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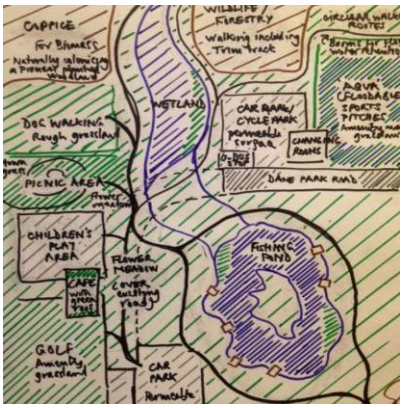
Developing the potential for Payments for Ecosystem Services: an Action Plan

May 2013



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Cover images (clockwise from top left): Rural countryside – people looking out at the views from Box Hill; Hull PES pilot – sketchmap of palette of different SuDS treatments within Dane Park; Montgomeryshire Wildlife Trust Pumlumon PES pilot – peatland restored to its function as a natural sponge; Hull PES pilot “Whatever the weather” workshop; Public footpath signs in an ancient woodland; Four ducks in clean river.

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Foreword

In our white paper “The Natural Choice – securing the value of nature”, we committed to putting natural capital at the heart of our economic thinking and decision making. We all depend on healthy ecosystems and the services they provide. Nature provides us with healthy soils, clean water and pollination essential to food production; it stores and absorbs carbon, provides attractive settings and landscapes that support jobs, wellbeing and cultural identity; if managed well, it can support flood risk and resilience to a changing climate. There can be real opportunities to make ourselves better off through investments in natural capital. We are more aware than ever of the scale of the need to protect and enhance nature thanks to studies like the Lawton Review and the UK National Ecosystem Assessment.

This is where Payments for Ecosystem Services (PES) approaches come in. In essence, PES schemes seek directly to reward land managers for the value of nature’s services above and beyond normal market incentives, so that these services can be maintained and enhanced. PES is not a panacea for all our environmental challenges, but PES initiatives that go beyond, or build on, traditional government financed schemes are innovative and exciting.

This Action Plan aims to develop the potential for PES on the ground. It identifies actions government can take to facilitate practical and innovative schemes and outlines how PES can play a role across different policy and environmental contexts. In its first State of Natural Capital Report, the Natural Capital Committee offers strong support for PES approaches and their potential.

Indeed, Defra’s PES pilot projects to date have revealed great enthusiasm for PES across a broad range of stakeholders. Businesses, land managers, environmental trusts and charities, local authorities, knowledge providers and others are increasingly working together to test the potential of PES approaches in diverse situations, from nutrient management to urban regeneration. Defra’s Best Practice Guide for PES which is published alongside this Action Plan will help to harness that enthusiasm in order to overcome the practical challenges that PES faces. I am delighted that Professor Sir John Lawton has endorsed the Guide and I hope we can all rise to the challenge he sets out in his Foreword: “Increasingly, paying for ecosystem services will be another powerful reason for society to look after the natural world, and to stop taking for granted the benefits we derive from it.”

Richard Benyon,
Parliamentary Under-Secretary for Natural Environment and Fisheries

Executive summary

i. Payment for Ecosystem Services (PES) is about identifying practical ways to deliver **new and additional** investment in the natural environment as well as seeking better targeting and value for money of **existing** funding streams. For instance, some PES opportunities (e.g. in water catchments) are linked to the potential for investing in the natural environment to provide cost effective business solutions. PES schemes, broadly conceived, can involve public, private and / or third sector funding.

ii. PES, particularly private-sector financed PES, is an innovative and developing area, but will only ever be a part of the solution for protecting and improving the natural environment. It requires a clear regulatory framework for operation so that PES opportunities can be incentivised that go beyond compliance and are therefore compatible with the polluter pays principle.

iii. Therefore this Action Plan is about promoting practical and innovative development of PES schemes identifying what actions government can take to enable such mechanisms to go forward. It provides an opportunity to look across different policy contexts and to offer an overview of how PES can be incorporated into these areas, as well as to identify synergies and potential linkages.

iv. Experience over recent years in understanding the enablers for PES have put the spotlight on a number of key building blocks including:

- the need for clear guidance, framework and metrics, to give confidence to potential investors
- the need for clear and accessible evidence for the cost and environmental effectiveness of land management practices for ecosystem services
- the importance of partnership-working and intermediary roles which create the right conditions and trust for PES to develop among buyers and sellers and facilitate new kinds of funding mechanisms and
- the need to develop understanding of the demand side from beneficiaries to unlock future investment opportunities.

v. There are three broad but linked categories of action in this Plan:

   a. **Capacity building for PES**. This includes the launch and promotion of a Best Practice Guide, and our intention to continue the PES pilot research fund in late 2013-14 and other cross-cutting actions which address some of the challenges for PES (section 2).

   b. **Specific areas of opportunity for PES** that Defra is exploring with others (section 3).

   c. **Evaluating PES** (section 4).

vi. The following table presents a **summary of actions** which we intend to focus on in the near term, working with wider stakeholders as much as possible. **This is an evolving agenda and therefore this Action Plan reflects work in progress. Further development requires partnership-working and capacity-building among a wide range of stakeholders; further investment and engagement are required in the longer term to fully realise the potential benefits of PES.**

Capacity Building Actions
• There is a strong case for supporting PES pilot projects to help build capacity and spread good practice and other lessons learnt. Subject to review of the first two rounds of the fund, Defra plans to continue the PES pilot research fund in late 2013-14. • Defra is publishing a Best Practice Guide for PES schemes and will host a number of activities to disseminate the Guide, including through the Defra sponsored Ecosystems Knowledge Network. • Defra will fund new research on how wider beneficiary participation in PES schemes might be encouraged, with a focus on business sectors with dependencies on the natural environment. • We want to see further progress in the concept of planning for ecosystem services on a spatial basis as an important facilitator of PES schemes both for public and private funding. • Defra will work with others on exploring new financing models for PES and building understanding of key issues relating to multiple funding sources. • The Law Commission is currently consulting on the concept of “conservation covenants”, which could overcome one of the barriers to developing long-term PES schemes.

Specific areas of opportunity	
Water quality	Growing take-up and acceptance of catchment schemes linked to PES mechanisms funded by water companies are expected through the water price review (PR14). While much attention is related to upstream catchment schemes, there are potentially other novel applications of PES funded natural solutions relating to water quality – for example, constructed wetlands for dealing with wastewater discharges compared to expensive and input-intensive treatment plants, or a PES scheme to address increased nutrient pollution from development. Defra will: • **ensure that PES approaches are integrated within a coherent framework for a Catchment-based Approach across England** • **strengthen the evidence base on the benefits of catchment approaches and continue capacity building in implementing PES approaches** • **fund new research into financing mechanisms at catchment level with a view towards piloting in a number of catchments.**
Flood risk management	There is a movement towards a PES approach in this area, with the new Partnership Funding arrangements seeking to increase contributions from local beneficiaries. The Pitt Review of the 2007 floods recommended greater use of natural processes and land-use options to complement more traditional approaches to tackling flood risk, but the technical understanding of this is not yet comprehensive. Defra will: • **continue to fund flood risk demonstrator projects including 'Slowing the Flow' at Pickering, and evaluate relevant PES pilot research projects including the Hull PES pilot (on urban flood risk management)** • **consider, as part of the policy evaluation of Partnership Funding whether (and how) the approach influences the selection of measures, and how it opens up the opportunity for a broader range of schemes with broader benefits to access funding.**
Linking Environmental Stewardship and PES	70% of land in England is under an Environmental Stewardship agreement and can broadly be considered one of the world's largest publicly funded PES schemes, although payments are based on income foregone. There are broad opportunities to (i) develop Stewardship into a more coherent market for ecosystem services, recognising scheme constraints, and (ii) explore how public and private "PES" mechanisms can complement each other. Additional funders might include water companies, housing

	developers, tourism or marketing schemes. Defra will: • **explore the potential for different models of agri-environment delivery including reverse auctions and match-funding mechanisms, in the context of developing the new Rural Development Plan for England; and work with stakeholders to improve targeting and flexibility;** • **review the barriers and opportunities to incorporating private funding alongside Rural Development Programme funding.**
Forestry & Woodlands	There are many examples of good practice in the woodlands sector for developing payments for ecosystem services (e.g. the Woodland Carbon Code) and this experience can benefit other areas in development (e.g. peatland restoration). The development of a roadmap by summer 2013 will help to set out the enabling factors to develop ecosystem markets in practice. The sector itself is looking to release its full potential through 'Grown in Britain'. This initiative takes an inclusive approach along the whole wood supply chain from forest to consumer to develop market demand for wood products that will in turn increase sustainable woodland management and creation to achieve wider ecosystem improvements. Defra will: • **work jointly with Forestry Commission to develop a woodland ecosystem market roadmap by summer 2013, as part of the Government's Response to the Independent Panel on Forestry report** • **ensure lessons learnt from application of PES in forestry are applied to help wider development of PES** • **support the work being undertaken by 'Grown in Britain'.**
Peatland restoration	Peatlands form a significant part of the UK's natural capital which, if in good condition, provide a range of ecosystem services: they store carbon, regulate water quality, provide habitats for internationally important species and opportunities for distinctive recreation. A peatland carbon code could facilitate payments by business to land managers for carbon-saving peatland restoration. Defra will: • **work in partnership with the IUCN UK Peatlands Programme and others to support the testing, development and launch of a pilot UK Peatland Carbon Code, addressing the challenges identified** • **publish research (in partnership with Natural England) which develops evidence-based carbon metrics to inform the pilot peatland carbon code**

	• **work closely with officials in the Devolved Administrations to ensure that peatland PES approaches are applicable across the UK.**
Place-based partnership initiatives	Place-based, multi-service PES schemes, that value, measure and seek to improve multiple ecosystem services within a single geographical area, are starting to be developed. These approaches have the potential to provide a means to develop closer synergies between the delivery of different ecosystem services; may offer potential opportunities to combine multiple sources of funding from a range of beneficiaries and strengthen the overall economic case for action. An important building block for the development of such approaches is the various partnership initiatives that are emerging, including the Catchment-based approach, Nature Improvement Areas (NIAs) and Local Nature Partnerships (LNPs). Defra will: • **explore with LNPs the potential for targeted support where there is a community of interest around payments for ecosystem services** • **encourage both the Government-funded and the locally-determined NIAs to explore PES approaches, and capture and share the lessons learnt.**
Evaluation	
The practice of developing Payments for Ecosystem Services schemes is still in its infancy in England. So this Action Plan focuses upon piloting, capacity-building, fostering innovation and demonstrating good practice. Learning by doing will be key. This Action Plan is therefore only a starting point, and will need to be revisited as evidence emerges of the potential for and limits of PES. Defra will: • **explore the potential for an open-access repository of PES and PES-like schemes, involving the Ecosystem Knowledge Network and others, in order to track progress and share good practice over the medium-term** • **convene a stakeholder workshop in autumn 2013 using the PES pilot research projects to evaluate emerging findings and peer review the potential for PES** • **publish an overall evaluation and review in Spring 2014, following completion of all current pilots, to inform next steps.**	

1. Why PES?

1.1 Securing the value of nature: the Natural Environment White Paper

The Government recognises that many of the values and services that nature provides to society and the economy have been overlooked in decision-making. At the same time the Lawton Review, UK NEA and other studies have made us aware of the scale of the risks and opportunities facing nature. As part of its programme to mainstream the values of nature in decision-making, the Government's **Natural Environment White Paper**[1] committed to publishing an Action Plan to expand schemes in which the providers of nature's services (such as farmers and land managers) are paid by the beneficiaries (such as other businesses or the wider public), after undertaking a full assessment of the challenges and barriers. Markets for ecosystem services may be publicly and/or privately funded, and can benefit both business and nature.[2] The White Paper commitment is about promoting practical development of payments for ecosystem service (PES) schemes and identifying what actions government can take to facilitate such approaches.

1.2 What is the PES agenda about?

Payment for Ecosystem Services (PES) is about identifying practical ways to deliver **new and additional** investment in the natural environment as well as seeking better targeting and value for money of **existing** funding streams.

To deliver well targeted investment, PES should be based on '**ecosystems approach'**[3] thinking such as working at the right spatial scale and delivering through partnership approaches. The ecosystems approach helps to identify the range of benefits which investment in nature can bring to potential beneficiaries. An increased understanding of nature's value to society and the economy can help to identify new opportunities to protect and enhance those services cost-effectively[4] (Figure 1). For example, a water company might invest in water catchment management schemes

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[1] *The Natural Choice: securing the value of nature* www.official-documents.gov.uk/document/cm80/8082/8082.asp

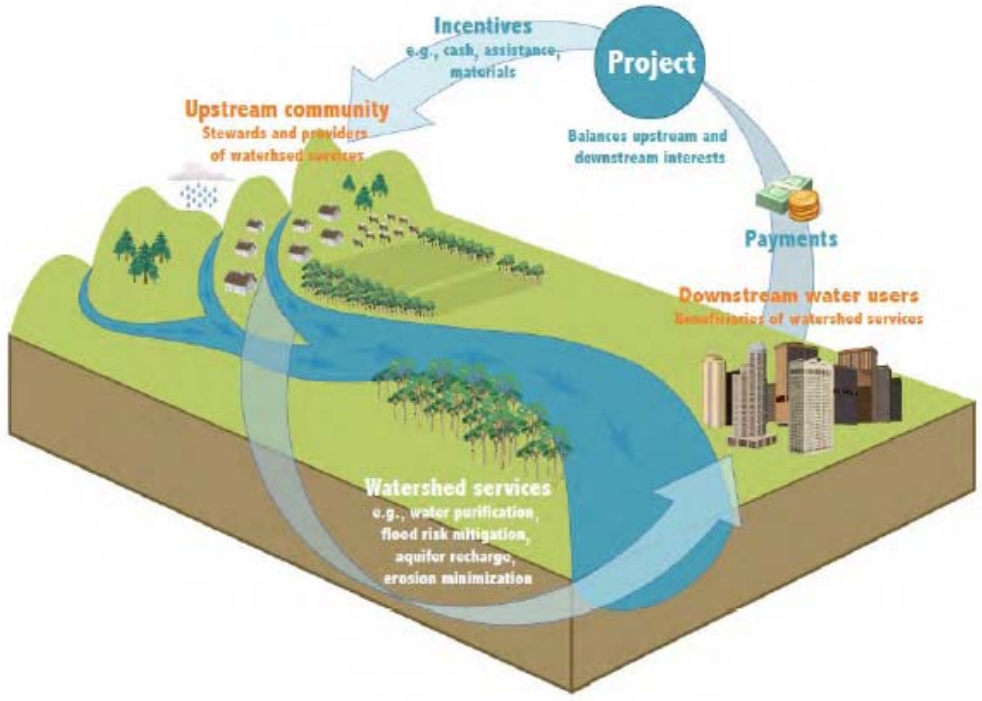
[2] The broader agenda of opportunities for business that benefit nature has been addressed by the Ecosystem Markets Task Force which reported to Government in March 2013. www.defra.gov.uk/ecosystem-markets/work/publications-reports/. The Government will respond to the Task Force in the summer of 2013.

