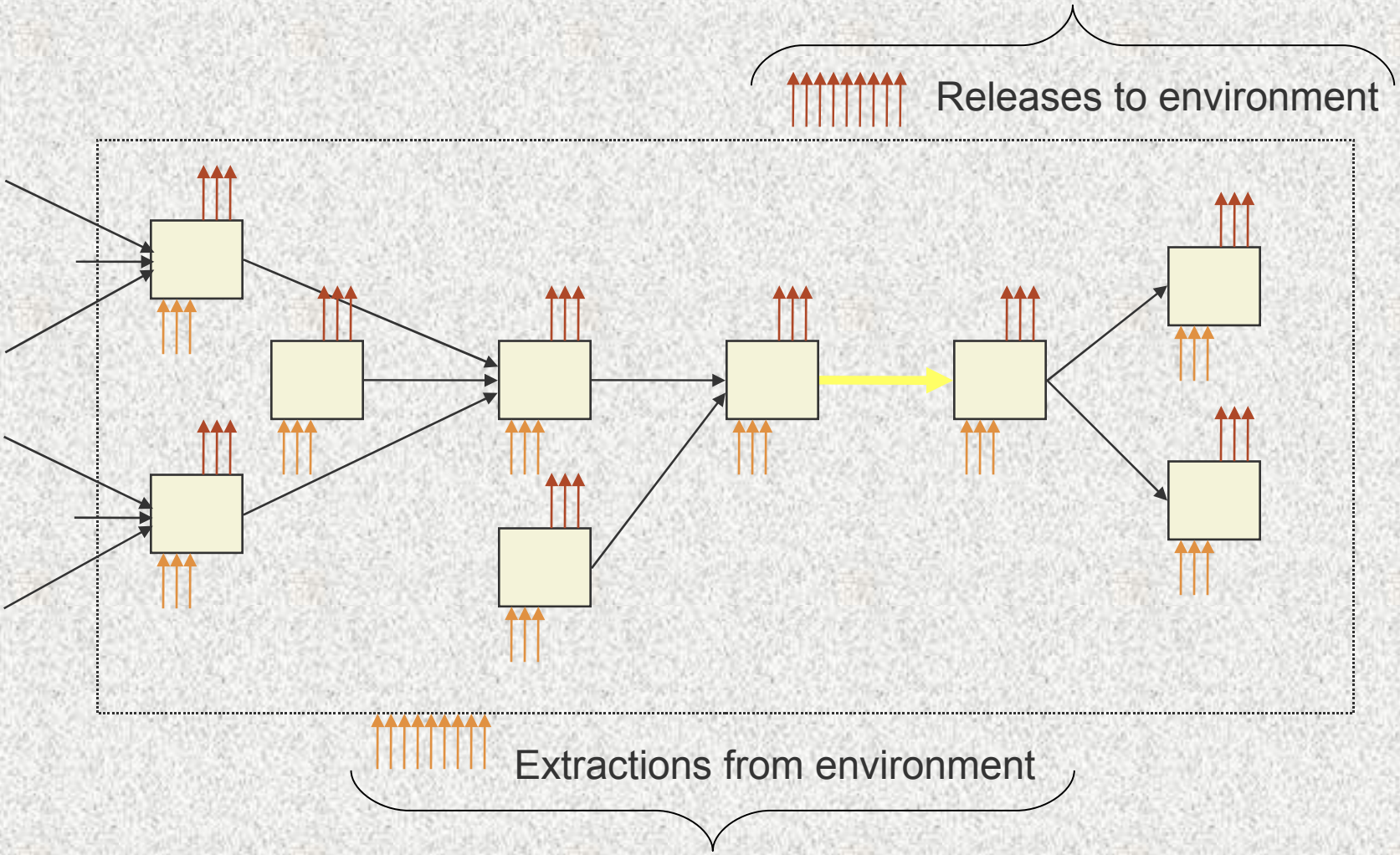
The Product USE Phase



The product “End-of-life”

