Industry Forum on Responsible Packaging

Welcome

WATERSHED MEDIA

** Publisher of "Paper or Plastic" by Dan Imhoff*

Feedstock and sustainable farmers:

What would a sustainable, GMO-free biopolymer feedstock production system look like (farmer income, soil and water quality, energy use, climate considerations, etc.) and ***how would the industry both support family farmers in producing these materials and promote this linkage in their product marketing?***

Infrastructure:

The lack of an infrastructure to close the technical and biological loop present huge challenges to sustainable packaging. This includes few industrial-scale composting systems, many different plastics in the waste stream, sorting problems, underfunded local government programs, etc.

What steps could the natural foods industry take to address this "system" issue?

One Action

What one action or commitment will you make, in your own life, to help create more responsible packaging?

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Sustainable Business Practices

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Woodland Hills Solar Installation

Responsible Packaging?

- 3 questions.

Packaging by Type

- Primary package: Ice Cream tub, Beer Bottle.
- Secondary packages: packaging that packages the primary package; e.g. the box tray and the film overwrap for bottled water, or a beer 6-pack.
- Transport packaging: these carry the primary and secondary packages. Could be Cardboard, Filler-materials, Pallets, Strapping, Shrink wrapping, Returnable plastic produce containers, and so on.

Sometimes we can measure

- As the next slide shows, it is possible to understand what actions create what scale of resource use.
- Ecological footprint. . . The land and water area that would be required to support a defined human population and material standard indefinitely.

Energy by Transport Method

- BTUs/ton-mile:

- Rail = 371
- Boat = 411
- Truck = 4,359 (12 times as much)
- Plane = 31,609 (85 times as much)

-Paper or Plastic

Embodied Energy

- An accounting methodology which aims to find the sum total of the energy necessary - from the raw material extraction, to transport, manufacturing, assembly, installation as well as the capital and other costs of a specific material - to produce a service or product.

The Idea of a System

A system is a collection of parts which interact with each other to function as a whole.

A Green Claim Assumes …

The earth is a single living system.

- **Open to energy from the sun**
- **Closed to matter**

The principles of the science of ecology determine the validity of a green claim.

The author of Biomimicry, Janine Benyus explains ecology:

Nature runs on sunlight.
Nature uses only the energy it needs.
Nature fits form to function.
Nature recycles everything.
Nature rewards cooperation.
Nature banks on diversity.
Nature demands local expertise.
Nature curbs excesses from within.
Nature taps the power of limits.

Sustainability:
2 simple rules to follow

- Live off of current solar income
- The cyclic principle: waste = food for something else; there is no bioaccumulation of persistent human-made molecules

The Life Support Systems

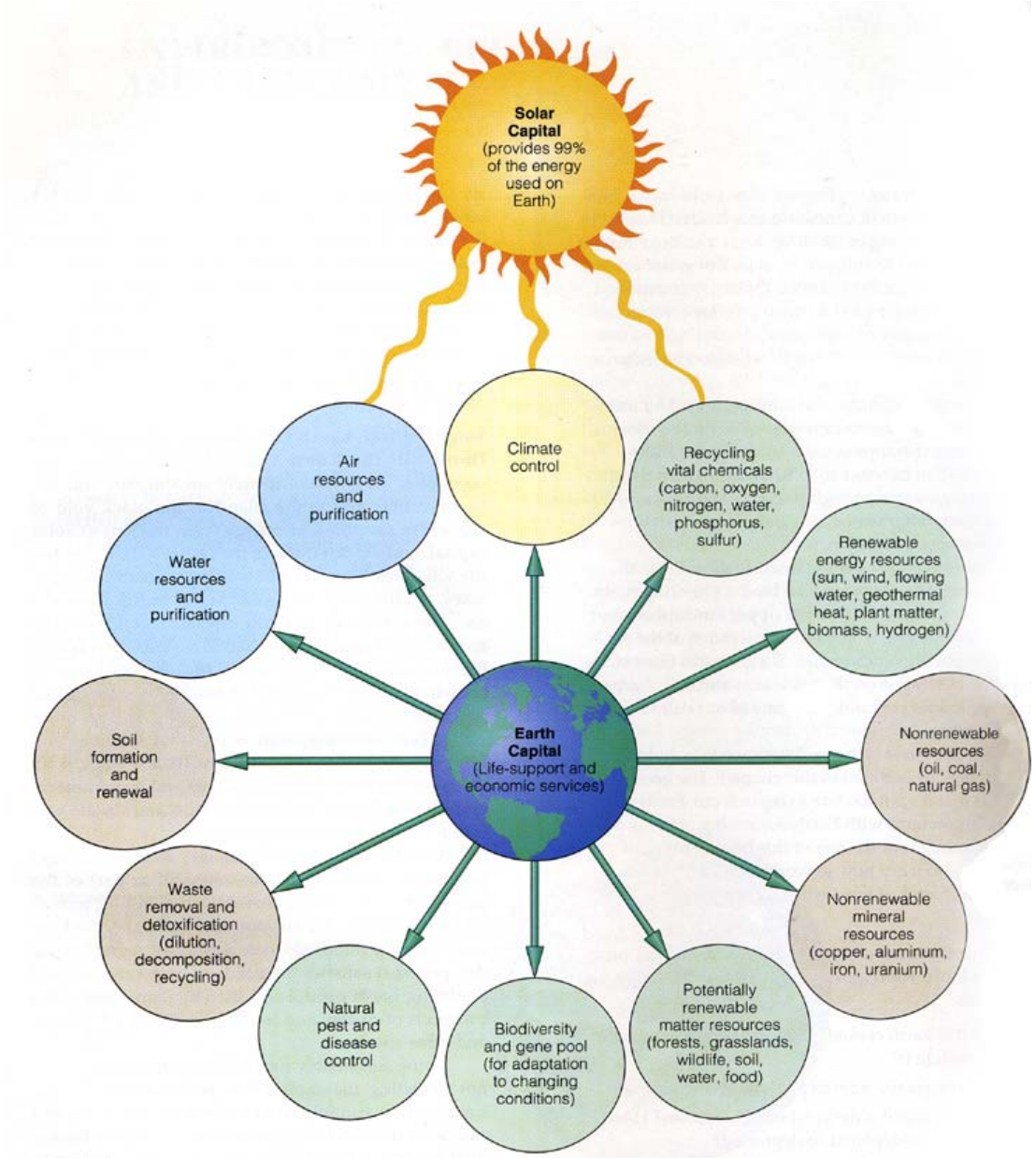


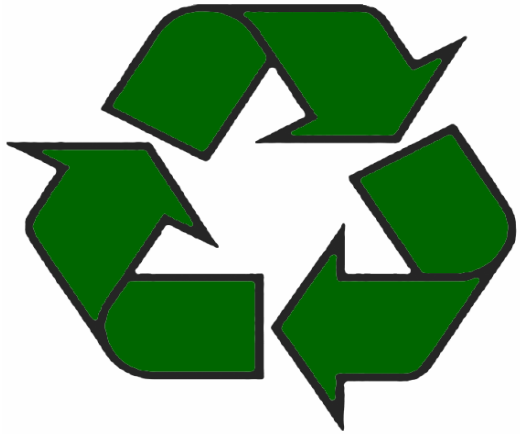
Figure 1-2 Solar and Earth capital consists of the life-support systems provided by the sun and the planet for use by us and other species. These two forms of capital support and sustain all life and all economies on Earth.

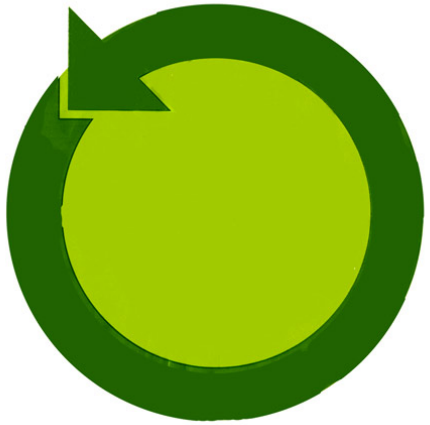
- Note how powerful the previous pictogram was in showing interrelationships and interconnections and how they worked as a whole.

- To verify if green claims are authentic, we can observe them in terms of pictograms and cycles.

Does the Symbol Make it Green?

- As an example, we assume when we see either of these pictograms that a green claim is valid, because they infer a closed loop.





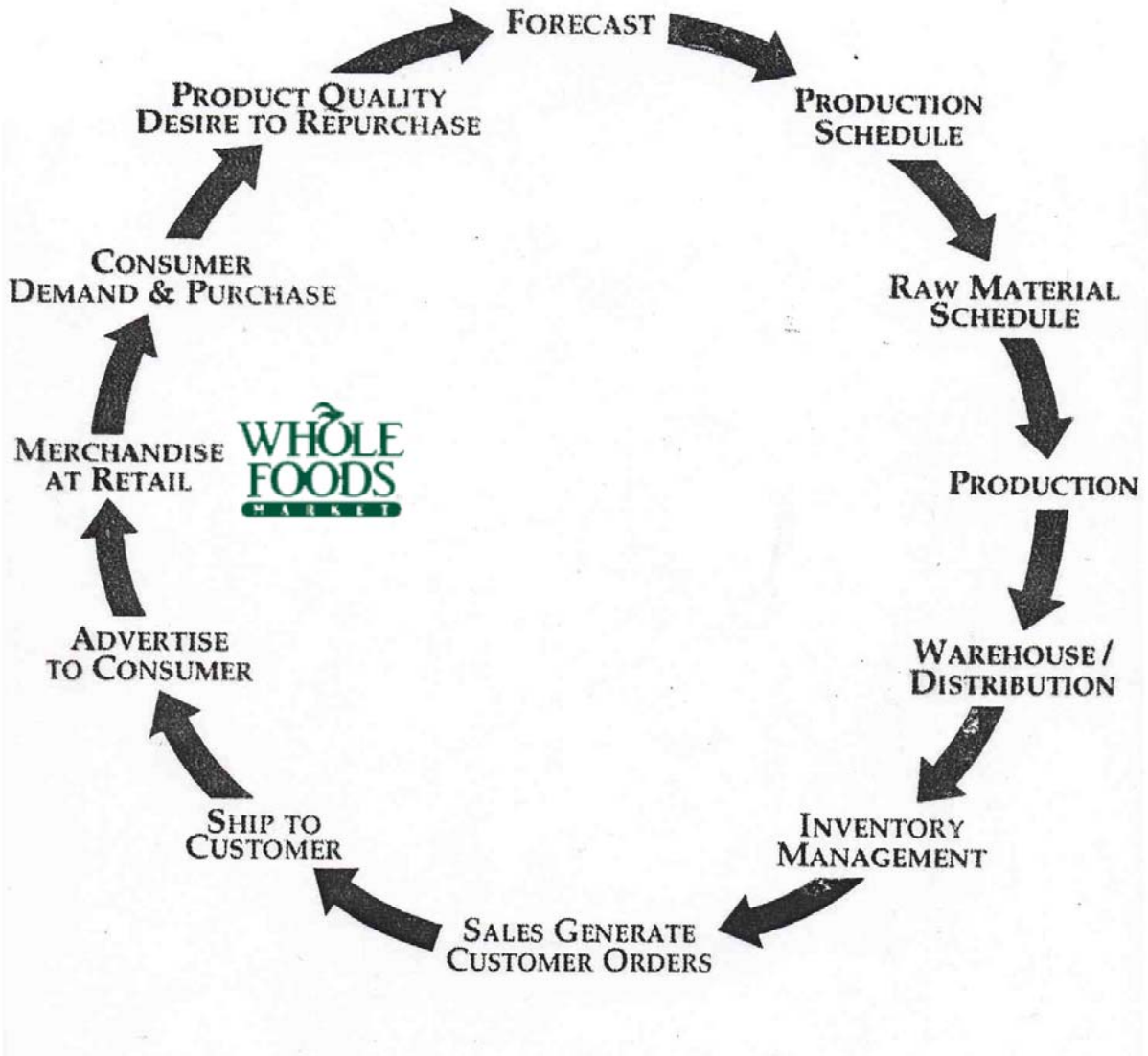
But is the loop really closed?

Solving Complex Problems through Systems Thinking

- We are becoming familiar with the need for our supply chain to be a series of closed loop systems based on ecological principles.
- That supply chain can be shown as a closed loop system.

Supply Chain Management

Notice how we communicate these as a cycle of interrelated and specifically sequenced events.