[3] For a practical guide, see: www.gov.uk/government/publications/what-nature-can-do-for-you

[4] The analytical underpinnings of PES are set out fully in a Defra Evidence and Analysis Paper (October 2011) at: www.gov.uk/government/publications/payments-for-ecosystem-services. An overview of the benefits and drivers for PES can be found in Defra's *Payments for Ecosystem Services: a Best Practice Guide* at www.gov.uk/government/policies/protecting-biodiversity-and-ecosystems-at-home-and-abroad/supporting-pages/valuing-the-benefits-we-get-from-nature

('green infrastructure') as a cost-effective alternative to end-of-pipe solutions ('grey infrastructure'); or a local authority might invest in action to prevent sediment entering a river upstream so reducing the costs of dredging ('invest to save').[5] In many cases a PES approach will not provide a full solution but it can provide a focus for actors to think about and value nature's services in a new way.

Figure 1 The PES concept



The principles outlined in **Box 1** are commonly accepted as defining PES but, in practice, PES schemes tend to be quite diverse in nature and therefore sometimes not easy to define so exactly.

Payments for ecosystem services are developing rapidly across the world. The *State of watersheds payments* report highlights transactions totalling more than $8 billion in 2011 and with evidence of a substantial step up in new watershed PES programmes in 2012: "Green infrastructure as a substitute for or complement to traditional engineered approaches is gaining currency in the developed world – from using forests as green infiltration galleries in Germany, to using mussel beds to filter nitrate pollution instead of a treatment plant in Sweden, to New York City planning to restore wetlands to its waterfront to deal with storm events." [6]

[5] A recent example is the Bristol Avon pilot hoping to reduce costs spent by Bristol City Council on dredging to remove silt.
[6] For further information, see report published in January 2013 at: www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=9542&section=news_articles&eod=1

Box 1 Key PES principles

Voluntary: stakeholders enter into PES agreements on a voluntary basis;

Beneficiary pays: payments are made by the beneficiaries of ecosystem services (individuals, communities and businesses or governments acting on their behalf);

Direct: payments are made directly to ecosystem service providers (in practice, often via an intermediary or broker);

Additionality: payments are made for actions over-and-above those usually required from land managers and others, i.e. providers should not be compensated for satisfying regulatory obligations (i.e. meeting 'polluter pays' requirements);

Conditionality: payments are conditional on the delivery of ecosystem service benefits (in practice often for actions agreed likely to deliver the desired ecosystem services);

Ensuring permanence: management interventions should not be readily reversible;

Avoiding leakage: PES schemes should be set up to avoid leakage, whereby securing an ecosystem service in one location simply leads to the loss or degradation of ecosystem services elsewhere.

1.3 PES in a wider policy framework

Whilst PES represents a useful and innovative approach to conservation of nature, it is not a panacea.[7] **PES is simply one approach that may complement rather than replace other approaches, including different forms of regulation and awareness-raising.** There are also potential overlaps with instruments such as biodiversity offsets[8] and some other innovative market-based mechanisms (such as nutrient trading in the US) which may incorporate PES principles with more regulatory elements, combining both 'beneficiary pays' and 'polluter pays' elements.

PES must not be seen or used as a substitute for the 'polluter pays principle' established by statutory requirements for resource management. This will give potential buyers clarity about the scope for PES beyond this baseline and confidence that investment made will not be delivering outcomes which should already be being delivered to comply with legal requirements. Neither should PES schemes be used to protect rights under the common law, such as unimpaired water quality or visual amenity, but can be applied as additions to them. Importantly, PES schemes should be developed and managed adaptively, acknowledging that growing common case law and more stringent statute law may change the baseline requirements beyond which PES payments are appropriate.

[7] Policy and practice note on payments for ecosystem services, "Enhancing the environment through payment for ecosystem services" Rural Economy and Land Use Programme, (September 2012) www.relu.ac.uk/news/policy%20and%20practice%20notes/39%20PES/PES.pdf

[8] www.gov.uk/biodiversity-offsetting. Biodiversity offsets are not covered in this Action Plan.

1.4 Government's role

In the context of developing PES, Government and its agencies have a role in facilitating stakeholders including the private sector to develop PES through:

- capacity building
- disseminating best practice
- demonstrating 'proof of concept' for PES applications through piloting
- removing barriers that could enable PES opportunities to develop.

PES is most likely to be developed through **partnership** between public and private sources of funding. Indeed, there are only a few examples of purely privately funded voluntary PES, Vittel's scheme in France being one of the few exceptions. There is also scope for Government-financed schemes which have a PES element, such as Environmental Stewardship and Woodland Grant Scheme payments, to become better and more cost-effectively targeted at the delivery of clearly-articulated additional ecosystem service benefits.

As noted above, PES requires a clear framework for operation which can provide suitable clarity and enforceability of the regulatory baseline.

Government's role can be summarised as facilitating innovation and removing barriers to private and third sector action following PES best practice principles and in a coherent way alongside publicly funded PES.

1.5 Aims of this Action Plan

This Action Plan provides an opportunity to look across different policy and ecosystem contexts and draw together a high-level overview of how PES can be incorporated into these areas, as well as to identify synergies and potential linkages. It aims to:

- propose further actions to which Defra can contribute to enable and build capacity for PES (section 2)
- highlight and build on progress already made, developing strategic but practical direction for PES in England, for a range of stakeholders both in policy and involved in delivery of these approaches in practice (section 3 and Annex)
- evaluate progress and lessons to date (section 4).

Research published in 2011 by Defra exploring the potential for PES in England has been taken as a starting point for this Action Plan.[9] Since then there has been engagement with stakeholders at various workshops and events on PES including, among other events, an expert workshop in December 2011 and a workshop for the best practice guide in May 2012. This is helping to develop a more detailed view of the barriers and opportunities that should provide a good basis for the Action Plan.

PES is an evolving agenda so this Action Plan reflects work in progress. Further development requires partnership-working and capacity-building among a wide range of stakeholders; further investment and engagement are required in the longer term to fully realise the potential benefits of PES.

[9] URS for Defra, *Barriers and Opportunities to the Use of Payments for Ecosystem Services* (2011) randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=17662&FromSearch=Y&Publisher=1&SearchText=ne0121&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description

2. Building capacity for PES

2.1 Challenges for PES

Research commissioned by Defra on the potential for PES in England provided a detailed assessment of the key barriers and challenges.[10]

Category	Challenges
Informational	• Lack of awareness among beneficiaries and providers
Technical	• Scientific uncertainty • Establishing baselines • Diffuseness • Appropriate programme size • Avoiding leakage • Ecosystem valuation • Excludability and free riding • Shortage of skills and experience
Spatial	• Spatial variability
Temporal	• Permanence • Time lags • Differing time horizons
Financial	• Perceived risks • High start-up costs • High transaction costs
Institutional	• Collective action problems

Many of these challenges can be overcome particularly as experience grows in taking PES schemes forward. However, other barriers may be institutional and require enabling actions, for example, removing barriers for catchment management approaches for water company investment as part of the upcoming Price Review (PR14). Experience over recent years in understanding the key enablers for PES has highlighted a number of building blocks and challenges of particular importance including:

- **The importance of partnership-working and intermediary roles:** There is a significant and growing evidence base around the importance of partnership approaches. In particular the role of the intermediary is key to creating the right conditions for PES to develop and building trust among buyers and sellers and overcoming collective action problems where beneficiaries and potential buyers may be diffuse. In this context, new, innovative funding mechanisms may be required to enable the pooling of multiple funds and multiple beneficiaries.

[10] URS for Defra, *Barriers and Opportunities to the Use of Payments for Ecosystem Services* (2011)

- **The need for a clear framework and metrics:** Developing best practice guidance and various assurance mechanisms (e.g. the Woodland Carbon Code) can help to encourage PES schemes to develop and give confidence to investors.

- **Understanding demand from beneficiaries:** While there are considerable and important efforts to understand the supply side for PES (e.g. how land managers can deliver ecosystem services on the ground), a key gap relates to better understanding demand from beneficiaries of ecosystem services, such as businesses, in order to identify future PES opportunities.

The following sections explore these challenges further, setting out actions to address them and to develop our understanding further, building capacity and seeking to remove barriers.

2.2 Funding PES pilot research projects

Following a commitment in the Natural Environment White Paper, Defra set up a research fund to support pilot and feasibility studies recognising that in order to develop PES schemes can require significant capacity building and analytical support, particularly at the early stages of development. The focus is on exploring the potential for innovative PES projects on the ground that involves the private and third sectors. Defra has now funded ten projects over two competitive rounds. The first round projects have completed (to be published shortly) and second round pilots are ongoing (see **Box 2**).[11]

All the pilots are testing the potential for a PES approach in a specific context, with some "starting from scratch" and others building on existing ecosystem-based initiatives. The diversity of services and habitats – including water quality, wastewater, floods, urban green space, peatlands – highlights the variety of contexts in which a PES approach could be fruitful. Because they are pilots, they do not guarantee that new PES schemes will emerge, but they will provide valuable lessons and momentum to take forward to the next stage. Useful evidence is already emerging from these pilots which are highlighted in various places in this Action Plan. Plans to evaluate the lessons from the PES pilots are set out in section 4.

There is a strong case for supporting PES pilot projects to help build capacity and spread good practice and lessons learnt. Subject to review of the first two rounds of the fund, Defra plans to continue the PES pilot research fund in late 2013-14.

[11] ekn.defra.gov.uk/resources/programmes/pes-pilots/

Box 2 Defra PES pilot research projects

Completed projects (to be published shortly)

Hull – The Land Trust, working with Hull City Council are developing practical PES options to enhance flood alleviation and other ecosystem services through better management of green space and implementation of Sustainable Urban Drainage Systems.

River Fowey – UEA and Westcountry Rivers Trust have designed and implemented a reverse auction in which farmers in the River Fowey catchment compete for South West Water funding for actions to improve water quality. The report also examines the potential to extend the mechanism to multiple buyers. See also Box 9.

Poole Harbour and the Frome and Piddle catchments – RSPB have tested a PES approach to managing nutrient levels in the Poole Harbour watershed; new developments would pay others to reduce nitrogen entering the Harbour from existing sources, balancing the input from their new project.

Developing a place-based PES in the English Uplands. Funded jointly by Defra and Natural England, led by the Crichton Carbon Centre. Focusing on the South Pennines, it builds on previous ecosystem pilot evidence by NE to identify, quantify, value and enhance packages of ecosystem services, working with partners, farmers and other land managers. The project also develops carbon metrics to underpin a voluntary peatland carbon code.

Ongoing projects

Peatland restoration – Led by Birmingham City University, developing our understanding of the potential for a UK Peatland Carbon Code to facilitate the financing of the restoration and re-wetting of degraded peatlands across the UK.

Bristol Avon Rivers Trust with Wessex Water are testing a PES approach to mitigate phosphate failures from treated sewage effluent through constructed wetlands which could provide cost-effective waste water treatment and deliver multiple ecosystem benefits.

Liverpool-Leeds Canal – The Canal & River Trust is evaluating the feasibility of delivering PES-funded improvements to key ecosystem services (in particular water quality, water resources and biodiversity) provided by a section of the inland waterways. The project aims to understand the value of these services and the scope and cost of improvements.

Pumlumon, Wales – managed by Montgomeryshire Wildlife Trust, this project is a layered PES scheme. The project will evaluate the first 6 years of the scheme and explore new links with potential downstream beneficiaries in England.

Visitor Payback – Birmingham City University with Nurture Lakeland and Project Maya are investigating the potential for PES to extend visitor payback schemes. The pilot will deliver a national toolkit, research potential revenues, and explore whether smart phone technology can reach new audiences without the high administrative costs of many current schemes.

River Lea in Luton – Led by Cranfield University, working closely with Luton Borough Council and other local stakeholders, developing methods and tools for identifying PES opportunities aiming to restore and enhance the River Lea in Luton for multiple benefit.

Cotswolds (Upper Thames) – This pilot extends into the Cotswold Catchment Sensitive Farming area and brings together land managers (FWAG SW) and academics (CCRI), building on the Integrated Local Delivery framework to develop a PES with multiple benefits working with NFU, Thames Water and Gloucestershire County Council.

