

Measuring the Impact of Recycling & Materials Management – A life cycle primer

Presented by

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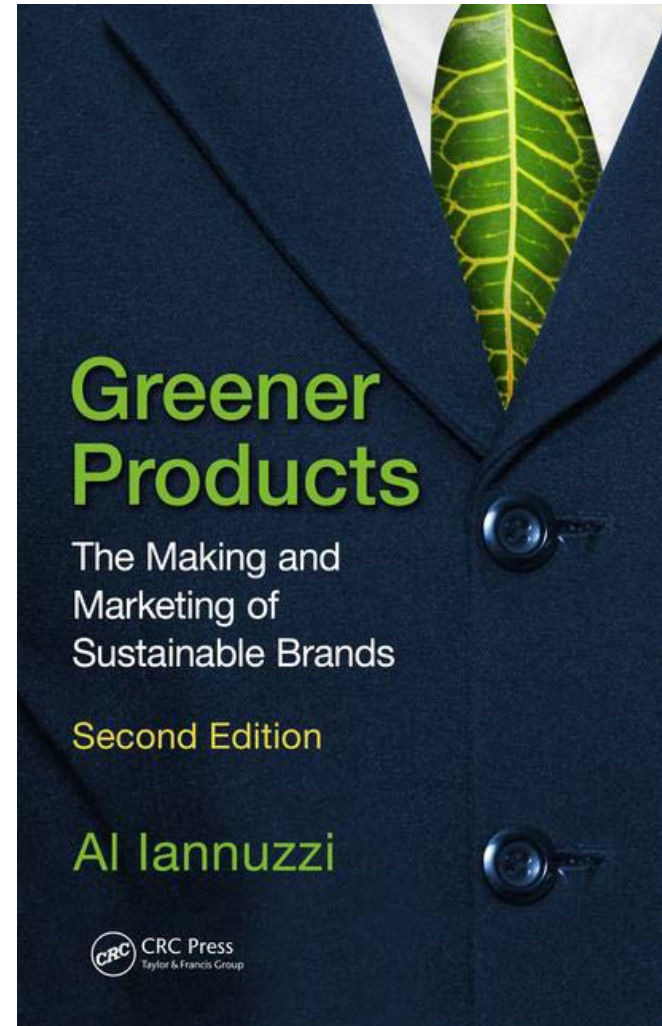
We have over 25 years of developing
and applying life cycle information –
What have we learned?

Learning 1 – All products/materials/packaging have some type of impact – there are no green products/materials/packaging – only ‘greener’

Al Iannuzzi – *“Whenever I speak about greener products, there are two things I usually say:*

- *1. There is no such thing as a green product.*
- *2. What good is a greener product if no one knows about it?*

The reason for these assertions is that life-cycle assessments have shown that every product has impacts, from raw materials to transportation, manufacturing, customer use, and end of life. Every product can be improved in some way, which is why I use the term Greener.”

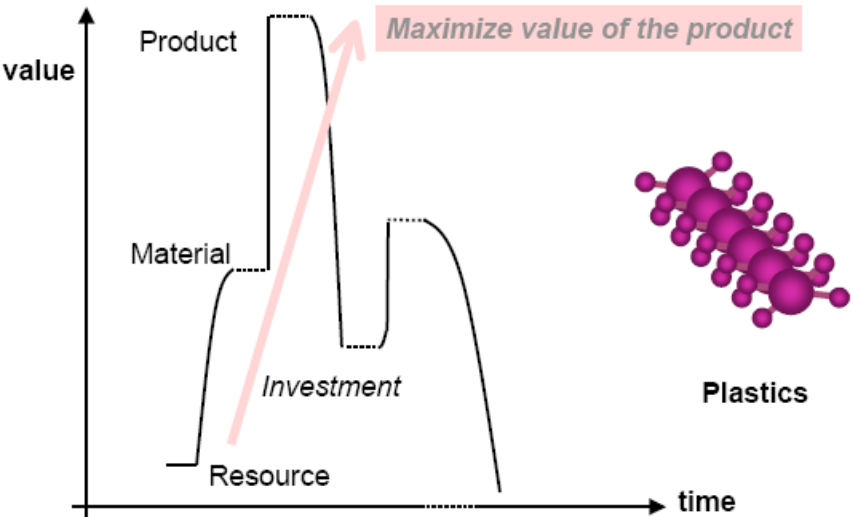
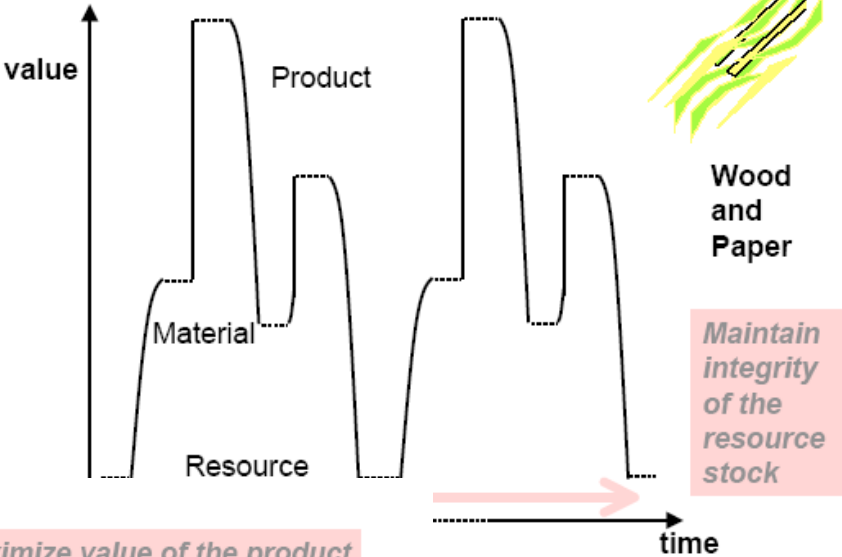
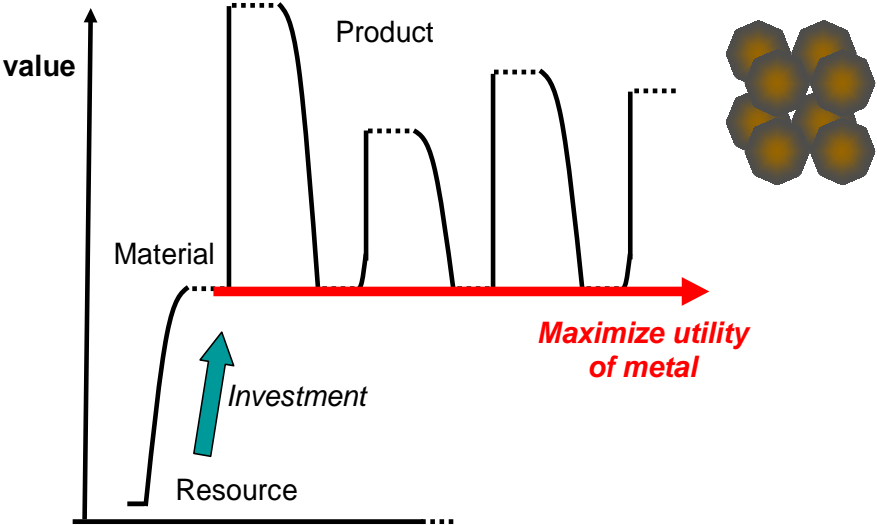


