UK National Ecosystem Assessment

UK-NEA Phase 2 Workpackage 3: Economic Value of Ecosystem Services

Ian Bateman (UEA)
Royal Society Wolfson Professor
PI UK-NEA WP3

On behalf of the WP3 team:

Ian Bateman, Amy Binner, Mike Bowes, Brett Day, Ben Ditchburn, Silvia Ferrini, Carlo Fezzi, Rosie Hails, Nick Hanley, Amii Harwood, John Hillier, Kevin Hiscock, Mark Hulme, Andrew Lovett, Robert Matthews, Gavin Siriwardena, Pete Smith, Antara Sen, Pat Snowdon, Gregory Valatin, Silvia Vetter
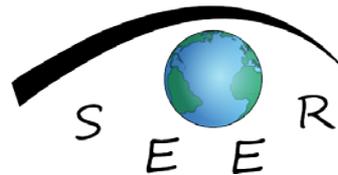
WP3 Partners

Funding: 66% SEER, CSERGE and partners; 33% UK-NEA

WP3 Team

- Professor Ian Bateman (UEA): PI; Project management, economics & land use modelling
- Dr. Amy Binner (UEA): Lead Researcher – Integration of models;
- Dr Mike Bowes (CEH, Oxford): Co-I; Geochemistry and ecological response
- Professor Brett Day (UEA): Co-I; Integration, environmental economics and valuation
- Dr. Ben Ditchburn (Forestry Commission) Forestry modelling
- Dr. Silvia Ferrini (Siena): Forestry and biodiversity modelling
- Dr. Carlo Fezzi (UEA): Lead Researcher - Integrated land use modelling
- Professor Rosie Hails (CEH): Ecology
- Professor Nick Hanley (Stirling University): Economics of ecosystem services
- Dr. Amii Harwood (UEA): Lead Researcher - Spatial analysis;
- Dr. John Hillier (Aberdeen): Mathematical modelling
- Professor Kevin Hiscock (UEA): Co-I; Hydrological modelling
- Dr. Mark Hulme (British Trust for Ornithology): Biodiversity modelling
- Professor Andrew Lovett (UEA): Co-I; Spatial analysis
- Dr. Robert Matthews (Forestry Commission): Greenhouse gas modelling
- Dr. Gavin Siriwardena (British Trust for Ornithology): Co-I; Biodiversity
- Professor Pete Smith (Aberdeen): Co-I; Greenhouse gas modelling
- Dr. Antara Sen (UEA): Recreation, GHG and land use integration modelling;
- Dr. Pat Snowdon (Forestry Commission): Forest economics and policy
- Dr. Gregory Valatin (Forestry Commission): Forest economics
- Dr. Silvia Vetter (Aberdeen): GHG modelling

Three new appointments will be added to the above team:
- Hydrologist (interviews mid July)
- Ecological Modeller (interviews mid September)
- Programmer (interviews mid September)

WP3: Background

The economic analysis undertaken in the first phase of the NEA examined how agricultural land use was determined by the following drivers:

- Policy change

- Market forces and technology

- Spatial variation in the natural environment

- Temporal variation in the natural environment (climate change)

These drivers change land use and NEA1 examined the impact upon:

- Agricultural outputs and their value

- Greenhouse gases and their value

- Recreational visits and their value

- Biodiversity measures (non-monetary)

  (a separate approach was used to consider changes in urban greenspace)

WP3: Objectives

Short term goals:

- Investigate and demonstrate the potential for increasing the efficiency of (reduced) budgets by using economic valuations of ecosystem service related goods to target policy

Long term goals:

- Re-develop all prior models to permit the incorporation of uncertainty into all analyses

- Extend the analysis to include woodland

- Extend the analysis to include the water environment

Background: Why ecosystem service valuation matters

Best option

?