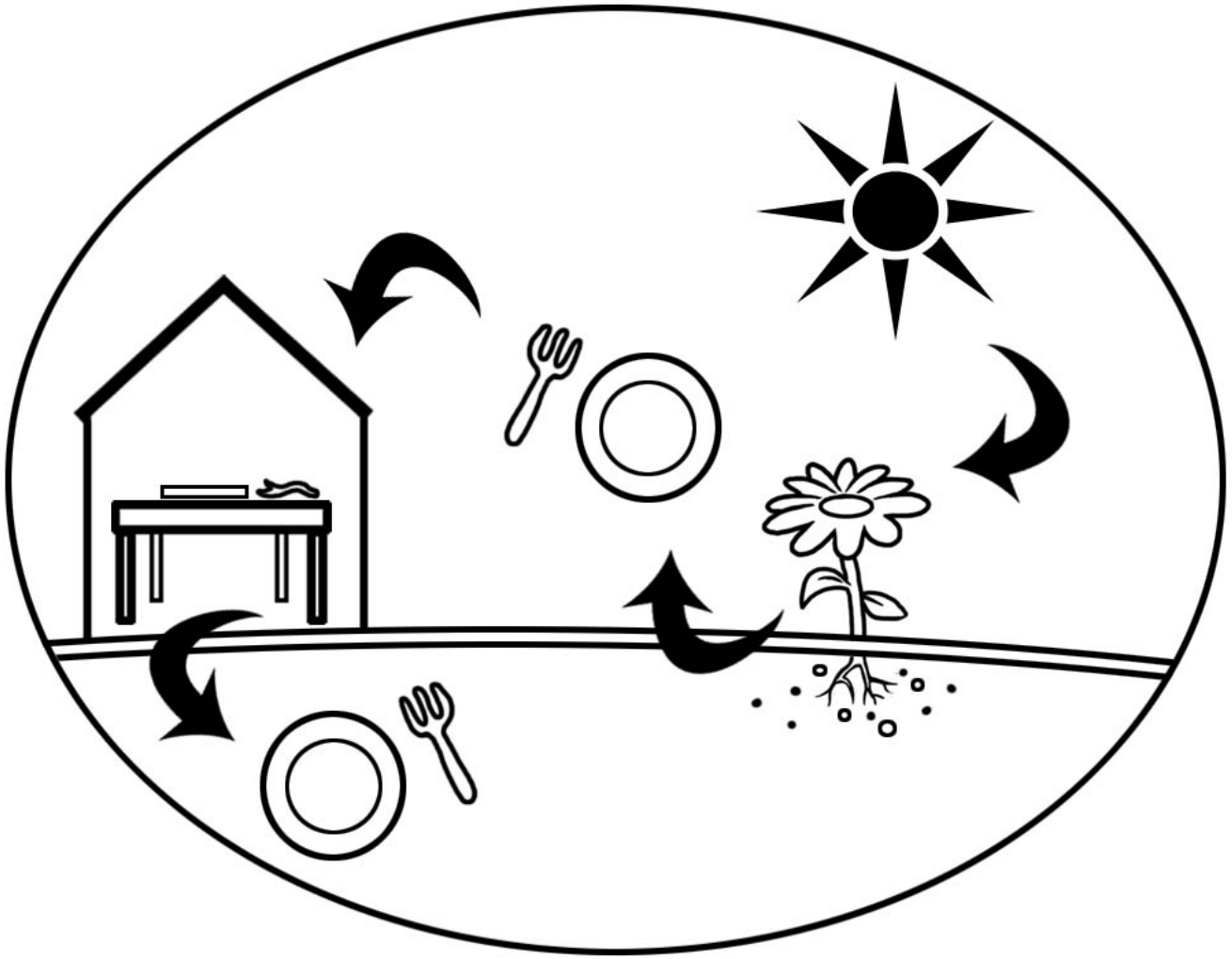


Reality Check

- **We know the supply chain fulfillment pictogram doesn’t quite tell the complete story because it doesn’t show any waste.**

- **In a sustainable economy, we want to focus on two principles:**
  1. **live off current solar income and**
  2. **there is no waste (waste is food for something else).**

These two principles can be shown with a simple pictogram.



Redesign

Rethink

Reduce

Reuse

Recycle

Major change: A Paradigm Shift

- Industrial >> informed-ecological
- Ancient sunlight >> current sunlight
- Scarce resources >> regenerative resource
- Disposable >> recyclable and/or compostable
- Chemical Agriculture >> Organic Agriculture’s Principles
- Reactive to the past >> anticipate the future needs
- Short term results >> long term planning

Common Ground

- Single living system
- Operating Principles of Ecology
- Regenerative Economics

The **precautionary principle**

- states that if the potential consequences of an action are severe or irreversible, in the absence of full scientific certainty the burden of proof falls on those who would advocate taking the action.

Vision

- A picture of the future
  that you wish to create.

- The Organic Center:

10% organic sales by 2010

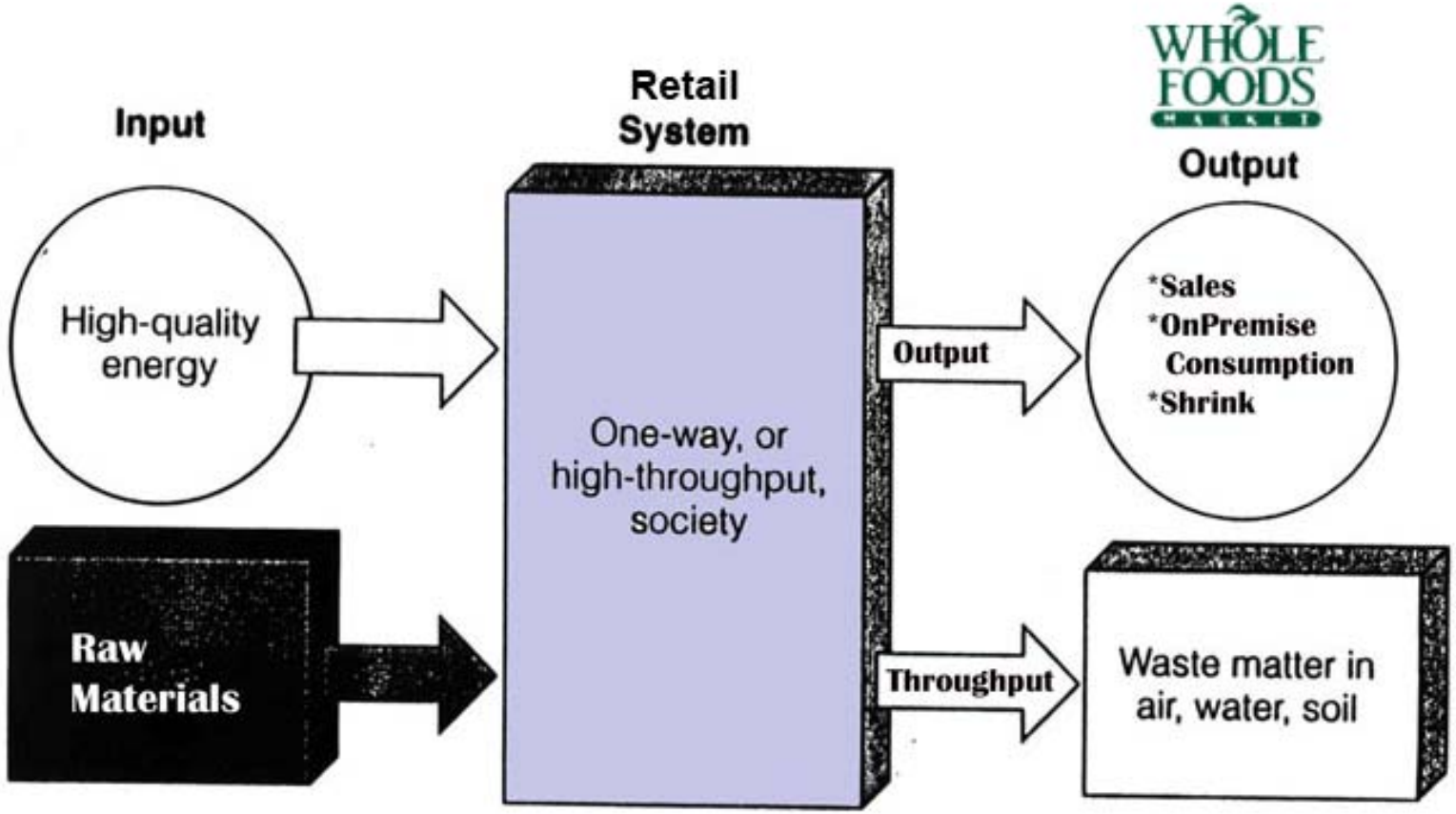
Green Supply Chain Example

Materials Pooling

- is to pioneer innovative ways to foster collaboration among different organizations working together toward more intelligent materials practices, that create a closed loop material flows.

Input Output Throughput

All stores and facilities have energy and material input, output and throughput (often what we call “waste”).



Waste matter in air, water and soil needs to be food for something!

“Sinks” for throughput.
(a term for the destination of a flow.)

- Recycling: it becomes itself again
- Composting: top soil amendment
- Water
- Top soil (e.g. Landfill)
- Air
- Crust of the earth

Zero Waste

It is possible to have no trash compactor, and get to zero waste!

Greenwashing

- The claim of an environmental benefit, when, under analysis, the opposite is true.
- To make an environmental claim, although true, is “so what?”
- Often supported with adjectives like “green” and “eco-friendly” and “biodegradable”.

Downcycling in one generation

It is worth noting that the concept of materials recycling means returning the material for use in the original product.

The subsequent reuse of material for other products with lower requirements, sometimes termed "**downcycling** " is not long-term recycling. One more life as something else, then no more recycling.

Downcycling

- You say that recycling, as it's currently practiced, is "downcycling." What we call recycling is typically the product losing its quality. Paper gets mixed with other papers, re-chlorinated and contaminated with toxic inks. The fiber length gets shorter, allowing more particles to abrade into the air, where they get into your lungs and nasal passages, and cause irritation. And you end up with gray, fuzzy stuff that doesn't really work for you. That's downcycling.

  -Cradle to Cradle

3 basic streams

- Recyclables: #1 and #2 rigid plastics, glass, aluminum, paper (also cardboard and film plastics).
- Compostables: “green wastes”
- Trash: like food soiled petro-plastics.

Single Stream Sign

Cardboard

Cardboard is valuable.

All dry cardboard needs to be bailed. Wet or food-soiled cardboard can be composted.

Film Plastics

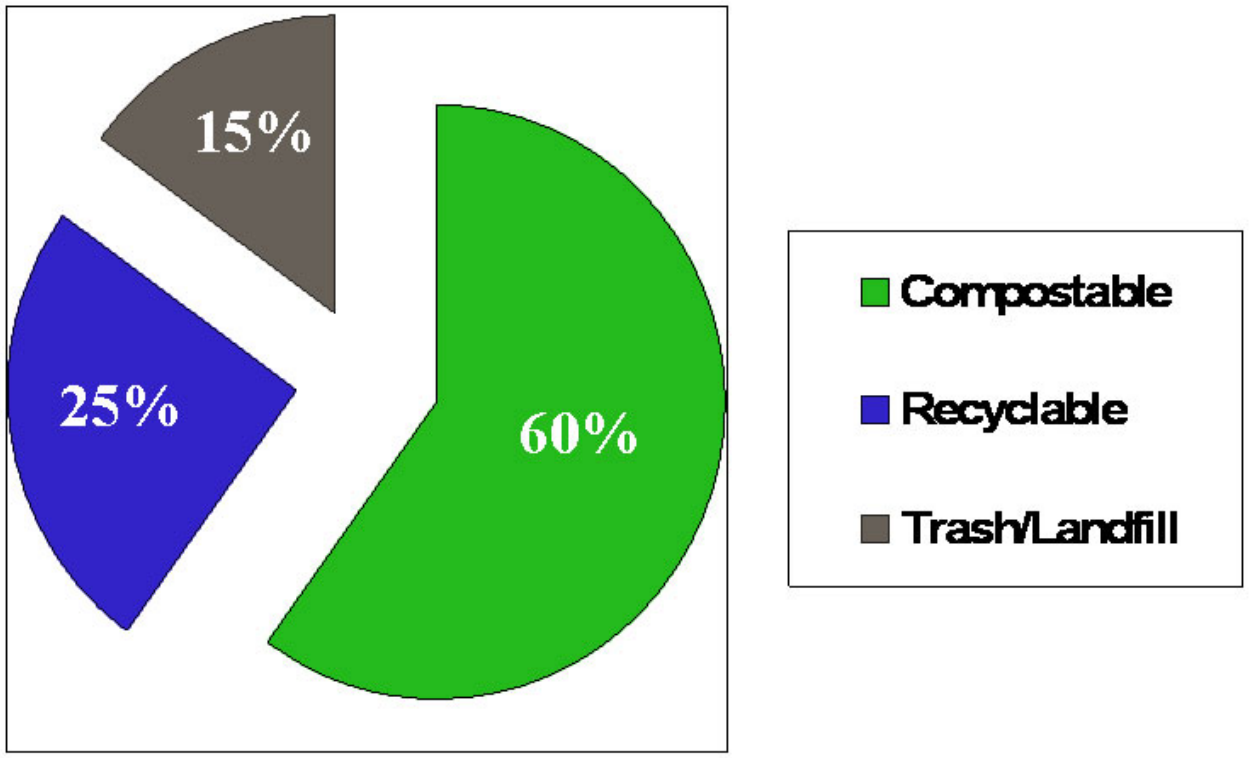
Laundry Bag Holder
Used for Film Plastics

A laundry bag holder with a clear plastic bag is a good receptacle for shrink wrap recycling in receiving.

Compostable Green Waste:
“If it was alive, it’s compostable.”