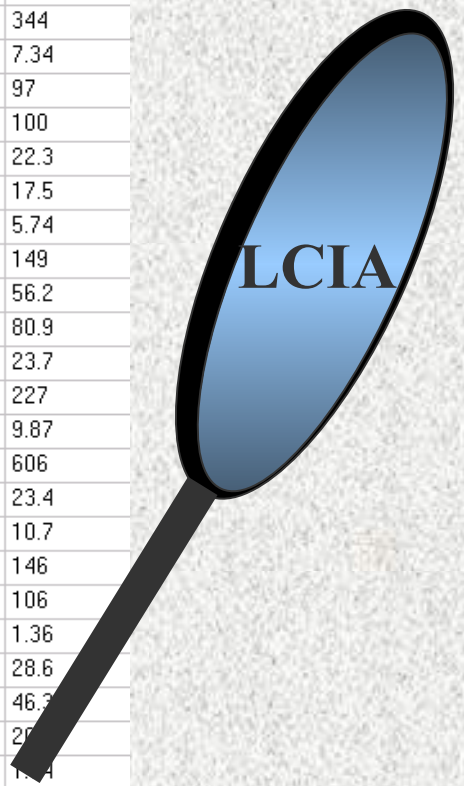


Product Life Cycle Assessment (LCA)



Inventory results (LCI)

Substance	Compartment	Unit	Total
Aluminum	Air	mg	27
Ammonia	Air	mg	776
Ammonium carbonate	Air	ng	441
Antimony	Air	µg	9.52
Antimony-124	Air	nBq	33
Antimony-125	Air	nBq	344
Argon-41	Air	Bq	7.34
Arsenic	Air	µg	97
Barium	Air	µg	100
Barium-140	Air	µBq	22.3
Benzaldehyde	Air	ng	17.5
Benzene	Air	mg	5.74
Benzene, ethyl-	Air	µg	149
Benzene, hexachloro-	Air	ng	56.2
Benzene, pentachloro-	Air	ng	80.9
Benzo(a)pyrene	Air	µg	23.7
Beryllium	Air	ng	227
Boron	Air	mg	9.87
Bromine	Air	µg	606
Butadiene	Air	pg	23.4
Butane	Air	mg	10.7
Butene	Air	µg	146
Cadmium	Air	µg	106
Calcium	Air	mg	1.36
Carbon-14	Air	Bq	28.6
Carbon dioxide, biogenic	Air	g	46.3
Carbon dioxide, fossil	Air	kg	2
Carbon disulfide	Air	mg	
Carbon monoxide, biogenic	Air	mg	24.4
Carbon monoxide, fossil	Air	g	26.4



Impact Assessment results

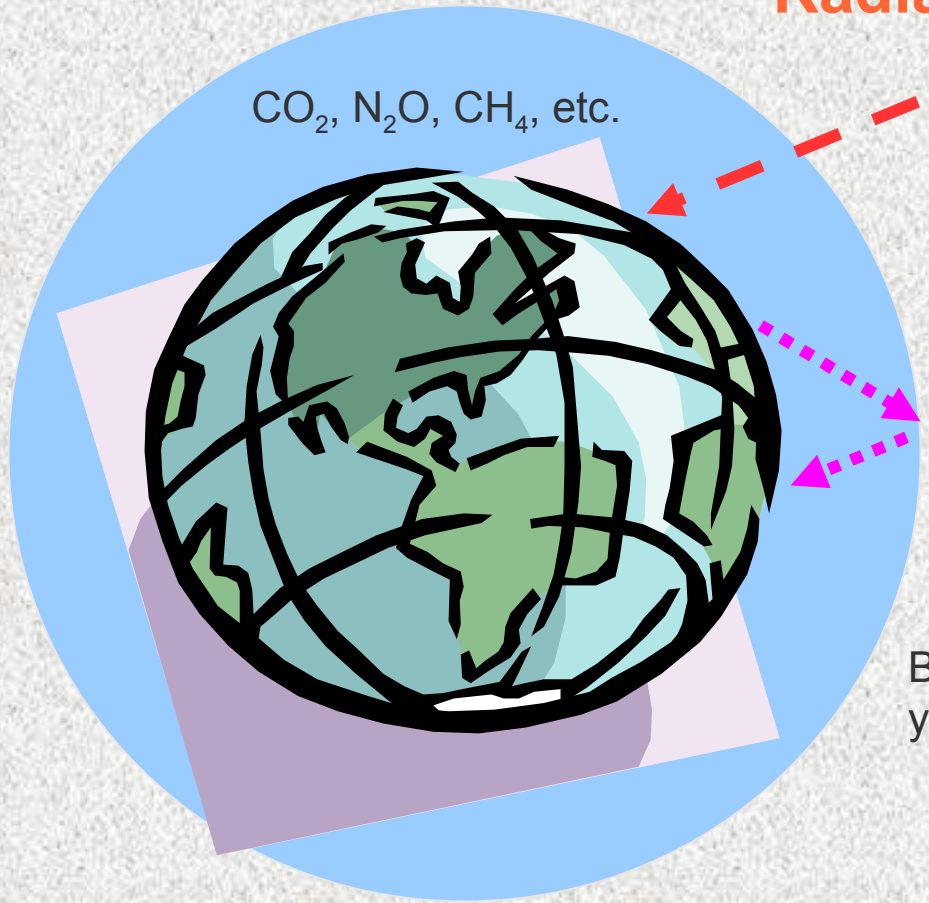
Impact category	Total
Carcinogens	2.35E-5
Resp. organics	3.03E-6
Resp. inorganics	0.0011
Climate change	0.000432
Radiation	1.21E-6
Ozone layer	5.16E-9
Ecotoxicity	1.15E-5
Acidification/ Eutrophication	0.000128
Land use	1.85E-6
Minerals	1.3E-6
Fossil fuels	0.00624

