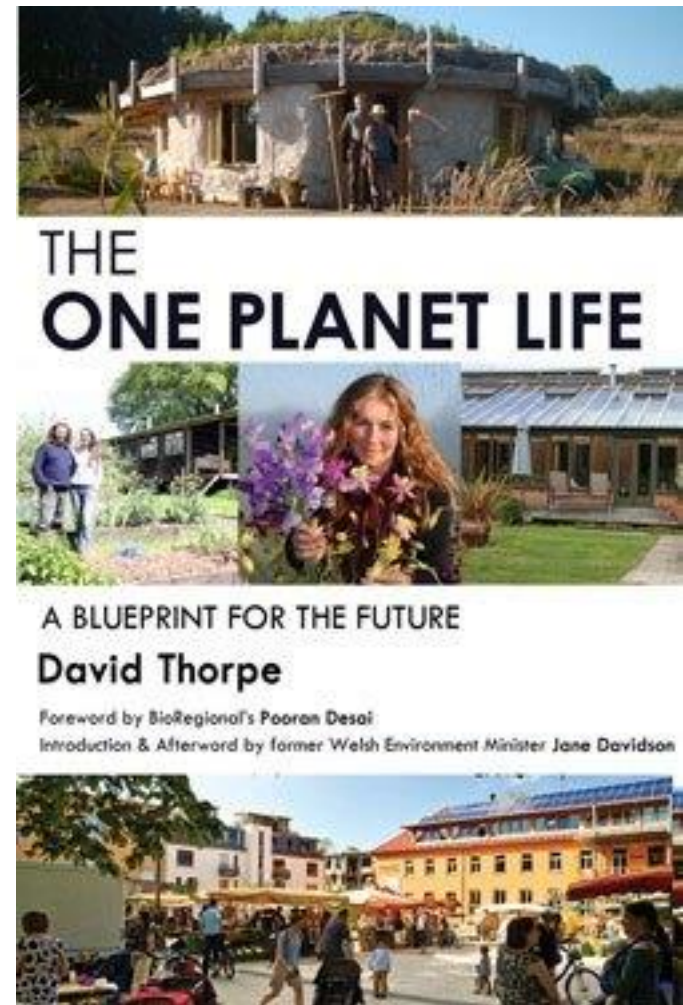
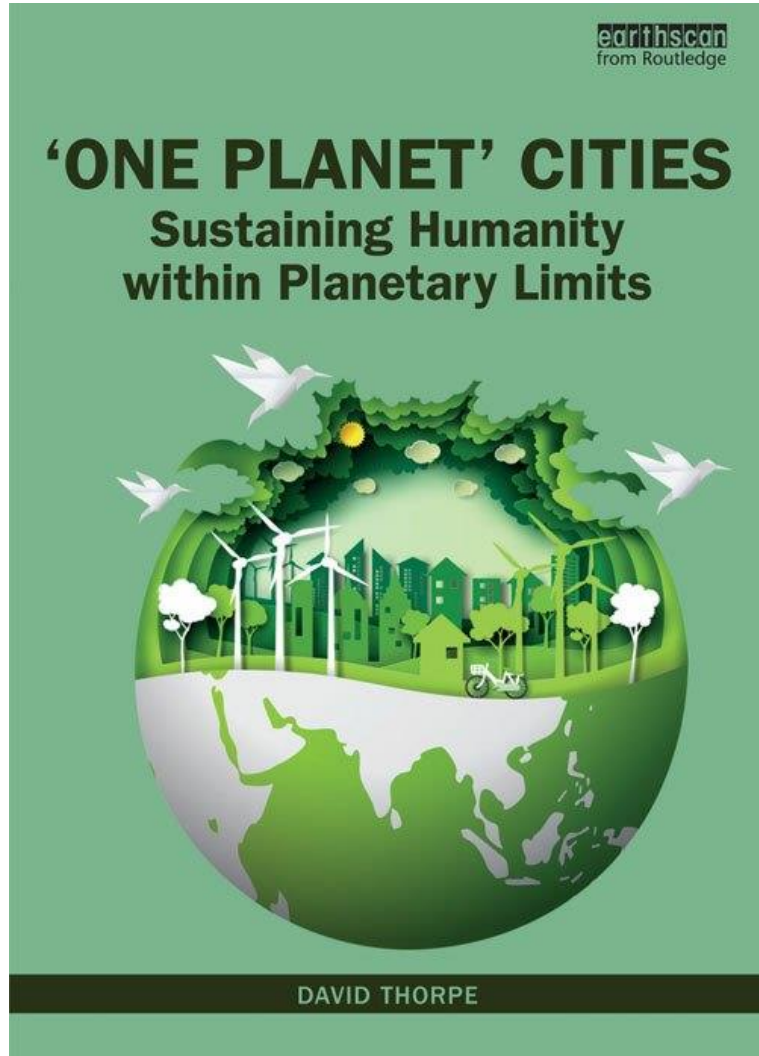


'One Planet' Cities



We face twin crises of climate and extinction

- Global wildlife populations have fallen by 60 per cent in just over four decades.
- Cities are like giant vacuum cleaners, sucking up resources from the rest of the planet.
- If they don't reverse this, they will die, like the Ouroboros, the mythical snake that ate its own tail.



But unlike the Ouroboros they won't be reborn.
Civilisation will end.

The loss of nature

60% decline since 1970

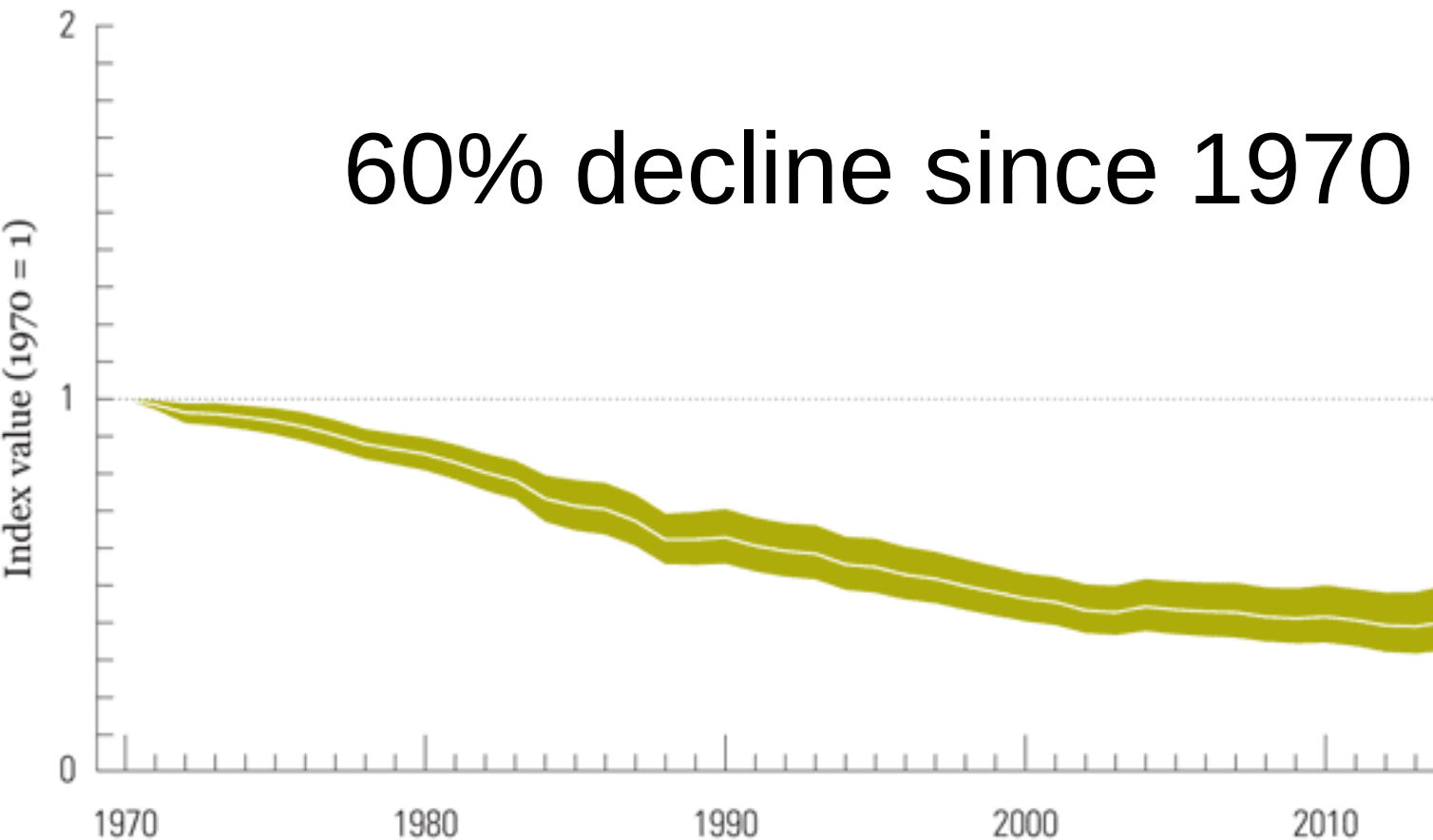


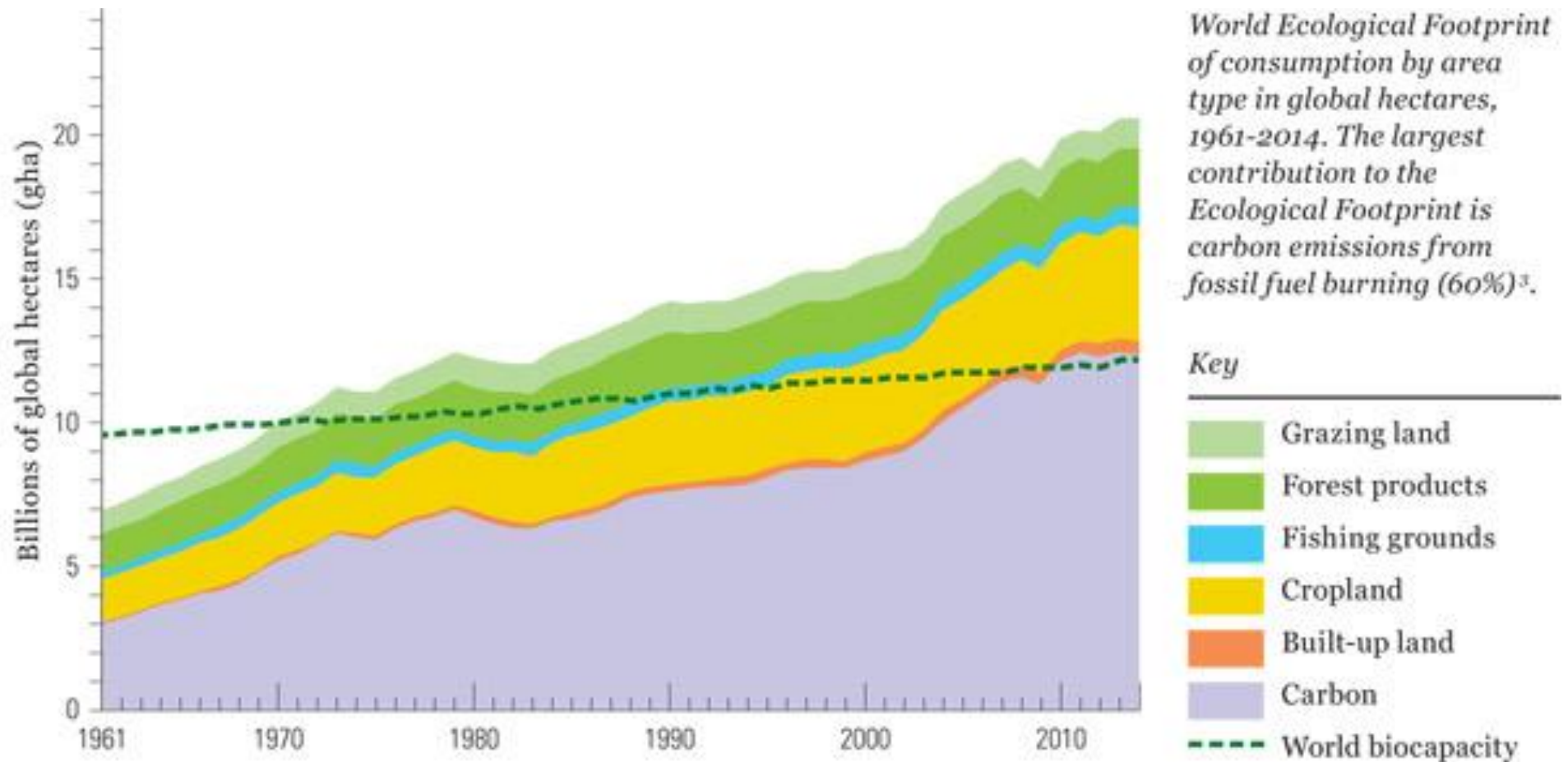
Figure 20: The Global Living Planet Index: 1970 to 2014

Average abundance of 16,704 populations representing 4,005 species monitored across the globe declined by 60%. The white line shows the index values and the shaded areas represent the statistical certainty surrounding the trend (range: -50% to -67%)¹.

