Natural Capitalism

Kansas State University
January 4, 2006

Lena Hansen
Rocky Mountain Institute

CAPITALISM:

The productive use of and reinvestment in capital.

But what is capital?

- **Money**—financial capital
- **Goods**—physical or manufactured capital: buildings and equipment
- **People**—human capital: culture and community
- **Nature**—natural capital: natural resources and ecosystem services

Without natural capital there is no life and therefore no economic activity

Water and Nutrient Cycling

Atmospheric and Ecological Stability

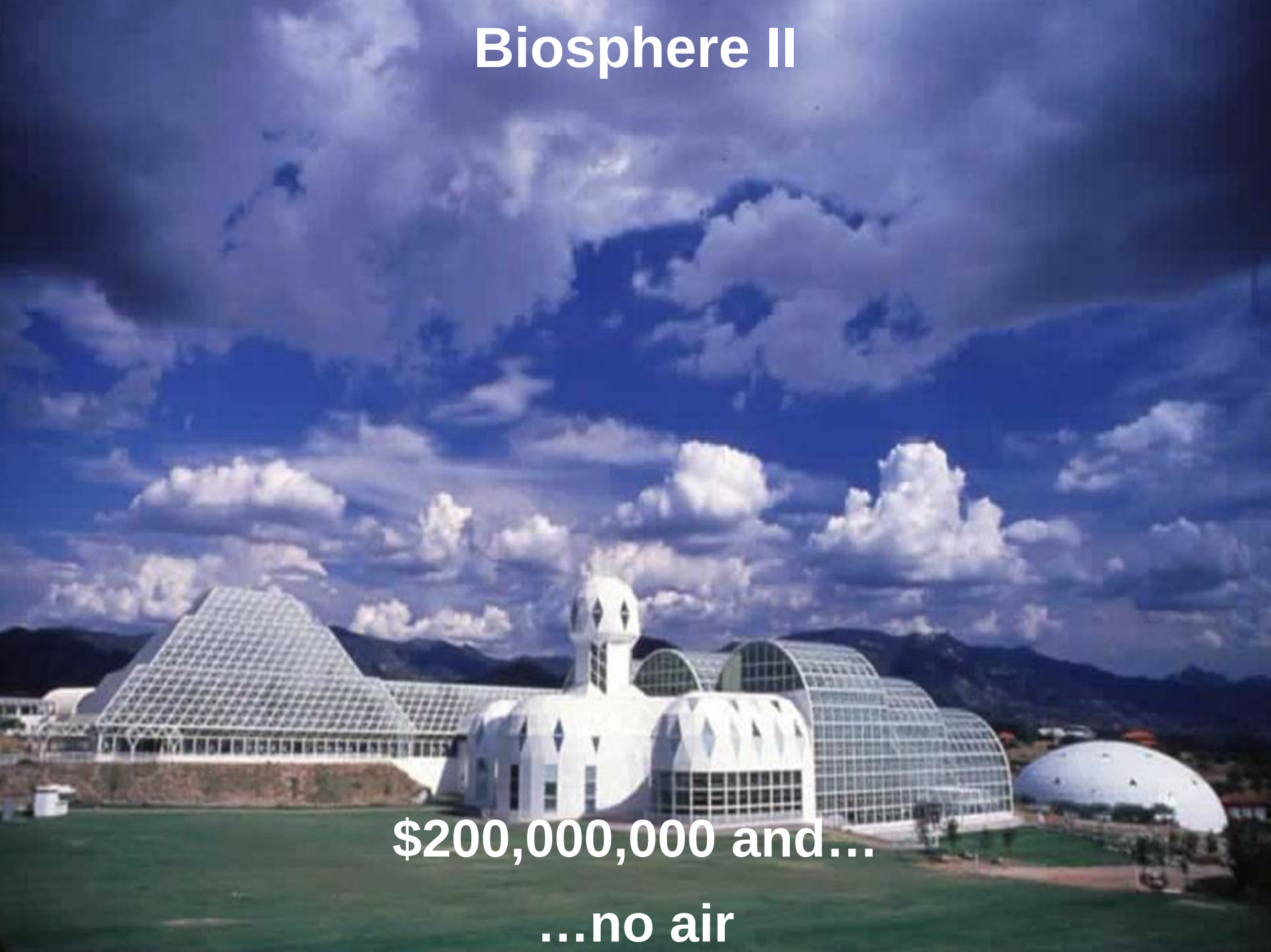
Pollination and Biodiversity

Topsoil and Biological Productivity

Assimilation and Detoxification of Society's Wastes

Valuing Nature: Insurance Example

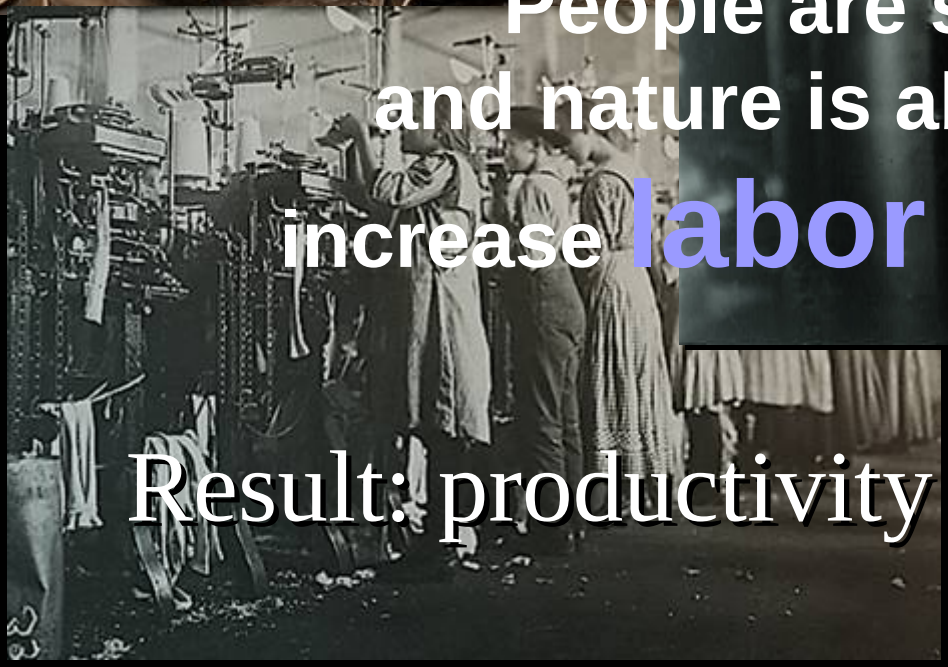
Biosphere II



$200,000,000 and…

…no air

First Industrial Revolution



Theory:
People are scarce
and nature is abundant—
increase labor productivity.

Result: productivity increase of 100X

Next Industrial Revolution

People are abundant
and nature is scarce—
increase resource productivity.

The limits to future profits are…

…not boats

Next Industrial Revolution

4X, 10X,

even 100X

as much benefit…

…from each unit of resources.

“People who seem to have had a new idea have often just stopped having an old idea”

Four principles of natural capitalism

P1: Radically increase resource productivity

P2: Biomimicry: closed loops, no waste, no toxicity

P3: Shift to a solutions based economy:
from *product* to service

P4: Reinvest in natural and human capital

P1: Radically increase resource productivity

Do more, better,
with less, for longer

What is radical resource efficiency?

