The economic impact of the UK Centre for Ecology & Hydrology

Final Report

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UKCEH

LE London Economics

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Executive Summary

In September 2025, London Economics was commissioned by the UK Centre for Ecology & Hydrology (UKCEH) to undertake an assessment of the economic impact of UKCEH's activities in the UK. The analysis focuses on impacts generated during 2024, which is treated as a representative year to illustrate UKCEH's typical annual economic contribution.

UKCEH is a leading national research institute that undertakes integrated environmental research across land, water and air systems. Its activities include the operation of large-scale monitoring and observation networks, the development and application of advanced environmental models, and the generation and curation of long-term environmental data. UKCEH delivers research and analytical services to government, academia, and other stakeholders, as well as playing a role in training and skills development through supervision of postgraduate researchers, therefore forming a key part of the UK's environmental research infrastructure.

Given the diverse and long-term nature of UKCEH's impacts, the assessment adopts a hybrid approach. A top-down institutional analysis is combined with a bottom-up examination of selected impact pathwaysThe case studies selected for the bottom-up analysis represent a subset of UKCEH's activities, but illustrate the type of socioeconomic benefits generated by UKCEH and quantify the scale of impacts associated with those selected acitvities. This is underpinned by a Theory of Change framework linking UKCEH's activities to economic outcomes and wider societal benefits. This approach provides an estimate of the overall magnitude of impacts while allowing selected pathways to be examined in more detail, without undertaking a full bottom-up evaluation of all activities.

Strand 1: Institutional-level economic impacts

This strand assesses the economic impacts associated with UKCEH's activities at the institutional level, comprising:

- Direct, indirect, and induced effects associated with UKCEH's expenditure and employment, estimated using economic multipliers derived from ONS Input-Output data.
- Research productivity spillover impacts, estimated by combining information on UKCEH's research-related income with evidence from the academic literature on the productivity spillover effects of public investment in research.

UKCEH is shown to support high-skilled employment across its sites in Wallingford, Lancaster, Edinburgh and Bangor (North Wales), generating local economic activity through procurement and collaboration. This includes a strong contribution to local labour markets and regional growth, with skilled roles supporting innovation-led activity in surrounding economies. In 2024, UKCEH supported 243 postgraduate researchers who were enrolled across its doctoral training partnerships and supervisory programmes, strengthening the UK's pipeline of environmental science talent and contributing to long-term productivity and skills development

UKCEH undertakes a substantial portfolio of international research and collaboration, reflecting the global nature of environmental challenges. This international activity also reinforces the UK's global science leadership, strengthening the visibility and influence of UK-funded environmental research.

Strand 2: Exploration of selected impact streams

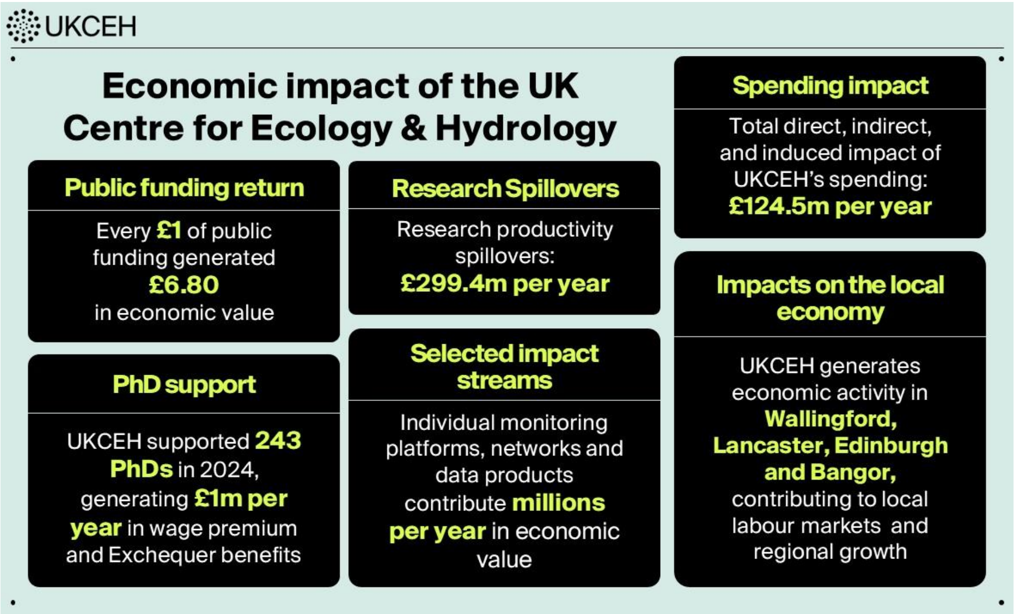
Three case studies provide deeper insight into how UKCEH's research translates into economic value.

- **Land Cover Maps**, which deliver nationally consistent land cover data used across government, academia and industry. The analysis estimates the annual economic value generated through avoided analytical effort, reduced survey requirements and improved efficiency in environmental assessment and planning activities.
- **Cumbrian Lakes Monitoring Platform**, which provides long-term evidence on key Lake District lakes, including Windermere, supporting water quality management and environmental regulation. The analysis estimates the economic value of avoiding ecological deterioration, reflecting the lakes' high recreational, cultural and environmental importance.
- **Environmental Change Network** (ECN), a long-running UK ecosystem monitoring programme. Since 1992, ECN has collected measurements of physical, chemical and biological variables at instrumented field sites across the UK. Without a figure to reflect the overall value of monitoring environment change, the analysis draws on the FREEDOM-BCCR programme as an illustrative case, showing how long-term monitoring of dissolved organic matter (DOM) supports better water treatment decisions, reducing operational and capital costs through avoided expenditure and deferred infrastructure investment.

Overall findings

Together, the two strands provide a structured and proportionate estimate of UKCEH's economic impact, combining a high-level assessment with illustrative evidence from key impact pathways. As only a subset of UKCEH's activities is captured in the case studies, the results are conservative and likely underestimate total value. Overall, the analysis suggests that **£1 of public funding is estimated to generate around £6.8 in economic value**. The findings are presented in Figure 1.

Figure 1 Annual estimated economic impact of UKCEH



Source: London Economics analysis

Table 1 Aggregated annual economic and social benefits of UKCEH (2024)

Impact type	Total annual impact (2024)		
	Low scenario	Central scenario	High scenario
Spending	£124.5m	£124.5m	£124.5m
Research spillovers	£89.8m	£299.4m	£596.8m
PhD support	£1.1m	£1.1m	£1.1m
Total impact	£215.4m	£425.0m	£722.4m
Case study impacts			
Land Cover Maps	£0.3m	£0.9m	£1.4m
Cumbrian Lakes Monitoring Platform	£2.6m	£10.3m	£18.0m
Environmental Change Network	£2.0m	£3.9m	£5.5m

Overall, the findings underline UKCEH's role as a critical part of the UK's environmental data and research infrastructure. By generating high-quality evidence, maintaining long-term monitoring networks, and working closely with stakeholders, UKCEH enables more informed decisions that support economic efficiency, environmental resilience and long-term sustainability.

OVERVIEW OF THE REPORT

This report is structured as follows:

- **Executive summary:** providing a summary of the study and key findings.
- **Introduction:** outlines the purpose, scope and context of the study and introduces the analytical approach.
- **Theory of Change:** providing an overview of how UKCEH's activities generate short- and long-term economic and social impacts.
- **Institutional level economic impacts:** examines the economic impacts of UKCEH's activities, captured by the impacts generated from its spending and productivity spillovers.
- **Exploration of selected impact streams:** presents three case studies which explore and quantify the impacts of specific UKCEH activities: land cover maps, the Lake Monitoring Platform and the UK Environmental Change Network.

Image source: UK Centre for Ecology & Hydrology

1 Introduction

In September 2025, London Economics was commissioned by the UK Centre for Ecology & Hydrology (UKCEH) to undertake an assessment of the economic impact of UKCEH's activities in the UK. The analysis focuses on impacts generated during 2024, which is treated as a representative year to illustrate UKCEH's typical annual economic contribution.

UKCEH is a leading national research institute that undertakes integrated environmental research across land, water and air systems. Its activities include the operation of large-scale monitoring and observation networks, the development and application of advanced environmental models, and the generation and curation of long-term environmental data. UKCEH delivers research and analytical services to government, academia, and other stakeholders, as well as playing a role in training and skills development through supervision of postgraduate researchers, therefore forming a key part of the UK's environmental research infrastructure.

Through these activities, UKCEH contributes to economic activity both directly, via its expenditure and employment, and indirectly, through research outputs, knowledge exchange, and collaboration with external partners.

This study examines UKCEH's economic impact using a structured analytical framework that combines institution-level analysis with more detailed exploration of selected impact streams.

1.1 Analytical framework and approach

The economic effects associated with UKCEH activities occur through multiple channels and over different time horizons, creating challenges for measurement and attribution. As such, the assessment adopts a hybrid, mixed-methods approach, combining a top-down analysis of institutional-level impacts with a bottom-up exploration of a limited number of impact streams in greater depth. This approach provides an estimate of the overall magnitude of economic impacts while allowing selected pathways to be examined in more detail, without undertaking a full bottom-up evaluation of all activities.

A **Theory of Change** (ToC) was developed to underpin the analysis. The ToC sets out how UKCEH's inputs and activities lead to outputs and, over time, to economic outcomes and impacts.

Strand 1: Institutional-level economic impacts

This strand assesses the economic impacts associated with UKCEH's activities at the institutional level, comprising:

- Direct, indirect, and induced effects associated with UKCEH's expenditure and employment, estimated using economic multipliers derived from ONS Input-Output data.
- Research productivity spillover impacts, estimated by combining information on UKCEH's research-related income with evidence from the academic literature on the productivity spillover effects of public investment in research.

Strand 2: Exploration of selected impact streams

To complement the institutional-level analysis, a second strand explores three selected impact streams in greater depth. This strand supports interpretation of the top-down results and provides a more detailed examination of how economic impacts arise in practice. For each selected stream, the analysis draws on desk-based research and impact-specific consultations with UKCEH stakeholders involved along the impact pathways. These consultations were conducted in addition to regular engagement with UKCEH project team.

Together, the two strands provide a structured and proportionate assessment of UKCEH's economic impact, combining estimates of overall scale with illustrative evidence on key impact mechanisms.

2 Theory of Change

Figure 2 presents the Theory of Change (ToC) developed for UKCEH. The ToC provides a structured representation of how UKCEH's inputs and activities generate outputs, outcomes and, ultimately, longer-term economic and societal impacts.

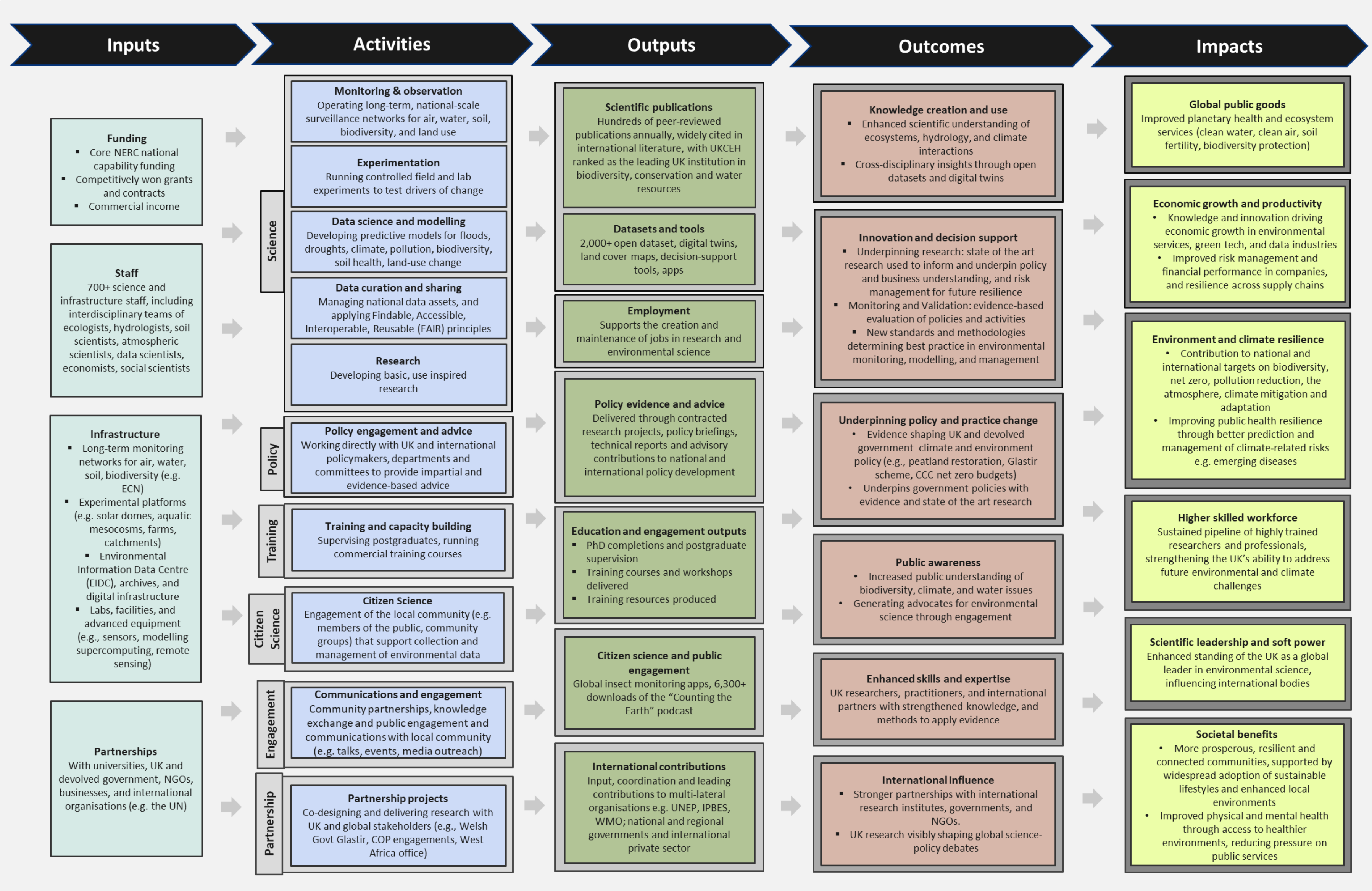
The ToC distinguishes between six broad and interrelated domains of activity: science, policy, training, citizen science, engagement, and partnership working. These activity domains are not discrete or sequential. They draw on shared inputs and capabilities, operate in parallel, and frequently reinforce one another. For example, scientific activity supports policy engagement and training; citizen science contributes to data generation and public engagement; and partnerships underpin delivery across multiple domains.

These activities feed into overlapping outputs, outcomes and impacts, rather than one-to-one causal chains. Outputs generated in one domain may support outcomes in another, and multiple activities may contribute jointly to the same outcomes or impacts. As a result, the ToC does not imply a linear progression from inputs to impacts. Instead, it reflects a system in which multiple pathways operate simultaneously and interact with external factors, including wider research activity, policy frameworks and private-sector responses.