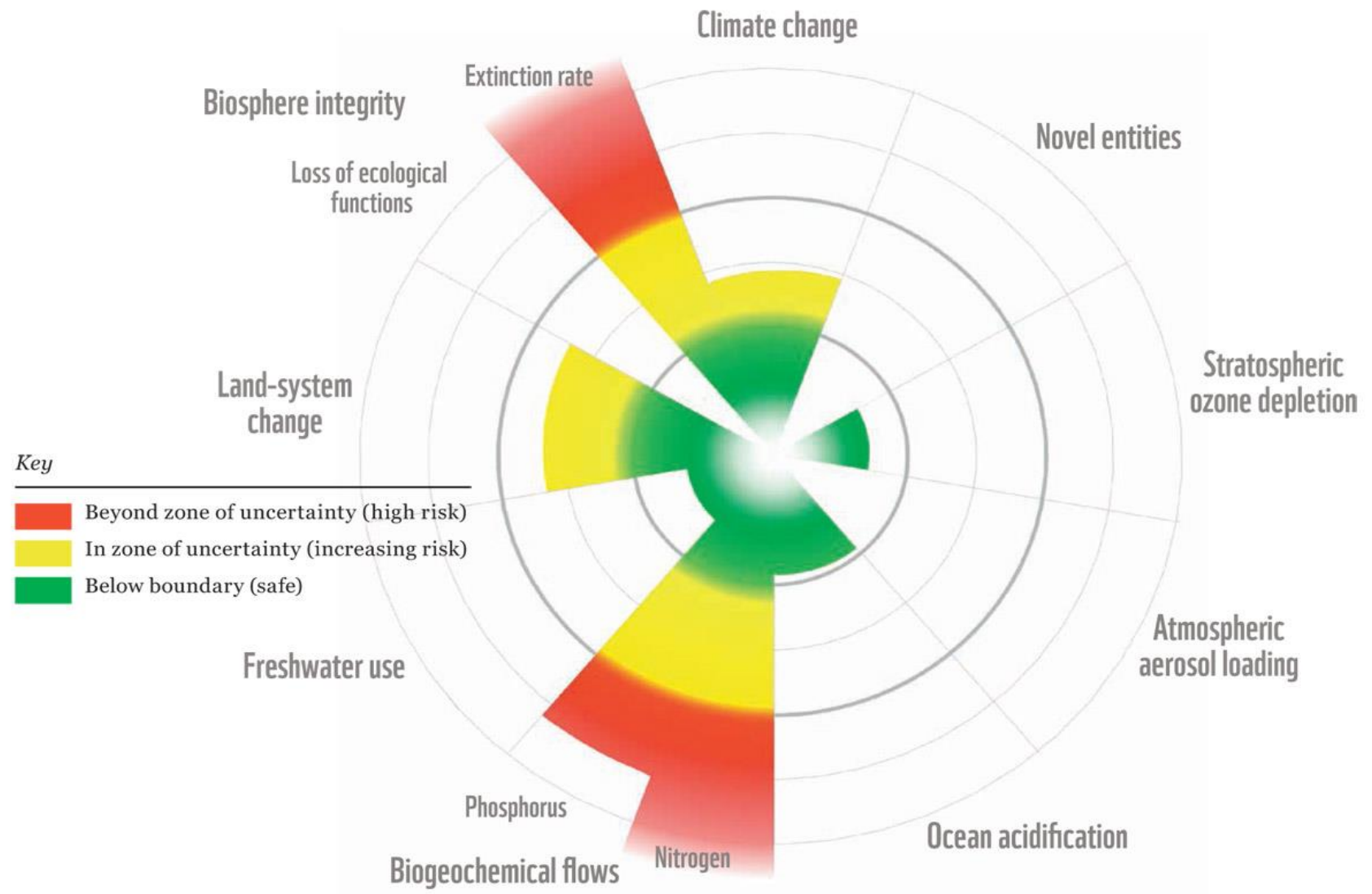
Key

- Global Living Planet Index
- Confidence limits

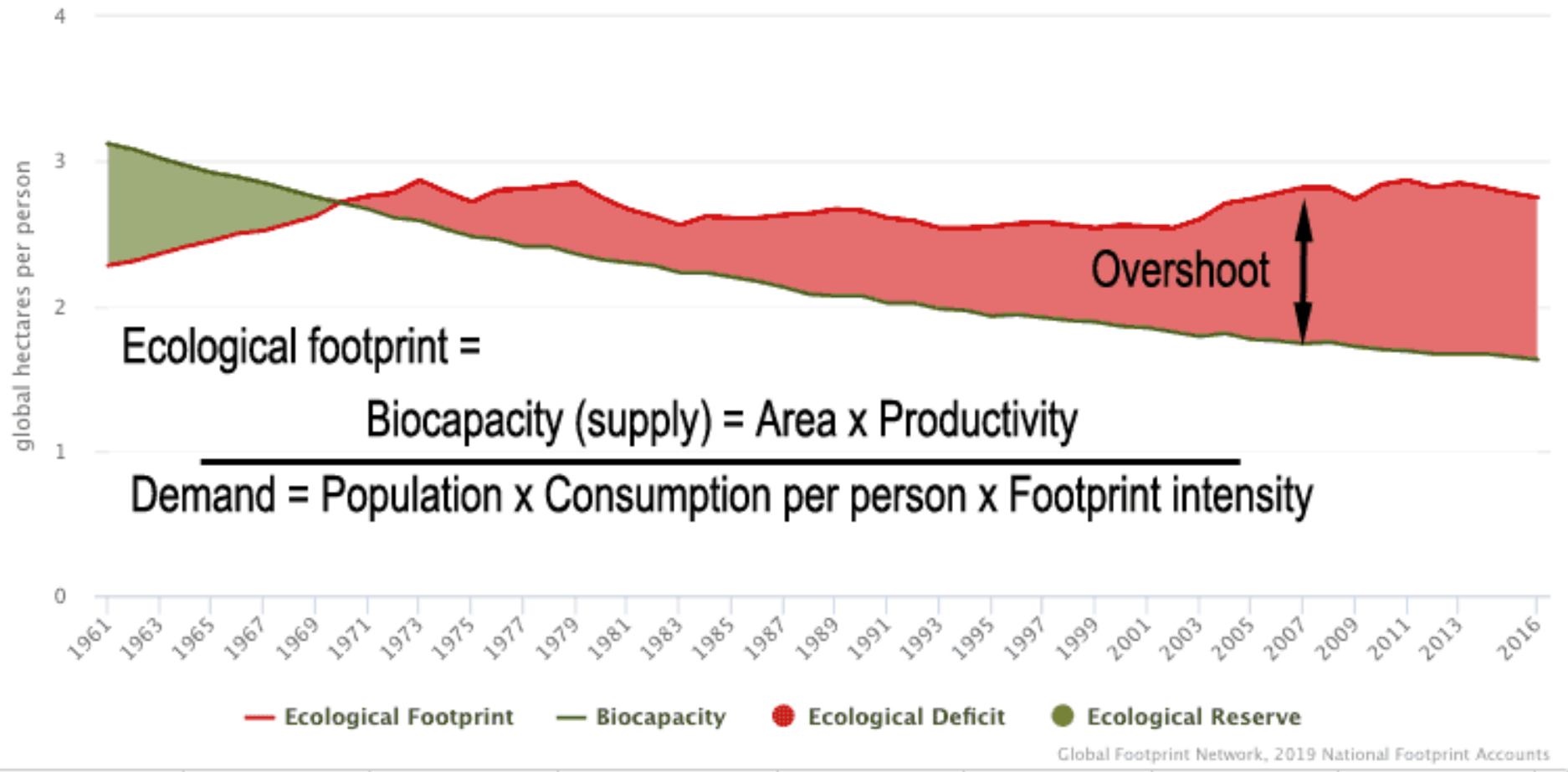
Planetary boundaries



Planetary boundaries



Ecological footprint



Humanity's demand for goods and services from ecological systems is currently 75 percent higher than what the planet can renew today – GFN 4.19

