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Technology for Sustainability – Some Facts and Some Fallacies

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My main points:

- Sustainability engineering is necessary but will never be more than part of what is needed by society, for the journey towards sustainability.
- A complete revision of the nation's economic goals is probably the most important plank of a sustainability policy.

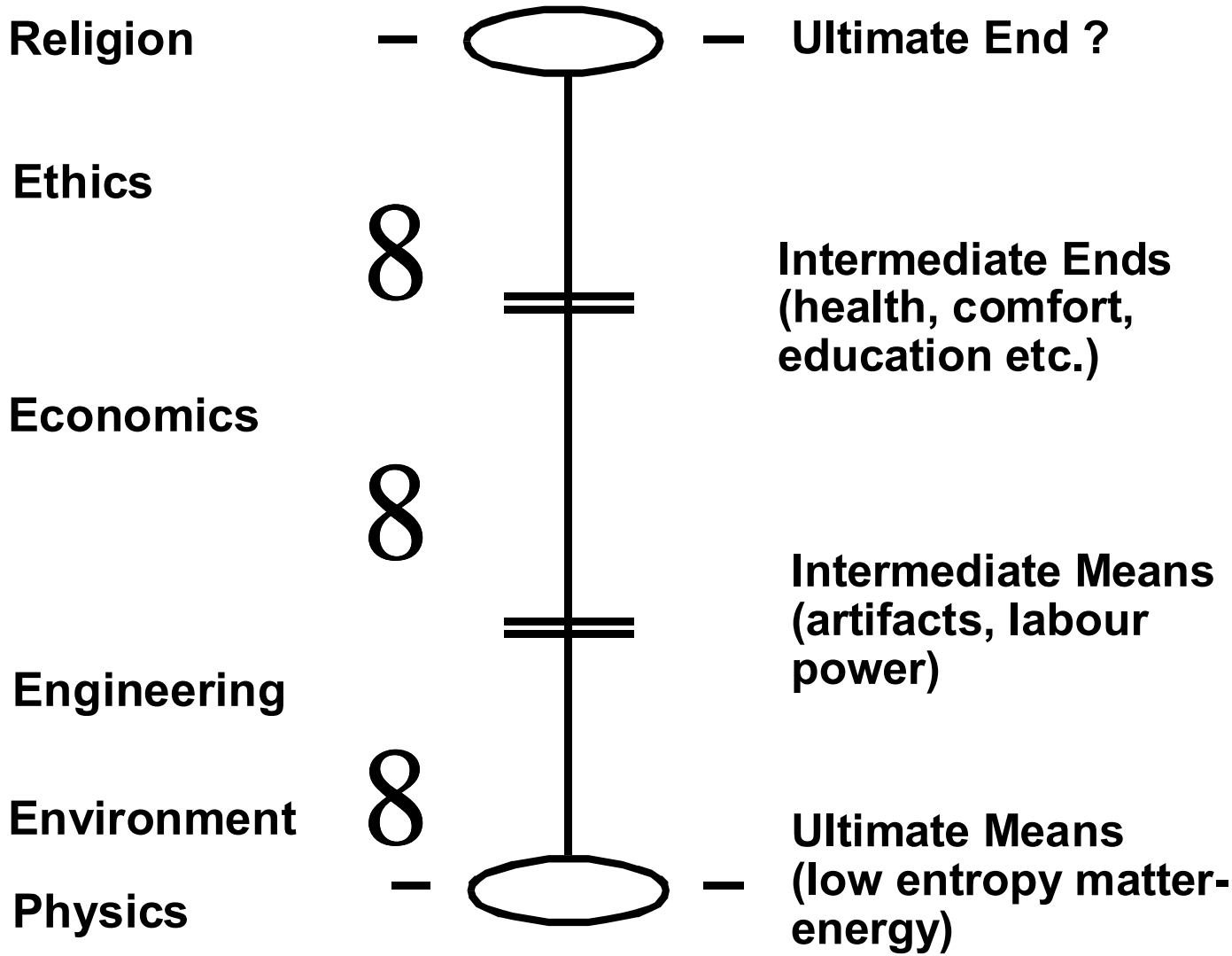
The Goal of an economy is wellbeing of the people who live in it – in both the short and the long term.

Wellbeing is a final goal, only meaningful if it is sustainable over the long term.

Wealth is an intermediate goal, valuable when it contributes to the final goals, and not when it does not.

Growth, efficiency and consumption are also intermediate goals, not ends in themselves.

Daly's means-ends hierarchy



Wellbeing is not simply a function of consumption of goods and services, let alone necessarily improved by growth in consumption. Its achievement requires simultaneous satisfaction of several basic needs.

Good and services largely address material needs.

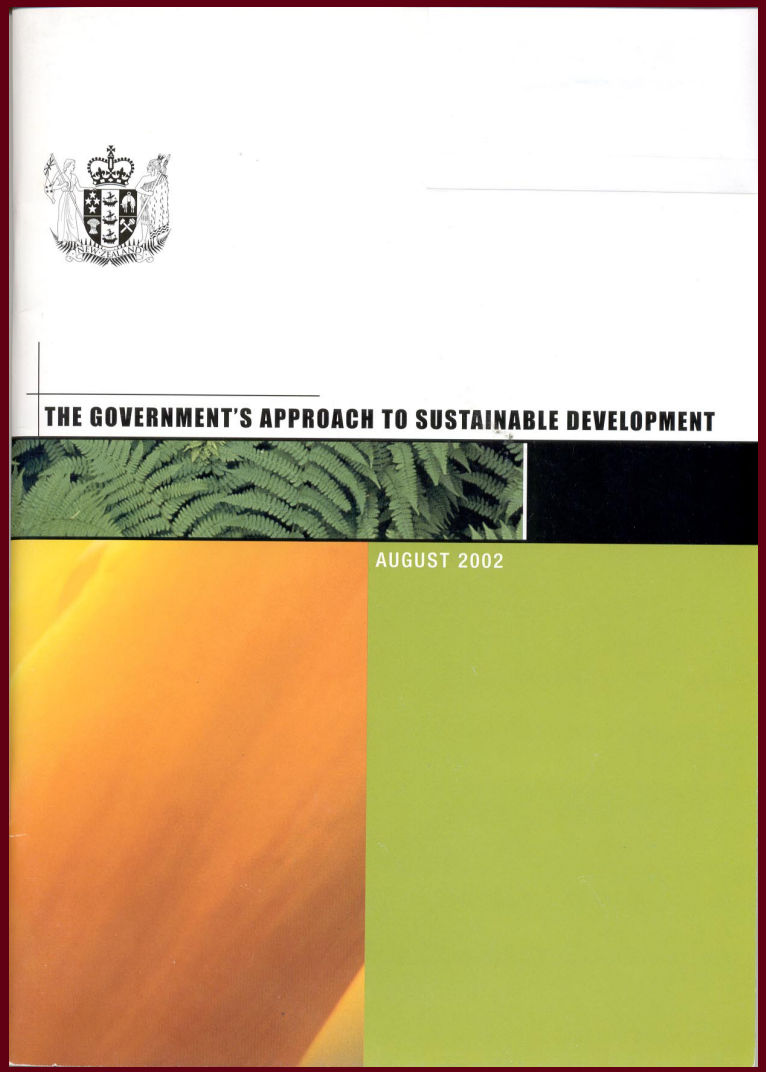
Non-material needs have to be addressed differently. Many of these are only indirectly, if at all, related to conventional economic activity, e.g. freedom, creation, participation, affection, identity.

A sustainability ethic to link wellbeing to policy:

"All people have their basic needs satisfied, so they can live in dignity, in healthy communities, while having the minimum adverse impact on natural systems, now and in the future."

Peet and Peet, 1999

The NZ Government's Sustainable Development policy:



Prime Minister:

"The central issue is how we achieve <u>sustainable economic growth</u> in a manner which enables us to improve the wellbeing of all our peoples without compromising the quality of the environment."