2.3 A Best Practice Guide

Following a commitment in the Natural Environment White Paper, Defra commissioned an expert consortium with hands-on experience of developing PES schemes to develop a **Best Practice Guide** in collaboration with potential users. This Guide collates a number of instructive domestic and international **case studies** demonstrating the various challenges and solutions associated with a PES approach. This authoritative, practical and business-focused Guide will help users to:

- understand the principles of PES
- identify and test potential opportunities and suitable partners for PES
- find solutions to technical, legal and institutional issues.

The Guide is now published alongside this Action Plan. The Guide and its annex of case studies can be found at www.gov.uk/government/policies/protecting-biodiversity-and-ecosystems-at-home-and-abroad/supporting-pages/valuing-the-benefits-we-get-from-nature .

A number of activities are planned to promote and disseminate the Guide:

- the Defra sponsored Ecosystems Knowledge Network (EKN) is hosting an event for practitioners on payments for ecosystem services in May 2013, building on the Best Practice Guide and Defra's pilot research projects
- Natural England and Defra will host a webinar on the PES Guide with the Green Infrastructure Partnership
- Defra will explore further opportunities to disseminate the Guide and build capacity with partnership initiatives such as LNPs and NIAs, and other organisations such as IEMA as appropriate.

2.4 Strengthening the evidence base

Important research initiatives are strengthening the broad evidence base around ecosystem services, which provide a foundation for investment in natural capital and PES schemes. These include the UK National Ecosystem Assessment and its Follow-on phase, the Natural Environment Research Council's Valuing Nature Network (VNN) and Biodiversity & Ecosystem Service Sustainability (BESS) research programmes. In addition, there are two key areas in which specific and focused evidence can help facilitate PES:

- **Cost-benefit evidence**: Evidence of the cost-effectiveness and value for money of investing in green infrastructure and natural solutions is a key factor in user-financed PES, for example in catchment management schemes (see Box 3).[12] For PR14, robust *ex ante* business cases will need to be undertaken by water companies proposing catchment, rather than end-of-pipe, solutions and recent guidance has been published by UKWIR providing a step by step guidance on assessing the benefits of catchment management schemes.[13] As far as possible, we need to encourage *ex post* evaluations of PES schemes and for the results to be published in order to broaden the evidence base and good practice in this area.

Box 3 Examples of benefit-cost ratios for catchment management schemes[14]

South West Water's 'Upstream Thinking' project aims to improve water quality in river catchments in the water service company's area as a way to reduce treatment costs. It also aims to help it manage water volumes during droughts and control run-off during floods. During the PR09 funding round, SWW is spending £9m on moorland and farmland projects and £1m on catchment investigation projects which totals 1% of total CAPEX between 2010-2015. In PR14 (addressing the 2015-2020 investment period), SWW plans to spend between £30-£50m on catchment management projects, split approximately 66% on moorland rehabilitation projects and 33% on wider farmland. Costs to the customer appear modest, totalling £0.60/year/household during PR09 and an estimated £2.00/year/household for PR14. Cost benefit analysis for Upstream Thinking in PR09 indicated a benefit cost ratio of 65:1 for such investments in catchment schemes.

Wessex Water has estimated that, as a result of implementing catchment management schemes, it is spending – on average – one-sixth of the cost that would be required for more traditional, expensive engineering solutions.

- **Building understanding of beneficiaries and the demand for ecosystem services**: Evidence of the dependency of society and business on nature has been developed through the UK National Ecosystem Assessment, the Ecosystem Markets Task Force and other initiatives. However, it is clear that this journey is just beginning, and there is a need to invest in understanding the demand from beneficiaries much more in order to identify future PES opportunities including interdependencies and potential synergies. There are some interesting lessons emerging from Defra's PES research pilots on beneficiaries and the buyer dimension has been built into the PES Best Practice Guide. More focused business sector analysis (e.g. on food and drink, tourism) could offer opportunities to progress understanding.

[12] Research for Defra has also estimated the benefits arising from Environmental Stewardship, *Estimating the wildlife and landscape benefits of Environmental Stewardship* (2010) www.archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/estimatingthewildlife.pdf

[13] www.ukwir.org/web/ukwirlibrary/95165

[14] See *Review of the Effectiveness of Catchment Management Initiatives*: www.ukwir.org/web/ukwirlibrary/95165 and the *PES: A Best Practice Guide - case study annex*.

Defra will fund new research in 2013-14 on how wider beneficiary participation in PES schemes might be encouraged, with a focus on business sectors with dependencies on the natural environment such as food & drink and tourism.

Box 4 Beneficiary analysis by the World Resource Institute (WRI)

A good example of beneficiary analysis is for the Neuse River Basin in North Carolina. Here the World Resource Institute and partners found that "*clear documentation of the risks that beneficiaries face from water pollution, drought, and watershed degradation will help jump-start their participation in emerging payments for watershed services programs".*[15]

2.5 Spatial planning for ecosystem services

The *PES Barriers and Opportunities Report* for Defra (2011) highlighted **planning for ecosystem services on a spatial basis** through stakeholder engagement as an important facilitator for PES schemes to emerge and to increase the efficiency and effectiveness of existing funding sources including public agri-environment schemes:

"Planning for ecosystem services on a spatial basis would involve undertaking a range of activities within a defined area (for example, a catchment) including: gathering evidence to identify geographical variations in ecosystem service provision; identifying areas at risk of seeing services lost or degraded; establishing the spatial variation in opportunity costs associated with enhanced service provision; and determining the land uses and land management techniques likely to deliver improved provision."

This is an area in which we are seeing a growing number of different applications such as the work of Westcountry Rivers Trust's work (e.g. on the Tamar Catchment) and Natural England's ecosystem service pilots.[16] New institutional and spatially defined partnerships, including Defra's **Catchment-based Approach, Nature Improvement Areas and Local Nature Partnerships (Box 5)** have an important role in considering ecosystem services locally and can provide the basis for multi-benefit PES schemes to emerge.

New tools such as InVEST[17] are available to assist decision-makers and stakeholders assess ecosystem service potential across spatial areas. **Box 6** provides one example of the way that spatial planning of ecosystem services can facilitate PES. At the same time it is important to recognise some considerable challenges and knowledge gaps. For example, different ecosystem services operate at different spatial scales and the scale of beneficiary population will also vary.

[15] pdf.wri.org/insights_from_the_field_forests_for_water.pdf
[16] publications.naturalengland.org.uk/publication/4084624?category=38019
[17] www.naturalcapitalproject.org/InVEST.html

Box 5 New types of institutional partnerships

Nature Improvement Areas (NIAs) are landscape-scale areas of land proposed in the Natural Environment White Paper that aim to deliver a step change in nature conservation, where a local partnership has a shared vision for their natural environment. The partnership will plan and deliver significant improvements for wildlife and people through the sustainable use of natural resources, restoring and creating wildlife habitats, connecting local sites and joining up local action. Defra has provided funding of £7.5 million to establish 12 NIAs across England.

Local Nature Partnerships (LNPs) are another Natural Environment White Paper commitment. They aim to help their local area to manage the natural environment as a system and to embed its value in local decisions for the benefit of nature, people and the economy. To do this effectively they will need to be self-sustaining strategic partnerships of a broad range of local organisations, businesses and people with the credibility to work with, and influence, other local strategic decision makers. There are 48 LNPs working across England.

The **Catchment-based approach** is a Water White Paper commitment and was initially piloted in 2012 to test approaches to improved engagement, information sharing and co-ordination of action to manage river catchments. This assessed how to involve local people and businesses to protect and improve water and to build approaches that deliver multiple benefits

We want to see the concept of planning for ecosystem services on a spatial basis further incorporated as an important way to facilitate PES schemes, both for public and private funding. It is encouraging to see new and various efforts to map ecosystem services at a spatial level including the on-going work being undertaken by Natural England and the wider Defra family.[18] All of this work could help to underpin the development of PES and improve the targeting and integration of existing and new funding in the future**.**

Box 6 Use of spatial planning of ecosystem services

Forest Research's '**Woodland for Water**' report[19] found strong evidence to support woodland creation in appropriate locations to achieve water management and water quality objectives. The report found indicative evidence that targeting woodland buffers at the field scale may be effective in slowing down run-off and intercepting sediment and nutrients, whilst wider targeting of woodland planting in the landscape can reduce fertiliser, pesticide and sediment loss into water. Evidence from Europe and further afield provides examples of effective payment schemes for water-related forest services, which have succeeded in achieving woodland creation and a reduction in nutrients reaching watercourses.

[18] The Ecosystem Knowledge Network is an excellent repository for a range of projects taking an ecosystems and spatial approach, see ekn.defra.gov.uk/resources/examples/englandwales/

[19] www.forestry.gov.uk/pdf/FRMG004_Woodland4Water.pdf/$file/FRMG004_Woodland4Water.pdf

2.6 Developing the market infrastructure

Metrics and assurance: The development of clear measurements, standards and indicators linking actions to services can be key to ensuring that buyers can quantify the benefit they receive.[20] The Woodland Carbon Code (**Box 7**) is a good example of such an enabler and Defra is also funding research into peatland carbon metrics and assurance for peatland restoration buyers (see Section 3 and A5). A short RELU study on PES recommended that Defra building on the Best Practice Guide, should oversee an accreditation framework or set of principles to which all PES schemes should adhere to in return for some kind of accreditation, for example added value and coordination of local schemes with national strategic priorities.[21] A single scheme may not be straightforward given the potential diversity of PES and a more practical prior stage might be the development of a repository of schemes (section 4). To see further uptake of payments for ecosystem services there may be a need to consider the potential new demands for assurance and verification activities and the role for government and agencies.

Box 7 Woodland Carbon Code

Planting woodland to remove CO_2 from the atmosphere is a way of compensating for emissions while also providing many other social and environmental benefits. Investors in carbon capture projects need confidence that the woodlands will be well managed and really will capture the CO_2 claimed. Certification against the Woodland Carbon Code meets this need by providing this evidence. It also creates real and verifiable carbon 'rights' which can be sold to recoup the costs of creating the woodland and generate an income.

For a project to be certified, it has to:

- register with the Forestry Commission within two years of the start of planting
- predict carbon capture using woodland carbon models
- prepare a Project Design Document outlining how it meets Code requirements
- have this validated by an accredited certification body
- have it verified periodically to show that it continues to meet the required standards.[22]

The Code has already generated a wide range of woodland creation projects across the country to abate carbon dioxide emissions in the atmosphere. Figures to end December 2012 from the Forestry Commission highlight 42 projects in England (including those awaiting validation) covering 745 hectares and an estimated 432, 000 tonnes carbon sequestered (over the lifetime of the projects).

[20] It is worth noting that the US Office for Environmental Markets was created to play a strategic role in "reducing entry costs" through ensuring consistency in metrics and standards. For more details see: www.fs.fed.us/ecosystemservices/OEM/index.shtml/index.shtml

[21] www.relu.ac.uk/news/policy%20and%20practice%20notes/39%20PES/PES.pdf

[22] www.forestry.gov.uk/pdf/WoodlandCarbonCodeDL6pplinkslo.pdf/$file/WoodlandCarbonCodeDL6pplinkslo.pdf

Exploring new financing models and mechanisms: In many contexts the benefits of investment in natural infrastructure may be diffuse and there is a need to explore new means to aggregate demand from beneficiaries and mobilise funding solutions. New financing models will need exploring if we are to see an expansion of PES, particularly in the context of "**place-based**" models of PES, in which multiple ecosystem services, multiple beneficiaries and a range of different aims and responsibilities are involved within a defined geographical area. These approaches are starting to emerge and can facilitate spatial planning, develop closer synergies between the delivery of different services, draw in multiple sources of funding and strengthen the overall economic case for action. They can build upon new partnership initiatives mentioned above.

As we try to combine multiple funding sources, there are a number of key issues that start to emerge where new thinking may be required, for example, how or whether to "stack" become important and issues around combining public and private funding (see **Box 8** and Section A3). [23]

Box 8 Linking agri-environment and private finance[24]

There is an opportunity to combine the finance available to farmers through agri-environment schemes with private finance for particular ecosystem service enhancements. There are precedents. For example, SCaMP catchment management have successfully combined money from United Utilities with money from agri-environment schemes (see case study in section A3 for further detail). For woodland creation projects, landowners are eligible to receive funding both through the English Woodland Grant Scheme and through selling carbon credits through the Woodland Carbon Code, with certain conditions attached to ensure additionality from carbon finance.[25] In theory public and private finance could be brought together in different ways to encourage the desired changes to land management:

- private finance could be used to introduce new options to Stewardship schemes
- private finance could be used to make existing Stewardship options more financially attractive to farmers, using outcome-based top-ups
- projects could seek funding both from agri-environment schemes (e.g. applying for HLS funding) and from selling carbon credits through a Peatland Carbon Code
- projects could combine funding from a variety of funding sources, alongside state-funded agri-environment to deliver a wider range of ecosystem services and benefits.

[23] Stacking (also called "layering") refers to schemes where payments are made for different ecosystem services separately from the same system. For example, the same peatland restoration project could run a carbon offset scheme in parallel with a scheme targeting water companies to pay for water quality benefits, whilst taking in money from a visitor payback scheme.

[24] Adapted from forthcoming NE/Defra study "*Developing place-based approaches for Payments for Ecosystem Services*, May 2013, Crichton Carbon Centre, URS, IUCN, Birmingham City University.

[25] Forestry Commission (2011) *Co-funding of woodland creation through EWGS and carbon finance* at: www.forestry.gov.uk/pdf/ON020-EWGS&CarbonFinance.pdf/$file/ON020-EWGS&CarbonFinance.pdf

The key challenge is to ensure **additionality** and avoid the risk that improvements would have occurred in the absence of the additional funding made available through combining private and public revenue sources. Care also needs to be taken that the public and private schemes do not have contradictory objectives.