Challenging Suppliers



- Environmental impact of beverage containers – 1970s LCA study
- No material ban / de-selection
- Challenged material & container companies to make adjustments
- Developed infrastructure for aluminium
- 90% Life cycle energy reductions

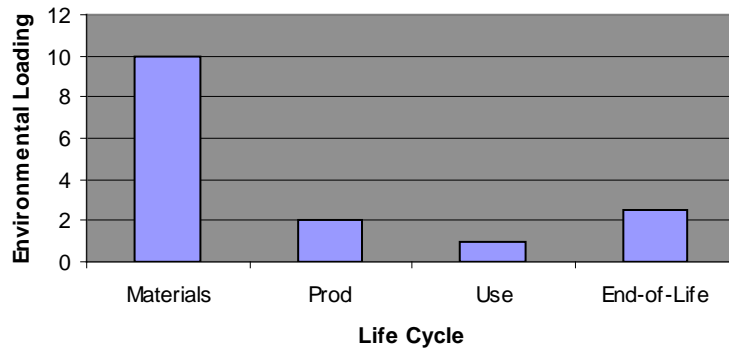
But all products/materials are not equal



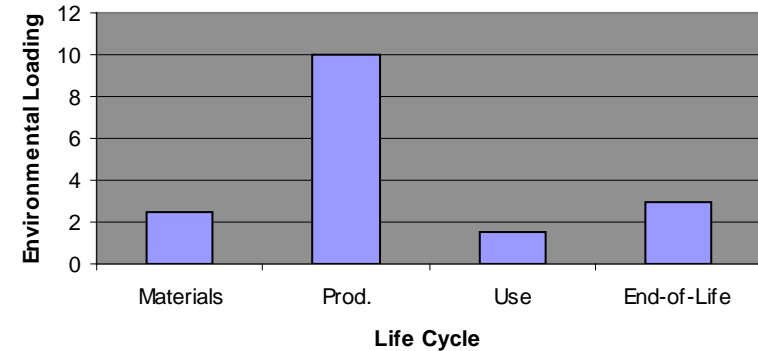
Source:
http://www.fivewinds.com/upload/edfiles_shared/36-EcoEfficiency_Materials.pdf

Learning 2 – Products/materials/packaging can have multiple impacts

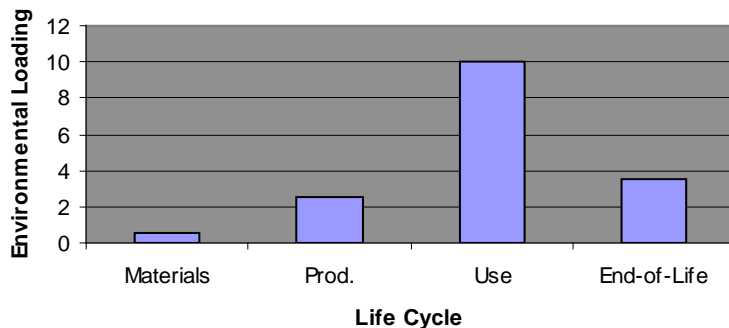
**Type a: short-lived material-intensive product
(e.g. single use package)**



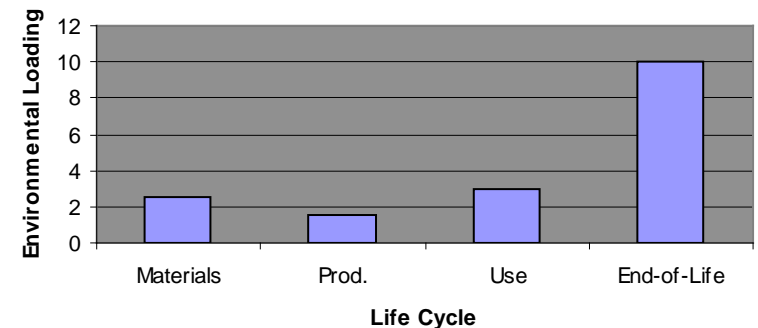
**Type b: manufacturing-intensive product
(e.g. laptop computer, paper products)**



**Type c: long-lived, energy and resource consuming products
(e.g. automobiles, appliances, buildings)**



**Type d: product with special end-of-life or disposal characteristics
(e.g. single use diapers)**



What is the better car from an environmental perspective?

