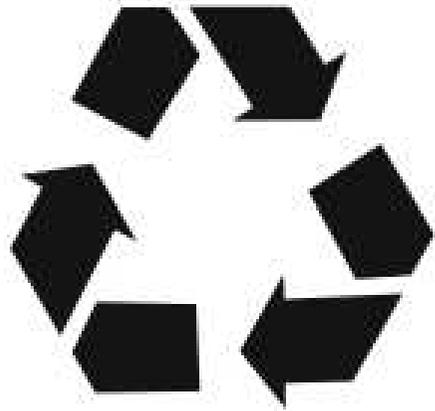
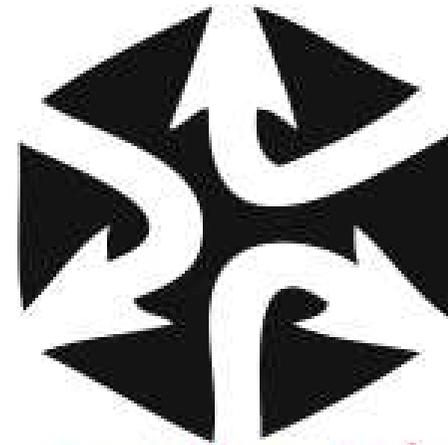


**closing loops**



S E N S E  
& S U S T  
A I N A B  
I L I T Y

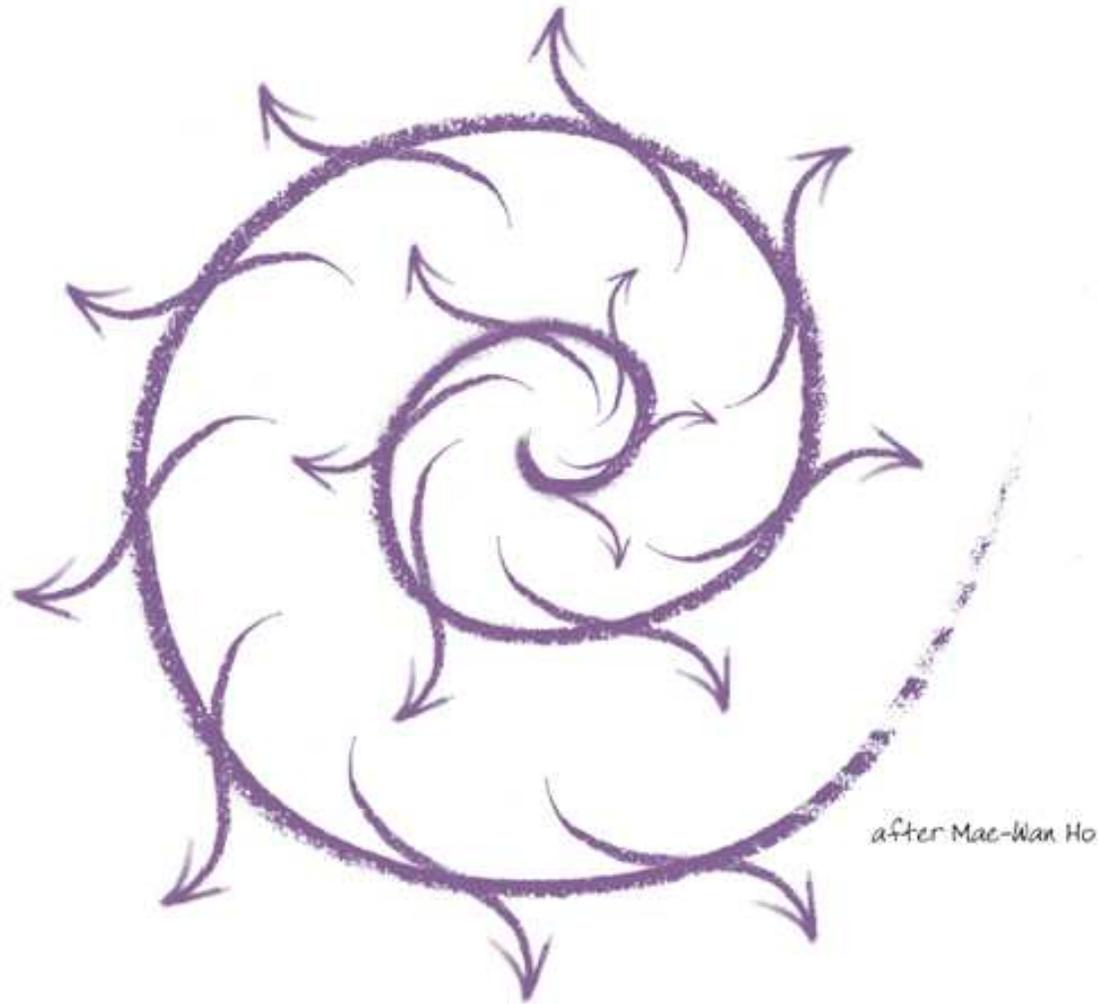


**opening minds**

# George Lakoff

"The mind is inherently embodied.  
Thought is mostly unconscious.  
Abstract concepts are largely  
metaphorical."

*Philosophy in the Flesh*

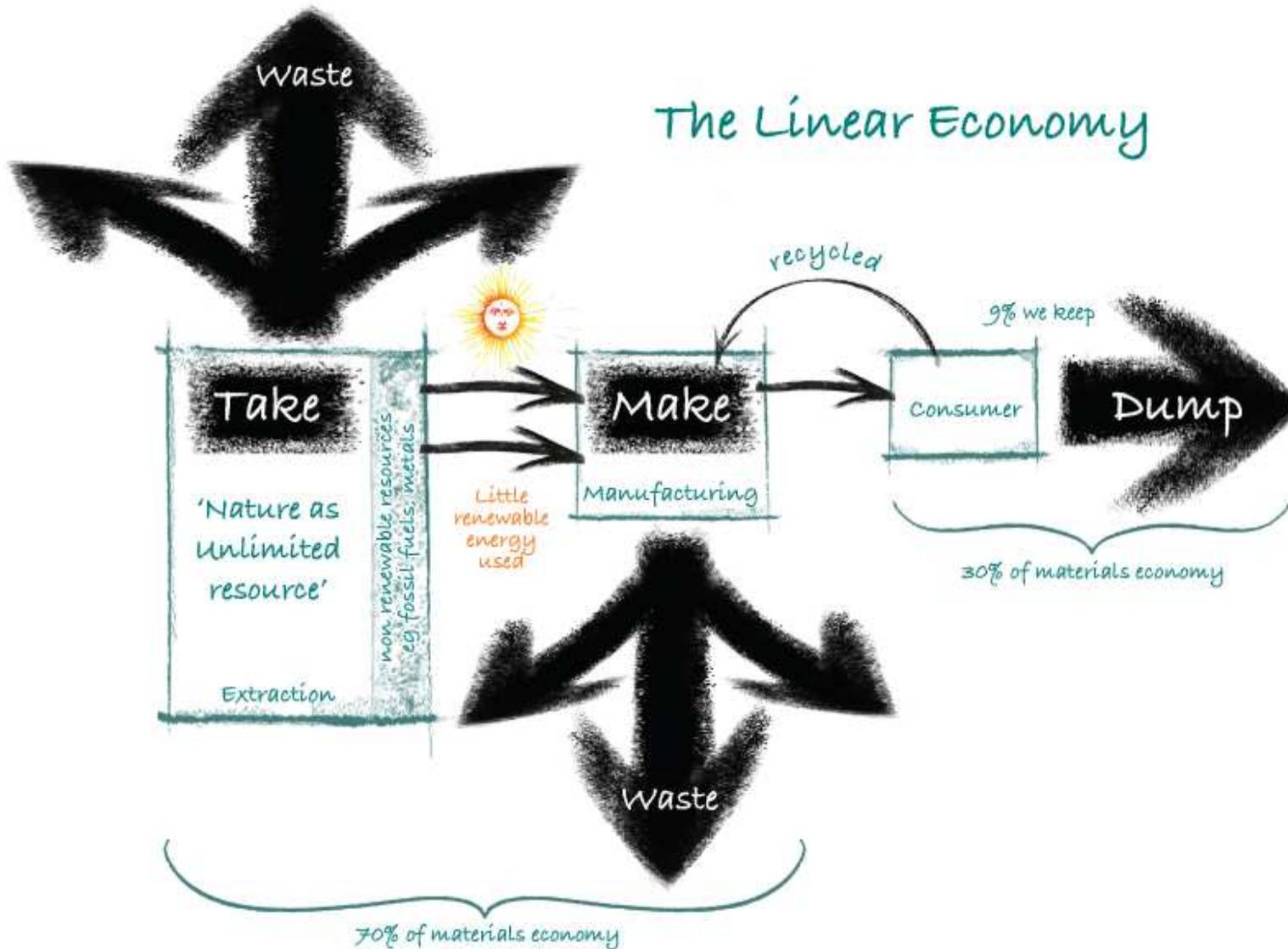


after Mac-Wan Ho

*The dominant economic model of infinite  
unsustainable growth that swallows up the  
earth's resources and exports massive  
amounts of wastes and entropy*