Innovative funding mechanisms such as **reverse auctions** (so called because bidders sell rather than buy, usually to a single large buyer) can be an important means of engaging the supply side and enhancing ecosystems cost-effectively. This approach can be particularly useful when there are a large number of potential suppliers or providers and the use of an auction can introduce greater competition into the process and improve value for money. Reverse auctions require the land manager or owner to submit bids specifying the minimum payment they are willing to accept as compensation for specified changes in land management practice. Bids providing the highest environmental benefits per unit costs are accepted until the budget is reached. These can work in a public or private financing context and recent evidence from one of Defra's pilots in the River Fowey (Box 9) suggests there is potential to apply this approach more widely. See also Section A1.

Defra will work with others on exploring new financing models for PES and building understanding of key issues relating to multiple funding sources.

Box 9 Fowey River Improvement Auction - Designing a PES auction[26]

On behalf of South West Water, in 2012 the University of East Anglia and Westcountry Rivers Trust designed and organised a reverse auction for PES in the River Fowey catchment in Cornwall. It is the first of its type in the UK. It aimed to distribute funds from South West Water to farmers in the catchment for investments in farm capital that improve river water quality in a more cost-effective manner than water treatment solutions. The River Fowey is the source of the majority of Cornwall's drinking water but suffers from sediment, nutrient and pesticide pollution, primarily emanating from farming activities. It therefore provides fertile ground for trialling a payment for ecosystems services (PES) mechanism.

In the auction, farmers were invited to bid for grants for environmentally-improving capital investment projects. These were evaluated on a value-for-money basis. Nearly half of eligible farmers participated and the scheme was considerably oversubscribed. The project has shown that an auction-based PES mechanism can successfully distribute funds to farmers for investment in capital items that improve water quality. Comparison with an advisor-led PES mechanism used previously in the distribution of Upstream Thinking funds reveals that the auction can save on administrative costs and extend the possibility of participating in the scheme to a wider constituency. Competitive pressures are also evident in the bidding process. It concludes that auction mechanisms are likely to be most efficient and effective in distributing funds for a single type of investment, particularly when the benefits of those investments can be estimated reasonably accurately without site-specific knowledge. Auctions also have a considerable advantage in that they scale-up with relatively little additional cost. See forthcoming report for more detail.

[26] www.cserge.ac.uk/research/current-projects/fowey-river-improvement-auction

Overcoming contractual barriers: PES schemes, though voluntary, require some sort of contractual basis where payments are conditional on the delivery of a service, or the completion of actions such as land use changes considered likely to protect or enhance a service. This can be hampered by deficiencies in existing legal provisions. The RELU study on PES states that "long term resource protection requires robust, durable and flexible legal tools. Restrictive covenants are used in the UK but can lack flexibility and enforceability if land ownership changes, compared to conservation easements that protect land from development or certain kinds of use in perpetuity, used in the USA." Indeed, the **Law Commission launched a consultation in March 2013 on the concept of *"conservation covenants"*.**[27] Whereas at present, individuals and organisations are only able to contract with each other to improve the environmental performance of an activity, a conservation covenant would allow the environmental obligation to apply to the particular area of land and be transferred to future owners of the land. Positive conservation covenants are used in many other jurisdictions, but in the law of England and Wales are not binding on subsequent owners of the land to which they relate. The Law Commission highlights that: "Instead, landowners and responsible bodies are relying on complex and expensive legal workarounds, or the limited number of existing statutory covenants that enable certain covenants to be enforced by specified bodies (for example, the National Trust)".

[27] lawcommission.justice.gov.uk/areas/conservation-covenants.htm

3. Developing the potential for PES: specific opportunities

This Action Plan provides an opportunity to look across different policy contexts and draw together a high-level view of the potential for incorporating PES in these areas**. Table 3.1** below provides an overall summary of progress and potential across the various policy-related areas as well as highlighting enabling actions. A detailed assessment for each area is provided in **Annex A**.

Specific opportunities identified in this section and detailed further in the Annex should not be seen as attempts to "pick off" individual services, but as points of entry into applying an ecosystems approach in ways that lever in new sources of funding to protect and enhance nature. For instance, well managed **peatlands** can provide services in terms of carbon storage, water quality, biodiversity and recreation. Across all these areas, there is considerable scope for inter-linkages and integration, for example, across **water and land management** and the need to modernise and integrate wider funding arrangements (particularly agri-environment funds). While many PES schemes are applied in the rural context, there is an important potential role in linking to **urban green infrastructure** as the Defra PES pilot project undertaken by the Land Trust in Hull City demonstrates (see Box 11).

Scoping out where the demand for payments might come from is a common theme. In addition, where PES schemes require multiple funding, exploring new sustainable funding approaches (e.g. such as a catchment trust fund) may offer opportunities in the longer term to scale up.

For certain areas, **key investment periods** e.g. PR14 water price review and the next Rural Development Programme for England (RDPE), will be important in determining uptake and progress and new opportunities. For water catchment schemes, PR14 should see a significant increase in catchment-based schemes from the £60m invested in PR09. A new RDP provides the opportunity to renew agri-environment schemes, their targeting and prioritisation in ways that can more easily accommodate initiatives from the private sector. In other policy areas, there are potential opportunities for piloting and exploring new approaches which could provide a firmer platform in future funding periods.

PES is a potential option for expanding and improving place-based '**visitor payback'** schemes, where voluntary payments are made by visitors to a particular location to contribute towards the upkeep and provision of the natural environment. The practice is suitable for a broad range of places such as National Parks, Areas of Outstanding Natural Beauty, and natural spaces where specific recreational activities occur. A Defra PES pilot project is currently investigating the scope for increasing investment in visitor payback schemes through taking a PES approach, by directing the visitor's payment towards additional investment in specific ecosystem services.

Box 10 Some PES Case Studies

"From Forests to Faucets Partnership": The Denver Water – U.S. Forest Service "From Forests to Faucets Partnership" is an emerging example of one of the largest "payment for watershed protection" efforts in the US, treating 38,000 acres of forest over five years designed to avoid higher future costs for Denver Water. Through an innovative partnership, Denver Water is providing matching funds for the USFS to improve forest health, reduce wildfire risks, and prevent costly impacts to the water collection system from wildfire.

South West Water's 'Upstream Thinking' project aims to improve water quality in river catchments in the water service company's area as a way to reduce treatment costs. It also aims to help it manage water volumes during droughts and control run-off during floods. During the PR09 funding round, SWW is spending £9m on moorland and farmland projects and £1m on catchment investigation projects which totals 1% of total CAPEX between 2010-2015. Cost benefit analysis for Upstream Thinking in PR09 indicated a benefit cost ratio of 65:1 for such investments in catchment schemes.

Moorland restoration in the Peak District and South Pennines: As well as storing much carbon, Bleaklow and the neighbouring Pennine hills supplies the drinking water for many of the big cities of northern England. However, treacle-coloured water carrying small particles of peat from degraded peatlands increases treatment costs for water companies. The Moors for the Future Partnership is leading a project to restore Bleaklow to healthy wet bog. It is co-ordinated by the Peak District National Park, and co-funded by the European Commission. Partners include Environment Agency, Natural England, National Trust, United Utilities and Yorkshire Water.

Pumlumon Project: Managed by Montgomeryshire Wildlife Trust (MWT), this scheme has been operating for six years and operates essentially as a "layered" PES scheme, with several buyers buying a package of ecosystem services from several providers, through an intermediary (MWT). Key services provided include carbon storage and sequestration, water storage and flood attenuation, improved water quality and biodiversity, and new opportunities for visitor access. Outputs to date include 1,346 tonnes CO2e/year saved, 155m litres of extra water stored, and 45,000 additional visitors to nature reserves.

Slowing the Flow at Pickering is a scheme investigating whether better land management can enhance flood protection for Pickering, North Yorkshire and deliver benefits for water quality, wildlife, and soil protection. The scheme aims to achieve protection for 1 in 25 year flooding events through a mixture of land management measures and woodland creation; these measures aim to increase the time it takes for rain falling on the upper catchment to reach surface water running through Pickering.

The Mersey Forest is a growing network of woodland across Cheshire and Mersey created through a partnership of seven local authorities, landowners, the Forestry Commission, Natural England, businesses in the area and the local community. It was one of 12 areas chosen in England to be the focus of long-term tree planting programmes to improve the local environment for the benefit of people, wildlife and the economy. The Mersey Forest has led to the planting of over 8 million trees since its inception in the early 1990s.

Visitor Payback: A Visitor Payback Scheme is supporting the ecosystem services pilot in Bassenthwaite Catchment. Visitors donate money to promote landscape management via participating local businesses, providing a mechanism for tourists who benefit from the natural environment to directly support it.

Climate change is a key driver of potential PES schemes, as inevitable climate change will affect the ecosystems services that we rely on, such as water supply. The National Adaptation Programme provided an opportunity to begin to consider how investing in natural solutions and green infrastructure can increase **resilience to climate change**. For example, investing in green infrastructure can help in local climate regulation such as providing a cooling effect in urban heat islands. A report on the progress of this programme will be published later in 2013. The role of PES mechanisms for climate change adaptation will be informed by a Defra research study currently being undertaken.[28]

Box 10 provides a range of further case studies to highlight the growing application of PES across different policy contexts. For more detailed case studies, see Defra, *Payments for Ecosystem Services: a Best Practice Guide – Annex of Case studies*[29].

[28] *Role of PES in climate change adaptation*, URS, forthcoming study for Defra.
[29] www.gov.uk/government/policies/protecting-biodiversity-and-ecosystems-at-home-and-abroad/supporting-pages/valuing-the-benefits-we-get-from-nature

Table 3.1: Specific areas of opportunity

Water quality

Evidence from the number of established schemes highlights that the water sector and the scope for upstream catchment management schemes to provide sustainable approaches to delivering improved water quality offers the most immediately promising opportunities for PES. This is linked closely to the requirements for meeting drinking water standards, reducing the costs of treatment by ensuring better raw water quality and to meet the environmental requirements of the EU Water Framework Directive (WFD). There is a potential strong business case for water companies to direct increasing investment in catchment schemes particularly in relation to the next major price review (PR14). While much attention is related to upstream catchment schemes, there are potentially other novel applications – for example, constructed wetlands for dealing with wastewater discharges compared to expensive and input-intensive treatment plants; or a PES scheme to address increased nutrient pollution from development.

Progress	Potential	Specific challenges
The 2009 price review, water companies put forward proposals to spend £60 million on more than 100 catchment management schemes and investigations. For the upcoming investment period from 2015 to 2020 (PR14), Ofwat are reviewing the regulatory framework to encourage the companies to consider more innovative and sustainable solutions, including catchment management.	Significant uptake in catchment management schemes following PR14 with clearly-articulated customer benefits. An improving information and evidence base on the business case for investment in catchment management. There is increasing recognition of a wider set of contexts for water PES – moving beyond drinking water standards, to use in meeting WFD and Bathing Waters, water storage, nutrient offsetting, recreation. Longer term, new catchment funding models offer the potential to draw in a wider range of funds from different beneficiaries and may have a role in helping to meet longer term WFD objectives.	Need for integration across water and land management and link to wider funding arrangements particularly agri-environment funds. Importance of monitoring and evaluation if we are to upscale.

Defra will:

- **ensure that PES approaches are integrated within a coherent framework for a Catchment-based Approach across England**
- **strengthen the evidence base on the benefits of catchment approaches and continue capacity building in implementing PES approaches**
- **fund new research into financing mechanisms at catchment level with a view towards piloting in a number of catchments.**

Flood risk management		
Natural flood risk management aims to work with natural processes – such as the alteration, restoration or use of landscape features – to reduce flood risk and damage. In some cases this approach can complement hard engineering solutions, and provide additional benefits such as improvement to water quality, carbon sequestration, biodiversity and amenity value. There is scope for a better alignment between those who pay for flood risk management and those who benefit. Whilst there remains a role for Government intervention, there are also benefits in moving towards a greater role for a 'beneficiary pays' approach, although there needs to be a mechanism for eliciting payment. There are potential welfare gains if people and businesses can identify improvements and be given a means to pay for them.		
Progress	Potential	Specific challenges
In England, the new Partnership Funding arrangements for flood defences are designed to increase contributions from local beneficiaries, so this is already a step towards a PES-type approach. The Ecosystem Markets Task Force has highlighted new financing models for delivery of FRM that can enable natural solutions.	The Pitt Review advocated more working with natural processes and rural land-use options rather than exclusively relying on larger hard defences. "Soft" options are unlikely to replace hard flood defences in most cases, but may complement more conventional flood management and in some cases could prove an attractive proposition when additional benefits are taken into consideration. In the current state of play it is more feasible for natural flood risk management to work in smaller scale catchments where the governance and identification of suppliers and beneficiaries is more straightforward.	Depending on the evaluation of existing projects, there may be a need for further research to develop understanding of the science behind natural flood risk management. This may include further pilot projects. There is further work to be done on exploring the range of beneficiaries, and there may be scope for joining up with agri-environment schemes. Using land for flood management involves trade-offs against other land uses.
Defra will: • **continue to fund flood risk demonstrator projects including 'Slowing the Flow' at Pickering, and evaluate relevant PES pilot research projects including the Hull PES pilot (on urban flood risk management)** • **consider, as part of the policy evaluation of Partnership Funding whether (and how) the approach influences the selection of measures, and how it opens up the opportunity for a broader range of schemes with broader benefits to access funding.**		