World Markets Scenario
Increased intensification of natural resource use to maximise market values

Market value gain
+ £420 million per annum relative to the current baseline

Change in agricultural values (FGM £/ha/yr)

- Loss >200
- Loss 50 - 200
- Loss <50
- No Change
- Gain <50
- Gain 50 - 200
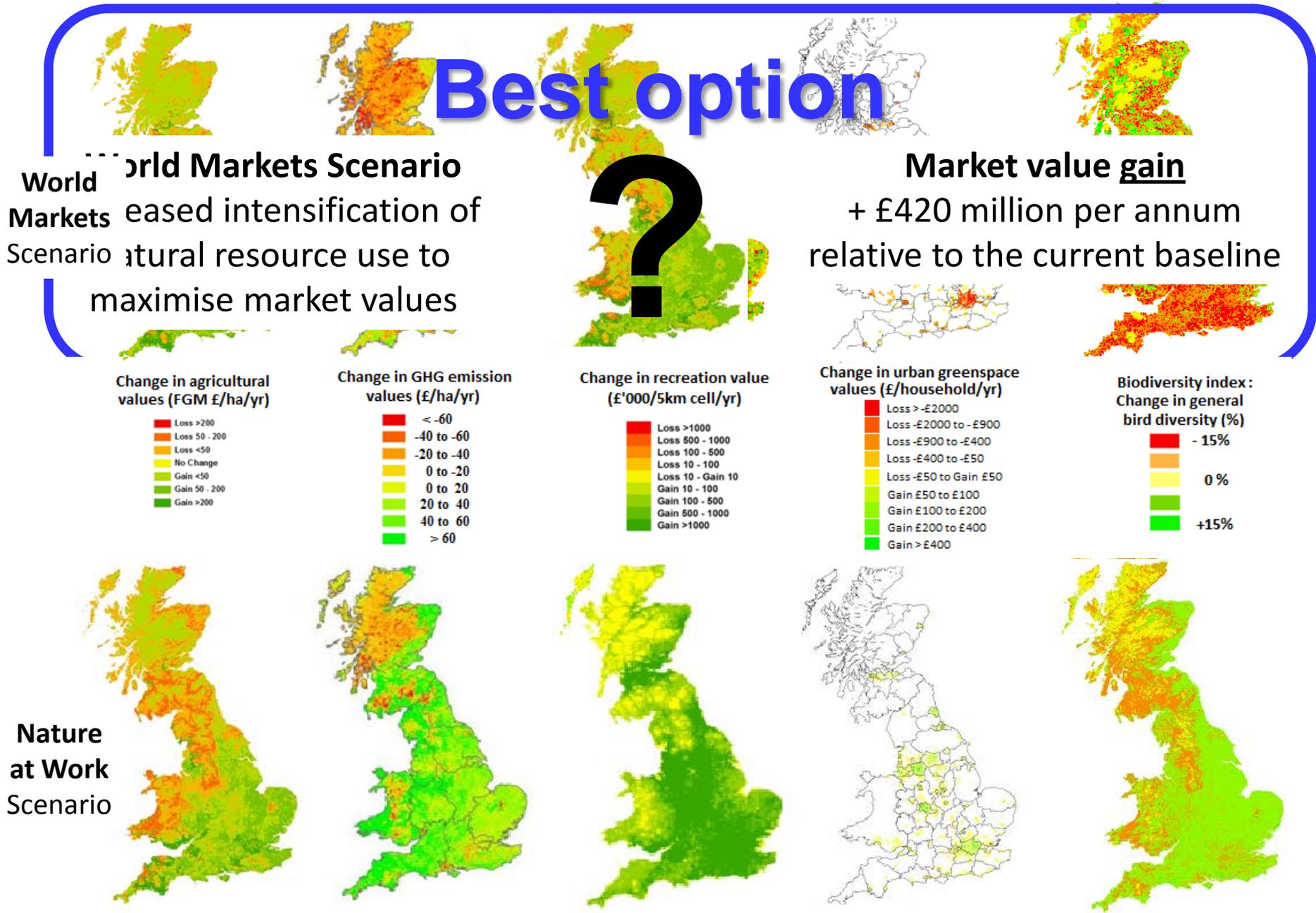- Gain >200

Nature at Work Scenario
Sustainable use of natural resources to maximise net ecosystem service values

Market value loss
- £510 million per annum relative to the current baseline

Background: Why ecosystem service valuation matters

Best option

World Markets Scenario
Increased intensification of natural resource use to maximise market values

World Markets Scenario

?

