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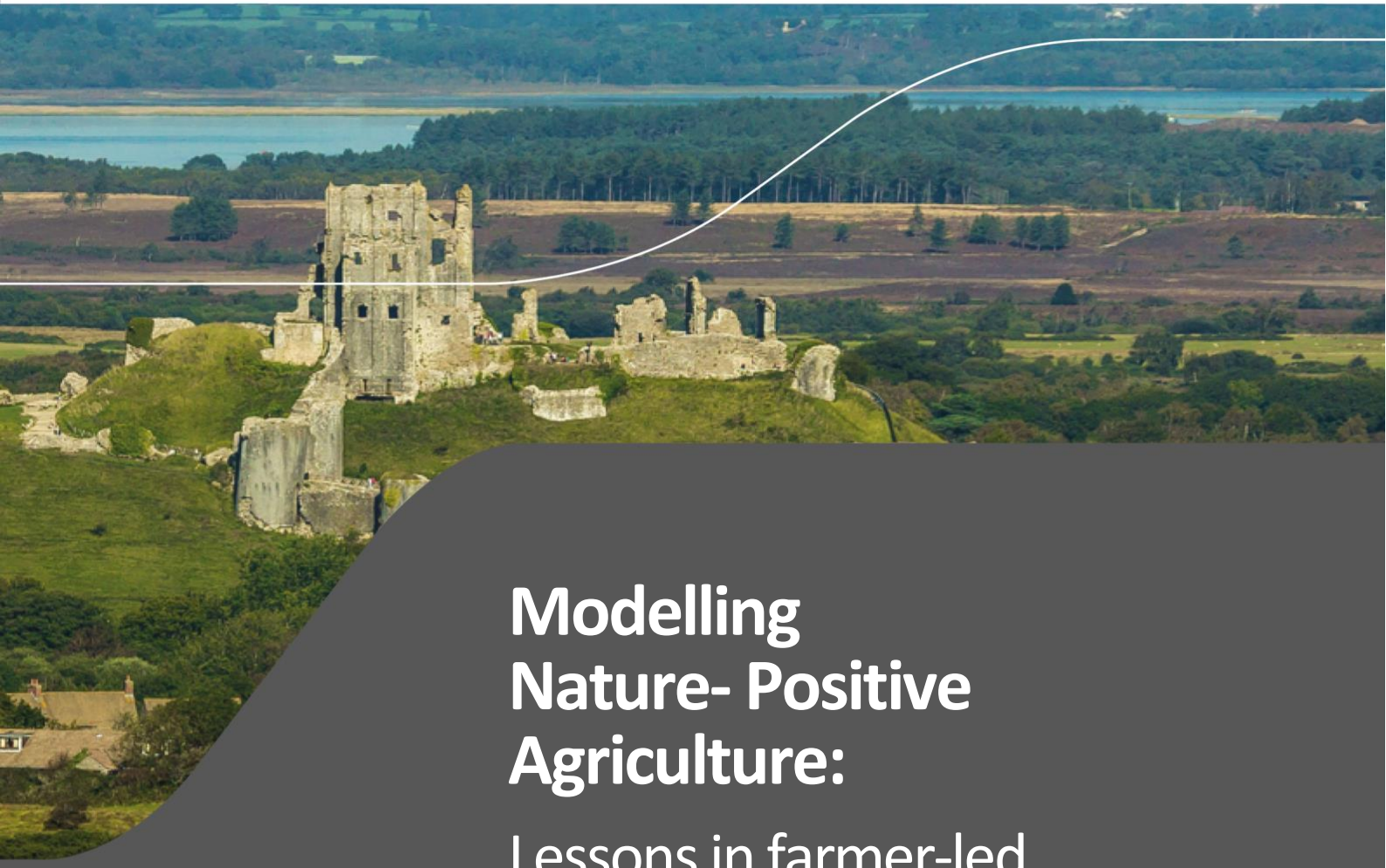
POOLE HARBOUR
Nutrient Management Scheme



Modelling Nature- Positive Agriculture:

Lessons in farmer-led nutrient management from Poole Harbour

The University of Cambridge Institute for Sustainability Leadership

The University of Cambridge Institute for Sustainability Leadership (CISL) is a globally influential Institute developing leadership and solutions for a sustainable economy. We believe the economy can be 'rewired' through focused collaboration between business, government and finance institutions to deliver positive outcomes for people and environment. For over 30 years, we have built the leadership capacity and capabilities of individuals and organisations, and created industry-leading collaborations, to catalyse change and accelerate the path to a sustainable economy. Our interdisciplinary research engagement builds the evidence base for practical action.

Poole Harbour Nutrient Management Scheme

The Poole Harbour Nutrient Management Scheme (PHNMS) was developed in response to recommendations in a draft Judicial Review Consent Order. The scheme seeks to prevent a potential Water Protection Zone and further regulation in the Poole Harbour catchment. The initiative is voluntary and farmer-led, with NFU backing, and will provide an Environment Agency 'approved' scheme to help manage the loss of nitrates from agriculture. Poole Harbour Agriculture Group (PHAG), a farmer collective, partners with other catchment stakeholders to meet the following objectives:

- Provide a framework for delivering nutrient reductions into Poole Harbour from the agriculture sector whilst enabling offsetting by other sectors, including water companies and developers.
- Influence the development of an effective Nutrient Accounting Tool that farmers can use to account for nutrient losses to the environment.
- Enable the trading of nutrient allocations between farms.
- Focus on improving water quality by reducing nitrogen and, in time, delivering additional environmental benefits such as reducing phosphate, sequestering carbon or biodiversity gains.