Effects of climate change in the UK

More precipitation

Less precipitation

Higher temperatures

Extreme weather events at
wrong times of year

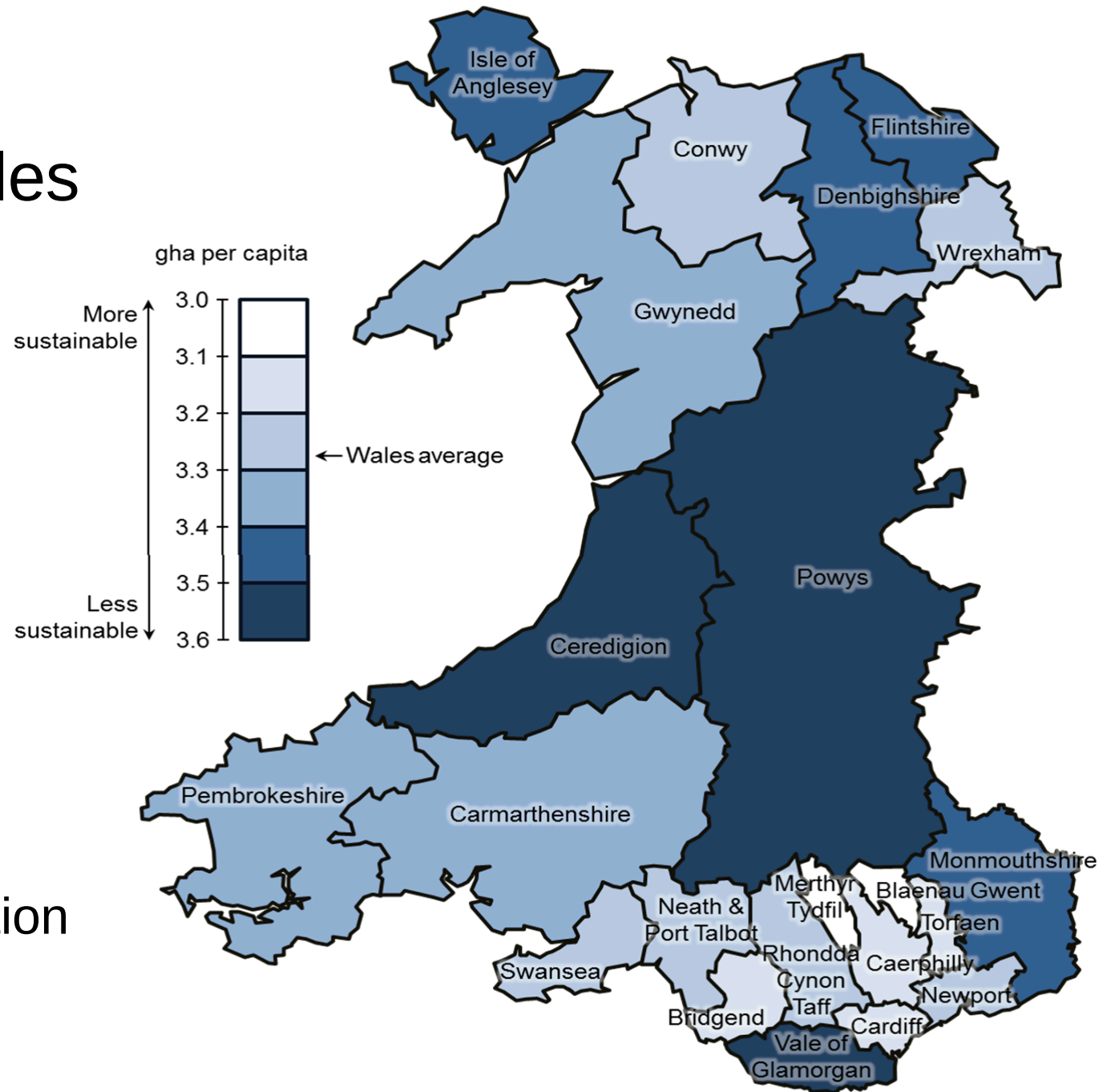
Increased levels of CO₂

Gulfstream might change
direction

Pollinator crisis

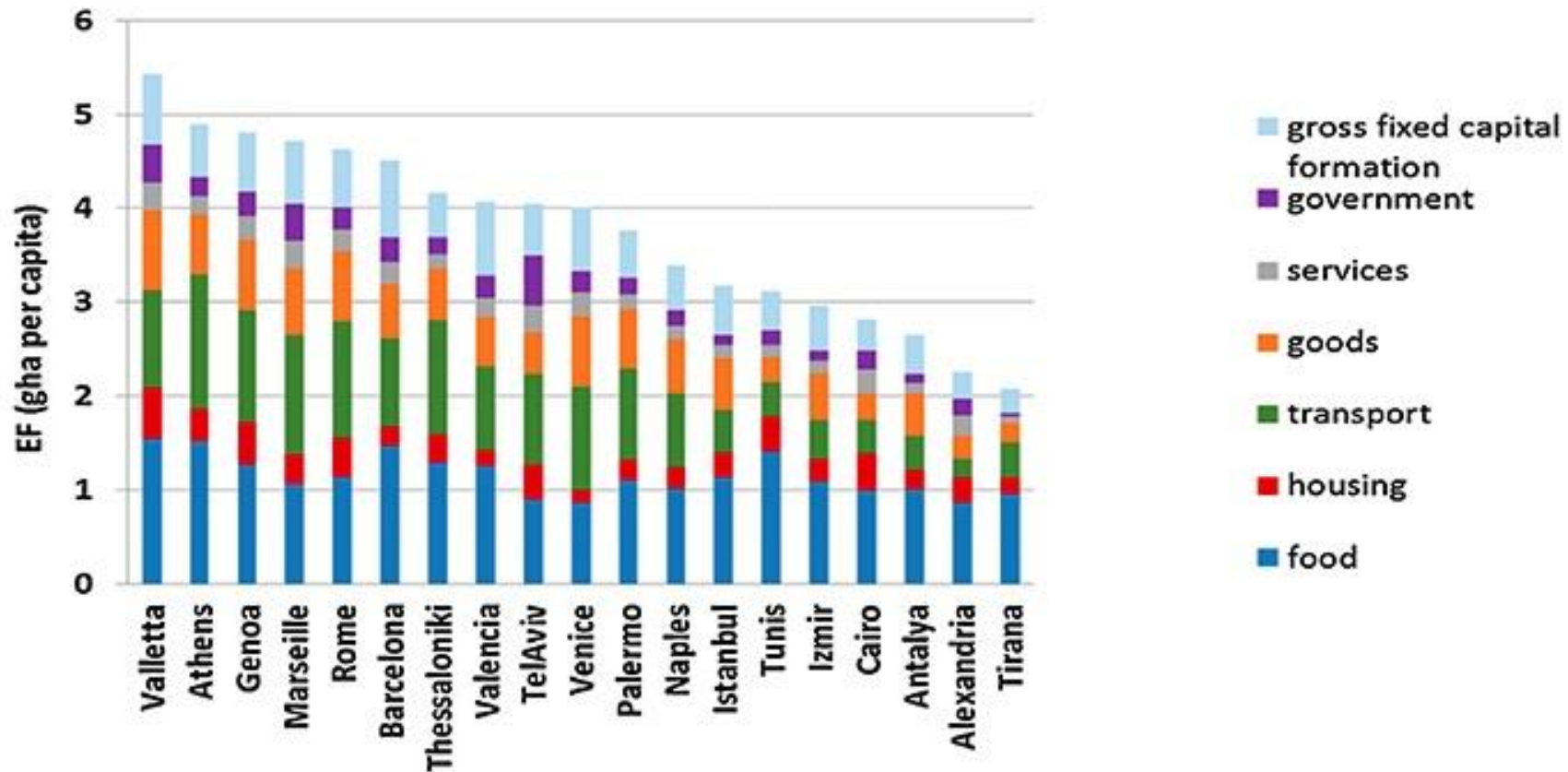


Ecological Footprint of Wales



NB: mainly consumption based – need to add production

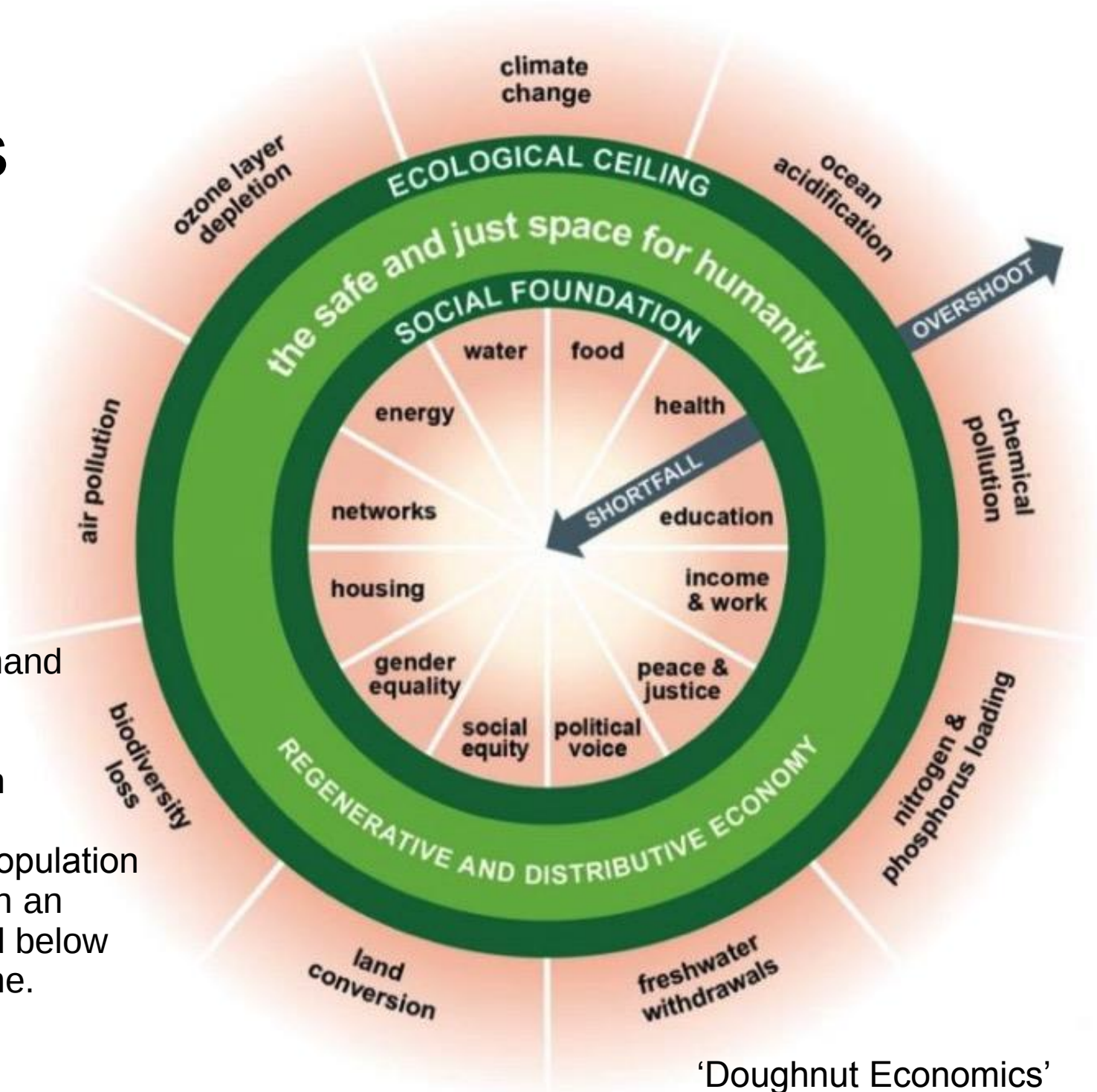
Mediterranean City Footprints



Kate Raworth's doughnut

86% of the world's population lives in a country with an ecological deficit. I.e. its residents demand more from nature than the country's own ecosystems can regenerate.

71% of the world's population lives in a country with an ecological deficit and below world-average income.



'Doughnut Economics'

The challenge

We must reduce our ecological footprint from this:



Home & Energy 27%

Transport 17%

Food 23%

Goods 14%

Services 9%

Govt 7%

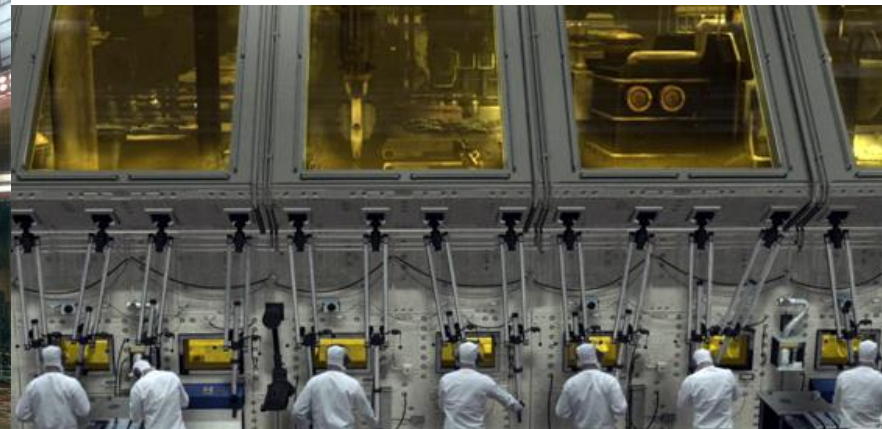
Capital assets 4%

To this:





Dark,
dismal
without
nature



**We must imagine the future now
By picking the best from the present
And daring to dream further**

**We must also take power
and work with
those who would create
the future for us.**

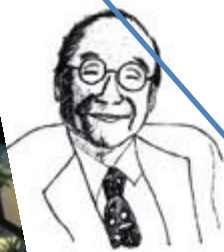
We have no choice.

