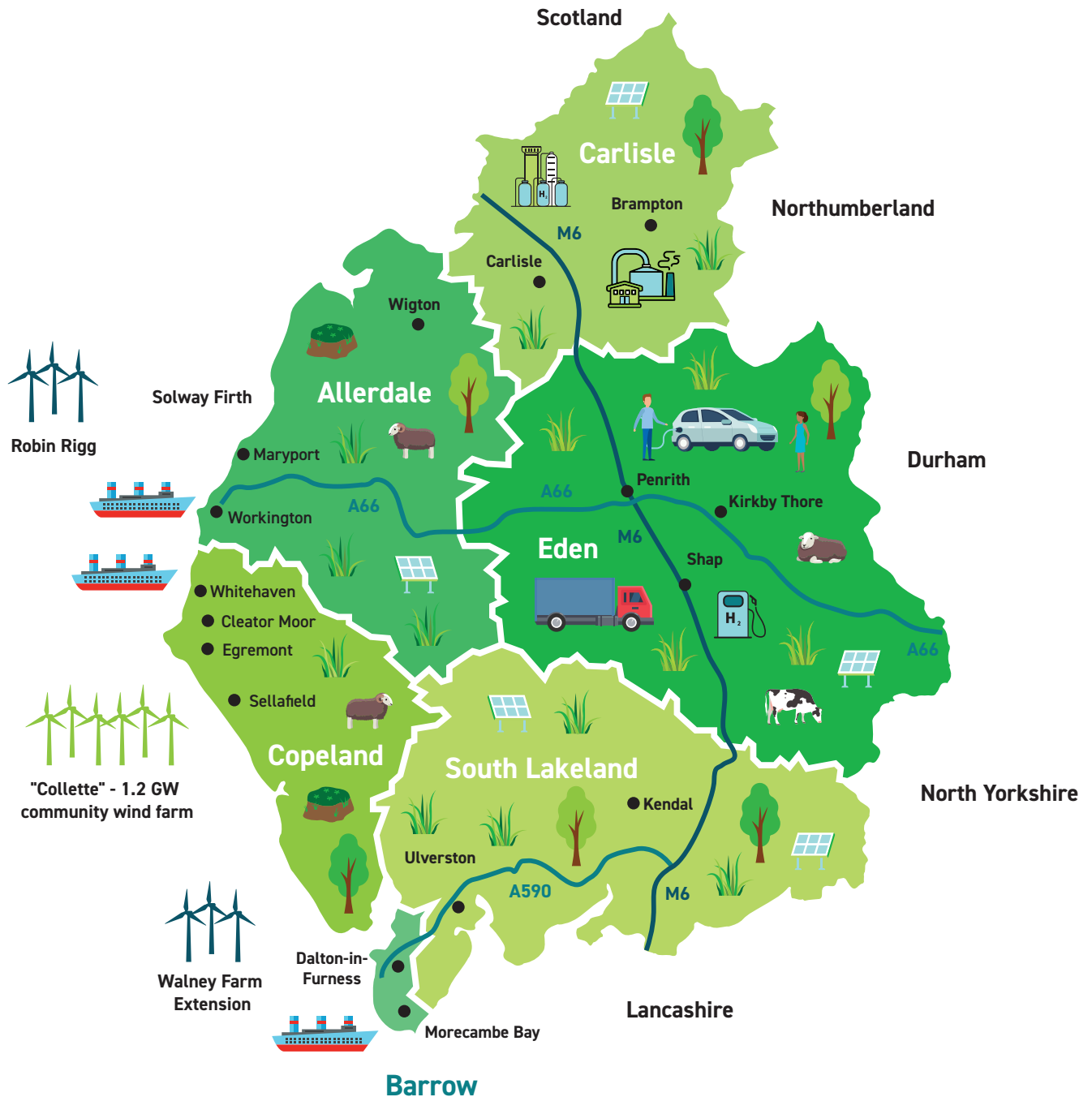


INVESTING IN CLIMATE POSITIVE CUMBRIA



A Green Investment Report for Cumbria

November 2021

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Overview

About the Green Investment Plan Cumbria Project: Works with a wide cross-section of stakeholders to identify transformative decarbonisation and climate resilient projects for Cumbria, while exploring finance mechanisms, fund structures and ways of accelerating finance from institutional investors, banks, public finance and community funding institutions.

Report Aim: This report presents a mix of transformative and deliverable investment ideas, alongside some possible financing structures, developed with a view to accelerate investments in Cumbria's significant climate positive potential.

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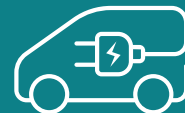
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Acknowledgements: This report draws on discussions and inputs with many organisations in Cumbria and beyond, including but not limited to: Giles Archibald (SLDC), Dan Austen (Lake District Farmers), David Bliss (Lowther Estate), Laura Burns, Suzanne Caldwell (Cumbria Chamber of Commerce), Mark Cropper (James Cropper PLC), Tim Duckmanton (Lake District National Park), Neville Elstone (Cumbria Woodlands), Paul Evans (Cumbria Wildlife Trust), Anna Gerring (Rivers Trust), Hannah Girvan (Cumbria Council), David Hall (NFU), Tina Holt (CAfS), David Hughes (Cumbria LEP), Mark Holroyd (Forestry England), Renee Kerkvliet-Hermans (IUCN), Dyan Jones (SLDC), Sally Lansbury (Allerdale Council), Jo Lappin (Cumbria LEP), Paul Leadbitter (Great Northern Bog), Peter Leeson (Woodland Trust), Duncan McCombie (Yes Energy Solutions), Marna McMillin (Energy 4 All), Marcos Navarro (Nat West), Lauren Pamma (GFI), Elizabeth Radford (Eden Rivers Trust), Phil Scott (Lake District Farmers), Prof Rebecca Willis (Lancaster University) and Jez Westgarth (National Trust).

With Thanks: This report was made possible through financial support from the Quadrature Climate Foundation and help from Cumbria Action for Sustainability (CAfS). We declare no conflict of interest and the views in this report are independent of the funder and CAfS.

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A flock of Herdwick. Image credit: Getty Images

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Some Acronyms and Abbreviations

ASHP	Air Source Heat Pump	kWh	Kilowatt Hour
BEIS	Department for Business, Energy and Industrial Strategy	LAD	Local Authority Delivery
BRP	Building Renovation Passport	LDNPA	Lake District National Park Authority
CCC	Climate Change Committee	LEP	Local Enterprise Partnership
CCS	Carbon Capture and Storage	LCOE	Levelised Cost of Energy
CEEB	Coalition for the Energy Efficiency of Buildings	LPG	Liquid Petroleum Gas
CO2	Carbon Dioxide	MW	Megawatt (one million watts)
CO2e	Carbon Dioxide Equivalent	mtCO2	Million tonnes of carbon emissions
COP	Conference of the Parties	MEES	Minimum Energy Efficiency Standards
ECO	Energy Company Obligation	Off-G	Off-Grid
ELMS	Environmental Land Management Scheme	On-G	On-Grid
EPC	Energy Performance Certificate	OO	Owner-Occupied
ESCOs	Energy Services Companies	PRS	Private Rented Sector
ESG	Environmental, Social and Governance	REIT	Real Estate Investment Trust
GSHP	Ground Source Heat Pump	RHI	Renewable Heat Incentive
GW	A Gigawatt (one billion watts)	RSL	Registered Social Landlord
GWh	Gigawatt Hour	SAP	Standard Assessment Procedure
HA	Hectare	SME	Small and Medium Enterprise
HN	Heat Networks	Solar PV	Solar Photovoltaic
		SPV	Special Purpose Vehicle

Some Definitions

- ‘Climate Positive’ - when an activity goes beyond achieving net zero to create an environmental benefit by removing additional carbon dioxide from the atmosphere.
- Finance mechanism - a specific arrangement, including governance and delivery, to make investment happen.
- Investment option - an idea of what could be invested in and how it could generate a return.
- Investability - when the scale, risk and returns of an investment are attractive to investors under current conditions.
- ‘Investment Ready’ - when a project is at the stage where it can secure either enough equity to build the project or, more likely, a combination of equity plus debt.
- Pathways - is the term used to describe the emissions, technologies and investment trajectories that will be needed to deliver net zero.
- ‘Net Zero’ - is the balance between emissions emitted into the atmosphere and those removed from the atmosphere.

Further Information

- Net Zero Strategy: Build Back Greener (Oct 2021) •
- The Heat and Building Strategy (Oct 2021)
- Green Financing Framework (June 2021)
- The Potential for Green Jobs in Cumbria - Cumbria Action for Sustainability (CAfS) (March 2021)
- Dasgupta Review (Feb 2021)
- A Carbon Baseline for Cumbria - Small World Consulting Ltd (Feb 2020)
- Cumbria Local Enterprise Partnership (CLEP): Strategic Economic Plan, Infrastructure Plan and Strategic Investment Plan
- South Lakeland District Local Plan - 2010-2025/ Eden District Local Plan - 2014 -2032/ Carlisle District Local Plan - 2015-2030
- Financing Energy Efficient Buildings: the Path to Retrofit at Scale (CCEB) (May 2020)
- Unlocking Public and Private Capital to Decarbonise Road Transport (GFI and CDRT) (Nov 2020)
- The UK’s Industrial Strategy White Paper (2017)

1. Foreword

Capitalising on Net Zero's Business Opportunity in Cumbria

I welcome this report by the recently formed Green Investment Plan Cumbria project, a report that follows on from Cumbria Action for Sustainability (CAfS) Potential for Green Jobs report.

This report is well-timed as Cumbria sets in motion its reorganisation of local Government to be governed by two new 'unitary' councils. It will be largely up to the business community to develop, finance, build, and operate the net zero solutions needed and businesses in Cumbria are already reducing emissions in their own operations and along their value chains, investing in technology solutions and enhancing their efficiency.

Clearly, there are skills implications to net zero and we are doing research for the Local Skills Improvement Plan (LSIPs) which is a new initiative from the Department for Education, currently being piloted by eight Chambers of Commerce nationally, of which Cumbria Chamber is one.

We at the Chamber are aware, from 6 April 2022, the largest UK-registered companies and financial institutions will have to disclose climate-related financial information on a mandatory basis – in line with recommendations from the Task Force on Climate-Related Financial Disclosures.

I hope that this report will be read far and wide and that it will lead to a competitive net zero investment strategy for Cumbria. An investment strategy that will help Cumbria's businesses make the right decisions to seek out social and environmental opportunities, alongside financial returns.

Suzanne Caldwell
Managing Director
Cumbria Chamber of Commerce



Financing Climate Action in Cumbria

Within this report, there are some pioneering investment ideas and funding structures that will reduce Cumbria's emissions, create jobs, enhance the county's competitiveness, and cement Cumbria's position as part of the Government's levelling up agenda and its leadership in the UK's race to zero.

The finance and business worlds are stepping up, quantifying climate risk and re-aligning capital flows. Substantially investing in net zero must start as soon as possible and Cumbria should consider how best to get funding from the UK Infrastructure Bank whose purpose is to unlock private capital for the creation of future-fit, resilient infrastructure - meeting local investment needs.

Cumbria has the potential to attract the growing pool of sustainable finance from banks and institutional investors, as well as from public finance institutions and citizens themselves. Getting finance flowing locally is essential and creating a platform to bring investors together alongside developers and the Government will help speed things up. Effective public-private collaboration will help deliver a fair and inclusive transition to net zero in Cumbria.

Ingrid Holmes
Executive Director
Green Finance Institute (GFI)



2. Executive Summary

1. Climate Positive Cumbria

This Green Investment Plan for Cumbria report follows on from Cumbria Action for Sustainability's (CAfS) March 2021 report on 'The Potential for Green Jobs in Cumbria'.^{1,2}

Our report seeks to illustrate what a green investment plan for Cumbria might look like. We have identified an ambitious pipeline of transformational projects, alongside others that are more easily deliverable. These opportunities range across nature, transport, buildings and the energy sectors and involve various suggested mechanisms for finance, some of them with innovative carbon or community features. Actions are identified that can help enable an increase in green investment into Cumbria, and to ensure that the benefits to Cumbria from such investments are maximised. These include creating skills and knowledge capacity to support innovative measures, and new governance structures (in particular representing community interests in investment plans). We have also included practical projects to improve demand and local capacity, such as education, reskilling and retraining for workers.

Our proposals will help create jobs, enhance Cumbria's economic competitiveness, build strong partnerships, and empower Cumbrians to own their future. If acted upon, they will enable Cumbria to go beyond achieving net zero GHG emissions to be one of the UK's first climate positive counties (that is, removing more GHG emissions than Cumbria puts into the atmosphere).

While Cumbria's reorganisation into two new unitary authorities¹⁵ will take some time to fully bed down, strategies for investing in net zero projects need to start now to meet national 2030 deadlines and the 2037 local target. We hope that common net zero ambitions and plans can be a bridge between the two unitary authorities, to build from all that has already been achieved, and with an accelerated pace of delivery to meet Cumbria's 2037 net zero target.

In short, these proposals will both position Cumbria as a net zero UK leader and contribute to raising its prosperity levels by creating a local economy where no one is left behind.

2. Key Recommendations

Within this report, we propose fifteen key investment propositions. All are to be undertaken with a view to just transition principles and the maximisation of community engagement. Our proposals are divided into three types of projects:

1. Transformational Infrastructure Projects.
2. Innovative Community Projects.
3. Enabling Actions.

Transformational Infrastructure Projects

1.	Green Hydrogen: Cumbria has significant potential to produce and pipe green hydrogen ³ that will complement the process of decarbonisation and electrification in hard-to-abate sectors such as steel, cement and heavy road transport. In this report, we suggest a three pronged strategy for establishing a green hydrogen economy in Cumbria that, as well as local uses, could include export of the gas to ports across the Irish Sea (and beyond), creating employment throughout the supply chain, including at Cumbria's ports.
2.	Offshore Wind Expansion: Significant expansion of offshore wind capacity (with community ownership) in Cumbria. We suggest developing a 1.2GW community owned offshore wind farm in West Cumbria. What we call project "Collette" would lead to significant emission reductions – between 850 and 1100 Kt CO2e savings each year. At between 23% and 30% of Cumbria's total 2019 emissions, these savings are enough on their own to match the savings needed for Cumbria to meet its net zero targets. "Collette" would also use surplus renewable energy generated to produce green hydrogen, facilitating the strategy mentioned above and further carbon savings.
3.	Decarbonisation of major industrial emitters via tailored programmes, that address their specific circumstances while respecting their importance to employment, productivity and contribution to the national and Cumbrian economies.
4.	Decarbonisation along the M6 Cumbrian Corridor to reduce transport emissions, again linked to the green hydrogen strategy.
5.	Expansion of nature-based renewables opportunities such as agrivoltaics, linked to the nature strategy.
6.	Improvements to local rail electrification .
7.	Expanding EV charging infrastructure including in rural areas and key destinations of the visitor economy.

¹ Source: www.cafs.org.uk/wp-content/uploads/2021/03/The-potential-for-green-jobs-in-Cumbria.pdf

² CAfS report highlighted 9,000 jobs could be created for local people over the next 15 years as Cumbria seeks to hit its 2037 net zero target. Their report also outlined that £8.88 billion of investments would be needed to reduce Cumbria's carbon emissions by 57% and that a savings of £854 million could be made to Cumbria's annual energy bill because of the investment.

³ Green hydrogen refers to hydrogen produced via the electrolysis of water, with the electricity used in the process sourced from renewable energy such as wind and solar.

Innovative Community / Collective Projects

We propose a number of projects with financing and delivery mechanisms that involve either community engagement or where a collective approach would be beneficial. Some of these also involve the use of carbon credits, which as things presently stand (and in the absence of significant fiscal incentives in sectors such as domestic heating) is the main novel financing instrument that private actors have access to. These projects include:

8.	Agrioltaic and agroforestry schemes where dedicated funds could be established if a co-ordinated collective approach was taken by farmers.
9.	An innovative financing mechanism for the proposed Cumbrian Coastal Community Forestry is designed to promote community governance and engagement and maximise community 'goods' arising from the project. This mechanism also involves the use of carbon credits.
10.	A proposal for a collective financing 'warehouse' for woodland, peatland and other nature-based projects using carbon financing. The latter might include such as nutrient reduction through changes to livestock farming in the Petteril and Natural Flood Management (NFM) measures in the Wyre.
11.	Significant community investment in the "Collette" offshore wind project , engaging the local community in this major contributor to Cumbria's net zero agenda and promoting the flow of investment returns and other economic benefits into the local economy.

Enabling Actions

12.	Create an agri-innovation hub to develop skills in innovations such as agri-forestry, agri-voltaics, livestock management and nature-based solutions opportunities mentioned above. Combining public payments with private investments, they have the potential to scale up to many of the catchments in Cumbria.
13.	Develop a retrofit skills hub and a retrofit delivery organisation to train Cumbrians in retrofitting skills and encourage consumers to undertake projects by increasing the understanding of options among consumers and confidence that works will be professionally carried out. The skills hub could be delivered by the Cumbrian network of further education colleges, the Ecological Building Systems, based in Carlisle, and others.
14.	Allied to the above, a potential carbon-credit for domestic retrofit schemes . This would help to create a financial incentive for property owners to undertake such work. Although we do not propose a precise mechanism for this, we also recommend that stakeholders investigate the best way for future plans and strategies to be connected to financing . Such a mechanism should promote the development of a pipeline of projects that are relevant to Cumbria's net zero ambitions, promote community and economic benefits and are ready for investment by a range of finance providers from national and local government to private finance, corporations, philanthropy and local residents themselves.
15.	Tackle visitor travel behaviour and accelerating rural on demand responsive transport (DRT). Behaviour change and demand management are important tools for reducing carbon from transport.

3. Investors and Finance Mechanisms

The ideas for financing mechanisms and fund structures put forward within this report are for discussion purposes only and would require further detailed development in phase 2 of the project. They often involve blending different kinds of investment to address and align the agendas and requirements of the various investors and other parties that may have an interest in participating. Such 'blended finance' approaches are now commonplace in the growing social / impact investing market and are rapidly gaining understanding in more mainstream markets.

Public investment can be used strategically to catalyse private investment in untested markets or in unproven technologies. This approach is referred to as blended finance, which can be broadly defined as "the use of catalytic capital from public or philanthropic sources to increase private sector investment in sustainable development".⁴ Blended finance helps to address barriers for private investors, such as high perceived or real risk; and poor returns for the risk relative to comparable investments.

⁴ Source: www.convergence.finance/blended-finance

Potential Investors

There are many potential sources of investment for viable projects and businesses in Cumbria. These include:

- Commercial investors seeking a return.
- “Social” or “impact” investors that are looking to promote positive social and/or environmental outcomes, and who may be willing to accept a lower (or even no) financial return.
- Local, regional or national government bodies seeking to advance policy implementation.
- Corporations seeking to, for example, ‘green’ their supply chains.
- Corporations seeking to fulfil their social responsibility undertakings.
- Parties seeking carbon offsets.
- The public, for example through crowdfunding or community bonds.

Fund Structures

In some cases, we have suggested the creation of dedicated funds to propose the take-up of projects in different sectors.

At this stage, we have not sought to propose detailed governance arrangements for such funds. As a general principle, these will need to incorporate mechanisms for the different interests likely to be involved to be fairly represented, and for community interests to be considered at every stage from design to ongoing management. Nor, for simplicity, have we shown a number of the parties that would be required for their operation, such as fund managers/trustees etc. Finally, while the funds are all believed to be viable conceptually, the structures have not been modelled in detail at this stage.

4. Report Methodology

The ideas presented within this report are based on independent analysis and dialogue with national financial practitioners, as well as local experts. We have engaged extensively on many of our proposals, including hosting four roundtables in 2021 with a cross section of local and national practitioners and experts. All suggestions are categorised into the following four areas based on the Green Financing Framework categorisation, with a separate chapter on each.

- Living and Natural Resources
- Renewable Energy
- Energy Efficiency and Retrofits
- Clean Transportation

“Now, Next and New”

Within each chapter, to give an indication of the investability and feasibility of proposals, we have considered ideas with a “Now, Next and New” delivery and investment lens.

- “Now”, meaning those that are possible/investable ideas without major further development.
- “Next”, those that don’t depend on new technology but do require some development in terms of behaviour, policy, feasibility and/or means of financing.
- “New” opportunities that require significantly fresh approaches (for example to financing mechanisms) or advances in technology.

3. Introduction

Why Cumbria?

Cumbria's net emissions for 2019 were 3.06 MtCO₂.¹ This includes emissions from railways passing through the county, and removals from land use, such as through peat restoration and tree planting. It does not include emissions from the M6. If counted, emissions from vehicles travelling along the M6 motorway would increase Cumbria's production-based emissions by 40%.²

What Makes Cumbria Outstanding

1. Hosts England's highest mountains, biggest lakes and has the largest amount of common land.
2. Geographically important – a key UK artery between the North and South.
3. An iconic landscape – visited by more than 45 million people every year.
4. A wealth of renewable assets - Cumbria's offshore wind potential is strategically important to the UK's energy sector. Potential to produce and export significant quantities of green hydrogen to the UK, Ireland and even Europe.
5. Cumbria already has the most amount of distributed generation already connected to the grid. Home of Community Energy.

Cumbria is of key importance to the UK, the Northern Powerhouse, and the Borderlands Economic Growth Initiative. Geographically, Cumbria is a key UK artery, centred between Manchester to the South, Glasgow and Edinburgh to the North and Newcastle and Sunderland to the East. The M6, A66 and A69 are key national roads.

A predominantly rural county, Cumbria is the second-largest in England, covering an area of 6,804km² (nearly half of this, 3,000 km², comprising its two national parks). As well as having a coastline of some 180 miles, the county has the largest number of protected landscapes in England, including two UNESCO World Heritage Sites and three Areas of Outstanding Natural Beauty. It hosts England's highest mountains, biggest lakes and largest amount of common land (112,900 ha – 16% of Cumbria's land area).^{3, 4} These iconic landscapes attract more than 45 million visitors each year.



Figure 1. Map of Cumbria. Credit: Cumbria LEP. The M6 provides Cumbria with a strong north / south transport corridor

¹ Source: Sub regional data on emissions, BEIS (2019)

² Source: A Carbon Baseline for Cumbria, Small World Consulting Ltd (2020)

³ Source: www.cumbria-industries.org.uk/farming-in-cumbria-today

⁴ 30 percent of England's common land is in Cumbria

Cumbria has a thriving economy worth £11bn in GVA, supported by 23,600 registered enterprises and 240,000 employees. Over the past 10 years Cumbria has seen the second fastest GVA growth nationally (51.1% in Cumbria vs 34.2% nationally) and fastest productivity growth (3.1% in Cumbria vs 2.2% nationally.⁵) The main industries are nuclear fuel reprocessing, shipbuilding, wood, paper and pulp, rubber and plastics, food and drink, advanced manufacturing and tourism.

Some 55⁶ large companies (i.e. with more than 250 employees) are located in Cumbria. Among these are household names such as Pirelli Tyres, Nestlé, United Biscuits, Kimberly-Clark, Heinz, Sealy Beds, GSK bio-pharmaceuticals, while other major industries are represented by Sellafield, Iggesund Paperboard, Innovia Films and Siemens Subsea Technologies.

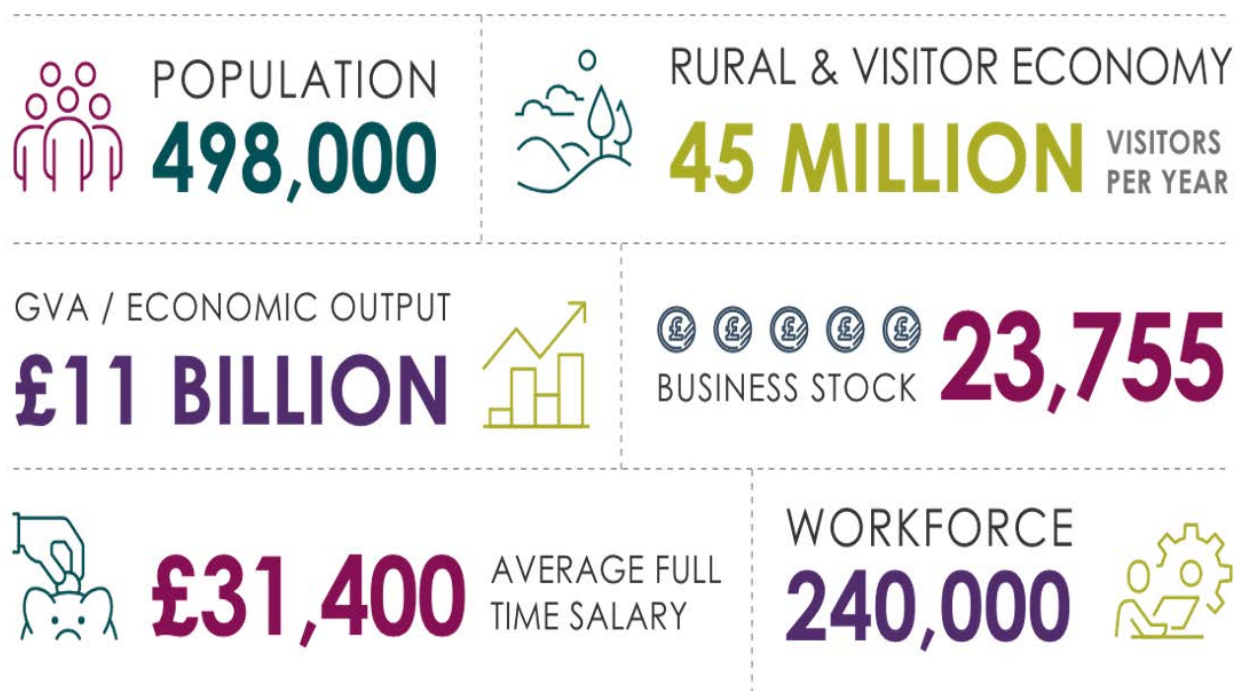


Figure 2. Diagram Credit: Cumbria LEP

Importance to the UK's Energy Security

Historically, Cumbria's 'energy coast' focused first on coal, then on nuclear. It is now moving rapidly into the renewable era. The Walney Extension Offshore Wind Farm, located 15km west of Barrow-in-Furness, is one of the world's largest, and the area already hosts over a fifth of the UK's wind farm generation capacity.

Significant Renewable Energy

Cumbria already generates more electricity than it uses, and, in the future, it could export a substantial amount more, along with green hydrogen. The Solway Firth, the west coast of Cumbria and the wider Irish Sea could see an accelerated deployment of offshore wind, as well as tidal energy, with green hydrogen, also being used to reduce carbon in harder to abate sectors and as an energy store. Now that onshore wind farms can once again compete for government subsidies, significant new capacity could come on stream as early as 2025.

Home to the First Community Energy Project

Community-owned energy offers a route for connecting renewables with local empowerment. The first community energy project in the UK, Baywind, was set up in Cumbria in 1996 after raising £2 million through share offers from the general public. Energy 4 All was subsequently founded by Baywind in 2002, to help other communities do what it had done.

⁵ Source: Cumbria County Council and Cumbria LEP. councilportal.cumbria.gov.uk/documents/s75530/Appendix%201%20Proposal%20for%20the%20Creation%20of%20a%20Major%20Road%20Network.pdf

⁶ Source: www.thecumbrialep.co.uk/facts-figures/



The Walney Windfarm, Cumbria. Photo Credit: Orsted

Cumbria's Diverse Rural Landscape and Natural Capital Sets the Area Apart

Cumbria's natural capital offers considerable investment opportunities. It has one of the UK's largest livestock industries (sheep and cattle) and provides the UK with a significant proportion of its food supplies. Its active lowland raised bogs store large amounts of carbon and will now play a vital role in combatting the impacts of climate change. In 2019, Natural England announced Bolton Fell and Walton Mosses as a new National Nature Reserve in Cumbria which will become an active carbon sink in time.



Bolton Fell Moss. Photo credit: Emma Goodyer

Cumbria is also one of five pilot areas trailing the development of the Local Nature Recovery Strategy (LNRS) and, with the reshaping of agricultural subsidies, there is an exciting opportunity for Cumbria to create new private investment models built around enhancing natural capital, not least through carbon storage in its vast (and largely degraded) peatlands.

Future Growth

As to the future, according to the Cumbria LEP Infrastructure Plan, growth is projected to be greatest in Carlisle, with an anticipated additional 6,193 FTEs (13.3%) by 2031. Barrow-in-Furness and South Lakeland are also projected to have significant employment increases of 14.3% and 9.2%⁷ respectively. Although employment opportunities are expected to continue to be concentrated in a few specific industries such as the nuclear sector, there will be significant opportunities for jobs growth from the construction of offshore renewable energy. For example, Barrow-in-Furness is expected to see a net gain of 3,992 jobs.⁸

Some Challenges

There are also challenges, however, not the least of these from climate change. The impacts of flooding such as those from Storm Desmond in 2015, which led to massive disruption, demonstrated the inability of landscapes to absorb extreme weather.

Cumbria's agricultural businesses, while central to the much-loved character of the area, face enormous difficulties. In particular, upland farmers' incomes have been challenged by volatile prices and rising costs and rents. Meanwhile, according to a Cumbria Wildlife Trust⁹ survey of bogs in the Lake District, most of Cumbria's extensive peatlands (like 70% of English peatlands as a whole) have been damaged by drainage, heavy grazing, regular burning, cultivation, forestry or other management and require action to restore.

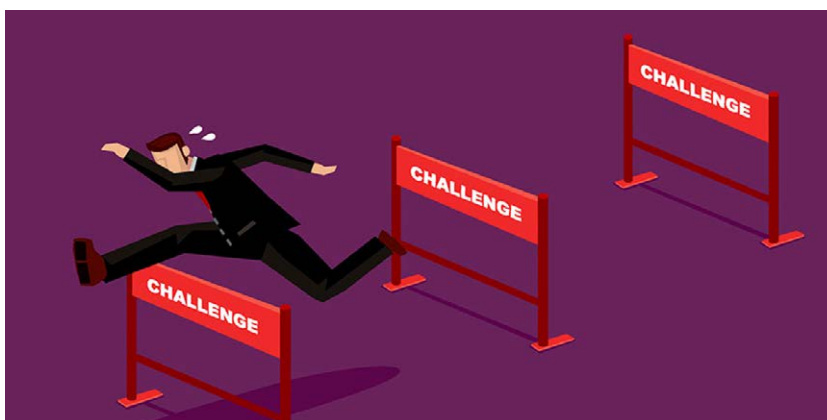


Image credit: www.scrumstudy.com

These challenges, however, also present opportunities. For example, Cumbria's farm systems, beyond food production, provide a wide range of public goods and ecosystem services, which have an increasingly recognised value; while the imperative to restore peatlands could create significant finance flows from schemes under the IUCN's new Peatland Code and associated carbon credit sales.

There are also a number of challenges in respect of the local workforce, set against a background of a declining working-age population that according to the Cumbria LEP is expected to shrink by over 20,000 over the next 15 years.¹⁰ Particular challenges include:

- One of the lowest rates in England of people qualified to Level 4 or over (degree level).¹¹ This means that the labour market for attracting highly skilled people is modest and skilled workers tend to work in advanced manufacturing
- A lack of personnel skilled in retrofit measures, which, as is noted in a later chapter, could be a significant source of new opportunities for local people
- Cumbria has proportionally low numbers of finance and business service professionals compared to other counties. If net zero ambitions are to be realised, there will be a need to train up more finance professionals in green finance in particular
- The complexity of having an economy defined by a few large companies, with many smaller companies working in rural areas.

One big 'plus', however, is Cumbria's success in creating apprenticeships, which are positive for the economy, employers, and apprentices themselves.

