



# **Landscape Collaboration for Sustainable Land Use**

NCUB Food Economy Task Force, Work Stream 3

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## Executive Summary

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*'With rising demands to produce more food from the land, and the growing crises of climate change and biodiversity loss, it is more important than ever to manage landscapes sustainably'*

**Prof. Tim Benton, Global Food Security**

This report summarises the findings from Work Stream 3 of the NCUB Food Economy Task Force. It focuses on the challenging question of how to achieve more sustainable land use in the UK, and the role for greater research-business collaboration in achieving this.

Agriculture uses 70% of the country's surface area and directly employs more than 400,000 people. An industry that operates on this scale inevitably has intended as well as unintended effects on the environment. In the near future, the UK's agri-food sector will need to respond to increasing global demands for food without impacting upon pressured ecosystems – all within the context of rising volatility from climate change.

This report sets out a new approach to these issues. It suggests that rather than the individual farm or land holding, the landscape as a whole is the correct scale on which to tackle the problems of sustainable land use.

This way of thinking about land use allows systems to be envisaged that would involve a full range of stakeholders in key decisions about the land, including farmers and growers, other businesses, conservation groups, the general public, and universities and research organisations. These would have a number of vital roles: creators of new knowledge, producers of skilled landscape facilitators, and experts in the collection and presentation of landscape information.

Examples of functions that can benefit from landscape level action include land management for flood risk, for enhancing populations of pollinators, for reducing numbers of pests, and for cultural heritage. Currently the market fails because individual farm performances are affected by these functions and by the behaviours of nearby land managers, but few mechanisms exist to launch coordinated responses.

Flooding risk is a case in point. For a farmer towards the bottom of a catchment, the behaviours of land managers uphill will affect their risk exposure. However, to agree and direct responses requires coordination amongst participants, as well as recognition of efforts made and measurement of benefits received. How can the landowners up the hill be encouraged to act in order to benefit others lower down the catchment?

This report presents the case for greater collaboration between businesses and research organisations at the landscape scale in order to increase the sustainability of land use across the UK. It affirms the importance of the landscape scale for sustainable land use, and introduces the notion of 'landscape signals' as a technique for focusing collaboration. Landscape signals emerge when the benefits of managing functions (or the risks of not managing them) are strong enough to stimulate action at a landscape level. Table 1 of the report lists fifteen landscape signals identified during the research.

The report also proposes a practical, stepwise process to aid collaboration between businesses and research organisations to promote landscape approaches to land management. The steps include: prioritising an area; identifying the landscape signals via mapping, expert input and consultation on the ground; deciding on project viability; and finally, implementing the initiative. The process recognises the roles of different types of business such as farmers, food retailers and manufacturers, water companies and local SMEs, and shows the potential that a landscape lens offers to identify new opportunities and reduce supply chain risks.

A significant finding is the important role of ‘trusted intermediaries’. Landscape initiatives will always encompass multiple issues and require engagement with different stakeholders. The ability to keep diverse interests working together constructively is not straightforward, and the role of an effective, independent facilitator is essential to success.

The research for this report included interviews, desk-based research, the examination of established landscape initiatives, and site visits for the development of case studies in Cambridgeshire and Lincolnshire. Building on feedback from Working Group members, the report makes three high-level recommendations, with nine subsidiary proposals for different stakeholders.

# 01. Introduction

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## 1.1 The Food Economy Task Force

The Food Economy Task Force of the National Centre for Universities and Business (NCUB) was convened to examine how the UK can improve collaboration between business and research organisations in order to develop a more competitive and sustainable UK agri-food sector.

Three Work Streams were set up to focus on specific aspects of this issue:

- **Work Stream One:** developing the right talent for the food economy now and for the future.
- **Work Stream Two:** science and translation, and the race to the top of global innovation.
- **Work Stream Three:** optimisation of land use, resources and pull through into innovation.

This report is the output of Work Stream 3.

For the purposes of this report, 'business' primarily refers to larger, upstream agri-food industry (such as manufacturers or retailers). Farms are also businesses, of course, but in their role as land managers we differentiate them in this report from other upstream businesses. The term 'research organisations' is used here to encompass universities, research institutes and other independent research organisations (IROs).

## 1.2 Phase I

The preparatory phase of work comprised semi-structured interviews with eleven Work Stream members (see Annex 1) to gather input and understand perspectives from representatives of industry, farming, academia and other stakeholders. Discussions were structured to include how to define 'sustainable and optimal land use', opportunities for research-business collaboration on sustainable land use, and influences affecting farmers' decision-making.

### **Interview findings were shared at the Work Stream members' meeting, and it was agreed:**

- Not to spend time attempting to define 'sustainable' or 'optimal' land use. The field is too contested and inherently complex, and a comprehensive definition is not feasible, or a priority, for this study. "Preserving ecosystems services at the landscape scale" may serve as an operational definition for the purposes of this report.
- Land use is dynamic and multi-faceted, it is not in a stable state, and needs to be seen in the context of the wider system.
- Businesses see untapped potential in the sector, and opportunities for greater collaboration with universities.
- Bridging the gap between universities and businesses – and finding trusted intermediaries to do so – remains a challenge.
- More sustainable land use can be achieved by tackling problems at landscape level, comprising multiple farms or land owners.

Members were eager that the second phase of work should pursue research on landscape approaches, seeking to understand how they can be initiated and implemented through collaboration between research organisations and business.

## I.3 Phase 2

### Three objectives were set for the second phase of the project:

1. Articulate the benefits to farmers, the agri-food industry, rural businesses and research organisations of landscape collaboration,
2. Diagnose challenges and propose approaches to facilitate more landscape-level collaborations between researchers and businesses,
3. Demonstrate the merits of a landscape approach, using examples and detailed case studies.

The research conducted for this report is supplemented by semi-structured interviews with a wide range of stakeholders, including research organisations, retailers, farmers, NGOs, and water companies (see Annex 2).

The report includes a number of examples of landscape initiatives, along with two case studies. The first of these, the Lincolnshire Coastal Grazing Marshes Partnership, is a landscape initiative that is working closely with farmers (Annex 3). The second case study, East Cambridgeshire, was chosen because it is an important supply area to several food retailers but does not have an existing landscape initiative, and so could be used to 'dry run' the steps needed to start an initiative (also Annex 3). GIS mapping of both areas formed part of the study, and was conducted by 3Keel's project partner, Geoger Ltd.

## 02. Landscapes and Sustainability

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*'This has been too long coming - so many of the critical environmental and agricultural challenges exist across multiple farms, and the responses we develop must reflect this.'*

**Prof. Iain Gordon, James Hutton Institute**

Agriculture uses 70% of the country's surface area and directly employs more than 400,000 people. The agri-food sector as a whole is also an important source of UK exports, worth £19 billion to the economy in 2013. The scale and nature of agriculture means it has the potential to provide the foundations of a thriving and healthy society.

Looking forward, the UK's agri-food sector will need to respond to increasing global demands for food without impacting upon pressured ecosystems, and all within the context of rising volatility from climate change. The need to ensure food security and increase the environmental, social and economic benefits from managing land has therefore never been higher.

Land provides multiple functions and has multiple values. A single farm may produce food, provide habitats for wildlife, generate renewable energy and provide amenity to local communities. As a result, defining 'sustainable' land use can be complex and requires work on multiple functions that are often highly location-dependent.

The basic unit of land management over much of the UK is the farm, and it is at the farm level that decisions are taken and where sustainability is either improved or diminished. Many facets of land management are obviously managed better, or indeed can only be managed, at the level of an individual farm. Examples might be when to harvest a crop, deciding on crop rotations, the management of margins, or when to move livestock to a different pasture.

Some of the functions and processes associated with land, though, occur at scales larger than that of individual farms. These can only be managed (or can be managed better) at a scale beyond that of the farm. Take river flood risk as an example: the flood damage to a farm will usually be determined far more by how well multiple neighbours upstream protect the catchment than by any actions that an individual farmer takes. To give another example, a pollinator such as the bumblebee will not stay within the confines of one farm (even if it could recognise property boundaries), but will use different resources such as food or nesting sites within a larger land area, and will use resources differently at different times of year.

It is also worth noting that there is an active danger in managing factors at a smaller scale than the one at which they operate: the 'tyranny of small decisions'. This is when individual farmers make independent decisions that on their own have little impact, but which aggregate up to have a large effect. An example might be the decision by a farmer to uproot a hedge: on its own this will have little impact on biodiversity, but if several other neighbouring farmers do the same the impact on local plant and animal populations may be significant.

The majority of the landscape work in the UK to date has focused on the river catchment as the unit of landscape (e.g., the Demonstration Test Catchments and Catchment Sensitive Farming), where the risks and opportunities are clear, particularly for water companies, farmers, and local wildlife. Other landscape-scale approaches such as Living Landscape, by the Wildlife Trusts, have also been pursued, but to a lesser extent.

Over the course of the initial consultations for this report, representatives from both industry and academia expressed the strong belief that there is potential to apply landscape approaches to a broader range of functions of the land – such as sustaining a population of pollinator insects, or the cultural identity associated with the people – and that the greatest benefits may accrue from recognising multiple functions within each landscape. Recognising these multiple functions is especially pertinent at a time when there is pressure to ensure food security while maintaining or enhancing ecosystem services.

## Box 1: What is a landscape?

Definitions of 'landscape' abound in scientific disciplines such as geography, landscape ecology, and conservation, but they boil down to a few salient points:

- Landscapes can only be defined subjectively. Their size is determined by the factor being studied or managed. A landscape for water management might comprise a river catchment; a pollinating insect might inhabit one area within that catchment; and a common sense of regional identity may exist across a series of catchments
- Managing and understanding landscapes will involve both functional relationships (e.g., protection of water bodies) and spatial relationships (e.g., the degree of connectedness of wildlife habitats)
- Because each land parcel is multi-functional and multi-faceted, managing and understanding landscapes will involve complexity: how the multiple functional and spatial dimensions interact with each other

The elements that go into making a landscape will be physical (hills, rivers, lakes), living (flora and fauna, including hedges, copses and margins) and human (different forms of land use such as farming, forestry, buildings, and cultural associations).

In summary, there are clear potential benefits to sustainable land management from working at the landscape level, and a strong appetite from research and organisations and businesses to pursue work that can reveal these unrealised opportunities.