Impacts also emerge over different time horizons. Short-term outputs and outcomes, such as knowledge creation, skills development or decision support, may contribute to longer-term impacts related to economic productivity, environmental and climate resilience, scientific leadership and wider societal benefits. Attribution becomes increasingly challenging further along the results chain, and the ToC should therefore be interpreted as a conceptual framework rather than a precise causal model.

The ToC underpins both strands of the assessment. It informs the institution-level analysis by clarifying the channels through which UKCEH's expenditure and research activity generate economic impacts, including productivity spillovers. It also provides the foundation for the detailed exploration of selected impact streams, supporting the development of impact-specific value chains and the interpretation of qualitative and quantitative evidence.

Figure 2 Theory of Change logic map



Source: London Economics based on consultations with UKCEH staff and desk research

3 Institutional-level economic impacts

This section outlines the analysis of the **economic impact of UKCEH's activities**. Specifically, it estimates the **direct, indirect and induced effects** of UKCEH's spending, captured by procurement expenditure, capital expenditure and staff costs that are spent to undertake UKCEH's environmental research and monitoring activities. It also estimates the **productivity spillover effects** from UKCEH's research activities.

3.1 Direct impact of UKCEH activities

3.1.1 Gross direct impact of UKCEH's spending

The direct impact considers the economic output generated by UKCEH's own activities, by purchasing goods and services (including labour) from the economy in which it operates. The direct economic impact of the purchase of goods, services and labour by UKCEH is measured using data on UKCEH's staff expenditure, capital expenditure and procurement expenditure. The analysis also uses data on the number of staff employed (in terms of full-time equivalent employees) in 2024.

Based on this, in terms of monetary economic output (measured in terms of expenditure), the **gross direct economic impact** associated with UKCEH's expenditures stood at approximately **£61.7 million** in 2024. This includes **£32.1 million** in staff related costs and **£29.5 million** on procurement and capital expenditure.[1] In terms of staff, UKCEH employed a total of **674** FTE staff in 2024 (707 in headcount terms).

Figure 3 Gross direct economic impact (in terms of output) of UKCEH's expenditure in 2024, by type of expenditure

Source: London Economics' analysis of UKCEH annual accounts and procurement data

[1] Totals may not add up precisely due to rounding.

Box 1 Licensing income

In 2024, UKCEH generated **£0.5 million** in net income from the licensing of information products (IP). The majority of this income came from the licensed product Land Cover Maps (Section 4) and financed part of the £61.7 million in total expenditure reported in this section.

UKCEH is taking active steps to strengthen its approach to licensing and commercialisation as part of a broader strategy to generate economic impact and enhance the translation of their science into real-world benefit. Building on strong market demand for environmental expertise, they are in the process of developing how commercial collaborations can be approached to provide a clearer pathway for taking UKCEH's tools, data, models and innovations to market in ways that generate public value.

Alongside this, UKCEH are exploring further opportunities across consultancy, commercial collaborations, strategic partnerships and potential spin-outs, with licensing forming a key route for long-term impact and financial return. This work positions UKCEH to respond to the UK Research and Innovation's (UKRI) emphasis on innovation, economic growth and financial resilience.

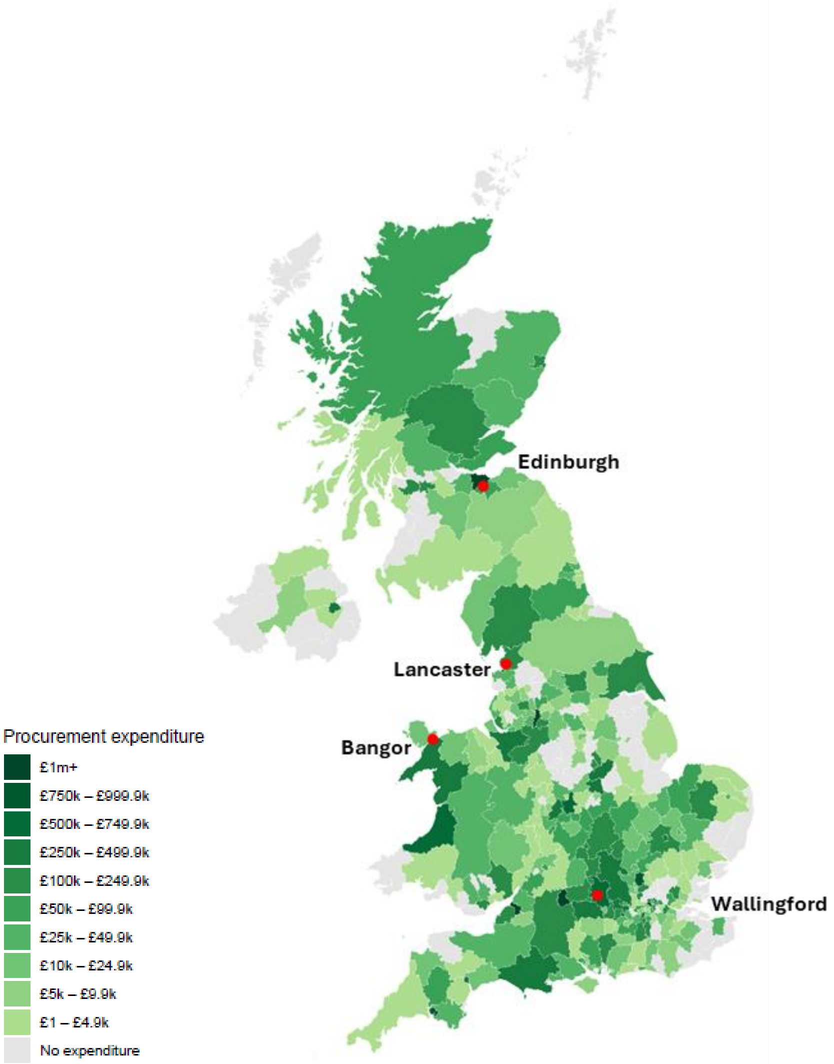
3.1.2 UKCEH geographic footprint

In addition to these total expenditures, the geographic breakdown of UKCEH's procurement and staff expenditures was investigated to demonstrate its impact across the UK. UKCEH has four sites: Bangor (North Wales), Edinburgh, Lancaster, and Wallingford.

Figure 4 presents the distribution of UKCEH's UK procurement expenditure (based on invoice address data for 2024) by local authority. The map illustrates that procurement expenditure is distributed widely across the UK rather than strongly concentrated around the organisation's main operational sites. Relatively small shares of total expenditure occur within the local authorities containing the Bangor, Edinburgh, Lancaster, and Wallingford sites: **Gwynedd** (**£374,687**, **1.3%**), **Midlothian (£79,445**, **0.3%**), **Lancaster** (**£184,111**, **0.7%**), and **South Oxfordshire** (**£663,750**, **2.4%**).

By contrast, a number of local authorities outside the immediate vicinity of UKCEH's principal sites account for relatively high levels of procurement expenditure. In particular, UKCEH spent **£3.5 million** (**12.7%**) with suppliers located in **Swindon**, followed by **Westminster** (**£1.3 million**, **4.5%**), **the City of Bristol** (**£1.2 million**, **4.2%**), **the City of Edinburgh** (**£1.2 million**, **4.2%**), and **Manchester** (**£1.2 million**, **4.2%**). The relatively high level of expenditure in Swindon reflects rent payments to the Natural Environment Research Council (NERC), part of UKRI, which is based in Swindon. This distribution indicates that UKCEH's procurement activity supports suppliers across a broad geographic footprint rather than being concentrated solely near its core locations.

Figure 4 Distribution of UKCEH's procurement expenditure in 2024 by local authority (of invoice address)



Note: Data was received from UKCEH on the postcodes associated with £30.7 million of procurement expenditure (excluding negative values). Of this total, expenditure records from outside the UK or with an invalid postcode (associated with £2.5m of expenditure) were excluded. As a result of these exclusions, the figure is based on a total of £27.8m of procurement expenditure. Totals may not add up precisely due to rounding.

Source: London Economics' analysis based on data from UKCEH and the Office for National Statistics Postcode Directory (Aug 2024). Contains National Statistics, Ordnance Survey, Royal Mail, Gridlink, NISRA, and NRS data © Crown copyright and database right 2025.

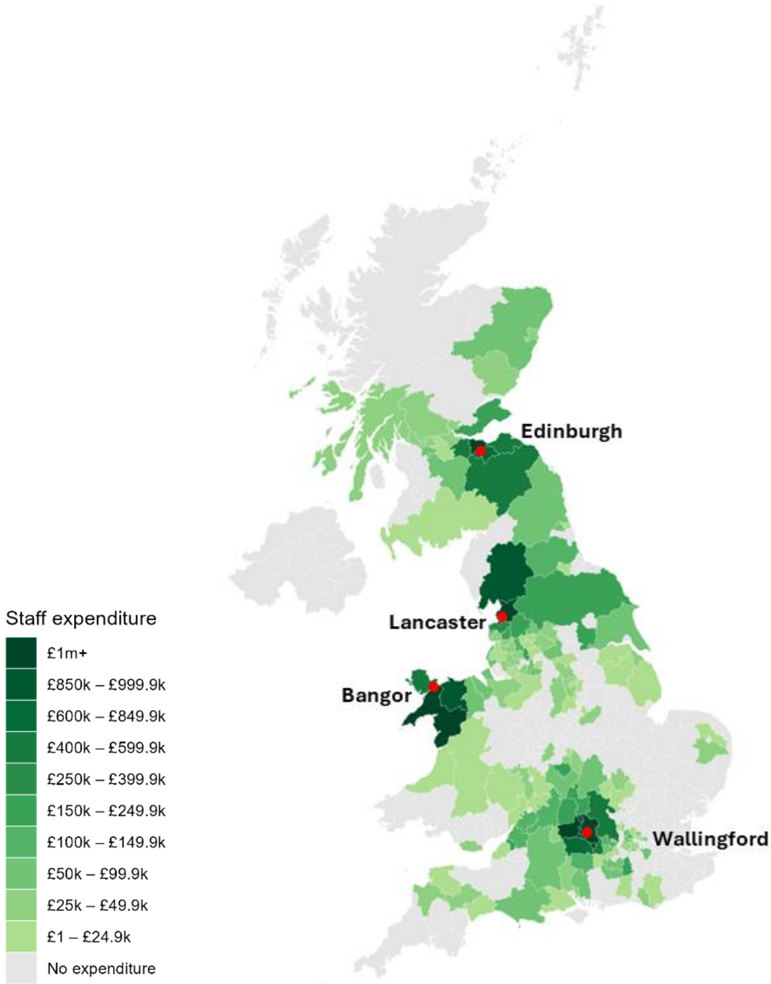
In addition, Figure 5 illustrates the geographic distribution of UKCEH's staff expenditure by local authority (based on the postcode of employees' home addresses). The map shows a clear concentration of staff expenditure in the vicinity of UKCEH's main sites in Bangor, Edinburgh, Lancaster, and Wallingford, alongside a broader distribution of staff across the UK.

Overall, approximately **37.5%** (**£12.0 million**) of UKCEH's total staff expenditure is associated with employees in the four local authorities that contain the organisation's principal sites. These comprise: **South Oxfordshire** (**£6.6 million**, **20.7%**), **Lancaster** (**£3.6 million**, **11.2%**), **Gwynedd** (**£1.2 million**, **3.6%**), and **Midlothian** (**£0.6 million**, **2.0%**).

Beyond these core site locations, staff expenditure is distributed across a wider group of nearby and regional local authorities, including the **City of Edinburgh** (**£3.0 million**, **9.3%**), **Vale of White Horse**

(**£2.0 million**, **6.3%**), **Oxford** (**£1.3 million**, **4.0%**), and **Reading** (**£1.2 million**, **3.6%**). This pattern indicates both strong local clustering around UKCEH's principal sites and a broader regional employment footprint extending across northern England, southern Scotland, and south-east England.

Figure 5 Distribution of UKCEH's staff salary expenditure in 2024 by local authority (of home address)



Note: The figure is based on the home address postcodes associated with £32,139,528 of staff expenditure by UKCEH.

Source: London Economics' analysis based on data from UKCEH and the Office for National Statistics Postcode Directory (Aug 2024). Contains National Statistics, Ordnance Survey, Royal Mail, Gridlink, NISRA, and NRS data © Crown copyright and database right 2025.

Box 2 UKCEH's international activities and global footprint

UKCEH undertakes a substantial portfolio of international research and collaboration, reflecting the global nature of environmental challenges such as climate change, biodiversity loss, water security and pollution. While the quantitative economic analysis presented in this report focuses on impacts within the UK and therefore does not capture international procurement or the wider overseas effects of UKCEH's activities, international work forms an important part of UKCEH's overall mission and funding model.

UKCEH works in partnership with a wide range of international organisations, including United Nations bodies and programmes such as the Intergovernmental Panel on Climate Change (IPCC), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the United Nations Environment Programme (UNEP), the United Nations Educational, Scientific and Cultural Organisation (UNESCO), and the World Meteorological Organisation (WMO). Through these engagements, UKCEH contributes scientific evidence that informs global environmental policy frameworks and decision-making.

International work is delivered through collaborative research programmes with universities, governments, scientific institutions, businesses and civil society organisations across multiple regions, including India, China, Africa, Southeast Asia and British Overseas Territories. A significant component of this activity is supported through UKRI/NERC funding, including funding streams specifically targeted at international and global environmental programmes.

In July 2024, UKCEH established a regional office in Accra, Ghana, to support the delivery of scientific research and strengthen long-term partnerships across West Africa. The office acts as a hub for collaborative projects addressing issues such as climate resilience, flood risk, land use and environmental change, and supports engagement with regional stakeholders including meteorological agencies, research institutions and policymakers.

UKCEH's international work also contributes to capacity building and knowledge exchange, supporting the development of scientific capability and evidence-based decision-making in partner countries. This includes the co-development of tools, models and data platforms, as well as training and collaboration with local researchers and institutions.

While the economic effects of these activities are not captured within the UK-focused impact estimates presented in this report, UKCEH's international work represents an important channel through which UK-funded environmental science contributes to global public goods, supports international policy development, and enhances the UK's scientific leadership and influence.

3.2 Indirect and induced impacts of UKCEH activities

The indirect and induced economic impacts of UKCEH's expenditure reflects the subsequent rounds of spending throughout the economy. These are defined as follows:

- **Indirect effect ('supply chain impacts'):** UKCEH's expenditure on the purchases of goods and services generates revenue for its suppliers, who in turn purchase additional inputs to meet this demand. This results in a chain reaction of subsequent rounds of spending across industries, often referred to as the 'ripple effect'.
- **Induced effect ('wage spending impacts'):** UKCEH's employees use their wages to purchase consumer goods within the economy. This is turn generates wage income for employees within the industries producing these goods and services, again leading to subsequent rounds of spending.