Finally, there are underlying economic challenges in housing and transport. In the former, despite widespread deprivation in the county, a large number of second homes has led to rising house prices. As to transport, there is poor general connectivity, in rural areas and especially along the west coast of Cumbria, which means getting around the county can be time consuming and expensive. There is also a need for better connectivity on either side of the county's strategic artery, the M6. Meanwhile, there is a lack of public transport in rural areas and high costs when and where it is available.

⁷ Source: Cumbria Infrastructure Plan. www.cumbria.gov.uk/elibrary/Content/Internet/544/17312/18058/18062/44218152912.pdf?timestamp=4422352336

⁸ Source: www.rathbonegreenbank.com/sites/rathbonegreenbank.com/files/imce/rathbone-greenbank-financing-a-just-transition-report.pdf

⁹ Source: www.cumbriawildlifetrust.org.uk

¹⁰ Source: Cumbria Local Enterprise Partnership 2021 Skills Report. www.thecumbrialep.co.uk/news-detail/2021/people-employment-and-skills-in-2021/

¹¹ Source: www.cumbriafoundation.org/wp-content/uploads/2017/05/Cumbria-Revealed-Final-web-version.pdf

3.2 The Opportunity to Create An Ambitious Pipeline of Transformative Projects for Cumbria

Published in October 2021, the UK's Net Zero Strategy sets out how the UK will deliver on its commitment to reach net zero emissions by 2050. These actions are expected to unlock up to £90 billion of private investment by 2030, supporting 440,000 well-paid jobs in green industries in that year.

“Finance is the engine of this transition. It is a critical enabler in helping the real economy transition to a net zero carbon model, and multiple financial players must be engaged to scale investment”. Minister Trudy Harrison, Parliamentary Under-Secretary of State for Transport

The Strategy also incorporated a section on ‘local climate action’ which emphasised the ‘essential role’ to be played by devolved and local government.

Alongside the Net Zero Strategy, the UK Government also released its new plans for “Greening Finance: A Roadmap to Sustainable Investing”. This roadmap “sets out the government’s long-term ambition to green the financial system and align it with the UK’s world-leading net-zero commitment”, a process that is seen as happening in three phases:

1. Informing – ensuring decision-useful information on sustainability is available to financial market decision-makers
2. Acting – mainstreaming this information into business and financial decisions
3. Shifting – financial flows across the economy shifting to align with a net-zero and nature-positive economy

The Green Finance Strategy is expected to be updated in 2022, which will go beyond the roadmap and set out an indicative sectoral transition pathway to 2050.

Capitalising on Cumbria’s Potential

Given its wealth of renewable and natural assets, Cumbria has the potential to attract its share of the growing stream of sustainable finance that the Government intends to stimulate via measures such as those envisaged in the Roadmap – and that indeed is already starting to flow from banks, institutional investors, public finance institutions, local investors, and citizens themselves.

What has been missing to date, however, to access this stock of finance, is a clear decarbonisation and investment strategy to seize all of Cumbria’s potential while protecting its outstanding natural environment. Building, perhaps, on some of the ideas in this report, this needs to be a costed plan with a timeline for investment, sending a clear signal to businesses and investors.

Cumbria Must Link Up to Local, Regional and National Pools of Capital

Stimulating private investment at local, regional and national levels, alongside government support, is essential to meet the net zero goal, and the green finance market has a crucial role to play in this.

At the national level, the first Green Sovereign Bond/ Gilt was issued earlier this year and the UK Government’s Green Financing Framework (June 2021) set out six types of green expenditures that will be financed via this source: Clean Transportation, Renewable Energy, Energy Efficiency, Pollution Prevention and Control, Living and Natural Resources and Climate Change Adaptation.

The Green Gilt was followed by the world’s first standalone retail Green Savings Bonds, issued by National Savings & Investment.

A further addition to the UK’s green finance landscape is the new UK Infrastructure Bank (UKIB). Both local authorities and businesses in Cumbria need to consider how best to access the initial £22 billion of finance it will provide for infrastructure projects, including guarantees. UKIB states that it will also be developing an advisory service to assist potential clients in developing projects.

There are a range of other sources of public financial support, which we list (though not necessarily exhaustively) in the Annex.



Photo credit: GPOnline

Develop Bankable Investments: A Place-based Approach

Investors have a range of levers at their disposal to drive decarbonisation and increase investment in climate solutions. They are actively looking for investable projects and ways to increase their portfolio exposure to renewable energy, green buildings, transport, and nature-based solutions. All too often, however, such investments are not presented to them at a level of preparedness that allows them to pursue the opportunities put forward. Or to put this in another way, projects or business ideas are brought to them that are not yet 'investable' or 'bankable'.

Getting projects and business plans 'investor ready' takes time and perseverance on the part of developers and entrepreneurs, as well as (in the later stages of development) finance for feasibility studies, environmental assessments and so on.

To maximise the chances of there being an ongoing supply of new investable/bankable projects emerging (what is often called a 'pipeline' of such projects) there needs to be support for developers and entrepreneurs from the very earliest stages of initiation of the project or business idea through the various stages of development and preparation leading to projects being introduced to potential investors and/or lenders. Routes need to be found, as well, to make the connection and introductions between investors and potential investees on a regular and open basis.



Photo credit: Mott Macdonald

A Placed Based - 'Whole System's' Approach

As noted in the Executive Summary, we, therefore, recommend the establishment of a placed-based, 'whole system' approach to galvanise investment in Cumbria's net zero ambition. The 'place' could be defined either at a Cumbria or a regional level – the latter perhaps creating more opportunity for scale, but also, inevitably, more complexity.

The 'whole system' approach will entail creating a mechanism (and perhaps a platform) that will facilitate the following to occur:

1. Translating Cumbria's net zero strategy into a pipeline of specific projects and business ideas – this report is perhaps the first contribution to that process.
2. Accelerating this pipeline of green projects from concept/startup through pre-feasibility and feasibility stages where business models and revenue-earning potential can be gauged, design and environmental assessments completed, offtake agreements negotiated and so on
3. Connecting now investable/bankable projects with suitable providers of debt and equity finance

Local authorities – which have a large demand for capital but often lack capacity in terms of understanding finance (especially private finance) and therefore struggle to attract investment – could be 'clients' in this acceleration process, alongside private entrepreneurs and developers.

Another key function of the acceleration mechanism or platform will be the identification of sources of finance (mainly grants) and capacity building to support developers through the project preparation process.

Capacity building needs will likely be in areas such as financial planning, management, human resources, investor relations and understanding climate impacts.

The need for a place-based approach is supported by Government policy as set out in the Net Zero Strategy. In its section on 'local climate action' the Strategy emphasised the 'essential role' to be played by devolved and local governments and identified the key priorities in this regard as:

- Setting clear expectations for local places.
- Providing resources for local places.
- Building capacity and capability at the local level

How Much Funding is Needed to Make Cumbria Net Zero?

No specific research on this topic has yet been done, but it is possible to perform a rough calibration via other research.

According to a report by the Energy Transitions Commission (ETC) (September 2020),¹² by scaling up energy efficiency efforts and deploying renewable energy generation capacity the world could “technically and economically” transition to net zero by 2050 for the cost of less than 1% of GDP annually through to mid-century.

Converting 1% of Cumbria’s £11 billion GVA would equate to £110 million pounds of green investment in the area each year for renewables and energy efficiency alone, to which would need to be added finance for nature restoration, adaptation and resilience. Investment at these levels clearly cannot be supported by public funds alone but will require instead a very substantial contribution by the private sector. This in turn will mean a major effort to enable such investors to better understand the local market and needs before they can invest in the local opportunities presented to them.

The necessity to involve private finance at scale alongside public finance is another compelling reason to create a holistic, place-based investment plan.



Image credit: Xander Wealth

Local Investment

There is a range of sources of local investment that it will be important to maximise, not least to demonstrate to external finance that Cumbria has the confidence in its own future and plans.

Alongside local councils, these include local building societies, community development finance institutions, community energy developers, pension funds such as the Cumbria Local Government Pension Scheme (LGPS), the LEP, local business, philanthropists, communities and citizens.

Local authorities themselves are well placed to access debt finance, both through the Public Works Loan Board (PWLb) and through the emerging Community Municipal Bond (CMB) market, which represents a powerful, low-risk investment vehicle to deliver impact locally while meeting a clear financial need for investors.

Strategically, Cumbria should take full advantage of funding from existing initiatives such as the Borderlands Energy Master Plan which includes a capital fund of up to £31m to invest in energy projects across the Borderlands area. This could help facilitate the optimisation of renewable energy generation in Cumbria.

In addition, local financial institutions can act as anchor funders for local climate action. For example, Cumbrian building societies could lead the way in financing green buildings, while local authority pension funds in Cumbria could follow the leads of, for example, York and North Yorkshire Pension Fund in committing to invest in sustainable infrastructure; or Avon Pension Fund, which will be transitioning some £780m into a Paris-Aligned Benchmark (PAB) which are indices that include companies aligned with the Paris Agreement.

It is important that Cumbrian or North West investors are nurtured. According to the British Business Bank, the presence of local investors is critical to the success of UK equity, with there being a clear correlation between equity and local investment (with the investor and the investee company within a radius of two hours travelling distance of each other in more than 80% of equity stakes). Otherwise, private investors will be unfamiliar with local policies and business environments.¹³

One estimate¹⁴ suggests there is around £4 billion of investable wealth per 100,000 people in the UK and for the 500,000 people in Cumbria there could be around £20 billion that could be invested locally rather than invested elsewhere. Another estimate by Abundance suggests there is £3.8 billion (or so) in ISAs in Cumbria.

¹² Source: <https://www.energy-transitions.org/publications/making-mission-possible>

¹³ Source: www.british-business-bank.co.uk/wp-content/uploads/2021/10/J0018_Regional_Tracker_Report_AW.pdf

¹⁴ www.pccancities.org.uk/report-community-municipal-bonds-turning-words-action

It is also encouraging to see the development of regional community banks such as North West Mutual, a new bank being developed to serve Lancashire, Merseyside and Cumbria. Credit unions in Cumbria have also grown from strength to strength, savings with them have gone up and almost the whole of Cumbria is covered by a local credit union. Supporting credit unions means investing in the local community and helping the people of Cumbria to become more financially independent.

Community Participation

“The shift to Net Zero needs to be led by those who know their communities best.”

Polly Billington, CEO, UK100

Plans to reach this target must also be rooted in community participation across the county, putting local people in the driving seat in deciding on their future. More projects need to be done by and for the people of Cumbria and new approaches to citizen involvement are needed.

Kendal has already set up a climate change citizens' jury and more are planned across Cumbria. Meanwhile, with nearly 70 organisations spanning the public, private and third sectors, the Zero Carbon Cumbria Partnership will be a key driver in developing this shared sense of the way forward to the overarching goal of achieving net zero by 2037.

As a result of initiatives such as these, and growing interest and confidence among communities and citizens, we can expect to see a trend to more community investments, with surplus profits being invested back into local net zero projects.



Image credit: Shutterstock



4. Renewable Energy

1. Overview

The energy transition will require a significant investment of funds but will also bring substantial benefits. The challenge will be to effectively implement the optimal mix of interventions to create a resilient net zero future. Renewable energy, grid networks, hydrogen vectors, decarbonising industry, and transport present some of the greatest opportunities for investment.

Cumbria has the potential to create a sizable amount of generating capacity from a diversity of renewable sources and potentially export its renewables to local, national and possibly international markets.

In this chapter, we focus on some of Cumbria's most transformative and viable opportunities - "expanding offshore wind", while at the same time catalysing community investment and engagement and bringing green hydrogen into the energy system.

Key Recommendations

- Significant expansion of offshore wind capacity (with community ownership) in Cumbria.
- Three pronged hydrogen strategy.
- Decarbonisation of major industrial emitters, via tailored programmes while respecting their importance to employment, productivity and contribution to the UK's and Cumbria's economy.
- Decarbonisation along the M6 Corridor to reduce transport emissions.
- Linkages to and expansion of nature-based renewables opportunities such as agrivoltaics and agroforestry.
- All to be undertaken with a view to just transition principles and the maximisation of community engagement from both governance and economic perspectives.

Supply Chain, Grid and Port Infrastructure

In order for all of these opportunities to be maximised, there needs to be a transformation of existing energy and transport assets, including the electricity and gas networks, the road and rail network and Cumbria's three ports. Importantly, to mitigate the risk of electricity grid constraints in planning for an anticipated increase in renewable energy development and generation - the UK Government must work in collaboration with Cumbria's new unitary authorities, Ofgem, Crown Estate, National Grid, Electricity North West and other stakeholders so that a significant uplift in renewables generation can flourish.

2. Understanding Cumbria's Emissions

Overall emissions in Cumbria have been reducing since 2005 in line with national emission reductions. Figures 1 and 2 show how the six districts in Cumbria compare; Allerdale, Eden and South Lakeland had a greater proportion of emissions than those in Barrow-in-Furness, Carlisle, and Copeland, but these differences are now decreasing (all data is taken from BEIS UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019).¹

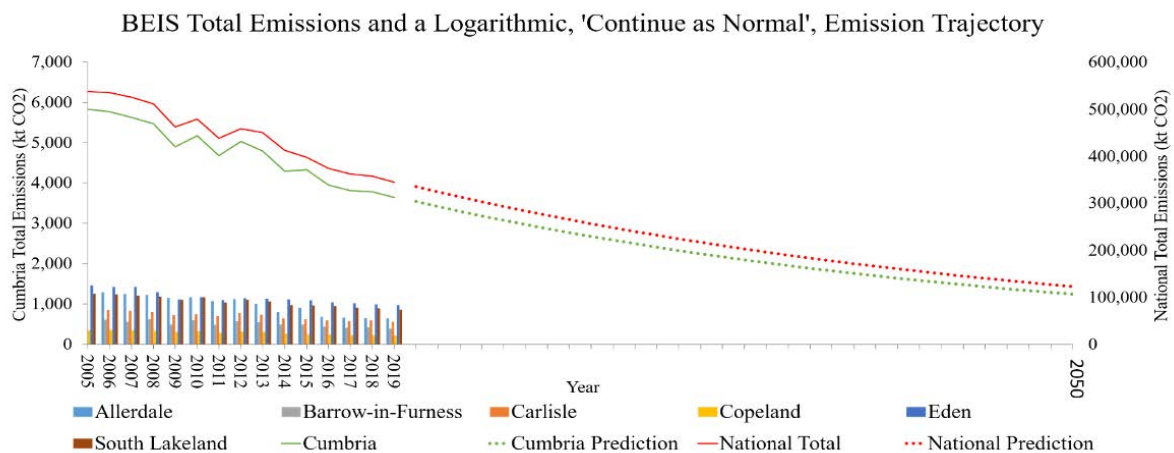


Figure 1. The chart shows Cumbria emissions compared with national emissions and indicates how the trajectory is in danger of flattening and then missing net zero by 2050 unless harder to tackle emissions are targeted.

¹ Source: data.gov.uk/dataset/723c243d-2f1a-4d27-8b61-cdb93e5b10ff/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019

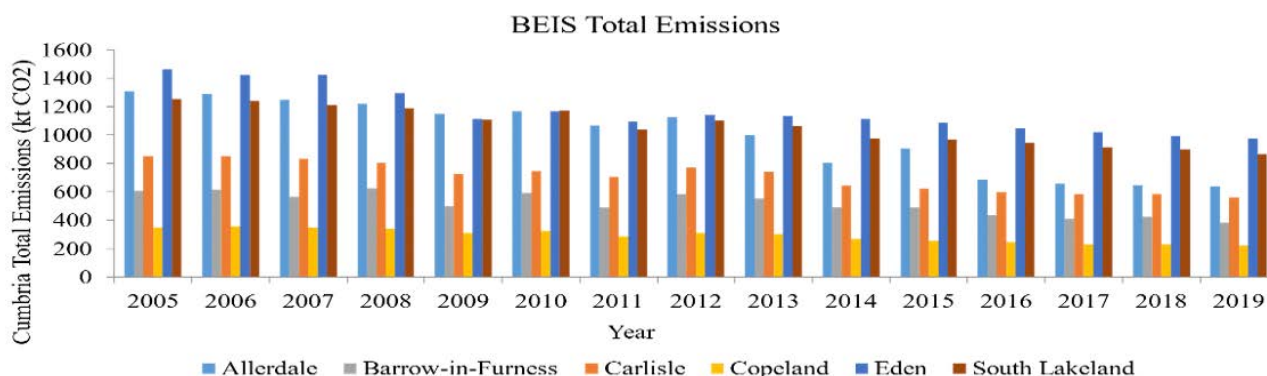


Figure 2. A magnified view of the Cumbria emissions breakdown by district shown in Figure 1.

Reductions in Cumbria to date are mainly due to the national scale decarbonisation of electricity such as the closure of coal-fired power stations and deployment of renewable energy. The challenge of how to cut the more challenging emissions, especially emissions from industries that are key to the Cumbrian economy, remains unresolved.

Understanding Some of the Challenges

Energy systems are likely to become more complex by 2035 due to the increased diversification of the energy mix, which is likely to include a greater percentage of offshore renewables, an increased role for hydrogen (including a repurposed gas network) and lower energy consumption as a result of greater energy efficiency measures and demand management. A priority is the upgrading of the grid network transmission system (due in 2027 in Cumbria) which are currently the pinch points in the county. These will need to be improved as renewables increase.

Industry accounts for 31% of Cumbria's total emissions.² When determining a net zero strategy for Cumbria, it is important to identify the largest individual emitters (known as "point source emitters"). Often these emitters will have decarbonisation challenges that are very specific to the nature of their business, and many of them will be significant to both the Cumbrian economy as a whole and to the local economy. A priority is the upgrading of the grid network transmission system (due in 2027 in Cumbria) which is currently the pinch point in the county. This will need to be improved as renewables increase. .

The largest point source emitters in Cumbria are shown in Figure 3.

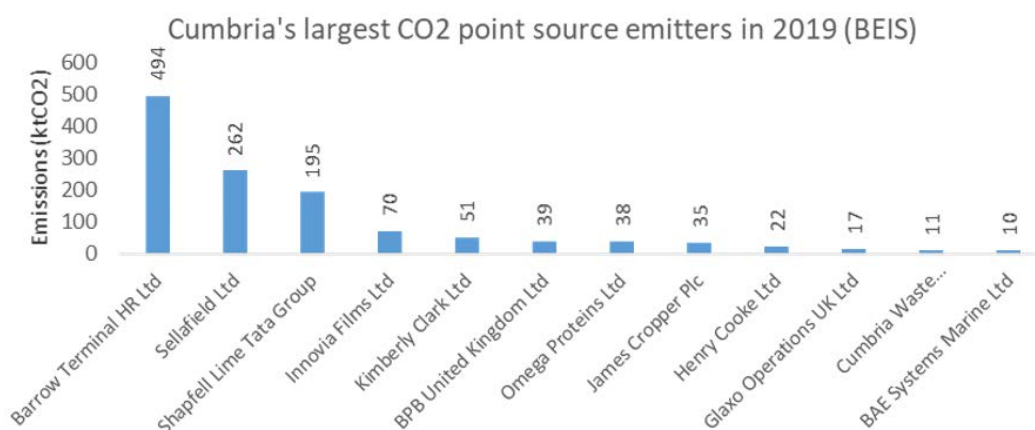


Figure 3. Cumbria's largest point source emissions in 2019³

As the figure shows, there is a clear gap between the three major emitters in Cumbria and the rest. These three top emitters are Barrow Gas Terminal, the nuclear decommissioning site Sellafield Ltd, and the Shapell Limestone Quarry in Penrith.

² Source: www.cumbria.gov.uk/elibrary/Content/Internet/536/671/4674/17217/17225/4414012219.PDF

³ Source: data.gov.uk/dataset/723c243d-2f1a-4d27-8b61-cdb93e5b10ff/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019



- The emissions at the Barrow Gas Terminal are from the processing of gas from the Morecambe Bay fields which are being depleted. In the past, the Barrow Terminal supplied around 10% of domestic gas demand. Today, the hub can still heat 1 million homes, but is expected to reach the end of its gas production life in the mid-to-late 2020s.⁴ Plans are in progress for the conversion of the terminal and Morecambe Bay assets, with both hydrogen and carbon capture and storage being considered, including links to Merseyside's Hynet project.
- Sellafield achieved a 12% reduction in carbon emissions between 2018/19 and 2019/20⁵ with the site's electricity consumption reduced by around 8,000MWh. This reduction was largely due to the end of reprocessing spent nuclear fuel at the Thermal Oxide Reprocessing Plant (Thorp). Emissions from the Fellside gas-powered combined heat and power plant, wholly owned and adjacent to the Sellafield site, also decreased. Sellafield imported more electricity from the grid, which had the effect of reducing overall emissions.
- Scrubber technology has helped Shapfell achieve a promising reduction in emissions.

Some of the actions and recommendations in this chapter could assist with the further decarbonisation of Sellafield and Shapfell.

Grid Constraints

Another important consideration are grid constraints. In general, the Cumbrian network is difficult to manage and connecting low carbon technologies is difficult too. The "Cumbrian Ring" network loops around the National Park and has two points of connection with the national grid at Harker, north Cumbria, and at Hutton in the south. These are the pinch points for electricity that can be connected to the grid in terms of excess generation and they are being upgraded, with work due to be completed in 2027.

One issue is that large volumes of renewable energy are generated in Scotland, but the demand is much higher in England. Scottish/English grid constraints are mitigated in part but not wholly by the subsea Western Link and high-voltage, direct current (HVDC) cable which lies off Cumbria's west coast.

Cumbria already has the largest amount of distributed generation already connected - in comparison to other areas in the region and Cumbria has more energy generation than demand. Domestic properties can still connect anything they want and generations below 1 MW aren't constrained and can still be connected.

Carbon Budgets for Cumbria

The Tyndall Centre has modelled the scale and required rate of decarbonisation needed for Cumbria to stay "well below 2°C and pursuing 1.5°C". Table 1 below shows the CO₂ budget for each of Cumbria's six local authority areas; how many years, at current rates, the budget will be consumed by; and the rate of CO₂ reduction required per year from 2020 levels to meet the target set (which ranges from 11.2% to 13.9%). The carbon reduction challenge that these numbers present is significant.



Photo credit: www.offshorewind.biz

⁴ Source: www.iea.org/reports/nuclear-power-in-a-clean-energy-system

⁵ Source: www.gov.uk/government/statistics/regional-renewable-statistics



Table 1. The required rate of carbon reduction for the six Local Authority areas in Cumbria to comply with Paris obligations

	CO2 budget, 2020-2100 (MtCO2)	At current rates, the budget will be used by	Required rate/year of CO2 reduction from 2020
Allerdale	4.9	2028	11.2%
Barrow in Furness	2.7	2027	12.8%
Carlisle	4.6	2027	13.5%
Copeland	2.4	2027	12.4%
Eden	6.2	2026	13.9%
South Lakeland	5.4	2027	13.6%

3. The Role of Offshore Wind and Other Renewables in Cumbria

According to the IEA, renewable energy is the optimal energy generation pathway to address the climate crisis, alongside energy efficiency, other innovative technologies and nuclear energy.⁶

The main sources of renewable electricity in Cumbria are photovoltaic, onshore wind, hydro, anaerobic digestion, offshore wind, landfill gas, and plant biomass generation. Some details on each of these are provided in Table 2.

Table 2. BEIS Renewable Electricity: Installed Capacity at Local Authority Level - as of 2021

Local Authority Name	PV (MW)	Onshore Wind (MW)	Hydro (MW)	Anaerobic Digestion (MW)	Offshore Wind (MW)	Landfill Gas (MW)	Plant Biomass (MW)	Total
Allerdale	36.68	96.22	0.86	3.6		2.01	50.25	189.62
Barrow-in-Furness	14.86	6.72	0	0	329	2.33	0	352.91
Carlisle	23.17	49.21	0.02	1.48		1.33	0.16	75.37
Copeland	4.09	22.92	0.66	0.49		1.93	0	30.09
Eden	18.43	1.46	1.22	2.95		0.82	1.38	26.26
South Lakeland	13.5	37.83	4.12	0.03		0	0	55.48
Lancashire/Solway Firth Coast Offshore Wind (connected to land outside of Cumbria)								
Lancaster					1,327.00			1327
Dumfries & Galloway					174.00			174
Total	110.73	214.36	6.88	8.55	1830	8.42	51.79	2230.73

The region's present power requirements cannot be met by available renewable and low carbon generation capacity and the shortfall is covered using carbon-intensive power sources such as methane gas, coal and oil. In 2018, 4.7 TWh of electricity, 4.8 TWh of natural gas, 5.1 TWh of oil, and 1.4 TWh of other sources were used to power buildings, transport, industry, and electricity needs.⁷

To reduce the amount of GHG emissions from this mix, energy efficiency measures must be deployed, and Cumbria's heat sources and grid electricity must be further decarbonised.

In terms of potential new sources of energy (apart from offshore wind, discussed next), Cumbria has put in a bid to site the prototype nuclear fusion reactor - Spherical Tokamak for Energy Production (STEP). This proposal sits alongside plans for a large Hinkley Point type nuclear reactor, Small Modular Reactors (SMRs), or Advanced Modular Reactors (AMRs). If successful, these plans could lead to Cumbria becoming a strategically important centre of clean energy generation, and a significant contributor towards the UK's net-zero ambition.

⁶ Source: pg 7 of www.enwl.co.uk/globalassets/go-net-zero/net-zero/decarbonisation-pathways/cumbria-decarbonisation-pathway.pdf

⁷ Source: BEIS, Electricity Generation Costs, 2016 assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/566567/BEIS_Electricity_Generation_Cost_Report.pdf



Walney wind farm at sunset. Photo credit: Janet Ellen Smith

The Case for Offshore Wind

When compared with the other renewable sources in Cumbria, offshore wind contributes by far the greatest installed capacity. It is also the technology that can add capacity most rapidly in the near term.

Present Capacity

Cumbria is strategically important to the UK's energy sector and its security. In 2020, Cumbria's 1.83 GW of installed offshore wind capacity generated 11% (4,473 GWh) of the UK's total electricity.⁸

Along the Cumbria coastline, there are eight existing offshore wind installations, detailed in Table 3 and with locations shown in Figure 4. All, apart from Robin Rigg East and West, are at the southern end of the Cumbrian coastline, with cables reaching land in Lancashire.

Table 3. Operational Offshore Wind Around Cumbria

Ref (See Map Figure 4)	Name	Capacity (MW)	Status	Owners
1	Walney 1	183.6	Operational (since May 2011)	Ørsted, SSE, OPW
2	Walney 2	183.6	Operational (since April 2012)	Ørsted, SSE, OPW
3	Walney 3	660	Operational (since September 2018)	Ørsted, PFA, PKA
4	Ormonde Offshore	150	Operational (since February 2012)	Vattenfall, AMF
5	West of Duddon Sands	389	Operational (since October 2014)	Ørsted, Scottish Power
6	Barrow	90	Operational (since April 2006)	Ørsted
7	Robin Rigg West	84	Operational (since July 2009)	RWE
8	Robin Rigg East	90	Operational (since April 2010)	RWE

⁸ Source: BEIS, Electricity Generation Costs 2020 assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911817/electricity-generation-cost-report-2020.pdf



Figure 4. Map (Source: BEIS⁹) showing the offshore wind assets around Cumbria. The callouts refer to Table 3

Cost and Viability of Offshore Wind

The levelised cost of energy (LCOE) is a predicted cost of the electricity generated (£/MW), averaged over the full life cycle of the generation technology in question. The LCOE for offshore wind has been reducing rapidly recently. BEIS, which in 2016¹⁰ predicted a LCOE of 106 £/MW for projects commissioned in 2020, is now¹¹ predicting a reduction to 57 £/MW in 2025, 47 £/MW in 2030, and 43 £/MW in 2035.¹²

These figures show the commercial viability of offshore wind compared to carbon-intensive electricity generation and gas. While, as just noted, offshore wind is generally more expensive than onshore renewables, the latter is constrained by planning issues and the need to use land that could be used for nature-based carbon sequestration and food production. Offshore wind, less hindered by planning constraints provides one of the transformational carbon saving opportunities available at this time, and for this reason, is the focus of this report.

The Potential

The full potential of offshore wind and floating offshore in the Irish Sea has not yet been fully assessed. New advances in floating offshore wind, and the ability to generate hydrogen offshore, which can then be transported by ship, means that wind farm sites can be located further offshore. Offshore, floating platforms operate in water depths of 100 to 200 meters and are unconstrained by the need for either shallow water or physical links to the land. They are tethered to the seabed by mooring lines and require dynamic high-capacity submarine cable systems to collect and export the power generated.

The recent UK Net Zero Strategy (October 2021) plans for the UK to be powered entirely by clean electricity by 2035, “subject to security of supply”. It builds on the Government’s Ten Point Plan (November 2020), which outlined the ambition to expand offshore wind production from the present 10.4 GW to 40 GW (including 1 GW of floating wind) by 2030, with the creation of 60,000 jobs.

The Plan includes the deployment of new flexibility measures, including storage, to help smooth out future demand fluctuations and price spikes. According to the Climate Change Committee (CCC) Sixth Carbon Budget, offshore wind energy could generate 75-140 GW by 2050, up from 40 GW in 2030, representing 80% of the country’s renewable portfolio.¹³

⁹ Source: data.barbour-abi.com/smart-map/repd/beis/?type=repd

¹⁰ Source: BEIS, Electricity Generation Costs, 2016 assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/566567/BEIS_Electricity_Generation_Cost_Report.pdf

¹¹ Source: BEIS, Electricity Generation Costs 2020 assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911817/electricity-generation-cost-report-2020.pdf

¹² Comparing the 2025 predictions for different technologies, offshore wind is 28 £/MW cheaper than combined cycle gas turbine (electricity generated from natural gas) plants, but 11 and 12 £/MW more expensive than onshore wind and large-scale solar respectively.

¹³ Source: www.theccc.org.uk/wp-content/uploads/2020/12/Policies-for-the-Sixth-Carbon-Budget-and-Net-Zero.pdf (pg118)



Recent Developments - “Morgan and Mona”

In February 2021, Crown Estates Offshore Wind Leasing Round 4 results were announced,¹⁴ the first such UK leasing round since 2010. BP and EnBW were the preferred bidders for new offshore wind farms in the Irish Sea, near Cumbria and North Wales. BP has named the potential offshore wind farms “Morgan” and “Mona” and, when complete, they could have up to 3 GW of generation capacity, sufficient to power the equivalent of approximately 3.4 million UK households with clean electricity. Both come with a 60-year lease.¹⁵

The Link Between Hydrogen and Offshore Wind in Cumbria

The Ten Point Plan (2020) in regard to renewables, as mentioned above, included 5 GW of green hydrogen production capacity by 2030. The National Hydrogen Strategy (August 2021), referred to subsidies for hydrogen production and will allocate £240 million to a Net Zero Hydrogen Fund, open from early 2022. Where the 5 GW of hydrogen will be produced is yet to be determined, the focus to date has been the industrial clusters.¹⁷

However, Cumbria’s access to offshore wind presents a compelling opportunity to accelerate green hydrogen production. Its rural topography and the nature of its remote industrial sites – that need to survive, grow, and decarbonise all at the same time – both point to the need for hydrogen.

Hydrogen has the capacity to be a game-changer in decarbonising the global energy system and it has an important role to play in tackling the harder to decarbonise sectors such as high-grade industrial heat for steel, chemicals, long-haul transport, shipping, and domestic heating (delivered via a proposed repurposed gas network).



