

The Caronacene and its ecological challenges



Herbert Girardet

Presentation outline

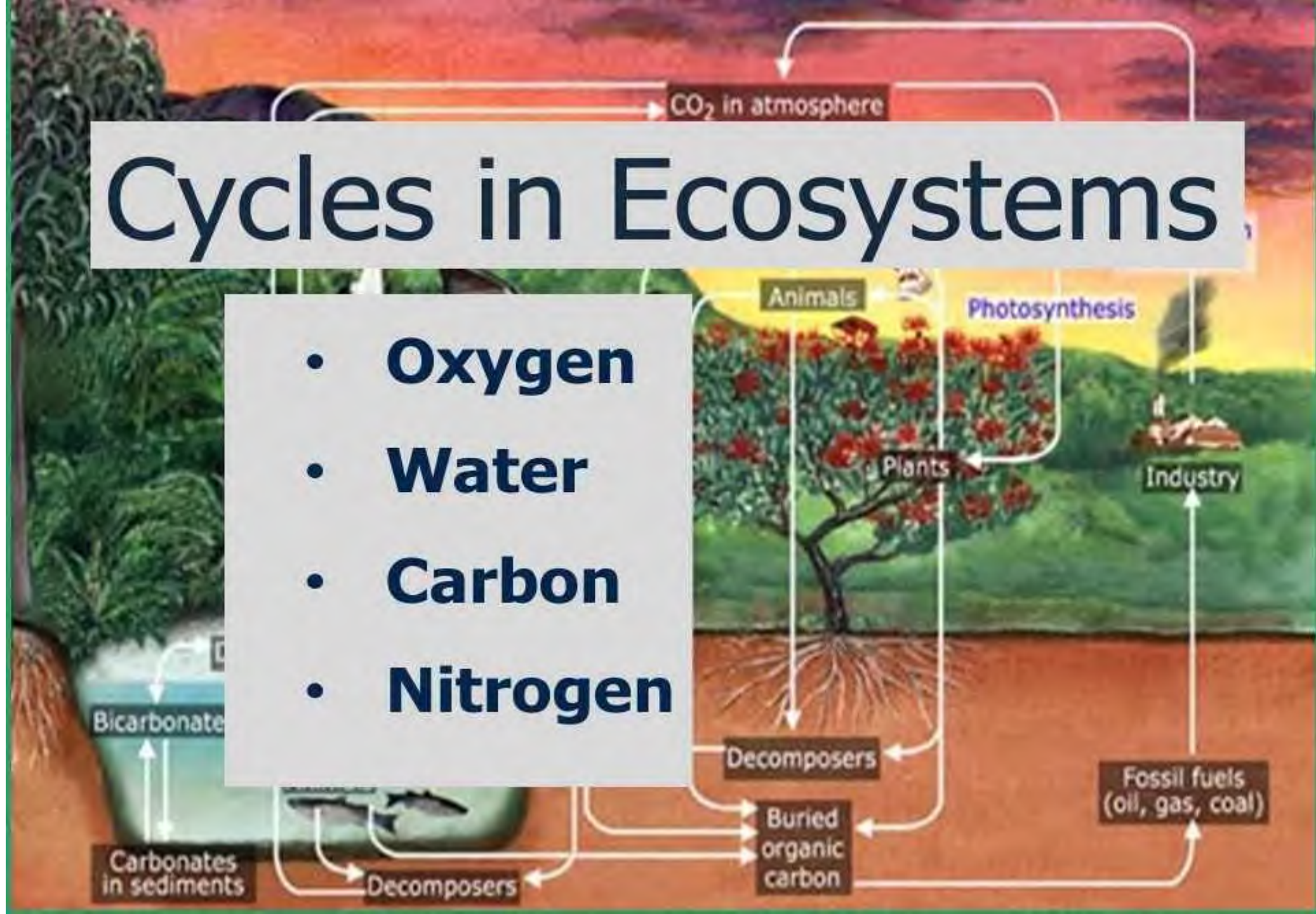
- Understanding nature as a regenerative, circular system
- Agropolis: the town set in its local farming landscape
- Petropolis: global urbanisation powered by fossil fuels
- The 'Coronacene': New ecological challenges for society
- $I = P \times A \times T$: Human Impacts equal Populations x Affluence x Technology
- Ecopolis: the regenerative city
- 'It is the economy, stupid:' The problem with modern economics
- The metabolism of society: moving from linear to circular
- The Adelaide case study
- A new enlightenment?





Cycles in Ecosystems

- **Oxygen**
- **Water**
- **Carbon**
- **Nitrogen**



Matter Cycles through Ecosystems



Carbon Cycle



Water Cycle



Nitrogen Cycle

Life as a regenerative, circular system

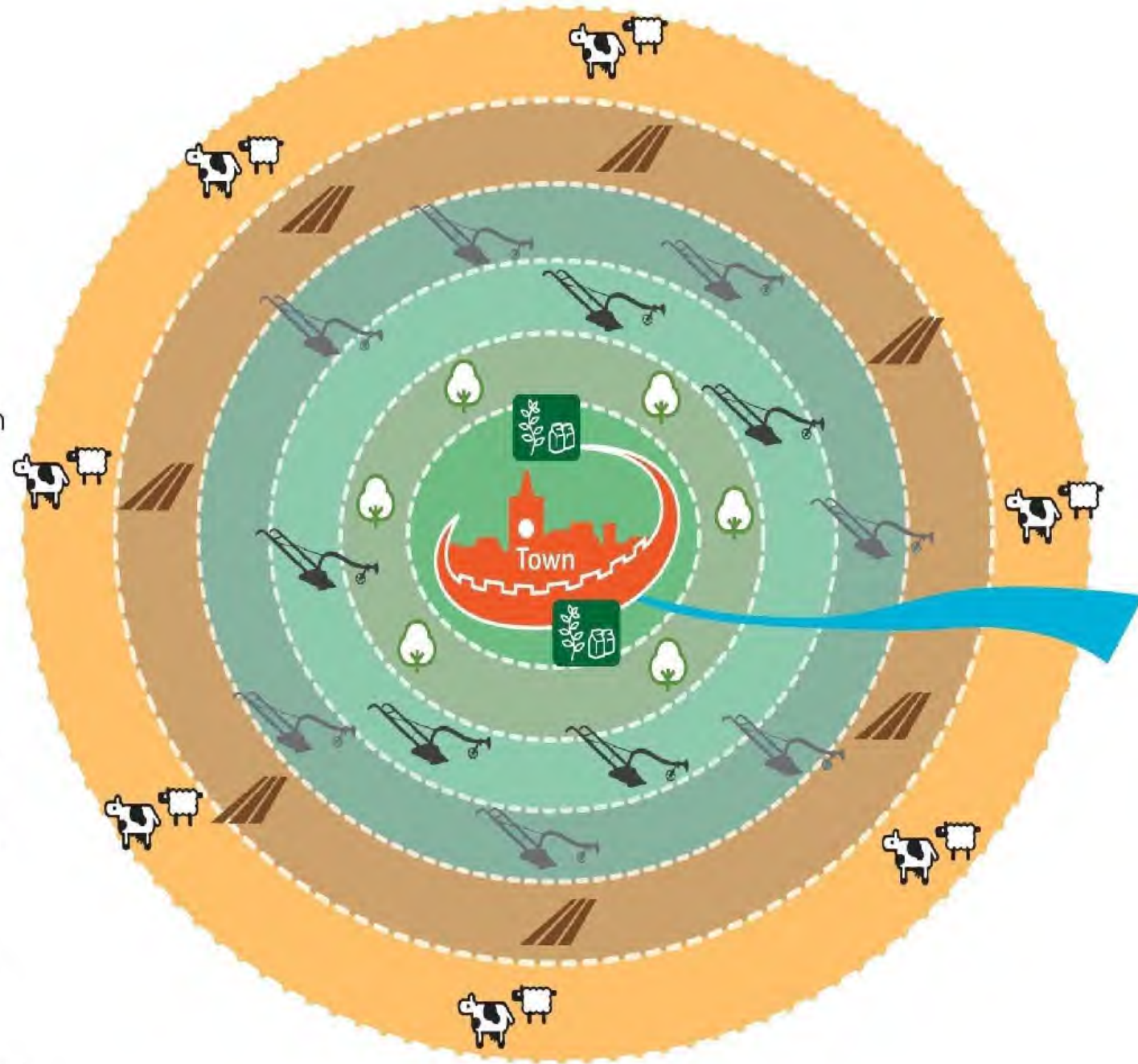
- ‘In nature nothing is permanent. Everything is food for someone else, co-evolved in an endless dance —a harmony and rhythm that defines life.’ (Albert Bates, eco-author)
- Nature has the capacity to avoid *entropy*, i.e., disintegration and loss of quality
- ‘Life seems to be orderly and lawful behaviour of matter, not based exclusively on its tendency to go over from order to disorder, but based partly on existing order that is kept up’ (quantum physicist Erwin Schroedinger, in ‘What is life’?)
- The cycle of life is also the inescapable basis for human existence

Pygmies, central Africa, living as forest hunter gatherers





"Agropolis"



Traditional farming – based solely on renewable energy





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Montereggioni, Tuscany



"Petropolis"