WHOLE FOODS MARKET

60% Compostables



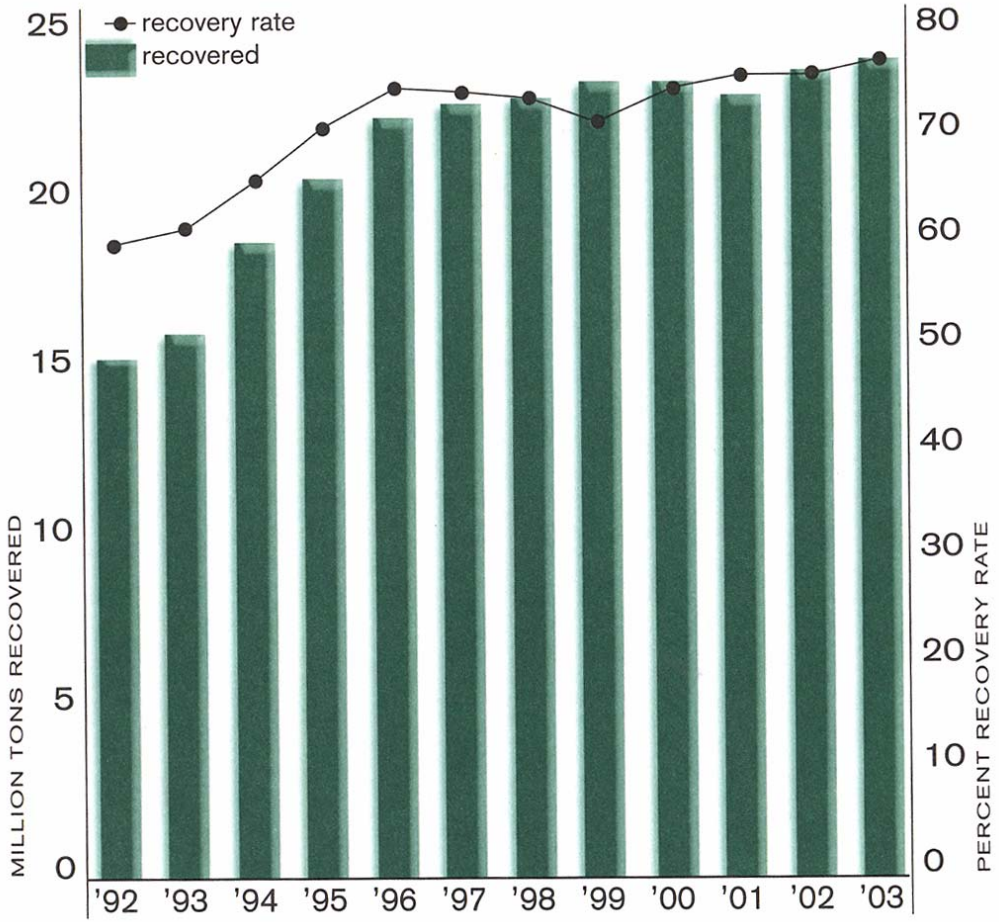
What is recycling?

- Involves the separation and collection of materials for processing and remanufacturing into new products .

- A material becomes itself again, and again. (e.g. clear glass)

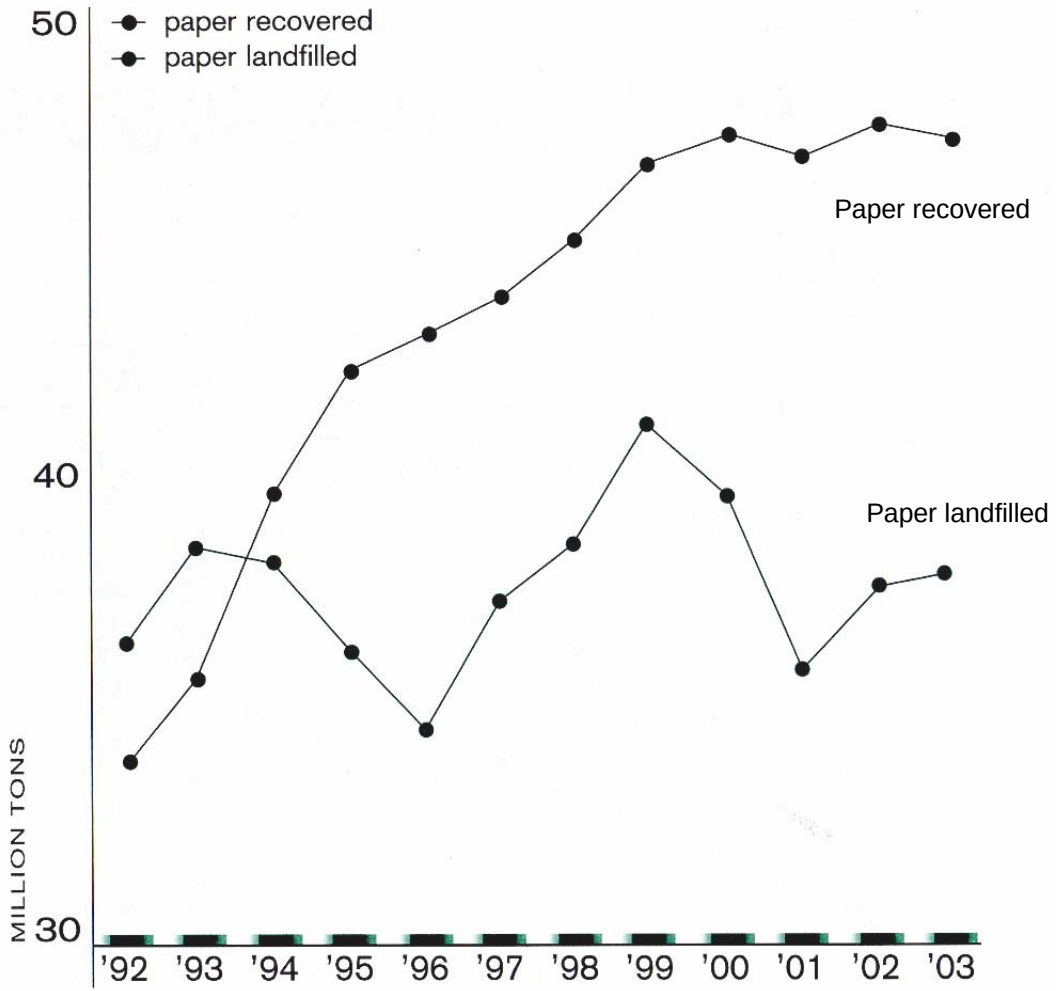
Recovery and Use of Old Corrugated Containers (OCC)

Recovery of old corrugated containers rose 2.2% in 2003 to a record-high 23.7 million tons. The recovery rate for OCC approached 76% in 2003, up from 54% in 1990.



Paper Recovery versus Landfilling

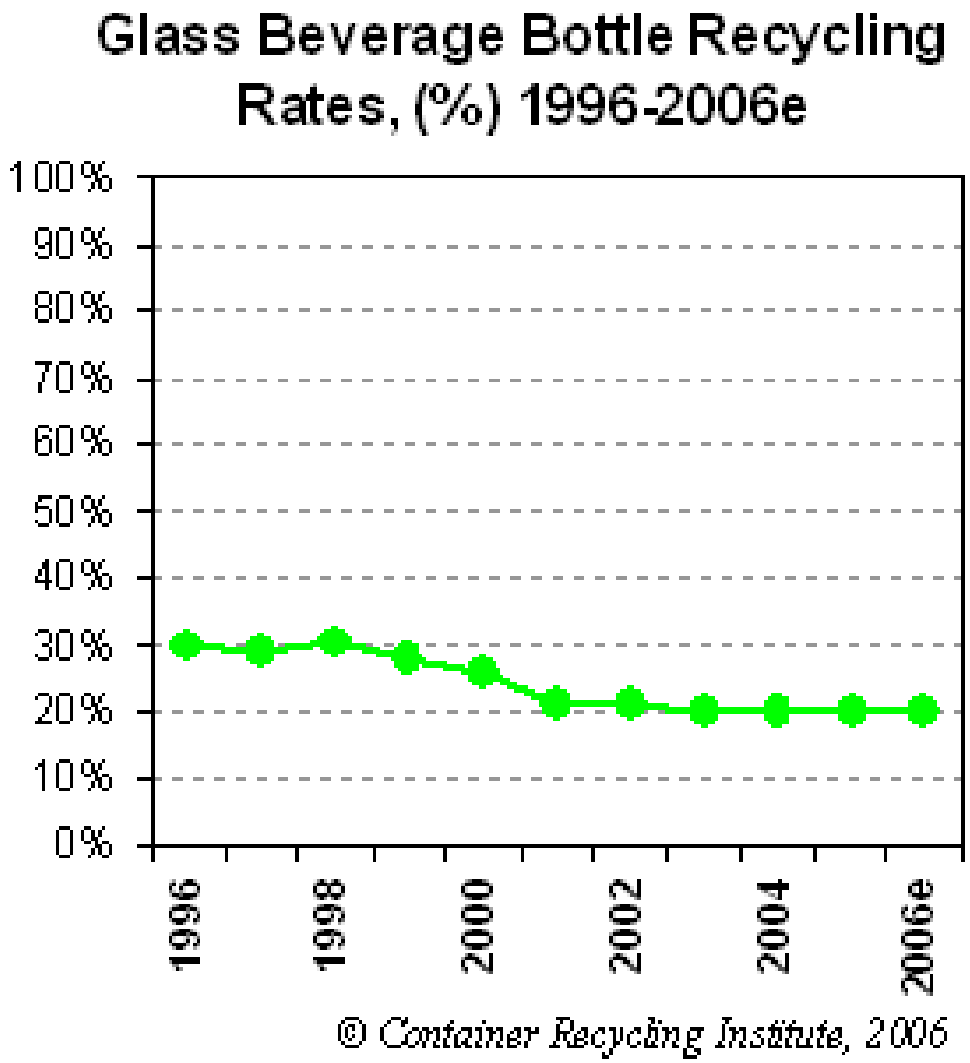
Currently far more paper is recovered for recycling than is landfilled. In addition to landfilling, paper that is not recycled may go to waste-to-energy facilities or wind up in permanent or semi-permanent applications such as construction products.



Aluminum Can Reclamation

Year	Pounds of Aluminum Collected (millions)•	Number of cans/pound of aluminum	Number of cans collected••	Number of Cans Shipped (billions)•••	Pct. of aluminum cans collected
2003	1,479	33.72	49.9	99.7	50.0
2004	1,518	33.92	51.5	100.5	51.2
% change	2.6	0.6	3.2	0.8	1.2

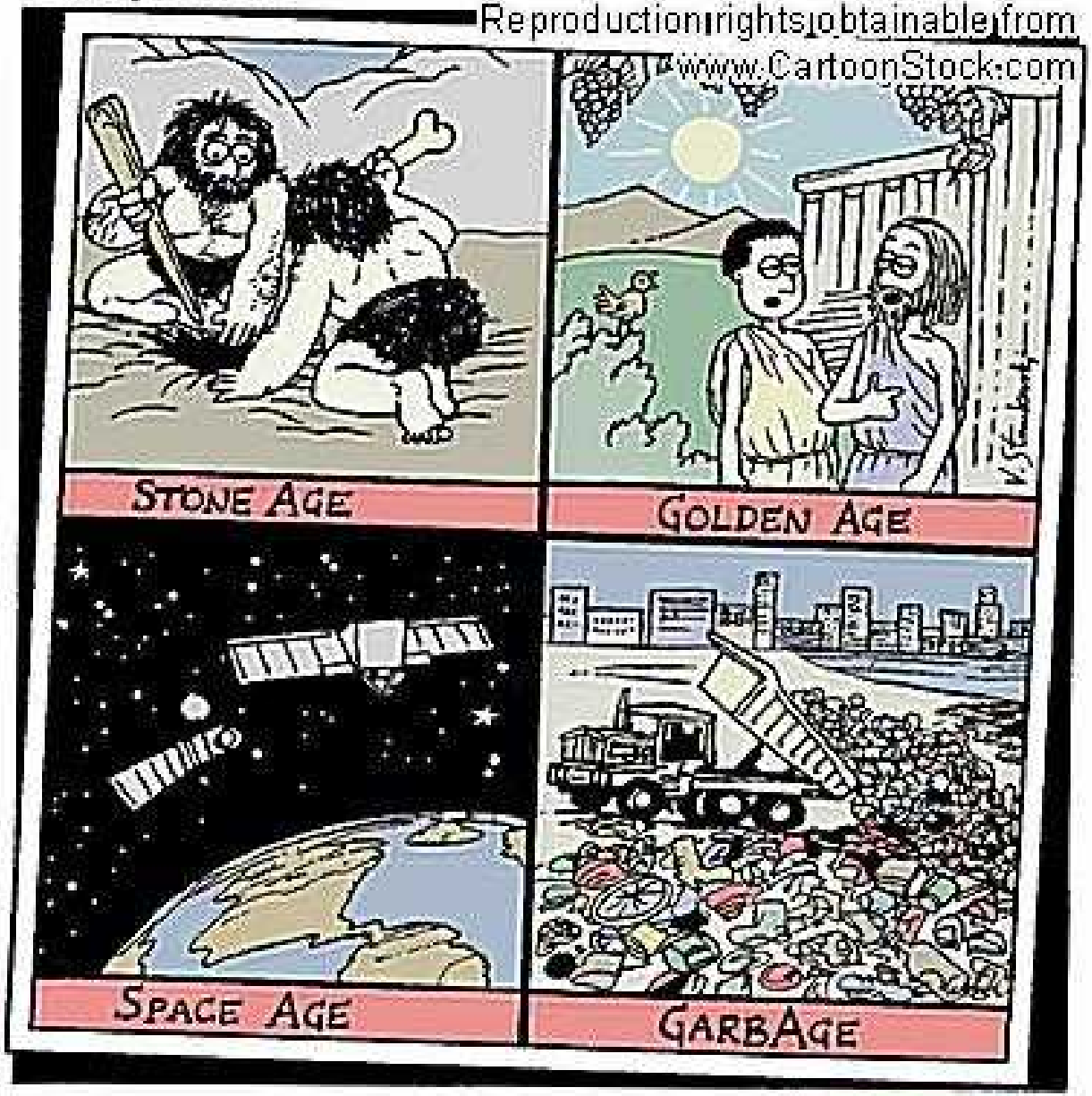
Source: The Aluminum Association, Inc.
Can Manufacturers Institute
Institute of Scrap Recycling Industries, Inc.


Glass Beverage Bottle Recycling Rates, (%) 1996-2006e
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1996
1998
2000
2002
2004
2006e
© Container Recycling Institute, 2006

Zero Waste is the Goal.