Source: 'Sense and Sustainability - Educating for a low carbon world',  
Ken Webster and Craig Johnson. TerraPreta, 2008

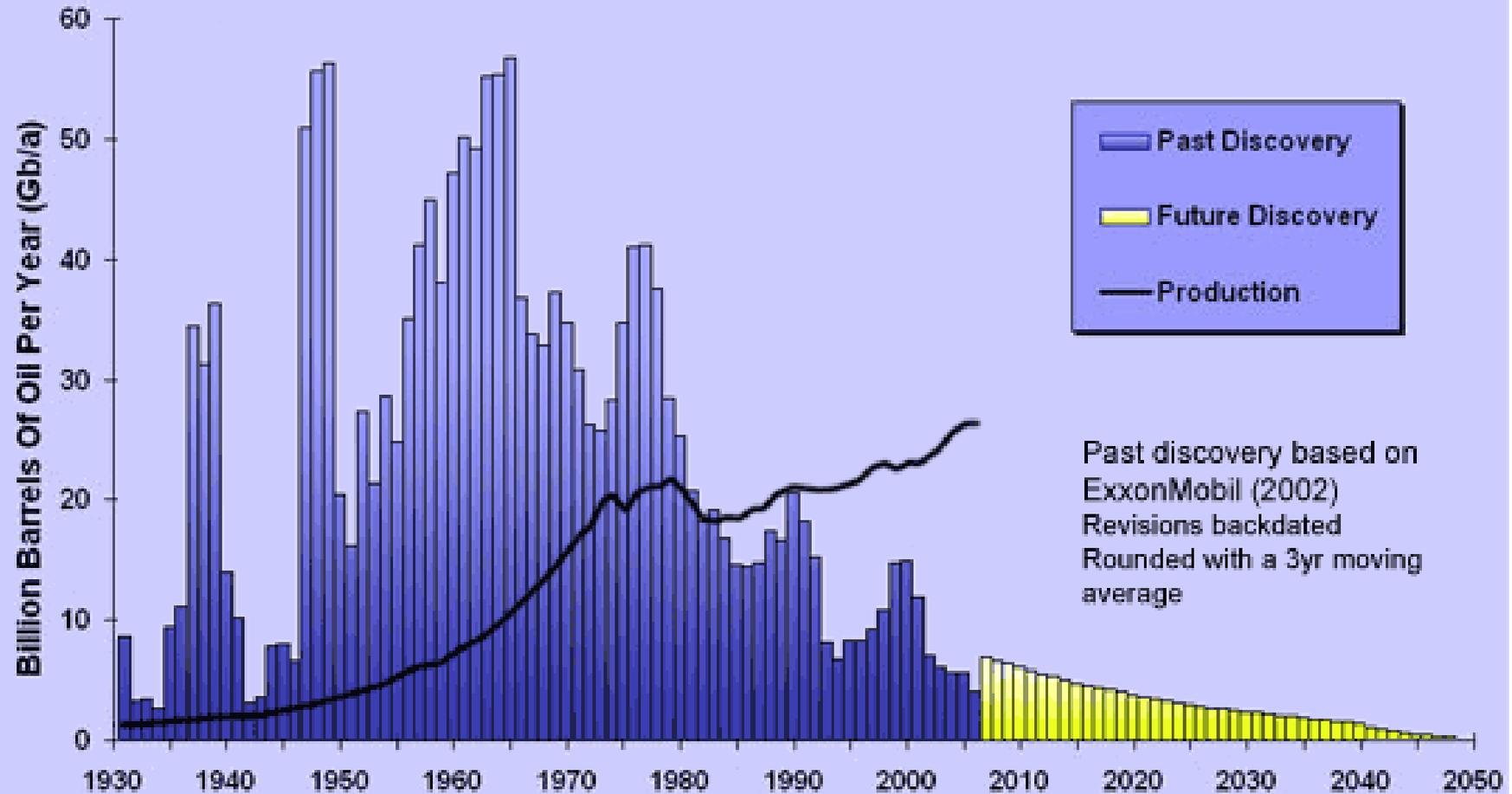
# The Linear Economy



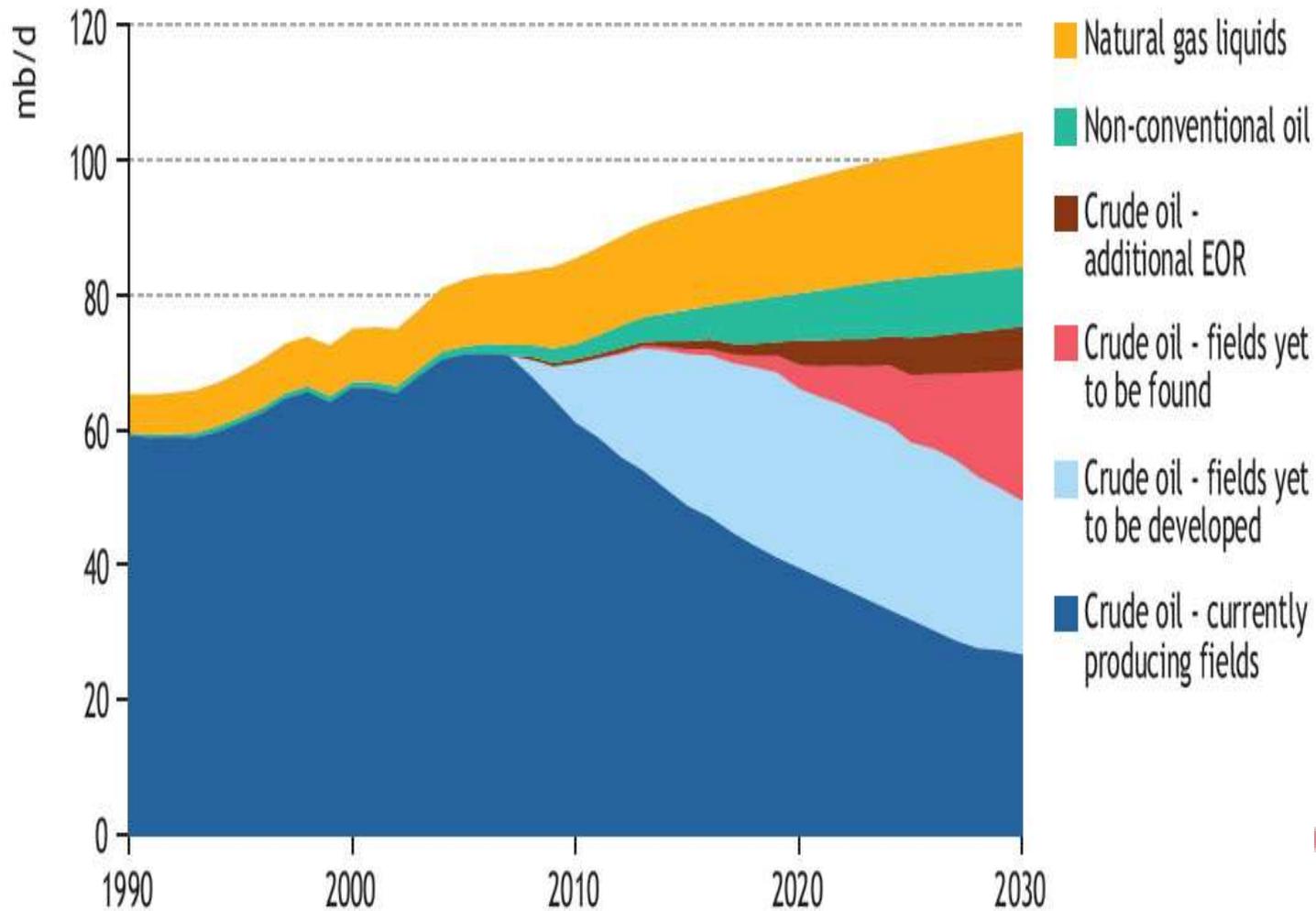