Central city



Navigable river



Air imports/exports



Road imports/exports



Rail imports/exports



Sea imports/exports



Global communications



Oil imports



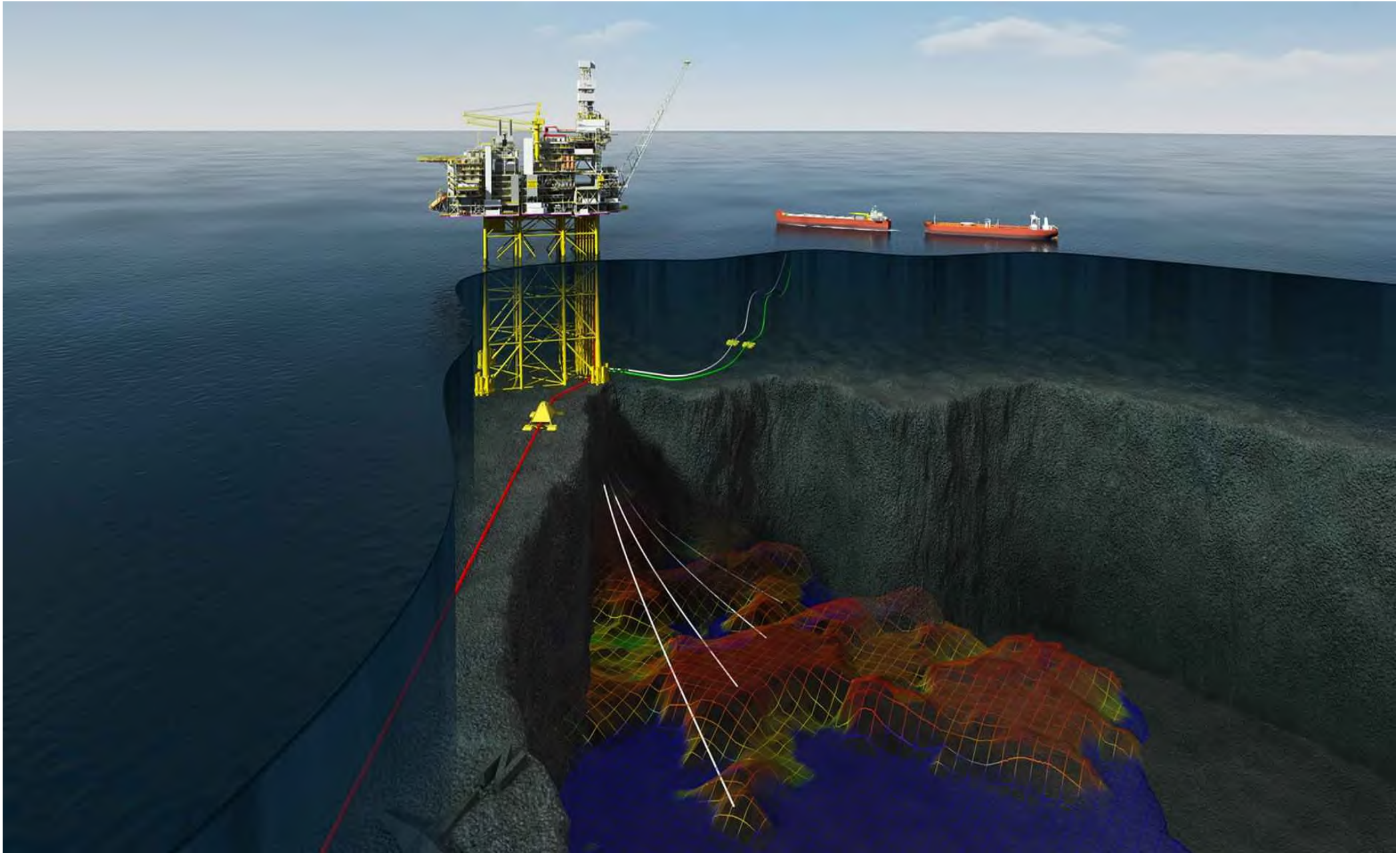
Food imports

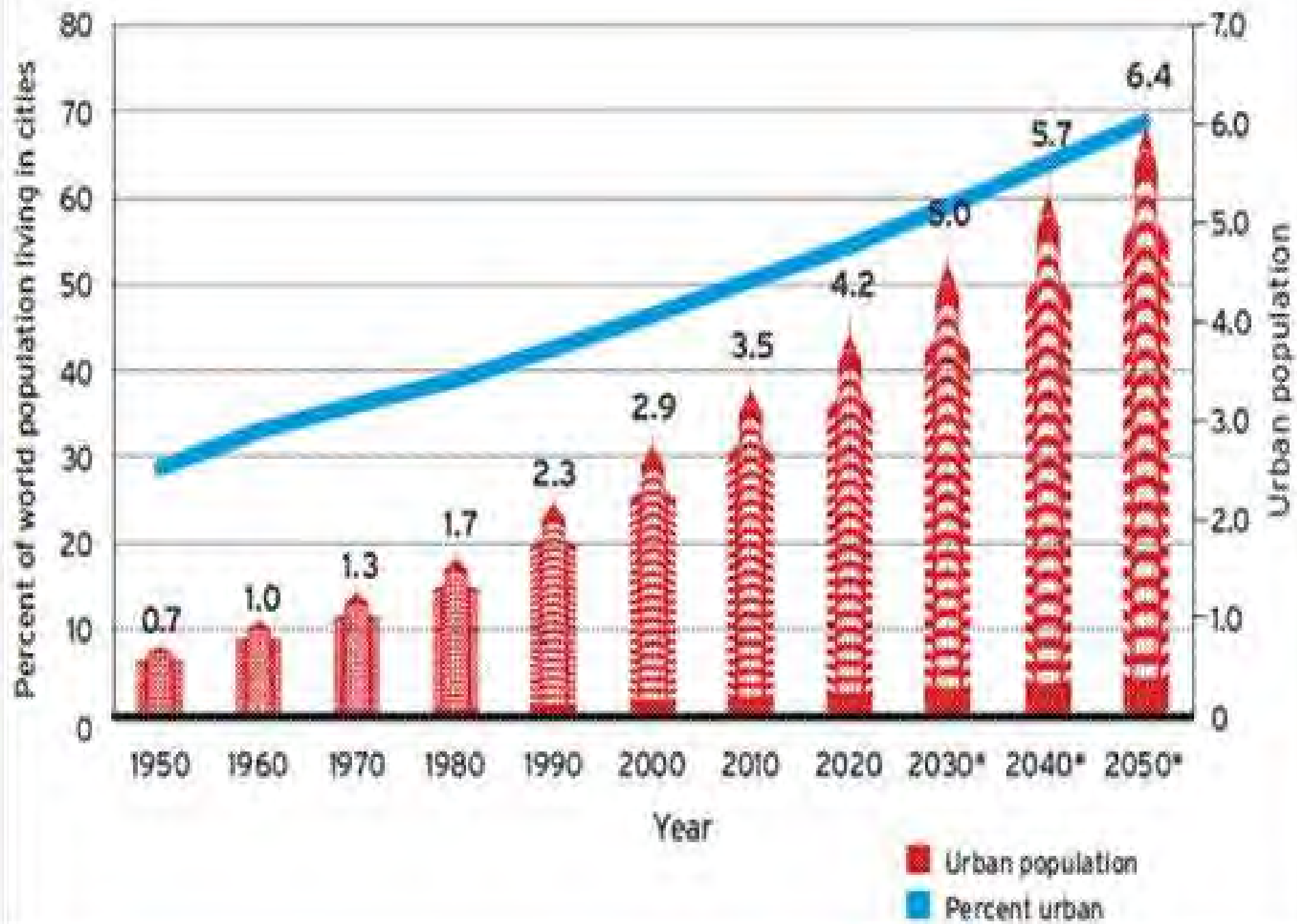


Motorway links

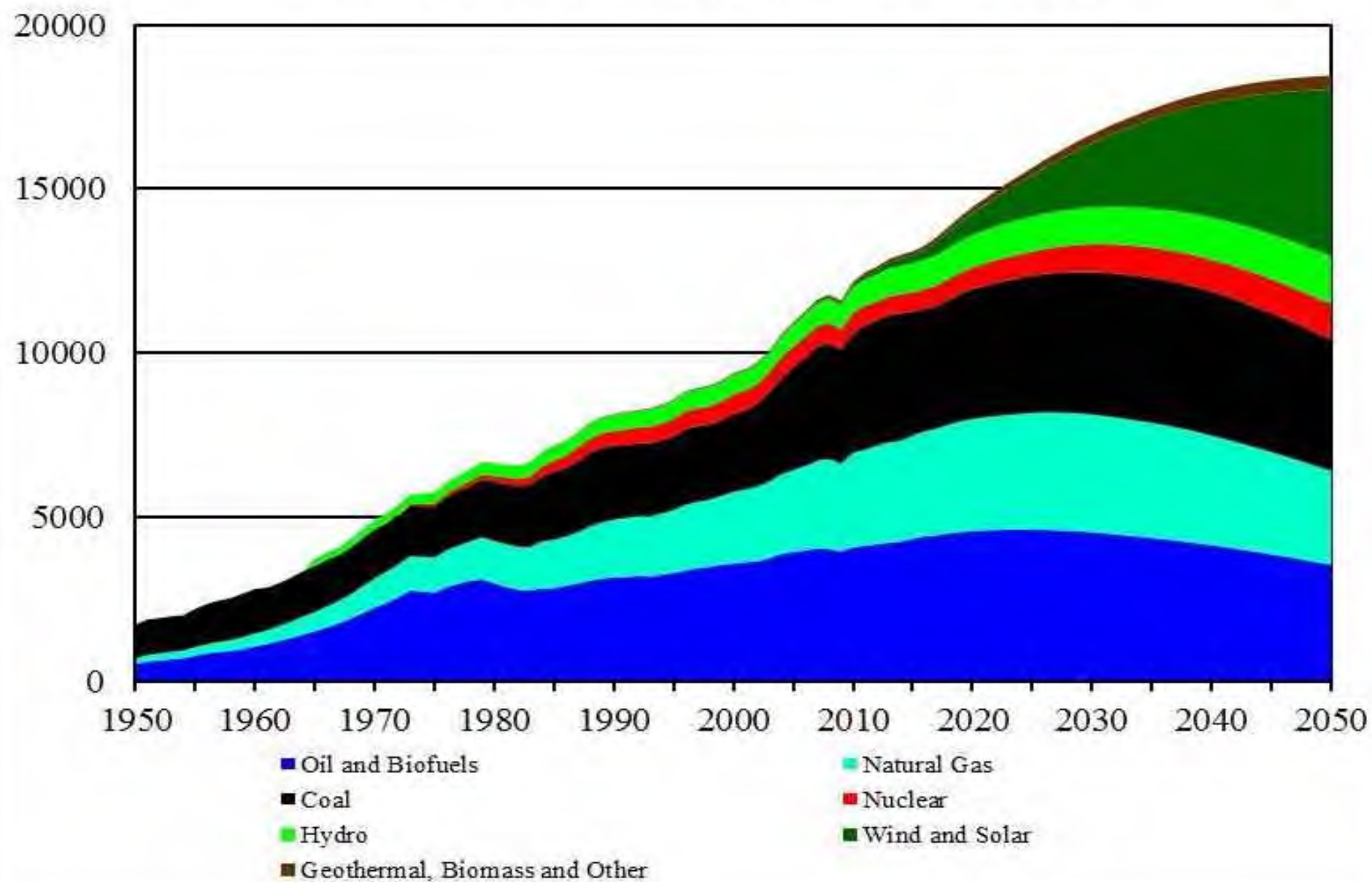


The 'roots' of the modern city

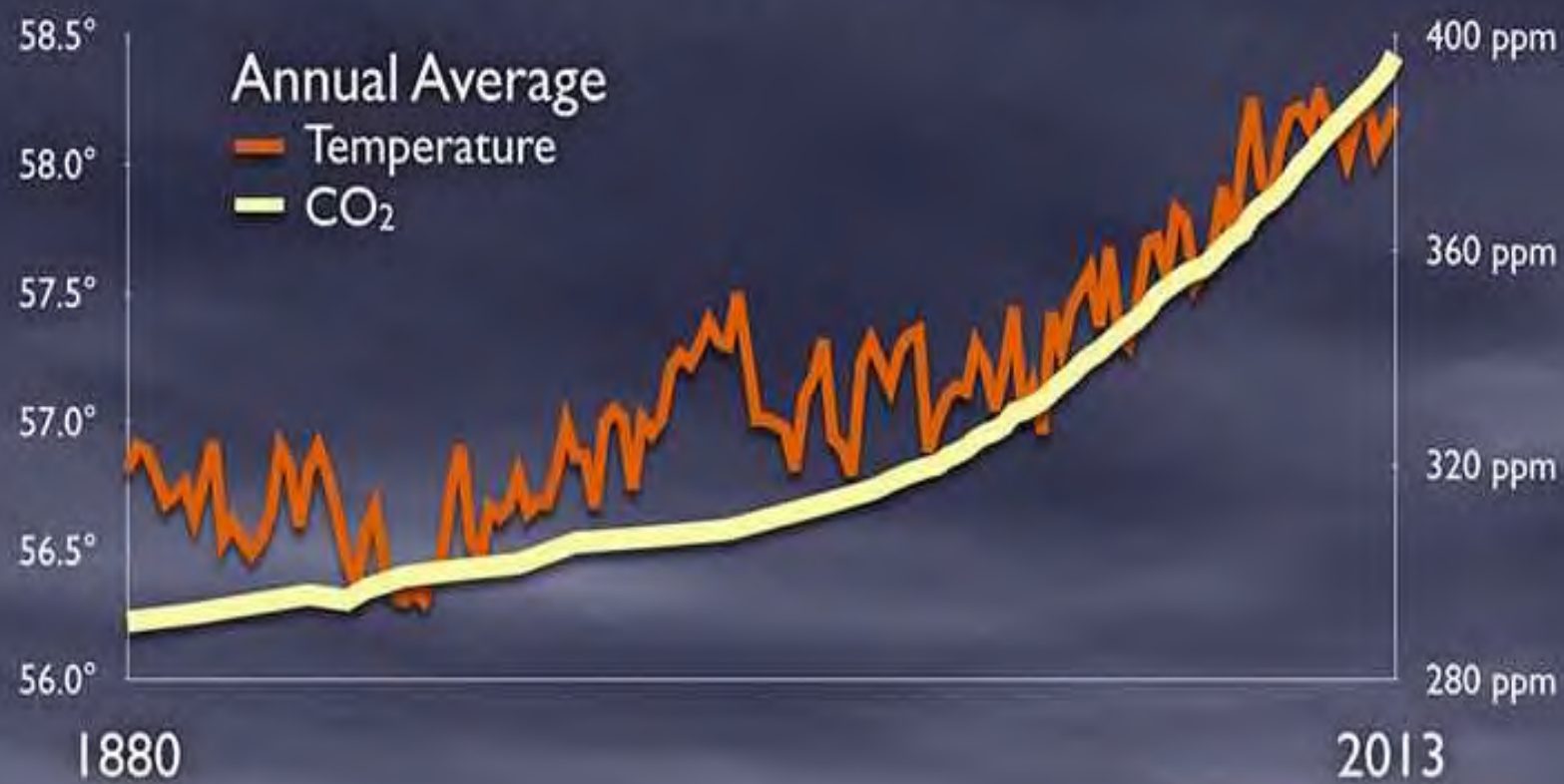




World Primary Energy Consumption
(Million Tons of Oil Equivalent, 1950-2050)



Global Temperature and CO₂



Source: National Climate Assessment 2014





Civilisation or mobilisation?



Shanghai Pudong 1978



Shanghai Pudong 2018



China: an Ecological Civilization?

‘We need to move towards an ecological civilization. It is an ethical morality and ideology which realizes harmonious co-existence and sustainable development both among people and between them and nature and society, reflecting the progress of civilization.’

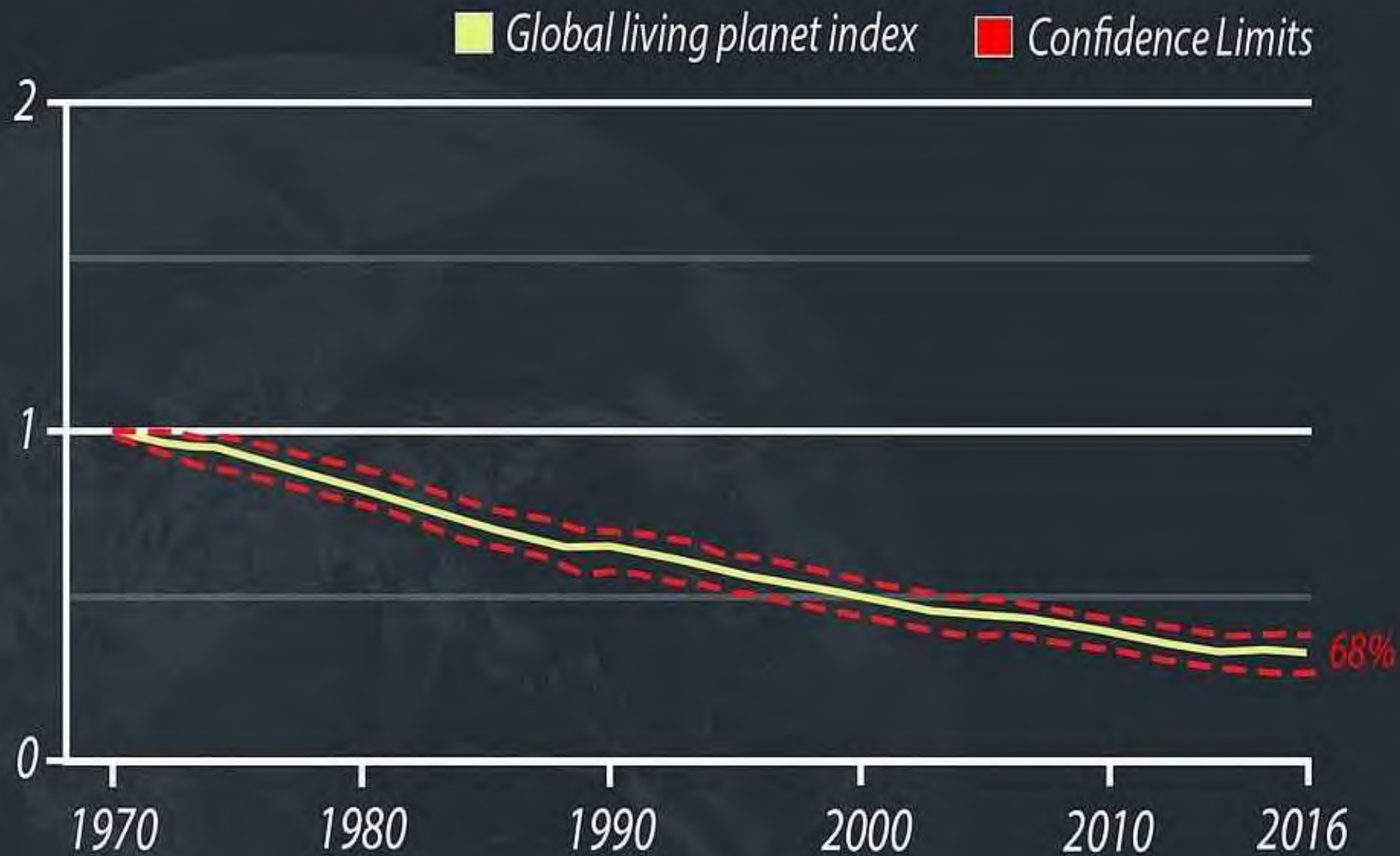
President Xi Jinping, 2017



Rainforest turned into soybean super-farm to feed Chinese and EU pigs



Living Planet Index - 1970 - 2016









Air pollution from factories



Pollution from fertilizers



Industrial waste



Noise pollution



Collapsing fish stocks



Methane emissions

'Costa del Polythene', Andalusia: 36,000 ha of greenhouses







Blue planet under threat

The map is shaded according to **risk index** which indicates threats from loss of above-ground diversity, pollution, nutrient over-loading, over-grazing, intensive agriculture, fire, soil erosion, desertification & climate change

Risk index



90% of the world's seabirds may have bits of plastic in their stomachs

20% of the Amazon rainforest has disappeared in the last 50 years

170 The number of times global temperature has risen

60% The fall in the numbers of fish, birds, mammals and reptiles from 1970 to 2014



The human – nature interface

- $I=P-A-T$: Human Impacts equal Populations x Affluence x Technology
- We are increasingly living off nature's capital, not its annual income
- The age of the 'Coronacene': New ecological challenges for humanity
- Unprecedented contacts with wild species
- New diseases – Aids, Ebola, Covid, Sars, West Nile Fever, Mers
- Animal to human disease transfer
- 'Biocidal' civilisation – no accounting for externalities
- Disruption and destruction of ecosystems by global trade
- 'In our victory in our battle against nature we will find ourselves on the losing side.' (E.F. Schumacher)

