CECAN Webinar:

A Systems Approach to Environmental Policy in Defra

Tuesday 24th November 2020, 13:00 – 14:00 GMT

Presenter: Tom Oliver, facilitated by Fran Rowe and Amy Proctor

Welcome to our **CECAN Webinar.**

All participants are muted. Only the Presenters and CECAN Chair can speak. The webinar will start at **13:00 GMT.**

Tom will speak for around 45 minutes and will answer questions at the end.

Please submit your questions at any point during the webinar via the question box in the Zoom webinar control panel.

Today's webinar will be recorded and made available on the CECAN website.

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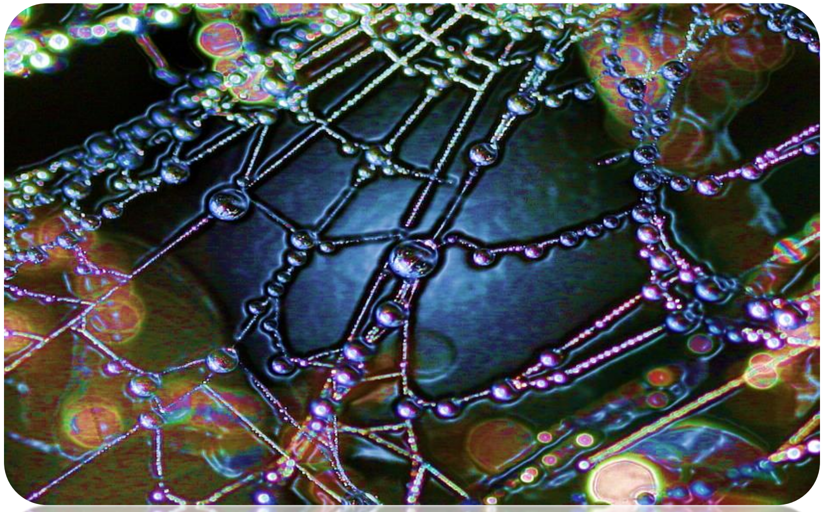
A Systems Approach to Environmental Policy in Defra



Prof. Tom Oliver

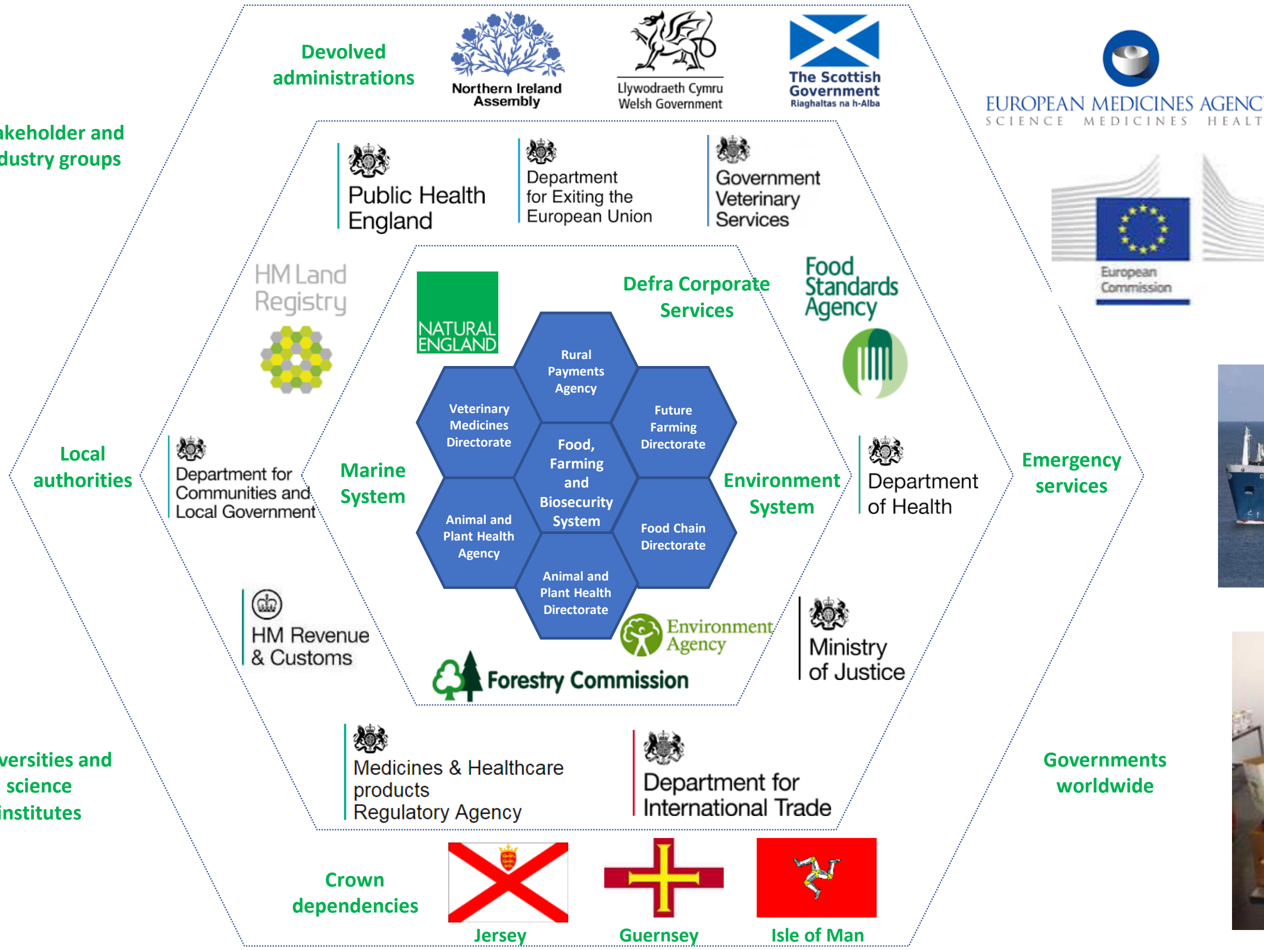
t.oliver@reading.ac.uk

thomas.oliver@defra.gov.uk

CECAN webinar 24.11.20

The Defra Group and partners

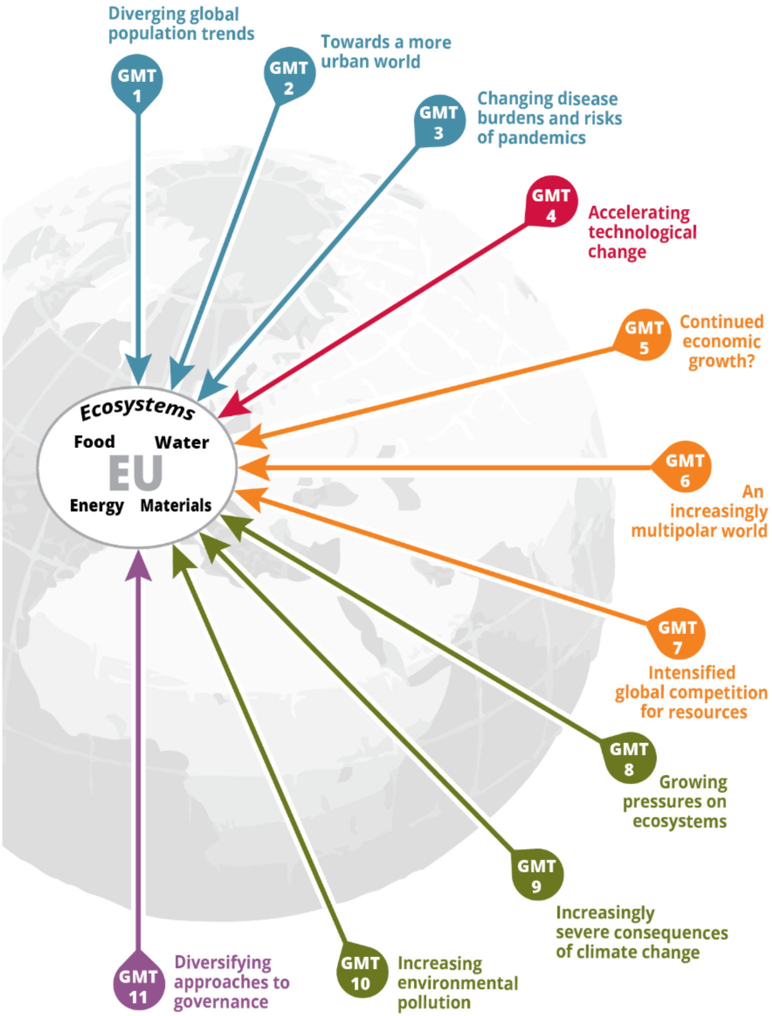
33 agencies and public bodies (26,000 FTE)



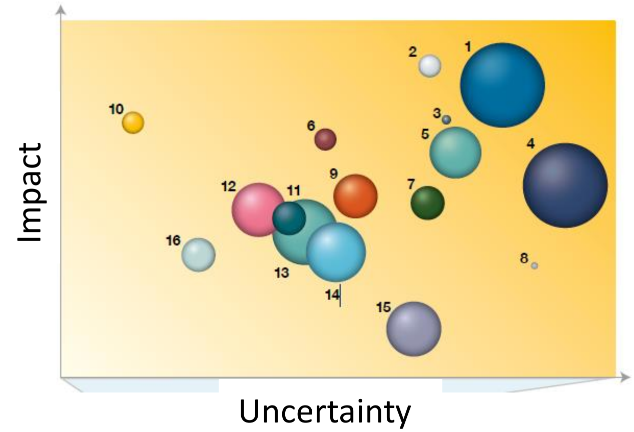
Some current challenges

- **Air pollution** causes 28,000-36,000 deaths per year (Public Health England)
- 10% of children have a diagnosable **mental health** problem (NHS Digital), and 20% older people suffer depression (Mental Health Task force)
- 67% UK men and 60% women **overweight or obese**
- Only between 15% (RSPB) to 30% (Defra) of 2020 CBD **biodiversity** targets met
- Of 218 countries assessed for **biodiversity intactness** the UK came 29th lowest (UK State of Nature)
- 2.2 million tonnes of **topsoil is eroded** annually in the UK (POSTnote)
- In 2019, 84% of **river water bodies** not in WFD Good Ecological Status (Environment Agency)

A rapidly changing world



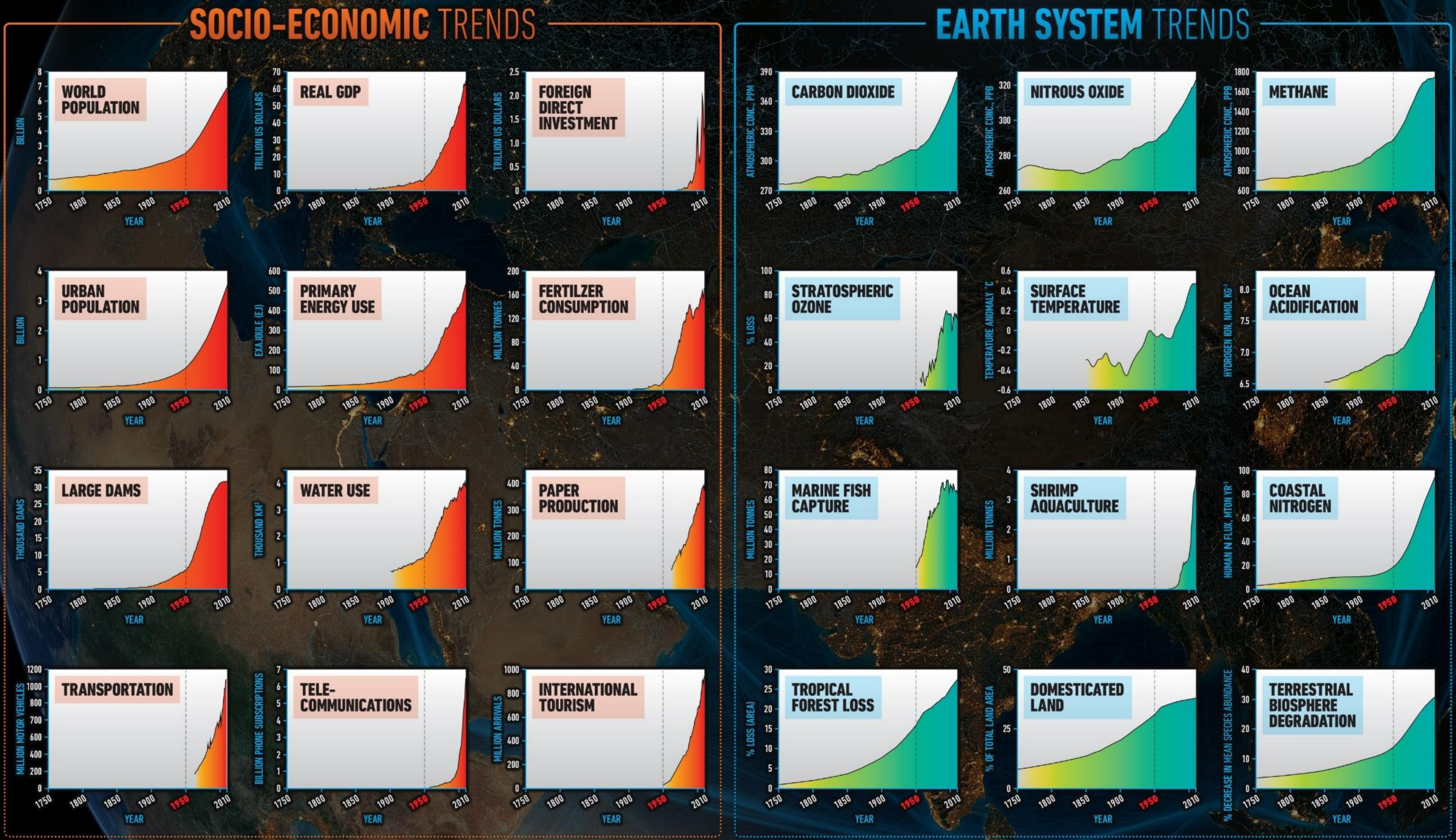
European Environment Agency- Global ‘megatrends’



1. Harnessing artificial intelligence
2. An expanding competitive space
3. Increasing proliferation of weapons of mass effect
4. Erosion of state sovereignty
5. Adaptation of the rules-based international system
6. An expanded and unregulated information space
7. Rising inequality, reducing social cohesion, and fragmented societies
8. Understanding human enhancement
9. Increasing competition in the global commons
10. Increasing disruption and cost of climate change
11. Increasing demand and competition for resources
12. Greater automation and an increasingly diverse workforce
13. Managing technological change
14. The challenge of affordability
15. Increasing threat from crime and extremism
16. Managing demographic change

MoD Global Strategic Trends – the Future Starts Today 6th Edition

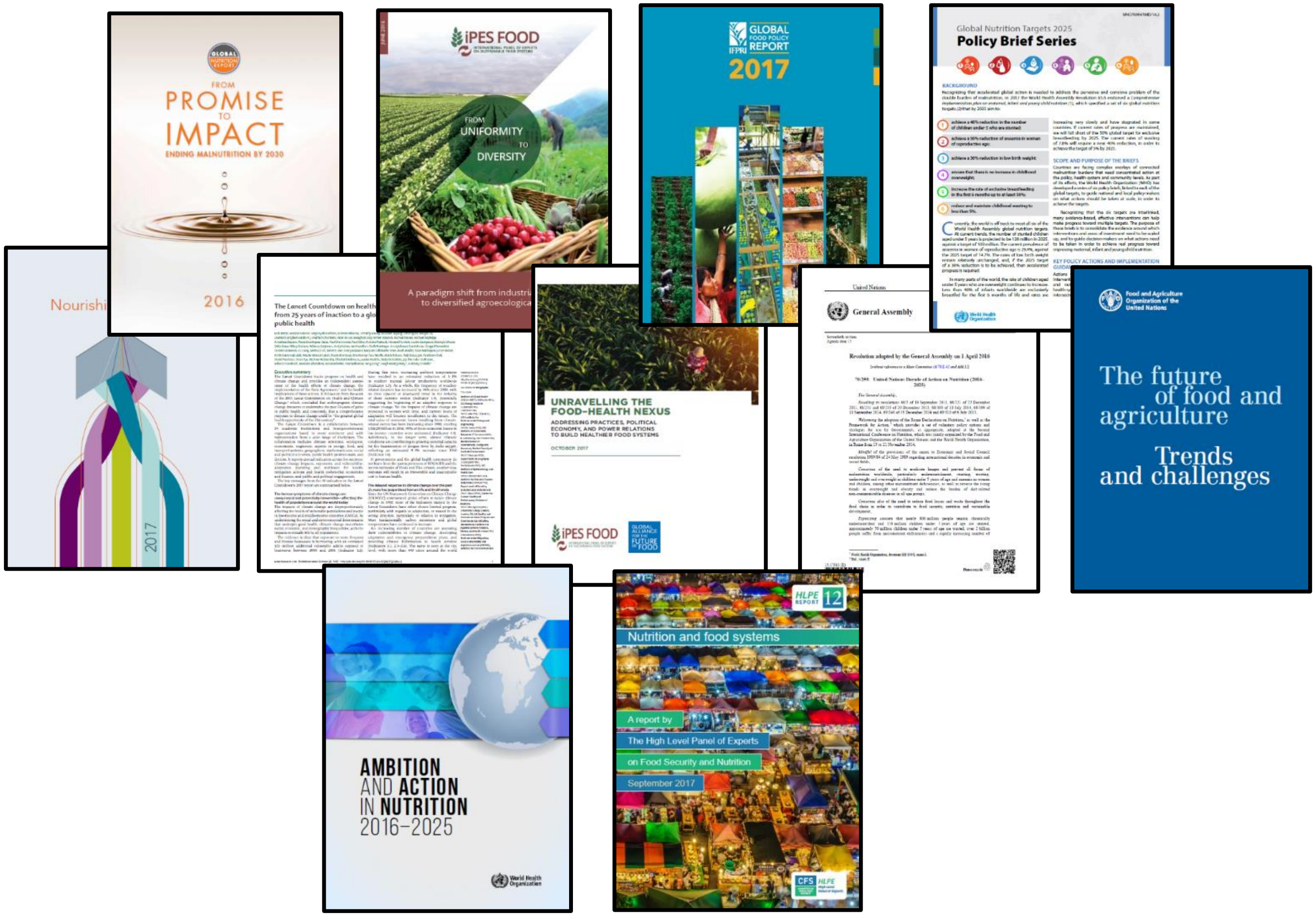
THE GREAT ACCELERATION



REFERENCE: Steffen, W., W. Broadgate, L. Deutsch, O. Gaffney and C. Ludwig (2015), The Trajectory of the Anthropocene: the Great Acceleration, Submitted to *The Anthropocene Review*.

