



Ecodesign Ideologies



Okala Practitioner Chapter 3

Ecodesign Ideologies

The Natural Step
Factor 10 & Factor 4
Natural Capitalism

These ideologies have developed over the past several decades. They provide frameworks that strive to meet human needs while restoring ecological quality and ecological health.

The Natural Step

The Natural Step (TNS) is a systems thinking framework developed by Dr. Karl Hendrik Robert.

TNS promotes “forms of societal organization that are based on cyclic processes compatible with the Earth’s natural cycles.”*

- TNS looks towards the future.
- TNS shares a framework and a common language.
- TNS focuses on larger system conditions rather than details.

* B. Nattrass, M. Altomare (1999) *The Natural Step*, New Society Publishers

The Natural Step

System condition 1

Substances from the Earth's crust must not systematically increase in the biosphere.

Fossil fuels, metals and other minerals must not be extracted at a faster rate than their redeposit and regeneration in the Earth's crust.



The Natural Step

System condition 2

Substances produced by society must not systematically increase in the biosphere.

Substances must not be produced faster than they can be broken down and be reintegrated into the cycles of nature or be deposited in the Earth's crust. The following are some of the synthetic chemicals that have been found in human breast milk in North America.

HALOGENATED	dichlorobenzene	n-dodecanal	alkylated lactone	C10H16 O
COMPOUNDS	chlorodecane	KETONES	phthalide	C10H18 O
chlorodifluoromethane	trichlorobenzene	acetone	OXYGENATED	C10H20 O
chlorotrifluoromethane	ALDEHYDES	methyl ethyl ketone	ISOMERS	C10H22 O
dichlorofluoromethane	acetaldehyde	methyl propyl ketone	C4H6O	C9H8O2
chloromethane	methyl propanal	methyl vinyl ketone	C4H8O	C11H20 O
trichlorofluoromethane	n-butanal	ethyl vinyl ketone	C5H10 O	ALCOHOLS
dichloroethylene	methylbutanal	2-pentanone	C4H6O2	methanol
Freon 113	crotoaldehyde	methyl pentanone	C6H12 O	isoproponal
methylene chloride	n-penanal	methyl hydrofuranone	C7H10 O	n-proponal
chloroform	n-hexanal	2-methyl-3-hexanone	C7H14 O2	1-butanol
1,1,1 – trichloroethane	furaldehyde	4-heptaonone	C6H6O2	1-pentanol
carbon tetrachloride	n-heptanal	3-heptaonone	C6H14 O2	x-furfuryl alcohol
trichloroethylene	benzaldehyde	2- heptaonone	C6H16 O	2-ethyl-1-hexanol phenol
chloropentane	n-octanal	methyl heptaonone	C7H8O2	2,2,4-trimethylpenta-1,3-diol
chlorobenzene	phenyl acetaldehyde	furyl methyl ketone	C7H10 O2	x-terpineol
iodopentane	n-nonanal	octanone	C9H18 O	ACIDS
3-methyl-1-iodobutane	methyl furaldehyde	acetaphenone	C8H6O2	acetic acid
chloroethylbenzene	n-decanal	2-nonanone	C10H12 O2	decanonic acid
dibromodichloromethane	n-undecanal	2-decananone	C10H14 O	SULFUR COMPOUNDS

The Natural Step

System condition 3

The physical basis for the productivity and diversity of the biosphere must not be systematically deteriorated.

The productive surfaces of nature must not be diminished in quality or quantity, and we must not harvest more from nature than can be recreated or renewed.



The Natural Step

System condition 4

Resources must be used fairly and efficiently to meet human needs.

Basic human needs must be met with the most resource efficient methods possible, including equitable resource distribution.



A family in Mongolia with all of the objects that they own.