Walney Extension, off the coast of Cumbria. Photo credit: Ørsted

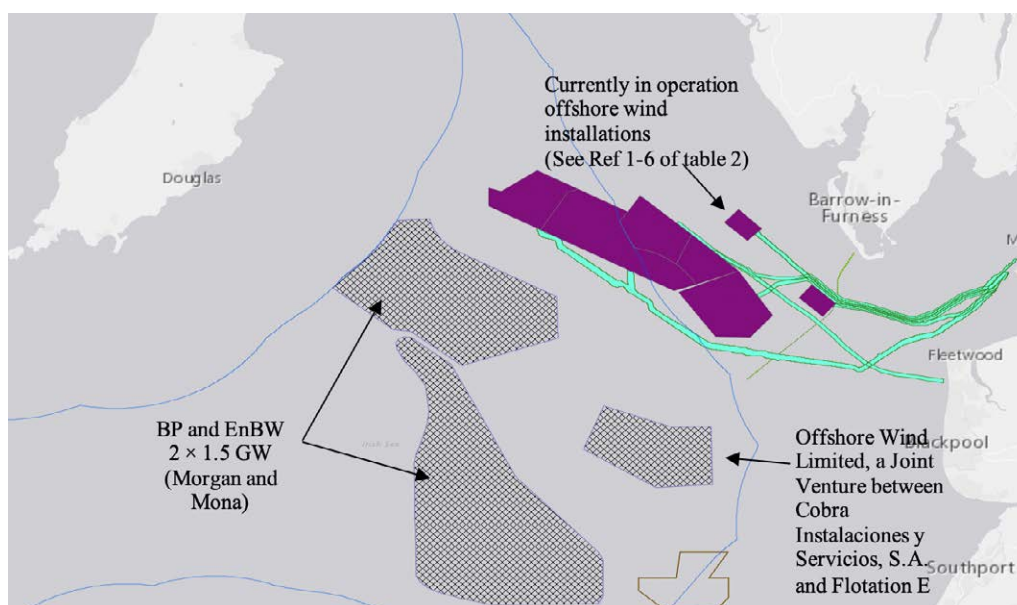


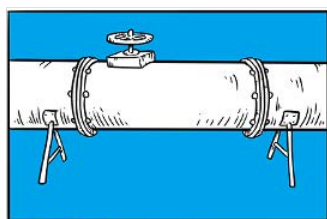
Figure 5. Crown Estates open data portal¹⁶ interactive map. Hatched areas are preferred projects and purple areas are active sites.

¹⁴ Crown Estates leasing round 4 press release www.thecrownestate.co.uk/en-gb/media-and-insights/news/2021-offshore-wind-leasing-round-4-signals-major-vote-of-confidence-in-the-uk-s-green-economy/

¹⁵ Source: www.bp.com/en/global/corporate/news-and-insights/press-releases/bp-and-enbw-announce-morgan-and-mona-offshore-wind-projects-in-the-irish-sea-launch-supplier-registration-portal.html

¹⁶ Source: opendata-thecrownestate.opendata.arcgis.com/

¹⁷ The six largest industrial clusters by emissions are Humberside, South Wales, Grangemouth, Teesside, North West England and Southampton.



Blue hydrogen

Made from natural gas, CO₂ emissions captured and stored



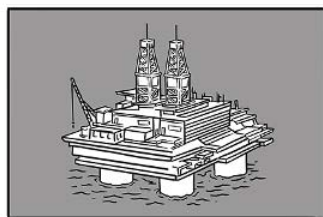
Green hydrogen

Made from renewable electricity, no CO₂ emitted



Brown hydrogen

Made from coal, CO₂ emitted into the atmosphere



Grey hydrogen

Made from natural gas, CO₂ emitted into the atmosphere

Hydrogen is a means of storing renewable energy which, given the intermittency of wind and solar, is a key factor to accelerating their deployment. Compared to storing energy in batteries, there is no requirement for precious metals. Compared to pumped hydro, there is no requirement for suitable topography. Hydrogen can be stored overground in tanks, or underground in salt caverns or depleted gas fields. Storage can be at scale, potentially large enough for inter-seasonal storage (the UK's overall energy demand is significantly higher in winter than summer).

Hydrogen can be transported by pipeline, but also by road, rail and ship - the latter three allowing for a more flexible 'offgrid' distribution. Distribution by ship is a key consideration for Cumbria if hydrogen is produced offshore or is required for export or import to other countries.

Hydrogen can be produced in several ways, four of which are shown in Figure 6, with varying levels of efficiency, carbon intensity and cost. Only low carbon hydrogen, 'blue' and 'green', are considered for expansion. Methane gas reformation with carbon capture (blue hydrogen) will likely be key

Figure 6. The Colours of Hydrogen. Diagram Credit: Energy Institute

in industrial areas adjacent to offshore depleted gas reservoirs – for example in Merseyside, Teesside, the Humber and potentially at Barrow-in-Furness. Green hydrogen is produced when renewable electricity is used to split water (the process of electrolysis) into hydrogen and oxygen.

Green hydrogen is the focus of this report and references to 'hydrogen' hereafter should be taken to refer to this form of the gas unless specified otherwise.

Important investigations are underway into hydrogen production from offshore wind and floating offshore wind, with hydrogen brought to land by both pipeline and ship. ERM's Dolphyn project aims to produce hydrogen from floating offshore wind, using electrolyzers located on the turbine platforms, therefore avoiding power connections, and transporting hydrogen molecules to shore by ship. Other projects of interest are the Oyster Project in the UK (ITM/ Ørsted) which is investigating offshore green hydrogen production; the PosHydon project in the Dutch North Sea, where green hydrogen will be mixed with the gas on a working platform and transported via a gas pipeline to the coast. Developing sites further offshore means the landscape impact can be mitigated.

Cost and Viability of Green Hydrogen

The cost of producing green hydrogen is presently a major barrier. While this cost is falling - mainly due to falling renewable power costs - green hydrogen is still 2-3 times more expensive than blue hydrogen (produced from fossil fuels with carbon capture and storage) and further cost reductions are needed.¹⁸ However, most hydrogen forecasts show cost parity between green and blue hydrogen somewhere between 2030 and 2040, with green falling beyond the parity date.

The cost of green hydrogen production can be quantified using the levelised cost of hydrogen (LCOH)¹⁹ and is driven by different technologies and scenarios for production. The scenario most relevant to this report is dedicated offshore wind using a Polymer Electrolyte Membrane (PEM) electrolyser. In 2021, BEIS Hydrogen Strategy mentioned that the cost of hydrogen produced using this method would decrease from 112 £/MWh H₂ in 2025 to 71 £/MWh H₂ in 2050.²⁰ Here, the report assumes that the costs of offshore wind generation, with 51% (2025) and 63% (2050) capacity factors, are absorbed by the hydrogen production plant.

¹⁸ Source: irena.org/-/media/Files/IRENA/Agency/Publication/2020/Dec/IRENA_Green_hydrogen_cost_2020.pdf

¹⁹ This is a lifetime average cost, expressed in present value terms, that covers all relevant producer-faced costs including capital, operating, fuel, and financing costs.

²⁰ Source: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011506/Hydrogen_Production_Costs_2021.pdf and assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011283/UK-Hydrogen-Strategy_web.pdf



4. Investment Opportunities - “Now, Next and New”

This chapter lays out several opportunities for decarbonisation in Cumbria. As in other chapters, these are organised under the headings of opportunities that could be seized in the following ways:

- “Now”, meaning those that are possible/investable ideas without major further development.
- “Next”, those that don’t depend on new technology but do require some development in terms of behaviour, policy, feasibility and/or means of financing.
- “New” opportunities that require significantly fresh approaches, finance or advances in technology in particular.

“NOW”

1. An Emerging Green Hydrogen Strategy for Cumbria

There is an immediate opportunity to invest in an emerging strategy to kick start the hydrogen economy, tackle the most challenging to decarbonise sectors and stimulate green growth.

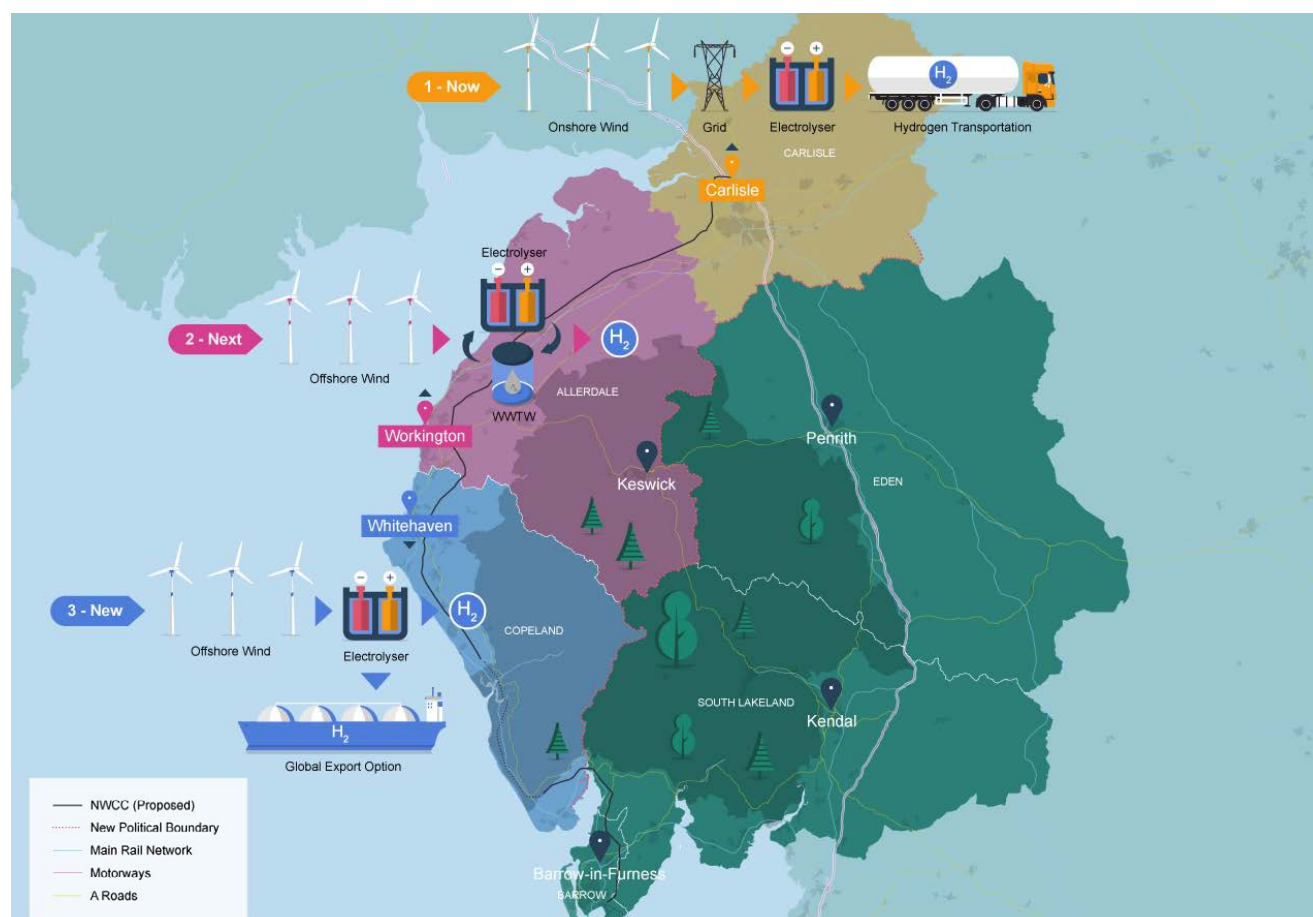


Figure 7. “Now, Next and New” propositions for an emerging hydrogen economy in Cumbria. Image credit: Arup

Our “Now” proposition incorporates a large-scale, grid-connected green hydrogen production facility located at (or near) Harker, north of Carlisle. This would provide a means to overcome England/Scotland’s grid constraints using the strategic road network to distribute energy whilst unlocking the expansion of further onshore renewables.

Distribution would initially be by a fleet of road tankers to service stations, transport depots and industrial demand centers along the M6, A595, A66 and A69 corridors, with the intention to expand to rail and gas grid distribution in time. Road

¹⁵ Source: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011506/Hydrogen_Production_Costs_2021.pdf



tankering of hydrogen would initially be using diesel propulsion, adding slightly to the embodied emissions of the hydrogen, but over time hydrogen fuel cell tankers would be used and these would only distribute to those areas not covered by the gas or rail network.

“NEXT”

2. Green Hydrogen and Oxygen from Surplus Power from Robin Rigg

The “Next” proposition is to use surplus power from the existing Robin Rigg offshore wind farm (in the Solway Firth), to generate green hydrogen and oxygen from an electrolyser located near Workington, adjacent to a wastewater treatment plant. The final effluent (treated water) from this plant would provide the water input to the electrolyser, and surplus electricity from the wind farm would be used to split the water into hydrogen and oxygen. Approximately seven times more oxygen than hydrogen (by weight) is produced from this process.

The hydrogen produced, and any leftover oxygen, would be stored and transported by tanker locally, becoming the new ‘raw materials’ to decarbonise existing local industries and enable the growth of new ones.

The innovation proposed at Workington demonstrates a ‘circularity’ in energy use that could be replicable across the country at wastewater sites. The use of surplus power would also add to the business case for the expansion of offshore wind at this location, as well as the supply chain economic opportunities and job creation for building and maintaining the infrastructure, keeping the gas industry operational into the future, and other socioeconomic opportunities.

An example of the growth of new industries would be the return of steel manufacturing to Cumbria. The heat required for steel making is typically generated in a blast furnace by burning coal or methane, or in some cases via an electric arc furnace. Many steel mills are considering fuel-switching for their blast furnaces to hydrogen direct reduction of iron (DRI), particularly after the successful HYBRIT project in Sweden and those trialled by SSAB. Building a green steel plant could be considered on a former industrial site in West Cumbria such as the Workington Steel Works - famous for its use of the Bessemer Converter that converted iron into steel.

“NEW”

3. A Proposed Community-focused 1.2GW Offshore Wind Farm - “Collette”

The “New” proposition is the main subject of this chapter. “Collette” would be a 1.2 GW community-focused offshore wind farm which would intend to use hydrogen as a means of transfer of energy to shore. The project is in the pre-feasibility stage and is described in detail below.



A visualisation of where “Collette” could be located off the coast of West Cumbria. Image design. Laura Burns



Significant potential exists to develop a 1.2 GW wind farm with 80-100 turbines, off the coast of West Cumbria, to be delivered via a consortium of partners focused on green growth and community transformation. A scheme of this size is likely to involve a capex more than £3 billion, with a predicted lifetime of 27 years. A phased development approach may be necessary, and this has been described below. ‘Collette’ would represent 5% of the UK Government’s ambition to quadruple the UK’s offshore wind capacity, from 10 to 40 GW, by 2030.

The installation would supply renewable energy to locations such as Whitehaven and Sellafield and potentially to all of Cumbria. In addition, depending on the inclusion or not of a hydrogen element in the project, export could be possible throughout the Irish Sea. The use of excess power from the installation to produce green hydrogen would create, effectively, a storage buffer to deal with the intermittency of wind.

The optimum means of bringing energy onshore from the wind farm would need to be investigated. Options include the following:

- a) No hydrogen production at all, only a cable connection to the land, as is the case with conventional offshore wind. Potential grid constraint issues would need to be explored.
- b) Onshore hydrogen production at suitable locations (mostly likely at Whitehaven Harbour) with a cable bringing electrical energy to the onshore electrolyser. Hydrogen produced here would initially be distributed by road tanker, and later by rail, gas grid, and ship.
- c) Offshore hydrogen production with a subsea hydrogen pipeline to shore; the pipeline may be able to act as storage and as a distribution medium.
- d) Offshore hydrogen production using ships for storage and distribution; distribution directly to shore but potentially throughout the Irish Sea.
- e) A phased or combined approach of the above.

With the development of hydrogen electrolysis, energy storage systems, ‘green steel’ production and the electrification of transport, there is an increasing array of markets that could improve the potential sale price of electricity.

Initial estimates²¹ indicate that all of Cumbria’s potential / latent hydrogen demand (based on the region’s current emissions) could be met through this one project, potentially with excess to export (by road, rail, ship, or gas pipeline).

Emission Reductions

- As to emissions reductions, the contribution “Collette” could make would be very significant, at between 850 and 1100 Kt CO₂e savings each year.²² This is between 23% and 30% of Cumbria’s total 2019 emissions, more than twice the reduction recommended by the Tyndall Centre (Table 1).
- Regarding carbon embedded in the construction, operation and decommissioning of the wind farm, these would be covered from grid carbon savings in 1.5 years.
- Using the renewable energy generated to produce hydrogen would facilitate further carbon savings. This includes where hydrogen is used to replace carbon-intensive and cost-volatile methane (burnt to provide industrial or domestic heating) and oil (burnt in heavy transport vehicles). These further carbon savings can be calculated when there is clarity on how the hydrogen will be used.

As the grid electricity is decarbonising year on year, this carbon saving will also be reduced each year. Therefore, these figures are only suitable for short term carbon estimates.²³



Image credit: Amelia Moore

²¹ Source: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011506/Hydrogen_Production_Costs_2021.pdf

²² Assuming a future capacity factor range between 42% (current technology) and 52.9% (combined beneficial technology)# (the ratio of installed capacity to measured generation - mainly capturing wind’s intermittency) and a 195 gCO₂/KWh grid carbon intensity. Source: pg 61 Table 9-1 assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/839515/L2C156060-UKBR-R-05-D_-_potential_to_improve_Load_Factors_of_UK_offshore_wind_to_2035.pdf

²³ Assuming an 11g CO₂e/kWh of life cycle emissions, which is estimated over a 27-year operating life, a 1.2 GW wind farm (with a capacity factor between 42% and 52.9%) will emit between 1300 and 1650 kt/CO₂e. It will take 1.5 years for the grid carbon savings to offset these emissions, primarily from construction and decommissioning.



A Phased Approach

Given its size, “Collette” would require a phased approach:

- Phase 1: Offshore renewable production connected to the grid, potentially with onshore hydrogen production at a suitable location at Whitehaven Harbour.
- Phase 2: As hydrogen demand expands, production of the gas would now take place offshore at the wind turbine site, with transfer to shore by either ship or pipeline.
- Phase 3: Expansion of offshore wind and offshore hydrogen production throughout the Irish Sea, unconstrained by proximity to land (and consequent issues with aesthetics) or onshore land availability for hydrogen production. Export of hydrogen to the west coast of the UK, Ireland and even Europe.

6. Identifying Potential Partners & Stakeholders

To achieve its full potential, Collette would need to be delivered via a consortium of partners focused on green growth and community transformation. Several partner organisations have already been identified and consulted, but more will need to be brought aboard to fill the various roles described below:

- A technical partner, with experience in the technical and commercial aspects of offshore wind and hydrogen and developing the business case for projects.
- A Net Zero Action Partner - could be a Community Interest Company. Its role would be to support and coordinate local brokers, represent community interests with the ability to catalyse action on a portfolio of decarbonisation projects including action by the investment community.
- Local Government and council partners, such as Cumbria Local Enterprise Partnership (CLEP) and the new unitary authorities.
- A community energy partner, with experience in developing community wind projects.
- Major energy developers, who are looking to diversify their portfolio into transformational renewable energy projects.
- Financial partners, who may include institutional investors looking for a £3 billion + venture, UK Government and private companies. All of whom can be part of creating a finance structure that includes direct investment from local citizens.



Stakeholders will need to be engaged early in the project, particularly where there will be a direct impact on their circumstances or interests. In terms of the technical aspects of the project (as opposed to the intended wider community engagement), some of the expected stakeholders in “Collette” would be:

- Communities on the coast where the visual impact needs to be mitigated.
- The Crown Estate which is the seabed landowner and whose initial support and advice is critical. This may include advice on further leasing rounds, or on the possibility of bespoke parallel procurement routes directly from the Crown Estate with the same level of scrutiny and governance.
- Whitehaven Harbor, where a large-scale electrolyser could be sited (under one scenario to be considered) and where ships could load or unload hydrogen.
- If renewable energy for Sellafield is considered, early engagement with the Nuclear Decommissioning Agency (NDA) is essential to ensure their requirements are included.



- National Grid, which owns the high voltage electricity grid (necessary for both backup and excess power). National Grid also owns the high-pressure gas National Transmission System (NTS). In Cumbria this approaches Sellafield from the south. There is work underway to investigate repurposing of the NTS to 100% hydrogen. A scenario could be explored where the local stretch of the NTS, or a pipeline adjacent to it, could export hydrogen away from Cumbria to meet the demands of Merseyside.
- For hydrogen distribution by ship, shipping companies and the requirements for on-load and offload facilities must be considered. For hydrogen distribution by road or rail, relevant stakeholders must be engaged, including the optimal means for storage, distribution and dispensing.
- Industries that need to decarbonize must be thoroughly consulted, particularly those in need of power or heat.
- The Environment Agency for siting any new facilities.

Developer Selection

Regarding selection of the developer for the project, the offshore wind development market is very competitive, with the strike price bids under the Contracts for Difference (CfD) regime continuing to reduce. There is therefore no shortage of developers that are interested in projects, if they are technically and commercially feasible.

The traditional way for UK offshore wind farm opportunities to be secured is through bidding during leasing rounds run by the Crown Estate. This is beneficial as it involves a known governance process.

An alternative option would be to engage the Crown Estate early in the process and work in partnership with them to put forward a tailored bidding process. Under this scenario, a tender exercise would take place to bring in a major energy developer that would be expected to meet core outcomes in the tender document.

Community Engagement

Among the outcomes to be embedded in the tailored bid approach would be a significant level of community investment and involvement.

As well as the Copeland community immediately adjacent, there are ambitions for all of Cumbria's citizens to be invested in the "Collette" project, providing them not only with a financial return, but also to give them a stake in the future and engage them in the net zero transition. Plans for engaging with the wider community on this project will be developed in the next phase of this project. These should include the potential involvement of Sellafield as a local anchor institution that could help connect the local community to the project.

7. Risks and Funding Structures for "Collette"

The risks inherent in renewable energy projects such as "Collette" are different depending on the technology being used and change during the development lifecycle of the project – generally reducing over time as each component of the project is successfully completed, as illustrated below.

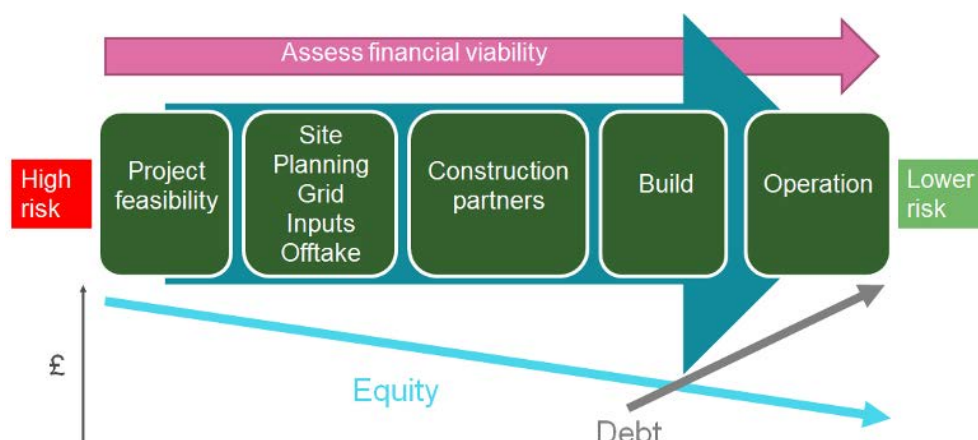


Figure 9. Development Cycle Risk Profile



Before a project is ready to be constructed, all project feasibility studies and securing of consents must have been completed, as well as agreement(s) reached with the future users ('off takers') of the power to be produced. This is a costly exercise and is usually funded by a specialist project developer using equity finance.

Building and commissioning stages of a project are also typically financed by equity and either corporate or 'project finance' debt. In the case of the former, risks are taken 'on balance sheet' – that is, secured against the assets of the project sponsor. In the case of project finance, the risks are instead secured against the assets of the project alone, and there is limited recourse to the sponsor balance sheet. (Ironically perhaps, the technique of project finance was first developed for the financing of North Sea oil in the 1970s.)

The total funds required to build an offshore wind farm of 1.2 GW such as "Collette" are likely to be more than £3 billion. Commonly, the finance structure for the construction of an offshore wind farm will be around 70-80% debt, with the remainder being equity.



Photo credit. Reglobal.co

Once a project is fully operational, risks have generally been reduced to a level where these earlier and more expensive sources of finance can be refinanced with cheaper long-term debt finance that will bring down the overall cost of finance for the project sponsor. This long-term debt finance provides a reasonably steady and predictable return for investors – in the case of "Collette" over a period of some 27 years given the expected life of the project. It is thus often suitable for institutional investors such as pension funds, which are seeking to match their long-term liabilities to pay their pensioners with a known income stream.

Green bonds are now a standard instrument for the refinancing stage of projects. In 2019, 32% of the green bond issuances came from companies exclusively in the wind industry, either through project or corporate bonds. In that year, for example, Ørsted issued green senior bonds with a value of over €1bn to invest in the Hornsea 2 offshore wind farm, off the Yorkshire coast.²⁴

The refinancing stage of Collette could therefore also be a good opportunity for direct community investment in the project for those that would like long-term stable returns but also to be seeing their investments creating positive social and climate impacts.

As much community funding as possible would be raised for Collette, with a proportion of the total capital expenditure earmarked for this, whilst also ensuring that it is economically deliverable. This earmarked funding would be time limited such that the project delivery could not be held up if there was less community investment than envisaged (which could result in loss of other funding). The target may be set at 10% community investment (approximately £300 million) but if this wasn't reached by a certain time, this proportion of the investment would be released such that other funders could fill the gap.

8. Community Energy's Time Has Come (Again)

As a means of investment and ownership, community energy is well established across the UK, with representative bodies such as www.greencommunityenergyengland.co.uk leveraging considerable political support.

Community energy in the UK began with the Baywind Cooperative in Cumbria in the late 1990s. This raised funds directly from members of the public, who became members of the co-operative. In 2020, Baywind set up Energy4All, based in Barrow, to help more communities own renewable energy assets. Energy4All has now set up around 30 community energy societies that own wind, solar and hydro projects across the UK. In 2015, the Harlock Hill wind farm was repowered and a new community benefit society, High Winds, was set up by Energy4All who own it. High Winds has raised £9.7 million from community share offers and loan notes and owns two 2.3 MW turbines at Harlock Hill and three at the adjacent Mean Moor site.

The way in which community renewables boost local economic activity through investment, jobs and tax revenue staying in local hands are demonstrated by a study of the effects of a seven-turbine community wind park at [where] in Germany. This 21 MW facility generated \$71 million in regional income over a 20-year operating period, while the same-sized park in the hands of commercial developers produced only \$8.6 million for the local economy.²⁵

²⁴ Source: windeurope.org/wp-content/uploads/files/about-wind/reports/Financing-and-Investment-Trends-2019.pdf

²⁵ Source: www.greenbiz.com/article/can-europes-community-owned-renewables-compete-big-energy



The Enabling Policy Environment for Community Energy

The House of Commons Environmental Audit Committee (EAC) says “by 2030 the community energy sector could grow by 12-20 times, powering 2.2 million homes and saving 2.5 million tonnes of CO₂ every year.”²⁶

Until 2017, there was a steady growth in the UK’s community energy sector, mainly driven by the Feed-in Tariff (FiT) scheme. This was hugely successful in attracting investment in small-scale renewable electricity generation. It allowed applicants to receive payments from their energy supplier if they generated their own electricity, for example with solar panels or wind turbines. The FiT was closed to new applicants from 1st April 2019 on the grounds that technology costs had dropped sufficiently to make further support unnecessary.

In January 2020, the Government introduced the Smart Export Guarantee (SEG). Unlike the FiT scheme which paid a minimum Government tariff to generators for the electricity they produced, the SEG requires some electricity suppliers to pay generators for the excess energy that they export to the grid at a rate that is commercially agreed between the parties (which must be above zero). It has been criticised by small-scale renewables developers as being too limited in scope. It provides no minimum export price, and no long-term certainty beyond 12-month periods. Both factors put the community energy sector at a disadvantage to larger renewable energy projects which receive long-term certainty from Contracts for Difference (CfD), or which benefit from economies of scale.

Current rules under the SEG also only permit the purchase of electricity from nationally licensed electricity suppliers, which means that community projects cannot sell their energy to their own communities and still access the SEG.²⁷

It is also generally difficult for community projects to sell the energy directly to residents and businesses due to the current legislative environment. This situation may change with passage of the Local Electricity Bill, which is currently before Parliament and has the support of 280 MPs and 79 Local Authorities. If approved, the Bill would create a ‘right to local supply’ and this would lead to an increase in domestically generated clean energy being sold directly to local households and businesses, allowing local benefits to accrue.²⁸

In terms of learning from others, the Welsh Government set some important targets in 2017:²⁹

- Wales to generate electricity equal to 70% of its consumption from renewable sources by 2030.
- 1 GW of renewable energy capacity in Wales to be locally owned by 2030.
- New renewable energy projects to have at least an element of local ownership from 2020.

9. The Importance of Generating Social Value and Community Buy-in for “Collette”

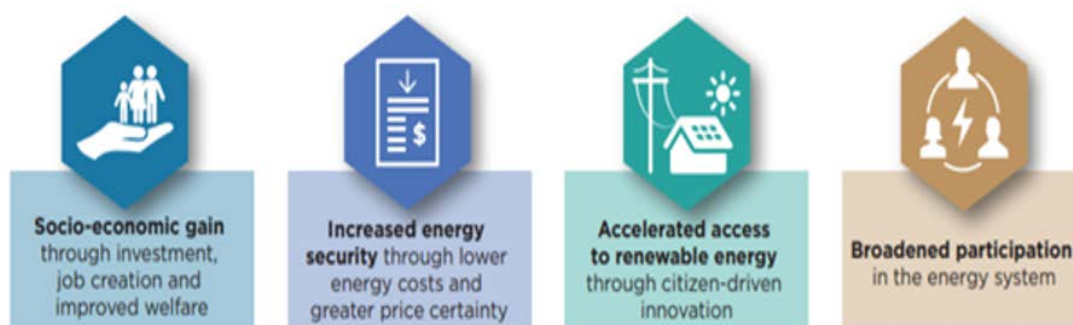


Figure 10. Potential benefits of community energy. Image credit: IRENA³⁰

Alongside the financial opportunities arising from the ability for the community in Cumbria and the region to invest in “Collette”, our vision for the project is driven by the generation of social value in an area of high socio-economic deprivation and the creation of a lasting legacy for Cumbria. These outcomes will be delivered via a range of engagement and investment measures whose objectives are to:

²⁶ committees.parliament.uk/committee/62/environmental-audit-committee/news/139374/new-inquiry-what-role-could-community-energy-play-in-decarbonising-energy-and-heat/

²⁷ Source: www.solarpowerportal.co.uk/news/eac_calls_for_minimum_floor_price_for_flawed_smart_export_guarantee

²⁸ Source: www.powerforpeople.org.uk/the-local-electricity-bill

²⁹ Written Statement: Publication of the ‘Local ownership of energy generation in Wales – benefitting Wales today and for future generations’ (18 February 2020)

³⁰ Source: www.coalition.irena.org/-/media/Files/IRENA/Coalition-for-Action/IRENA_Coalition_Stimulating_Investment_in_Community_Energy_2020.pdf



- Ensure the community is consulted on, and involved in, both in the vision and the decision-making process, from the outset. This includes involvement in decisions on locations and the mitigation of visual landscape impact, establishing renewable energy demand from local industry, and exploring opportunities to support industry and communities. By aligning community and developer interests, a community led approach will avoid the delays and contention seen too often in major infrastructure projects.
- Create a finance structure that ensures both that citizens can invest in the project, and that community projects benefit from a proportion of the profits. The main options for such a structure are discussed below.
- Use the availability of locally produced renewable power, hydrogen and oxygen to attract new industries and jobs.
- Create a Cumbrian green hydrogen export proposition, with a strong community focus while ensuring profits flow into Cumbria. If hydrogen is produced and exported by ship, it could be taken to ports throughout the Irish Sea, potentially creating opportunities for employment throughout the supply chain, including at Cumbria's ports.



