Government Office for Science

Foresight

Land Use Futures:

Making the most of land in the 21st century

EXECUTIVE SUMMARY

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This report is intended for:

Policy makers and a wide range of professionals and researchers whose interests relate to all aspects of land use. The report focuses on the UK, but will also be relevant to the interests of many other countries.

This report should be cited as:

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The Government Office for Science (GO-Science) would like to thank the Project's Lead Expert Group who oversaw the technical aspects of the Project and who were involved in much of the work. They were:

Professor David Newbery – Professor of Economics, Cambridge University (Chair)
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Professor Carys Swanwick – Professor of Landscape, Sheffield University
Professor Mark Tewdwr-Jones – Professor of Spatial Planning and Governance, UCL

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A list of those involved is provided in Appendix A.

The Foresight Programme in the UK Government Office for Science is under the direction of the Chief Scientific Adviser to HM Government. Foresight strengthens strategic policy-making in Government by embedding a futures approach.

Foreword

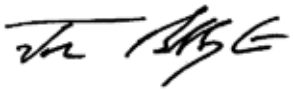
Together with our human capital, land is possibly the UK's greatest asset. It provides the basic services that we need to prosper and flourish, the environment in which we all work and live our lives, and it forms the historical and cultural bedrock of the country. It is difficult to imagine a national asset that affects us all so profoundly.

However, our land is a finite resource, and it is set to come under increasing pressure as the century unfolds. Factors such as climate change, demographic shifts, and changing patterns of work and habitation will all create major challenges. Also, as these pressures intensify, so will the demands we make on our land. This is already happening as we seek to maximise economic returns, and as we recognise its potential to yield benefits in diverse areas such as ecosystem services, mitigating climate change, and wellbeing.

Deciding how to balance these competing pressures and demands is a major challenge for the coming century, and one that is all the more pressing due to the time that may be needed to roll out new land use policies. For this reason, the Government Office for Science has spent the last two years undertaking a major Foresight project on the future of land use in the UK.

The work adds value by combining two aspects. Firstly, it has drawn on an exceptional breadth of cutting-edge science and other evidence – around 300 leading experts from diverse fields have been involved. Secondly, it has benefitted from the practical and pragmatic perspectives of leading stakeholders across the country: the public and private sectors, local and central government. However, a report of this breadth cannot aspire to consider every issue in fine detail. Instead, it aims to identify the strategic challenges for the future, and provide advice on how they can be addressed within a coherent and integrated framework.

I am most grateful to my predecessor, Professor Sir David King, who commissioned the Project, to the group of senior stakeholders who have advised on the work throughout, and to the many other individuals who have been involved. I am particularly grateful for the support of the Department for Environment, Food and Rural Affairs, and Communities and Local Government, both of which have sponsored this work. Therefore, it is with particular pleasure that I now hand the findings to Defra and CLG's Ministers for their consideration and make the findings publicly available.



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Executive summary

1. The Foresight Land Use Futures Project

This Project has taken a broad and overarching look at the future of UK land use over the next 50 years. It demonstrates that there is a strong case to develop a much more strategic approach: to guide incremental land use change, incentivise sustainable behaviours, and to unlock value from land.

This report shows that a reappraisal is vital to help address major challenges ahead – for example, relating to demographic shifts, climate change, and rising demand for commercial and residential development in areas such as the South East of England. The challenge is to meet the rising expectations which will come with rising incomes; and to deliver a wider range of sustainable benefits from land. In particular, a more coherent and consistent approach is needed for managing the growing demands on land – at different levels of Government, and across the wider community of stakeholders involved in the many land use sectors.

The aims of the Project

The Project aims to use the best available scientific and other evidence to take a broad look at:

- The most important challenges and opportunities for land use in the UK over the next 50 years[1] – particularly those that merit decisive action; and
- What can be done to use and manage land more sustainably and to unlock greater value for people and the economy – now and in the future.

The Project has also sought to identify where incremental change would be desirable, and where a more strategic shift is needed.

A word of caution

It is not feasible for a project with such a broad scope to consider every issue in the same level of detail and complexity as the responsible government departments and the devolved administrations. Instead, the added value has come from taking a particularly broad and strategic view across the many sectors and interests relating to land use.

As with other Foresight reports, it is expected that detailed evaluation of the findings will need to be considered by policy-makers over the next 12 months.

1 In this report, 'the future' is generally taken to mean the next 50 years to 2060, unless otherwise indicated.

An independent look

This report provides an independent analysis of the challenges ahead and how they might best be addressed. As such, the findings do not constitute government policy. Rather, they are intended to inform the strategic and long-term choices facing government departments, the devolved administrations, business, and society as a whole.

How the Project adds value over previous work

The added value comes from a combination of three factors:

- The breadth of the analysis: the work looks across different levels of governance; takes account of spatial and geographic differences across the country; and reviews trends across the major land use sectors – including the built environment and infrastructure, natural resources, agriculture, conservation and leisure.

- Crucially, the analysis takes an even-handed view – it does not judge one type of land use to be more or less important than another. It also contrasts the perspectives which characterise different land use communities and different expert disciplines – acknowledging the reality that these viewpoints often conflict.

- The analysis lifts horizons from a short-term focus on narrow impacts, to looking at the strategic needs of the UK over the next five decades.

The Project's analysis is comprehensive. It has:

- Involved over 300 leading national and international experts and stakeholders[2] from diverse disciplines, ranging from economics, geography and planning to the environmental sciences, engineering, and multidisciplinary areas such as conservation and climate change.

- Drawn upon over 40 specially-commissioned papers[3], as well as a wide range of existing reviews and studies[4].

- Spanned the interests across Government and across a diverse range of organisations outside of Government.

- Primarily focused on England but the Project has implications for the whole of the UK.

2 See Appendix A.

3 See Appendix B. All the Project's papers are freely available through www.foresight.gov.uk

4 See Appendix D of the Final Project Report for an illustrative list.

2. The importance of land use: the need for an integrated perspective

Land and its many uses provide the bedrock of the country and the foundation for our wellbeing, prosperity and national identity. The pervasive effects of changes in land use and management underline the need to take the broadest possible perspective in developing future policies and strategies on land. While much has been achieved over recent decades, there is a strong case to do more.

Land is one of our greatest assets. How it is used and managed affects everyone's prosperity and quality of life. Despite commonly held public perceptions, much of the land of the UK remains undeveloped[5] – around 90% in the case of England. However, the productive capacity of land underpins the whole economy through its provision of food, timber and other goods, and through its use for housing, business, transport, energy, recreation and tourism. Land also plays a critical role in providing services that are vital for the physical wellbeing of the population, such as clean air, water and healthy soils. Also, with some of the most beautiful and historic landscapes in the world, the landscape of the UK underpins our national identity, cultural heritage and mental wellbeing.

All of these benefits are important in their own right: a land devoid of green spaces for recreation, or semi-natural landscapes that support wildlife, would be as unthinkable as land that is not economically productive. In this context, the ability of given parcels of land or landscapes to deliver multiple benefits simultaneously – so called 'multifunctionality' – adds to its value and versatility. However, many land uses can conflict with each other: more land for one use can mean less for another. As explained below, in the future, greater pressure on land will mean that the requirement for land to deliver multiple benefits will also increase.

Whilst it is important to consider the impact of change within individual land use sectors such as conservation, agriculture and housing separately, the evidence in this report makes clear that progress on the most important challenges ahead will only be made by:

- Identifying how the various demands on land made by different sectors will interact, and evaluating the consequences of those interactions; and

- Taking a broad and overarching perspective across sectors and different levels of governance.

Government has already made progress in both areas, but a key conclusion of this Report is that there is a strong case to do more. Achieving a more coherent and consistent approach to guiding land use and management so that more sustainable and valued outcomes are delivered is a recurrent theme throughout this report.

5 "Undeveloped" in this context means land which has not been built on.

