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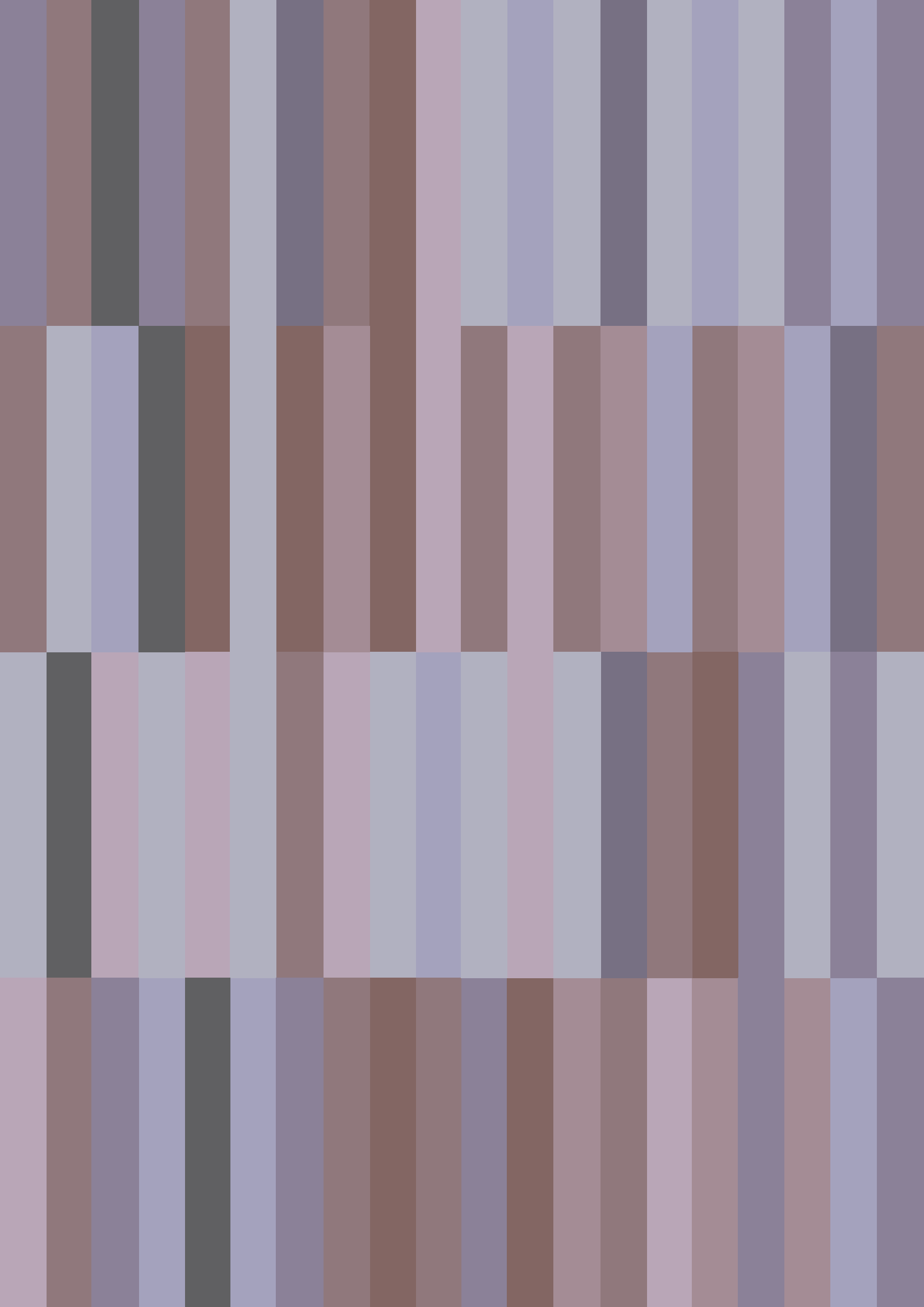
Rural Economy and
Land Use Programme

Shaping the Nature of England: policy pointers from the Relu programme



Shaping the Nature of England: policy pointers from the Rural Economy and Land Use Programme

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An opportunity for change

The UK Government is taking a fresh look at how we manage our natural environment in England. This presents an opportunity to draw on evidence from across the Relu programme and rethink entrenched practices and approaches to land use, environmental assets and who should be involved in decision-making.

Can we put a price on nature's services?

Land and water are keys to our survival. They are finite, but the demands we make on them are growing, along with our population. At the same time, climate change is an additional stressor within the system. An ecosystems services approach would provide an over-arching approach to managing these vital resources and would help us to ensure that multiple benefits are delivered from any one area. We need to recognise and reward land managers for providing all ecosystem services, including those which are public goods and not currently rewarded within the market.

An ecosystem services approach is deliberately holistic and recognises the value of *all* the diverse ecosystem services provided by any one area of land – whether 'provisioning', 'regulating', 'cultural' or 'supporting'. All existing and potential ecosystem services should be regarded as legitimate, and be fully reflected in decision-making. This approach also usefully emphasises that real environmental limits must be respected if land is to continue to provide a wide range of ecosystem services into the future.

The values which society today places on different ecosystem services are demonstrated in current market interventions and environmental legislation, and in associated policy and funding mechanisms which incentivise specific services, or regulate damaging activities. For example, food production has been valued more highly than biodiversity, landscape beauty, water quality or other services; this is still reflected in the relative balance of funding for Single Farm Payments and agri-environment schemes. A more balanced approach to priorities between different ecosystem services in future would lead to a shift in such relationships.