- Save 25,000,000 gallons per year at a manufacturing plant
- Increasing pumping efficiency of an industrial pumping loop from 95 to 7 hp
- Achieving a 29% reduction in electricity consumption (at equal production), a 45% drop in water usage, and a 29% decrease in the emission of greenhouse gases.

Old design mentality

Optimize each part in isolation

(which pessimizes the system)

Invention is
“… a sudden
cessation of
stupidity”

New design mentality

An example:

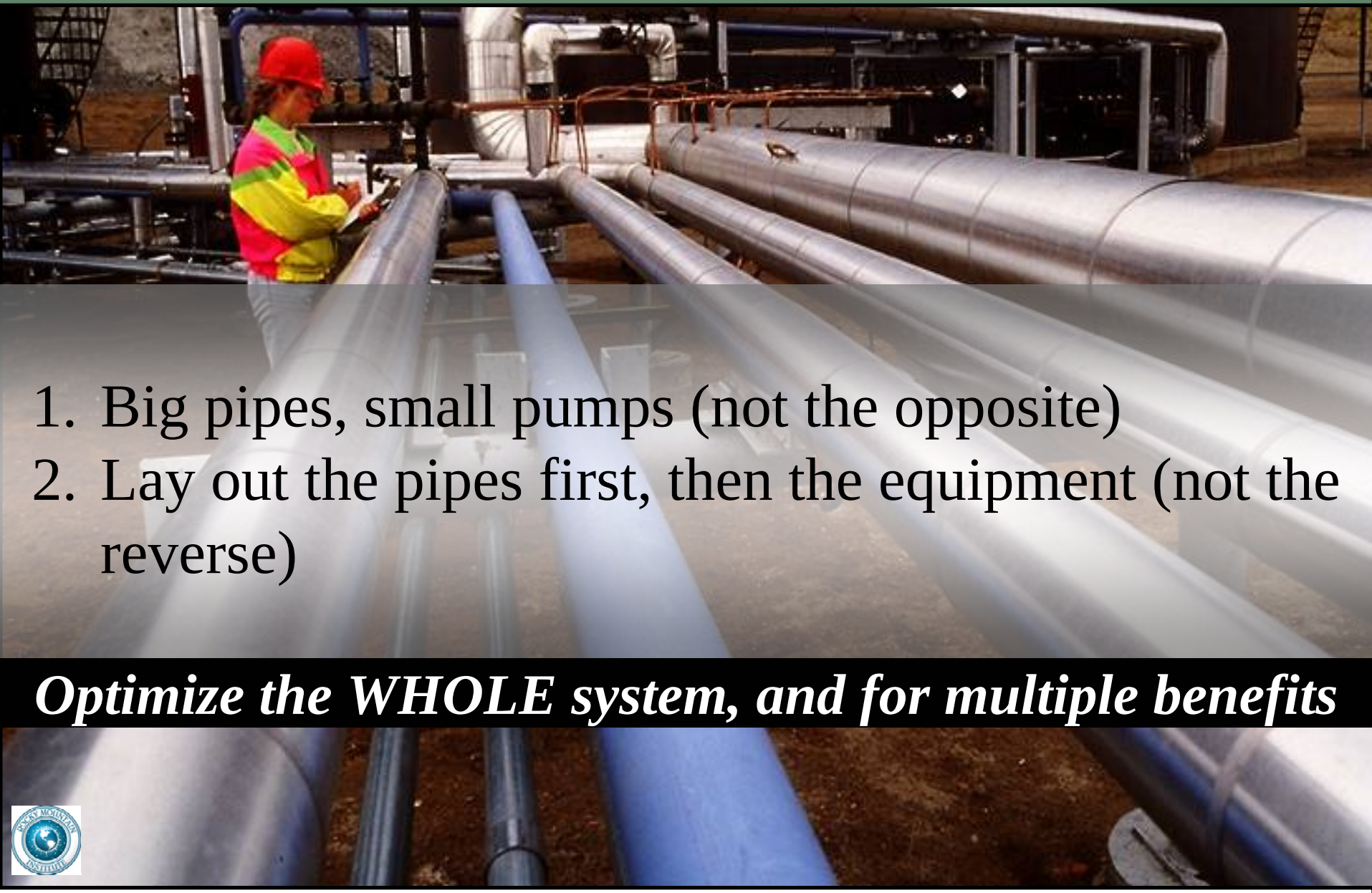
- Redesigning a standard (supposedly optimized) industrial pumping loop

cut power from 95 to 7 hp (–92%),

cost less to build,

and worked better.

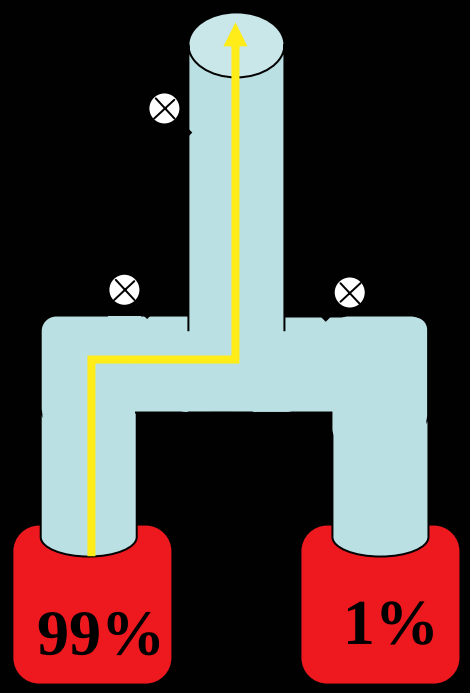
No new technologies, just two design changes



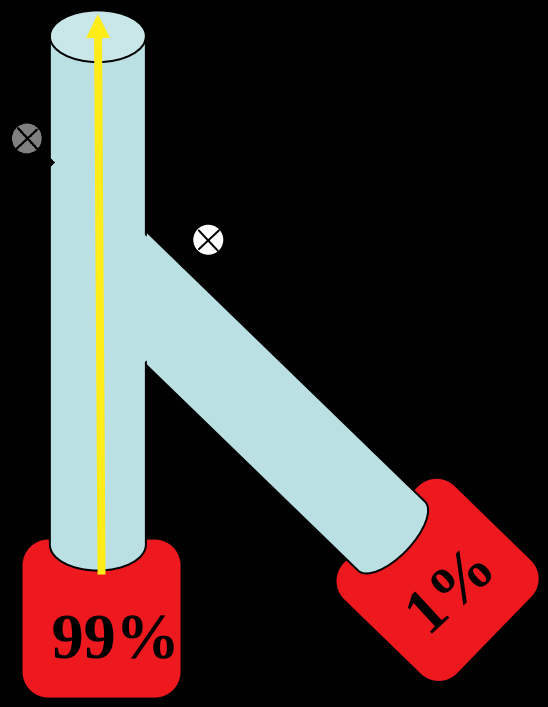
1. Big pipes, small pumps (not the opposite)
2. Lay out the pipes first, then the equipment (not the reverse)