- Zeri.org:
- Transition to no landfill
- Then no incineration (molecular garbage in the air)
- Then no mining of toxic materials

Snapshots

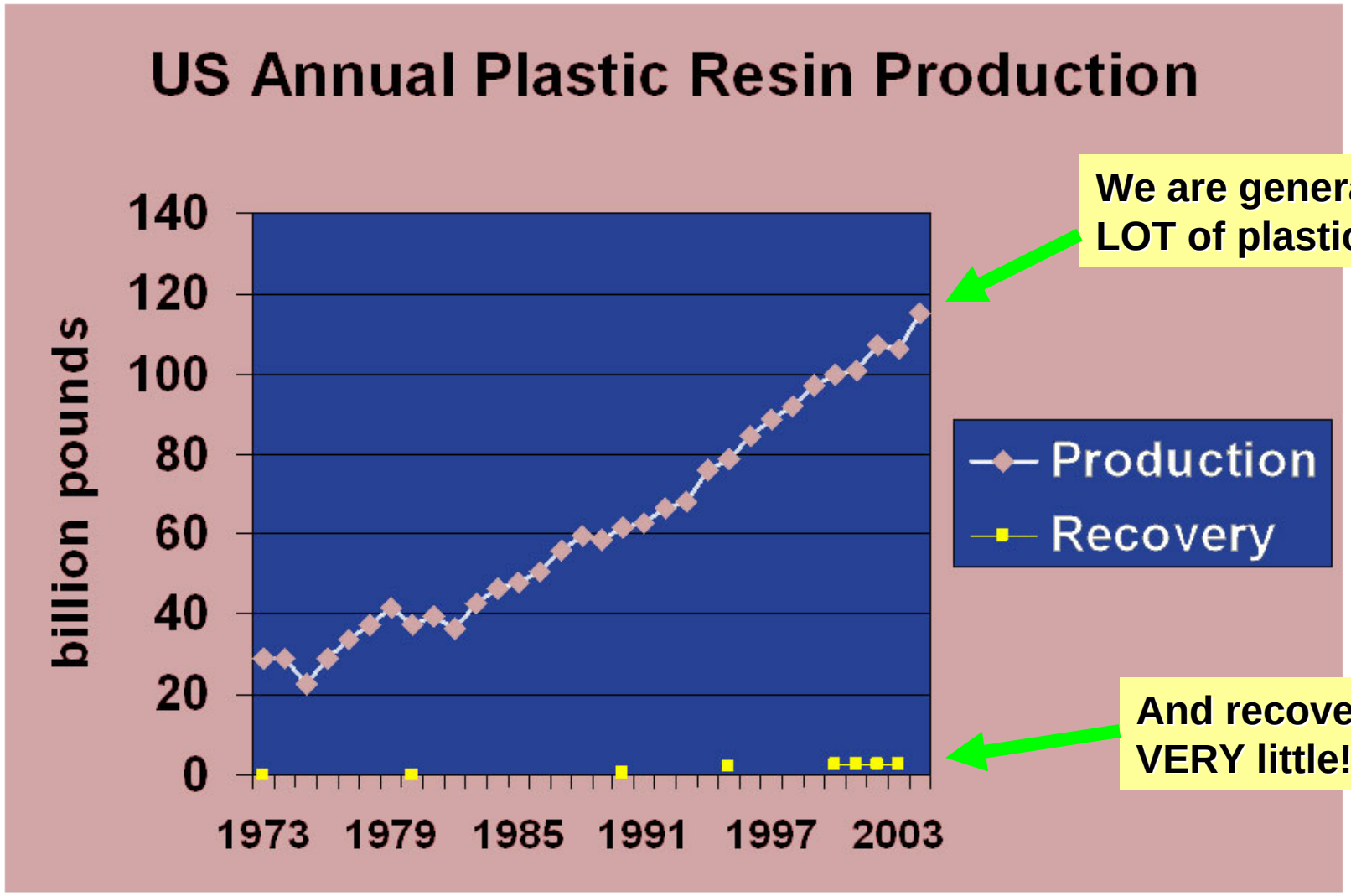


Plastic Bottles:

Recycling is Down

Waste is Up

So “Downstream” is increasing at a greater toxic release rate than ever before.

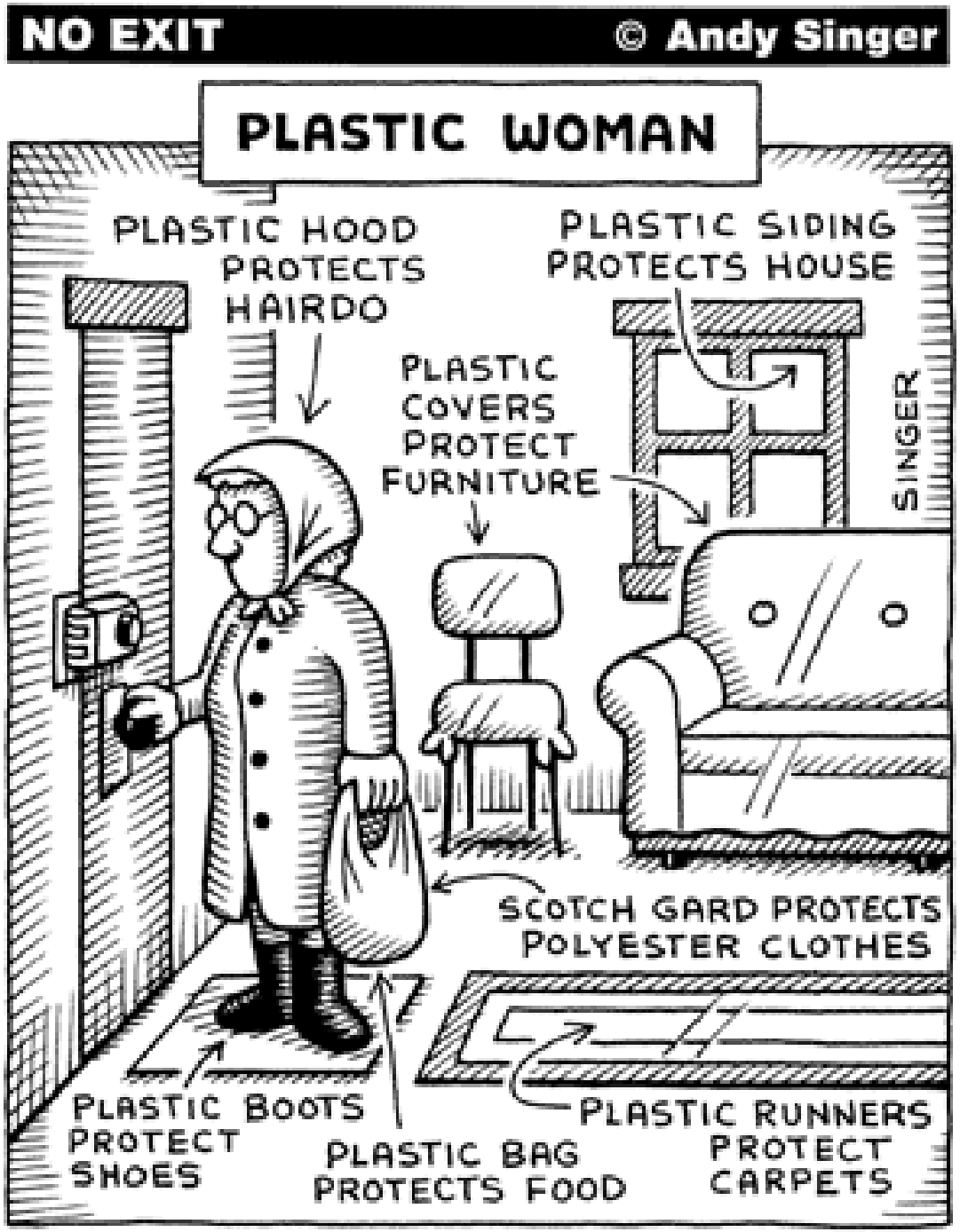

US Annual Plastic Resin Production
billion pounds
140
120
100
80
60
40
20
0
1973
1979
1985
1991
1997
2003
Production
Recovery
We are generating a LOT of plastic!!!
And recovering VERY little!!!

(APC, 2004)

Since they don't biodegrade… how do we get rid of plastics?

- **Landfilled - 95%**
- **Recycled – 5%**

Municipal Solid Waste, US EPA 2001


NO EXIT
© Andy Singer
PLASTIC WOMAN
PLASTIC HOOD PROTECTS HAIRDO
PLASTIC SIDING PROTECTS HOUSE
PLASTIC COVERS PROTECT FURNITURE
SINGER
SCOTCH GARD PROTECTS POLYESTER CLOTHES
PLASTIC BOOTS PROTECT SHOES
PLASTIC BAG PROTECTS FOOD
PLASTIC RUNNERS PROTECT CARPETS

Hydrocarbon Plastics – (The Myth of) the Chasing Arrows

PLA is a molecule, not a brand. (**Polylactic acid** or **Polylactide)**

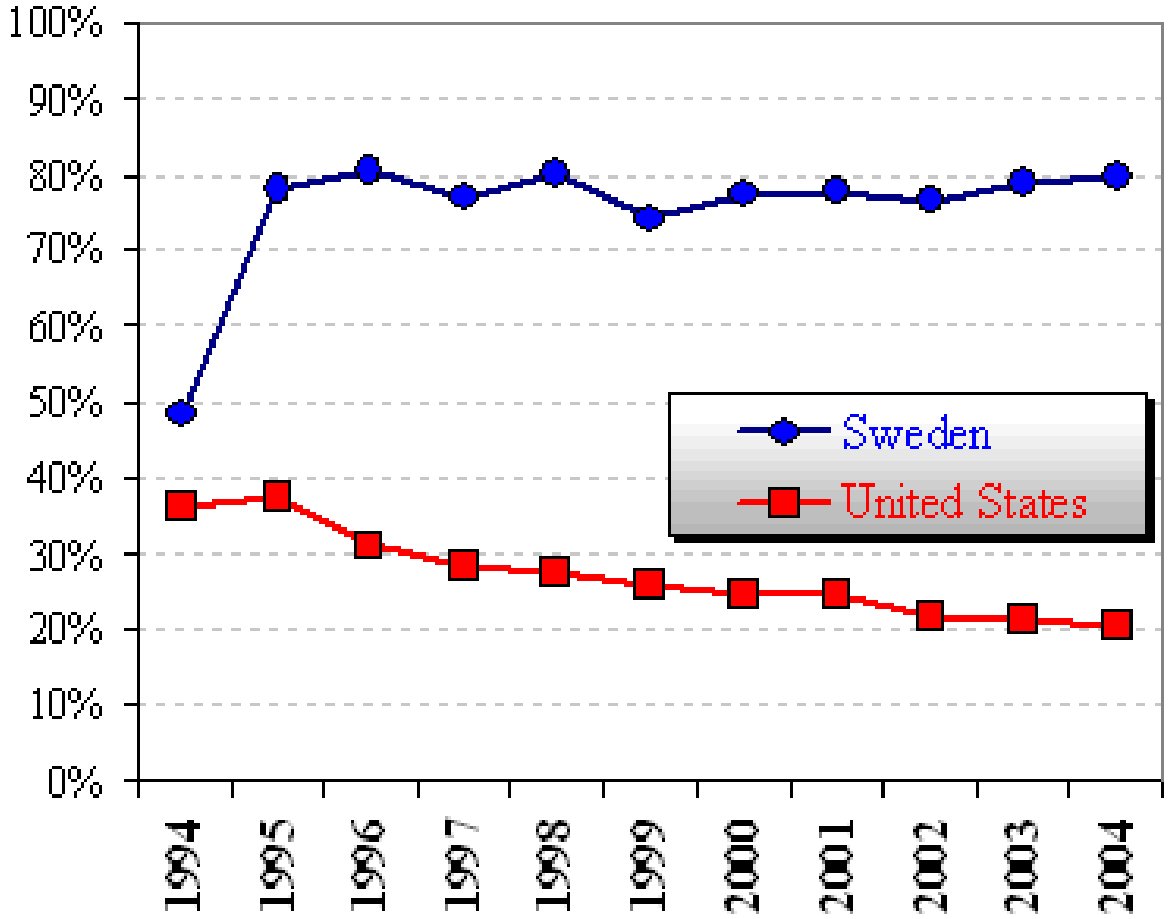
- PHA, & PHB are also molecules.
- Green cell based “bioplastics”
- Also synthetic and biobased hybrids that refer to themselves as “green”
- Green Plastics Stevens

Recycle Logos

Here's what the numbers represent:

#1 - Polyethylene Terephthalate (PET)
#2 - High Density Polyethylene (HDPE)
#3 - Vinyl (Polyvinyl Chloride or PVC)
#4 - Low Density Polyethylene (LDPE)
#5 - Polypropylene (PP)
#6 - Polystyrene (PS)
#7 - Other (which commonly includes: Polycarbonate, ABS, Nylon, Acrylic or a composite of 2 or more resins)