Relu projects show that adopting an ecosystems services approach will help policy-makers to:

- Identify and quantify the range of services provided by land and water under different management options, drawing on evaluations of diverse data sets for any one area.
- Understand the synergies and trade-offs between the different types of benefits and costs associated with different options for land and water management.
- Reconcile competing objectives with policy measures which reward land managers for providing environmental public goods that are not rewarded by markets for food, fibre and energy.
- Appreciate how benefits and costs are distributed among different public and private interests, facilitate dialogue among them, and show what can and cannot be achieved through collaborative working.
- Design and promote new forms of land and water management that can deliver intended outcomes more cost-effectively.
- Design targeted policies that reward land and water managers for providing a wider range of beneficial services, within a single framework.
- Support the 'joining up' of hitherto fragmented policy objectives and funding mechanisms.
- Adapt policies to future challenges (political, economic, social, technological, legal and environmental), incorporating new knowledge as it becomes available.

Relu projects have adopted several approaches to valuing ecosystem services. However, it is clear that valuation techniques for non-market benefits have weaknesses, and may be better used to inform rather than determine decisions. A pragmatic way forward is to be guided by the cost of the actions required to achieve a desired service such as biodiversity maintenance or flood alleviation. Adopting this approach could lead to payments for the provision of environmental public goods which reflect the true cost of providing different ecosystem services rather than the opportunity costs of farming the land.

An opportunity for change

What are the challenges?

We face multiple, incremental environmental challenges including biodiversity loss and water quality, alongside climate and demographic change. If we are to tackle these in the spirit of the "Big Society", we must move towards an Engage-Deliberate-Decide approach (instead of Propose-Announce-Defend), to engage people more effectively. This has to be done by means of more integrated thinking, and within EU and UK policy frameworks. Only by taking all these dimensions into account can we find effective ways forward.

In the 20 years since the last Environment White Paper from a UK Government, the context has changed dramatically. Overcoming the sheer inertia of two decades of policy to focus on tomorrow's problems rather than yesterday's will be a huge challenge. Nevertheless, it will be critical that long-standing policy frameworks, and their associated mindsets and mechanisms, are adapted to the strategic challenges of climate change, demographic changes, biodiversity loss and water quality.

Relu research underlines the need to recognise that these challenges all have political, economic, social, technological, legal and environmental dimensions. These cannot be effectively tackled by the traditional linear path of 'Propose-Announce-Defend' (diagnosis, development of preferred options by experts, public consultation, a political decision, and implementation). The more sophisticated approach of 'Engage-Deliberate-Decide' will be needed if organisations and individuals, including land managers and local communities, in particular, are to be engaged effectively in tackling the challenges.

Established policy frameworks that will require adaptation to deliver an effective ecosystem services approach to current and future strategic challenges include:

- **The Common Agricultural Policy:** in particular, strengthening agri-environment schemes to enable comprehensive and effective delivery of critical ecosystem services that are environmental public goods and not delivered through markets.

- **The Common Fisheries Policy**, and UK fisheries legislation: in particular, improving sustainability of wild fish stocks and developing alternative sources of fish protein (e.g. through sustainable forms of fish-farming).

- **The Water Framework Directive** and associated water quality legislation: in particular, delivering integrated, catchment-scale collaboration among the diverse interests involved in land and water management.

- **Soil policy:** in particular, developing strategic policies to protect soils and improve their management, so that they are better able to deliver a wider range of ecosystem services, including producing food, alleviating flooding, and cycling nutrients.

- **The Habitats Directive and UK legislation for biodiversity:** in particular, developing traditional approaches, based on designating 'hot-spots', into a whole-landscape approach, with more emphasis on creating habitat networks and restoring biodiversity.

- **Land-use planning policy:** in particular, broadening policies that now protect agricultural land essentially for its provisioning role (e.g. the basis for identifying the 'Best and Most Versatile' land) into policies that in future recognise the value of safeguarding the much wider range of ecosystem services that rural land provides, alongside food production; and embedding the ecosystems services approach within the development planning and control framework.

How can we achieve joined-up policy?

One illustration of the critical need for much closer integration of different strands of policy is provided by the debate on human health and the environment. Interdisciplinary research helps to break down the silos of policymaking and enable a more holistic view.

Several Relu projects provide examples of the benefits of taking this kind of cross-sectoral approach to policy decisions and their impacts:

— Reduced demand for dairy products and meat, driven by concerns about diet and health, would cause a significant decline in dairying, particularly in the south east and west midlands, with dairy cows replaced by grass-fed beef or sheep on fertile lowland pastures. Upland livestock production would be less viable, leading either to ranching or land abandonment, with serious implications for valuable wildlife habitats on upland farms. Fruit and vegetable growing would increase, particularly in the traditional areas of the south and east, often through the widespread and intensive use of polytunnels.

— People are being encouraged to eat more fish, but this could threaten some wild stocks which are in decline. Fish farming provides an alternative but faces criticism for pollution, poor welfare standards, and using wild fish as a source of fishmeal for the farmed fish. Small-scale inland aquaculture systems could offer a sustainable solution to the need for fish protein in human diets, provided these systems are properly integrated with other local food chains, and use low-carbon energy sources. This would also offer a valuable business opportunity for farmers and other rural people.

— Withdrawing harmful pesticides from the market protects human and environmental health, but can present a challenge for the effective control of farm pests and diseases. This is an opportunity to develop biopesticides, which are naturally occurring substances, microorganisms, and 'signal' chemicals produced by plants that all help to control pests. This demonstrates that 'high-tech' can also be 'green', and that we should use all the technology at our disposal to promote environmental benefits.

— Pathogenic microorganisms in livestock waste may pose significant risks to public health if they contaminate coastal bathing waters, food or drinking water. Farmers may not appreciate that their management of livestock waste or slurry on land upstream, several miles away from main rivers and the coast, could have such impacts. Policies for environmentally sustainable livestock management should take account of this public health dimension.