Optimize the WHOLE system, and for multiple benefits

Once you've minimized flow, next minimize piping friction



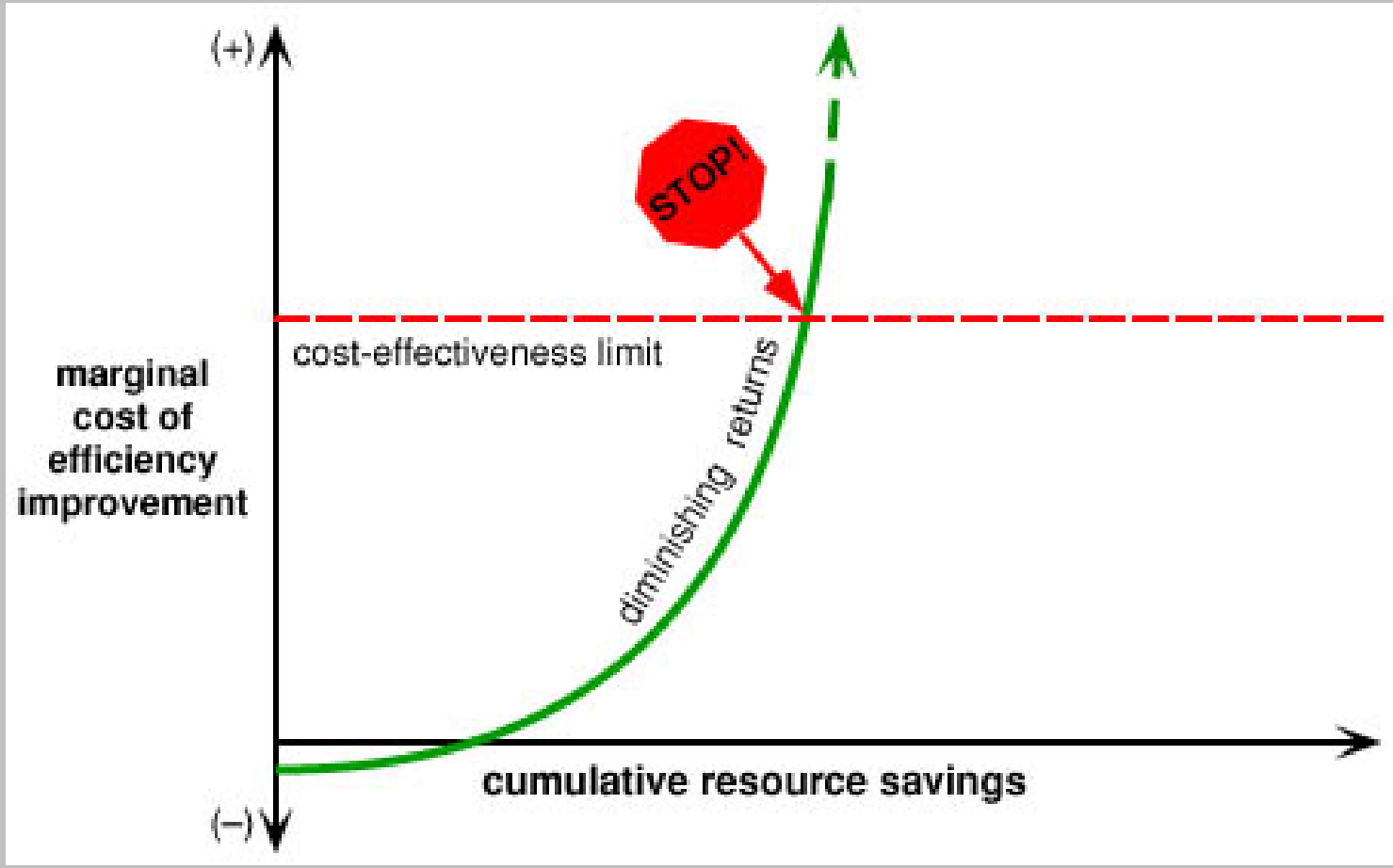
vs.