3. Why this project was undertaken: major factors driving change

Over the last 50 years, demand across many land use sectors has intensified in response to important factors such as population change and also rising incomes – which have fuelled increased expectations. However, the next 50 years will see even greater pressure on land use: continuing expected growth in population and incomes, the impact of climate change, new technologies, and changing public attitudes and values will all have profound effects.

A major issue for policy will be whether all the economic, social and environmental benefits of the land can continue to be delivered against a backdrop of greater expectations from the market and individuals, and the need to live within environmental limits. This Project has shown that major challenges and rising tensions will result unless action is taken: a key aim has been to identify where interventions in policy will be most needed.

Looking ahead just 20 years, there could be substantial changes affecting the country, and by 2060, the world is likely to be a very different place. Six particularly important factors will drive change over the next 50 years in the UK.

3.1 Demographic change

The Office of National Statistics[6] (ONS) suggests that the population could increase by approximately 9 million by 2031, and by 15 million by 2051, although there is considerable uncertainty associated with these projections as they are based on past trends and uncertain levels of future inward migration. Moreover, these changes are not likely to occur evenly across the UK. Whilst relatively high growth is projected to occur in England and Northern Ireland between 2008 – 2031, 16.7% and 13% respectively, projected increases in Wales and Scotland are lower at 11.2% and 7%.

Excluding the net effects of migration, the overall increases would be 3 million and 2 million for 2031 and 2051 respectively, due to the net effect of an ageing population and changing fertility rates. The number of people living alone is also rising: by 2031, 18% of the population are projected to live in single occupancy households; 42% of this increased number will be people over the age of 65.

Two major challenges will be:

- How to manage the associated significant increase in the demand for land for housing, recreation, transport, water, food and energy in the face of uncertain demographic change.

- How to manage the potential for uneven distribution of demographic change across the UK, for example, in the South East of England as compared with other parts of the country (see Section 4, below).

3.2 Economic growth and changing global economic conditions

Economic growth will alter consumption patterns: where land supply is constrained, the demand for additional living space as incomes rise will be an important determinant of house prices. As the future macro-economic situation and business structure of the UK will have a strong influence on where jobs and homes are located, pressures on land use in the South East of England are expected to intensify. Overall, the underlying trend

6 See Chapter 1 of the Final Project Report.

of economic growth in the UK in the longer term is currently estimated to be 2–2.5% per annum[7], implying a continuing increase in the demand for land for development.

Future change in the global economy will also influence land use. For example, rising global demand for food and changing commodity prices will affect the amount of land that is brought into food production. Changes in the global financial system may also affect the stability of markets for land assets. Here land may be seen as an investment opportunity, irrespective of the benefits that it provides in use.

3.3 Climate change

The potential role of land and land use in both climate change mitigation and adaptation will be profound. The move to a low-carbon economy will increasingly influence land use decisions, settlement patterns, the design of urban environments, and choices on transport infrastructure. Agriculture, forestry and semi-natural habitats will have the potential to play important roles in mitigating the effects of climate change, but will also need to adapt to changing temperatures and precipitation patterns. Also, increasing flood risk will have implications for building on flood plains and vulnerable coastal areas.

A significant increase in renewable energy capacity is required. Meeting the EU 2020 target for renewables may lead to greater competition for land, and changes to landscape character. Also, areas of the UK with the greatest capacity for future renewable energy production may be spatially separated from the areas of greatest demand. However, the scale of the land-based effects will depend, for example, on the policy choices made on the 'energy mix'[8] and how much production capacity is on-shore[9]. Planning policies have a critical role in shaping incentives to ensure the required changes in land use occur. Delays could cause difficulties, or result in excessive costs, in achieving the 2020 targets.

A major challenge will be:

- How to make better use of the land across the UK for climate change mitigation and for supporting the transition to a low-carbon economy, as well as managing the impacts of changing climatic conditions.

3.4 New technologies

New products, processes and ways of working will enable us to increase the productivity of available land, and relieve some of the pressures associated with intensive land use. Developments in information and communications technology will enable people to live and work differently. Advanced information, engineering and biological sciences, including technologies such as 'precision farming' and anaerobic digestion, can help farming to reduce its environmental burden. Similarly, new energy, water and waste treatment technologies can lessen the environmental footprint of urban development. In many cases it will be possible to achieve multiple benefits simultaneously, as with sustainable urban drainage and habitat creation in towns.

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7 See Chapter 1 of the Final Project Report..

8 The Department for Energy and Climate Change, for example, is producing a set of scenarios for 2050 to model the possible impact of different 'energy mixes' to inform the development of energy policy.

9 Rights have been granted for up to 6,400 additional off-shore wind turbines with the potential to generate an extra 32GW of clean electricity. See http://www.decc.gov.uk/en/content/cms/news/pn10_004/pn10_004.aspx

Whether technological innovations drive the evolution of sustainable land use in a socially desirable way will depend on incentives and governance structures.

3.5 Societal preferences and attitudes

People's preferences and attitudes on land use will interact with all the other drivers of change, such as rising incomes and the drive towards a lower-carbon society. Many people's desire to protect the natural environment, and preferences for home ownership, car usage, shopping patterns and other social trends are already changing how land is used, although these can sometimes result in conflicting demands. Markets are one important route through which preferences are expressed, through prices, along with the planning system and participation in decision-making.

A challenge for policy-makers will be:

- How best to reconcile conflicting public attitudes, and also, differences between the preferences of individuals and communties and societal needs – through the broad range of mechanisms for managing and influencing land use, such as incentives, the market, regulation, and formal decision-making processes.

3.6 The policy and regulatory environment

Government policies and regulatory measures relating to development control comprise a framework of planning acts based around the Town and Country Planning Act 1947, supplemented by other relevant legislation. Devolution to Scotland, Wales and Northern Ireland has also produced diverse responses to the management of land resources. In addition, a large proportion of UK land – used for other purposes – is regulated by a large body of national, EU and international legislation. Membership of the European Union (EU) has been a major driver of land use change, particularly in the agricultural sector, and has created binding targets in diverse areas such as water resource management and conservation.

Policies will inevitably evolve in response to climate change and other drivers. The responsiveness of the multi-layered system of governance in the UK will have a profound influence on how effectively land is used in the future to deliver sustainable social, economic and environmental goals.

A key challenge will be:

- How governance of the land system should respond to manage pressures on goods and services provided by land at national, regional and local levels.

The risks of inaction: some illustrative examples

Without significant policy changes, the drivers of change will interact to create growing tensions and conflict between sectors, with serious implications for the UK's wellbeing and prosperity. Without action, possible consequences include[10]*:*

- **Increasing demand for water as a result of expected population growth and urbanisation, occurring alongside reduced water availability.** Climate change impacts in the UK are expected to result in significant reductions in river flows and groundwater recharge[11], amid general patterns of rising demand through to 2050, with the highest increases expected in the South East of England.
- **Detrimental impacts on the state of the natural environment.** Declining bird populations are used as an indicator of the health of the natural environment. Since 2000 there has been deterioration in populations of breeding farmland birds, breeding seabirds, as well as in plant diversity in woodland and grassland and boundary habitats.
- **Potential vulnerability of farming communities in upland areas and abandonment of land, where viability is more dependent on income support.** This could result in a serious loss of the public goods and services provided by land mainly managed for food production, but where benefits relating to landscape quality, water resources and recreation also accrue.
- **Difficulties in achieving EU 2020 targets for renewable energy at reasonable cost, if there are delays in the development of on-shore wind farms and other forms of renewable energy production.** A significant increase in renewable energy capacity is required. Land use and planning policies have a critical role to play in shaping incentives to ensure the required changes in land use occur.
- **House prices resuming their rise ahead of general inflation with implications for affordability, and smaller homes.** Between 1969 and 2008 property prices rose at an average real rate of 3.5%, and rapid growth is expected to resume. Rising incomes drive real house prices increases where the supply of land is restricted. New, smaller houses in the UK are being built at higher densities than the average for the current stock.
- **The difference between the price of land with planning permission for development and other land will remain excessive in areas of high demand for development.** One study[12] shows that obtaining permission to change use from agricultural to residential use can increase the price of the land by as much as 600–700-fold, creating very substantial gains for the landowner and high costs for house buyers. Regional disparities in relative land scarcity between the South East of England and other parts of the UK could grow if existing patterns of development continue.

