

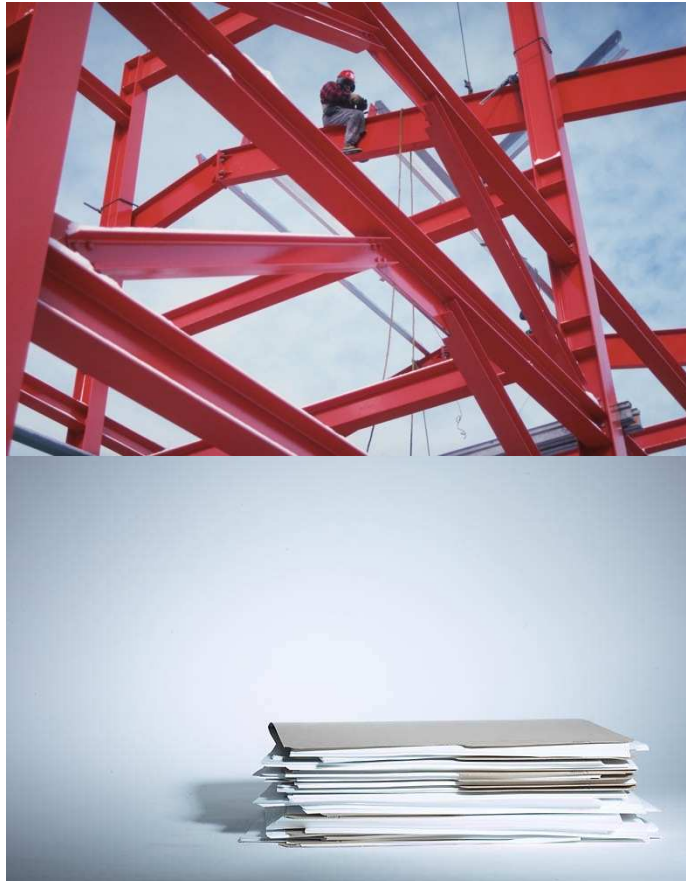
Understanding a life-cycle approach

Learning unit B: exploring eco-efficiency



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Did you know...



- Producing one ton of recycled steel saves the energy equivalent of 3.6 barrels of oil and 1.5 tons of iron ore, compared to the production of new steel?
- Producing paper using a chlorine-free process uses between 20 and 25 percent less water than conventional chlorine-based paper production processes?





Learning objectives

- Recognize where products come from and where they go after use – *life-cycle*
- Think about a product's impacts on the environment and economy throughout
 - Qualify impacts
 - Quantify impacts

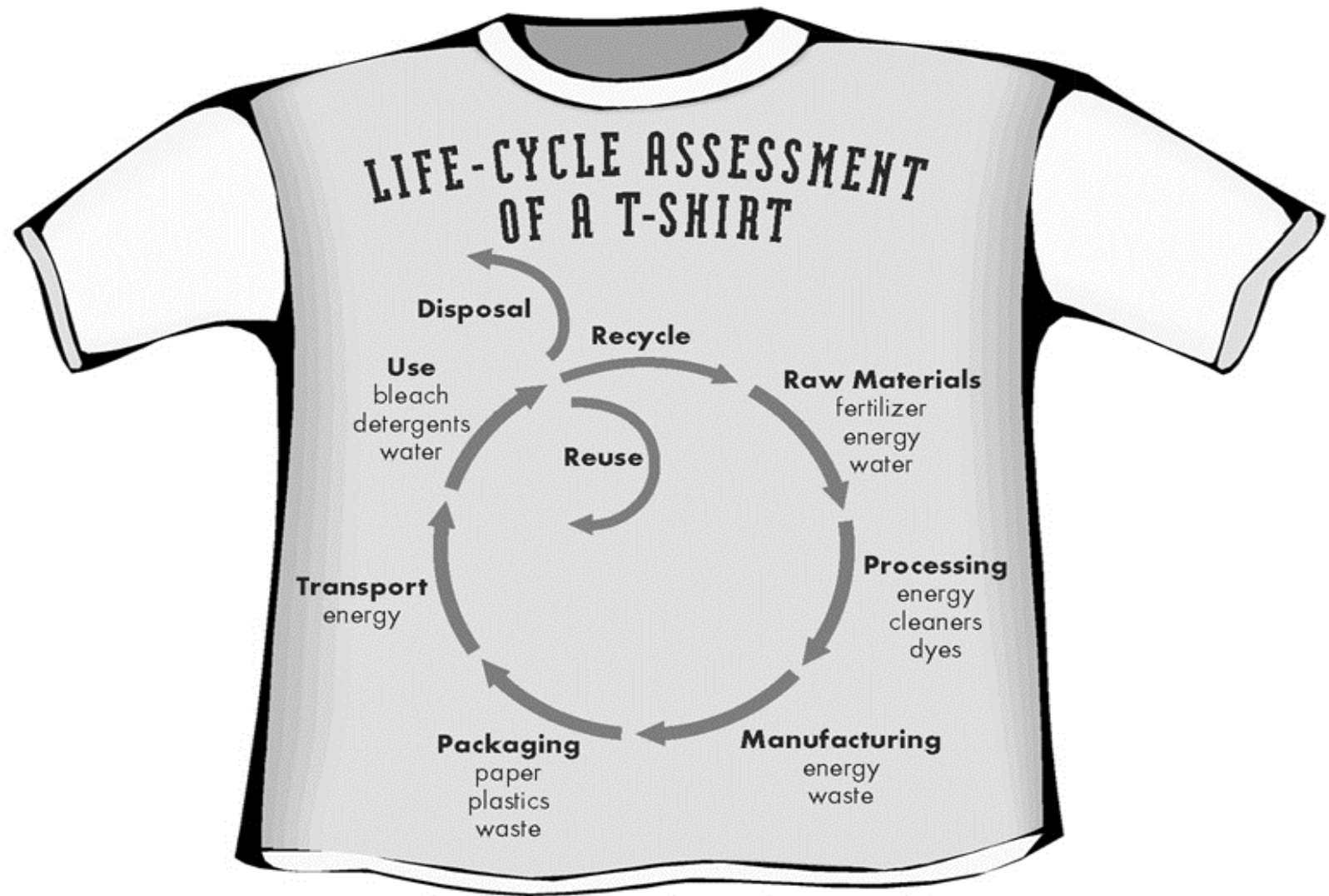
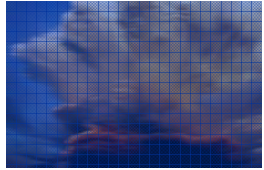