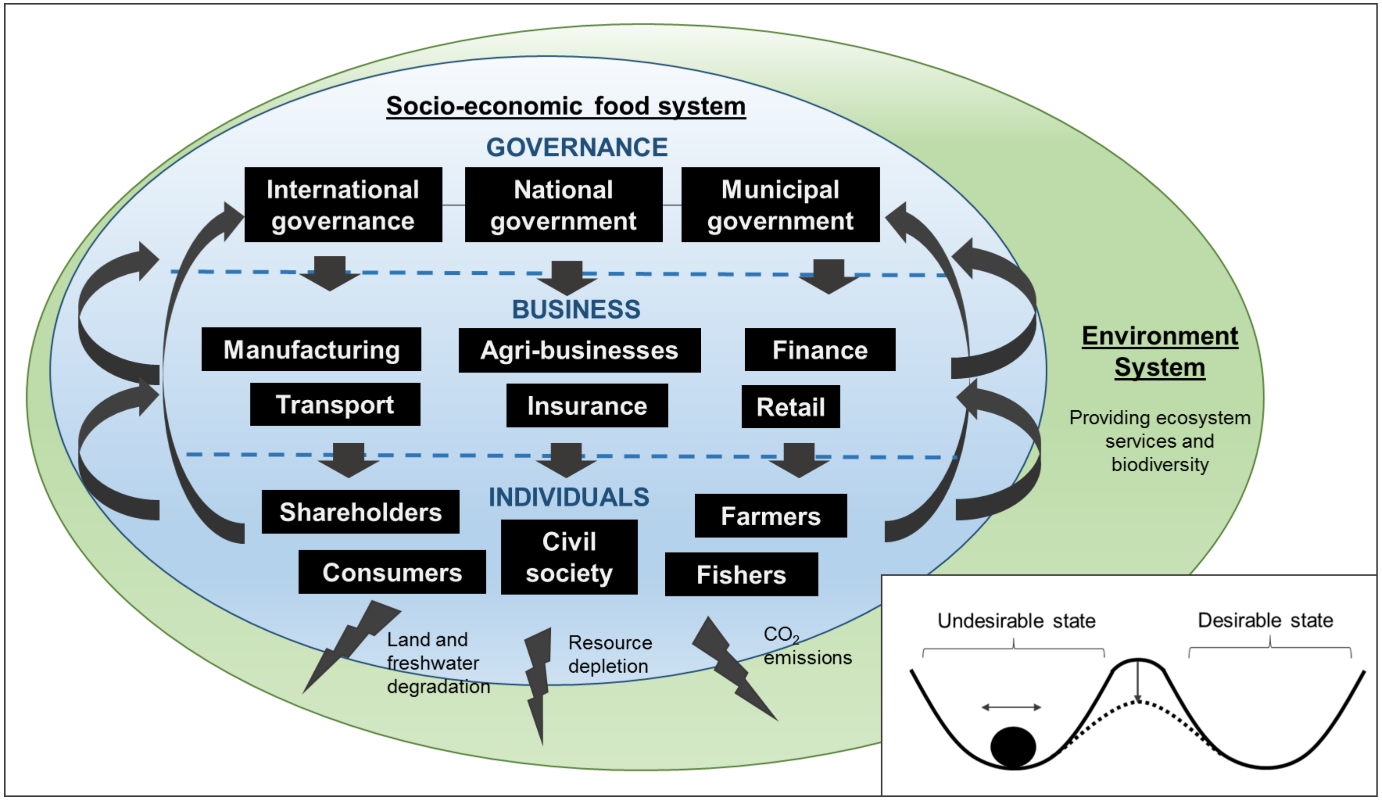
MAP & DESIGN: Félix Pharand-Deschênes / Globaïa

Growing calls for systemic transformation…



Transformation towards a more sustainable trajectory

Overcoming systemic 'lock-ins'



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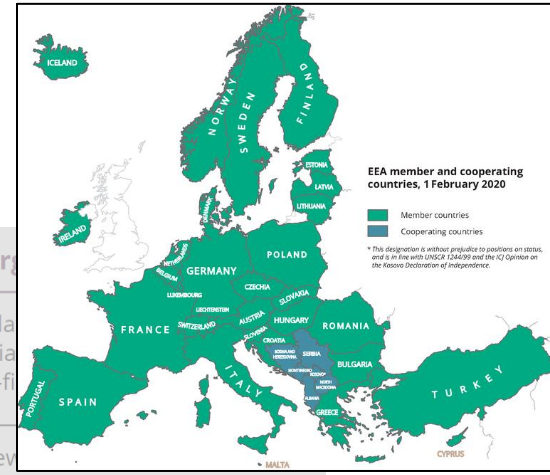


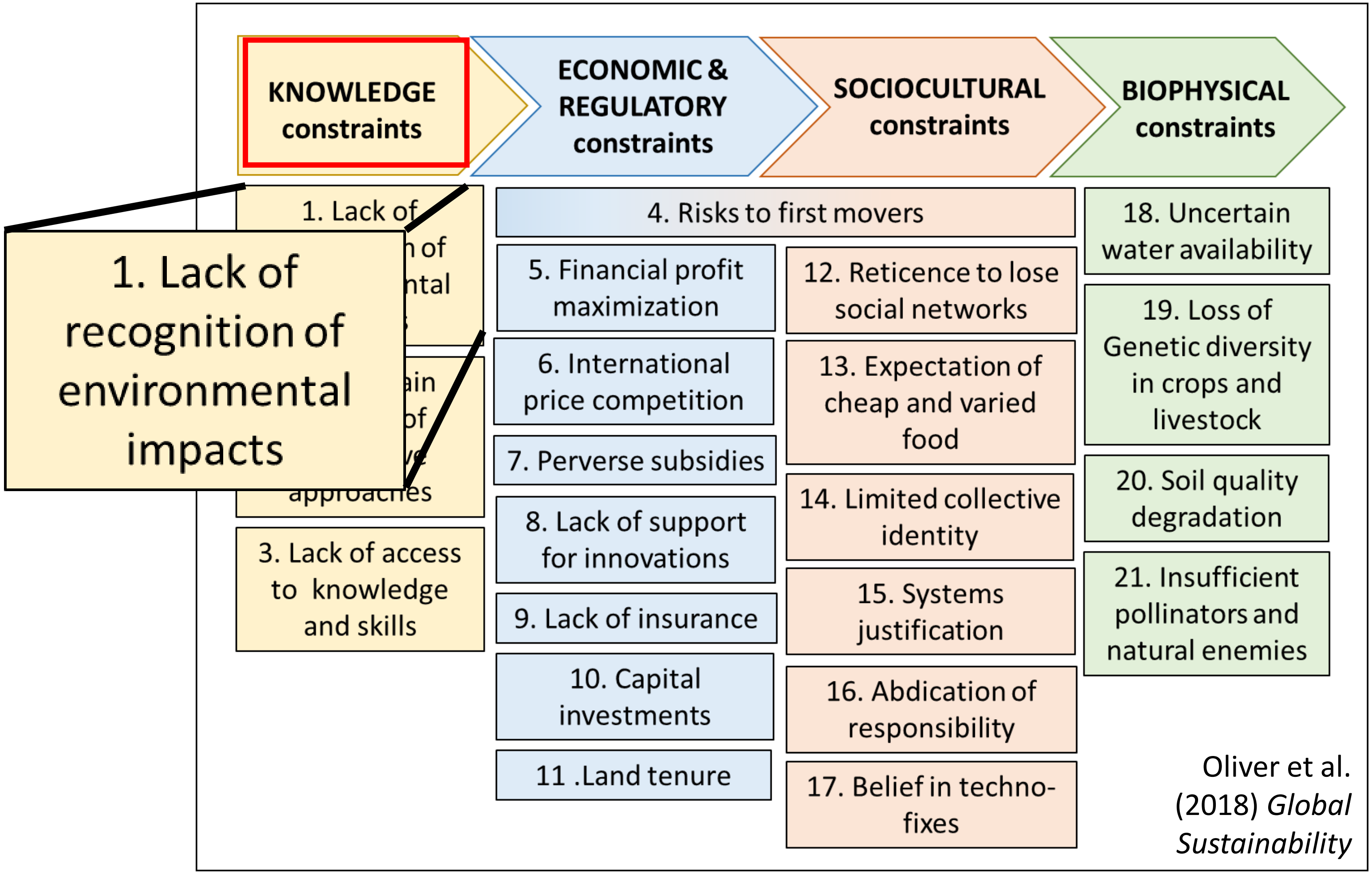
Innovations for food system transformation

	Mobility	Food	Energ
Incremental technical innovation	Fuel-efficient petrol or diesel cars	Precision farming, food waste valorisation, integrated pest management	Insula applia coal-fi
Radical technical innovation	Battery electric vehicles, electric bikes, alternative fuels, autonomous vehicles	Permaculture, no-tillage farming, plant-based meat and dairy products, genetic modification	Renew pumps, passive houses, whole-house retrofitting, smart meters
Social or behavioural innovation	Car sharing, modal shift, teleconferencing, teleworking, internet retail	Alternative food networks, organic food, dietary change, urban farming, food councils	Decentralised energy production ('prosumers'), community energy, energy cafes
Business model innovation	Mobility services, car sharing, remanufacturing vehicles, bike sharing	Alternative food networks, organic food	Energy service companies, back-up capacity, vehicle-to-grid electricity provision
Infrastructural innovation	Intermodal transport systems, compact cities, integrated transport and land use planning	Reforms to distribution systems, storage provision and better food waste management	District heating systems, smart grids, bio-methane in reconfigured gas grid

SOER 2020, European Environment Agency

Transformation towards a more sustainable trajectory

Food system ‘lock-in’ mechanisms



Transformation towards a more sustainable trajectory

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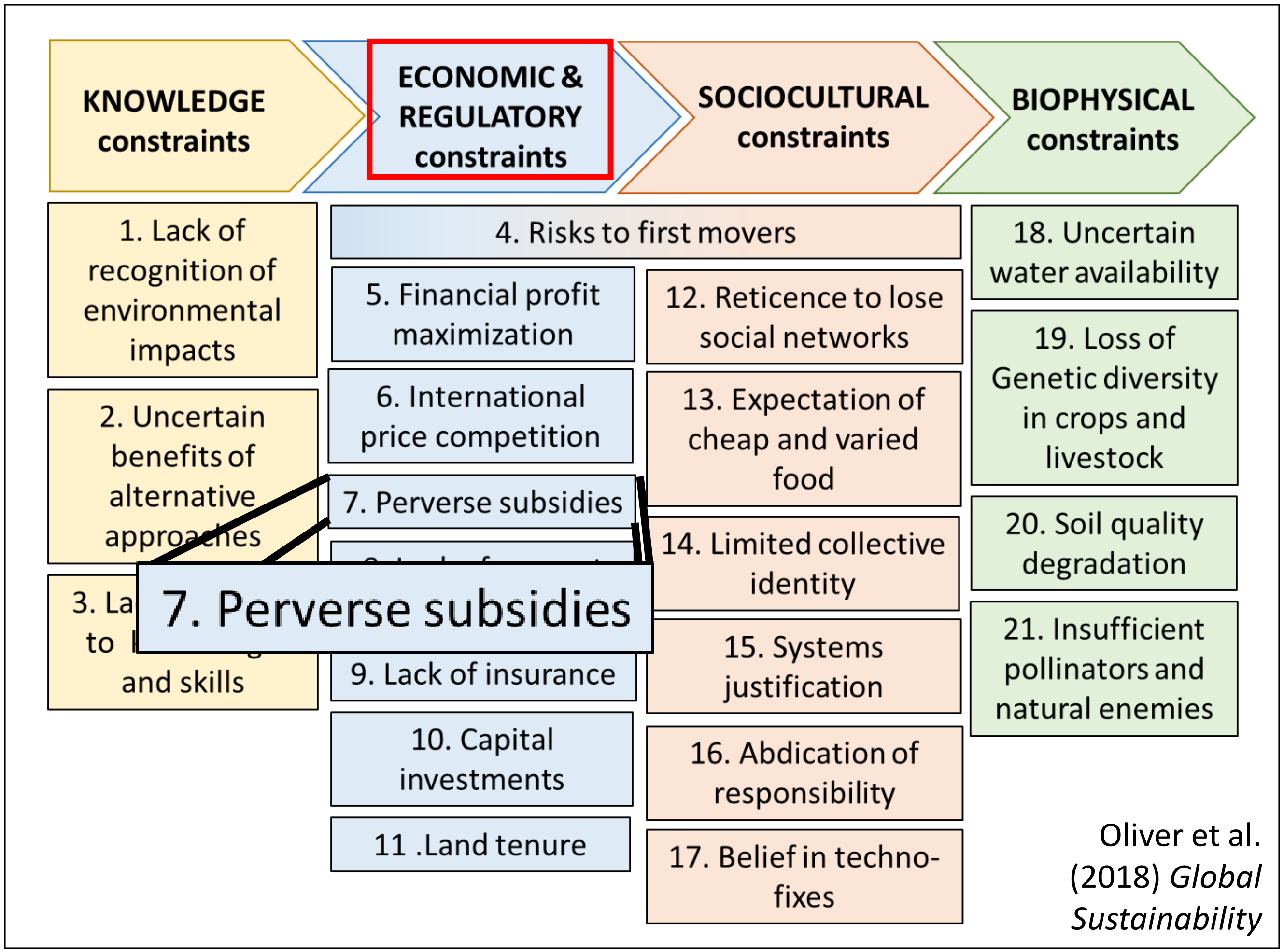