Minister for the Environment:

"... priorities ... such as <u>economic growth</u>, the implications of international population change for New Zealand, <u>decoupling of economic growth from environmental harm</u>, governance for sustainable development ...."

SO … what is to be sustained in ***sustainable development?***

Two very different answers to this question:

(Daly, 2003)

1. ***Utility*** should be sustained. In practice, surrogates such as Consumption are used, normally expressed as dollars per capita spent on goods and services.
2. ***Physical throughput*** should be sustained, so that the throughput of resources available to future generations is no less than at present, i.e. Natural Capital must be kept intact.

Why these differences?
What do the main disciplines think "sustainability" means? (Common, 1996)

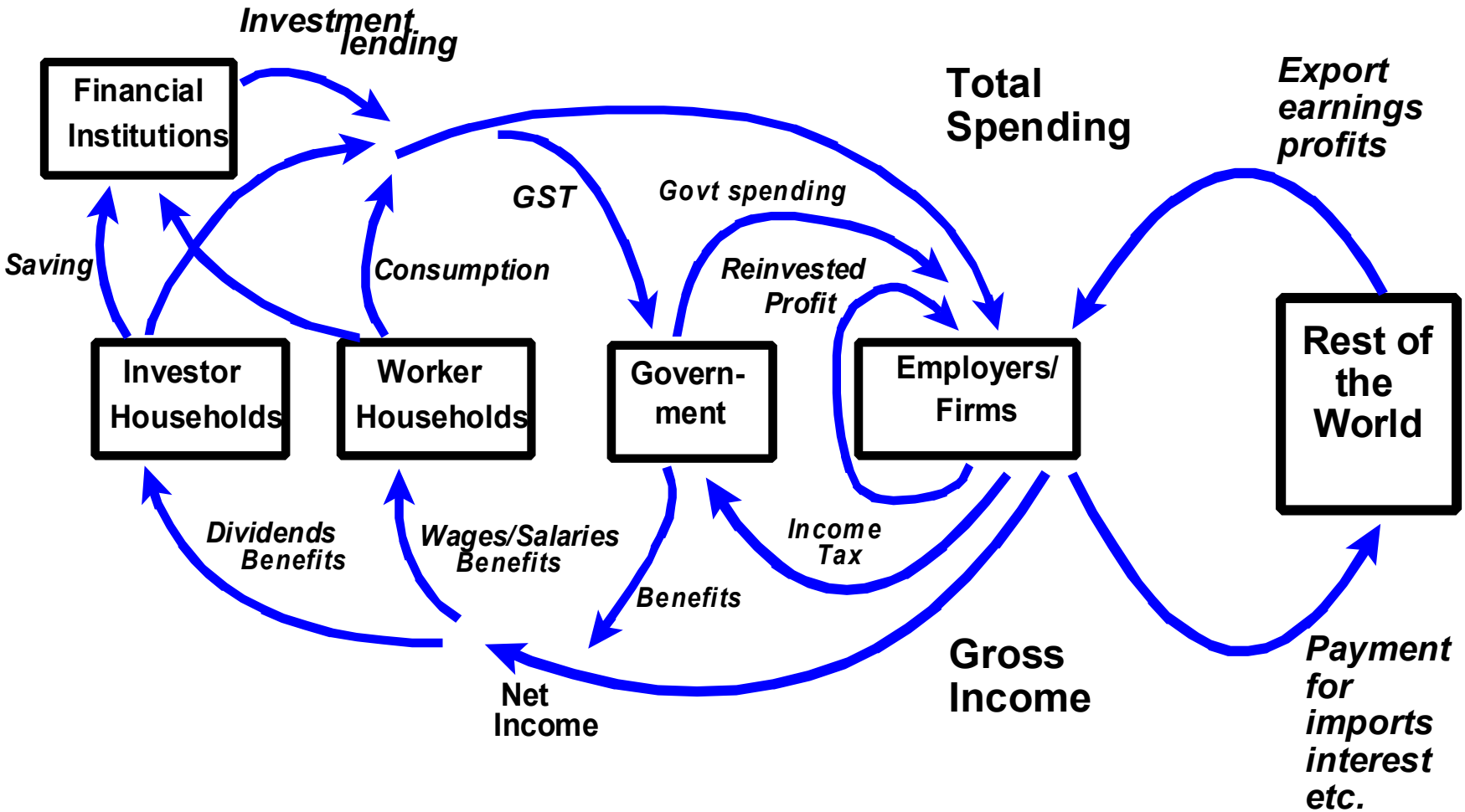
- **Economics** - maintaining a constant (or, preferably, growing) level of per capita aggregate consumption (as a surrogate for Utility).
- **Ecology** - maintaining the resilience, or functional integrity, of ecosystems (by limiting Throughput to that which can be supplied and/or assimilated sustainably).


BUT WHAT IF YOU'RE WRONG AND WE RUIN THE PLANET?
WHAT IF YOU'RE WRONG AND THE WATER AND AIR ARE TOO CLEAN?!
ENVIRONMENTAL DEBATE

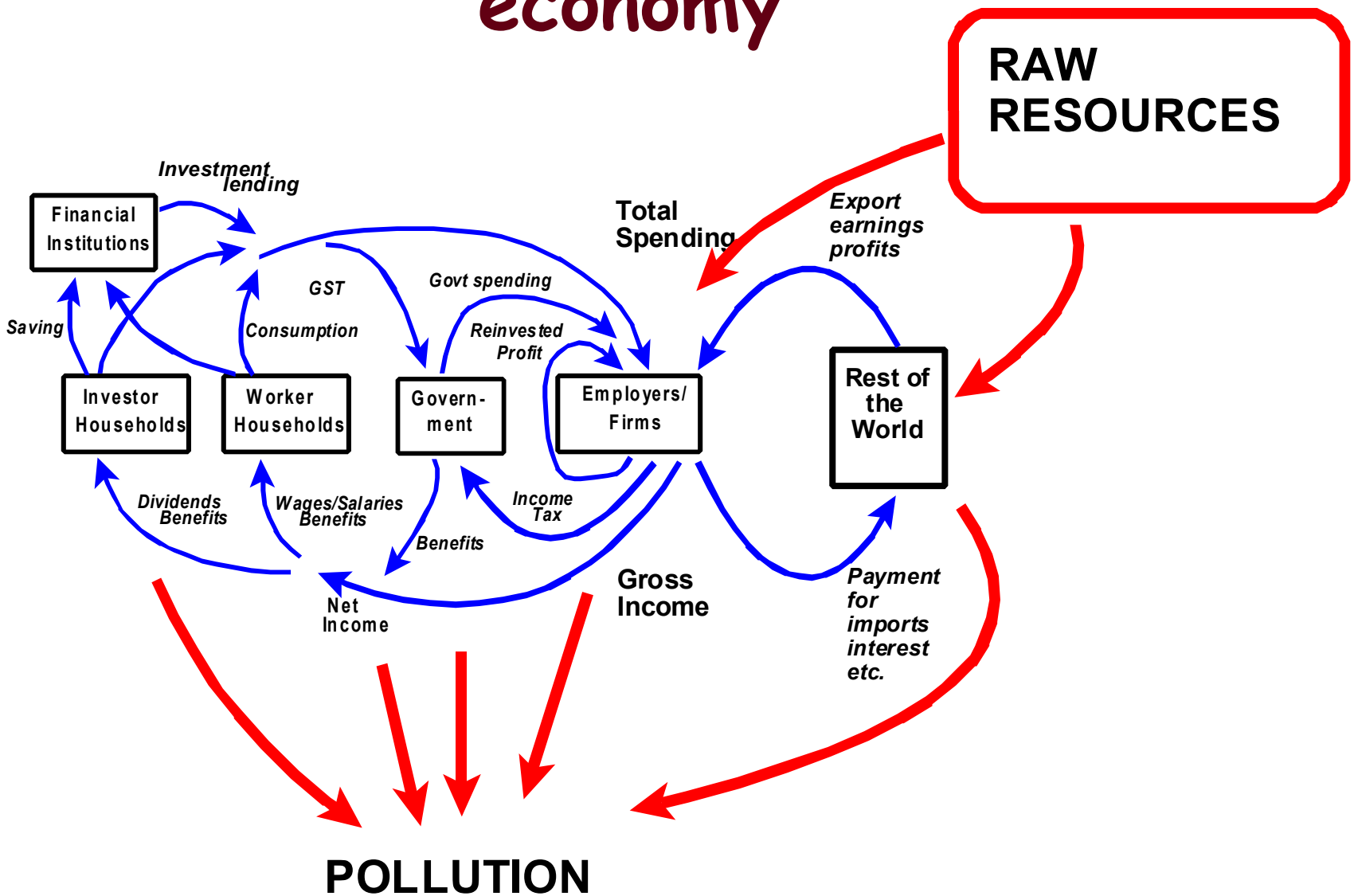
So what *is* the problem?