Plastic Bottle Recycling Rates

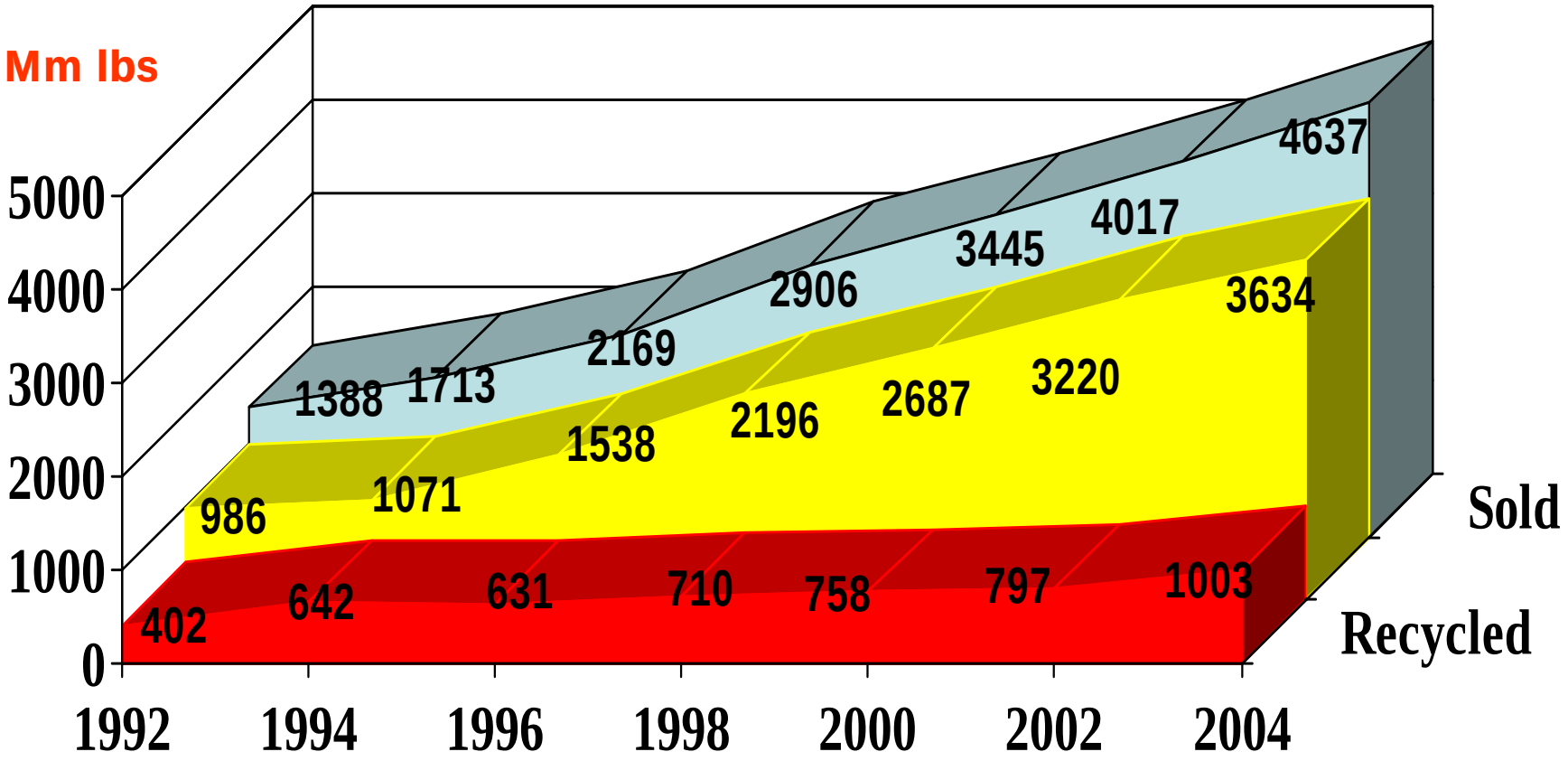


Sources: US data derived from NAPCOR and the American Plastics Council; Swedish data from AB Svenska Returpack

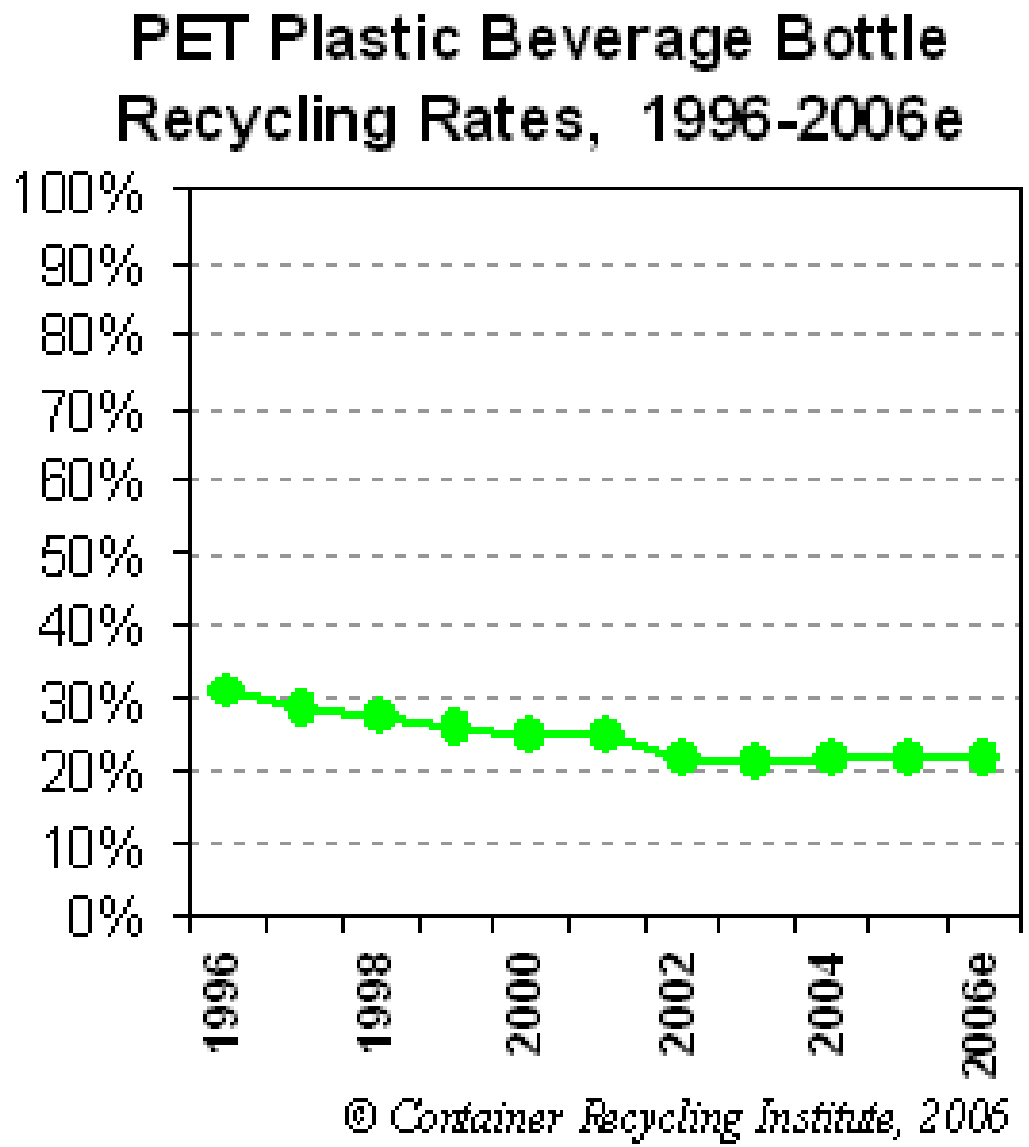
CRI
CONTAINER RECYCLING INSTITUTE

PET Bottle Recycling Not Keeping Pace with Sales

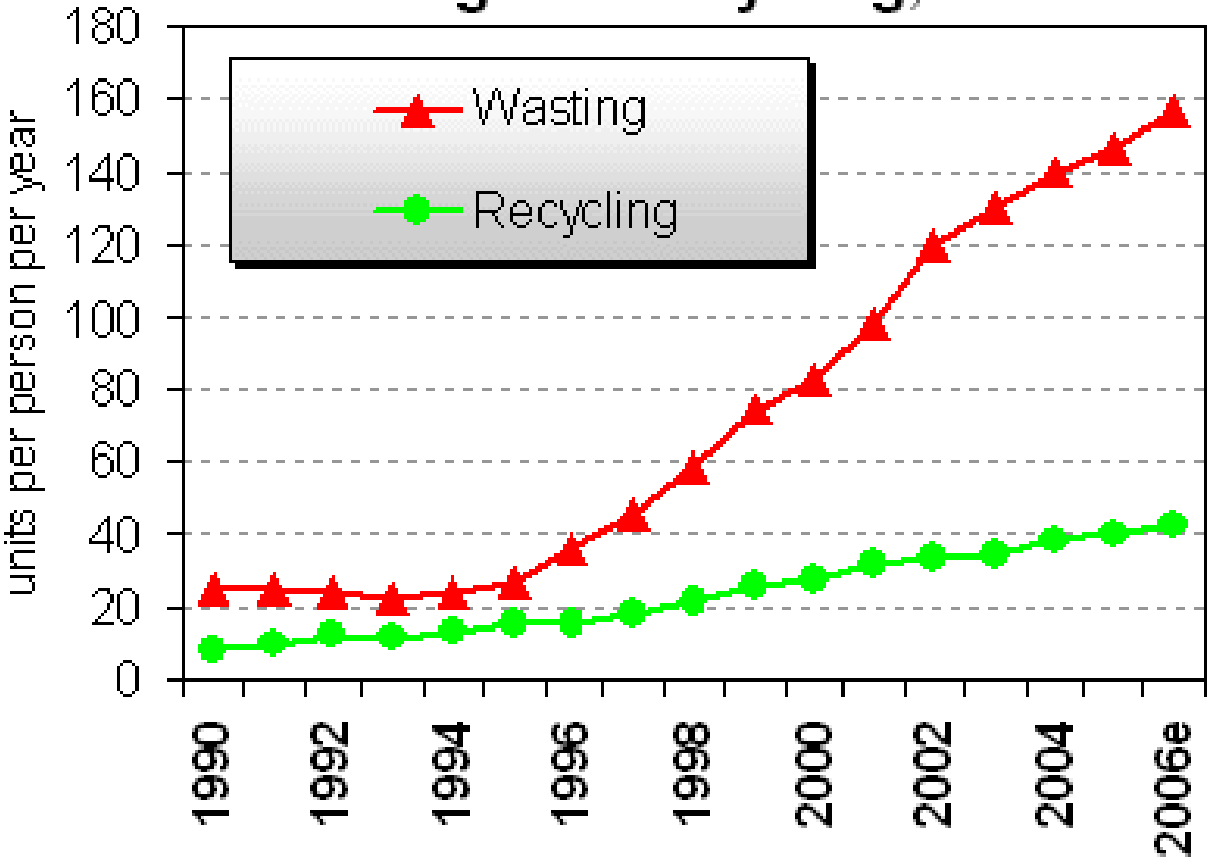
1992 - 2004



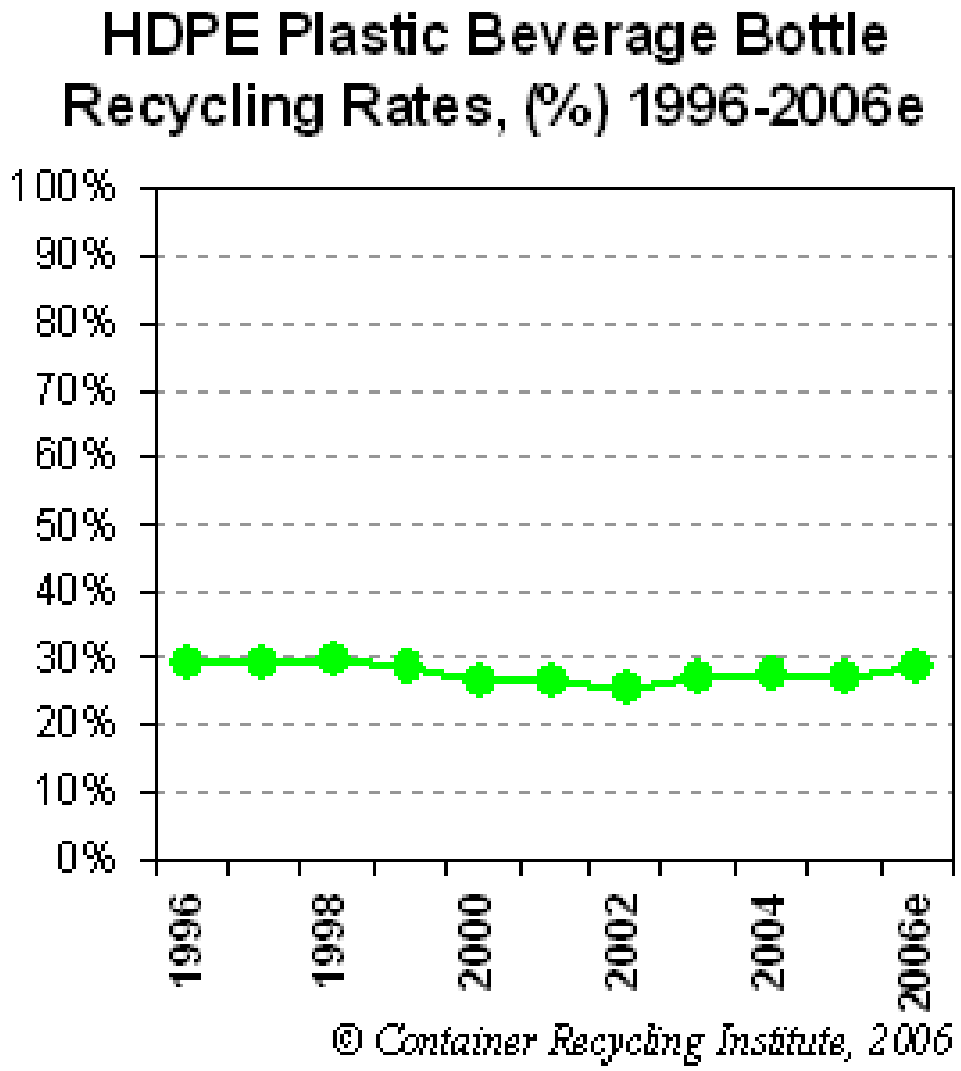
Source: "2004 National Post-Consumer Plastics Recycling Report." R.W. Beck, Inc. for the American Plastics Council. 2005.