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Summary

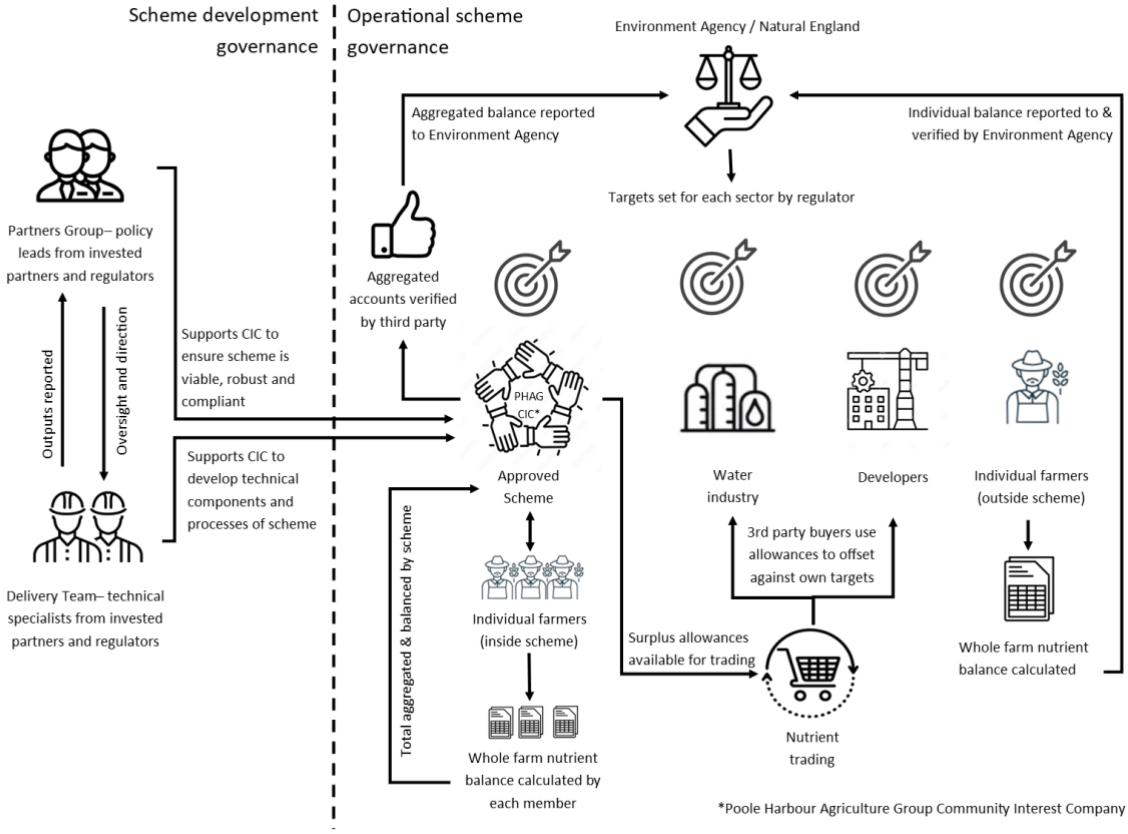
Sustainable approaches to agriculture offer benefits for farmers, food security, the private sector, the natural environment and the wider public. They provide an opportunity to address and manage the growing impacts of climate change, pollution, biodiversity loss and development on England's landscapes and habitats through partnerships of key stakeholders. Such solutions are set to expand under sweeping new Government agriculture and environment policies and regulations post-Brexit. They range from payments to farmers for adopting sustainable practices to nature-based solutions that protect, restore and deliver ecosystem services such as flood protection and carbon sequestration.

Water quality is a key area of concern for UK policymakers. The Government's 25 Year Environment Plan (25YEP) calls for restoring at least 75 per cent of national waters to 'close to their natural state', and developers and water companies must now pursue 'nutrient neutral' development in parts of the country. In 2018, CISL and HRH The Prince of Wales, Patron of CISL, released the Catchment Management Declaration, a call from business, civil society organisations and the public sector to commit to the water catchment-related ambition of the 25YEP and support collective activities that deliver successful catchment management. The ground-breaking Poole Harbour Nutrient Management Scheme (PHNMS) in Dorset was developed against this backdrop.

Set up by and for farmers, the scheme is supported by regulators, the agricultural sector and local stakeholders. Its goal is to stem the nutrient leaching harming Poole Harbour's protected coastal habitat and unique wildlife. To avoid a blanket Water Protection Zone (WPZ) being imposed on local agriculture, participating farmers are changing their practices to reduce leaching levels year on year. To help offset the costs, they can trade the excess nitrates they are allowed to generate under Environment Agency requirements with other regulated stakeholders such as Wessex Water and local developers. Over time, the scheme will include trading among participating farmers across the 820km^2 catchment.

Eighteen farming businesses took part in a 2021 trial to test the scheme. Each farm used a nitrate leaching tool to calculate its soil nutrient load and 13 farms with loads below those required by the Environment Agency then sold the surplus to Wessex Water (see By the Numbers). In future years, such transactions will enable the company to offset its release of nitrates in wastewater, generate significant extra income for farmers and, over time, improve water quality and ecology. The trial's success has led to a wider pilot with around 40 farms, launched in summer 2022. The goal is to involve most catchment farmers by 2024.

The graphic below provides a snapshot of this innovative approach to sustainable farming. Backed by the NFU and local councils, and managed by Poole Harbour Agriculture Group (PHAG), a farmer collective, PHNMS will be run as an Environment Agency 'approved scheme'. Whilst its primary goal is to reduce nitrate runoff from farms, it has the potential to deliver co-benefits for sustainable, productive agriculture, biodiversity, and carbon and climate goals.



Poole Harbour Nutrient Accounting and Trading Trial: By the Numbers

18 farms covering **6,100** hectares of land trialled a nitrate leaching accounting tool through Poole Harbour Agricultural Group

15 farms recorded nutrient loading below the **27.7Kg** N/ha required by the Environment Agency*, enabling them to trade - **52.2** tonnes of surplus nitrates

13 farms contracted with Wessex Water to trade nitrate allowances

38.79 tonnes of nitrate allowances purchased by Wessex Water in 2021

* Loading levels set by the Poole Harbour Consent Order Technical Investigation and Recommendations 2021

Early Lessons Learned

Environment Agency requirements for reviving Poole Harbour will force local farmers to reduce nitrate leaching further each year through 2030, making the measures they need to take potentially more difficult and costly. The goal of the PHNMS trial was to establish the rules, tools and partner roles to make the voluntary approach successful – and scalable around the country.

The trial generated valuable early lessons for the pilot phase, which will run through 2024. These are summarised below, with more detail in Part B: Lessons and Next Steps.