Astana: how not to do it



And are these part of the solution
or the problem?

STARCHITECTS



the
GOOD the
BAD and
the **UGLY**



Developers' concepts
For African cities

SCOTT MURRAY

KENNY CUPERS

PAUL KAPP

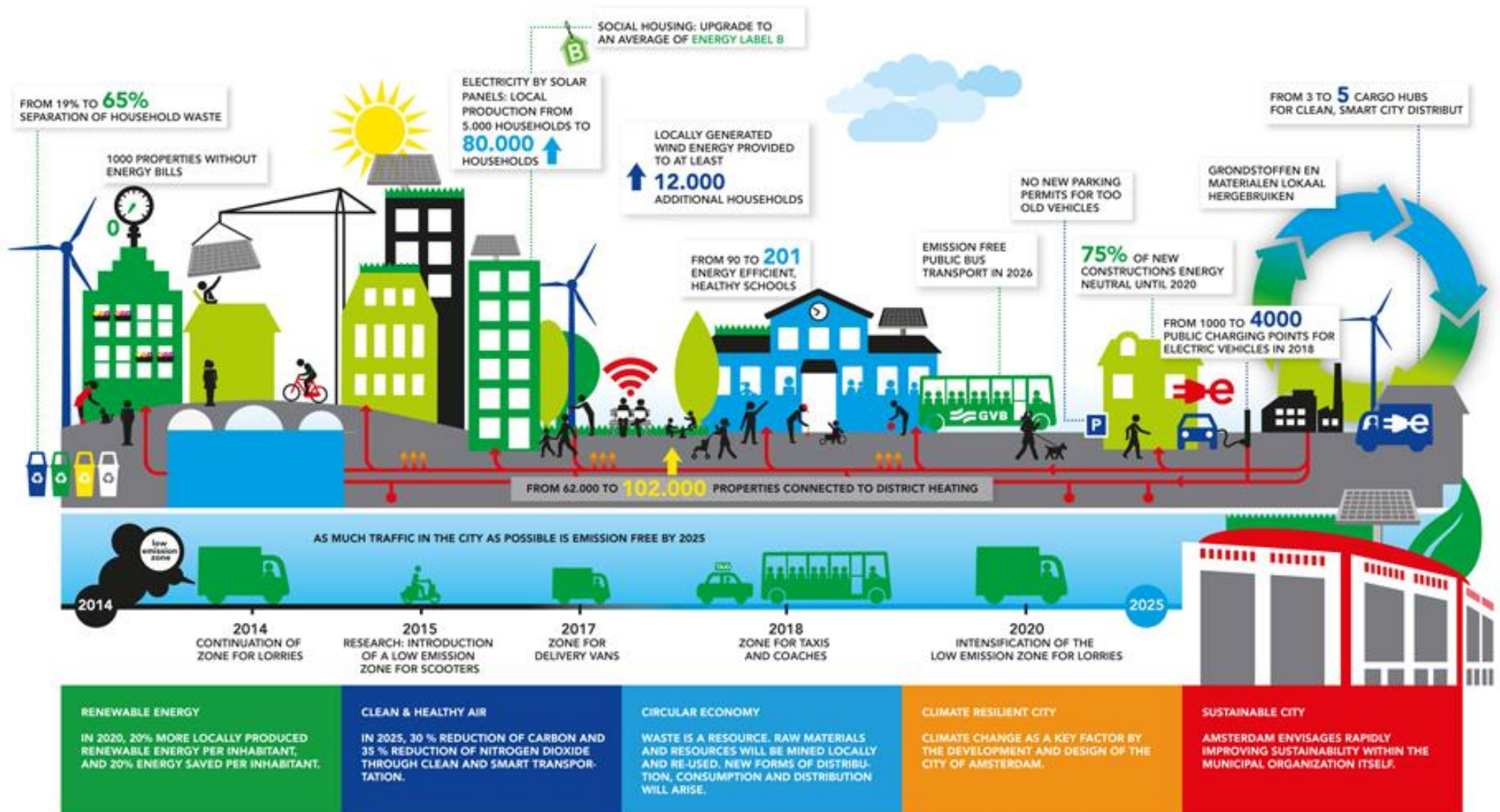
ROBERT BENSON

One planet challenges

1. Feeding & clothing everyone
2. Regeneration (putting back nature)
3. Going negative carbon
4. Transforming industry
5. Managing water
6. 'One planet' communities
7. Zero carbon buildings
8. Mobility
9. How smart is a 'smart city'?
10. Financing

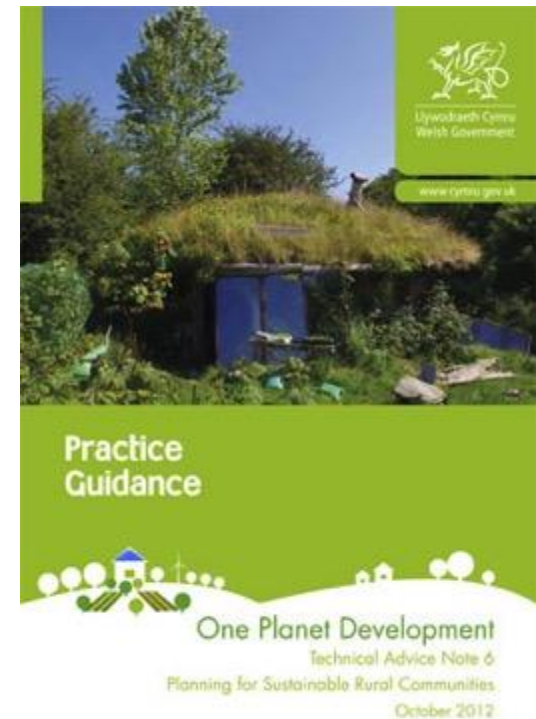
WHAT can
we do?

The mainstream 'sustainable' 'smart' city features



Inspiration: One Planet Development

- Welsh Government Policy
- Zero carbon homes
- No waste
- 100% renewable energy
- 65% livelihood from land-based activities
- Urban or rural
- Ecological footprint analysis as validation



One Planet Development in the countryside



Measure it!

The Welsh Gov's ecological footprint calculator

One Planet Development Ecological Footprint Calculator

Current Per Capita Ecological Footprint gha

Estimated Per Capita Ecological Footprint on First Habitation gha

Year Three & Year Five review Per Capita Ecological Footprint gha

Future estimated Per Capita Ecological Footprint gha

ut ref. **Data entry sheet**
 * It is recommended you enter current household figures as a baseline to guide your estimates

	Existing Household Actual Figures Pre Application (not required on application)	Estimated Household Figures on First Habitation Required on Application
1 Number of people in Household	4	1
2 Household annual income	15000 £ per year	
ENERGY		
3 On Grid electricity	500 kWh	0 kWh
4 Off grid electricity: solar PV	500 kWh	0 kWh
5 Off grid electricity: wind turbine	0 kWh	0 kWh
6 Gas (includes bottled gas) - 1kg LPG = 12.77 kWh	0 kWh	0 kWh
7 Biomass - logs - 1 tonne (see notes) = 3869 kWh	50 kWh	0 kWh
8 Coal - 1 kg = 8.05 kWh	0 kWh	0 kWh
9 Oil - 1 litre = 10 kWh	0 kWh	0 kWh
HOUSING & INFRASTRUCTURE		
10 Rent or mortgage expenditure	1200 £ per year	0 £ per year
11 Capital Cost - renewable energy equipment /water plant - spread over 15 years	500 £ per year	0 £ per year
12 Capital Cost - Costs of home construction - spread over 30 years	5000 £ per year	0 £ per year
13 Maintenance and repair of the dwelling	500 £ per year	0 £ per year
14 Goods & services for household maintenance	500 £ per year	0 £ per year
15 Water supply and miscellaneous dwelling services	20 £ per year	0 £ per year

Benefits of OPD

- Sustainable low impact homes
- Creating sustainable livelihoods
- Affordable housing
- Increased land productivity
- Good for the land and wildlife
- Efficient use of natural resources
- Sustainable transport
- Measurable
- Good for the local community
- Good for the UK and the planet



One Planet Development businesses



Passive solar and passive house



The ideal form for a passive solar building in a temperate climate would be longer on the north-south-facing side than the east-west facing sides, with double or triple-glazed windows on the sun-facing side and very small or no windows on the opposite side. *The 'Black Forest' passive solar 'earthship' in Colorado Springs, Colorado. Made of rammed earth and reused tyres.*



The ideal form for a passive house design would be a cube because it minimises the surface area to volume ratio, limiting heat loss. *The Solcer House, designed by Cardiff University's Welsh School of Architecture,*

Affordable housing

- Many styles of housing possible
- Only criteria is zero carbon lifetime impact
- Other Building Regs apply



Zero carbon homes



Round larch wood
Traditional jointing
Timber frame
Straw bale
Lime external render
Clay internal render
Tata steel roof



W. Carmarthenshire

Structural straw bale



(under construction)
Loadbearing straw bale
Lime external render
Clay internal render
Woodfibre roof insulation
Tata Steel roof



W. Carmarthenshire

Passivhaus & timber



*The Triangle, Swindon,
hemcrete and timber frame*

*Cornell Tech
(latitude 40.7oN)
is the world's
tallest Passive
House and one of
the first high-rise
residential
building in the
world built to
Passive House
standard.*



*LILAC housing
Estate, Leeds.
ModCell'
building system:
timber frame,
recycled
newsprint,
straw bale
structural
panels finished
in a mixture of
hemp/lime
render and
timber.*



Mjøstårnet,
Norway by Voll
Arkitekter for
AB Invest.
World's tallest
timber building.
85.4m 18
storeys high.
Uses cross-
laminated
timber.
Contains
apartments,
hotel,
swimming pool,
office space,
and restaurant.

LILAC

Low Impact Living Affordable Community

Project type: Timber frame,
cellulose insulation, hempcrete

Building Type: Collective
housing > 50m

Construction Year: 2013

Net Floor Area: 1,676 m²

Useful area

Cost: 2,221,617 €

Number of Dwellings: 20

Cost/m²: 1,326 €/m²

Cost/Dwelling: 111,081 €



Pentre Solar



Timber frame 2-4 bed £80-£100k
Build: passive house principles
Each monopitch roof has 8kW
integrated PV over galvanised steel
sheet laps over timber frame.
Total energy demand c.12% of a
conventionally built home.



Pentre Solar

- Concrete slab beneath: thermal mass, greater carbon footprint, but lower maintenance requirement.
- Windows: double glazed
- Insulation: 27cm of recycled newsprint pumped into cavity.
- Paint: clay-based – breathable with no off-gassing.
- Efficient washing machine, condenser drier, kitchen, water-saving bathroom with occupancy sensors on LED lights.
- Sky connection, Wi-Fi and an outside socket for charging electric vehicle.



Sustainable Urban Drainage systems



‘Nature based solutions

Source: Tom Watson, Natural Environment Research Council: The science of sustainable drainage.