PET Plastic Beverage Bottle
Recycling Rates, 1996-2006e
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1996
1998
2000
2002
2004
2006e
© Container Recycling Institute, 2006

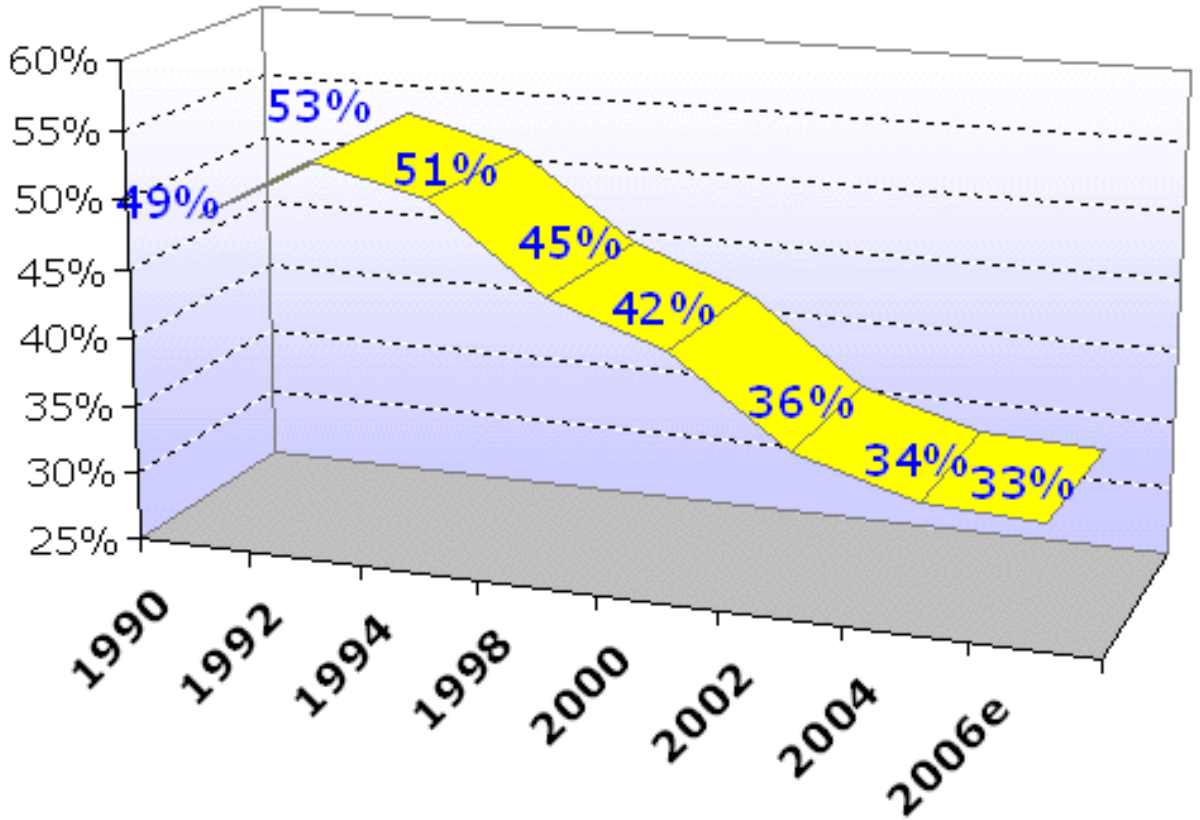
Per Capita PET Beverage Bottle Wasting and Recycling, 1990-2006



Source: data derived from the American Plastics Council and the National Association of PET Container Resources.


HDPE Plastic Beverage Bottle
Recycling Rates, (%) 1996-2006e
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1996
1998
2000
2002
2004
2006e
© Container Recycling Institute, 2006

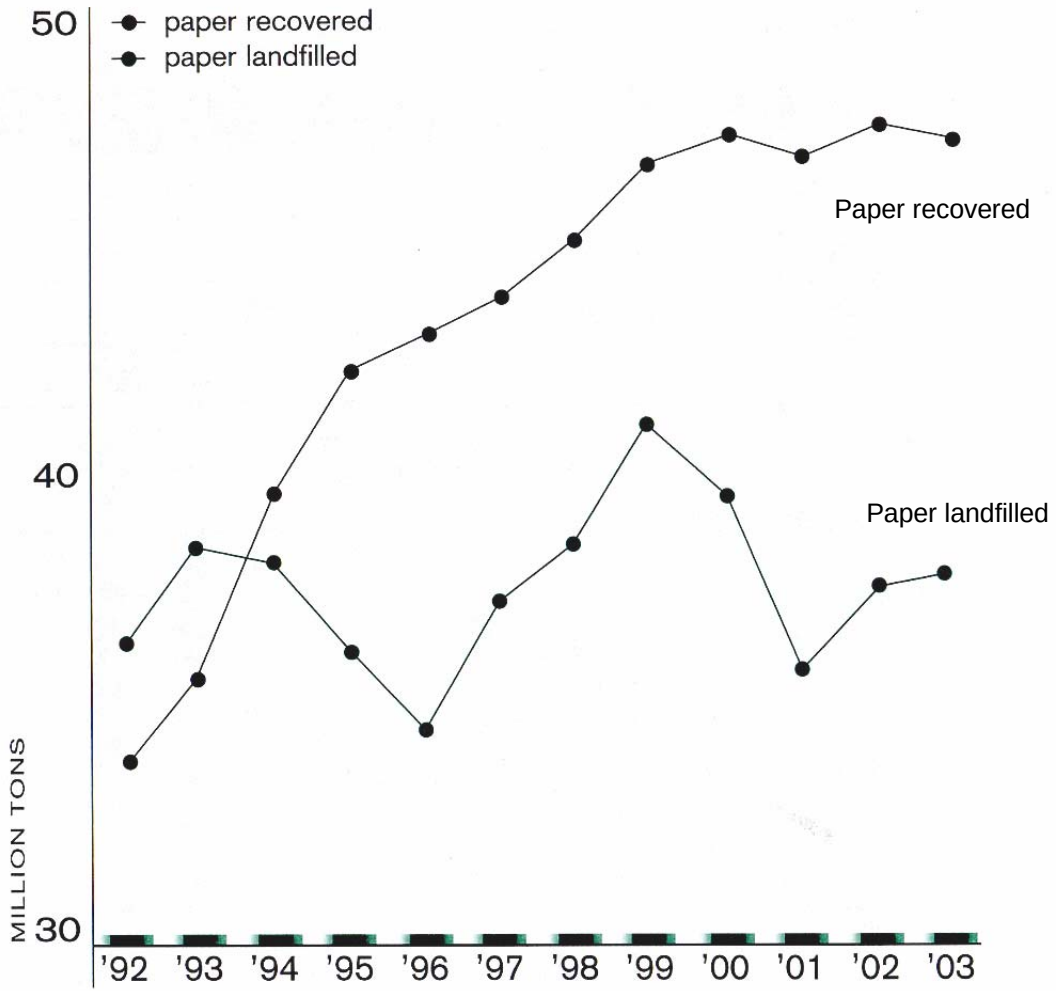
Overall Beverage Container Recycling Rate in the United States, 1990-2006



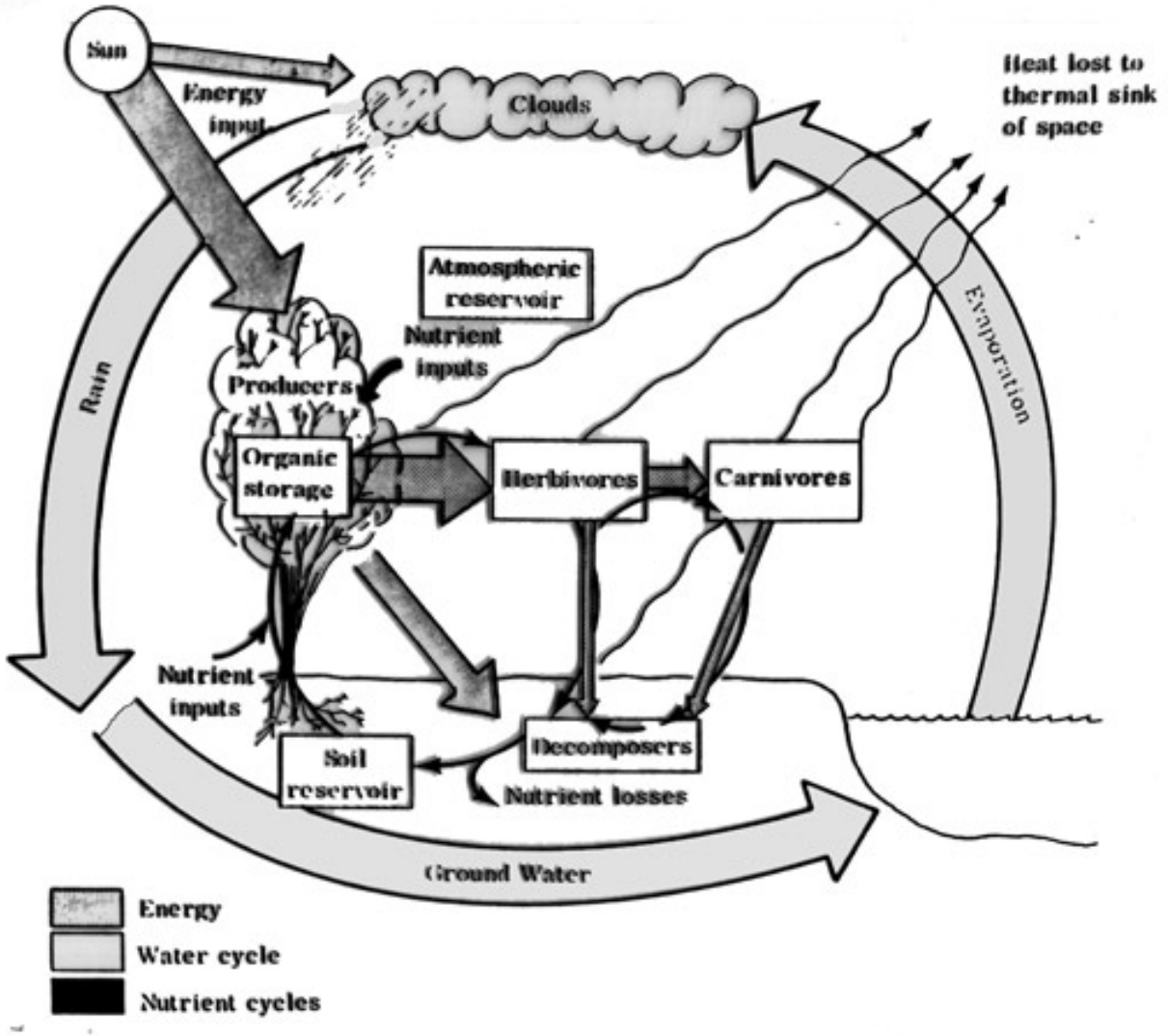
CRI data derived from Aluminum Association, U.S. Commerce Dept., U.S. EPA Office of Solid Waste, American Plastics Council, National Association of PET Container Resources. Indudes aluminum, steel, glass, PET plastic, HDPE plastic. Includes dairy.

Paper Recovery versus Landfilling

Currently far more paper is recovered for recycling than is landfilled. In addition to landfilling, paper that is not recycled may go to waste-to-energy facilities or wind up in permanent or semi-permanent applications such as construction products.

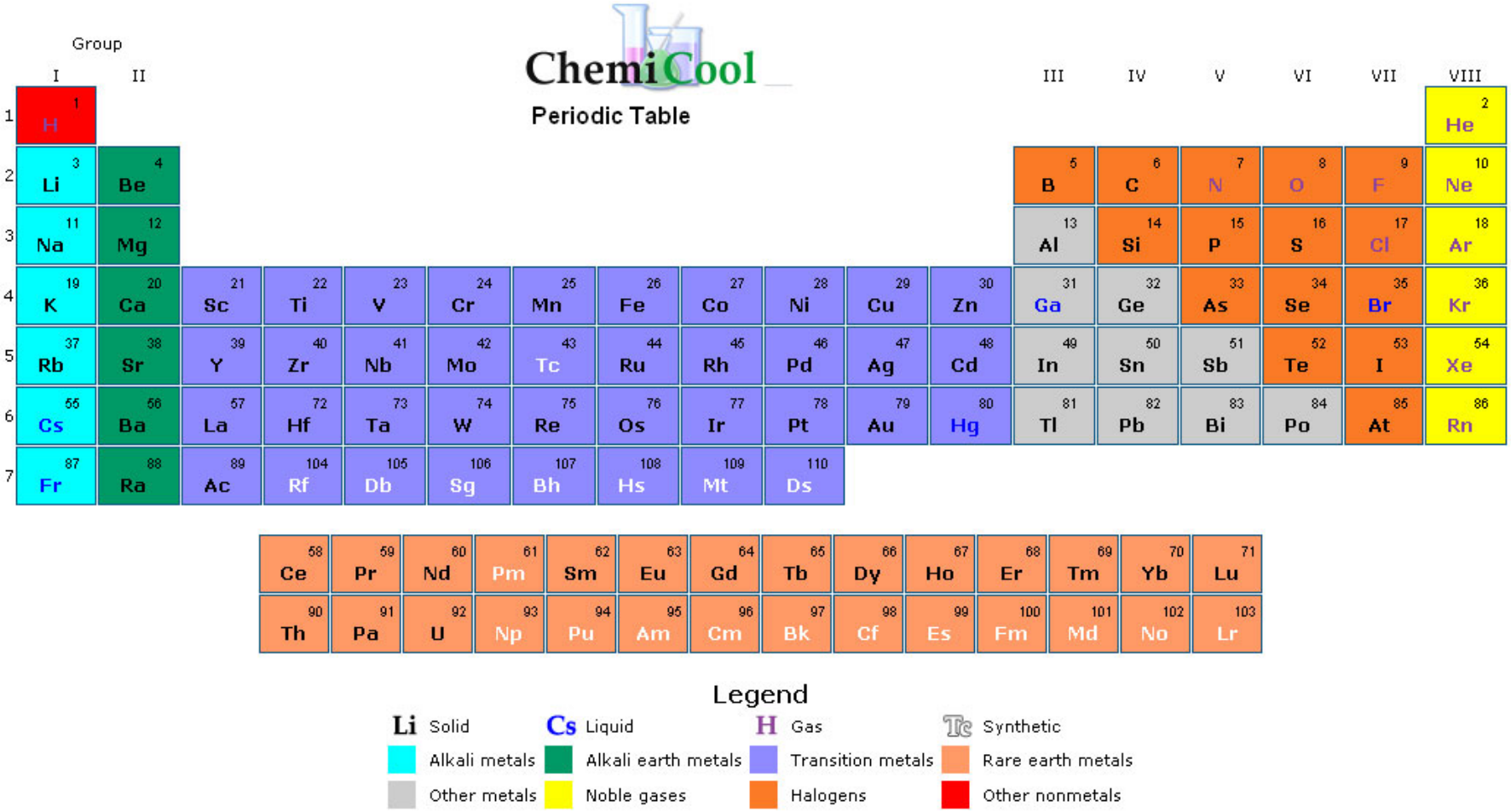


The simple idea is to redesign commerce so that it mimics these ecological cycles.