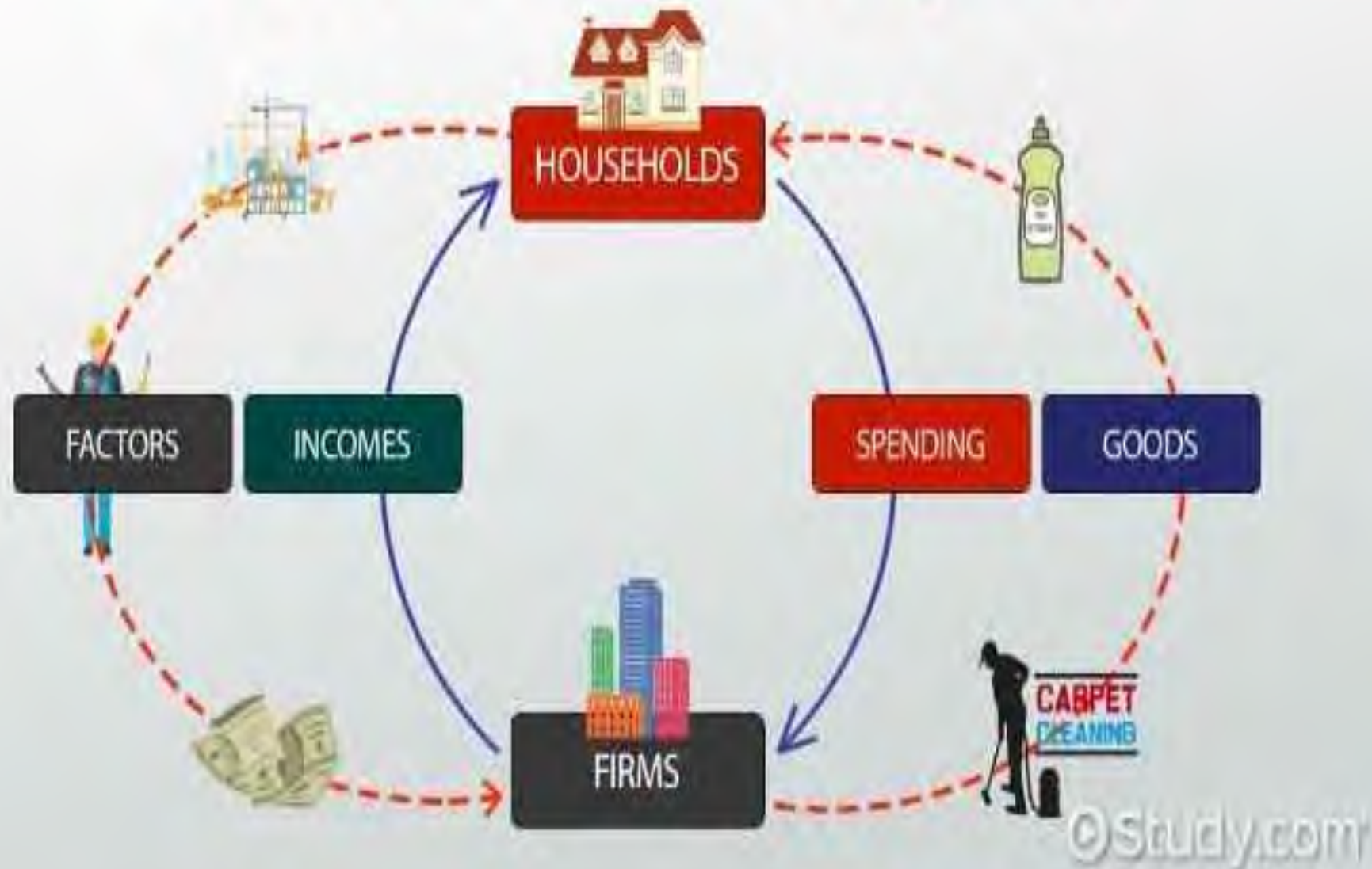
The blind economist



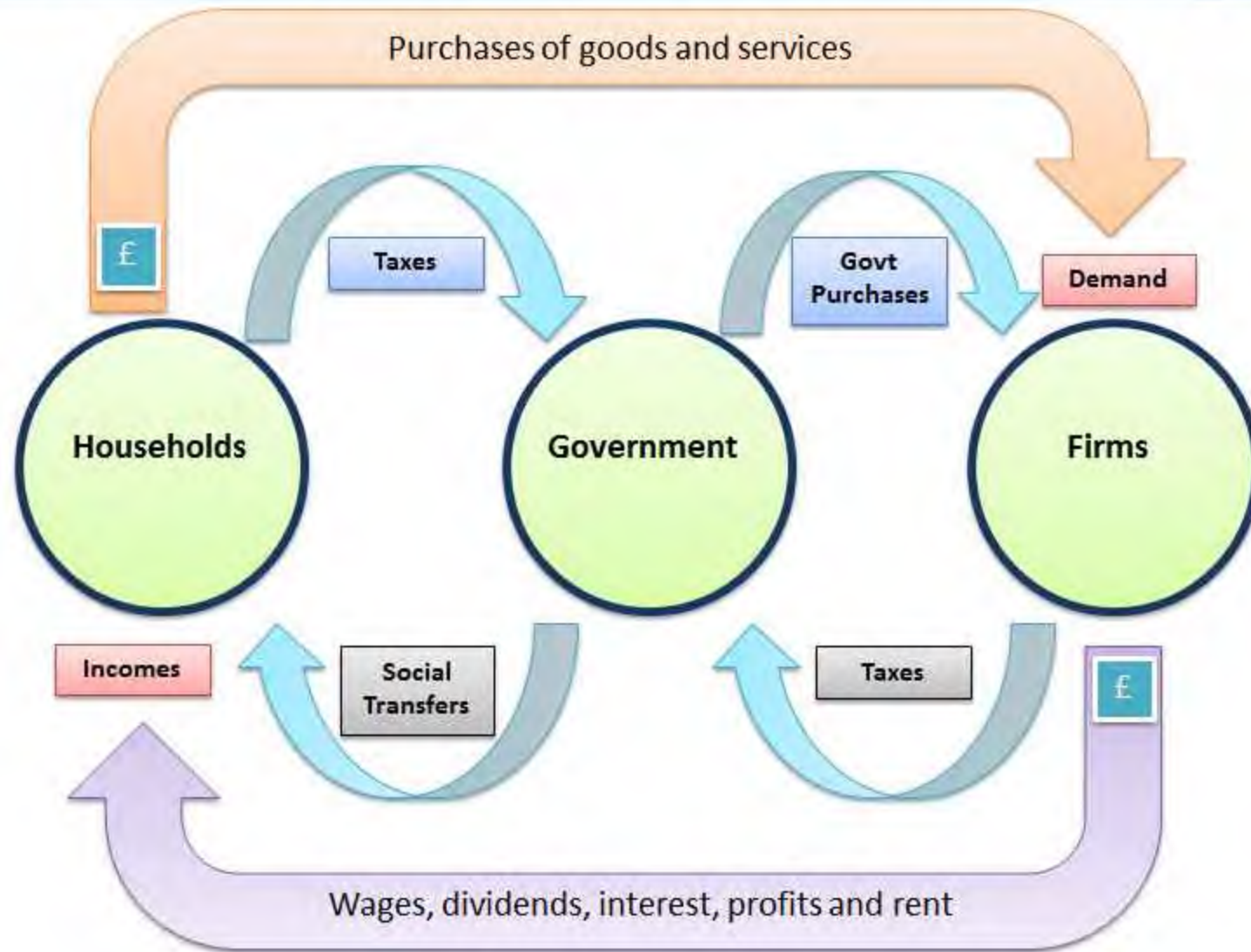
The problem with modern economics

- It is a 'secret science', inaccessible to the ordinary mortals
- It ignores the fact that infinite growth on a finite planet is impossible
- It is solely focuses on transactions between the various 'economic actors' and
- It ignores our interdependence with natural systems
- It favours finance capital to the detriment of natural and social capital
- It favours owners of capital to the detriment of workers
- It treats people solely as consumers rather than as true human beings
- The market is supreme – it 'should not be subject to policy regulation'
- It largely ignores 'externalities' – the unpaid, hidden costs of economic activity

