



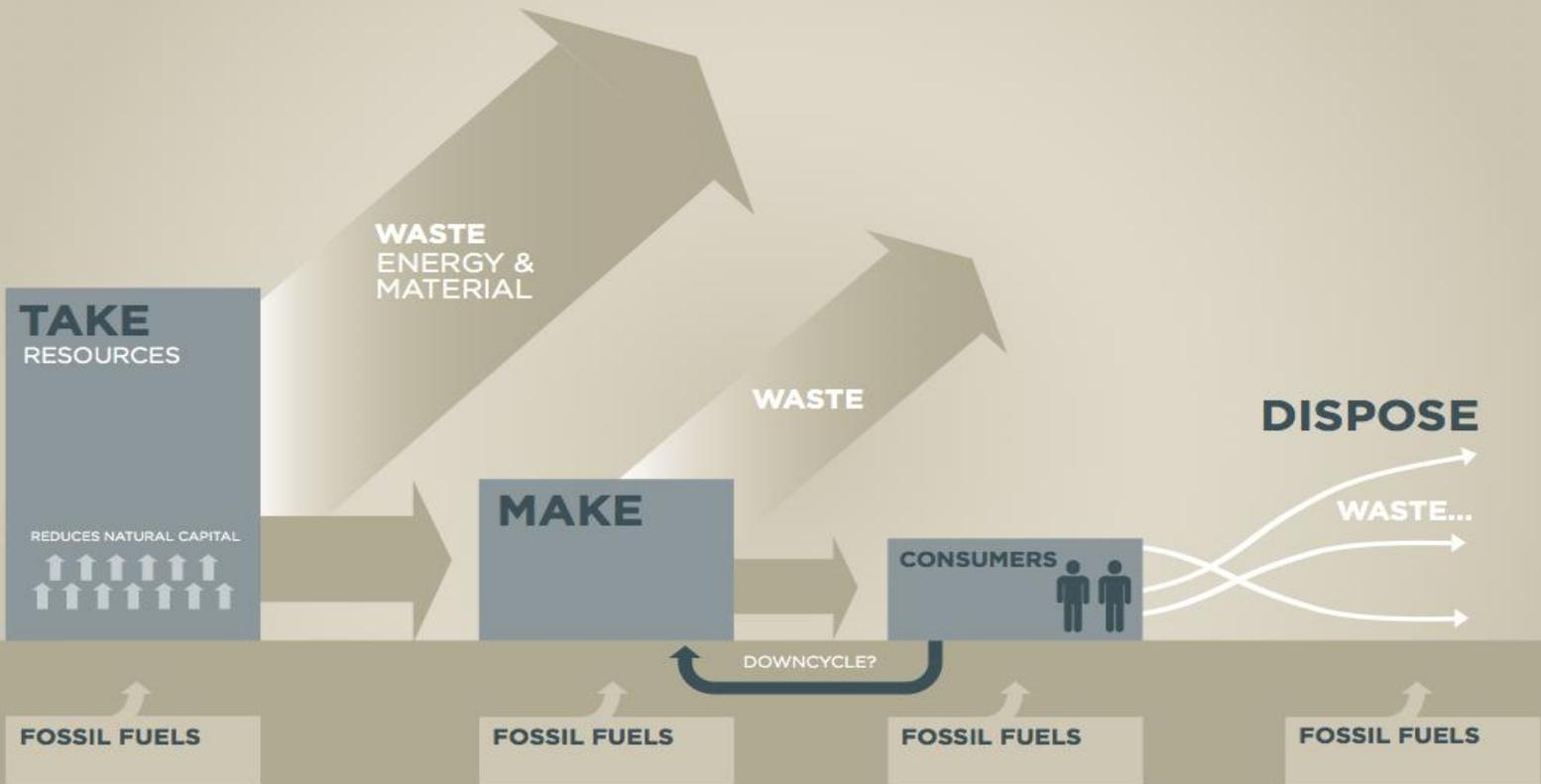
ELLEN MACARTHUR FOUNDATION
Rethink the future

