

Channel Payments for Ecosystem Services (CPES) Project

Task 2 – Policy Implementation

T.2.1 Review of current policy – England

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1.0 Background and purpose of this report

This report provides a description of the national framework for water policy in England. It includes information on institutional and economic aspects of the mechanisms available to help the agricultural sector (farmers, contractors, advisors and supply chain) integrate environmental considerations into agricultural practices.

The assessment is part of the Channel Payments for Ecosystem Services (CPES) Project funded through the InterReg Programme. This is a collaboration between English, French and EU partners working to deliver Water Framework Directive (WFD) requirements in a number of rivers flowing into the English Channel.

The report aims to review the current water policy framework in England, and the role of Payments for Ecosystem Services (PES) to provide a baseline assessment. The baseline will be used alongside a similar review for France to inform development of future approaches to PES design. The new PES approaches will be trialled in comparative studies in local catchments. The baseline will help assess the effectiveness of these local trials at the end of the project.

The policy work is led by Dr Sara Hernandez (French partner). English partners include the University of Chichester, Westcountry Rivers Trust (Tamar catchment trial), Environment Agency Solent and South Downs Area, Portsmouth Water (West Sussex Groundwater catchment trial) and Southern Water (Western Rother trial).

2.0 The National Framework for Water Policy in England

2.1 General Overview

The House of Commons Library Briefing Paper on Water Quality ([Number CBP 7246](#) July 2018) provides a succinct and up to date description of water policy in England. It highlights “most of the work in managing and protecting water bodies in England is governed by the EU’s [Water Framework Directive \(WFD\) 2000/60/EEC](#)”.

In England the WFD is implemented through the Water Environment (Water Framework Directive) (England and Wales) [Regulations 2017 No. 407](#). Within these regulations the Environment Agency is identified as the competent authority for implementing the WFD in England. There is close cooperation with Natural Resources Wales and the Scottish Environment Protection Agency for water bodies that cross the border with Wales and Scotland respectively.

The Government's Department for Food, Agriculture and Rural Affairs (Defra) provided the Environment Agency [River Basin Management Guidance](#) in July 2014. Along with the WFD regulations, this guidance set out the steps, timetable and engagement with stakeholders required to update and implement River Basin Management Plans (RBMPs) to deliver WFD objectives during 2015 to 2021.

A key component is the [Catchment Based Approach](#) (CaBA). Defra implemented this in May 2013, setting out a policy framework "to encourage the wider adoption of an integrated Catchment Based Approach to improving the quality of our water environment." The approach established over 100 catchment partnerships across England. These partnerships consist of environmental Non-Governmental Organisations, water companies, farming groups, local government, local businesses, fisheries interests, government agencies, and other relevant local stakeholders, working together to understand the pressures on their local water bodies and how best to resolve them.

These partnerships include the Environment Agency and work to inform RBMPs. Defra highlight in the CaBA policy framework that catchment partnerships also "...look at the water environment in terms of all the **ecosystems services** connected to a healthy catchment and aim for better integration of planning and activities to deliver multiple benefits (for example, supporting the delivery of objectives for Water Framework Directive, Biodiversity 2020 and flood risk management)."

2.2 More Detailed Description

The water policy framework in England is described in detail within RBMPs for the two River Basin Districts (RBDs) in which the England CPES comparative catchment trials are located (South East RBD and South West RBD).

Part 1 of the RBMP provides a summary of: the current state of the water environment; the pressures affecting it; environmental objectives for protecting and improving it; a summary of programme of measures needed to achieve the objectives; and progress since the 2009 RBMP. It also provides an outline of the relative role of different partners, including agricultural stakeholders in river basin management (page 7 and 8).

Part 2 of the RBMP provides an overview and additional information on how the RBMPs were drawn up. It summarises the technical, economic and engagement processes used to develop each district's RBMP, including the involvement of catchment partnerships and RBD Liaison Panels.

The South East RBD RBMP can be accessed at: <https://www.gov.uk/government/collections/river-basin-management-plans-2015#south-east-river-basin-district-rbmp:-2015> and is relevant to the West Sussex groundwater catchment and Western Rother comparative studies.

The South West RBD RBMP can be accessed at: <https://www.gov.uk/government/collections/river-basin-management-plans-2015#south-west-river-basin-district-rbmp:-2015> and is relevant to the Tamar comparative study.