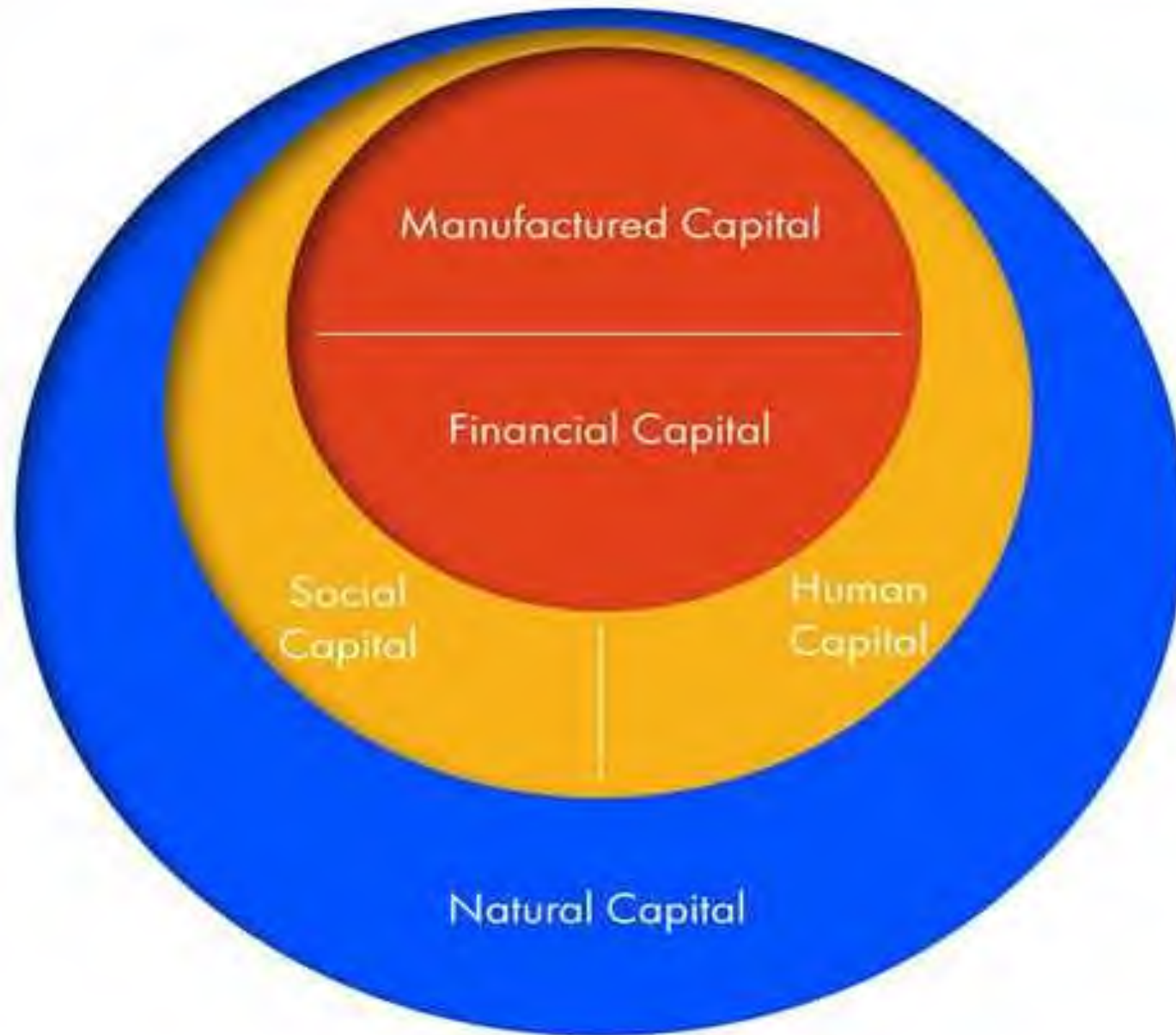
Circular Flow Diagram



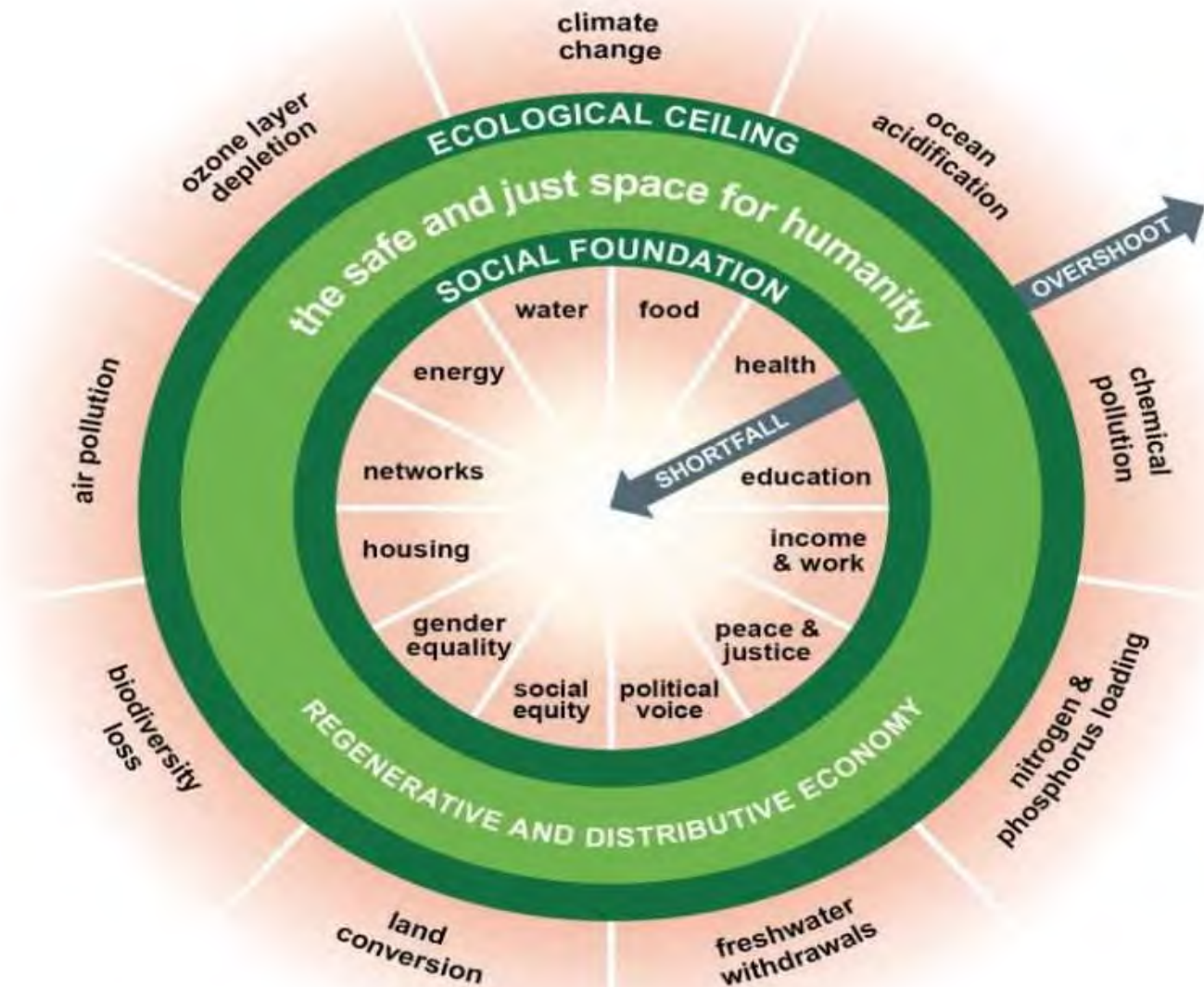
The Domestic Circular Flow of Income & Spending



‘Our economy is a wholly owned subsidiary of the world’s ecology – and not the other way around’ (Prof. Herman Daly)



The 'doughnut economy' (Prof. Kate Raworth)



Regenerative living: the challenges

- Before the industrial revolution the human economy was essentially circular: organic wastes, in particular, were used as the basis for sustainable farming systems
- Today, the human economy has become linear: Wastes are discharged as pollutants to the detriment of future life
- Many new synthetic materials, such as plastics, agrochemicals, pharmaceuticals, and metal alloys cannot be 'digested' by nature
- Inventing a new regenerative economy means, above all else, to do everything possible to stimulate the regenerative capacity of nature by deliberate policies and incentives

"Ecopolis"