Transport

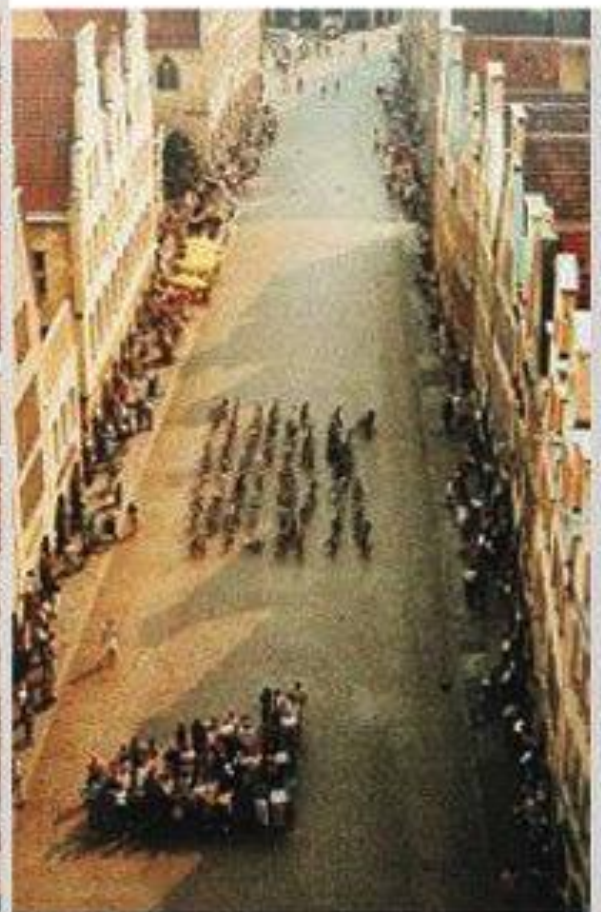
Space required to transport 60 people



car



bus



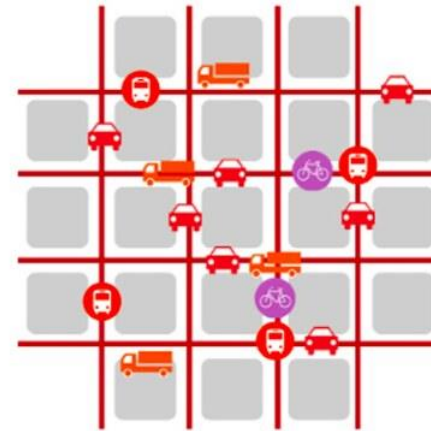
bicycle

Barcelona superblock



SUPERBLOCKS MODEL

Current Model



Superblocks Model



- PUBLIC TRANSPORT NETWORK
- BICYCLES MAIN NETWORK (BIKE LANE)
- BICYCLES SIGNPOSTS (REVERSE DIRECTION)
- FREE PASSAGE OF BICYCLES
- PRIVATE VEHICLE PASSING
- RESIDENTS VEHICLES
- URBAN SERVICES AND EMERGENCY
- DUM CARRIERS
- DUM PROXIMITY AREA
- ACCESS CONTROL
- BASIC TRAFFIC NETWORK
- SINGLE PLATFORM (PEDESTRIANS PRIORITY)



Rethinking urban public space:
moving from linear and uni-purpose to dynamic spaces with
diverse uses

Barcelona superbblock



ZONES D'ESTADA

- 1 Taules de pícnic
- 2 Recorregut literari
- 3 Espai per a mercats eventuais

ZONES DE JOC

- 4 Àrea gran de jocs infantils
- 5 Àrea petita de jocs infantils
- 6 Tarima per a espectacles
- 7 Espai de joc
- 8 Tauler d'escacs
- 9 Àrea de jocs infantils

ZONES ESPORTIVES

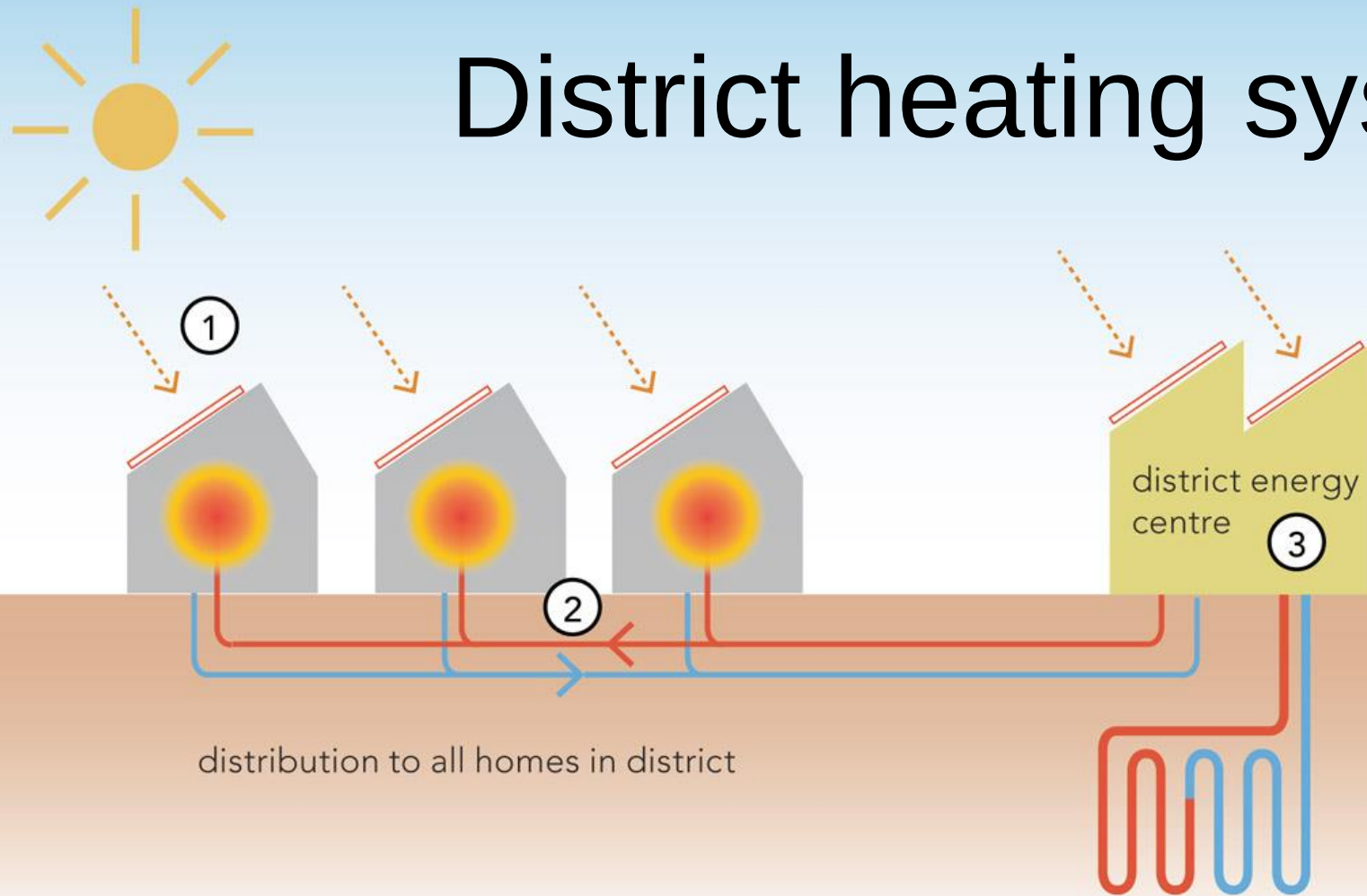
- 10 Circuit de joc
- 11 Taules de ping-pong
- 12 Cistella de bàsquet
- 13 Pista d'atletisme

OBRES DE REURBANITZACIÓ

- 14 Cruïlles d'accés a la superilla
- 15 Obres de reurbanització del carrer de Pere IV entre els carrers de Roc Boronat i Bilbao
- 16 Places de Dolors Piera i Isabel Vila
- 17 Tram del carrer dels Almogàvers entre els carrers de Roc Boronat i Llacuna
- 18 Obres de l'edificació del PMH, d'11 plantes i 68 habitatges en dret de superfície, d'entre 60 i 84 m². Data prevista d'inici a partir d'abril - maig de 2017

— Àmbits d'actuació de les obres de reurbanització

District heating systems



1. Heating and hot water is supplied by a communal or district system. PV on individual homes to power electrical equipment and charge vehicles

2. District systems tend to work more efficiently in dense or urban developments as installation costs are lower and less heat is lost through the network

3. A district scale energy centre makes efficient use of possible technologies:

- heat from waste
- combined heat and power
- ground source heat

Goldsmith Street, Norwich, RIBA Stirling Prize winner 2019

Seven terraces of homes designed by Mikhail Riches with Cathy Hawley for Norwich City Council.

The judges called it "a modest masterpiece. High-quality architecture in its purest most environmentally and socially-conscious form... These desirable, spacious, low-energy properties should be the norm for all council housing."



A distinct improvement on last year's winner, Norman Foster's £1.3bn headquarters for the allegedly 'green' billionaire Michael Bloomberg, CEO of C40 Cities (below).



Vauban & Freiburg



Food connects everything

- all the Sustainable Development Goals



Urban growing



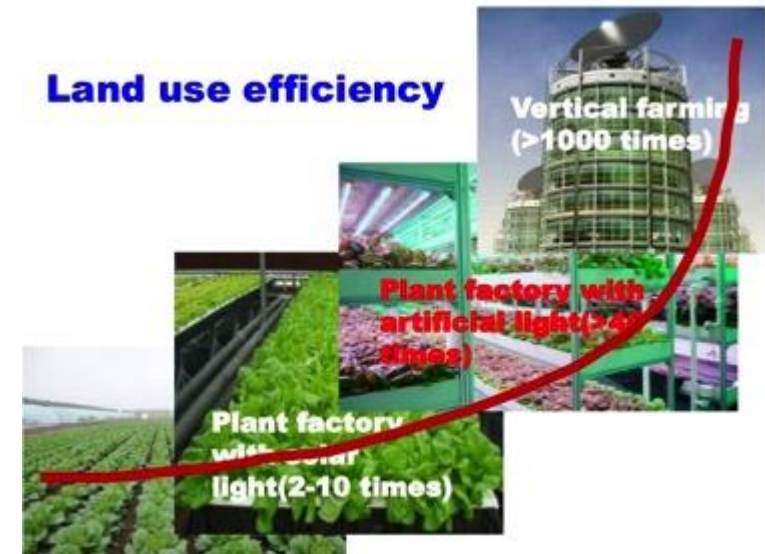
Detroit

- Detroit City Plan updated 2012 to feature urban agriculture, acknowledging environmental, economic and social benefits.
- 2013's Detroit Future City Strategic Framework: priority for all city stakeholders in order to accelerate economic revival, address land use issues, improve city services, and foster civic engagement.
- Urban agriculture gets zoning ordinance, formally permitting certain types of food production as a viable land use.
- Planning barrier and land cost often a vital issue.



Vertical farming in China

- Cultivated land is only 0.08ha/person – 40% of world average.
- 80% of population will live in cities by 2050
- Partly-automated indoor farming is an essential feature of the future.
- Professor Dr Qichang Yang CPAEE & CCAS in Beijing. 40 research institutes in Ministry of Agriculture: indoor /vertical urban farming, greenhouse engineering, plant factories, hydroponics and energy efficiency.



Vertical farming in China

Regional Distribution of Plant Factory In China (2014)



Inside view of the plant factory



Plant factory with LED light (Zhejiang)

Plant Factory for demonstration in Zhejiang



Bird eye view of the plant factory, 1600 m² (include PF with artificial light 880 m²)

Movable cultivation beds with LED light



Tuberous roots

Soilless sweet potato plant 10 yrs old has produced 500 potatoes.