# THE GROWING GAP

## Regular Conventional Oil: Discovery & Production

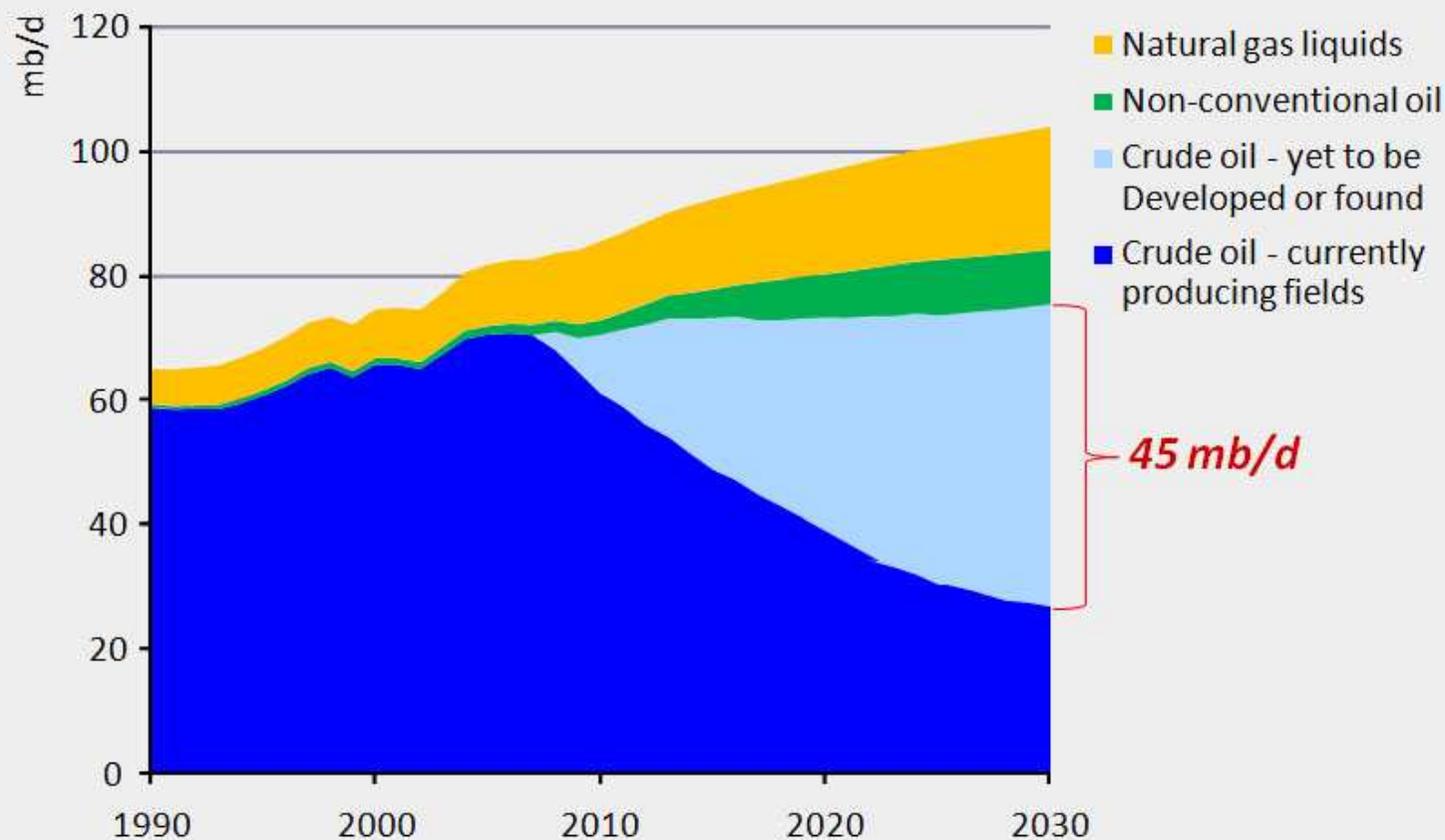


# World Energy Outlook 2008



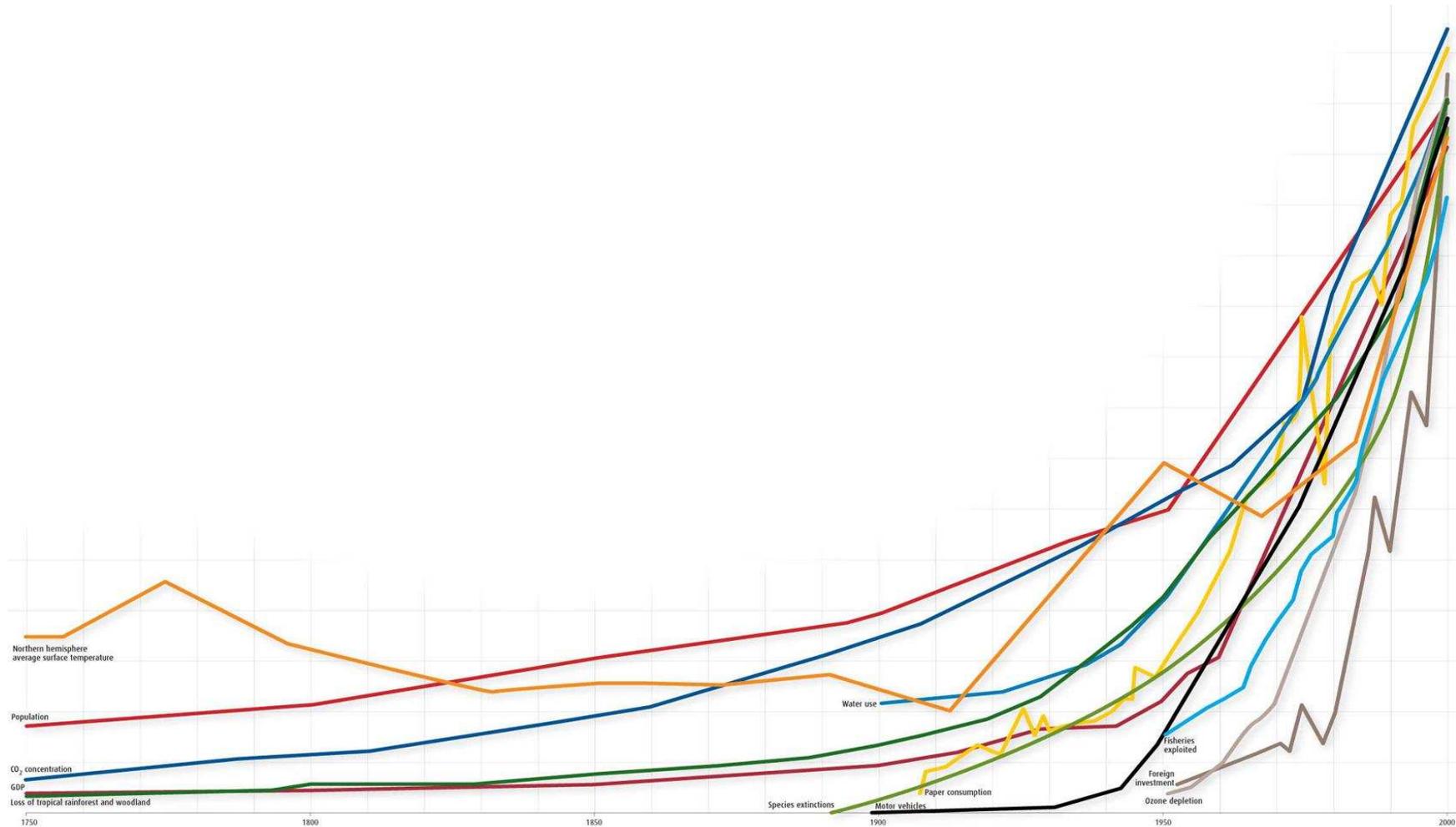
# World oil production by source in the Reference Scenario