*'As a retailer we spend a considerable amount of time with our suppliers, farmers and growers working on our specific supply chains, the addition of landscape scale activities will unlock more value and resilience for everyone involved.'*

**Stuart Lendrum, Sainsbury's**

## 03. Landscape Signals

### 3.1 Signals: a starting place for sustainable landscapes?

Given that there are likely to be multiple benefits to working at a landscape scale, we suggest it is appropriate to analyse landscapes by the main elements that are important to stakeholders. To do this, we have coined the term 'landscape signals' to define the mechanism by which landscape-level functions become relevant and worthwhile for action. These landscape signals emerge when the benefits of managing landscape functions (or the risks of not managing them) are strong enough to stimulate people to operate at a landscape level: they become signals from the landscape.

Landscape signals are properties of a landscape that either can be pursued to deliver a net gain to beneficiaries, or which have a negative impact on stakeholders if they are not maintained. A list of potential landscape signals is shown in Table 1 below. This list of signals is broad but not necessarily exhaustive. Other signals are likely to exist, or arise as time goes on.

The landscape signals shown here have been categorised as risks (i.e. acting on them will decrease risk to stakeholders) or as benefits (i.e. acting on them will increase benefit to stakeholders). The term "Risk" as used here has a broad definition, in that it may also be thought of as incurred "cost" for stakeholders. For example, if a farmer's neighbour destroyed the curlew habitat next door, that farmer would pay a personal cost that might not typically be considered a "risk". In some instances, signals may present both risks and benefits. With any given signal falling into at least one of the spheres of sustainability (economic, environmental, or social) Table 1 also gives an indication of the stakeholders for whom each signal will be especially salient.

**Table 1:** Sixteen examples of 'landscape signals'

Signal	Elaboration	Risk/ Benefit	Sustainability Sphere			Potential Landscape Scale	Key Stakeholders & Relative Strength (bold = strong) of signal	Example(s)
			Economic	Environment	Social			
<b>Pollinators &amp; Beneficial Insects</b>	Determined by biology and the make-up of the particular area in question. Beneficial insects may produce useful crop protection effects; pollination services are often bought in to increase crop & fruit yield.	Benefit	✓	✓		<ul style="list-style-type: none"> <li>Determined by biology (such as the spread) of insects and needs of the local farms</li> </ul>	<ul style="list-style-type: none"> <li><b>Farmers</b></li> <li>Retailers</li> <li>Conservation community</li> </ul>	Large orchards in North Kent cooperating to increase populations of natural pollinators
<b>Pest/ Pathogen</b>	Determined by biology and the make-up of the particular area in question, and also by variables such as flood, drought, and populations of beneficial insects.	Risk	✓	✓		<ul style="list-style-type: none"> <li>Determined by biology (such as the spread) of insects and needs of the local farms</li> </ul>	<ul style="list-style-type: none"> <li><b>Farmers</b></li> <li>Retailers</li> </ul>	Farms having more problems with aphids because there are fewer lacewings or wasps

Signal	Elaboration	Risk/ Benefit	Sustainability Sphere			Potential Landscape Scale	Key Stakeholders & Relative Strength (bold = strong) of signal	Example(s)
			Economic	Environment	Social			
<b>Water Trading</b>	Co-operation on shared resource such as river, aquifer, reservoir.	Benefit	✓	✓	✓	• Water catchment	<ul style="list-style-type: none"> <li>• Retailers</li> <li>• <b>Water companies</b></li> <li>• Local Business</li> <li>• <b>Farmers</b></li> </ul>	Initiative with Sustainable Food Lab and Sustainable Agriculture Initiative Platform
<b>Flood Risk Management</b>	Co-operation on reducing flood risk within a catchment (e.g., through river restoration and riparian zone management).	Risk	✓	✓	✓	• Water catchment	<ul style="list-style-type: none"> <li>• <b>Farmers</b></li> <li>• Retailers</li> <li>• <b>Water companies</b></li> <li>• <b>Local Business</b></li> <li>• <b>Community</b></li> </ul>	Pooler Harbour Catchment Initiative, Dee and Tweed Pilot Catchments
<b>Drought Risk Management</b>	Cooperation on shared resource capture and use (e.g., cooperative use of on-farm reservoirs to capture winter rain).	Risk	✓	✓	✓	• Water catchment	<ul style="list-style-type: none"> <li>• <b>Farmers</b></li> <li>• Retailers</li> <li>• <b>Water companies</b></li> <li>• <b>Local Business</b></li> <li>• <b>Community</b></li> </ul>	
<b>Water Quality</b>	Includes groundwater. Co-operation to reduce nutrient and/or pesticide loads in response to legislation (e.g., the EU Water Framework Directive standards or the Drinking Water Inspectorate supply standards) and or because recreation (e.g., angling) or biodiversity are affected.	Risk	✓	✓	✓	• Water catchment	<ul style="list-style-type: none"> <li>• Farmers</li> <li>• Retailers</li> <li>• <b>Water companies</b></li> <li>• <b>Local Business</b></li> <li>• <b>Community</b></li> </ul>	Catchment Sensitive Farming
<b>Soils</b>	Managing run-off or erosion.	Risk	✓	✓	✓	• Determined by sensitivity	<ul style="list-style-type: none"> <li>• <b>Farmers</b></li> <li>• Retailers</li> <li>• Water companies</li> </ul>	
<b>Shared Infrastructure</b>	Co-investment, potentially with customers, in particular assets which enhance performance, e.g., renewables investment, or machinery.	Benefit	✓			• Often very local	<ul style="list-style-type: none"> <li>• <b>Farmers</b></li> <li>• Retailers</li> <li>• Water companies</li> <li>• Local Business</li> <li>• Community</li> </ul>	Breadalbane Initiative for Farm Forestry

Signal	Elaboration	Risk/ Benefit	Sustainability Sphere			Potential Landscape Scale	Key Stakeholders & Relative Strength (bold = strong) of signal	Example(s)
			Economic	Environment	Social			
<b>Biodiversity Conservation</b>	Both in the broad sense of maintaining and protecting systems, as well as in the sense of particular species.	Benefit		✓	✓	<ul style="list-style-type: none"> <li>• Dictated by species biology</li> <li>• SSSI</li> <li>• ESA (Environmentally Sensitive Area)</li> <li>• Priority Catchment</li> </ul>	<ul style="list-style-type: none"> <li>• Farmers</li> <li>• <b>Community</b></li> <li>• Retailers</li> <li>• Local Business</li> </ul>	Inner Forth Landscape Initiative
<b>Amenity Value</b>	For B&Bs, restaurants, shops; engaging more visitors in the area.	Benefit	✓		✓	<ul style="list-style-type: none"> <li>• 'Tourist region' e.g., the Dales, the Lake District</li> <li>• Town/City</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Community</b></li> <li>• <b>Local Business</b></li> <li>• Farmers</li> </ul>	Inner Forth Landscape Initiative, Heritage Lottery Fund
<b>Recreation</b>	This can include opportunities for urban populations to improve access in local areas, which may connect with major public health agendas.	Benefit			✓	<ul style="list-style-type: none"> <li>• 'Tourist region' e.g., the Dales, the Lake District</li> <li>• District/ County Council</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Community</b></li> <li>• <b>Local Business</b></li> <li>• Farmers</li> </ul>	Game & Wildlife Conservation Trust
<b>Waste/co-products</b>	E.g., straw - trading locality.	Benefit	✓	✓		<ul style="list-style-type: none"> <li>• Dictated by specific waste/co-product – its availability, logistics costs, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Farmers</li> <li>• <b>Local Business</b></li> <li>• Retailers</li> <li>• Water companies</li> </ul>	National Industrial Symbiosis Programme (NISIP)
<b>Energy Synergies</b>	AD plant, fuel resources. Along with waste/co-product above, these play into the broader sustainability agenda to increase 'public goods' by conserving natural capital.	Benefit	✓	✓		<ul style="list-style-type: none"> <li>• Dictated by configuration between landowners and energy demand (e.g., a town or city, or an industrial unit)</li> </ul>	<ul style="list-style-type: none"> <li>• Farmers</li> <li>• Local Business</li> <li>• Retailers</li> <li>• Water companies</li> </ul>	Local dairy farmers contribute manure/slurry to AD plant, receive discounted heat
<b>Cultural Heritage</b>	Cooperation to manage or enhance particular local assets, such as archaeological sites or historic buildings – the 'look' of the landscape.	Benefit	✓		✓	<ul style="list-style-type: none"> <li>• District/ County Council</li> <li>• Parish</li> <li>• Town/City</li> </ul>	<ul style="list-style-type: none"> <li>• Farmers</li> <li>• <b>Local Business</b></li> <li>• <b>Community</b></li> </ul>	Lincolnshire Coastal Grazing Marshes Project, BIFF, IFLI, HLF

Signal	Elaboration	Risk/ Benefit	Sustainability Sphere			Potential Landscape Scale	Key Stakeholders & Relative Strength (bold = strong) of signal	Example(s)
<b>Education</b>	May provide opportunities to change perceptions, opinions, and behaviours among community.	Benefit			✓	<ul style="list-style-type: none"> <li>• District/ County Council</li> <li>• Parish</li> <li>• Town/City</li> </ul>	<ul style="list-style-type: none"> <li>• Farmers</li> <li>• <b>Community</b></li> <li>• <b>Local Business</b></li> <li>• Retailers</li> </ul>	Inner Forth Landscape Initiative
<b>Protected Geographical Status</b>	Three schemes under EU law which protect the reputation of regional products, promote traditional and agricultural activity and to eliminate non-genuine products.	Benefit	✓		✓	<ul style="list-style-type: none"> <li>• Determined by history of production</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Farmers</b></li> <li>• <b>Local Business</b></li> <li>• <b>Retailers</b></li> </ul>	

**Notes:** IFLI is the Inner Forth Landscape Initiative (see below); HLF is the Heritage Lottery Fund (a major grant provider to landscape-level work); BIFF is the Breadalbane Initiative for Farm Forestry (see below); and LCGMP is the Lincolnshire Coastal Grazing Marshes Project (see below).