Central city



Navigable river



Market gardening and community supported farms



Nature park and community orchard



Mixed farming and renewable energy



Grazing and forests



Air imports/exports



Road imports/exports



Sea imports/exports



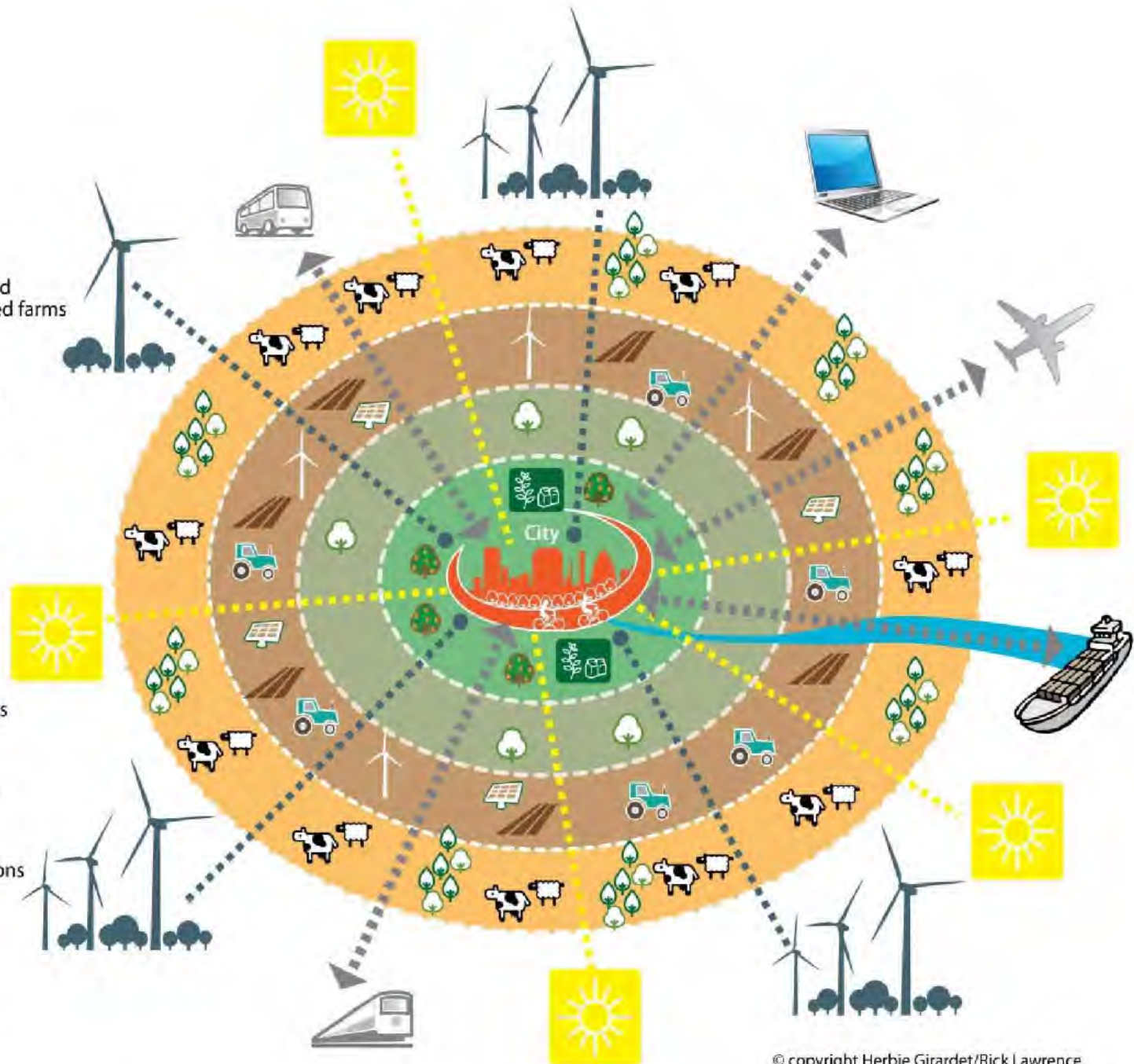
Global communications



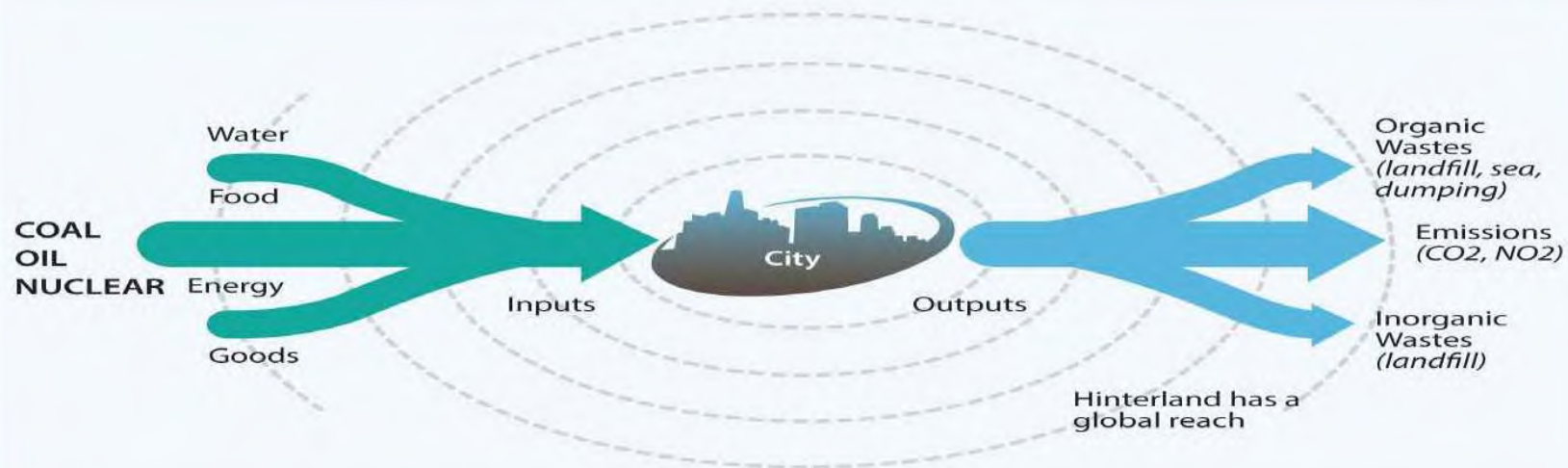
Renewable energy



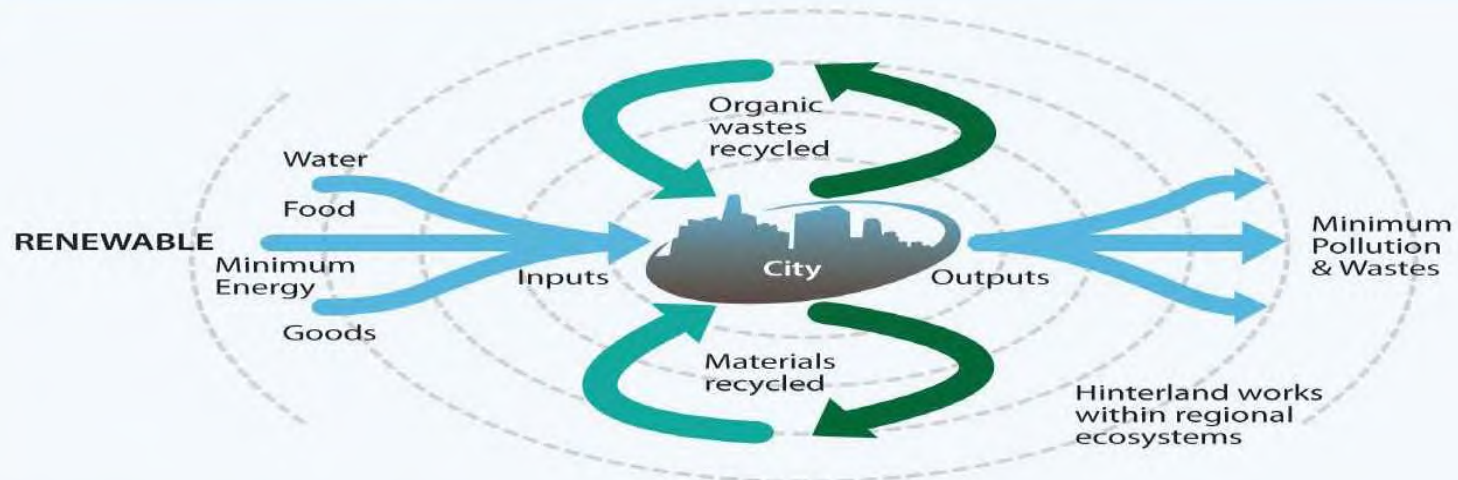
Renewable energy



LINEAR METABOLISM CITIES CONSUME RESOURCES AND CREATE WASTE AND POLLUTION AT A HIGH RATE



CIRCULAR METABOLISM CITIES REDUCE CONSUMPTION AND POLLUTION, RECYCLE AND MAXIMIZE RENEWABLES

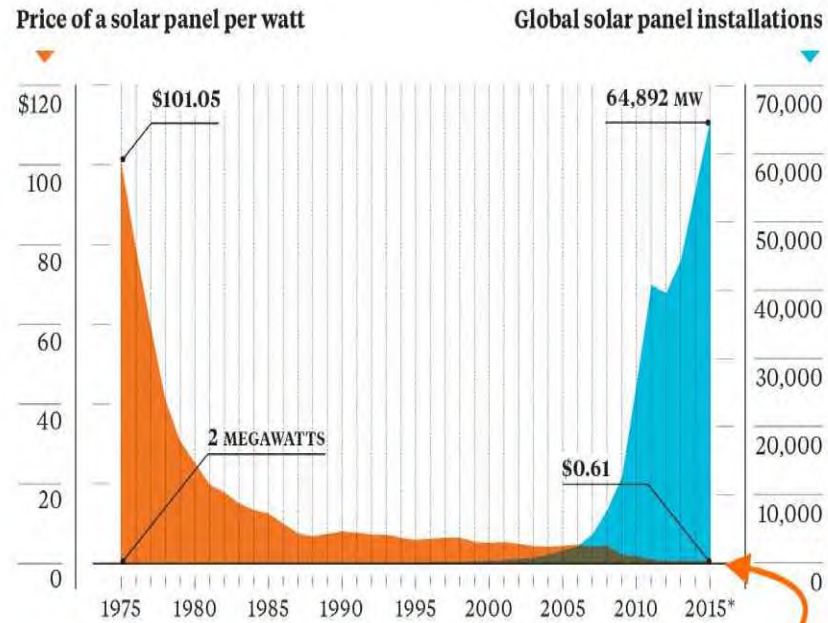


Towards a new economics

- Externalities need to be fully costed in the price of products and services. When the unpaid costs of our current economic practices are added up, much of economic activity becomes uneconomic
- We need to create a circular economic system, enabling the continual reuse of resources. This will stimulate innovation and many new business and job opportunities
- The fragility of global trade is becoming increasingly apparent. As routine, global *trade in products* comes increasingly under question, could there be a new emphasis on a global *exchange of ideas*?

Solar on Fire

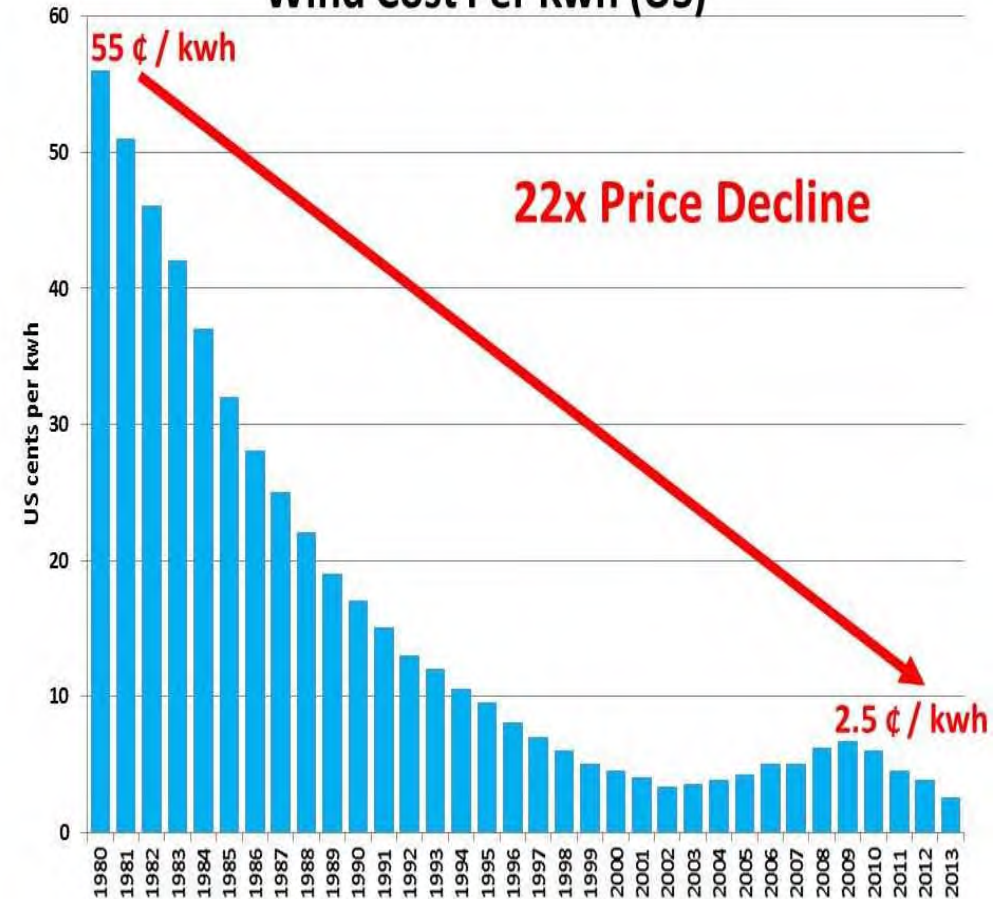
As prices have dropped, installations have skyrocketed.