3.0 Institutional Analysis

3.1 Agricultural impacts

The RBMPs, through the Significant Water Management Issues (Challenges and Choices) consultation, and wider engagement with stakeholders (including RBD Liaison Panels and catchment partnerships) has helped clarify that status of the water environment in England. In 2015 17% of surface water bodies, and 53% of groundwater bodies were achieving WFD water body objectives (good or better ecological status).

Phosphorus and physical modification were the main pressures preventing water bodies achieving good ecological status (44% and 26% respectively).

Agriculture was the largest reason for not achieving good status, implicated in 31% of water not achieve good status (relative to 28% from water industry and 13% from urban and transport sectors).

In particular, sediment pollution from soil erosion, phosphorus from fertilisers and pesticide pollution, as well as historic physical modification for land drainage continue to be major pressures on water services.

These pressures impact a multitude of water ecosystem services, which were described in “Water for life and livelihoods England’s waters Challenges and choices - Summary of significant water management issues – a consultation. Environment Agency (2013).” Impacts on ecosystem services are also highlighted in the Strategic Environmental Assessment report associated with each RBMP.

Information on pressures on the water environment have been made available on-line. [A guide to accessing this data and information](#) is published as part of the RBMPs. Details of how assessments have been undertaken are also available on line, and through Part 2 of the RBMPs.

Environmental data is also made available through the Environment Agency’s [Catchment Data Explorer](#). Environment Agency Catchment Coordinators liaise directly with catchment partnerships, including agricultural sector stakeholders to help them access information, and provide additional evidence.

3.2 Measures to mitigate agricultural impacts

Section 2.2.5 of Part 2 of the RBMPs provide a useful overview of the institutional measures available in England to tackle agricultural pressures. This section is extracted from the 2015 RBMP and presented below in full...

Extract from RBMPs: Part 2: Section 2.2.5 Agriculture (pages 17 to 19).

A healthy water environment and healthy soils are fundamental to the rural economy and the sustainable production of food. In order to achieve this, actions to address pollution will need to be taken up in sufficient numbers at a catchment scale. Government has made available a mix of advice, regulation and incentives, as shown in Figure 1 [below]. When underpinned by local knowledge and leadership these measures can deliver the environmental protection and improvements society needs.

i. Adoption of good practice

A range of good practice actions will provide baseline levels of protection for the water environment and are applicable to all farmers and land managers.

More farmers and rural land managers will take significant steps towards adopting good practice through routine business decisions, participation in farm assurance schemes, and through industry initiatives designed to provide advice on efficient use of water, nutrients and pesticides.

Common Agricultural Policy includes fiscal incentives to meet basic environmental protection conditions, for example, managing land to prevent soil erosion and providing small buffer strips. Government supports an advice service to help recipients of these payments to comply with these rules.

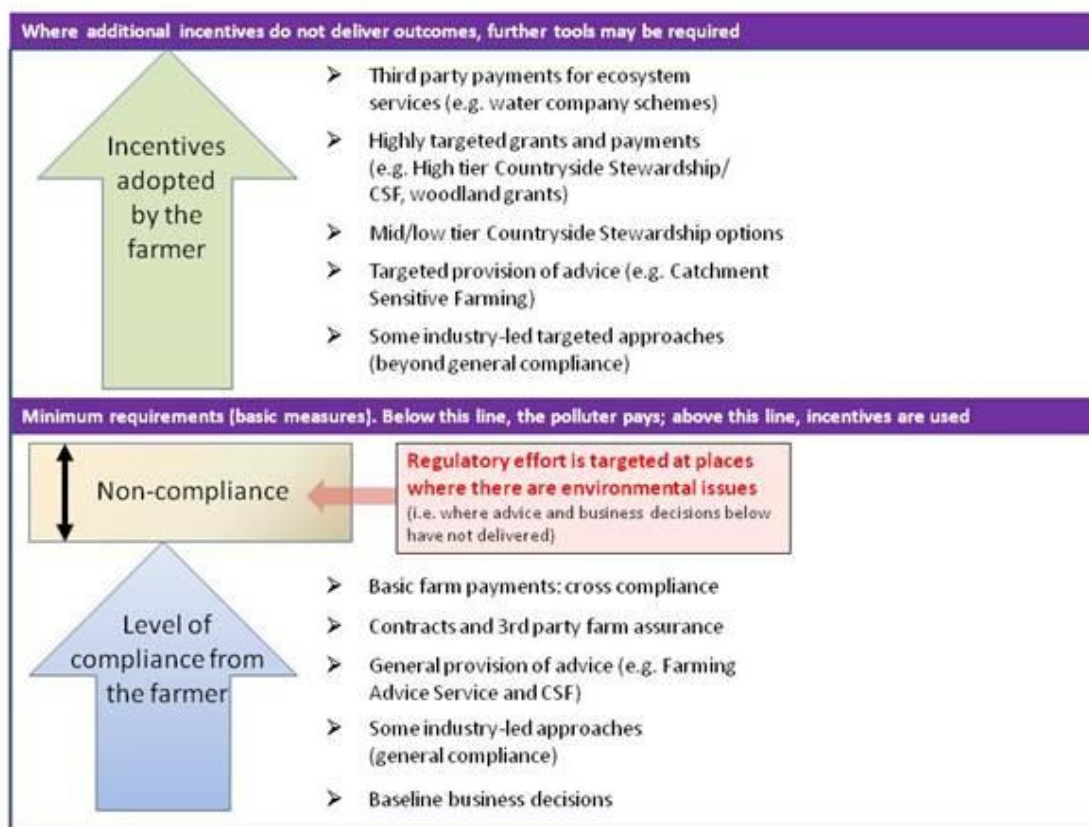
Where agricultural businesses fall short of the standards required engagement and enforcement of regulation is needed to ensure the minimum of good practice. Compliance with regulation will be improved as a result of:

- improved data sharing between Defra delivery bodies*
- better targeting of farm inspections*
- enforcement that is risk-based and recognises good performance*

The main requirements of domestic legislation to address agricultural pressures on the water environment are set out in section 3.2 of Part 1 the river basin management plans. These include:

- Safe and adequate storage for slurry, silage, manure and chemicals*
- Compliance with the nitrates action programme where a farm is in a designated Nitrate Vulnerable Zone*
- Operating within the terms of licences and permits (for example, complying with conditions in abstraction licences, and permits relating to the application of pesticides and operation of sheep dips)*

Figure 1: Farming and the water environment – the delivery landscape [...in 2015]



ii) Additional Actions

Additional actions will help achieve protected area objectives and improve water bodies not achieving good status.

This includes actions that go beyond the minimum level of good practice and incentives from government, for example, Countryside Stewardship and the private sector encouraging land managers to adopt best practices or to provide ecosystem services.

These incentives will encourage beneficial practices through voluntary action, such as sensitive management of fields or targeted land use change. Incentives are prioritised where the greatest environmental benefits can be achieved. Examples include creating sediment traps and wetlands, and utilising some land for the many benefits of woodland creation. Countryside Stewardship measures will bring benefits to water quality, improve biodiversity and ensure landscape is more resilient to flooding.

A Catchment Based Approach that encourages catchment scale engagement with farmers, such as Catchment Sensitive Farming, can and has made significant reductions in some pollutants where farmers engage and are effectively encouraged by workshops, capital grants and one-to-one advice. These schemes also assist with improved targeting of supplementary measures and facilitate better practice in soil and nutrient management. Farming industry led initiatives such as the Campaign for the Farmed Environment have engaged in voluntary action by motivating farmers to implement measures to protect water. Their work to promote voluntary retention of expiring environmental stewardship options can help reduce the risk of any deterioration and raise awareness of other schemes that will improve water quality.

Action through initiatives from the water industry, rivers and wildlife trusts and farming industry led campaigns supplement government led initiatives. In some cases additional funding is available but in all cases local initiatives are used to engage with land owners, explore water quality issues and target the best measures to the right place.

iii. Additional regulation

Government keeps regulatory measures under review. Defra has been working with interested parties to identify some basic actions farmers could take which reduce diffuse pollution from agriculture.

3.3 Additional Action

In addition to the measures above, catchment partnerships work together to help fund and deliver additional local action with the agricultural sector (e.g. through voluntary measures or charitable grants such as the Heritage Lottery Fund).

Section 3.4 of Part 1 of the RBMPs outline the local measures that each catchment partnership hope to deliver between 2016 and 2021.

Catchment partnerships also have an important role in helping to target the measures of the partnership members (e.g. Environment Agency regulation or Natural England Catchment Sensitive Farming advice). For instance WaterUK, the trade association for water companies supports the involvement of catchment partnerships working with water companies to inform future water industry catchment schemes through the Periodic Price Review Process (refer to [the joint WaterUK, CaBA and Environment Agency briefing note](#)).