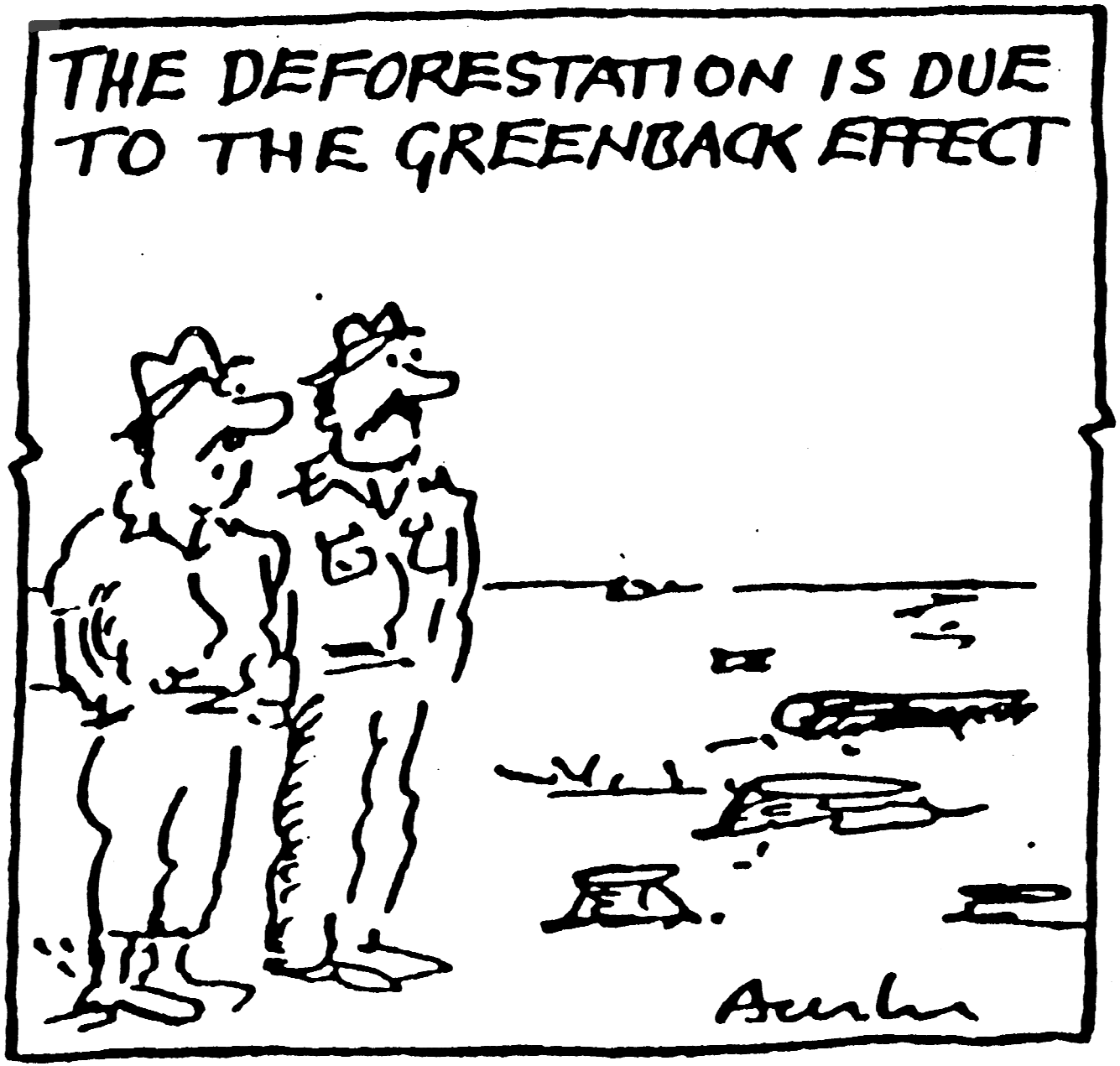
- ***If*** Utility depends upon Consumption of goods and services, ***and if***
- Consumption presupposes Production of those goods and services, ***and if***
- Production requires Transformation of Resources taken from the Environment, (i.e. stuff to which value is added), ***then***
- *The drivers of, and the long-term relationship between resource use and transformation processes are central issues relating to the possibility of achieving SD.*
- ***.... Is "doing things smarter" enough?***