World Energy Outlook 2008

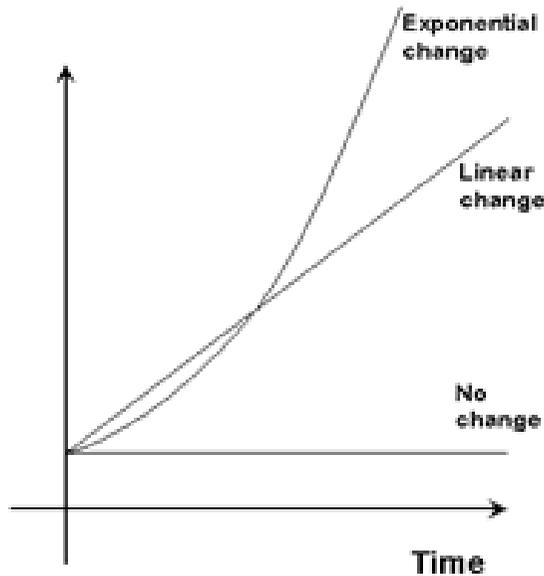


***Even if oil demand was to remain flat to 2030, 45 mb/d of gross capacity – roughly four times the capacity of Saudi Arabia – would be needed just to offset decline from existing fields.***

# Systemic stress



# Change



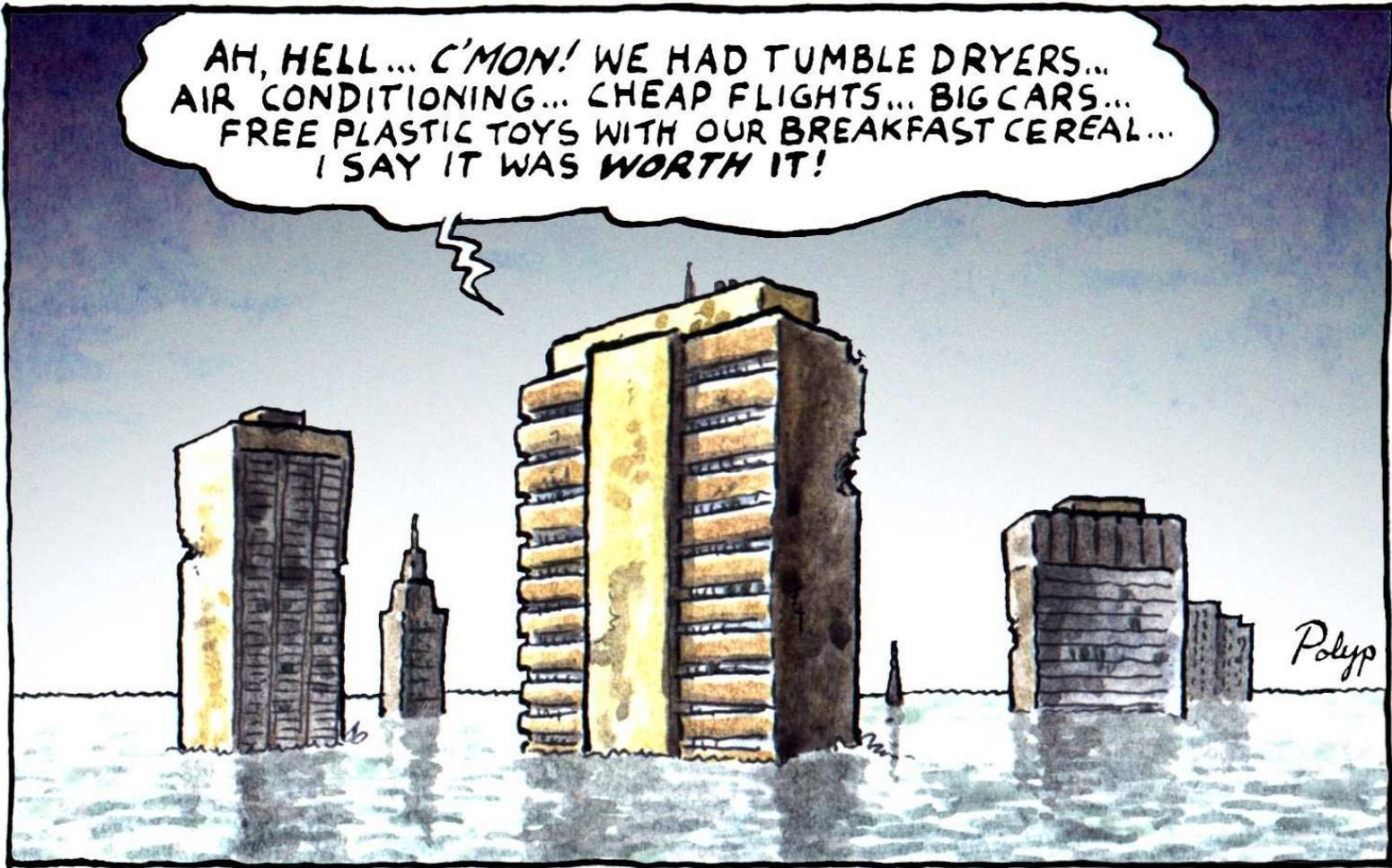
- Most real systems are non linear
- Feedback matters
- Time left for action shortens
- 'Tipping points' uncertain



# End of the line?

- Climate change
- Maximum oil output nearby - 'peak oil'
- Systemic stress - biodiversity, water , food, materials, population etc

AH, HELL... C'MON! WE HAD TUMBLE DRYERS...  
AIR CONDITIONING... CHEAP FLIGHTS... BIG CARS...  
FREE PLASTIC TOYS WITH OUR BREAKFAST CEREAL...  
I SAY IT WAS *WORTH IT!*



# Which way out?

Describe some frameworks for a truly sustainable, prosperous, equity enhancing eco-restorative world.

An impossible question perhaps, but what scenarios are out there?

Are you ready for that task? :-)