Circular Economy LOWASTE

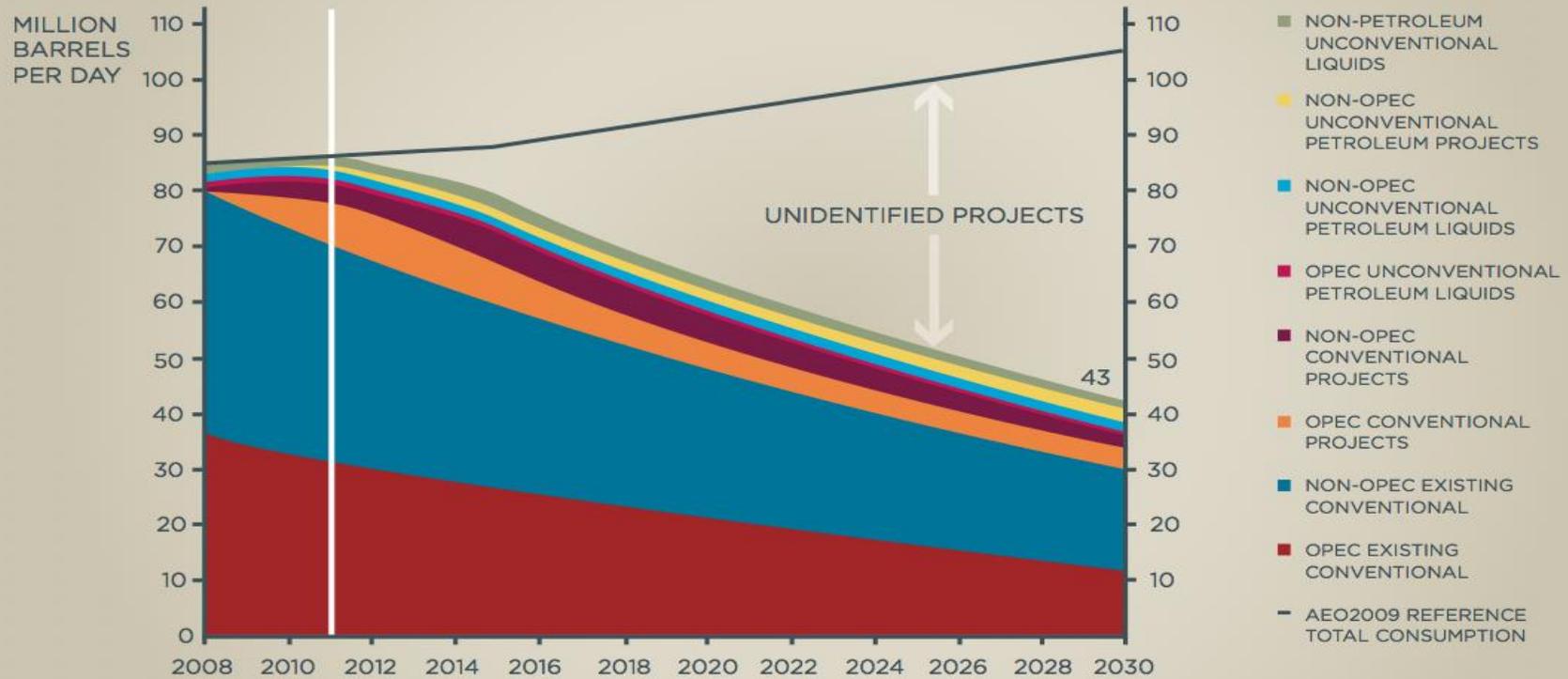
Ken Webster



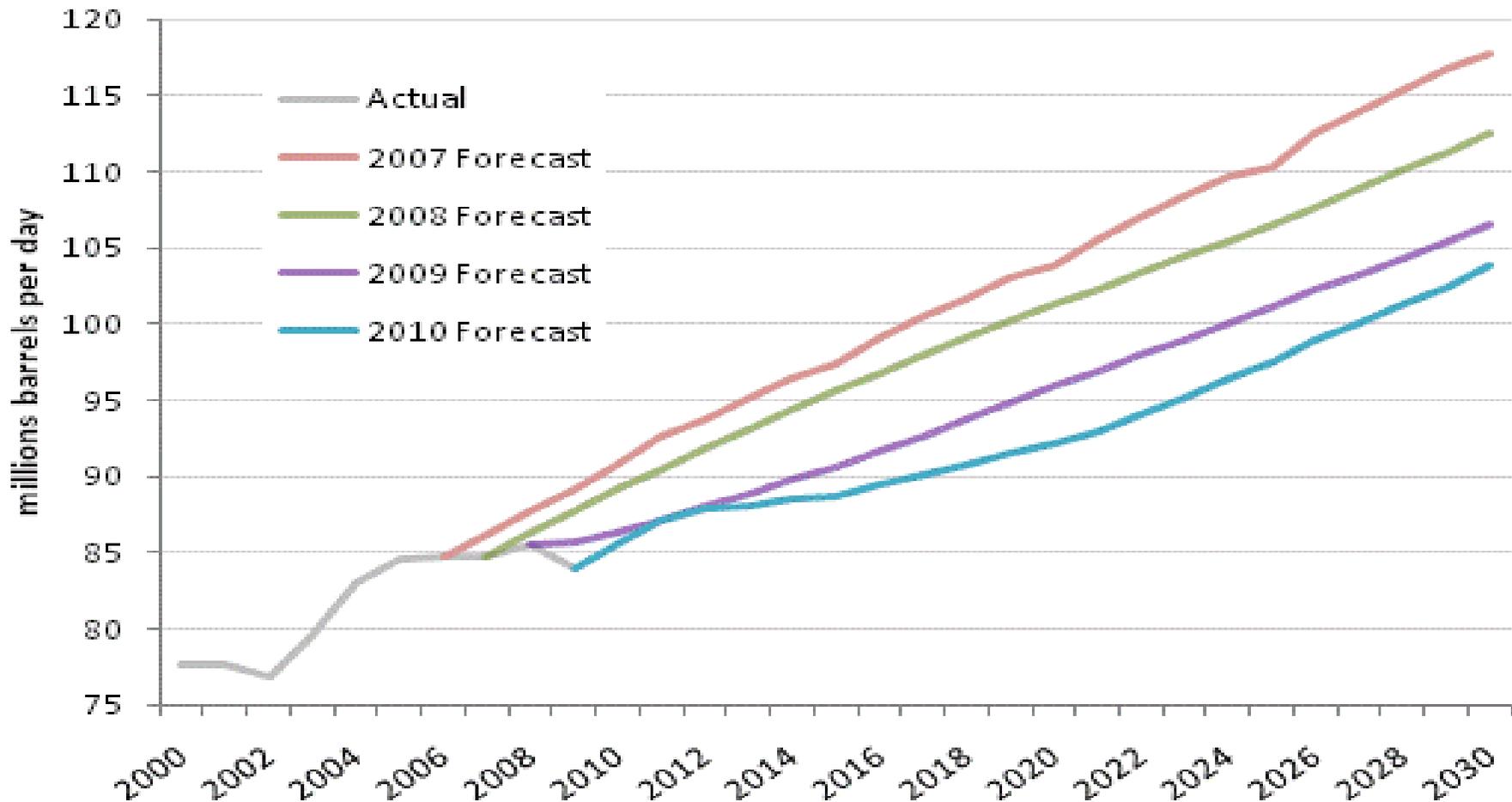
LINEAR ECONOMY



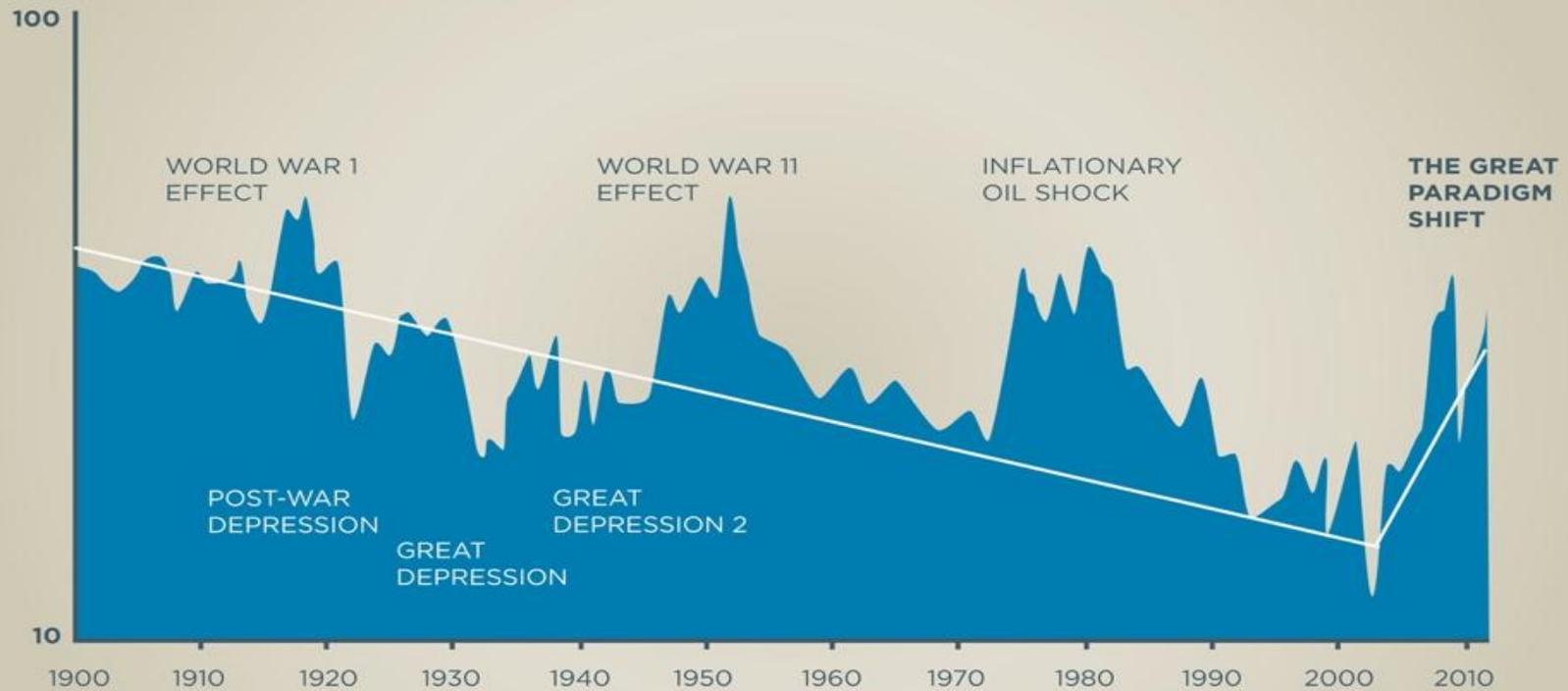
THE WORLD'S LIQUID FUEL SUPPLY



Managing the News? (EIA forecasts of Oil production)



COMMODITY INDEX PARADIGM SHIFT?



H	C	N	O	P	S	Cl
Na	Mg	Al	Si			
K	Ca	Fe				
Ti	Cr	Mn	Cu			
B	F	Ar	Br			

non-metal elements

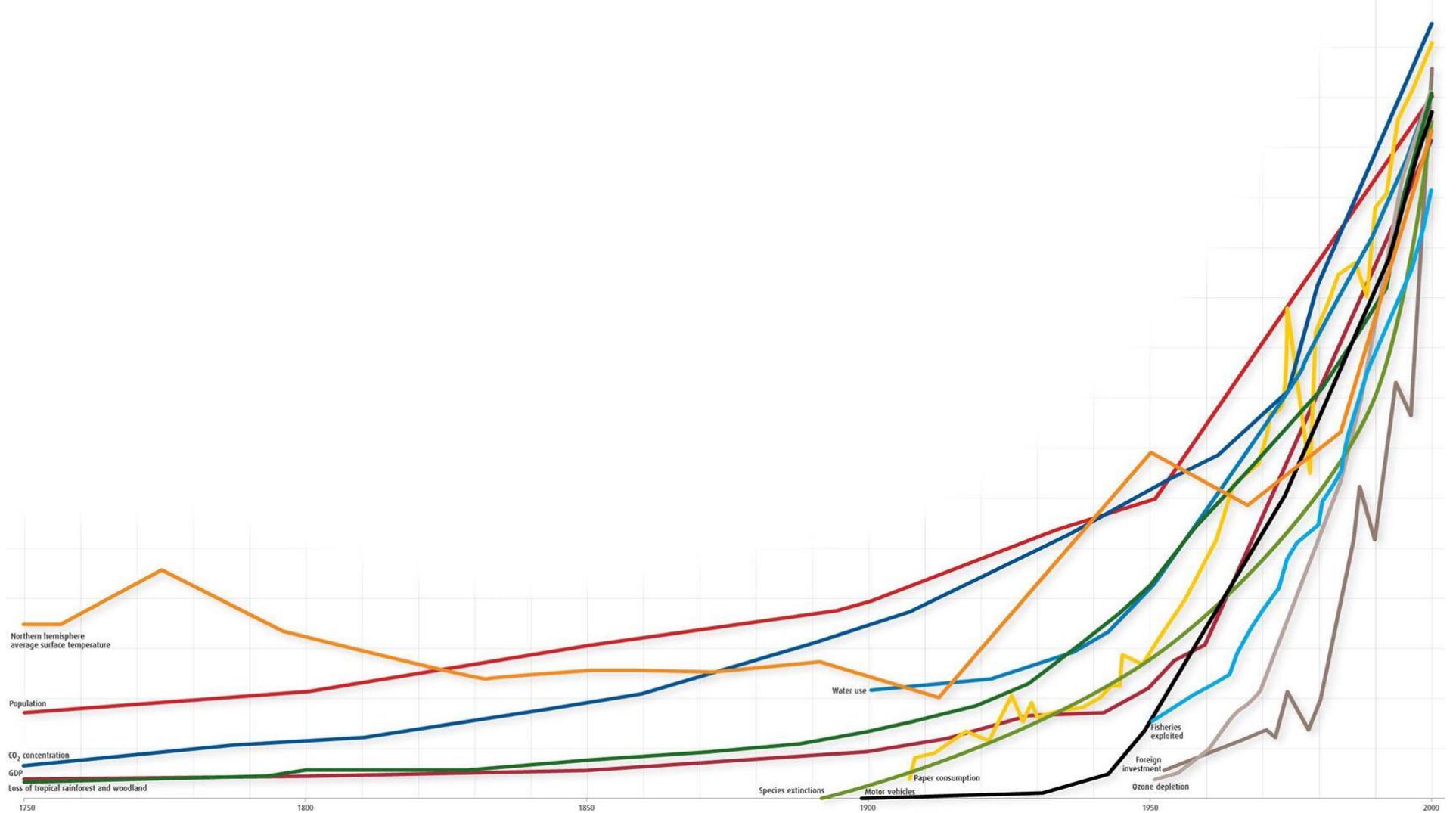
elements of hope

critical elements

frugal elements

Li	Be	Sc	V	Co	Ni	Zn	Ga
Ge	As	Sr	Y	Zr	Nb	Mo	PGM
Ag	Cd	In	Sn	Sb	Te	Ba	REM
Ta	W	Re	Au	Hg	Tl	Pb	Bi