Image: Peter Menzel, material World

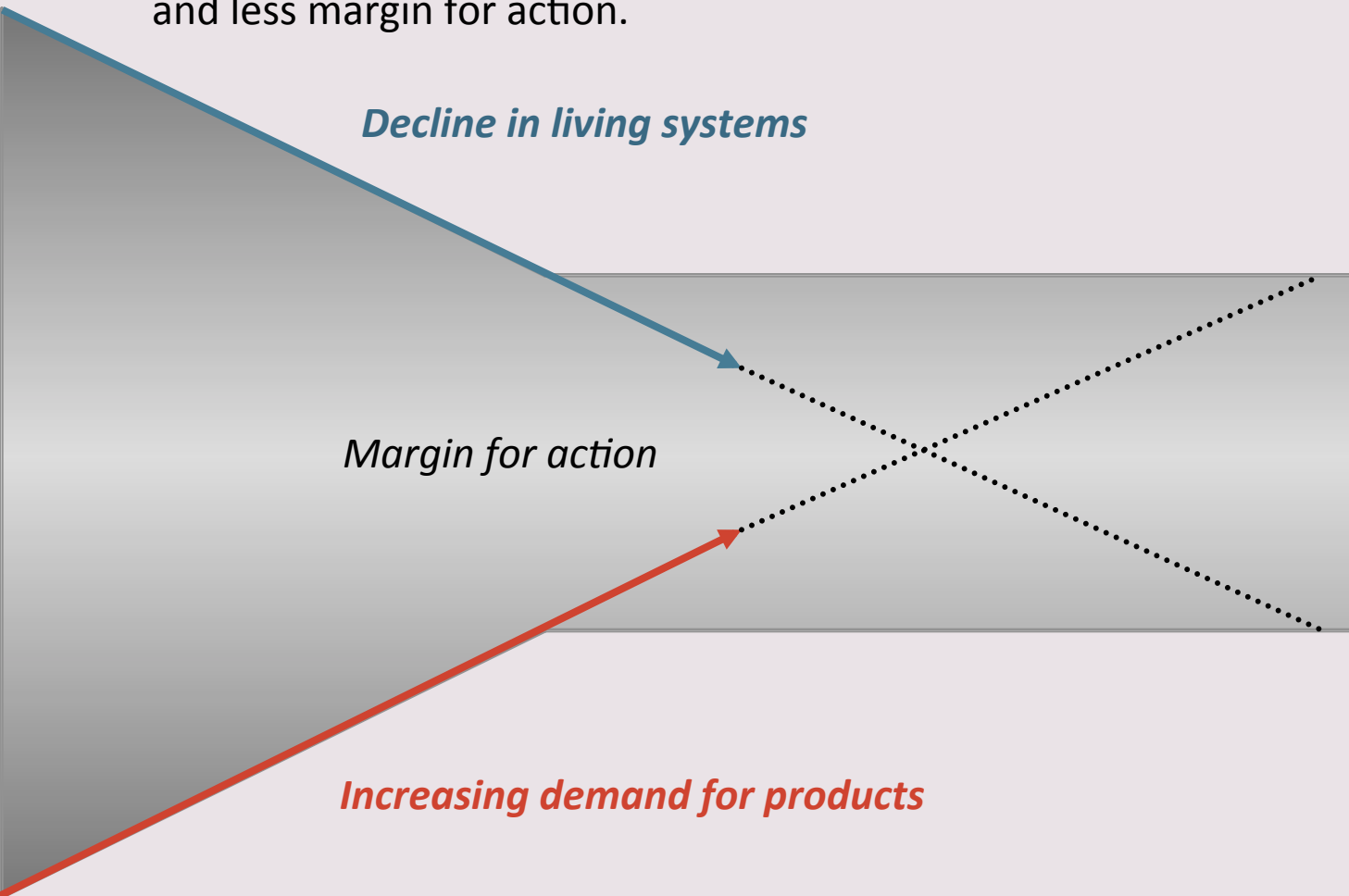


A family in Japan with all of the objects that they own.