A model showing the flow of energy, the cycling of water, and the association of biogeochemical cycles with both

Periodic Table of Elements



How a sustainable commerce materials flow diagram would look.

Note there is no more use of mining from the earth's crust.(We continually recycle what is already up on the surface.)

No more landfill.

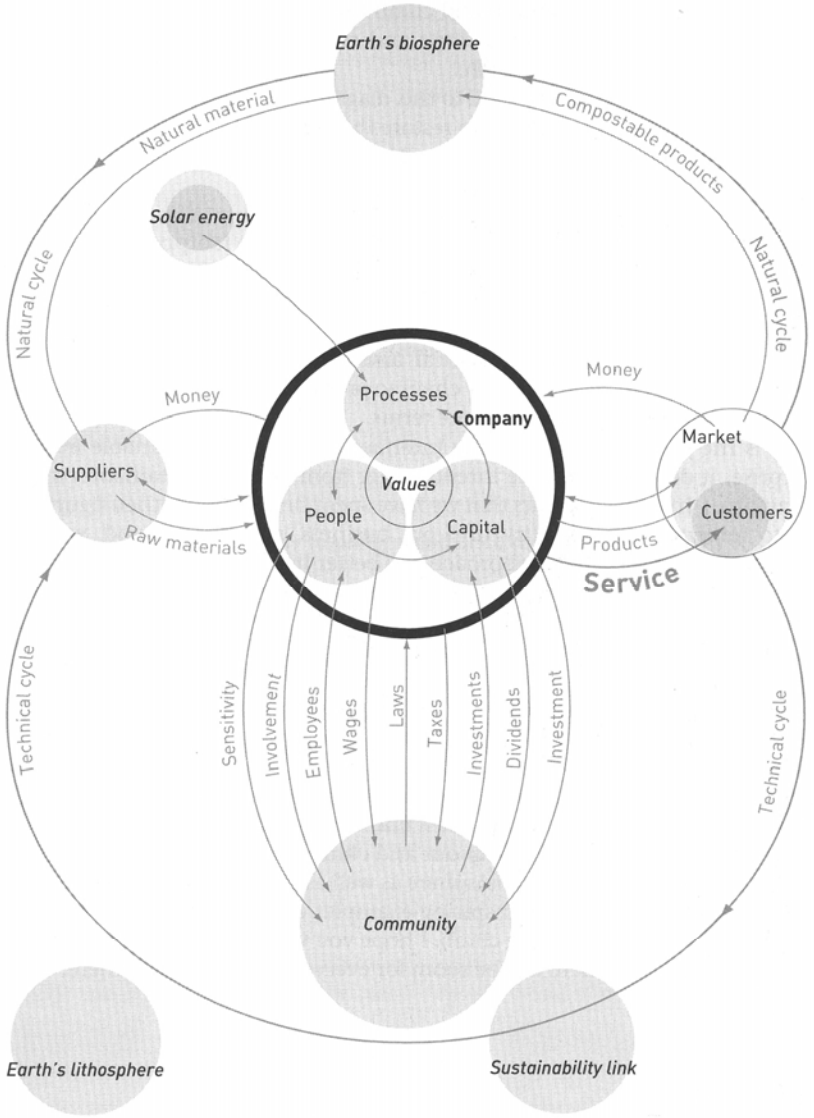
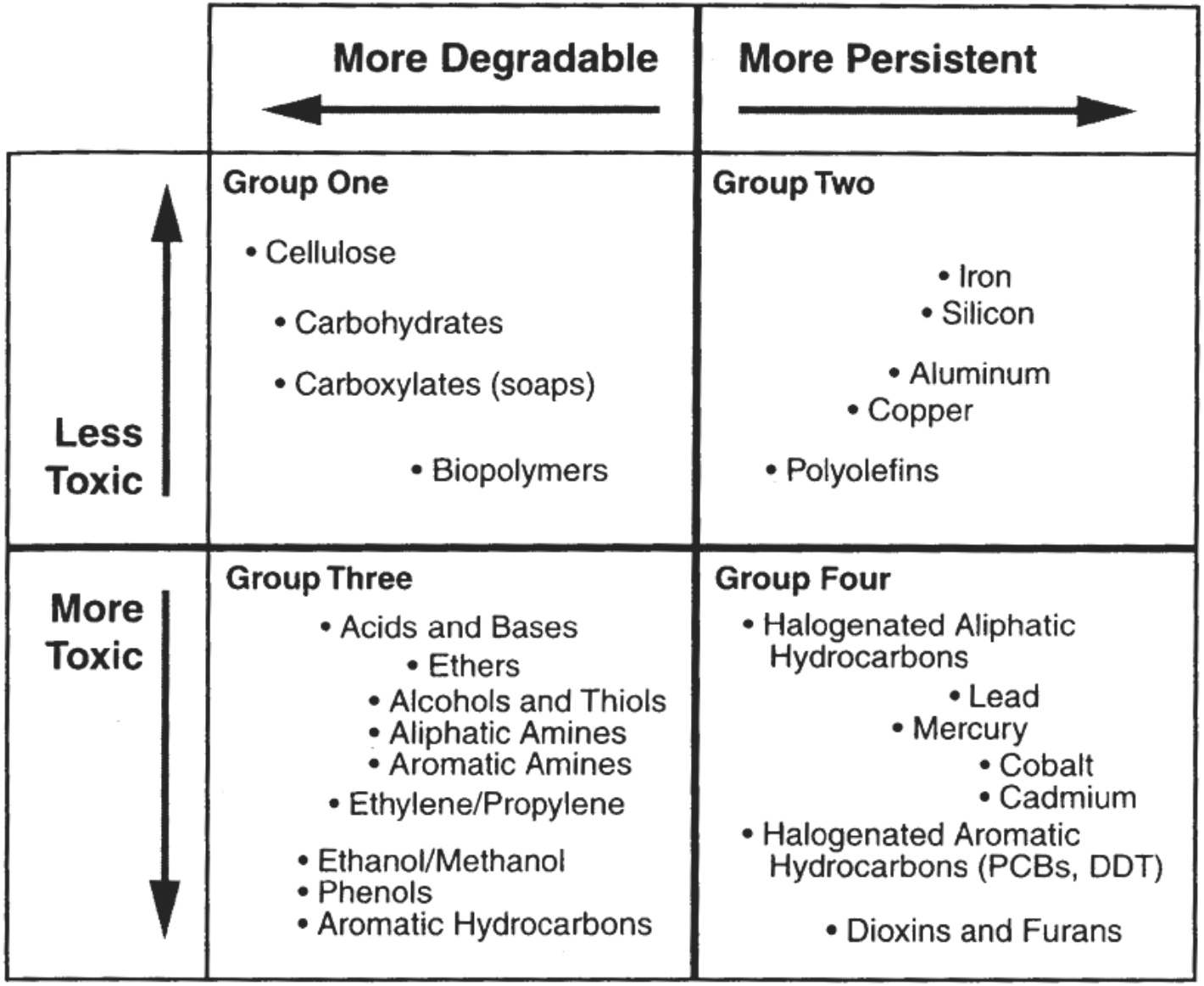
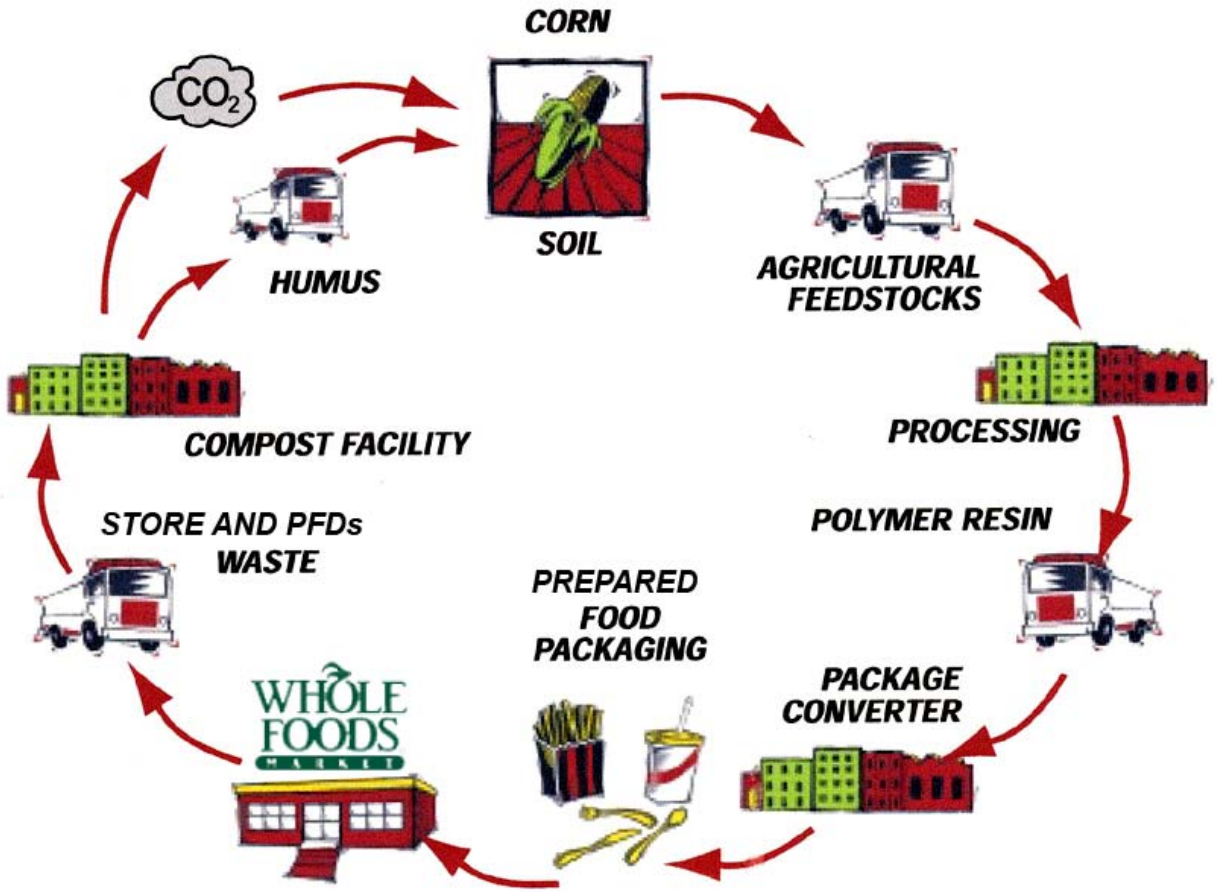


Figure 1.5 The Interface model: a prototypical company of the 21st century

Moving Materials Towards Sustainability

The following matrix describes a way to think about all the materials on earth. They range from very toxic and very persistent, to non-toxic and compostable. Sustainability implies making group four obsolete, and making group one the primary operating realm.


More Degradable
More Persistent
Group One
• Cellulose
• Carbohydrates
• Carboxylates (soaps)
• Biopolymers
Group Two
• Iron
• Silicon
• Aluminum
• Copper
• Polyolefins
Less Toxic
More Toxic
Group Three
• Acids and Bases
• Ethers
• Alcohols and Thiols
• Aliphatic Amines
• Aromatic Amines
• Ethylene/Propylene
• Ethanol/Methanol
• Phenols
• Aromatic Hydrocarbons
Group Four
• Halogenated Aliphatic Hydrocarbons
• Lead
• Mercury
• Cobalt
• Cadmium
• Halogenated Aromatic Hydrocarbons (PCBs, DDT)
• Dioxins and Furans



The Green Cell Packaging Cycle

This is an example of moving towards group one.