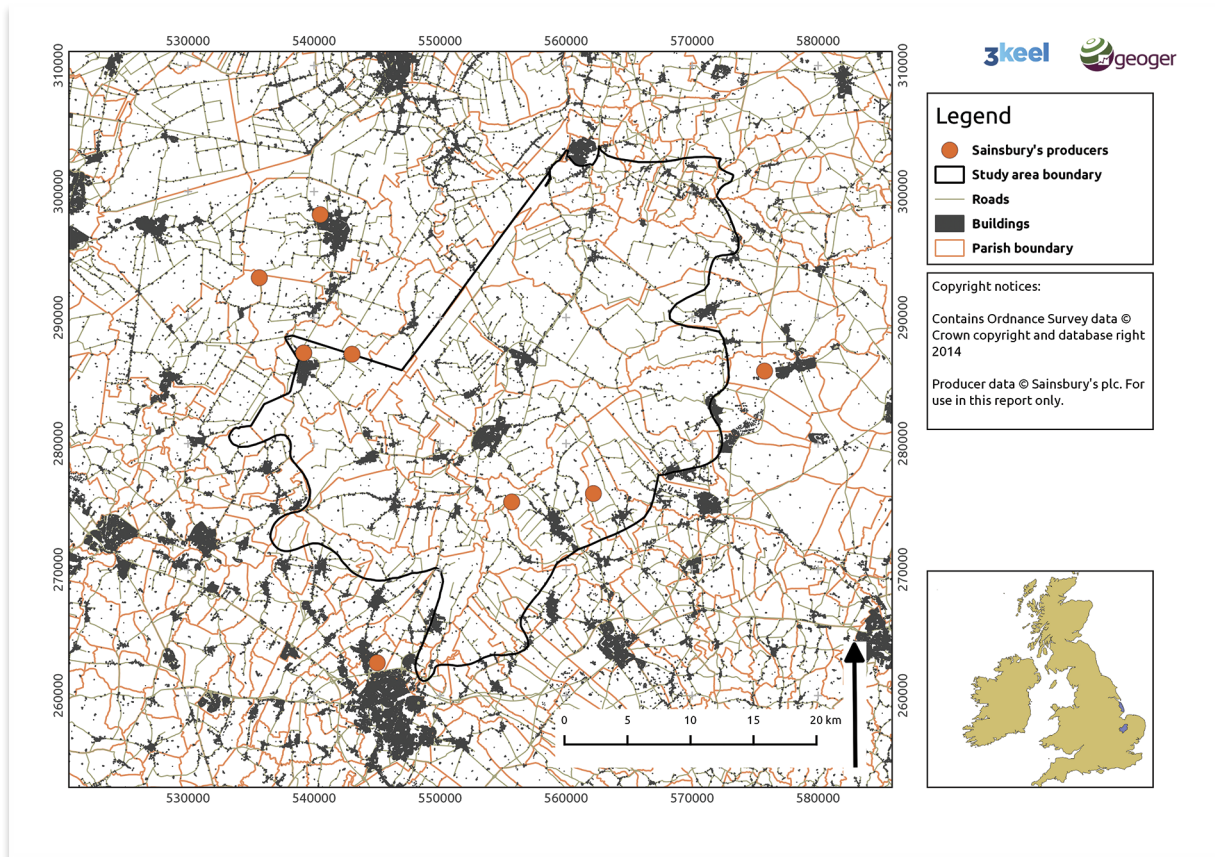
### 3.2 Responding to landscape signals

Examining the risk/benefit profile of landscape signals begins to show how added value might be realised within the agriculture and food sectors. Consultation with retailers has confirmed the potential for them to reduce risk to their supply chains by collaborating in landscape initiatives (for example to reduce flood risk or to manage pest populations), and indeed to realise value (for example by reputation enhancement among farmers or customers). Although it is already common for food retailers and manufacturers to strengthen their relationship with suppliers, these efforts generally align with product groups and are undertaken by particular technical managers or buyers. A larger business with diverse product ranges may not be aware that several important suppliers are located within a shared landscape.

As part of the research for this work, data from Sainsbury's supply chain has been used to plot supplier locations for our case study landscapes in East Cambridgeshire (see Annex 3 for more information and multiple data layers for the landscape). Figure 1 shows a selection of growers and producers located within and around the case study boundary, and illustrates how the spatial data can start to provide new insights into different product supply chains. During Working Group discussions, it was suggested that with additional data from other retailers and food manufacturers, we would be able to create links between supply chain customers who have a shared interest in the optimal management of a single landscape.

Different signals will be stronger for different stakeholders. The strength of a signal results from a combination of the level, directness and immediacy of the risk or benefit concerned, and from the sphere of influence of the signal. Some signals – like flood risk – are likely to affect a range of stakeholders across landscapes and supply chains, and provide an overall strong signal. Other signals may be strong for some stakeholders and weak for others. A decreasing population of native pollinators may be a strong signal for fruit farmers and local wildlife trusts, but not for arable farmers.

**Figure 1:** Selection of growers and producers located in and around the case study boundary



It is helpful to note that many signals are linked with each other. This means that they can be dealt with through the same initiative at the same landscape level. Although some landscape signals may affect only a small handful of stakeholders, the initiation of a landscape-level initiative in response can be of wider value. An initiative that focused on restoring habitat for biodiversity conservation might simultaneously increase the populations of pollinators and beneficial insects, to the benefit of farmers.

Some examples of how existing landscape initiatives are responding to landscape signals are given below.

## Box 2. Landscape initiatives responding to landscape signals

Existing landscape initiatives illustrate some of these signals. All respond to multiple signals:

### Signals: Water Quality and Flood Risk

The Poole Harbour Catchment Initiative began as a pilot project in 2012, as the Frome & Piddle Catchment Initiative. In 2013, the boundary was extended to include the whole catchment, incorporating all rivers and streams that drain into Poole Harbour. One of the principal motivations for the initiative was that aquatic biodiversity was failing to meet the Water Framework Directive (WFD) targets, largely due to nitrogen and phosphorus pollution and high rates of water abstraction. The Dee Pilot Catchment's primary aim is to reduce flood risk through river channel restoration. This is one of four pilot catchment projects being undertaken by the Scottish Environmental Protection Agency (SEPA). The work is in the detailed preparation stage, with implementation of management activities expected in 2016.

### Signal: Biodiversity Conservation

Many initiatives respond explicitly to biodiversity conservation as a primary goal. Examples include the Poole Harbour Catchment Initiative, within which is the Frome River SSSI and which lists improved biodiversity habitat as one of its primary aims. The Lincolnshire Coastal Grazing Marshes Partnership (Annex 3) is in part a response to the impact of the loss of traditional grazing land on birdlife and rare plants. The 'Living Landscapes' approach of the Wildlife Trusts aims to work in partnership to improve the value of landscapes for biodiversity. This approach was launched in 2006 and includes 150 landscapes. For example, the Gwent Levels living landscape covers one of the largest surviving areas of ancient grazing marshes and reed (drainage ditch) systems in Britain, and is home to many species of bird and mammal. The aim of the initiative is to restore and create wildlife habitat, and increase the connectivity between habitat patches, by working with farmers.

### Signal: Cultural Heritage

The Inner Forth Landscape Initiative (IFLI) covers 202km<sup>2</sup> of land around the River Forth, its estuary and inter-tidal zone. The overarching signal it is responding to is heritage. The initiative aims to conserve and restore the built and natural heritage features that define the Inner Forth Landscape, increase community participation in all areas of local heritage, increase access to the landscape and education about its heritage, and increase training and development opportunities in heritage skills.

To sum up, landscape signals exist when the benefits of managing landscape functions (or the risks of not managing them) are strong enough to stimulate people to work at a landscape level. Analysis of existing landscape initiatives shows that they occur when landscape signals motivate people and organisations to collaborate. Focusing on these landscape signals, rather than on all of the possible landscape-level processes and functions, is a practical basis for collaboration and action.

## 04. How Can it Happen?

This section focuses on some of the practical steps that can be taken if researchers and agri-food businesses are to collaborate with the multiple stakeholders in existing landscapes. These stakeholders will always include farmers as the principal custodians of the land, as well as numerous other businesses and private sector organisations such as water companies, local tourism forums, local authorities, and civil society groups including conservation NGOs.

The process described here has been developed using findings from consultation, research on existing landscape initiatives, and from two in-depth case studies. The first of these is the Lincolnshire Coastal Grazing Marshes Partnership, a landscape with an existing landscape initiative that is working closely with farmers. The second is East Cambridgeshire, an area without an active landscape partnership. It was chosen for its relevance in the agri-food sector because a variety of different suppliers to food retailers are located there. A short description of the two case studies is given in Box 3, with a fuller account, including maps, in Annex 3.

### Box 3. Landscape Case Studies

#### Lincolnshire Coastal Grazing Marshes Partnership (LCGMP)

The LCGMP is an existing landscape initiative working closely with farmers. This case study was chosen to better understand some of the practical 'how to's' of landscape initiatives.

The LCGMP was set up in 2003 in response to concerns over the loss of the coastal grazing marshes of East Lincolnshire. The area is relatively poor agricultural land (Map 1, Annex 3) predominantly used to rear beef cattle, with some dairy and sheep, and in recent years, an apparently increasing amount of maize to fuel an anaerobic digestion plant. Livestock help keep the habitat suitable for the birds and mammals that call the marshes home, reflected in the high coverage of stewardship schemes (Map 5, Annex 3). In 2011 the partnership secured funding through a Landscape Partnership grant from the Heritage Lottery Fund (HLF) for a 3-year project focusing on three target areas comprising 9,000ha.

LCGMP answers a number of landscape signals: biodiversity conservation (wading birds and rare plants), cultural heritage (archaeological sites), with potential to boost tourism and the local economy (the amenity value and recreation signals).