Structure

- Life-cycle – what is it?
- Choosing boundaries and shifting issues
- A life-cycle approach
- Life-cycle assessment – one tool
- Segue to life-cycle exercise





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Worldwatch Institute, Worldwatch Paper 166: Purchasing Power: Harnessing Institutional Procurement for People and the Planet, July 2003, www.worldwatch.org



Life-cycle stages

- Products can be evaluated through each stage of their life-cycle:
 - Extraction or acquisition of raw materials
 - Manufacturing and processing
 - Distribution and transportation
 - Use and reuse
 - Recycling
 - Disposal
- For each stage, identify inputs of materials and energy received; outputs of useful product and waste emissions
- Find optimal points for improvement – eco-efficiency



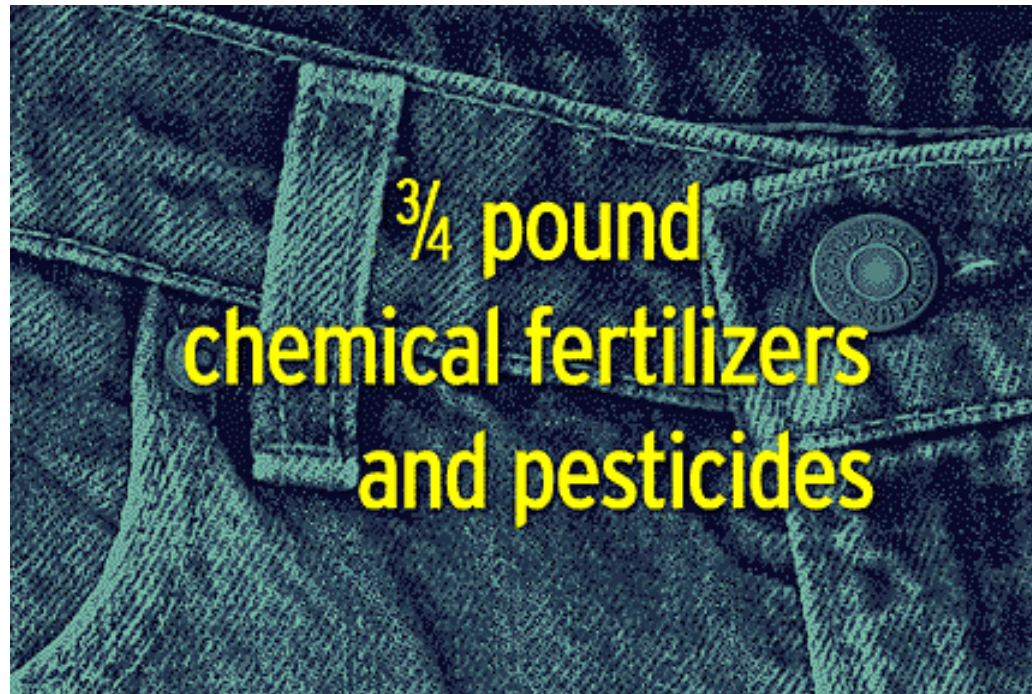


A life-cycle approach

- Ensures companies identify the multiple environmental and resource issues across the entire life-cycle of the product
- Knowledge of these issues informs business activities:
 - planning, procurement, design, marketing & sales
- Rather than just looking at the amount of waste that ends up in a landfill or an incinerator, a life-cycle approach identifies energy use, material inputs and waste generated from the time raw materials are obtained to the final disposal of the product *