The hinterland approach

cities used to feed themselves from the surrounding areas



Golden Horseshoe, incl. Greater Toronto area.

7 municipalities 10-year Golden Horseshoe Food and Farming Plan 2021:

to grow the food and farming cluster

to link food, farming and health through consumer education

to foster innovation to enhance competitiveness and sustainability

to enable the cluster to be competitive and profitable by aligning policy tools, and

to cultivate new approaches to supporting food and farming.

Problem: big agriculture.

Doing this in Wales

National
Development
Framework

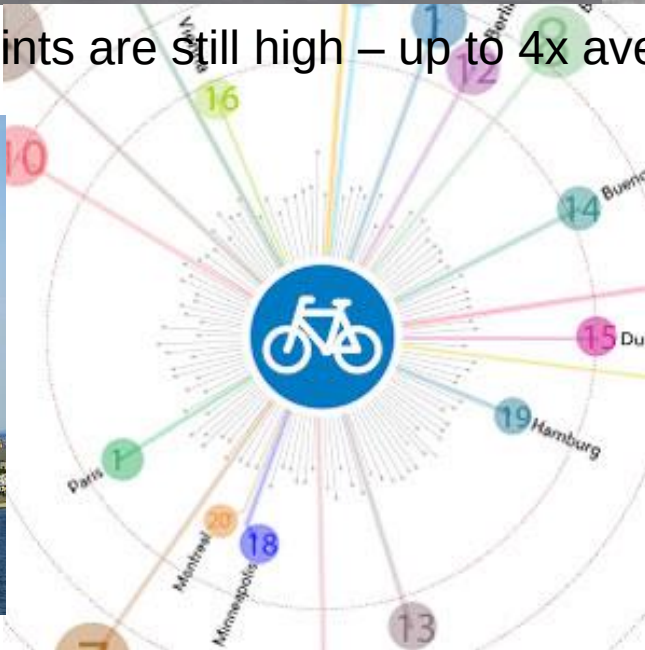
Adapt the
'Preston model'
using public
procurement tools



Copenhagen – carbon neutral by 2025 45% cycle to work.



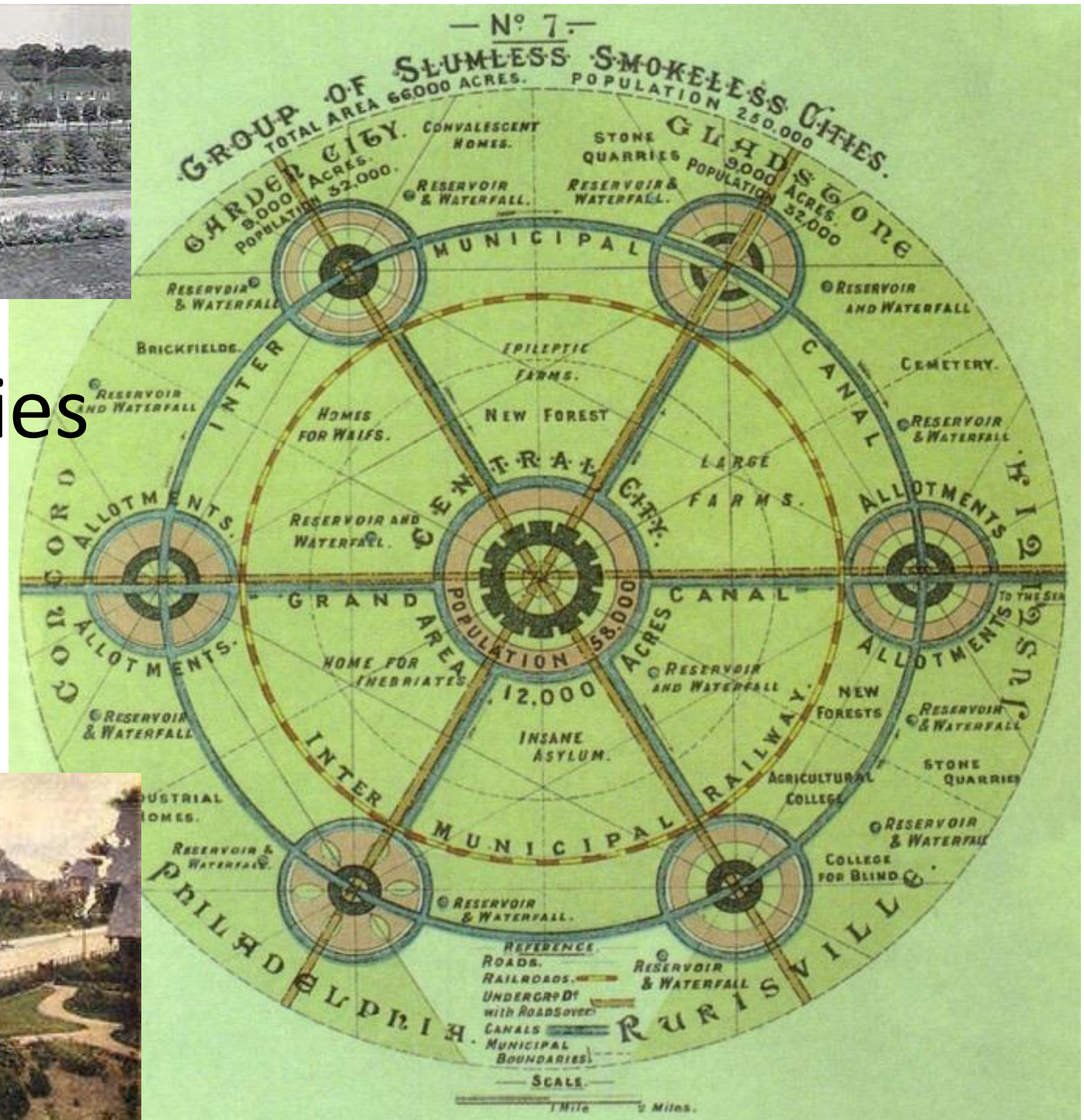
But carbon and ecological footprints are still high – up to 4x average around the world.



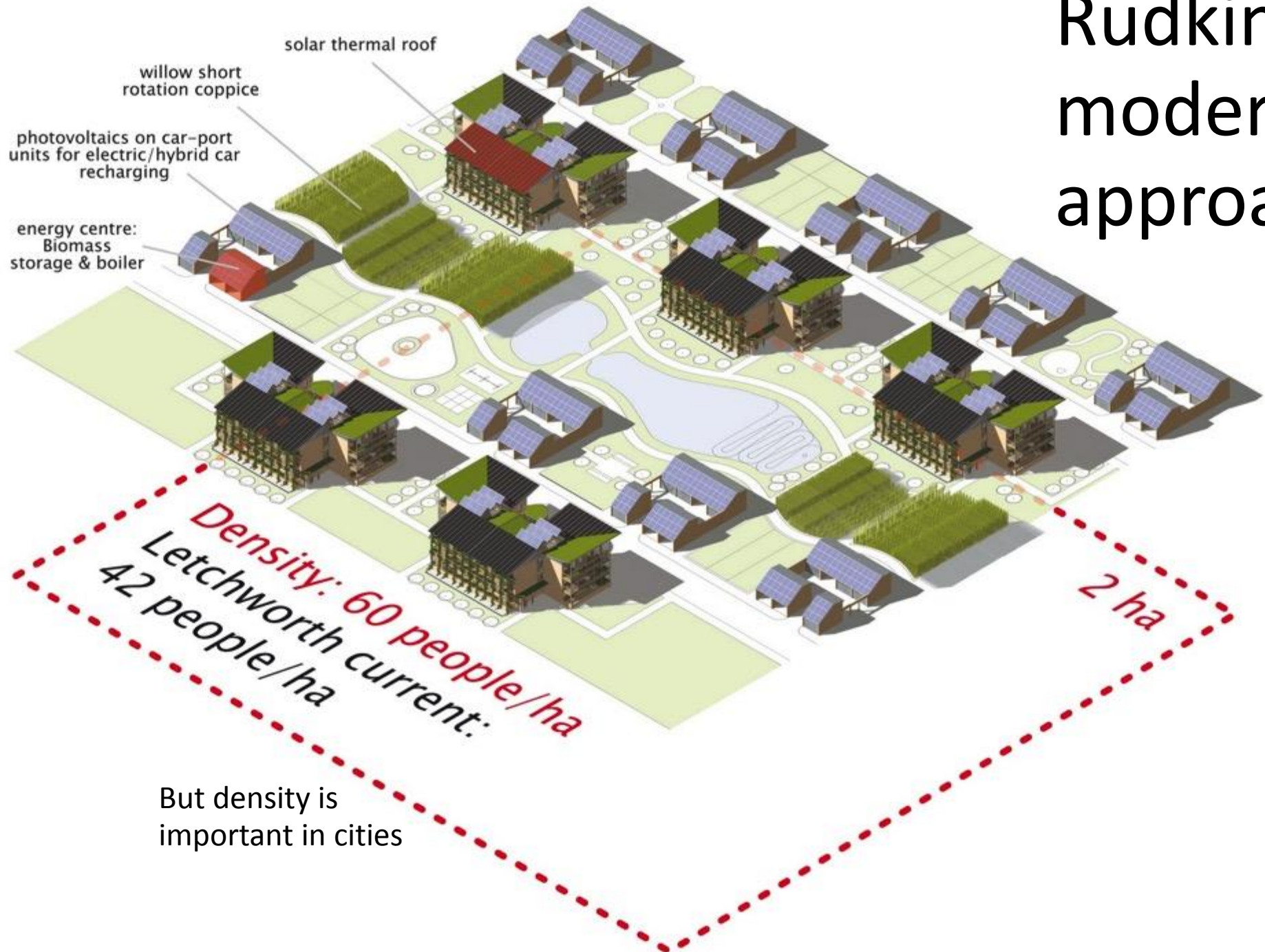


Garden cities

Where it all began



Uxcester: Rudkin's modern approach



But density is
important in cities

UK's only new eco-town

Elmsbrook, Bicester, Oxfordshire



Zero carbon eco-business
centre by Architype

Heathcote Road, Leicester

*68 Passivhaus Standard homes for affordable
rent. Largest Passivhaus estate in Europe.*



The Cannery, Sacramento

Useful lessons:

- a farm,
- agricultural training college,
- community-supported agriculture • some affordable housing,
- jobs,
- renewable energy,
- energy efficiency,
- low-carbon transport,
- support of the local council.
- The financial approach is conventional (developer investment recouped from high value sales and retail outlet rent).
- There is an inclusive multigenerational approach to residential development.



Towards one planet cities



What is the actual total life cycle
impact of things we do and use and
make?

Where does stuff come from?

What happens to it?

Is the city really sustainable?

Let alone regenerative?

Are people happy?

How can we know?

One Planet New Urban Developments

- EcoFootprint to 1.88gha
- 35% food not 65%.
- Land-based work requirement is swapped for proximity to services, reducing EF.
- Waste assimilation incl., sewerage all on-site.
- Zero carbon, at least 100% onsite renewable energy (heat too).
- Cycling, walking, electric vehicles.