Circular flow model of the NZ economy

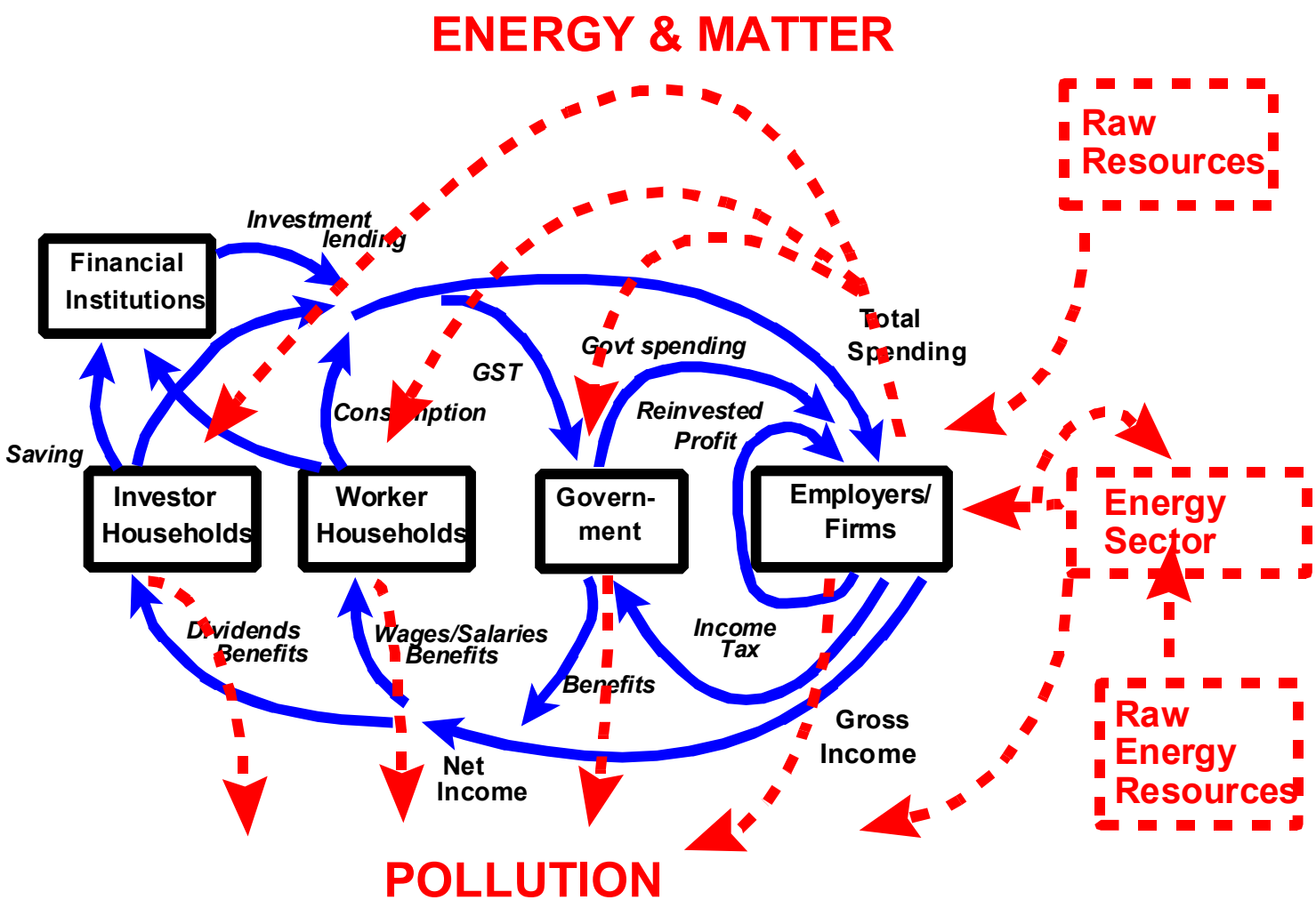


Environmental model of the economy

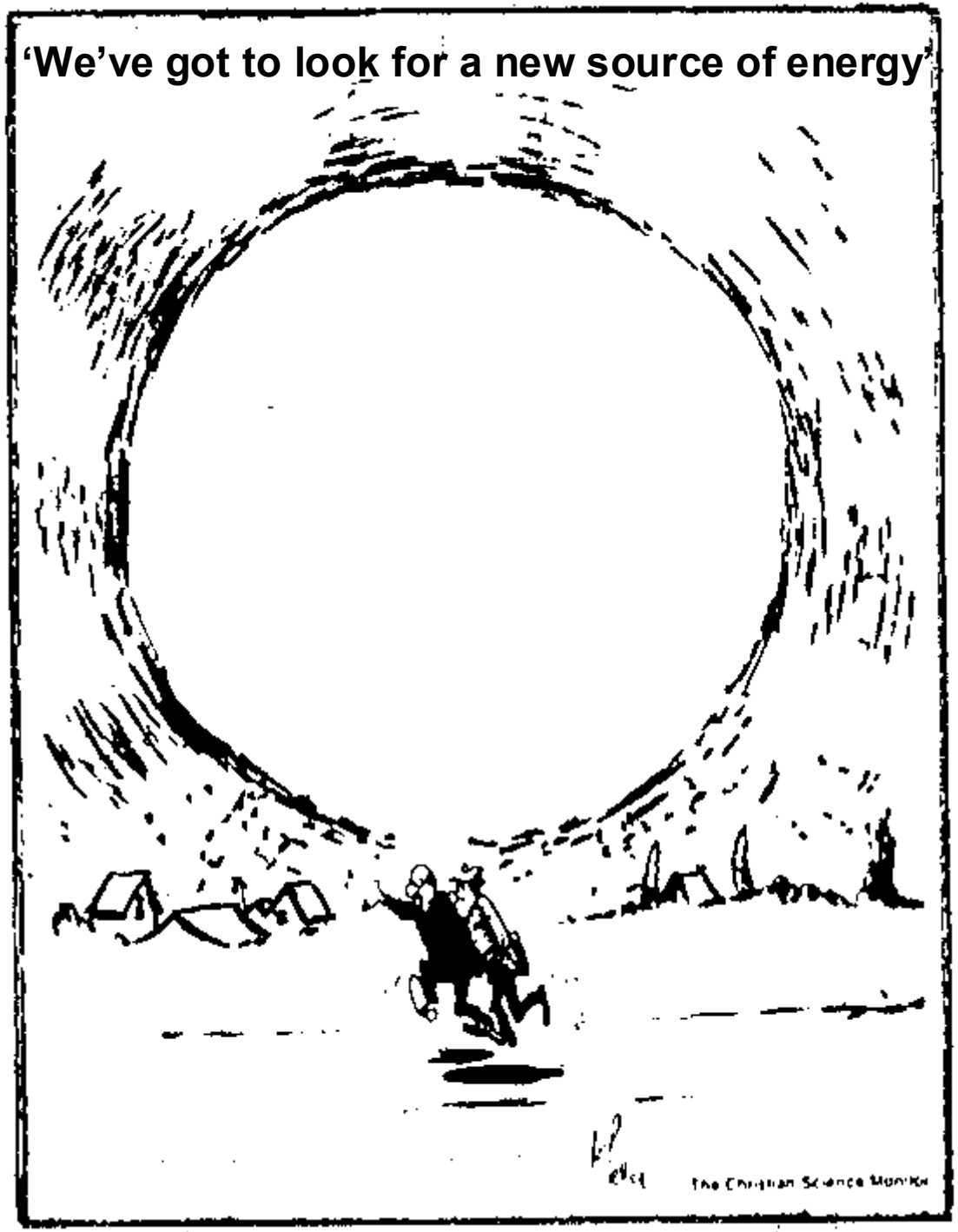



THE DEFORESTATION IS DUE
TO THE GREENBACK EFFECT

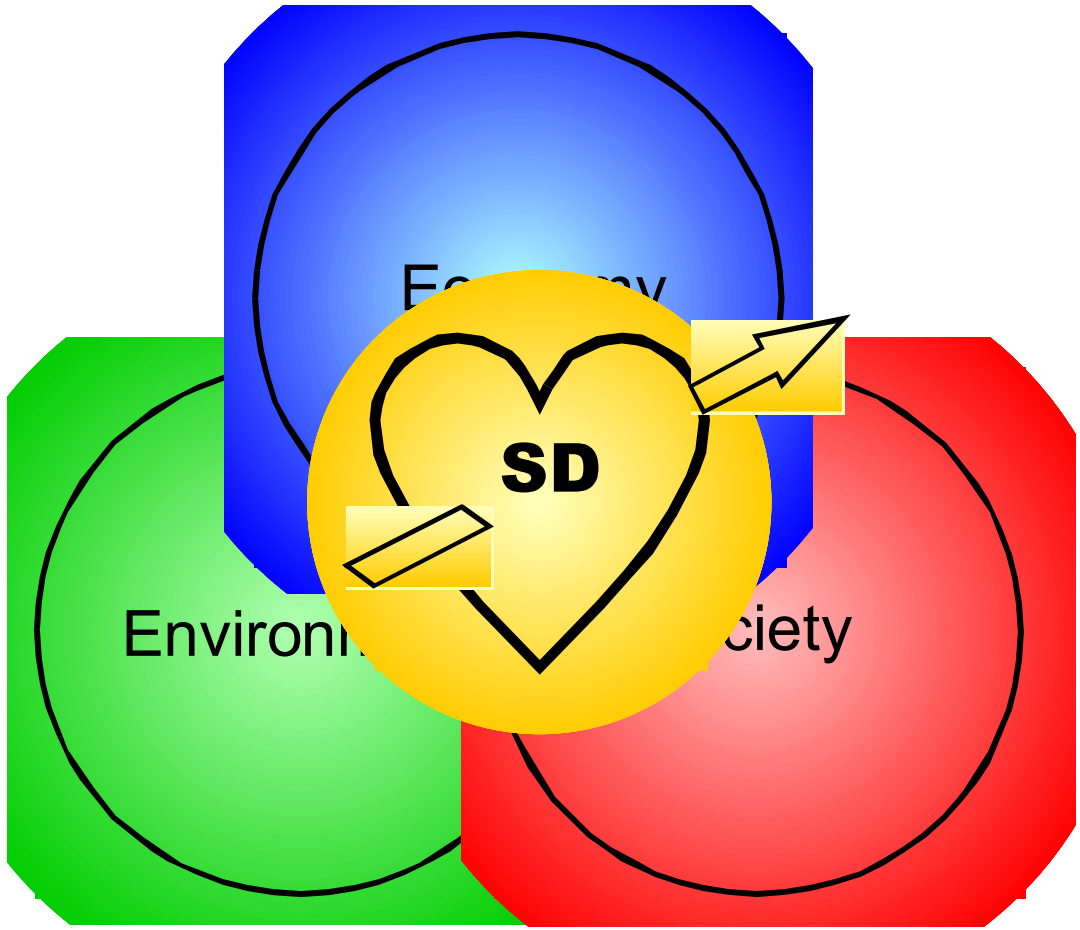