Linking Environmental Stewardship and PES		
More than 70% of land in England is under an Environmental Stewardship agreement. Consisting of a “broad and shallow” Entry-Level Stewardship (ELS) scheme and a more targeted Higher-Level Stewardship (HLS), it can loosely be considered one of the world’s largest publicly funded PES schemes, although payments are broadly based on income foregone. There are two broad opportunities to (i) develop stewardship into a more coherent market for ecosystem services recognising scheme constraints; and (ii) explore how public and private “PES” mechanisms can complement each other. Additional funders might include water companies, housing developers, tourism or marketing schemes.		
Progress	Potential	Specific challenges
SCaMP and woodland creation both offer examples of combining stewardship funds and private finance to good effect. However, it is not entirely clear how actual or potential sources of private PES funding are currently interacting with the different agri-environment schemes. This is partly because private-sector PES is still a relatively new concept and partly because agri-environment schemes have operated in isolation.	The start of a new RDP offers opportunities to revise state-funded PES schemes like Environmental Stewardship so they can more easily work alongside private sector investment and adopt ecosystem approach principles. Realising these opportunities could considerably enhance the benefits currently provided by Environmental Stewardship, which currently covers nearly 6.5 million hectares of land.	In developing new approaches to linking Stewardship and private sector PES, care is required in order to avoid breaching EU rules on dual and match funding, such as allowing private funders to top up agri-environment payments to ensure additional ecosystem services are delivered. In addition, the value for money and relevance of innovations such as reverse auctions will need to be carefully appraised. Opportunities may mostly lie in supporting pilot projects during the period 2014-20, with a view to fuller integration after that. Developing and sharing evidence and targeting frameworks with the farming industry and private sector would make it easier to see synergy and co-ordination potential.
Defra will: • **explore the potential for different models of agri-environment delivery including reverse auctions and match-funding mechanisms, in the context of developing the new Rural Development Plan for England; and work with stakeholders to improve targeting and flexibility** • **review the barriers and opportunities to incorporating private funding alongside Rural Development Programme funding.**		

Forestry & Woodlands		
Woodlands have significant economic, social and environmental value across many sectors of the economy and society. English woodlands already play an important part in the growth of the UK forest carbon market and in ground-breaking projects that use land management to improve water quality, reduce flood risk, enhance biodiversity and adapt to impacts of climate change. There is an opportunity to build on this by looking in more detail at the wider range of new market opportunities in woodlands and forestry.		
Progress	Potential	Specific challenges
The government's Forestry and Woodlands Policy Statement highlighted strong commitment to valuing the many social and environmental benefits of woodlands and to developing new market opportunities to realise these benefits. The statement went on to highlight that Government would be supporting further work to assess these values and to explore new ways of enabling the outputs of woodlands to be recognised and valued in markets.	There are many examples of best practice in the woodlands sector for developing payments for ecosystem services. For example, the Woodland Carbon Code is an important enabler for investment in woodland carbon projects. The development of a roadmap by summer 2013 is demonstrating a commitment to develop ecosystem markets and look at the range of enabling factors. The sector itself is looking to release its full potential through 'Grown in Britain' (www.growninbritain.org/). This initiative takes an inclusive approach along the whole wood supply chain from forest to consumer to develop market demand for wood products that will in turn increase sustainable woodland management and creation to achieve wider ecosystem improvements.	One of the key challenges is around capturing the multiple values that woodlands offer. For example, recreation and tourism related to forests can be significant but the value may not be able to be captured by forest owners but rather by the myriad of firms associated with tourism and recreation. The development of the Woodland Carbon Code has been an important enabler but further development of market infrastructure has been shown to be required to catalyse the flow of private investment into woodland creation in England.
Defra will: • **work jointly with Forestry Commission to develop a woodland ecosystem market roadmap by summer 2013** • **ensure lessons learnt from application of PES in forestry are provided to help wider development of PES** • **support the work being undertaken by 'Grown in Britain'.**		

Peatland restoration

Peatlands form a significant part of the UK's natural capital which, if in good condition, provide a range of ecosystem services: they store carbon, regulate water quality, provide habitats for internationally important species and opportunities for distinctive recreation. Yet according to the IUCN UK Peatland Programme's Commission of Inquiry on Peatlands, around 80% of UK peatlands are degraded. Investing in conserving and restoring them will help to meet national and international obligations and aspirations on biodiversity and water quality, as well as in reducing greenhouse gas emissions. A peatland carbon code could facilitate payments by business to land managers for carbon-saving peatland restoration. Such a code could promote and facilitate such investments by verifying the carbon benefits of restoration (which are relatively small in overall carbon budget terms) and provide assurance of wider ecosystem benefits.

Progress	Potential	Specific challenges
Defra's "barriers and opportunities" research highlighted the potential role of PES for peatland with respect to both climate regulation and water quality. In particular, it focussed on the potential to develop a peatland code. Recent Defra research on the development of a pilot Peatland Code will be completed in summer 2013 and could target the CSR voluntary market initially.	Market research in 2009 suggested demand from UK companies and individuals wishing to voluntarily support land-based carbon reduction projects is likely to exceed 1 million tonnes of carbon reduction per year (and could potentially exceed 10 million tonnes). More focused market research as part of the Defra's PES pilot on peat highlights some ignorance of the potential benefits of peatland restoration, but also the attraction for certain types of UK business to invest in peatland restoration (perhaps alongside other funders) that is local to staff or customers with social and environmental as well as carbon benefits.	There are a number of political, technical, scientific and economic issues which would need to be worked through in order to develop an effective peatland carbon code which would give confidence to investors.

Defra will:

- **work in partnership with the IUCN UK Peatlands Programme and others to support the testing, development and launch later in 2013 of a pilot UK Peatland Carbon Code, addressing the challenges identified**
- **publish research (in partnership with Natural England) which develops evidence-based carbon metrics to inform the pilot peatland carbon code**
- **work closely with officials in the Devolved Administrations to ensure that peatland PES approaches are applicable across the UK. On 5 February 2013, UK Government Environment Ministers issued a public letter recognizing the importance of conserving peatlands in the UK and British Overseas Territories for biodiversity, water and climate change.**

Place-based partnerships and initiatives		
Place-based, multi-service PES schemes, that value, measure and seek to improve multiple ecosystem services within a single geographical area, are starting to be developed. These approaches have the potential to provide a means to develop closer synergies between the delivery of different ecosystem services; may offer potential opportunities to combine multiple sources of funding from a range of beneficiaries and strengthen the overall economic case for action. An important building block for the development of such approaches is the various partnership initiatives that have been emerging including: Catchment-based approach pilots, Nature Improvement Areas (NIAs) and Local Nature Partnerships (LNPs).		
Progress	Potential	Specific challenges
LNPs and NIAs are designed to work at a strategic level and improve the range of benefits and services from a healthy natural environment. There are 48 government-recognised LNPs covering almost all of England. LNPs will work strategically to embed the value of nature into local decision making. 12 Government-funded NIAs cover hundreds of thousands of hectares, to restore habitat which will benefit wildlife and people. Initial investment by Defra and NE of £7.5 million has been matched by over £40 million of additional resources. The catchment-based approach aims to cover the whole of England starting from 2013 and will support engagement and potentially broker PES in a place-based way.	RELU has suggested that Defra "*capitalise on NIAs/LNPs and national parks to test and scale up design and delivery of PES schemes*" (Policy practice note, September 2012). Specific NIAs with a potential interest in exploring PES opportunities include Dark Peak, Nene Valley and Wild Purbeck. This will offer a good opportunity to learn lessons on developing approaches to PES. Similarly, LNPs may provide opportunities for strategic level delivery of ecosystem services and incorporating PES thinking. For example, New Anglia LEP's Green Economy Manifesto has an aim to use PES best practice guidance working with the LNP. In the South Pennines a recent NE/Defra study identified considerable interest in developing a place-based PES scheme, potentially under the auspices of the Local Nature Partnership, chaired by Pennine Prospects.	Need for integration across water and land management and link to wider funding arrangements. Resources and expertise are required to develop PES schemes particularly in the early stages.
Defra will: • **discuss with LNPs the potential for targeted support where there is a community of interest around payments for ecosystem services** • **encourage both the Government-funded and the locally-determined NIAs to explore PES approaches, and capture and share the lessons learnt.**		

4. Learning by doing: evaluating PES

The practice of developing Payments for Ecosystem Services schemes is still in its infancy in England. The fundamental challenge is in developing new market and institutional mechanisms that facilitate new streams of funding for ecosystem service protection and enhancement. In this context, Government's role is largely facilitative (Section 2). So this Action Plan focuses upon piloting, capacity-building, fostering innovation and demonstrating good practice. Learning by doing will be key. **This Action Plan is therefore only a starting point**, and will need to be revisited as evidence emerges of the potential for, and limits to, PES approaches.

4.1 Monitoring progress

It will be important to monitor developments in PES at an England level systematically, showing what types of schemes are implemented. Data is at present rather scarce and fragmented. Information that could be collected include: the number of PES schemes active and at pilot stage; funds invested; hectares managed; key players and their motivations; habitats and services brought into PES schemes; as well as more detail on type of PES scheme and spatial location.

- **Defra will explore the potential for an open-access repository of PES and PES-like schemes, involving the Ecosystem Knowledge Network and others, in order to track progress and share good practice over the medium-term.**

4.2 Evaluating the PES pilot research fund

It will be important to draw out lessons from the range of projects supported to inform the future potential for, and development of, PES schemes in England. There are two overarching questions:

- Has the fund met its objective of supporting practical and innovative PES projects on the ground with potential to contribute towards "proof of concept" for PES schemes?
- Is there a case for continuing Government support for more pilots and if so, what is the right type of support?

To answer these, several specific questions will need to be addressed in an objective fashion:

- Would the pilots have happened in the absence of Government funding?
- What is the legacy of the PES Pilots?
- How useful has the developing PES Best Practice Guide been to the Pilots (which have proved a test-bed for the Guide)?
- Have the pilots identified common barriers and challenges that can be overcome?

- What do the pilots suggest about the willingness of potential beneficiaries to participate in PES?

- What do the pilots tell us about opportunities to be explored in future research?

Early experience to date of the PES pilots suggests that:

- they are helpful in testing the feasibility of PES in new contexts in which market approaches have not been used

- it is essential to ensure that sufficient technical and oversight is built into research so that key assumptions are adequately tested

- PES opportunities do not generally exist in isolation but must respect wider strategies and plans in the target area, to which they could add value

- it is essential to communicate with many stakeholders in simple, intuitive terms rather than hope they will engage in higher-level principles and technical language.

A case study showing some specific emerging lessons from one of the first round of Defra PES pilots is given in Box 11.

Box 11 Lessons learnt from the Hull PES pilot which focussed on flood risk

Two local PES schemes were considered. One was a large-scale multi-agency approach to create large scale Sustainable Urban Drainage Systems (SUDS) and greenspace for the regeneration of the Orchard Park area of Hull. Flood mitigation is the main ecosystem service, with other ecosystem-related benefits like recreation, landscape, health and even employment piggy-backing on top. The second scheme was a street level scheme using a palette of different small-scale treatments, which is thought to have the potential to be applied to other urban areas facing the same flood risk problems.

PES is found to be applicable to urban areas, where existing green and blue space delivers ecosystem services. It is a complex picture however, with lots of interactions between buyers and sellers to account for. The pilot found that ecosystem services and PES concepts were understandable and appealing to people when explained in simple and clear language and accompanied by visuals. Community and business preferences for ecosystem services were found to include the whole package of climate, air quality, water, food, biomass, cultural and biodiversity, rather than simply flood alleviation alone. Concentrating on these wider benefits was found to be important in facilitating engagement.

The Hull pilot found it beneficial to have a steering group, which was made up of different departments within Hull City Council and local organisations, and to also engage stakeholders through a workshop. The steering group helped to define the initial scope, identify challenges and opportunities, provide data and information, test concepts and language and shape the proposed PES schemes. Their experience did however highlight that there were time implications of such stakeholder participation, and these should be reflected in project design.

A further lesson is the need for PES schemes to be adaptable, pragmatic and opportunistic in responding to constantly changing local circumstances. There is a commitment amongst the partners to work together to try and take the proposed PES schemes forward.

Defra considers there is a case for continuing to support PES pilot projects to help in capacity building and plans to continue the PES pilot research fund in late 2013-14 (see section 2.2). This will be subject to review of the first two rounds of the fund which could help to ensure the research fund is focused appropriately, for example in application of PES in more experimental areas.

Defra will:

- **convene a stakeholder workshop in autumn 2013 using the PES pilot research projects to evaluate emerging findings and peer review the potential for PES**
- **publish an overall evaluation and review in Spring 2014, following completion of all current pilots, to inform next steps.**

4.3 Evaluating PES in the longer term

Longer term, a fuller evaluation would be desirable, focusing on: the potential for PES in England; Government's role; how PES fits with and informs the wider and evolving policy environment; and what further actions could help develop the market infrastructure. This should be informed by progress in the actions set out in this Action Plan, the evaluation of Defra's PES pilots, and longer-term progress in institutional innovations, such as Defra's Catchment-based approach to environmental management of land and water for multiple benefit, and the role of Local Nature Partnerships and Nature Improvement Areas.

It is already clear that 'payments for ecosystem services' is a loose concept which encompasses a diverse range of initiatives; but the acid test will be whether these initiatives can lever in more income streams to protect and enhance the natural environment for the benefit of society and the economy.