Transformation towards a more sustainable trajectory

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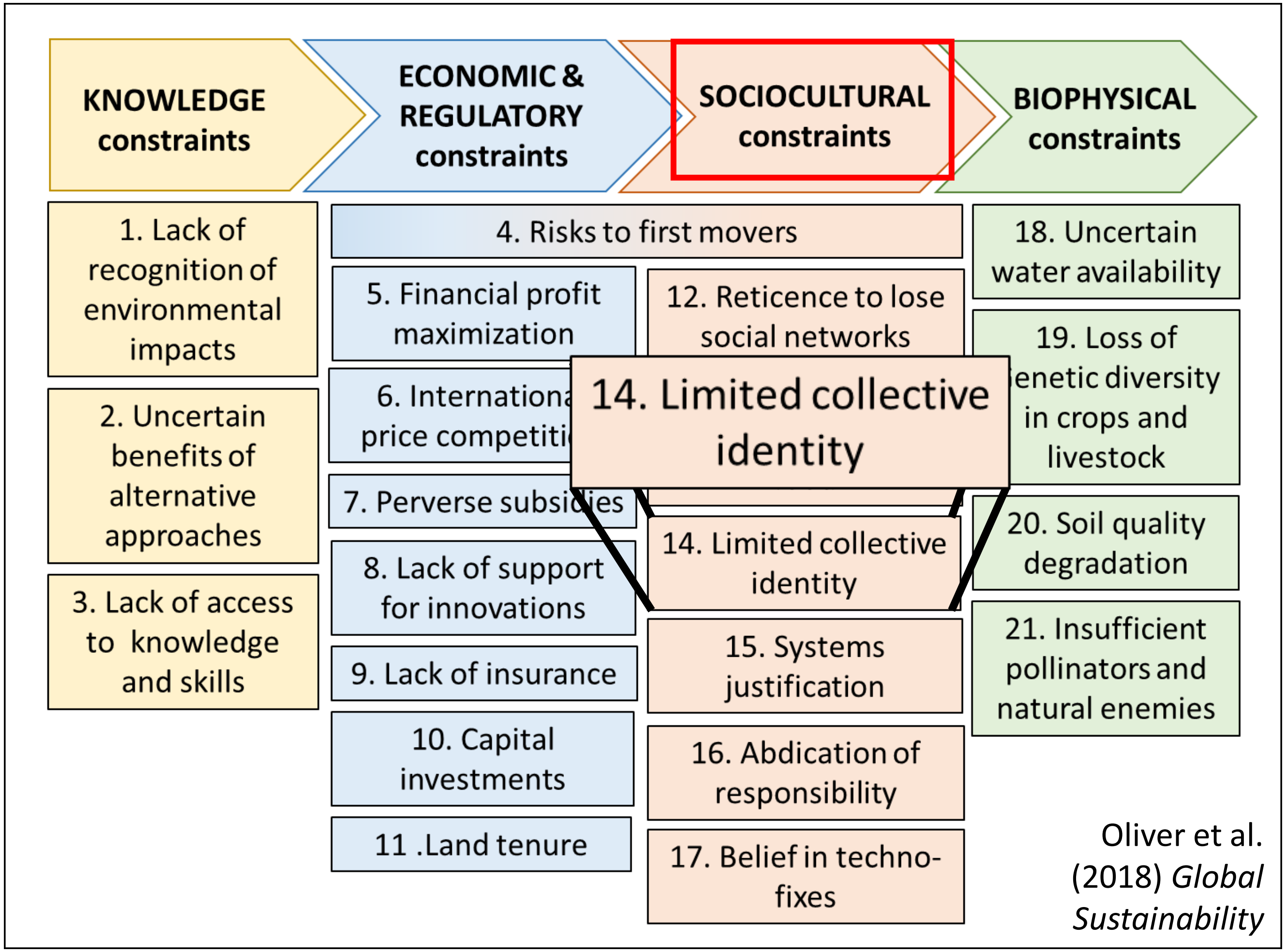
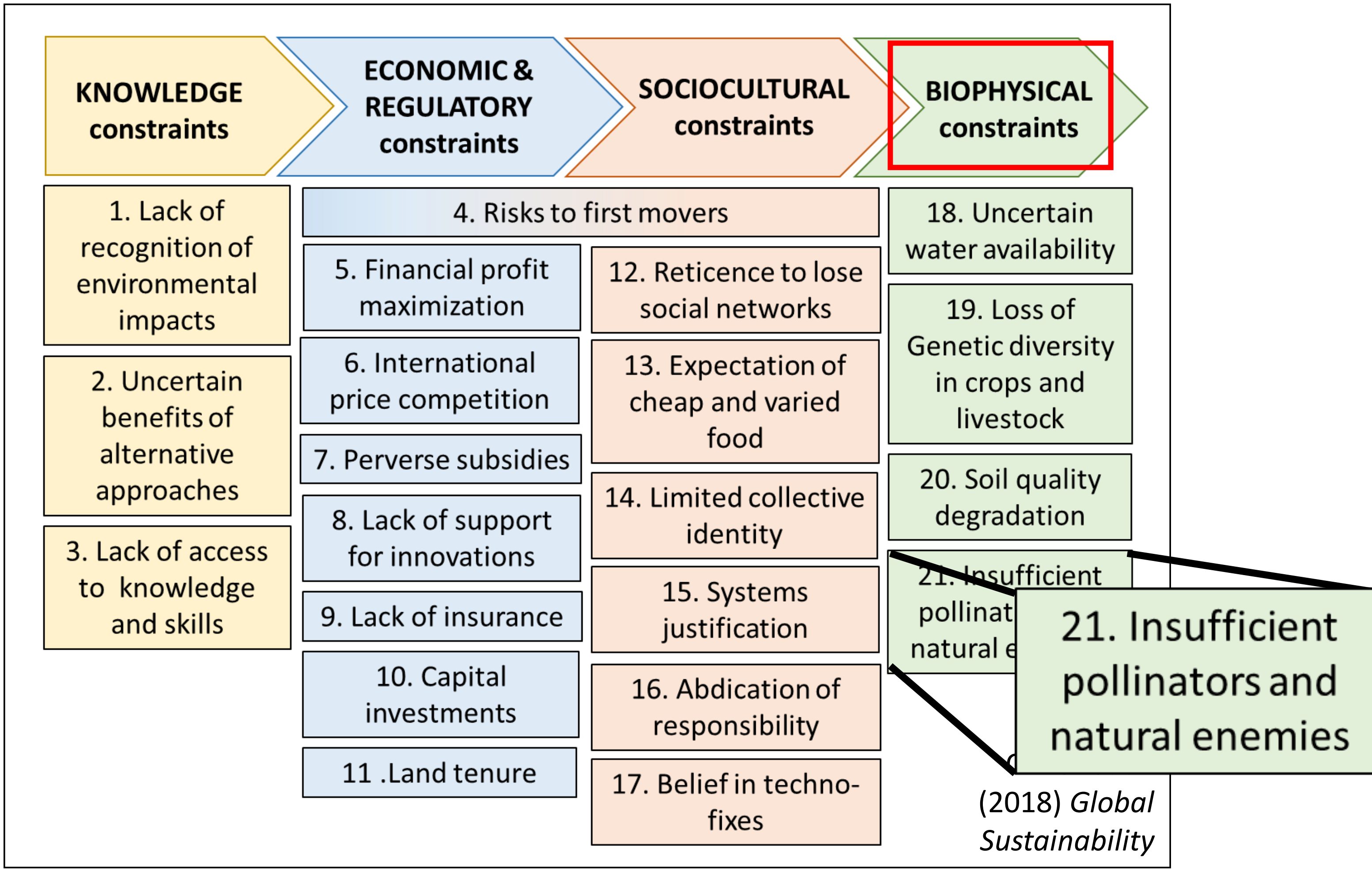


The Self Delusion: The Surprising Science of Our Connection to Each Other and the Natural World, Tom Oliver, Weidenfeld & Nicholson, 2020

Transformation towards a more sustainable trajectory

Food system 'lock-in' mechanisms



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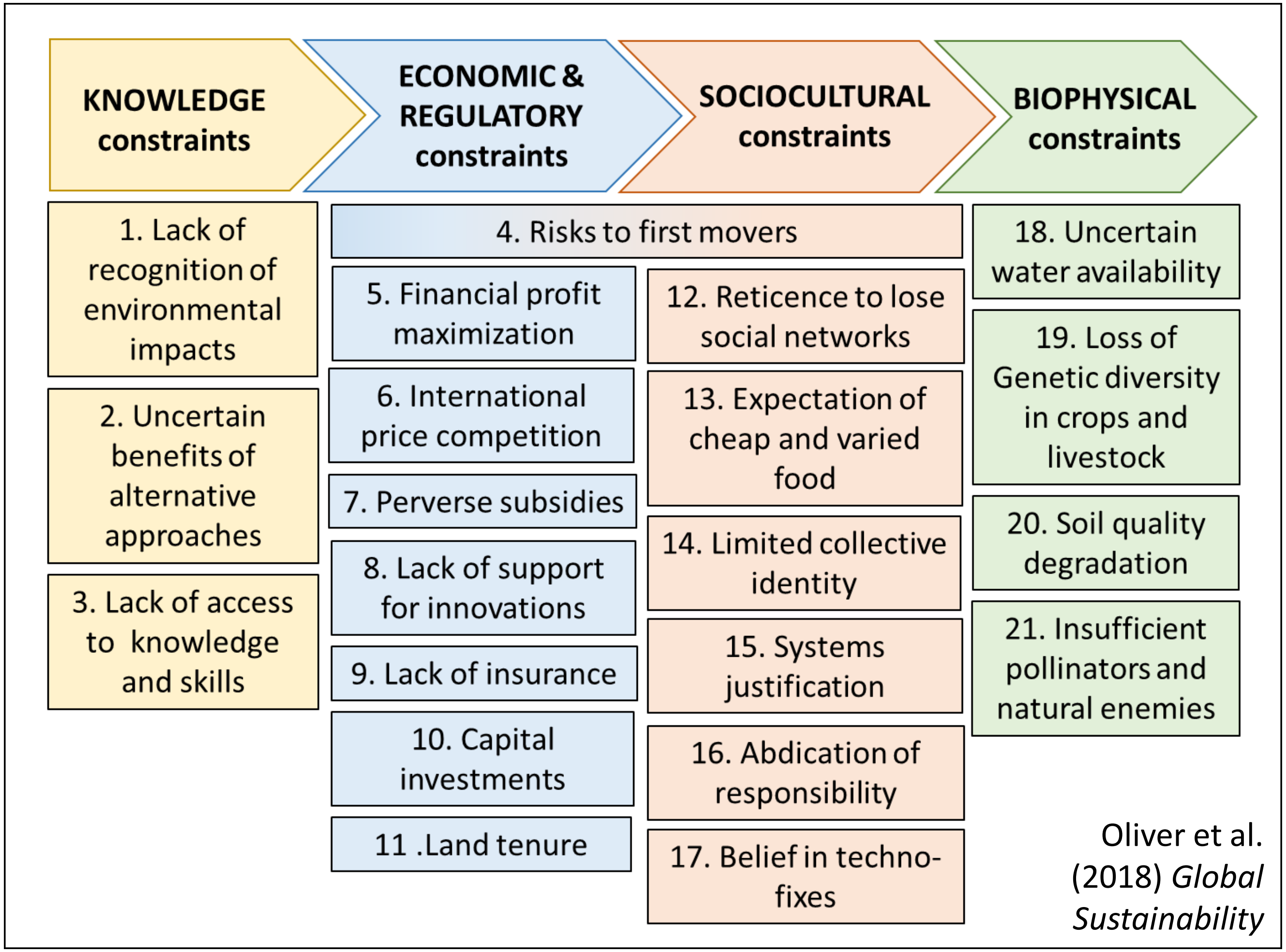

Transformation towards a more sustainable trajectory

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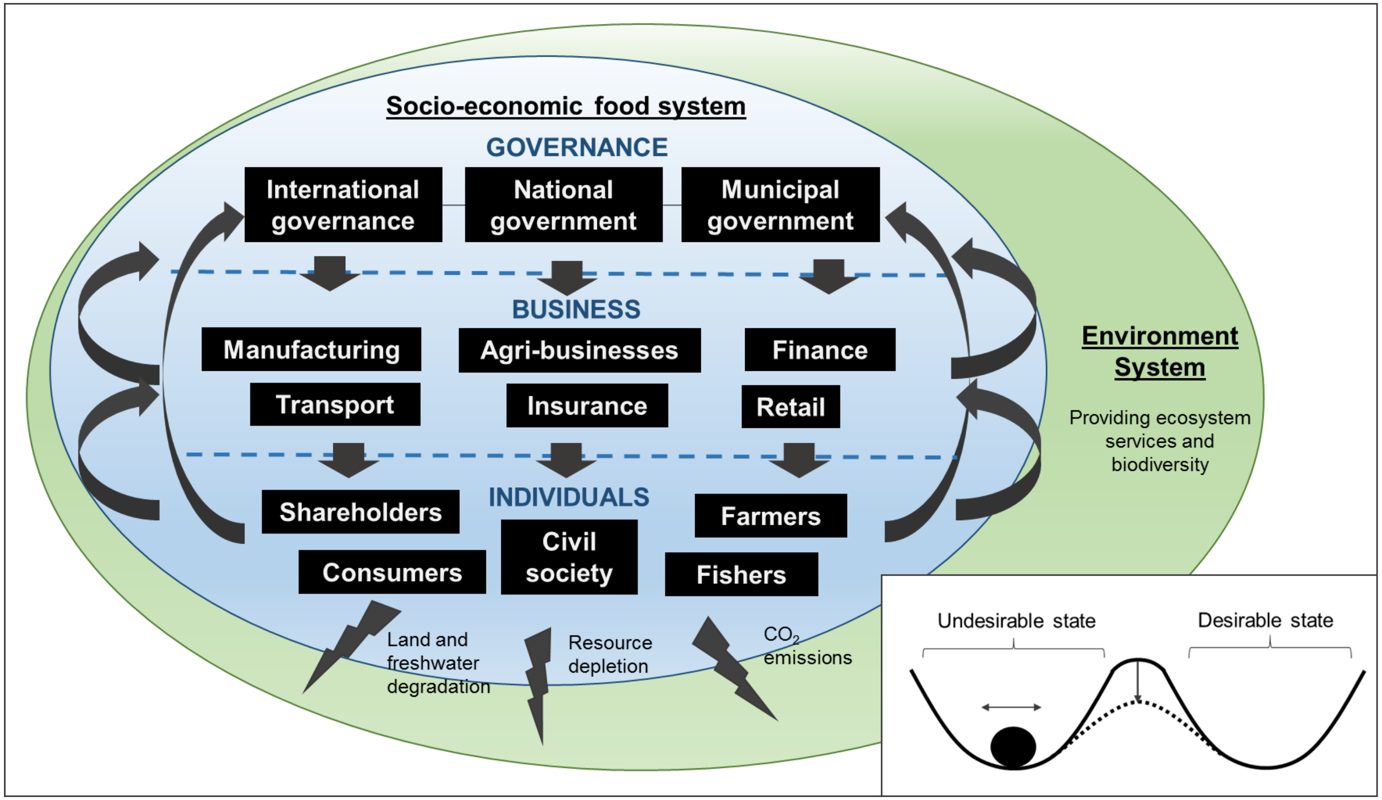

Transformation towards a more sustainable trajectory

Targeting multiple leverage points to tackle lock-in mechanisms

		‘Lock-in’ mechanisms pertaining to:-		
		INDIVIDUALS	**BUSINESS**	**GOVERNMENT**
Solutions instigated by:-	**INDIVIDUALS**	Knowledge-exchange on best practice; information provision to inform consumer choice; change social norms around consumer choices, food waste, recycling and farming/fishing practices; promote collective identity and social responsibility; debunk infeasible techno-fixes; follow best practice to restore pollinators and natural enemies; implement responsible use of water, soil and natural resources	Highlight good and poor business practice; use shareholder influence and invest in sustainable initiatives; exercise consumer choice for food that is sustainably produced, manufactured and transported	Communicate sustainability concerns; debunk infeasible techno-fixes; develop and engage with civil society movements and demands; vote on sustainability credentials
	BUSINESS	Improve information on sustainability of supply chains for foods; develop innovative insurance products and financing approaches; choice editing to promote sustainable food choices; invest and innovate sustainable products and services; facilitate new crop and livestock varieties for food producers;	Knowledge-exchange on best practice; demonstrate feasibility of positive change; develop innovative insurance products and financing approaches; debunk infeasible techno-fixes; innovative water management through public-private partnerships; develop innovations in sustainable practice	Provide reports on sustainable initiatives; co-develop innovative insurance products and financing approaches; innovative water management through public-private partnerships; facilitate new crop and livestock varieties and guidelines and regulation for sustainable food production
	GOVERNMENT	Education; information and skills provision; stimulate and protect sustainable innovations; incentivise sustainable practices and regulate/tax others; reform land tenure governance; consult and act on social contract to protect future generations; change social norms around consumer choices, food waste, recycling and farming/fishing practices; debunk infeasible techno-fixes; improve incentives, regulation and enforcement on natural resource use	Information and skills provision; stimulate and protect sustainable innovations; incentivise sustainable practices and regulate/tax others; limit power of vested interests; debunk infeasible techno-fixes; incentivise practices which restore essential biodiversity; regulate and enforce sustainable natural resource use	Monitor and raise profile of social and environmental impacts; inter-governmental alignment on food system policy; debunk infeasible techno-fixes; take responsibility on social equity and intergenerational justice; implement biodiversity targets; quantify and reduce environmental impacts from imports; cooperate internationally on pests and disease