10 The examples listed are intended to be illustrative rather than exhaustive. They are not presented in any order of priority.

11 See Chapter 4, Section 4.1 of the Final Project Report..

12 See Chapter 5, Section 5.2 of the Final Project Report..

4. Three particularly important cross sectoral challenges

The major drivers of change, identified in Section 3 above, will exacerbate existing tensions and challenges and also interact to generate new ones. This Project has identified three major cross-sectoral challenges for the next 50 years that require specific attention, as currently there is a danger that they will not be fully addressed. These are discussed below and are followed by Section 5 which considers individual land use sectors.

It is important to recognise that all three of the challenges detailed below will inevitably be subject to uncertainties that will increase into the future. Therefore, a major task for policy-makers will be to develop policies and approaches that are robust to a range of possible outcomes. In this context, the Project has developed three contrasting future scenarios as an analytical tool to help to evaluate possible policy changes[13].

4.1 Rising demand for land in and around the South East of England

In the South East of England demographic shifts, together with rising incomes and expectations, will combine to drive up demand for land, not only in the housing and commercial sectors, but also for local services and infrastructure, water supply, and land for recreation. Changing land use patterns and policies in the South East will also have wider implications for the rest of the UK[14].

There are important decisions to be made on the desirable balance between accommodating a rising population in the South East of England, or encouraging population shifts to other regions or countries in the UK.

This could involve:

- Ensuring that those who live and work in the South East bear (as far as possible) the full costs involved – including their footprint from housing, congestion, pollution, water resources, and on the natural environment; or incentivising demand in other regions (for example, through regional economic policies).
- Accepting increasing demand in the South East will inevitably lead to choices between:
  - Policies that either encourage living at higher densities; or
  - Making more land available for development.

The size of dwellings in many other developed countries already exceeds that in the UK, and aspirations for larger homes associated with rising incomes can be expected to continue. If land release policies are pursued, decisions will be needed on what types of land to release, in which areas, and what this implies for the present location and use of green belts. It will also have implications for the development of infrastructure in sectors making use of land, such as water supply, housing, transport, and public services.

13 See Appendix E of the Final Project Report.

14 A more detailed discussion of the challenges facing the South East of England can be found in Chapter 6 of the Final Project Report.

4.2 Climate change and land use

As outlined in Section 3 above, land use will play a pivotal role in both mitigation of and adaptation to climate change. Further research into the complex interaction between the effect of climate change on land itself, and the use of land to reduce greenhouse gas emissions, is needed. It should be integrated into policy to avoid land use and management changes undermining emission reduction targets.

Because of the scale of the climate change challenge, together with the diversity and interaction of conflicting sectoral interests, there is a strong case for an integrated and coherent climate change adaptation and mitigation strategy which takes a broad view: across the land use system, and of the effect of a common and adequate price for carbon. Without such a broad perspective, it is possible that the many implications of climate change for land use may create unacceptably large tensions with other land use sectors.

4.3 Delivery of public goods and services

In a land system increasingly influenced by both global and domestic markets, it will be vital to ensure the continued delivery of public goods and services from land, a large proportion of which is in private ownership.

Goods and services from land include countryside amenity and ecosystem services in rural and urban areas – for example, relating to biodiversity, water regulation and carbon sequestration. Options include:

- Actively promoting and incentivising the 'multifunctional' use of land as an obvious and potentially sustainable response. However, it would require a combination of institutional and regulatory mechanisms and economic incentives to achieve this.

- Movement towards an area, or catchment-based approach to land use policy, rather than through the functional management of land within existing administrative boundaries. This could involve the creation of land management institutions and encouragement of stewardship covenants and partnerships to enable different aspects of individual tracts of land to be considered together by local communities and stakeholders in decision-making.

Workable area-based or functional approaches need to be predicated on incentive structures, and thus decisions will be needed on:

- How funding streams and charges can contribute. Given the unique nature of land, such incentives need to be tailored to individual areas or catchments, whichever approach is adopted.

- The necessary institutional arrangements – in particular, the balance between national, regional and locally-determined mechanisms.

The strategic management of those services that land provides where the source is distant from the end consumer, also needs to be considered: water supply and flood risk management are both areas where the combined effect of climate change and demographic shifts are likely to exacerbate existing pressures. Provision of these services cannot be left solely to local communities as there could be substantial cumulative effects.

5. Sectoral pressures

A theme running throughout this report concerns the multiple and growing demands we make on land. These arise primarily in nine sectors which make a major contribution to the wellbeing and prosperity of people living in the UK. They include land for water resources, conservation, agriculture, woodlands and forestry, flood risk management, energy infrastructure, residential and commercial development, transport infrastructure and recreation[15]*. In this report, the current and future trends for each sector with regard to their impact on land use change are analysed.*

Identifying the most important implications for policy within individual land use sectors is fundamental to reviewing the effectiveness of land use (see Sections 5.1 – 5.9). However, in considering these sectors, it should be stressed that they can all interact with each other in complex ways: as illustrated in Section 4 above, and discussed below.

5.1 Land for water resource management

Land plays a crucial role in the supply of water. Three key challenges over the next 50 years will include: managing land use to protect the future quality and supply of both surface and groundwater; the effects of climate change, which will affect both quality and quantity of supply; and population growth, which will drive demand. Meeting these challenges will require integrated and cross-governmental approaches to ensure sustainable water use.

Suggested priorities for action:

- *Developing a more integrated strategy for quality and supply – involving integrated catchment area management, water pricing, and demand management, particularly in areas of stress – and ensuring that the implications for water resources are factored more systematically into decision-making on land use and land management changes, nationally, regionally and locally.*

- *Developing a plan of action to reverse long-term degradation of aquifers due to ingress of nitrates and other contaminants.*

As both the supply and demand for water resources interact with a wide range of factors – such as soil protection, flood risk management, climate change mitigation and housing supply, developing an improved understanding of relevant interactions will be important in managing future water resources. There is therefore a case for further research in the following areas:

- **Pricing.** Sustaining a larger population will require a combination of increasing supply, which would be expensive (desalination, pipelines, reservoirs), and managing demand (e.g. pricing, metering). Getting prices right (i.e. taking account of the full cost of water supply including environmental consequences) can also play a central role in resolving availability problems.

- **Technological solutions such as re-use and recycling of water.** These have the potential to impact on the efficacy of water-related ecosystem services and are

15 Detailed discussion of all nine sectors of land use and their interactions, can be found in Chapters 4, 5 and 7 of the Final Project Report.

likely to be progressively deployed by treatment on-site and direct reuse, or by indirect reuse.

- **Cross-government investment in monitoring and modelling at appropriate temporal and spatial scales.** This is essential to deliver the evidence base on which to make informed choices on where land use and land management can increase the sustainable use of water in the long term.

5.2 Land use for conservation

In the UK, as elsewhere, few landscapes remain natural. Nevertheless, many of our distinctive semi-natural habitats and cultural landscapes are valued in terms of their importance to the country's identity and heritage, protecting wildlife, and for the contribution they make to people's wellbeing and prosperity. However, future effects of climate change and human-led changes in land use will present substantial challenges to the UK's semi-natural environments.

Suggested priorities for action:

- *Evaluate how protected areas for wildlife might become better connected to help species adapt to climate change and changing habitats.*
- *Review the effectiveness and operation of existing regulatory and other measures designed to ensure the quality and management of land within designated areas, to ensure they are fully utilised.*
- *Review possible future measures which influence land management beyond the designated area, together with those relating to the designated areas themselves – recognising that the effects of the two will interact.*

Wildlife is already responding to climate change through changes to seasonal events such as flowering, species distribution and species abundance. However, changes in land use have led to the fragmentation of habitats. Therefore, as climate change begins to affect land cover, some species may not be able to adapt to these changing conditions[16].

