

Land Use Strategy toolkit:

A multi-criteria web-based tool to aid land use planning

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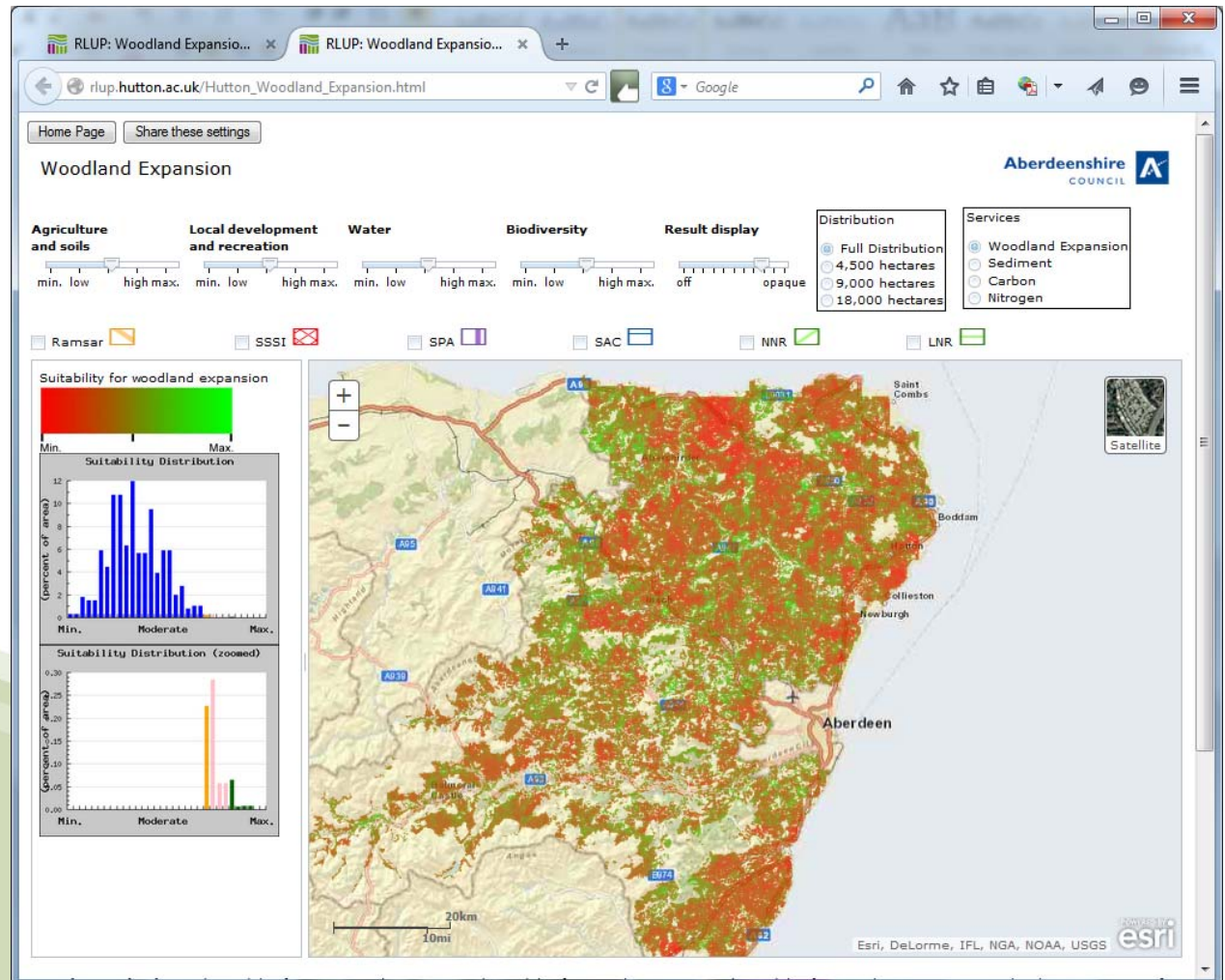