Systemic stress



Resource efficiency

Individual behaviour change

Buy 'green' products

Legislate to reduce harm

Economic growth to pay for
clean up

USE



LESS

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!**



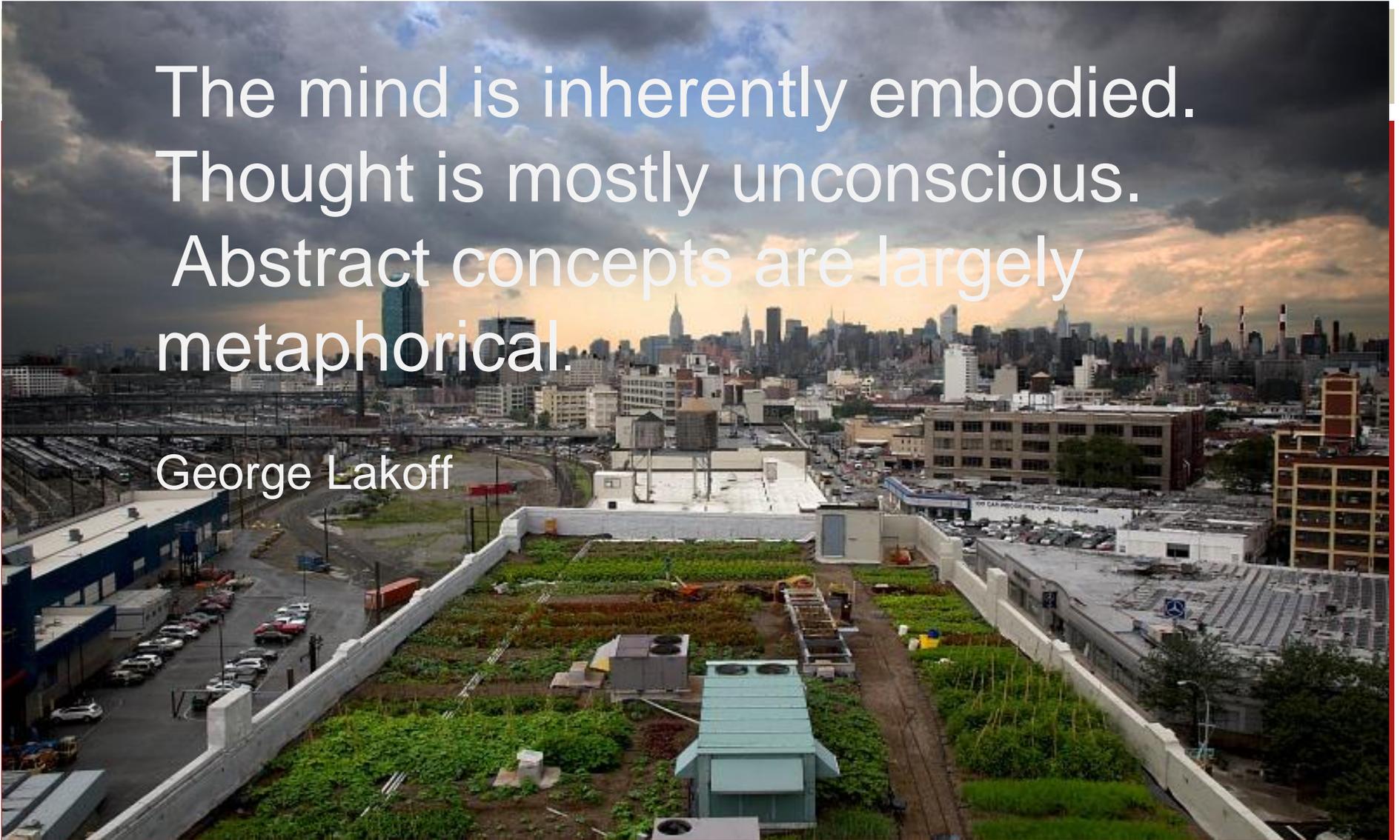
Polyp





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

George Lakoff



The world as mechanism

Understandable

Predictable

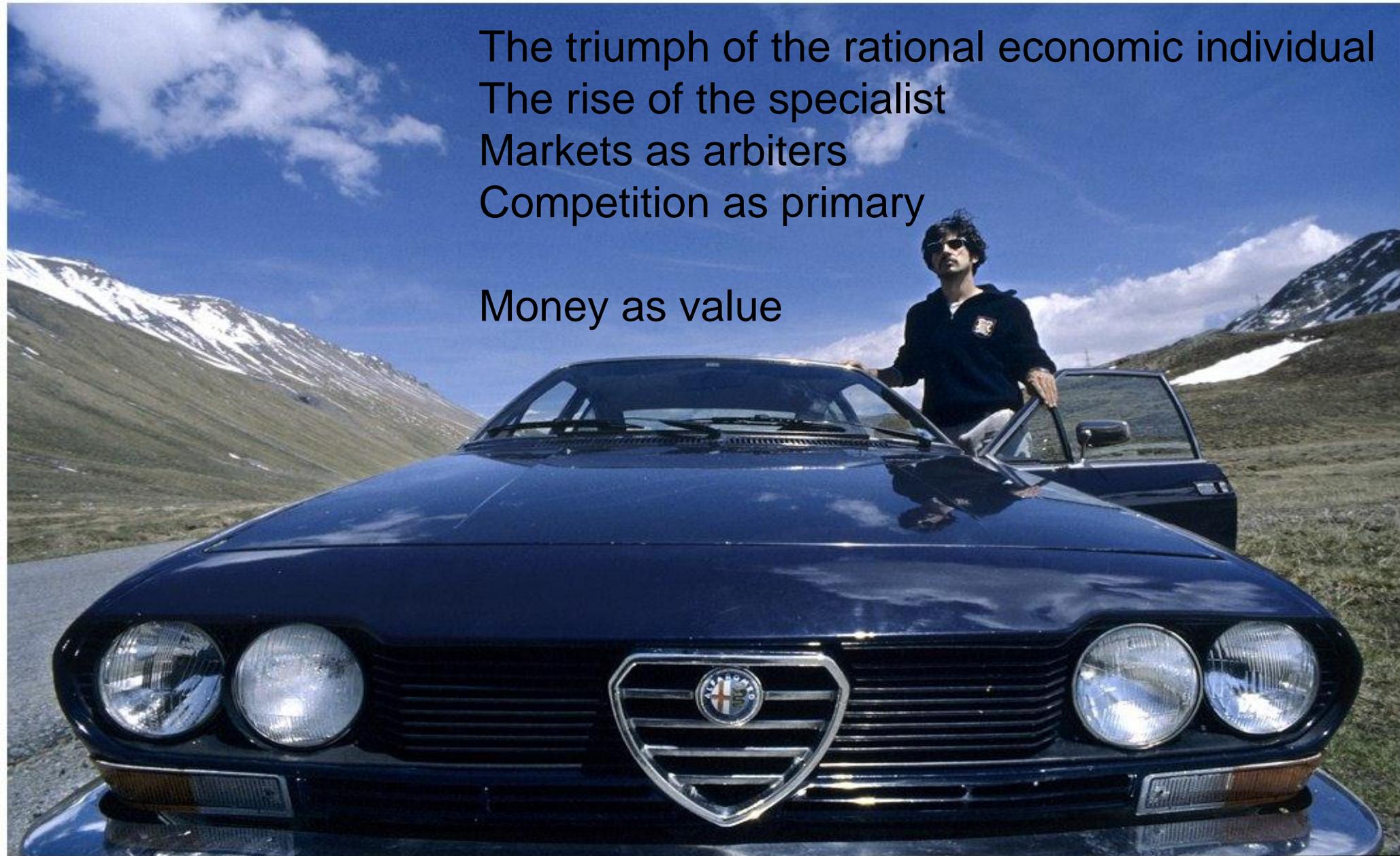
Controllable

Linear

Nature as resource and waste dump



The triumph of the rational economic individual
The rise of the specialist
Markets as arbiters
Competition as primary
Money as value