Specific implications for policy include:

- Biodiversity, landscape and historic environments are currently governed by separate systems, although there can be overlaps. There is a case to reconsider this sectoral approach, as the interactions between these different perspectives on the value that society attaches to land become clearer. The ecosystem services approach, supported by the National Ecosystem Assessment, provides a valuable way of dealing with this issue.
- The management of other land use sectors should recognise the value of biodiversity that resides in everyday surroundings. For example, in the urban environment, this means recognising the important role that gardens and green spaces can play. Local development schemes could aim to provide greater environmental benefits; for example, by creating areas of new habitats, and also by helping to deliver national-scale landscape networks.

16 See Chapter 4, Section 4.2 of the Final Project Report..

- Biodiversity, landscape and aesthetic value, and other cultural services provided by land, are often not marketed. New incentives could be needed to ensure that managing land for this purpose is encouraged, particularly in urban areas.

5.3 Agriculture

As the global population grows and market conditions change, the role of land for food and energy production in the UK will also evolve. Agriculture is arguably the single most dominant influence on the landscape. It currently occupies over 70% of the UK land surface. Besides playing a role in the supply of food, it is an integral part of the food industry and contributes to the economy and wider environmental aims. However, many of the roles and services provided by the agriculture sector are not fully rewarded.

A suggested priority for action:

- *Review and redesign incentives and reward systems for managers of rural land – to reflect the cost of carbon and the wide range of ecosystem services the land can provide alongside the production of food, fibre and energy.*

There are three important drivers of change in agricultural land. First, international markets for agricultural commodities determine the incentives for farmers to produce food, either for domestic consumption or export. Secondly, agri-environment policy influences land use by requiring farmers to adopt good agricultural and environmental practices, rewarding them for environmental improvement. Thirdly, new technologies and innovations induced by markets and regulation provide new possibilities for sustainable farming.

- The productivity of agriculture must be enhanced while simultaneously reducing its environmental burden. This requires new investments in technologies, knowledge and skills to improve the future sustainability of agricultural land use. This will require diverse collaborations amongst many different stakeholders, public and private, with interests in the future of land and the services it provides.

- It is important to maintain critical capacity in high-quality farmland and the physical infrastructure that supports it, such as land drainage systems. These are important strategic assets that are likely to increase in value, but be subject to greater risk, in the advent of climate change and increased global demand for food and energy.

- It will be necessary to recognise and reward the multiple roles of agriculture, not only as a producer of food but also as a provider of many other, wider ecosystem services which, because they are non-priced 'public goods', can go unrecognised and unrewarded. These include climate change mitigation through carbon sequestration, flood risk management, protection of biodiversity, and recreation. These multiple benefits must be realised through new adaptive technologies and systems of governance, including incentives for low-carbon agriculture.

- The current arrangements for income support for farmers could be better targeted to help agriculture reduce its negative impacts and considerably enhance its beneficial impacts in the public interest. This can be done in ways that simultaneously support rural livelihoods and the economy, both in the uplands and lowlands.

5.4 Woodland and forestry

The land area covered by woodlands and forests has more than doubled since 1924 and now covers nearly 12% of the UK land area. Forests represent long-term investments for the nation, and together with woodlands, provide diverse benefits and services including commercial timber production and non-marketed services such as biodiversity, flood protection, climate change mitigation, recreation and amenity. However, the commercial value of forests, and the incentives provided to the new planting of forests and woodlands, are in most cases much less than the value of benefits provided. This poses a significant challenge to the future of this key national asset.

A suggested priority for action:

- *Decide how best to promote and encourage the careful use and positioning of forestry and woodlands to extend the range of benefits they provide in addition to timber.*

Further possible actions include:

- Service provision needs to be integrated by strengthening policies to promote multifunctional forests and woodlands, especially in England. The implications of forest and woodland management for flooding and water quality management needs particular emphasis.

- The need for improved soil carbon management and the integration of energy issues into both agriculture and forestry means that policies for these two sectors need to be better integrated. The introduction of carbon trading is likely to affect planting and harvesting strategies.

- The location of forests relative to centres of population can be a critical determinant of value. There is therefore a case to extend Community Forest and Farm Woodland initiatives.

- New research is required to enable forest and woodland to play a full role in climate change mitigation and adaptation – climate change will have spatially-distinct impacts on forest and woodland services.

A possible increase in demand for conventional wood products over the next 50 years will not be met from standing timber resources. The contribution of forests and woodlands to meeting this deficit could be increased, but new incentives are likely to be required given the long lead times involved.

5.5 Flooding

Where we build and how we manage land is intimately connected with flood risk due to surface, fluvial and groundwater sources. Climate change is likely to increase the frequency of flooding, with consequences for property, livelihoods, infrastructure, agricultural production, and ecosystems. It is estimated[17] *that by 2035, the number of existing properties exposed to 'significant' risk of flooding in England alone could rise from about 500,000 to over 800,000 in the absence of any increase in expenditure on flood protection.*

17 See Chapter 4, Section 4.5 of the Final Project Report..

Suggested priorities for action:

- *Development of proposals for integrating the analysis of flood risk and management costs more fully into the appraisal of different land use options.*

- *The development of regulatory and economic instruments to provide appropriate incentives to enable increasing levels of flood risk to be managed. In particular, the full cost of long-term flood protection and increased risk needs to be taken into account when new developments are proposed in flood risk areas.*

There is broad experience in the UK in flood risk management but, given the prospects of increased pressure on land use and increased flood risk due to climate change, there will be much greater need in future for:

- **Better understanding of the relationship between land use and flood risk management.** The extent to which changes in land management can 'mitigate' flooding at the catchment scale for extreme rainfall events remains unclear, although it is likely that rural land can contribute to flood alleviation by retaining and storing floodwaters in vulnerable catchments. Across the range of urban and rural areas, cost-effective 'adaptive' measures to reduce flood damage costs, including controls on land use and development, are needed.

- **Better appraisal of options for flood risk management and for evaluation of the implications for land use.** In addition to engineered flood defences, the resilience of existing and new buildings and property to flooding need to be improved.

- **More proactive flood plain zoning can help to reduce future exposure to flooding in the built environment, using flood corridors in urban areas to help deal with peak flows.** The case for zoning of coastal floodplains is even stronger given the predicted rise in relative sea levels[18]. Achieving change in land use, including making more space for water, will require government to consider issues of incentives, compensation and social equity. A much stronger and integrated role in development and land use planning for agencies responsible for flood risk management is required.

- **Exploiting the broad scope for joining flood risk management with other land use objectives and benefits.** There is significant potential for changes in management of agricultural land to reduce runoff, soil erosion and water pollution simultaneously, and to combine flood storage and restoration of floodplain ecology both in rural and urban areas. A broader, integrated approach requires new and diverse collaborations amongst regulators, land managers, developers, the corporate sector and the insurance industry, as well as the integration of different policy areas and funding streams.

5.6 Energy

The land take associated with conventional energy production has been modest to date, although this could change substantially through the shift to low-carbon production. Increasing the low-carbon energy supply through the planning system, pricing and new technologies will be key.

18 See the Intergovernmental Panel on Climate Change (IPCC) 2007 Fourth Assessment Report and subsequent reports following the Copenhagen Summit in 2009.

Suggested priorities for action:

- *Identify and prioritise delivery of land-based measures needed to ensure the EU 2020 Renewable Energy Targets are met, including a step change in granting planning approval for on-shore renewables.*

- *Pricing of carbon in the energy sector and competing land uses (including agriculture and forestry) should be reviewed, so that better price signals guide land use changes.*

The implications of the energy sector for land use in the future will depend on both the growth of demand and trends in the pattern of supply.