— Improving public awareness of health risks in the natural environment could usefully encourage greater personal responsibility. For example, targeted information on the risks of infection with *E. coli* and tick-borne Lyme disease, and how these risks can be minimised would help people to enjoy the countryside more safely, without causing undue anxiety.

How can we protect and enhance England's natural assets?

We now have a key opportunity to review the full range of policy mechanisms to protect and enhance England's assets, and to create coherent frameworks better adapted to changing needs and circumstances. Agri environment schemes could still have a key role to play and CAP reform provides a golden opportunity to refine their design, tackling current weaknesses and looking ahead to future challenges.

There are nine main policy mechanisms that have been used to differing extents to protect and enhance natural assets over the past 20 years, but there have been criticisms about a lack of coherence in their design and delivery:

- *Providing information, advice and training:* e.g. the Code of Good Agricultural Practice, nutrient management plans, and the Catchment Sensitive Farming Programme.
- *Promoting voluntary action:* e.g. the Voluntary Initiative for Pesticides, and the industry's Campaign for the Farmed Environment.
- *Offering incentives:* e.g. annual management payments and capital grants under the Environmental Stewardship agri-environment schemes.
- *Levies, charges, and taxes:* e.g. levies on farm produce to contribute towards marketing and research work, and charges for abstraction licences.
- *Investing in infrastructure:* e.g. by the water industry (drinking water, sewerage), the Government (managing flood risk), and developers (sustainable urban drainage).
- *Regulating land management through statutory designations and rules:* e.g. Nitrate Vulnerable Zones, Sites of Special Scientific Interest and CAP cross-compliance.
- *Regulating built development through land use planning:* e.g. at various spatial levels.
- *Purchasing or leasing property rights in the use and management of land:* e.g. easements or covenants under which farmers accept restrictions on how they manage land in return for payment.
- *Purchasing land outright:* to enable direct control of its use and management, instead of seeking to work through existing owners and managers of land.

We have an opportunity to improve coherence of policy mechanisms at both UK and EU levels within a new, integrated policy framework designed to adapt to changing needs and circumstances.

Relu projects have examined how several policy mechanisms currently operate, and how they might be improved. Relu Briefing Papers on the Water Framework Directive (*Briefing Paper 11*), and the Common Agricultural Policy (*Briefing Paper 12*), and many of the Relu Policy and Practice Notes (see Annex) provide evidence to support the development of policies for land, water and biodiversity and also, importantly, to develop delivery tools and approaches. Relu projects offer particularly useful insights into agri-environment schemes, which are relevant to other land management polices too, including forestry.

From small-scale beginnings in the 1980s, agri-environment schemes have developed over the last 25 years as a largely effective way of broadening the focus of rural land management to include protecting and enhancing England's natural assets, alongside the continued production of food. Drawing on Relu findings, key recommendations for the next stage of agri-environment policy and delivery in England are:

- **Increased, secure funding**: agri-environment schemes should be retained as a key mechanism for delivering environmental policy within the CAP. A radical increase in funding is required to fulfil their role in delivering environmental policy commitments and ecosystem services. They should be allocated a higher proportion of the CAP budget and be supported at a higher rate of EU co-financing. Payments to farmers should be increased as necessary to ensure that desired environmental public goods will continue to be delivered following any reductions in the Single Farm Payment. Payment calculations should reflect the real costs of delivering public goods, both on highly productive land and in situations where farming is unprofitable but environmentally beneficial.
- **Ecosystem services approach**: agri-environment schemes should be explicitly designed and implemented within the framework of an ecosystem services approach to the delivery of environmental public goods. This will assist in managing the varied demands on land, setting priorities, and identifying and tackling conflicts. It will also prompt consideration of the role of the schemes in rewarding services not hitherto supported, such as taking action to reduce flood risk (e.g. to reduce run-off and hence peak flows, or to store floodwater to protect areas downstream).
- **Land management at the right scale**: the menu of land management options, in any one area, should be based on a systematic assessment of all the environmental public goods which could be provided by farms in that area. Management prescriptions should be tailored, as far as possible, to local conditions, and uptake targeted at the most appropriate scale (e.g. 'catchment' for water quality, or 'landscape' for farmland birds).
- **Involving stakeholders in scheme design and delivery**: advice from local farmers and other stakeholders on scheme options, delivery, and how to co-ordinate action between farmers can be of great value. Their advice should have a more prominent role in the process of designing, delivering and reviewing agri-environment schemes. More use should be made of tools to support deliberation on objectives and priorities, and to help resolve conflicts. Participatory Geographical Information Systems offer one useful approach to this.

— **Promoting collaborative approaches**: The scale at which scheme agreements are planned, negotiated, funded and delivered should shift, over time, from the *individual farm* to the local *community of farms*. Key considerations in making this shift include:

  — Rewarding farmers fairly for the additional benefits and costs of collaborative action and ensuring that farmers outside agreements cannot negate the work of those within them.

  — Building on experience and precedents from the other parts of the UK and elsewhere in Europe, where collaborative agri-environment agreements have been successful (e.g. improving the environmental management of common grazing land).

  — Improving cost-effectiveness and landscape scale benefits for wildlife by co-ordinating agri-environment management spatially across several farms.

  — Improving water quality by co-ordinating agri-environment management on farms across the catchment.

— **Securing long-term delivery of environmental public goods**: agri-environment schemes should incorporate, or be supplemented by, new contractual mechanisms to secure land management that delivers environmental public goods over periods of decades rather than years. This will be particularly important in managing carbon, and in restoring, re-creating or linking wildlife habitats. Other countries offer valuable experience, from which the UK can learn, about using mechanisms such as purchasing easements or land.