Life Cycle Impact Assessment

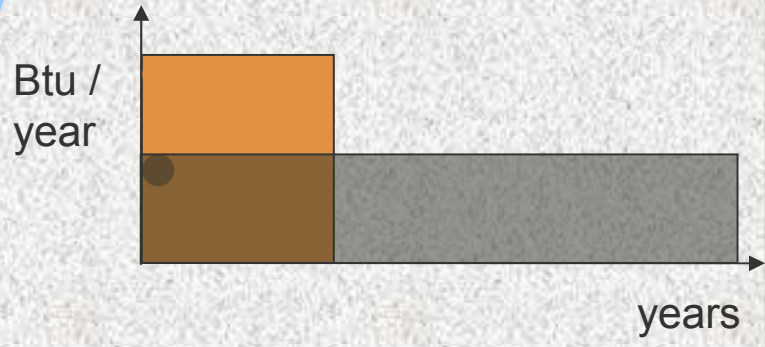
- Origins
  - Global warming potentials (GWPs)
  - Ozone depletion potentials (ODPs)
    - Origin outside LCA
    - Reasonable international acceptance
    - Indicators, equivalency measures, not damage calculations
    - Permit summation within impact category

The greenhouse mechanism

Electromagnetic Radiation



Infrared Radiation



Data Source for “Life Cycle Inventory”

- Economic Input/Output Approach
- 500 sectors, producing and consuming 500 commodities
- Exhaustive “economic census” ea. 5 yrs
- Annual updates
- Environmental impacts per sector (kg CO2 per $ output)
  - Pollution: US EPA
  - Energy consumption: Dept. of Energy
  - Resources: US Geological Survey

Source for Impact Assessment Method

- “Eco-Indicator 99”
- Impact categories include:
  - Climate Change
  - Ozone Depletion
  - Human Health impacts of pollution
  - Resource depletion (fossil fuels, and minerals)
  - Land use / Habitat loss --> biodiversity impacts
  - Ecotoxic pollutant impacts on biodiversity
  - Acidification and Eutrophication impacts on biodiversity

Some Green Purchasing Questions

Micro

- What makes a green product green?
  - Which product is greener?
  - Green *how?*
  - *How much greener?*

Macro

- On which purchasing categories would green purchasing make a big difference?
- What kind of difference – what benefits?

Some Green Purchasing Questions

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Product-specific data

Macro

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Product group data

Some Green Purchasing Questions

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Macro

- On which purchasing categories would green purchasing make a big difference?
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The Earthster Consortium

- Consortium of co-sponsors:
  - Sponsor refinement / scale-up of prototype
  - Pilot-test in-house
  - Input to design
  - Advanced implementation
  - Perpetual credit as co-funders that launched it
- Panel of interested stakeholders:
  - Validation and verification of reporting
  - Harmonization of environmental reporting and other reporting with international data standards, lenses
  - Standards for LCI data, reference flows, functional unit

Life Cycle Assessment

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What is Life Cycle Assessment?