In April 2018 the Government introduced additional agricultural regulations which were not included in the 2015 updated RBMPs. These [Farming Rules for Water](#) provide additional basic controls on agricultural activities including fertiliser use and soil management.

3.4 Delivery of Programmes of Measures

Many organisations are involved in regulating and supporting farmers to implement these measures. The table below highlights some of these leads and provides links to where more detail on funding allocation processes, timetables, contracts, and transaction costs may be found.

Measure/Mechanism	Leads
Baseline business decisions	<ul style="list-style-type: none">• Farmers, growers and land owners
General provision of advice	<ul style="list-style-type: none">• Natural England Catchment Sensitive Farming
Contracts and 3 rd party farm assurance schemes	<ul style="list-style-type: none">• Food supply chain (e.g. Business in the Community or Red Tractor)• Pesticide Voluntary Initiative• Agricultural trade associations such as Agricultural Industries Confederation, National Farmers Union, Country Landowners Association, Tenant Farmers Association, and Farming and Wildlife Advisory Group Association
Basic Farm Payments	<ul style="list-style-type: none">• Farming Advice Service• Rural Payments Agency
Regulatory enforcement	<ul style="list-style-type: none">• Rural Payments Agency• Environment Agency

Industry led targeted approach (beyond general compliance)	<ul style="list-style-type: none"> • Campaign for Farmed Environment • Pesticide Voluntary Initiative
Targeted provision of advice	<ul style="list-style-type: none"> • Natural England Catchment Sensitive Farming • Water companies • Catchment Partnerships
Mid-Tier Countryside Stewardship	<ul style="list-style-type: none"> • Defra
Highly targeted grants and payments (e.g. Higher tier Countryside Stewardship and Woodland grants)	<ul style="list-style-type: none"> • Rural Payments Agency • Natural England (including Catchment Sensitive Farming) • Forestry Commission
Third party payments for ecosystem services	<ul style="list-style-type: none"> • Water companies • Food supply chain (e.g. Business in the Community or Red Tractor) • Catchment Partnership

4.0 Economic Analysis

4.1 Funding Action in the RBMPs

Economic analysis is a core requirement of river basin management planning including consideration of the positive and negative consequences of environmental pressures and management measures. Wider environmental priorities, economic considerations and social issues are also taken into account when setting objectives in RBMPs.

In proposing objectives in the updated RBMPs, the Environment Agency considered what measures are technically feasible, and whether the benefits delivered by carrying out the measures are proportionate to the costs. In addition, the plans include consideration of distributional impacts (how costs are distributed between those sectors that pay) and social impacts. A key test for adopting alternative objectives is a justification that the measures necessary to achieve the default objective would be 'disproportionately expensive'. The Secretary of State for Environment, Food and Rural Affairs decides what is disproportionate, based on a range of evidence, including the RBMP impact assessment.

In England water management measures, including those for agriculture are funded through a diverse variety of public and private mechanisms including Government grants, water industry customer bill payments, private sector funding (including voluntary action from farmers), and charitable grants (e.g. Heritage Lottery Fund). In developing the RBMPs, the Environment Agency aims to ensure public and private money is invested effectively and transparently for the greatest benefit to society as a whole.

The [RBMP Impact Assessment \(2015\)](#) highlights that nationally, businesses, the third sector and public sector jointly spend about £5 billion a year to protect the water environment (to prevent deterioration) and protect public health and wellbeing. This includes £450 million by agriculture to meet basic regulatory requirements and further reduce impacts on the water environment, including payments under the Common Agricultural Policy and voluntary industry initiatives.

Details of how the economic appraisals were undertaken for RBMP are given in Part 2 of the plans, but the tools and guidance used are also freely available to download

at <https://ea.sharefile.com/d-s629e37ec59a49d6a>, including a training package for undertaking the process <https://ea.sharefile.com/d-s03c125bf5b745139>.

4.2 Cost-effectiveness of measures

Information on cost-effectiveness of measures was obtained from a wide variety of sources including water company business plans, individual project appraisals, government published figures and the Environment Agency's own business plans. Local costs were preferentially selected. If costs were not available locally then national values were used.