Image credit: www.renews.biz

These objectives need to be considered and communicated clearly and positively. “Collette” could be transformational in terms of its long term, sustainable impact (in every sense) on the west coast and Cumbria, as well as having national significance.

Community ownership of energy generation was the sixth recommendation in the recent Copeland's People's Panel on Climate Change. The importance of strong leadership and the need for independently appointed expert(s) to consider the best ways of enabling community ownership and maximising participation were also suggested.³¹

Structures for Community Investment and Engagement

A mechanism for both creating routes for community investment and administering the surplus/profits of “Collette” (and indeed similar projects) needs to be carefully considered at the outset.

There are many models for governance and distribution, ranging from a Community Benefit Society (CBS), a Community Interest Company (CIC), to county based community foundations, such as Cumbria Community Foundation.

A Community Benefit Society (CBS)

- A CBS or a cooperative could raise equity finance from the local community through the sale of withdrawable shares (community shares). Shareholders would become members of the society. This is a frequently used structure for community energy organisations, the CBS raises equity finance from individuals and local organisations through a community share issue (of withdrawable share capital), supplemented by loan finance from a financial institution. The CBS either buys a share of the revenue from the wind farm (or other renewable energy source) developer, or purchases some of the assets (e.g. a specific number of wind turbines). Local people and organisations can have an ownership stake in the wind farm through a democratic community organisation (controlled by its members, with one member one vote) and receive a return for their investment.
- Advantages of this model include:
 - Community shares are a well proven model.
 - Share interest is a ‘charge for the capital’, not a distribution of profits. If the society does better financially than expected, this cannot be paid out in higher rates of share interest. A CBS must use its surplus for the benefit of the community.
 - The community group has an ownership stake in the project.

³¹ Source: www.copeland.gov.uk/sites/default/files/attachments/copeland_peoples_panel_rec.pdf



Photo credit. Adobe Stock

- Potential disadvantages of this model include:
 - A CBS must carry out a trade and not simply own shares in another entity, restricting the scope for joint ventures with a commercial wind developer.
 - With an equity investment, the Community Group is buying into the highest risk return.
 - If additional funds are required with community investment e.g. the CBS needs to raise loan finance from a financial institution to supplement the funds to make its investment meaningful / to deliver the project, it can be difficult to raise the funds. Banks are reluctant to lend to Community Groups that do not own assets. Including financing and administrative costs, it is challenging to see the CBS raising cheap capital which limits the investment options for it. Even in a shared revenue structure, the fact that a Community Group will have to leverage the investment means it is likely that the Community Group will end up taking more risk than the developer. This creates a mismatch between risk and return.
 - Despite having an ownership stake in the project, the CBS may have no control.

A Community Interest Company (CIC)

- A CIC is a type of company designed for social enterprises that want to use their profits and assets for the public good. A CIC's role in a project such as "Collette" would be to support and coordinate local brokers, represent community interests in the delivery of the investment, and receive community benefits (financial or otherwise) as part of investment payback. A CIC usually raises its funds through grants or donations. If established as a company limited by shares it can raise funds by issuing shares, as with any other company.
- Advantages of this model include:
 - CICs are intended to be easy to set up.
 - Assets and profits must be used for the community interest (with limits on the dividends that can be paid to shareholders).
 - registered with and governed by the Financial Conduct Authority (FCA), a requirement that helps build confidence amongst prospective investors.
- Potential disadvantages of this model include:
 - CICs must register with Companies House and also satisfy a Community Interest Test to show the primary purpose is to provide benefits to the community, rather than to the individuals who own, run or work in them.
 - There will be a limit on the levels of distribution of profits or assets that may be made to members – this is known as the asset lock.

Direct Investment - Working with a Regulated Firm

- Finally, investments could be raised from retail investors, with a key objective of local investors being given the opportunity to invest, and to be involved in local engagement, whilst at the same time providing a return on investment.



Photo credit. Montage Health

- This route would involve working with a regulated firm to structure an investment offer (equity or debt) and then produce an investment memorandum explaining the risks and rewards of the investment, before finally issuing the document directly to the community group or to individual retail investors.
- Once the funds were raised, they would be paid directly to the project company. Dividends or interest payments (and potentially royalties based on performance) would be paid to the community group or individuals and the project company would be obliged to provide a certain level of information to the investor(s) on an ongoing basis.
- Advantages of this model include:
 - It ensures that the investment is marketed in the right way and that the risks are understood by investors.
 - It gives the opportunity for multiple types of investors to invest as offers can be structured in several different ways.
 - It provides a good opportunity for the host council or LEP to invest, with them raising funds from citizens to then invest in the project (providing people with a rate of return and level of default risk that is commensurate with the covenant strength of the council as opposed to the project). This is called a Community Municipal Investment (CMI). Alternatively, authorities could invest alongside citizens on the same terms. Councils can currently borrow from the Public Works Loan Board (PWLB) at very low levels and are considering investments in green infrastructure for two reasons: firstly, to support their Net Zero strategies; but, also to generate an income to replace money lost due to cuts in central Government grants. Income from a renewable energy investment could therefore be used to fund core services such as adult social care and children's services and this can be built into the overall story.
 - For debt investments, the investment could have a low minimum investment amount and could be ISA and pension eligible. Interest would also be paid immediately which makes the offer more attractive for yield seeking investors (councils and individuals).
 - The model is scalable and could provide a commercially attractive pool of investors from which to fund future projects, if third party funding partners are ever required.
 - Investors can be given the opportunity to donate their returns to community projects either through the council or by other means.
- Potential disadvantages of this model include:
 - If there is a target that is not reached, the funds may need to be returned to investors.
 - For an equity investment, investors are buying into the highest risk return. Also, although investors have an ownership stake in the project, they may not have any control. There will also be a delay in receiving any return as funds will be distributed to debt providers first.
 - Additionally, investments could be raised from retail investors, with a key objective of local investors being given the opportunity to invest, be involved in local engagement whilst at the same time providing a return on investment.

A similar approach could be taken for other CIC or CBS projects mentioned in the nature and retrofit chapters in this report.



9. What if No “Collette”

As a stand-alone project, “Collette” provides the greatest potential in terms of scale and impact in Cumbria – for carbon savings, energy generation, development of the hydrogen sector, local job creation and community investment and benefit.

It is a vision that will require a considerable upfront investment of time and resources to get it beyond the concept stage. Legal and financial costs will be significant even during this initial phase – but the prize is a one-off, transformational opportunity. With less than 1% of offshore wind owned by UK plc, then perhaps there has never been a greater rationale to make this work in Cumbria and the UK.

Beyond “Collette”, there is a range of smaller opportunities for potential community investment in renewable energy in Cumbria and these should also be encouraged.

As mentioned above, the pioneers of community energy have been Baywind / Energy4All, but a series of other community owned companies have followed in their wake, such as Community Energy Cumbria (hydro and solar), RainePower (hydro) and Burnside Community Energy (BCE).

The last of these, BCE, offers a replicable model of community investment in a larger project, in this case forming a partnership with the paper company James Cropper plc. Nearly 1 MW of solar PV has been installed on the roofs of the Cropper paper mill, funded entirely through 3 community share offers, reducing annual CO2 emissions by 330 tonnes and supporting the company’s decarbonisation targets.

‘Anchor’, high energy user businesses like James Cropper plc offer a ready market for green energy generation, thereby underpinning the investment rationale either for the community, for the business or in a joint partnership. The giant among such potential off takers in Cumbria would be Sellafield, but there are many other large companies, institutions and utilities with large buildings and energy demands such as United Utilities, Electricity Northwest, Stagecoach, BAE Systems, Westmorland General Hospital. All of these have a decarbonisation agenda and offer potential investment opportunities with a community element.



Directors Mark Cropper and Phil Davies at Burnside Community Energy Ltd on the roof of James Cropper plc. Photo credit: BCE



5. Living and Natural Resources

1. Overview

This chapter identifies net zero investment opportunities based on Cumbria's rich natural capital assets. While there are already examples of innovative management of natural capital in Cumbria, including catchment management, peatland restoration, woodland creation and agricultural innovations – we focus on how to catalyse private sector funding to generate investments that will significantly scale up these approaches in Cumbria.

Accelerating private investment will provide important additional sources of income for landowners and managers, including in agriculture which has a below-average GVA, and will help speed up the development of the environmental services market.

Like other chapters, to frame our work we use a 'Now, Next and New' lens. All propositions are complementary to the Cumbria LEP Natural Capital Plan, the CLEP Rethink agenda for a Green Recovery, the Lake District National Park Partnership Plan, as well as the local implementation of the Government's 25 Year Environment Plan (25YEP).

Key Recommendations

In total, they require an investment of £0.91bn and this could save 6.2m tCO₂e over the next 10 years, and over 43m tCO₂e over 60 years² and create 1,500 full-time equivalent jobs.

Table 1: Investment Opportunities

Opportunities	Scale of Investment	Carbon Savings (tCO2e)		Potential Returns From
		10 yrs	60 yrs	
1. “Now” Investor Ready Propositions				
Woodland and Peatland				
NC1: Finance for 7,000 ha of community woodland creation in Cumbria over the next 10 years.	£42m	350,000	1.7m	Carbon, public health, regeneration
NC2: Finance for 30,000 ha of peatland restoration in Cumbria over the next 10 years.	£378m	2.75m	22m +	Carbon, biodiversity credits, water quality improvement
Agricultural Innovation				
NC3: Establish lower carbon livestock enterprises on 50,000 ha of grassland in Cumbria over the next 5 years.	Opportunity cost: £140m PV 50	85,000	425,000	Carbon, product premium, catchment markets
2. “Next” Investor Propositions				
Agricultural Innovation				
NC4: Establish agro-forestry on 10% of Cumbrian farmland (50,000 ha) in the next 5 years.	£50m	3m	15m	Carbon, farm productivity, biodiversity credits, catchment markets
Catchment Trading Platforms				
NC5: Support adoption of market approaches in the majority of catchments.	£175m	Indirect – reduced energy use, e.g. in water treatment	Nutrient pollution reduction, flood risk reduction, siltation reduction.	
3. “New” Investor Propositions				
Agrivoltaics				
NC6: Establish agrivoltaics on 10% of Cumbrian farms in next 5 years	£260m	850,000		5.1m



The recent Net Zero Strategy commits the Government to boost the existing £640m Nature for Climate Fund with an additional £124m, ensuring that at least £750m will be spent by 2025 on peat restoration, woodland creation and management. Another commitment includes restoring approximately 280,000 ha of peat in England by 2050 and trebling woodland creation rates in England. This will contribute to an overall target of increasing planting rates to 30,000 ha per year by the end of the Parliament.

The Government has also recognised the need to unlock private revenue for the natural environment in its Green Finance Strategy and the Dasgupta Review made clear the value of nature to our economy and society. In June 2021, major financial institutions and multinational corporates endorsed the launch of a new market-led Taskforce on Nature-related Financial Disclosures (TNFD)¹, to support the assessment of nature-related financial risks and to facilitate investors seeking sustainable solutions with ‘nature positive’ outcomes.



Tree near School Knott Tarn. Photo credit. C Shannon

The Challenge of Investing at Scale - Learn By Doing

While there is a growing demand for a broad range of green investment nature-based opportunities, investment at scale has so far been hindered by a lack of coherence on environmental regulations and a lack of both existing public funding mechanisms and incentives for private investment. However, this can change through innovative investments in the natural environment, which are not limited to those outlined in this chapter. The full value of these investments should be assessed over the long term: following investment, natural assets like peat bogs and woodlands provide renewable resources, and unlike built capital investments do not have capital renewal costs. They can have some maintenance costs, but these are low relative to built capital assets.

Understanding Cumbria's Priority Investment Opportunities

Mechanisms such as new environmental interest companies, innovative fund design and environmental market brokers have the potential to create nature-based investment markets in Cumbria and beyond. They can aggregate projects including catchment markets, community woodlands, agricultural innovations and peatland restoration, to scale up and spread risk across investment opportunities.

Below we set out some priority natural environment investment opportunities for Cumbria. These opportunities would involve investment in approximately 140,000 ha of Cumbria. The investments are not spatially exclusive, so the exact area is uncertain, but they could involve up to 20% of the county.

The level of employment supported by these investments will depend on the labour intensity of activities. The agrioltaics costs are predominantly for solar panels and other equipment. Employment impacts for the natural environment investments can be estimated from available multipliers of approximately 21.5 years of employment per £1m of spending². The catchment, woodland, agroforestry and peatland restoration investments sum to approx. £650m over 20 years. This investment is estimated to support 30,500 years of employment or 1,500 full-time equivalents.³

There is a clear gap in the organisations present in Cumbria to facilitate natural capital investments. New entities are needed to enable innovation and investment, but they should be developed without duplicating governance.

Recommendations

In total, they require an investment of £0.91bn and this could save 6.2m tCO₂e over the next 10 years, and over 43m tCO₂e over 60 years⁴ and create 1,500 full-time equivalent jobs. To help achieve these opportunities, a number of recommendations are made:

- NC-A: Establish a Cumbrian Environmental Community Interest Company.
- NC-B: Establish a Warehousing Body for Environmental Credit Trading in Cumbria.
- NC-C: Establish an Agri-Innovation Hub.
- NC-D: Maximise Private Sector Investment Leveraged by ELMS Scheme in Cumbria.

¹ The TCFN framework will be tested and refined in 2022 before its launch and dissemination in 2023

² Source: eftec, European Centre for Nature Conservation, University of Antwerp & CEEWeb for Biodiversity (2017) Promotion of ecosystem restoration in the context of the EU biodiversity strategy to 2020. Report to European Commission, DG Environment. Available at: ec.europa.eu/environment/nature/knowledge/index_en.htm Based on approximately 40 FTE per €1m of spending in 2009 prices, adjusted to £ 2020 prices, and adjusted for average UK and EU wage rates, which equates to approximately 21.5 jobs per £1m in 2019 prices. 1 job = 1 year of employment.

³ Assuming 10 years of employment = 1 Full-time equivalent (FTE) job

⁴ 60 years in the recommended HM Treasury appraisal time frame. The Green Book: appraisal and evaluation in central government - GOV.UK (www.gov.uk)



2. Understanding Cumbria's Natural Capital

Cumbria has a land area of 6,768 km² (or 676,724 ha) and is a predominantly rural county. The natural environment is crucial for two of Cumbria's biggest industries, agriculture and tourism, both sectors being significant employers, and crucial for mitigation of and adaptation to climate change.

Cumbria's iconic landscape is fundamentally important to the UK's tourism, attracting almost 50m visitors a year, generating over £2.2bn annually and supporting over 35,000 FTE jobs countywide.⁵ Within this, the natural environment is estimated to support £358m/yr of tourism expenditure. It is also estimated to support £147m/yr of agricultural income.

More details of the value of benefits from Cumbria's environment are provided in a baseline natural capital account, developed to inform this study, based on regional work for North West England by United Utilities⁶. This quantified:

- The breakdown of land cover within Cumbria, as shown in Figure 1, with nearly 60% grassland.
- The value of sixteen different benefits from natural capital.
- Estimated carbon sequestration in woodland, grassland and saltmarsh, of 670,000 tonnes CO₂e per year (tCO₂e/yr).
- Estimated emissions from livestock of 500,000 tCO₂e/yr.

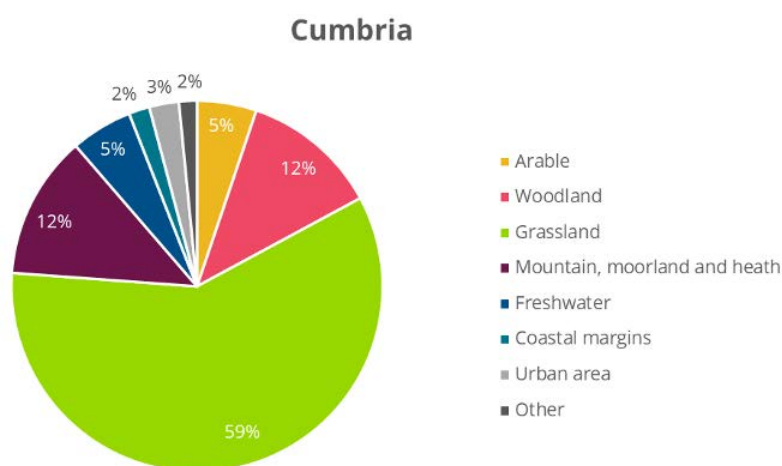


Figure 1. Cumbria Habitats Breakdown

Understanding Natural Capital Investments

Potential investments in natural and living resources should enhance underlying environmental assets, as well as allow multiple local projects to innovate and reflect local conditions. They should ensure local interest is retained in investments so that: i) they are shaped to meet local environmental and community needs & priorities, as well as the factors that generate a financial return to investors, and ii) a portion of the financial return is realised by local communities (100% of profit does not leave Cumbria and go back to investors).

3. Investment Opportunities in Cumbria - “Now, Next and New”

This section lays out a number of investment opportunities for living and natural resources in Cumbria.

Innovative natural capital investment in Cumbria could occur in three stages: “Now, Next and New”.

- The “Now” proposition includes community woodland, peatland, low carbon livestock. These are investor-ready and supporting actions can help them get to scale quicker.
- The “Next” proposition includes agroforestry, and catchment trading. These are also almost investor ready, but need more support to develop the investment structures and they also need help to communicate the benefits of roll out.
- The “New” proposition includes agrivoltaics, which is not a new idea but what is new is the consideration of the investing potential. This is a complex idea and an investor-ready grid connection feasibility study needs to be done.

⁵ Source: councilportal.cumbria.gov.uk/documents/s18253/Item%209%20-%20Cumbria%20Tourism%20final%20report.pdf

⁶ Research – Investing in Net Zero Cumbria (greeninvestmentplancumbria.net)



The Enabling Environment

The Lake District National Park joined National Parks UK, a global coalition of Protected and Conserved Areas such as Exmoor, New Forest, and the South Downs National Parks to carry out a massive programme of nature restoration. They are collaborating with a company called Palladium to leverage private finance into nature restoration through a new facility called Revere.

The Lake District National Park Partnership (LDNPP) ambitious new five-year Partnership Plan recognises the intrinsically interlinked issues of farming, forestry, nature recovery and climate change. Core commitments include i) Nature recovery should cover at least 10 % of the National Park by 2025. ii) Development of a nature recovery prospectus for the recovery of priority species and habitats across the park by 2022, with active delivery by 2025. iii) Actively pursuing the reintroduction of lost species, including Eurasian beavers, pine martens, eagles and more, by 2025. iv) Maintaining, celebrating and strengthening the World Heritage status and traditional farming systems while ensuring that these contribute substantially to nature and climate recovery. v) Increasing woodland cover to 17 % by 2050, ensuring the right trees are planted in the right places, for the right reasons, in the right way.

After decades of funding cuts to environmental protection and biodiversity, more recently there has been an increase in government funding. Public funding from the Government is an important source of finance and government intervention remains critical to growing and “crowding in” private investment in nature based solutions.

Of interest is the Natural Environment Investment Readiness Fund (NEIRF) – the second round is now open with the aim to create investable nature recovery schemes. The Government aims to stimulate private investment and market based mechanisms to improve and safeguard the natural environment and part of the grant money will help projects get ready for investment. The NEIRF provides grants of between £10,000 and £100,000 to support environmental projects that:

- Help achieve one or more natural environment outcomes from the 25-year environment plan.
- Have the ability to produce revenue from ecosystem services to attract and repay the investment.
- Produce an investment model that can be scaled up and reproduced.

“Now” Propositions

The “Now” proposition includes community woodland, peatland, low carbon livestock. These are investor-ready and supporting actions can help them get to scale quicker.

i) Woodland and Peatland

This opportunity involves generating benefits from woodland and peatland habitat restoration and management to realise financial returns while improving the well-being of local residents and visitors. Individual projects are usually too small to attract external investors, so an intermediary/ fund to pool investment and return is needed.

Community - A New Coastal Community Forest for Cumbria

A new community forest will be created along the west coast of Cumbria from Barrow to Carlisle, delivered by Cumbria County Council, in partnership with the Forestry Commission, Cumbria Woodlands and the National Trust. This corridor of woodlands will help Cumbrian coastal communities

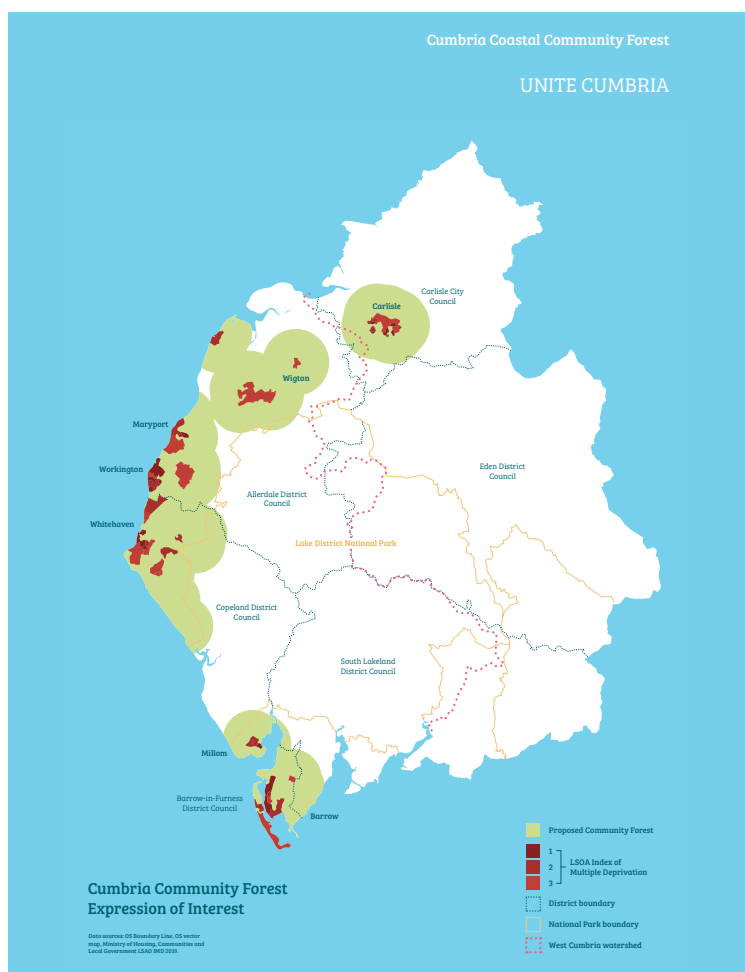


Figure 2. Map Source: Cumbria Community Forest Expression of Interest



enjoy the benefits of being outdoors and close to woodlands. The area has high levels of economic and social deprivation and only 9.9% woodland cover – 3% below the national average. Up to 150 hectares of trees, woodlands and forests will be planted, over the next five years. The aim is to create a minimum of 5,000 hectares of new woodland over the next 25 years. The project received £220,000 from Defra's Nature for Climate Fund. Cumbria's community forest will add to England's network of Community Forests.

Up to 150 hectares of trees, woodlands and forests will be planted, over the next five years. The aim is to create a minimum of 5,000 hectares of new woodland along a 56 mile stretch of the western coast of Cumbria over the next 25 years. The project has received £220,000 from Defra's Nature for Climate Fund. Cumbria's community forest will add to England's network of Community Forests.

Cumbria Coastal Community Forest. Create A Single Community Forest Finance Mechanism

Opportunity NC-1: Finance for 7,000ha of Community Woodland Creation in West Cumbria over the next 10 years.

Building on the proposed 'Cumbria Coastal Community Forest', as earlier described, the first tranche of government funding would support 150 ha. Additional funding is needed to raise the investment required to deliver the Community Forest's 25 year objectives and target 7,000 – 10,000 ha of new woodland. Woodland creation is estimated to cost £6,000 per ha, giving a required investment of at least £42m.

7,000 ha of new woodland in Cumbria is estimated to sequester 1.7m tCO₂e over 60 years.

Using a market price of woodland carbon code (voluntary) credits of approx. £20 tonne of CO₂e, this could be worth £34m in cash returns⁷. Health and wellbeing benefits, in terms of recreational welfare and avoided medical costs as a result of enabling physical activity, are estimated at £238 m (PV60). These benefits can potentially motivate investment from public health bodies (NHS Trust/ Local Authorities) and others with funds to support community wellbeing, or from ELMS, for example through support for the Local Nature Recovery Strategy.

To maximise the potential for realising financial and wellbeing returns from the Cumbrian Coastal Community Forest, the activity would ideally be coordinated via single planning, finance and governance mechanism. This could enable investment at a larger scale while looking after community interests and managing delivery risk. It should:

Possible Nature Investment Mechanism for a Cumbria Coastal Community Forest

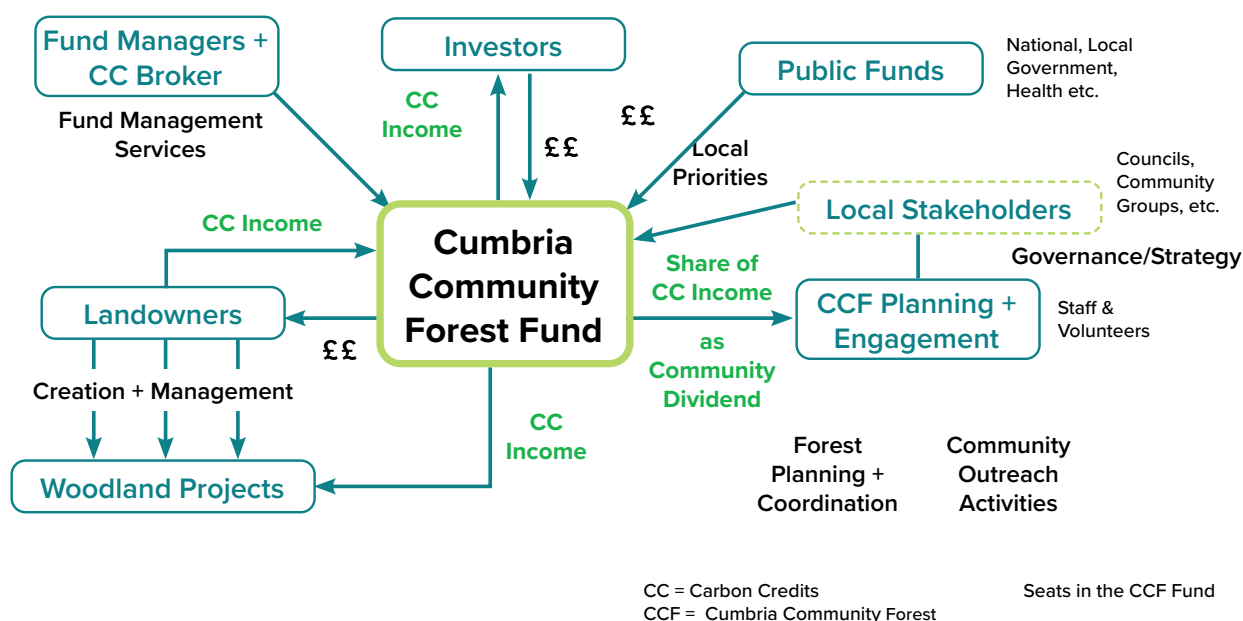


Figure 3. A possible finance mechanism for a Cumbria Coastal Community Forest

⁷ Note for fund: Skewed toward the latter part of the project as carbon sequestration by woodlands increases as they mature.



- Involve communities, through a role in the ownership and governance of the Forest, and through processes to prioritise locations and types of woodland.
- Receive investments; fund, monitor and verify woodland creation; and return environmental credits and/or funds to investors, and benefits to local communities.
- Identify land for cost-effective woodland creation, through partnerships or mechanisms such as a reverse auction (as used to attract land to create the National Forest in Leicestershire).

For more information on our community forest investment proposal, please get in contact with us.

Woodland and Peatland Carbon

Woodland

The benefits from woodland creation need not be restricted to the Coastal Community Forest area (although without the Coastal Community Forest initiative, it may be more reliant on other benefits, particularly carbon credits). However, it can also support catchment management for nutrient and flood risk reductions (see Opportunity 3).

Trees, woodlands, and forests play a key role in greenhouse gas removal. The Climate Change Committee (CCC) has recommended planting around 30,000 ha of new woodland in the UK every year until 2050, equating to nearly a million ha of woodland over the next 30 years. Productive woodland has the greatest potential to sequester carbon and this is because peak CO₂ uptake occurs at the same time as peak timber growth. However, Cumbria is below the national average for woodland cover, with 58,500 ha of woodlands covering 9.9% of the county (compared to 12% nationally) and include are equally balanced between conifer and broadleaf species - storing the equivalent of some 35 million tCO₂e and sequestering some 650,000 tonnes a year.⁸

The Woodland Carbon Code returns vary by woodland type and other factors but can generate around 100-300 tCO₂e over 30 years. Current price levels of around £20 per tonne can generate a revenue of up to £200/ha/year, with a potential present value revenue of around £3,000 / ha over 30 years. The Woodland Code is now quite well established as a source of voluntary carbon credits, with several brokerage firms active in the market, so this is seen as quite a mature and easily tapped revenue stream. Current examples of carbon buyers in the UK include high street retail chains, national transport operators and infrastructure developers.

Peat

Opportunity NC-2: Fund 29,000 ha of Peatland Restoration in Cumbria over the next 10 years.

Peatlands are England's largest natural land carbon store. The Climate Change Committee (CCC) estimates the amount of healthy peatland required to help the UK achieve its carbon targets needs to be increased from the current 25% to 58 per cent by 2035 and to 79% by 2050.

The Peatland Code estimates the avoided emissions from restoration taking into account the condition and depth of the peatland. The avoided emissions are approximately 19 tCO₂e/ha/yr for actively eroding peatland or 2 tCO₂e/ha/yr for drained peatland. Based on a £20/tonne CO₂e voluntary carbon prices, these give revenues of £16,600 - £33,200 and £1,700 - £3,400 per ha, over 50 – 100 years, respectively. The timescale is determined by the depth of the restored peatland.

In Cumbria, there are approximately 42,000 ha of peat which, according to Cumbria Wildlife Trust, because of their condition, releases the equivalent of 222,769 tonnes of CO₂ every year. Most of Cumbria's peat (at least 70%)⁹ is suitable for restoration, and an immediate carbon saving could be made by restoring peat and altering land management.¹⁰ Nearly 5,000 ha of peatlands in Cumbria have been restored since 2015, providing useful experience at a local level.

Further restoration efforts are required on approximately 29,000 ha (70% of 42,000 ha) in Cumbria. The exact condition of this area is not known, but in England, approx. 27% of peatland is heavily eroded.¹¹ If the remainder is drained, its restoration could avoid emissions of 2.1 – 4.3m tCO₂e and generate £37m – 73m of voluntary carbon credits, over 50-100 years. For the eroding peat,



Foulshaw Moss, Cumbria. Photo credit: Ian Alexander Waite

⁸ Source: Cumbria Coastal Community Forest EOI, June 2021

⁹ Source: Simon Thomas. Peatland Partnership. Cumbria WT, per com.