- Farmer buy in: farmers understood the scheme, were eager to take the lead in voluntarily reducing nitrates and welcomed the opportunity for extra income.
- Regulator buy in: the NFU and farmers engaged the Environment Agency and Natural England from the outset, and both regulators have been valuable contributors to the scheme's development and invested in its success.
- Usability: farmers found the nitrate accounting tool time-consuming and frustrating. The pilot will simplify processes, including by automating the import of farm data into the tool.
- Trading: the trial showed that effective trading of surplus nitrate allowances between farmers requires a critical mass of participation across the catchment.
- Finance: philanthropic funding will phase out in 2023-24, leaving member farmers carrying the scheme's financial costs until more join and trading picks up. To reduce this burden, partners are exploring government support and commission charges on trading and sponsorship.

Part A: Piloting a farmer-led nutrient management scheme

National context: pressure for sustainable agriculture

The growing impacts of climate change, pollution, biodiversity loss and housing development, combined with new policies and regulations, have increased pressure on farmers to change how they manage their land.

The Government's 25 Year Environment Plan (25YEP) lays out a roadmap and stringent targets to improve England's air and water quality and protect biodiversity. Many of these targets directly affect farmers, including those to improve the quality of 75 per cent of waters 'to close to their natural state' and restore 75 per cent of terrestrial and freshwater protected sites to favourable condition. By October 2022, legally binding targets for water quality and biodiversity will be developed under the Environment Act 2021.[i]

This shift towards more sustainable land and water management coincides with the post-Brexit phaseout of the Common Agricultural Policy. In the biggest change in UK farm policy for 50 years, the new Agriculture Act 2020 focuses on providing 'public money for public goods' that go far beyond food production. In place of subsidies, farmers will access payments to deliver Environmental Land Management Services (ELMS) that improve water quality and biodiversity, mitigate climate change and generate other societal benefits. The first ELMS scheme, the Sustainable Farming Incentive, will roll out in 2022, and the government views its success as critical to achieving the 25YEP goals.[ii]

In addition, 25YEP highlights the need for private investment in the natural environment. This provides an opening for developers and the water sector, which themselves face new demands to deliver nutrient neutral property development in parts of England with protected waters.[iii] As the new regulations roll out, there are strong incentives for all concerned – regulatory agencies, farmers, water companies and local councils – to work together on effective voluntary approaches that deliver essential services while improving the natural environment.

The ground-breaking Poole Harbour Nutrient Management Scheme (PHNMS) in Dorset has developed over the past three years in this fast-evolving national context. It brings together farmers, the NFU, Wessex Water, the Environment Agency, Natural England and other local stakeholders to model a new approach to curbing nutrient losses from farms and achieve cleaner waters on protected coastlines.

Local context: preserving Poole Harbour

Poole Harbour is one of the world's largest natural harbours, renowned and protected for its outstanding landscape, birdlife and fisheries. The health of the unique coastline of heaths, mudflats and saltmarshes is threatened by rising levels of plant nutrients from farm runoff and sewage treatment wastewater.

Over the last 50 years, the amount of nitrogen entering the harbour has risen from under 1,000 tonnes to around 2,300 tonnes, reaching critical levels.[iv] The resulting algal blooms are a visual blight on the harbour foreshore, smothering other plant life, de-oxygenating the water and preventing wading birds from feeding.

Poole Harbour is a designated Special Protection Area (SPA) as well as a Site of Special Scientific Interest (SSSI) – designations that come under the regulatory authority of Natural England. Typically, the Environment Agency protects such sites from damaging nutrient levels by tightly regulating leaching from farms and imposing a Water Protection Zone (WPZ) if pollution presence remains high. In 2015, a judicial review required the Environment Agency and Natural England to take action to restore Poole Harbour to favourable condition and to explore using water protection zones (WPZs).

To avoid a WPZ, catchment farmers established a voluntary approach to reduce nutrient leaching and transition to sustainable food production. Backed by the NFU and in partnership with national and local stakeholders, they conceived the Poole Harbour Nutrient Management Scheme, which entered a pilot phase with Environment Agency 'approved' status in summer 2022.

Mobilising Key Players

Many local stakeholders had a shared interest in, and history of, developing farmer-led solutions to Poole Harbour's water quality challenges. Since 2014, both local farmers and Wessex Water have been working through the Poole Harbour Catchment Initiative (PHCI) to improve water quality in the rivers that feed the harbour. Other members, including Catchment Sensitive Farming and Farming & Wildlife Advisory Group South West helped farms access government agri-environment schemes, improve their nutrient efficiency and reduce environmental impact.

The threat of a Water Protection Zone, with accompanying legal targets to reduce pollution, provided a strong incentive for farmers and the water company to seek a voluntary alternative.

Beginning in 2018, PHCI's Agriculture sub-group of advisers, landowners and farm business representatives became the driving force behind developing the Poole Harbour Nutrient Management Scheme. Wessex Water came on board as a potential third-party buyer of surplus nitrates. The company's motivation was to keep costs down and generate better environmental value by working with farmers to reduce nitrate levels rather than building carbon-heavy systems at its treatment works.

Based on farmers' ongoing efforts to stem nitrate leaching, both regulators – the Environment Agency and Natural England – agreed to support a voluntary, farmer-led approach. Their fallback position is to implement a WPZ if nitrate reductions are not made quickly enough.

The Table summarises these key stakeholders and their roles.

Key Players and Roles	
Supply Partners	
Farmers	Drive and direct the project with a focus on reducing nitrate leaching from farms whilst maintaining a viable commercial agriculture industry; primary aim is to prevent the need for further regulation.
National Farmers Union (NFU)	Support catchment members by taking a lead role in developing PHNMS, including project management and provision of expertise and support to enable farmer success.
Demand Partner	
Wessex Water	Contribute catchment data and experience of on-farm interventions and nutrient trading; act as a buyer of nitrate allowances to deliver its own required nutrient reductions.
Regulators	
Environment Agency	Ensure that participating farmers comply with relevant legislation and regulations. Provide oversight to ensure the tools used are fit for purpose and support farmers to demonstrate improvements in practice.
Natural England	Ensure that the scheme delivers real, sustained reductions of nitrate flows into Poole Harbour.
Support Partners, Local Authorities	
Bournemouth, Christchurch and Poole Council, and Dorset Council	Engage with project partners to ensure that delivery of long-term nitrate mitigation required from local housing developments is compatible with the scheme.
Cambridge Institute for Sustainability Leadership (CISL)	Advise on strategy/governance; design trading structure; provide technical support for nitrate accounting software.
Catchment Sensitive Farming:	Ensure catchment-wide representation so the scheme works for all farmers and promotes scheme membership; support development and testing of nutrient accounting verification processes.
Poole Harbour Catchment Initiative (PHCI)	Help facilitate and coordinate the project and manage communications, along with the NFU.