The costs associated with the rural land management sector were produced using the Cost of Agricultural Measures (CAM) tool. This is a spreadsheet that considers 61 agricultural measures that would give a positive response to water quality pressures at a catchment scale. The measures were bundled into a number of suggested mechanisms for ease of understanding and implementation, for example, agri-environment or voluntary initiatives. The CAM was based on expert judgment of experienced personnel, using information from research studies including:

- [Defra Project WQ0106](#) "An Inventory of Mitigation Methods and Guide to their Effects on Diffuse Water Pollution, Green House Gas Emissions and Ammonia Emissions from Agriculture User Guide J.P. Newell Price et al (2011)
- [Defra Strategic Evidence and Partnership Project Component B Report \(A Inman\)](#) (Oct 2011) undertook a review of current policy tools and funding mechanisms available to address water pollution from agriculture in England in 2011. This was primarily based on the experience of local practitioners in three catchments. It provided a wealth of qualitative information, but limited quantified values (e.g. costs per Ha of various measures).
- [EU River Basin Network](#) on Water Framework Directive and Agriculture - Practical Experiences and Knowledge Exchange in Support of the WFD Implementation (2010-2012).

In all catchment appraisals, the most cost effective measures have been selected, for example, low cost measures were preferred against higher cost land use change. However, the effectiveness of measures at a catchment scale in reducing diffuse.

4.3 Assessing Benefits and Costs

Different methods for determining benefits were employed for surface and groundwater. Details are given in Part 2 of the RBMPs. Where benefits could not be monetised they have been captured qualitatively in an appraisal summary table for each catchment to record whether benefits or dis-benefits to ecosystem services are 'significant', 'noticeable but not significant' or have 'no net change'. These tables are based on the ecosystem services framework to assessing benefits, as specified in the Treasury's 'Green Book supplementary guidance: environment'.

The cost and benefit figures produced using the catchment appraisal method were collated nationally. The costs, were broadly allocated to 4 main sectors whose activities cause the problem ('polluter pays principle'), not necessarily who pay for the measures. These sector groups were: Government; rural land management; industry, services and infrastructure; and water industry.

Based on the 2015 RBMP Impact Assessment, and other relevant information, the Secretary of State opted to adopt a package of regulatory and investment actions to achieve the environmental objectives and actions in the updated plans (2015) - aim to prevent deterioration, achieve protected area objectives and carry out all technically feasible improvements in status where benefits exceed costs. This represents a phased approach to

The total undiscounted cost of adopting this option were estimated at £28bn over a 37 year period. In line with Treasury Green Book advice a 37 years (2015 - 2052) has been used in the impact assessment. The total costs to solve the issues caused by the sectors are:

- government £3.2bn
- industry, services and infrastructure £1bn
- rural land management (including farming) £13.1bn
- water industry £10.5bn
- costs not assigned to a sector £0.3bn.

The likely mix of funders for the Rural Land Management component (including agriculture) are:

Polluter pays	<ul style="list-style-type: none"> • Farmers and growers. • Pesticide manufacturers and suppliers
Beneficiary pays	<ul style="list-style-type: none"> • Water companies where it reduces their overall operating costs, for example, water companies' catchment schemes mainly in drinking water protected areas • Voluntary groups (such as Catchment partnerships through charitable funds)
Government pays	<ul style="list-style-type: none"> • Payments to farmers and other land managers under the EU Common Agricultural Policy (e.g. Countryside Stewardship).

4.4 The Programme of Measures 2015-2021

These main programmes of measures and their estimated contribution towards cost of the proposed option are described in the Table below. The total undiscounted cost for the period is £2.78bn, with an annual average of £464.3m. This does not include the cost of ongoing action to prevent deterioration from current pressures.

Programmes of measures	Cost (£million)
Water industry national environment programme, excluding Thames Tideway scheme (2015-20)	2,300
Countryside Stewardship scheme (2015-20)	400
Farmer match funding for capital grants received under Countryside Stewardship scheme	50
Environment Agency flood and coastal risk management capital programme. Estimate of potential associated environmental enhancements (2015-16)	7
Environment Agency environment programme (2015-16)	5
Government Catchment Partnership Action Fund (2015-16)	5
Local action by catchment partnerships and local authorities	16
Abandoned Metal Mines Programme (2015-16)	3

Most of the cost of action to address problems in the rural land management sector is met by government (for example, via Countryside Stewardship scheme funding), with some also being borne by the water industry (for example, via paying for advice to farmers and incentives to change land management practices). The rest is paid for by farmers where they pay 50% of costs when in receipt of a capital grant under the Countryside Stewardship scheme to deliver environmental improvements.