Annex A: Specific opportunity areas for PES

A.1 Water quality

A.2 Flood risk management

A.3 Linking Environmental Stewardship and PES

A.4 Forestry & Woodlands

A.5 Peatland restoration

A.1 Water quality

1. The opportunity

Evidence from the number of established schemes suggests that the water sector and the scope for upstream catchment management schemes to provide sustainable approaches to delivering improved water quality offers the most immediately promising opportunities for PES. This is linked closely to the requirements for meeting drinking water standards, reducing the costs of treatment by ensuring better raw water quality and to meet the environmental requirements of the EU Water Framework Directive (WFD). Water companies need to look for the most socially, environmentally and financially sustainable solutions, with catchment management approaches offering one such solution. There is a potentially strong business case for water companies to direct increasing investment in catchment schemes particularly in relation to the next major price review (PR14).

While much attention is related to upstream catchment schemes, **there are potentially other novel applications of PES funded natural solutions relating to water quality: for example, constructed wetlands for dealing with wastewater discharges compared to expensive and input-intensive treatment plants; or a PES scheme to address increased nutrient pollution from development.** Defra is currently funding a number of PES Pilot research projects in these areas (see below). In addition, there are some emerging pilots that are looking at the potential for natural solutions to help in enhancing water storage (e.g. South West Water reviewing options that can help retain water on the moors).

The ecosystem service of focus here is the provision of clean water/water quality. The state of the natural environment – and the type and extent of land management activity within a particular catchment – will affect the quality and quantity of the water bodies within them. There is potential for enhancement of other ecosystem services. For example, if a company carried out work to restore an area of upland moorland, this could boost the environment's natural capacity to store carbon and improve biodiversity.

2. Potential actors

(a) Buyers - Government (on behalf of the public): National Government, Environment Agency, Local Authorities; **Private businesses (on behalf of customers/consumers):** Water companies, hydroelectric power (energy groups), food and drinks sector; tourism & leisure industry; fishery/shellfish businesses; port authorities.

(b) Providers - Land owners and managers including farm owners and tenants.

(c) Intermediaries - Environmental NGOs e.g. Rivers Trusts, RSPB**;** Natural England, Environment Agency, Forestry Commission, Farming Industry (farmers reps, land agents and farm advisors e.g. agronomists).

The provision of clean water is of interest to various groups as beneficiaries or potential buyers. However in addition, to public funding, the main driver of demand for improving water quality through catchment schemes are water companies. Intermediaries such as the Rivers Trusts play an important role as well as a wide range of knowledge providers. Internationally, heavy water users such as sugar and paper mills, food or drink manufacturing plants and mining enterprises are also buying into catchment-based water resource protection schemes, indicating the scope for similar opportunities in England.

3. State of play

At the time of the 2009 price review, Ofwat highlighted its support for water company proposals to spend £60 million on more than 100 catchment management schemes and investigations. Nearly two-thirds of that money to be spent over the period 2010-15 is for work that United Utilities, South West Water and Yorkshire Water will carry out to restore upland water catchments, while more than 90 of all catchment management schemes are investigations.

As part of the price review for 2015-2020 (PR14),[30] Ofwat is reviewing the regulatory framework to encourage water service companies to consider more innovative and sustainable solutions, including catchment management:

"*In the past, to deliver the good quality drinking water we all enjoy, the companies and their customers have paid for intensive treatment processes once water has been taken from the environment. After we have used this water, it must be treated to remove pollutants before it is returned to the environment. Again, customers pay for this. But as well as generating significant quantities of greenhouse gas emissions, this treatment capacity is expensive to build and operate…. Continuing to use such approaches would be very costly. …So, there is a need to consider more sustainable solutions for customers and the environment that tackle diffuse pollution at its source.*[31]

Important principles and issues for review for PES-funded catchment schemes to develop in practice include:

- demonstration of expected customer benefits (CBA); if adopting catchment management approaches enables a company to meet legal water quality standards at a reduced cost then customers will benefit from lower bills

- applying the polluter pays principle (not paying for compliance for widespread good practice) and ensure all sectors play their part in tackling problems at source

- forging partnerships where benefits accrue to others (multiple benefits)

[30] www.ofwat.gov.uk/pricereview/pr14/pr14publications/prs_web201301framework
[31] Ofwat discussion paper: "*From catchment to customer – can upstream catchment management deliver a better deal for water customers and the environment*?"(2011) www.ofwat.gov.uk/sustainability/prs_web1109catchment

- companies incentivised to innovate (and an outcomes approach will encourage that rather than prescriptive measures approach) to deliver customer benefits

- ensuring under a new total expenditure (totex) approach that there is no bias towards incentivising capital-intensive – and often carbon-intensive – solutions, such as building water treatment works.

4. Challenges

Overall, the key issue that will determine the scale of water company investment in catchment management is commercial self-interest: water companies will only invest in catchment management where this approach will provide value to their customers and shareholders.

It is vital there is clarity on requirements under the regulatory baseline (e.g. what farm environmental compliance standards are required underpinned by effective enforcement). The Water White Paper declared “acting to promote and secure compliance with existing requirements” to be a key part of the catchment-based approach. This will give the water industry and other potential buyers confidence that investment made in farm-level activities will not be delivering outcomes which should already be being delivered to comply with legal requirements, but also that there is explicit government support for achieving cost-effective, catchment-based solutions.

These schemes are mainly linked to more cost-effective, catchment-based approaches to raw water quality and the achievement of drinking water standard. However, some schemes also address environmental conditions including application of catchment approaches to waste water management which are still at an experimental stage. There are wider issues to which PES mechanisms could be applied which will require further work. Additional opportunities to be explored include how to deliver schemes that require broader partnership funding beyond water companies.

5. Defra will:

- **ensure that PES approaches are integrated within a coherent framework for a Catchment-based Approach across England**

- **strengthen the evidence base on the benefits of catchment approaches and continuing capacity building in implementing PES approaches**

- **fund new research into financing mechanisms at catchment level with a view towards piloting in a number of catchments.**

These specific enabling actions are discussed below. A growing take-up and acceptance of catchment schemes linked to PES mechanisms funded by water companies is expected to be put in place through PR14 with Government ensuring the regulatory framework put forward by Ofwat encourages consideration of more innovative and sustainable solutions, including catchment management.

- **Ensuring PES approaches are integrated within a coherent framework for a Catchment-based Approach across England**

It will be important to ensure that PES schemes are integrated within the Catchment-based Approach implemented by Government since March 2011.[32] PES may contribute to additional measures (in addition to those basic measures required under the polluter pays principle) to protect water bodies under the catchment approach. In February 2013 Defra announced the intention to roll out the 'management' catchments to cover the whole of England with detailed plans to be presented during Spring 2013.

- **Strengthening the evidence base and continuing capacity-building efforts**

An on-going need is to continue to develop the evidence particularly in relation to the costs and benefits of green infrastructure solutions and demonstration that can provide effective, 'value for money' solutions. More specifically in the water context, it is clear that we need to continue our efforts to improve the evidence base on catchment management approaches for delivering water quality improvements if we are to see a scaling up of the use of these approaches linked to PES mechanisms. The Demonstration Test Catchments (DTC)[33] are a good example of these efforts; DTC is a UK government-funded project currently working in three river catchments across England and designed to provide robust evidence regarding how diffuse pollution can be cost-effectively controlled to improve and maintain water quality in rural river catchment areas. In the context of water company investments in catchment solutions, developing the evidence base to demonstrate the benefits of these approaches in terms of better water quality, lower treatment costs and lower cost services to customers is required (see Box 3).

Improving the evidence base on wider business beneficiaries of ecosystem services will also be important in the context of water quality and water resources, for example in understanding how sectors like food processing and tourism could be linked to catchment approaches and PES.

There have been a number of Defra PES pilot research projects in the water context which are helping to learn lessons on different aspects of PES application in this area such as: the potential cost effectiveness of use of auction approaches within a PES mechanism (Fowey pilot); novel applications of PES approaches such as to deal with nutrient pollution from development (Poole Harbour pilot); and the application of PES to sewage treatment and benefits of investing in constructed wetlands (Bristol Avon Rivers Trust).

- **Funding new research into financing mechanisms at catchment level with a view towards piloting in a number of catchments**

There is a need to explore new sustainable financing models for catchment-based approaches that can provide innovative approaches and improved ways of targeting funding and encourage a wide range of beneficiaries to participate to finance water quality

[32] In April 2011 EA began piloting new approaches in 10 catchments, with a view to rolling out effective elements to other catchments from 2013. Also, in January 2012, a further 15 pilots were established. These are being hosted by external organisations. All 25 pilots ran until December 2012 and are now being evaluated before the roll out.

[33] www.demonstratingcatchmentmanagement.net/

and wider environmental enhancement. Specific areas that the research and pilots would aim to cover include: catchment trust funds; catchment auctions and catchment trading schemes (i.e. nutrients or pollution) and 'offsetting' schemes.

The concept of a **catchment trust fund** is that ecosystem service beneficiaries could pay into a central fund with monies disbursed to relevant enhancement projects within a catchment-based approach. Examples of current thinking in this area of sustainable financing models for water are emerging which this research and any piloting would aim to build on.[34]

Reverse auctions are one way of implementing a PES approach in a potentially cost-effective way and so can help to incentivise catchment solutions. Interest in application of these delivery mechanisms has been increasing, for example, see the EIB-sponsored Eco-delivery project,[35] and an EA diffuse pollution reverse auction study.[36] These approaches have been applied in government funded agri-environment programmes (e.g. US Conservation Reserve Program, Australia BushBroker) and more recently in the water context has been piloted in the Fowey River funded by South West Water (Box 9). In the longer term, there is a need to explore broader-based market mechanisms, such as **catchment nutrient trading** models, that can provide potentially cost-effective approaches to addressing various environmental quality standards. These approaches may build in PES mechanisms as part of a broader set of market-based and regulatory policy instruments.[37]

6. Long term direction

Key points in terms of future direction of travel are:

- expected significant uptake in catchment management schemes following PR14 with clearly-articulated customer benefits
- an improving information and evidence base on the business case for investment in catchment management but will be crucial to develop appropriate monitoring and evaluation of PES schemes to provide the evidence to upscale efforts in this area
- increasing recognition of a wider set of contexts for water PES including, for example, moving beyond addressing drinking water standards towards wider benefits such as meeting standards for WFD and Bathing Waters, water storage, nutrient offsetting, etc
- need for integration across water and land management and link to wider funding arrangements particularly agri-environment funds.

[34] For example, the Cambridge Natural Capital water stewardship collaborative project – see: www.cpsl.cam.ac.uk/Business-Platforms/Natural-Capital-Leaders-Platform/Water-Stewardship.aspx
[35] www.eco-delivery.stir.ac.uk/
[36] *Reverse auctions for diffuse pollution in the South East*, Environment Agency, March 2012
[37] For example, see Nutrient credit trading for the Chesapeake Bay www.chesbay.us/Publications/nutrient-trading-2012.pdf

A.2 Flood risk management

1. The opportunity

Natural flood risk management involves working with natural processes to reduce flood risk and damage. It involves working at the catchment scale and concerns the alteration, restoration or use of landscape features; mechanisms include storing water using landscape features, increasing soil infiltration, and slowing water by interrupting and increasing resistance to its flow. Such measures may be able to reduce the height of downstream water levels during a flood, or delay the arrival of the peak of the flood. These measures, applied strategically, may also yield wider ecosystem service benefits such as enhancing water quality, habitat for wildlife, biodiversity, carbon capture, landscape and greenspace provision. When these benefits are taken into account, natural flood risk management may in some cases be the best option.

There may be scope for a better alignment between those who pay for flood risk management and those who benefit. Flood management requires an appropriate level of Government intervention, but there is a case for moving towards a greater role for a 'beneficiary pays' approach, although there needs to be a mechanism for eliciting payment. There are potential welfare gains if people and businesses can identify improvements and be given a means to pay for them. However, the effectiveness and benefits of upland land management change as a means of reducing downstream flooding are not fully proven. This means that such projects need to be carefully considered on a case by case basis; the difficulty of modelling and predicting impacts can be a significant barrier to such proposals. Managed flood storage is, however, well understood but it is often difficult to make the case for relocating activity to make room for it; the natural flood plain where flood storage is most likely to effective also tends to be the most productive agricultural land, so there are trade-offs including distributional issues between sectors of society.

Flood risk management is an example of a regulating service that can be provided by ecosystems. There is a potential opportunity for PES if alternative land uses or land management practices can reduce or mitigate flood risk, and beneficiaries are willing and able to pay for this.

The Pitt Review: *Learning Lessons from the 2007 floods*[38] advocated more working with natural processes and rural land-use options rather than exclusively relying on ever larger hard defences. These options are unlikely to replace existing hard flood defences in most cases, though may significantly influence the case for management options for end-of-life infrastructure. Instead, ecosystem-based management options may complement more conventional flood management and may also prove an attractive proposition when the

[38] webarchive.nationalarchives.gov.uk/20100807034701/http://archive.cabinetoffice.gov.uk/pittreview/thepittreview.html

aforementioned additional co-benefits are taken into consideration. The limited evidence currently available suggests that the value of these other benefits may outweigh the flood risk benefits, suggesting that multiple funding packages may work best with an emphasis on payments from those enjoying the benefits of other ecosystem service as well as reduced flood damages.

2. Potential actors:

(a) Investors (and why they might benefit)

- Local authorities on behalf of members of the public (avoiding/reducing damage to property).
- Developers (buying capacity for new developments where flood risk is already critical).
- Highways Agency (note: this is suggested by one of the recent PES pilots – Cotswold Catchment).
- Businesses (avoiding/reducing damage to property and interruption to business).

(b) Providers

- Land owners/managers.

(c) Intermediaries

- Environment Agency, LNPs, NIAs, LAs, NGOs such as River Trusts.