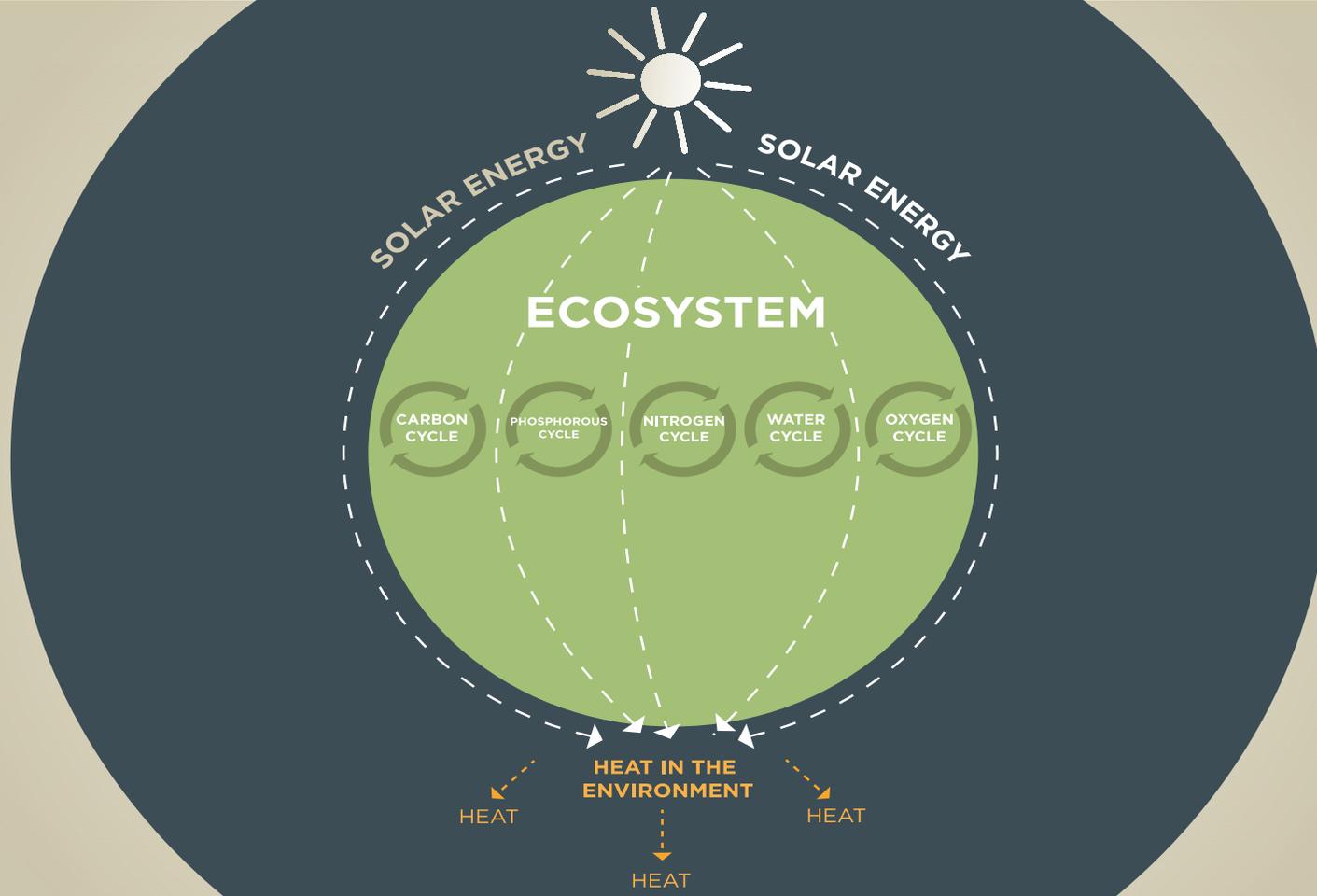


Frameworks and Change

If the machine inspired the industrial age, the image of the living system may inspire a genuine postindustrial age
Peter Senge et al. (*Sloan Management Review*)

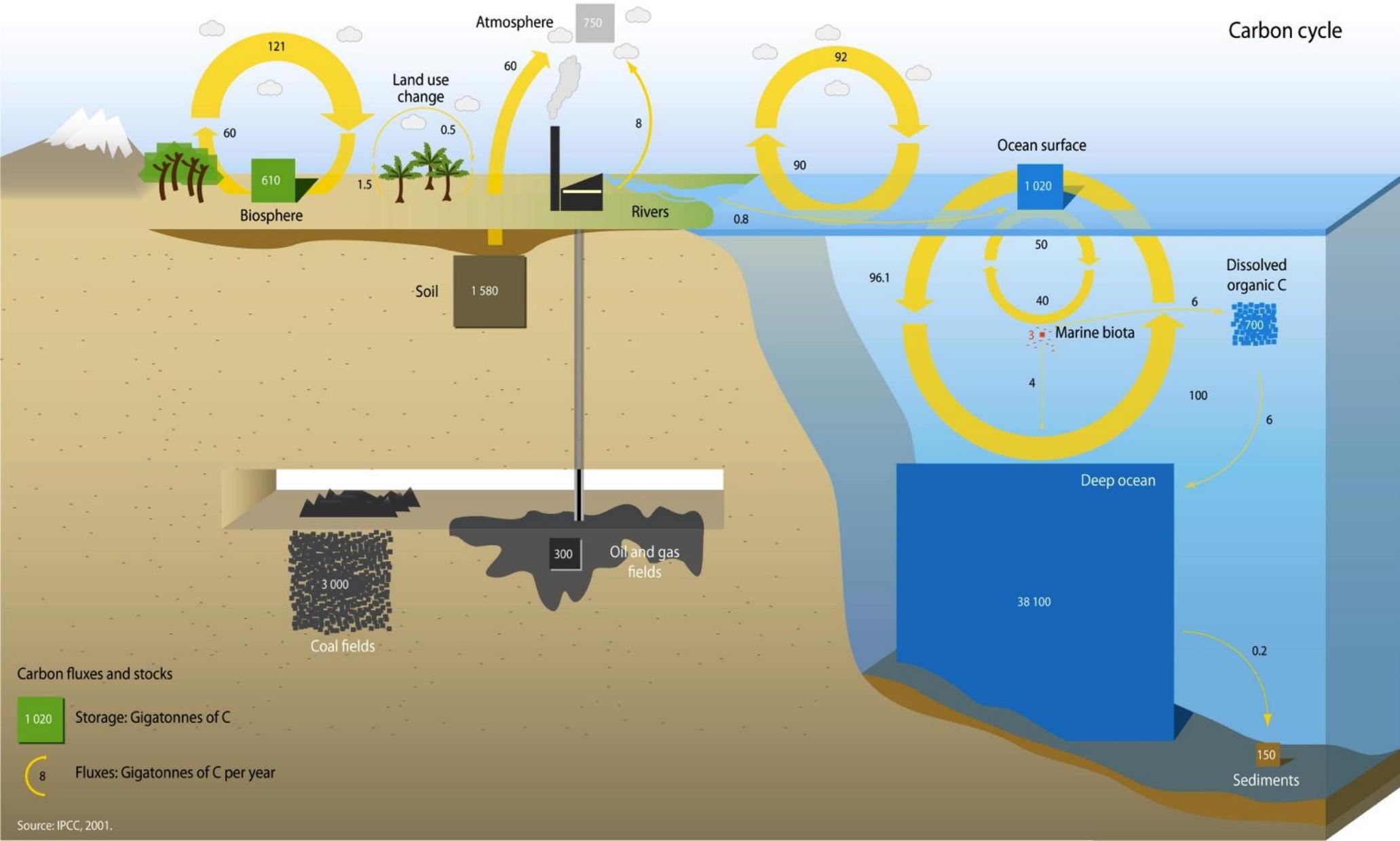
You never change things by fighting against the existing reality. To change something, build a new model that makes the old model obsolete
Buckminster Fuller