— **Addressing strategic challenges**: agri-environment schemes should have the capacity to address the challenges of climate change, demographic changes, biodiversity loss and water quality, for example by:

  — Promoting carbon storage through land management that prevents the loss of soil carbon, especially in the uplands, and increases the rate at which carbon is taken up from the atmosphere. It will be important to ensure that the benefits of this are not offset by increased emissions of other greenhouse gases.

  — Encouraging integrated pest management by creating habitats to harbour predators which will eat pests (biocontrol), adopting complementary nutrient and soil management practices, and supporting these with new technologies such as biopesticides. This will also help to ensure that chemical pesticides are used only when they are really needed.

  — Improving water quality by extending to lowland farms the current agri-environment option for erecting streamside fencing to reduce faecal contamination of water by livestock. This will reduce public health risks of pathogens in drinking and bathing water, and in shellfish.

  — Responding to threats, for example by restoring landscape features damaged by diseases and pests, and avoiding the creation of habitats favoured by ticks.

— **Reviewing support for conversion to organic systems in areas of highly-productive farmland**. An alternative, more environmentally effective use of agri-environment support might be to create networks of land managed primarily for biodiversity around intensively managed fields on conventional farms. The benefits could be enhanced by using 'no-till' or 'low-input' management.

— **Providing formal agri-environment training**, targeted on novel or technically-difficult options, as an integral part of all schemes, to improve their overall environmental effectiveness. This will help farmers to understand scheme objectives, and support them in exercising their land management skills.

— **Sharing experience of payment calculations with other Member States**, with the aim of establishing consistent practices which provide appropriate rewards for the provision of environmental public goods.

— **Moving towards payment by results** will require the development of cost-effective technologies to monitor the provision of ecosystem services. In the meantime, agri-environment schemes could specify desired outcomes rather than prescribing inputs (e.g. 'a sward of a certain composition and height' rather than 'the timing and density of grazing'). Farmers would become more involved in delivering quality environmental goods, and able to check and adjust management practices themselves.

Are there novel mechanisms we could employ?

There are novel policy mechanisms that could be employed for securing long-term management of land for environmental purposes, including those that have been used successfully in other countries. New research has an important part to play.

In managing land for the delivery of ecosystem services and environmental public goods, agri-environment schemes will continue to have a pivotal role but Relu projects have shown that there could be a place for other, more novel mechanisms too. For example, water suppliers in the UK, and elsewhere, have purchased water-gathering grounds to protect them from pollution. This approach could be extended to the purchase of groundwater catchments. Alternatively, water companies are seeking to protect water resources by working directly with land managers, and more than a hundred catchment management schemes and investigations are testing this approach. The results could inform efforts to move away from 'end-of-pipe', energy-intensive, engineered solutions to providing high quality drinking water.

Mechanisms more commonly used in other parts of the world include the public purchase of long-term easements or covenants restricting land use, or sale-and-leaseback arrangements. Payments for Ecosystem Services (PES) are voluntary transactions between land managers and individuals or groups which benefit from the services provided. A new Relu project will evaluate the Westcountry Rivers Trust's WATER project, which aims to develop a market-based catchment restoration scheme. Another approach, used in England by the National Forest, is a tendering process for land managers to specify what services they will provide, at what cost, over what period, and then bid competitively for a share of the funds. There may also be opportunities to raise funds for land management from consumers (as visitors and tourists) and through local community and charity initiatives.

There is scope to build on recent beneficial changes in regulation of biopesticides, making it easier and cheaper to get them to market, and to improve the control of organisms harmful to plants.

Managed fisheries encourage angling, and improve habitats, but can also bring risks of damage to sensitive lakes, escapes of non-native fish and the spread of disease. The risks of environmental damage could be reduced, by improving information and training for fishery owners and managers, and for the anglers themselves.

How can we reduce England's footprint on the natural environment overseas?

We cannot concentrate exclusively on our environmental footprint within the UK. We live in one world and cannot insulate ourselves from global concerns. We must therefore continue to develop life-cycle analysis techniques and apply these when considering whether to import or produce goods at home, while recognising that policy decisions must also take account of economic and social considerations. Freshness seems to be more important to consumers than precise provenance, so more emphasis needs to be applied to freshness rather than food being "local". We need more accurate global databases, to enable greater sophistication in life-cycle analyses, and to promote greater openness about the underlying assumptions. We also need to support developing countries in taking steps themselves to reduce their environmental footprint.

Relu research underlines the value of accurate and comprehensive life-cycle analysis in helping to reduce our environmental footprint globally (both at home and abroad). But choices between different options must take account of all dimensions, not just environmental, but economic and social too. Although progress is being made in developing life-cycle assessments for natural resources, more work is needed to improve the quality of the data used, their sophistication, and fairness in treating very diverse production systems, for example by:

- Developing more precise and accurate databases of land use and emission factors for developing countries, and for different agri-ecological zones.
- Establishing a single, easily accessible global database of all the data needed to determine carbon footprints for farm products.
- Publishing all the assumptions behind carbon footprints used in labelling schemes, so that it is clear which impacts have (and have not) been considered.
- Distinguishing between different phases of the life-cycle, including the user phase (e.g. to show consumers that the relatively high footprint of products such as coffee reflects carbon usage in the home, rather than the actions of producers in developing countries).