Market value gain
+ £420 million per annum relative to the current baseline

Change in agricultural values (FGM £/ha/yr)
- Loss >200
- Loss 50 - 200
- Loss <50
- No Change
- Gain <50
- Gain 50 - 200
- Gain >200

Change in GHG emission values (£/ha/yr)
- < -60
- -40 to -60
- -20 to -40
- 0 to -20
- 0 to 20
- 20 to 40
- 40 to 60
- > 60

Change in recreation value (£'000/5km cell/yr)
- Loss >1000
- Loss 500 - 1000
- Loss 100 - 500
- Loss 10 - 100
- Loss 10 - Gain 10
- Gain 10 - 100
- Gain 100 - 500
- Gain 500 - 1000
- Gain >1000

Change in urban greenspace values (£/household/yr)
- Loss >-£2000
- Loss -£2000 to -£900
- Loss -£900 to -£400
- Loss -£400 to -£50
- Loss -£50 to Gain £50
- Gain £50 to £100
- Gain £100 to £200
- Gain £200 to £400
- Gain > £400

Biodiversity index : Change in general bird diversity (%)
- - 15%
- 0 %
- +15%

Nature at Work Scenario

Background: Why ecosystem service valuation matters

World Markets Scenario

Change in agricultural values (FGM £/ha/yr)
- Loss >200
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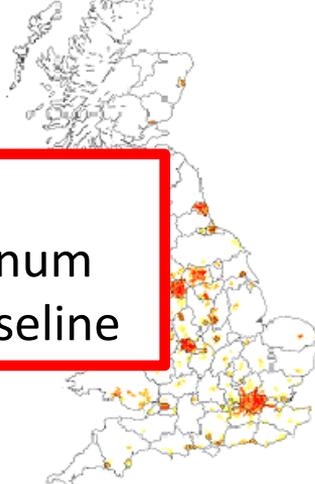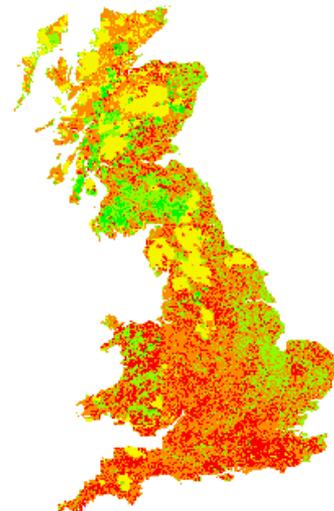- No Change
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- Gain >200
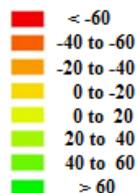
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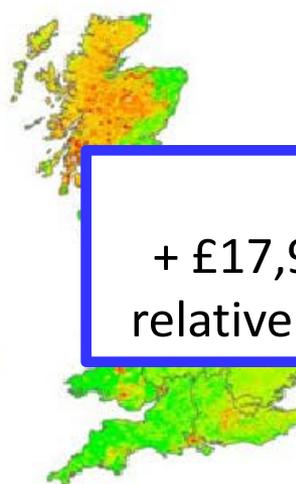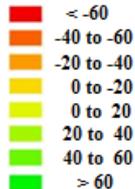- 20 to 40
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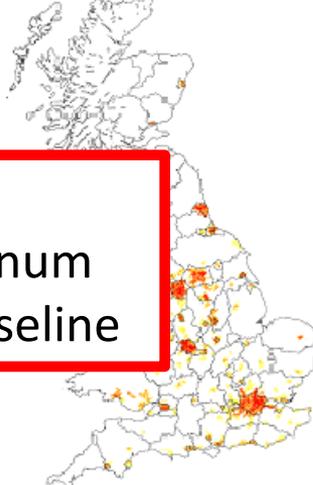
Net value loss
- £18,990 million per annum
relative to the current baseline
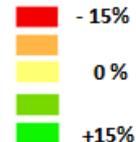
Net value gain
+ £17,920 million per annum
relative to the current baseline
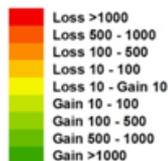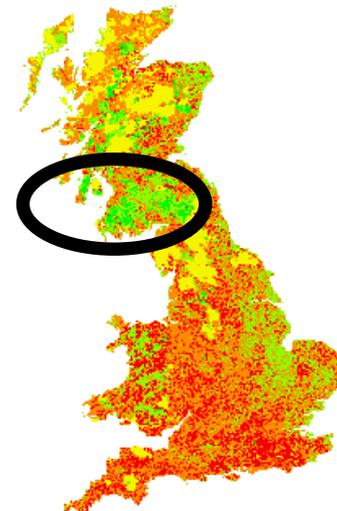
Nature at Work Scenario