¹⁰ Source: www.cumbriawildlifetrust.org.uk/about/what-we-do/living-landscapes/wildlife-conservation-projects/peatland-restoration

¹¹ Source: www.iucn-uk-peatlandprogramme.org/sites/default/files/2019-11/COI%20State_of_UK_Peatlands.pdf



these figures are 20 - 41m tCO₂e and £350m – 701m over 50-100 years (ranges depend on peat depth). In total these give avoided emissions of 22 – 45m tCO₂e and generate £387m – 774m of voluntary carbon credits.

Different techniques are used to restore peatlands depending on the characteristics of the site to be restored. Costs of techniques vary (but are not limited to) whole-tree mulching, felling to waste, damming drains with plastic and hag reprofiling. Overall, the median restoration cost per ha is £1,009.¹² Damming drains with peat is the least expensive method at £105/ha.

The Peatland Code, developed by the IUCN, is very recent and therefore much less tested than the Woodland Code. Given that it follows the same principles, however, there should be a reasonable expectation that it will be an effective way for land managers to generate a new income stream.

Previously, the only funding for peatland restoration was through Government grants. This continues with the Nature for Climate Peatland Grant Scheme (NCPGS), which provides funding to restore peatlands in the uplands and lowlands of England. It is a competitive grant scheme that will run until 2025 and includes both discovery and restoration grants.

Cumbria is part of the 'Great North Bog' initiative which aims to restore thousands of acres of peatland stretching from the Peak District to the Scottish Borders. The area covers five national parks including the Peak District, Yorkshire Dales, North York Moors, the Lake District and Northumberland. The peatland restoration project is estimated to cost in excess of £200m over a 20-year lifespan and involves protecting and restoring 2,700sq miles of upland peat. The Great North Bog area is estimated to store more than 400m tonnes of CO₂. Cumbria is also part of the Northern Lowland Peatland Coalition – which includes sixteen sites from north Cumbria, Lancashire, Greater Manchester, to the Mersey floodplain. The Cumbria tranche covers 99 ha.

Some examples of peat bog restoration projects in Cumbria include Bampton Commons, Bolton Fell Moss, Foulshaw Moss, Wedholme Flow, Roudsea Wood and Mosses National Nature Reserve, with more underway.

Agricultural Low Carbon Innovation

Recommendation NC-D: Maximise private sector investment leveraged by ELMS scheme in Cumbria.

There are several potential private-sector funded innovations through which agriculture can reduce its carbon footprint and diversify incomes to farmers. Opportunities for this include:

- NC3: Establish lower carbon grazing enterprises on 50,000 ha of grassland in Cumbria over the next 5 years.
- NC4: Establish agro-forestry on 10% of Cumbrian farmland (50,000 ha) in the next 5 years.
- NC-6: Establish agrivoltaics on 10% of Cumbrian farms in the next 5 years.¹³



Looking on to Ullswater. Photo credit: Adam Burton

Agriculture dominates the Cumbrian landscape and contributes to about 6% of Cumbria's carbon emissions (based on 2017 figures) and 2.1% of the GVA for the county (£250m) (CLEP, 2017). Grassland is the dominant land use in Cumbria, covering 59% of the land and the livestock sector generates an estimated income of £131m¹⁴ per year for the county. These agricultural systems have high carbon emissions, including from the livestock which may omit 0.5m tonnes of CO₂e per year. Where the intensity of livestock management is high, this can have negative impacts on biodiversity and water quality.

It is a concern that Cumbria's agricultural output is declining, not only in relative terms but also in absolute terms. As described in the Lake District Management Plan Consultation, the sector faces multiple challenges relating to changes to public support payments, climate change adaptation and delivering nature recovery and net zero climate targets. In particular, upland farming continues to be some of the most marginal and fragile in terms of financial sustainability and resilience.

Major changes are expected in agriculture due to the introduction of the Environmental Land Management Scheme (ELMS) for farm payments. There are also several potential private-sector funded innovations through which agriculture can reduce its carbon footprint and diversify incomes to farmers. In 2016, Defra reported that there were 5,135 farm holdings in the county and the total farmed area was 508,000 ha. The average size of Cumbrian farms is 99 ha (England's average is 85), employing on average 2.4 people (England's average is 2.8). Self-employed incomes in Cumbria are not much over £9000. Innovation is needed.

¹² Source: file:///C:/Users/ciara/Downloads/How_much_does_peatland_restoration_cost___insights_from_the_uk_accessible.pdf

¹³ Note - some overlap with energy recommendations.

¹⁴ Based on expected gross margins.



Environment Land Management Scheme (ELMS) and Local Nature Recovery Strategy

While there is broad acceptance of the need to change from the Basic Payment Scheme (BPS) and Countryside Stewardship funding into ELMS, the phase-out of direct payments and Environmental Land Management (ELM) timelines are of concern to current farming practices in Cumbria. The NFU's impact analysis has shown that medium performing farm businesses on average would see a 14% reduction in profitability in 2022 with profits reducing 25% by 2023 and over a third (35%) by 2024. For some sectors, reductions in profitability would be as high as 28% in 2022, 49% by 2023 and almost three-quarters (71%) by 2024.¹⁵

ELMS should be integrated with a wide range of other environmental policies and funds to maximise impact (e.g. the Climate and Nature Recovery Fund, Biodiversity net gain, Local Nature Recovery Strategies, as well as the England Peat and Trees Action Plans).

Cumbria is also one of five pilot areas trialling the development of the DEFRA Local Nature Recovery Strategy (LNRS). The Strategies will form part of the national Nature Recovery Network, which plans to create or restore 500,000 ha of wildlife habitat outside protected sites across the UK. This will also be critical to strengthening resilience to the physical impacts of climate change such as flooding. Cumbria experienced some of the worst flooding events in 2009 and Storm Desmond in 2015.

Low Carbon Livestock Farming

Opportunity NC3: Establish lower carbon grazing enterprises on 50,000 ha of grassland in Cumbria over the next 5 years.

There are a range of practices, and some lower carbon livestock systems are being used which focus on soil health and hedge/grassland sequestration.

In the Annex, a scenario analysis is presented to estimate impacts for different livestock systems on 50,000 ha of farmed land in Cumbria. A low carbon livestock system is compared to a conventional system, using data from existing systems and the baseline Cumbria Natural Capital Account. Compared to the conventional scenario, the low carbon scenario emits 20,000 (over 80%) fewer tonnes of CO₂e per year but provides only 25% of the income.

Displacement of emissions means the additionality of carbon savings is uncertain. For the production volume, conventionally farmed, the low carbon system reduces emissions by 8,500 tCO₂e per year (or 425,000 tCO₂e over 50 years). Under the low carbon scenario, the farming system can potentially have income streams from:

1. Meat from livestock.
2. Carbon credits for a reduction in emissions from livestock and additional woodland creation.
3. Value of public benefits potential, funded through ELMS.
4. Other private markets, such as biodiversity units for biodiversity net gain, or catchment management (e.g. for water quality).

To take investment forward the length of contracts on the income sources need to be aligned with a potential investment horizon. An enhanced monitoring & verification system would be needed to account for required returns.

“Next” Investment Propositions

These “Next” propositions include agroforestry and catchment trading. These are also almost investor ready, but they need more support to develop investment structures and help to communicate the benefits to help roll out.



Near Higham Hall, Bassenthwaite Lake. Photo credit: Una Aynsley

¹⁵ Source: committees.parliament.uk/writtenevidence/21852/pdf/



i) Agro-Forestry

Opportunity NC4: Establish agro-forestry on 10% of Cumbrian farmland (50,000 ha) in the next 5 years.

Agroforestry is a well-established land use management system in which trees or shrubs are grown around or among crops or pastureland. It comes in many forms from alley (harvesting crops between lines of trees) to hedges and from shelterbelts to in-field trees. It can potentially support 6 tCO₂e of sequestration per ha per year, which at £20 per tonne CO₂ provides £120 per ha, or for a typical 99 ha farm could provide £11,880 per year from voluntary credits. If adopted on 10% of farmland (approx 50,000 ha) it could sequester 300,000 tCO₂e/yr, or 15m tonnes over 50 yrs.

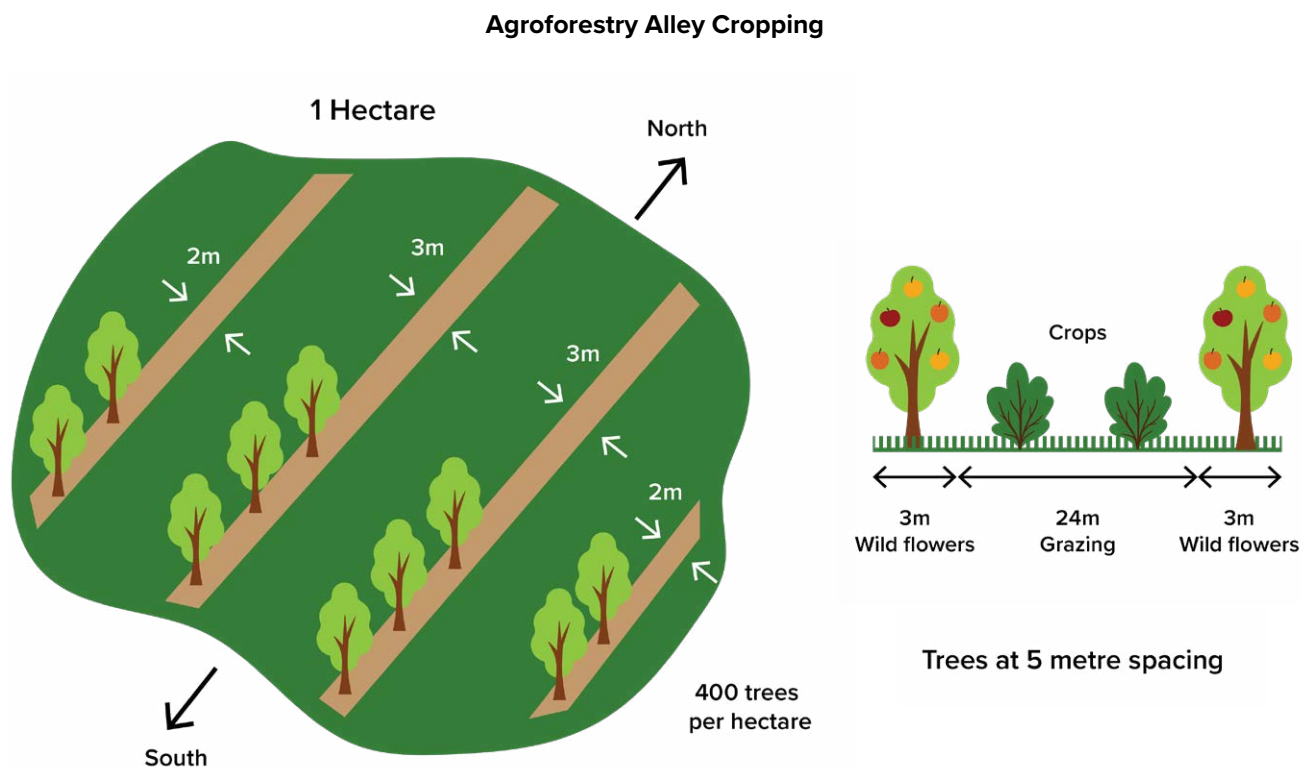


Figure 4. Planting distances of agroforestry and alley cropping

Note. The spacing between the rows varies but is designed to accommodate the mature size of the trees while leaving room for the planned alley crops.

Agroforestry is a diversification in farming practice that initiates an agroecological succession. The method can provide enhanced yields from food crops and livestock, can increase biodiversity, improve soil structure and health, reduce erosion, reduce nitrate leaching and support increased carbon sequestration. The trees and shrubs planted also have a role in water management, protecting water quality from pollutants and helping to slow the flow by improving the infiltration of water into the soil. In this way agroforestry, particularly in uplands, can be a key component in regional flood mitigation.

Agroforestry is not well understood yet by farmers and requires substantial changes in farming practice, but the benefits can be significant. This is why we suggest starting with demonstration farms that can provide leadership.



Agroforestry is an excellent example of integrated land use in action. Implementation of arable and grazing land can increase productivity by up to 40% and create a more resilient and sustainable future for farms as climate change impacts increase. Each farm could implement the scheme with an investment of £100,000 in planting up to 400 trees and shrubs per ha. If covering 50,000 ha on 500 farms (some 10% of the total number) this would require £100m of investment, for which grants are available to support part of this. This would enable Cumbria to meet the Climate Change Committee (CCC) afforestation targets and mean that livestock numbers could be supported at significantly higher levels than the reductions under 'Low Carbon Livestock Farming' described above.

A specialist fund could be set up to channel investment to farmers for the implementation of agroforestry schemes. A possible structure of such a fund are set out and explained below, as a starting point for discussion.

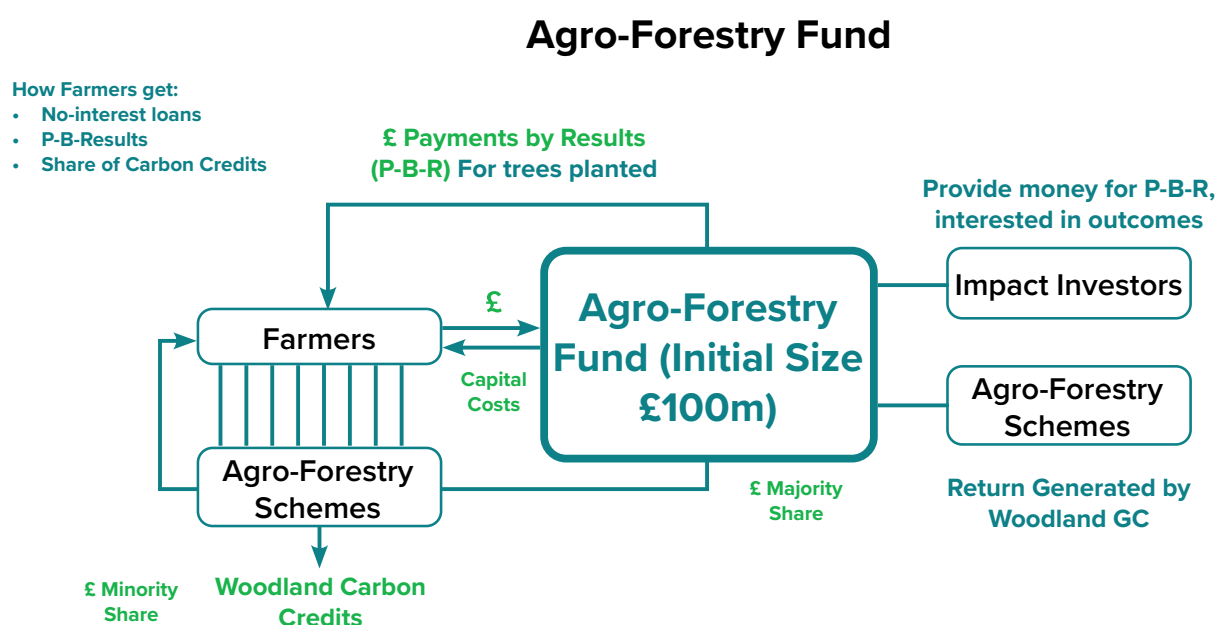


Figure 5. Proposed Agroforestry Fund

Understanding the Agroforestry Fund

The Fund would provide low or perhaps even no-interest loan finance for farmers to implement agroforestry schemes. The initial suggested size of £100m would fund 1,000 farms over approximately 15 years, at the average cost per the scheme of £100,000.

Income streams (or avoided costs) for farmers to repay the initial outlay would be increased yields (and reduced inputs), voluntary carbon credits and 'payments-by-results' from public and private investors interested in the ecosystem services outcomes, such as watershed and flood management and reduced soil loss and nitrate leaching.

Returns for commercial investors would arise from their share of carbon credits and, depending on the economics of sub-projects, potentially a share of payments-by-results. The existence of the Fund should also permit some cost savings on trees and labour from the effects of aggregated purchasing power. The interest cost to farmers would be offset by a share of the woodland carbon (and perhaps also ecosystem services) credits generated.

The life of the fund could be say 12 years, allowing a good payback period for farmers, whose income should improve from the start and thus allow a steady repayment profile over the final 8 years of a 12-year fund, allowing a 4-year grace period where only interest would be paid and income from carbon credits would kick in from year 5. Alternatively, the fund could remain open-ended, if there was a facility for new investors to buy out investors wishing to leave.



ii) Catchment Trading Platforms

Opportunity NC5: Support adoption of market approaches in the majority of catchments.

Catchment trading refers to payments made to land managers in a river catchment to provide benefits to downstream activities. The changes made to land management aim to improve the quality of the natural environment, such as by reducing nutrient runoff and holding back flood waters. The benefits to downstream activities take the form of avoided costs, either from reduced damages (e.g. flooding) or from reduced costs of engineered solutions (e.g. concrete flood banks, extra water treatment works). The land management solutions are less energy intensive than downstream alternatives, so reduce greenhouse gas emissions.

There are already local payments for ecosystem services arrangements in operation in some catchments in Cumbria such as the Petteril (nutrient reduction through changes to livestock farming) and Wyre (Natural Flood Management (NFM) measures). Under both approaches, payments are made for ecosystem management actions that provide benefits to downstream activities. Combining public payments with private investments, they have the potential to be scaled up to the majority of catchments in Cumbria

- The Petteril Catchment - Installing and operating traditional phosphate removal technology in the Petteril catchment would have cost United Utilities £14m and would have missed 70% of the river's problem. The cost of the integrated catchment management strategy comes in at closer to £4m. As well as the reduced costs, there is also a reduction in energy consumption and thus carbon emissions, and also additional benefits are delivered through increased carbon sequestration in the land being managed, slowing the flow of floodwater, and reduced risk of pollution at nearby Bowscar borehole. Extrapolating these benefits from the Petteril (£10m saving in a 16,000 ha catchment) to the two M6 catchment areas (see below - total area 280,000 ha) would save an estimated £175m.
- The Wyre - Natural Flood Management (NFM) measures covered 50 ha of land in the catchment and have involved an investment of £100,000. The Wyre catchment is 27,500 ha. Applying the same density and cost of NFM measures as in the Wyre to the M6 catchments would involve £1.0m – £2.5m of investment.

NFM contributes to carbon sequestration through habitat restoration and reduces the need for more carbon-intensive built flood management structures.

“New” Investment Propositions

i) Agrivoltaics (AV) - Farming and Solar Energy

Opportunity NC6: Establish agrivoltaics on 10% of Cumbrian farms in the next 5 years.

Agrivoltaics (AV) refers to a process for the simultaneous use of land for agricultural production and photovoltaic (PV) electricity production. It is gaining ground very quickly in some developed countries. Agrivoltaics technology offers a way to expand large-scale photovoltaic systems on open spaces while keeping agricultural land use as a resource for food production. This is necessary because while fertile farmland must be preserved for agriculture, solar energy is expected to become a pillar of energy supply in the long term. Productivity on arable land has been found in trials to increase because of reduced transpiration in the summer heat.

Extensive trials in Germany have shown that putting in 850kw of panels per ha (covering only 1% of the ground) is a good arrangement. The termination of the feed-in tariff in the UK in 2019 reduced the income from PV schemes by a quarter, which makes the viability of schemes more challenging but still achievable (assisted by a continuing fall in equipment costs). The UK Smart Export Guarantee (SEG) scheme is suitable for an 850kw installation and pays typically 5p per kWh quarterly for energy fed into the UK grid



Near Bassenthwaite Lake.
Photo credit: Una Aynsley



AV trials have shown that when used above grassland pasture, animals make a lot of use of the shade created by panels and animal productivity is maintained as long as the grass is not overgrazed. Farmers can choose ground-level panels just for animals to graze underneath or high level mounted panels under which alley cropping can take place, just as in agroforestry arrangements, meaning that the technique can be applied in both livestock and arable production settings.

If each farm in Cumbria was to put 1 ha into agrivoltaics, accommodating an 850kw installation, this would represent a total of 4GW of power generation, enough to power 1 m homes with average sunlight. On the average farm size of around 100 ha, this is only 1% of the land. The PV could power all the farm needs, subject to storage and farming methods, and surplus is exported, there need not be any loss of farm productivity because the land would still be used for arable or livestock production as before. The total installation cost loan needed for green investment in Cumbria will be £490k per farm. Initial uptake across 10% of farms would require a total investment of £260m. Some allowance is made for grid connections but integration with Cumbria's grid upgrade would be essential to accommodate the increased local supply.

Return to farmers is provided through energy supply (up to an agreed level), and potentially rent on the land used. Typical farm use is estimated at 50 MWh p.a. and expected generation is c 725MW p.a., giving a surplus of 675 MWh per farm for export to the grid, which would enable the fund mechanism described below to work. 725 MWh of solar energy avoids using grid energy and associated emissions of 169 tCO₂e per farm (based on 0.233 tCO₂e per MWh). If 10% of farms (approx 500) were to use agrivoltaics in this way, it would save 84,500 tCO₂e per year.

Notes Flows

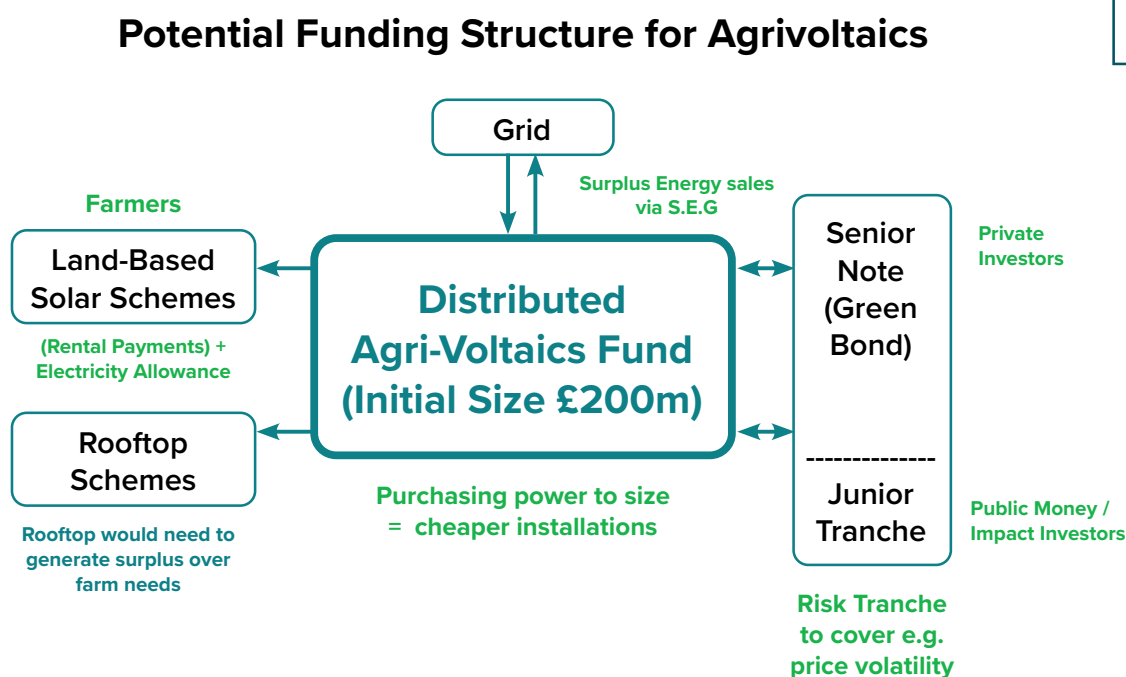


Figure 6. Proposed Funding Structure for Agrivoltaics

Understanding The Agrivoltaics (AV) Fund

The AV Fund would provide finance for farmers and others with land or rooftop assets (referred to for simplicity as farmers, as they would be the main target) to establish small solar PV projects on their properties. The average cost of such projects, for one ha of land, could be £490,000.

In order to avoid risk for the farmers, all capital and maintenance costs of projects would be covered by the Fund. Income for the farmers would be provided mainly 'in kind', via their enjoyment of the energy supply from the project up to an agreed level. As mentioned above, if typical farm use is 50 MWh p.a., this would be worth some £8,500 p.a. To the farmer, at current



prices, this would leave a surplus of 675 MWh available for export to the grid, which would be the main source of return for investors in the Fund. Depending on the size of the project, farmers might also receive a rental for the site on which panels were installed.

The Fund would be financed via the issuance of green bonds. As the agrivoltaics technology is new in the UK, some proof of concept would be needed, which might be secured via an equity tranche of say £25 m to cover the first 50 installations over a period of say two years, with the senior bond tranche being issued at this point. This path would also allow some reserves to be built up in the fund since sales to the grid would commence on day 1 while repayments to the fund would be delayed for a grace period. Ideally, the equity tranche would be subscribed by a concessional investor seeking a return of capital over time, in order to help prove out the technology.

The maturity of the bonds once issued would be linked to the expected operating lives of the panels. The bonds would be designed to appeal to institutional investors, providing a steady and predictable source of income over a long period (15-20 years) before repayment. Since energy export revenues would be built up from day 1, and bond repayments would not start for at least a decade, substantial reserves would quite quickly be built up in the fund, so that the junior tranche could be paid down once the proof of concept and technology was secured.

The key risk to the project would be the long-term offtake of surplus energy. For this risk to be realised, the Smart Export Guarantee (SEG) scheme would have to be ended without any replacement or other way of distributed generation being sold to the grid, which seems unlikely during a transition phase when all sources of energy are likely to be needed.

Community Interest Company (CIC) to Support Investments in Now, Next and New Propositions

- **Recommendation NC-A: Establish Cumbria Environmental Community Interest Company**

The opportunities identified are at different stages of development in terms of being investment-ready. The woodland and peatland opportunities are investment-ready in terms of required actions being proven and revenue opportunities established (at least for carbon). They may need more delivery resources and/or governance to scale up, so there is potentially a role for a Community Interest Company to:

- Support and coordinate local brokers to retain targeting and ensure actions are location-appropriate and build trust with land managers/ delivery partners.
- Represent community interests in the delivery of investment (including in the Cumbria Coastal Community Forest and Catchment Trading platforms for nutrients and NFM), and
- Receive community benefits (financial or otherwise) as part of investment payback.

The Peatland and Catchment investments need to be aggregated to provide a scale of investment, and spread of risk, for external investors. The outputs from the agricultural measures mentioned above would also benefit from this aggregation. An environmental community interest company with the ability to trade / bank environmental credits (e.g. for biodiversity, carbon, nutrient reduction actions) and funds (e.g. to disburse when projects meet conditions).



Sheep near Bassenthwaite Lake. Photo credit: Una Aynsley

¹⁷ For example the Lowther Estate is already undertaking tree planting and extensive livestock production, and planning peat restoration.



This could be achieved through a warehousing facility for environmental market credits (see finance model below). This facility would establish standardised metrics and monitoring of carbon sequestration in habitats (and avoided peatland emissions), nutrient reduction actions (e.g. field buffer strips), NFM measures and potential biodiversity units under Biodiversity Net Gain.

- **Recommendation NCB: Establish a Warehousing Body for Environmental Credit Trading in Cumbria.**
- **Recommendation NC-C: Establish a Low Carbon Agri-Innovation Hub.**

In addition, the agricultural measures would need to address cultural barriers. For example, the NFU reports that there is resistance to the term agroforestry amongst the farming community. This is partly a result of the lack of a universally accepted definition and general confusion around what it encompasses. To become a mainstream activity being suggested here, farmers need accessible and high-quality advice and examples of best practices and indeed potential productivity and income gains that are also often not well understood.

It is recommended to develop a low carbon agricultural innovation hub that can:

- Promote 10+ demonstration farms¹⁷ for agricultural innovation, including for lower carbon livestock and Agroforestry approaches, and agrivoltaic installations, as discussed above.
- Monitor demonstration/ pilot farms for viability and environmental outcomes (carbon, nutrients, water runoff, biodiversity).
- Address investment readiness issues such as:
 - Feasibility studies for suitable farmland locations for investment (e.g. for agrivoltaics in terms of aspect and electricity grid connections).
 - Training in new environmental markets and contracts, such as for Woodland Carbon Code and Biodiversity Net Gain.
 - Recommending standard contracting terms for low carbon farming opportunities.
 - Enabling market access by tenant farmers, who occupy a significant minority of farmland in Cumbria.

Funding for the hub could come from existing economic development funds / support (e.g. Cumbria LEP and the Borderlands Growth Deal) and private sector sources with interests in low carbon farming, such as Morrisons.¹⁸

Understanding the Ecosystem Services Warehouse Fund

‘Warehouse’ structures are commonplace in asset classes such as mortgages, car leases and similar consumer assets. These structures allow for assets to be originated ‘piecemeal’ over time and held in the warehouse vehicle until sufficient volume exists for periodic issuance of notes, bonds or similar instruments, using the built-up assets as collateral. Proceeds of issuance ‘refresh’ the warehouse funds, allowing more assets to be created.

The proposed Ecosystem Services Warehouse would originate ecosystem services contracts with farmers or others able to offer services such as water quality, flood or catchment area management, soil retention or peatland restoration. The Warehouse might be best operated on a regional basis, to maximise the origination of high-quality assets over reasonably short timeframes while still retaining the ability to understand the local context for underlying schemes.



School Knott Tarn. Photo credit: C Shannon

¹⁸ E.g. Morrisons leads green farming revolution with pledge to have first net zero British farms by 2030 (morrisons-corporate.com)



Ecosystem Service Warehouse Fund

Notes
Flows

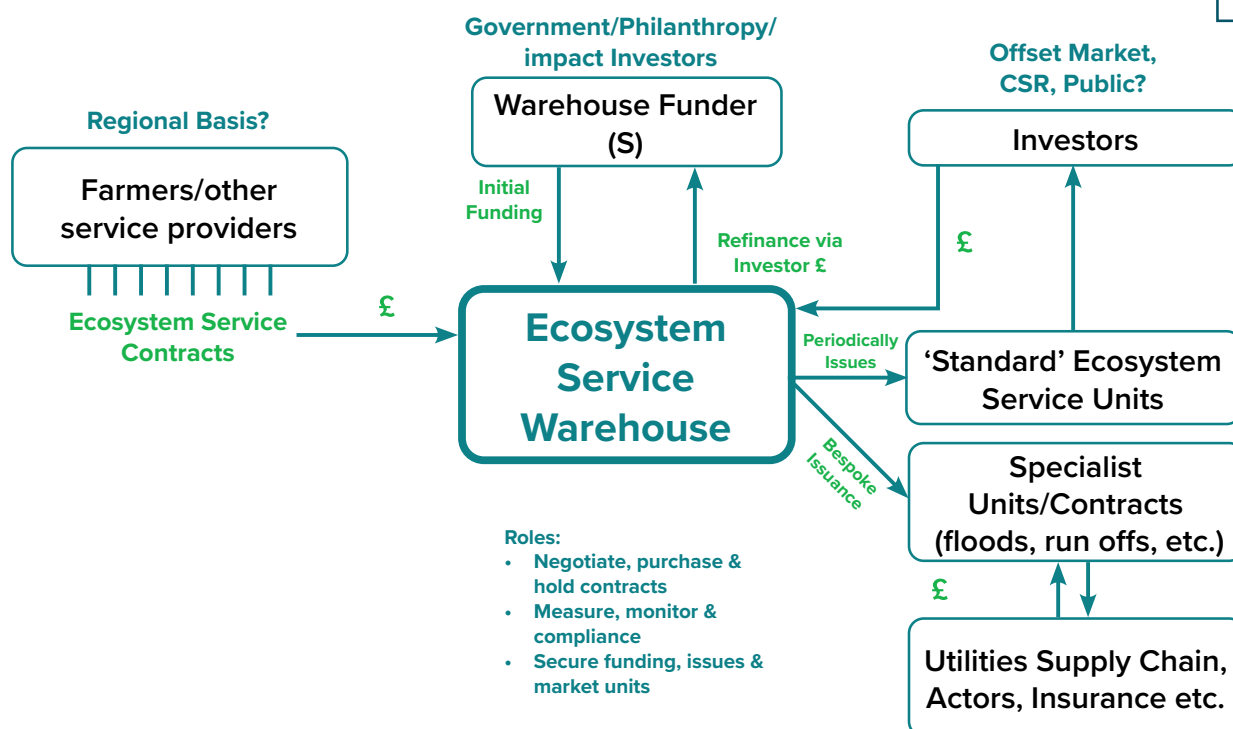


Figure 7. Ecosystem Service Warehouse Funding Structure

The Warehouse Manager would need to be able to carry out a number of functions, on an in-house or contracted basis, including:

- Identifying a pipeline of potential services, and then negotiating and holding contracts for them.
- Measuring and monitoring the performance of contracts and taking corrective action if needed.
- Securing funding for the Warehouse and issuing and marketing instruments based on its assets from time to time.