# 1. Let the Poor Die

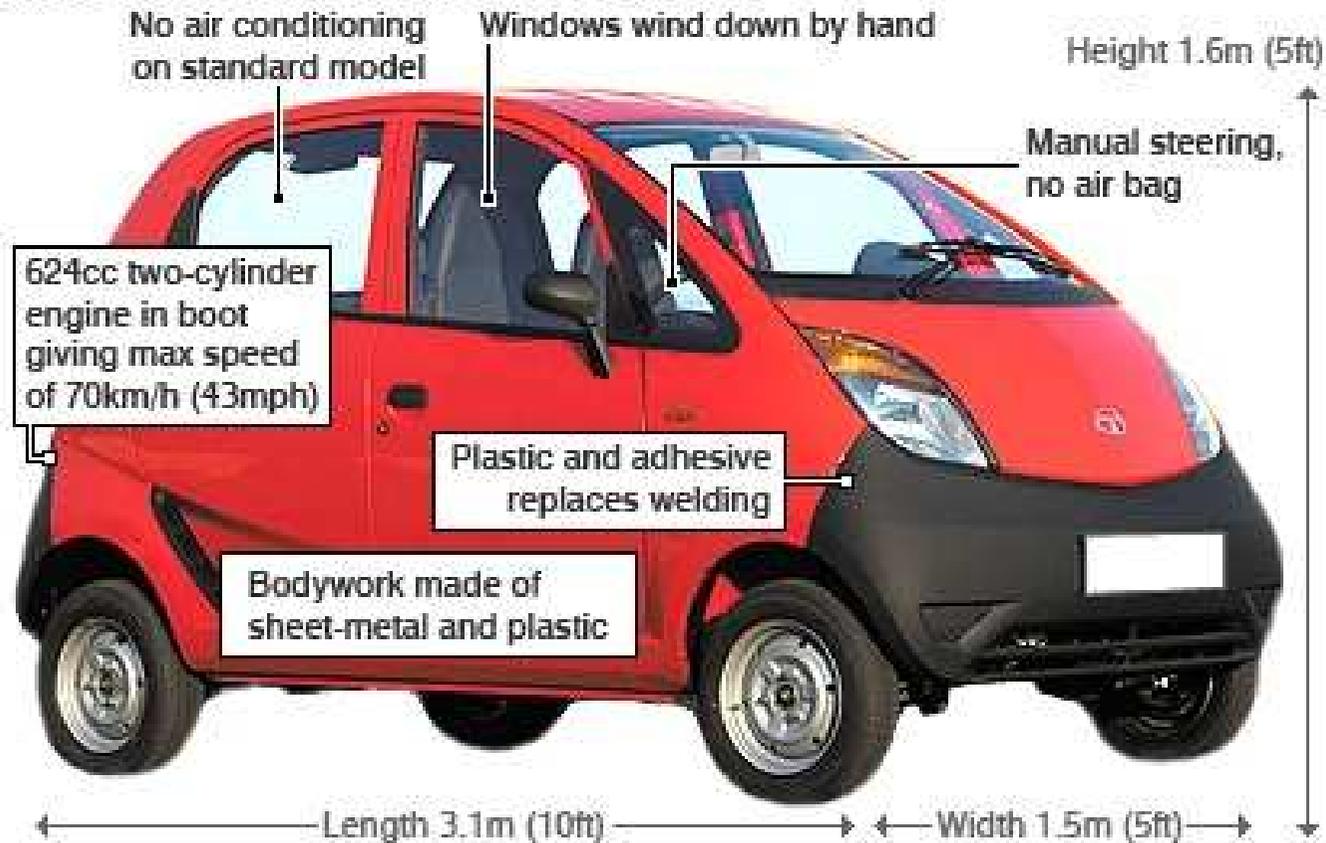


## 2. Do with Less



# 3. Green after Gold

## WHAT MAKES THE TATA NANO SO CHEAP?



## 4. Revenge of Gaia



## 5. Going Back



# A Changed Worldview?

- If the machine inspired the industrial age, the image of the living system may inspire a genuine postindustrial age,' say *Peter Senge et al.*, in *Sloan Management Review*.
- You never change things by fighting against the existing reality. To change something, build a new model that makes the old model obsolete. - *Buckminster Fuller*

# Spoilers

- Jevons' Paradox
  - Recycling or *downcycling*?
  - Carbon negative?
  - Prisoners' Dilemma
  - Earth in oUR hands?
  - Debt and Interest driven
- 
- Reassess choices

# Efficiency?

Without a fundamental rethinking of the structure and the reward system of commerce, narrowly focused eco-efficiency could be a disaster for the environment by overwhelming resource savings with even larger growth in the production of the wrong products, produced by the wrong processes, from the wrong materials, in the wrong place, at the wrong scale and delivered using the wrong business models.

With so many wrongs outweighing one right, *more efficient production by itself could become not the servant but the enemy of a durable economy.*

InterfaceFlor [manufacturers of flooring]





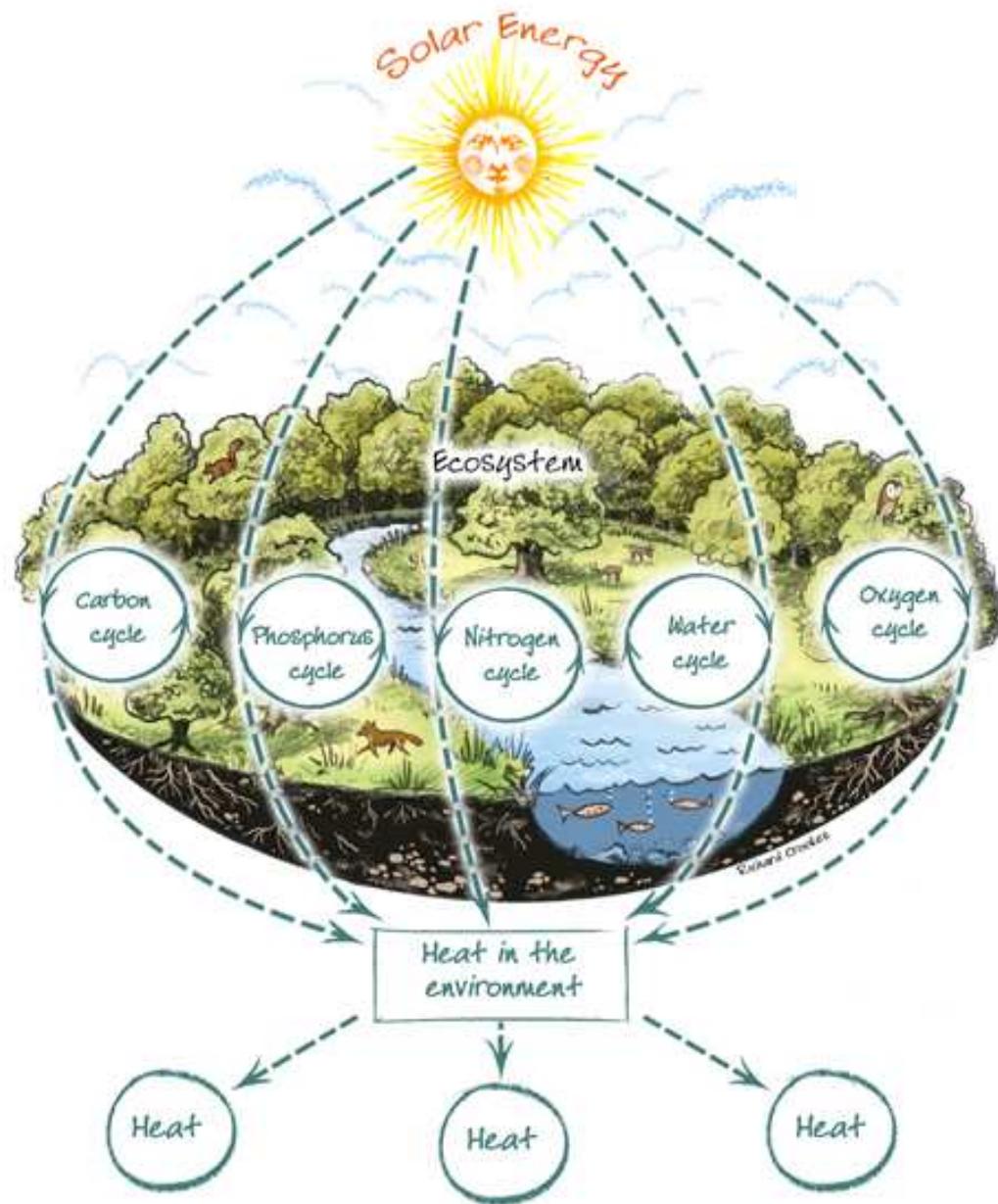
## Prisoner's Dilemma in environmental contexts

		Behaviour of other individuals	
		Env. friendly (Ecological)	Env. unfriendly (Unecological)
Individual Behaviour	Env. friendly (Ecological)	I U 30 C 20 B +10	III U 0 C 20 B -20
	Env. unfriendly (Unecological)	II U 30 C 0 B +30	IV U 0 C 0 B 0

# Learning

- First-order : adaptive learning , takes place within accepted boundaries – leaves basic values and beliefs unchanged.
- Second-order: critically reflective learning, when we examine the assumptions according to which we proceed in first-order learning.
- Third-order: when this reflective examination leads to a transformative perspective-shift.