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Aberdeenshire RLUP tool

- Rationale for the tool
- Description
- Demonstration
- Messages

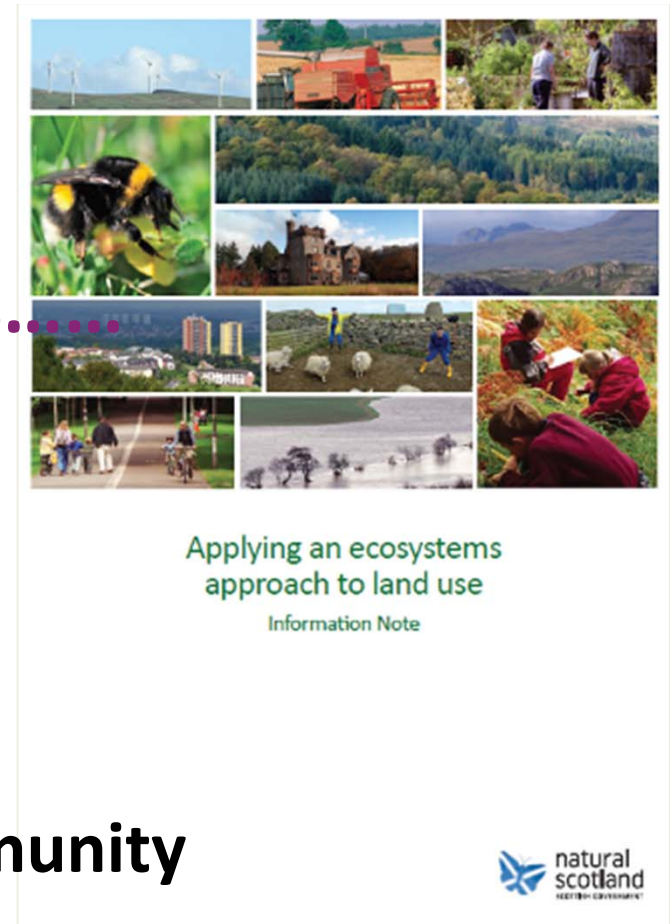


Aberdeenshire RLUP tool

- “...should have a strong spatial component and use ***detailed GIS*** as a basis for mapping....”
- a tool to aid decisions about ***land use change*** so as to better deliver policy objectives and highlight trade-offs
- important to recognise the ***drivers of change*** which influence land use and land use decision making in an area (2050 horizon)
- Aim is to identify and ***rank*** areas according to:
 - their suitability for the proposed change (e.g. woodland expansion)
 - but where other benefits (such as recreation opportunities) or
 - problems (such as poor water quality) can be identified.

Land Use Strategy: how can we reconcile these goals.....

- Low carbon economy
- Safeguarding food production
- Halting biodiversity loss
- Enhancing recreation and community opportunities
- Sustainable water management



... whilst taking into account climate change?

Land Use Strategy goals



The Lakes

Low carbon economy	Safeguarding food production	Halting biodiversity loss	Enhancing recreation opportunities	Sustainable water management

Land Use Strategy goals (= complexity)

proposed targets or responses to achieve these broad policy goals



Low carbon economy	Safeguarding food production	Halting biodiversity loss	Enhancing recreation opportunities	Sustainable water management
<p>Increase woodland cover</p> <p>Avoid trees on deep peat soil</p> <p>Avoid woodland removal.</p> <p>80% renewable energy.</p> <p>Reducing GHG emissions.</p> <p>Mitigate the impact of timber transport.</p> <p>Peat restoration.</p>	<p>Safeguard against inappropriate use.</p> <p>Reducing GHG emissions (NO & CH4).</p> <p>Dealing with changing pests and diseases</p> <p>Appropriate crops</p> <p>GAEC</p>	<p>Farm woodland</p> <p>Protected areas</p> <p>SBS, LBAPs</p> <p>Soil functions</p> <p>Invasive, non-natives</p> <p>Deer</p> <p>Ecological networks</p> <p>Pollution</p> <p>ESA</p> <p>Aichi Biodiversity targets (CBD)</p>	<p>Avoid woodland removal</p> <p>Farm woodland</p> <p>Green space</p> <p>Livelihoods</p> <p>Cultural tradition</p> <p>Health and well-being</p> <p>Urban green space</p> <p>Access</p> <p>Tourism</p> <p>Sense of identity</p> <p>Food</p> <p>Community</p> <p>Transition network</p>	<p>Extreme weather events</p> <p>Flood prevention</p> <p>Water quality</p> <p>Pollution control</p> <p>Abstraction</p>

Land Use Strategy goals

proposed targets or responses can be seen as criteria



Low carbon economy	Safeguarding food production	Halting biodiversity loss	Enhancing recreation opportunities	Sustainable water management
Increase woodland cover Avoid trees on deep peat soil Avoid woodland removal. 80% renewable energy. Reducing GHG emissions. Mitigate the impact of timber transport. Peat restoration.	Safeguard against inappropriate use. Reducing GHG emissions (NO & CH4). Dealing with changing pests and diseases Appropriate crops GAEC	Farm woodland Protected areas SBS, LBAPs Soil functions Invasive, non-natives Deer Ecological networks Pollution ESA Aichi Biodiversity targets (CBD)	Avoid woodland removal Farm woodland Green space Livelihoods Cultural tradition Health and well-being Urban green space Access Tourism Sense of identity Food Community Transition network	Extreme weather events Flood prevention Water quality Pollution control Abstraction

Some of the 22 criteria in the tool used to assess suitability

Policy Areas (starting points)

- 1. Woodland Expansion** This scenario illustrates the suitability of each parcel of land for change to native woodland as assessed by 22 policy relevant criteria (Criteria are equally weighted).