Thermophysical model of the economy



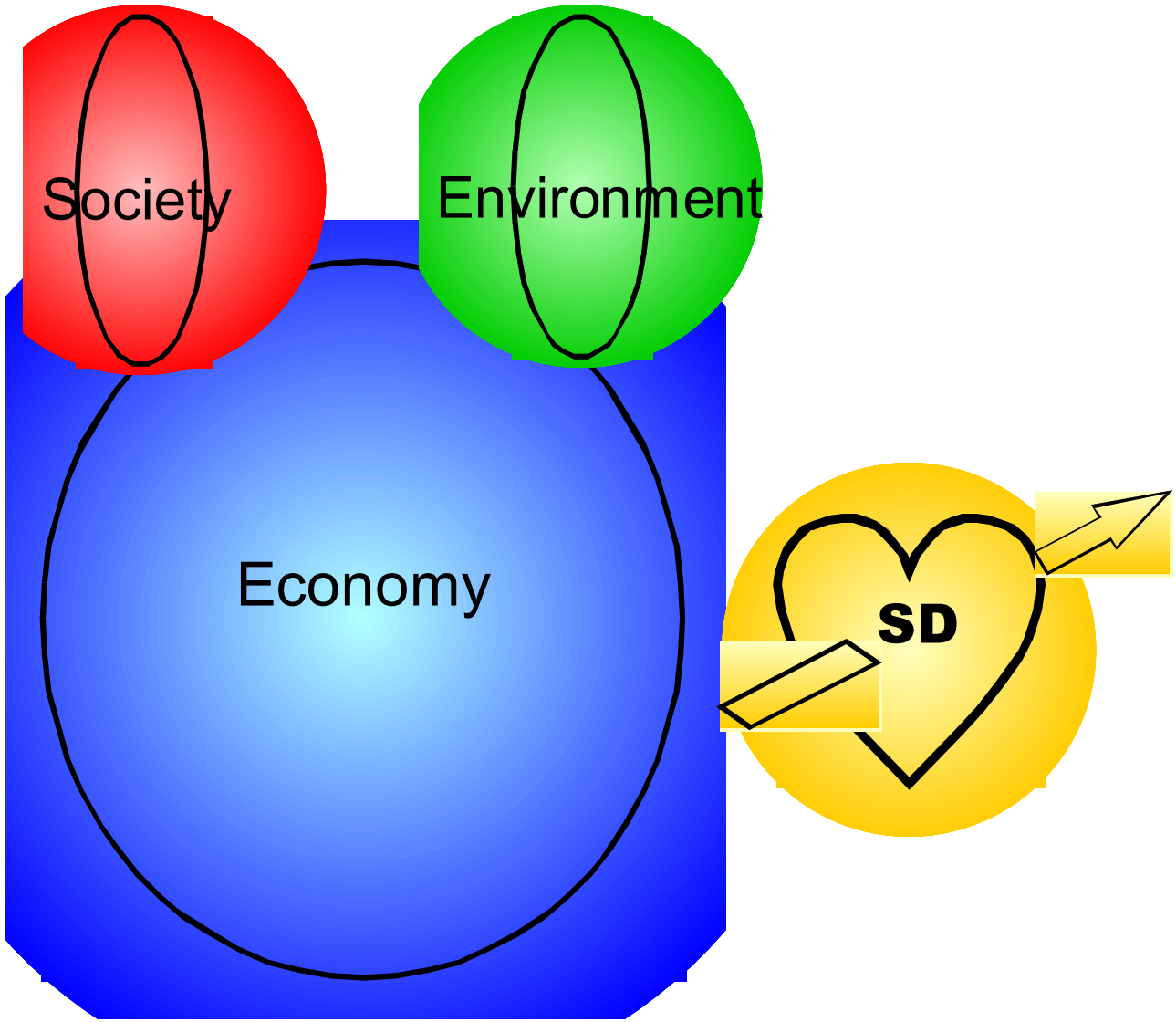
‘We’ve got to look for a new source of energy’



The usual Weak Sustainability model put before us (e.g. Triple Bottom Line)



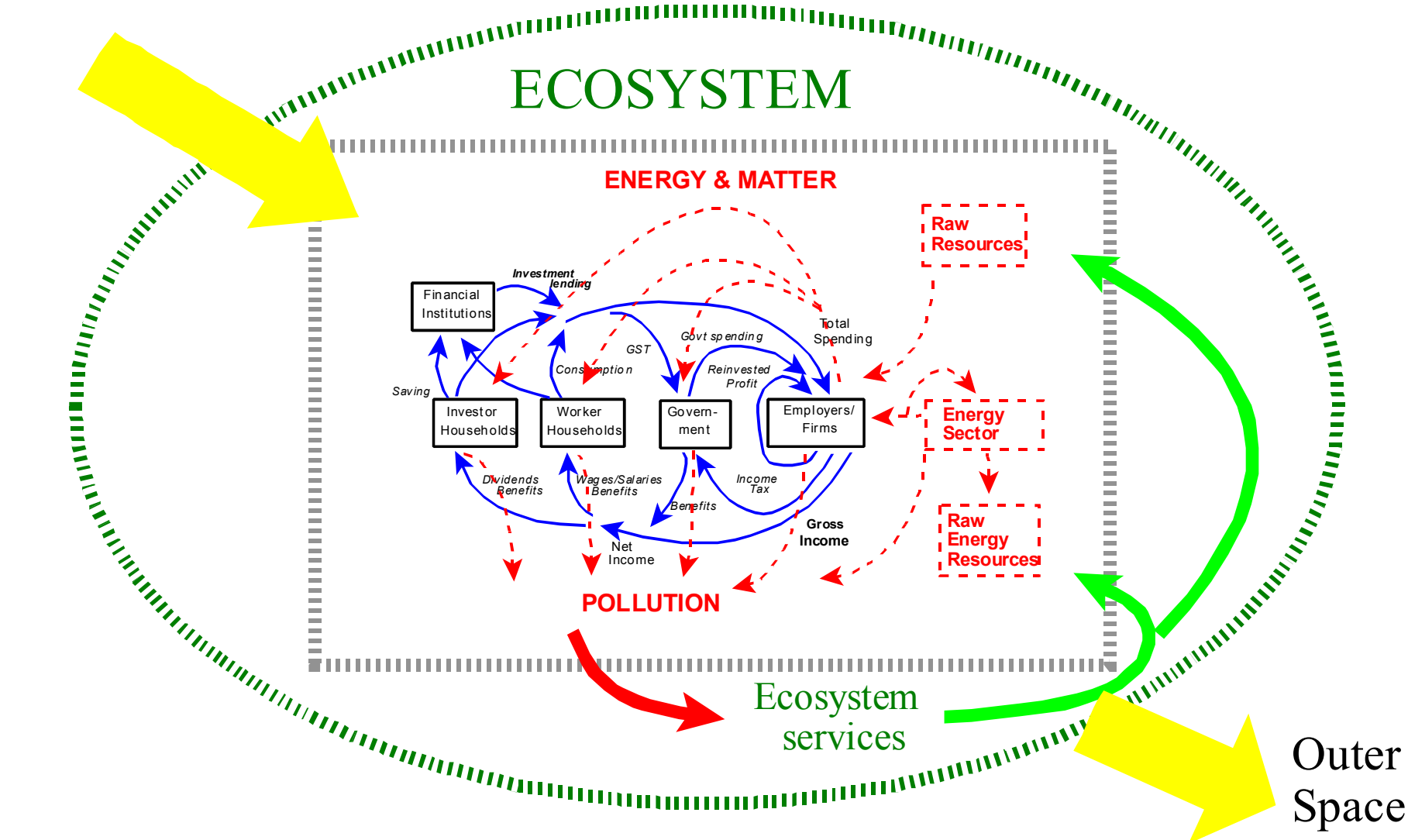
The real situation?