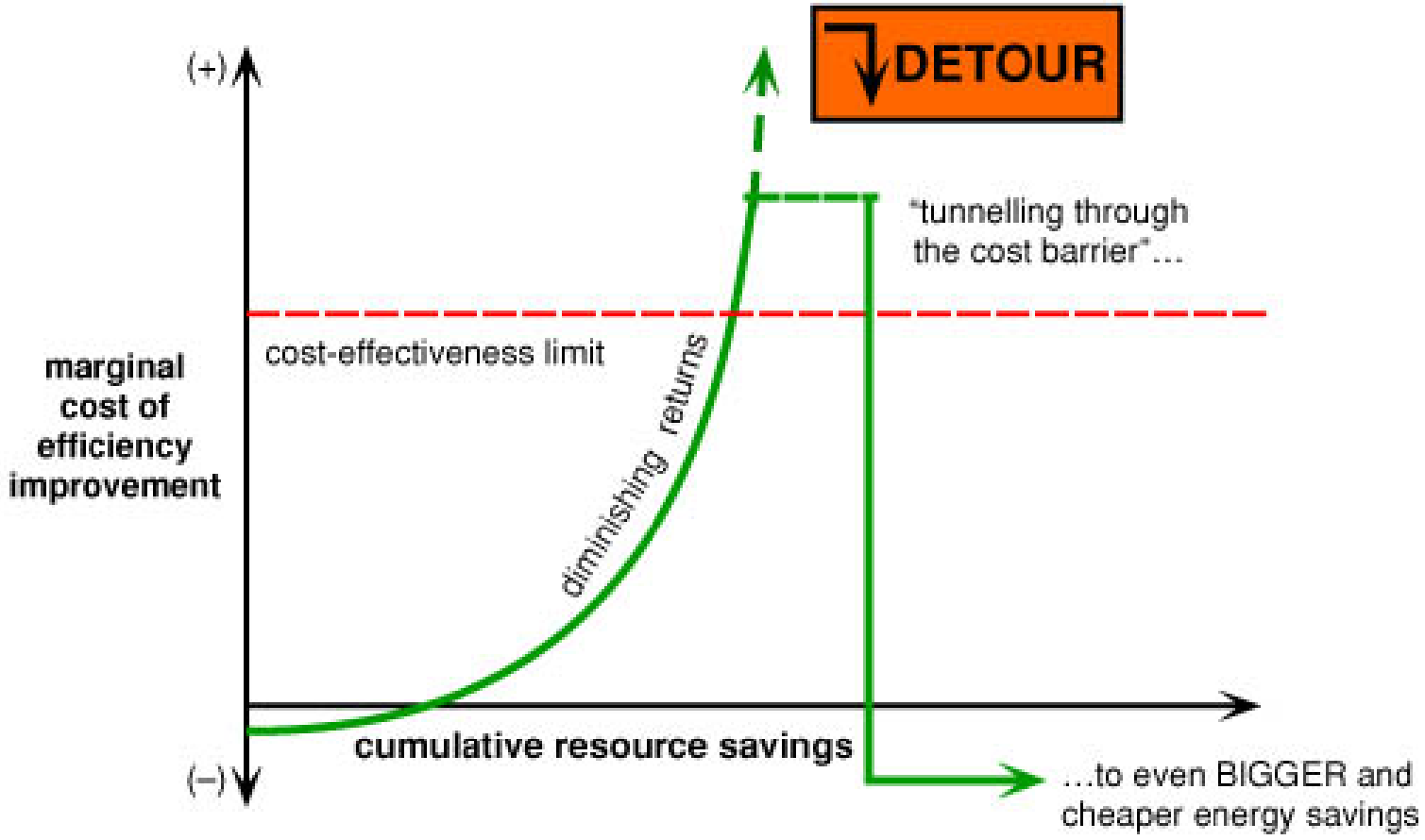
Boolean pipe layout

hydraulic pipe layout

Old design mentality



New design mentality



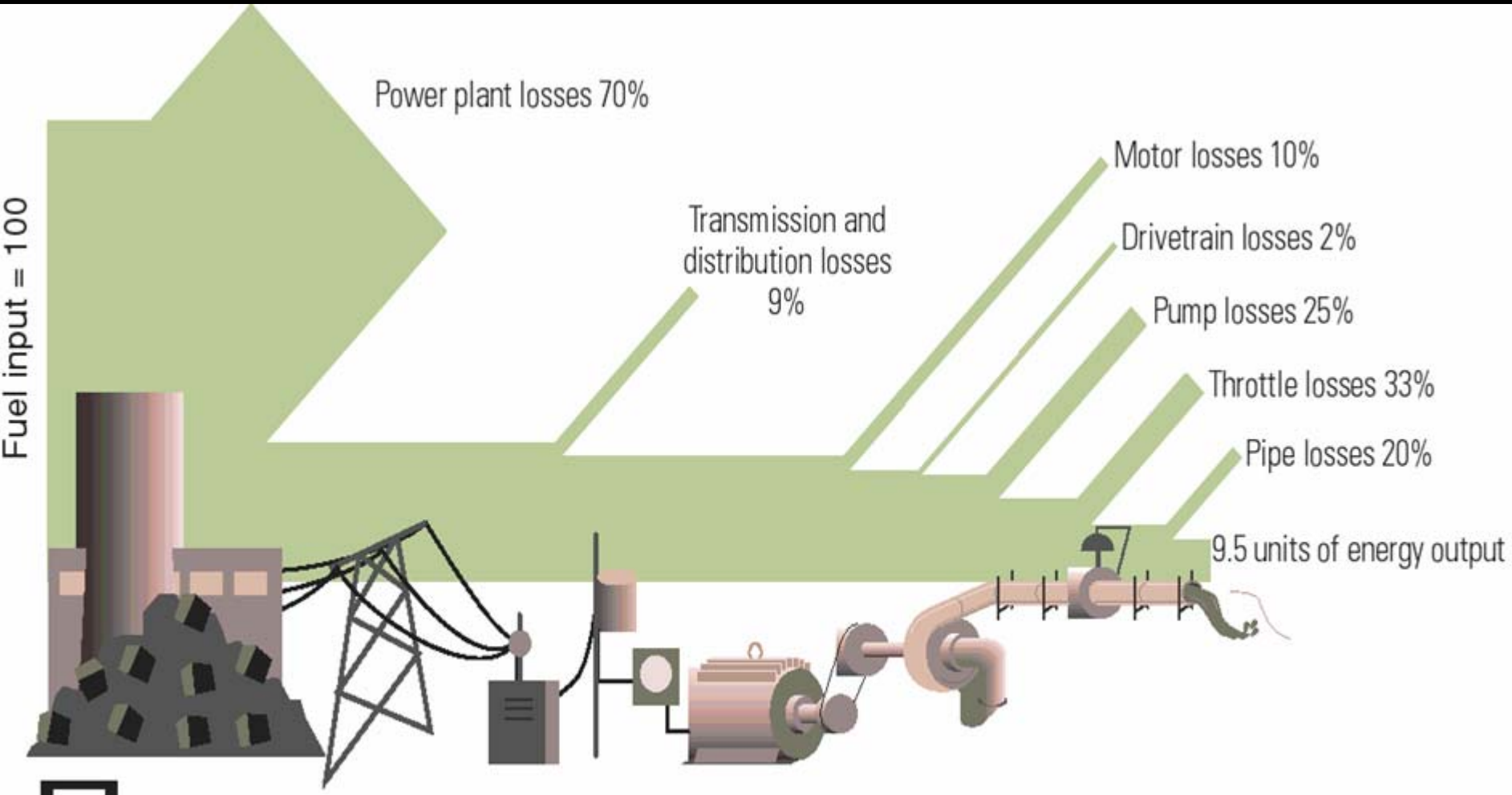
Rocky Mountain Institute
experimental house & office

Grow bananas

with no furnace

at –40ºF

Compounding losses…or savings—so start at the downstream end



From the *Drivepower Technology Atlas*.
Courtesy of E SOURCE, www.esource.com.

P2: Biomimicry

Closed loops, no waste,
no toxicity

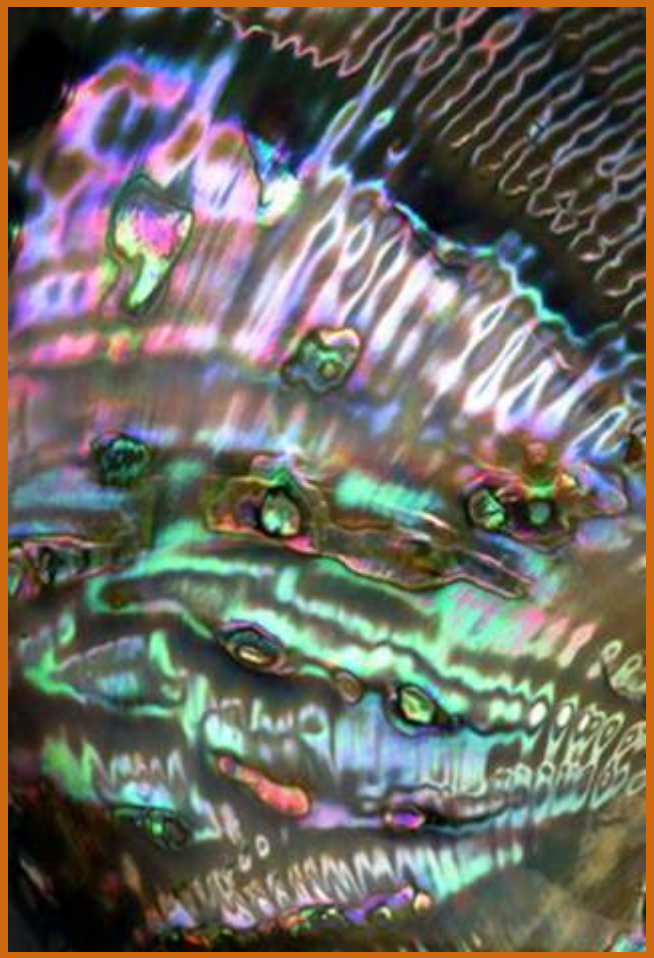
Nature as model, measure,
and mentor

Nature as mentor

Three levels of biomimicry

Process:

How is it made?