- Sustainability “Footprinting” (climate and much more)

Emissions of GHGs from all other suppliers	Emissions of GHGs from your energy suppliers	Emissions of GHG's from your organization	Emission impacts after you discard
“Scope 3”	“Scope 2”	“Scope 1”	“Scope 3”

Global Warming emissions from the *entire* supply chains of *all* inputs to your org.	Emissions of GHG's from your org.	Emission impacts after you discard
""Cradle to gate"	"*Use* phase"	"End of Life"

Global Warming emissions from the *entire* supply chains of *all* inputs to your org.	Emissions of GHG's from your org.	Emission impacts after you discard
Impacts on human health		
Impacts on ecosystems		
Impacts related to resource depletion		
""Cradle to gate"	"*Use* phase"	"End of Life"

Grandma's Home-Made Organic

... is dioxin-free, right?

... sorry Grandma.

“Show me the data.”

“How many grams, and how does that compare with our other impacts, like climate change?”

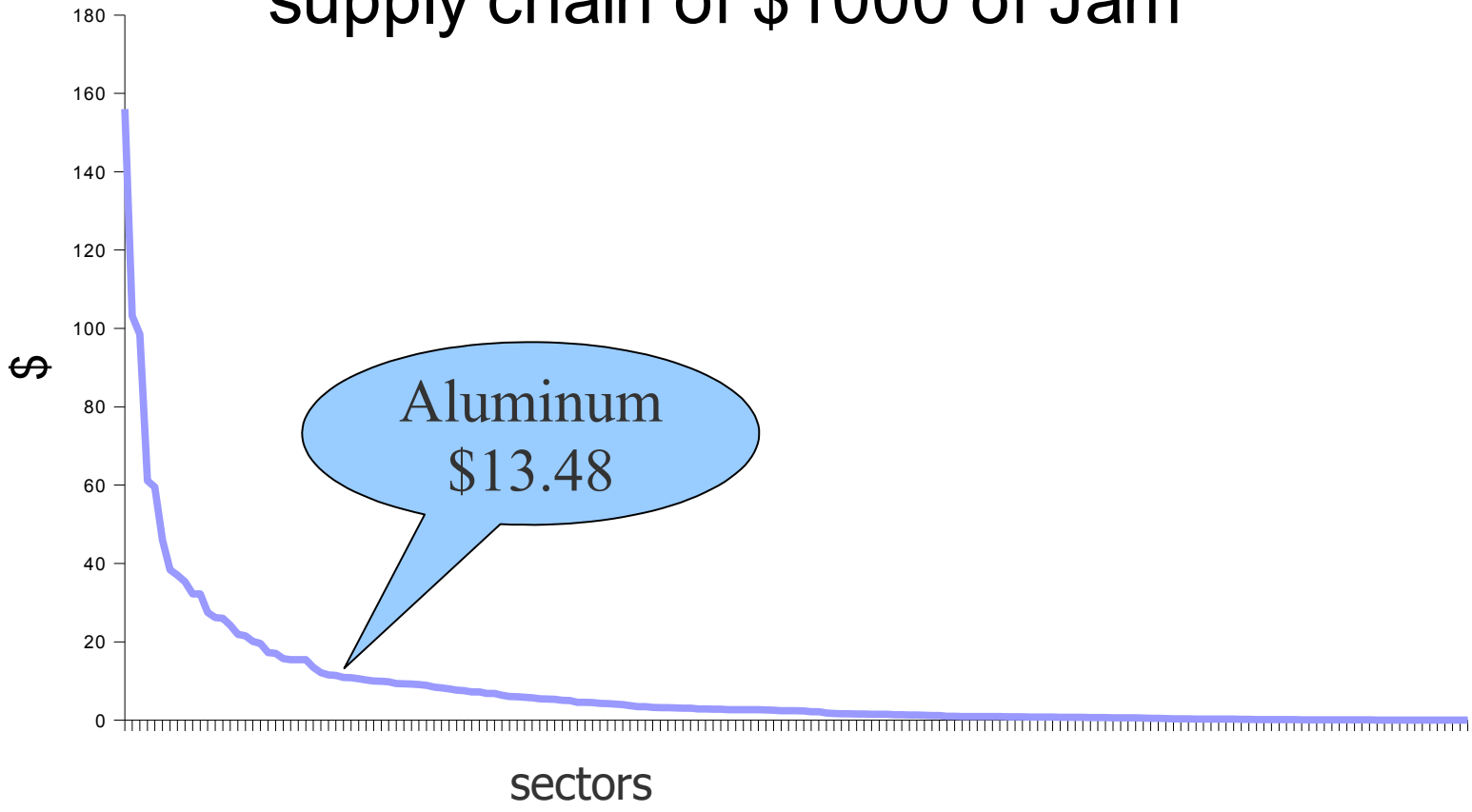
“And I've been wondering about all the jar-washing by our customers...”