The Warehouse would probably mainly issue 'generic' ecosystems services 'units' comprising the effects of a blend of all the different types of contracts it was entering into. These units would be aimed at investors looking to enable a range of environmental goods to be implemented, without having any specific 'agenda' for such goods. These might include ESG funds, impact investors, organisations looking for offsets for their own activities, the CSR market and even the general public.

Because of its skill sets, however, the Warehouse could also offer to create bespoke issuances of aggregated contracts with specific themes for organisations seeking to achieve specialist outcomes, for example, water utilities, companies looking to green aspects of their supply chains, insurers seeking flood management services, and so on. It could also act as a broker of large contracts.

The initial funding for the Warehouse, in the form of a loan, could be secured from commercial sources, or public, philanthropic or impact investing sources looking to enable the outcomes to be delivered. The involvement of a mix of these actors could reduce financing costs for the Warehouse.

The Warehouse structure could be open-ended (allowing it to become a permanent 'feature in the landscape' for both investors and service providers), although each issuance made would have a specified maturity.



6. Energy Efficiency and Retrofit in Cumbria Buildings

1. Overview

Domestic energy consumption (gas, other fuels, and electricity) is responsible for 26%¹ of Cumbria's carbon dioxide emissions. This is higher than the UK average of 21%.

While substantial progress has been made in decarbonising electricity there has been much less progress in decarbonising how we heat buildings, or in improving their energy efficiency so that heat does not simply escape through walls, windows and up chimneys.



A street in Kendal. Photo credit: The Cumberland

Whilst there is room for further innovation in financial products and mechanisms for retrofit, more significant challenges lie in boosting demand for domestic retrofit. Additionally, in Cumbria, there is an urgent need to develop a local workforce of skilled retrofitters. This underpins our proposed ideas for what should be prioritised.

Key Recommendations

1. Make maximum use of ECO and other funding for low-income households.
2. Establish a retrofit delivery organisation.
3. Develop an advisory and project management service for the owner-occupier market.
4. Apprenticeship 'Payment by Results Scheme'.
5. Develop a retrofit strategy for Cumbria.
6. Develop a carbon-credit scheme for home retrofit.

¹ Source: cumbria.gov.uk/elibrary/Content/Internet/536/671/4674/17217/17225/4414012219.PDF



2. Cumbrian Homes Are Not Fit for The Future

According to the Potential for Green Jobs in Cumbria report:²

- **Around 70% of properties in Cumbria have an Energy Performance Certificate (EPC) rating of D or below.**³
- To upgrade them in the next 15 years - **220 residential properties a week will need upgrading to EPC C or better.** (A band C rating is the lowest for a home to be considered reasonably energy efficient and to qualify for schemes such as the Renewable Heat Incentive).
- An average of **1350 jobs a year** could be created over a 15 year transition period (to retrofit domestic and commercial buildings and install heat pumps, or other zero carbon heating, in 90% of domestic properties).⁴

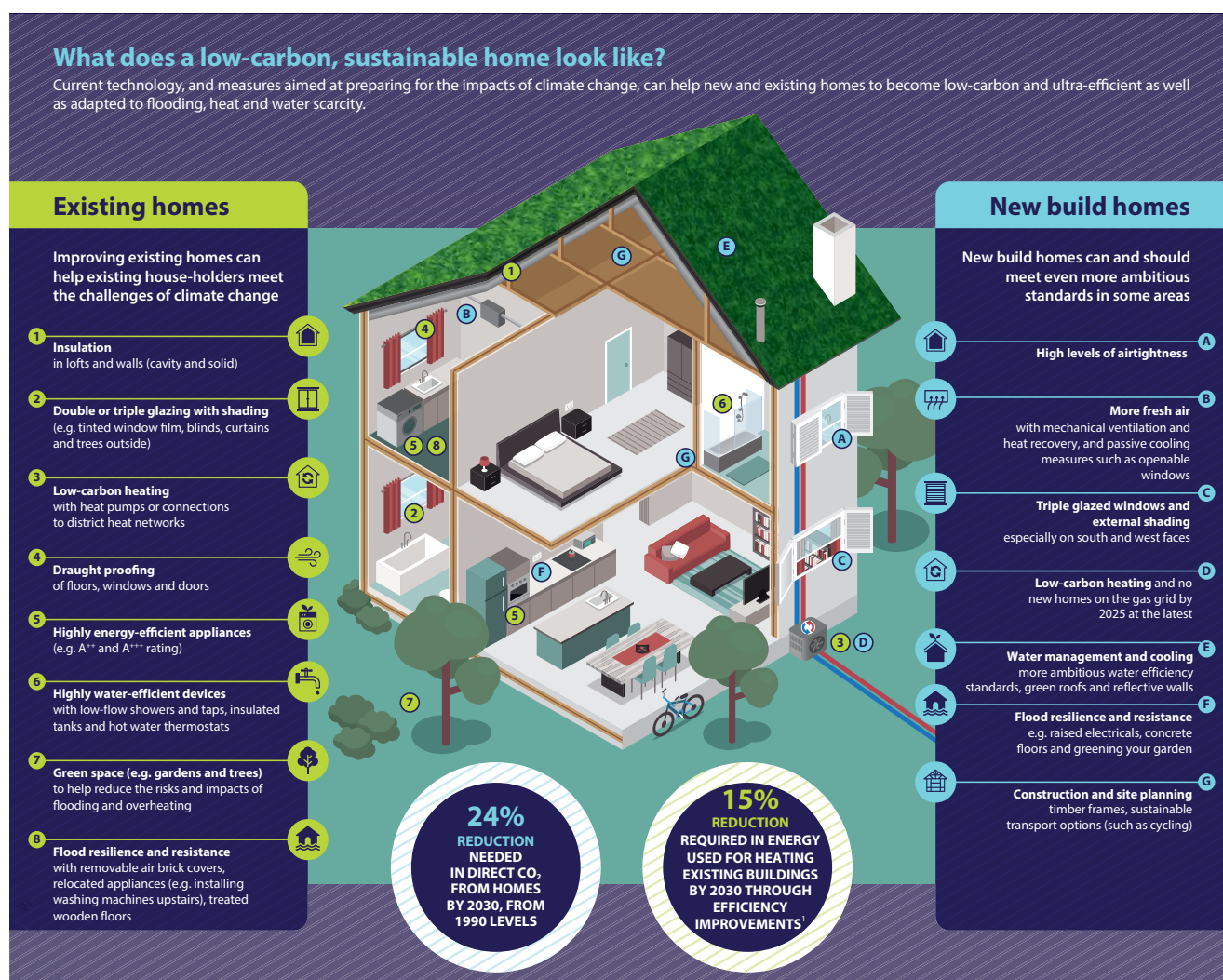


Figure 1. UK Housing Fit for the Future. Image credit: The Climate Change Committee (CCC), February 2019

Barriers to Retrofit

Despite the necessity of retrofitting in order to reduce emissions from domestic energy consumption, progress has so far been stymied across the UK by piecemeal national policy, low demand and a lack of understanding of the need for retrofit from householders, and not enough skilled retrofit installers.

² Source: The Potential for Green Jobs in Cumbria, Cumbria Action for Sustainability, March 2021

³ Information on the energy efficiency of buildings in Cumbria has been obtained from the national database of energy performance certificates (EPCs)

⁴ Source: The Potential of Green Jobs in Cumbria, Cumbria Action for Sustainability (CAfS), March 2021



One key reason for this low demand is that the costs of retrofit vary considerably depending on the scale of work required, and where high can be a significant barrier to take up. Some properties will need a 'whole house retrofit', including improving or installing insulation, glazing, draught-proofing, and replacing the boiler; all of which could cost as much as £35,000. In many cases property owners are not sure work they need done, and therefore how much they need to spend, compounding the uncertainty over the investment decision.

Other reasons for low demand may include the following challenges:

- The **low returns and long pay back periods** often associated with retrofit measures (and indeed associated domestic generation measures such as solar PV) mean that there is no obvious financial incentive for property owners to undertake work that can be expensive and disruptive.
- Lack of **consistent, long-term Government policy** undermining the confidence needed to invest in major energy efficiency measures.
- Lack of **trusted information** on what should be done to a particular property.
- Lack of skilled **tradespeople/installers** who can do the work required to a good standard.
- Lack of an understanding on how to access **finance**.
- In many cases, homeowners move before their investment has been recovered. Often, if investments were made, they were not able to recover these in the sale price, as valuations do not sufficiently reflect energy efficiency.

70% of Cumbrian Homes Have an EPC of D or below

In the rented property sector, an additional contributory factor to low demand is the problem of split incentives. These occur when the tenant enjoys the additional comfort and energy / cost savings resulting from a retrofit, while the landlord, who is making the investment, is not necessarily able to increase the rent commensurately. Since April 2020, landlords cannot let or continue to let domestic properties with EPCs of F or G and the government has consulted on raising this to band C by 2025 for new tenancies and by 2028 for existing tenancies.⁵ In Cumbria, about 12% of homes were privately rented in 2011⁶ (latest data available), and about 70% of those are likely to have an EPC of D or below. Hence, around 21,000 properties in this sector will need work to improve their energy efficiency within the next seven years.

The Building Renovation 'Passports' (BRPs), for which a framework was announced by the Green Finance Institute in November 2021, may help to overcome some of the informational shortfalls for property owners, and with the issue of works covering different ownership periods of a property.

At the launch of the initiative, the GFI stated that BRPs are intended to provide users with "a clear snapshot of a property's current green status and recommend the steps needed to improve it, signposting to both verified tradespeople and suppliers and to available sources of financing for the work. They will also help private landlords to ensure compliance with energy efficiency standards, give public sector housing providers information needed to form their retrofit strategies, and help valuers and estate agents correlate energy efficiency and property values, and mortgage lenders to better assess the climate risks to their portfolio."



A typical terraced house, Workington. Photo credit: www.rightmove.co.uk

Some Policy Issues

The 29 million existing homes across the UK must be made low carbon, low-energy and resilient to a changing climate. The Climate Change Committee's Sixth Carbon Budget (December 2020) suggests that investment in decarbonising UK's homes will need to rise to a peak of £14 billion per year by 2028 and continue at a scale of £6.7 billion per year until 2048.⁷

In light of the huge number of homes that need to be upgraded in the UK, and, on the other hand, the lack of clear financial advantages and other significant barriers that property owners face in making retrofit decisions and getting work carried out, domestic decarbonisation clearly needs strong policy signals and leadership.

⁵ assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/946175/prs-consultation-2020.pdf Accessed 5/10/21.

⁶ www.cumbriaobservatory.org.uk/housing

⁷ Source: www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf



Policies to support low carbon measures have been weakened or withdrawn, including Zero Carbon Homes and the Code for Sustainable Homes. This has led to many new homes being built only to minimum standards. Policy has over a long period of time lacked scale and consistency and therefore has not been reliable for decision-making. The lack of such consistency has been evident, for example, in the funding of energy efficient retrofit through the Energy Company Obligation (ECO) and other grant schemes. Companies that have supplied insulation and related services have found that work has dried up as public support programmes have been unexpectedly scaled back, or not materialised as expected, resulting in little appetite by the construction industry and relevant trades to get involved in energy efficiency work. Local strategies must be developed that can react in an agile way to both positive and negative developments from the central Government.

The most recent Heat and Buildings Strategy published in October 2021, while claiming to promote a whole-buildings and whole-system approach to minimise the costs of decarbonisation, in fact focusses on individual technologies such as heat pumps. Not only will such an atomised approach likely be counter productive – as it will lead to the uncoordinated installation of energy efficiency measures, deployed in isolation, with the focus on those measures that are deemed most cost-effective rather than those that are going to have the most impact – the level of support offered also fails to even begin to match the scale of the issue identified.

A central plank of the Heat and Buildings Strategy is a new £450m, three-year “boiler upgrade scheme” that will offer homeowners grants of £5,000 when switching to an air-source heat pump or £6,000 when switching to a ground-source one – support that, the Government estimates, will lead to the installation of up to 90,000 electric heat pumps over the next three years. The Climate Change Committee (CCC), however, recommends that 900,000 heat pumps be installed by 2028.

Cost is seen as the major barrier to heat pump uptake - the average cost for a heat pump is between £9k and £15k, leaving a gap of at least £4,000 for the property owner (some 3 times the cost of a new gas boiler). The Strategy states that the Government expects price reductions of 25-50% “as the market expands and technology develops”, but it is not clear what the timeframe for such reductions will be.⁸

3. Understanding Cumbria’s Different Routes to Retrofit and its Housing Stock

The housing stock in Cumbria can be split into two types:

- Older buildings that require breathable materials to be used – a quarter to one third of all properties in Cumbria.
- Modern buildings that can be made more energy efficient by installing cavity wall and loft insulation, double glazing and draught-proofing.

The Problem of Older Buildings in Cumbria

In relation to the older buildings, from EPC data, 22% of properties in Cumbria with an EPC rating were built before 1900. The quotient ranges from 11% in Barrow to 34% in Eden (but note that in Barrow 33% of properties were built between 1900 and 1929, so roughly the same proportion of stock there is effectively a century or more old).

Buildings constructed before 1900 are designed to lose moisture as water vapour through their walls, allowing them to ‘breathe’. Using modern, cement-based mortars, renders and plasters on these buildings prevents this breathing and often results in damp and mould. Similar problems arise from incorrect approaches to the insulation and airtightness of older buildings. Unfortunately the breathable materials that are needed for these buildings, such as lime mortars, are more difficult to apply, and most tradespeople are not skilled in their use.

A large proportion of Cumbria’s housing stock therefore requires specialist skills and understanding related to their improvement. These older buildings can also be more expensive to improve and maintain over the long term which presents further investment challenges.

It is unfortunate that grant-funded insulation programmes have not always recognised the challenges of improving energy efficiency in older buildings, nor that the measures they fund are not always appropriate. There can also be barriers resulting from conservation areas and listed building designations.

⁸ Source: www.gov.uk/government/news/plan-to-drive-down-the-cost-of-clean-heat



Understanding the Different Routes to Retrofit

There are a number of different approaches to retrofit:

- a. **Individual measures** such as loft insulation, cavity wall insulation and new heat sources. This approach was more common in the early 2000s - projects such as those carried out by Cumbria Energy Efficiency Advice Centre (CEEAC)⁹ would offer these measures to householders without considering whether they were what the individual property most needed.
- b. An **area-based approach** - this also began in the 2000s and was used by CEEAC and many local authorities. It provided insulation or new windows to many properties within a street or area, resulting in significant cost savings. The disadvantage of this approach was not enough improvements were made i.e. a property could have insulated walls and loft, but half the heat would still be lost up an open chimney or through ill-fitting windows.
- c. **A whole house approach** - this is more commonly used today and considers all that needs to be done to the whole house, taking into consideration both the characteristics of the property and the lifestyles of the occupants. A whole house approach should improve the fabric of the building first so that the building is well insulated and airtight, but ventilated, before considering the heating system or adding renewable energy such as solar photovoltaics. This approach is more expensive than, say, just putting in a new, more efficient heat source, but it will have a much longer lasting impact on reducing the energy required to keep the home warm.

Overall, in order to transform the housing stock in Cumbria, a whole house approach should be taken, albeit with economies of scale being targeted through mass procurement and area-based systematic changes. The first step in preparing any area strategy would be surveys of representative properties in order to provide a good overview of what is required.

“The industry needs around 500,000 new professionals and trades to tackle the retrofit challenge. 90% of the work is about improving the general fabric of the buildings and this depends on good general tradespeople – joiners, plasterers, and builders.” Construction Leadership Council.”¹⁰



Domestic heat pump. Photo credit: Chris Ratcliffe/Bloomberg

Retrofit Skills: Issues and Opportunities

As noted above, one of the important barriers to the scaling of retrofit is a lack of qualified and experienced tradespeople to carry out works.

This shortage is itself the result of a vicious cycle of low demand, exacerbated by inconsistent Government policy and stop-start financing schemes, all militating against firms investing in skills and people. This is especially the case in a construction market where there is an overall lack of skilled trades and therefore little incentive for companies or individuals to diversify into the new skills they would need for retrofit work, including manufacturing, designing, installing, and administering retrofit solutions.

The skills deficit then in turn keeps the vicious cycle going as, with demand outstripping supply, installers are able to charge a premium for their services, raising prices for property

owners looking to undertake retrofit projects. Additionally, problems faced in identifying registered or trusted installers reduces confidence in the industry among potential clients.

The skills gap is very large: according to a recent report by Bankers for Net-Zero and the Green Finance Institute, the retrofit industry will need to grow by at least a factor of 10 to deliver the required levels of retrofits.¹¹ Closing the gap will only be made more complex by the nature of the retrofit industry, which consists mainly of SMEs.

All of the skills and personnel problems mentioned above are as prevalent in Cumbria, and indeed may be worse than elsewhere given the nature of the housing stock in the county.

Addressing the shortage will require the provision of a holistic package of training, jobs, access to funding and a long-term stream of work—Addressing just one or two of these challenges alone will not be sufficient. Some ideas for how to do this in the Cumbrian context are described below.

⁹ CEEC won an Ashden Award for insulation of over 9,200 cavity walls and 5,300 lofts, plus a range of other measures, over 2 years. www.ashden.org/winners/cumbria-energy-efficiency-advice-centre-ceed

¹⁰ Source: www.constructionleadershipcouncil.co.uk/wp-content/uploads/2021/05/Construction-Leadership-Council-National-Retrofit-Strategy-Version-2.pdf

¹¹ Source: volans.com/wp-content/uploads/2021/09/Tooling-up-the-Green-Homes-Industry_FINAL.pdf



4. Understanding How Retrofit is Financed

The UK's domestic retrofit market can be divided into several segments which are determined by the type of property or tenancy arrangement, these include:

- Owner-occupier.
- Private rental.
- Buy-to-let.
- Social Housing.
- Non-domestic buildings (commercial and public buildings).

Private Sector Finance Products for the Owner- Occupier/Residential Market

- Ready availability of private finance is critically important to drive energy efficiency.
- For the private sector, funds either need to come from an occupier's or landlord's own funds, a bank loan or through a third party share of savings model.
- Models that relate to a third party investing the capital and then making their return through savings made as a result of the energy efficiency improvements are difficult to make work for residential properties because the capital spend is small versus that required for commercial properties and it is also difficult to secure the savings from the bill-payer. However, if economies of scale could be harnessed, through an area based, strategic, mass retrofit project, this may attract more investment because a small percentage of lost revenue could be absorbed.
- Green mortgages are also available, such as those provided by Ecology Building Society, Coventry Building Society, Nationwide, Barclays, that give discounted rates or incentives for energy efficiency improvements or for buying energy efficient homes".
- There is also a 'Renovation Mortgage' from Ecology Building Society that offers a discounted rate for projects that improve a property by two or more EPC bandings.
- Green Additional Borrowing Mortgage is offered by Nationwide that gives a low initial rate on loans to pay for energy efficiency improvements to existing mortgage customers.
- For the Buy-to Let market, a Bridge-to-Let Loan is offered by LendInvest which includes offering cashback to landlords that improve the EPC rating of their investment property.

Energy Company Obligation (ECO)

- Funding from Energy Companies, mandated by the government, aimed at reducing fuel poverty (obligation is to achieve a specified value of life-time bill savings).
- Funding is only available to occupants who meet certain income criteria, determined by whether they are in receipt of qualifying benefits, who live in band D, E or F properties. Local authorities can engage with energy suppliers on these criteria through the 'LA Flex' process.¹²
- Householders can access ECO funding through their energy supplier, an installer who provides eco-funded measures, or their local authority (if it is involved in 'LA Flex').
- The government has proposed that the new round of ECO funding - ECO4 will run from April 2022 to 2026 and provide £1billion a year.¹³ Up to half of this may be spent through the 'LA Flex' process. Under the ECO4 proposals band E and F properties will have to be improved to band D and band D ones to band C.
- There will be many householders who are not on the right benefits to make them eligible for ECO funding but who do not have sufficient savings, income or equity in their homes to fund retrofit themselves or by borrowing.

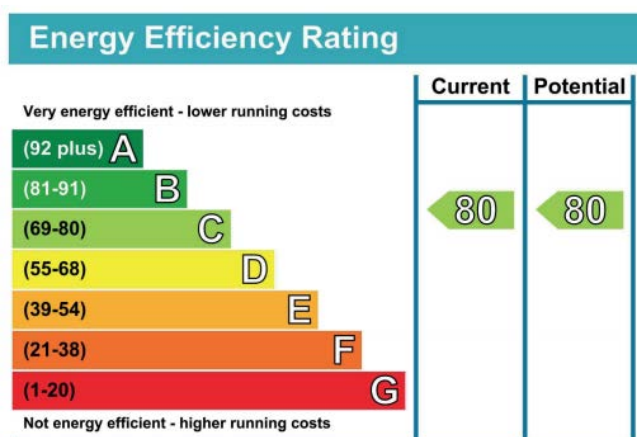


Figure 2. Energy Performance Certificate (EPC)

¹² See assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/776540/energy-company-obligation-3-LA-flexible-eligibility-guidance_.pdf.

¹³ www.gov.uk/government/consultations/design-of-the-energy-company-obligation-eco4-2022-2026



Finance for Properties Owned by the Commercial Sector

- There is also a need to retrofit commercial buildings. These, alongside social housing, will provide an important stream of work for the retrofit supply chain. Private sector finance tends to be more readily available for commercial properties because the occupiers are more suited to longer term finance, albeit some SMEs have faced difficulties in accessing finance often due to the scale of the investment required being relatively small and their balance sheets being less robust.
- Energy Services Company (ESCO) models are often used for commercial properties whereby energy efficiency measures are designed and installed by the ESCO who contractually guarantees the energy savings to be made over an agreed payback period. Sometimes these models are funded by the ESCO (or a partner), whilst others are funded by the organisation that is having the work done, with the ESCO just providing the services (which may include operation and maintenance of the systems).

Enabling Frameworks

- For private sector investment to be unlocked for retrofit on a large scale, the Government needs to put in place long-term clear policies that provide confidence that a return can be made from the investments made.
- According to the GFI (in their Energy Efficiency & Property Valuations), a value needs to be attributed to the improvements and ideally linked to the property itself, not the owner or occupier, to drive structural change. We are otherwise relying on mortgage providers to drive the market for whole house retrofit forward, with piecemeal funding being provided for individual measures such as heat pumps.

Finance for Properties Owned by the Public Sector

- The energy performance of properties in the social housing sector is generally better than owner-occupied and private rented housing. The Green Finance Institute (GFI) report, Financing Energy Efficient Buildings puts this down to “a combination of a newer stock, a higher proportion of flats, regulatory requirements and Registered Social Landlords (RSL) typically proactive and planned approach to renovation”. However, work still needs doing in the sector and this work can provide a good base load of activity for retrofit contractors.

The public sector can invest directly in energy efficiency improvements using capital receipts or money from its own capital funds, albeit this amount of capital is limited. Local authorities may have access to Housing Revenue Accounts and there are financial resources from the Department for Education for the refurbishment of schools.

Funds could also be raised through:

- Salix which provides interest-free loans to the public sector to improve energy efficiency;
- Public Works Loan Board (PWLB) which is a statutory body of the Government that provides loans to the public sector for capital projects;
- The Public Sector Decarbonisation Scheme that provides grants for public sector bodies to fund heat decarbonisation and energy efficiency measures. The Government has already started allocating a small share of the promised £3.8bn Social Housing Decarbonisation Fund (SHDF), to be spread over the next decade.
- Local climate bonds - allow local authorities to raise capital to fund specific initiatives such as solar panel installations and electric vehicle plans, and investors can invest from as little as £5 through crowdfunding.
- Green bonds - where public sector bodies raise capital in the markets specifically for retrofit activities, offering low interest rate and long term finance.



Cumbria County Council building in Carlisle. Photo credit: Rose and Trev Clough/ Geograph



Social Housing Financing

Whilst further innovation is required, a number of financial institutions already provide finance to the social housing sector:

- Lloyds Bank have an interest rate reduction associated with improving the energy efficiency, they agreed their first sustainability-linked loan (SLL) through a £22m revolving credit facility signed with Welsh social landlord Cartrefi Conwy.
- In February 2021, NatWest issued a €1bn affordable housing social bond, the first of its kind by a UK bank and there is an increasing focus on retrofit, with some specialist funding available for retrofit projects.

Social housing providers across England can now access support from the Social Housing Retrofit Accelerator (SHRA) that helps them bid for the £160m Social Housing Decarbonisation Fund (SHDF). Some social housing providers may also have a balance sheet that is strong enough to issue green bonds for retrofit programmes, offering long term capital and low interest rates.

Retrofit Initiatives in Cumbria

A number of retrofit initiatives have been undertaken to date in Cumbria, aimed at addressing the information, consumer confidence and financing gaps described earlier in this chapter.

These include:

- Since 2008, Cumbria Action for Sustainability (CAfS) has been running events on green building and giving advice about energy efficiency. It currently runs a 'Cold to Cosy Homes' project, in partnership with local authorities, and it gives advice, free LED light bulbs, provides professional draught-proofing and signposts people to get support and grants when available.
- CAfS has also recently set up a 'Retrofit for Cumbria' project, working with Carbon Co-op to recruit 35 able-to-pay households to do whole house retrofits. This is a pilot project, the longer term aim being to develop a service like People Powered Retrofit (PPR) that covers Greater Manchester [www.carbon.coop]. PPR is currently raising start-up capital from a community share offer and intends to work with 1,150 homes in the next 5 years, making them more energy-efficient and saving 2,700 tonnes of CO2 over 5 years. They will also grow their training programme, with the aim of retraining 3,500 local contractors.
- The Cumbrian local authority most active in retrofit is Eden District Council ("Eden"), which has obtained £1.5 million from the Green Homes Grant Local Authority Delivery Scheme ("LAD") to retrofit 135 homes. This provides improvement grants for owner occupiers of houses with an EPC rating of E, F or G who have an annual household income of £30,000 or less. Eden is working with the energy provider E.ON on delivery. Eden has led a successful bid by a consortium of Cumbrian local authorities for another £5 million of LAD2 funding and the same consortium has bid for LAD3 funding.
- Eden and Carlisle have also set their own criteria for residents in or at risk of fuel poverty to receive Energy Company Obligation funding ("ECO") and eligible residents can have measures funded through contacting their local council. In other districts in Cumbria the only way to get this funding would be to contact an installer who has access to it (and is prepared to travel – there being no such installers in Cumbria at present).



Wall Cavity Insulation. Photo credit. Yes Energy Solutions



CAfS 'Cold to Cosy Homes' offers free energy saving advice and equipment

4. Investment Opportunities in Cumbria – Now, Next and New

Addressing the significant investment gap to decarbonise the building stock in Cumbria and across the UK, requires innovative thinking on the funding and business models, training and policies needed to drive retrofitting at scale.

Like other chapters, this section lays out a number of investment opportunities and propositions for retrofitting in Cumbria through a “Now, Next and New” lens.

- “Now”, meaning those that are possible/investable without major further development.
- “Next”, those that don’t depend on new technology but do require some development in terms of behaviour, policy, feasibility and/or means of financing;
- “New” opportunities that require significantly fresh approaches to finance or make advances in technology in particular.

“NOW”

1. A Retrofit Strategy for Cumbria

The Cumbria LEP, local authorities, CAfS and social housing providers should work together on a long term plan to improve the efficiency of the county’s homes and other buildings, using a local workforce as far as possible. The strategy needs to be informed by a representative survey of the current housing stock to identify the scale of the work needed.

The Strategy needs to cover:

1. Develop the supply chain for retrofit - increasing the workforce and ensuring it is appropriately trained.
2. Provide a long term stream of work in retrofit.

Our suggestions for building the workforce are:

- Develop a retrofit skills hub (see “NEXT”).
- Create a retrofit delivery organisation (see “NEXT”).
- Measures to incentivise existing tradespeople/building companies to take on apprentices (see “NEW”)

Our suggestions for providing a long term stream of work are:

- Local authorities could make full use of the funding available to it (such as Salix and PWLB, as well as through issuing Green Bonds) to make public buildings zero carbon, as far as possible using a local workforce.
- Local authorities could use their planning and building control powers to increase the energy efficiency of new builds and of existing buildings when these are refurbished or extended.
- Social housing providers could make extensive use of schemes such as the Social Housing Decarbonisation Fund and similar schemes, such as the Social Housing Retrofit Accelerator.
- Develop a retrofit advice and project management service, similar to the People Powered Retrofit, to help homeowners, landlords, small businesses and community organisations in their retrofit journey, including advising on funding available



from mortgage providers and other lenders as well as advice on grants and ECO funding (see “NEXT”)

- Work with local financial institutions on creating lending products to fund retrofit.
- Local Authorities could participate in the ‘LA Flex’ aspect of ECO and promote it to their residents to maximise the amount of ECO funding coming to Cumbria.
- Investigate ways to provide grant funding to households that are not eligible for ECO funding but do not have savings or the means to borrow (e.g. those living in low-value homes).

LA FLEX - means Flexible Eligibility and is part of the Government’s Energy Company Obligation Scheme. Councils have the power to widen the eligibility criteria for ECO, allowing them to tailor energy efficiency schemes to their respective area.

“NEXT”

2. Develop a Retrofit Skills Hub

This proposition could be modeled on the Low Carbon Academy in Greater Manchester which will train over a thousand people in retrofitting skills.¹⁴ Developing a retrofit skills hub could be part of the skills programme of the Cumbria LEP.¹⁵

We suggest that the skills hub could be delivered by the Cumbrian network of further education colleges and by Ecological Building Systems, based in Carlisle who supply the breathable (vapour open) products, such as insulating lime renders, that need to be used on older buildings and provide training on how to use them.

3. Establish a Retrofit Delivery Organisation

Cumbria presently has very few contractors with retrofit skills, meaning that work is often undertaken by contractors coming into the area from outside. The results of this are that both economic and skills retention benefits are realised elsewhere and in parts of Cumbria remote (such as West Cumbria) it is difficult to find installers who can do jobs like cavity wall insulation.

In the absence of strong government incentives for retrofit as noted above and, as a result, lack of incentive for private contractors to invest, one way of increasing the size of Cumbria’s skilled retrofit workforce would be to establish a retrofit delivery organisation. If this was set up as a community benefit society it could raise start-up funding and working capital through a community share offer.

It would make sense for such an organisation to be located in West Cumbria, as this is where jobs are most needed. This organisation could also work with the local authorities on area-based retrofit projects that bring ECO funding into Cumbria.

A model for such a community based organisation is YES Energy Solutions (formerly Yorkshire Energy Services), which started in 2000 as a division of Kirklees Council but soon became an independent community interest company with a subsidiary directly employing retrofit installers.