The total of the direct, indirect and induced effects constitutes the gross economic impact of UKCEH's activities.[2] These effects are measured in terms of economic output, gross value added (GVA)[3], and full-time equivalent (FTE) employment supported[4]. The effects are measured on the UK economy as a whole. The analysis is also broken down by regions in which a UKCEH site is located.

The impacts of UKCEH's activities were estimated using economic multipliers derived from ONS Input-Output tables[5], which measure the total production output of each industry in the UK economy, and the inter-industry (and intra-industry) flows of goods and services consumed and produced by each sector. In other words, these tables show how changes in demand in one sector affect activity across the wider economy.

To be able to achieve a breakdown of the analysis by region, a multi-regional Input-Output model was developed, combining sub-national Input-Output tables for each UK region (published by the Office for National Statistics[6]), with a range of regional-level data to achieve a granular breakdown by sector and region.

To estimate the total direct, indirect and induced impact, the relevant economic multipliers[7] derived from the Input-Output analysis associated with organisations in the government, health and education sector were applied in Lancashire (for the Lancaster site), Berkshire, Buckinghamshire and Oxfordshire (for the Wallingford site), West Wales and the Valleys (for the Bangor site), and Eastern

[2] It is important to note that, while the analysis accounts for leakage where possible (for example, e.g. adjusting for the extent to which any additional income for supplying industries might be spent on imports of goods and services from outside the UK), the estimated impacts are not adjusted for displacement or additionality. In particular, the analysis does not attempt to estimate the extent to which UKCEH's research expenditure may have displaced alternative economic activity, or whether the research activity and associated expenditure would have occurred elsewhere in the UK economy in the absence of UKCEH, including through alternative uses of public or research funding. As a result, the findings should be interpreted as gross direct, indirect and induced impacts associated with UKCEH's research expenditure.

[3] Gross value added is used in national accounting to measure the economic contribution of different industries or sectors ,and is defined as economic output minus intermediate consumption (i.e. the cost of goods and services used in the production process).

[4] Full-time equivalent (FTE) jobs represent the total number of full-time jobs supported, accounting for part-time positions on an equivalent full-time basis.

[5] Input-Output tables quantify the interdependencies between different sectors and regions of an economy by detailing the origin and destination of resource flows between each sector and region.

[6] See Office for National Statistics (2023d).

[7] Specifically, the analysis makes use of *Type II* multipliers, defined as [Direct + indirect + induced impact]/[Direct impact].

Scotland (for the Edinburgh site). The derived multipliers (for the impact on the respective regions and the UK economy as a whole) are presented in Table 2.

Based on these estimates, in terms of economic output, every £1 million of spending by UKCEH from the Bangor site generates a total of £2.1 million of impact through the UK economy, of which £1.2 million is accrued in West Wales and the Valleys.[8] In terms of employment, based on these estimates, for every 100 FTE staff employed directly by UKCEH at the Bangor site, a total of 193 staff are supported throughout the UK, of which 116 are supported in West Wales and the Valleys. The same logic applies to the other regions.

Table 2 Economic multipliers associated with UKCEH's activities

	By region			Total UK		
Region	**Output**	**GVA**	**FTE employment**	**Output**	**GVA**	**FTE employment**
West Wales and the Valleys	1.24	1.20	1.16	2.08	1.93	1.64
Lancashire	1.22	1.19	1.15	2.12	1.96	1.67
Berkshire, Buckinghamshire and Oxfordshire	1.30	1.25	1.18	1.95	1.84	1.62
Eastern Scotland	1.26	1.23	1.18	2.06	1.90	1.72

Note: All multipliers constitute Type II multipliers, defined as [Direct + indirect + induced impact]/[Direct impact].
Source: London Economics' analysis

As UKCEH's activities are spread across four sites, total economic output (as measured by expenditure) was apportioned across the sites before applying the relevant regional economic multipliers. As site-level expenditure data was not available, expenditure was allocated using a proxy based on staff costs. Specifically, total staff costs at each site were expressed as a proportion of total staff costs, and these proportions were used to derive a weighted allocation of expenditure across sites. Table 3 shows the resulting distribution of staff costs and output (the gross direct economic impact) by site.

Table 3 Staff costs by site

Site	Total staff cost	Proportion of total	Output
Bangor	£2.9m	9%	£5.6m
Lancaster	£6.5m	20%	£12.4m
Wallingford	£17.0m	53%	£32.6m
Edinburgh	£5.8m	18%	£11.0m
Total	**£32.1m**	**100%**	**£61.7m**

3.3 Total impact of UKCEH activities

The total direct, indirect and induced impact associated with UKCEH activities in 2024 is estimated to be **£124.5 million**. In terms of GVA and FTE employment, the total direct, indirect and induced impact was estimated at **£71.4 million** and **1,113 FTE jobs**, respectively.

[8] The analysis assumes expenditure patterns of UKCEH is consistent with the expenditure patterns of other organisations operating in the respective regions' government, health and education sector.

Figure 6 Total impact of UKCEH activities

Note: Monetary estimates are presented in 2024 prices.

Source: London Economics' analysis

Box 3 Case study: Spinouts

Wallingford HydroSolutions Limited (WHS) is one of two **active** spin-out companies originating from UKCEH. WHS was founded in 2004 by staff from UKCEH, with the objective of translating applied hydrological science into user-focused tools and consultancy services to support the sustainable management of the UK's water environment.

WHS operates as an independent environmental consultancy specialising in hydrology, hydraulics and water-environment services. It is well established as a developer and provider of industry-standard hydrological tools and techniques and delivers consultancy services across the full water cycle. WHS was part-owned by UKRI/NERC for 19 years before transitioning to full employee ownership in 2023. It now operates as a 100% employee-owned company, independent of UKCEH, while continuing to collaborate with UKCEH on specific tools and services.

WHS develops and maintains a number of widely used hydrological software products. These include Qube, used for estimating river flows in ungauged catchments, and, in collaboration with UKCEH, the WINFAP and ReFH2 modelling packages, as well as UKCEH FEH Web Service. These tools are used extensively by practitioners across the UK to support flood risk assessment, infrastructure planning and water-resource management, embedding UKCEH-originated science within applied decision-making.

In 2024, WHS reported a turnover of £1.7 million and employed 19 staff. Using standard Input-Output multipliers applied at the ITL2 sub-regional, ITL1 regional or sectoral level, WHS's activities are estimated to support **total economic output of £3.4 million**, contributing **£1.7 million in GVA** and supporting **31 FTE jobs** across the UK economy when direct, indirect and induced effects are considered.

Oxford Expression Technologies Ltd (OET) was established in 2007 through a collaboration between Oxford Brookes University and NERC. The company operates in the life sciences sector, providing products, services and consultancy to pharmaceutical and biotechnology organisations internationally.

OET specialises in baculovirus-based protein expression systems, which are used in biological research and the development of pharmaceuticals. Its core technology, flashBAC, is a high-throughput platform that enables the rapid production of recombinant proteins, allowing researchers to generate proteins more efficiently for applications such as drug discovery and vaccine development.

In addition to its core platform, OET has expanded into related areas, including virus-like particle production and mammalian expression systems. The company is also involved in collaborative research projects with external partners, including grant-funded programmes focused on the development of novel vaccines.

In 2024, OET employed 18 staff. Using standard Input-Output multipliers applied at the ITL2 sub-regional, ITL1 regional or sectoral level, OET's activities are estimated to support **29 FTE jobs** across the UK economy when direct, indirect and induced effects are considered.[9]

[9] OET did not report turnover data for 2024, therefore, its total economic output and GVA have not been estimated.

While both WHS and OET operate independently and their economic activity cannot be directly attributed to UKCEH on an ongoing basis, the companies illustrate two pathways through which UKCEH-originated research and expertise has been translated into sustained commercial activity and applied impact within the UK water and environmental sector and the life sciences sector, respectively.

3.4 Productivity spillovers

The wider academic literature indicates that investments in research and development (R&D) and other tangible assets may induce positive externalities.[10] In the context of research activities, existing academic literature assesses the existence and size of positive productivity and knowledge spillovers, where knowledge generated through the research activities of one agent enhances the productivity of other organisations.

UKCEH produces environmental data and scientific research that is diffused widely. For example, UKCEH generates many open-access environmental datasets (e.g. ecological, hydrological and climate monitoring) which are used in academia and other research bodies. Spillovers are also enabled through UKCEH's direct collaboration with industry resulting in knowledge exchange, upskilling and raising the average productivity of environmental science workforce. UKCEH's long-term monitoring infrastructure and applied research outputs reduce costs, mitigate risks and support innovation across a range of sectors, generating positive externalities that extend well beyond the organisation itself.

While they are challenging to quantify, economic spillovers from scientific R&D and discovery are well evidenced in the economic literature. Most prominently, research by Haskel and Wallis find that research funded by UK public research councils significantly filters through to the private sector, suggesting a strong role for knowledge spillovers.[11] More recently, a study commissioned by the Department for Science, Innovation and Technology (DSIT) estimated substantial returns to public R&D investment, further reinforcing the case for publicly funded research as a driver of wider economic benefits.[12]

In order to estimate the productivity spillovers associated with UKCEH's research activities, productivity spillover multipliers are applied using existing literature to the different type of research-related income received by UKCEH.

3.4.1 Research income

UKCEH receive funding for their research activities. This includes income from research grants and contracts provided by:

- UK public sources, including UK research councils (e.g. NERC, UKRI, EPSRC), government departments (e.g. DEFRA, DSIT, DESNZ), devolved governments, and non-departmental UK public bodies.
- International sources, including funding from the European Commission (e.g. EU Grants Horizon Europe, EC DG Environment).
- Private sources, including charities and industry.

These sources have been aggregated into research council funding, other government departments and public sector funding (split into research council and non-research council funding), European Commission funding, and private sector funding. Aggregating across these four funding types, the

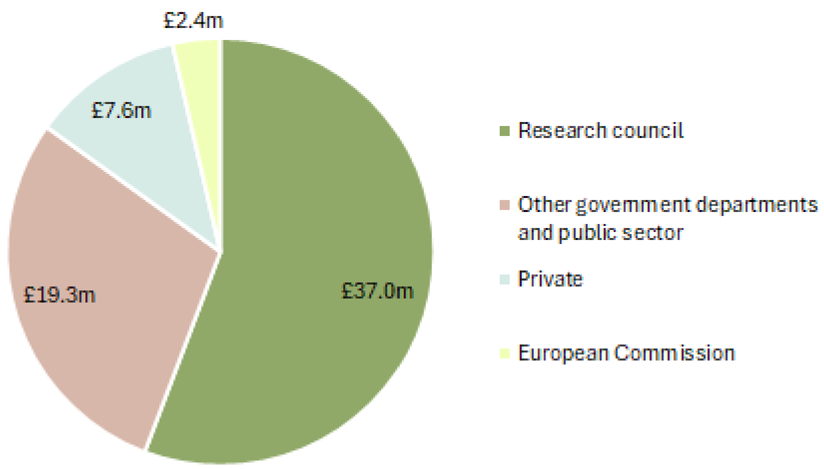
[10] Economists refer to the term 'externality' to describe situations in which the activities of one 'agent' in the market induce (positive or negative) external effects on other agents in that market (which are not reflected in the price mechanism).

[11] Haskel J, Wallis G (2010). Public Support for Innovation, Intangible Investment and Productivity Growth in the UK Market Sector

[12] Frontier Economics (2024). Returns to Public R&D. Report for the Department for Science, Innovation and Technology (DSIT)

total research income accrued by UKCEH in 2024 stood at **£66.3 million**. Approximately **£37.0 million (56%)** was received through UK research councils, **£19.3 million (29%)** from other government departments and public sector funding, **£7.6 million (11%)** from private sector sources, and **£2.4 million (4%)** from the European Commission (Figure 7). Therefore, the vast majority (89%) of UKCEH funding comes from UK public sources.

Figure 7 Funding received by UKCEH by source in 2024



Note: All values are presented in 2024 prices.

Source: London Economics' analysis based on UKCEH income data.

3.4.2 Estimating productivity spillovers

The analysis draws on evidence from the wider academic literature on the productivity spillover benefits of R&D. This literature indicates that publicly funded research typically generates larger productivity benefits than privately funded R&D. Therefore, consistent with this evidence, the productivity spillovers associated with public sector funding to UKCEH are assumed to be larger than private sector funding.

Productivity spillover effects are assumed to not be immediate.[13] Instead, a time-lag of six years between funding and productivity impacts materialising is assumed to reflect the time required for research to diffuse through the economy and be commercially adopted. Further, although the underlying literature often models productivity uplifts in perpetuity, a more conservative assumption is adopted whereby productivity remains elevated for twenty years only, thereby avoiding the risk of overstating long-run effects.

Based on these assumptions, the analysis derives productivity spillover multipliers of **4.6 for publicly funded research** and **2.3 for private further funding** (Table 4).[14] That is, for every £1 invested from the public sector in UKCEH's activities generates an additional annual economic output of £4.6 across the UK economy.

[13] Frontier Economics (2023). Rate of return to investment in R&D: Report for the Department for Science, Innovation and Technology (DSIT).

[14]

Table 4 Productivity spillover multipliers

Funding source	Multiplier
Public funding	4.6
Private sector funding	2.3

Note: The public funding multiplier (4.6) is derived using a central assumption of a 40% annual productivity return to public R&D investment, with a 6-year lag and 20-year duration of effects (Frontier Economics, 2024). The private sector funding multiplier (2.3) instead applies a 20% annual productivity return assumption, consistent with Frontier Economics (2023).
The underlying literature is based largely on economy-wide analyses of R&D productivity spillovers across OECD countries. While some studies indicate variation in returns by sector, firm size and research type, the evidence is not sufficiently robust or consistent to support differentiated assumptions by industry, geography, company size or partnership. A single central estimate for private sector productivity returns has therefore been applied.

Source: London Economics' analysis based on return parameters reported in Frontier Economics (2024).

Applying these multipliers to research income, the research conducted by UKCEH in 2024 is estimated to have generated total productivity spillovers of £299.4 million. Where £170.3 million was generated through research council funding, £121.7 million from non-research council UK public funding (made up of other government departments and public sector funding and European Commission funding), and £7.4 million from private sector funding.

Box 4 Upper and lower bound productivity spillover estimates

To reflect uncertainty around the magnitude of research productivity spillovers, this study also presents upper and lower bound estimates for the total productivity spillovers generated by UKCEH's research activities.

A small body of R&D literature provides estimates of productivity spillovers from academic R&D. A study by Haskel and Wallis investigates evidence of **spillovers from public funding of Research & Development**.[15] The authors analyse productivity spillovers to the private sector from public spending on R&D by the UK research councils.[16] Their analysis finds strong evidence of the existence of market sector productivity spillovers. They estimate a **marginal spillover effect of 12.7** (i.e. for every £1 spent on university research through the research councils results in an additional output of £12.70 in UK companies).