Mapped Criteria.

Some criteria are **+ve** (the pixel is more suitable for woodland if it matches this criteria)
Other criteria are **-ve** (the pixel is less suitable for woodland if it matches this criteria).

Constraints

Negative Attribute Value = -1

- Outside multifunction
- Non native Conifer
- Land Capability for Commercial Forestry
- Land Capability for Agriculture 2050
- Land Capability for Agriculture
- Flood plain buffer around town
- Buffer around roads
- Coastal settlements

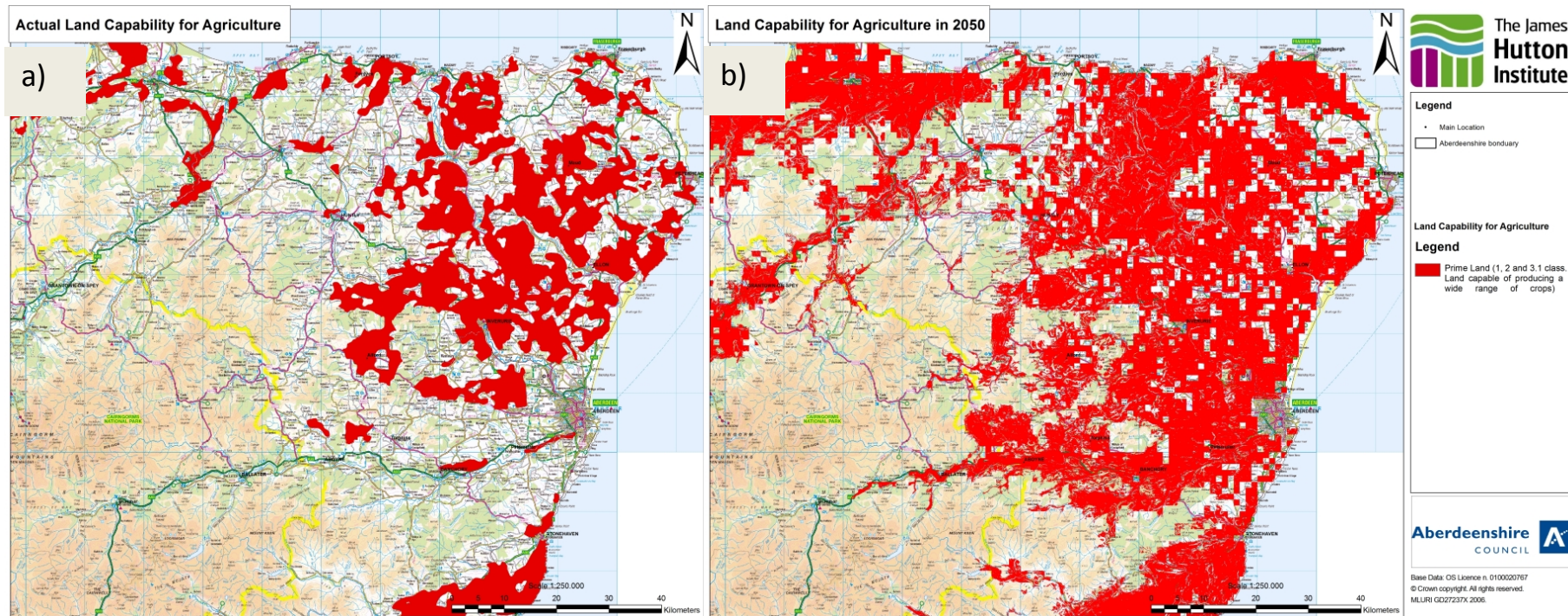
Opportunities

Positive Attribute Value = +1

- Within 50 m from rivers
- Within 500 m from core path
- In Nitrate Vulnerable Zones
- In sub-catchments with high N
- In sub-catchments with high Sediment Export
- On Woodland Corridors
- On Target networks areas
- Within multifunctional area
- On flood-prone areas
- On suitable for Forestry
- On wet mineral soil
- On Woodland Corridors (lca 2050)
- Out from multifunction area but at 1km from native woodland
- Internal settlements

The tool predicts this for all pixels in Aberdeenshire except those that are excluded such as urban areas, existing woodland, montane habitats.