YES Energy Solutions managed the award-winning Kirklees Warm Zone that provided free loft and/or cavity wall insulation to 50,000 homes in Kirklees between 2007 and 2010. It now works with local authorities, housing associations and community groups nationwide helping them to access ECO funding for retrofit using a network of trusted installers. It has undertaken two projects in Cumbria, but itself notes that contractors from Dumfries and the North-East were used for the work.

4. Develop an Advisory and Project Management Service for the Owner-Occupier Market

Many householders want to improve the energy efficiency of their homes, but don’t know what to do and / or are daunted by the complexity. A service that provided advice and project management for households undertaking home retrofits, would be both beneficial to such households, and it would help to increase demand for retrofit services in Cumbria.

A model for this solution is Carbon Co-op’s People Powered Retrofit, which offers a range of services to support householders through the retrofit process, including:

- Advice and assessment.
- Development of a costed retrofit plan.
- Engaging and managing contractors and ensuring that they carry out work to a high quality.
- Providing training for retrofit contractors and consultants.

¹⁴ www.lowcarbonacademy.co.uk

¹⁵ www.thecumbrialep.co.uk/skills



In its pilot project, Carbon-Co-op found that there was a good level of demand for this service from people able to spend several tens of thousands of pounds on retrofitting their homes. CAFS is hoping to develop a similar initiative in Cumbria, starting with their pilot ‘Retrofit for Cumbria’ project – within which they are working with Carbon Co-op to recruit 35 homes in Cumbria to undertake a whole house retrofit.

Facilitation and development of this ‘able-to-pay’ market for retrofit has the potential to provide a steady stream of work for the local supply chain that is not subject to the vagaries of government-controlled funding streams.

This market could be further bolstered by the take-up of mortgage or equity-release products by owners who do not have sufficient savings or cash flow. Such products would likely offer relatively cheap finance as banks and building societies increasingly link their lending rates to the environmental credentials of the buildings they lend to. It is recommended that any advisory services set up in Cumbria should include advice on finance.

However, while the ‘able to pay’ or ‘able to borrow’ markets are important, they will not on their own drive enough demand for insulation and low carbon heating systems. Better information, regulation and incentives for both borrowers and lenders are also needed.

“NEW”

5. Establish an Apprenticeship ‘Payment by Results’ Scheme

Incentivising local tradespeople and building companies to take on one or more apprentices would be another way of expanding the workforce equipped with retrofit skills.

This could be done using a ‘payment-by-results’ approach, whereby interested stakeholders could incentivise builders by paying a set amount for each apprentice trained (or each experienced builder upskilled) to pre-agreed levels. Stakeholders might include:

- ‘Impact investors’ who have developed instruments such as ‘social impact bonds’ to try to deliver specified outcomes
- Companies involved in retrofit supply chains such as providers of insulation and renewable heat or generation products
- Companies with CSR agendas including promoting green lifestyles, reducing fuel poverty etc

Tradespeople qualifying under the scheme could help to leverage its effects by themselves committing to share their skills with new people admitted to the scheme over time.

The scheme could be led and organised by the Retrofit Skills Academy hub, as recommended above.



Carpenter with an apprentice. Image credit: RCI Magazine



Retrofit Skill Builders Fund

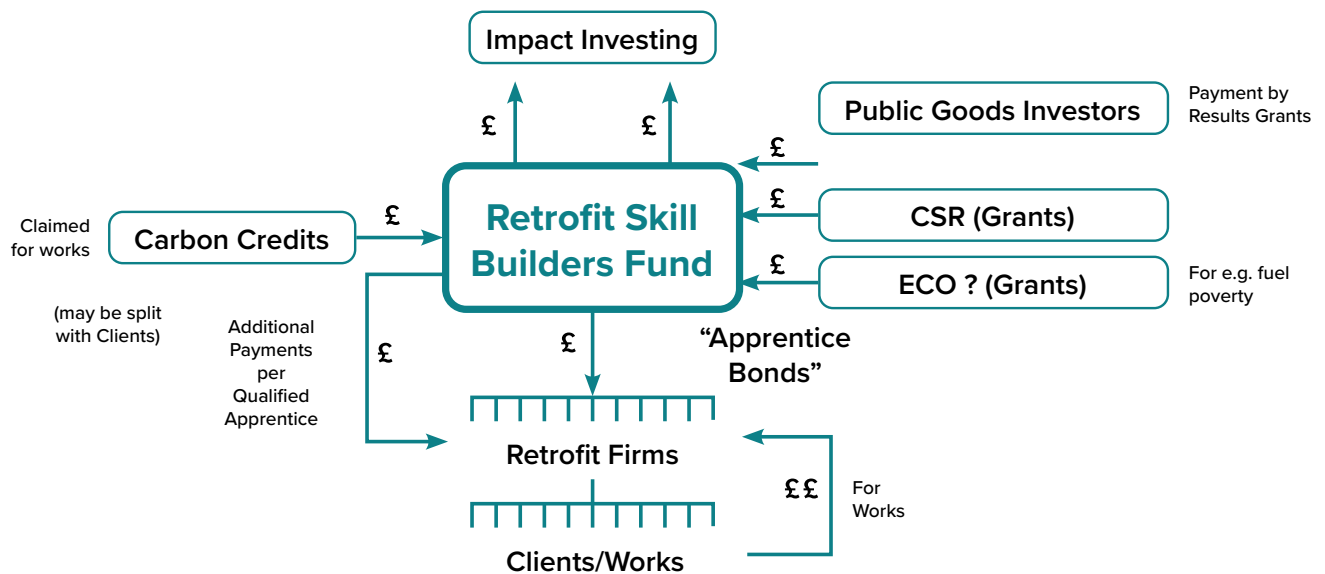


Figure 3. A Retrofit Skill Builder Fund. Image credit: Green Investment Plan Cumbria

6. Develop a Carbon Credit Scheme for Retrofit

Voluntary carbon credit markets are a growing source of funding within several areas – with codes having been developed for woodland and peatland projects. However, despite it making a significant contribution to the UK's overall carbon footprint, there is currently no code for rewarding improvements in domestic energy efficiency.

A code could be based around the SAP scores used for the Environmental Performance Certificates (EPCs) that almost all homes now require, and would reward improvements made to the home that increase the score. The money realised via credits would be paid to either the homeowner or finance provider, if involved. Monitoring could be done via the 10-year renewal of EPCs, but retrofit measures (such as wall insulation or double glazing) are unlikely to be removed from homes so there is little danger of scores going down over time.

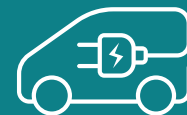
Whilst each domestic credit would in itself be quite small, because of the huge number of homes that need to be upgraded (Government targets are 6-9 million by 2032), at an aggregate level the amounts could be quite large. Using the per home range above and the target range just cited, between £3-6.75 billion.

Cumbria has among the worst housing stock in the UK in terms of EPCs, this means (if perversely) it has a bigger opportunity than most other areas to benefit from the creation of a domestic EE credit.

As well as generating cash value, the monetisation of improvements would help to signal to consumers the value of energy efficiency.



Installing insulation boards. Photo credit: edie newsroom



7. Clean Transportation

1. Overview

Decarbonising transport in Cumbria will involve a combination of technologies, policies, regulations, and behavioural shifts. The transition of road transport will predominantly be to electrification, although there will be a role for hydrogen, particularly in the heavy goods vehicle (HGV) segment, including farm machinery, and freight. It is acknowledged that changing how transport is fueled does not tackle other transport-related issues such as congestion and social isolation, both significant problems for Cumbria.

Cumbria faces two challenges: first, Cumbria's rurality makes the viability of at-scale operational models for transport challenging without significant intervention. Second, a large visiting population contributes significantly to Cumbria's emissions.

Transport decarbonisation requires, in addition to infrastructure needs, the development of investable services and a package of services that can transform normal lives, as well as provide a successful visitor experience in Cumbria. In addition, decarbonising transport is unlikely to be effective without Government support and this applies to EV charging infrastructure and hydrogen refueling, and interventions to manage transport demand.

The Green Finance Institute (GFI) estimates that £150 billion will be required by 2030 to decarbonise road transport in the UK. How much investment is needed for Cumbria is not clear, but it will require a mix of investment opportunities and different financial mechanisms across numerous asset classes with varying risk and return characteristics that will appeal to different investors.

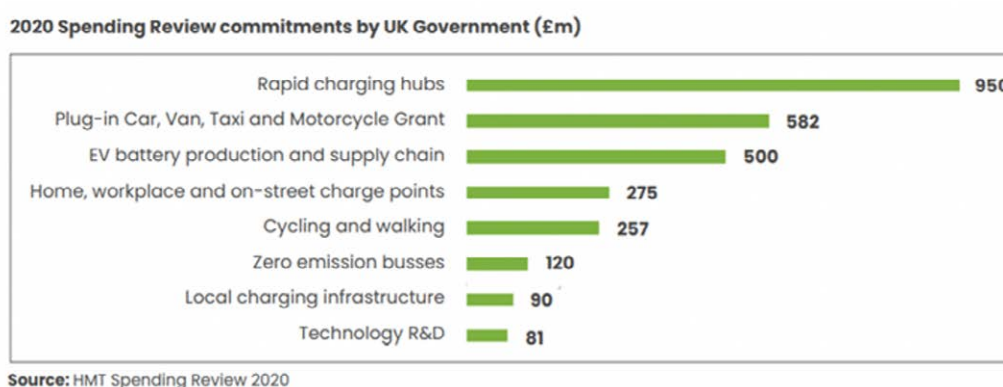


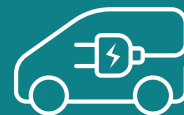
Figure 1. UK Government Transport Spending Commitments. Diagram credit: GFI

Key Recommendations

1. Tackle Visitor Travel Behaviour
2. Improve Local Rail Services and Electrification
3. Accelerate Rural on Demand Transport (DRT)
4. Improve Cumbria's Cycling Infrastructure
5. Expand Charging Infrastructure and Increase EV Rapid / Fast Charging in Rural Areas
6. Establish a Multi-Modal 'Green Corridor' along the M6



Steel Fell from the A591 near the Travellers Rest Inn. Photo credit: Alamy



2. Cumbria's Transport Emissions

Transport is the UK's and Cumbria's worst-performing sector for carbon emissions and greenhouse gas emissions are continuing to increase.

Transport was responsible for emitting the largest amount of CO₂ in Cumbria in 2019 - 1.4 million tonnes, accounting for 28% (compared to a national average of 27%)¹ of Cumbria's territorial carbon dioxide emissions and much of this is due to road transport. On a consumption basis, emissions were broadly split equally between residents and visitors, residents accounting for 51% of total emissions, visitors travelling to and from Cumbria 36% and visitors within Cumbria 13%.²

- On a per-capita basis, Cumbria's transport emissions were 22% higher than the UK national average.
- 86% of journeys were travelled by car compared to the 77% national average.
- 18% of trips were made by walking compared to 26% nationally.
- 56% of households owned two or more cars compared to the national average of 25%.³

Given these striking levels of car dependency (from residents and visitors), there is significant potential to reduce carbon emissions from transport through behaviour change, increased availability, and affordability of public transport, alongside measures to reduce demand, increase accessibility, and make existing modes of transport cleaner. It is typical that high rates of car ownership in rural areas is explained by a lack of alternative transport, not by a desire for people in rural areas to own more cars.

The Ten Point Plan (November 2020) outlined that £2bn over the next five years would go into cycling and walking infrastructure with the aim that half of all journeys in towns and cities will be cycled or walked by 2030 and a "world class" cycling and walking network will be created by 2040. Although it needs to be acknowledged that this funding does not apply to predominantly rural areas of Cumbria.

Improving cycle infrastructure should not be an add on, but a considerable part of the business and expenditure of the Cumbria Highways department. Enhancing cycling infrastructure clearly needs public sector investment, with support perhaps from organisations like Sustrans. A cycling infrastructure investment also needs to be considered as part of demand management and behaviour change programmes. Meanwhile, an increase in cycling has the potential to support an increase in cycle shops selling and repairing bikes (the latter, unlike the former, cannot be done via the internet). Cycle tourism could also form a major part of Cumbria's visitor economy, with cyclists more likely to spend money in local shops in rural areas than car-borne visitors.

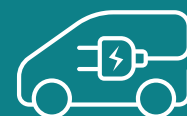


Cycling in Ambleside. Photo credit: www.lakesdalesloop.co.uk

¹ Source: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/984685/transport-and-environment-statistics-2021.pdf

² Source: Cumbria's Baseline Carbon Budget for 2019. Small World Consulting Ltd

³ Source: Cumbria's Baseline Carbon Budget for 2019. Small World Consulting Ltd. Cumbria is fortunate in having a sufficiently detailed carbon budget; the Lake District has had its carbon budget, updated several times, since 2010.



Tourism's CO2 Impact

"It feels like we are at peak car, I want to see less reliance on it in the future. It cannot go on getting worse otherwise it really will become too much to handle in our national parks. We need to see a shift to more sustainable travel." Richard Leafe, Chief Executive of the Lake District National Park Authority (LDNPA)).

Whilst tourism is a key part of Cumbria's economy, it also has a significant impact on vehicle CO2 emissions. On an average day, Cumbria has 128,767 visitors (which increases its population by 26%). This is more evident in the Lake District, where visitors increase the population by 188%. Fortunately, leisure travellers are generally open to travelling differently, which means this important cohort of transport users represents an opportunity for significant shifts in travel behaviour to help reduce emissions.



*May bank holiday in Bowness on Windermere.
Photo credit: Gordon Shoosmith/Alamy and the Guardian*

Table 1: Resident and visitor populations for Cumbria and the Lake District (2019, ONS)

	Resident population	Visitor days	Effective visitor population. Visitor days/365	Visitor: resident (%)
Cumbria	498,083	47,000,000	128,767	26%
Lake District	41,600	28,550,000	78,219	188%

Poor Use of Public Transport

Overall, the use of public transport in Cumbria is low. Train service frequency and capacity is patchy across the county limiting its utility and attractiveness. Meanwhile, almost all bus services in Cumbria are operated on a commercial basis. In the Lake District National Park, service patterns, ticket deals and fares are generally targeted at visitors rather than residents.

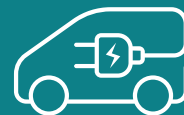
In February 2021, the Government published the 'Bus Back Better' initiative, urging all primary local authorities to submit an ambitious Bus Service Improvement Plan (BSIP) with a deadline of October 2021 to receive a share of £3 billion national funding.

Stagecoach is Cumbria's main bus operator.⁴ Whilst their fleet is generally modern with relatively low emissions for diesel, the key issues restricting use are high fares, fares structures targeted at visitors, a business model that relies on concessionary pass holder revenues and services limited to the main commercial corridors only. Bus services in Cumbria need to be more widespread, integrated and more affordable and Cumbria County Council (CCC) could do more to implement change.

Transformation is possible either through interventionist demand management (e.g. in busy visitor areas) or through the powers available to the transport authority using the Bus Services Act to have more influence over services and fares. In addition, the bus fleet then needs to further reduce emissions through progressive conversion to or replacement with electric or hydrogen. If the annual bus miles were doubled this could create hundreds of additional jobs across Cumbria.

Currently, Cumbria County Council does not provide any funding to support non-commercial bus routes and some parts of the County – such as the southern part of Copeland – have no bus services at all. However, this is set to change as the Council secured £1.5 million from the DfT Rural Mobility Fund (2021-2024) which will be directed at new 'Demand Responsive Transport' (DRT) services targeting 4 rural hubs - Penrith, Wigton, Egremont and Ulverston. This provides a good opportunity to build complementary services and extend reach.

⁴ For example the 4.5 mile, 15 minute bus journey from Windermere to Ambleside costs a family of four £17 (see www.stagecoachbus.com/plan-a-journey) compared to the £3 (£1.50 per adult) that journey would cost in London, where any bus journey is just £1.50 per adult.



Stagecoach bus in Grasmere, Cumbria. Photo credit: Ed Webster

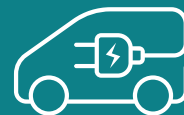
Rail - In 2018, the UK Government agreed to phase-out diesel trains by 2040. Around 42% of the UK's rail network is currently electrified, with most of the rest being diesel-powered. Electrifying lines carry high upfront capital costs. Costs were partly behind the £38bn rail electrification programme (announced in 2012) being abandoned by the Government in July 2017. Another alternative to electrification is to use hydrogen fuel cells to power trains. The hydroFELX hydrogen train was launched in September 2020 after receiving £750,000 of investment from the Government.

Rail services need to shift away from diesel and move towards electrification across Cumbria with much better links to/from stations, including buses & shuttles fully integrated with the rail service, car clubs vehicles, e-bike rental and baggage forwarding being the norm at stations. Many of the services still use diesel trains, which are often of very poor quality. Services are mostly hourly and are even less frequent on the Settle-Carlisle line.

3. Decarbonisation Transport Policy

- **Cumbria's Transport Infrastructure Plan (CTIP) 2022 - 2037:** Developed by Cumbria County Council (CCC) and Cumbria Local Enterprise Partnership (CLEP) - (recently subject to a period of public consultation) sets out the policy framework for the role of transport and connectivity in supporting sustainable and inclusive growth in Cumbria for 2022-2037. Overall, there is concern that the draft plan does not have any strategic focus on transitioning to net zero and there is not enough focus on non-infrastructure projects such as access and behaviour change, including among the visitor population. There is also a concern that many of the infrastructure proposals will significantly increase greenhouse gas emissions. It is expected that the newly formed Transport Group of the Zero Carbon Cumbria Partnership - of which Cumbria County Council (CCC) are a key partner - will develop a detailed strategy for transport decarbonisation.
- **Transport for the North's (TfN) - Net Zero by 2045:** TfN's transport plan outlines an ambitious target of net zero by 2045 for surface transport and suggests a phase-out of petrol, diesel and hybrid car and van sales by 2030. It also includes an ambitious uptake of zero-emission cars (55% of sales) and vans (40% of sales) by 2025.⁵

⁵ Source: transportforthenorth.com/decarbonisation/



- The UK Government's Transport Decarbonisation Plan (July 2021)

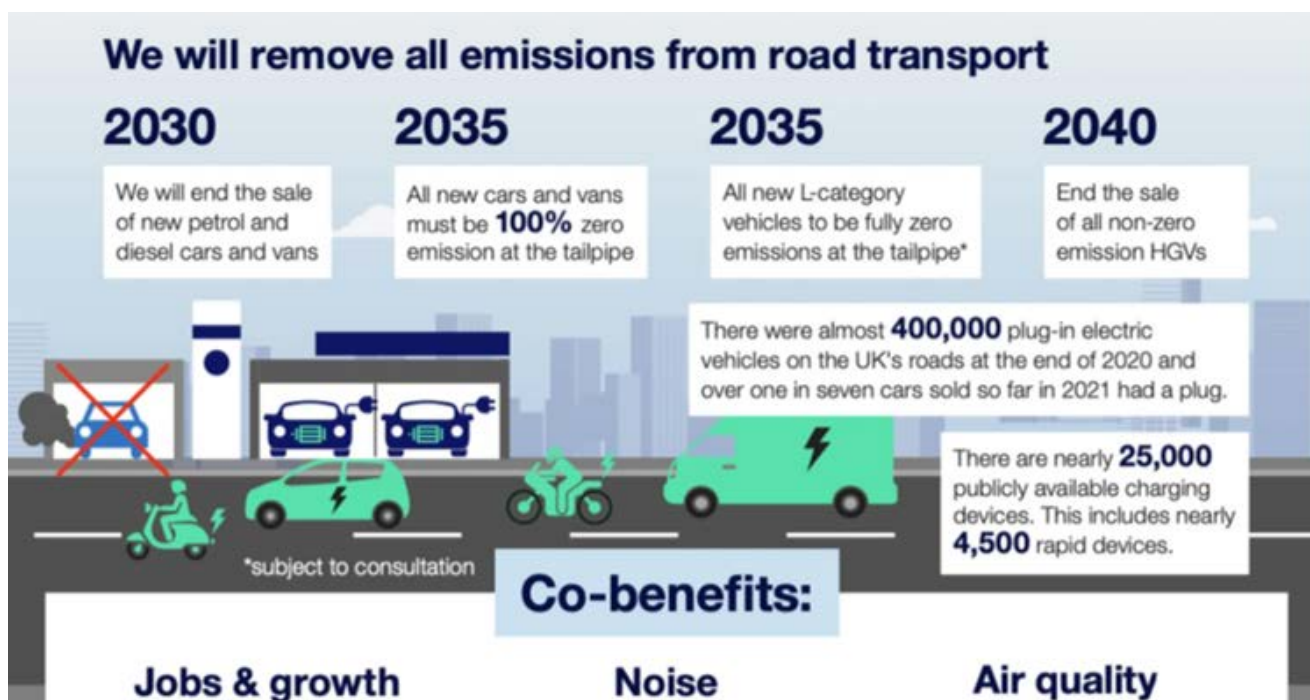


Figure 2. The UK's Transport Decarbonisation Plan. Image credit: DfT

- Repeated its commitment to end sales of petrol and diesel-fuelled cars and vans by 2030, and hybrids by 2035, and a ban on the sale of new diesel and petrol HGVs and buses from [2040].
- Specified conditions on EVs, such as the availability of six rapid charge points at every motorway service area by 2023; all new housing to have charging technology installed; favourable company car tax rates for zero-emission cars; and no requirement to pay vehicle excise duty or van benefit charges.
- Created at least one zero-emission transport city and four industrial 'Super Places'.
- Committed the government to invest £3 million in 2021 to establish the UK's first multi-modal hydrogen transport hub in Tees Valley which could be fully operational by 2025.⁶ This could be a model for the M6 hydrogen hub proposal highlighted within this report [see below].
- Committed the government to increase rail freight, potentially "creating a net-zero rail network by 2050", and removing diesel trains by 2040,⁷ alongside support for the development of battery and hydrogen trains.
- Outlines £2bn of funding over the next five years for cycling and walking infrastructure and a £12bn investment into local transport systems which will enable local authorities to prioritise clean transport.

Considerations for Cumbria

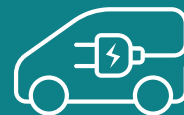
Decarbonisation needs to occur across every aspect of Cumbria's transport system.

There have been several detailed attempts at translating transport decarbonisation roadmaps into policy and strategy. Those relevant to Cumbria are:

- As part of the Wales Transport Strategy, a "rural offer" has been specified explicitly that combines transport decarbonisation with other outcomes to identify strategic transport priorities for rural Wales.
- Transport for the North (TfN) and the North of England Decarbonisation Strategy (2021).

⁶ Source: assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002285/decarbonising-transport-a-better-greener-britain.pdf

⁷ *ibid*



Key ideas and similarities across these strategies include:

1. Travel less - Reducing the need to travel and managing travel demand
2. Travel better - Shifting how journeys are made (generally from car to other modes)
3. Travel cleaner - Making vehicles cleaner

1. Travel Less

An essential part of a decarbonisation strategy should be focused on supporting people and vehicles to travel less. Since COVID, there has been a huge growth in home working, alongside a massive increase in online shopping and more localised deliveries - all of which reduced car travel but have impacted the volume of freight going to local and rural areas. Some solutions include

- Introducing low emission zones (LEZ's) to increase the environmental performance of delivery vehicles.
- More holistic design of areas to be made accessible without cars.
- Funding the rollout of cargo bikes and e-cargo bike schemes for last-mile delivery in villages, towns and city centres.
- Creating goods warehousing space so that last mile deliveries have suitable coordination points and work with retailers to develop an easy to access drop-box locker and shop-based collect and returns network.
- Developing a logistics system based on shared logistics platforms at gateways and hubs with vehicle-efficient onward shared vehicle use.

2. Travel Better

This focuses on transport mode shifts which include less private motorised trips in favour of more public transport, walking, and biking trips. Enabling people to travel around by public transport when they get to Cumbria would also facilitate visitors using public transport to get there, so reducing the 'visitor travel to Cumbria' element of Cumbria's carbon footprint and would help enhance the attractiveness of Cumbria as a destination for those without a car.

In recent years, there has been an escalation in micro-mobility solutions in the form of MaaS (Mobility as a Service) which is the concept of shifting transportation solutions to an on-demand service. Instead of individuals owning and operating their own vehicles, MaaS enables access to a wide range of transport options.

The secret to success involves creating the MaaS framework based on existing (limited) services to create the conditions for the development of new types of mobility services that increasingly makes the MaaS offer increasingly appealing. This market will continue to grow in the UK but comes with challenges in Cumbria due to the limited core MaaS-compatible services. In addition to existing bus and proposed DRT services, we suggest the following:

- The expansion of existing Co-Wheels and Enterprise car club services at key gateways and tourist destinations would also facilitate this: people staying in those destinations would then have the option to use a car for one or two days during their stay, rather than having one available the whole time.
- The 2019 explorEbike pilot (supported by the LDNPA) led to an Ebike plan for 2020-2023 scaling up across the Lake District. With a final target of 314 ebikes across 80 hosts, its monthly P&L showed the model going into profit in year 3. It did not proceed mainly because of the 2020 covid lockdown, but also because of changing priorities of the main investor.
- In 2020, a UK based ebike-share and e-scooter share operator prepared detailed a flexible illustrative business plan for 50 ebikes. This focussed on post-lockdown access in a Lake District locale. Due to a lack of local capacity (but not lack of enthusiasm), this was not developed.

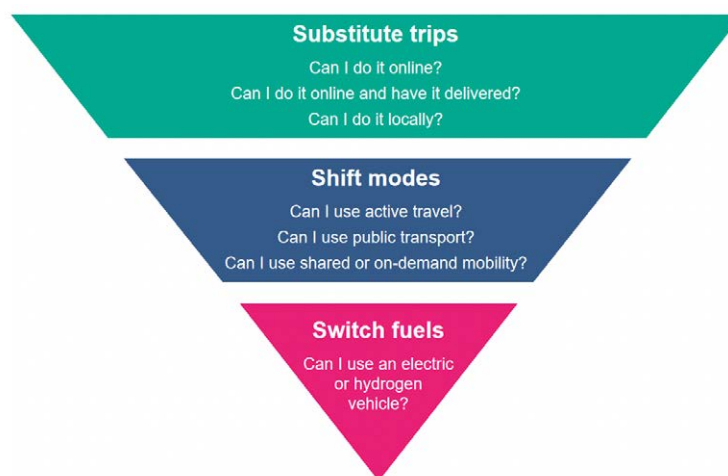
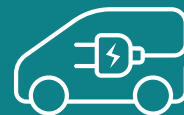


Figure 3. City Science's Sustainability, Access & Mobility (SAM) Framework



3. Travel Cleaner

The technology for zero emission cars, lorries, buses and trains largely exists and is improving all the time. Both electricity and hydrogen are central to decarbonising the transport sector and as demand increases and innovation accelerates, the cost of these technologies will continue to fall.

In the future, it is important to consider how to enable HGV's that pass-through Cumbria to access net zero refuelling infrastructure, perhaps based on green hydrogen. Shifting freight away from the congested road network and onto railways for longer journeys is also an option. Cumbria also has three ports and a large freight sector, which increases road traffic congestion and their associated emissions.

Another key trend that Cumbria needs to be better prepared for is smart mobility where transportation is moving from an asset-based business (people own cars) to a rides-based business (shared transportation). Beyond reducing carbon emissions, an important co-benefit is the reduction of air pollution.

Low Rates of EV Uptake in Cumbria

Cumbria has comparably low rates of EV uptake and this is due to the high upfront costs, especially compared to relatively low household incomes, and a lack of confidence in charging infrastructure.⁸

In 2020, the Government announced plans to end the sales of new conventional petrol and diesel cars and vans by 2030, and hybrids by 2035. While it is welcome news that all new homes and office buildings in England will have electric car charge points from 2022, in 2019, only 1,777 new homes were built in Cumbria. Fewer still are new homes built in rural areas.

Currently, the returns on investment on charge points are low (around 5 years) and there are some inherent market failures. These market failures include utilisation rates that do not give the revenue returns that investors are looking for (particularly in rural areas). Secondly, areas that experience seasonal demand means investors tend to prioritise areas where demand is higher, and the business case is most favourable i.e. areas where the risk of market failure is lower.

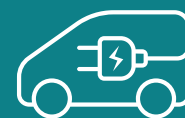
Further consideration also needs to be given to the potential for public finance or philanthropic finance organisations which could de-risk private sector capital using credit guarantees, a financial loss against construction risk or mechanisms that create financial support for infrastructure projects.

ChargeMyStreet is a community project, creating a network of fast EV charge points for drivers without access to off-street parking and domestic charging. Based in Lancaster and Cumbria, the aim is for every home to be within 5 minutes' walk of an EV charge point, to support the uptake of plug-in cars. Access is via the EO app, with memberships available for regular users. 66% of the UK live in homes without driveways, so it is encouraging to see businesses, community halls and even hotels host the Charge My Street EV charge points in Cumbria.



Charge My Street chargepoint at Thwaites Village Hall. Photo credit: www.nwemail.co.uk

⁸ EVs include all variants of plug-in cars and vans including pure battery electric vehicles (BEVs) and plug-in hybrid (PHEV) versions.



Cumbria Action for Sustainability (CAfS) estimates that by 2030 between 2,100 and 6,400 public charge points will be needed to meet residents' needs in Cumbria and between 3,150 – 9,600 for visitors. **This means that on average 70 new charge points will need to be installed each month for the next nine years.**⁹ The availability of charge points is vital to public confidence in switching to EVs and the scale of the charging challenge in Cumbria is immense. Decision-makers properly plan for a fit-for-purpose network over the coming decade.

Table 2. Possible Costs of EV Charge Points in Cumbria¹⁰

	Typical cost per charger
Domestic 7kW charger (7 hours)	£850- £1,000
Fast 22kW charger (3 hours)	£10,000
Rapid 50kW charger (30 minutes charge)	£50,000

Public charging infrastructure is generally installed either by charge point network operators or by host site organisations, with sometimes a joint approach is taken to supplying / fitting / operating the equipment.¹¹ British Gas owner Centrica has pledged to install up to 100,000 electric vehicle charging points per year by 2025, across the UK. Centrica also aims to install up to 20,000 heat pumps per year by 2025 and aspires to develop a low carbon portfolio of 800MW of solar and battery storage by 2025.¹²

Financing EV Charge Points

1. Overall, it's harder to finance the earlier years of installing charge points because of the low take-up and it takes time for the market to build to a point where the cash flows are secure and cheaper finance can refinance the more expensive debt. Utilisation linked loans for charging points is an idea that the Green Finance Institute (GFI) are thinking about, and this is a loan mechanism that could be available to SMEs or local authorities where repayments are linked to the utilisation rate of the Chargepoint, a bit like student loans (written off after a period time if a certain threshold isn't reached) perhaps a loan could be written off if EV uptake doesn't reach expected levels. This could work for farmers and provide an additional source of revenue.
2. Key to how much interest that can be paid is determining what "other revenues" support the business model i.e., advertising or retail (hubs). Local businesses could collaborate and aggregate on demand for charging infrastructure, by coming together they can engage with providers to identify charging points and help build the business model.
3. If the model has more guaranteed demand (i.e., fleet, taxis, depots etc.) then it is possible to think about an amortising structure (probably with some sort of payment deferral for initial years). However, this can't go out too long into the future due to the tech/obsolescence risk.
4. Local authority involvement is important as they can help incentivise drivers to use the chargers (clean air zones, taxi ranks, etc) and help provide the best sites for charging on public land.
5. Consideration should also be given to local climate bonds which are a local community and municipal investment that can be transport related (e.g. charge points or cycling infrastructure). Local authorities can raise finance through a crowdfunding model with residents. They would be cheaper than Public Works loans, and they create an opportunity to diversify the councils funding streams and help engage the local community in local projects.