Image: Peter Menzel, material World

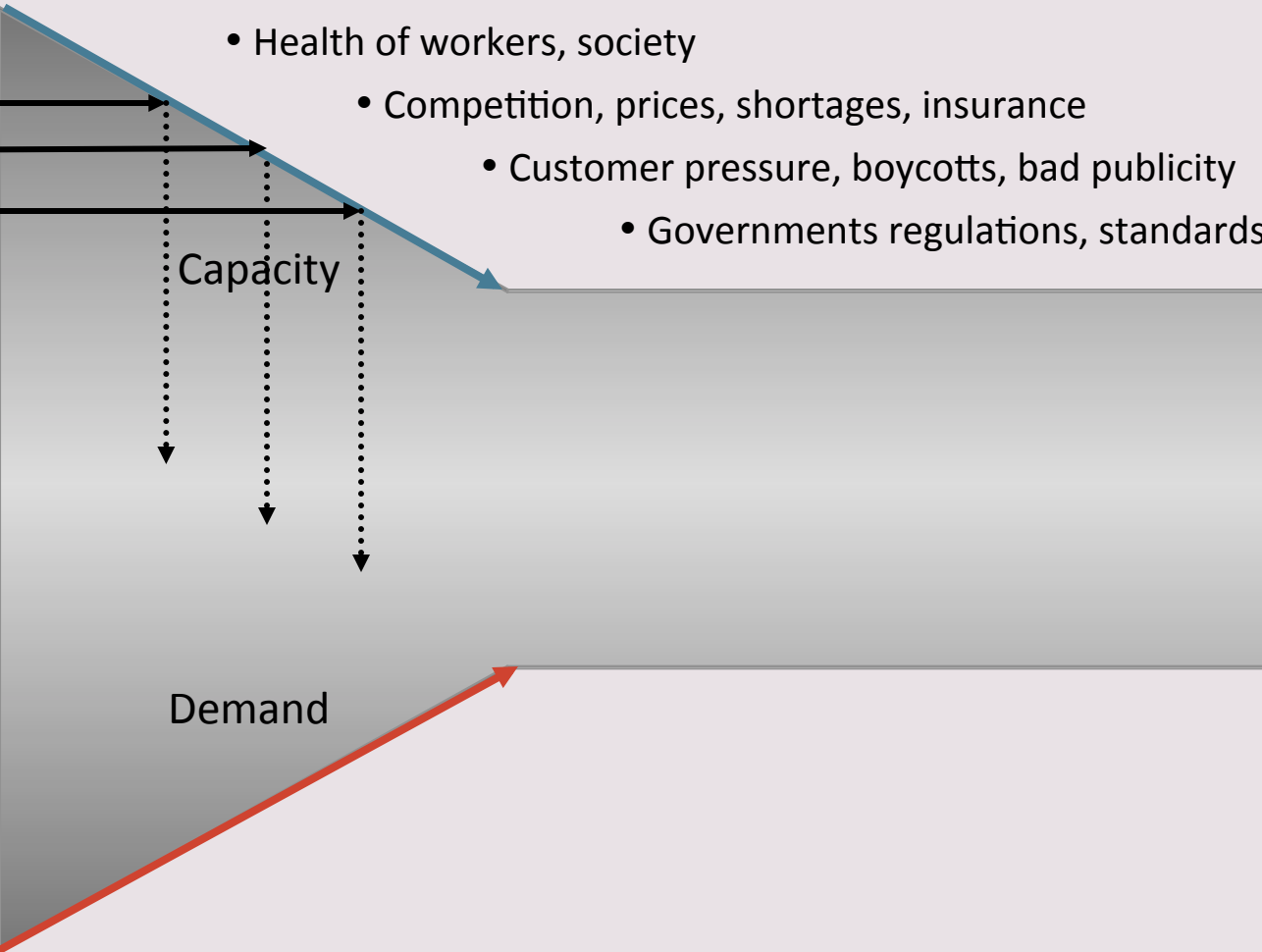
TNS Funnel

The TNS Funnel visually describes how the decline in living systems conflicts with the increasing demand for products. As the funnel narrows, there is less and less margin for action.