- **Planning.** A major shift will be needed in granting planning approval for on-shore renewables and transmission lines if the UK is to meet its EU 2020 Renewable Energy Targets at reasonable cost. Recent changes to the planning system, including the establishment of the Infrastructure Planning Commission, should help in the resolution of conflicts between national priorities and local sensitivities, but remain untested. Land take for on-shore wind turbines in some scenarios to 2050 could be 1–4%[19].

- **Energy crops.** Unlike wind, energy crops could add substantially to the demand for land, potentially providing direct competition with food production. Supplying 8–12% of the 2050 energy demand from the UK-grown energy crops (rather than from imports) would need up to 25% of the land area. There is a case for further R&D support for developing energy crops, and for analysis to inform how best to incentivise the production of specific fuels, ensuring that fossil energy and carbon emission permits are 'correctly' priced.

- **Appropriate pricing.** Energy, carbon and potentially, ecosystem services[20] need to be appropriately priced to: guide the land use changes required to achieve renewables targets; recognise the value of ecosystem services; and to inform decisions on the design of incentives for growing different crops i.e. for food, energy or forestry, as well as peatland restoration.

5.7 Residential and commercial development

Despite popular misconceptions, land in the UK is relatively undeveloped[21] (for example, around 90% in the case of England). Projections of total household numbers in England suggest possible rises of 6.3 million (29%) between 2006 and 2031, or 252,000 households per year, with a large proportion of the growth in the South East of England. Managing these increases whilst meeting public aspirations for lower-density housing will be a significant challenge.

Suggested priorities for action:

- *The strategic policy options for meeting development needs in the South East of England and other high demand areas – including whether to make additional land available for development – will need to factor in the full impacts on the land system at*

19 See Chapter 5, Section 5.1 of the Final Project Report..

20 See Chapter 3 of the Final Project Report..

21 'Developed' here means 'built on'. Nearly all land has been modified in some form.

an early stage in policy development. These include the range of ecosystem services, local services and infrastructure, public preferences, the appropriate mechanisms for delivery, and the present and future value of land in alternative uses.

- *Consider the need for a duty on local planning authorities to consult formally with local residents on options, benefits and trade-offs for new forms of development. This should be based on detailed analysis and evidence, as pioneered, for example, in the Cambridge Futures exercise*[22].

England is the most densely populated country in the UK. Housing densities are increasing (up from 25 dwellings/hectare in 2002 to over 40 in 2007), and houses are becoming smaller. New houses in the UK are now amongst the smallest in Europe, despite strong evidence that people generally dislike living at high density[23].

- Policy-makers need to find ways to accommodate future population growth whilst balancing public aspirations for lower-density housing and protecting the countryside. The analysis in this report suggests the balance struck must reflect the full value or strategic importance (including non-marketed services) of land in alternative uses.

- There is a strong economic case that planning controls on land in some areas, especially in the South East of England, are tighter than can be justified by current valuations of the net costs of development. Releasing land for development in areas of high demand can confer large social welfare gains and would require some relaxation of planning policy. The long-term social, economic and environmental costs and benefits will need to be carefully weighed.

- The allocation of housing and development land needs to pay appropriate attention to costs such as flood risk, and the real cost of water supply.

5.8 Transport

Transport-related infrastructure represents almost 25% of the total developed land in England, occupying 2.4% of the total land area. Transport infrastructure is essential for the efficient and healthy functioning of society, business and the economy. The transport network of Britain is well connected but suffers from creeping congestion. The annual cost of excess delays in English urban areas is currently estimated to be £17.5 billion in terms of lost time and resources. Unless ways are found of managing this congestion, including road investments, losses could increase by an additional £22 billion per year by 2025. By the period 2020 to 2030, there is also likely to be substantial overcrowding on the rail network, particularly on the East and West Coast mainlines.

22 See Chapter 7 of the Final Project Report.

23 See Chapter 5, Section 5.2 of the Final Project Report.

A suggested priority for action:

- *The development of proposals to ensure that provision of transport services is fully integrated into future land use strategies and specific proposals for change of use. For example, these would link future policies influencing settlement patterns with infrastructure provision and climate change.*

Failure to integrate transport into land use strategy over the next two decades will have serious consequences for congestion, pollution and managing climate change, and will lead to mismatches between the location of housing development and the availability of jobs.

- There is evidence that policies which seek to reduce the need of travel by increasing the density of development are unlikely to work in isolation, and may exacerbate congestion and environmental damage. Costs for individual householders in terms of reduced space and higher prices need to be taken into account.

- Evidence suggests that rationing road use in cities by pricing is economically and environmentally sound, but may accelerate the rate of decentralisation of economic activities to fringe locations ('Edge Cities').

- It is essential that the full costs of congestion and the need for new transport infrastructure are taken fully into account in decisions about the location of development, which should seek to take advantage of existing links.

- Increasing capacity for public transport to reduce inter- and intra-urban congestion is highly beneficial and would have small effect on overall land take.

5.9 Land for recreation

Leisure activities are a fundamental part to modern lifestyles and play a vital role in promoting health and wellbeing. The recreation and tourism or 'visitor' economy has been estimated to contribute £52 billion per year, or 3.7% of the UK economy[24]. Taking account of the wider indirect impacts, the sector is estimated to account for £114 billion or 8.7% of UK GDP. Despite short-term declines, tourism and recreation are predicted to grow in the future.

A suggested priority for action:

- *Ensure there is appropriate policy-relevant research into the value of different landscapes for recreation and tourism in urban, urban fringe and rural settings – including their contribution to individual and community wellbeing and prosperity, and to the UK economy.*

24 See Chapter 5, Section 5.4 of the Final Project Report..

Some aspects of tourism and leisure activities require dedicated areas of land, while others are often managed through other primary land uses such as agriculture and forestry.

- Future pressures on land use from tourism will stem particularly from inbound visitors. It has been estimated that there could be a doubling of international tourism by 2020, with implications for land use in terms of provision of accommodation, facilities, infrastructure and transport, as well as management issues.

- Population growth and increased recreational participation rates could lead to demand for more facilities for sports and active recreation. If policies of urban containment and densification continue, competition with other forms of development in urban areas might intensify, resulting in loss of urban recreational facilities, gardens and green spaces.

The importance of green space in and near towns and cities is likely to grow as population densities increase. There are major challenges ahead in finding the right mix of development and green space, in achieving appropriate design of green spaces, and in securing proper long-term management.

- Rural recreation has been important for many people over the last 50 years, encouraged by the mobility brought by the car and opportunities to escape from the urban environment. Some drivers of change may serve to increase the number of visits, aiding the rural economy in many places. Others, especially ICT-related technological drivers and restrictions on car use, could drastically reduce the demand for access to the countryside in the medium to longer term.

Past and present land use[25]

Land use governance in its broad sense – including how land is valued and its use incentivised, in addition to formal governance structures – has evolved over the past 50 years in response to changing demands and expectations. However, whilst this has, to an extent, enabled land to deliver substantial benefits – for example, the containment of urban sprawl – there is now a strong case for reappraisal (see Section 7).

The way land is now used and managed is a legacy of historical priorities and incremental societal change. The purpose of managing the land use system has broadened substantially over the last 60 years. In the post-war period, the emphasis was on rebuilding cities and the economy, decentralising the population from overcrowded and bomb-damaged inner-city areas, preventing urban sprawl, providing sufficient quantity of housing, and controlling new development.

Most new housing has been built within existing settlements or in small rural developments; and more crop and grazing land has been turned over to woodland in the last 25 years than into housing. Change from agriculture to developed uses has been low in recent years, and is slowing down.

The UK has been generally successful in containing urban sprawl, but market pressures and changing socio-economic conditions strongly suggest the need to review the principles and practices built on historical perspectives of managing development. The processes of governance, divided between various agents and strategies, are complicated and have created uncertainty, for example, for land managers[26]. The rural-urban divide is no longer clear-cut, and the separation of governance responsibilities may not be helpful in tackling the challenges covered in this report.