Bringing farmers on board

From the outset, all stakeholders agreed that the nutrient accounting and trading scheme must be developed and led 'by farmers, for farmers'. This was critical not only to build trust and standing within the farming community but also to ensure the scheme was practical and viable from a farm business standpoint.

Driven by a desire for autonomy, and concern that additional regulation might make some local farms untenable, Poole Harbour's farmers have risen to the challenge. Together, they have demonstrated leadership in the sector, and to national regulators, by taking ownership of a sustainable solution to curb endemic nitrate pollution. There are over 550 agricultural holdings in the catchment area, encompassing large intensive dairies, heathland livestock grazing, salad crops and arable land. Since 2018, farmer outreach coordinated by the NFU has led to business owners representing over 75 per cent of agricultural acreage expressing interest in joining the pilot scheme.

Whilst the project has benefitted from the technical expertise of partner organisations, all key decisions on its governance and approach have been made by a core group of farmers. In 2019, a group of farmers drawn from the PHCI Agriculture sub-group began working on the PHNMS project. This group was formalised as the Poole Harbour Agriculture Group Community Interest Company (PHAG), a new legal entity, in late 2021. PHAG's farmer-led board will own and oversee the nutrient management scheme through the two-year pilot and full implementation in 2024-2030, with the ongoing support of the partners above.

FARMER PERSPECTIVES

Wakely Cox, PHAG chair, mixed livestock and arable farmer

"Our farm has been part of our family for generations. We produce high quality food for animals and people across the county, the country and beyond.

As thriving farm businesses, managing nitrates is part of our daily business, but we understand that things need to change. The amount of nitrate washing to Poole Harbour over many years has created a problem we must work to solve together, in a short space of time. It's important to me that we leave farming in the best shape possible for those who come after us."

Mike Watkins, arable and beef farmer

"It goes without saying that farmers need to do all we can to avoid a Water Protection Zone. This scheme gives us the best opportunity to do that and, being farmer-led, will be practical for farmers to use. Even if a Water Protection Zone is imposed on us later on, the PHNMS scheme will put us in the best possible position to manage our businesses under the new rules."

Designing and trialling a farmer-led nutrient accounting and trading system

Following several years of development and design, early implementation of the Poole Harbour Nutrient Management Scheme (PHNMS) is underway. Key elements of the nutrient accounting and trading scheme have been trialled, and the lessons learned incorporated in a full-scale pilot, which launched in summer, 2022. This section describes the progress made to date, including project development and trial outcomes, and is followed by an overview of next steps and lessons learned.

Timeline

2015

Judicial review brought by WWF, Fish Legal and the Angling Trust requires additional action by the Environment Agency and Natural England to restore Poole Harbour.

2018

Environment Agency and Natural England issue **Draft Poole Harbour Consent Order Technical Recommendations that** propose regulations for farmers to meet a catchment nutrient emissions threshold.

Local stakeholders and national partners develop farmer-led nutrient accounting and trading system.

2020

2021

Eighteen farmers road test the scheme using the nutrient leaching tool, and 13 trade with Wessex Water.

PHAG works with the Environment Agency to meet the approved scheme's legal requirements.

Poole Harbour Agriculture Group becomes a legal Community Interest Company.

2022

Two-year pilot phase launches with open membership for catchment farmers and the opportunity to review their participation in early 2023.

2024

Environment Agency reviews the scheme's progress in meeting requirements to reduce farm nitrate losses.

2025

Fully operational scheme in place, open to all catchment farmers.

2030

Government (Defra) deadline for farms to reach target nitrate reductions, including into Poole Harbour.

Objectives

The goal for PHNMS partners was simple: to design a mechanism for the catchment's agriculture sector to collectively reduce nitrate runoff into rivers and the receiving harbour. However, achieving this level of farmer-to-farmer coordination to improve management practices, with a common goal and regulator support, was unprecedented.

In designing the trailblazing scheme, partners, therefore, recognised that it must:

- Work fairly for every farm size, type and location, with every member able to access appropriate benefits through participation
- Be scalable to other catchments around the country and replicable for other nutrients and potentially other types of pollutants
- Incorporate the drivers and values of all participants – farmers, regulators and third-party buyers
- Be owned and led by farmers, to maximise buy-in and sow the seeds of genuine long-term change in the sector
- Adopt a practical approach with robust, well-supported and user-friendly processes
- Achieve genuine, rapid and sustained nitrate reductions in the catchment
- Enable flexibility and innovation, with support to refine new processes along the way

WATER COMPANY PERSPECTIVE

Ruth Barden, Director of Environmental Solutions, Wessex Water

"We are very interested in working at a catchment scale with a trusted system to account for and deliver nitrate reductions, initially. This could be expanded in future to other natural capital benefits like phosphorus, carbon, biodiversity, natural flood management and more.

For us, a single system is important so everyone can be confident in the value of these goods, mechanisms are not competing to deliver and there is full transparency for all involved. We want to be able to clearly show that we are delivering what we should and understand that farmers want to do likewise.

We are highly supportive of the collaboration the project has enabled between agri-advisers meaning better outcomes for farmers, for us and other partners providing farm advice and, most importantly, for the environment."

Step 1: Partnering on Project Development

Developing a voluntary, farmer-led nutrient accounting and trading scheme was a first for the UK. Getting it off the ground was a complex task that required the buy-in of half a dozen local and national stakeholders, with competing interests.

Collaboration among this disparate group of sectors and agencies has been the key to success. While a core group of committed farmers has driven decision-making, each key partner has lent time and expertise to lead on different aspects of the trailblazing project.