Identifying issues at each life-cycle stage

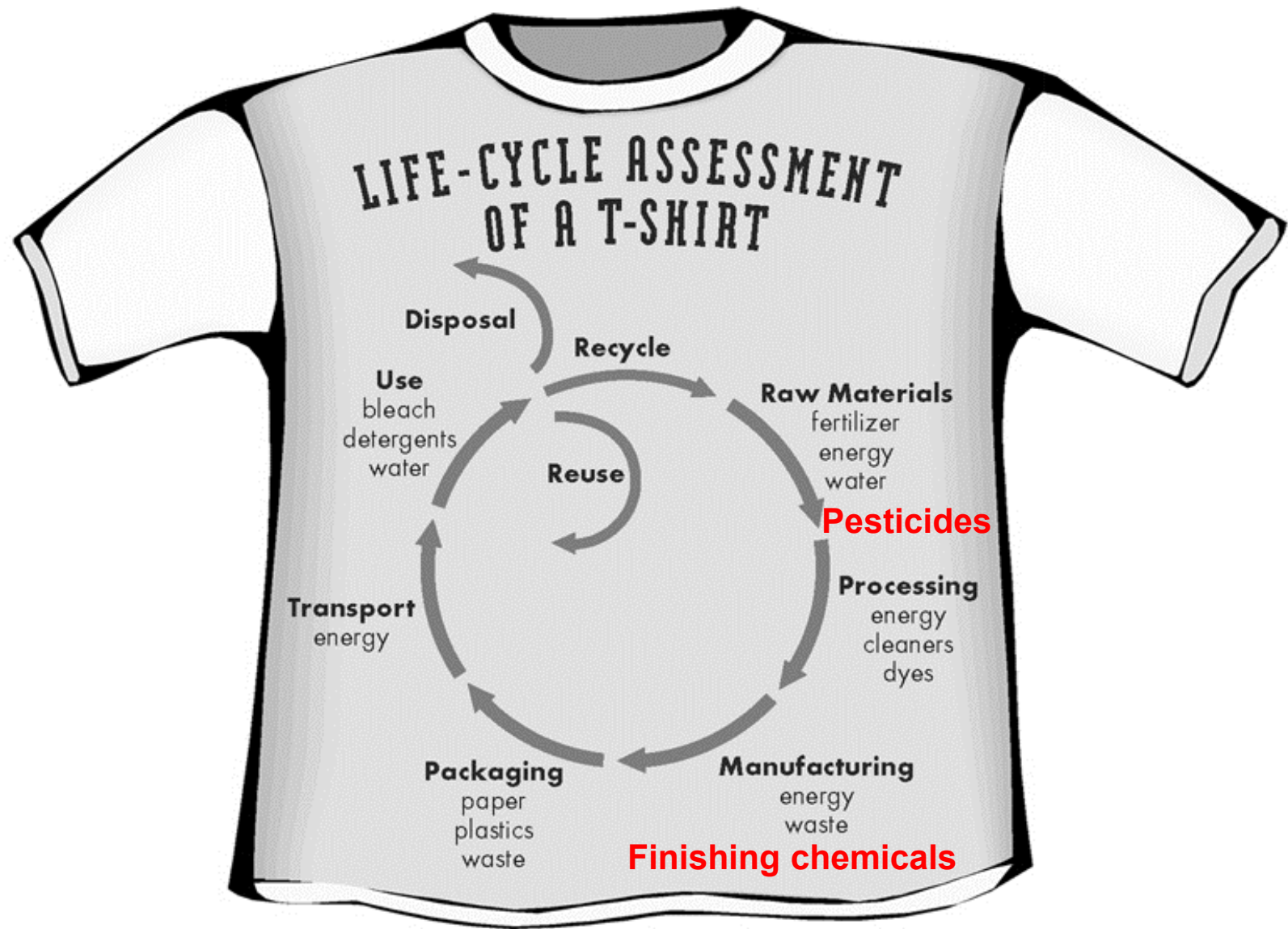
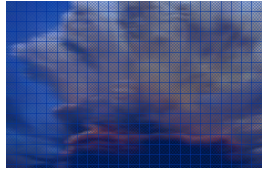


Estimated amount of synthetic fertilizers and pesticides it takes to produce the cotton for a conventional pair of jeans.