(Steven Sterling)



Source: 'Sense and Sustainability - Educating for a low carbon world',  
 Ken Webster and Craig Johnson. TerraPreta, 2008

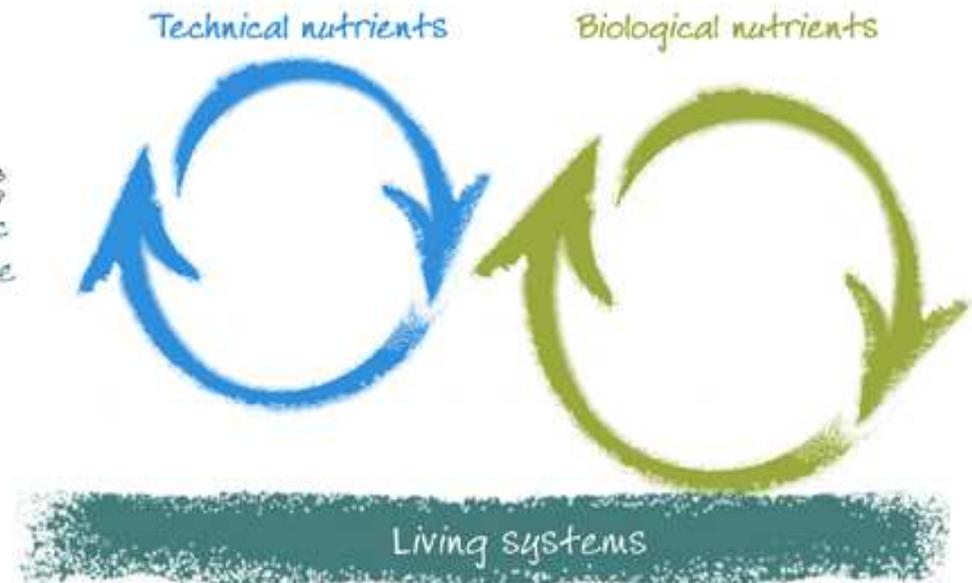
Lets think of a cherry tree



## 'Linear economy'

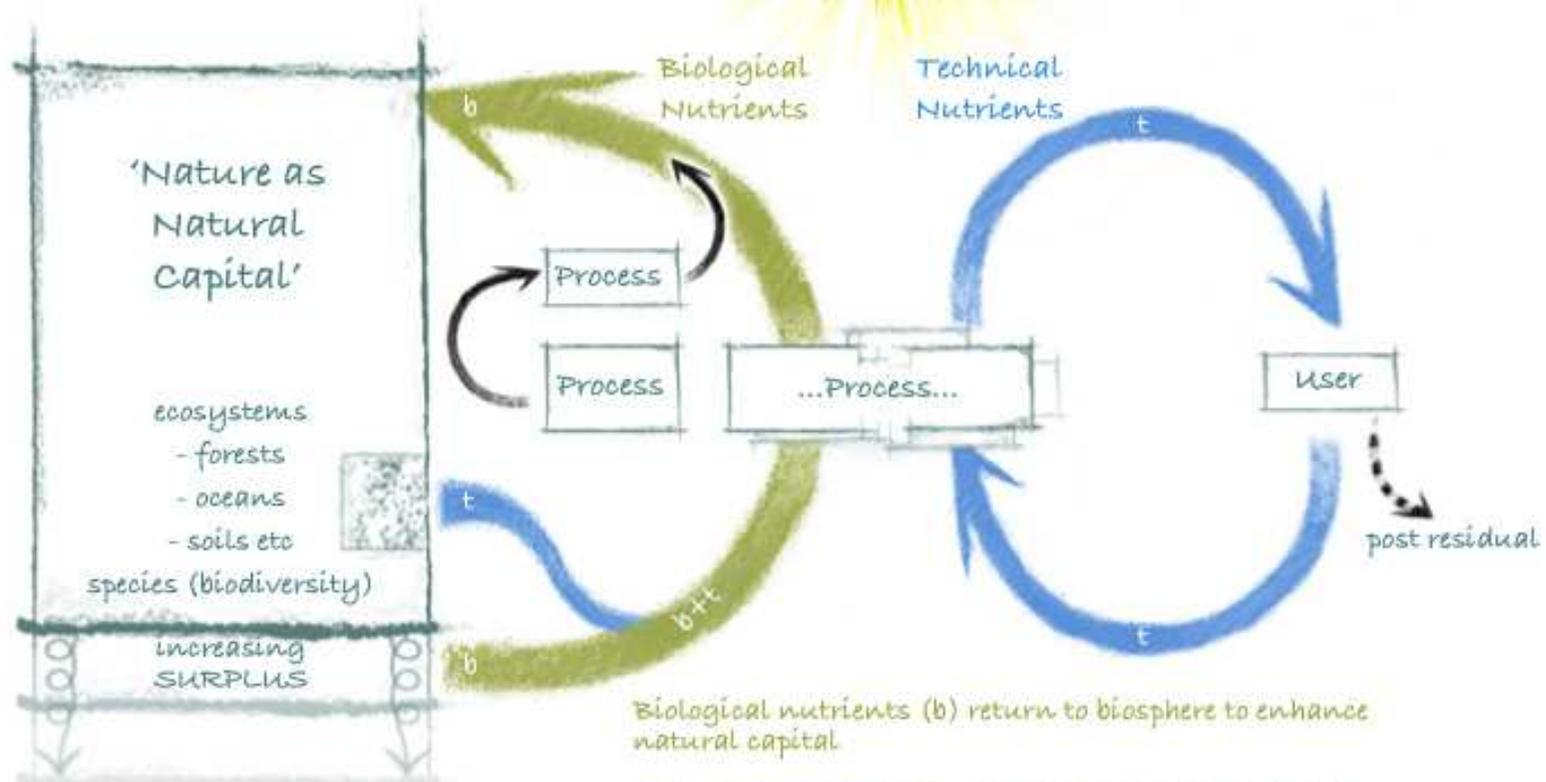


## 'Circular economy'



after W. McDonough and M. Braungart

# A Circular Economy (where waste = food)



= non renewable resources eg fossil fuels, metals

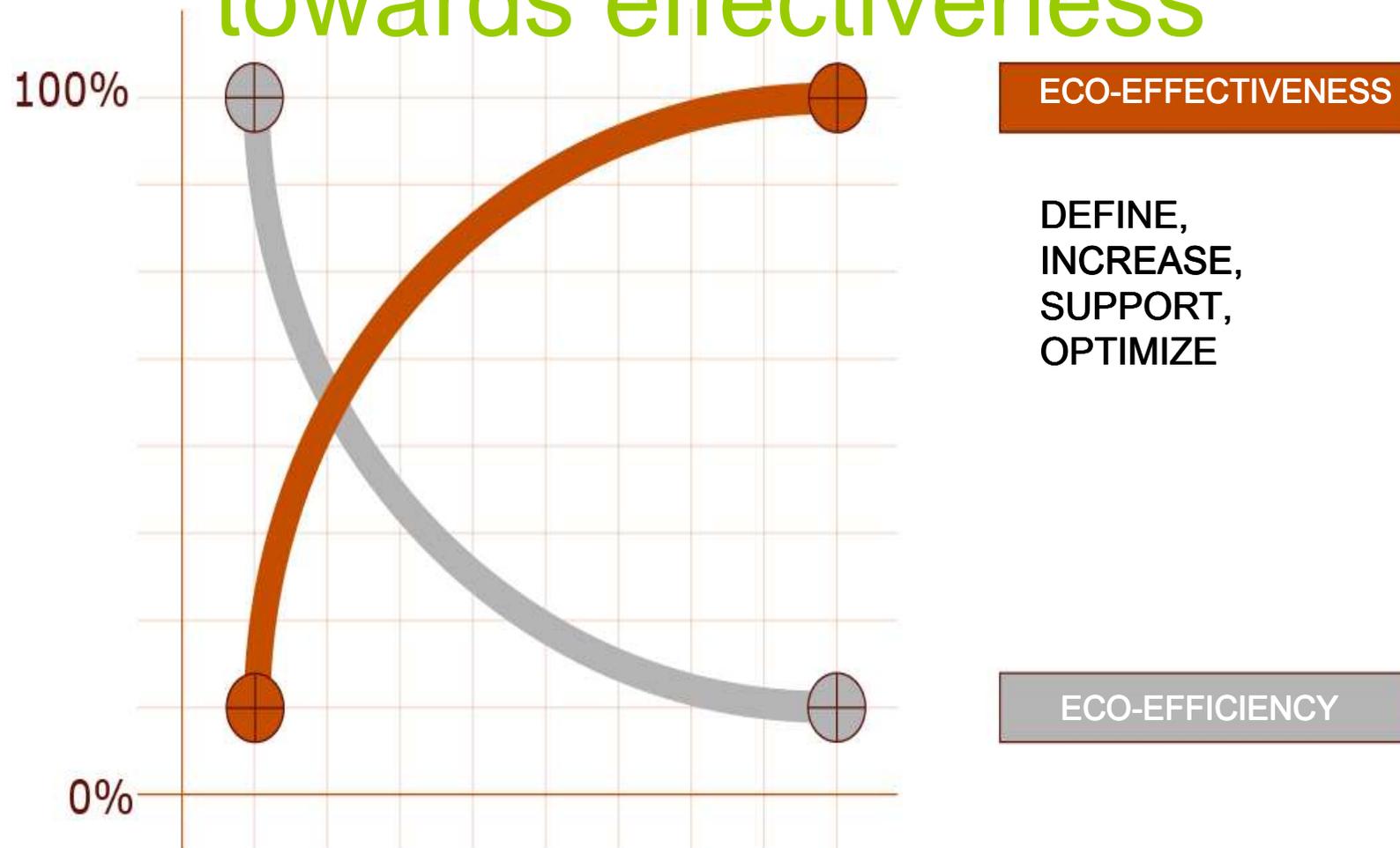
Biological nutrients (b) return to biosphere to enhance natural capital.