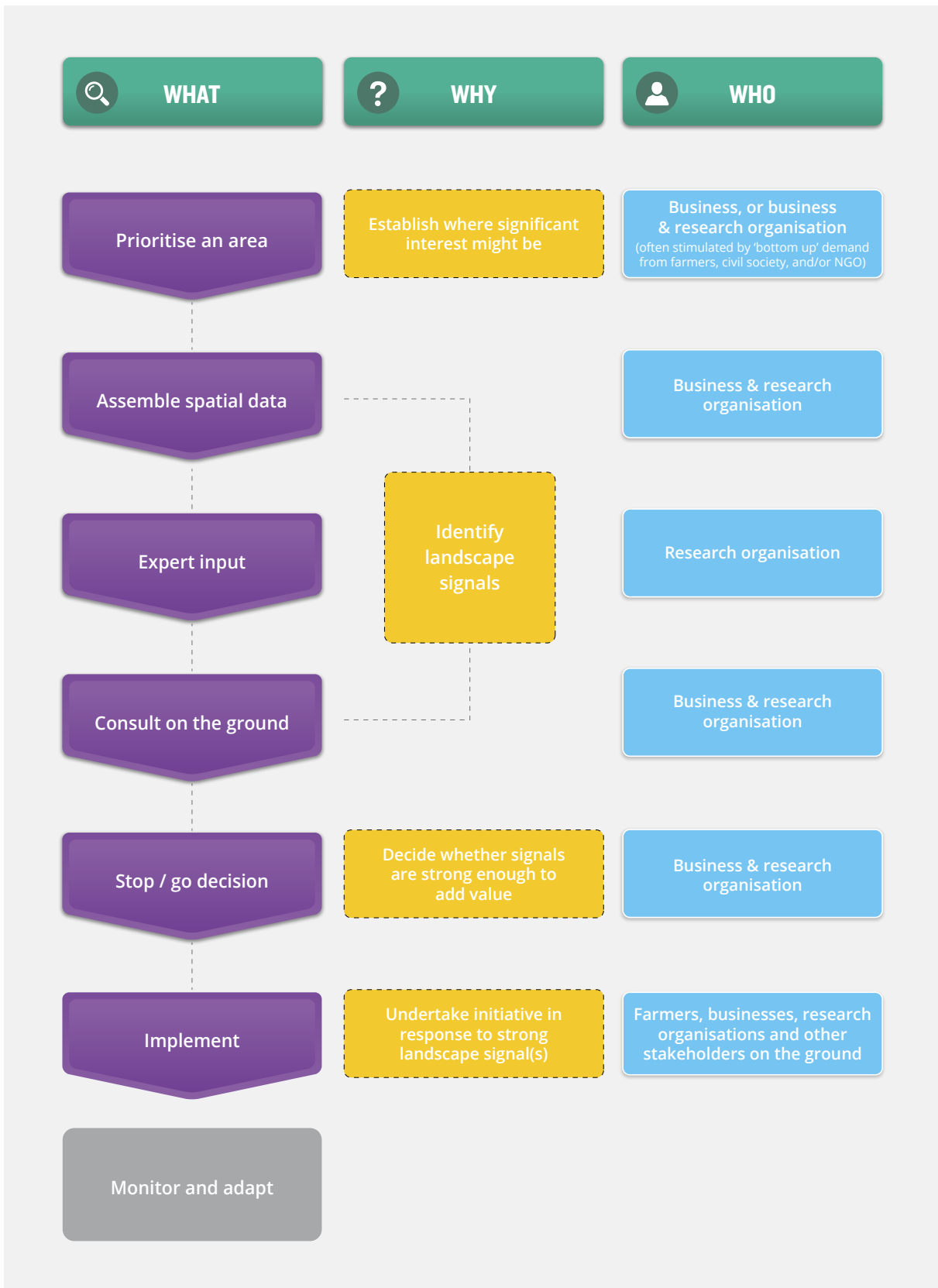
#### East Cambridgeshire

The second case study, East Cambridgeshire, was chosen because it has been flagged as an important supply area to several food retailers and does not have an existing landscape initiative. So it could be used to 'dry run' the essential steps in starting an initiative. While there are currently no well-established landscape initiatives directly involving East Cambridgeshire, it is bordered by such initiatives including the Ouse Washes Landscape Partnership, Fens for the Future, and the Cam and Ely Ouse Catchment Partnership.

Interviews with key players in and around the landscape indicated that the main landscape signal was water quality, with diffuse pollution and river flow as principal issues. Figure 1 of this report plots a number of suppliers to Sainsbury's located in the area, and any extension to this project should seek to add other retailers' suppliers to this map to illustrate further potential for collaboration.

Figure 2 below shows a schematic process of six steps for landscape collaboration, and the following section provides a fuller description of each step.

**Figure 2:** Six steps to landscape collaboration



## Step 1

### Prioritise an area

The first step of the process is to identify geographical areas of potential interest. There are innumerable ways in which a given landscape could be selected and prioritised as a region of interests, depending on the initiator. A retailer or food manufacturer is likely to choose an area that contains a large number of suppliers, or producers of critical raw materials. Or the impetus might begin 'bottom-up' with farmers expressing their concern over flood risk, or an NGO wishing to conserve a particular wildlife habitat. Although the details of landscape signals are developed over subsequent steps, a clear idea of the relevant signals may exist from the outset in some instances.

## Step 2

### Assemble and map spatial data

*'The data environment is changing so fast - there is more and more high quality, granular, and free data which enables the creation of powerful maps furnished with local data.'*

**Dr Sarah Jackson, Met Office**

This second step in the process is about assembling spatial data and land capability mapping. As part of this Work Stream, we conducted a quick mapping exercise of both case study areas, using free-access data (see Annex 4). This is a technical step that requires expertise in GIS, and on which research organisations would be well placed to lead.

Mapping can greatly facilitate the identification of landscape signals, bringing together interested parties and identifying knowledge gaps. Overlaying different types of information is a powerful way of understanding the issues. For example, overlaying suppliers onto a flood risk map would indicate whether this risk might be an important landscape signal (e.g., Annex 3, Map 3). Maps are also good catalysts for conversation. They could facilitate discussion about the different agricultural approaches that might be taken in different parts of the landscape by showing the distribution of different grades of agricultural land [Map 1], or the proximity of farms to designated conservation areas [Map 2].

Mapping is also a powerful way of revealing concentrations of suppliers from different product groups. This can encourage a more horizontal, geographic, approach to complement the existing vertical relationships in supply chains. Moreover, this approach could allow a range of customers (e.g., a cereal manufacturer and a brewer) to join forces and support a number of farmers from a single landscape.

## Step 3

### Gather expert input

Spatial data provides a valuable quantitative foundation for landscape thinking. Expert knowledge then provides the qualitative complement and is critical to understanding broader trends. It can help answer key questions. How unusual is the type of grassland found in the landscape? What is the contribution of the landscape to UK biodiversity? What is the likely importance of possible landscape signals for which there is no data, such as the abundance of beneficial insects? This is a function on which research organisations are well placed to lead. Such insights are invaluable in broadening the understanding of the landscape signal (e.g., the urgency of a potential risk), and provide important leads for further consultation (Step 4).

## Step 4

### Consult on the ground

This is the final step in identifying landscape signals, and it is also the most important. While the preceding two steps provide context for the landscape, this step determines whether a landscape-level process or attribute provides sufficient risk or benefit that people are prepared to act: are farmers really so worried about flood risk as to work with other stakeholders to reduce risk? Are the advantages to managing pests collaboratively sufficiently high? The consultation does not need to be exhaustive at this stage, but would commonly include farmers and farmers' representatives, businesses from different sectors, and conservation NGOs where appropriate.

Successful landscape initiatives require the formation of social capital, the networks between stakeholders that will enable collective action. Early on in the process, it will be advantageous to consider potential facilitators for the initiative, and in many cases he or she is already present and active in the landscape. But it must be appreciated that not all stakeholders in a landscape will live or work there, for example the central purchasing functions of a business, visitors to the area, or donors to a conservation group such as the RSPB. These stakeholders should not be overlooked.

## Step 5

### Stop/go decision

In this step, the data and information obtained in steps 1-4 is collated and analysed, to decide whether the landscape signals are strong enough to derive value from landscape collaboration and therefore to justify new partnerships or relationships. Criteria for making this decision will include whether there is a clear demand from stakeholders, whether there are sufficient data to indicate that a risk or an opportunity is significant, and whether the scale of approach appears to be manageable. Formal methods for project appraisal may be deployed, but for each case the detail, complexity and rigour of this decision will depend on the initiating organisations and the programme objectives.

## Step 6

### Implement, monitor and adapt

The way in which a landscape initiative is implemented will be heavily determined by the landscape signals to which it is responding, as well as by the stakeholders involved. For this reason, at this stage our process will be replaced by another established management method, such as project cycle management (establishing a vision, aims, activities, monitoring, and so forth). While it is beyond the scope of this report to make recommendations on the specifics of particular management methods, monitoring feedback, and adapting accordingly, will be a key step in ensuring the success of new initiatives and relationships.

## The role of facilitators

*'Our farmers are always co-operating, and keen to collaborate, but instigators will be needed on the ground to create new landscape-level partnerships and new relationships.'*

**Andrea Graham, National Farmers' Union**

One of the key challenges for landscape initiatives is to facilitate the involvement of a diverse range of stakeholders, taking account of their different interests, objectives, and abilities to contribute to governance

and funding<sup>1</sup>. Farmers and primary producers, as managers of the land, are central actors. They will have needs that can be quite different from those of other partners such as the food industry, rural business, water companies, universities or wildlife trusts.

Along with multiple stakeholders, landscape initiatives usually involve multiple issues. Consultees involved in the Lincolnshire Coastal Grazing Marshes Partnership said that addressing multiple benefits makes their scheme more successful. Answering multiple signals in one initiative can help engage more and varied partners, grow community engagement, and help access funds. The ability to keep diverse interests working together in a common direction is not straightforward, and landscape initiatives pose unique requirements for facilitation.

These challenges were borne out from our research work. For example, many of the farmers we consulted commented that they felt that their engagement with landscape initiatives was more as provider of ecosystem services than as a joint beneficiary. Another interviewee presented the challenges of facilitation as being akin to a cartoon showing environmental NGOs versus farmers, yelling at each other through megaphones, with neither one listening.

*'The role of trusted intermediary is the missing ingredient between land managers and researchers.'*

**Prof. Jim Harris, Cranfield University**

One of the key findings on facilitation is that farmers appreciate having someone who speaks their language and has relevant information at hand, but who is independent from commercial affiliations: a trusted intermediary. In the Lincolnshire Coastal Grazing Marshes some farmers spoke of how much they had appreciated dedicated time from a project officer who understood the issues and was able to help provide access to social and economic benefits including support in applying for grant schemes. Other consultees spoke of how ADAS had provided neutral advice and had been a bridge between farmers and researchers. Spreading good practice between farmers, fostering collaboration between landowners and farmers, and sharing and helping to interpret information and data, were all seen as important ways in which facilitators could benefit farmers. On the other hand, farmers in Lincolnshire spoke of their wariness at being 'told how to farm' by 'zealous' conservationists, while other consultees have raised concerns over the influential role of input suppliers in advising farmers.