ENERGY THROUGH: MATERIALS CYCLE THE BIG PICTURE

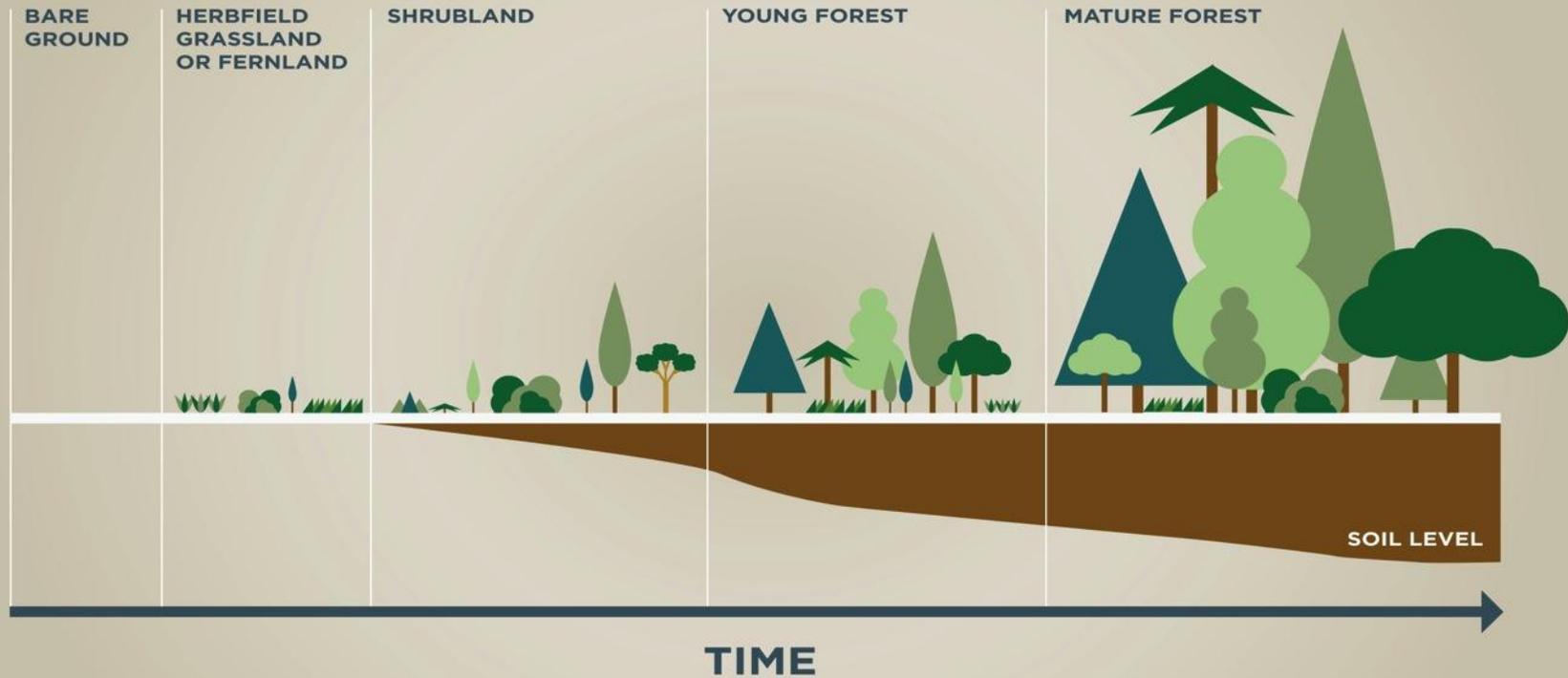




Carbon cycle

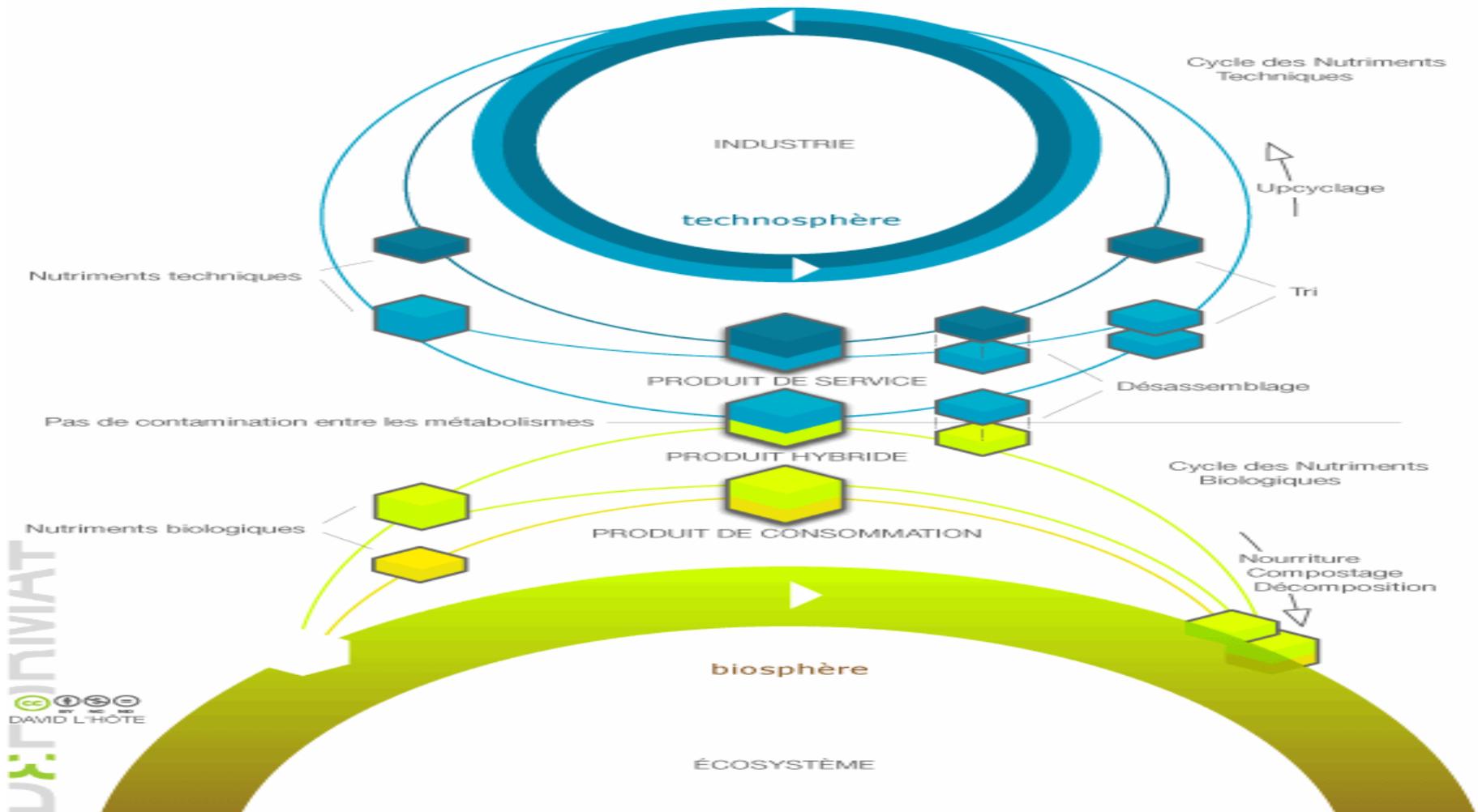


FOREST SUCCESSION





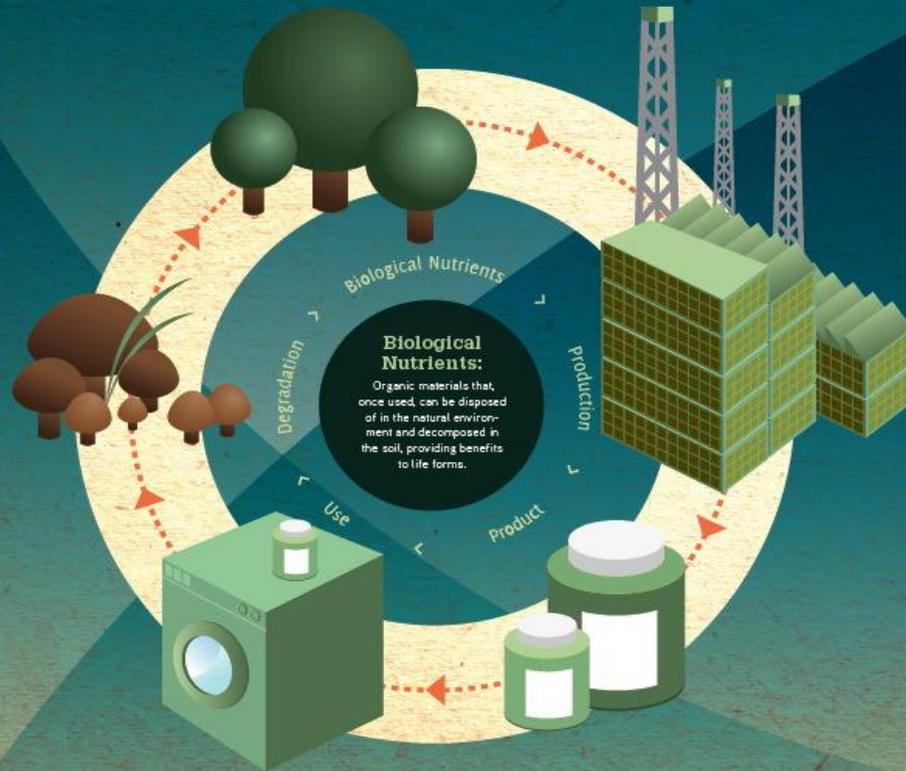
Two materials flows – the key understanding - materials as 'nutrients'



Cradle to Cradle ®

Cradle to Cradle® Remaking the Way We Make Things

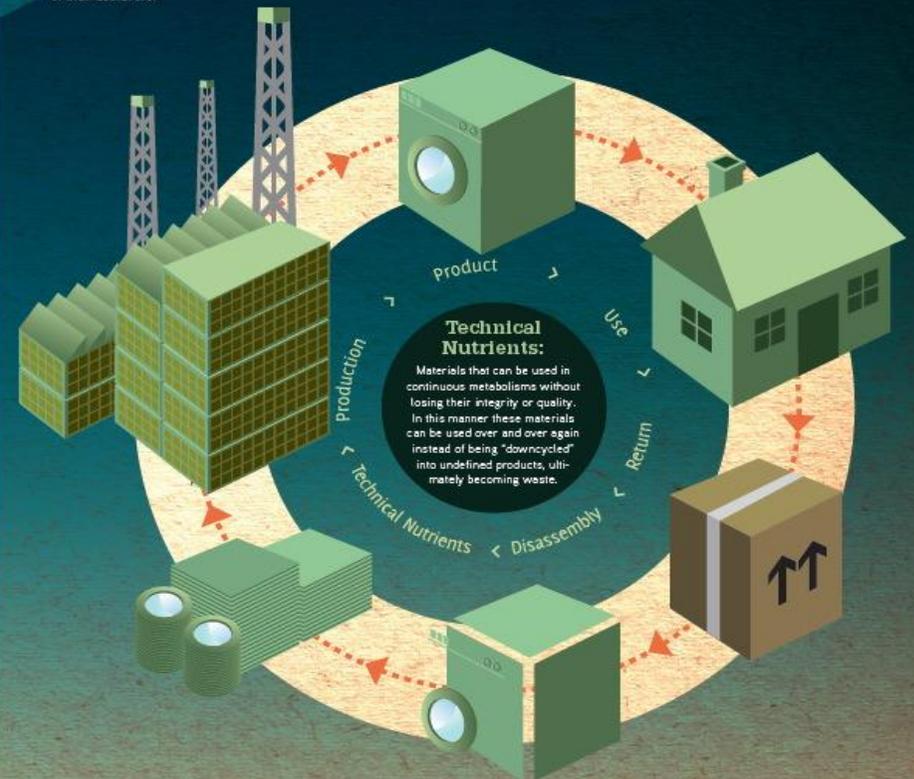
True recycling is when all materials can be used repeatedly within nature or industry as biological or technical nutrients.