Much urban land is now managed by a range of quasi-public, private or market-led management and delivery mechanisms. These sit alongside the local authority planning mechanisms, and are not easily coordinated. The systems and mechanisms that guide land use change in the future will need to reflect new priorities, new trends in patterns of use, and changing concepts of how land creates value.

25 A detailed discussion of past and present trends in land use can be found in Chapter 2 of the Final Project Report.

26 For example, see Natural England's 'Demonstrator Project' commissioned and reported in 2009.

6. The need for a better appreciation of value in land use governance

How we value land, and the services it provides, is at the heart of decisions on land use change[27]. However, as priorities for land use and land management shift (for example, to reflect long-term challenges identified in this report), these need to be reflected in how we govern land use today.

There is a strong case for decisions about land use – at all levels, and across different land use sectors – to reflect a much broader concept of the value generated by land. Only then will the greatest benefits be unlocked, and tensions effectively managed. A more sophisticated approach to valuing land needs to be embedded into policy cycles and into the governance mechanisms, including future incentives and regulation.

If the land system is to deliver best value for the country in a sustainable way, we need to estimate the value of land in alternative possible uses (including for future generations), recognising that planners, local authorities and the Government must act within existing laws that respect property rights. The appropriate concept of value is a broad one, encompassing the full range of ecosystem services, whether or not they are marketed.

The economic approach to valuation seeks to quantify values as far as possible, establishing monetary values (or ideas such as willingness to pay) as a widely understood basis for comparison. But some argue[28] that this approach is more difficult to apply to some services provided by land (for example relating to the value of the natural environment). As such, this could result in undue weight being given to values that are more easily measured. Foresight's analysis suggests that quantification and finding new ways to understand and measure value will remain important, but that there is scope for integrating both types of values more comprehensively into cost-benefit analysis through approaches that attempt to weigh the full impact of policies on, for example, public health and ecosystem services[29].

Given the growing demands being placed on land, and the sometimes conflicting needs of individual households, communities, regions and the country as a whole, it is important to ensure that mechanisms – economic or regulatory – are in place to deliver best value.

As pressures on land grow, activities that damage land and result in negative environmental impacts need to be discouraged, for example, through regulation by making the 'polluter pay'. Conversely, activities that enhance land quality and provide environmental services that benefit society should be encouraged and rewarded, through schemes that reward land managers for environmental services. This process itself may need to be part of a deliberative process of arbitration over particular decisions, but could be facilitated by a general review of taxes and subsidies or payment schemes.

27 See Chapter 3 of the Final Project Report for a discussion on the value of land.

28 See Foresight workshop report November 2008 – 'Valuing Land' (available at www.foresign.gov.uk).

29 The 'Ecosystems Approach'

7. Achieving sustainable land use

7.1 'Systemic' issues in managing land use that need to be addressed

Detailed analysis of how the present land use system operates for different sectors of land use, at different spatial scales and at different levels of governance, has identified a range of 'systemic' issues that need to be addressed[30]. This is necessary in order to meet future challenges and realise future opportunities more effectively and sustainably.

Section 6 above has already outlined the need to broaden our concept of the value of land and how that information should be used to inform land use policy and governance in its broadest sense. However, this report has identified a number of other broad issues relating to the present land use system that need to be addressed in order to meet the many challenges and opportunities over the next 50 years. The following illustrates some of these 'systemic' issues. Chapter 7 of the full Project Report provides a more detailed discussion of these and others. It also discusses options for addressing them.

The disconnect between institutional arrangements and private ownership

Institutional arrangements for land use policies can sit uncomfortably alongside private ownership of land and property rights. A balance needs to be struck between protecting the interests of landowners, local priorities, and the wider public interest; and between short-term priorities and possible future needs.

At present, private incentives, in local land markets and local planning institutions, are not always aligned with the declared objectives of land use policy. This makes conflict and delay endemic in the governance system. The fiscal system, particularly the local tax system, can also contribute to this misalignment of incentives. For example, new urban developments typically impose significant costs on the local community, including increased service usage, impacts on transport capacity, and local amenity degradation. However, central government revenue streams take time to adjust to changes at local level; and the central operation of business rates means that local authorities cannot increase local taxation to meet up-front costs without an undue burden on existing residents.

The need for an overarching perspective

Some local decisions relating to development are heavily controlled, and are guided by planning policy that requires important issues such as the effect on the natural environment to be factored in[31]. However, it can be unclear which issues take priority, whether the cumulative effect of such decisions is recognised, and how strategically important or unique the effect of a given change in that location may be.

The need to incentivise better the provision of public goods and services

For example, there is an inherent tension in the business needs of farmers and their ability to deliver a range of public goods and ecosystem services. While it is important that farmers protect natural resources and prevent environmental damage, they, together with non-farming rural landowners need to be rewarded for the continued provision of public goods and ecosystem services.

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30 Section 7.3 of Chapter 7 of the Final Project Report provides further discussion on these 'systemic' issues.

31 See Chapter 2 of the Final Project Report..

Aligning incentives and policy objectives

In some areas of the UK, the misalignment of incentives and policy objectives is leading to very high differentials in prices for land in different uses; for example, between housing and agriculture[32]. Much greater effort needs to be made to ensure that property rights, prices and incentives are properly aligned with strategic policy objectives, so that these price differentials can be reduced. Also, where market prices convey important information about the general public's preferences and pent-up demand for land, there is a strong argument that this information should inform land use policy at a strategic level; as well as other means of reflecting preferences (for example surveys).

Tensions between different parts of the land use governance system

The structures in place to deliver land use change unrelated to built uses are subject to different governance arrangements (often at EU or international level, such as the Water Framework Directive), compared with those related to built uses. Furthermore, responsibilities for energy, transport, agriculture and environmental policy, and the land use implications involved, are divided between different government departments and involve different institutional arrangements[33]. All have an impact on land use or land management. Mechanisms for ensuring that a coherent and consistent approach to policy-making is taken across these different sectors are needed.

The need to improve how conflicts are addressed – between different sectors, spatial scales, and levels of governance

Growing competition for land means that individual parcels of land and landscapes will come under increased pressure to deliver a wider range of goods and services. As demonstrated in Sections 4 and 5, the land use sectors that deliver these can conflict with each other, so it is vitally important that the system that governs the allocation, use and management of land should be more coherent and consistent, both across different land use sectors and across national, regional and local levels of governance. This is important if tensions are to be managed effectively. Examples include managing the environmental implications of some intensive farming methods, land for food versus land for some energy crops, and inner city land for commercial development versus land for sports and leisure. Conflicts between current and potential land uses are frequently manifested in delays to the planning process and legal wrangling. Tensions have also arisen between the operation of the market and regulation of land use.

The planning system mediates between these conflicts, while taking account of national, regional and local expectations, and being responsive to the needs of landowners, developers, the state, and the public. More recently, in response to the prospect of climate change, damage to the natural environment and a national political commitment to sustainable development, the planning system has adopted a broader perspective on valuing land and in assessing the impact of land use change.

32 See Chapter 3 and also Section 4.1.1 of the Final Project Report.

33 See 'Governance System' diagram in the Systems Maps Catalogue (this Project report may be obtained through www.foresight.gov.uk).

An overview

It is important that the governance system that regulates the allocation, use and management of land should be coherent and consistent. This is because the current system:

- Involves decisions taken at different spatial scales that do not always reflect the scale at which impacts are felt, or reflect how natural systems operate. For example, effective water resource management requires action across the whole catchment;
- Fails to properly account for the many external benefits and costs associated with land use with consequences for overall welfare;
- Combines market mechanisms and regulation in ways that can conflict, generating severe pressures in some sectors such as housing;
- Is in some respects a legacy of historical priorities which may not reflect the value of the land in different uses, influenced by new and future aspirations and priorities;
- Has different governance arrangements for urban and rural domains;
- Faces growing pressures as population and demands for goods and services from land rise, and as climate change poses greater challenges relating to both adaptation and mitigation.