In implementing these measures the percentage of surface water bodies in England achieving WFD objectives (good or better ecological status) are predicted to rise from 17% in 2015 to 21% by 2021.

4.5 Closing the remaining Gap

Following completion of the measures planned for 2015 to 2021, there will still be a significant amount of action required to achieve the environmental objectives in the RBMPs by 2027. The 2015 RBMP Impact Assessment highlights the water industry is broadly on track to deliver their fair share of improvements. For all other sectors a significant increase in the rate of improvement would be required.

The 2015 RBMP Impact Assessment estimates the shortfall in funding for rural land management measures to help improve waters to good by 2027 to be in the order of £12.6 billion (i.e. £1.26 billion per year between now and 2027).

Funding to close this gap will need to continue to come from a diverse mix of investors, including agri-environment, voluntary contributions from the farming and food sectors, water industry and other private investment. Securing additional funding from the beneficiaries of action to control impacts from agriculture, for instance through Paid Ecosystem Services will be an important element of future water management policy and delivery.

The review of the updated plans in 2021 will consider whether the environmental objectives are still appropriate and how to implement the improvements required.

It should be noted that our understanding of agricultural policy and its cost-effectiveness is developing all the time. New information not available at the time of RBMP 2015 publication has come to light, and new measures have been rolled out (e.g. Farming Rules for Water). Annex A provides a list of new information which may be relevant to future reviews. There are also plans to undertake a review of the collective cost-effectiveness of agricultural measures for water management resource protection in England to inform future agricultural policy, but this is not yet complete. This new information will need to be considered within any future review of the cost-effectiveness of agricultural measures.

5.0 The developing approach to Environmental Management and the role of Paid Ecosystem Services

In June 2011 the Government published the Natural Environment White Paper, [The Natural Choice: securing the value of nature \(June 2011\)](#). This highlighted all sectors of society need to put the value of nature at the heart of decision-making including Government, local communities and businesses. The paper endeavoured:

“...to mainstream the value of nature across our society by creating a green economy, in which economic growth and the health of our natural resources sustain

each other, and markets, business and Government better reflect the value of nature; Government alone cannot create a greener economy. Markets that trade sustainably in natural goods and services are essential. More businesses should benefit from new market opportunities, and from using natural capital more sustainably in their own supply chains. Government and business have a shared interest in protecting natural capital and should work together.”

A number of actions were highlighted including:

- Publishing an action plan to expand markets and schemes in which payments are made by the beneficiary of a natural service to the provider of that service. This was published in [May 2013 Developing the Potential for Payments for Ecosystem Services: An Action Plan](#)
- Establishing a [Natural Capital Committee](#) to advise on development and implementation of an approach to protect and improve natural capital and the services it provides
- Establishing an [Ecosystem Services Task Force](#) to encourage businesses to expand the trade in green goods and the market for sustainable natural services.

These actions have led to a number of key initiatives such as [Guidance for policy and decision makers on using an ecosystems approach and valuing ecosystem services. \(November 2014\).](#)

The Ecosystem Markets Task Force Report identified opportunities for water related PES schemes including: [Duke, G et al. \(2012\) Opportunities for UK Business that Value and/or Protect Nature’s Services; Elaboration of Proposals for Potential Business Opportunities. Attachment 1 to Final Report to the Ecosystem Markets Task Force and Valuing Nature Network](#)

- Catchment Trust Funds: ecosystem service beneficiaries from across a catchment pay into a central fund which is then distributed to enhancement projects.
- Flood risk PES
- Water storage PES

Defra initiated local pilot projects starting in 2012 and ending in 2015 exploring the efficacy of a Paid Ecosystem Services (PES) approach. [Defra Review of Payments for Ecosystem Services Pilot Projects \(2012-15\)](#) (Defra 2016) report presents the findings and lessons learned from process evaluation of the initial stages of the 16 pilots, clearly demonstrating ‘proof of concept’ as to the efficacy of a PES approach.

These initiatives have filtered into the water policy framework through the ‘Water for Life’ White Paper (2011), and ultimately the Water Act 2014, as well as the 2013 Catchment Based Approach. They also helped inform development of the 2015 RBMP economic appraisals as set out above.