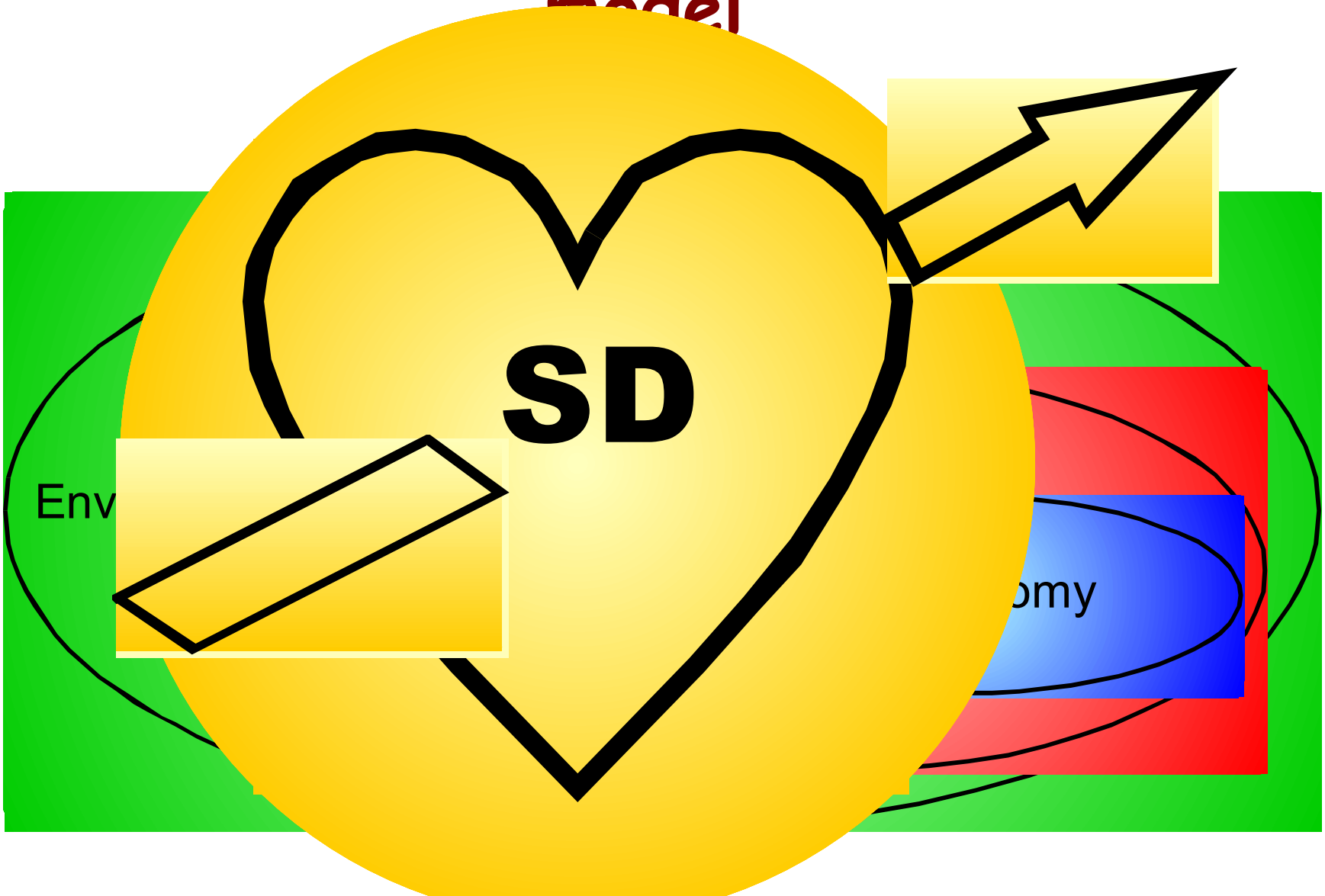

BUY!
CONSUME!
WASTE!!
LET'S GET OUR
ECONOMY
MOVING AGAIN

- There is a clear conceptual gulf between the economic, the ecological and the technological meanings of sustainability itself, and hence of the meaning of sustainable development
- *This gulf must be bridged, as a matter of urgency*
- *Few - if any - governments have a clue how to make the transition to "true" sustainability*

Thermo-biophysical view of the economy

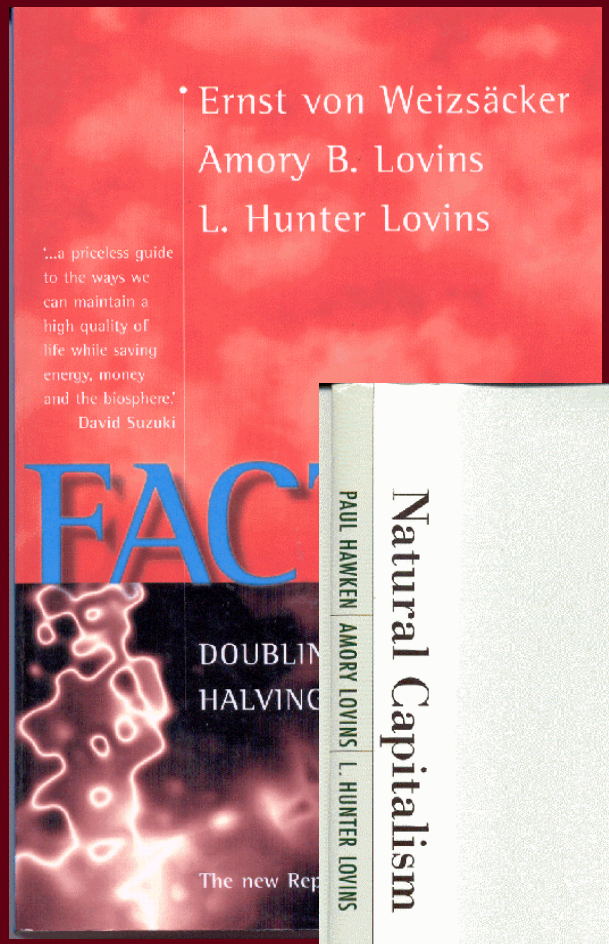


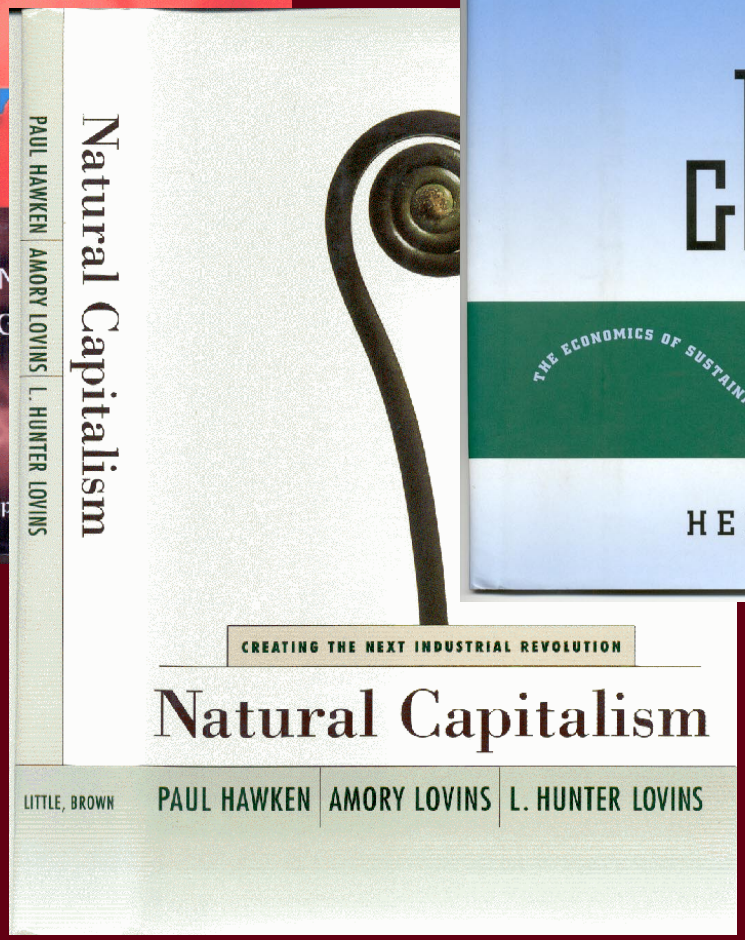
Concentric "strong sustainability" model