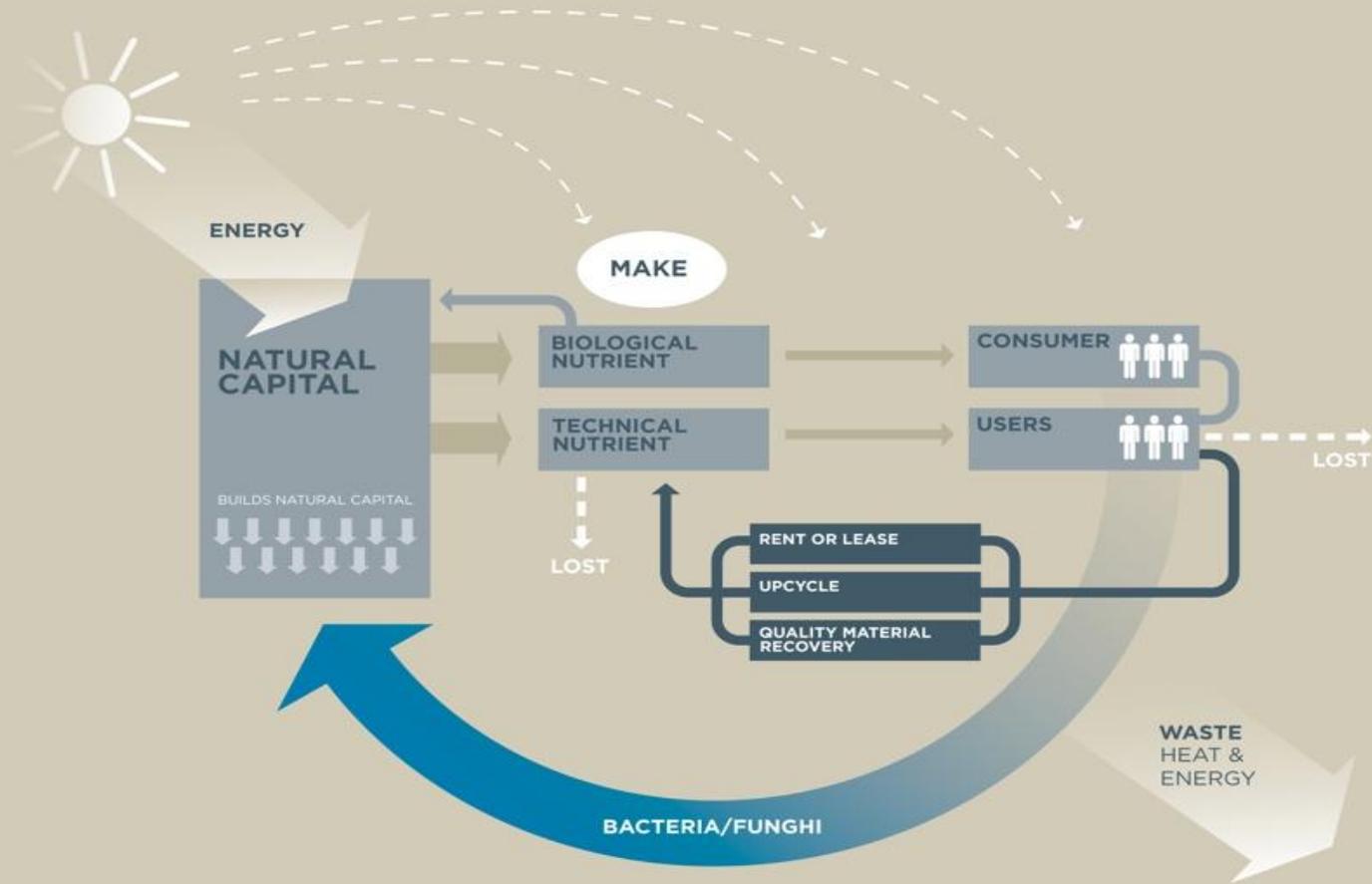
Cradle to Cradle (C2C) design enhances quality and adds value by taking inspiration from nature, where everything is a nutrient for something else; waste = food. C2C is the antithesis of the "Cradle to Grave" paradigm, where products disappear in landfills or incinerate at the end of their useful life.

The C2C paradigm sets design principles based on renewable energy and materials recycling in continuous pathways. This innovative approach encourages a new and profitable model for business, by redefining the way design decisions are made that

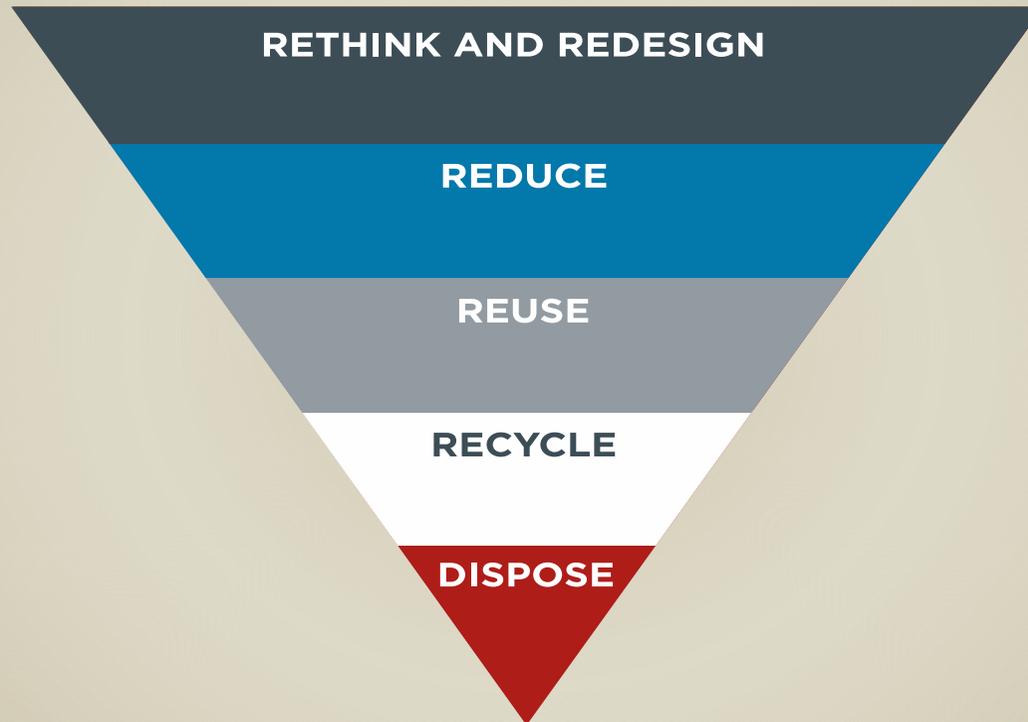
encourage a shift from "doing less bad" to "doing good," creating long-term positive effects on the environment and human health. (Some passages courtesy Philips Electronics)