Maintaining the direction and focus of an initiative such as these, with a potentially wide range of stakeholders and interests, requires both facilitation skills and personal tenacity. Whilst research organisations would pass the neutrality test, there would seem to be a skills gap for the landscape facilitator role: who is training them?

To fill this gap, one of our key recommendations is to ensure the development of trusted intermediaries to facilitate landscape-level initiatives that will add economic and social value. Policy makers and research organisations should incentivise the training of these transdisciplinary facilitators. Their task of supporting participants and helping to deliver benefits will call for broad experience and a wide range of skills.

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<sup>1</sup> The number of institutional members of landscape partnerships – let alone individual participants – is often considerable. For example, the Inner Forth Landscape Initiative has the following partner organisations: RSPB Scotland (lead partner), Stirling Council, Clackmannanshire Council, Falkirk Council, Scottish National Heritage, Scottish Environment Protection Agency (SEPA), Historic Scotland, Sustrans, and Central Scotland Green Network Trust.

## 05. Challenges

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**Assembling new formations of actors, especially those as diverse as may be found across landscapes and along supply chains, inherently presents challenges. Here we consider some of them.**

### 5.1 Governance

Existing structures – community, parish, district council, etc – almost never coincide with the area of a landscape. That means that there is no existing structure within which to take decisions, communicate them, and be held to account by participants in the initiative. In the words of one consultee, ‘it all comes back to governance’.

The diversity of landscapes, stakeholders, and landscape signals means that there is no single way to structure landscape governance. Will the initiative be a legal entity? Will the partnership have the ability to bestow certification? Will the initiative be open solely to invited and invested stakeholders, or can interested members of the community take part? The key is to have a small number of governance principles to guide the formation of the initiative, such as cost efficiency, inclusiveness, transparency, communication, shared commitment, and accountability to members. The Association of Deer Management Groups has taken the step of laying out its principles of collaboration explicitly.

One of the reasons this is important is that partners are likely at some point to have interests that pull in different directions. The likely presence of a spectrum of partners, from farmers and landowners up to national businesses, means too that different partners may have very different financial muscle and infrastructure to bring to the partnership. This can naturally lead to imbalances in power, where smaller partners do not have their voices heard equally.

The use of basic frameworks and documentation as guides to governance, including legal clauses, can help to ensure that imbalances are avoided, while an agreed-upon structure can mediate differences and protect the interests of individual stakeholders.

### 5.2 Unintended policy consequences

A second major challenge is the existence of perverse incentives to sustainable land use at the landscape scale. Over the course of this work, and in speaking to experts in the agri-food sector, the role of agricultural policies has repeatedly featured as an important determinant for land management behaviours. It is commonly thought that there is no national strategic vision or policy for landscape outcomes, although in Scotland the Land Use Strategy has been highlighted as a framework for supporting multifunctional land use.

The main public subsidy instrument, the CAP, is currently directed almost entirely towards individual land holdings via the Single Farm Payment, an approach which is heavily criticised in some quarters for the consequences of its incentives, and which remains an emotive issue. However, the structure of CAP is subject to change, and an instructive example comes from the Netherlands, where from 2016 the primary focus of CAP will be farmers’ associations rather than individual farm holdings. This builds on successful Dutch pilot schemes where CAP objectives were met through successful landscape-level initiatives by four agrarian associations, covering over 700 farmers. In the Netherlands, this is seen as a response to the further shift of CAP from production support to support for public goods and services. The Dutch government considers regional collectives to be a useful means for their delivery.

This research for this project has not attempted to tackle the large questions now being asked about agricultural and land policies. Consultees raised a range of concerns, including: reports of the ploughing up of wildlife-rich meadows in 2012 to secure subsidy payments; reductions in land heterogeneity as a consequence of the largest farms expanding and converting neighbouring land to the same farming system; encouraging upland sheep farming on marginal land which might better be used for other functions such as flood protection or biodiversity; and green belt regulations potentially curbing agri-entrepreneurialism and certain types of farm diversification.

These challenges and debates will continue, but the key point for landscape approaches is to recognise the limited support currently available from policy makers for work at the landscape scale.

### 5.3 Visibility of expertise and knowledge

A frequent comment in interviews concerned the ad hoc and personal way in which knowledge of landscape expertise is distributed. Personal relationships are the main way in which farmers and businesses find people who can provide the expertise they need to collaborate on landscape initiatives. Poor knowledge of researchers' expertise on issues and regions appears to be an important limit on collaboration between business and research organisations for sustainable land use. Other than by tendering for relevant expertise, this is an issue that cannot be addressed by landscape collaborators in isolation, but instead needs a higher level impetus. Ideas proposed have included trade shows; an online 'dating portal'; designated champions or intermediaries who can translate between farmers, business and research; and centres of excellence on landscape analysis and management. An example of this is the ClimateXchange, part of the Centres of Expertise approach in Scotland. While that example is focused on policy, the structure may be easily translatable to business and farmers.

### 5.4 Land ownership and management

Ownership of land may also be a hurdle; farmers and primary producers who own their land are likely to respond differently to initiatives in their landscape from tenants who may not be on a particular piece of land for any significant length of time. One company consulted noted that there was a trend amongst specialist vegetable growers to farm large areas of rented land. Low profit margins mean that the scale of growing needs to be large, and few farmers can purchase the areas required. Another interviewee contrasted renting agricultural land and renting a house: the land can be damaged with no personal repercussions, whereas a tenant would have to pay for damaging a house.

Like the policy issues touched upon above, challenges relating to ownership and tenancies extend way beyond the remit of this report. For any landscape initiative, land tenancies will be critical to understanding partner behaviours.

### 5.5 Funding

Funding is the next key challenge. The most straightforward method of funding landscape initiatives is self-funding – stakeholders contributing financially to support the initiative from within. While this method is simple and does not require relying on fundraising or grant applications, the financial requirements for any potential participant may prove to be a barrier to recruiting partners unless the larger agents (e.g., water companies) subsidise smaller agents such as individual farmers wholly or partly.

External funding can enable projects to get off the ground. Examples include the Heritage Lottery Fund's Landscape Partnership Grant Scheme, which provides between £100,000 and £3 million, and Defra awards

for Catchment Sensitive Farming. Although one consultee suggested that crowd-sourcing might allow local people and visitors to become a source of funding. e.g., for wild flower strips alongside footpaths, it seems critical that other external funding streams also become available to support such work.

## 5.6 Measuring success

The final challenge is how partners, and the outside world, can perceive and measure success. 'Success' is unlikely to be black and white, and will most likely vary for different stakeholders and signals. Developing performance indicators that are relevant and acceptable to all partners and the general public is important not only to ensure satisfaction among the stakeholders and funding bodies, but also to demonstrate the capabilities of landscape level initiatives.

## 06. Recommendations

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This final section summarises how the main findings of this work can be taken forward as recommendations relevant to different groups, including policy makers. These findings endorse the notion that there are multiple facets of sustainable land use that can be managed best by collaboration and action at a landscape level. They also show that there are unrealised benefits to be gained from engaging with landscapes, including improved management of risk, reputational benefits, and unforeseen opportunities.

### I: Embrace landscape-level initiatives

#### **Recommendation 1**

Embracing and integrating landscape-level initiatives into policy and practice are necessary to getting many of the sustainable land-use outcomes we need.

#### **To achieve this, all parties should:**

**1.1** Use landscape signals as a practical focus for collaboration and action, rather than trying to tackle all possible landscape-level processes and functions.

#### **Policy makers and business decision-makers should:**

**1.2** Create policies and approaches that support the development of landscape initiatives in the public and private sectors, leading to sustainable land-use outcomes.

### 2: Adopt a stepwise process to foster collaboration

#### **Recommendation 2**

Evolving a simple, stepwise process that can be adopted to foster collaboration at the landscape level between research organisations and businesses.

#### **To achieve this, research organisations should:**

**2.1** Create transdisciplinary teams within the organisation and make them visible and available to support every step of the landscape process. Provide development and career incentives for staff involvement.

**2.2** Make their geospatial and mapping capabilities visible to potential partners. Include training on GIS, spatial modelling and data analysis within existing courses to develop a cohort of skilled people to support landscape-level work.

**2.3** Take a practical role in landscape collaboration by delivering work to identify, analyse, and communicate landscape signals to businesses and land users.

**Policy makers should:**

**2.4** Create mechanisms which link people who need landscape expertise to those who can provide it, on a UK-wide basis. Scotland's Centres of Expertise could serve as a model for this.

**Retail and food manufacturing businesses should:**

**2.5** Move towards more open data on supply chains, and collaborate at the landscape level on a pre-competitive basis in order to realise new benefits and manage risks. For example, sharing data about the location of suppliers of different product lines is a key step in understanding where unrealised shared benefits or risks may lie.

**Policy-makers and larger businesses should:**

**2.6** Invest more in landscape centred-research. This funding should be focused on research that produces social and economic impacts, and which includes generic frameworks for understanding and managing landscapes, as well as research into specific landscapes.

### 3: Develop trusted intermediaries who can facilitate action

**Recommendation 3**

Ensuring the development of trusted intermediaries to facilitate landscape-level initiatives that will add economic and social value.

**To achieve this, policy makers and research organisations should:**

**3.1** Create policies to incentivise the training of transdisciplinary facilitators within research organisations. Facilitators are needed to support landscape initiative participants, and to help deliver benefits. They need both experience and a broad range of skills to be effective. Training could begin with modules on multi-stakeholder facilitation in relevant Master's degree courses, in subjects such as agriculture and environmental science.