DesignTex™

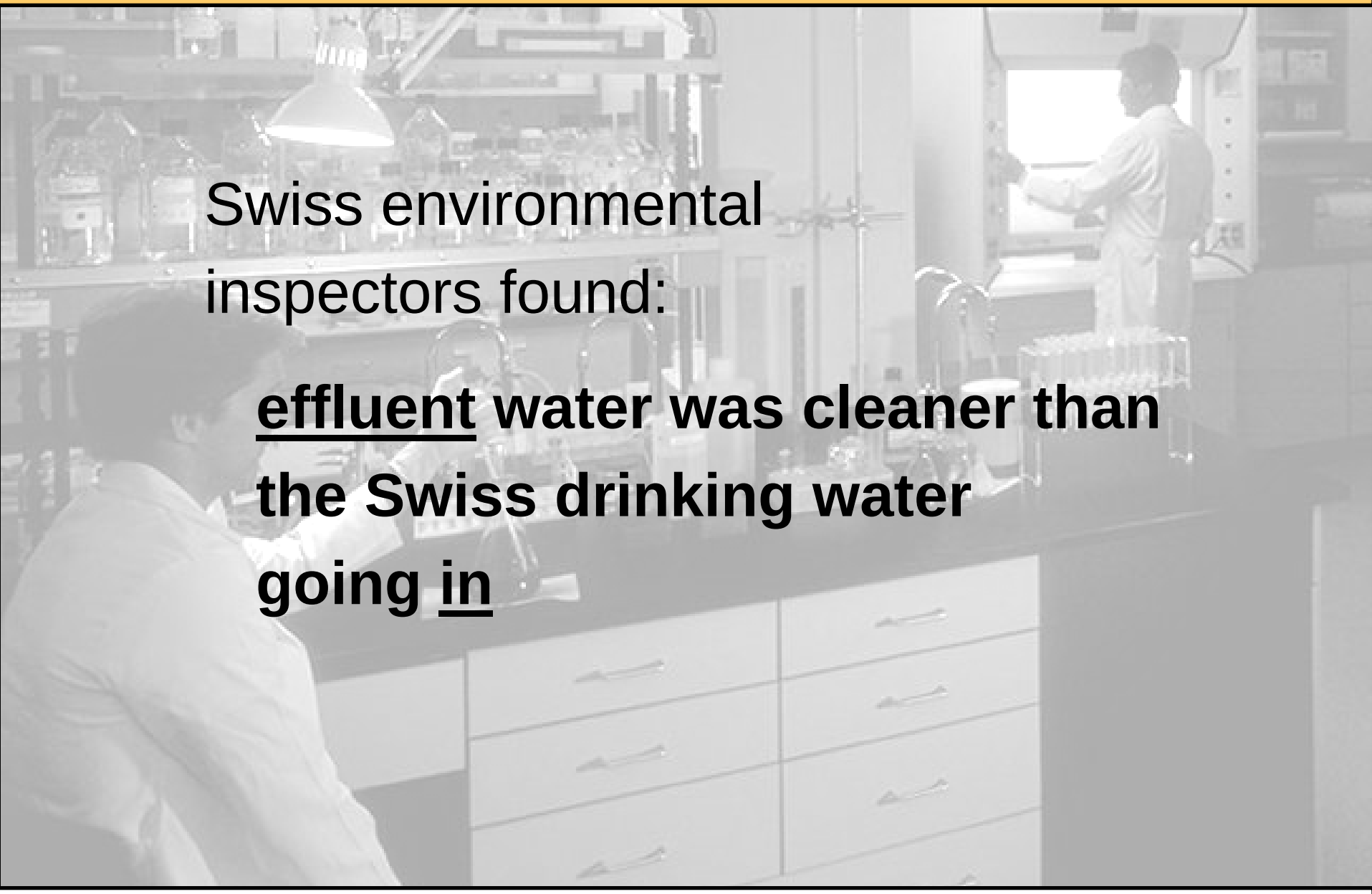
Of 8,000 tested,
only 38 cloth treatment chemicals were non-toxic

Upholstery
edge trimmings:
toxic waste

DesignTex™

Natural cloth treated with the safe chemicals looked and felt better, lasted longer, and cost less

DesignTex™



Swiss environmental inspectors found:

<u>effluent</u> water was cleaner than the Swiss drinking water going <u>in</u>

Three levels of biomimicry

Design:

How does it work?

Design: How does it work?

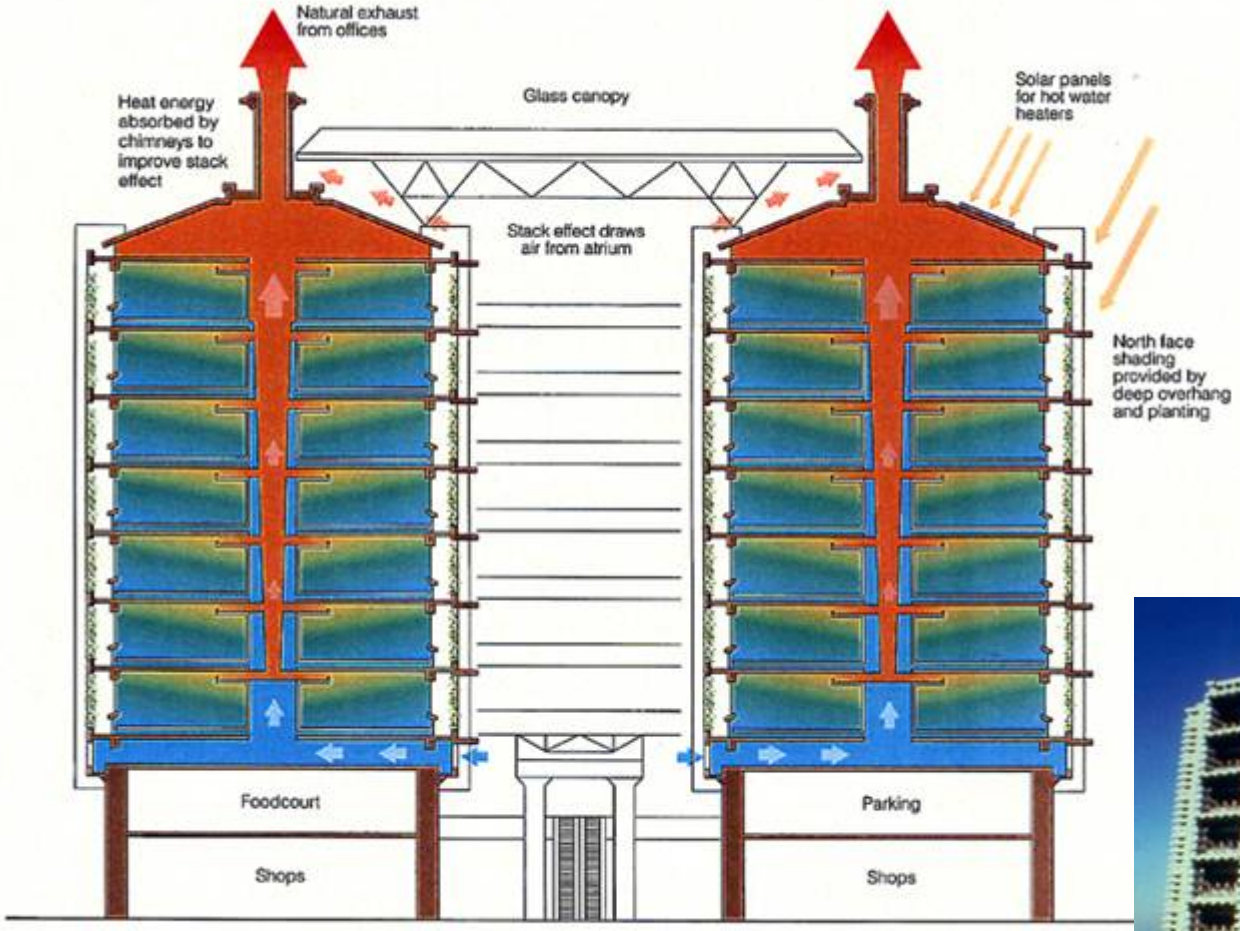
How does nature stay cool?