Source: "The Organic Cotton Site: Ten good reasons"



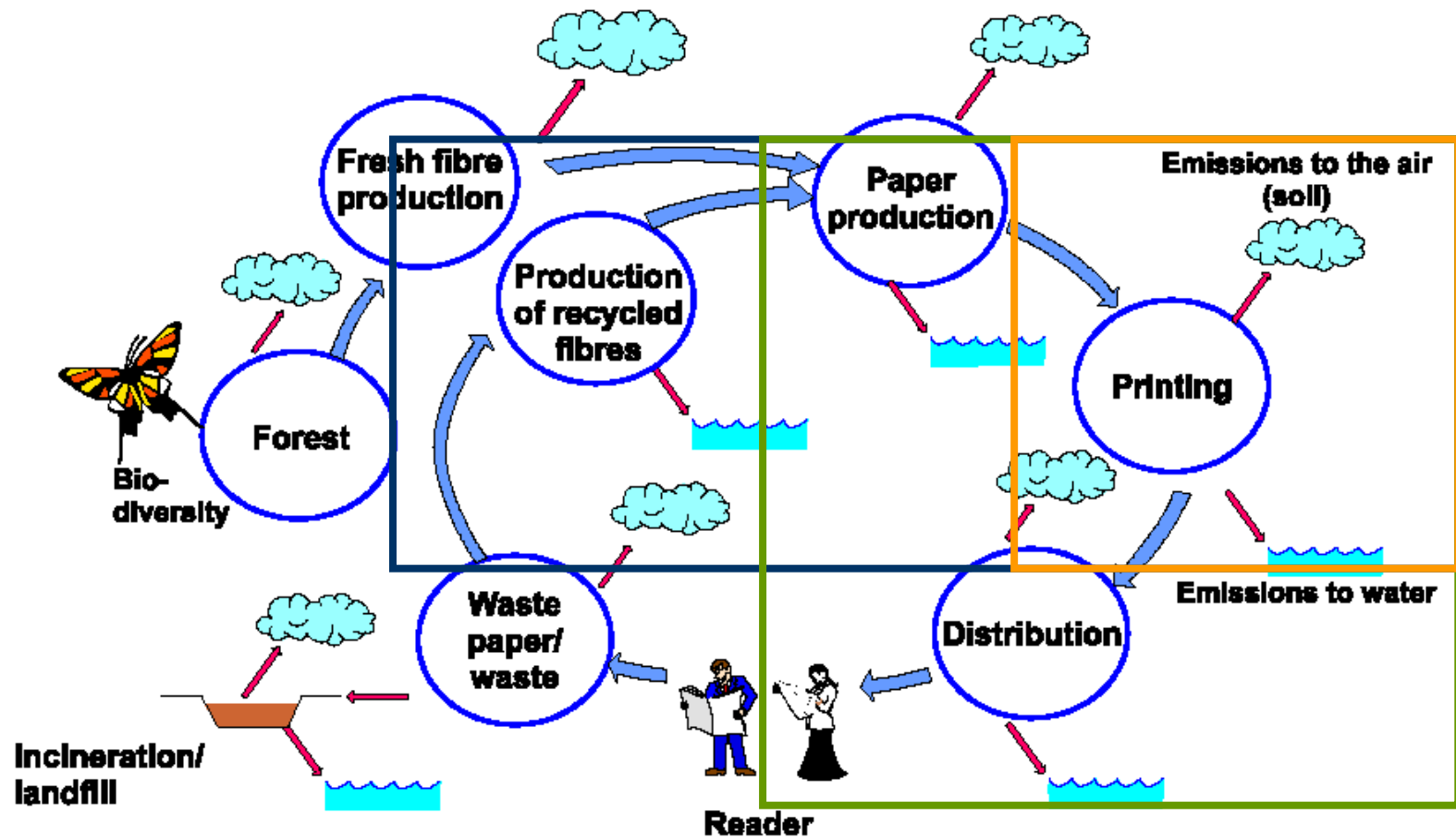
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Life-cycle – identify the boundaries





Life-cycle – helps avoid shifting the issues

- Looking at the entire life-cycle helps ensure reducing waste at one point does not simply create more waste at another point in the life-cycle
- Issues may be shifted – intentionally or inadvertently – among:
 - Processes or manufacturing sites
 - Geographic locale
 - Different budgets and planning cycles (first cost)
 - Environmental media – air, water, soil (MTBE)
 - Sustainability dimension: economic, social, environmental burdens
- Depends on “boundaries”
- Be conscious of what is shifted and to where!
- For example, MTBE...