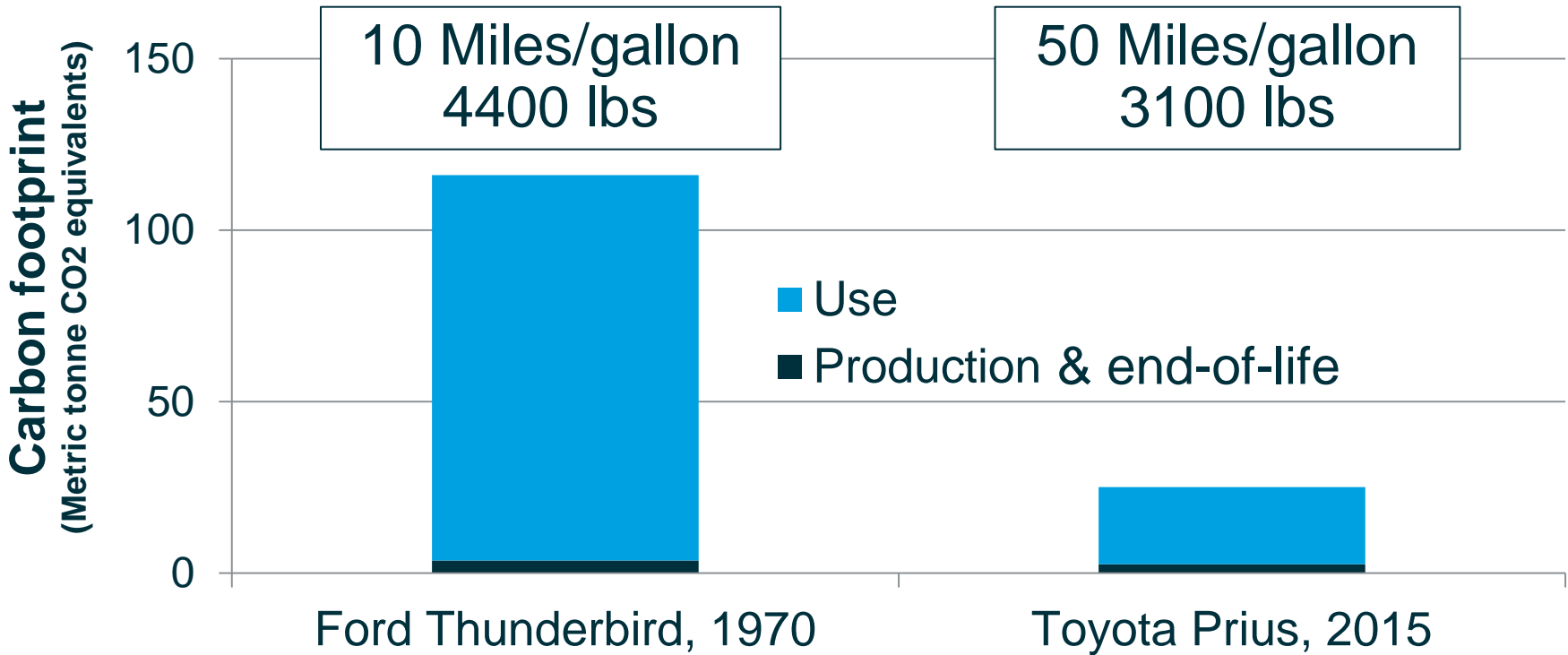


1970 Ford Thunderbird



2015 Toyota Prius

The answer is obvious



Comparison based on recyclability only



Ford Thunderbird – 1970



Thunderbird	
Metals	Close to 100%

Scrap dealers' dream



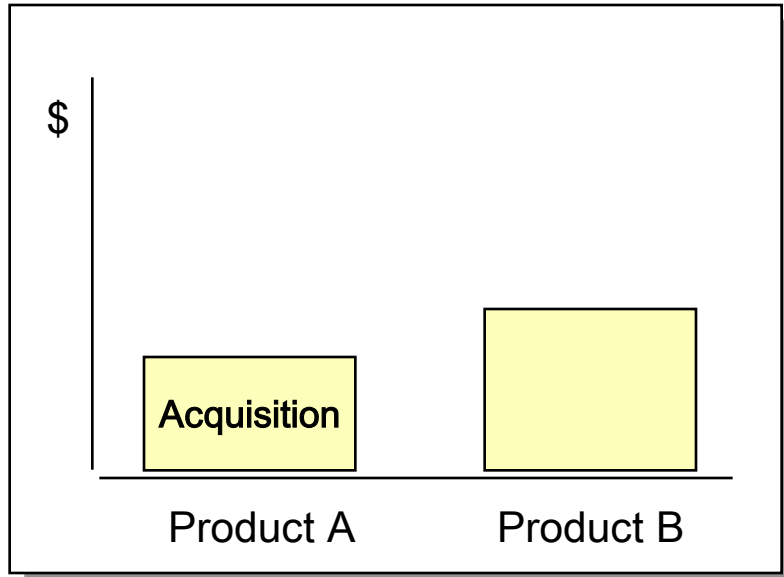
Toyota Prius – 2015



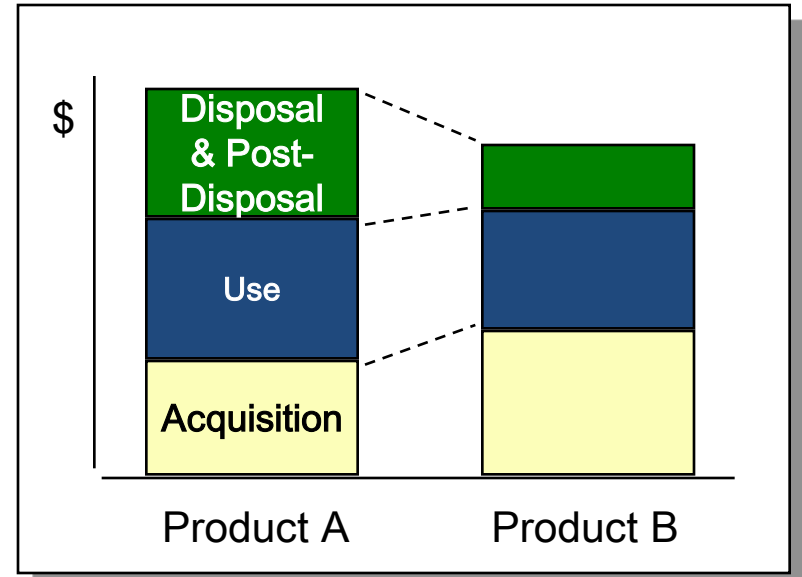
Prius	
Metals	71%
Composites	18%
Others	11%

Monstrous hybrid?

First Choice Is Not Always Obvious



First Costs – Product A
(acquisition/purchasing)



Best Value - Product B is more cost-effective.

Total Cost of Ownership Inputs

Cost elements associated with the costs of doing business for the purchaser of the product system

Three Categories:

Labor Related

- EHS Training
- Auditing / Monitoring
- Waste Handling Costs
- Labelling
- PPE Costs
- Exposure Monitoring
- Record keeping
- Dispensing Costs
- Material Handling
- Lost Work Days

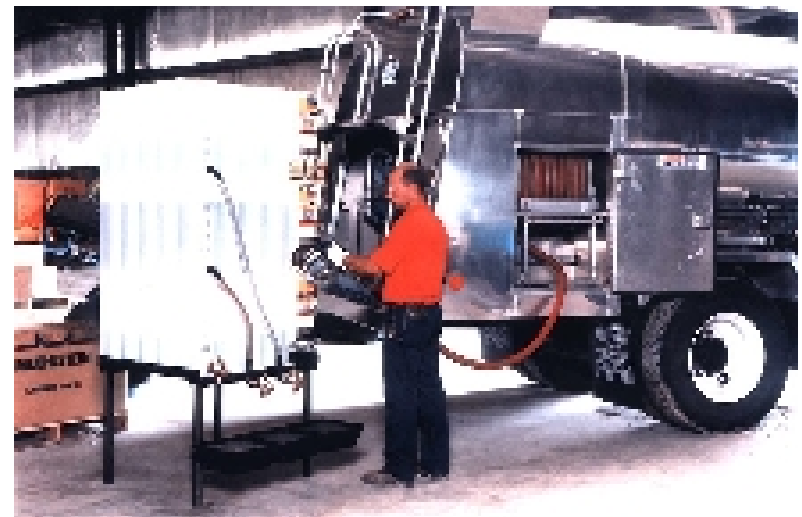
Management Related

- Fines / Penalties
- Non-Hazardous Waste Disposal
- Hazardous Waste Disposal
- Registration Costs
- Wastewater Costs

Process or Energy Related

- Process Changes
- Property Protection Costs
- Energy Costs
- Water Costs

Bus Cleaning Opt



TCO Example

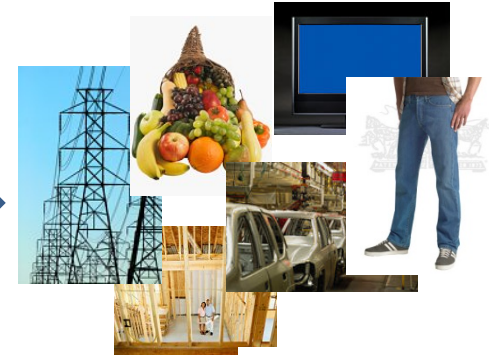
	First Cost	Health & Safety Benefit	Productivity Benefit	Future Cost Avoidance
<p>Selection of System approach to cleaning</p> <p>(estimates)</p>		 Reduced injury due to not moving drums	 More efficient use of staff	 Reduced workman comp claims & more efficient use of space

Learning 3 – products/packaging/resources should be managed throughout their entire life cycle

Raw Materials



Materials Manufacture



Product Manufacture



End Disposition



Recycling



Use



Transportation & Distribution

Duelling Diaper Debates



vs.



- More waste from disposable diapers than cloth diapers ~ cloth diaper industry
- Cloth diapers have meaningful environmental impacts due to use and heating of water for washing
- Which product is better??

Different and *equally valid* interpretations can result depending on the impact and where it occurs.

What is Life Cycle Assessment?

“Life Cycle Assessment is the process of compiling and evaluating the inputs and outputs to estimate the potential environmental impacts of a product system across its lifetime”

Or:

What is the total impact of making my product/material/packaging, including all upstream and downstream activities required to make, use, or end of life disposition?