To derive an **upper bound estimate**, this 12.7 multiplier is applied. Total productivity spillovers are estimated at **£596.8 million** (comprising £467.7 million from research council funding, £121.7 million from other public funding, and £7.4 million from private sector funding).

To derive a **lower bound estimate**, a more conservative approach is adopted. The analysis assumes an annual rate of return to public R&D investment of 20% applied consistently across funding sources. It also assumes a six-year lag between research spending and realised productivity effects, and a shorter ten-year persistence period. Under these assumptions, a multiplier of 1.35 is derived.

Applying this lower multiplier results in total productivity spillovers estimated at **£89.8 million** (comprising £49.8 million from research council funding, £35.6 million from other public funding, and £4.3 million from private sector funding).

[15] Haskel, J., & Wallis, G. (2010). Public support for innovation, intangible investment and productivity growth in the UK market sector.

[16] The authors use data on government expenditure published by the Department for Business, Innovation and Skills for the financial years between 1986-87 and 2005-06.

Overall, **the estimated range for productivity spillovers is therefore £89.8 million to £596.8 million**, with the **central estimate of £299.4 million** adopted for the aggregate impact calculation. This central estimate is considered conservative, given evidence in the wider academic literature suggests that productivity spillovers from publicly funded research may be substantially larger.

Box 5 Case study: Postgraduate research training and skills development

UKCEH plays a significant role in supporting postgraduate research training across the UK environmental science system. In 2024, UKCEH was involved in the supervision of **243 currently enrolled postgraduate research** (PGR) **students**, with the largest numbers supervised from Wallingford (118), followed by Lancaster (52), Edinburgh (47) and Bangor (26).

UKCEH contributes to postgraduate training both as a lead supervisor and as a co-supervisor alongside university partners. Of the 243 PGR students supported, **62 had UKCEH as lead supervisor**. For lead-supervised students, UKCEH allocates an estimated 10 days of supervision per year, while for co-supervised students an estimated 5 days of supervision per year is allocated. In total, around **24% of UKCEH scientists** (128 staff) **are involved in PGR supervision**, reflecting the breadth of engagement across the organisation.

UKCEH also supports postgraduate training through formal participation in doctoral training partnerships (DTPs). UKCEH participates as a **host organisation in 15 DTPs**, with estimated in-kind contributions (including supervision time, access to laboratories, field sites, desk space and administrative support) of approximately £225,000 per partnership over five years. In addition, UKCEH participates as a **collaborative partner in six DTPs**, with estimated in-kind contributions of around £100,000 per partnership over three years. These arrangements enable students to access UKCEH's infrastructure, data and expertise while remaining embedded within university-led doctoral programmes.

Postgraduate researchers associated with UKCEH contribute directly to research outputs. As of January 2025, **732 publications** involving UKCEH-associated postgraduate students have been collated, covering work produced since 2014. Of these, **12 publications were classified as 'hot'**[17] by Web of Science, indicating high levels of academic attention relative to field and year. UKCEH-supported PhD students are affiliated with more than 50 UK and international universities, including institutions across Europe, Africa and Asia, and many projects are delivered in partnership with CASE[18] partners, government bodies and charitable organisations.

Available data on PhD completion indicates strong progression and completion outcomes. For the subset of students for whom graduation data are available, 59% completed within four years, with a further 31% completing within five years. A large proportion of the latter group completed during the COVID-19 period, when doctoral timelines were widely disrupted. Taken together, this suggests that **around 90% of students**, where data are available, **completed within four to five years**, once COVID-related impacts are accounted for.

Through supervision, training partnerships and access to specialist infrastructure and data, UKCEH contributes to the development of a highly skilled cohort of researchers with expertise in environmental science, data analysis and applied research. These skills support future research

[17] "Hot Papers" are defined by Essential Science Indicators (ESI) in Web of Science as papers published within the past two years that receive citations rapidly after publication, ranking in the top 0.1% of papers in the same field and time period based on citations accrued during the most recent two-month period.

[18] CASE (Collaborative Awards in Science and Engineering) studentships are doctoral training awards that involve a formal collaboration between an academic institution and a non-academic partner, such as industry, government or third-sector organisations. These studentships combine academic research with practical experience, typically including a placement with the partner organisation and joint supervision.

capacity across academia, government and industry, and represent an important pathway through which UKCEH's activities contribute to longer-term economic and societal impacts.

Economic value of UKCEH's postgraduate research training[19]

To estimate the benefits of skills development, this study assumes that the economic value of the skills acquired is equivalent to their value in the labour market. The analysis combines data on estimated PhD earnings premium, counterfactual average salary data in relevant fields, taxation information, the number of PhD students supported by UKCEH[20] who move into UK industry to derive the total present value of the lifetime skills premium accruing to the graduates themselves, as well as of additional tax receipts accruing to the UK exchequer.

The total net present value of skills-related earnings benefits is estimated at approximately **£10.1 million**, with associated Exchequer benefits from income tax, National Insurance and VAT estimated at approximately **£11.9 million**.

On an annualised basis, this implies an economic value of approximately **£0.51 million per year** from skills-related earnings uplifts for UKCEH-supported postgraduate researchers, alongside approximately **£0.60 million per year** in associated Exchequer receipts.

3.5 Aggregated impact of UKCEH activities

Combining all of the above strands of impact, the total economic impact on the UK economy associated with UKCEH's activities in 2024 was estimated at approximately **£403.4 million** (see Table 5). In terms of the components of this impact:

- UKCEH's **expenditure** accounted for **£124.5 million** (**29%**) of this impact, and
- **Productivity spillovers** generated through UKCEH's **research activity** accounted for **£299.4 million** (**71%**).

[19] The valuation is based on a lifetime earnings premium approach consistent with HM Treasury Green Book guidance. The analysis estimates the incremental earnings associated with UKCEH-supported postgraduate research training relative to a counterfactual baseline derived from ONS salary data for professional, scientific and technical occupations and education occupations (£45,817). A blended wage premium of 10% is applied as the central estimate, reflecting the expected average earnings uplift associated with doctoral-level skills across heterogeneous employment pathways. The analysis incorporates destination assumptions for postgraduate researchers, including 90% remaining in the UK, 80% of UK-based graduates entering industry, and exclusion of approximately 20% assumed to remain employed by UKCEH to avoid double counting. In the absence of granular destination data by sector, outcomes are modelled as an aggregated average premium across academia, public sector, environmental consultancy and private sector roles. The annual earnings premium is assumed to remain constant in real terms over the working life of graduates. Lifetime benefits are calculated over a 34.5-year working life (based on average PhD completion age of 32 and retirement age of 66.5), discounted at 3.5% in line with Green Book guidance to derive net present values. The resulting lifetime earnings premium per cohort is multiplied by the number of postgraduate researchers supported in 2024 to estimate aggregate impacts. Associated Exchequer benefits are estimated by applying standard effective tax rates to incremental earnings, including income tax, employee and employer National Insurance contributions, and VAT effects.

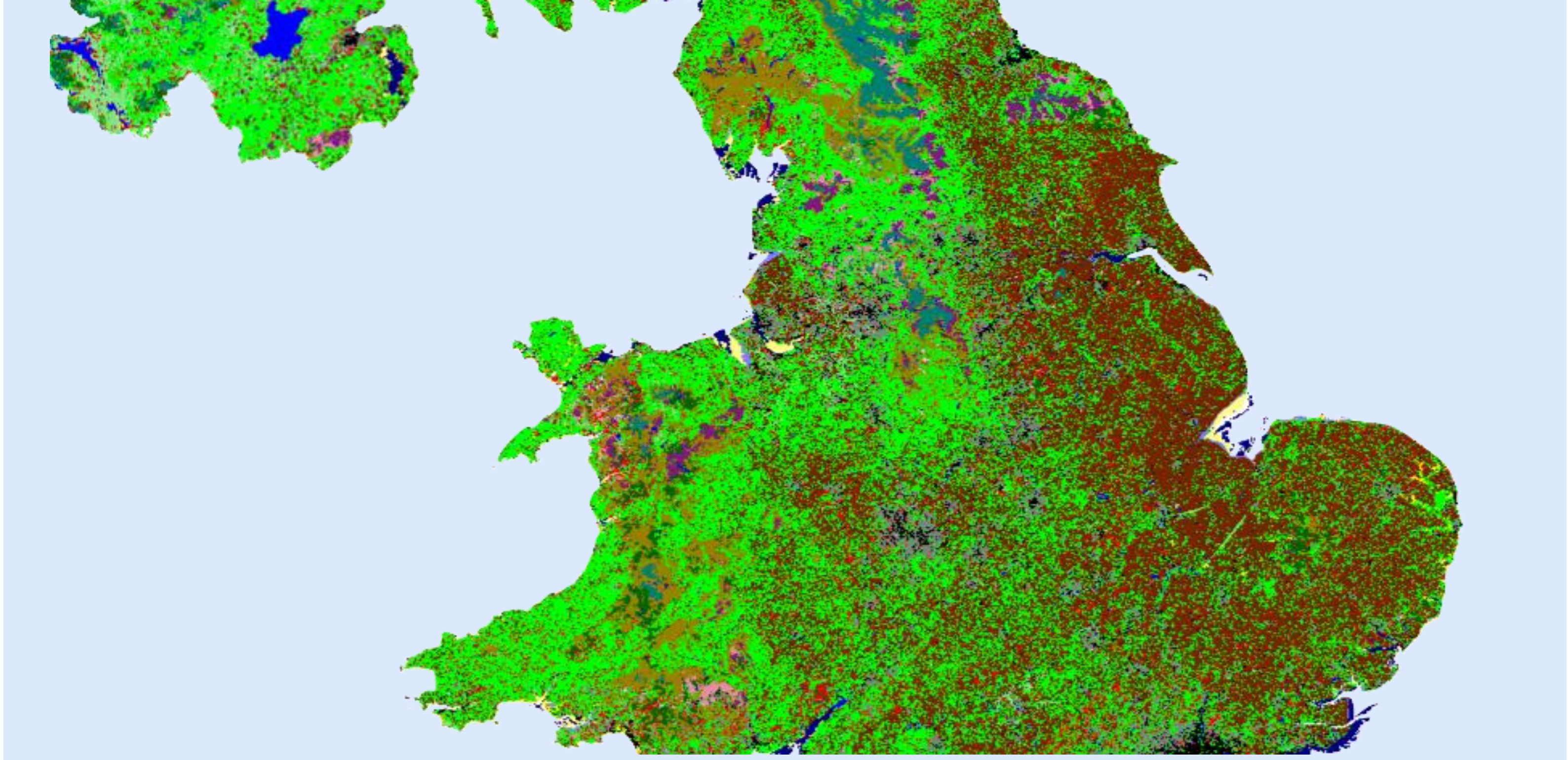
[20] The analysis uses the number of enrolled postgraduate researchers supported by the UK in 2024 as a proxy for the scale of annual postgraduate training activity.

Table 5 Total economic impact of UKCEH's activities in the UK in 2024

Type of impact	£m	%
Impact of the Centre's spending	**124.5**	**29.3**
Direct impact	61.7	14.5
Indirect and induced impact	62.8	14.8
Impact of research	**299.4**	**70.4**
Productivity spillovers	299.4	70.4
Impact of PhD support	**1.1**	**0.3**
PhD support	1.1	0.3
Total economic impact	**425.0**	**100**

Note: All estimates are presented in 2024 prices and may not add up precisely to the totals indicated.

Source: London Economics' analysis

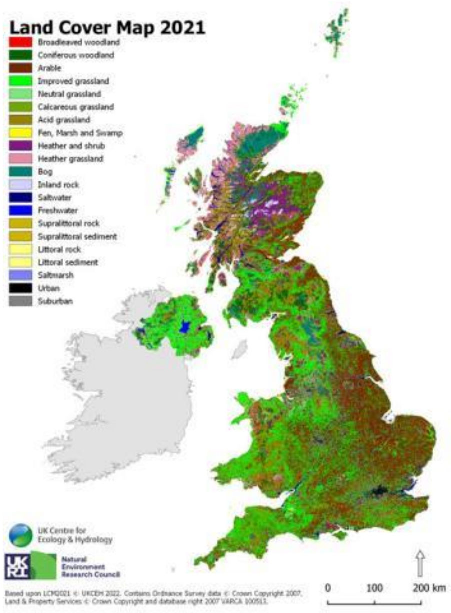


4 Land Cover Maps: Case Study

4.1 Background

UKCEH's Land Cover Maps (LCM) are nationally recognised, UK-wide datasets that describe the physical material present on the Earth's surface. They provide a consistent, thematically classified depiction of land cover - such as woodland, grassland, arable land, freshwater, urban fabric and infrastructure - derived from satellite imagery. By offering a spatially explicit record of land cover and how it changes over time, LCM supports environmental monitoring, research and decision-making across the UK.

Figure 8 UKCEH Land Cover Map (2021)



Source: UKCEH

National land cover mapping by UKCEH and its predecessor organisations extends back to the first LCM of Great Britain in 1990, with consistent UK-wide coverage developed through subsequent releases in the Land Cover Map series and annual updates in recent years. As a result, LCM represents the most comprehensive single source of harmonised land cover information available for the whole UK over multiple decades.

LCM classifies land cover into **21 Broad Habitat types** based on the UK Biodiversity Action Plan (BAP) framework. This habitat-based approach aligns closely with how land is understood and managed for biodiversity, climate, water and natural capital purposes, making the dataset particularly well suited to environmental assessment and policy applications.

[21] Image in the header is sourced from UKCEH

The distinctive value of LCM lies in its combination of national coverage, thematic detail, consistency across all four nations, and long-term continuity.[22] This allows users to work with a single, trusted representation of land cover when assessing environmental conditions, comparing places, or tracking change over time. As a result, LCM plays a critical enabling role in supporting evidence-based policy, operational planning and research across the UK.[23]

Users and applications

LCM is used widely across academia, the public sector, the private sector and the third sector. **Academic users** apply the maps in teaching and research across disciplines including ecology, hydrology, climate science, air pollution, public health and spatial modelling. **Government departments and agencies** use LCM to support policy development, regulatory delivery, statutory reporting and national assessments. **Commercial users** include utilities, engineering consultancies and environmental service providers, while **charities** and **local authorities** use the dataset for conservation planning, biodiversity assessment and strategic decision-making.

Survey data from 2019 indicated that commercial organisations typically applied LCM when delivering projects for public sector or charitable bodies, and that most users were technically experienced professionals. The main aims reported centred on environmental protection and enhancement, with LCM most commonly applied as a foundational dataset to support activities such as biodiversity assessment, natural capital analysis, flood risk modelling and spatial planning. However, the sample was small (n=10) and intentionally weighted towards commercial users, so the findings are indicative rather than representative of the full user base.