COLOUR KEY

- Knowledge
- Economic/ Regulatory
- Sociocultural
- Biophysical

Oliver et al. (2018) *Global Sustainability*

Transformation towards a more sustainable trajectory

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Cross-scale and cross-sectoral interventions

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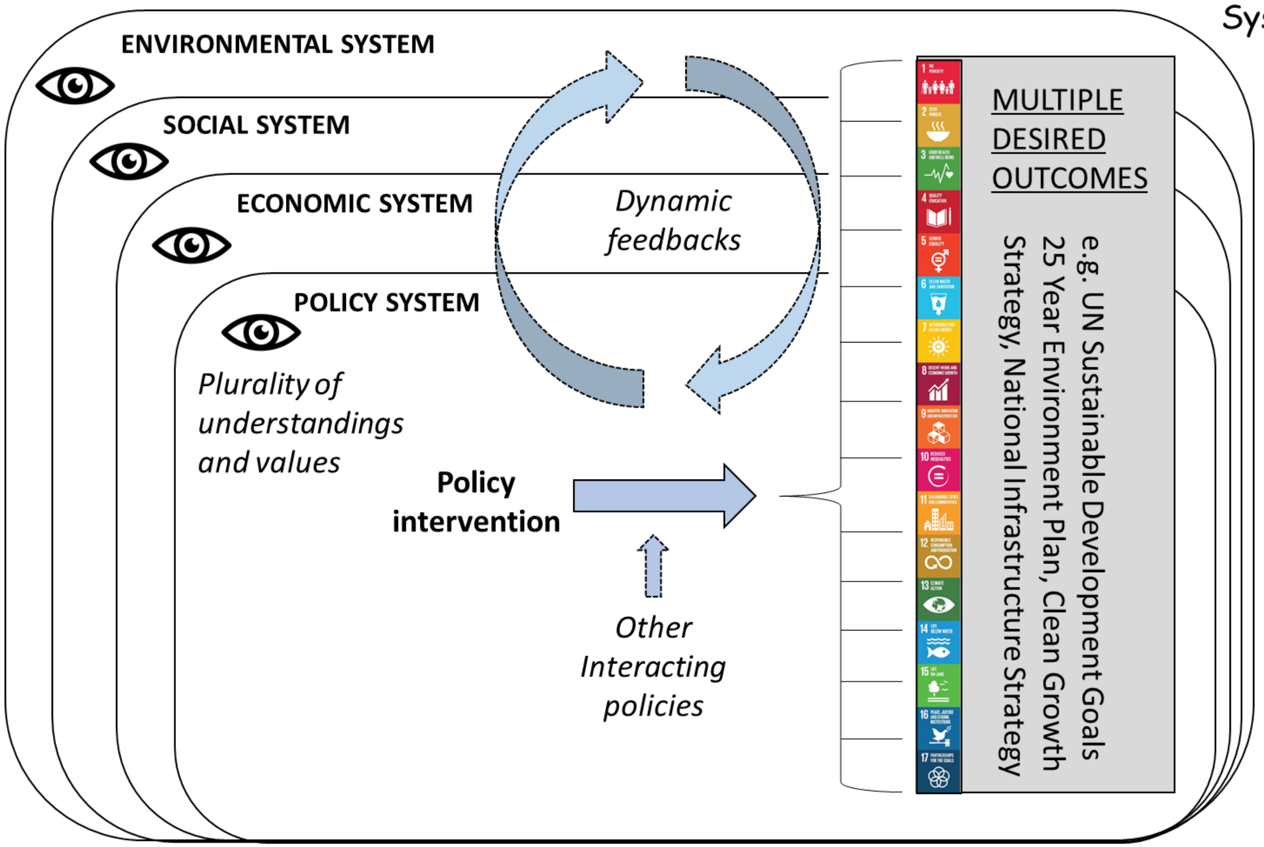
The need for a systems approach



Systems thinking considers:

MULTIPLE DISCIPLINARY LENS
- Political
- Economic
- Environmental
- Social
- Arts & humanities

MULTIPLE SPATIAL SCALES
- Local
- National
- International

MULTIPLE TIME SCALES
- Months
- Years
- Decades
- Generations

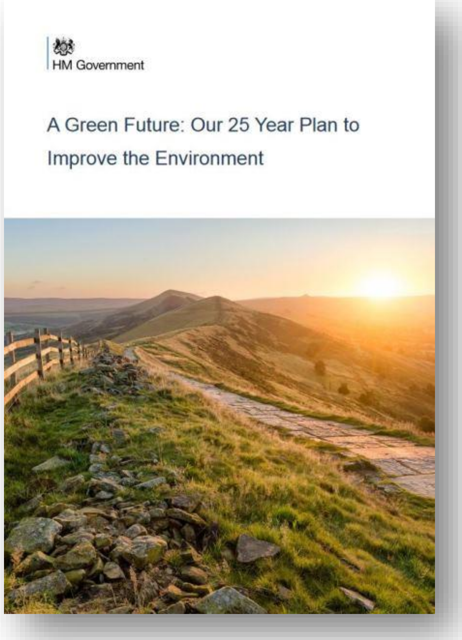
Defra systems primer (forthcoming)

Defra's difficult decisions

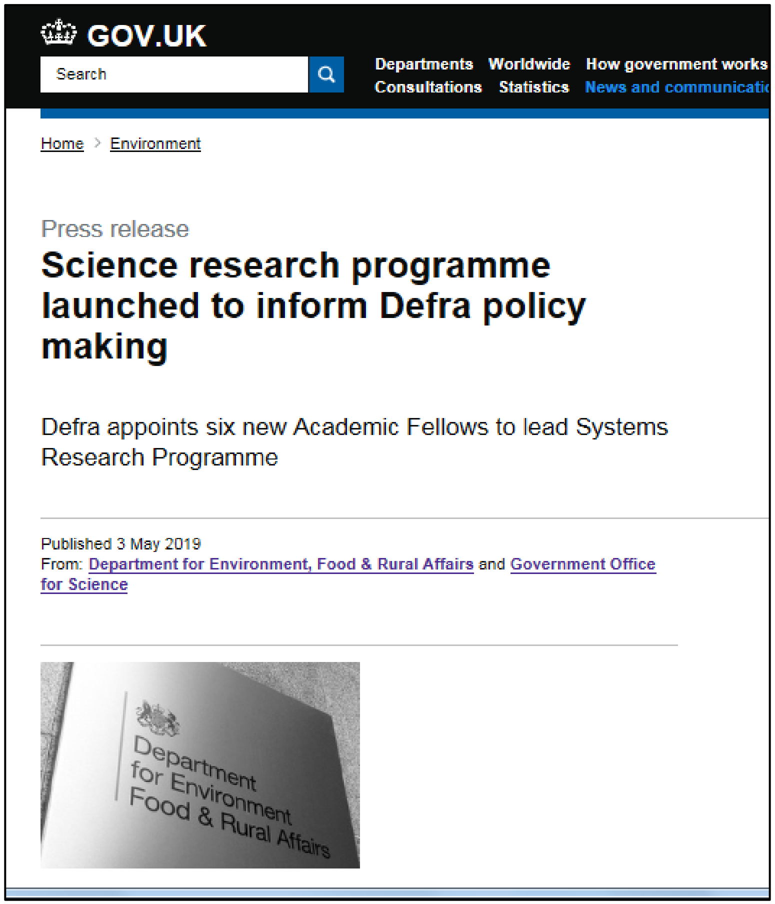
Developing policy within complex socio-ecological systems

- **Time-lags** (e.g. groundwater)
- **Interdependencies** (e.g. 25 year plan goals)
- **Multiple confounding factors** (e.g. farmland birds)
- **Unpredictable emergent problems** (e.g. livestock sulphur deficiency)
- **Feedback loops and tipping points** (e.g. nitrogen)
- **Scale issues** (GHG vs protected species)
- **Plurality of perspectives, views and interests** (What we are aiming for? Governance, messaging, behaviour change)

- **Fragmented evidence**
- **Limits of experimental design**
- **Monitoring** – challenge of attribution



Defra systems research programme



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Press release

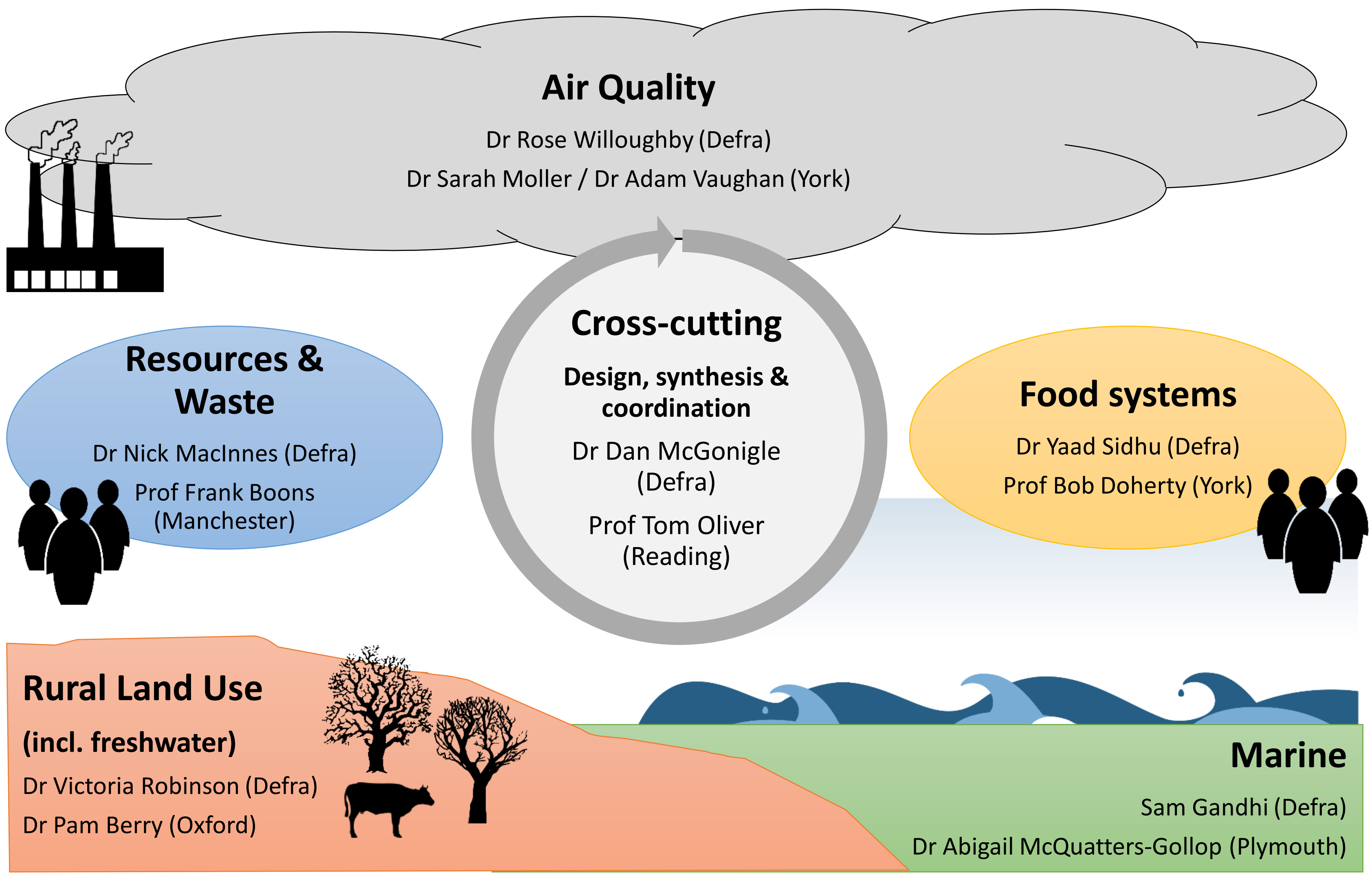
Science research programme launched to inform Defra policy making

Defra appoints six new Academic Fellows to lead Systems Research Programme

Published 3 May 2019
From: Department for Environment, Food & Rural Affairs and Government Office for Science

Department for Environment Food & Rural Affairs

Programme structure



Programme aims

- **Account for complex interactions in policy**:
  - More robust policies with fewer unintended consequences
  - Enhanced collaboration between policy teams
- **Embed systems thinking into policymaking processes:**
  - Better use of evidence
  - Improved working at the science-policy interface
  - Enhanced knowledge and skills of evidence and policy specialists
- **Fill evidence gaps:**
  - Targeted research
  - Greater research capacity on complex systems

Work areas (constantly evolving)

Rural Land use

- Nature Based Solutions
- Future land-use

Marine

- Blue Carbon
- Marine protected areas

Air quality

- Particulate Targets
- Net zero C and Air Quality

Food

- Nat. Food Strategy
- National food security
- Net zero C food chain

Resources and Waste

- Food waste
- Critical material streams
- Plastics
- Data

Cross-cutting

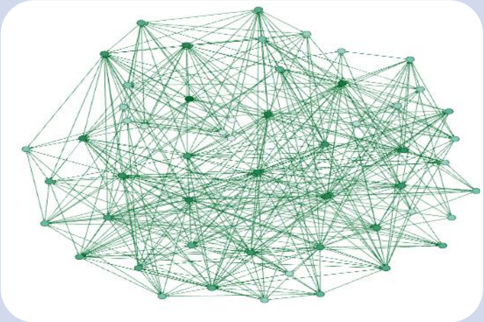
Implications of net zero C for Defra

Biomass
(Bioenergy, Food and Biodiversity)

Land-use conflicts

GHG & 25 YEP
(Trade-off analysis)

Approaches: ‘systems-plus’



Systems methods

Building on:

Soft systems

Critical systems

Systems dynamics

Engineering tools

Management science

Evidence synthesis

Evidence reviews

Expert elicitation

Integrated spatial modelling

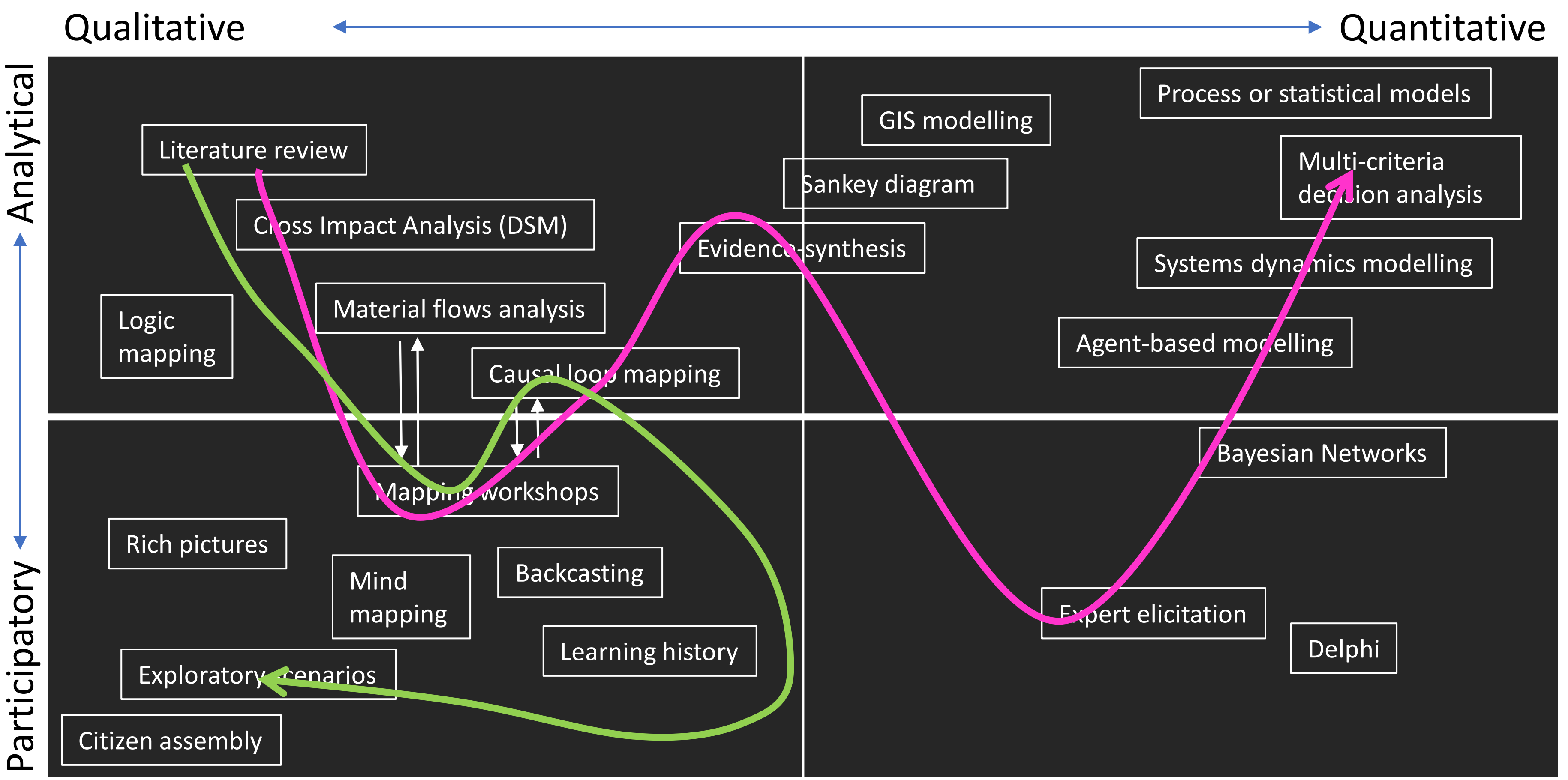
Synthesis

Data analysis

Knowledge brokering

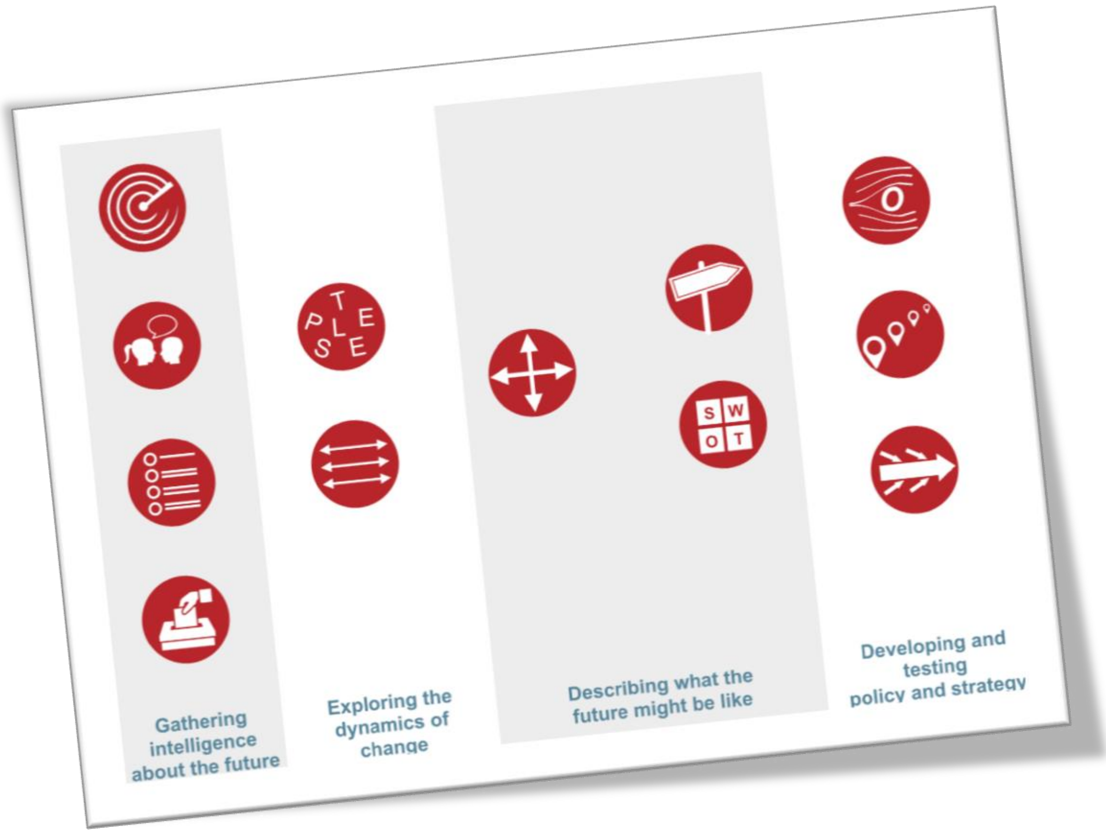
Transdisciplinary and post-normal approaches to share knowledge between researchers, policymakers and stakeholders

Approaches



Qualitative
Quantitative
Analytical
Participatory
Literature review
Cross Impact Analysis (DSM)
Logic mapping
Material flows analysis
Causal loop mapping
Evidence-synthesis
Sankey diagram
GIS modelling
Process or statistical models
Multi-criteria decision analysis
Systems dynamics modelling
Agent-based modelling
Bayesian Networks
Mapping workshops
Rich pictures
Mind mapping
Backcasting
Learning history
Exploratory scenarios
Citizen assembly
Expert elicitation
Delphi

Related initiatives....



Related initiatives….

Mapping the Food, Farming & Biosecurity (FFaB) System

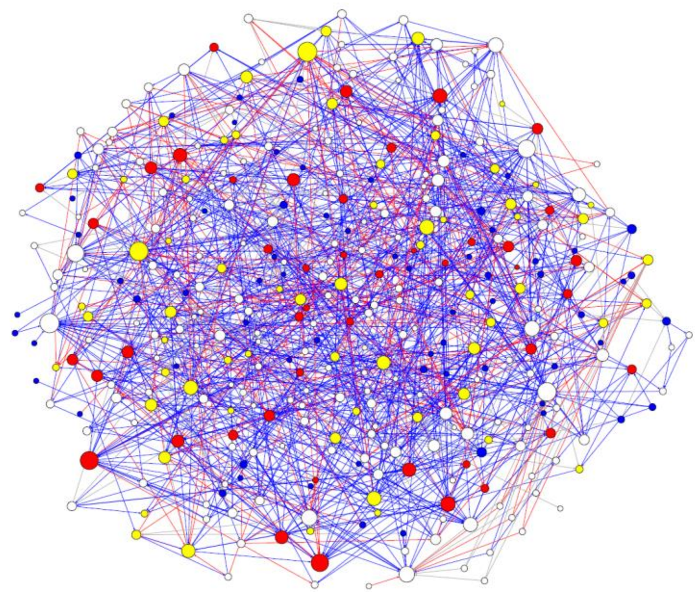
1. Identification of factors

2. Links/connections

3. Draft map

4. Validation of map

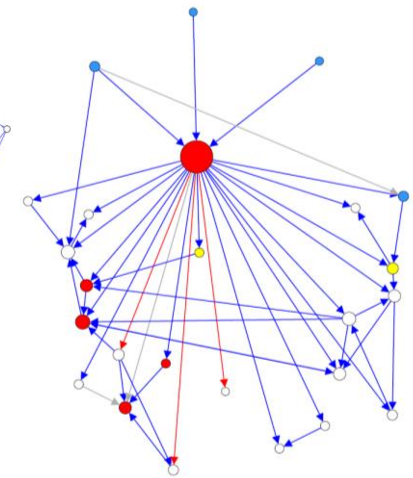
Current FFaB network map
(>360 nodes and >100 links/connections)



Priorities

Stakeholders **DEFRA**

Policy **Cross cutting**

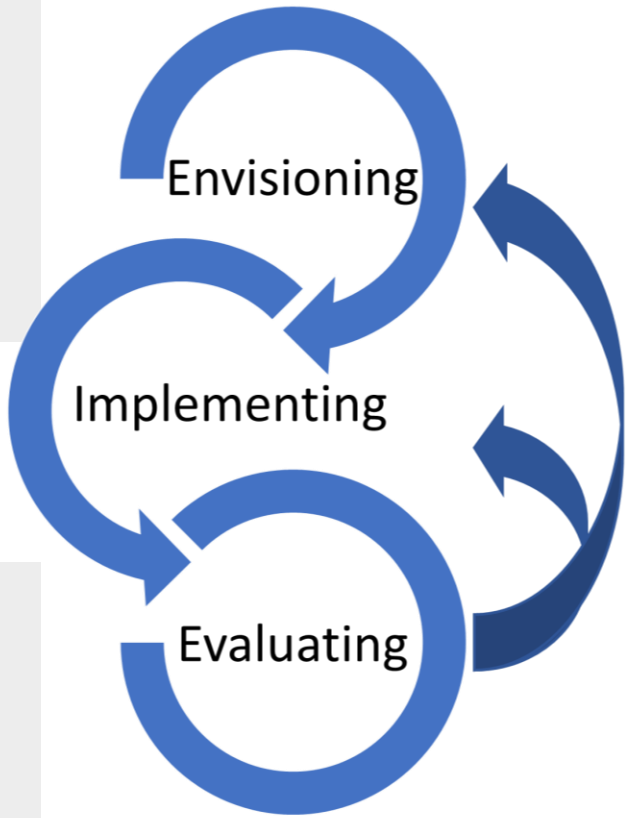


Uses include:

- Providing context for evaluation planning, ensuring that design of monitoring and evaluation is appropriate for the complexity
- Identifying levers, risks, trade-offs and synergies, relationships between policy areas and their outcomes in the context of the whole system

Three interlinked phases of sustainability transitions

Envisioning
- Co-creating plausible and normative visions
- Innovative approaches to navigate societal values to feed into decision-making processes
- Reconcile visions across different spatial scales



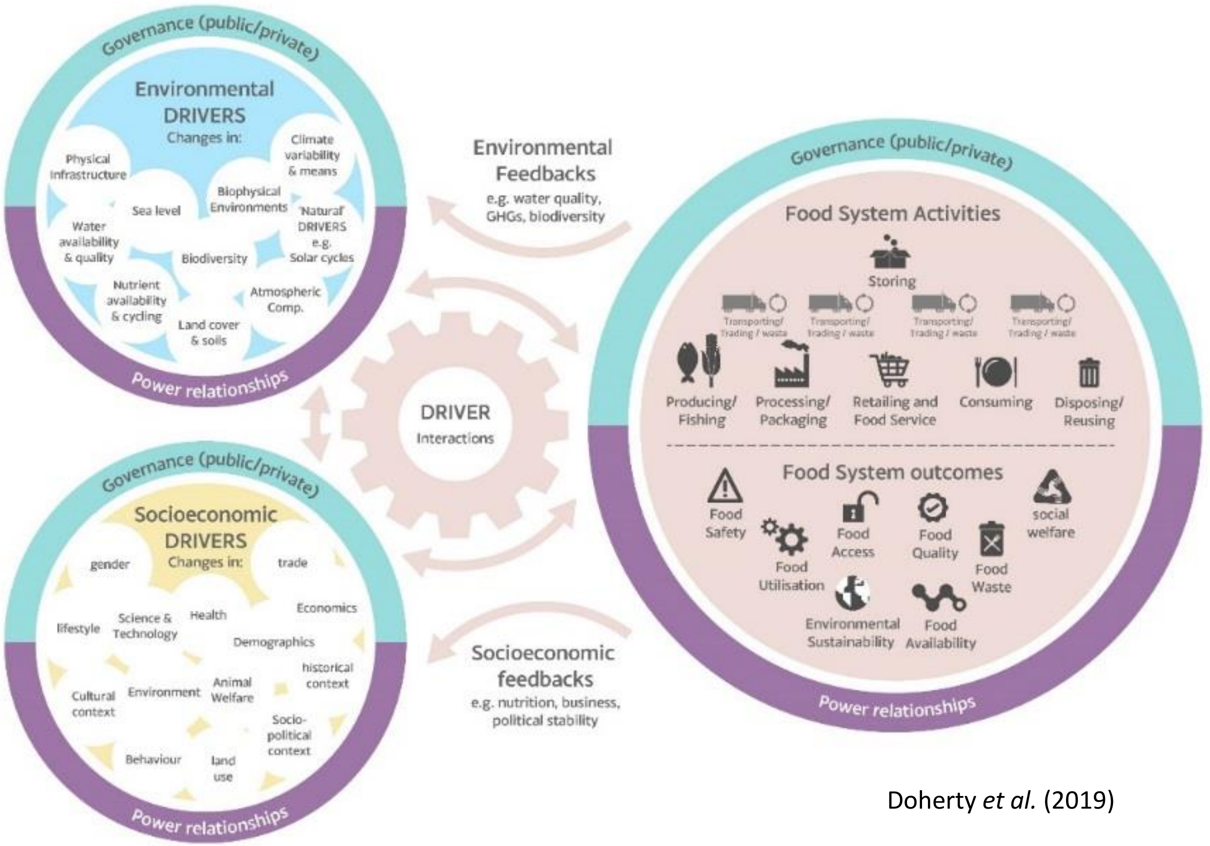
Implementing
- Anticipatory knowledge (multiple policy outcomes/impacts)
- How implementation success varies in a changing context
- Polycentric governance requiring effective coordination and integration capacity

Evaluating
- Learning attitude
- New sustainability transition indicators
- Feedback into implementation decisions and decisions over the choice of transition pathways

Envisioning alternative futures

Informing the National Food Strategy

- Co-developed conceptual framing of food system with policy team
- And used this to structure:
  - Stakeholder consultation
  - Public dialogues and citizens' assemblies
  - Dashboard of metrics
- 'Food in every policy' approach



Doherty *et al.* (2019)

Also working with Royal Society on their *[Living Landscapes](#)* programme

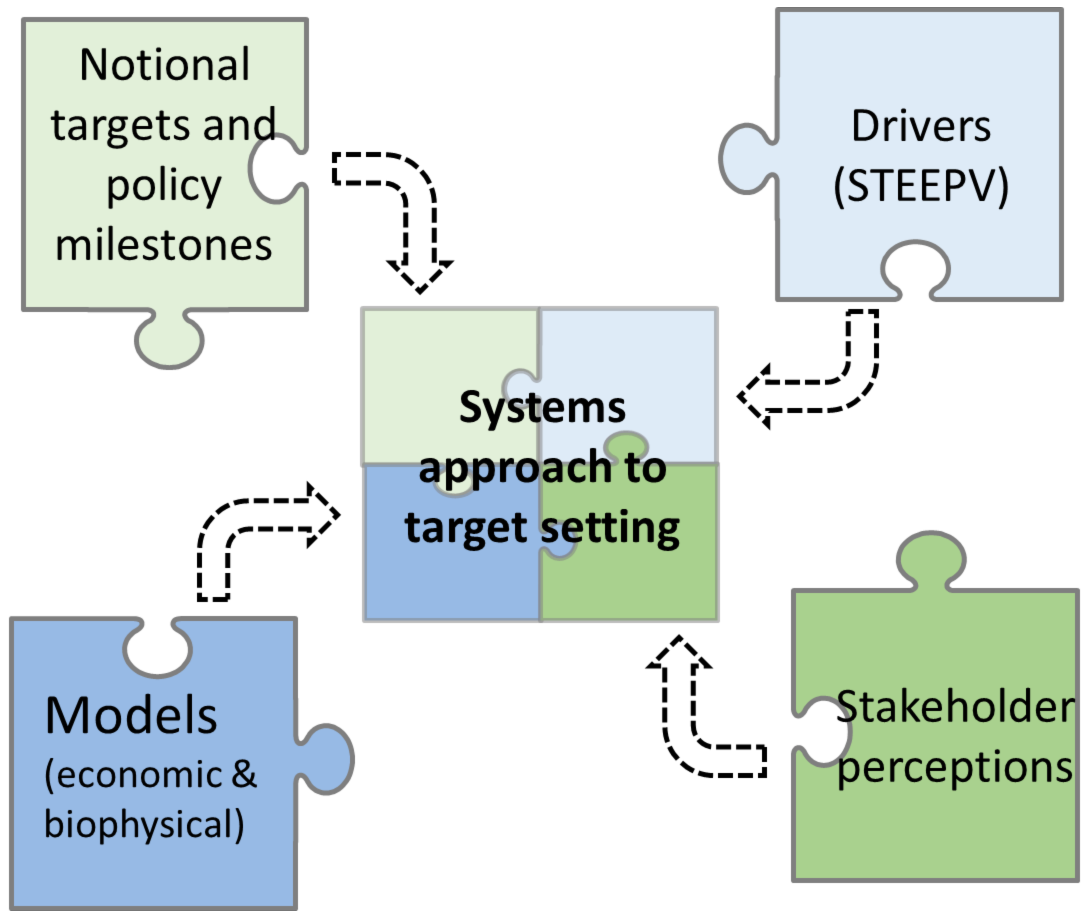
Envisioning alternative futures

Environmental targets refresh

2043 environmental targets and milestones

Multiple policy teams: air quality, water, biodiversity, forestry, waste and resources