A clear governance structure was established at the outset, encompassing a Farmer Group, Partner Group and Delivery Group. The Farmer Group of self-selecting farm owners guided the scheme from a practical, farmer-centred standpoint and has since evolved into the board of directors of the Poole Harbour Agriculture Group Community Interest Company (PHAG CIC). The Partner Group included other organisations with a direct stake in the scheme's success – the regulators, Wessex Water and local authorities. Its role was to ensure the accounting and trading system met all players' needs, and to broker compromises between competing interests. The Delivery Group consisted of technical organisations with the resources to build the scheme from a concept into a concrete operation, and included PHCI, the Environment Agency, Wessex Water, CSF and CISL.

From 2018-2020, these stakeholder groups conducted a wide range of activities encompassing Governance, Communications, Regulations and Compliance, Software and Tools, Measures, Trading, Reporting and Business Development. Success required them to address the following challenges:

Compliance: Ensuring the scheme would operate to meet all regulatory and compliance requirements. These included those imposed by Natural England and the Environment Agency and Wessex Water's Operating Techniques Agreement (agreed with the regulator) and local authority requirements for Nutrient Neutral Development.

Scientific basis: Ensuring the leaching values used for farmer compliance and trading were based on robust scientific modelling. This required a detailed analysis of available tools, conducted by the University of Hertfordshire. As a result, PHNMS opted to use the Environment Agency's Nutrient Leaching Tool but added improvements.

Effective farm interventions: Developing a practical, agreed list of farm intervention measures and practices to reduce leaching, with agreed nitrate values attached. To avoid double counting, the list (see page 13)excluded sustainable practices that farmers already employ, either to comply with regulation or to access public funds such as Countryside Stewardship payments.

Workable trading system: Designing a trading system that could enable both farmer-to-farmer trading in order to balance nitrate loss at catchment scale, and the sale of surplus allowances to third parties. Considerations included price setting, managing liquidity within the scheme, verification requirements for nitrate values in financial trades, legal and regulatory requirements and risk, and aligning the timing of trades to the farming and regulatory year.

Onboarding and engagement: Keeping the farming community, other stakeholders and funders engaged in and informed about the scheme's progress. Activities have included one-on-one specialist advice as needed, regular bulletins and talks, farmer engagement days and a project website with forthcoming membership portal.

Robust reporting mechanism: Building a simple but robust reporting mechanism to provide the regulator, PHAG CIC Board and third-party buyers with appropriate information on progress without over-burdening farmers with additional paperwork.

Innovative business model: Developing a business model for the first-of-its-kind scheme that is amenable to all stakeholders and will enable self-financing over time.

After two years of collaboration and groundwork, the project partners delivered a workable blueprint, described below.

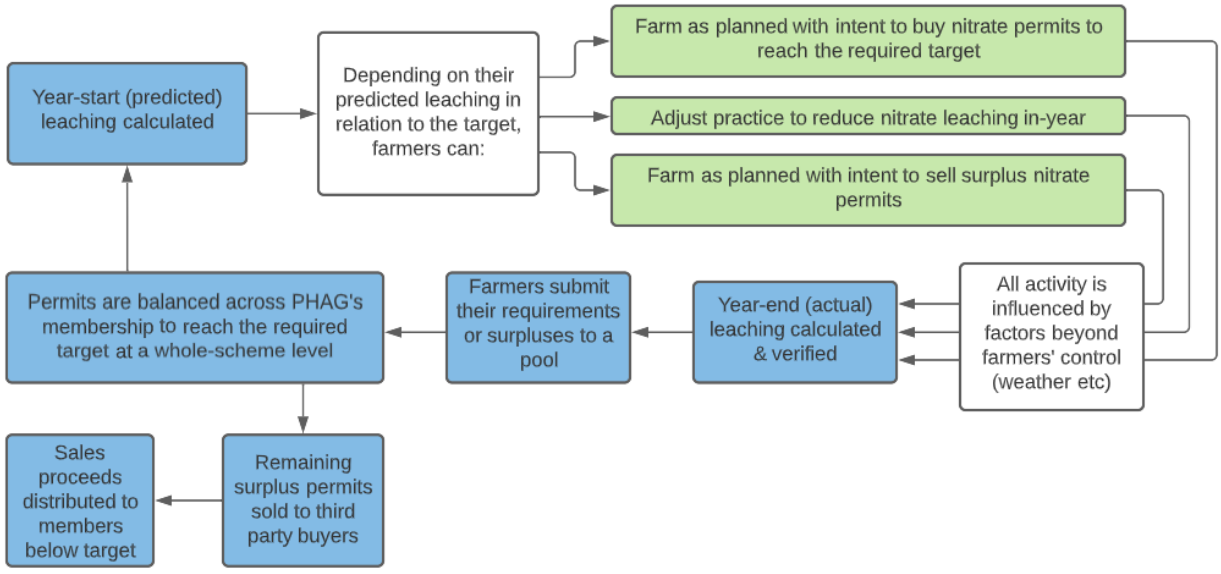
Step 2: Designing a Farmer-Centred Nitrates Management System

PHNMS incentivises farmers to cooperate in meeting their regulatory requirements to reduce the nutrients harming Poole Harbour. Farmers who over-deliver are rewarded for their efforts, while those struggling to achieve the target can introduce sustainable farming measures over time.

The Environment Agency sets a sector-wide nitrate leaching limit target and approves the accounting and verification tools. Its oversight provides all participants with the confidence to engage in trading. Once the required target is achieved, members can collectively choose to sell the surplus through PHAG to third party buyers such as Wessex Water in the form of nitrate allowances.

Starting with the pilot launch in 2022, member farmers will go through the annual cycle shown in the graphic, using nutrients data they already collect for regulatory requirements and business planning.

A farmer's journey through the PHNMS annual cycle



Farmers pay a membership fee to the Poole Harbour Agriculture Group Community Interest Company (PHAG) to enter the scheme, receiving access to tools and support in return. In their first year, they must prove compliance with existing agricultural regulation through a tool provided by the Environment Agency and establish a nitrate leaching baseline using an approved accounting tool. After PHAG verifies this baseline, the Environment Agency will consider the business a lower pollution risk and remove it from a list of priority farms to engage.