World Markets Scenario

Nature at Work Scenario

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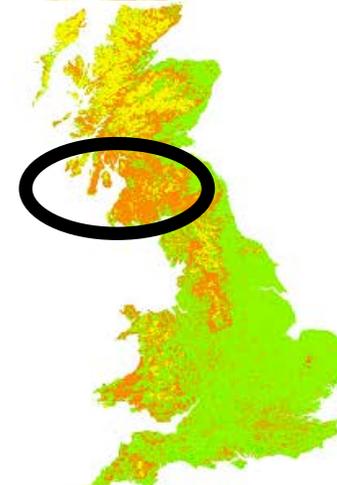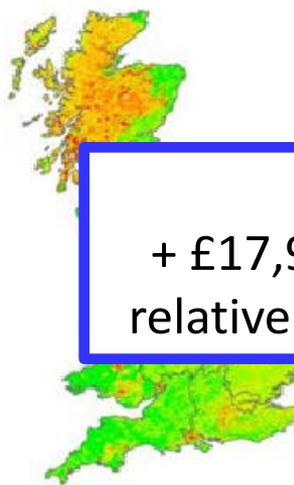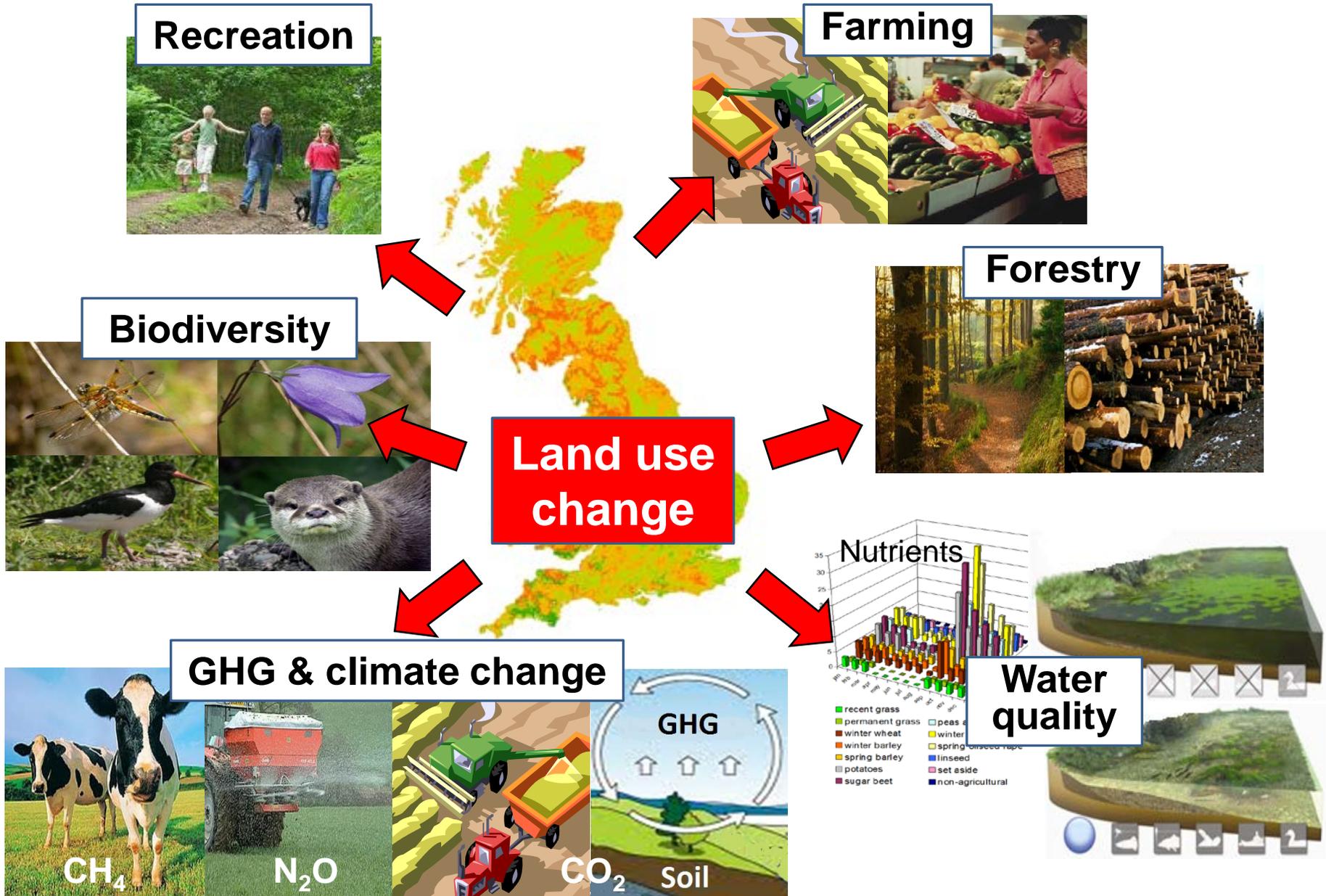- 20 to 40
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Biodiversity index : Change in general bird diversity (%)
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Long term objective: Uncertainty analysis and extensions