Conducting an LCA

Goal & Scope Definition

Determination of scope and system boundaries

Life Cycle Inventory

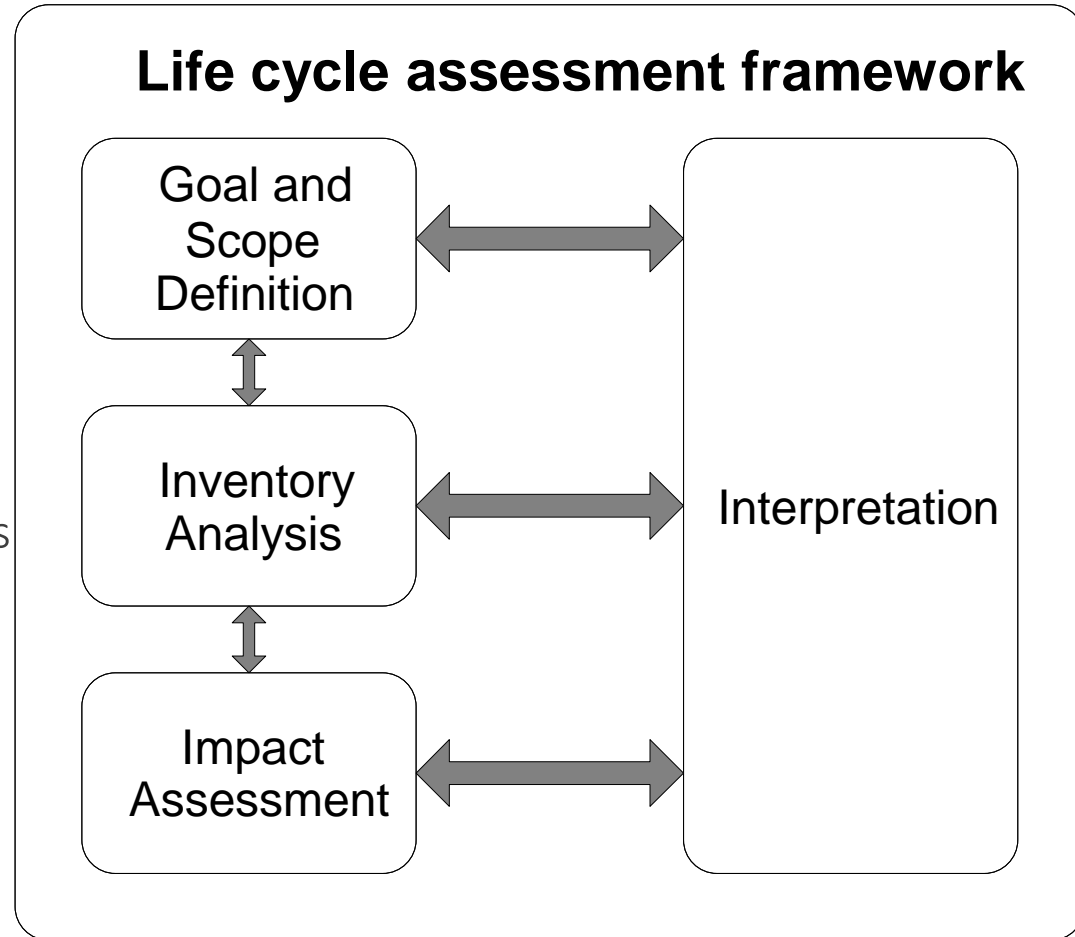
Data collection, modeling & analysis

Impact Assessment

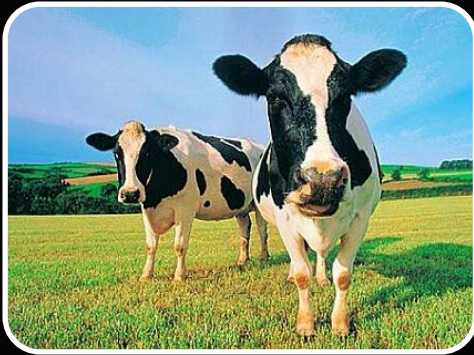
Analysis of inputs and outputs using indicators

Interpretation

Sensitivity analysis, dominance analysis, etc.



Corporate strategy driven by LCA Data



Initial Data

- Leather sourced from US
- Shipped to Portugal, back to US
- Round-trip 8,000 miles