In each successive year, the sector target that farmers must meet will tighten along a water quality improvement trajectory to return the Poole Harbour Special Protection Area to favourable condition. This 'glide path' has a fixed final target of 18.1kgN/ha in 2030.

Each PHNMS farmer will enter their planned agricultural practices and predicted yields in the accounting tool annually and calculate anticipated leaching from their land. Typically, farmers must add more nitrate efficiency and reduction measures each year to meet their tightening target. The

tool includes 24 approved interventions (see box), and technical partners will help each farmer make cost-effective and best practice decisions that work for their business.

At the end of each year, all members will calculate their actual leaching rate, considering higher or lower than expected yields, outside influences and any changes to farming practice they made. Next, an annual 'cap and trade' process will occur, with farms below the target selling surplus allowances into a pool. Farms above the target can then purchase pool allowances to bring their totals down to the required threshold, and PHAG can sell any remaining allowances to third party buyers. Candidates include Wessex Water and local housing developers, sectors which also have glidepath nitrate reduction targets. Income from third-party sales will be distributed to PHAG members. (See Appendix 1 for a detailed explanation of the cap-and-trade process.)

Poole Harbour Catchment Farming Water Quality Delivery Timescales and Glide Path

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Maximum nutrient loss glide path (annual loss/target loss)	159%	153%	147%	141%	135%	129%	123%	117%	111%	105%	100%
Yearly target/credit tonnes/N/yr	1792	1724.31	1656.7	1589	1521.5	1454	1386.2	1318.59	1251	1183.4	1127
Annual reduction (tonnes/yr)	91.93	67.62	67.62	67.62	67.62	67.62	67.62	67.62	67.62	67.62	56.35
Glide path leaching target (Kg/ha) (assuming land area of 62178ha: Adas Gooday et al, Nov 2017 Tables 8 & 16)	28.8	27.7	26.6	25.6	24.5	23.4	22.3	21.2	20.1	19.0	18.1

Note: 2021=assumed losses where Environmental Stewardship Schemes are being implemented

Source: Environment Agency 2021, page 88. 'Delivering Water Quality Improvements Across Poole Harbour Catchment consent order recommendations final Feb 2021'.

Approved Sustainable Farming Measures to Reduce Nitrate Leaching
Plant autumn cover crops to reduce bare ground in winter
Avoid high risk areas for nutrient loss
Establish and harvest crops early to avoid bare ground in winter
Avoid high risk times for nutrient loss
Cultivate land in spring instead of autumn
Plant nitrogen-efficient crops
Reduce cultivation across the farming year
Use fertiliser recommendation system
Maintain soil organic matter levels
Calibrate fertiliser spreader
Where appropriate, allow drainage to deteriorate, which holds water back and reduces overland nutrient loss
Calibrate manure spreader
Where appropriate, improve drainage to prevent waterlogged ground and reduced crop take-up
Avoid slurry/manure spreading at high-risk times
Maintain ditches to prevent waterlogging ground
Integrate fertiliser and manure
Under-sow maize with crops that reduce bare ground as the maize establishes
Avoid farmyard manure spreading at high-risk times
Use clover as a legume for nitrogen fixing
Use fertiliser placement
Phase feeding of livestock
Use nitrification inhibitors
Reduce livestock dietary nitrogen and phosphorus intake
Replace urea with ammonium nitrate

Step 3: Conducting a Farmer Road Test

In spring 2021, PHAG launched a small-scale trial of the nutrient accounting and trading scheme with 18 farm businesses. The goals were to test how workable farmers found the scheme, gather feedback on how best to support them through the accounting process, and assess how to implement the trading mechanism going forward.

To test the approach, farms that missed the glide path target for 2021 (27.7kg/N/Ha) were given the opportunity to sell surplus allowances to Wessex Water. There was no obligation on farmers to trade and no repercussions on participating farms whose nitrate levels exceeded the target.

Owners of 23 farms of different types and sizes were invited to participate, and 18 took up the offer. They then attended mandatory online workshops which guided them through the farmer journey shown on page 12. Content included onboarding, how to calculate their farm's nutrient balance, practical training in the Environment Agency's Nitrate Leaching Tool, understanding their results and the principles of trading.

Farmer feedback was used to fine tune the scheme's tools, data handling, eligibility criteria, communications and support mechanisms. The sessions were recorded, anonymised and published on the project website with additional resources for trial members to access when needed.

At the end of the two-month trial, in July 2021, CISL and PHAG ran a shadow exercise to estimate nitrate trading pricing based on participating farms' nitrate accounting results. Since many trial farms were already taking steps to reduce nutrient leaching, 15 of the 18 achieved or surpassed the Environment Agency's 2021 leaching target without having to adjust their agricultural practices. This meant that it wasn't possible to model trading accurately based on the trial figures, and that prices could not be set with enough confidence for farmers to trade with each other. Instead, Wessex Water expressed an interest in acting as a buyer to test the fledgling scheme's trading and verification elements.

Thirteen farmers opted to sell their surplus nitrate allowances. Each received support from expert advisers at Catchment Sensitive Farming and Wessex Water to verify their Nitrate Leaching Tool results and check the mitigating measures and other inputs they had declared. PHAG then negotiated with Wessex Water on behalf of the farmers. A single price (£/Kg/N) was agreed with sales contracts drawn up for each farm business. Wessex Water's commitment to purchasing nitrate allowances from trial farmers already below the emissions target levels generated tens of thousands of pounds of income for those environmental leaders.

Poole Harbour Nutrient Accounting and Trading Trial: By the Numbers

18 farm businesses trialled the scheme's nitrate leaching accounting tool

6,100 hectares of farmland within Poole Harbour catchment covered

168.9 tonnes of nitrogen – the permitted loading figure for all farmland covered by the trial and entered into the Nutrient Leaching Tool

116.7 tonnes – the amount of nitrogen leached by trial farms, as estimated by the Nutrient Leaching Tool, an average of **19.1 Kg** N/ha per farm

15 farms recorded nutrient loading below the **27.7Kg** N/ha required by the Environment Agency, enabling them to trade the surplus of - **52.2** tonnes of nitrates

13 of these farm businesses contracted with Wessex Water through the Poole Harbour Agricultural Group to trade nitrate allowances.