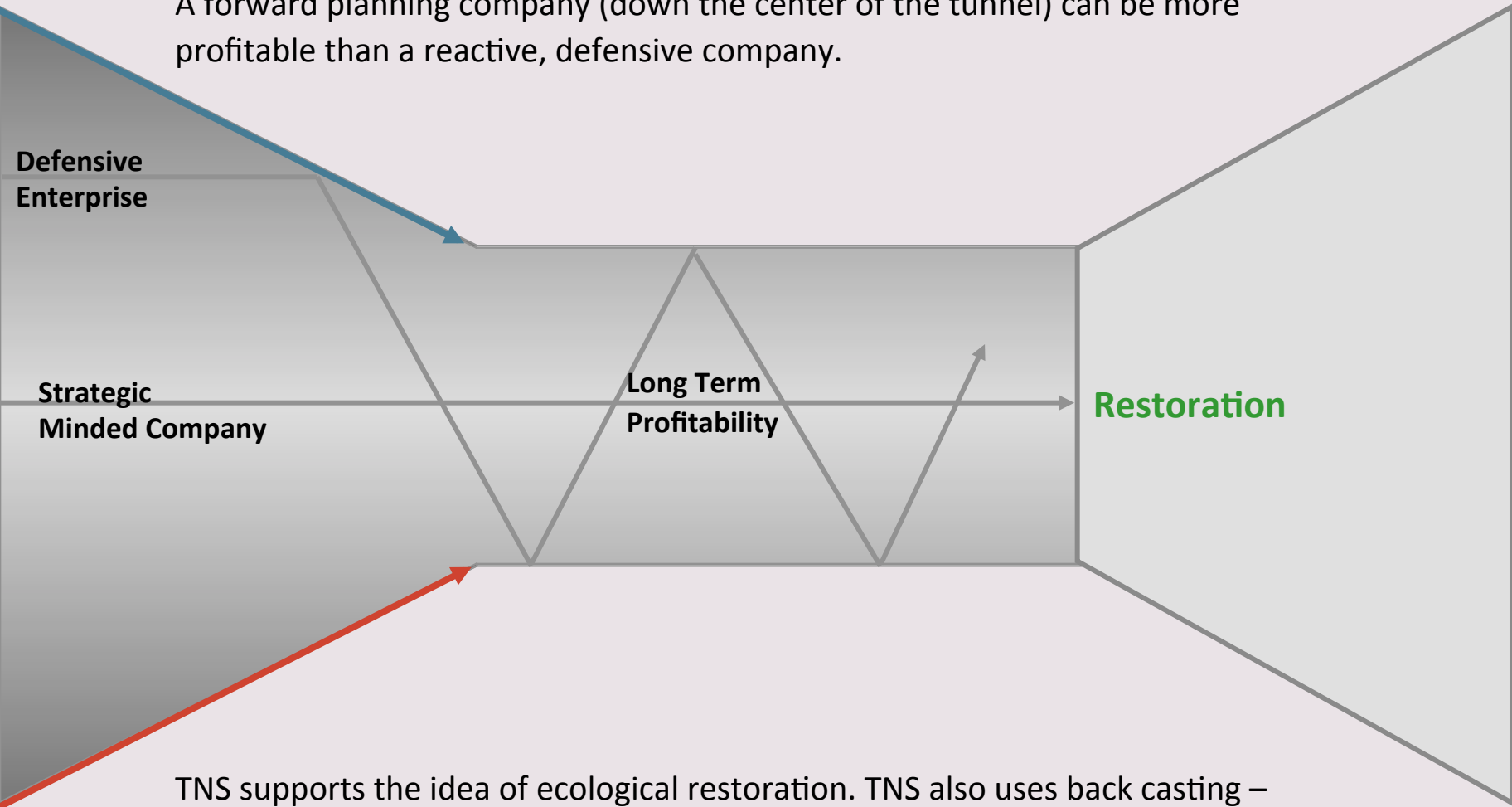
The TNS Funnel visually describes how environmental deterioration affects businesses.

- Ecological — species, atmosphere, land, water
 - Health of workers, society
 - Competition, prices, shortages, insurance
 - Customer pressure, boycotts, bad publicity
 - Governments regulations, standards



Businesses can understand that it is economically advantageous to change now, before future pressures make it necessary.

A forward planning company (down the center of the tunnel) can be more profitable than a reactive, defensive company.



TNS supports the idea of ecological restoration. TNS also uses back casting – a conceptual process starting at a desired date in the future and projecting backwards to define steps necessary to achieve the desired end.

Factor 10

“As less than 20 % of humankind consume in excess of 80% of the natural resources at this time, the richer countries need to dematerialize their technologies – or increase the resource productivity – by an average of *at least a factor 10**.”

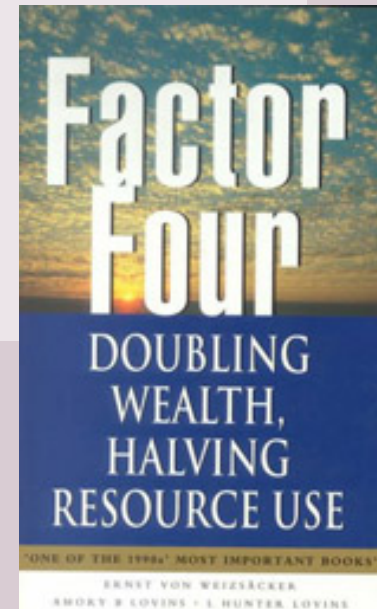
Factor Ten equates to a 90% decrease in resource usage. It uses the MIPS metric, a measure of material and energy use per unit service.

Schmidt-Bleek, Factor 10, 1993, Germany

Factor 4

The goal of being twice as productive with half the resources (materials and energy), leading to a factor 4 improvement in efficiency. The Factor 4 efficiency gain equates to a 75% reduction of energy and material usage.