Infrastructure

- How many US have curbside for beverage containers: 50%
- How many states have deposit laws: 8 (and they recycle at 4 times the rest)
- How many industrial scale composters take food wastes: 18
- How many cities take food waste compostables at curbside: 4

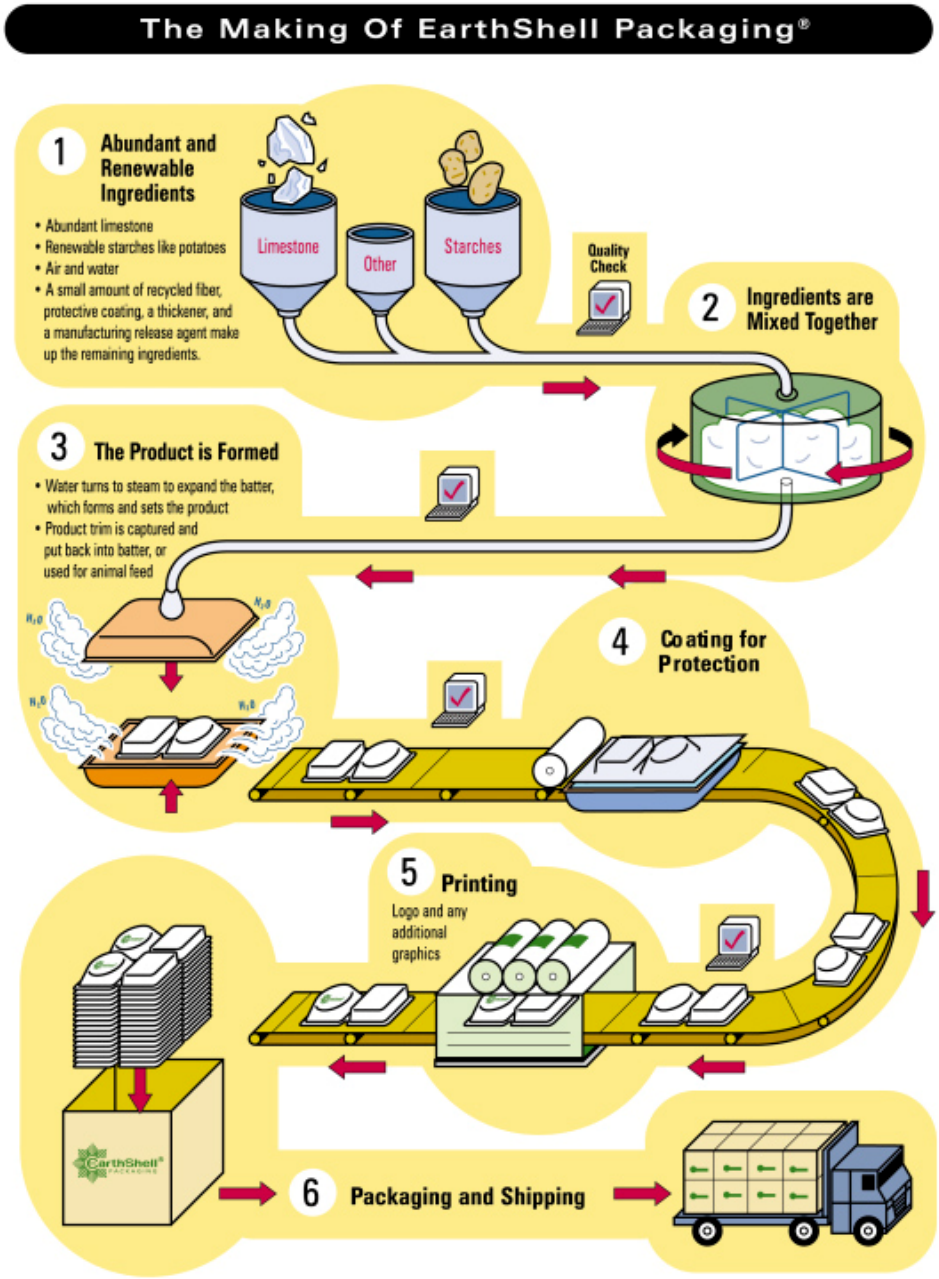
The next two slides are examples from Earth Shell

Every product, every material, can describe itself in two simple pictograms.

1. How it is made and from what it is made.

2. What is the life cycle? Is there any persistent waste?

How is it made and what is it made from?



Product Life Cycle

Ask questions:

Every product, every material, can describe itself in two simple pictograms.

1. How it is made and from what it is made.

2. What is the life cycle? Is there any persistent waste?

Green Supply Chain Example

Using Third Parties to Verify Green Claims

• We have a model of how to verify and utilize a third party through organic certification programs. In the U.S. the word “organic” is defined by the Feds, and WE rely on third party certifiers to make sure that that claim is real. WE also rely on a key trade organization, the OTA, as well as significant consumer NGO advocate groups like the Organic Consumers Association to keep the integrity in the green claim of “Organic”.

•Likewise, the attached matrix shows that there are other such third parties in existence, and that there’s a role for other third parties, depending on what the claim is..

Extended Producer Responsibility

(EPR) is the extension of the responsibility of producers for the environmental impacts of their products and packaging to the entire product life cycle -- and especially for their take-back, recycling, and disposal. EPR is based on the 'polluter pays' principle.

Take Back Policy

- A mandatory take back requires that producers take back their products after use either for recycling or some other defined waste management.

  (e.g. electronics)

Why get “upstream” to solve the system?

- By looking at the input market (upstream) for the materials as opposed to the output market (downstream) – so that the inputs either recycle easily or compost easily.

Anticipatory Design

- “Significant competitive advantage lies with those organizations and individuals who anticipate well in turbulent times.”

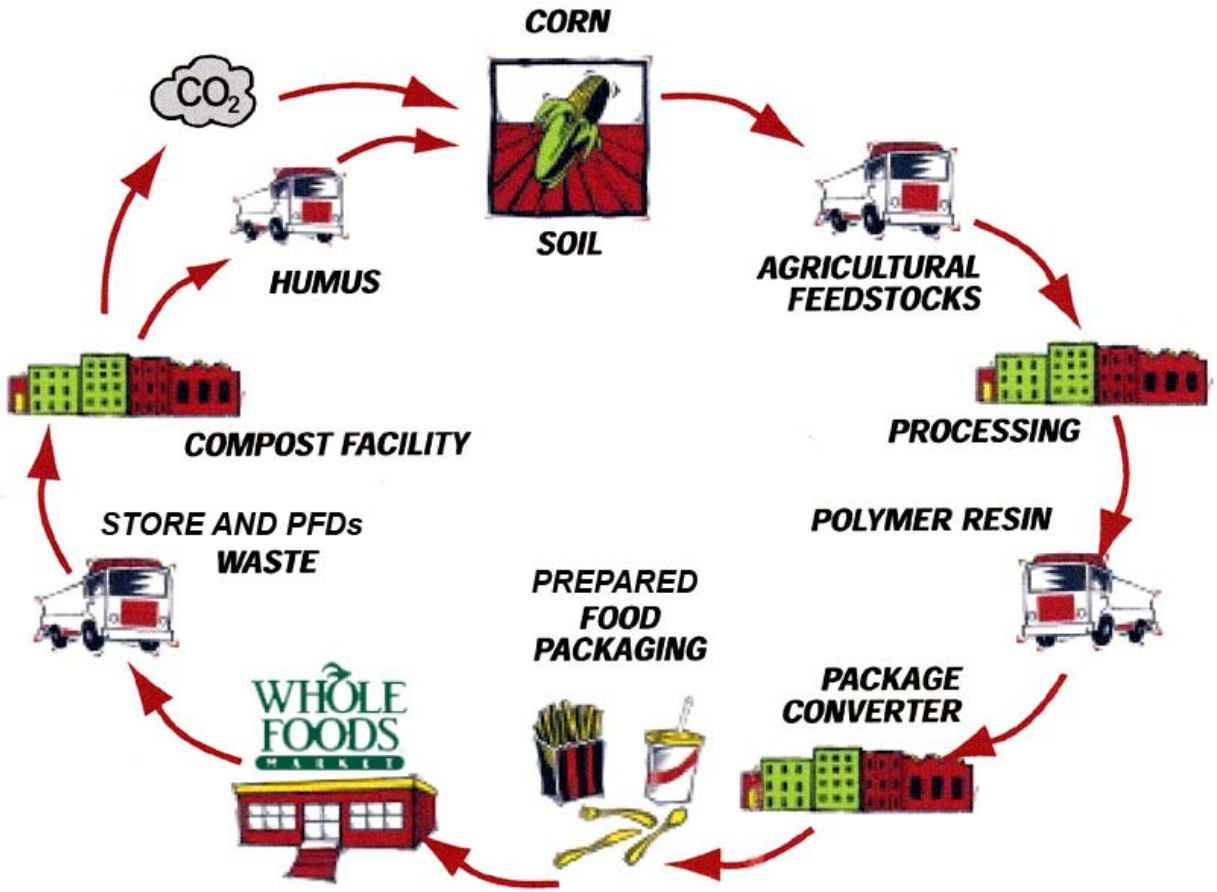
  -- Peter Drucker

Life Cycle Analysis

- Untangling the intricate flows of energy, raw materials, pollution, transportation, and other factors in the hope of accounting for all the environmental and social costs of production. (a noble goal – though evasive)

What is a biopolymer and why does it have a closed loop?

- The source for the polymer is a green cell. The main difference between biopolymers and conventional hydrocarbon polymers is that, due to their physical and chemical structure, biopolymers can be broken down by microorganisms, i.e. fungi and bacteria. . .they compost and become part of the soil again.



The Green Cell Packaging Cycle

This is an example of moving towards group one.

Composting as Very Normal System.

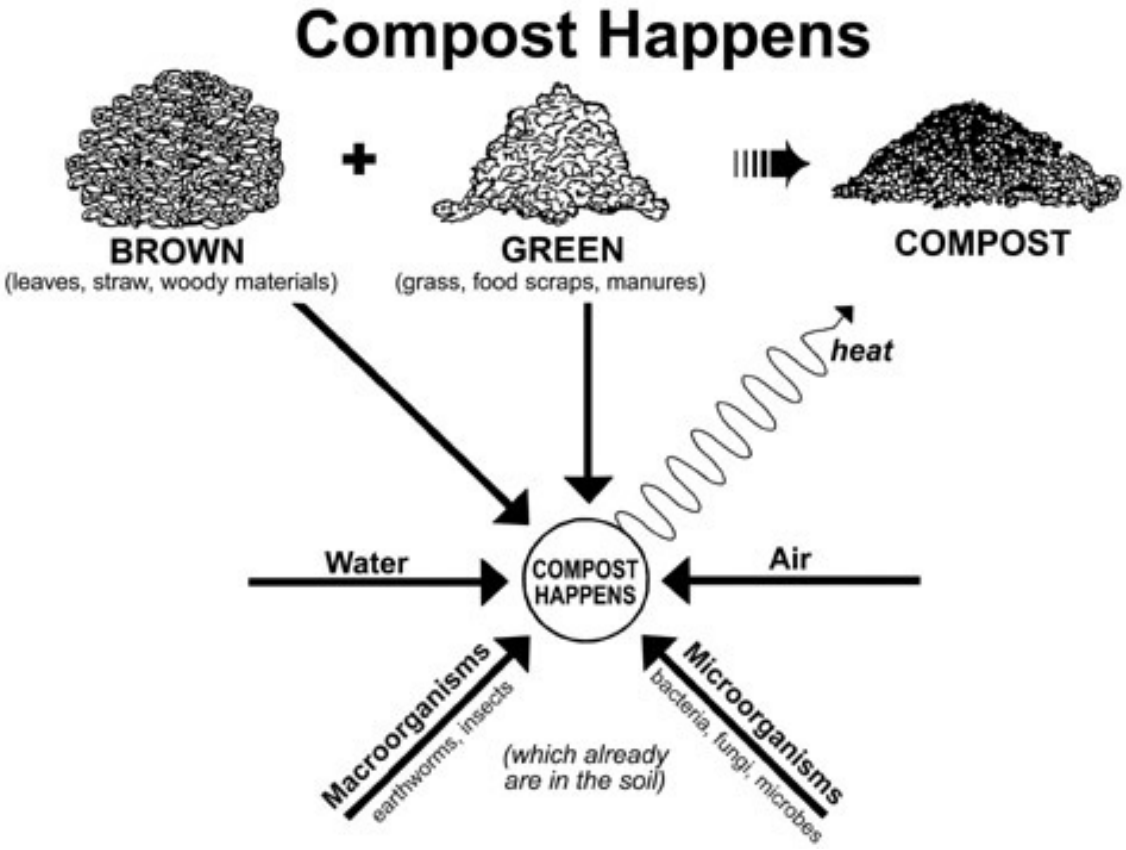
In the Netherlands and Germany, many products can be recycled by composting. More than 95% and 60%, respectively, of all households have access to industrial composting plants; containers ("bio bins") are provided for the collection of organic household refuse. In the EU, organic matter makes up 30-40 percent of total domestic refuse. Composting is the most favorable method for recovery, since incineration requires a high calorimetric value and landfill is not suitable for organic materials (creates methane).

DIN CERTCO operates a certification scheme for compostable products made of biodegradable materials and licenses the use of the corresponding Mark developed by the Interest Group for Biodegradable Materials (IBAW).
Certification is here an integral part of an industrial recycling system. It enables compostable products to be identified by a unique mark and channelled for recovery of their constituent materials in specially developed processes. The Compostability Mark thus conveys product information to waste-disposal plant operators and product image to consumers.

BPI Logo Program

Join the BPI labeling program. It is open to all materials and products that meet ASTM D6400-99 or D6868 based on testing in pre-approved, independent laboratories.

Food wastes blend with yard wastes.



Green Supply Chain Example

Trimtab Factors

- Industrial Subsidies head to zero
- Green accounting replaces GNP etc.
- Account for carbon, water, nitrogen, phosporous, and oxygen cycles

Key Resources for this Presentation:

- Biomimicry; Janine Benyus
- Materials Matter; Kenneth Geiser
- Cradle to Cradle; William McDonough & Michael Braungart
- Ants, Galileo & Ghandi; Sissel Waage
- Gaia: An Atlas of Planet Management; Norman Myers
- Living in the Environment; G.Tyler Miller
- Paper or Plastic; Dan Imhoff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