## Annex I

### Interviewees for Phase 1

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Organisation	People
Thanet Earth Marketing	Robert James
Met Office	Sarah Jackson
Syngenta	Mike Bushell
UK Global Food Security & University of Leeds	Tim Benton
Organic Research Centre	Laurence Smith
National Farmers' Union	Andrea Graham
Waitrose	Alan Wilson
Sainsbury's	Stuart Lendrum
Cranfield University	Jim Harris
BBSRC	Paul Burrows
WRAP	Keith James

## Annex 2

### Contributors to Phase 2

3Keel and the Work Stream 3 Steering Group thank the following contributors for their time and insights:

Organisation	People
University of Leeds	Ute Bradter
Sainsbury's	Stuart Lendrum, Sue Lockhart, Simon Hinks
Waitrose	Alan Wilson
National Farmers' Union	Diane Mitchell, Rob Wise, Paul Tame, Andrea Graham
Lincolnshire Coastal Grazing Marshes Partnership	Roger Wardle, Joe Blissett
Greater Lincolnshire Nature Partnership	Fran Hutchinson
Lincolnshire Wildlife Trust	Tim Sands, Caroline Steel
Lincolnshire Farmers	David Stovin, John Willoughby
Environment Agency	Richard Chadd
University of Oxford	Paul Jepson
The Food and Environment Research Agency	Glyn Jones
Fens for the Future	Jo Finlow
Produce World Group	Guy Thallon
Ouse Washes Landscape Partnership	Mark Nokkert
The James Hutton Institute	Iain Gordon
Anglian Water/Cambridge and Ely Ouse Catchment Partnership	Martin Bower
Cranfield University	Jim Harris
UK Global Food Security & University of Leeds	Tim Benton
G's Growers Groups	John Currah

## Annex 3

### Case Studies

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Two case study sites were chosen. The first, the Lincolnshire Coastal Grazing Marshes, was chosen because it has an existing landscape initiative. The purpose of studying this was to understand at first hand – from documents and from interviewing people involved – how the landscape initiative was done (what the governance structure was, who is involved, how it is funded and facilitated, etc) and what the impact has been.

In contrast, the second case study, East Cambridgeshire, has a mixture of field vegetables, wheat, rape and other crops, and was suggested as an area which supplies a significant variety of products to UK food retailers. The area does not have a landscape-level initiative, and the purpose of choosing the area was to run a scenario: are there landscape signals around which farmers, universities, business and others could come together to act? How could relevant information be compiled?

#### The Lincolnshire Coastal Grazing Marshes

##### Basic Description

The Lincolnshire Coastal Grazing Marshes Partnership (LCGMP) was set up in 2003 in response to concern over the loss of the coastal grazing marshes of East Lincolnshire. The area is relatively poor agricultural land (Map 1) predominantly used to rear beef cattle, with some dairy and sheep, and in recent years, an apparently increasing amount of maize to fuel an anaerobic digestion plant. The coastal grazing marshes are home to many waders and birds as well as rare plants such as the green-winged orchid. Livestock help keep the habitat suitable for the birds and mammals that call the marshes home, and this is reflected in the high coverage of stewardship schemes (Map 5). In 2011 the partnership secured funding through a Landscape Partnership grant from the Heritage Lottery Fund (HLF) for a 3-year project focusing on three target areas comprising 9,000ha.

LCGMP's primary goals for this 3-year phase include regenerating the coastal grazing marshes and conserving them for future generations, protecting local habitats and heritage, and sustaining a viable stock farming industry. From the website: "the Lincolnshire coastal grazing marshes are, first and foremost a working landscape, important for farmers and farming businesses."

##### Landscape Signals

LCGMP sends out a number of landscape signals. In addition to being an important habitat for wildlife, especially water voles and wading birds (the biodiversity signal, see Map 2), the grazing marshes also contain many archaeological and historical sites including ridge and furrow and medieval towns (the cultural heritage signal). The local county and district councils also work to make these areas more interesting and accessible, to boost tourism and the local economy (the amenity value and recreation signals).

Many of the stakeholders involved in LCGMP believe that addressing multiple benefits makes their scheme more successful. Answering multiple signals in one initiative can help in engaging more and varied partners as well as in community engagement and in accessing funds.

##### Governance

LCGMP's main partners for this project include East Lindsey District Council (the host partner), Lincolnshire County Council, English Heritage, the Environment Agency, the Farming and Wildlife Advisory Group, Lincolnshire Wildlife Trust, Lindsey Marsh Drainage Board, the NFU, and Natural England. The project is run by a project manager, who reports to the board (comprised of representatives from these partners), and is implemented by two full-time project officers.

LCGMP is within the purview of the larger Greater Lincolnshire Nature Partnership. While the two partnerships are independent in terms of governance and funding, the larger initiative is available to provide assistance. Many key players overlap and serve as partners on both initiatives.

## East Cambridgeshire

### Basic Description

The district of East Cambridgeshire, situated between Cambridge and Bury St Edmunds, is an area of important and diverse agricultural use; livestock, arable, cereal, and fruit and vegetable farming are all practiced.

East Cambridgeshire is not currently home to any initiatives comparable to the Lincolnshire Coastal Grazing Marshes; it was chosen rather for its relevance in the agri-food sector (several major suppliers to food retailers are here) and the presence of strong landscape signals, as a study in modelling the potential for landscape level initiatives. While there are currently no well-established initiatives directly involving East Cambridgeshire, it is surrounded by areas that are covered by such schemes. Nearby initiatives include the HLF-funded Ouse Washes Landscape Partnership and the multi-partner Fens for the Future to the north, and the Cam and Ely Ouse Catchment Partnership (CamEO) to the west. CamEO intends to set up a sub-catchment group in the area, and Produce World is setting up a strategic board to support its work in the area which will include retailers in its membership.

One important insight concerns the differences between East Cambridgeshire and the area to the North. To the North is reclaimed fenland, with large, rectangular fields and very rich agricultural land (Map 1) which is used for higher value crops such as field vegetables. To the south, the land is more typical lowland arable with wheat and rape predominating. This means that the underlying economics, and the potential for altering management practices, are likely to be different between these two areas.

A second issue is that of rented land. One consultee noted an increasing trend towards land purchases by people from the City of London. So specialist vegetable growers, who need to operate on a large scale because their profit margins are low, are increasingly farming rented land, and have little long-term interest in sustainability issues.

### Landscape Signals

Interviews were carried out with key players in and around the East Cambridgeshire landscape, such as the Ouse Washes Landscape Partnership, Fens for the Future, CamEO, and Produce World Group, many of whose grower groups are located in East Anglia, including East Cambridgeshire. They indicated that strong landscape signals are present in East Cambridgeshire and include water quality (diffuse pollution and low river levels), drought management, biodiversity conservation, cultural heritage, and flood risk management.

### Landscape Initiative Potential

The importance and suitability of East Cambridge for diverse agricultural use, including high-value field vegetables, immediately suggests it as an area that may benefit from landscape initiatives for sustainable land use. Indeed, our interviews suggest that landscape initiatives in this area are currently in the early stages of being developed; this includes a new HLF bid for a partnership in the area by some of the partners of the Ouse Washes Landscape Partnership, and movement towards the formation of a sub-catchment group based around East Cambridgeshire's River Lark from CamEO. One consultee noted that it was important to 'get your needs out on the table straight away' so that solutions could be found which benefited all parties.

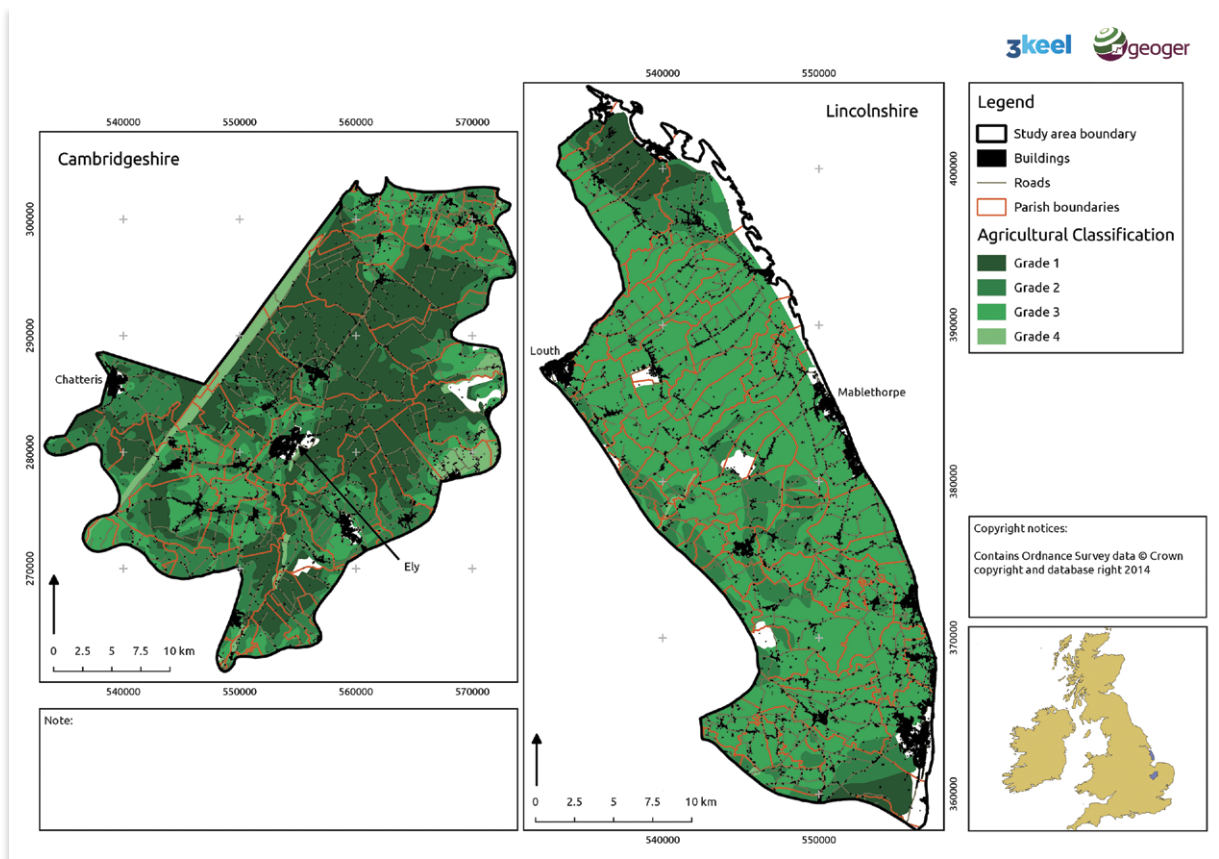
This action on several fronts toward landscape level initiatives in East Cambridgeshire suggests that the combination of landscape signals and prime, important agricultural land is in itself a valid and useful indicator of areas where landscape level initiatives are necessary.