Assumption

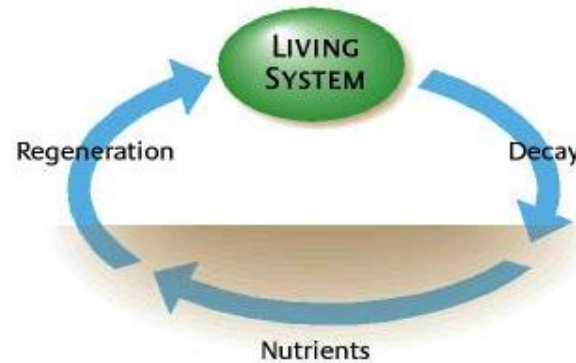
- Transportation is key issue

Results

- Leather production is largest contributor to greenhouse gases

Why industry produces waste

LIVING SYSTEMS FOLLOW CYCLES

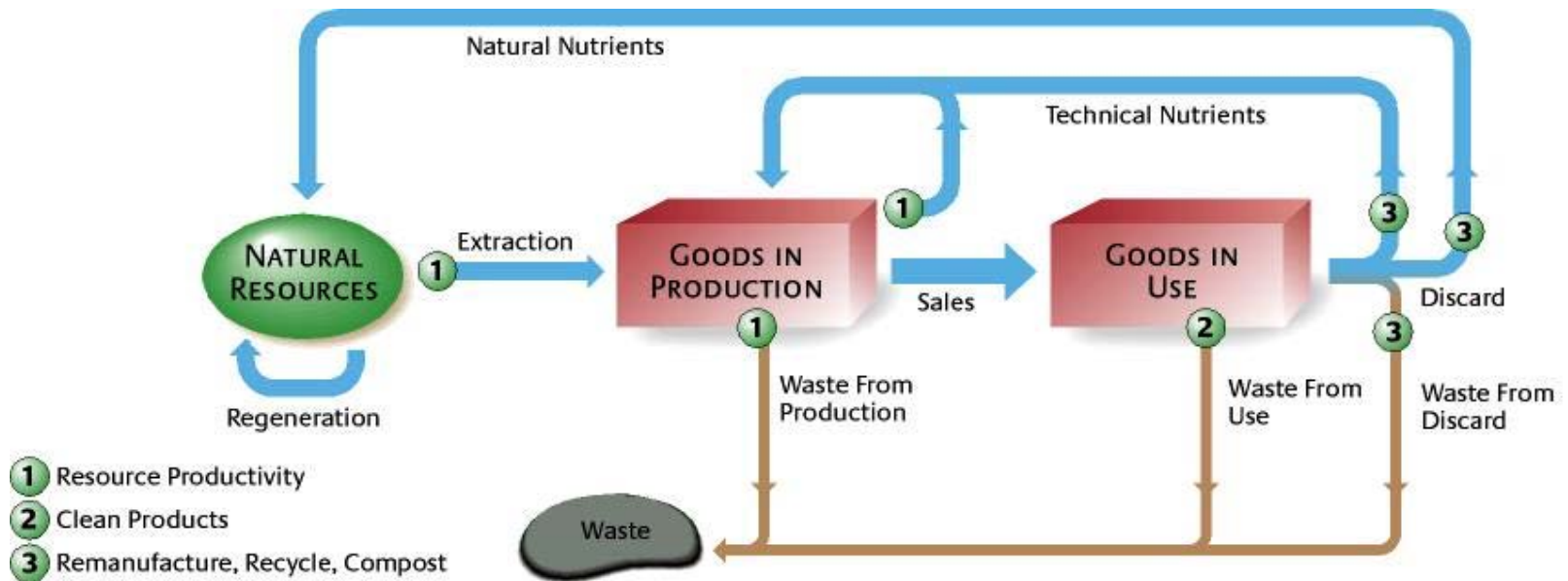


INDUSTRIAL-AGE SYSTEMS DO NOT



Source: P. Senge

The Big Picture: Environmentally Sound Industrial System

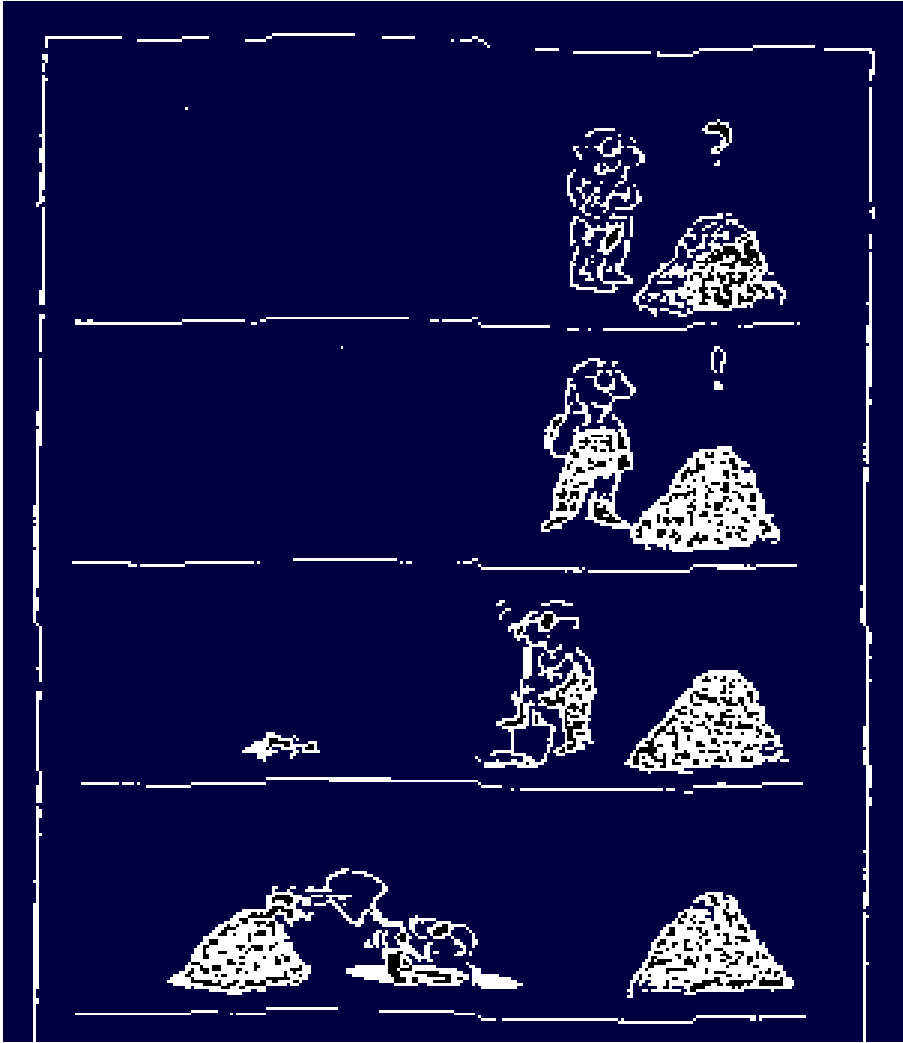


1. Source: "Innovating our Way to the Next Industrial Revolution," P. Senge & G. Carstedt, *Sloan Management Review*, January 2001

Life Cycle Thinking

Avoid...

...solving a problem...