3. State of play

In England, Defra's new Partnership Funding arrangements for flood defences attempt to increase contributions from local beneficiaries, so this is already a step towards a PES-type approach. The Committee on Climate Change's Adaptation Sub-Committee's 2012 progress report on flooding suggested that "In principle individual households and businesses should be willing to cover the costs of property-level flood protection because they receive the benefits. However, the upfront costs and uncertain benefits mean that households and businesses may not be willing to invest in these measures on a significant scale". [39] The final report of the EMTF included recommendations linked to flood risk management and in particular new financing models for delivery of FRM that can enable natural solutions.

There is scope for engaging additional ecosystem services to lever in more money for natural flood defences, which may increase the affordability of such schemes from a PES

[39] CCC Adaptation Sub-Committee Progress Report 2012 hmccc.s3.amazonaws.com/ASC/CCC_ASC_2012_Spreads.pdf

perspective. The ecosystem services of flood projects and the contributions to meeting the requirements of the Water Framework Directives are recognised in Government's Partnership Funding approach.[40]

A form of agri-environment scheme to provide a payment for ecosystem services has been instituted in Switzerland, where cantons are obliged to restore rivers and streams to their natural state, reverse artificial corrections, and provide more room for flood plains. Landowners and users receive direct payment from cantons, which in turn receive federal funds for this purpose.

In the current state of play it may be more feasible for natural flood risk management to work in smaller scale catchments where the governance and identification of suppliers and beneficiaries is more straightforward.

4. Challenges

The science is still not conclusive, with current models unable to perfectly replicate complex hydrological processes; each catchment is different, meaning that there is not a simple one-size-fits-all approach. There is also a lack of long term data.[41]

There is little catchment-scale evidence of the benefits and they are difficult to value. It is difficult to separate out the value of the flood risk benefits provided from the potential co-benefits of landscape management, as well as a risk that flood-related benefits may be small relative to these other benefits. Flood risk benefits depend on the value of the assets at risk, which will vary by location and therefore PES may be viable in some places but not others.

Some of the more substantial 'soft' engineering actions – such as restoring rivers, reconnecting or establishing new washlands and floodplains – may involve substantial upfront expenditure for landowners, necessitating front-loading of PES payments. PES schemes may therefore in these circumstances be limited to changing land management practices.

A barrier to using PES for flood risk management is that the benefits on the ground may not be particularly visible or tangible, leading to scepticism around the benefits and a lack of demand from beneficiaries. An alternative to PES, and highlighted by the Environment Agency led working group set up to respond to the Pitt Review,[42] is greater targeting of agri-environment schemes to combat flood risks. However, given all the pressures from other priorities it is unclear if this will be achievable.

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[40] Defra Flood and Coastal Resilience Partnership Funding introductory guide: archive.defra.gov.uk/environment/flooding/funding/documents/flood-coastal-resilience-intro-guide.pdf

[41] Parliamentary Office of Science and Technology note 396 Dec 2011 www.parliament.uk/briefing-papers/POST-PN-396.pdf

[42] EA Defra Pitt review response to recommendation 27 www.environment-agency.gov.uk/research/planning/136425.aspx

5. Defra will:

- **continue to fund flood risk demonstrator projects including ‘Slowing the Flow at Pickering, and evaluate relevant PES pilot research projects including the Hull PES pilot (on urban flood risk management)**

- **consider, as part of the policy evaluation of Partnership Funding whether (and how) the approach influences the selection of measures, and how it opens up the opportunity for a broader range of schemes with broader benefits to access funding.**

6. Long term direction

Depending on the evaluation of existing projects, there may be a need for further research to develop understanding of the science behind natural flood risk management. This may include further pilot projects. There is further work to be done on exploring the range of beneficiaries, and there may be scope for joining up with agri-environment schemes.

A.3 Linking up Environmental Stewardship and PES

1. The opportunity

More than 70% of land in England is under an Environmental Stewardship agreement, which is a voluntary scheme for farmers and land managers. The scheme consists of a tiered structure of a "broad and shallow" Entry-Level Stewardship (ELS) scheme (with upland and organic specific strands) and a more targeted and demanding Higher-Level Stewardship (HLS) that builds upon that. Because of its voluntary nature and the wide range of ecosystem services supported[43] it can be broadly considered one of the world's largest publicly funded PES schemes, although payments must be broadly based on income foregone.

Despite the wide range of benefits supported, farmers' choice of land management options under ELS apply has led to an imbalance in the outcomes commonly achieved. Farmers commonly adopt simpler measures that impose less on the basic farming business ("hedges and edges"), rather than more demanding in-field options that can offer more for wildlife and ecosystem service provision.[44] Whilst flat payment rates minimize transaction costs to encourage entry, there are issues over cost, environmental effectiveness and additionality of the schemes, particularly ELS. With funding expected to tighten over the next decade, there is a need to consider new ways of making best use of and maximising private sources of funding. For instance, HLS already provides a mechanism, at least in theory, for funding ecosystem services such as peatland restoration and catchment management, areas in which there is potential demand from the private sector.

So there are two broad but linked categories of opportunity:

- developing Environmental Stewardship into a more coherent **market for ecosystem services**
- exploring **how public and private "PES" mechanisms can complement each other**; in particular how public funds can lever in new private sources of funding and vice versa and to remove any barriers that might prevent this. Additional funders might include water companies, housing developers, tourism or marketing schemes.

Both elements are crucial if we are (a) to make the most of scarce public funds and (b) avoid inefficiencies, missed opportunities and unintended consequences in the interface between public and private PES.

[43] These include species diversity; protection of water and soil function; prevention of erosion and water pollution; flood management; wildlife conservation and the cultural heritage of landscape with lots of potential to optimise synergy between them through effective targeting and advice.

[44] See evidence for example from: Environmental Stewardship Review of Progress (2008, NE-Defra), Mid-term Evaluation of the RDPE (ADAS UK & Hyder Consulting UK 2011) and FERA, *Review of evidence requirements to support negotiations on future agri-environment schemes in the next round of CAP* (2013).

2. Potential actors:

(a) Buyers - Government (on behalf of the public); potential match-funding with specific beneficiaries.

(b) Providers - e.g. Land managers (farmers). The current Government-delivery approach to agri-environment tends to style farmers as "customers" applying for public funds rather than "suppliers" of ecosystem services. In contrast, privately financed schemes, and mechanisms such as reverse auctions, would more correctly emphasise the farmer's role as "supplying" quality assured services to buyers.

(c) Intermediaries - Natural England, Environment Agency, Forestry Commission, Farming Industry (farmers reps, land agents and farm advisors e.g. agronomists), Environmental NGOs, Utility Companies, food supply chain, experts in market creation.

3. State of play

A pilot study for Defra and NE of the potential for PES in the South Pennines states that "There is an opportunity to combine the finance available to farmers through agri-environment schemes with private finance for particular ecosystem service enhancements", noting the precedents of SCaMP and woodland creation, and the potential interplay between capital and maintenance cost funding (see Box 8). Yet it is not entirely clear how actual or potential sources of private PES funding are currently interacting with the different agri-environment schemes. This is partly because PES is still a relatively new concept and partly because agri-environment schemes have operated in isolation. There are, however, examples in which private and public funds have come together to protect and enhance ecosystems, of which the SCaMP programmes in northwest England are prominent (Box 12).

Other examples in which public and private funding are brought together include work on the Exmoor mires, the Pumlumon project in Wales and cases in which Environmental Stewardship is combined with other funding streams such as LEADER funding and the aggregates levy.[45]

The **Ecosystem Markets Task Force**, reporting in March 2013, recommended that "*Government should make more effective and innovative use of Pillar 2 funds by ... better targeting and coverage of a range of ecosystem services; closer linking with other rural development funds; innovative payment mechanisms; and given limited funds, exploring opportunities for synergies with other potential funding streams. This experience should prepare the ground for more radical reform of the CAP in 2020*." The Government will provide a formal response to the Task Force in summer 2013, building on this Action Plan where appropriate.

[45] For example, the Long Preston Floodplain project on the River Ribble is using Environmental Stewardship, LEADER and Aggregates Levy funds to protect a Natura 2000 site and deliver additional ecosystem services, www.longprestonwetgrasslandproject.co.uk/river-ribble.php

Box 12 Case study – United Utilities' SCaMP

United Utilities (UU) pioneered an ecosystem approach to managing water quality with its **Sustainable Catchment Management Programme (SCaMP)** over 10 years ago. SCaMP has demonstrated how such an approach can leverage funding from a variety of sources to implement measures that benefit the rural environment, economy and society. The first phase of SCaMP, between 2005 and 2010, covered 27,000 hectares of land. In a partnership between UU and RSPB, the prime focus was to improve the condition of Sites of Special Scientific Interest and water quality through activities such as restoring blanket bogs and areas of eroded and exposed peat, restoring heather moorland and establishing new woodlands. SCaMP provided farmers with new farm buildings and fencing to keep livestock away from watercourses and special habitats. Costs were split between UU funds (£10.7m) and support through external grants including agri-environment (£2.6m).

The arrangement has benefited farmers, UU, water customers, wildlife and habitats. SCaMP2, running from 2010-2015 covers the remaining 29,000 hectares of catchment land which UU owns. UU funds (£11.6m) are again supported with various external grants (£1.3m). UU is also investing in catchment land owned by others in partnership with others. At Kinder, it is investing £875k in partnership with Natural England / The National Trust (£875K) and at Woodhead, UU is investing £0.7m in partnership with Moors for the Future drawing down £2.6m of EU LIFE+ / agri-environment funding.

corporate.unitedutilities.com/scamp-index.aspx

Defra is in the process of assessing scheme design for the next **Rural Development Programme**. The new programme will need to address new policy priorities, and operate under a period where public finances are under increasing pressure. All new options will need to consider administrative costs, value for money and deliverability – including the impact on delivery bodies. Schemes must comply with new EU rules, and be designed to avoid disallowance.

4. Challenges

Current EU and trade rules and system inertia may constrain the extent to which new approaches to agri-environment schemes may be possible, such as allowing private funders to top up agri-environment payments to ensure additional ecosystem services are delivered. In addition, innovations such as reverse auctions will carry their own costs and will need to be carefully tested for their value for money and fit within the wider policy framework.

Box 13 Reverse auctions - Bush Tender, Australia:

Landholders competitively tender for contracts with Victoria State Government to be paid for protecting and improving the native vegetation on their land. The scheme uses a reverse auction-based approach, in which landowners propose conservation activities and their cost.

The opportunity to link up agri-environment with private PES is also a challenge i.e. to integrate public and privately funded schemes in a carefully designed way so as to reduce risks of any overlap or conflict in the delivery of environmental outcomes. Many potential PES schemes concern the uplands and most upland farmers are already part of an agri-environment scheme. If private sector funding is to be leveraged with public sector funding, then the public sector element needs to be paying for additional benefits beyond those accruing to the private sector third party so as to avoid paying twice.

Development of a new agri-environment scheme for the next RDP is moving quickly and could be finalised before thinking on private sector PES is fully developed so opportunities may mostly lie in supporting pilot projects during the period 2014-20, with a view to fuller integration after that. Developing and sharing evidence and targeting frameworks with the farming industry and private sector would make it easier to see synergy and coordination potential.

5. Defra will:

- **explore the potential for different models of agri-environment delivery including reverse auctions and match-funding mechanisms, in the context of developing the new Rural Development Plan for England; and work with stakeholders to improve targeting and flexibility**
- **review the barriers and opportunities to incorporating private funding alongside Rural Development Programme funding.**

6. Long term direction

As the EMTF states, experience with new forms of market-based mechanisms can prepare the ground for further radical changes in the next RDP perspective from 2020.

A.4 Forestry & Woodlands

1. The opportunity

Woodlands have significant economic, social and environmental value across many sectors of the economy and society. The area of woodland in England at March 2012 was estimated to be around 1.295 million hectares and represents around 9.9% of England's land area. Woodland cover comprises 961,000ha of broadleaves and 334,000 ha of conifers. Urban forests and street trees provide many of the benefits of their rural counterparts such as carbon sequestration and recreation and landscape benefits. They can also have additional benefits, due to their closer proximity to people, such as providing shade, filtering pollutants, increased quality of life and capturing storm water.

Grants (and direct intervention by government on the Public Forest Estate) have historically been used to encourage or increase woodland creation, woodland management and other activities. Since 1998 the UK Forestry Standard has been the reference standard for sustainable forest management in the UK. Collectively known as the **England Woodland Grant Scheme** (EWGS) there are currently six main grants available to support landowners who want to create new woodland and/or carry out sustainable woodland management, particularly where it protects and enhances the woodland's environmental or social value.

English woodlands already play an important part in the growth of the UK forest carbon market and in ground-breaking projects that use land management to improve water quality, reduce flood risk, enhance biodiversity and adapt to impacts of climate change.

Carbon markets arguably present the biggest current opportunity for PES schemes in forestry, providing companies and individuals with the option of abating their emissions through investing in woodlands for carbon sequestration purposes. The government is supporting the woodland carbon market through further development of the Forestry Commission's **Woodland Carbon Code**. The Code has already generated a wide range of woodland creation projects across the country to abate carbon dioxide emissions in the atmosphere. Figures to end December 2012 from the Forestry Commission highlight 42 projects in England (including those awaiting validation) covering 745 hectares and an estimated 432, 000 tonnes carbon sequestered (over the lifetime of the projects).

Woodlands provide an ecosystem service through the regulation of water supply and quality which can help with flood alleviation and access to better water. An interesting example of a tool to help target investment in woodlands is "*Woodland for Water*" (2011).[46] This provides evidence supporting woodland creation in appropriate locations to help the UK achieve water management and water quality objectives under the Water Framework Directive (WFD) as well as help in mitigating flood risk. An on-going demonstrator project

[46] www.forestry.gov.uk/fr/INFD-8MMBRT

for woodland based measures for reducing flood risk is 'Slowing the Flow' in North Yorkshire.