These challenges have been illuminated by a Relu study of the relative carbon footprint of vegetables consumed in the UK but grown (a) in UK glasshouses, (b) in Spain and driven here, or (c) in Africa and flown here. Perhaps surprisingly, the energy costs of growing a crop in heated glasshouses in the UK may in fact exceed those of growing it in a field in Africa and flying it here. The overseas trade will bring important economic and social development benefits to the growers in Africa, and the food will also be fresh (importantly, the research showed that 'freshness' is what consumers particularly value about 'local food'). This study suggests that policy-makers need to think carefully about the wider implications of carbon-labelling before introducing such approaches to guide consumers. Without careful assessment, these could have serious, and often unfair, implications for developing countries which export food crops. While developing countries could take practical steps to reduce their carbon footprint, by increasing yields, and by carrying out more processing locally (so that goods could be transported by sea rather than by air), accounting methods also need to be refined (for example by including both the carbon sequestered under bush crops such as coffee, and the carbon embedded in machinery used in developed countries).

How can the "Big Society" play a greater role?

The UK Government could promote a "Big Society" approach to enhancing our natural value by supporting and mobilising volunteers, establishing new types of formal groups (community action groups, trusts and co-operatives), and developing awareness-raising campaigns to promote environmental messages. Relu research has demonstrated a wide range of tools and approaches to promote shared understanding and collaboration and new approaches for partnership working, especially at a local level.

Rural communities are well-placed to lead localised policy-making and action, but need focused help and support to do so. The Rural Coalition has recently provided some valuable recommendations:

— '*National and local government should recognise and adopt community-led planning as 'best practice' as part of putting in place the mechanisms to underpin the 'Big Society'.*

— '*To deliver the 'Big Society', localism and empowering communities, the Government needs to start by building local capacity for delivery - for example through support for local enablers and activists, advice and training, and modest funding opportunities.*

— '*Parish and Town Councils should become the 'guardian' of the community-led plan, monitoring progress and regularly refreshing the priorities in the light of changing circumstances.*

— '*Local Authorities should recognise that there will often be a very strong case for individual communities obtaining visible benefits, community facilities and community-led services from accepting more development in their area.*'

(The Rural Coalition, 2010)

The Local Government Information Unit has promoted four principles for local leadership on environmental projects: '*setting a long term vision, promoting community engagement, attracting investment, and progressive partnership*' (Lee, 2010). These can also be adapted to apply to economic and social concerns.Many Relu projects, particularly those focused on managing land and water, have drawn actively on the ideas, knowledge and experience of local people. The projects have built significantly on established approaches for engagement, going beyond 'consultation' or 'participation' by emphasising 'deliberation', 'co-creation', and 'learn' not 'tell'.Recommended good practice for engagement, distilled from Relu experience, includes:

— Targeting specific local issues at an appropriate scale (neighbourhood, parish, catchment, or landscape), and engaging people from the outset, when challenges are first being aired, not after the research, analysis and action plans have already been finalised.

— Bringing together the key players in the area (land managers, local interests and public bodies) also involving any outsiders who could help.

— Being clear about the specific objectives for involving people, and open to their different perspectives, priorities and motivations.

— Combining, and encouraging respect for, different types of expertise (including scientific data and models, and local knowledge and ideas).

— Using face-to-face meetings, field workshops and discussions to develop trust and share information; having independent skilled mediators or facilitators to lead, if necessary, to promote common understanding and defuse any conflicts.

— Promoting an agreed understanding of problems, opportunities and constraints, informed by local inputs and using Geographical Information Systems to aid discussion.

— Getting people to co-create and deliberate on current and potential future models and scenarios, and to develop innovative proposals adapted to local conditions.

— Ensuring shared and open access to data to help everyone understand the issues, and to measure impacts and monitor success.

— Continuing with active engagement over time, with regular reviews and adaptation to take account of new information, always recognising that it often takes substantial time to build the trust and understanding needed for successful collaborative working.

Engaging local stakeholder groups in tackling environmental issues is not always straightforward, particularly where there may be a history of conflict between the players. Examples of approaches used by Relu projects to engage local people include:

— *Competency groups* to integrate scientific knowledge and local experience. By working together to incorporate local knowledge of floods in a standard flood risk model, local people and scientists were able to explore scenarios, discuss costs and trade-offs, identify and deliberate on options for action, and deliver widely-owned solutions that were more likely to be implemented. The local participants brought a wide range of knowledge and expertise to the discussions, and the involvement of independent facilitators was important in promoting constructive dialogue.

— *Community catchment management*, where researchers explored a complex diffuse pollution problem, affecting a lake, with local farmers, tourist businesses, and public bodies. A community group promoted surveys of local practice, and the installation of a buoy on the lake to monitor water quality. The feedback and data are helping local people to take decisions which should deliver a range of improvements.

Mobilising the time, energy and skills of *volunteers* could bring significant benefits in managing natural resources. For example, anglers, fishing clubs and fishery managers have a wealth of knowledge about particular water bodies and an active interest in safeguarding water quality and improving fisheries. Harnessing this potential requires both effective communication with volunteers and support for them, for example with training. There is scope to expand the work of River Restoration Trusts, and of local initiatives such as RiverCare, which actively engage local communities in monitoring, managing and enhancing the water environment, particularly in towns.

More formal structures, such as *community action groups, trusts and co-operatives*, could be modelled on the environmental co-operatives in the Netherlands which bring together farmers and other local people to implement large scale environmental management projects on farmland. A new Relu project will take this work further, studying the scope for collective contracts within agri-environment schemes.

In supporting community action it, is very important to provide readily available and easy to understand information about the environment and the effects of land management. Straightforward frameworks help to make sense of complex interactions, and enable sensible choices to be made between options. The value of tools and approaches which help people work effectively together towards shared goals must not be underestimated. Communication and decision-support tools which Relu projects have developed and tested include:

— *The 'Ecosystem Health Report'* card, which is a map-based graphic and data table that 'scores' water-quality parameters for each monitoring point within a catchment. The card facilitates discussion about actions to tackle diffuse pollution, and repeating the scoring periodically helps to monitor outcomes.