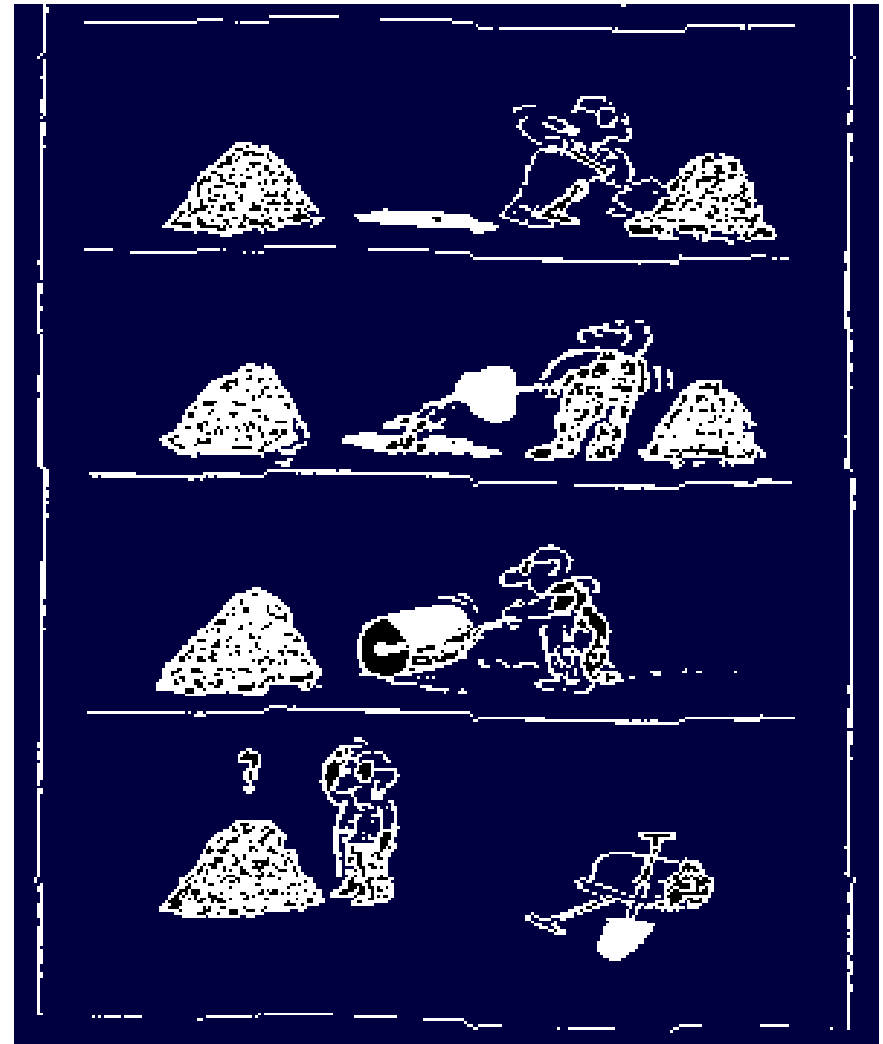


Life Cycle Thinking

Avoid...

...solving a problem...

... by creating
a problem.



Learning 4 - We must focus and take action on the right impacts at the right life cycle stage



Why we care - to ensure that:

- Work on the right **issue**
- Focus on the appropriate **life cycle phase**
- Identify & engage the right **stakeholders** to evaluate and implement solutions
- Informs implications of **trade-offs**
- **Balance** resource limitations

Shaping Sustainability Standards to Drive more Sustainable Appliances



Home Appliances

Need to include environmental, technical & CSR considerations

Scientific Studies

Existing standards

Stakeholder Concerns

Product Life Cycle Data

Feedback from Key Value-chain players

Industry & Product Experts

Inputs into Hotspots Analysis



AHAM 7001-2012/CSA SPE-7001-12/UL 7001 Sustainability Standard for household refrigeration appliances



A trademark of the Canadian Standards Association, operating as CSA Group



Published June 6, 2012



CERTIFICATE OF COMPLIANCE




Whirlpool Corporation
KRF730ESS, KitchenAid® 25 Cu. Ft. 36-Width Standard Depth French Door Refrigerator with Interior Dispense

Final Attributes for Standard

Attribute	Components	Points
Materials	<ul style="list-style-type: none">• Materials of concern• Refrigerant and foam blowing agents selection• Product recycled content• Packaging recycled content• De-materialization/ Efficient Use of Raw Materials	25
Energy During Use		45
Manufacturing & Operations	<ul style="list-style-type: none">• Environmental management systems• Greenhouse gas emissions reporting and reduction• Water use• Pollution prevention• Corporate sustainability	15
Product Performance		5
End-of-Life Management	<ul style="list-style-type: none">• Design for recycling• Landfill diversion	10
Innovation (bonus)		10

Learning 5 – LCA information is essential but not sufficient

Comparing eLCA & Hotspots Analysis

Methodology	Stakeholder Engagement	Potential Impact Coverage	Ease of Use	Approach	
				Qual.	Quant.
Hotspots Analysis (e.g., AHAM, PGSI, WQA)	■ ■ ■	○ ○ ○ ○	++		
<i>Traditional</i> Environmental Life Cycle Assessment (i.e., ISO 14040)	■	○	+		

Legend

■ ■ ■ Full engagement and pilot testing
 ■ ■ Moderate engagement throughout process
 ■ Limited phases of engagement