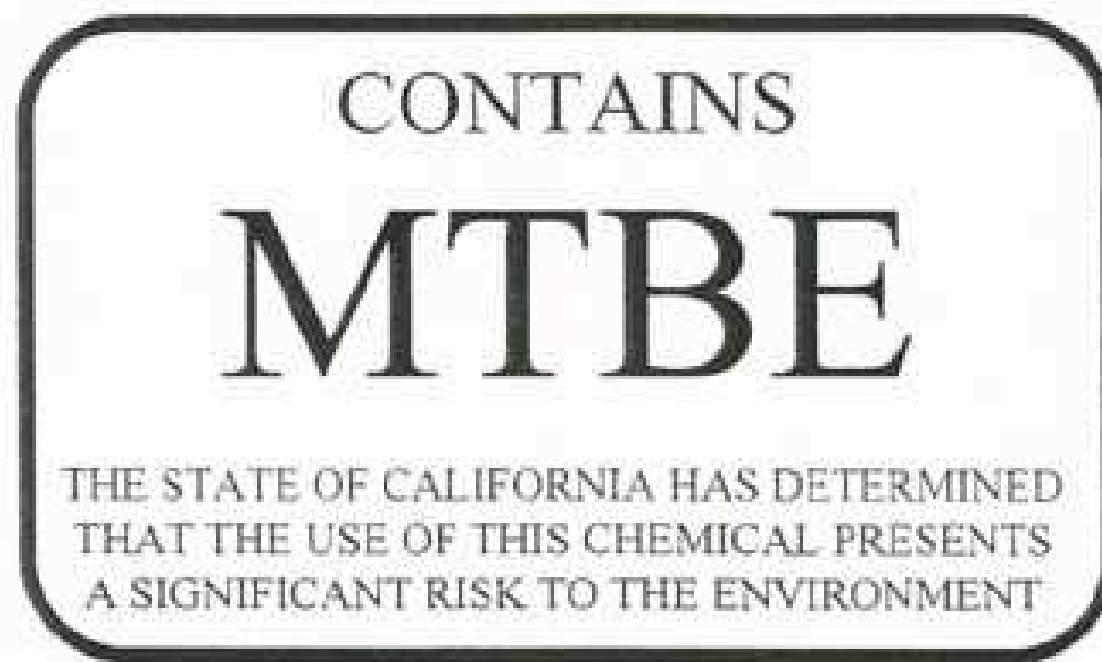


Methyl tertiary butyl ether - MTBE

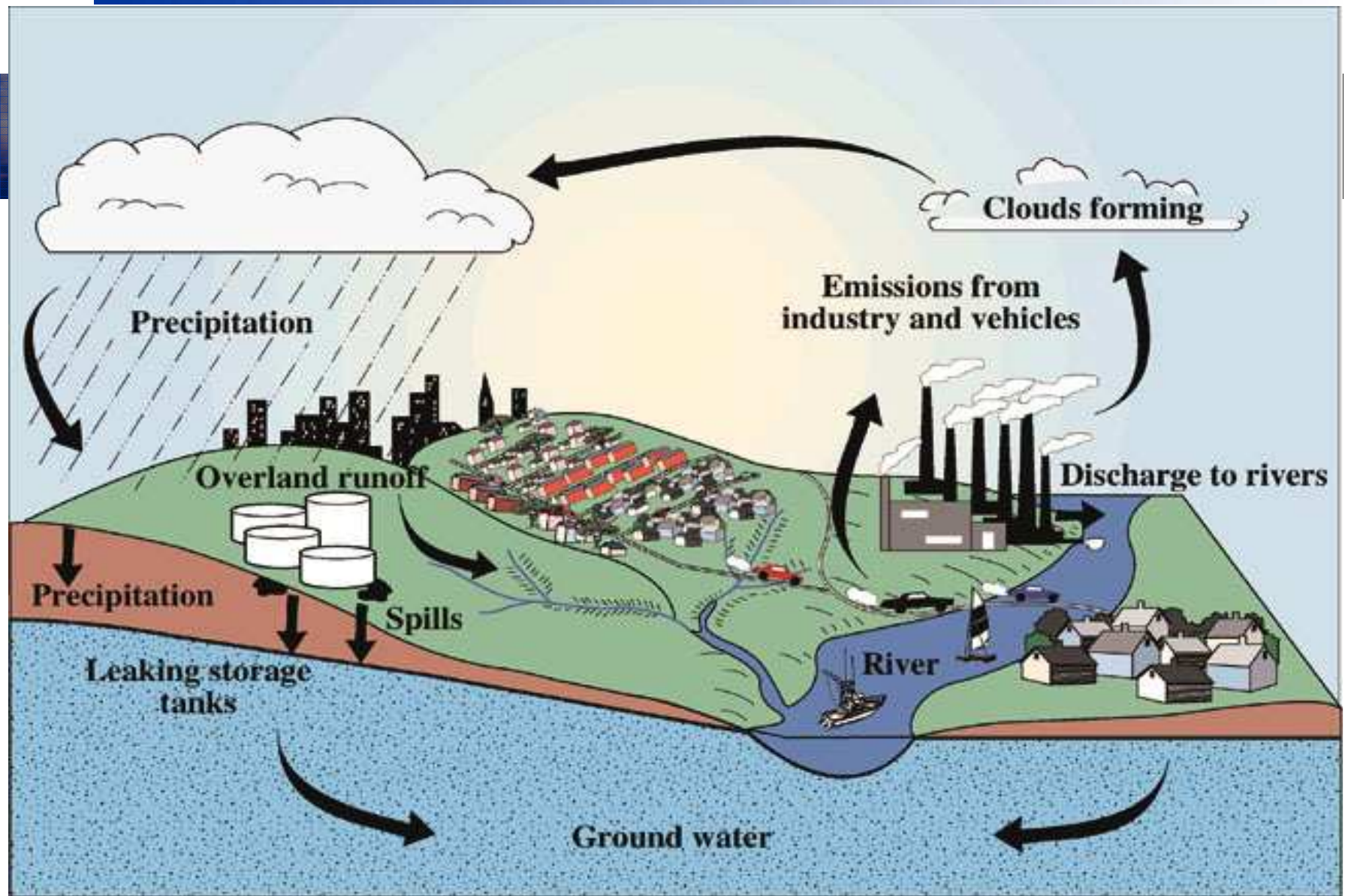


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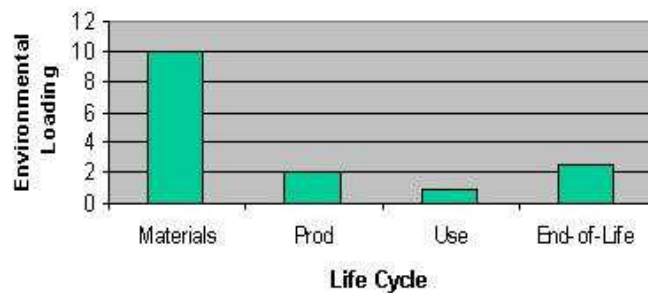


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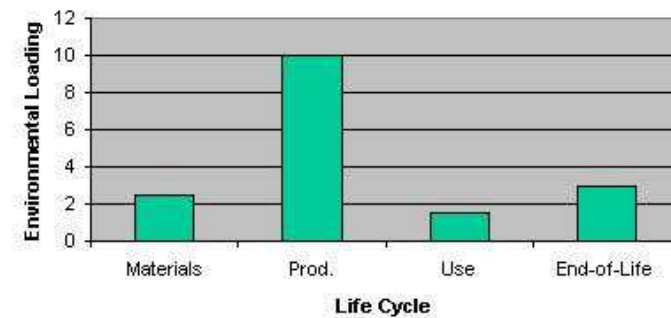


Different products have impacts at different life-cycle stages