— *A 'kite' tool*, used in the management of water pollution risks, is a graphic tool that maps four variables on a scale of 1-10 on its own axis (microbial burden, transfer potential, infrastructure, and obstacles to risk management). The colour of the resulting polygon shows the overall risk (red, amber, green), while the shape indicates priorities for mitigating actions.

— *Computer-based Participatory Geographical Information Systems (PGIS)* can create spatial models and simulations; integrate local knowledge with scientific research; provide an agreed basis for wider discussion; encourage the sharing of incidental information, and help to evaluate the impact of changes.

Several Relu projects have developed and used scenarios to prompt new thinking among different interests. One project engaged local people in developing two scenarios for managing peatlands, for UK food security; or for carbon storage and wildlife. The scenarios prompted discussion about opportunities and threats from climate change and future options for sustainable actions.

Models can stimulate engagement, improve understanding, aid deliberation of options, inform targeting, and support policy decisions. Relu projects have used models in many different contexts, including:

— Bringing together economic and hydrological models to consider the costs and benefits of different ways of reducing diffuse pollution, and then examining the impacts of changes in key drivers over time.

— Using data from a sample of different types of upland farms to model how farm income, land use and biodiversity might change under six policy scenarios.

— Modelling how key biodiversity indicators (weed and bird populations) respond to management changes.

— Bringing together different tools, including cost-benefit techniques, deliberative methods, and qualitative and quantitative analyses, to create a 'big picture'.

Awareness-raising campaigns can promote positive environmental messages. Examples from other countries include signs in the Hudson River catchment which remind visitors, every time they cross a tributary stream or watershed, that any waste will end up in the iconic Hudson River estuary. Similarly, signs are used in the Netherlands to inform visitors that access to trails is just one of several local ecosystem services, alongside water supply protection, biodiversity and flood risk alleviation.

What role can civil society play?

We have a once in a generation opportunity to shift thinking away from a short-term 'winner takes all' approach to resource management, towards a holistic approach, whereby decisions are based on the long view and driven by a desire to optimise the yield of ecosystem services from any one area. We could move away from a focus on influencing the management of individual parcels of land, without reference to the wider landscape, towards one where proposed actions are viewed in the context of local synergies and trade-offs, and actions are planned and managed at the most appropriate scale for the ecosystem services involved. This is a scenario in which land management contracts would be negotiated with groups of land managers, rather than individuals, promoting collaborative action to deliver benefits which are greater than the sum of the parts. It would value and draw on the knowledge and expertise of people who understand their local environment, discourage "silo" thinking within the public sector and adapt readily to new evidence and changing conditions.

This could be achieved by:

— Providing communities with official environmental information, in accessible formats, which enables them to 'own' local challenges, to tackle them, and to monitor success.

— Promoting civil society organisations as collaborative partners for public bodies, on an equal footing, recognising their valuable roles as providers of local information on the environment, and of skills and expertise, and as promoters of voluntary action.

— Providing support as necessary to build the capacity and capabilities of civil society organisations so that they can play enduring roles in the new organisational structures.

— Providing better information for individuals on how lifestyle choices impact on their health and on natural resources (food, water, carbon, biodiversity).

— Working to establish a better shared understanding of environmental challenges and, so far as possible, a shared view of the actions needed to tackle them, among land managers, rural and urban communities, businesses, and voluntary organisations, to provide a firm basis for collaborative action in all our interests.

There would be a key role for local authorities in managing natural resources, building initially on their new responsibilities in relation to water management.

The thrust of the 'Big Society' concept is to push power away from central government to local government, and to drive it down even further, to communities, to neighbourhoods and individuals. Adopting and applying the good practices developed by Relu projects will help enablers, such as individual activists, community groups, local elected councillors and local authorities, to take a lead in encouraging and supporting local action.

Relu has examined the role of local authorities in managing water resources, but the opportunities could also apply to the management of biodiversity and other natural resources. Local authorities could, at a catchment level, co-ordinate, plan and integrate the actions of all public sector players, voluntary organisations and businesses; they could influence priorities and targets within their area, collect and publish data to support actions and monitor success. They could lead and manage engagement with local people, provide training and networking opportunities, stimulate and support locally-led initiatives, and 'join up' implementation among different interests within their areas, and with other authorities and stakeholders working in the same catchment.

Local authorities will face some challenges in taking on these roles. There may be a need to strengthen capacity and capability, which will be difficult at a time of financial restraint. Legislative changes may also be needed to give local authorities sufficient powers to take on a larger role in managing natural resources. They may also have to reposition their relationships with other public bodies. Nevertheless, local authorities are well-placed to be instrumental in promoting beneficial change, through their ability to provide a strong local focus for exchanging ideas and information, developing partnerships, and encouraging collaboration.

How can we create a smarter, greener economy?

Integrated Rural Development Programme support for farm businesses to develop high quality, high value products, targeted on farming systems that sustain valuable wildlife habitats, would support a smarter, greener economy. Sustainable, suitably located renewable energy crops and micro-generation systems on farms could also provide wider economic and environmental benefits.