Will be held to account by forthcoming Office for Environmental Protection

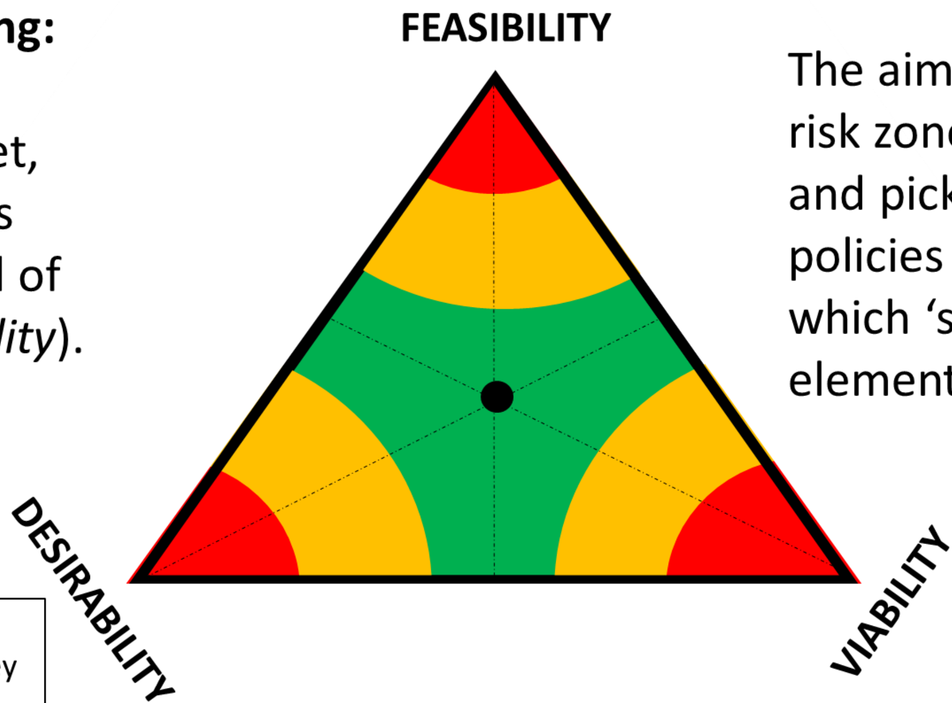


Envisioning alternative futures

Environmental targets refresh

Setting targets is a process of **balancing:** the *feasibility* of achieving the target, internal constraints (*viability*) and level of ambition (*desirability*).

Expert elicitation and environmental outcome modelling in the context of drivers



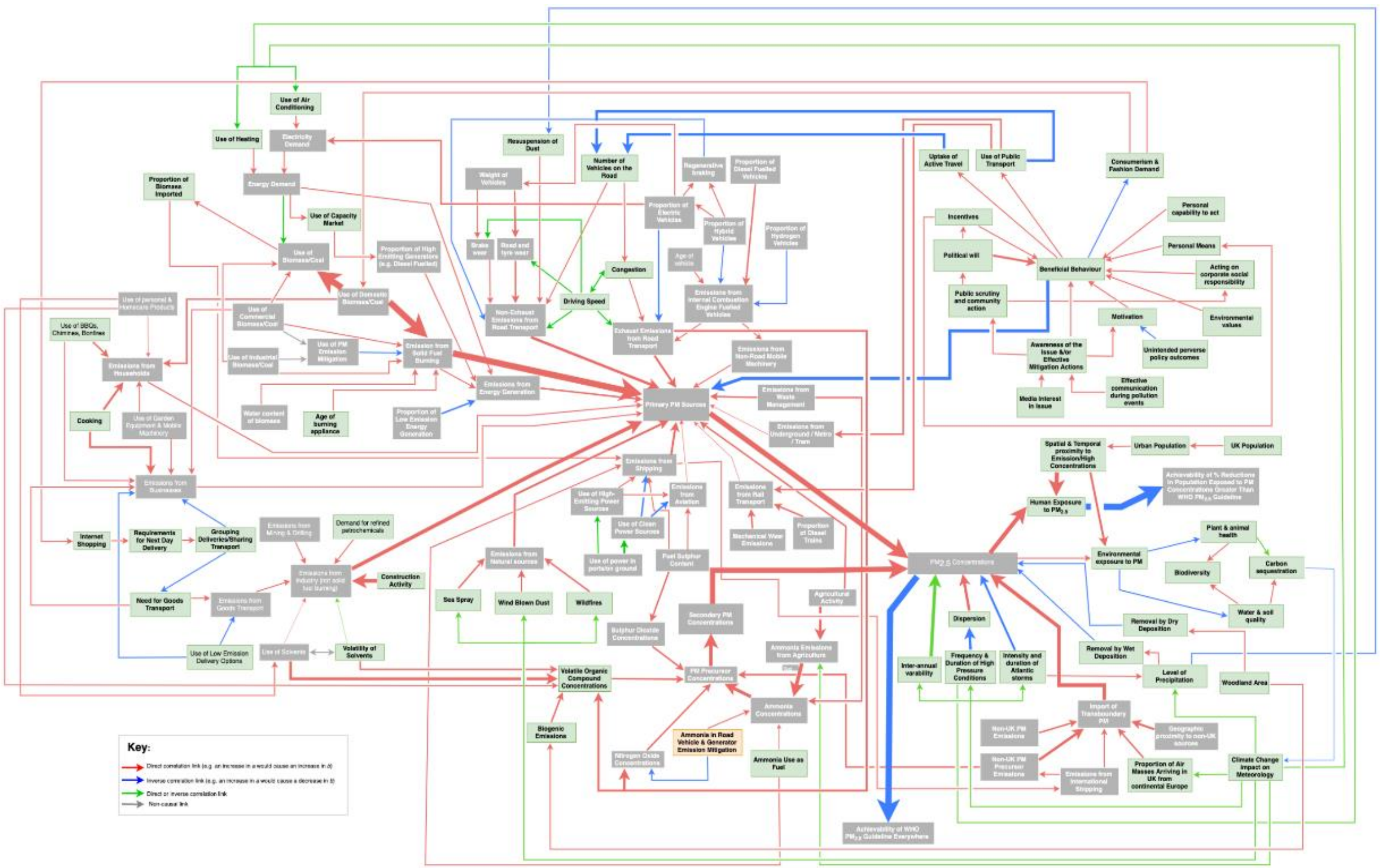
The aim is to avoid high risk zones (red shading) and pick promising policies and targets which 'satisfice' all three elements

Intelligence on acceptability to key stakeholders

Economic C/B analysis and policy achievability given drivers and departmental constraints

Implementing transformational policy

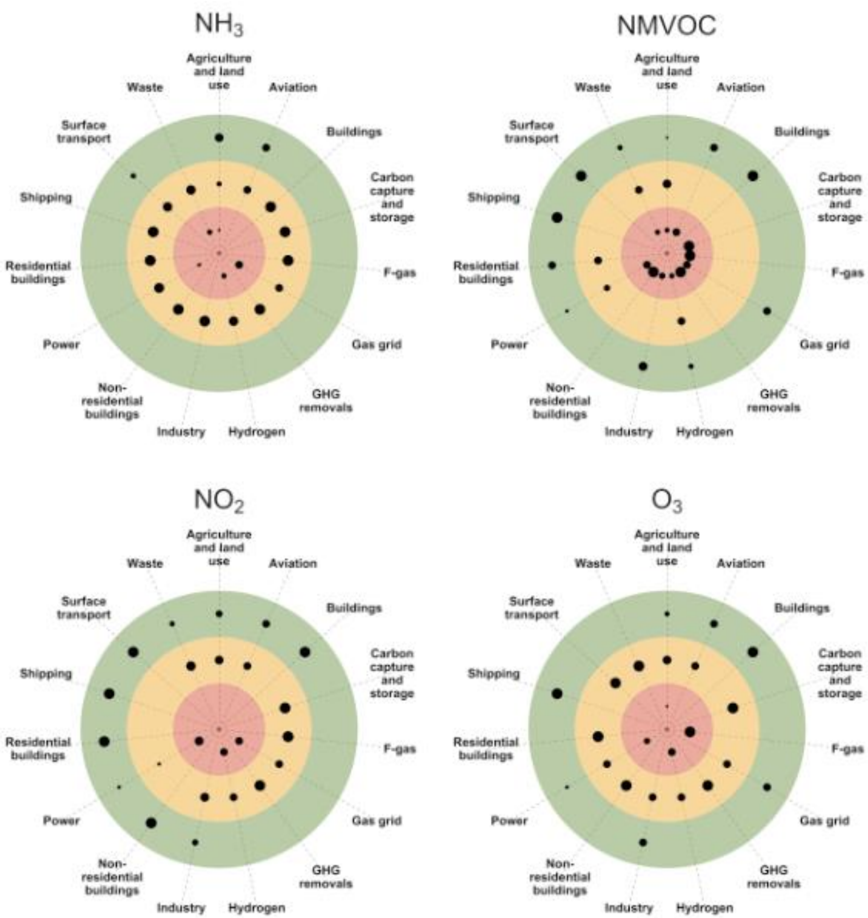
PM2.5 policy options



- Identifying possible 'policy blind spots'
- Participatory causal loop mapping to identify main influencing factors
- Expert review
- Mapping evidence gaps/ uncertainties

Implementing transformational policy

Air quality/ greenhouse gas trade-off analysis for CCC actions



- Expert workshop in January 2020 to systematically complete a matrix
- Follow-on expert review of key trade-offs and opportunities.
- Identification of policy risks and opportunities

		Air Quality Impact										Narrative
		PM		NO_2		O_3		NMVOCs		NH_3		
Sector	GHG reduction measure	Effect	Scale	Effect	Scale	Effect	Scale	Effect	Scale	Effect	Scale	
Power	Electricity demand increase	"-ve"	2	"-ve"	2	"-ve"	1	"-ve"	1	"-ve"	1	Under a 2020 'business as usual' scenario this action in isolation would have the potential to have widespread negative impacts on air quality, but under low-carbon emission 2050 energy scenarios (for example powered by renewables / nuclear /CCS combinations) could have significant positive impacts.
Power	Widespread increase in renewables (largely offshore wind, with onshore wind and solar)	"+ve"	2	"+ve"	2	"+ve"	2	"+ve"	1	Neutral		Phase out of combustion sources would have a range of benefits. This assessment ignores the transitional impacts of the manufacture and construction of the listed technologies.
Power	Bioenergy with carbon capture and storage (BECCS)	"-ve"	1	"-ve"	1	"-ve"	1	"-ve"	2	"-ve"	1	Fast-growing plants have the potential to increase biogenic VOCs (and therefore ozone) depending on which species are used. Localised Increased NOx and PM emissions could arise from additional transport and pelletizing of plants to biofuels. Potentially some changes in ammonia emissions from fertiliser.
Power	Natural gas with carbon capture and storage	Neutral		Neutral		Neutral	1	"-ve"	2	Neutral		Change in air quality impacts relative to natural gas without CCS are the capture solvent emissions. Assessment assumes effective mitigation of combustion emissions such as NOx and PM as part of the CCS process.
Power	Nuclear generation	"-ve"	1	"-ve"	1	Neutral		Neutral		Neutral		The primary air pollution source arises from long construction times (decades) needed to build a nuclear power plants including dust, temporary power and off-road vehicles . Impacts are likely to be localised to specific communities.
Power	System flexibility (flexible gas plant, interconnection, demand-side response, battery storage, hydro storage, power-to-gas)	Neutral		"-ve"	1	Neutral		Neutral		Neutral	1	Any air quality effects are likely to be small. Back up generation possibly involving combustion of H_2 would be expected to be located in rural locations.
Hydrogen	Demand: widespread H2 use in industry and use in other sectors (HGVs, gas grid)	Neutral		"-ve"	2	"-ve"	1	"+ve"	1	Neutral		H_2 use may lead to increased NOx emissions, depending on how it is used, although expectation is H_2 will be mainly in fuel cells. Use in domestic combustion boilers could give an adverse effect for NOx, but a positive displacement of VOCs.
Hydrogen	Production: Methane reformation with carbon capture and storage	Neutral		Neutral		"-ve"	1	"-ve"	1	Neutral		The methodology used will be central to determining impacts. Large scale production likely to lead to well-controlled point source emissions. Increased VOC emissions may be associated with the process but large uncertainties in the likely technology.
Hydrogen	Production: electrolysis using low-carbon power	Neutral		Neutral		Neutral		Neutral		Neutral		Assuming a low carbon energy source, no significant impact anticipated.
Hydrogen	International H2 market, potentially transported as ammonia	Neutral		"-ve"	1	Neutral		Neutral		"-ve"	1	NH_3 is a toxic gas that would require safe storage and transportation, although this is a well-established industry already. Likely very small potential for fugitive NH3 emissions. Potential for increased NOx emissions if used for combustion, but prediction is for main use in fuel cells
Carbon capture and storage	CCS used across the economy	"-ve"	1	Neutral		Neutral		"-ve"	2	Neutral		Each CCS method has different potential for affecting air quality. Some CCS methods generate carcinogens (VOC and PM) in post-combustion. Difficult to measure, due to toxicity. The technologies are known but not yet operating at scale in the UK or widely internationally.
Gas grid	Biomethane from anaerobic digestion injected to gas grid	Neutral		Neutral		Neutral		"-ve"	2	"-ve"	2	Methane injected into the gas grid will still have the same leakage potential, with the additional issue of NH_3 emissions from the digestion. Questions remain over where the waste products from the process will go after and downstream impacts of waste disposal.