Weizsacker (Wuppertal Institute), Lovins and Lovins (Rocky Mountain Institute), *Factor 4*, 1998



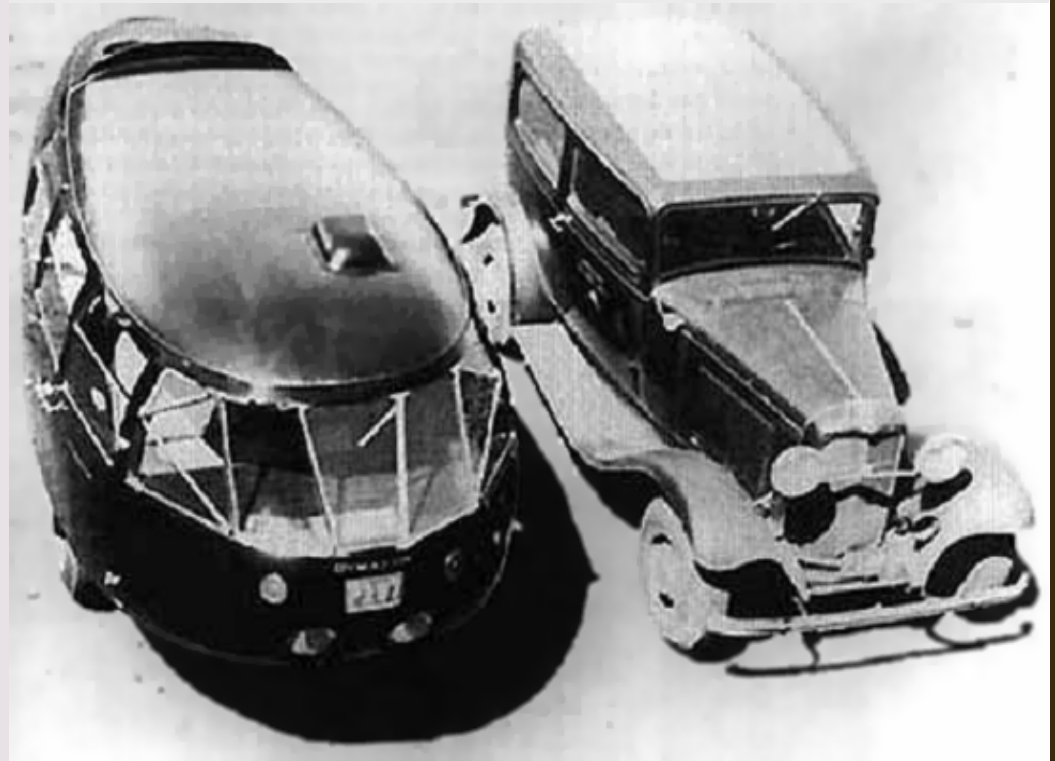
Factor 4 examples

Dymaxion car

Designed by Buckminster Fuller, 1932
weighs 1/6th of typical

Note:

Both factor 10 and factor 4 echo the
ideal of “ephemeralization”
espoused by Bucky.