4.2 Applications of LCM in practice

The use cases below illustrate how LCM create practical value across policy, regulation, infrastructure planning, environmental management and public engagement.[24]

Natural Capital Accounting (Office for National Statistics): LCM provides the Office for National Statistics with a single, UK-wide baseline of habitat extent for producing the UK Natural Capital Accounts. Using a harmonised land-cover dataset avoids the need to combine incompatible national or local datasets, significantly reducing analytical effort. This improves comparability across years and nations and strengthens confidence in downstream valuations of ecosystem services such as carbon storage, flood protection and recreation.

Catchment management and operational planning (United Utilities): United Utilities describe LCM as a “really important first step” for identifying environmental risks and opportunities across the landscape. The map is used to prioritise catchments for intervention, target land management measures and support opportunity mapping for biodiversity improvements. LCM also helps

[22] Fuller, R.M., Cox, R., Clarke, R.T., Rothery, P., Hill, R.A., Smith, G.M., Thomson, A.G., Brown, N.J., Howard, D.C. & Stott, A.P. (2005). *The UK Land Cover Map 2000: planning, construction and calibration of a remotely sensed, user-oriented map of broad habitats*.

[23] Marston, C.G., O’Neil, A.W., Morton, R.D., Wood, C.M. & Rowland, C.S. (2023). *LCM2021 – The UK Land Cover Map 2021*.

[24] The use cases referenced in this section are drawn from qualitative research undertaken in 2019 for UKCEH, comprising interviews and online surveys with current and previous users of the LCM. These materials were collected for internal research purposes and are not published. They are used here to illustrate typical applications of LCM and to inform assumptions applied in the subsequent valuation.

identify suitable farmland for sludge recycling, reducing reliance on costly disposal routes and supporting lower-carbon operations.

Habitat suitability modelling (Nature Space Partnership): LCM forms a core structural input to Nature Space's habitat suitability modelling for great crested newts. It provides the wider landscape context needed to assess connectivity and long-term population viability around development sites. Using LCM enables a desk-based assessment that avoids months-long delays associated with off-site field surveys and access constraints, delivering major time savings and reducing development delays.

Ecosystem accounting for policy (AECOM): AECOM used LCM as the baseline dataset for ecosystem accounting projects requiring consistent habitat extent across protected areas. LCM was preferred over alternatives such as CORINE because its higher resolution and thematic detail improved accuracy. While not strictly essential, LCM strengthened the evidence base and increased confidence in policy-relevant conclusions.

UK-wide biodiversity and carbon mapping (RSPB): RSPB used multiple editions of LCM to map where high biodiversity value coincides with high carbon-sequestration potential across the UK. LCM's harmonised national coverage enabled a single coherent map, which would not have been possible using country-specific datasets.

4.3 Economic valuation of LCM

UKCEH generated **£42,207 in licensing income from LCM in 2024**. While this provides an indication of income in a single year, LCM have been developed and used for thirty years, with value generated cumulatively over this longer period. This income arises primarily from commercial internal business use and a small number of licensed vector-data requests, however the majority of LCM use is provided free at the point of use. Academic researchers and students can access LCM at no additional charge through the EDINA Environment Digimap service where their institution holds a subscription, while non-commercial organisations can freely download raster LCM products from the Environmental Information Data Centre (EIDC) or request a licence for the vector LCM products with just an administration fee charged. Defra group bodies have direct access to LCM vector data at no additional cost under a group licence covering all 34 Defra arms-length bodies and their contractors. Therefore, licensing income represents only a partial measure of revealed minimum willingness to pay among a limited subset of users, shaped by licensing policy rather than market demand. It captures only a small component of the total value generated by LCM and does not provide a suitable basis for estimating their overall economic value.

The LCM's role is a core enabling dataset within environmental analysis, policy development and operational decision-making. The value of UKCEH LCMs can be derived from the reduction in time, effort and cost required for users to assemble suitable land-cover evidence. Many of the benefits associated with LCM are indirect, diffuse and incremental, arising through avoided analytical effort, reduced rework, improved usability of evidence and greater confidence in downstream outputs.

Consultations with UKCEH staff and users indicate that LCM are often used as a default baseline or "first step" in analysis, meaning that users may not explicitly observe or record the time and cost savings they generate. Together, these factors make market-based valuation approaches unsuitable for estimating the economic contribution of LCM.

Consistent with UK government guidance on valuing public-sector data and environmental information, this evaluation applies a **counterfactual avoided-cost approach.**[25,26] This estimates the additional costs users would incur if LCM were unavailable and they were required to rely on alternative inputs. The valuation therefore estimates the additional analytical effort and occasional survey costs that would arise in this counterfactual.[27]

Applying an avoided-cost approach nevertheless presents challenges. Counterfactual behaviour cannot be observed directly, and there is uncertainty over how much additional analytical effort or data collection would be required across different users and applications. In addition, there is uncertainty over the intensity and context of use, as LCM is frequently shared within organisations, reused over multiple projects, or embedded within models and tools, meaning that observed download or access metrics do not fully capture the scale or diversity of use. To address this, the valuation adopts conservative assumptions, bounded ranges and probability-weighted estimates rather than single point values, and focuses only on direct, short-term avoided costs. Wider benefits including, for example, improved decision quality, reduced delivery risk, avoided delays and downstream environmental and social outcomes, are explicitly excluded. The results should therefore be interpreted as a lower-bound estimate of the annual economic value generated by LCM.

On this basis, the following section sets out the avoided-cost valuation of LCM in 2024, including the scale of use, the estimation of avoided costs per use, and the resulting bounded estimate of annual value.

Valuation approach

The valuation estimates the annual value of UKCEH's LCM using a counterfactual avoided-cost approach applied on a per-use basis. In the absence of LCM, users are assumed not to abandon analytical or decision-making activity, but to substitute LCM with a combination of alternative land-cover datasets**,** satellite imagery and, in some cases, manual interpretation or site surveys.

Evidence from UKCEH user interviews, surveys and previous research indicates that this would typically result in:

- additional analytical time required where users must substitute LCM with less suitable datasets, including reconciling coarser spatial resolution, cross-walking incompatible classification systems, harmonising data across national boundaries and undertaking additional quality assurance and documentation due to the lack of UK-wide harmonisation; and

[25] HM Treasury (2022). *The Green Book (2022).*

[26] Geospatial Commission (2022). *Measuring the Economic, Social and Environmental value of public sector location data*.

[27] James Hutton Institute (2025). *NatureScot Research Report 1382 - Understanding the need and value of land cover and habitat data*.

- occasional commissioning of manual or semi-manual site surveys where available desk-based evidence is insufficient to support confident analysis or regulatory decision-making.[28]

The valuation estimates the avoided costs associated with these counterfactual behaviours and applies them to the number of effective uses of LCM in 2024. To reflect heterogeneity in use and uncertainty in counterfactual behaviour, avoided costs are expressed as a bounded range rather than a single point estimate.

Scale of use

In the absence of detailed user-level information, the number of effective uses in 2024 is proxied using recorded downloads across academic and non-academic access routes. Academic downloads via EDINA are treated as a proxy for university use, while catalogue downloads via the EIDC represent wider public-sector, commercial and third-sector use.

While these metrics involve both under- and over-counting, together they provide a basis for estimating minimum usage. In total, **11,930 effective uses** are estimated for 2024.

Avoided cost per effective use

The avoided cost per effective use comprises two components. First, **avoided analyst time** arises where users would otherwise need to undertake additional processing to substitute LCM with less suitable alternative datasets. These avoided analytical costs are valued using Green Book-consistent labour cost assumptions derived from ONS ASHE data and adjusted for employer on-costs and overheads, with **analyst labour costs** bounded between approximately **£18,600 and £36,800 per year**.[29,30,31]

Additional analyst time in the counterfactual is represented using a **discrete distribution** informed by qualitative evidence from the 2019 UKCEH LCM user survey and interviews. We assume **85%** of effective uses require only limited additional analyst time (approximately 1 hour), reflecting straightforward substitution tasks. A further **14%** of uses are assumed to require several hours of additional processing, checking and documentation, while a small minority (**1%**) are assumed to require 10 working days to reflect substantial analytical effort associated with complex, assurance-intensive workflows. This approach reflects heterogeneity in analyst roles, analytical complexity and the level of assurance required across different users.

Second, in a minority of cases, the absence of LCM would require the **commissioning of manual or semi-manual site surveys** where available desk-based evidence is insufficient to support confident analysis or regulatory decision-making. Survey costs are therefore applied on a **probability-weighted basis** rather than universally. A typical survey cost of approximately **£1,100 per site** is

[28] Alma Economics and Miller, D. (2025). *Understanding the need and value of land cover and habitat data*. NatureScot Research Report 1382.

[29] Office for National Statistics (ONS) (2024). Earnings and hours worked, by industry and occupation: ASHE Table 29.

[30] FCA (2020). *FG20/1: Assessing adequate financial resources.*

[31] HM Treasury (2022). *The Green Book (2022).*

assumed, combined with a bounded assumption that between **0.5% and 3%** of effective uses would require a survey in the counterfactual.[32,33]

Combining these components yields a **bounded avoided cost per effective use of £35.99 to £93.07**, rather than a single point estimate.

Results and interpretation

Applying the avoided-cost framework yields a **conservative bounded estimate of £0.3 million to £1.4 million** for the **annual value of UKCEH's LCM in 2024**. This range reflects uncertainty and heterogeneity in patterns of use, analytical complexity and labour costs. This result demonstrates that UKCEH LCM deliver material value by improving efficiency and reducing the need for bespoke data collection across a wide range of users and applications. Even modest avoided analyst time per use accumulates to a substantial annual benefit when applied across the full user base.

This estimate captures **direct, first-order avoided costs** associated with the absence of UKCEH's LCM in the counterfactual, specifically, additional analyst time and the occasional need for manual site surveys. It does not capture wider economic and social benefits associated with the use of land cover data, including improved decision-making, reduced delivery risk, avoided delays, and downstream environmental outcomes (such as those illustrated in section 4.2). The reported values should therefore be interpreted as a conservative estimate of total economic value. In practice, the benefits to individual users may be greater, depending on how the data is used.

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[32] Alma Economics and Miller, D. (2025). *Understanding the need and value of land cover and habitat data*. NatureScot Research Report 1382.

[33] Aye, T. (2024). *How Much Does a Topographical Survey Cost in 2025?* THS Concepts.

Cumbrian Lakes Monitoring Platform: Case study

5.1 Background

UKCEH manages some of the world's longest running lake monitoring programmes, in England (Cumbrian Lakes) and Scotland (Loch Leven). Freshwater lakes are complex ecosystems that support biodiversity, regulate water quality, provide opportunities for recreation, and contribute to local economies. Lakes also provide valuable natural laboratories from which to deliver collaborative research that advances knowledge of environmental, including climate, changes and ecosystem dynamics and impacts.

Effective lake management relies on robust evidence, itself derived from detailed and long-term scientific monitoring to understand how the water quality and ecological state of lakes change over time and how they respond to natural and human pressures. Given ecological processes operate over years or decades, long-term datasets are important for identifying trends and emerging pressures, as well as evaluating the effectiveness of lake management actions.

The Lake District in north-west England comprises of around 300 lakes and tarns (small mountain lakes), including Windermere, the largest natural lake in England. These lakes support diverse freshwater species and play an important role in recreation and tourism in the region, attracting 18 million tourists every year.[35]

[34] Image in header: Copyright: [John Hodgson]

[35] Cumbria Tourism (2024) Cumbria Visitor Data 2024

5.2 Cumbrian Lakes Monitoring Platform

UKCEH operates the Cumbrian Lakes Monitoring Platform, which undertakes long-term and high frequency monitoring of the north and south basins of **Windermere, Esthwaite Water and Blelham Tarn**. The monitoring programme originated in the mid-1940s, when it was first established by the Freshwater Biological Association (FBA). Over time it has developed into one of the world's longest and most detailed lake monitoring programmes. The platform records a wide range of physical, chemical and biological variables, including:

- **Physical conditions**: water temperature, transparency, above-water meteorology
- **Chemical conditions**: pH, alkalinity, dissolved oxygen and nutrient concentrations (phosphorus, nitrogen)
- **Freshwater species**: phyto- and zooplankton and fish populations (for Windermere)

The aim of the monitoring programme is to provide a long-term evidence base for understanding how lake ecosystems are changing over time and what factors are driving those changes. Secondly, the data supports the development of scientific models that help researchers and policymakers anticipate how lakes may respond to future environmental conditions and identify and assess effective management responses. The platform also contributes to wider scientific research by making the data available to the international research community, leading and supporting global studies of environment change in freshwater systems.

The monitoring is carried out through a combination of **regular field sampling** and **automated (sensor-based) monitoring equipment**. Manual sampling is typically conducted from boats every two weeks, while automated buoys deployed in the lakes collect high-frequency data, for some every few minutes. The combination of long-term manual observations and high-frequency automated measurements provides a particularly valuable dataset for lake ecosystem modelling and environmental analysis.

The programme is funded as National Capability by the **Natural Environment Research Council (NERC)**, and all data generated are made openly available through the Environmental Information Data Centre (EIDC). In addition to direct downloads, UKCEH frequently collaborates with external users who benefit from the organisation's expertise in interpreting the data. While many users access the datasets independently, others work directly with UKCEH scientists who have detailed knowledge of the monitoring programme. Download statistics from the Environmental Information Data Centre provide a useful proxy for demand and usage. In 2024, there were **4,925 recorded downloads**, representing an estimate of effective uses across academic, public-sector, commercial and third-sector organisations. Consultation with UKCEH noted that this may provide an "upper envelope" of demand, however, the data are not always fully credited when used in publication.

5.3 Main users and benefits

Data from the Cumbrian Lakes Monitoring Platform are used by academic researchers, environmental regulators, public bodies, water companies and multi-agency partnerships.

Supporting statutory monitoring

Regulators such as the **Environment Agency** use the monitoring data to complement their own statutory monitoring programmes. While regulatory monitoring often occurs at lower frequency, the Cumbrian Lakes Monitoring Platform provides higher-resolution information that helps interpret longer-term environmental trends.

"The data aids our understanding - the long-term datasets are useful for us when looking at our own data and trying to understand more subtle long-term changes. [We] have done a bit of work with long-term temperature data in the past, and this is useful when we look at algal bloom frequencies" – Environment Agency

"We did use some of your monitoring data in response to the Environmental Damage Regulation notification that we received in 2024. Your monitoring was more frequent than ours so it was very helpful in determining P levels" – Environment Agency

The data also feeds into initiatives such as the **Love Windermere Partnership**; a multi-agency group led by the Environment Agency focused on improving water quality in Windermere.[36] Recently, the Partnership used UKCEH data in their report, *A Changing Windermere*, which outlines current knowledge of how and why the lake is changing. This report was developed to reach the wider stakeholder community and public, to inform dialogue and decision making.