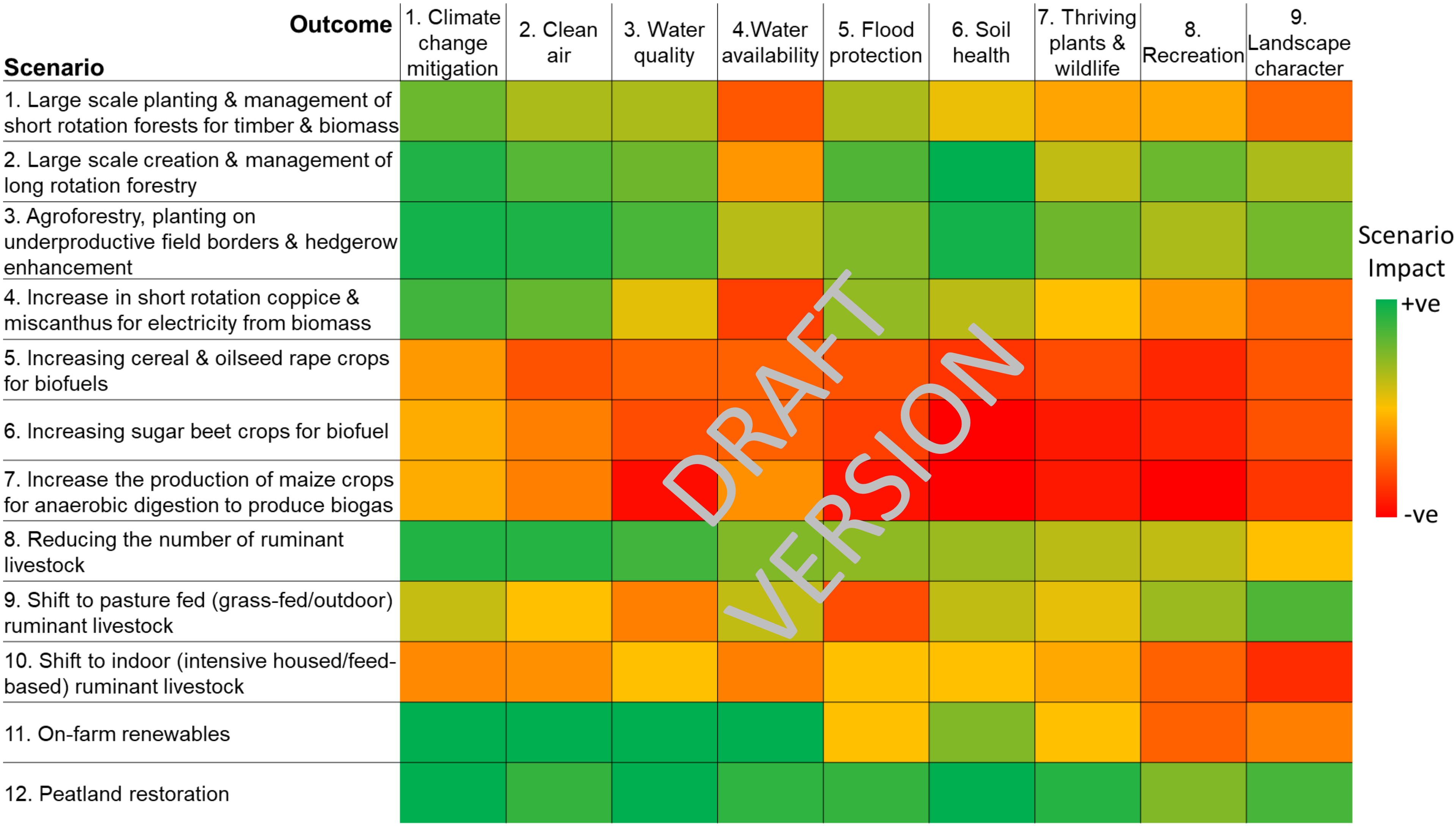
Implementing transformational policy

The Impacts of CCC Proposed Land Use Change Scenarios to Achieve Net Zero

- Expert elicitation and Delphi approach used to assess how land use change scenarios to achieve net zero could impact a range of environmental outcomes.
- Matrix summarises overall impact the scenarios on a range of environmental outcomes
- Each score has collated rationales and confidence based on variance across experts and number of responses

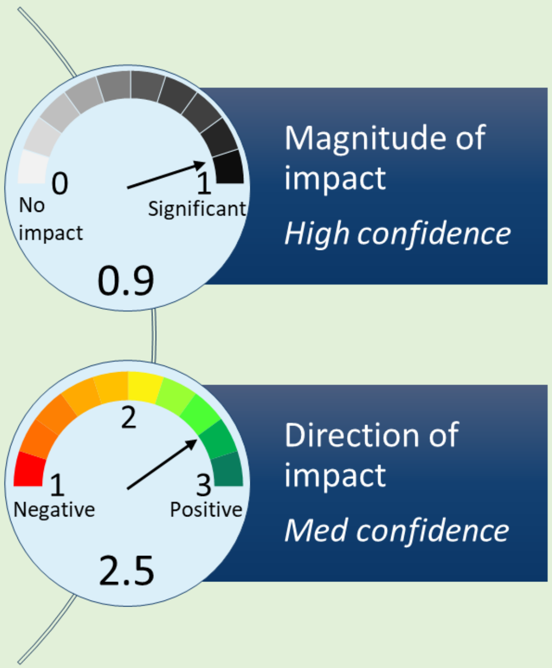
Implementing transformational policy

The Impacts of CCC Proposed Land Use Change Scenarios to Achieve Net Zero



Scenario: Large scale planting and management of short rotation forests for timber and biomass
Outcome: Climate change mitigation (GHG sequestration and/or reduced emissions)

Back to matrix



Rationale

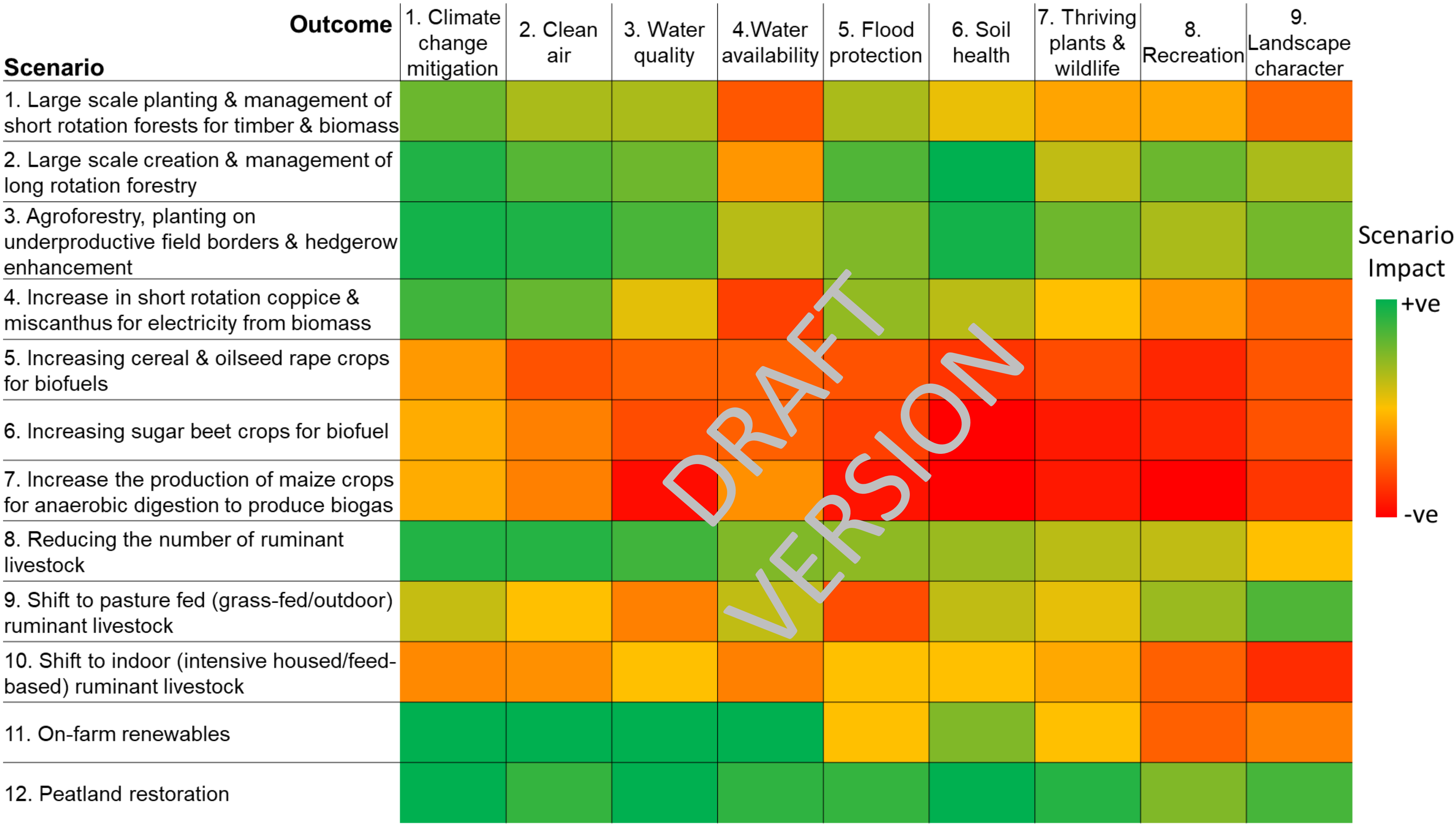
- Even if regularly harvested, woodland likely to have higher C storage than many other land uses
- Dependent on tree species, forest management (how long the trees take to grow and how long for the trees to be removed) and location (e.g. soil type)
- The potential to sequester carbon above and below ground, however, is highly dependent on soil type and management (frequent disturbance during rotation will remobilise much carbon). If planted on peat and other carbon-rich soil there is the potential to lose carbon from soil.
- Most effective carbon sequestration when timber is used for long lived products. Less effective if timber used as biomass for energy (and contingent upon power generation efficiency, including transportation emissions)

Further evidence sources / evidence gaps

- Paper 1
- Paper 2
- Defra report 3
- Lack of data in z

Implementing transformational policy

The Impacts of CCC Proposed Land Use Change Scenarios to Achieve Net Zero



Integrated spatial modelling

Recreation

Pollination

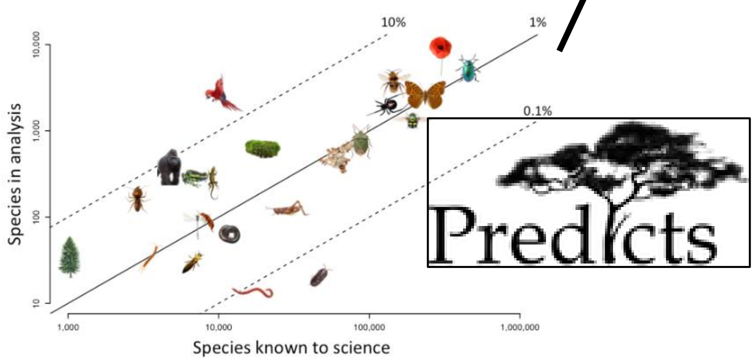
Flood protection

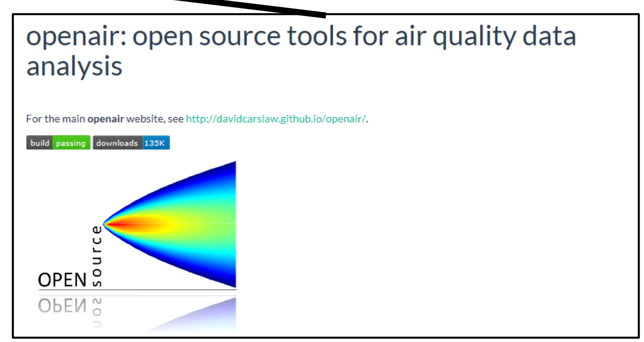
InVEST
integrated valuation of environmental services and tradeoffs

Decision support tools for land use policy

Water quality

Agricultural yield





Carbon sequestration

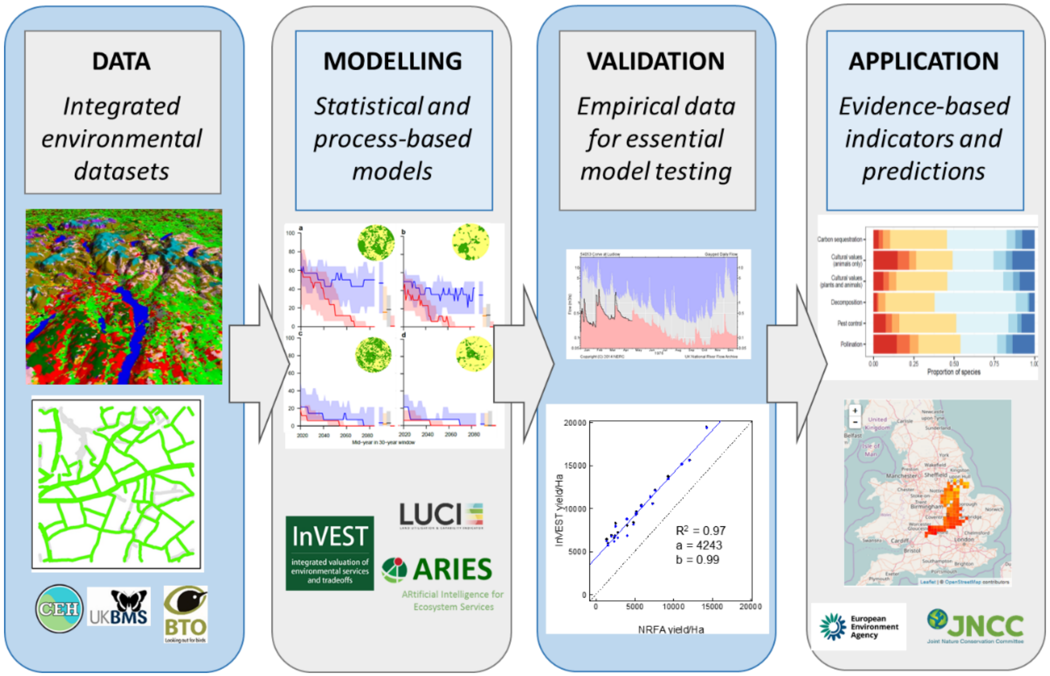
Biodiversity

Air quality

Landscape character

Integrated spatial modelling

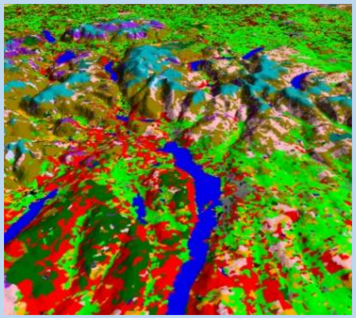
Decision support tools



Integrated spatial modelling

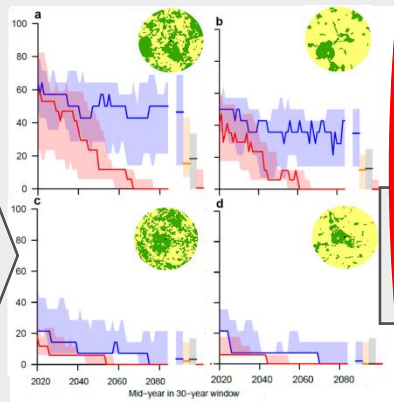
DATA

Integrated environmental datasets



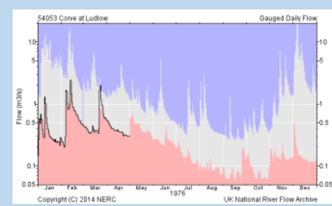
MODELLING

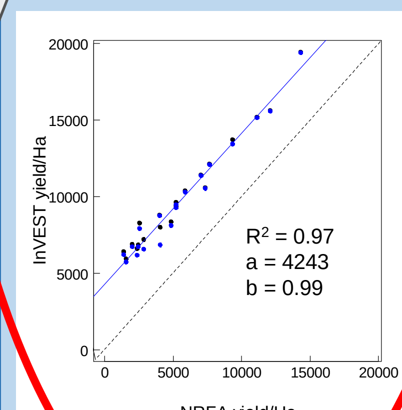
Statistical and process-based models



VALIDATION

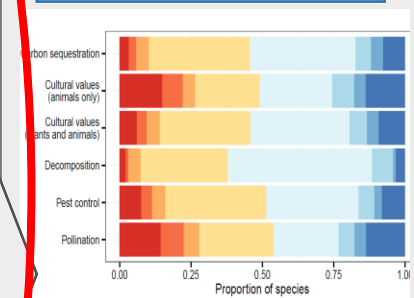
Empirical data for essential model testing

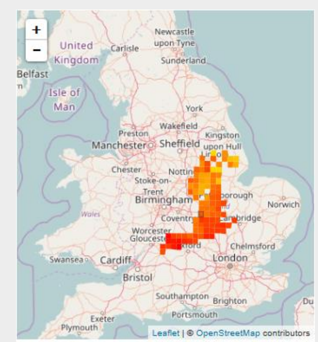




APPLICATION

Evidence-based indicators and predictions



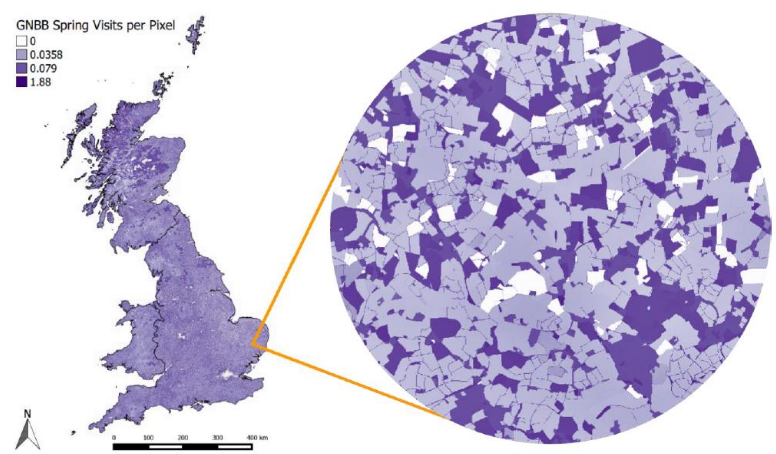


Integrated spatial modelling

Model validation

Some combined frameworks under development for use in **biodiversity offsetting** are not able to predict ecosystem functioning (e.g. for pollination)