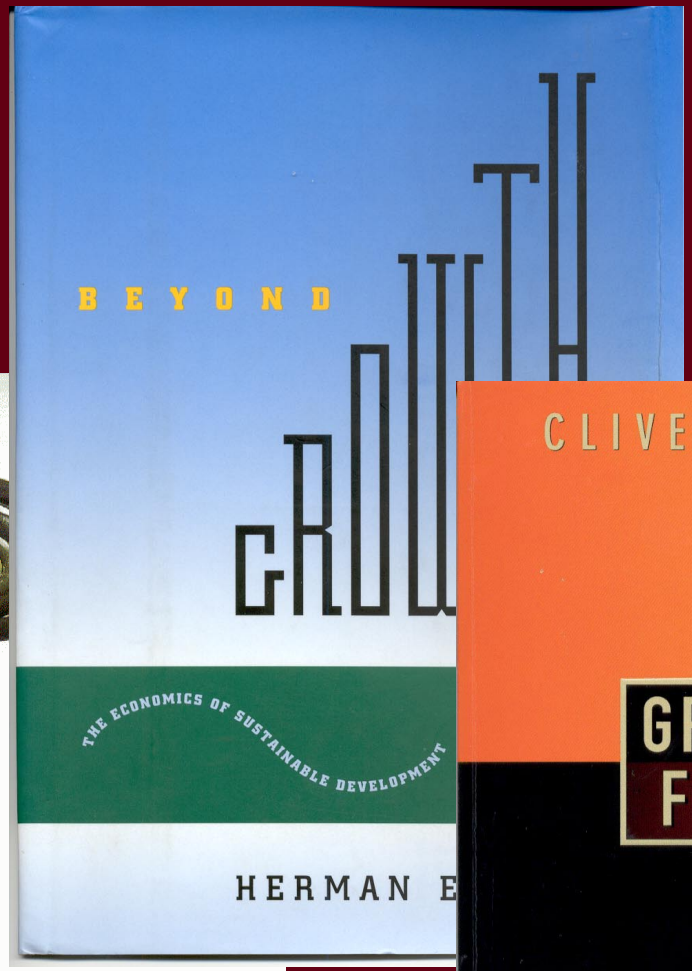


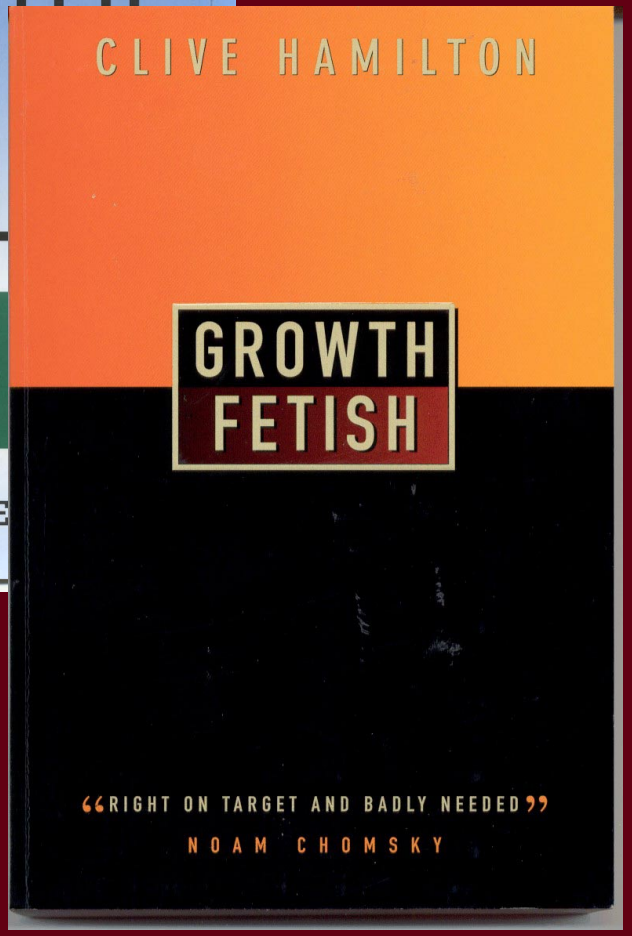
Are there Limits to Eco-efficiency and Green Processing?

- Continuing growth in GDP remains the central preoccupation of governments
- Material and energy inputs per dollar of output (i.e. coefficients) have in many cases been reduced – **not** decoupled
- ***BUT*** – in most cases, *absolute* amounts of resources consumed continue to increase
- ***The global environment is affected by <u>absolute</u> amounts***


Ernst von Weizsäcker
Amory B. Lovins
L. Hunter Lovins
'...a priceless guide to the ways we can maintain a high quality of life while saving energy, money and the biosphere.'
David Suzuki
FACT
DOUBLIN
HALVING
The new Rep


PAUL HAWKEN | AMORY LOVINS | L. HUNTER LOVINS
Natural Capitalism
CREATING THE NEXT INDUSTRIAL REVOLUTION
Natural Capitalism
LITTLE, BROWN
PAUL HAWKEN | AMORY LOVINS | L. HUNTER LOVINS


BEYOND
GROWTH
THE ECONOMICS OF SUSTAINABLE DEVELOPMENT
HERMAN E


CLIVE HAMILTON
GROWTH FETISH
"RIGHT ON TARGET AND BADLY NEEDED"
NOAM CHOMSKY

*De*materialisation of industrial production is not possible; *reduced* materialisation is the best we can hope for.

SO……

- *That to which value is added* must be reduced substantially, ***and***
- *The expectation of perpetual growth in consumption* (as a surrogate for utility) must be changed.
  - HDI? ISEW? GPI? MEP? …… GNH?

The big hard policy problem

Unless the full spectrum of basic human needs worldwide can be satisfied without overloading the global ecosystem's capacity both to supply resources and assimilate wastes, into the indefinite future, SD will remain a dream rather than a realistic policy option.

A much more positive picture of the opportunities for SD emerges if two policy conditions can be satisfied:

1. *Growth in production and consumption of material goods and services (i.e. in GDP) gives way to concentration on satisfying people's material needs materially, and their non-material needs non-materially (GNH?)*
2. *Nonrenewable-resource-intensive and ecologically-damaging processes are replaced by those which are environmentally and socially benign.*

Recasting Daly's hierarchy from Means and Ends to Sacrifice and Satisfaction:

Efficiency = Satisfaction/Eco-Sacrifice

JS Norgard, 2004

- Where Eco-Sacrifice represents the totality of that which is taken (as natural capital) from, or damaged (e.g via pollution) in the surrounding natural ecosystem.
- In practice, this is just as difficult to measure as the Satisfaction of their needs gained by people at the other end of the chain of production/consumption.

Decomposing the Norgard equation:

Overall Efficiency
= Satisfaction/Service
** Service/Stock*
** Stock/Throughput*
** Throughput/Eco-sacrifice*

This equation may be rendered slightly differently as the product of four sub-efficiencies:

Overall Efficiency
= Satisfaction Effy.
** Service Effy.*
** Maintenance Effy.*
** Throughput Effy.*

Improving efficiencies:

- Where the need is for physical goods and services, technology holds the key to improving the separate component efficiencies
- Where the need is for non-material services, low- or non-material means for their satisfaction are valid alternatives.
- Leisure is one important need satisfier, that does not have to have much (or indeed, any) material goods and services input, and is a means whereby human wellbeing can be increased with little or no eco-sacrifice.