Technical nutrients (t) are metals, plastics and other non-compostible materials which circulate from user (consumer) to manufacturers

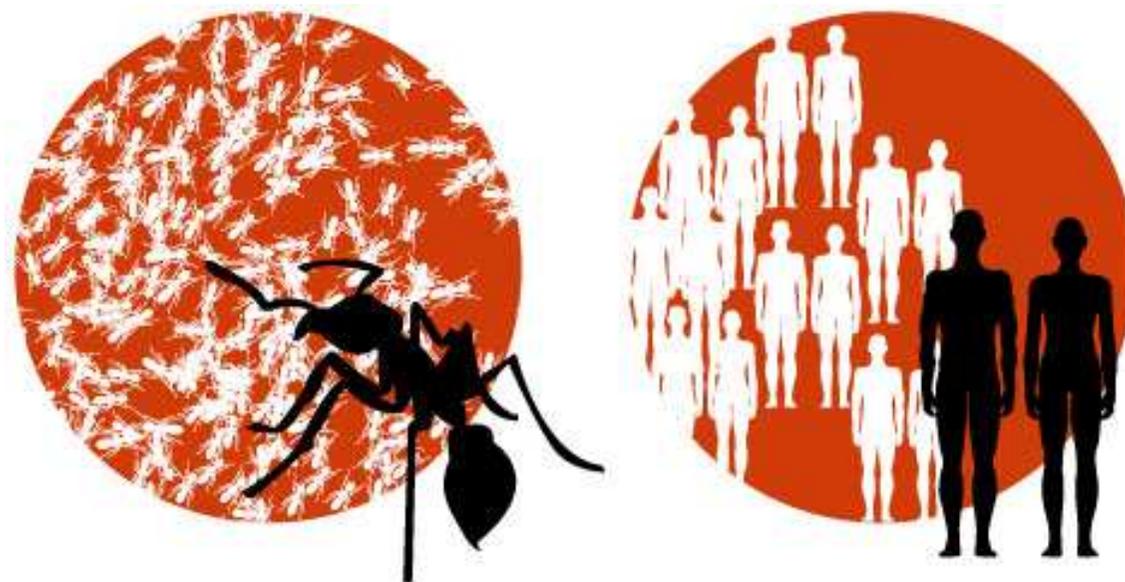
after W. McDonough and M. Braungart

Source: 'Sense and Sustainability - Educating for a low carbon world', Ken Webster and Craig Johnson. TerraPreta, 2008

# Cradle to Cradle is working towards effectiveness



THE BIOMASS OF ANTS IS FOUR TIMES GREATER THAN THAT OF HUMANS

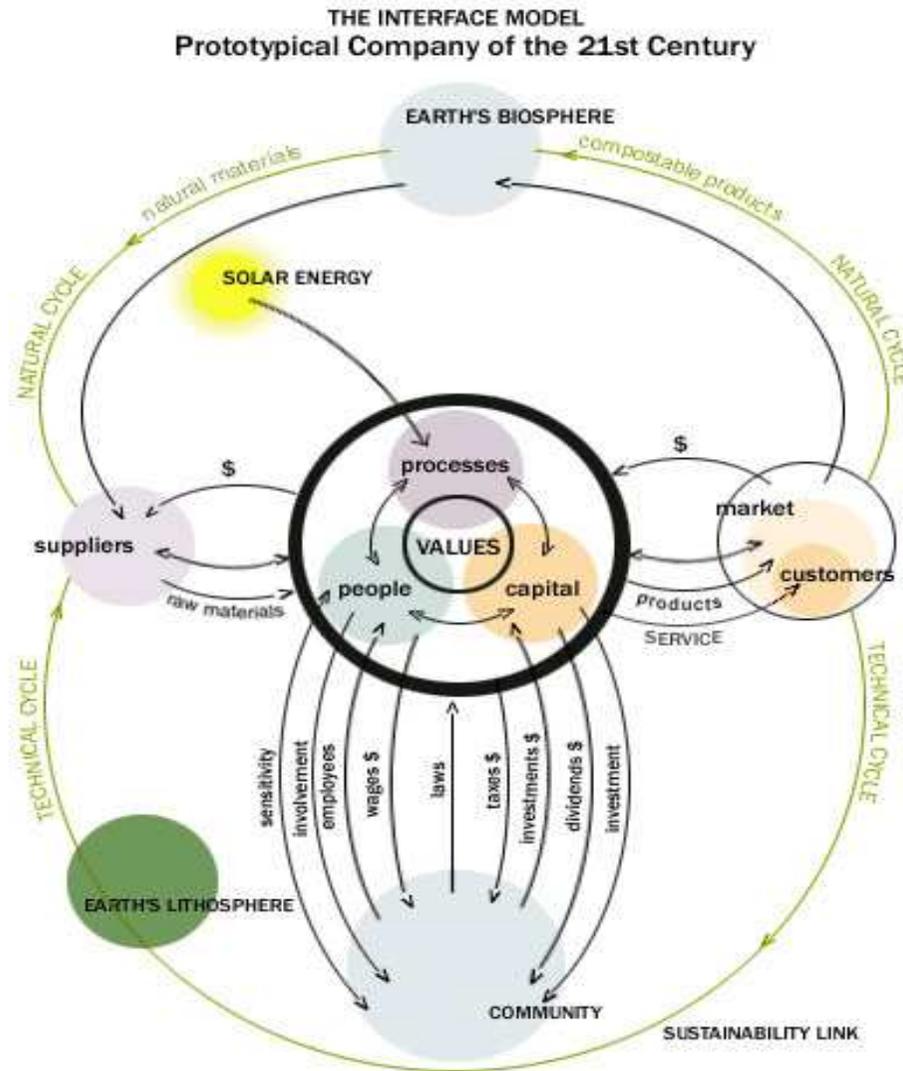






# Everything connects

- a 'prototypical company of the 21<sup>st</sup> century'... Biosphere, Lithosphere, Customers, Profit, Values



# creating a 'closed loop' economy



## NATURE AS MODEL



Biomimicry is a new science that studies nature's models and then imitates or takes inspiration from these designs and processes to solve human problems.

## NATURE AS MENTOR



Biomimicry is a new way of viewing and valuing nature. It introduces an era based not on what we can extract from the natural world, but on what we can learn from it.

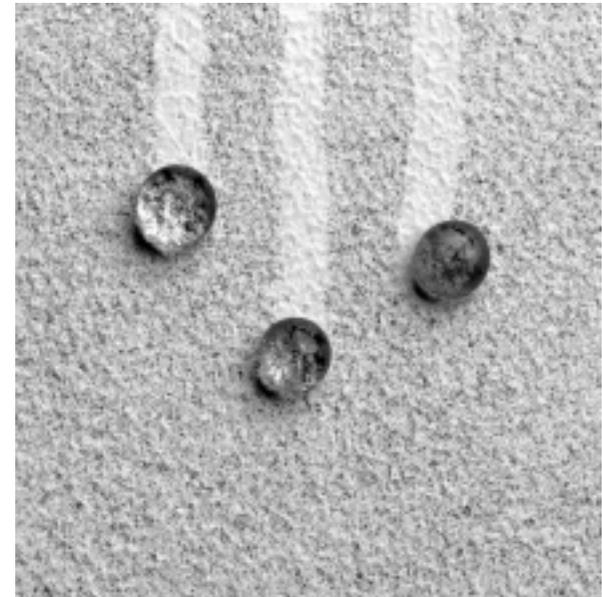
## NATURE AS MEASURE



Biomimicry uses an ecological standard to judge our innovations. After 3.8 billion years of evolution, nature has learned: What works. What lasts.