Termite mounds

- **Low energy-intensive materials**
- **Passive air conditioning**

Africa, Australia, and the Amazon

Eastgate


Natural exhaust from offices
Heat energy absorbed by chimneys to improve stack effect
Glass canopy
Solar panels for hot water heaters
Stack effect draws air from atrium
North face shading provided by deep overhang and planting
Foodcourt
Shops
Parking
Shops

Three levels of biomimicry

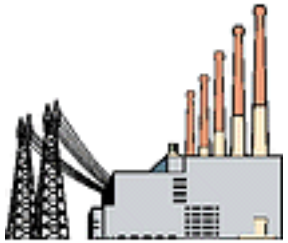
System:

How does it fit?

Kalundborg, Denmark

Statoil Refinery

Gyproc



Asnaes Power Plant

City of Kalundborg

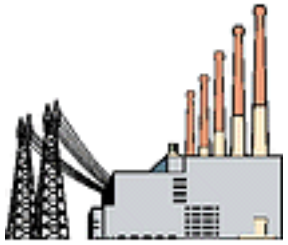
Novo Nordisk

Kalundborg, Denmark

Statoil Refinery

Fuel Gas →

Gyproc



Asnaes Power Plant

City of Kalundborg

Novo Nordisk

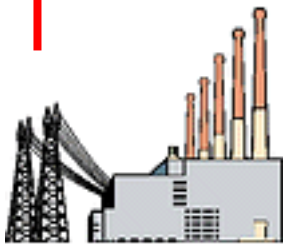
Kalundborg, Denmark

Statoil Refinery

Fuel Gas

Gyproc

Steam



Asnaes Power Plant

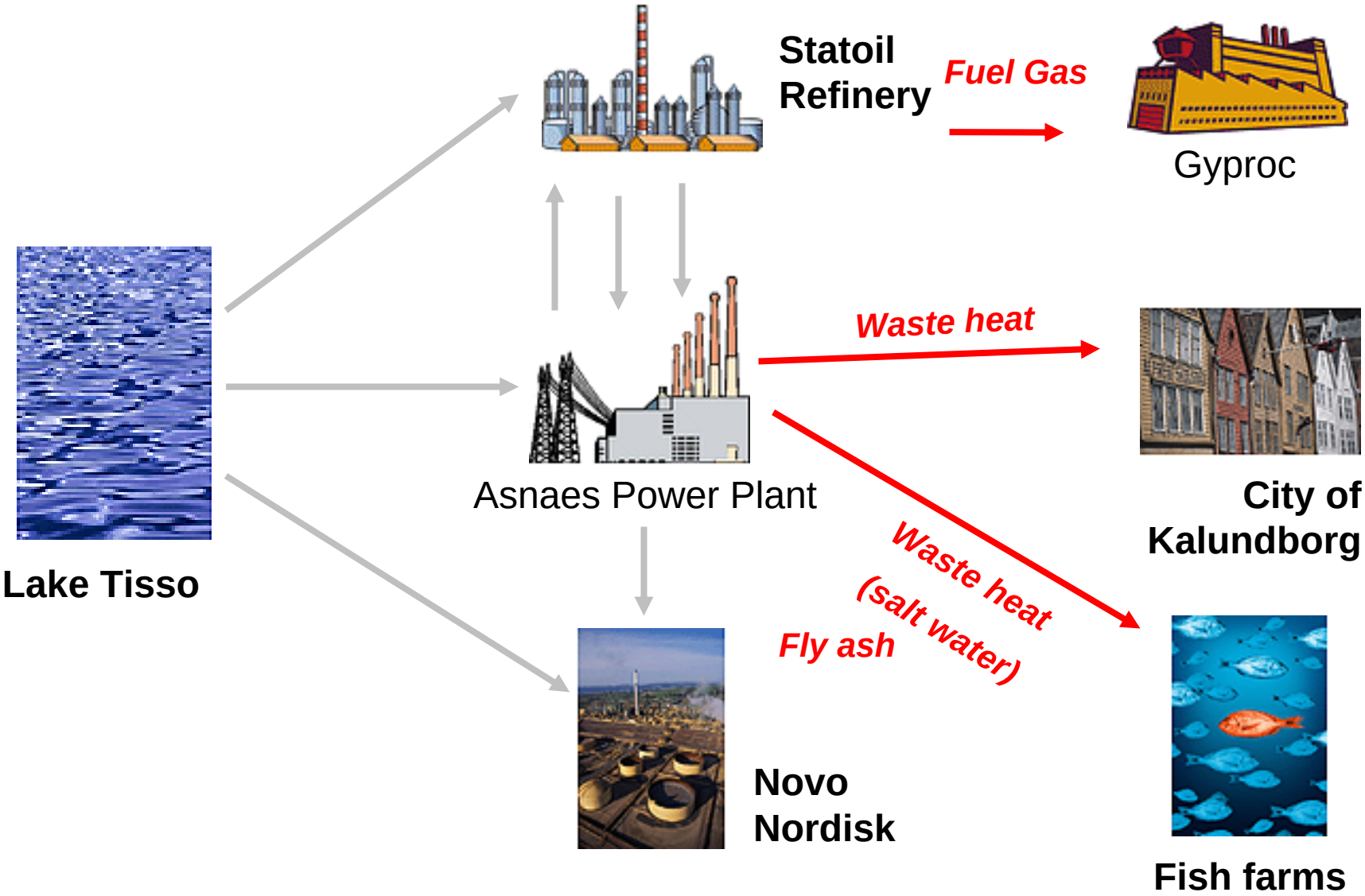
Waste heat

City of Kalundborg

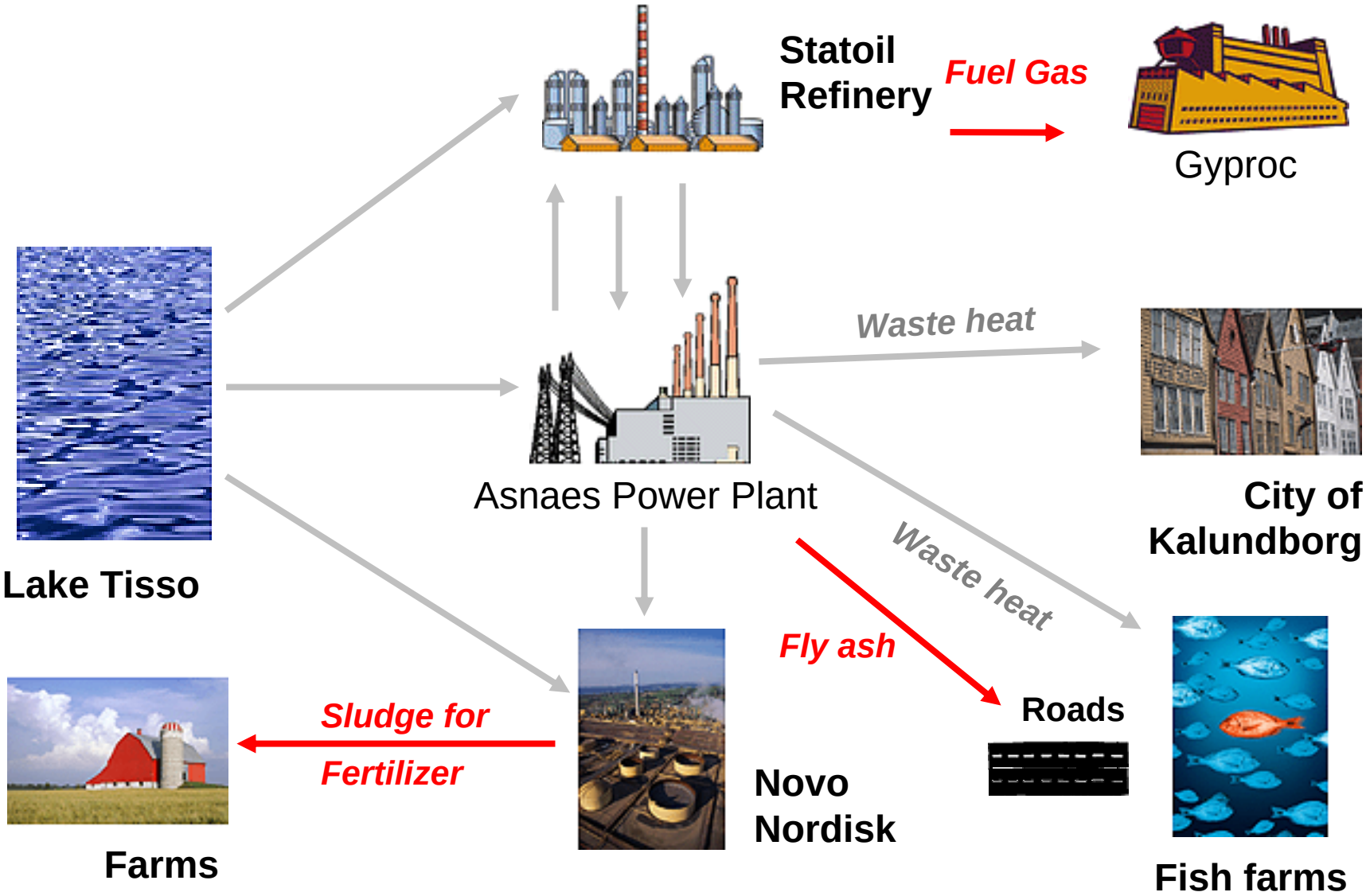
Steam

Novo Nordisk

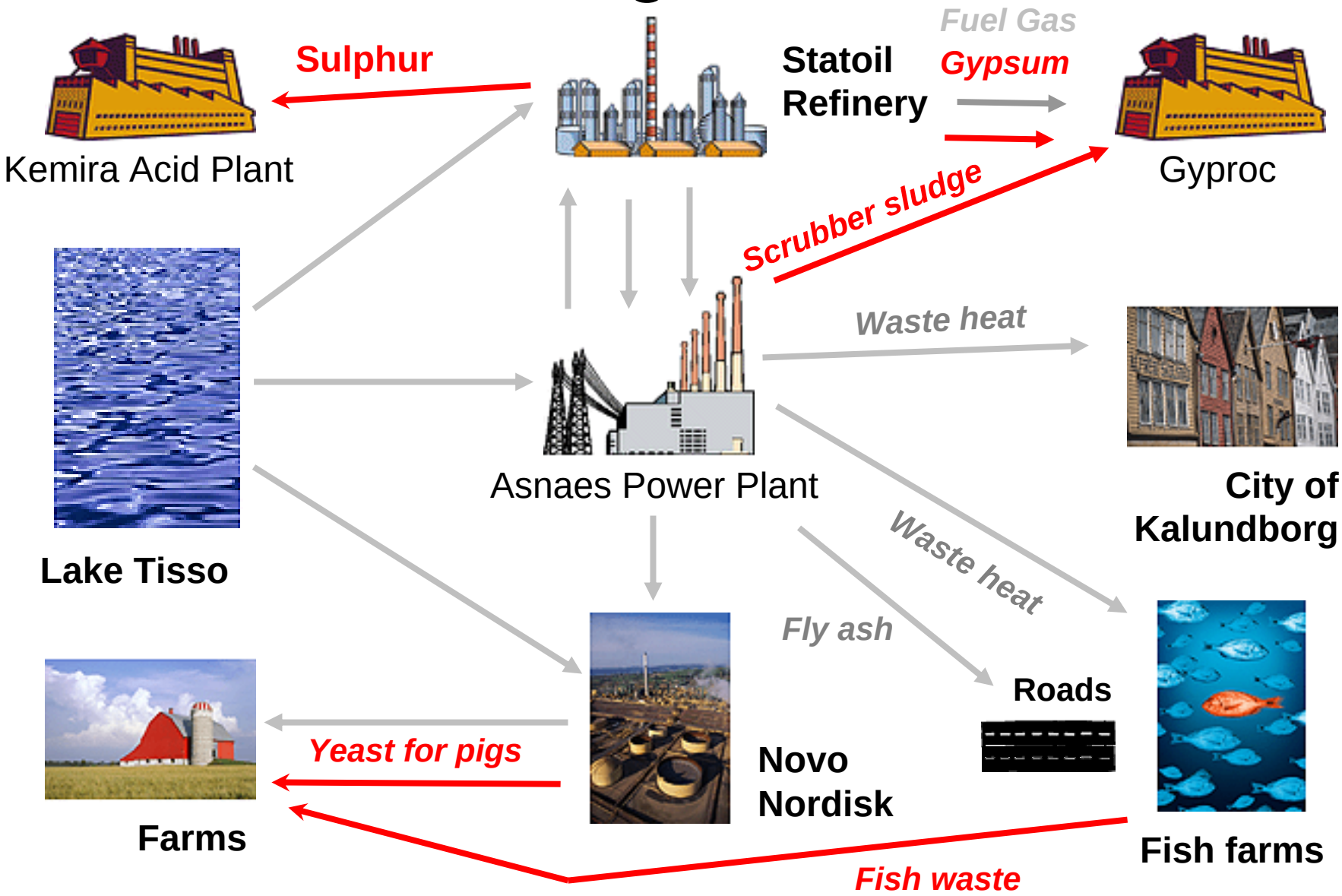
Kalundborg, Denmark



Kalundborg, Denmark



Kalundorg,Denmark



Kalundborg, Denmark

Annual savings:

- **$12–15 M USD**
- **30,000 tons of coal**
- **19,000 tons oil**
- **600,000 cubic meters of water**

P3: Shift to a solutions economy

From product to service

What are customers trying to solve?

“Less stuff… more service”

Hot showers and cold beer

End-use, least-cost analysis

- **From: Supply-side focus:**
  How to get *more* resources?