For Cumbria, to roll out suitable EV charging infrastructure consideration should be given to the below.

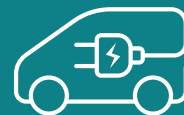
- How to provide charging for urban residents. The majority of rural residents will be able to get their EVs close to their house or garage and the economics for those that can charge overnight is pretty compelling given current offers from companies like Octopus. It is therefore important to develop a strategy for urban residents.
- Destination charging for people on journeys to make Cumbria an EV friendly tourist destination.

⁹ Source: www.cafs.org.uk/wp-content/uploads/2021/06/Electric-Vehicle-Charging-Deployment-in-Cumbria-Analysis-Forecasting-1.pdf

¹⁰ Source: Phil Davies presentation to the Green Investment Plan transport roundtable

¹¹ Source: www.cafs.org.uk/electric-vehicle-charging

¹² Source: www.centrica.com/media-centre/news/2021/centrica-launches-climate-transition-plan/



4. Investment Opportunities - “Now, Next and New”

Whilst rural transport is often seen as a long-standing problem, modern mobility solutions - along with better packaging and integration of these solutions - are unleashing new market opportunities. Public and private sector collaboration is essential to accelerate the rate of investment.

This chapter lays out several opportunities for decarbonising transport in Cumbria. As in other chapters, these are organised under the headings of opportunities that could be seized in the following ways:

- “Now”, meaning those that are possible/investable ideas without major further development.
- “Next”, those that don’t depend on new technology but do require some development in terms of behaviour, policy, feasibility and/or means of financing.
- “New” opportunities that require significantly fresh approaches, finance, or advances in technology in particular.

“NOW”

1. Reduce Emissions from Visitor Travel

There are four main ways to do this.

1. Work with the rail industry to increase capacity for peak visitor times, possibly including dedicated direct peak-season services into the Lake District (Windermere, Furness and Coast lines) from cities, create visitor-focused ticketing deals including onward travel, and reduce Sunday and bank holiday closures. This would work well with the train operating companies rethinking their business models and markets post Covid.
2. Work with coach and bus companies to create mainstream and market-specific services, such as for younger adults from cities, day-trip ramblers from local towns and cities and services to specific events (fell races, shows etc.).
3. Create more opportunities for ride sharing and target market for ridesharing via social networks and for events.
4. Develop place and market-smart end-to-end journey integration deals – this would include linking up services and fares that allow people to link fast, efficient inbound travel with gateway-to-destination onward travel.

These opportunities need to be articulated to potential operators with the Lake District National Park Partnership and destination management organisations.

Improved Visitor Park & Ride (P & R) in the Lake District National Park

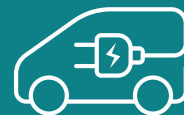
In the last 18 months, significant progress has been made in piloting systems for managing visitor access in National Parks across the UK. An example of this includes the popular Park & Ride scheme serving Pen-y-pass in central Snowdonia as part of a strategy to tackle miles of (free) verge car parking. Tickets are reasonably priced and cost just £2 for an adult single or £3 for an adult return.

The Lake District’s geography makes it potentially suitable for a similar scheme to be implemented now. There is already the ‘Park and Explore’ in Wasdale and Buttermere, however, this comes with a steep - but commercially pragmatic - price of £18 for all-day parking.¹³



A road in Cumbria with many white delivery vans on it. Photo credit: www.transportforthenorth.com

¹³ Source: www.lakedistrict.gov.uk/visiting/plan-your-visit/getting-to-the-lake-district/park-and-explore



There are opportunities to scale up P&R services across the Lake District National Park and enhance them with additional transport services running from and to strategic gateways (located at entrances to key tourist destinations). Services would operate based on projected demand and would help to reduce the number of vehicles in the Park, which is particularly high during peak and seasonal periods. The larger scale would have the benefit of reducing cost to users.

How Could This Be Funded?

In order to improve the economics of a P&R scheme for the Lake District, each scheme should ideally secure income streams from additional services aimed principally at tourists, but also with some value to local residents outside peak periods. Such services/revenue streams could include:

- Hospitality
- EV charging
- Parking (although parking charges would probably need to include valley shuttle tickets)
- Meeting spaces
- E-bike hire
- Visitor and Resident Shuttle Pass - Ticketing

An integrated “pay-once” (parking + access pass) would provide simplicity and clarity and avoid decision making around cost-comparison. This could be marketed as a free shuttle pass which could give visitors free travel on buses, trains and boats around the Lake District, included in the parking charge. Some considerations could be:

- Ticketing is designed and marketed around access and visitor experience.
- Packages would include parking, plus access into and around the Lake District by bus, train, and boat.
- The commercial opportunity is the creation of visitor cards for the valley locales. The economic model would be developed in partnership with the operators. Such a card (Freedom of the Lakes) was developed in the western Lake District around 2010 but was based on existing access services and conditions rather than as part of transformed access. Tyg-IT - the company behind it - has since focused on providing ticketing and payment services for visitor attraction.¹⁴
- It could also be possible for the Shuttle Pass to be sold as part of the accommodation package, or if accommodation providers all put their prices up by say £30 - included could be a free travel pass.
- Revenue from the Shuttle Pass could help subsidise travel for residents in the off season, and or a Resident Shuttle Pass created to encourage more local public transport use.



Photo credit: Cumbrian Insurance

2. Improve Cumbria's Rail and Decarbonise

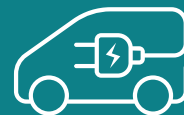
The only electrified railway line in Cumbria is the West Coast mainline that goes through East Cumbria, with stops in Oxenholme, Penrith and Carlisle. The usefulness of this for local travel is hampered by the demands of long-distance trains: many trains, for example, do not stop at either Oxenholme or Penrith, so the use of the mainline for local travel between key towns is frustrating, expensive and impractical.

- The electrification of the Oxenholme-Windermere line was approved in 2014 but was cancelled in 2017 and electrifying this line should be reconsidered. The Lake Line, as others have suggested, could also become part of a Lake District light rail network, using very low emission technology. It could also be extended through to Ambleside and on to Keswick and Penrith.¹⁵
- The re-opening of the Keswick to Penrith railway line – which could cost between £40m and £100m. The North West Regional Development Agency has said that re-opening the Keswick-Penrith railway appears likely to generate economic benefits in excess of its costs. The feasibility of further developing rail infrastructure should be investigated and the findings shared widely.¹⁶
- The Furness and Cumbria Coast Lines offer stunning scenery, but the rolling stock is of poor quality and services are limited, especially at weekends.

¹⁴ tygtickets.com

¹⁵ Source: ginadowding.org.uk/wp-content/uploads/2020/01/Transport-report.pdf

¹⁶ Source: www.cumbrianenergyrevolution.org.uk/other-sectors/



- The Cumbria Coastline is frequently blocked by landslides and there are sections of singletrack. It is only in recent years that the signal boxes were upgraded, and a Sunday service introduced. The line forms the sea wall at several points and is vulnerable to storm surges and rising sea levels.

3. Increase Demand Responsive Transport (DRT) Serving Cumbria's Dispersed Populations

DRT involves smaller buses operating across a zone on a loose timetable. Users – within the loose timetable constraints - can call / book (via app) the service to pick them up from within the zone and take them to other points within it. DRT services operate on tried-and-tested algorithms that optimise dynamic routes. These services work well in the dispersed rural settlements that characterise large areas of Cumbria.

The idea proposed within this chapter is for there to be packages of integrated transport and access solutions that would be available on-demand across rural locales. Users would access services through integrated ticketing or account subscription, developing into a Mobility-as-a-Service package. The convenience and quality of this service would mean that it would positively compete with private car use and provide a viable alternative to car ownership for existing reluctant car owners. This proposal builds on Cumbria's £1.5 million funded 2021-2024 Rural Mobility Fund programme targeting 4 rural hubs - Penrith, Wigton, Egremont and Ulverston.

Residents could purchase discounted subscriptions to the service. The short-term rollout of services would be encouraged by the provision of usage-level and price guarantees to service providers (a transport equivalent of the 'Power Purchase Agreement' (PPA) that have underlain the growth of renewable energy).

It is anticipated that these smaller bus services would be operated by a third-party provider. There is potential for procurement to be undertaken by the local authority for this service, but that stipulates certain green elements, including:

- Low carbon buses only, a green depot. The local authority could choose to own this, with the operator(s) paying for using it (either on a long-term lease or on a per use/vehicle basis).
- Services designed to integrate with other transport services - public, community and shared transport.

DRT is a key feature of 'shared mobility' that is outlined in TfN's Decarbonisation Strategy. Shared mobility refers to a number of different services that make low or zero emission vehicles accessible to people such as lift sharing, car hire, car clubs, demand responsive bus services, taxis, and cycle and e-scooter hire schemes.

Buses Could be Repurposed

As part of this, buses could be repurposed into an integrated fleet of vehicles capable of delivering people and goods to isolated areas. Rather than the vehicles being unused outside of peak hours, they could be fitted out to service other needs, such as goods and local food delivery, supporting wider areas of the community. Local hubs could run under a community-based initiative, connecting the goods to isolated individuals who are unable to travel long distances. The scheme could also run on a subscription basis where, for example, local grocery businesses and restaurants, would supply goods that could be delivered out to vulnerable people.

"Ticketing" & Subscriptions

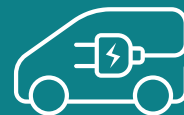
These services and their combinations are often successfully made available through subscription models (like car clubs and urban bike share schemes.). The introduction of the DRT service provides an opportunity to design subscription services from the outset. An integrated subscription model - that provides access across the different modes – becomes a real opportunity.

Different models would appeal to different types of people and lifestyles:

- Based on mobile phone models - PAYG or contact based on combinations of calls, texts and data.
- As capped daily payments – like London's Oyster scheme.
- Through more sophisticated Mobility as a Service models.

These require multiple transport services to enable users to choose between options, and it might be an option for them to be developed in parallel with a suite of new services or once they have been implemented. Users can become members of any of the component services or pay as they use individual services if and as they fit into their "mobility lifestyles".

We suggest that a pilot subscription service for local area-demand responsive transport should be created. Cumbria County Council could enter a 'transport purchase agreement' with the operator (via service procurement), guaranteeing a minimum income for the operator, which would charge customers.



4. EV Charging at Visitor Accommodation: The Lake District as an EV-friendly Destination

As noted above, national Government policy is strongly behind a rapid growth in the number of EVs in the UK fleet, creating pressure for a commensurate rollout of EV charging infrastructure. Rural areas, where density is lower, face particular challenges in this roll-out, while at the same time journey distances are often longer in rural areas than urban areas and EV ranges are affected by open-road rather than stop-start driving patterns.

All these considerations, as well as easier access to off-road parking in rural areas, point towards a distributed model for EV charging in rural areas, as posited to open relying on public charge points.

When allied with the importance of visitors to the rural economy in Cumbria, we believe that there is an opportunity to address several needs at once via a co-ordinated push to install distributed charging facilities in both homes and visitor accommodation sites (often, of course, the same place).

As well as securing adequate charging infrastructure for residents, such an initiative would:

- Enhance marketing opportunities for the Lake District & Cumbria as an “EV friendly” destination, generating new and additional business for accommodation providers as EV ownership spreads and the availability of charging becomes a prominent consideration in choosing holiday destinations.
- Reduce pressure on public EV charging, especially in peak season, because journeys during the day would be unlikely to exceed the EV’s range.

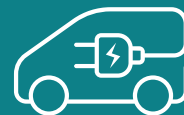
How would this work?

- Depending on their room numbers, accommodation providers would install one or more home charging points delivering 6-7kwh charging capacity, allowing easy overnight charging for 1-2 vehicles.
- The full cost of a smart charger is currently about c. £1,000. No special electrical connection is required.
- There are several quite attractive financial incentives for distributed EV charging currently in place, via grants and tax rebates. If the accommodation owner has an EV themselves, they can claim a £350 grant on a charger. As well as this, accommodation owners, as registered businesses, may be able to apply for a grant under the Workplace Charging Scheme (WCS) / Office of Zero Emission Vehicles (OZEV) scheme. Businesses can be subsidised up to 75%, up to a maximum of £350 for each charge port, for up to a maximum of 40 charge ports across all sites. Local grants may also be available via the Lake District Foundation’s current ESIF Low Carbon Lake District scheme.¹⁷
- The UK Government also provides tax benefits for business expenditures incurred on charging infrastructure with a 100% first-year allowance (FYA). Businesses therefore can greatly benefit from reduced costs in developing a charging infrastructure for their premises.
- The return for accommodation providers comes from two sources: (a) additional guests (because of their providing a key new accommodation feature) and (b) profit on the cost of charging. Even without a grant, just 20 additional guests for an accommodation provider making a profit of £50 per night would recoup their investment, while the increasing availability of very cheap overnight electricity tariff rates could make margins on charging a source of increased and regular income for hosts.



Image credit: Tesla

¹⁷ www.lakedistrictfoundation.org/low-carbon-lake-district-grants/



How Could This Be Implemented?

Especially with the grant / fiscal incentives available, the level of investment required, at an individual accommodation venue, is relatively low enough, and the payback period relatively short enough, and assured. For these reasons, a specific finance product would probably not be needed for the proposed roll-out, with costs probably able to be covered by accommodation providers themselves via existing credit arrangements. This could be looked at, however, in the light of feedback from hosts.

Rather, the key to the uptake of this potentially important new addition to Cumbria's tourism offer is probably active awareness-raising and education, explaining the benefits to accommodation providers for their businesses of the Lake District & Cumbria being seen as an EV-friendly destination.

The obvious leaders of such an awareness-raising initiative would be Cumbria Tourism, which could lead on a county-wide initiative in partnership with other stakeholders.

This initiative would first need to confirm the economics sketched out above, but could then mount an active campaign for adoption of the roll-out during 2022/23, with a view to being able to promote Cumbria as an EV friendly destination in time for the 2023 season.

Increasing EV Rapid / Fast Charging on the Go

Away from the motorway service station market, several independent networks such as Osprey, Instavolt and Geniepoint are already serving many sites with rapid chargers on a 'plug and charge' basis similar to refuelling a non-EV (i.e., not requiring complex subscription/membership arrangements). These networks are often using the car parks of chains such as gyms and coffee outlets. Other networks are subsidiaries of oil companies, such as BP Pulse and Shell Re-charge, while others, such as Podpoint, appear to be following a strategy of working with major retailers such as Tesco providing free charging, presumably as a customer service feature. The business models of these networks remain diverse, as do pricing strategies.

While these are all characteristics of a nascent market, it may be assumed that demand for public rapid/fast charge points (aimed at people on journeys rather than residents) will be addressed by network operators who will make financing arrangements for their investments on their own behalf. If these players are going to corner this market, Cumbria needs to develop relationships with them, so it doesn't miss out.

"NEXT"

An important aspect of any "Next" proposition is that Cumbria County Council (CCC) and the LEP as the transport authority, use its existing statutory powers and change policy to create better conditions to create an at-scale shift from high carbon transport and create the right enabling framework for innovation.

5. Income from EV as a Storage Hub

New electric vehicles, which average 220 miles on a single charge, can cost as little as £10 to charge, but are still relatively expensive to buy, starting at about £20,000 for a new car. However, the Government's subsidies for them, savings on road tax, very low servicing costs and especially the savings on fuel means that the 'payback' is relatively quick, as little as three years against the cost of buying a new petrol or diesel car. There's also up to £10,000 in tax relief for electric company cars and leasing agreements mean that an electric vehicle could be available for £200-£300 a month.

The cost of the EV could be decreased even further through earning an income from the EV acting as an energy storage hub. Developments and trials in vehicle-to-grid (V2G) technology and smart metering mean that it will soon be possible to sell stored energy from an EV's battery pack back to the grid. EV owners will be rewarded if they are willing to enable their car batteries to be used to help balance the grid.

OVO has been running a nationwide V2G trial, funded by the Office for Low Emission Vehicles (OLEV) and the Department for Business Energy and Industrial Strategy (BEIS), in partnership with Innovate UK.¹⁸ Some technological hurdles need to be overcome before V2G becomes a mainstream energy and mobility management tool and the new European ISO 15118-20 standard is expected to accelerate the V2G market because it enables bidirectional power transfer for multiple cars.

Other ways of reducing the cost of EVs include encouraging local businesses to consider salary sacrifice schemes for their employees and encourage them to adopt cycle to work schemes, as well as use their electric cars. Employers save National Insurance (NI) and employees can save tax and National Insurance. Octopus Electric Dreams offer their solution to SMEs, as does Fleet Evolution.

¹⁸ www.ovoenery.com/guides/electric-cars/vehicle-to-grid-technology

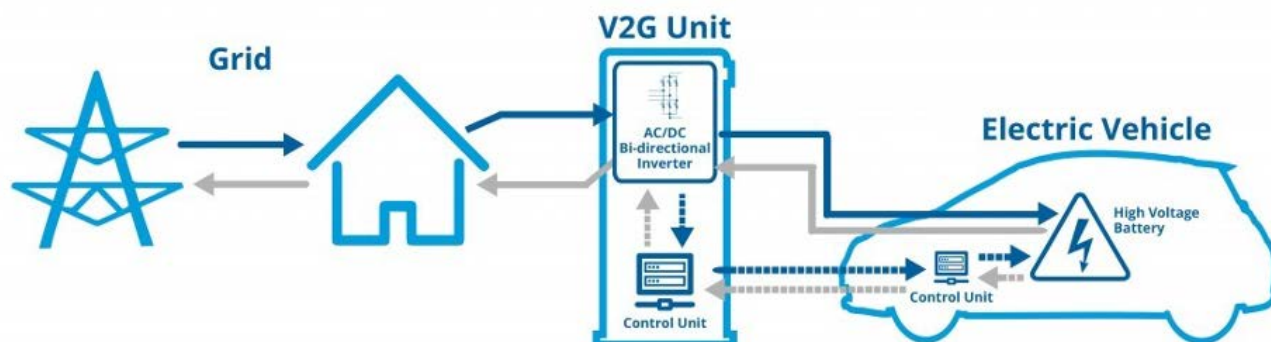
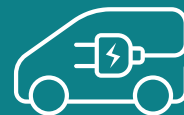


Figure 4. EV Charging: Software and Grid Services. Image credit: Cenex

“NEW”

6. Develop a Green (Hydrogen and Nature-based) Multi Modal Corridor Along the M6

The M6 is both a key North-South link and a point of interchange from which to access other parts of Cumbria (via the A66, A689 and A685). The M6 junctions (36-44) are in Cumbria, and they connect to Eden, South Lakeland and Carlisle. Transport on the M6 includes a great deal of long-haul heavy freight traffic, generates significant emissions which if counted towards Cumbria’s own production-based emissions, would increase these by 40%.

There is therefore considerable potential to create a ‘green corridor’ along the M6 in Cumbria that would integrate green technologies (such as hydrogen refilling stations for HGVs and coaches), alongside nature-based solutions. The benefits would be far-reaching not just for Cumbria but for green infrastructure investment that would also be beneficial for Cumbria’s neighbours. It would help unlock investment opportunities consistent with the net zero aspirations of the Northern Powerhouse, Transport for the North, and Transport for Scotland’s decarbonisation plans.

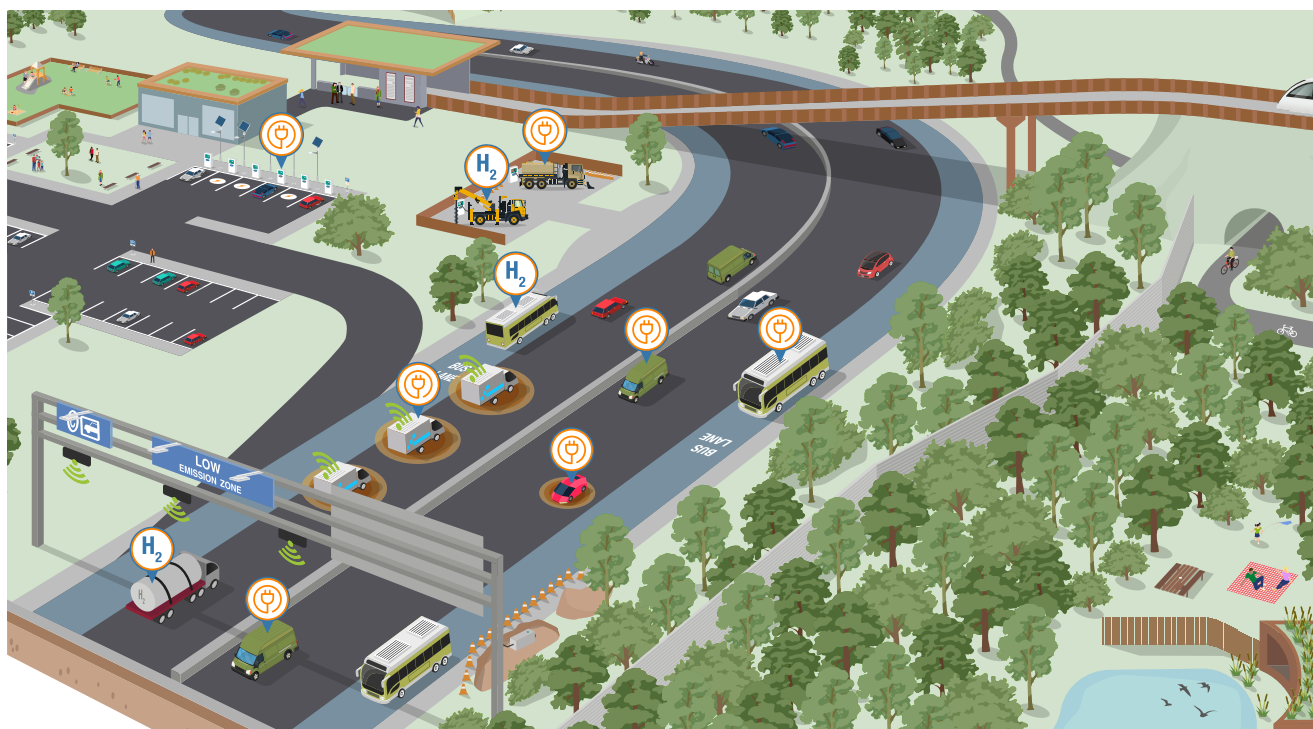
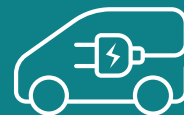


Figure 5. The proposition is to create a hydrogen and EV charging multi-modal transport hub, alongside nature-based solutions all along Cumbria’s leg of the M6. Image credit: Arup



The contribution that hydrogen can make in the freight sector, which is difficult to electrify, is potentially enormous. Photo credit: OMV.com

The success of the M6 green corridor will be reliant on close and effective collaboration between landowners and managers (such as Westmorland Family Group, The Woodland Trust, and the National Trust), energy providers (including Electricity North West), transport operators (such as Stobart's Group), investors, local Government and the LEP alongside Transport for the North, Highways England and the DfT.

Hydrogen created through electrolysis, using an electric current (e.g., from renewable or nuclear energy) to split water into hydrogen and oxygen, from proposed facilities at Harker and Workington (see Renewable Energy chapter) could be tankered into the M6 transport hub, as well as used for nearby industrial purposes. Other hydrogen production sites may include major industries along the M6 such as those in Shap, industrial estates in Penrith and Carlisle etc.

M6's hydrogen refuelling stations can operate on a 'store and dispense' model (in much the same way as diesel and petrol), hydrogen doesn't have to be produced at the refilling station but can be tankered in. Equally, the distribution of hydrogen to the refuelling stations can be delivered more efficiently via pipelines. Whilst a pipeline has a high upfront cost initially, once operational, a pipeline network would provide lower operating costs and better safety.

Hydrogen for transport makes sense for long haul heavy-duty vehicles not suited to battery electric propulsion, especially where those vehicles also encounter steep topography. Cumbria is an ideal location for piloting a green hydrogen transport hub, alongside those developing similar facilities at strategic locations around the country.

Government Funding

We suggest consideration should be given to developing a proposal for a green hydrogen and nature M6 transport hub that would be a vital link in the Government's Hydrogen Strategy (published in August 2021) which outlined that £105 million of UK Government funding, which could unlock £4 billion of investment in hydrogen by 2030 and some of this could be directed to Cumbria. We note the Government's commitment to invest £13m in 2021 to establish the UK's first multi-modal hydrogen transport hub in Tees Valley.

There is a clear hydrogen transport opportunity for the North West of England as there are currently no other projects planned all the way from Liverpool to Southern Scotland. This project would be a strategic hub, within a UK wide network of hydrogen refueling stations (HRS).

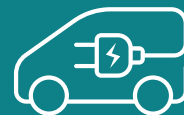
Greening the M6 - Living & Natural Resources

In addition to the green hydrogen hub, many of the potential green investment opportunities highlighted in this report's Living and Natural Resources chapter for other areas in Cumbria could generate substantial emission reductions, if implemented on the M6 corridor. They can be adopted on the same land or farms and potentially have a greater impact when concentrated in a specific geographical area.

Implementing these nature-based investment opportunities for Cumbria's leg of the M6 would require an investment of £300m. Investors could save 1.7m tCO₂e over the next 10 years, and over 13.6m tCO₂e over 60 years, and create nearly 700 full-time equivalent jobs.¹⁹

To understand this further, we considered two areas, defined around two groups of catchments along the M6 (M6 North and South), as shown in Figure 6.

¹⁹ 60 years in the recommended HM Treasury appraisal time frame. The Green Book: appraisal and evaluation in central government - GOV.UK (www.gov.uk)



Nature-based Recommendations (see Nature chapter for more nature ideas throughout Cumbria)

- Restore 70% of Peat in the M6 Areas:**
 The Peatland Code estimates the avoided emissions from peat restoration are approximately 19 tCO₂e/ha/yr for actively eroding peatland or 2 tCO₂e/ha/yr for drained peatland. Assuming at least 70%²⁰ of the peatlands in Cumbria's M6 areas are suitable for restoration, an immediate carbon saving could be made by restoring approx 11,500 ha of peatland (7,100 in M6 north and 4,400 in M6 South areas) and altering land management.²¹ An investment of approx. £11.5m would be required. In line with the England average, 27% of this peatland is heavily eroded²² and the remainder is drained. Therefore, its restoration could avoid emissions of 3.8 – 7.5 million tCO₂e and generate £75m – 151m of voluntary carbon credits, over 50-100 years.
- Graze Livestock on 10% of the Grassland on the M6 corridor** (12,000 ha in M6 North, 7,400 in M6 South), this would save 5,000 tonnes of tCO₂e per year (300,000 tonnes over 60 years) but would significantly reduce income. Grazing livestock along the M6 to reduce carbon emissions, including from the livestock, and where the intensity of management is high, can have negative impacts on biodiversity, soil and water quality. Instead, there is a range of practices that can address these issues:
 - Establish Agroforestry Systems on 10% of the Land** - this could support 6 tonnes CO₂e of sequestration per hectare per year without compromising agricultural output. On 10% of the farmland in the M6 corridor (13,200 ha in M6 North, 7,500 in M6 South), it could sequester 124,000 tonnes t CO₂e /yr, giving 1.2m tonnes over 10 years and 7.4m tonnes over 60 yrs. At £20 per tonne CO₂e, it could provide £2.5m/ from carbon credits. The investment required is approx £1,000 per hectare or £20.7m across 10% of the M6 corridor.
 - Implement Agri-Voltaics²³ on 10% of Farms** in the M6 corridor implemented schemes. If each accommodated an 850kw installation of 1% of their area, this would represent a total of 1.75GW of power generation. The installation cost is approx. £490k per farm so this would require a total investment of £100m. This could save 41,000 tCO₂e per year (and 410,000 tCO₂e over 10 years, and 2.46m over 60 years). If grid connectivity was a problem, local hydrogen production from solar energy could also be used to support farming machinery.
 - Adopt Catchment Management Measures** like those in the Petteril catchment (for nutrients) and Wyre (for natural flood management) (NFM).²⁴ In the two M6 catchments (total area 280,000 ha), this would save an estimated £175m on nutrient pollution removal and require £1.0m – £2.5m of NFM investment.

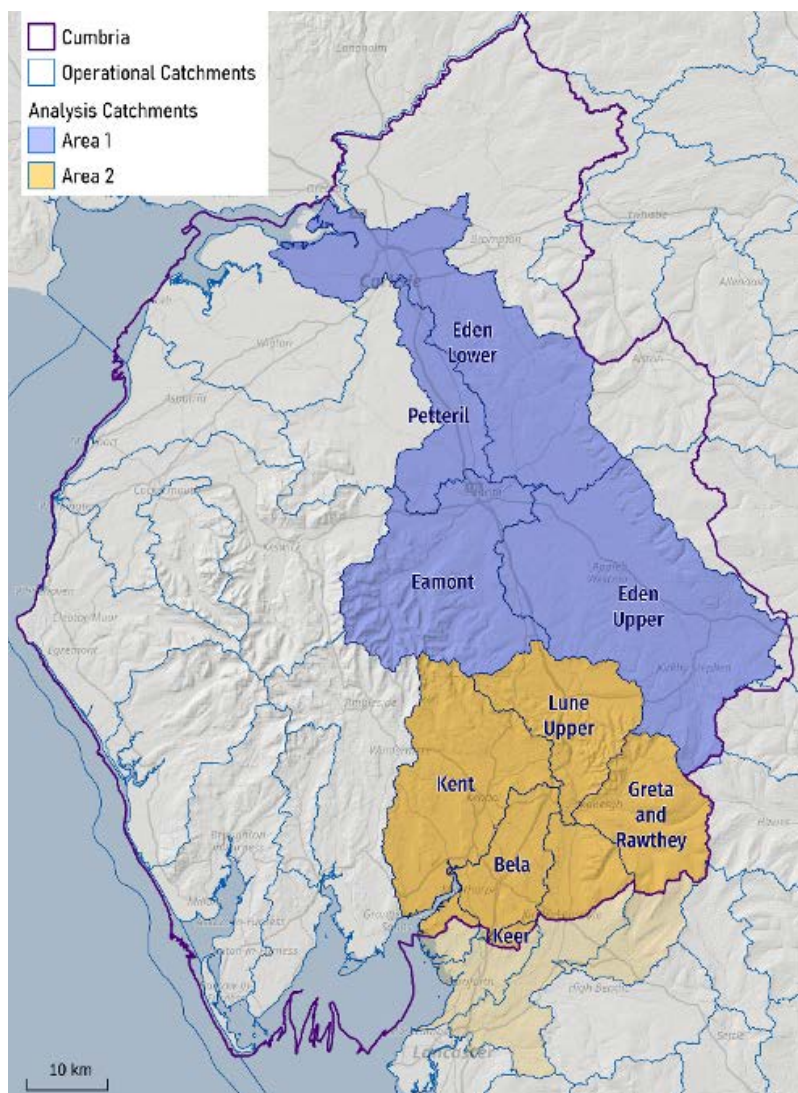


Figure 6. M6 North (Area 1) and South (Area 2) analysis areas.

²⁰ Source: Simon Thomas. Peatland Partnership. Cumbria WT, per com

²¹ Source: www.cumbriawildlifetrust.org.uk/about/what-we-do/living-landscapes/wildlife-conservation-projects/peatland-restoration

²² Source: www.iucn-uk-peatlandprogramme.org/sites/default/files/2019-11/COI%20State_of_UK_Peatlands.pdf

²³ Agrivoltaics refers to a process for the simultaneous use of land for agricultural production and photovoltaic (PV) electricity production.

²⁴ See Natural & Living Resources chapter



Sam and Claire Beaumont and their herd of Shorthorn cattle on their Cumbrian farm. Photo credit: Anthony Cullen for the Guardian