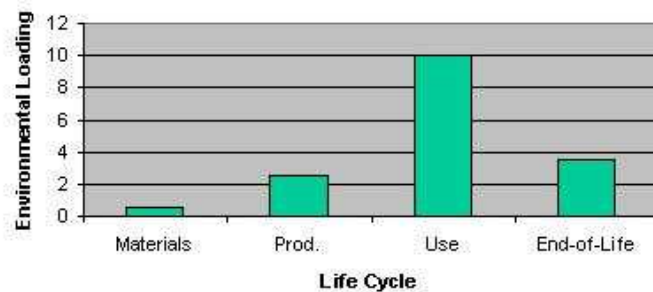
**Type a: short-lived material-intensive product
(e.g. single use package)**



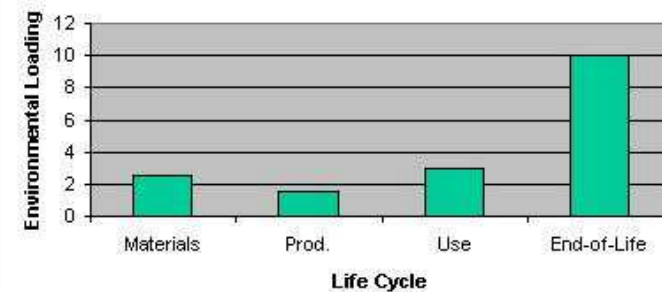
**Type b: manufacturing-intensive product
(e.g. laptop computer, paper products)**



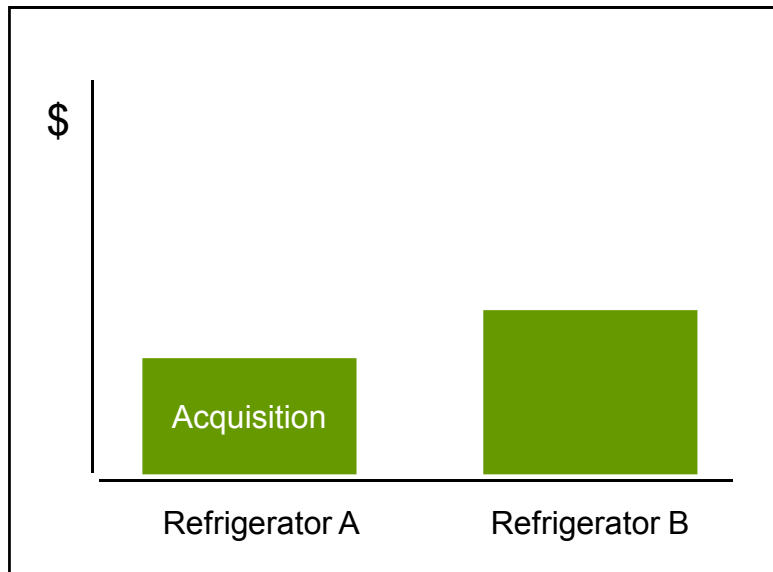
**Type c: long-lived, energy and resource
consuming products
(e.g. automobiles, appliances, buildings)**