Recreation

Farming

Forestry

Biodiversity

Land use change

GHG & climate change

Water quality

Nutrients

CH$_4$ N$_2$O   CO$_2$ Soil

GHG

recent grass
permanent grass
winter wheat
winter barley
spring barley
potatoes
sugar beet

peas a
winter
spring oilseed rape
linseed
set aside
non-agricultural

Long term objective: Uncertainty analysis and extensions

Recreation

Farming

Programmed integration

Biodiversity
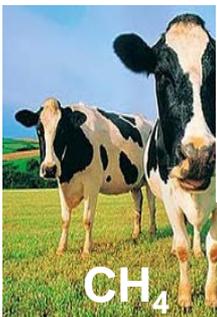
Permits fast re-analysis
(Monte Carlo analysis)

Forestry

Land use

Assesses the effects of uncertainty

Nutrients

Permits identification of optimal states
(from "What if?" to "What's best?")

GHG & climate change

Water quality

GHG

CH_4 N_2O CO_2 Soil

Long term objective: Uncertainty analysis and extensions

Recreation

Farming

Programmed integration

**Permits fast re-analysis
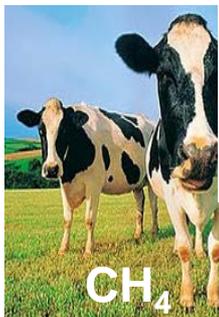(Monte Carlo analysis)**