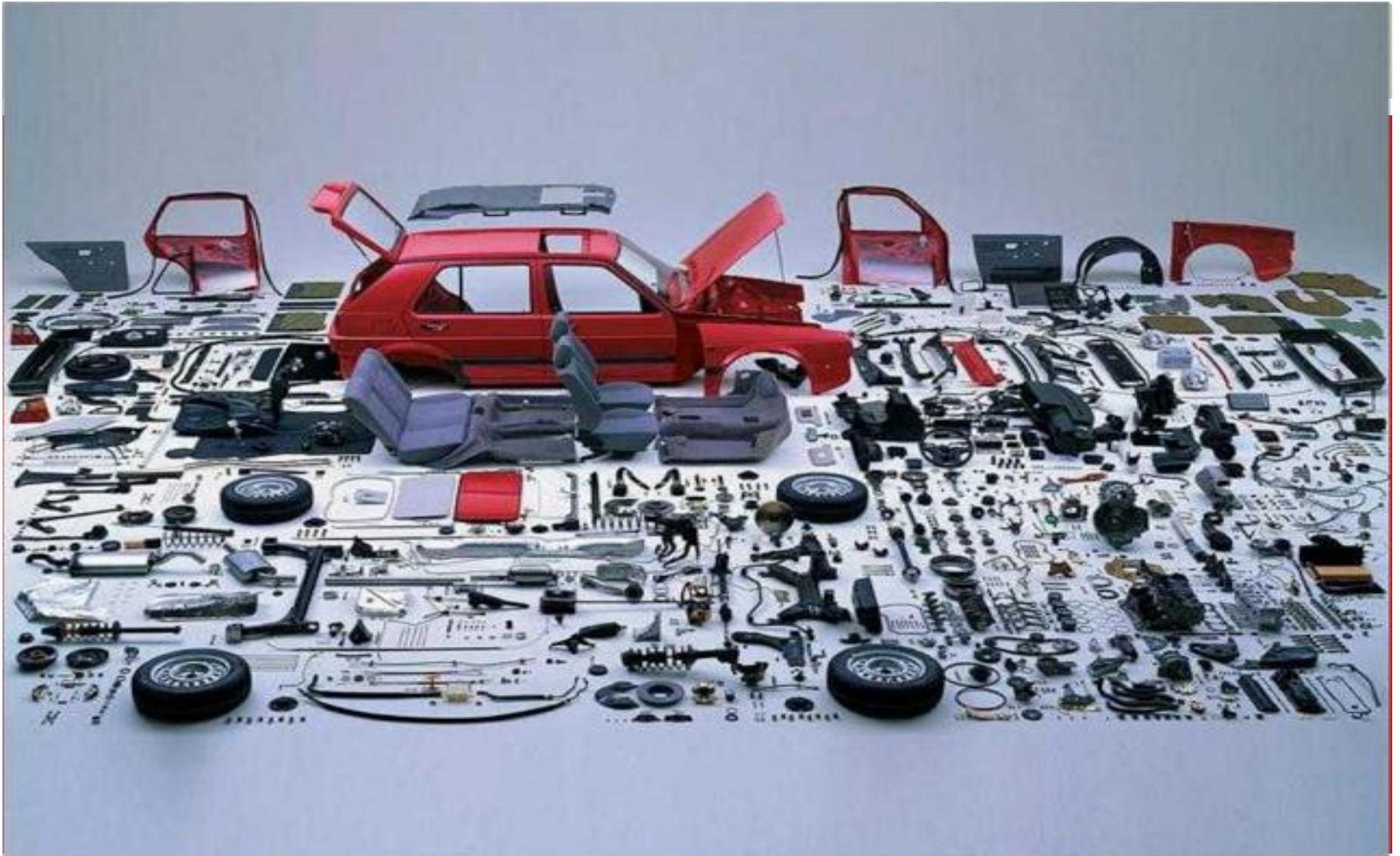


THE CIRCULAR ECONOMY



HIERARCHY OF WASTE





Regional employment advantages

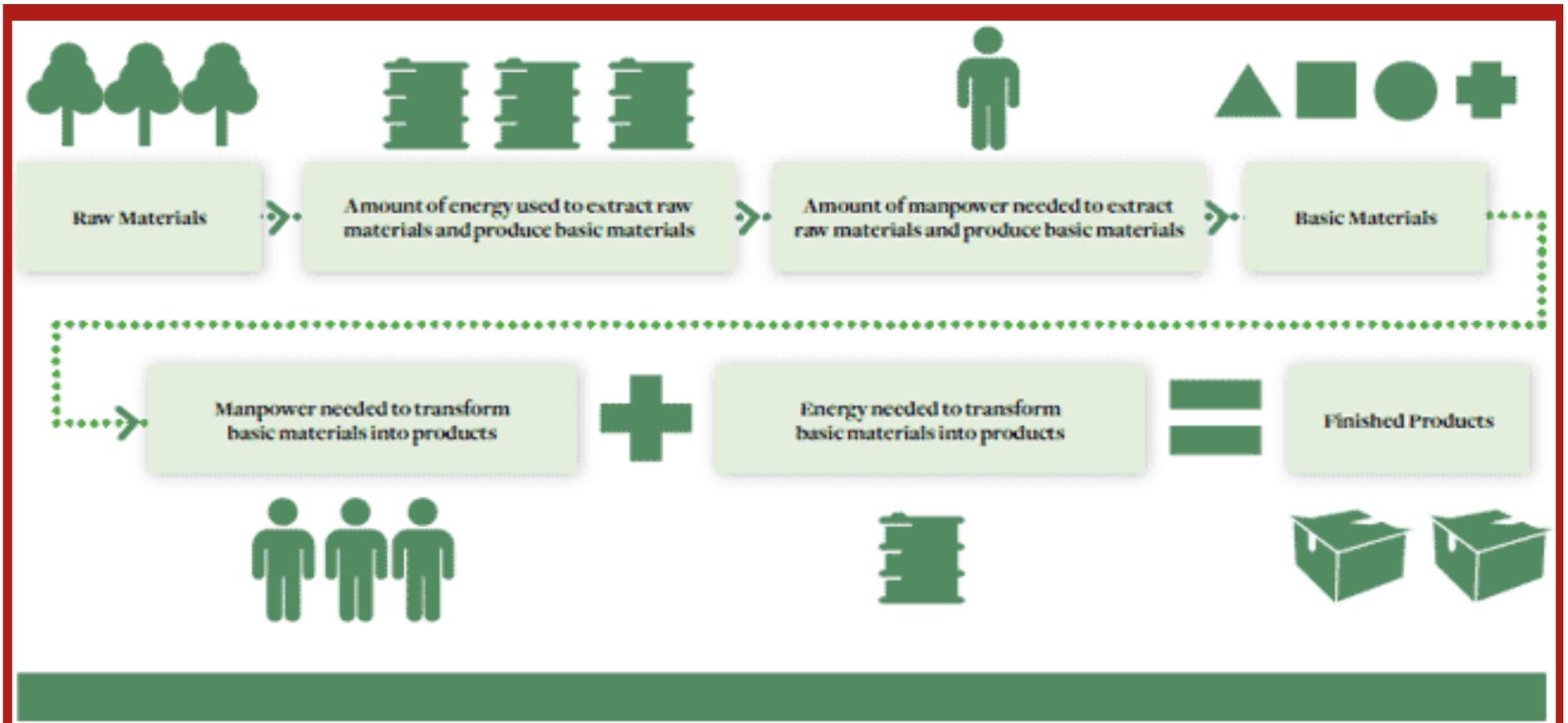
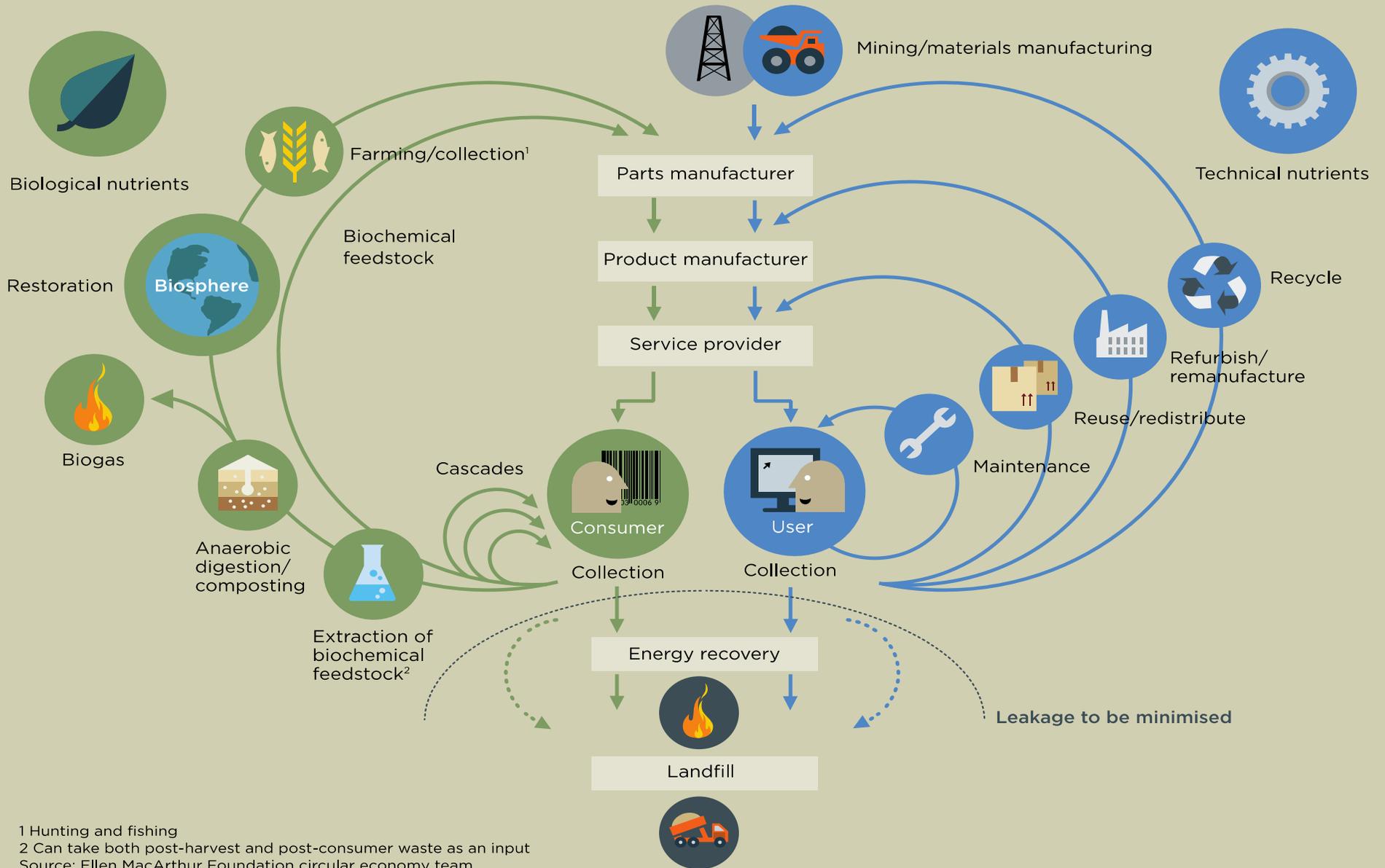
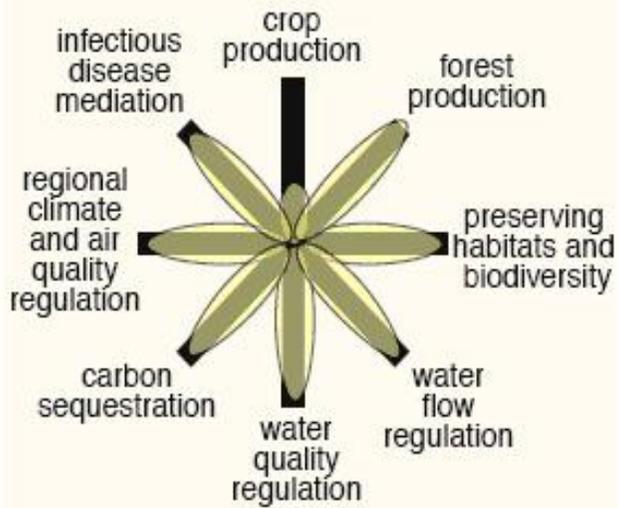
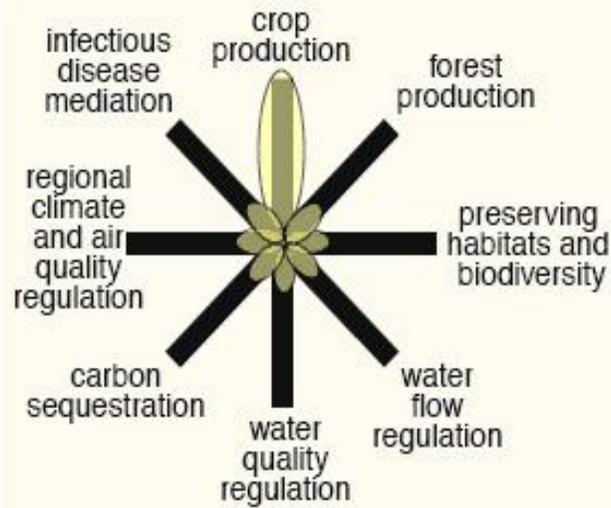