○ Environmental
 ○ Economic
 ○ Social
 ○ Governance

+++ Easy
 ++ Moderate
 + Difficult

■ ■ ■ Quantitative
 ○ Qualitative

Public Garden Sector

Sustainability Index

for North American Public Gardens

Version 1.0



LONGWOOD
GARDENS



PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY



Five Winds
STRATEGIC CONSULTING

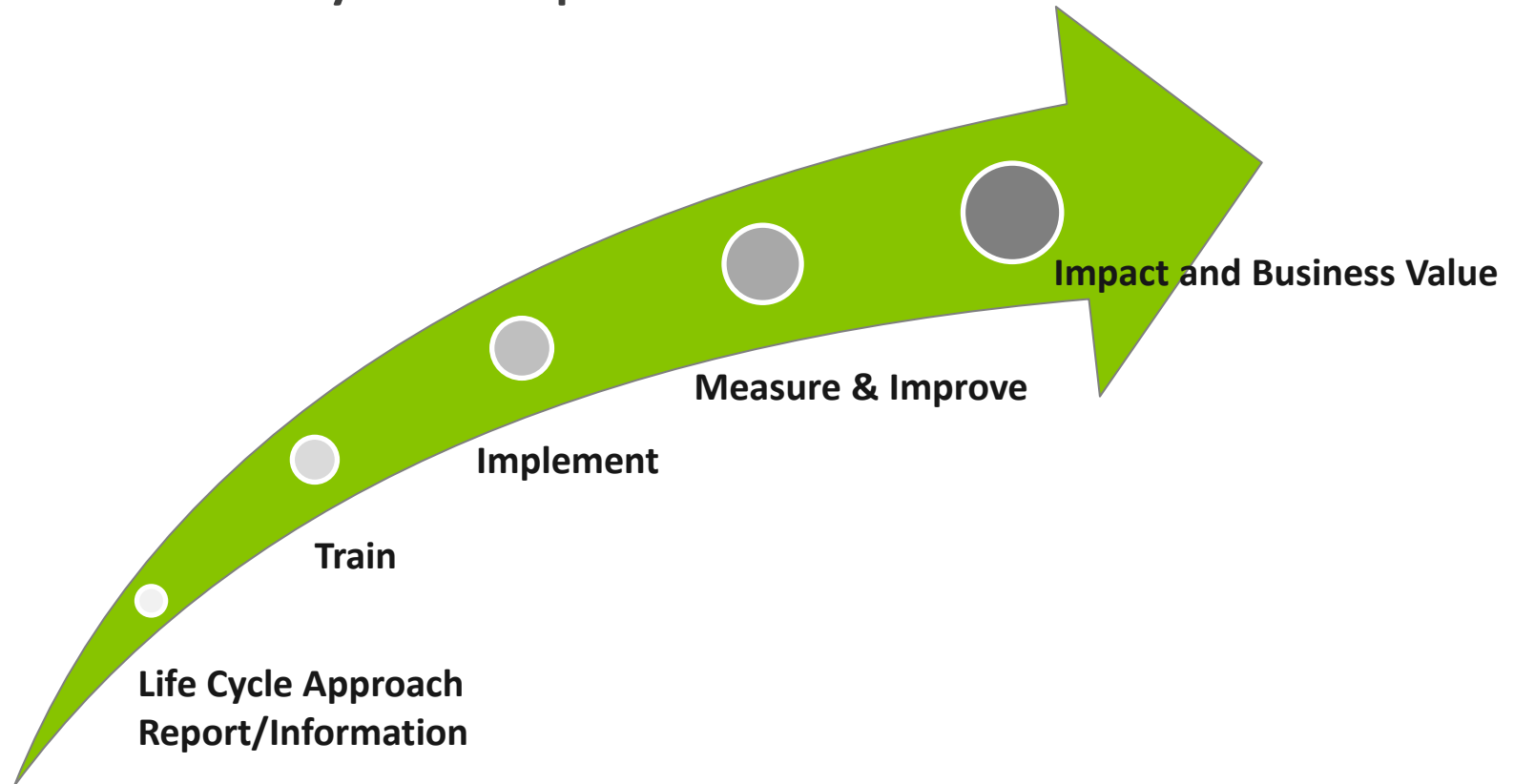
FOCUS AREAS WITHIN SUSTAINABILITY INDEX:

- | | | | | |
|--------|--|---|--------|------------|
| Enviro | 1. Water consumption | 10. External stakeholder engagement on public garden sustainability policies, programs, and targets | Social | |
| | 2. Water quality | 11. Community education and outreach on public garden sustainability initiatives | | |
| | 3. Wastewater | 12. Education and outreach on sustainable community development | | |
| | 4. Greenhouse Gas (GHG) emissions | 13. Well-being of public garden users, guests, and employees | | |
| | 5. Non-renewable energy | 14. Financial planning and business management | | Financial |
| | 6. Solid waste | 15. Strategic planning and governance | | Governance |
| | 7. Conservation of plants, plant communities, associated habitats, and ecosystems | | | |
| Social | 8. Toxic and hazardous waste from horticultural activities (i.e., pest control, fertilizer and chemical use, etc.) | | | |
| | 9. Development and growth opportunities for employees | | | |

Source: *Public Gardens* magazine, Summer/Fall 2012, pp.45-48

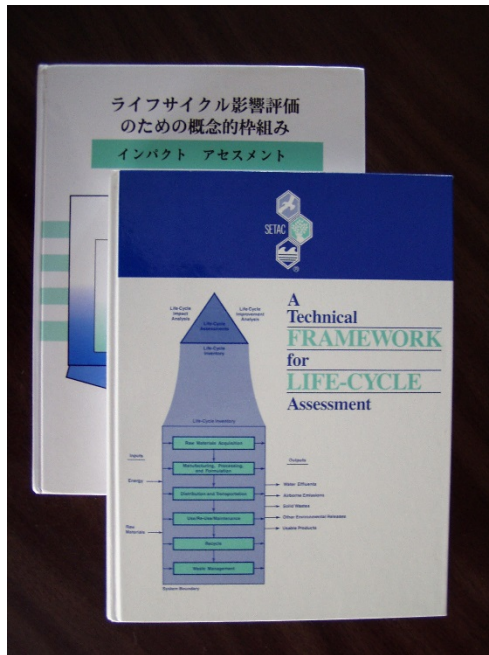
Learning 6 - It is all about actions, changing behaviors and business practices

Activity to Impact and Business Value



Adapted from "Impact Evaluation Review of Outcomes to Impacts RotI" – GEF Evaluation Office with Conservation Development Centre - 2009

Learning 7 - There is a growing life cycle community – they are a resource



**Let's work together on a successful journey to scale
and speed up application of life cycle information!!**



**Thank you very much
for your kind attention!**

Our key learnings

1. All products/packaging have some type of impact – there are no green products/packaging – only ‘greener”
 2. Products/materials/packaging can have multiple impacts
 3. Products/packaging/resources should be managed throughout their entire life cycle – which often extends globally
 4. We must focus and take action on the right impacts at the right life cycle stage
 5. LCA information is essential but not sufficient
 6. It is all about actions, changing behaviors and business practices
 7. There is a growing life cycle community – all around the world – they are a resource
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