# Lotus detail

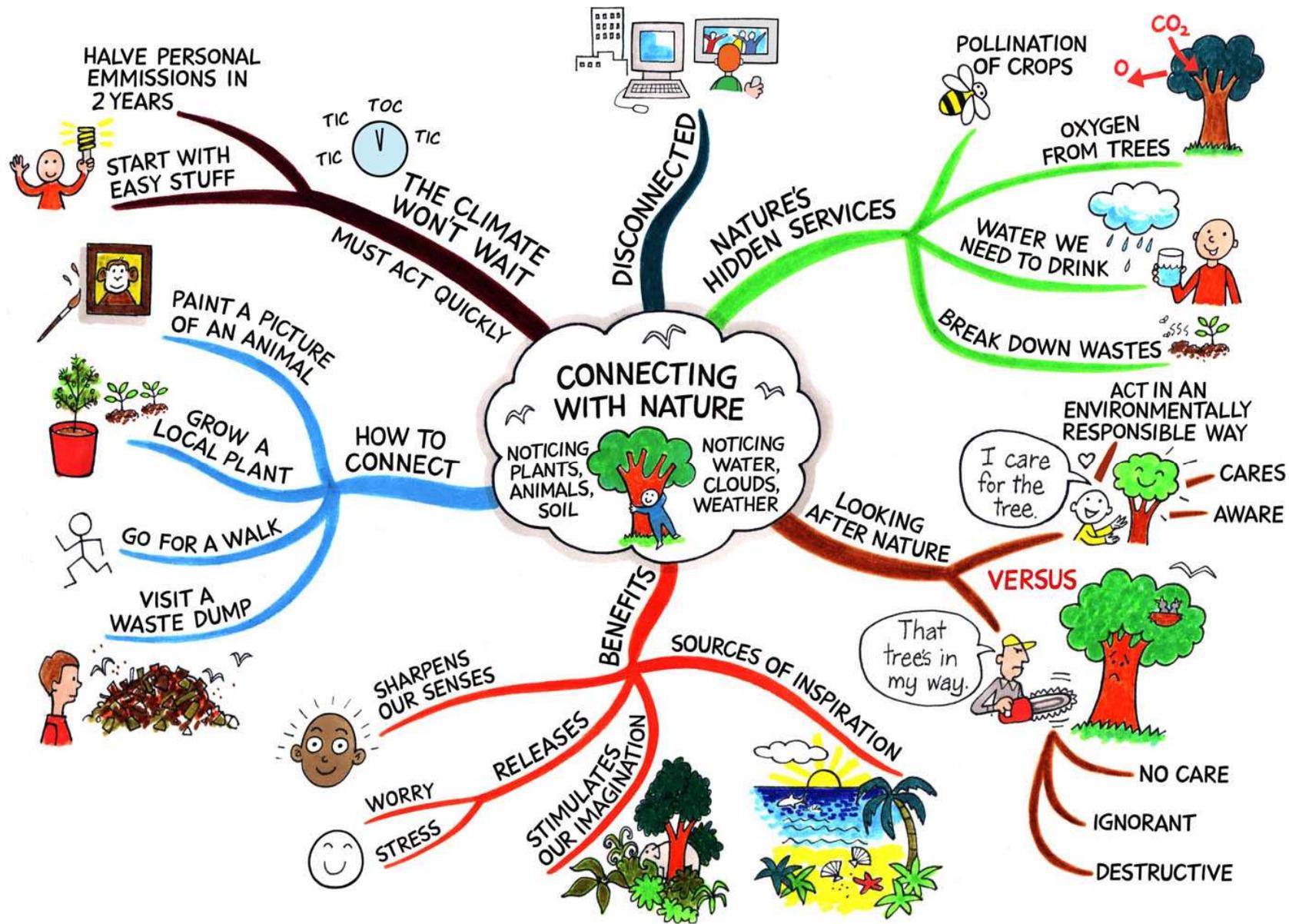




Old

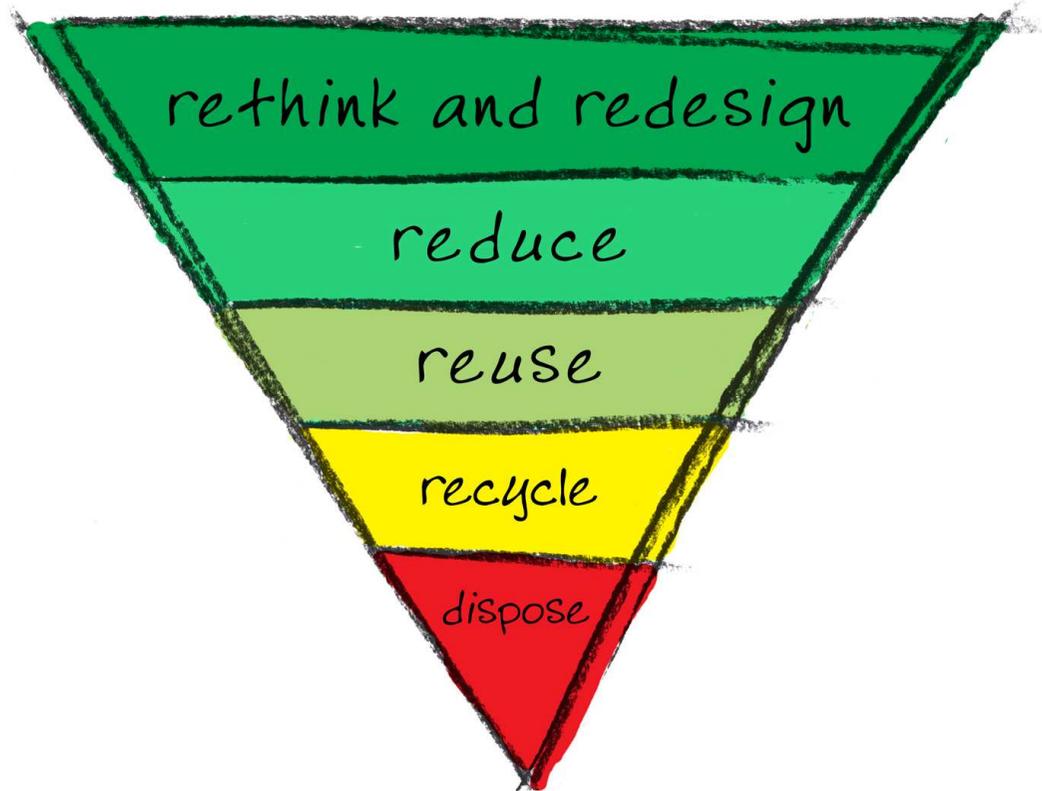
new  
(they mimicked)

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.



# And education?

- Can educational process continue to be dominated by a linear and fragmentary approach in a world increasingly operating in recognition of systems, connection and feedback?
- How we teach will need to reflect a changing worldview if it is not to become 'disconnected'
- Do we have an obligation to accelerate such change? Surely education needs to lead??

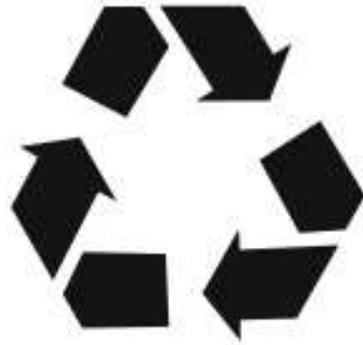


# A conversation too far?

One result of formal education is that students graduate without knowing how to think in whole systems, how to find connections, how to ask big questions, and how to separate the trivial from the important. Now more than ever, however; we need people who think broadly and who understand systems, connections, patterns and root causes.

David Orr [Earth in Mind](#)

**closing loops**



SENSE  
& SUST  
AINAB  
ILITY



**opening minds**

# PS. Discussing Radical Change

". . it is worth discussing radical changes, not in the expectation that they will be adopted promptly but for two other reasons. One is to construct an ideal goal, so that incremental changes can be judged by whether they move the institutional structure toward or away from that ideal. The other reason is very different. It is so that if a crisis requiring or facilitating radical change does arise, alternatives will be available that have been carefully developed and fully explored."

Milton Friedman