“And what can we ***do*** about these issues ??”

Canned fruits, vegetables, preserves, jams and jellies: What do the data say?

- The sector “Canned Fruits, vegetables, preserves, jams and jellies” purchases from 224 other sectors
- Sectors purchase inputs from a median number of 150 other sectors
- Your suppliers each purchases from their suppliers...

Output from every sector, $, induced in supply chain of $1000 of Jam



Take-away messages?...

We are radically connected.

(Every sector is in the supply chain of every sector.)

We can't get green/sustainable alone.

Life Cycle Assessment: Perspective

- Think broadly: Life cycle, cradle-to-next-life
- Think deeply: Impacts, endpoints
- Think quantitatively: data; how much of x?
- Think comparatively: what if we change y?
- Assess and document systematically: standards, transparency

Historical context

- When?
- 1968. Where?
- USA. Who?
- Coca-Cola Topic?
- Packaging
- Developed the method to answer the question: “What are the energy and solid waste implications of the beginning shift to 1-way (plastic) bottles?”

Findings, 1968

- Surprise: Plastic not as bad as employees feared
  - Weight of glass bottles
    - Transportation energy
    - Material use / processing in manufacturing
  - Declining “trippage rates”
  - Lightweighting of 1-way packaging

1970 – 75

- UK and Belgium: beverage packaging applications
- Ron Teaseley left Coke, went to EPA OSW
- Series of studies of consumer products
  - Plan: Regulate if disposables found problematic

Parallel Evolution: USA and Europe

- USA: Consulting firm with database: Franklin Assoc.
- Industry in-house, low-profile, proactive expertise (P&G)
- Emphasis on Inventory, de-emphasize impact assess.

- Europe: Quasi-academics
- Government development of databases began in early 1980's
- Included development / use of impact assessments

Late 1980's

- Re-emergence of environmental issues
- Planet Earth was “man of the year”
- New York “Garbage barge”
- “The Diaper Debate”
  - P & G was ready
  - Knew what impacts / assumptions mattered
  - Refined/informed ***functional unit*** with market research
- Final result of studies: “It depends”

1990's

- Surge in LCA interest, new actors
- SETAC “Code of Practice”
- ISO 14040 standards

- Application beyond consumer disposables
  - Automobiles
  - Electronics
  - Buildings
  - Integrated solid waste management

2000-2005

- LCA goes global
  - Data, participation
  - Impacts
  - UNEP / SETAC Life Cycle Initiative
- North America: academia gets involved
  - Students start graduating
- Journals: Int Jou LCA, and Jou Industrial Ecology
- Buildings, Auto, Govt:
  US LCI Database

2005-2008

- Climate
- Wal-Mart

2008-2010

- Climate
- Wal-Mart
- Web 2.0, Social Computing, Open Source Paradigm

Thanks, but what does this mean to ME??

- Life Cycle Assessment is an internationally standardized method for environmental (and social) “footprinting” of products
- Life Cycle Assessment is being done by others, and the results are used in the PIE tool
  - Average product categories in the US (and abroad)
  - Individual companies, specific products
- You can use the results, in PIE, to:
  - Prioritize your purchasing categories
  - Compare the impacts of prior and current purchasing
  - Identify environmentally preferable products
  - Compute and report the benefits of your choices

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