## Maps

The following maps are intended for illustrative purposes, demonstrating the various ways in which maps and spatial data might be used to define, understand, and analyse potential landscapes. In the lower left hand corner of each map, except Map 1, is a short note explaining what the map is showing, and details about the data used in its production.

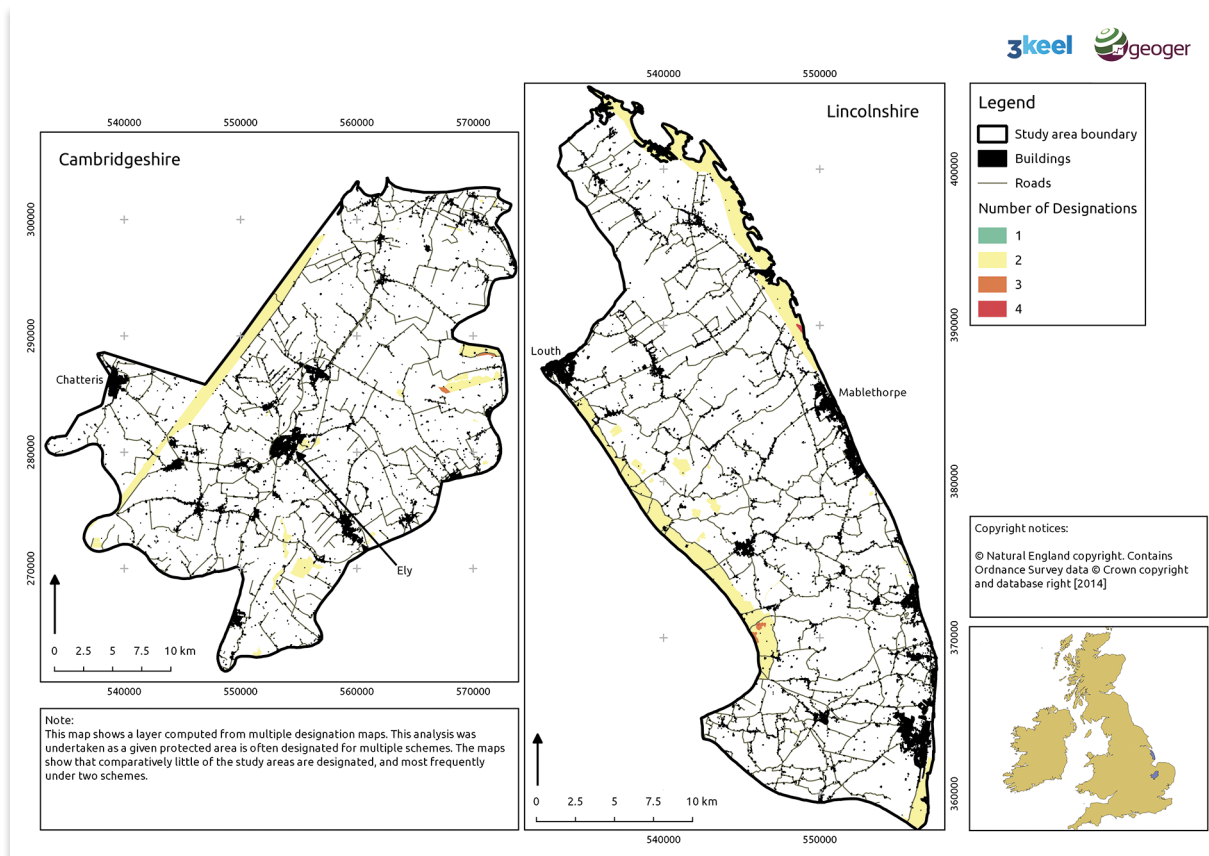
### Map 1: Agricultural grade classifications and parish boundaries

This map shows the agricultural grade classifications of the land encompassed in both case study areas, overlaid by the parish boundaries. It demonstrates that land classifications such as agricultural grade do not usually follow established governance boundaries.



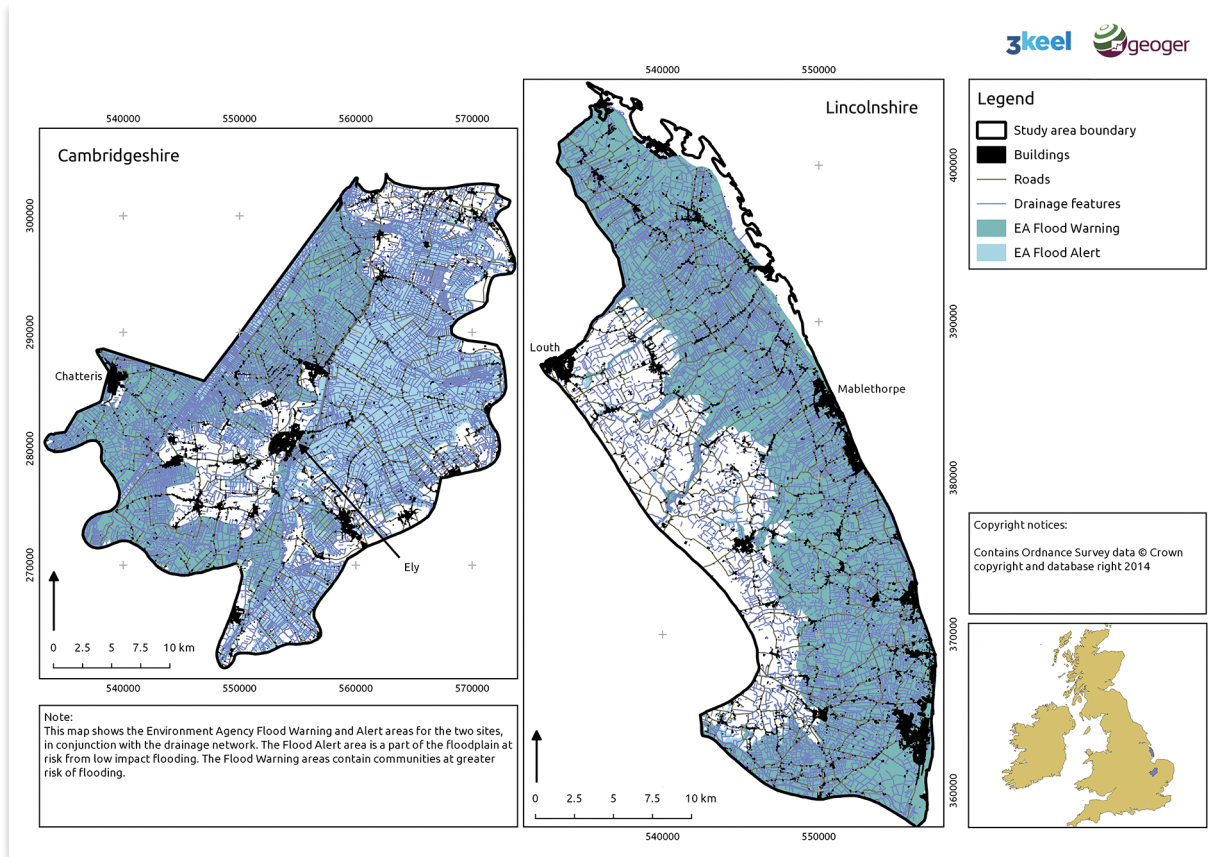
## Map 2: Number of land designations

This map combines nine land designations (Ancient Woodland areas, Areas of Outstanding Natural Beauty, four nationally protected zone types (including SSSIs) and three internationally protected zone types) into one map for each case study area. A given protected area is often designated under multiple schemes, but the maps show that only a small part of each study area is designated.



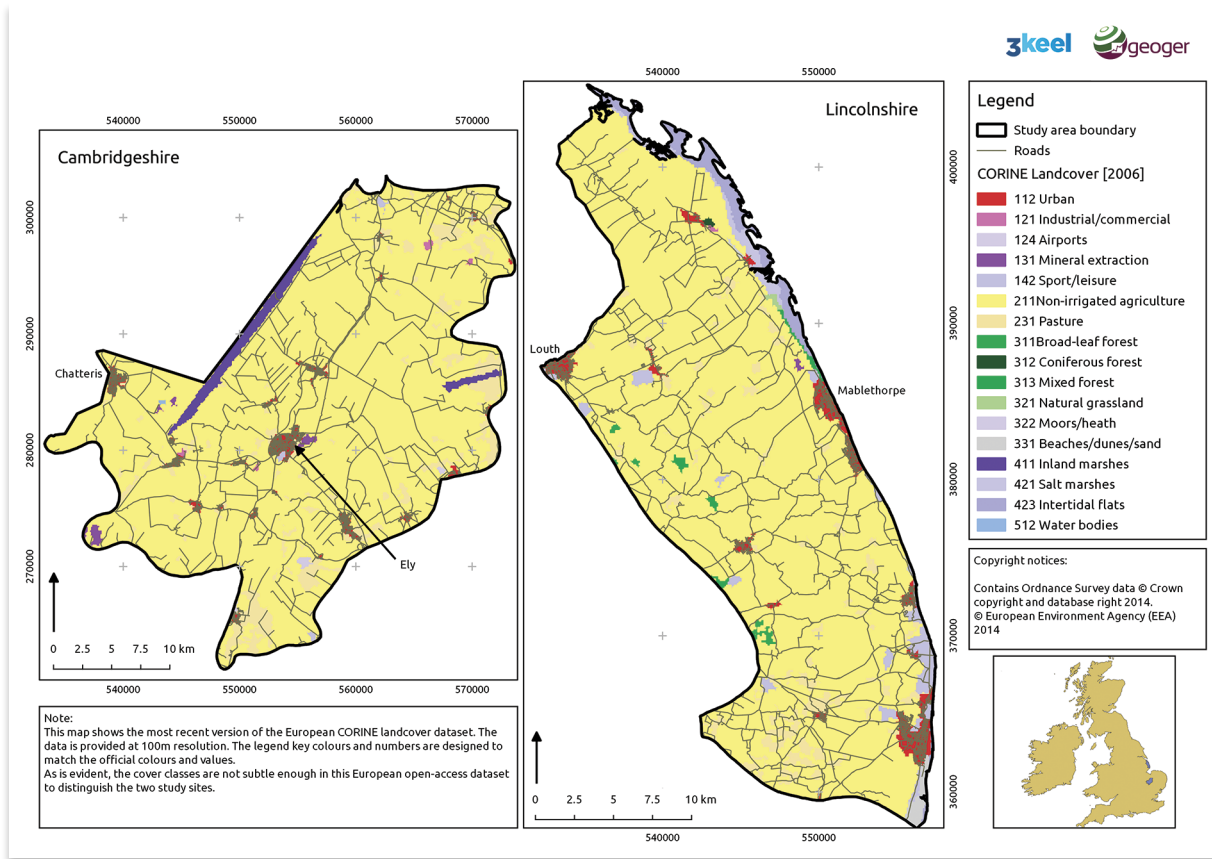
### Map 3: Hydrological map

This map shows the Environment Agency Flood Warning and Alert areas for the two sites, in conjunction with the drainage network. The Flood Alert area is the part of the flood plain at risk from low impact flooding, while the Flood Warning areas contain communities at greater risk of flooding.