38.79 tonnes of nitrate purchased by Wessex Water in 2021

ENVIRONMENT AGENCY PERSPECTIVE

Ian Withers, Wessex Area Environment Manager, Environment Agency

"Diffuse pollution from nutrients is a slow-burn but serious problem for our aquatic ecosystems. Poole Harbour's unique ecology, and how it is responding to nitrate and phosphate pollution, is the canary in the mine. This innovative scheme will not only address the threat posed by nutrients in the harbour now, it will also provide a potentially critical model for others to adopt to manage pollution at catchment-scale elsewhere.

This is a hugely important phase for the farmers in Poole Harbour; testing the tools on the catchment's farms will provide vital data to help the community – farmers, regulators, advisors, water companies and local authorities alike – to work together and determine the right balance for managing our land productively and protecting the biodiversity of the catchment. The collective has demonstrated that this is a universal desire; now we have to make it a reality."

Part B: Next Steps and Lessons Learned

Scaling up nutrient trading in Poole Harbour

The future health of Poole Harbour and its agricultural sector depends on the success of the PHNMS blueprint for a new kind of multi-stakeholder, farmer-led approach to pollution management. Farmers participating in the trial provided a wealth of useful feedback, which PHAG and its partners are using to fine-tune the scheme and make it fit for purpose.

The lessons learned will be incorporated throughout the pilot phase, which is open to all catchment farmers. After becoming a legal entity in December 2021, the Poole Harbour Agriculture Group Community Interest Company (PHAG) began recruiting and onboarding farmers from across the 820km^2 catchment.

The pilot will launch during summer of 2022 and operate flexibly and without farmer to farmer trading, with farm owners instead using a "shadow price". This approach will allow time for rules, tools, and roles to be taken on board by all stakeholders. These include the Environment Agency, which will need to agree with all processes and rules as they evolve in this first EA-approved scheme of its kind.

An independent third party, commissioned by PHAG, will take over management of the pilot phase through 2023. Neutral oversight will provide reassurance to the regulator and nitrate allowance buyers that farmers are using robust nutrient measurement, reporting and verification. The farmer-led Community Interest Company will then review the scheme's approach and next steps based on farmer take up, successful delivery, income generated and funding raised.

In spring 2024, the Environment Agency and Natural England will review progress, and may revert to a regulatory approach if farm-based nutrient reductions fall short. If the regulators give PHNMS the green light, the pilot will continue to evolve and grow. Both sustainable farm practices and nutrient trading will intensify as farmers work collectively to meet ever stricter nitrogen reductions to achieve the government's 2030 sector deadline.

Beyond 2030, farmers and other stakeholders will continue to account for and trade nitrates to maintain leaching rates below the regulatory target. If the scheme fulfils its potential, it may serve as a national model for farming communities, water companies, developers and local councils seeking voluntary pollution management solutions around the country.

NATURAL ENGLAND PERSPECTIVE

Nikki Hiorns, Wessex Team manager, Natural England

"This scheme is unique and trailblazing in finding new ways to work together to improve water quality and the environment. As regulators, our top priority is that it drives the restoration of Poole Harbour SPA to favourable condition by genuinely reducing nutrient inputs upstream in the catchment. Without farmers and land managers leading this change we won't solve the problem, so having PHAG members demonstrate that they want to do this and work in partnership is very encouraging.

We value our engagement in the scheme, and are seeking consensus between all sectors and land managers in the catchment. We are all working towards a mutually agreed outcome, which itself is very positive. Not only will delivery of the scheme lead to agricultural nitrate reductions in this catchment, we hope it will lead the way and teach other catchments how we can collectively work together for environmental benefit."

Learning lessons, advancing a national model

The goal of road testing PHNMS with farmers was to establish the rules, tools and partner roles to make the first-of-its-kind approach successful. The trial generated valuable lessons to incorporate into the 2022-2024 pilot phase, as well as for the scheme's national potential as a farmer-centred model for sustainable agricultural management. These early lessons are summarised below.

Farmer Buy-in

The trial demonstrated that early engagement with the farming community paid off. The NFU and other partners invested time and resources to explain Poole Harbour's environmental challenges, the Environment Agency's planned regulatory response and the need for a viable alternative. By the time trial farmers were required to do the hard work of nitrate accounting, they were committed to the scheme's success.

Farmers quickly understood that by joining the scheme, they would benefit from a gradual transition to the regulatory 2030 end target for leaching reduction. Since February 2021, the Environment Agency has required farms located within the catchment but outside the scheme to adhere immediately to the 2030 target – providing a significant incentive to join PHNMS.

In addition, farmers were eager to take ownership of curbing nitrate leaching from the agriculture sector and welcomed the opportunity for extra income. While most of the initial group who took part in the trial were already taking active measures to reduce leaching, the trial outcomes enable PHAG to attract more farmers to join the scheme.

Wessex Water's commitment to purchasing nitrate allowances from trial farmers already below the emissions target levels generated tens of thousands of pounds of income for those environmental leaders.

Beyond this immediate market opportunity for farmers in Poole Harbour, further markets are emerging to trade in phosphates, carbon, biodiversity conservation and flood mitigation. PHNMS is a potential gateway, through PHAG, to help farmer members aggregate and work together to access these developing markets and accumulate new environmental revenues to create a viable enterprise. The scale and scope will be dependent on the natural capital and market but could provide a much-needed new revenue stream.

Regulator Buy-in

The NFU and core group of committed farmers engaged the Environment Agency and Natural England from the outset. During three years of dialogue and development, both regulators have been valuable contributors to the scheme's design and trial, and invested in its success during three years of dialogue and development. The EA's own Nutrient Leaching Tool was adopted during the trial, ensuring robust accounting by farmers.

Useability

As more farms join the scheme, useability will be paramount. The trial demonstrated a clear need for processes and systems to be simpler and more intuitive. Participants found the nitrate accounting tool frustrating and over-complicated and several dropped out, requiring one-on-one support to re-engage. On the other hand, some farmers complained that the accounting method did not capture all the farm-specific variables involved.