"Reference to the monitoring undertaken by UKCEH through their Lakes Monitoring Programme … has enabled us to understand how, in our case, Windermere, has changed over time and where we need to focus our collective efforts in securing her future. As far as we are aware, this is the only long term dataset available on lake water quality and is therefore a vital piece of evidence to inform our work" – Love Windermere Partnership

Supporting environmental policy and regulation

The monitoring programme provides an important evidence base for environmental policy. Under the **EU Water Framework Directive**, achieving "good" ecological status for freshwater bodies is a statutory objective and applies to the majority of freshwater bodies in the UK for 2027. Currently, only 16% of lakes in England are "good" status or higher.[37] Long-term monitoring is therefore important for tracking ecological conditions and informing actions required to improve the status. The lakes monitored by the Cumbrian Lake Monitoring Platform currently have a "moderate" ecological status.

The Office for Environmental Protection (OEP) highlighted how effective monitoring "lies at the heart of the WFD" and provides an essential evidence base to underpin actions, concluding that current monitoring in the UK as a whole is inadequate due to EA budgets.[38]

UKCEH is also involved in collaboration with government bodies (e.g. Defra) to review whether the WFD classification framework is designed and implemented in the best way to measure and assess the water environment and direct and inform interventions. The project will provide a

[36] Love Windermere (2025) A Changing Windermere

[37] Environment Agency (2025) Classifications data for England

[38] Defra (2024) Policy paper: Government response to the Office for Environmental Protection report on the implementation of the Water Framework Directive Regulations and River Basin Management Planning in England

detailed and independent evidence base to inform policy on the suitability of the **ecological classification framework for water management**.[39]

Informing lake restoration and management

Monitoring data also play a key role in supporting **lake management and restoration** by identifying water quality issues and informing decision-making about interventions. For example, monitoring of water quality and fish populations identified high levels of phosphorus inputs from wastewater and agricultural runoff which contributed to eutrophication and decline of the cold-water fish Arctic charr populations. This population of fish represents significant cultural and ecological importance, having supported centuries of local fisheries, and long held great interest for the local community and tourists.[40] They also contributed to wider recognition of the lake's natural heritage, including its role in the UNESCO World Heritage designation of the Lake District.[41] In addition, monitoring data on **algal blooms** has broad economic and social benefits (see Box 6). These data supported restoration efforts in the 1990s, including phosphorus stripping at nearby wastewater treatment works and restrictions on the use of live bait to reduce the spread of invasive species.

Recently, UKCEH is leading a £920,000 project to generate scientific evidence to support the restoration of the UK's largest lake, Lough Neagh in Northern Ireland.[42] UKCEH's long-term monitoring of Loch Leven in Scotland has also provided the evidence base linking pressures such as nutrient enrichment to ecological change and directly informing management responses that enabled improvements in water quality.[43] Historically, water companies have also used the data to inform upgrades to sewage treatment works to improve lake water quality.

A key benefit of the platform is also the ability to assess whether restoration interventions are actually effective. UKCEH noted that restoration work is often implemented without adequate follow-up monitoring. In contrast, the Cumbrian Lakes Monitoring Platform enables assessment of outcomes over appropriate timescales, recognising that lakes may take years to respond to changes. This is especially pertinent given activities that are now being planned and launched by the Love Windermere Partnership, under their 2025-27 Action Plan.

[39] Defra (2024) Policy paper: Government response to the Office for Environmental Protection report on the implementation of the Water Framework Directive Regulations and River Basin Management Planning in England

[40] Winfield, I.J., Berry, R. & Iddon, H. (2019) The cultural importance and international recognition of the Arctic charr Salvelinus alpinus populations of Windermere, UK. Hydrobiologia 840, 11–19

[41] Winfield, I.J., Berry, R. & Iddon, H. (2019) The cultural importance and international recognition of the Arctic charr Salvelinus alpinus populations of Windermere, UK. Hydrobiologia 840, 11–19

[42] UKCEH (2026) Vital new research will support recovery of Lough Neagh

[43] UKCEH (2026) Loch Leven: A UK Lake Restoration Case Study

Box 6 Understanding and managing algal blooms

Harmful algal blooms are one of the most significant environmental challenges affecting freshwater lakes. These blooms occur when excess nutrients such as phosphorus and nitrogen stimulate the rapid growth of algae and cyanobacteria (also known as blue-green algae).[44] Some cyanobacteria produce toxins that pose risks to human and animal health, [45] and algal blooms can also block sunlight and deplete oxygen in the water which affects plants, fish and other wildlife.[46]

UKCEH monitors algal blooms, both in open water (as part of the monitoring platform), but importantly at shorelines (engaging with citizen scientists via the Bloomin' Algae app), as blooms often accumulate there due to wind effects. Monitoring data helps scientists understand the environmental conditions that lead to blooms and track how these risks are changing over time. For example, long-term data show that annual average surface water temperatures in Windermere have increased by around 1.7°C over the past 80 years, a trend that may increase the likelihood of algal blooms.[47] High nutrient concentrations are also needed to support larger blooms. Monitoring by UKCEH has detected declining water clarity, particularly in some of the Lake District's more pristine lakes. In Esthwaite Water and Blelham Tarn (part of the long-term monitoring programme) visibility is only around two metres, reflecting higher nutrient concentrations and algal growth in these lakes.[48] Data from 2021/22 shows that phosphorus concentrations were highest in Esthwaite Water, Blelham Tarn and Elterwater.[49] While concentrations of phosphorus and nitrogen in Windermere are declining, there is a risk that it will not be sufficient to offset the growth in algal blooms triggered by climate change (e.g. warmer surface temperatures, increased rainfall affecting agricultural runoff).

The economic impacts of algal blooms can be substantial. Harmful algal blooms can impact provisioning services associated with water supply (e.g. drinking water), biodiversity, recreational activities, tourism and regulating services linked to water quality.[50] National estimates suggest that the annual cost of algal blooms in the UK in 2018 was around £173 million, including approximately £60 million in drinking water treatment costs and around £50 million in lost recreation opportunities.

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[44] UKCEH (2026) Algal blooms and human health

[45] UKCEH (2026) Algal blooms and human health

[46] Environment Agency (2017) Algal blooms: advice for the public and landowners

[47] UKCEH (2022) Cyanobacterial blooms on Windermere

[48] UKCEH (2024) Study shows we can tackle pollution threats to the Lakes

[49] UKCEH (2024) Study shows we can tackle pollution threats to the Lakes

[50] Jones, L., Gorst, A., Elliott, J., Fitch, A., Illman, H., Evans, C., Thackeray, S., Spears, B., Gunn, I., Carvalho, L., May, L., Schonrogge, K., Clilverd, H., Mitchell, Z., Garbutt, A., Taylor, P., Fletcher, D., Giam, G., Aron, J., Ray, D., Berenice-Wilmes, S., King, N., Malham, S., Fung, F., Tinker, J., Wright, P., Smale, R. (2020). Climate driven threshold effects in the natural environment. Report to the Climate Change Committee.

Supporting recreation and the local economy

Water quality in the lakes is closely linked to **recreation and tourism in the Lake District**. The region attracts millions of visitors each year, and activities such as swimming, boating and other water sports, as well as the amenity value enjoyed by both locals and tourists, depend on maintaining healthy lake ecosystems. In the past, events such as the Great North Swim have been cancelled due to blue-green algae. More recently, visible algal blooms along lake shorelines have attracted significant media attention and affected public perceptions of water quality. Windermere alone, part of the Lake District National Park UNESCO World Heritage Site, attracts seven million visitors a year, and is home to more than 14,000 people, generating £750m for the local economy.[51]

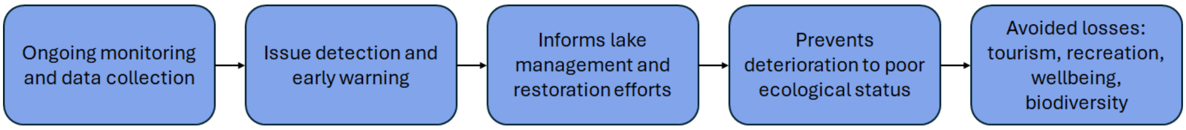
Supporting academic research and training

The Cumbrian Lakes Monitoring Platform also supports **scientific research and education**. Academic researchers use the data for original research and comparative studies with other international lake datasets. There are also PhD studentships linked to the data, for example from Lancaster University and University of Stirling. The lakes and monitoring infrastructure are also used for field training and student research projects. As such, the monitoring programme contributes to training skilled workers in environmental fields.

5.4 Economic valuation of the Cumbrian Lakes Monitoring Platform

The valuation aims to estimate the **economic value of the Cumbrian Lakes Monitoring Platform** by assessing the avoided damage from UKCEH monitoring activities. The approach estimates the potential economic losses if the monitored lakes were to deteriorate from **moderate to poor ecological status** and then attributes a proportion of this **avoided loss to the monitoring activities undertaken by UKCEH**. Figure 9 illustrates the value chain of the Cumbrian Lakes Monitoring Platform.

Figure 9 Cumbrian Lakes Monitoring Platform value chain



Source: London Economics

Estimating the economic loss from deterioration

A 2013 study commissioned by the Environment Agency estimated the economic damage associated with water bodies in England deteriorating to poor ecological status under the Water Framework Directive.[52] The study estimated total damages of **£1.1 billion per year** across rivers, lakes and coastal waters. To apportion these damages to the lakes covered by the Cumbrian Lakes Monitoring Platform, the analysis uses the **share of total surface area of inland waters, lakes and reservoirs in England** (Table 6). The total surface area of inland waters in England is estimated at **675km²**.[53]

[51] BBC (2025) Harmful bacteria 'highest in summer' in Windermere

[52] Wildlife and Countryside Link (2023) The economic costs of the Retained EU Law Bill

[53] Food and Agriculture Organisation (1991) Inland fisheries of Europe: United Kingdom

Table 6 Lake surface areas

Lake	Surface area (km^2)	Proportion of total water surface area in England
Windermere (North)	8.1	1.20%
Windermere (South)	6.7	0.99%
Esthwaite Water	1.1	0.16%
Blelham Tarn	0.11	0.01%
Total	**16.01**	**2.36%**

Adjusted to 2026 prices, the estimated national damage from deterioration is approximately **£1.26 billion per year**. Applying the 2.4% surface area share suggests that deterioration of the four lakes monitored under the Platform could imply **economic losses of approximately £29.7 million per year**.

This approach, however, assumes that environmental value per km² is uniform across all bodies of water in England and that all generate the same economic value. In reality this is unlikely to be the case. Lakes differ substantially in their recreational use, biodiversity, landscape value and cultural significance, as well as in the size of the surrounding population that benefits from them. As part of the Lake District National Park, a UNESCO World Heritage Centre World Heritage Site, these lakes, especially Windermere, are likely to generate significantly higher environmental and recreational and cultural value per km² than the average English water body.

Evidence from contingent valuation studies supports this view. A study of lakeside environments at Loch Lomond and Loch Leven estimated the public's willingness to pay (WTP) to protect lakeside quality, including views, access and path conditions.[54] Surveying over 1,000 adults in Scotland, the study found that respondents were willing to pay on average **£12.06 per household per year** to preserve lakeside quality at Loch Lomond. Loch Lomond holds a similar cultural and recreational significance in Scotland to that of Windermere in England, suggesting the WTP estimates provide a useful benchmark for understanding the value of maintaining lake environments at nationally important freshwater destinations.

Although Windermere likely provides benefits to people across the country, a conservative approach is to apply this WTP estimate only to those most directly connected to the lake. There are approximately 7 million tourists annually visiting Windermere and the resident population is around 14,000 people.[55] Applying the £12.06 annual WTP value to this population suggests an indicative social value of **around £84.6m million per year** associated with maintaining the quality and accessibility of the Windermere lakeside environment. This highlights the substantial societal value at stake if environmental quality were to deteriorate.

Combining this with the annual estimate of £2.1 million for Esthwaite Water and Blelham Tarn (based on Table 6), this gives a total value of **£86.8 million per year**.[56]

Probability of deterioration avoided

[54] McDougall et al. (2020) *Valuing inland blue space: A contingent valuation study of two large freshwater lakes.* Science of the Total Environment.

[55] Love Windermere (2025) A Changing Windermere

[56] This estimate does not include indirect spillover impacts on the local economy, including tourism-related expenditure and revenues to local businesses.

Given that all four lakes monitored under the Cumbrian Lakes Monitoring Platform are currently classified as moderate ecological status, deterioration to poor status represents the next step down the Water Framework Directive classification scale. A range of environmental pressures affecting the lakes (e.g. increasing phosphorus and nitrogen concentrations in some lakes, rising surface water temperatures and wider climate change impacts, introduction of non-native species) mean that deterioration cannot be ruled out in the absence of effective monitoring and management. Long-term monitoring by UKCEH has helped detect environmental change early and inform restoration and management responses.

A starting point for estimating the likelihood of deterioration is the national distribution of ecological status. Around **20% of England's water bodies are currently classified as "poor" or "bad" ecological status**, indicating that deterioration to poor status is a realistic outcome for some freshwater systems under sustained and multiple environmental pressures. However, the lakes monitored under the Cumbrian Lake Monitoring Platform are not a random sample of water bodies. This national distribution therefore provides a useful benchmark for considering the potential risk of deterioration.

Monitoring evidence suggests that Windermere remains environmentally stressed. A 2023 survey of Windermere found that only 5% of in-lake samples met "high" ecological standards for phosphorus and 16% met "good" status, while 79% were classified as moderate or poor. At the lake shore, only 14% of samples met good or high standards, with 86% rated moderate or poor. Although none of the samples were classified as "bad", these results indicate that nutrient pressures remain substantial and that ecological status is relatively close to the boundary between moderate and poor in some locations.[57]

Based on this, a scenario range of **10-35%** is assumed for the **probability that the lakes could deteriorate to poor ecological status without monitoring data** and therefore effective, targeted management. The low scenario assumes a 10% probability, the central scenario 20% and the high scenario 35%.

Proportion of monitoring attributable to UKCEH

Consultation with UKCEH confirmed that without the Cumbrian Lakes Monitoring Platform, long-term, consistent open-water data would largely disappear, and the ability to analyse seasonal and decadal trends would be lost.

Other organisations conduct monitoring of these lakes, but none provide equivalent coverage:

- The **Environment Agency** conducts periodic monitoring and places sensors on inflowing streams and rivers, but would lack the resources to replicate UKCEH's intensive, lake-wide open-water monitoring.
- **Water companies**, such as United Utilities, carry out some monitoring, but not at the same scale or frequency.
- Some **universities** run monitoring programs, but these are usually short-term due to project durations and staff turnover. Only a few exceptions, such as long-term fish monitoring initiatives, provide continuity, but these are rare.
- **Citizen science initiatives** exist, but freshwater systems are challenging to monitor in this way. Subsurface measurements require specialist equipment and laboratory analysis.

[57] Freshwater Biological Association (2023) Big Windermere Survey

Photo-based apps for algal blooms (e.g., Bloomin' Algae) cannot capture toxicity or subsurface conditions and still rely on expert verification and interpretation.