Just under 40% of all woodland is open for public access on foot, including the whole freehold public forest estate. Access to forests is widely seen as a public good although certain activities offer commercial opportunities for businesses through the provision of facilities or equipment. A further way in which access to forests is sometimes charged is through voluntary **visitor payback schemes** where popular visitor areas such as national parks adopt a scheme to encourage tourists to make contributions towards environmental improvements.[47]

Box 14 highlights case studies that demonstrate the investment in forestry to deliver multiple ecosystem services and the role that PES can play in delivery.

Box 14 Woodland case studies

Modelling work related to the flood alleviation **'Slowing the Flow' programme in North Yorkshire**, estimated positive monetized net benefits of between £0.8m and £9.6m, in terms of flood regulation, climate regulation, erosion regulation, education & knowledge and social cohesion. These values should be regarded as indicative due to difficulties in estimation and data.

The **Mersey Forest** is a growing network of woodland across Cheshire and Mersey created through a partnership of seven local authorities, landowners, the Forestry Commission, Natural England, businesses in the area and the local community. It was one of 12 areas chosen in England to be the focus of long-term tree planting programmes to improve the local environment for the benefit of people, wildlife and the economy. The Mersey Forest has led to the planting of over 8 million trees since its inception in the early 1990s covering 465 square miles and continues to grow.

Although not considered as part of the PES action plan, there is potential for biodiversity offsetting to provide a source of investment in forests. As announced in the Natural Environment White Paper, Defra is currently testing biodiversity offsets through 2 year voluntary pilots. The evidence generated throughout the 2 year testing period will be used to inform the decision how and whether to offsetting should be rolled out further so it is difficult to assess the extent of this at present.

Ecosystem services potentially relevant for PES - Carbon sequestration, flood alleviation, water quality, amenity, landscape, biodiversity.[48]

2. Potential actors:

(a) Buyers - Government and public agencies, visitors to woodlands, downstream beneficiaries including water companies, private businesses for CSR purposes and reducing business risk. Current buyers in relation to Woodland Carbon Code include

[47] Examples of similar type schemes in the forestry context include the discovery pass: www.forestry.gov.uk/pass. A specific example is the Friends of Thetford: www.fotf.org.uk/

[48] Timber could be included but not considered further given it is an existing market.

retailers such as supermarkets and travel companies, and some manufacturing and haulage companies. Lack of scale and lack of access to compliance carbon markets mean that opportunities are currently more limited with big emitting companies (who are in the EU ETS).

(b) Providers - e.g. Public and private landowners and tenant land managers, private businesses (commercial interests and investors), conservationists, amenity owners.

(c) Intermediaries - Natural England, Forestry Commission, Environment Agency, Wildlife Trusts, RSPB, experts in market creation, market brokers (e.g. Forest Carbon).

3. State of play

The government's Forestry and Woodlands Policy Statement[49] highlighted strong commitment to valuing the many social and environmental benefits of woodlands and to developing new market opportunities to realise these benefits. The Statement went on to highlight that Government would be supporting further work to assess these values and to explore new ways of enabling the outputs of woodlands to be recognised and valued in markets. A key aspect of this is the sector itself realising its full potential through its own 'Grown in Britain' campaign chaired by Dr Peter Bonfield (www.growninbritain.org/). This initiative takes an inclusive approach along the whole wood supply chain from forest to consumer to develop market demand for wood products that will in turn increase sustainable woodland management and creation to achieve wider ecosystem improvements

Specific commitments in the government's statement include commitments to:

- develop a **woodland ecosystem market roadmap** by summer 2013 to bring together actions by government and our partners over the next 5 years to (a) build knowledge (b) develop wider networks of collaboration and expertise and (c) implement mechanisms and projects to demonstrate good practice

- work with other organisations and initiatives to support the further development of markets in forest carbon and other ecosystem services such as water and biodiversity

- work with businesses on industry-led (*Grown in Britain*) actions which increase the amount of timber sold and which help woodland owners manage their woodlands.

The roadmap will consider a number of areas where further work is needed to help these markets develop. For example:

- the use of financial mechanisms to attract funding to social and environmental purposes

[49] www.gov.uk/government/publications/government-forestry-policy-statement

- the development of standards and the identification of best practice to support balanced economic, environmental and social outcomes, and maintain investor confidence

- the provision of information on both the potential scale of new woodland-based markets and the investment returns that they can deliver

- the establishment of networks of expertise, making links with and drawing on the expertise of other sectors

- the scope to realise carbon market opportunities if and when the Land-Use, Land-Use Change and Forestry sector is brought within the EU's emissions reduction targets.

4. Challenges

A key challenge concerns capturing the multiple values that woodlands offer. For example, recreation and tourism related to forests can be significant but the value may not be able to be captured by forest owners but rather by the myriad of firms associated with tourism and recreation. The development of the Woodland Carbon Code has been an important enabler but further development of market infrastructure has been shown to be required to catalyse the flow of private investment into UK woodland creation.[50] For example, the development of an 'impact' rating for monitoring and evaluating projects may attract investors and provide them with a way in which they can measure the social and environmental outcomes of their investments. The evidence base on forestry and regulating services needs to be expanded; for example water quality and quantity. Knowledge of the costs and benefits in this area is limited including how they vary geographically and how the cost-effectiveness compares with alternative means of intervention.

5. Defra will:

- **work jointly with Forestry Commission to develop a woodland ecosystem market roadmap by summer 2013**

- **ensure lessons learnt from application of PES in forestry are provided to help wider development of PES**

- **support the work being undertaken by 'Grown in Britain'.**

[50] See www.forestry.gov.uk/forestry/INFD-8FPHL8, Enviromarkets Report (May 2011)

6. Long term direction

There are many examples of best practice in the woodlands sector for developing payments for ecosystem services. For example, the Woodland Carbon Code is an important enabler for investment in woodland carbon projects. Experience and lessons learnt can be useful in application to other areas such as in the development of a pilot peatland carbon code. The development of a roadmap by summer 2013 is demonstrating an understanding that to develop ecosystem markets requires a range of enabling factors including building up the supporting infrastructure to develop them in practice, and the need to collaborate with partners and experts both in the forestry and land-use sector, and in other sectors; notably finance and economic activities which may drive demand for ecosystem services.

A.5 Peatland restoration

1. The opportunity

Peatlands form a significant part of the UK's natural capital which, if in good condition, provide a **range of ecosystem services**: they store carbon, regulate water quality, provide habitats for internationally important species and opportunities for distinctive recreation. However according to the IUCN UK Peatland Programme's Commission of Inquiry on Peatlands, around 80% of UK peatlands is degraded.[51] Investing in conserving and restoring them will help to meet national and international obligations and aspirations on biodiversity and water quality, as well as in reducing greenhouse gas emissions.

Defra's "barriers and opportunities" report and research for the Ecosystem Markets Task Force identified the potential role of PES for peatland with respect to both climate regulation and water quality.[52] It saw potential for the development of a **peatland code** which could facilitate payments to land managers by other businesses for peatland restoration that would offer potential for sale to both the CSR voluntary carbon market, and potentially the formal voluntary market via government Greenhouse Gas Reporting guidelines (as has been the case with the Woodland Carbon Code).[53]

Such a code could promote and facilitate such investments by verifying the carbon benefits of restoration (which are relatively small in the context of overall UK greenhouse gas emissions) and provide assurance of wider ecosystem benefits. Market research suggests demand from UK companies and individuals wishing to voluntarily support land-based carbon reduction projects is likely to exceed 1 million tonnes of carbon reduction per year (and could potentially exceed 10 million tonnes).[54] More focused market research as part of Defra's ongoing pilot on peat highlights a degree of ignorance and scepticism of the potential benefits of peatland restoration, but also the attraction for certain types of UK business to invest in peatland restoration (perhaps alongside other funders) that is local to staff or customers with social and environmental as well as carbon benefits.

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[51] See *Summary of Findings* (October 2011) www.iucn-uk-peatlandprogramme.org/sites/all/files/IUCN%20UK%20Commission%20of%20Inquiry%20on%20Peatlands%20Summary%20of%20Findings%20spv%20web.pdf

[52] *Barriers and opportunities to the use of PES*, pp. 158-63; *Opportunities for UK business that protect and value nature's services* (2012), www.defra.gov.uk/ecosystem-markets/2012/06/27/vnn-report-published270612/

[53] Comparisons for carbon reduction with the WCC are not straightforward, as peatland restoration reduces future emissions of carbon from degraded peatland whilst woodland creation sequesters carbon from the atmosphere. As at 31 December 2012, woodland schemes across the UK with the potential to sequester 1.39 million tonnes of CO2 over their lifetime (up to 100 years) have been registered under the Woodland Carbon Code, 31% of this in England. 36% of the sequestration potential (0.50Mt CO2) has been validated. Registered projects will create 3,011 hectares of woodland in the UK, 25% of it in England.

[54] Rabinowitz, R. & d'Este-Hoare, J. (2010) *The Feasibility of Creating a Funding Mechanism for UK Carbon Reduction Projects*. www.brebookshop.com/details.jsp?id=325558.

Peatland restoration could offer a form of net positive offsetting for energy companies installing wind farms in upland areas, whilst **visitor payback mechanisms** could provide a vehicle for linking tourism beneficiaries with specific restoration projects.

2. Potential actors:

(a) Buyers - e.g. Conservation groups, utilities, horticultural retailers, private companies investing in CSR or with a regional focus (e.g. tourism; local food companies) to give marketing advantage.

(b) Providers - e.g. Public and private land owners and managers.

(c) Intermediaries - e.g. Natural England, National Parks, NGOs, Nature Improvement Areas.

3. State of play

Peat has been covered by various measures on soil protection, land management and biodiversity that have evolved over the last 20 years. Some of these measures target action specifically on peat (for example Higher Level Stewardship directly funds the re-wetting of peat). Other measures such as SSSI and AONB designations and cross compliance rules can be helpful in preventing damage to functional peat bogs (although are less effective if peat is already drained because they tend to maintain the status quo).

NGOs and businesses have also done substantial work to restore peatlands. For example, projects have been undertaken in Yorkshire, North York Moors, the Fens, the Peak District, Exmoor and Dartmoor, sometimes with help from Defra and its agencies. These often involve co-funding by water companies because of the benefits to water quality (Box 15).

Box 15 Restoring Dartmoor Mires

Since 2011, the Dartmoor Mires Project has been restoring areas of high quality blanket bog in north Dartmoor following threats by encroaching erosion. The restoration aims to conserve and enhance this crucial habitat for upland wildlife, to improve water supply and increase the potential of the peatland to store carbon. The project will also be investigating whether the work brings benefits in terms of slowing the rate of run-off into streams and rivers, after rainfall. The Project is part of a joint Dartmoor and Exmoor project called Mires on the Moors, which began in April 2010 and will run for 5 years, with significant financial support from South West Water as part of their Upstream Thinking initiative. The National Park Authority co-ordinate the restoration and the project is steered by a range of partners.

www.dartmoor-npa.gov.uk/lookingafter/laf-naturalenv/dartmoormiresproject

Three Nature Improvement Areas announced in 2012 are focussed on improving peatland habitats in both upland (Dark Peak) and lowland (Humberhead Levels and 'Meres and Mosses of the Marches') areas. These build on previous approaches to protecting peat by facilitating partnerships of local authorities, local communities and landowners, the private

sector and conservation organizations, based on a local assessment of opportunities for restoring and connecting nature.

The Ecosystem Markets Task Force, reporting in March 2013,[55] recommended that:

- "*Business of all kinds should explore the growing opportunities for innovative, nature-based carbon abatement [including peatland] as innovative ways of adding value to their CSR and carbon-reducing commitments.*
- *Government should further support market demand by including peatland restoration in its Greenhouse Gas Accounting Guidelines.*
- *Government should ... be proactive in testing and developing a similar code for peatland restoration ...*"

The Government will provide a formal response to the Task Force in summer 2013, building on this Action Plan where appropriate.

4. Challenges

There are a number of political, technical, scientific and economic issues which would need to be worked through in order to develop an effective peatland carbon code which would give confidence to investors:

- scientific uncertainty about the carbon impacts of peatland restoration and the ultimate sustainability of the peat resource in England in the context of a warming climate
- uncertainty about the economic viability of carbon-driven peatland restoration
- complexities in taking account of other ecosystems services delivered by peatlands
- the potential overlap with existing funding streams (such as Environmental Stewardship)
- the implications for UK Greenhouse Gas accounting (at both the national and individual business level).

[55] See www.defra.gov.uk/ecosystem-markets/work/publications-reports/ The principal evidence base for the Final Report included an analysis of "nature based carbon abatement", see G.Duke et al, *Opportunities for business that protect and / or value nature: 2nd phase research for the Ecosystem Markets Task Force* (February 2013), pp. 39-54; www.defra.gov.uk/ecosystem-markets/files/EMTF-2nd-Phase-Research-Final-Report.pdf

5. Defra will:

- **work in partnership with the IUCN UK Peatlands Programme and others to support the testing, development and launch later in 2013 of a pilot UK Peatland Carbon Code, addressing the challenges identified**

- **publish research (in partnership with Natural England) which develops evidence-based carbon metrics to inform the pilot peatland carbon code**

- **work closely with officials in the Devolved Administrations to ensure that peatland PES approaches are applicable across the UK; on 5 February 2013, UK Government Environment Ministers issued a public letter recognizing the importance of conserving peatlands in the UK and British Overseas Territories for biodiversity, water and climate change.**

6. Long term direction

Through its own research programme and by continuing to work closely with the Research Councils, Defra will continue to support the improvement of scientific knowledge that can underpin the use of PES in incentivising and delivering effective peatland restoration.

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