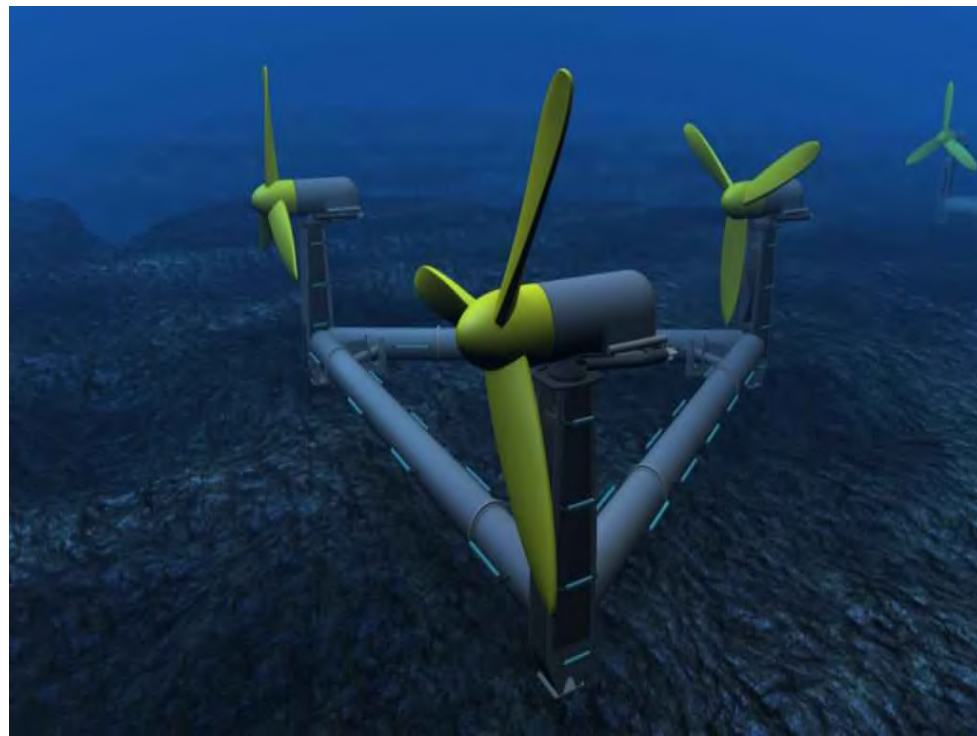
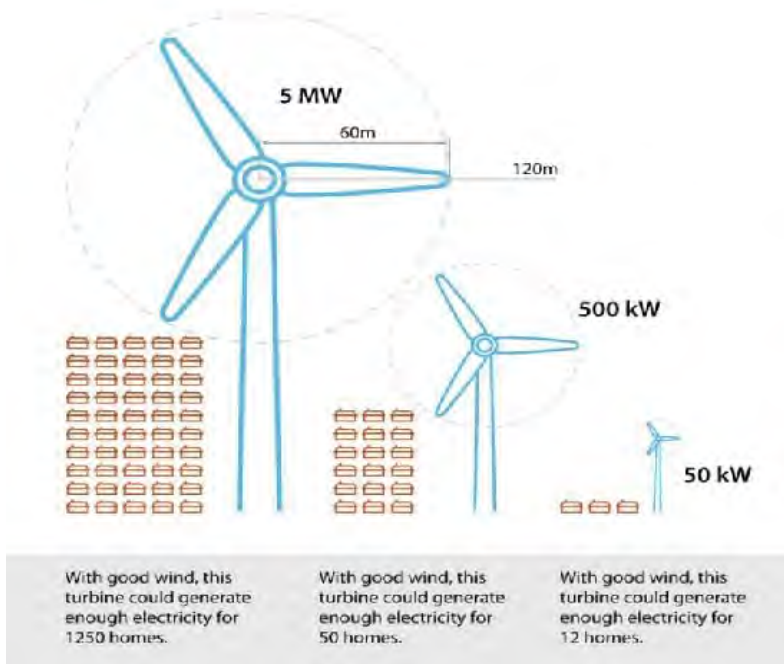


*Estimate. Sources: Bloomberg, Earth Policy Institute, www.earth-policy.org

Down to \$0.447 in August 2016

Wind Cost Per Kwh (US)