Without UKCEH, monitoring would be largely limited to shorelines, leaving a significant gap in understanding lake-wide conditions. Coverage, consistency, and data quality would all be substantially reduced, and no organisation was identified that could realistically replace UKCEH's ecosystem-scale monitoring.

Based on this assessment, a range of **30-60%** was judged as plausible for **attribution to UKCEH monitoring**. The low scenario assumes 30% attribution, the central estimate 40% and high scenario 60%.

Results

Applying the valuation approach yields an estimated economic value of avoided loss from the Cumbrian Lakes Monitoring Platform of **£2.6 million to £18 million per year**. The range reflects uncertainty in the specific value of preserving these four lakes at their current ecological status as well as lack of data on the probability that lakes would decline to poor ecological status in absence of the monitoring platform.

6 UK Environmental Change Network: Case Study

The **UK Environmental Change Network** (**ECN**) is the UK's long-term ecosystem research network. Established in 1992 by NERC following consultation with government, ECN was created in response to calls for more consistent and long-term information on the state of the environment and how it is changing. The network was developed through a consortium of partner organisations and was initially led by the Institute of Terrestrial Ecology (ITE), now part of UKCEH.

A key motivation for establishing ECN was concern about the ecological impacts of atmospheric pollution, particularly acid rain, alongside growing recognition that climate change and other large-scale environmental pressures could affect ecosystems across wide geographic areas. Detecting and understanding such changes requires sustained monitoring over long periods of time. At the time, the UK lacked a coordinated system capable of assessing environmental responses to these pressures across multiple ecosystems, particularly in natural and semi-natural (non-urban) environments.

Since 1992, ECN has collected measurements of physical, chemical and biological variables at instrumented field sites across the UK. The network initially focused on terrestrial systems and began with eight core monitoring sites, providing a foundation for long-term ecosystem observation.

A defining feature of ECN is its integrated monitoring approach, in which multiple environmental components are measured at the same locations using consistent protocols. This includes monitoring of:

- **Atmospheric and climate measures** (meteorology, air pollutants)

[58] Image source: UK-SCAPE. UK Environmental Change Network

- **Chemical measures** (e.g. rainfall, soils, water)
- **Biological measures** (including habitats, vegetation and selected invertebrate and vertebrate groups

Because these variables are measured using **consistent protocols across all sites**, the resulting datasets have been directly **comparable across locations and through time**. , ECN's long-term datasets have enabled researchers to distinguish short-term fluctuations from sustained environmental trends and to investigate the drivers of ecosystem change. Since 2016, a series of significant reductions to monitoring budgets have impacted the frequency and breadth of measurements, stability of some sites and coordination capacity, but many of the most important long-term records continue to be developed at the majority of sites and remain a unique source of information on the changing environment.

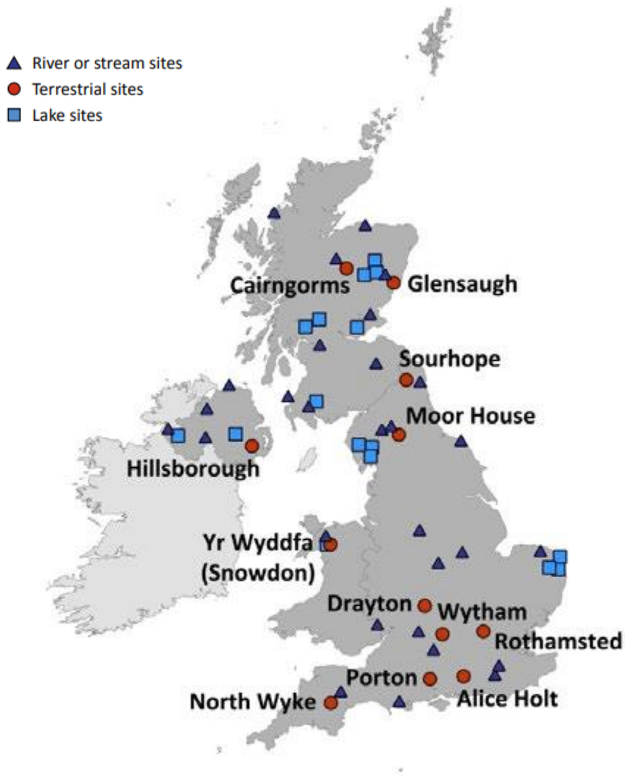
The first years of the programme were devoted to developing detailed monitoring protocols, drawing on input from subject experts. These protocols have proven influential and remain widely used, with some approaches later adopted or adapted by other monitoring initiatives (e.g. Natural England's Long Term Monitoring Network (LTMN). In some cases, ECN monitoring was also aligned with existing national schemes, such as moth monitoring linked to the Rothamsted Insect Survey, and the UK Rural Air Pollution monitoring networks under UKEAP. This has helped ensure compatibility with wider long-term datasets, and also provides important efficiencies for the other networks who would otherwise need to deploy additional operators.

6.1 ECN monitoring sites

ECN operates as a network of intensively studied sites distributed across the UK. For most of its existence the network's **terrestrial** component has comprised **11 monitoring sites**, spanning a wide range of landscapes and habitats, from lowland agricultural and woodland environments to upland moorlands and mountains. These sites include Alice Holt, Cairngorms, Glensaugh, Hillsborough, Moor House - Upper Teesdale, North Wyke, Porton, Rothamsted, Yr Wyddfa (Snowdon), Sourhope and Wytham. Together, they cover diverse habitats, including semi-natural grassland, woodland, peatland, moorland and arable farmland, allowing ECN to capture environmental change across a representative range of UK ecosystems.

In addition to its terrestrial network, ECN used to also manage a **freshwater monitoring component**, bringing together long-term observations from lakes, rivers and streams across the UK. This coordination has largely ceased over the last decade due to funding constraints although much of the monitoring was delivered by the UK environment agencies as part of their statutory responsibilities under the Water Framework Directive, and to a large part this continues within their individual monitoring programmes.

Figure 10 Overview of ECN sites



Note: Drayton is no longer active.

Source: Beaumont et al. (2017) The U.K. Environmental Change Network: North Wyke the first 20 years. Lawes Agricultural Trust

A key strength of the ECN network is the **long-term stability of its monitoring locations**. Many ECN sites are owned or managed by research organisations, conservation bodies or partner institutions, reducing the likelihood of major land-use changes that could disrupt monitoring. This stability enables researchers to attribute observed environmental trends more confidently to broader drivers such as climate change or atmospheric pollution, rather than to local land management changes.

6.2 Role of UKCEH and partner organisations

ECN operates as a **multi-agency programme**, with monitoring activities and funding contributions from a range of UK government departments, agencies and research organisations. The network is coordinated by UKCEH, which plays a central role in maintaining the integrity and long-term value of the programme.

Historically, UKCEH provided the **coordination and data stewardship** that allowed ECN to grow and function as a coherent national monitoring network. This included:

- overall network coordination and programme management;
- maintaining and updating standard monitoring protocols;
- ensuring consistency and comparability of data across sites;
- managing data quality assurance and documentation; and
- publishing and enabling reuse of datasets through the EIDC.

While this central coordination is essential to the value of the network, budget reductions over the last decade have substantially reduced the scope of these services. Despite this, UKCEH continue to liaise with partners and provide a hub for receiving, processing and releasing data, without which, monitoring activities would rapidly fragment, reducing the ability to generate consistent national evidence on environmental change.

ECN sites also host a wide range of co-located monitoring and research initiatives. These include programmes such as COSMOS-UK soil moisture monitoring, atmospheric pollution monitoring networks, long-term ecological experiments supported by the Ecological Continuity Trust. They have also made influential contributions to international observing initiatives. Co-locating monitoring activities increases scientific value while improving operational efficiency, allowing multiple datasets to be collected using the same research infrastructure.

6.3 ECN's long-term scientific and international influence

With some datasets now stretching well over thirty years, ECN has built one of the most uniquely detailed records of environmental and ecological change across the UK. Long-term datasets of this kind are rare but essential for understanding how ecosystems respond to interacting environmental pressures.

As the duration of the monitoring record increases, the value of the continuing ECN time series has grown. In a review marking the first two decades of the network, Sier and Monteith (2016) noted that ECN had already accumulated a robust set of baseline data describing environmental and biological variability across UK ecosystems in unprecedented detail.[59] Long time series make it possible to detect subtle trends that would be invisible in shorter datasets, and to assess the effectiveness of environmental policies over time. For example, ECN data have helped scientists identify ecological responses to reductions in acidifying pollution, supporting assessments of the effectiveness of international emission reduction agreements such as the Gothenburg Protocol. The network also provides a baseline against which future environmental changes can be measured and interpreted.

Beyond the UK, ECN has also exerted significant influence as an exemplar for the development of wider European initiatives on long-term ecosystem monitoring. In particular, it aligns closely with the principles underpinning **eLTER (Integrated European Long-Term Ecosystem, Critical Zone and Socio-Ecological Research),** a European research infrastructure (RI) designed to coordinate long-term environmental observations across multiple countries. Several ECN sites have been represented within early iterations of the eLTER network of research platforms. ECN's long-running, standardised monitoring approach has therefore helped inform the development of coordinated long-term ecosystem observation efforts across Europe.

6.4 Users and use cases

ECN datasets and monitoring sites are used by scientists, government agencies, environmental organisations and students to investigate environmental change, inform policy and support ecosystem management.

[59] Sier, A., & Monteith, D. (2016). *The UK Environmental Change Network after twenty years of integrated ecosystem assessment: Key findings and future perspectives*.

Because ECN sites combine long-running environmental observations with well-characterised ecosystems, they also serve as important **research platforms**. Scientists frequently locate additional studies alongside ECN monitoring programmes in order to take advantage of existing measurements, infrastructure and historical datasets. This integration of long-term monitoring with new research has supported a substantial body of scientific work, with **more than 950 publications** using ECN data or sites. The examples below illustrate several ways in which ECN monitoring and sites have been used to investigate environmental change.

Box 7 Ground beetle monitoring and insect biodiversity

What the monitoring showed: Long-term monitoring of **ground beetles** (**Carabidae**) at ECN sites has provided important insights into trends in insect populations. Analysis of pitfall-trap data collected at 11 ECN sites between 1994 and 2008 found that approximately **75% of the species studied showed declining populations**.[60]

Why it matters: Carabid beetles are important predators within terrestrial ecosystems and play roles in regulating insect populations and controlling weeds (by eating weed seeds) in agricultural landscapes. The economic impact may include increased reliance on herbicides which may results in higher input costs (herbicides) or reduced crop yields. The ECN dataset allowed researchers to detect changes and early risks across multiple habitats and regions, providing one of the first long-term, multi-site assessments of insect population change in the UK.

Source: London Economics' analysis of UK ECN website (Image: UK ECN website)

[60] Brooks, D. R., Bater, J. E., Clark, S. J., Monteith, D. T., Andrews, C., Corbett, S. J., Beaumont, D. A., & Chapman, J. W. (2012*). Large carabid beetle declines in a United Kingdom monitoring network increase evidence for a widespread loss in insect biodiversity*.

Box 8 Plant biodiversity responses to reductions in air pollution

What the monitoring showed: Long-term vegetation monitoring across ECN sites has helped scientists understand how plant communities respond to changing environmental conditions. ECN published a nationally unique dataset which was used in analysis to evidence that plant species richness (number of species occurring in a defined area) had increased between 1993 and 2012.[61]

Why it matters: The study linked changes in vegetation to reductions in acidifying pollutants (mainly sulphur deposition), which have gradually altered soil chemistry and reduced soil acidity. Species associated with less acidic soils increased in frequency across several habitats, suggesting that ecosystems were beginning to recover from the effects of historical air pollution. These trends are consistent with environmental improvements resulting from air pollution control policy implemented across the UK. Evidence of ecological recovery provides valuable information on the effectiveness of these policies and can therefore inform future policy development.

Source: London Economics' analysis of UK ECN website (Image: UK ECN website)

Box 9 Monitoring environmental change in mountain ecosystems

What the monitoring showed: At the ECN Cairngorms site, long-term photographic monitoring has been used to analyse changes in snow cover in upland environments. Using images collected between 2002 and 2015, researchers determined the duration of snow cover each year in the Allt a'Mharcaidh catchment.[62]

Why it matters: Snow cover is an important environmental factor influencing mountain ecosystems. The analysis showed that the period of snow cover increased significantly over the study period, largely due to later spring melt. Changes in snow duration can influence plant growing seasons and the timing of river flows. Changing river flows can lead to flood risks downstream, therefore this data can help to inform flood management and preparedness efforts and mitigate damages. Snow conditions are also closely linked to winter tourism in the Cairngorms National Park, a major visitor destination that supports local businesses and employment (e.g. through ski centres, accommodation, equipment hire). While there has been a clear increase in duration of snow cover, which may benefit the local tourism economy, high elevation snow models indicate this trend will be reversed due to climate change. This highlights the importance of long-term monitoring to inform adaptation planning.

Source: London Economics' analysis of UK ECN website (Image: UK ECN website)

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[61] Rose, R., Monteith, D. T., Henrys, P., Smart, S., Wood, C., Morecroft, M., et al. (2016). *Evidence for increases in vegetation species richness across the UK Environmental Change Network sites linked to changes in air pollution and weather patterns*.

[62] Andrews, C., Ives, S., & Dick, J. (2016). *Long-term observations of increasing snow cover in the western Cairngorms*.

6.5 Detailed impact case study: Reducing the economic impacts of surface water "brownification"

While ECN data supports a wide range of scientific research and environmental monitoring activities, some findings have had direct practical implications for environmental management and industry. One particularly influential example concerns the **increasing "brownification" of surface waters** in parts of the UK and northern Europe.

The problem: Rising DOC in upland drinking water sources

Surface waters in many upland regions have become progressively browner due to rising concentrations of **dissolved organic matter (DOM)**, organic material derived from soils and vegetation that dissolves into water. The amount of this material is commonly measured as dissolved organic carbon (DOC), a standard indicator used to quantify organic matter in water.

Source: UK ECN website

This trend, often referred to as "brownification", poses a **significant challenge for drinking water supply** because many UK water utilities rely on upland catchments and peat-dominated landscapes for their raw water sources. Estimates suggest that up to **70% of England's drinking water originates from peatland-dominated catchments**, which is similar for Scotland.[63] When DOC levels increase, water treatment processes must work harder to remove organic matter before disinfection. If not removed, DOM can react with chlorine during treatment to produce potentially harmful disinfection by-products, as well as causing taste and odour problems.

Higher DOC concentrations therefore increase the **cost and complexity of drinking water treatment**.[64] Understanding why DOC concentrations are increasing, and how they may change in the future, is therefore critical for managing both water quality and treatment costs.

ECN's role: long-term monitoring and scientific understanding

Through ECN and related monitoring programmes, UKCEH collects long-term data on:

- stream and soil water chemistry
- atmospheric deposition
- hydrology and climate
- catchment land cover and vegetation

These long-term datasets allow scientists to analyse environmental change across decades rather than years. For example, researchers used data from multiple monitoring programmes, including

[63] Nature Scot (2018) Peatland ACTION case study: What's the connection between peat and drinking water catchments?