FIGURE 6 The circular economy—an industrial system that is restorative by design

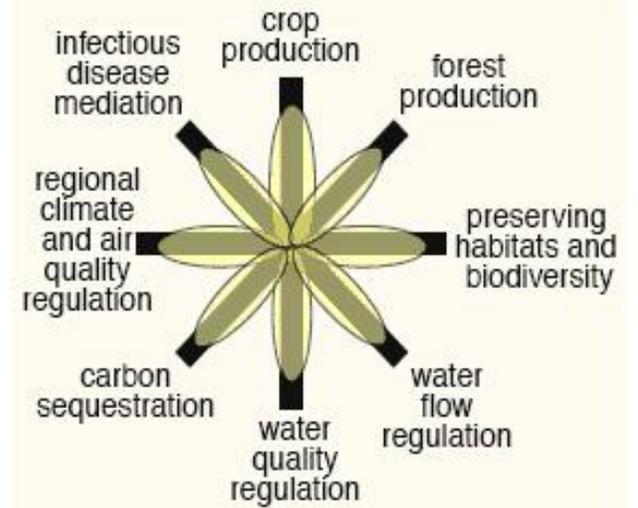




natural ecosystem

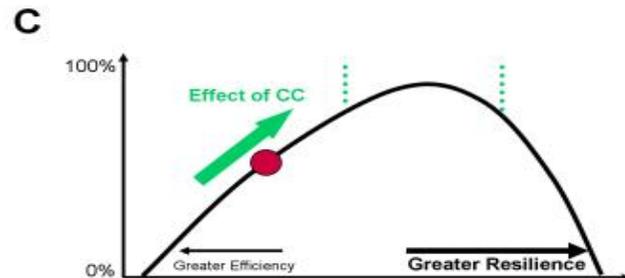
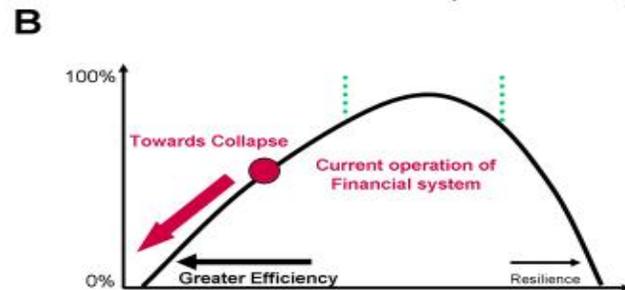
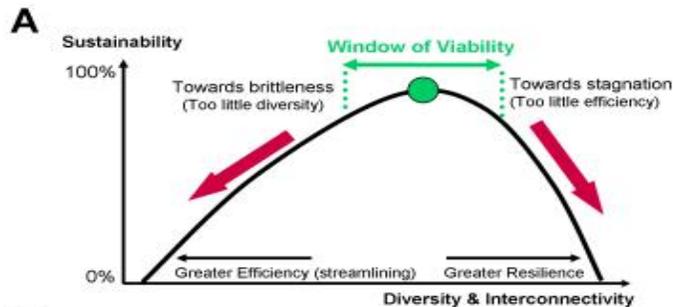


intensive cropland



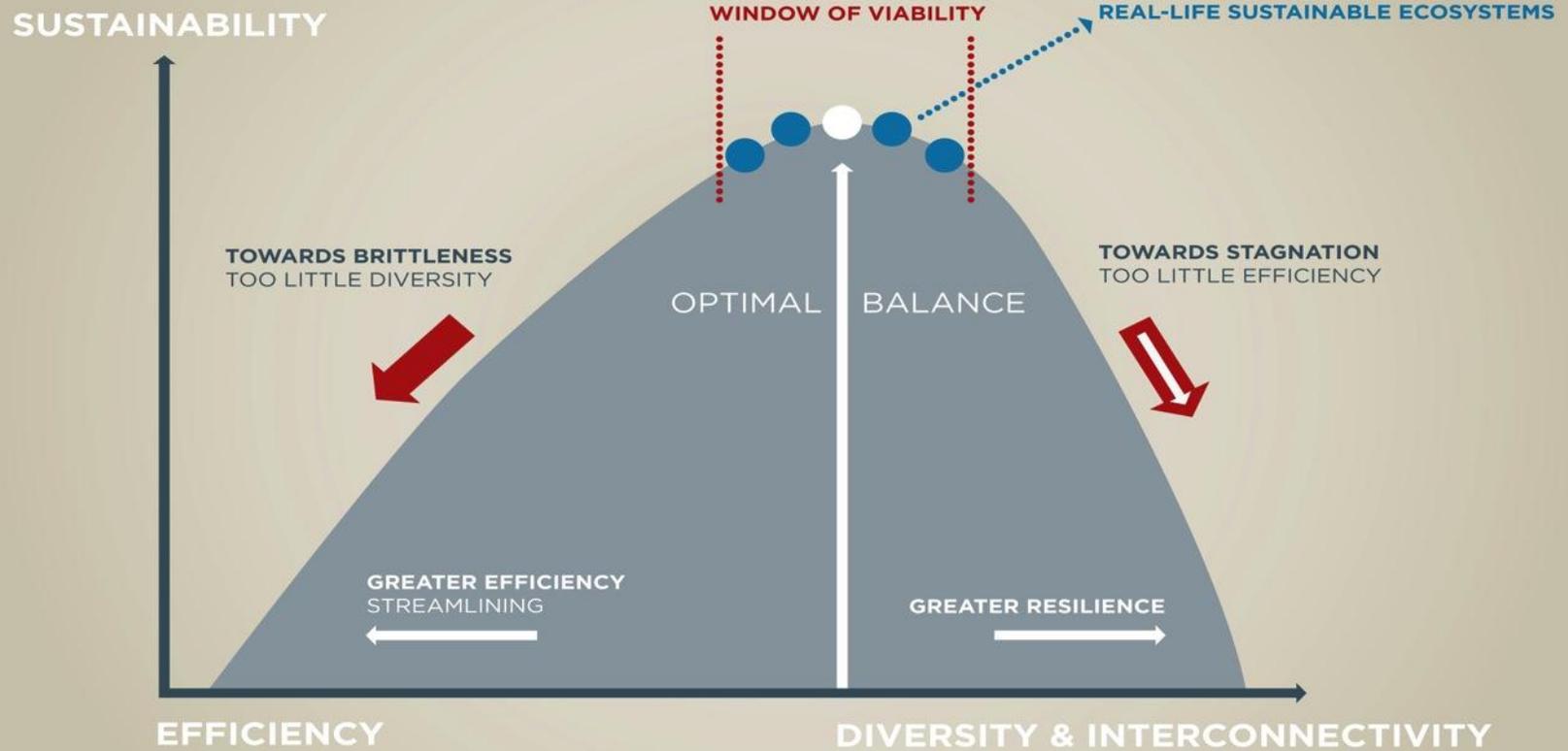
cropland with restored ecosystem services

Why optimise? Why not maximise flows in a system?

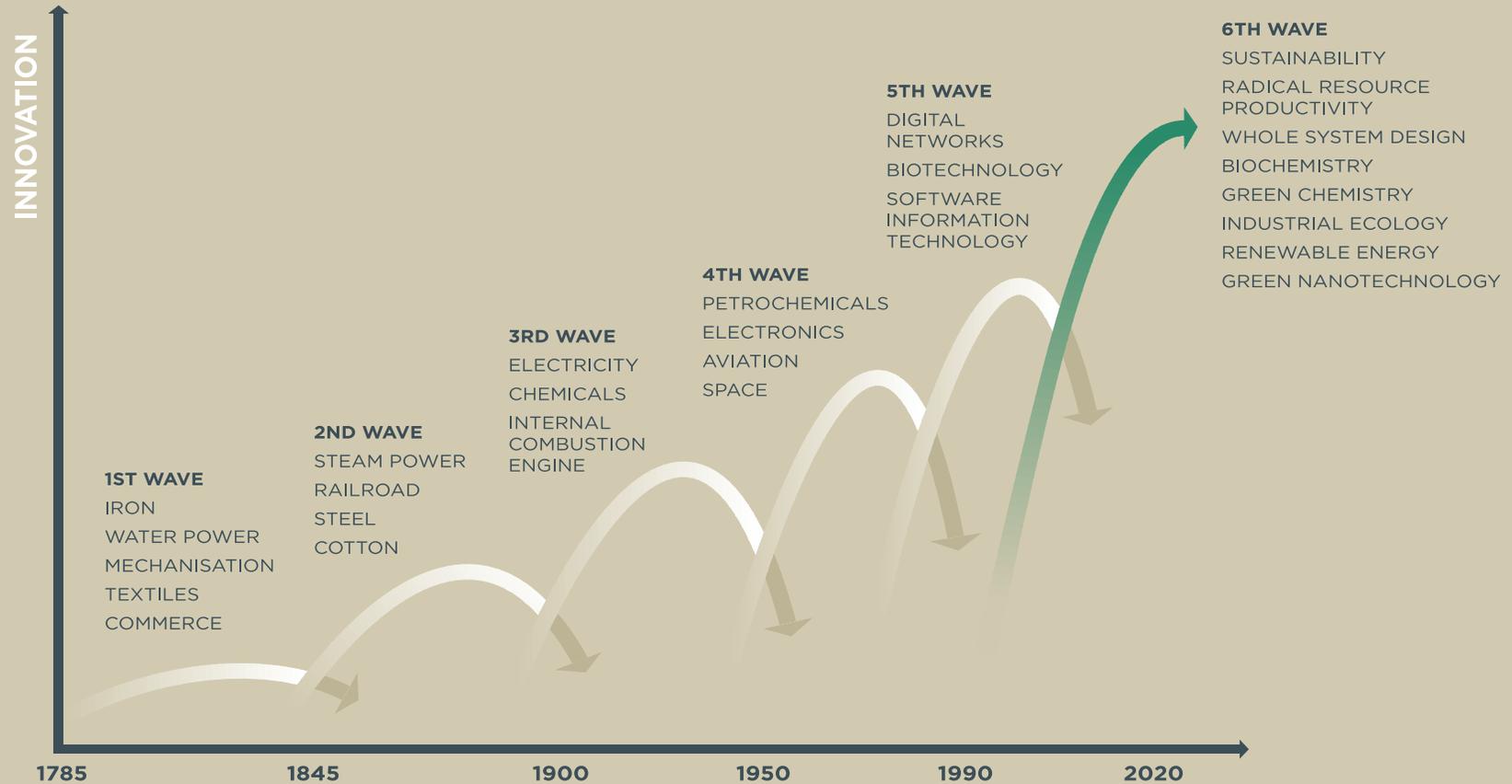


- If efficiency is the target then flows get increased and streamlined but the vulnerability to shock increases – the system becomes brittle
- If the opposite happens and the system is very resilient then it risks stagnation
- Resilience revolves around the number of nodes and connections

RESILIENCE V EFFICIENCY



WAVES OF INNOVATION



Circular economy

- Design led. System level emphasis.
- Metaphor is 'living systems' (non linear) Not 'mechanistic' (linear)
- Abundance not scarcity
- Waste = Food
- Shift towards renewables
- Diversity = strength
- Optimise not maximise
- Functional service or Performance economy
- Prices are messages they need to reveal full costs
- Money = Stuff