Taking account climate change: Land capability for Agriculture



Current prime
agricultural land

2020 prime agricultural
land potential



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Negative Attribute Value = -1

- Outside multifunction
- Non native Conifer
- Land Capability for Commercial Forestry
- Land Capability for Agriculture 2050
- Land Capability for Agriculture
- Flood plain buffer around town
- Buffer around roads
- Coastal settlements

**Linear
weighted
combination**



Suitability map

Positive Attribute Value = +1

- Within 50 m from rivers
- Within 500 m from core path
- In Nitrate Vulnerable Zones
- In sub-catchments with high N
- In sub-catchments with high Sediment Export
- On Woodland Corridors
- On Target networks areas
- Within multifunctional area
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- On suitable for Forestry
- On wet mineral soil
- On Woodland Corridors (Ica 2050)
- Out from multifunction area but at 1km from native woodland
- Internal settlements

Setting priorities:

User can produce maps of **native woodland suitability**: reflecting *their own policy priorities* and objectives.

- By moving *a slider* (altering the weighting) the user is affecting the weighting of input layers (22 criteria)
- The resulting map visualises this choice

For example: Slider 1 relates most to ‘safeguarding food production’:

Agriculture and prime land

“In the context of woodland expansion, what does the map look like if we alter the protection of land for agriculture?”

This slider alters the weighting of these criteria:

- Land Capability for Commercial Forestry (-ve);
- Land Capability for Agriculture 2050 (-ve);
- Land Capability for Agriculture (-ve);
- On wet mineral soil (+ve);
- Non native Conifer (-ve).

Increasing the weighting reduces its suitability of that pixel for native woodland if it is:

- prime land now, and likely to be in the future
- If it already commercial woodland
- If it is non-native conifer

Criteria Weight Slider

1

1

2

1

3

1

4

1

5

1

6

1

7

1

8

1

9

1

10

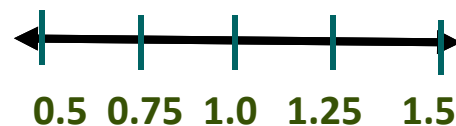
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11

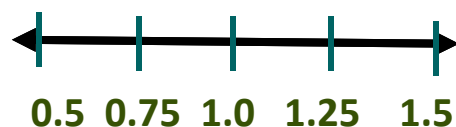
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12

1



Criteria weighting can
be adjusted to from
0.5 to 1.5x baseline



Equal
weighting:
(woodland
expansion
scenario)

Consequences of land use change (woodland expansion)..... for Ecosystem services (ratios to baseline)

The tool will allow the user to visualise the changes in three ecosystem services from current conditions (baseline) **as modified in the policy scenarios and by the policy slider preferences:**

- **Sediment retention/export:** the efficiency that each land use type retains sediment. The model takes into account the land use type as well as slope.
- **Nitrogen retention:** the efficiency that each land use type retains nitrogen. The predictions take into account the fact that crops receive more inorganic N but also retain it in the crop more effectively than woodland. Woodland only receives atmospheric N.
- **GHC retention:** The carbon change from baseline is **represented as CO₂ equivalent**. The change in the total net flow of carbon in term of CO₂ is calculated by adding changes in the soil organic carbon, the vegetation carbon and emissions carbon together. Map is ratio to baseline

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Conclusions.....



The tool explores how policy priorities may affect land cover under a medium climate change scenario (2050) **prompting users to think about change** and its implications

The tool allows the user to **visualise in a relatively simple way, large amounts of data and complex calculations** that link land, water, access, carbon and biodiversity issues.

The tool is interactive: tool **users have the option to reconfigure the map** by up or down-weighting some of the criteria

The tool could help planners to identify areas where land use change could **deliver multiple benefits**, and to explore the **consequences (trade-offs) of pursuing different policy goals** on other benefits these ecosystems provide.

A type of MCA: can deal with different levels of trade-offs (towards sustainability)

Development.....

The aim was not to produce a vision for land use in Aberdeenshire, but **a process** to aid decision making for multiple benefits

- Need to consider *other lenses* (or perspectives) such as commercial forestry, agriculture etc.
- Needs to incorporate more meaningful measures of landscape character and biodiversity
- Build on the **strong relationship between research, policy and practice.**
- The tool could help with the **development of regional level objectives** for the management of land. e.g. indicative woodland strategy
- Incorporate better **social and economic aspects, not only environmental issues**



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