7.2 A critical choice for policy-makers – towards a more coherent and consistent approach

This Executive Summary has identified challenges in three broad categories:

- *Three key cross-cutting challenges for the next 50 years (relating to the South East of England, climate change, and the delivery of public goods and services – Section 4);*
- *Challenges spanning nine sectors of land use – many of which also interact with each other – Section 5; and*
- *'Systemic' issues that are inherent in the system for managing land use and which need to be addressed – Section 7.1.*

The scale of these future challenges means that 'no change' is not an option as this could result in, for example:

- *Missed targets (e.g. housing and renewable energy);*
- *Further degradation of our natural environment (e.g. due to habitat fragmentation);*
- *A failure to adequately manage tensions between individual land use sectors and in geographic 'hot spots' such as the South East of England;*
- *Undersupply of public goods and services, such as water quality and urban green space; and*
- *A missed opportunity to realise greater benefit from land.*

A critical choice for Governments[34] *is whether to address the future challenges in an incremental and piecemeal fashion, or whether to aim for a more coherent and consistent approach to managing land use – or indeed some combination of the two*[35].

The key requirements are:

- Decisions that take account of the full value of land in alternative uses;
- Value is assessed on a consistent basis by decision-makers at different spatial levels and in different sectors;
- Private incentives are aligned as far as possible with social objectives and values – to minimise tensions in the system and deliver better outcomes;
- The identification and promotion of opportunities for multifunctional land use and benefits;
- The use of a combination of regulatory, institutional and economic mechanisms to enable best value to be delivered most efficiently and at least cost.

If these requirements are not met, there is a risk that incremental decision-making on individual project and land choices will continue to create unintended consequences and unsustainable outcomes, some of which may be irreversible. Certainty and direction for all the governance processes at different levels of decision-making are needed, whatever the balance between regulation and market mechanisms.

The guiding principle for a more coherent approach would be to combine a more sophisticated understanding of how land creates value for society with governance which more proactively incentivises achievement of better value and the delivery of a wide range of sustainable and valued land services. This approach would help to identify and manage:

- Land-related problems in urban and rural areas which, if left unresolved, are likely to get worse or dramatically reduce wellbeing;
- Vulnerabilities or systemic weaknesses on which external influences and forces could cause a spiralling of unintended and adverse consequences;
- Geographical 'pressure points' where a combination of influences have impact;
- Policy dilemmas where targets and commitments could lead to unintended consequences or produce conflicting outcomes;
- Drivers that produce uncertain outcomes over which we have little control.

There is therefore a strong case for governments to develop an over-arching approach which: recognises the cross-cutting nature of land across different sectors; adopts a long-term perspective; and takes account of the impact of changing circumstances

34 In the Executive Summary, 'Governments' refers to any of the Governments of the United Kingdom and its devolved administrations.

35 Chapter 7 of the Final Project Report provides a more detailed discussion of the need for a more coherent and consistent approach to land use governance.

(notably relating to climate change, changes in population size and distribution, and incomes). This would encompass all land use and management change – including the built and natural environment – in a consistent way. By building upon existing systems, their contribution over past decades would be acknowledged, but the need for change would be recognised.

7.3 The components of a strategic approach to land use governance

The design of a strategic approach for land use needs to be framed by political decisions – for example, on the balance between national, regional and local powers; the relative importance of the various future challenges; and the relative roles of regulation, incentives and markets. Wider issues of resource availability and the inherent capacity of land would also be a major consideration, as would the appropriate balance between economic development, social progress and environmental protection.

The task of developing this shift in approach should not be underestimated. It will require the support and leadership at the highest levels of government to stand any chance of succeeding.

Spatial aspects will be important. There is a need to take account of spatial variations in the demand for, and supply of, land resources of given qualities, and in the comparative advantage that land (and other natural resources such as water) bestows on particular regions and communities. Such 'critical geographies' mean that, although there are common challenges regarding land management, they vary considerably between different locations. Examples include: responding to housing demand in the densely-populated South East of England; maximising the net value of investment and existing infrastructure in northern cities, Wales, Scotland and Northern Ireland; and supporting rural livelihoods in relatively remote upland areas.

The appropriate framework for land use decisions will depend respective weight given to regulatory, voluntary and market mechanisms. A decentralised style might provide a national framework, consisting of broad principles informing a common approach to decision-making and methodology. The detail of implementation would be the responsibility of regional or local decision-making bodies, sectoral administrations, and civil society, largely relying on market processes. A more centralised style would involve greater direction from a national government body charged with overall responsibility for achieving the strategic and sustainable management of land assets. Either way, the critical innovation would be to embody the requirements set out in Section 7.2.

In summary, the essential elements of such an approach could include[36]:

- Establishing and cascading UK-wide land use objectives and priorities – aspirational or mandatory – ensuring consistency and compatibility across policy domains, but respects devolution;
- Ensuring clarity on decision making at national, regional and local levels, so that there is a balance between delivering national and strategic objectives whilst respecting regional and local circumstances;
- Ensuring decision-making is integrated and evidence-based. The aim should be to promote decisions that are based on a consistent approach, and which take better

36 Further detail can be found in Chapter 7 of the Final Project Report.

account of the full range of services and values that land could deliver in order to realise the greatest benefits. It also implies the need for guidance on valuation and other methodologies[37];

- Facilitating the collection and dissemination of better data and information flows on land use;
- Ensuring appropriate incentives to guide decisions on land use – particularly for landowners and land managers;
- Promoting decisions and policies that are robust in the face of changing circumstances and future uncertainty. This will involve being clear when future need should take priority over immediate concerns – for example, when the costs of delaying action might outweigh immediate savings;
- Promoting opportunities for multifunctional land uses and collaboration amongst potential beneficiaries;
- Periodic review of outcomes against national and local objectives, coupled with adjustments to incentives and governance;
- When developing new policies and interventions, it will be important to evaluate their robustness against future uncertainties. The scenarios developed by this Project (see Appendix E of the Final Project Report) should be used for this purpose.

7.4 Implementation: administrative and spatial considerations

The mechanism for enabling land's value to be taken into account within a more coherent and consistent approach lies in existing governmental structures and systems – it encompasses incentives and regulation, as well as more formal decision-making mechanisms. A key issue for Governments will concern the extent to which these should be refined, as opposed to working within the existing frameworks.

An underlying requirement will be the need to incentivise and 'mainstream' choices and decisions which can be expected to deliver better value in a sustainable manner, while retaining sufficient overall control to ensure that key objectives are met (such as avoidance of urban sprawl and adequate provision of accessible green space). In this context, it will be important to recognise that certain existing governance structures could militate against a more consistent approach. Examples include:

- The boundaries of administrative areas such as regions and local authorities do not necessarily relate to the functional and economic flows across the land.
- Some specific policies focus on networks, such as the transport system, which stretch across various governmental and geographical boundaries. These may not sit well with strategies and plans for the growth of towns and cities clustered in specific places.
- The forces that drive change in and over the land interact in complex ways, and sector-specific policy responses (in housing, transport, or agriculture, for example),

37 Included here is the need for a better understanding of the value and function of ecosystem services in the formulation and adoption of local and strategic land use policies.

may not be sufficiently effective in addressing the range of different considerations relevant to land use decisions in particular places.