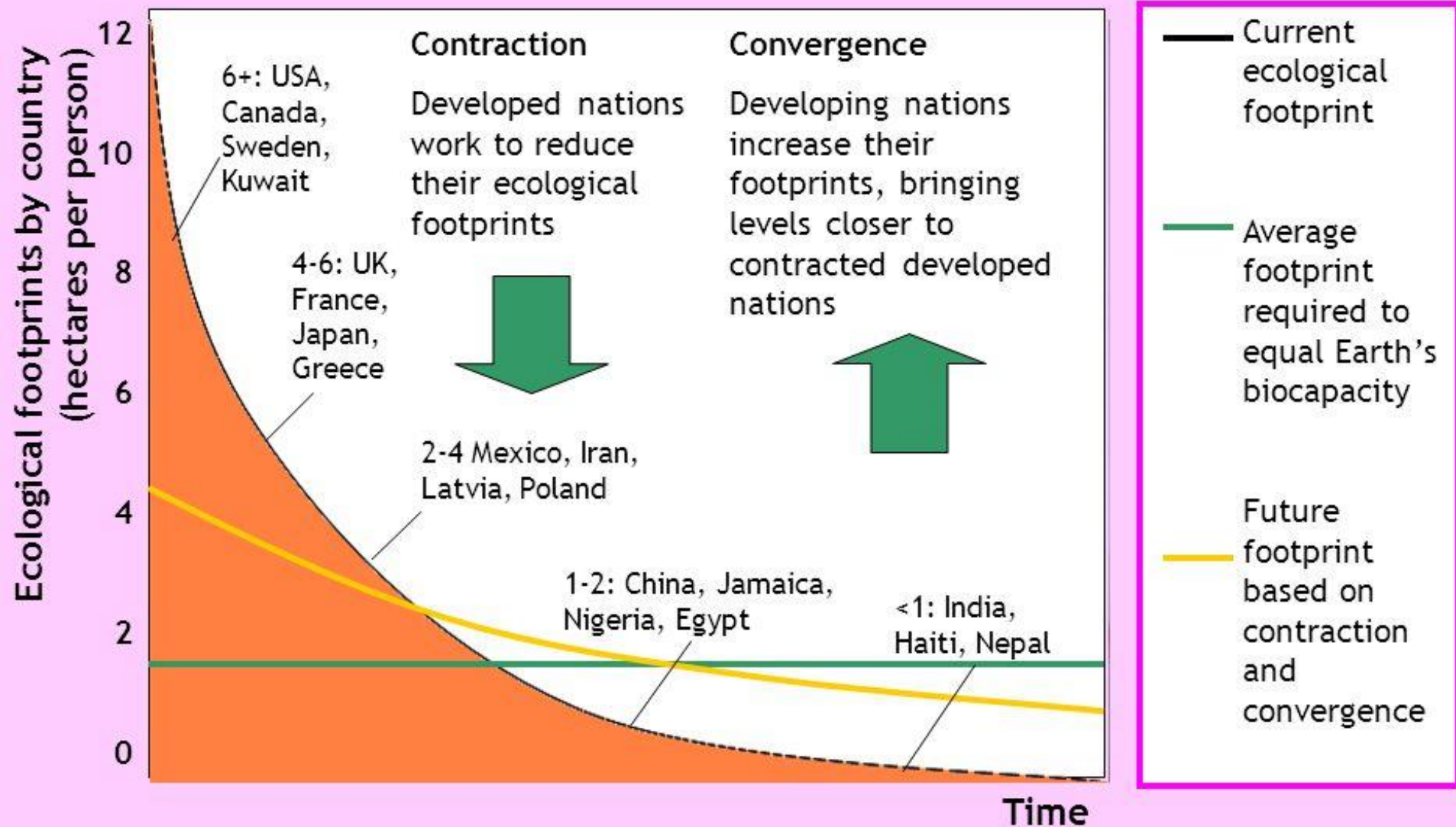
What is entailed in a 'one planet' city?

Adopting a framework for reducing over a defined time all activities over which a city has power & influence to reduce its ecological footprint (which includes carbon and biocapacity) to a measurably sustainable level.

The main tools are shifts in collective awareness and in the way all money is spent.

The objective is identify win-win-win solutions to create a flagship healthy, successful and resilient city.

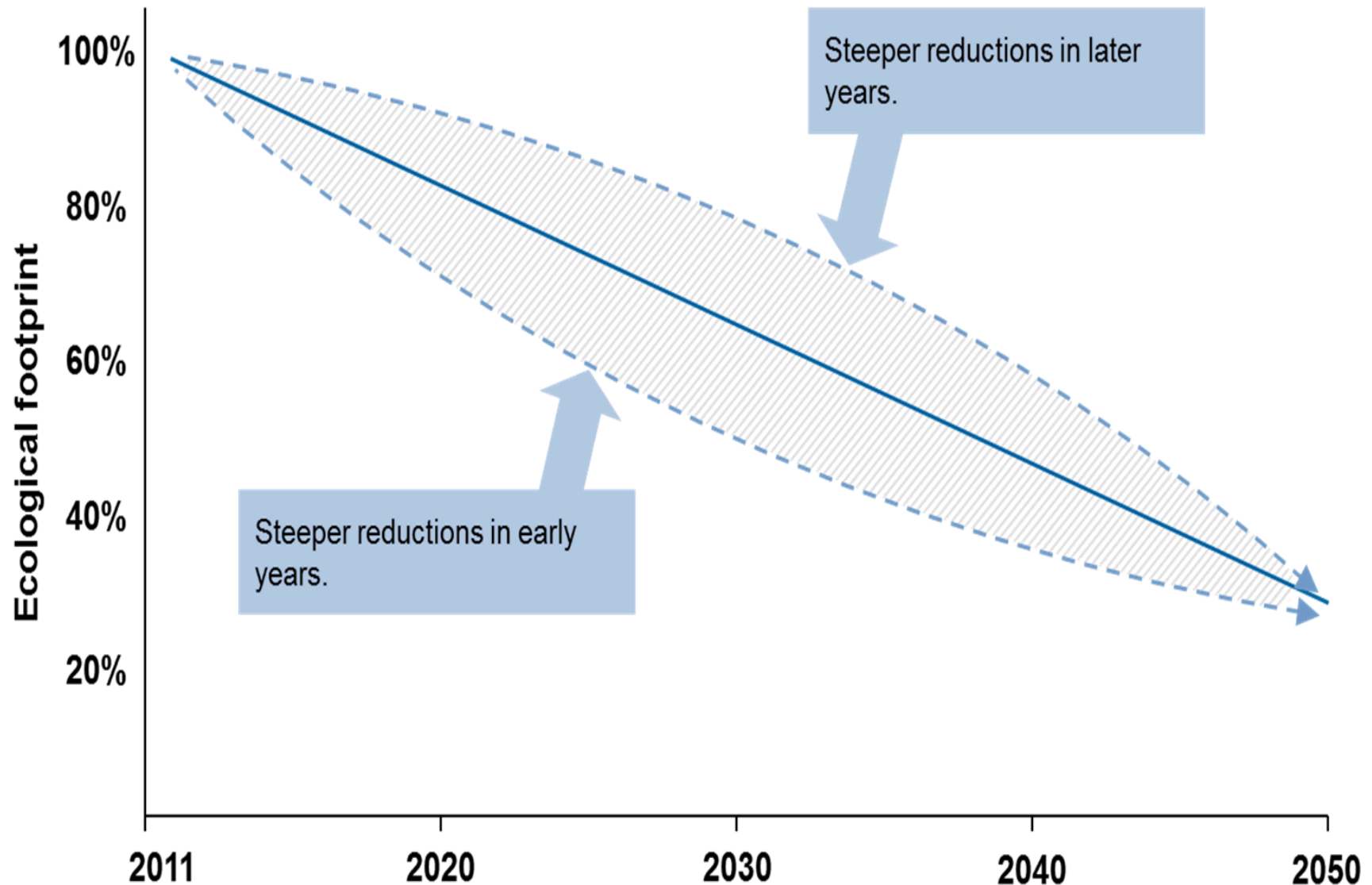
Contraction and Convergence Model



What are the strategies for dealing with climate change?

'Think Global, Act Local'

Contraction & convergence



The 6-step path towards One Planet Cities / communities

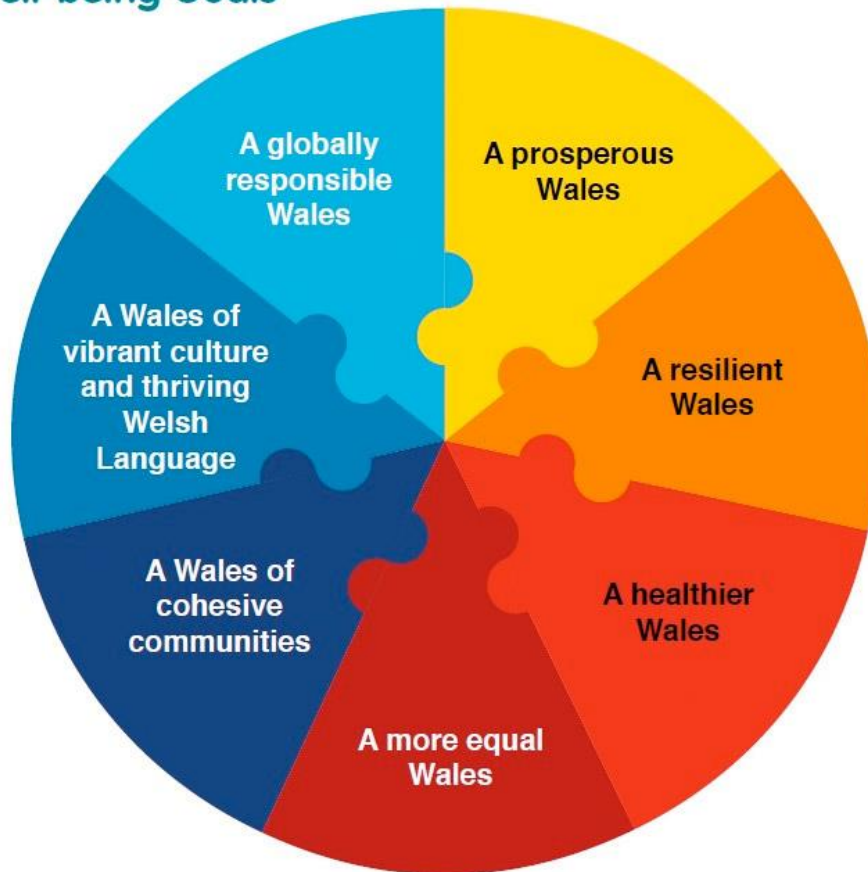
1. Obtain community buy-in and feedback at all levels
2. Decide which standards and objectives to use
3. Set baseline – the current situation
4. Set targets for each sector over realistic timescales
5. Set in place ways to measure them
6. Ratchet down consumption over one or two generations.

The 5 basic 'One Planet' city requirements

1. Aim to reduce the ecological footprint to 'one planet' by (say, 2050). This becomes an underlying principle of all planning and policy as a measurable strategy.
2. The same set of social and environmental criteria are used to assess all planning applications and supply chain procurements (*i.e. a reduction of ecological footprint and increase in biocapacity, step-changing over time, as now for One Planet Developments in the open countryside in Wales*).
3. Use of appropriate indicators – lifecycle & ecological footprint analysis, using the simple NPV+ tool which allows you to compare projects' impacts and benefits.
4. Official policy to support all areas and sectors to become more productive and more biodiverse. E.g. supporting more food growing in the city.
5. Shift to a closed loop economy and belief that meeting basic needs is sufficient for everybody.