Biodiversity

Forestry

Assesses the effects of uncertainty

**Permits identification of optimal states
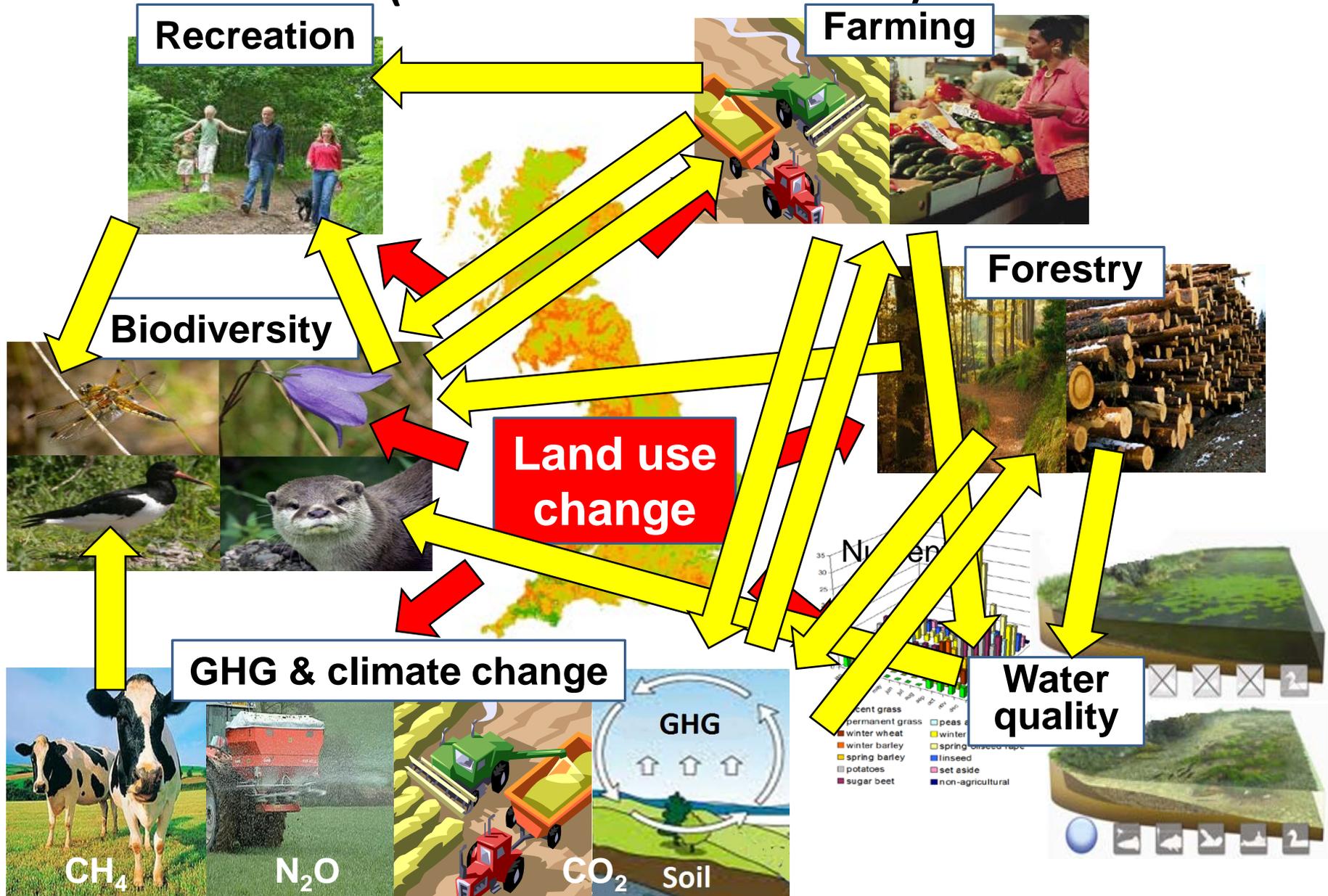(from "What if?" to "What's best?")**

CH_4 N_2O CO_2 Soil

From partial to general equilibrium: Dynamic feedbacks
(not within NEA timeframe)

Recreation

Farming

Forestry

Biodiversity

Land use change

GHG & climate change

Water quality

CH_4

N_2O

CO_2

Soil

GHG

NEA2 - WP3: Policy relevant outputs

- Demonstration of the efficiency potential of policy targeting.
- Tools for land use policy development and testing
- Incorporation of a wide array of land uses
- Incorporation of major impacts of land use change
- Assessment of the effects of uncertainty
- Valuation of the effects of alternative policy options.

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Economic Value of Ecosystem Services

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