Design Concepts & Biomimicry

McDonough et al's Cradle to Cradle Framework promotes the idea of a conceptual shift in engineering design practice towards processes similar to those used in Nature:

> *... away from current industrial system designs which generate toxic, one-way, 'cradle-to-grave' material flows and toward a 'cradle-to-cradle' system powered by renewable energy in which materials flow in safe, regenerative, closed-loop cycles.*

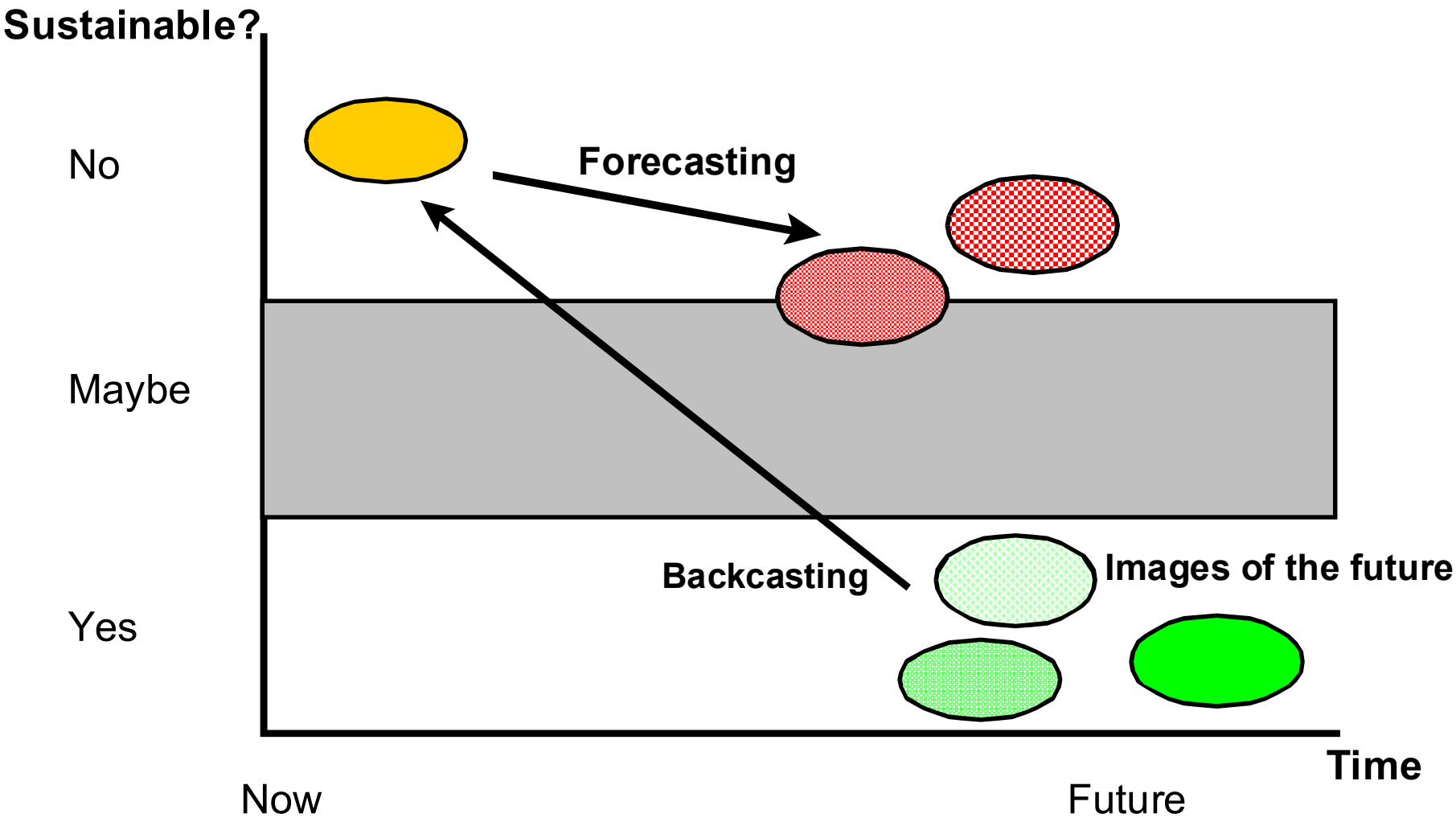
Economic Policy Priorities

In the mainstream (neoclassical) economic approach, a primary purpose of the economy is to achieve (Pareto-efficient) optimal allocation of resources. As Daly (2003) suggests, however, the [real] economic problem is more complex:

- *"A good **allocation** of resources is **efficient** (Pareto optimal);*
- *a good **distribution** of income or wealth is **just** (a limited range of acceptable inequality);*
- *a good **scale** does not generate "bads" faster than goods and is ecologically **sustainable**."*
- ***To bring these 3 together requires a much more sophisticated approach than is possible with present-day policy tools.***

Getting There from Here

Hunhammar, 1999 (after Steen & Akerman, 1994)



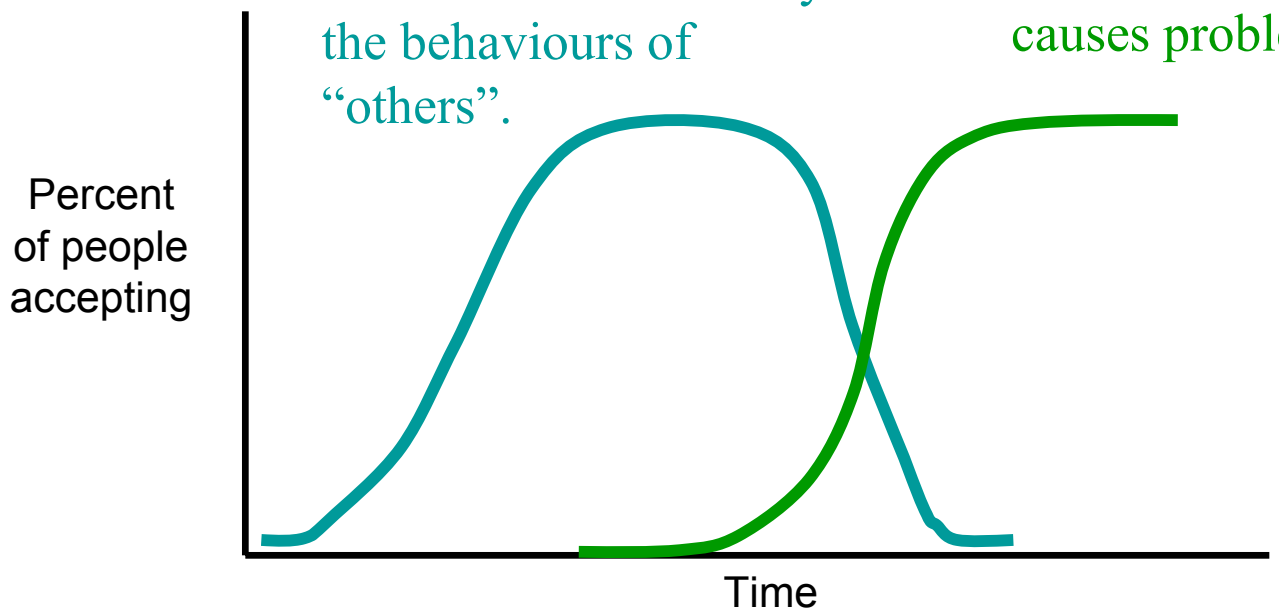
The Big Hard Mindset Change:

- SD is not about economics, science or technology. While all of these can help, none is sufficient to enable us to achieve strong sustainability.
- SD is at base a moral issue, where humans have a vital part to play in helping to ensure sustainability of the total system – including themselves – for generations to come.
- Only if we have such an overarching moral position, expressed in a practical working ethic, can we start to make the far-reaching changes that are needed, in the ground rules of human social and economic behaviour. Political economics has to come on board!

Shifting Mindsets

- Growth is always good.
- Markets alone can solve all problems.
- We are separate from nature.
- Problems are caused by the behaviours of "others".

- We exist in a world of limits.
- Markets don't measure everything that is important.
- We are an integral part of nature.
- Often the structure of systems causes problems.



Dominant Mindset **Emerging Mindset**

Sustainability Institute

Kia ora tatou!