Other European countries have a long history of supporting farming systems marketing very high quality food and other products, which are widely associated with vibrant forms of rural regeneration. Providing similar support in the UK could help kick-start and sustain a range of businesses based on the sustainable management of natural resources, bringing many other benefits (e.g. sustaining rare livestock breeds, local food chains, highly-valued wildlife habitats, and traditional landscapes). One Relu project looked at the niche market opportunities being exploited by a new generation of farm entrepreneurs, and by long-standing farm businesses. These focused on the production and marketing of products such as 'salt-marsh lamb', using traditional farming systems based on unimproved pastures. The policy implications of this project may be of wider application in driving smarter, greener growth. Supportive policy measures could include:

- Providing agri-environment and other RDPE support to promote such shifts in farming systems.
- Developing labelling systems based on product, place or process (like those in France and Italy) to encourage and support specific products such as salt-marsh lamb.
- Providing targeted support to set up producer groups and support collaborative production, processing and marketing.
- Aligning management options under agri-environment schemes with the requirements of quality production schemes, for example for management of species-rich grasslands.
- Developing the links between sustainable farming practices, landscape quality and product marketing (e.g. through the Grazing Animals Project, Wildlife Trust projects, and other producer, food and community group initiatives, including projects focused on game, such as venison).

In the energy sector, the introduction of energy feed-in tariffs has provided a significant incentive to micro-energy generation schemes. Similar mechanisms could be used to encourage the development and uptake of other new technologies. New green business opportunities for farms will come from unmet potential in the renewable energy sector. Support for small-scale anaerobic digestion schemes, often on farms, in Austria, Germany and Denmark has resulted in high levels of energy production and many other benefits for rural communities. Government targets for generating electricity from biomass will stimulate establishment of low-input perennial biomass crops such as short-rotation coppice willow and Miscanthus grass. It has been estimated that there is sufficient land available for these crops without encroaching on productive farmland or sensitive wildlife habitats, and a Relu project developed GIS tools to integrate the evidence for decision making, mapping land suitability and appraising sustainability. Grants help with establishment costs, but land managers are not yet rewarded for the wider environmental benefits provided by these crops, and there may be scope to reflect this within agri-environment schemes.

How can we achieve joined-up thinking for land management?

We need more integrated thinking about the implications of one course of action for other policy objectives and better connections between public bodies, policy areas, regions, local authorities, generations and countries.

Relu research has focused on bringing different disciplines together to study what have traditionally been conceived as single-issue problems, and on engaging local people and communities. This has underlined the need for more integrated thinking about the implications of any one course of action for other policy objectives. Policy-making and policy delivery needs to become much more 'rounded', 'joined-up', 'networked' and 'holistic' - but without falling into 'paralysis by analysis'. The key requirement will be to make better connections, for example between:

— **Government departments**: between Defra and its agencies and the Department for Communities and Local Government, given the critical role of the planning system in protecting and enhancing the natural environment.

— **Policy areas**: the links between the environment and the health of individuals, and the public as a whole, in an ageing and largely sedentary population.

— **Regions**: the significant environmental and social inequalities between some parts of England must be reflected and addressed in policy-making.

— **Local authorities**: protecting water quality and water resources within catchments, safeguarding soil from mis-management, and restoring biodiversity through green infrastructure, corridors and networks, will require much greater collaboration between local authorities, because natural resource units are not defined by political boundaries.

— **Generations**: we must take the interests of future generations into account in our decisions today, by building resilience into ecosystems so that they can continue to deliver a range of sustainable public goods, even under significantly changed environmental, social and economic conditions.

— **Countries**: there is scope to learn from experience overseas, not only in Europe, but also from Australasia, North America and elsewhere, in managing natural resources within modern democracies.

Current arrangements for managing the water environment underline the need to develop integrated approaches. The many activities and functions which impact on water quality at a catchment scale include: spatial planning, highways, surface water, storm water, waste management, domestic septic tanks, water supply, sewerage, land drainage, agri-environment schemes, stream corridor management, plus monitoring and research. Yet these fall under many different organisations with diverse remits and responsibilities. Successful catchment management will require great efforts to improve horizontal and vertical coordination, and collaboration, between many players. Local authorities, the Environment Agency, the water companies and OFWAT all develop relevant appraisals and plans, but tend to run on asynchronous cycles, have different priorities, and share limited information. The development of river basin management plans may stimulate a more coherent approach, helped by new tools, such as Water Cycle Studies, which deliberately take an integrated approach in assessing the impacts of planned growth on the water environment.

A Relu study of floodplain management illustrates the benefits of a more integrated approach to decision making. It showed that if floodplains are used to store water at certain times of year, this can destroy the eggs or chicks of ground-nesting birds and set back farmland bird conservation work. Equally, maintaining high water levels in the soil and in ditches can reduce flood-storage capacity and in turn affect the extent to which flood managers can control the retention and release of water to avoid flooding downstream settlements. Taking a holistic approach illuminates such conflicts between environmental objectives and assists in developing policy options to maximise the combined output of ecosystem services.

How can we take a landscape-scale approach to land management?

We need to find effective ways to co-ordinate land management actions at scales larger than a single farm, appropriate for delivering the priority ecosystem services in that area and to develop evidence-based policy mechanisms which incentivise land managers to act as a community, rather than simply as individuals.

There is clearly a need to co-ordinate public investment in land management if ecosystem services are to be delivered effectively, as shown by evidence from Relu projects. One obstacle to collaboration among land managers is that agri-environment schemes are usually delivered through voluntary agreements with *individuals*, within legal frameworks which respect and uphold their private property rights and freedom of choice. Improving collaboration will mean finding ways to incentivise farmers to act as a community, rather than as individuals. Simply designing new schemes and delivery mechanisms will not in itself be enough. Joint participation may often depend on convincing farmers that the individual benefits will strongly outweigh the costs of collaboration, both perceived and real. One Relu project showed that landowners with hunting estates were reluctant to join schemes if this meant relinquishing control over the management of their land. In contrast, another project found that farmers were willing to work together to secure agri-environment agreements if they considered that this would help to secure the continued viability of their individual farms.