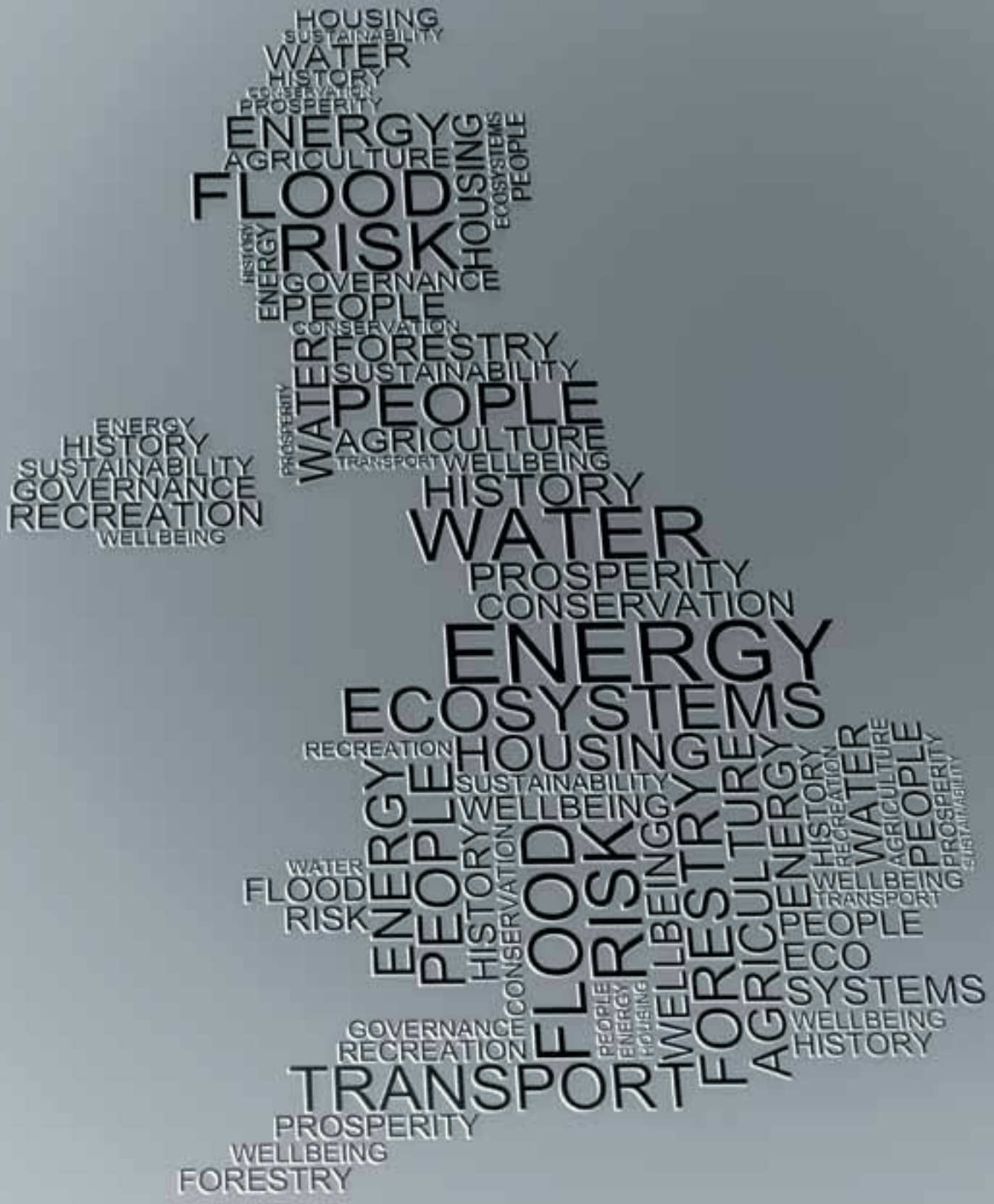
- Multifunctional land use explicitly requires integration of different and hitherto fragmented policy arenas and funding mechanisms. It also requires new collaborations amongst interested and influential stakeholders, and recognition of the diversity of the motivations of land owners and managers.

An important issue is whether a (central) body is necessary to oversee all aspects of land use policy and implementation, or whether a more decentralised approach would be sufficient. The essential requirement is that sufficient oversight should be established so that greater coherence and consistency is achieved.

8. Next steps

More detailed evaluation of the findings will be needed by government departments and the devolved administrations in the first half of 2010, with a view to developing a detailed way forward later in the year.

Consultation with stakeholders would be crucial to this process, as would be the sharing of information and experience between the four countries of the UK.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Appendix B: Evidence reviews and other project documents

The views expressed in these papers are the views of the authors and do not represent the views of the Government Office for Science, nor the policy of the UK Government.

Evidence Reviews (ER)	Ref No.*
Land use change in Britain	ER:1
The present and future use of 'land' below ground	ER:2
The future of soils and land use in the UK: Soil systems for the provision of land-based ecosystem services	ER:3
UK land use and soil carbon sequestration	ER:4
The relationship between land use and surface water resources in the UK	ER:5
Land use, water management and future flood risk	ER:6
The relationship between land use and groundwater resources and quality	ER:7
Land use and biodiversity relationships	ER:8
Land use and the state of the natural environment	ER:9
Land use and the coastal zone	ER:10
The future of the uplands	ER:11
Society's attitudes to and preferences for land and landscape	ER:12
Perceptions about land use	ER:13
Space per person in the UK: A review of densities, trends, experiences and optimum levels	ER:14
Land ownership in the United Kingdom: Trends, preferences and future challenges	ER:15
Rural land ownership in the United Kingdom: Changing patterns and future possibilities for land use	ER:16
Urban land and property ownership patterns in the UK: Trends and forces for change	ER:17
Conservation designations – Are they fit for purpose in the 21st century?	ER:18
Managing land use change	ER:19
The future of housing and homes	ER:20
Social and economic drivers of land use change in the British space economy	ER:21
The present and future land requirements of logistical activities	ER:22
The impact of sustainable energy production on land use in Britain through to 2050	ER:23

* These reference numbers are used throughout the report to refer to the various reviews and papers

Future play: tourism, recreation and land use	ER:24
Property rights, land use and the rural environment: A case for reform	ER:25
Agricultural land use in the era of climate change: The challenge of finding 'Fit for Purpose' data	ER:26
Agricultural technology and land use futures: The UK case	ER:27
Agriculture and land use: Demand for, and supply of, agricultural commodities, characteristics of the farming and food industries, and implications for land use in the UK	ER:28
Land use and climate change in the UK	ER:29
Land use planning and health and well being	ER:30
Future UK land use policy and the risk of infectious disease in humans, livestock and wild animals	ER:31
The state of the natural environment: land use and forestry	ER:32
Digging the backyard: Mining and quarrying in the UK and their impact on future land use	ER:33
Political economy of local and regional development in the UK	ER:35
International perspectives on future land use	ER:38
International perspectives on future land use: country case studies	ER:39
Bringing the real world into economic analyses of land use value: Incorporating spatial complexity	ER:40
Land Use Futures Project reference material	ER:41
Discussion Papers (Dis)	
The following reports and papers contain interesting perspectives, views and opinions but are not formal Evidence Reviews. They do not represent the views of the Government or of Foresight.	
A perspective on sustainable land use	Dis:1
Urban land market and policy failures	Dis:2
Findings from the Rural Economy and Land Use (RELU) projects contributing to the Land Use Futures Project	Dis:3
Horizon scan of emerging issues for the Land Use Futures project	Dis:4
Defra Land Use project: Demonstrator case studies workstream	Dis:5
Land Use Futures environmental valuation paper	Dis:6
Report of the Scoping workshop, 28 February 2008	Dis:7
Report of the Scoping workshop, 12 March 2008	Dis:8
Annex on Change drivers: from scoping workshop report, 12 March 2008	Dis:9
Report of the workshop on framing the SYSTEMS Work, 30 October 2008	Dis:10
Report of the first systems workshop, 1 December 2008	Dis:11
Report of the systems workshops, 20 January and 4 February 2009	Dis:12

Report of the workshop on valuing land, November 2008	Dis:14
Telling stories: Report of the scenarios workshop 18 February 2009	Dis:15
Report of the discussions from the Foresight Land Use Futures Project and the North East Regional Strategy workshop, June 2009	Dis:16
Report of the multifunctionality of land workshop report, July 2009	Dis:17
Report of the workshop on governance of the UK land system, July 2009	Dis:18
Report of the workshop on land valuation and decision making, July 2009	Dis:19

Note: Some reference numbers were originally reserved for reports that were subsequently not commissioned.

All of the Evidence Reviews and Discussion Papers can be downloaded through the Foresight website (http:/www.foresight.gov.uk)

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