Habitat	Food	Wood	Fish	WaterProv	Flood	Erosion	WaterQual	Carbon	AirQuality	Cooling	Noise	Pollination	PestControl	Recreation	Aesthetic	Education	Nature	SensePlace
Broadleaved, mixed and yew semi-natural woodland	1	6	0	3	9	10	10	10	6	10	8	7	8	10	10	10	10	10
Broadleaved, mixed and yew plantation	0	8	0	2	9	8	8	9	6	10	8	6	6	10	10	6	7	8
Native pine woodlands	0	0	0	3	9	8	6	7	8	10	10	6	8	10	10	10	10	10
Coniferous plantation	0	10	0	1	10	6	5	8	10	10	10	2	6	10	6	6	4	6
Wood pasture and parkland with scattered trees	5	2	0	7	6	8	6	5	3	6	6	7	8	10	10	8	8	10
Traditional orchards	5	1	0	7	8	8	5	5	4	8	6	7	8	8	10	8	7	10
Dense scrub	1	2	0	4	6	8	5	6	7	6	6	7	10	8	8	6	8	6
Hedgerows	1	1	0	4	6	8	5	5	8	6	6	8	10	8	10	8	10	10
Felled woodland	0	0	0	4	1	0	1	2	0	1	0	1	3	5	1	1	1	1
Tall herb and fern	1	0	0	8	5	8	5	4	1	2	1	7	10	8	10	6	8	4
Bracken	1	0	0	8	5	8	5	4	1	2	1	6	8	8	6	4	6	2
Semi-natural grassland	6	0	0	9	4	8	4	4	1	2	1	7	8	10	10	10	10	10
Acid grassland	6	0	0	9	4	8	4	4	1	2	1	6	8	10	10	10	10	10
Calcareous grassland	6	0	0	9	4	8	4	3	1	2	1	10	8	10	10	10	10	10
Neutral grassland	6	0	0	9	4	8	4	4	1	2	1	7	8	10	10	10	10	10
Improved grassland	10	0	0	7	3	4	1	3	1	2	1	2	3	5	4	2	2	4
Arable fields, horticulture and temporary grass	10	0	0	7	2	1	1	2	1	2	1	2	2	5	2	2	1	2
Arable field margins	0	0	0	8	4	6	5	2	1	2	1	6	8	10	8	6	6	4
Woody biofuel crops	0	10	0	3	4	2	1	4	1	2	1	2	4	5	2	2	1	2
Intensive orchards	10	1	0	3	8	6	1	5	4	8	6	6	4	5	8	2	1	2
Bog	1	0	0	10	5	8	7	10	1	4	1	4	3	8	8	8	10	10
Dwarf shrub heath	1	0	0	8	5	8	5	4	1	2	1	10	9	10	10	8	10	10
Inland rock	0	0	0	0	0	0	0	0	0	0	0	0	0	8	10	10	6	10
Freshwater	0	0	10	10	0	0	1	1	0	4	0	1	2	10	10	10	10	10
Standing open water and canals	0	0	10	10	4	0	1	1	0	4	0	1	2	10	10	10	10	10
Running water	0	0	10	10	1	0	1	0	0	4	0	1	2	10	10	10	10	10
Fen, marsh and swamp	1	0	0	10	4	8	7	6	1	4	1	4	3	6	10	10	10	10
Lowland fens	1	0	0	10	4	8	7	6	1	4	1	4	3	6	10	10	10	10
Purple moor grass and rush pastures	4	0	0	9	4	8	7	4	1	2	1	4	6	10	10	8	10	10
Upland flushes, fens and swamps	1	0	0	10	4	8	7	6	1	4	1	4	3	6	10	10	10	10
Aquatic marginal vegetation	0	0	10	10	4	8	7	2	1	4	1	6	8	6	10	10	10	10
Reedbeds	0	0	10	10	4	8	7	4	1	4	1	2	3	6	10	10	10	10



Gardner et al. (2020), Redhead et al. (2016 & 2018)

Integrated spatial modelling

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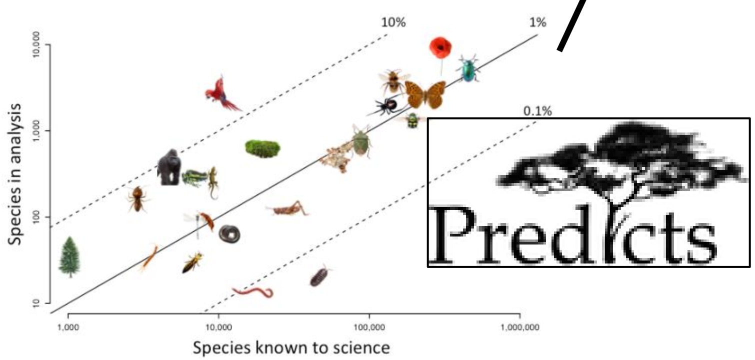
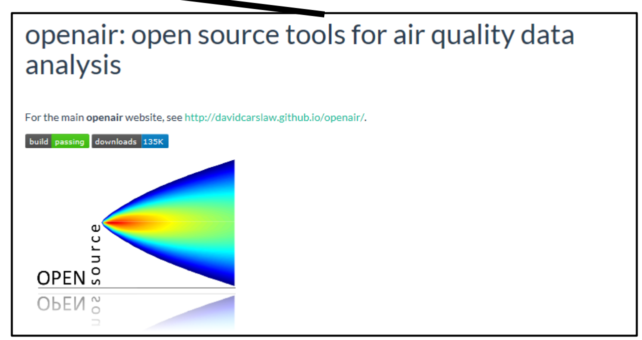




Carbon sequestration

Biodiversity

Air quality

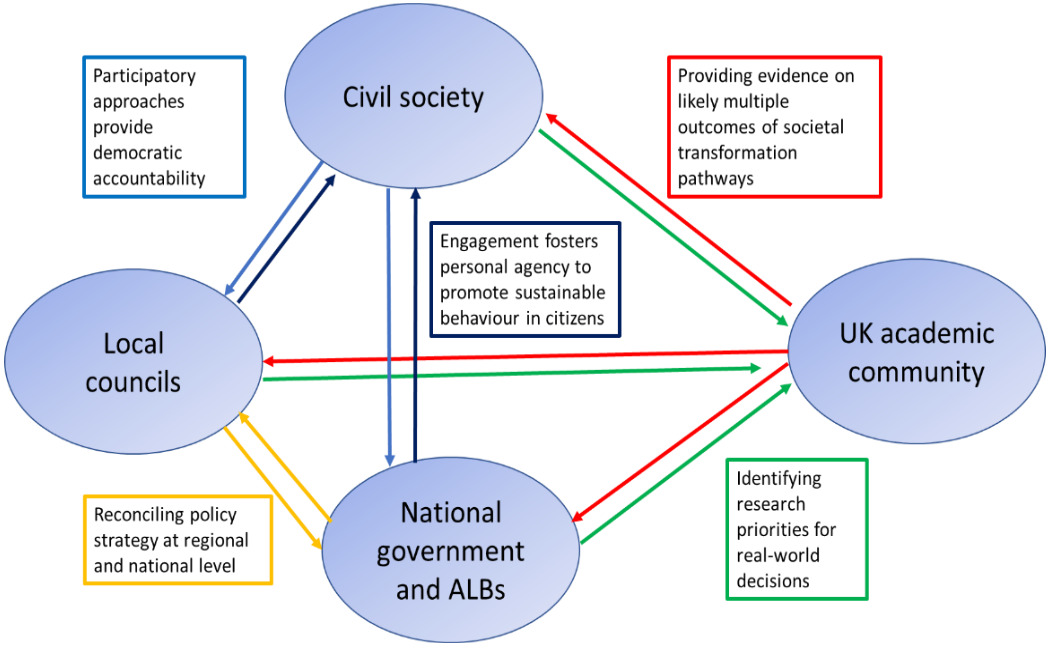
Landscape character

Integrated spatial modelling

Participatory decision support for landscape planning

Benefits of wide participatory modelling approaches (including citizens):

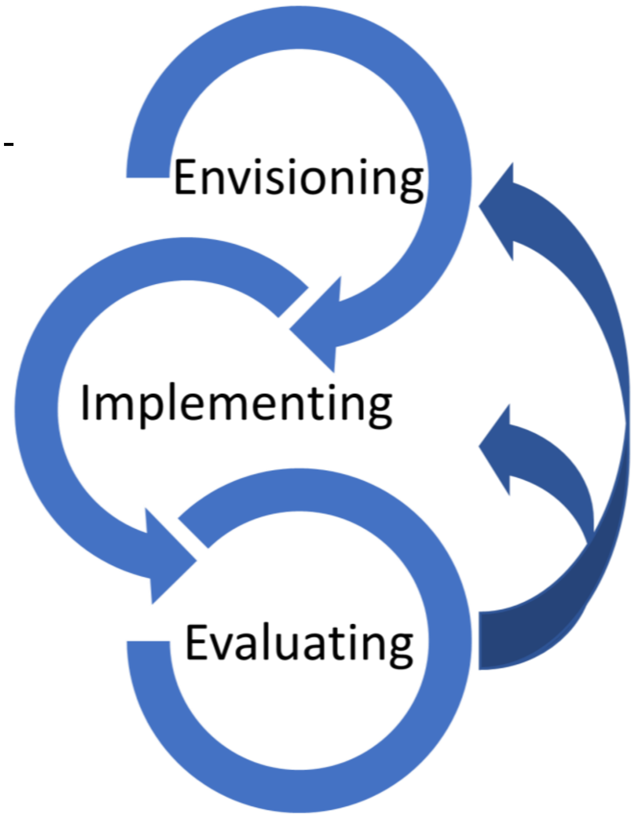
- **Normative assumptions** in models can parameterised - makes the outcomes both more reflective of societal values and more transparent
- Lends **democratic legitimacy** and public ownership to major policy decisions
- Evidence on **public attitudes**, i.e. better intelligence on what is politically possible
- Better **co-ordination** of polycentric governance around complex environmental issues
- Promotes **personal agency** and pro-environmental behaviour changes



Three interlinked phases of sustainability transitions

Envisioning

- Co-creating plausible and normative visions
- Innovative approaches to navigate societal values to feed into decision-making processes
- Reconcile visions across different spatial scales



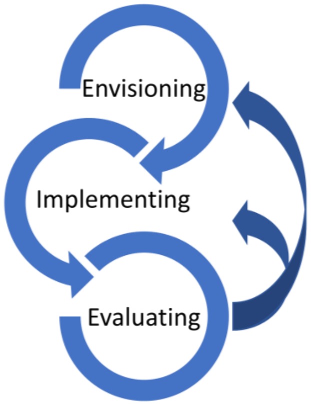
Implementing

- Anticipatory knowledge (multiple policy outcomes/impacts)
- How implementation success varies in a changing context
- Polycentric governance requiring effective coordination and integration capacity

Evaluating

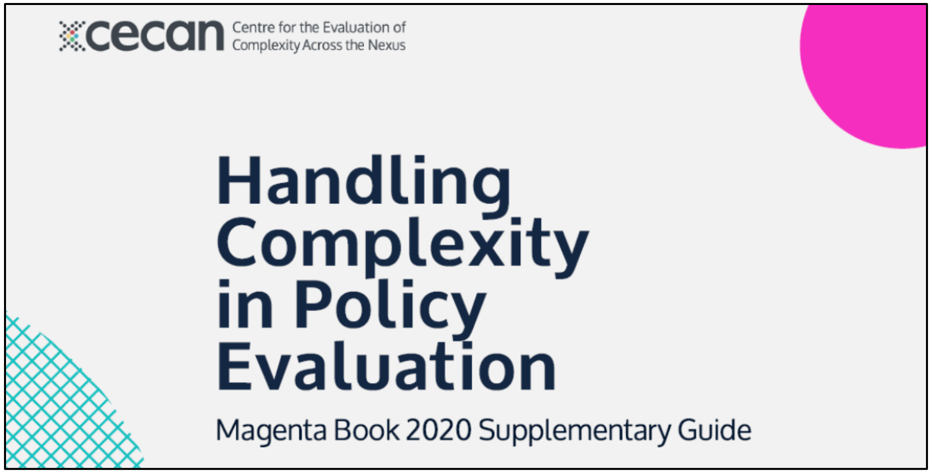
- Learning attitude
- New sustainability transition indicators
- Feedback into implementation decisions and decisions over the choice of transition pathways

Three interlinked phases of sustainability transitions

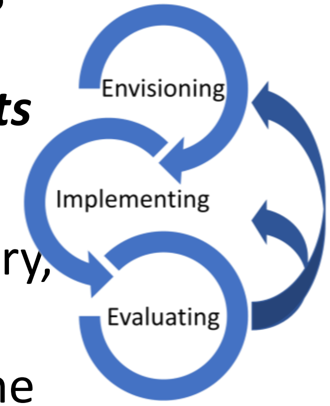


Evaluating

- Balancing multiple perspectives and value sets. More about ‘satisficing’ than ‘optimising’
- Deep uncertainty in complex system, means limits to predictability
- Likely to be unanticipated effects
- Critical need to monitor transition policy effectiveness and enable flexible, adaptive approaches; avoiding policy ‘lock-ins’



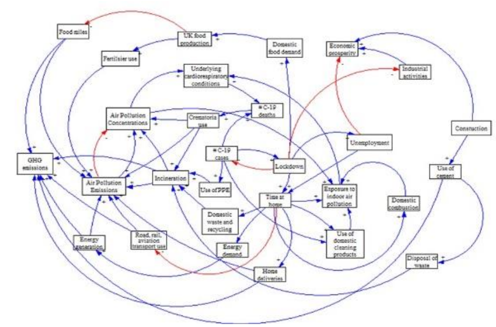
Three interlinked phases of sustainability transitions



New project Jan 2021- ***Systemic environmental risk analysis for threats to UK recovery from COVID-19***

Environment not currently explicit in some framings of national recovery, yet there are a number of major risks involving it that can impact economy, societal cohesion and health over a relatively short timeframe (e.g. <24 months)

Participatory systems mapping and evidence synthesis



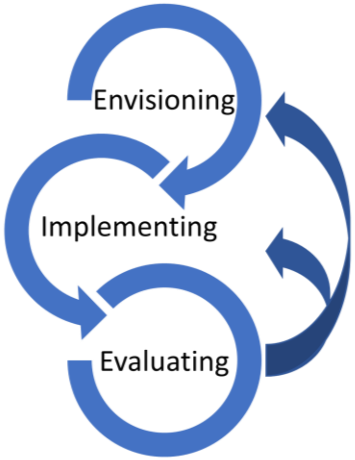
Case studies

1. **Biosecurity- preventing and improving resilience to a second zoonotic emergence**
2. **Improving respiratory health of the UK population**
3. **Food security**

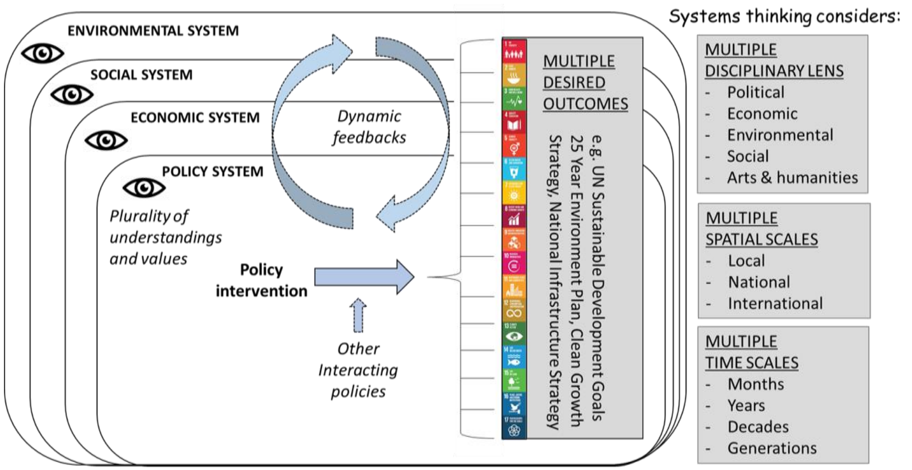
-> Inform urgent policy to mitigate these risks, recommend monitoring processes that track system dynamics based on key 'watchpoints' to trigger mitigation actions. Identify uncertainty levels and critical evidence gaps for targeting research

University of Reading
Department for Environment Food & Rural Affairs
University of York
cecan Centre for the Evaluation of Complexity Across the Nexus

Next steps?



- Systems research programme fellow contracts end March 2021
- Lot's of ongoing Defra work strands (e.g. Environmental targets; systemic risk project). Including **organisational reform**
- Plus developing systems approaches across government departments (e.g. net zero)
- Defra Systems research 'primer' published Jan 2021



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t.oliver@reading.ac.uk
thomas.oliver@defra.gov.uk