A number of water related schemes have been trialled including the Sustainable Catchment Management Plan (SCaMP), Upstream Thinking Project in South West Water and EnTrade reverse auctions to manage nitrate input to Poole Harbour. Environment Agency guidance for the PR19 Price Review process has collated a number of case studies.

PES can be used to not only control impacts on the environment, and support food production, but also incentivise provision of other services such as flood mitigation and improved resilience to climate change. The NaturEtrade scheme in the Somerset Hills and Levels which is exploring a reverse auction approach to implement six land management Natural Flood Measures.

PES schemes can therefore deliver multiple benefits including water supply / storage, flood risk management, biodiversity, recreation and improved well-being, as well as climate change mitigation and adaptation).

Water companies and businesses are only likely to invest in PES schemes which provide some degree of commercial return (e.g. value to their customers and shareholders) [Defra Strategic Evidence and Partnership Project Component B Report \(A. Inman\)](#) (Oct 2011), or where they provide future cost-savings/costs avoided through improved efficiency. Some commentators have also highlighted that PES schemes are only likely to be effective where they are complemented with clear regulatory baselines of basic statutory requirements.

The Government has published '[A Green Future: Our 25 Year Plan to Improve the Environment](#)' (January 2018), which sets out what we will do to improve the environment, within a generation. The plan outlines a future increased focus on protecting and improving the nation's natural capital and the ecosystem services it provides (including clean and plentiful water).

The plan highlights a number of case studies for innovative funding including paid ecosystem services, reverse auctions and green bonds. It is likely that these approaches will become increasingly important in future water management.

In addition to the 25 year Environment Plan the Government recently published the [Clean Growth Strategy](#) (2017) and [Industrial Strategy](#) (2017). Both highlight the economy is built on a foundation of a healthy natural environment, and the Clean Growth Strategy in particular sets out future agricultural initiatives that could potentially link with PES schemes (e.g. improved soil quality to enhance carbon sequestration), delivering water policy as well as growth policy objectives.

Annex A – Studies on the Relative Cost-Effectiveness of Agricultural Measures and Ecosystem Services

- Catchment Sensitive Farming [CSF Phase 3 report \(September 2017\)](#)).
- Catchment Management Modelling Platform – CaMMP (Defra project LM0308 c. 2016). A searchable resource of model, dataset and case study 'catalogues' to support catchment [management - case studies include appraisals of Countryside Stewardship options and metaldehyde advice measures](#).
- Projected impacts of increased uptake of source control mitigation measures on agricultural diffuse pollution emissions to water and air - [Efficacy and costs of source control measures for DWPA mitigation, for annual nutrient and sediment fluxes to water and GHG emissions, at the farm and water management catchment scales \(March 2017\)](#).
- The changing trend in nitrate concentrations in major aquifers due to historical nitrate loading from agricultural land across England and Wales from 1925 to 2150 - [Modelled ground water nitrate trend due to impact of historical loadings from agricultural land \(January 2016\)](#)
- Assessing the resource protection benefits of agri-environment through water quality monitoring (Defra Project LM0439) – [Water quality improvement resulting from Environmental Stewardship and scale of monitoring needed to evaluate Countryside Stewardship scheme \(2015\)](#)
- The effectiveness of water industry catchment schemes - UKWIR Quantifying the Benefits of water quality catchment management initiatives (2012)
 - [Volume 1 - A Benefit Assessment Framework](#)
 - Volume 2 - A Benefit Assessment Framework - Overview Report
 - Volume 3 - A Review of the Effectiveness of Catchment Management Initiatives
 - Volume 4 - Case Studies Report Ref. No. 12/WR/26/132012
- [UKWIR - The Benefits and Limitations of Integrating Natural Capital Accounting \(NCA\) and Ecosystems Services Assessment \(ESA\) into Water Company Activities \(2016\)](#)
- [M. Terrado et al 'Integrating ecosystem services in river basin management plans' Journal of Applied Ecology \(2016\) 53 page 865-875.](#)
- R. McInnes et al 'Multi-criteria decision analysis for evaluation of water quality improvements and ecosystem services provision in the Totworth Brook catchment (Bristol Avon catchment)' (CIWEM Water and Environment Journal 30 (2016) p 298 to 309)
- [Agriculture's contribution to UK – NFU report - Ecosystem services assessment of benefits and costs of agriculture to UK economy \(February 2017\)](#)
- [The potential for catchment services in England – Indepen Discussion paper for Wessex Water, Severn Trent Water and South West Water \(July 2014\)](#)