Well-Being of Future Generations Act

Well-being Goals



5 Ffordd
o Weithio

The 5 Ways
of Working



Supports the reduction of the ecological footprint of Wales and 46 other indicators of sustainability

Other supportive Welsh legislation

Planning (Wales) Act 2015

Environment (Wales) Act 2016

Woodland and Forestry Policy

Future of Land Management in Wales

White Paper on Reforming Local Government (2017)

National Development Framework consultation (2017-18)

Inquiry into the Future of Agricultural and Rural
Development Policies in Wales

How spending bodies would proceed

Every project initiated by public bodies would be evaluated relative to the overall goal as follows:

1. Where does a city or nation want to be resource-wise in 2030 and 2050 to position itself for success?
2. What Ecological Footprint reduction does this imply? (relative to the baseline survey)
3. What is the financial budget of the city for projects over the time period (for instance to 2030 or 2050)?
4. By dividing the reduction by the expected budget, you get a minimal performance standard for all projects.

Every project that does not beat this benchmark becomes a liability and should be avoided. Favour the best performing projects and learn from them.

Tools to help

1. Ecological Footprint accounting

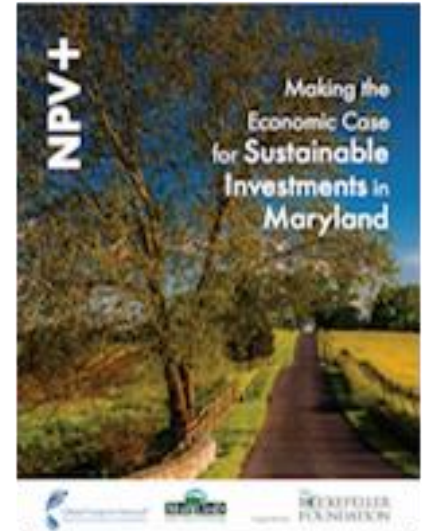
- Provides a biological view & joins all the human pressures – water, climate, biodiversity, food, energy, etc.
- Understandable by ordinary people (unlike carbon).
- Makes the economic self-interest obvious. Emphasizes resource security.
- Easy to identify best options.



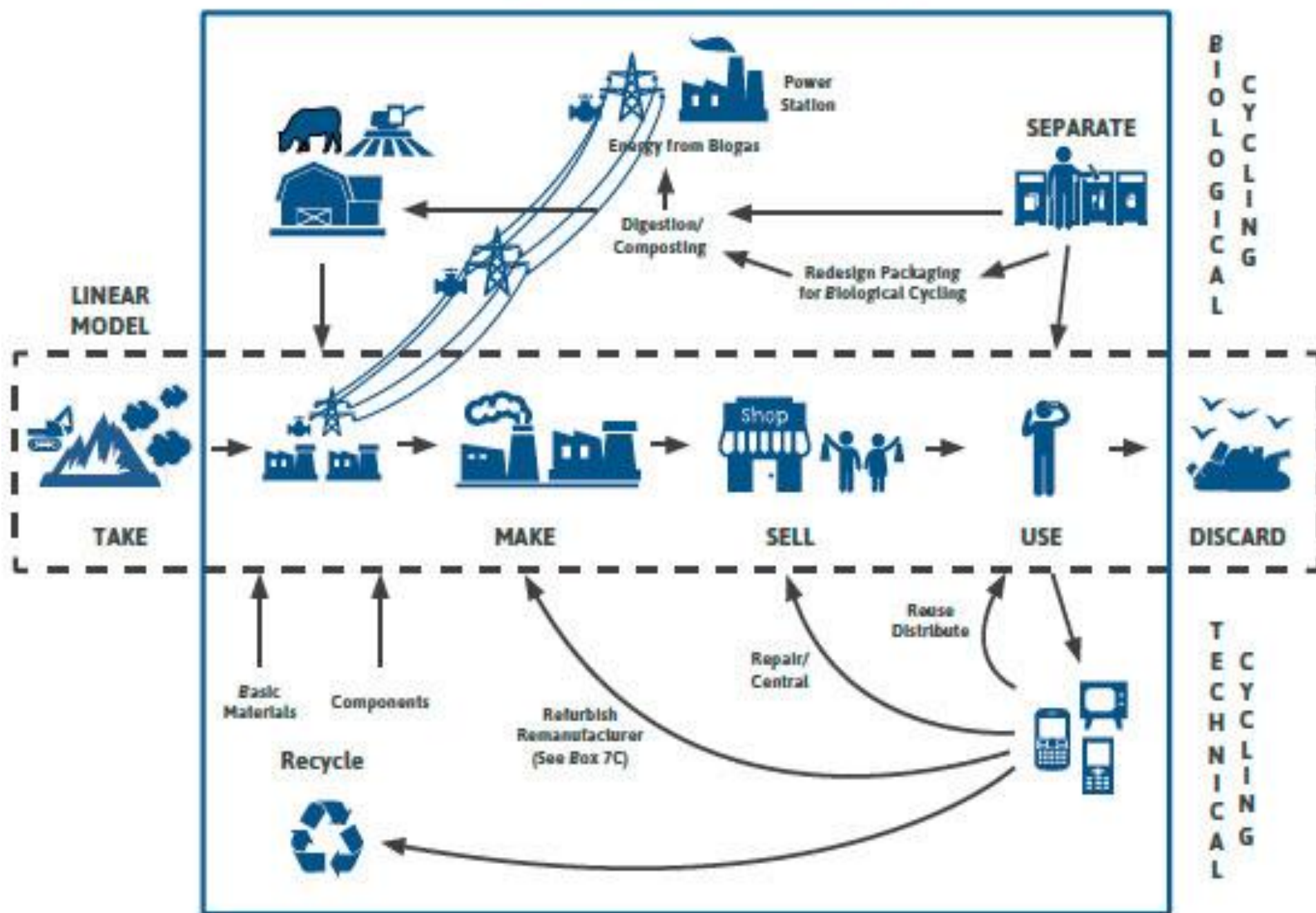
Tools to help

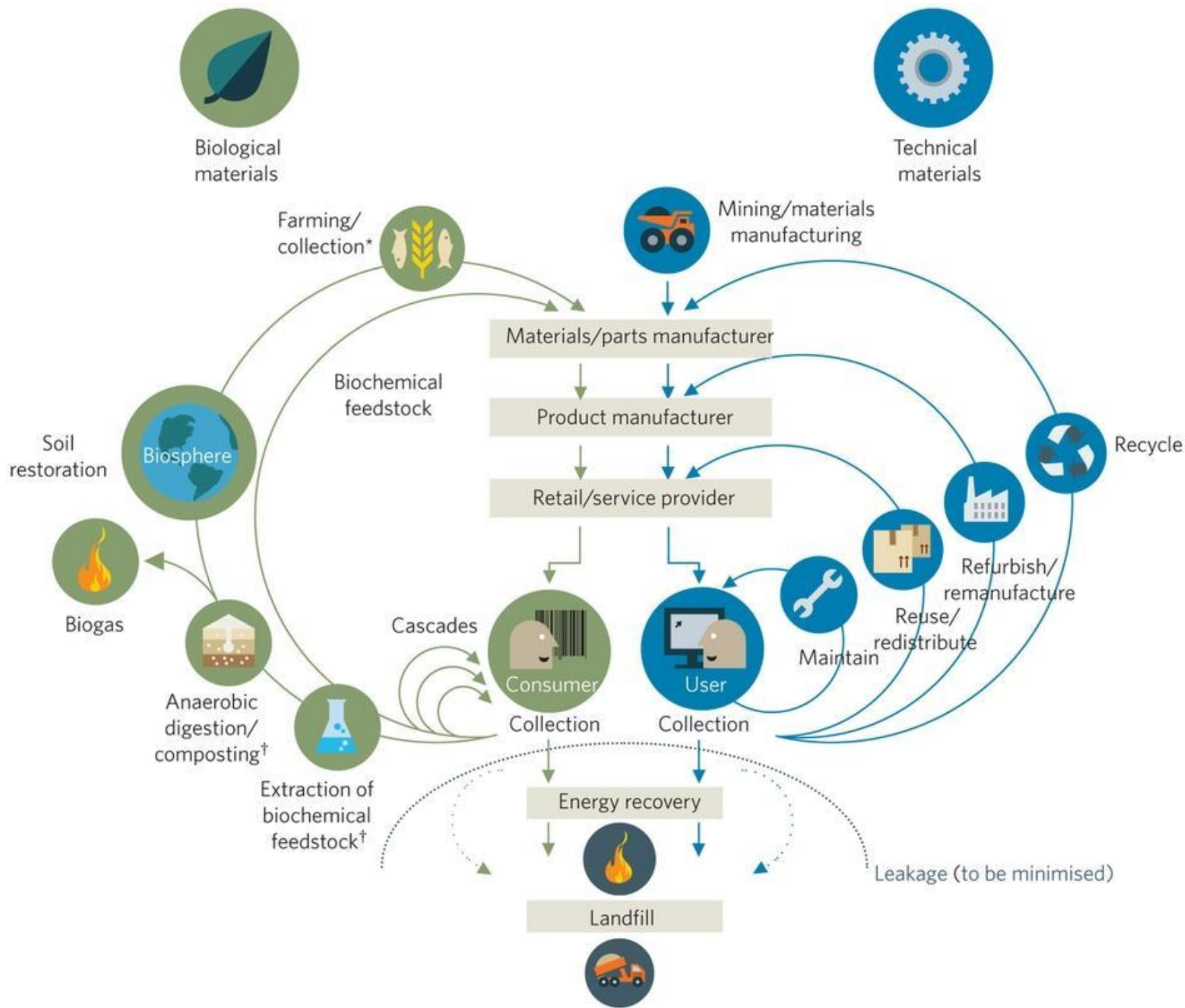
2. The Net Present Value+ tool

- Expands on classical NPV.
- NPV+ compares different scenarios for a given spend.
- Helps evaluate how much the spend benefits social, financial & environmental criteria.
- Clarifies the assumed future.
- Ensures all relevant costs & benefits are within 5 ways of working.



CIRCULAR ECONOMY MODEL





Principles

- Get people together & persuade council it's in their interest
- Local, social, environmental procurement wherever possible
- Holistic approach
- How will we improve biocapacity? – e.g. get people growing
- Go zero or net-positive carbon – switch and save
- Closed loop systems of production and reuse
- Climate change adaption
- Make our neighbourhood serve us:
- How will we get healthy?
- How will we complain and get justice?

*Look for
Win-win-win
solutions*

Standards

- For governance: Wales' Well-being of Future Generations Act
- For baselining: Quantify the metabolism of the city with material flows
- **For reducing the impact of consumption & increasing biocapacity:**
Ecological footprinting
- For carbon footprinting: PAS 2070
- For reducing the impact of imports and exports: the PRINCE model in Sweden, and EEMRIO ('environmentally extended input-output modelling')
- For promoting energy efficiency in organisations and industry: ISO 50001
- For environmental management: ISO 14001
- For promoting the circular economy: ISO 14040 Life Cycle Analysis
- For measuring the long-term value of local investments in infrastructure and natural capital: the Global Footprint Network's Net Primary Productivity and NPV+ tool
- A natural resources and biodiversity survey is also recommended.

Work together

PEOPLE POWER – CITIZENS' ASSEMBLIES

Let us act now!

All entities that spend money can do this.

It does not require the end of capitalism but a new way of evaluating how money is spent.

In a nutshell

- "You cannot go on destroying your environment because then your environment will destroy you.
 - "So you really must realise what are your limits
 - "But even then you can still grow by making much more sophisticated choices."
- *Pedro B. Ortiz, former Deputy Mayor and Director General for Metropolitan Planning at Madrid's Regional Government, author of The Art of Shaping the Metropolis.*

It means system thinking change

Diolch yn fawr

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