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

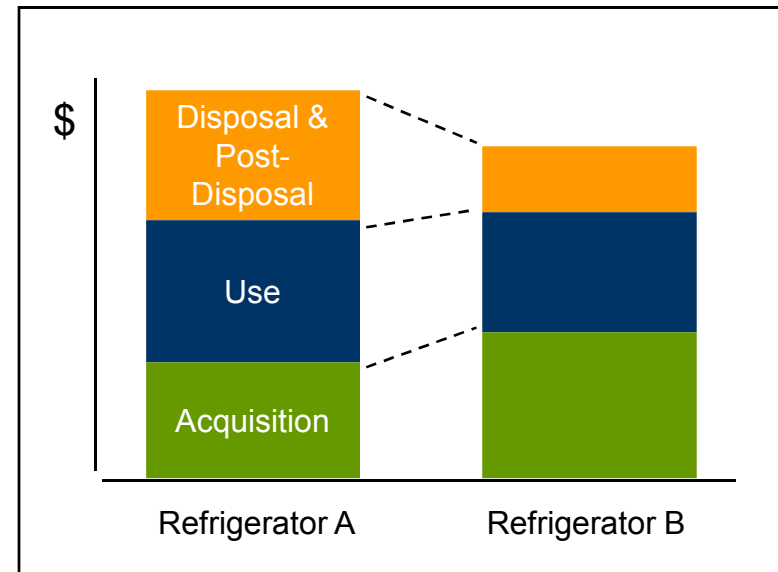


Life-cycle – identify issues and costs



Purchase Price

Refrigerator A appears cheaper



Price + Life-Cycle Costs

Refrigerator B costs less overall





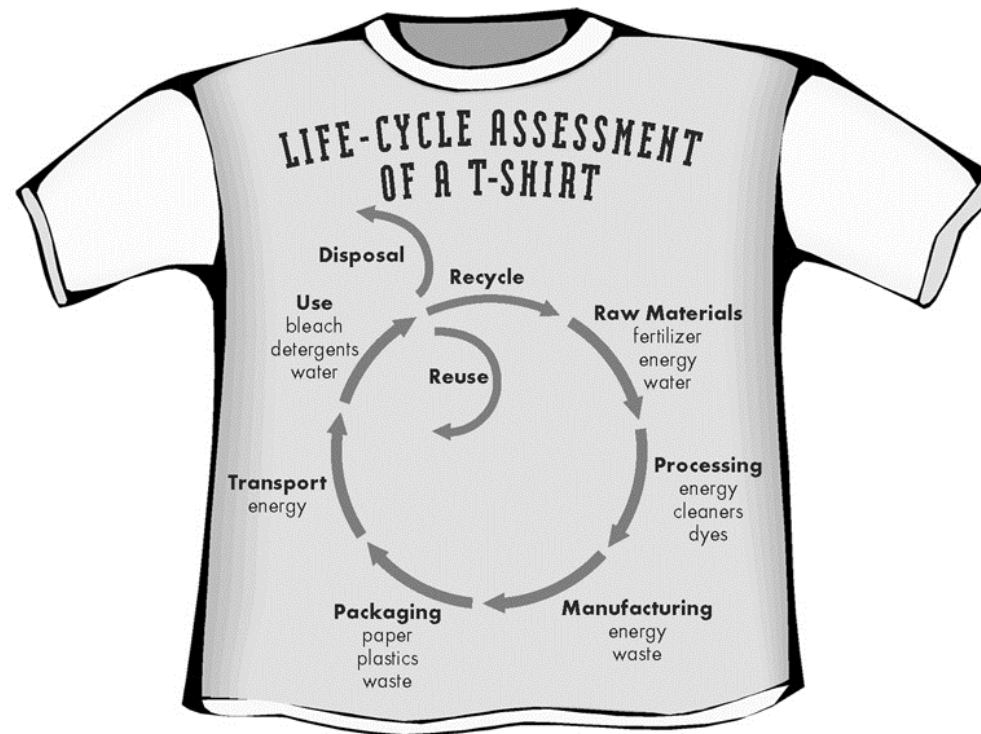
A life-cycle approach

- With a life-cycle approach, companies employ the tools they need to:
 - Reduce impacts across the life-cycle
 - Capitalize on opportunities for their business
- Tools range from simple mapping of life-cycle stages to comprehensive quantitative assessments