- **To: Demand-side focus:**
  What's the least expensive, least polluting way to deliver those services?

Xerox

Capitalized on existing leasing programs to build a “take-back” infrastructure &
a “document services” business

Xerox

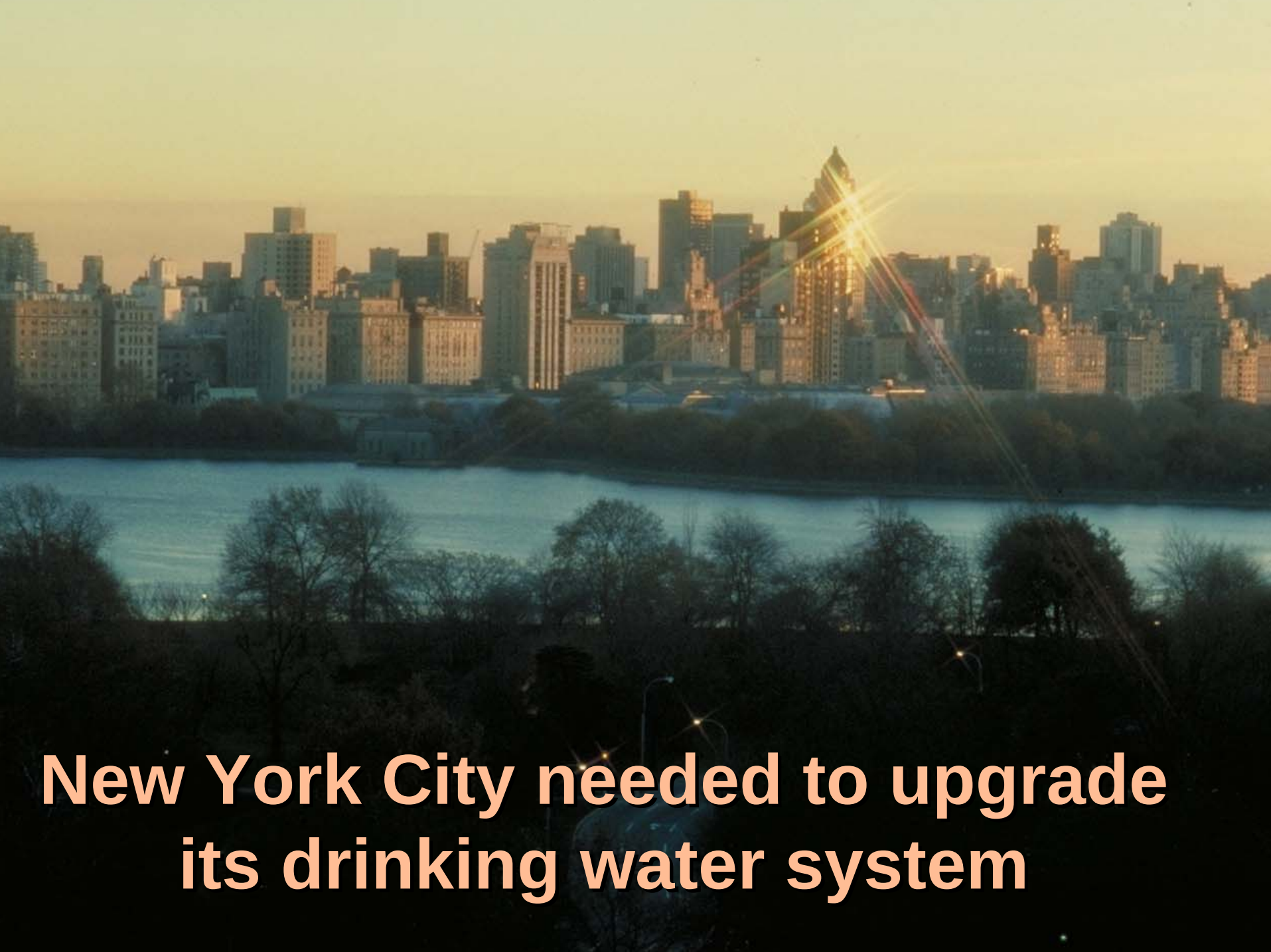
“Everything that Xerox delivers to its customers is designed to be returned -- whether it’s a machine, a cartridge, a spare, or packaging. All of these items, once returned, are processed for reuse or recycling. The only thing we want to leave with our customers is - THE DOCUMENT”.

*** Xerox Corporation, “the Environmental Call: What on Earth Are We Doing for Customers?” Xerox Environment, Health and Safety, 1997**

P4: Reinvest in

natural and human capital

Protect, enhance, restore and let nature renew



New York City needed to upgrade its drinking water system

New water filtration plant @ $4-$6 billion

+

$300-$500 million/year for maintenance

Instead …

NYC invested in the integrity of the watershed

- Purchased land as buffers

- Helped farmers reduce discharge

- Upgraded local sewage treatment plants

…Cost = $1.7 billion

What's stopping us?

- Short term financial pressures
- Accounting practices
- Purchasing practices
- Design and engineering practices
- Measurement systems
- Reward and recognition programs

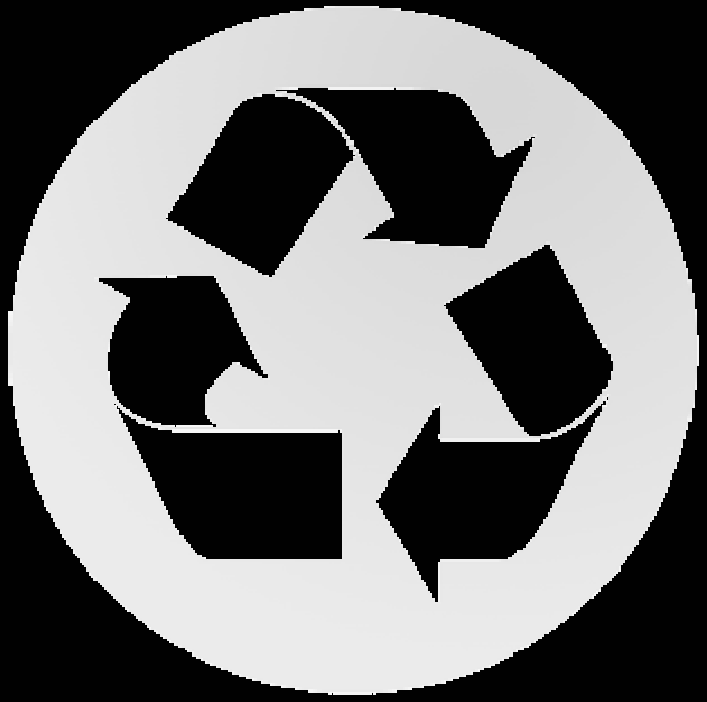
We can create a new future, a new vision

Private-sector leadership

- Over half the world's 100 largest economic entities today are not nation-states but corporations
- The business community may be the only institution that has the resources, skills, and motivation to solve these tough problems.

Archetype for the emerging world…

Natural-capitalist businesses take their values from their customers, their designs from nature, and their discipline from the marketplace.



www.rmi.org

“Whatever you can do, or dream that you can do, begin it. Boldness has genius, power and magic in it. Begin it now.”