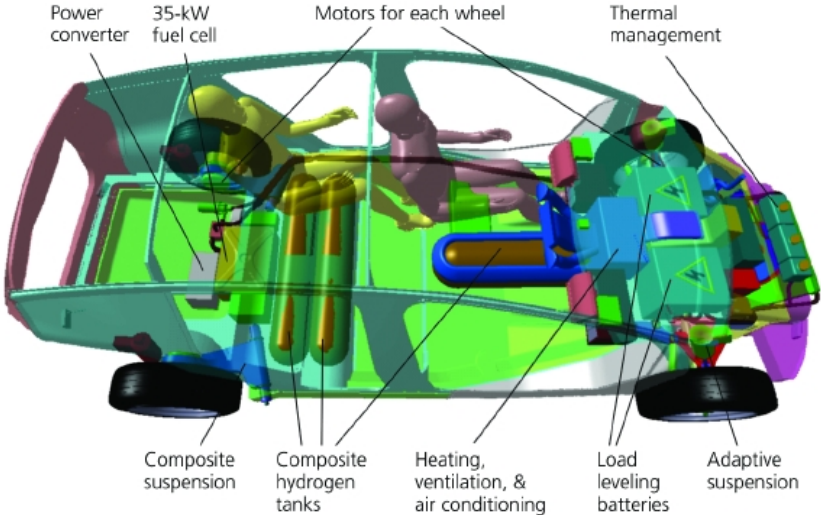
Geodesic dome

also by Fuller
uses 1/80th of materials
(by weight) to enclose a space

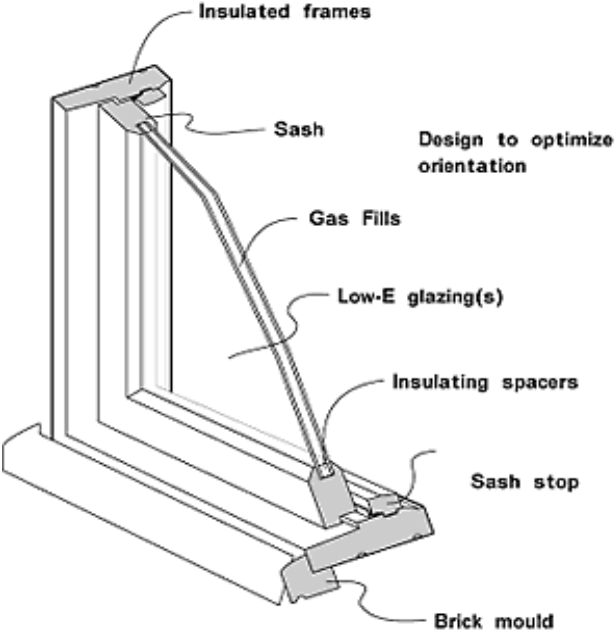


Factor 4 examples:

90 mpg Hypercar



Super window
significant heat transfer reduction



Examples:

Sunfrost refrigerator

0.5 kilowatt-hour / year



LED lamps

1/7th electricity per lumen of
incandescent lamps



Natural Capitalism

The traditional definition of capital is accumulated wealth in the form of investments, factories, and equipment. An economy actually needs four types of capital to function properly:

Human Capital, in the form of labor and intelligence, culture, and organization

Financial Capital, consisting of cash, investments, and monetary instruments

Manufactured Capital, including infrastructure, machines, tools, and factories

Natural Capital, made up of resources, living systems, and ecosystem services

Natural Capitalism

The environment is not a minor factor of production but rather is “an envelope, provisioning, and sustaining the entire economy.”

The limiting factor to future economic development is the availability and functionality of *natural capital*, in particular, life-supporting services that have no substitutes and currently have no market value.

Misconceived or badly designed business systems, population growth, and wasteful patterns of consumption are the primary causes of the loss of natural capital, and all three must be addressed to achieve a sustainable economy.

Future economic progress can best take place in democratic, market-based systems of production and distribution in which *all* forms of capital are fully valued.

Human welfare is best served by improving the quality and flow of desired services delivered, rather than by merely increasing the total dollar flow.

The best long-term environment for commerce is provided by true democratic systems of governance that are based on the needs of people rather than business.

Natural Capitalism

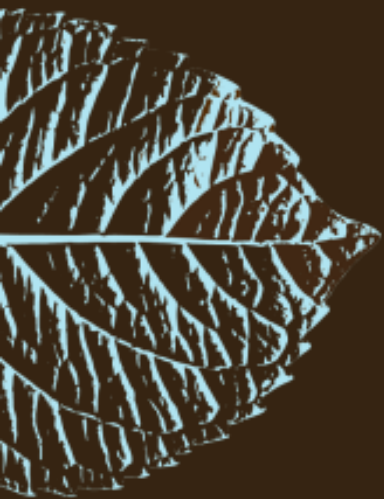
Supports these strategies:

RADICAL RESOURCE PRODUCTIVITY

BIOMIMICRY

SERVICE AND FLOW ECONOMY

INVESTING TO RESTORE NATURAL CAPITAL



Okala Practitioner

Integrating Ecological Design

This presentation is part of an educational presentation series that supports teaching from the *Okala Practitioner* guide.

Okala Practitioner and these presentations were created by the Okala Team to disseminate fact-based knowledge about ecological design to the design disciplines and business.

Unless provided in the presentations, Information sources are found in the *Okala Practitioner* guide.

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The Okala Team initiated the collaboration with the US EPA and the Industrial Designers Society of America (IDSA) in 2003. The team developed *Okala Practitioner* with support from Autodesk, IBM, Eastman Chemical and the IDSA Ecodesign Section.

Okala Practitioner is available through amazon.com.

More information and the free *Okala Ecodesign Strategy App* are found at Okala.net.

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