In many parts of the EU collaboration is an integral part of everyday agriculture, covering co-operative purchasing of inputs, sharing of machinery, worker training, harvesting and storing of produce, and marketing of crops and other products. If UK farmers already collaborate successfully to maximise rewards from the market, through farmers' markets, and food marketing schemes, why should they not also work together to secure rewards from the CAP for the provision of environmental public goods?

One option to encourage collaboration might be to reward farmers for voluntarily tackling local land management issues as a group, agreeing co-ordinated actions across several farms, and delivering these through group agreements. Two Relu projects have promoted such approaches which could help to:

— Bring together farmers and, importantly, other stakeholders within a target area chosen at a scale (parish, catchment, landscape type) appropriate to the natural resource focus (soil conservation, water quality, farmland birds).

— Foster negotiations on changes in land use and management to deliver a range of ecosystem services at the chosen scale.

— Identify locations which could most efficiently and sustainably provide different ecosystem services, using computer models and secondary data (e.g. tools such as Participatory Geographical Information Systems).

— Encourage deliberation on scientific evidence, and critical knowledge from local land managers and others, with the aim of delivering locally appropriate solutions.

— Improve efficiency and effectiveness of public funding, by informing and validating the menu of ecosystem services to be rewarded in the area, and advising on targeting.

— Reconfigure existing incentives, or create new ones, to deliver the desired combination of ecosystem services as cost-effectively as possible.

This approach could lead to the channelling of financial support from public funds through local groups, rather than through agreements with individual farmers. There are parallels with the approach adopted by community 'land care' groups and programmes in other countries. This approach could be applied to other resource management challenges which depend, for their ultimate success, on co-ordinated action beyond the farm scale.

How can we influence Europe and work internationally?

We have to draw on UK experience and research to develop evidence-based negotiating positions on EU and international policies, particularly on CAP reform and the Water Framework Directive. We must ensure that policy frameworks agreed at international level can be effectively implemented in the UK, and adapted to changing circumstances.

EU law provides the framework for most UK policy and practice in relation to management of natural resources, particularly the Common Agricultural and Fisheries Policies, and the Water Framework, Habitats, Birds and (proposed) Soil Directives. The UK also plays a role in developing international policy, including conventions on Biodiversity and Climate Change, and on world trade negotiations.

Relu projects have contributed important findings to the current debate on CAP reform, recommending reform of and better targeting of agri environment schemes and encouraging farmers to work together at landscape scale to deliver a wider range of ecosystem services (set out in Relu's *Briefing Paper 12)*, while *Briefing Paper 11* emphasises the need to improve engagement, policies and governance arrangements to facilitate successful implementation of the Water Framework Directive in the UK.

A written charter for land use

A possible approach to address these issues could be a written charter, re-framing the relationship between the public and private interest in land, setting out the rights, responsibilities and expectations of land managers and how these can be delivered through a combination of the market, voluntary self-regulation and action, state regulation, and actions supported by public incentives. The charter would promote collaborative action in both the private and public interest, enable important legislation to be refreshed and consolidated, and encourage both individual and collective innovation. The charter could similarly re-frame the rights, responsibilities and expectations of the public sector and civil society.

The written Charter for Integrated Natural Resource Management would:

— Establish a new set of aspirations for, and expectations of, the public sector, private sector and civil society in relation to our natural environment.

— Significantly shift thinking among many players in many different sectors, creating an enabling framework for individual and collaborative action.

— Promote an integrated approach to managing England's natural resources, so that all the dimensions of policy options are fully considered before decisions are made.

— Set out the rights, responsibilities and expectations of land managers and how these can be delivered through a combination of the market, voluntary self-regulation and action, state regulation, and public incentives.

Annex

Relu Briefing Papers
Copies may be downloaded from:
www.relu.ac.uk/news/briefings.htm

1 Setting the research agenda
2 Rural economy and land use futures
3 The unfolding research agenda
4 The UK rural economy and land use debates
5 Power and responsibility - Who decides? You decide!
6 Common knowledge? An exploration of knowledge transfer
7 What is Relu?
8 Land to mouth: exploring the links between sustainable land use and the food we eat
9 Landmarks for policy
10 Telling stories: Accounting for knowledge exchange
11 Water Framework: Implementing the Water Framework Directive
12 Informing the reform and implementation of the Common Agricultural Policy

Relu Policy and Practice Notes
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1 The role of regulation in developing biological alternatives to pesticides
2 Warm water fish production as a diversification strategy for arable farmers
3 Eating biodiversity: an investigation of the links between quality food production and biodiversity protection
4 Safe recycling of livestock manures
5 Stakeholder participation in the management and communication of food chain risks
6 Implications of a nutrition driven food policy for the countryside
7 Catchment management for the protection of water resources: The ecosystem health report card
8 Regional rural land use: a time for fresh thinking
9 Assessing the social, environmental and economic impacts of increasing rural land use under energy crops
10 Overcoming market and technical obstacles to alternative pest management in arable systems
11 Comparative merits of consuming vegetables produced locally and overseas: Fair and evidence-based carbon labelling
12 Social and environmental inequalities in rural areas
13 The sustainability of hill farming
14 Sustainable uplands: reshaping land use policy for our hills
15 Integrated management of floodplains
16 Policy-making for animal and plant disease: a changing landscape?
17 Sustainable uplands: learning to manage future change
18 Collaborative frameworks in land management: a case study on integrated deer management
19 Bovine tuberculosis: a problem for farmers, conservationists and policymakers
20 The changing role of local government in managing water resources
21 Angling in the rural environment
22 Models, decision-making and flood-risk: doing simulation modelling differently
23 Is wildlife conservation compatible with arable farming? Evaluating the options for sustainable agriculture

Relu Consultants' Reports
Copies may be downloaded from:
www.relu.ac.uk/news/ConsultantsReports.htm

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