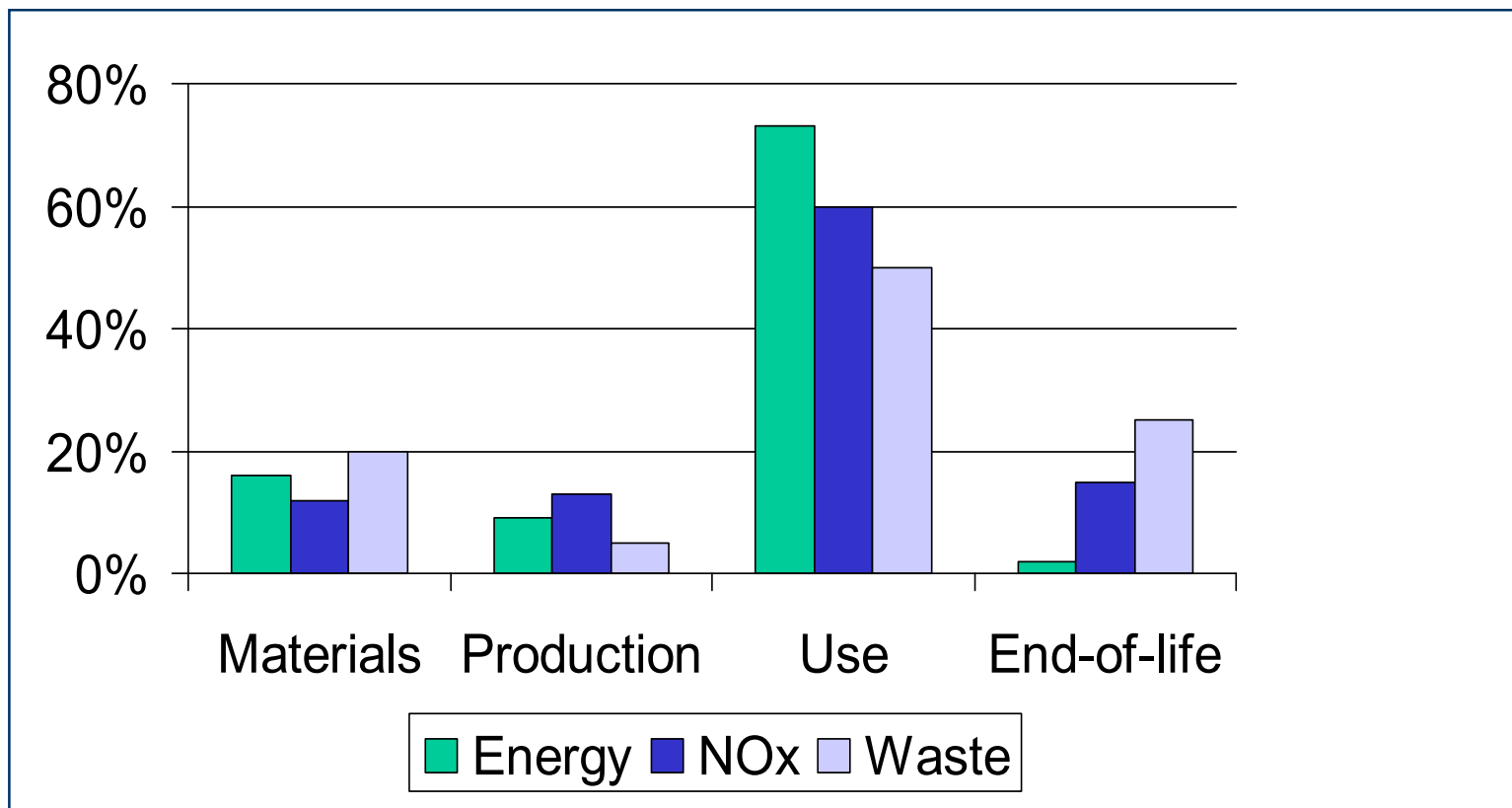
Life-cycle assessment

- LCA is a tool to systematically measure the environmental impacts associated with each stage of a product's life-cycle



Life-cycle assessment

Assessment of relative impacts across life-cycle – 3 issues are included





Life-cycle assessment

- Two attributes make LCA distinct and useful as an analytical tool:
 - whole system consideration of the total product life-cycle
 - presentation of tradeoffs among multiple environmental issues
- LCA is quantitative



How to do LCA

1. Determine scope and system boundaries
 - functional unit
 - life-cycle stages
 - define “unit processes”
2. Data collection
3. Analysis of inputs and outputs
4. Assessment of numerous environmental issues
5. Interpretation
 - LCA principles and framework are standardized by the Organization for International Standardization’s 14040 series of standards (ISO14040)





Conclusions – why take a life-cycle approach?

- Systems perspective
- Integrates environment into core business issues
- Efficiency
- Innovation
- Better return on investment – identify point of “biggest bang for the buck” *
- Engage stakeholders – investors, customers, employees
- Environment is not a cost center for the company, but a business opportunity



Conclusions – why take a life-cycle approach?

- Systems perspective
- Integrates environment into core business issues
- Efficiency
- Innovation
- Better return on investment
- Engage stakeholders
- Environment is not a cost center for the company, but a business opportunity
 - Look beyond the company's gate
 - Expose trade-offs and opportunities
 - Expand analysis of products, projects, policies and programs – what is the function, what are the boundaries, what are the impacts, where are the opportunities?



Hamburger exercise – life-cycle stages, inputs, outputs and issues ...