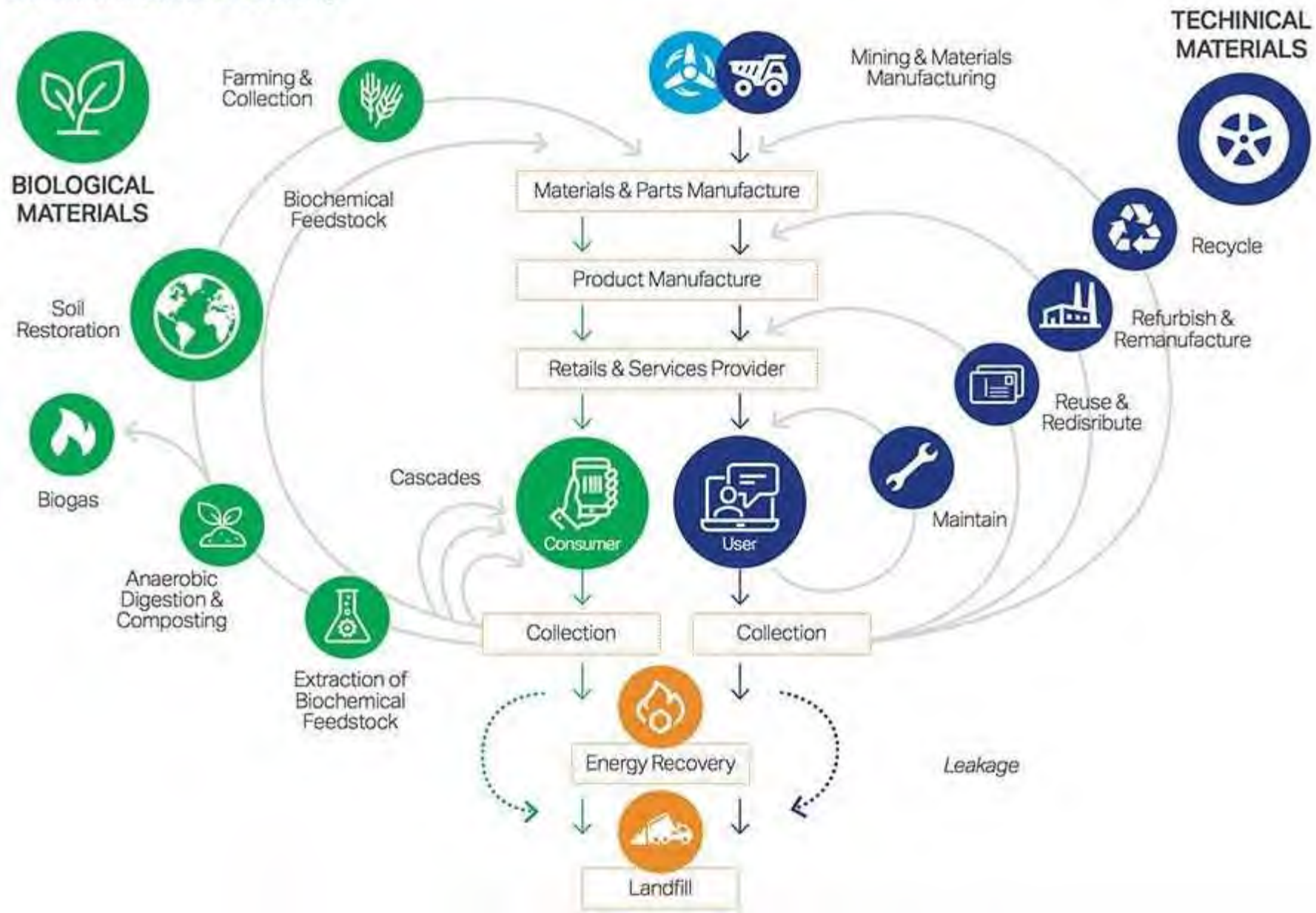




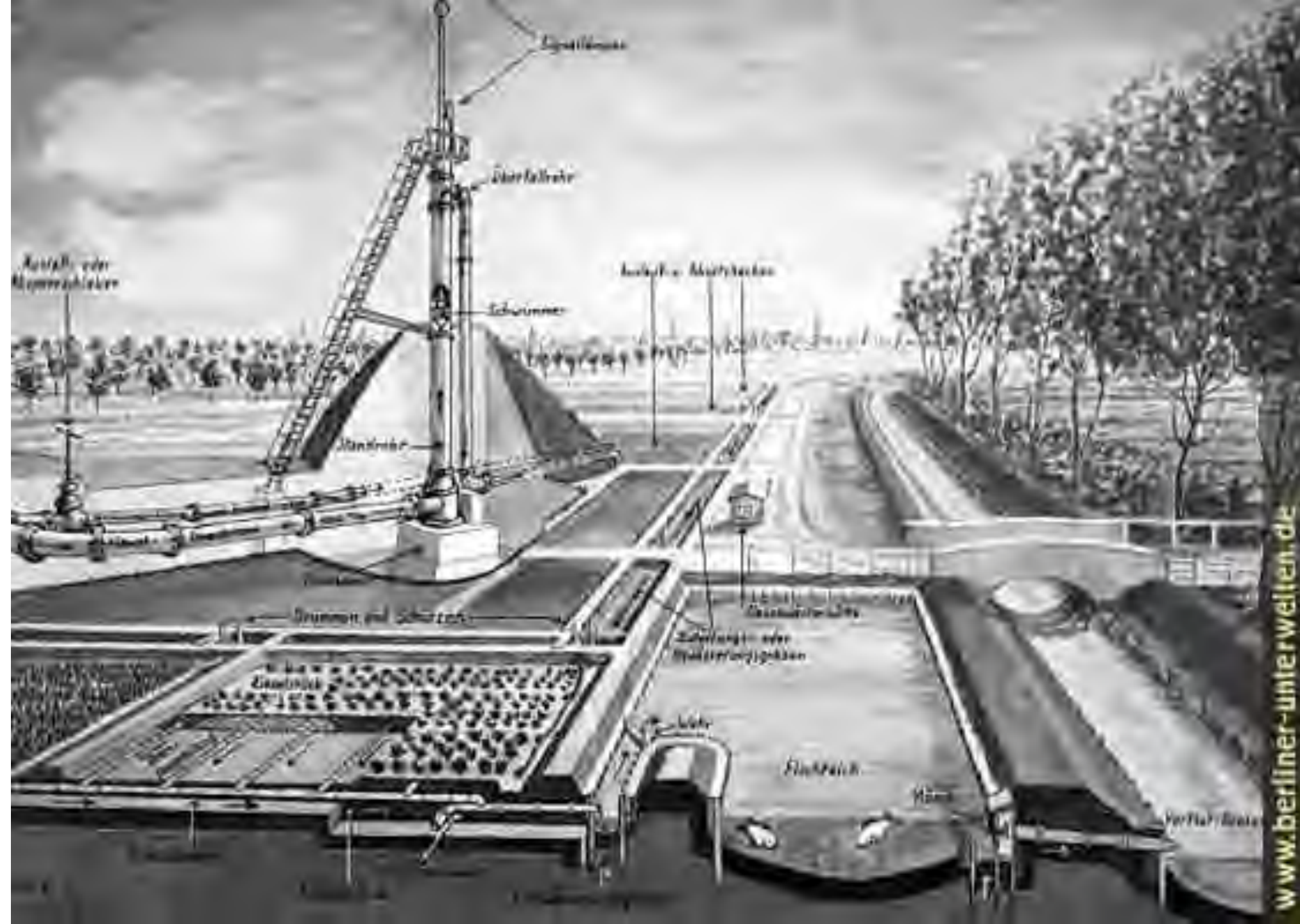




Outline of the circular economy







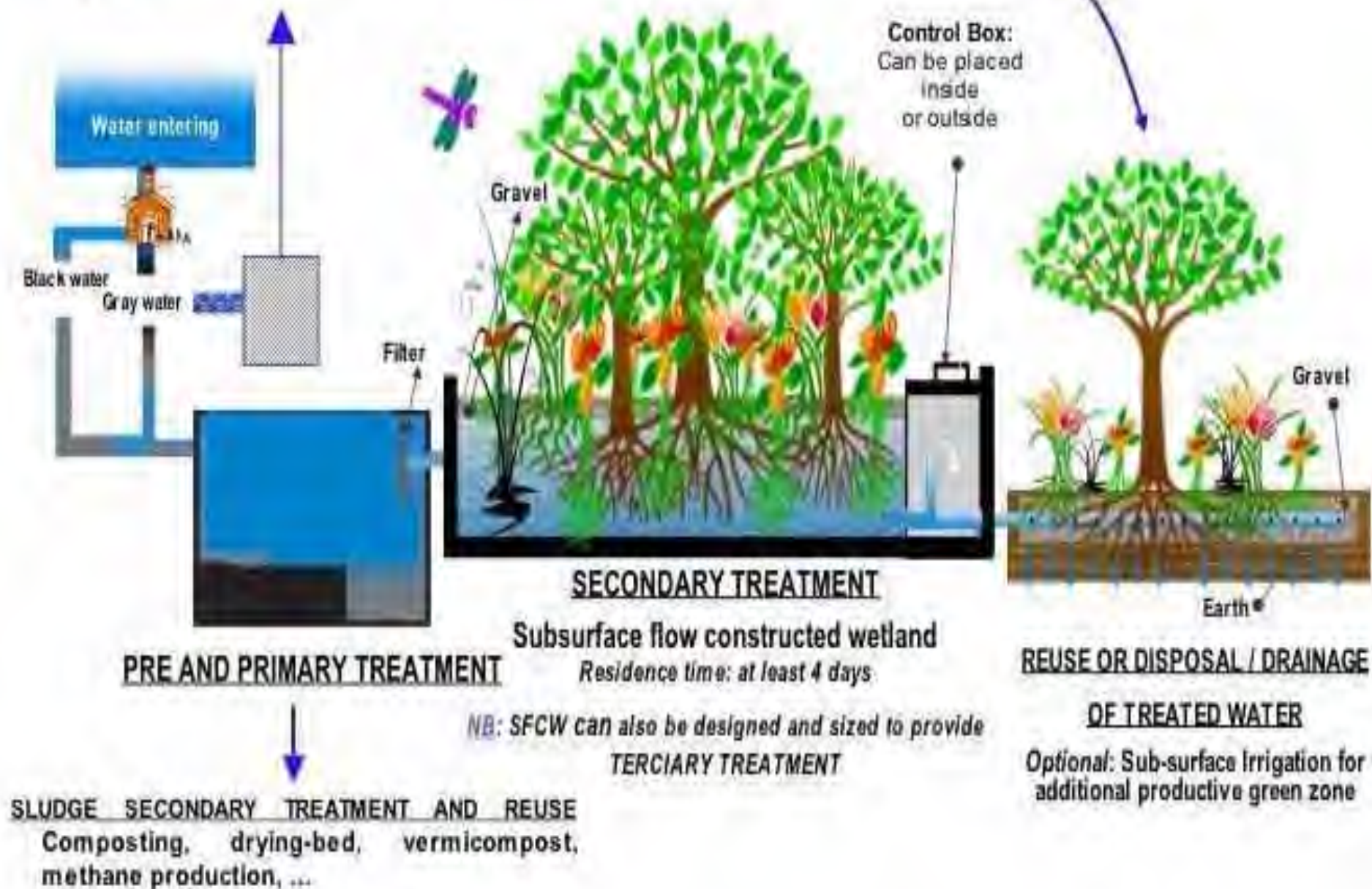




The Bristol 'poo-powered bus with methane from sewage



NB: When possible gray water to be separated from the black water







Plastic Roads?



Urban farming, Havana, Cuba

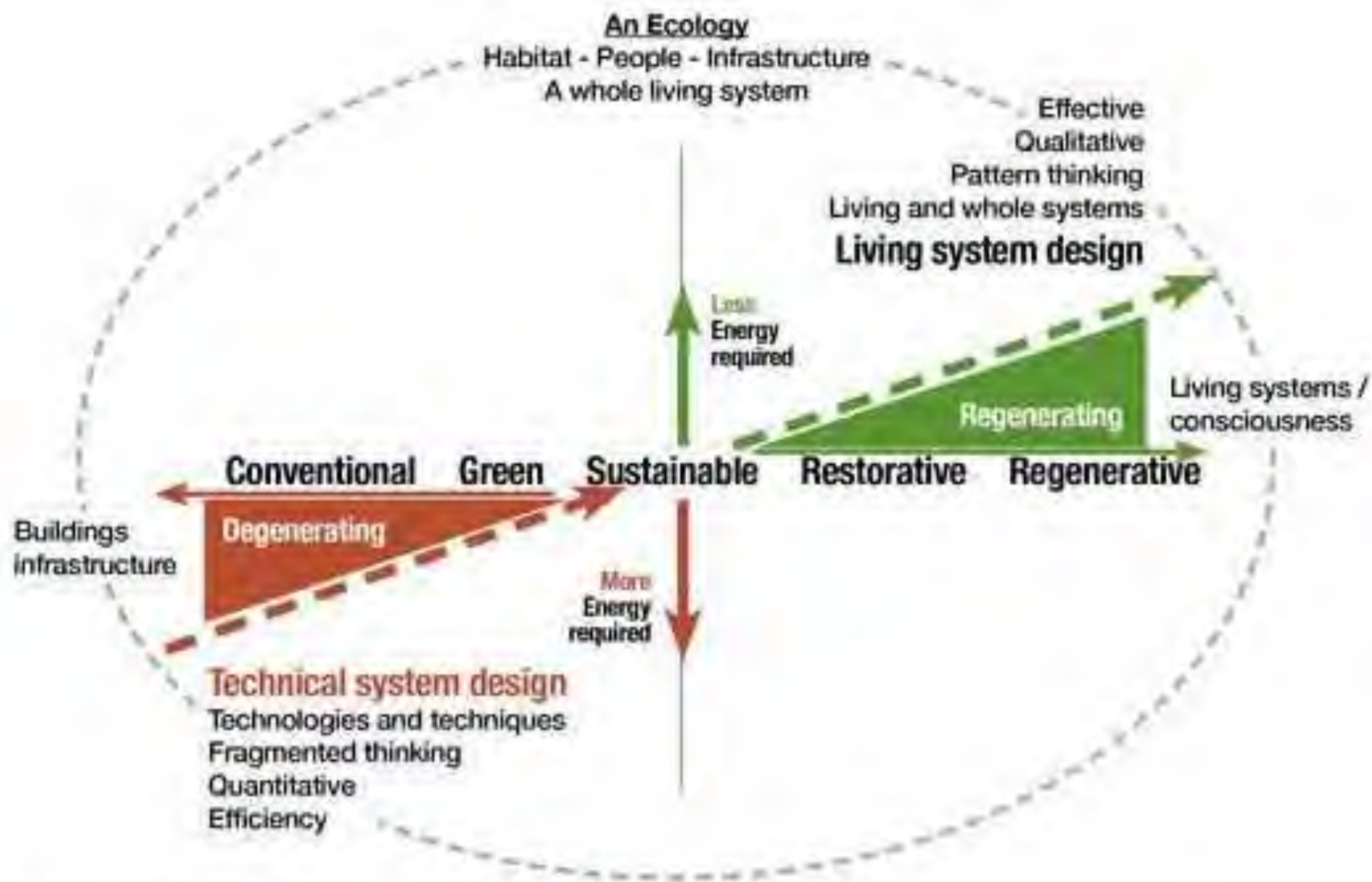












The four laws of ecology

1. Everything is connected to everything else. There is one ecosphere for all living organisms, and what affects one affects all;
2. Everything must go somewhere. There is no 'waste' in nature and no 'away' to which it can be thrown;
3. Nature knows best. The absence of a particular substance from nature is often a sign that it is incompatible with the chemistry of life;
4. Nothing comes from nothing. Exploitation of nature always carries ecological costs and these costs are significant, and ultimately have to be met.

Adapted from Barry Commoner, The Closing Circle, 1971

Adelaide – a story of ecological regeneration









The world's largest battery to store solar and wind energy















‘Regenerative’ Adelaide 2019

- 50% electricity supply from wind and solar
- 150,000 PV roofs on 600,000 houses = 300 MW peak
- The world’s largest lithium battery: 130 MW
- Solar hot water systems mandated for new buildings
- 3 million trees planted on 2000 ha for CO₂ absorption and biodiversity
- 25% reduction of CO₂ emissions since 2000
- Water sensitive urban development
- 180,000 tonnes of compost made from urban organic waste
- 20,000 ha of peri-urban land used for vegetable and fruit crops
- Reclaimed waste water & compost used to cultivate this land
- Large scale-building tune-up programmes across the city region
- New solar villages within the region
- **Thousands of new green jobs**





Yellow River - erosion control and landscape restoration







A new enlightenment?

- **The ‘Coronacene’ is not a passing phase – ‘other viruses are waiting’**
- **The world has failed to meet a single target to stop destruction of nature – UN Global Biodiversity Outlook 5, 15-09-2020**
- **We urgently need to define a new place in nature for ourselves**
- **From a mechanistic to an organic world**
- **Acknowledging the primacy of the Water, Carbon and Nutrient Cycles**
- **Ecological science (and philosophy) as non-negotiable basis for public policy**
- **Wales’s pioneering Wellbeing of Future Generations Act**
- **The challenge is for us to re-educate ourselves towards a new, regenerative culture, with all its many implications**





A HUMAN BEING IS A PART OF THE WHOLE CALLED BY HIS
UNIVERSE, A PART LIMITED IN TIME AND SPACE. HE EXPERIENCES
HIMSELF, HIS THOUGHTS AND FEELING AS SOMETHING
SEPARATED FROM THE REST, A KIND OF OPTICAL DELUSION OF
HIS CONSCIOUSNESS. THIS DELUSION IS A KIND OF PRISON FOR
US, RESTRICTING US TO OUR PERSONAL DESIRES AND TO
AFFECTION FOR A FEW PERSONS NEAREST TO US. OUR TASK
MUST BE TO FREE OURSELVES FROM THIS PRISON BY WIDENING
OUR CIRCLE OF COMPASSION TO EMBRACE ALL LIVING
CREATURES AND THE WHOLE OF NATURE IN ITS BEAUTY.

Albert Einstein

Creating Regenerative Cities

Herbert Girardet