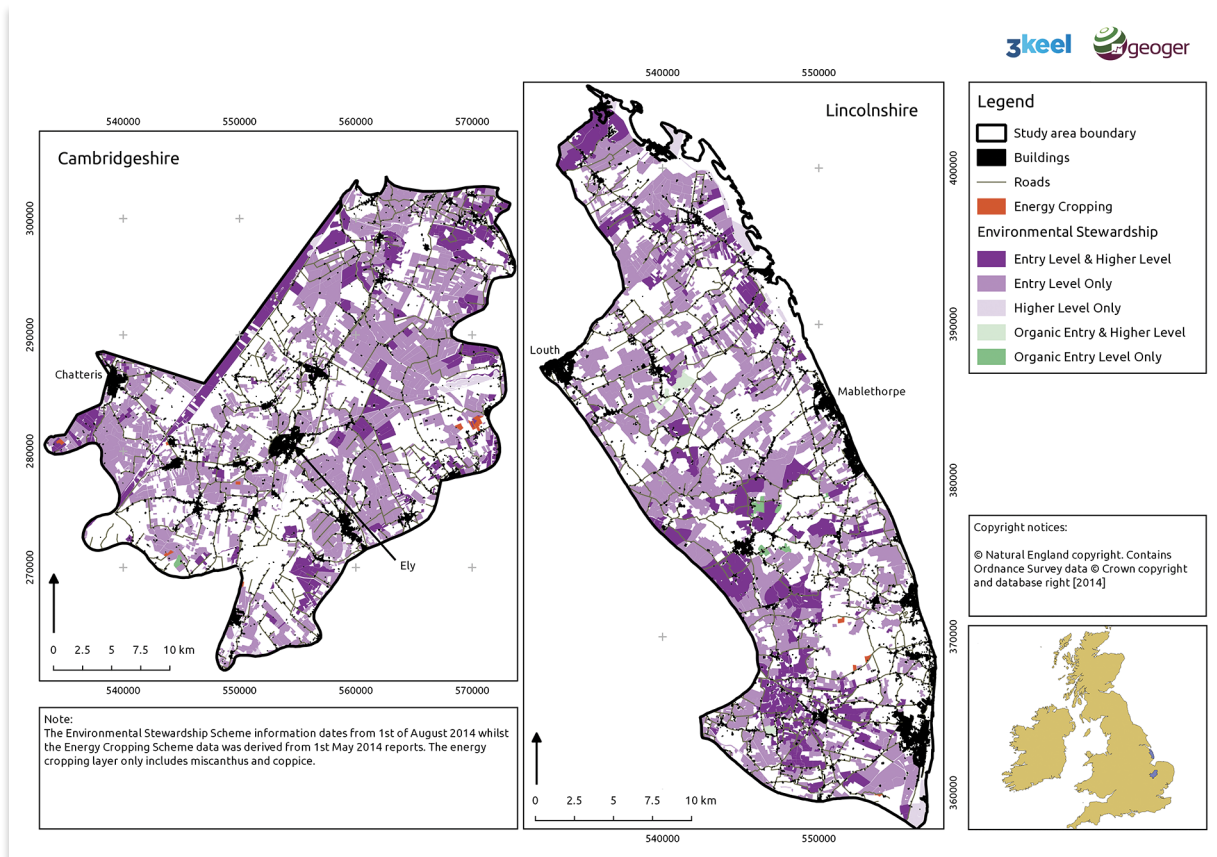
### Map 4: Land cover

This map shows the most recent version of the European CORINE landcover dataset. The legend, key colours and numbers are designed to match the official colours and values. As is evident, the cover classes are not subtle enough in this European open-access dataset to distinguish the two study sites.



### Map 5: Stewardship and energy cropping

This map shows the land in the case study sites that is under stewardship schemes, alongside the land that is in use for energy cropping. The energy cropping layer includes only miscanthus and coppice.



## Annex 4

### Notes on Mapping Data Sources

#### General datasets

The following datasets could be used either as background layers for output maps, or more usefully as base data layers to drive the aerial/spatial analyses that may be required in future.

Dataset	Notes
OpenStreetMap	No field-level information is held in this dataset, but there is the possibility of getting finer details on features such as paths etc. Depending on the use case, the dataset could require quite a bit of processing to standardise the tags needed. The data are open and freely available for commercial use but OpenStreetMap require that derivative data are also open.
Aerial Photography	Using aerial imagery is one way that the field boundaries could be digitised. The last UK wide aerial survey was completed in 2004 but local updates have been undertaken in some areas since then. Bespoke surveys or UAV (drone) surveys could be commissioned for specific details e.g., crop health monitoring etc.
Mastermap Topology Layer	This contains the field boundaries and various other features. This is the official mapping layer of the UK so is kept up to date. With the correct project partners it might be available for use under licence, otherwise it is commercially available. There is also an imagery layer that can be purchased. The majority of this aerial imagery is between 3-5 years old.

#### Land-cover/land-use

The following datasets could be used to provide better quality information on land-cover or land-use than is obtainable through the 100m resolution CORINE dataset.

Dataset	Notes
Land-Cover Map 2007	The Land-cover map of the UK is the base used to build the UK part of CORINE. LCMUK07 provides information on cover type at an object level. In most instances this is at a field-scale, but some editing may be required to match boundaries. With either the Environment Agency or Natural England (or another Governmental client) involved in future work, it may be possible to access the data at no cost. Otherwise it is available commercially through the Centre for Ecology and Hydrology (CEH).

Dataset	Notes
Various High Resolution Satellite Images	Many high resolution satellite datasets are available ranging from 10m resolution down to better than 0.5m resolution. Depending on the cloud-cover, orbit repeat times and number of spectral bands then these data can be used to assess change in crop cover and health between years and within a growing season. These data are available commercially.
Farm Records	This would need to be offered voluntarily, but individual farmers could be asked to provide information on their cropping patterns, including harvest and planting dates, variety and irrigation dates for specific fields. Care would need to be taken regarding commercial confidentiality, ownership of the final dataset and data privacy.
Rural Land Registry	The data contain individual identifiers and are subject to privacy laws and are therefore unlikely to be made available for 3rd party use, but it might be worth asking the Rural Payments Agency about accessing this information to analyse it for actual crop growth information in the study areas.
Traditional Orchards	This is a polygon dataset that is openly available (with registration) through Natural England. It contains the location and status of traditional orchards. A point version of the data is available online here: <a href="http://ptes.org/get-involved/surveys/countryside-2/traditional-orchard-survey/orchard-maps">http://ptes.org/get-involved/surveys/countryside-2/traditional-orchard-survey/orchard-maps</a>
Land Registry Ownership Polygons	This could be a cost effective method of obtaining polygons for mapping land-use, but the boundaries don't always relate to fields - more usually collections of fields. It is also an untidy dataset that would need quite a lot of work on before it was suitable.

## Water

The following datasets could be used to build on the information provided by the OS OpenData Vectormap District water layers.

Dataset	Notes
LiDAR or NextMap	Elevation data at 1m, 2m or 5m resolution. Dates will vary but the EA LiDAR data at 1m should be relatively recent. NextMap data was collected around 2005. These data are available commercially through the Environment Agency or resellers. With either the Environment Agency or Natural England (or another Governmental representative) involved, it may be possible to access the LiDAR data at no cost.
Flood Return	The 1:100yr and 1:200yr flood return outlines show areas at most flood risk, as modelled by the Environment Agency using their LiDAR data. This outline can be used in conjunction with their open flood alert and warning area layers to show high risk areas. This is a commercial dataset available from the Environment Agency.

Dataset	Notes
NFCDD or AIMS	This is an Environment Agency database of all structures on water bodies e.g., sluices, weirs etc. The National Flood and Coastal Defence database (NFCDD) has been updated and replaced by the Asset Information Management System (AIMS). AIMS includes asset location, condition and which communities benefit from them. AIMS is available to be used by any flood risk management organisation; Environment Agency, Local Authority, Internal Drainage Boards.
Abstraction	Records of water abstraction licences are held by the Environment Agency in the National Abstraction Licensing Database (NALD). This dataset is not currently available as open data as some of the information is likely to be considered commercially confidential and there may also be national security issues. It would be useful to investigate abstraction licences for winter storage reservoirs in high water-use crop areas.
MORECS	The Met Office MORECS service provides real-time assessments of rainfall, evaporation and soil moisture. Results can be automatically emailed or data can be supplied on disk for fast input into bespoke models. MORECS provides a reliable, UK-wide assessment of general soil moisture status, divided into areas 40 km square. This is a commercial service.

## Other

The following datasets may provide useful data depending on the type of work to be undertaken.

Dataset	Notes
10Km Species Data	The National Biodiversity Network Gateway provides amalgamated 10km square datasets on various species. The data are available for non-commercial use and the provider must give written agreement if we want to use the data for commercial gain. This potentially results in a complex licence agreement for commercial use, as there are often multiple providers, sometimes many private individuals.
Soil Data	Soil map data are available at 1:250,000 scale through the Land Information System hosted by Cranfield University.




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