The pilot will simplify processes and develop new systems to reduce the administrative burden on farmers. For example, data import from existing farm management software into the nutrient accounting tool will be automated. Partners are also exploring alternative nutrient accounting tools with the goal of achieving a middle way between sophistication and simplicity.

Trading

The trial showed that buying and selling surplus nitrate allowances between farmers will require a critical mass of participation across the catchment. Farmer to farmer trading was also a step beyond most farmers' readiness and comfort zone.

Currently, the scheme does not have sufficient market information to launch a fully-fledged farmer to farmer trading system. While the trial cohort covered 10 per cent of the agricultural catchment, it involved only 18 farms, most of which had made good progress curbing nitrate loss. The result was multiple farmers with a surplus of nitrogen allowances to sell, but only two farmers in deficit and required to model and cost nitrate reduction measures. In a commercial trading system, this would depress prices and remove the incentive to make farm improvements.

To address these challenges, the two-year pilot phase will include only paper or 'shadow' trading between farmers, with no money changing hands. The accounting process will go ahead to help farmers understand how it works and calculate their liability or opportunity in hard currency. Moving forward, farmers will learn to adjust to their individual situations before being required by scheme rules to settle their nitrate balances through trading or making farm improvements.

Sustainable farm practices

The trial also generated intense debate among partners over which agricultural measures farmers should deploy, and their relative merits and impact. Farmers sought confidence in the nature-based solutions proposed, based on evidence, and the UK's lack of a centralised, science-based register of approved measures to reduce nutrient leaching proved a hindrance. The PHNMS pilot is unlikely to take on this national role but will deploy a measures working group dedicated to refining an agreed list for participating farmers. This same challenge faces all pioneering projects seeking to deliver ecosystem services outcomes, whether for carbon reduction, water quality or biodiversity.

Financial viability

If PHNMS does not become financially self-sufficient in the next few years, its future will be in jeopardy. Philanthropic funding will phase out in 2022-2023, leaving member farmers carrying the cost of operating the scheme.

Early in the pilot, per member operating costs will be higher with a low number of farms taking part. As the scheme scales, and more farmers join, per capita costs should decrease. In later years, trading will increase as the leaching targets tighten, generating more income for PHAG from commission on trades and allowing membership fees to reduce.

To alleviate a near-term financial crunch on farmers, PHNMS partners are seeking alternative income sources, including government support and sponsorship.

The government's 'polluter pays' position typically creates a reluctance to provide seed funding for farmer-led schemes. However, this is changing as forward-thinking officials advocate to open up development budgets in relevant government departments. For pioneering projects like PHNMS to succeed and scale, government support for farmer innovation will need to be part of the equation.

Conclusion

Interest is surging among the private sector, local authorities, farmers and other landowners to collaborate on solutions that respond to regulatory and policy drivers to combat biodiversity decline and climate change. This collaboration and systems thinking approach represents a transformational shift needed from business, policymakers and society to deliver a nature-positive world. Farmers are at the heart of these efforts, and water and sewerage companies are among the sectors leading the charge.

The ground-breaking Poole Harbour Nutrient Management Scheme (PHNMS) in Dorset is a leading example of potentially transformative nature-based solutions. It brings together farmers, the NFU, Wessex Water, the Environment Agency, Natural England and additional local stakeholders to model a new approach to curbing farm nutrient losses and achieve cleaner waters on protected coastlines. The scheme's pilot phase will be closely watched as a potential blueprint for the water and other sectors and for other parts of the country.

More information can be found here on additional nature-based schemes in which the University of Cambridge Institute for Sustainability Leadership is involved. In 2022, we published a guide to help organisations navigate NbS: *Decision Making in a Nature Positive World: A Corporate Diagnostic Tool to Advance Organisational of Understanding of Nature-based Solutions Projects and Accelerate their Adoption*.

Appendix

Poole Harbour Nutrient Management System Cap and Trade System Explained

The PHNMS cap and trade method is linked to the glidepath leaching target set for agriculture by the Environment Agency and Natural England. This target is based on each sector doing its 'fair share' to reduce the amount of nitrate inputs to Poole Harbour SPA to a level where its conservation status is protected. The overall nitrate load to the harbour is spread across all responsible sectors, led by agriculture, the water industry and housing development.

The agriculture sector's 'fair share' is then divided by the area of farmed land in the catchment to reach a maximum leaching rate in kilograms of nitrate per hectare (kg/N/Ha). Farms can calculate their whole-farm target based on this figure and the amount of land they farm.

To determine how their practice compares to this target, farmers use an accounting tool to assess their leaching level. Generally: nitrogen inputs less yield (crops or animal products) = remaining N with potential to leach. This takes into account a range of nitrogen inputs, land uses, farming practices and timings, soil type, depth and condition, other mitigating measures applied and weather data. Different practices and conditions across the farm are factored in, giving the farmer a 'whole-farm balance', which forms the basis of their trading position.

Illustrative example

The regulator sets the annual target at 25Kg/N/Ha. A 100Ha farm runs the accounting tool, entering their farm practices and conditions at a field scale, resulting in a whole-farm balance of 2800kg (28kg/N/Ha farm average). This is 300kg over target; to reach compliance the farmer can choose to make further reductions on farm, or buy allowances from farms already below the target who have a surplus to sell, or a combination of the two.

Which route the farmer takes is likely to depend on cost-effectiveness. If doing more on-farm will cost £3.20/Kg and allowances cost £4.20/Kg to buy, the economic choice is to make on-farm changes. If the market price drops below £3.20/kg, the farmer may choose to buy allowances instead.

Realistic price determination is essential but challenging in this new market. What little precedent exists suggests price ranging from £0.50/kg to £9.00/kg. The annually tightening glidepath target means it is reasonable to expect that meeting the target will be easier to achieve at a lower cost in the early years, with the later years becoming harder and more costly.

To work out the true cost/benefit to their business, farmers need to understand the implications of a measure (such as cover crops, reduced livestock densities, lower fertiliser application rates) over its whole life cycle. For example, lower fertiliser application rates will generate a cost saving but may result in lower yields. Whether measures provide a net cost or income to the business over their full life cycle will influence the farmer's decision.

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