[64] Monteith et al. (2023),Long-term rise in riverine dissolved organic carbon concentration is predicted by electrolyte solubility theory. Sci. Adv. 9, eade3491

ECN, the UK Upland Waters Monitoring Network, precipitation chemistry monitoring networks (UKEAP Precip-Net) and river flow records, to analyse long-term trends in DOC in upland streams.[65]

Using up to 18 years of monitoring data across several sites, studies found that rising DOC concentrations were strongly linked to declining atmospheric sulphur deposition.[66] As air pollution declined and ecosystems began recovering from historical acidification, changes in soil chemistry increased the solubility and mobility of organic matter in soils, allowing more DOC to enter streams and reservoirs.

This research helped resolve long-standing uncertainty about the causes of brownification.[67,68] By identifying the underlying mechanism, recovery from acid deposition rather than solely climate or land-use change, the research provided water utilities with greater confidence about the drivers of DOC trends and the likely future trajectory of the problem.

Long-term monitoring sites are also located within operational water supply landscapes. For example, monitoring of the River Etherow catchment in the southern Pennines involves collaboration with organisations such as United Utilities, Yorkshire Water and Severn Trent Water, demonstrating the direct relevance of long-term monitoring data for water resource management.

Collaboration with industry: FREEDOM and FREEDOM-BCCR

Beyond monitoring and research, UKCEH has worked directly with the **water industry** to translate scientific understanding of DOM into **practical decision-support tools**. A key example is the **FREEDOM programme** ("Forecasting Risks for the Environmental Exacerbation of Dissolved Organic Matter"), funded by NERC and Scottish Water.[69]

FREEDOM combined monitoring data, modelling and collaboration with water utilities to improve understanding of how environmental change may influence future DOM levels in drinking water sources. UKCEH led the programme and contributed through the development of process-based models of DOM dynamics in reservoirs, including the PROTECH model, and by providing supporting environmental data such as catchment and land-cover information through UKCEH data resources.

A follow-on project, **FREEDOM-BCCR**, extended this work to focus on long-term resilience and planning for the water industry.[70] The programme brought together researchers and water companies to share data, test modelling approaches and develop practical outputs through direct engagement, briefing notes and webinars. Through this collaboration, UKCEH helped water utilities better understand potential future DOC trends and evaluate possible responses, including catchment management, reservoir management and treatment options.

[65] Clark, J., Bottrell, S., Evans, C., Monteith, D., Bartlett, R., Rose, R., Newton, R. & Chapman, P. (2010) The importance of the relationship between scale and process in understanding long-term DOC dynamics. Science of The Total Environment, 408(13)

[66] Sawicka, K., Monteith, DT. and et al. (2016). Fine-scale temporal characterization of trends in soil water dissolved organic carbon and potential drivers. Ecological Indicators, 68, 36-51

[67] Monteith et al. (2023),Long-term rise in riverine dissolved organic carbon concentration is predicted by electrolyte solubility theory. Sci. Adv. 9, eade3491

[68] Evans, C. D., Monteith, D. T., & Cooper, D. M. (2005). Long-term increases in surface water dissolved organic carbon: observations, possible causes and environmental impacts. Environmental pollution, 137(1), 55-7

[69] UKCEH (2026) FREEDOM

[70] Monteith, D., Pickard, A.E., Spears, B.M., and Feuchtmayr, H. (2021): An introduction to the FREEDOM-BCCR project. FREEDOM-BCCR briefing note 1 to the water industry. UKRI SPF UK Climate Resilience programme – Project no. NE/S016937/2.

The resulting insights help water utilities plan responses such as:

- catchment management interventions (e.g. peatland restoration)
- reservoir management strategies
- improved real-time monitoring of water quality
- optimisation of chemical (e.g. coagulant) dosing
- investment in new treatment infrastructure where necessary

The main benefit of this collaboration is **improved strategic decision-making**. By reducing uncertainty about future DOM risks, the programme helps water companies determine whether they can continue adapting their existing treatment processes or whether more substantial infrastructure investments may eventually be required.

Economic value of UK ECN monitoring and research

Environmental monitoring provides essential information for managing natural resources, but its economic value can be difficult to quantify directly. Public investment in monitoring and environmental research reflects its strategic importance: for example, Defra and UKRI have recently invested £20.6 million in recent research and innovation programmes aimed at advanced monitoring capabilities.[71] Overall environmental protection expenditure in the UK reached its highest level in 2025, exceeding £17 billion annually, which includes environmental R&D, waste and wastewater management, biodiversity and landscape protection).[72]

Without a figure to reflect the overall value of monitoring environment change, and the contribution of the coordination and stewardship of the ECN as a part of that, the FREEDOM-BCCR programme provides a useful example of how monitoring and research can generate economic value for the water industry.

The **valuation approach** assesses how UKCEH's long-term monitoring, research, and direct collaboration on DOM have contributed, and will continue to contribute, to the water industry's ability to manage DOM. This includes informing strategic decisions on water treatment, and understanding the scale and trajectory of DOM-related risks. Water utilities have a range of intervention options, including **catchment management**, **reservoir management**, **adjustments to water treatment processes** (e.g., coagulant dosing, real-time monitoring DOM and its chemical quality), or the **construction of new treatment plants**. Modelling conducted as part of the programme indicates that, under severe climate change scenarios, increased DOM could impose additional operating (OPEX) and capital (CAPEX) costs on water companies in the £100,000s, with extremely severe scenarios potentially costing millions in CAPEX.[73]

The valuation focuses on **avoided costs**, both operational and capital, achieved through **more efficient water treatment** and **informed catchment management**. It quantifies the economic benefit of interventions that prevent unnecessary treatment expenses or defer costly infrastructure investments.

[71] UKRI (2024) £6m for 19 innovation projects to monitor environmental change

[72] Statista (2025) Government spending on environment protection in the UK 2010-2025

[73] Monteith, D. (2020). Forecasting risk of environmental exacerbation of dissolved organic matter [Video]. YouTube. UK Climate Resilience Programme.

Estimates of the benefits of the FREEDOM programmes

Efficient water treatment: Research conducted by Cranfield University has demonstrated that changes in the operation of coagulation and clarification processes, central to DOM removal, can optimise treatment efficiency.[74] Specifically, process improvements can **reduce operating costs by up to 30%**, translating to annual sector-wide savings of approximately **£3.6 million in the UK.** This research demonstrates the **value of evidence-based guidance for utilities to optimise coagulant dosing** and other treatment parameters, delivering direct financial benefits attributable to scientific intervention.

Benefits of catchment management: Water companies have spent millions of pounds of **catchment restoration measures**, including peatland revegetation and ditch blocking over the last decade, where there is evidence they are bringing real benefits.[75] Some evidence suggests that proactive catchment management, including peatland restoration, can reduce costs by lowering dissolved organic carbon (DOC) concentrations at source.[76] Evidence from UK water utilities, for example, estimate treatment costs can fall from approximately £120 to £60 per megalitre of water when catchment conditions improve.[77] However, research by UKCEH found that while there are a range of benefits to upland catchment restoration with respect to improving carbon storage and biodiversity, there is no strong tangible evidence that it has led to reductions in DOC. Whilst land degradation had been suspected of driving increases in DOC, research by UKCEH found that recovery from effects of acid rain is the only clear driver of this change. As a consequence, some water companies have changed their stated expectations as to the benefits of their catchment management programmes.

In addition to operational savings, improved forecasting of DOM risks can help utilities **avoid or delay major infrastructure investments**. Large drinking water treatment upgrades, such as advanced treatment systems or new treatment works, can cost tens of millions of pounds, with major projects exceeding £100 million.[78] By improving understanding of how DOM levels may evolve under future climate and environmental change, programmes such as FREEDOM-BCCR help utilities make more informed long-term planning decisions and reduce the risk of unnecessary or premature capital expenditure.

Results

Applying the valuation approach yields an estimated potential annual economic value of **£2 million to £5.8 million** in avoided costs associated with the FREEDOM-BCCR programme and related ECN monitoring and research (Table 7). This range reflects the combined benefits that could arise from more efficient water treatment, improved catchment management, and better-informed long-term investment decisions.

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[74] Jarvis, P. & Jefferson, B. (2021) Impact case study – Cranfield University – Process optimization of water treatment works using zeta potential. Cranfield University

[75] Pickard, A.E., Chapman, P.J., Williamson, J., Spears, B.M., Banks, J., Bullen, C., Leith, F., Gaston, L., Moody, C.S, and Monteith, D. (2021): Rising concentrations of dissolved organic matter in drinking water supplies: can peatland restoration help? FREEDOM-BCCR briefing note 2 to the water industry. UKRI SPF UK Climate Resilience programme – Project no. NE/S016937/2.

[76] Ritson, J., Bell, M., Brazier, R. et al. (2016) Managing peatland vegetation for drinking water treatment. Sci Rep 6

[77] EARSC (2018) UK Peatland Management in the UK

[78] Bournemouth Water (2025) Water Minister praises £113 million project by Bournemouth Water to future-proof high-quality drinking water

The estimates incorporate **differential attribution to UKCEH's contribution** (via the ECN) across each benefit stream. Attribution levels vary to reflect the extent to which UKCEH's evidence and engagement are likely to influence future decisions and outcomes, with higher attribution ranges applied where impacts are more directly linked to research insights (e.g. treatment optimisation), and lower attribution where outcomes depend more heavily on subsequent actions by water companies (e.g. capital investment decisions).

Overall, the results indicate that UKCEH's monitoring and research have the potential to play a material enabling role in reducing future operational and capital costs for the water industry.

Table 7 Results

Benefit	Attribution range	Value estimate (£m)
Efficient water treatment	40-70%	£1.4 million - £2.5 million
Avoided capital expenditure	5-10%	£0.6 million - £3 million[79]
Total		**£2 million - £5.5 million**

[79] This is based on the following assumptions: large treatment plant upgrades can exceed £100 million but UKCEH research and coordination through ECN helps to avoid or delay expensive investments. An attribution range of 5 to 10% reflects the contribution to providing ongoing information for planning. If it is assumed £20 million to £50 million is avoided across the 6 utilities in the UK that are more reliant on upland peatlands, this would be £120 million to £300 million. It is then assumed the planning horizon is 10 years to estimate the annual avoided cost.

7 Public benefit cost ratio

To place the estimated economic impacts of UKCEH's activities into a public value context, a **public benefit-to-cost ratio** (PBCR) is calculated. This metric compares the economic benefits generated for the UK economy with the level of public expenditure required to support those activities, thereby providing an indication of the return achieved for taxpayers.

For the purposes of this analysis, public benefits are defined as the components of UKCEH's impact that represent net economic value created within the UK economy as a result of publicly supported activity. To ensure conceptual consistency with economic appraisal principles, these benefits are measured in GVA terms, rather than gross output. GVA captures the net contribution to the economy by excluding intermediate consumption and therefore avoids double counting across supply chains. As such, it represents the appropriate measure of value creation within national accounting and regional economic impact assessment. This also includes the aggregated central benefits estimated through the three case studies.

Accordingly, the PBCR numerator combines **the GVA generated through UKCEH's expenditure**, reflecting the direct, indirect and induced value added associated with publicly funded operational activity and **research productivity spillovers**, which represent economy-wide increases in value added arising from improvements in productivity generated by UKCEH's research activity. Taken together, these components capture the principal channels through which public investment in UKCEH translates into measurable economic value for the UK economy.

The PBCR denominator is defined as **total public expenditure supporting UKCEH's activities**. Focusing on public spending ensures that the resulting ratio reflects the return on investment to the public purse, rather than the financial efficiency of the organisation itself.

Dividing total public economic and social benefits by total public costs yields an **estimated public benefit-to-cost ratio of 6.8**. This indicates that **each £1 of public expenditure supporting UKCEH is associated with approximately £6.8 in net economic and social value added to the UK economy**, demonstrating a substantial return on public investment.[80]

[80] The benefits included in the calculation of the public BCR are the estimated impacts from UKCEH spending, research productivity spillovers and PhD support. The benefits from the case studies are excluded due to some risk of double counting with the impacts from productivity spillovers, however, the scale of double counting is unknown and varies across case studies.

8 Conclusion

This study provides an assessment of the **economic impact of UKCEH**, combining institution-level analysis with detailed valuation of selected impact pathways through case studies. The findings demonstrate that UKCEH generates substantial economic value for the UK through both its direct activities and its wider role in supporting evidence-based decision-making across government, industry and research.

At the institutional level, UKCEH's activities generated an estimated total economic impact of **approximately £423.9 million in 2024**. This includes **£124.5 million** associated with direct, indirect and induced expenditure effects, and a further **£299.4 million** arising from productivity spillovers linked to research activity .

The case studies provide additional insight into how this value is created in practice. The valuation of UKCEH's **Land Cover Maps** suggests a conservative annual value of **£0.3 million to £1.4 million**, reflecting avoided analytical effort and reduced need for bespoke data collection. The **Cumbrian Lakes Monitoring Platform** is estimated to generate **£2.6 million to £18 million per year** in avoided environmental deterioration, illustrating the value of long-term monitoring in protecting ecosystem services .

The **UK Environmental Change Network (ECN)** has wide economic and social benefits associated with long-term environmental monitoring. Through the FREEDOM-BCCR case study, the study highlights the potential for long-term monitoring and research to inform future decision-making in the water industry. The analysis indicates that improved understanding and forecasting of dissolved organic matter (DOM) risks could support more efficient treatment, targeted catchment management, and better-timed infrastructure investment. These benefits are estimated to have a potential annual value of **£2.0 million to £5.5 million**, reflecting avoided operational and capital costs . Importantly, these values represent the expected future benefits enabled by improved information and collaboration, rather than realised savings to date.

Across all components, the valuation adopts a conservative approach, as a result, the quantified estimates are likely to understate the full economic value generated by UKCEH. These findings indicate a strong return on public investment, with **each £1 of public funding estimated to generate around £6.8 in economic value**.

Table 8 Aggregated economic and social benefits of UKCEH

Impact type	Total annual impact (2024)		
	Low scenario	Central scenario	High scenario
Spending	£124.5m	£124.5m	£124.5m
Research spillovers	£89.8m	£299.4m	£596.8m
PhD support	£1.1m	£1.1m	£1.1m
Total impact	**£215.4m**	**£425.0m**	**£722.4m**
Case study impacts			
Land Cover Maps	£0.3m	£0.9m	£1.4m
Cumbrian Lakes Monitoring Platform	£2.6m	£10.3m	£18.0m
Environmental Change Network	£2.0m	£3.9m	£5.5m

Overall, the findings underline UKCEH's role as a critical part of the UK's environmental data and research infrastructure. By generating high-quality evidence, maintaining long-term monitoring networks, and working closely with stakeholders, UKCEH enables more informed decisions that support economic efficiency, environmental resilience and long-term sustainability.

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