

Delivering large-scale natural carbon capture on land

KEY POINTS

- Scotland is rich in low productivity land which, with the right fiscal framework, could be used to naturally lock up vast amounts of carbon while contributing to biodiversity and rural community regeneration.
- The potential is enormous. If all land managers maximised carbon sequestration of peatlands and woodlands across Scotland, we could reduce our national carbon emissions by up to 13 Mt CO₂e a year – equivalent to removing every single vehicle from our roads.
- We currently have incentive schemes for peatland restoration and woodland creation for those landowners willing to engage. By introducing a **natural carbon land tax** we could vastly scale up our efforts as a country, while ensuring that all major landowners play their part.
- A **natural carbon land tax** would band landholdings according to their land types and current estimated negative or positive emissions. Carbon soil science and data exist for determining what these could be, with some testing and refinements.
- Revenues generated could fund further peatland and woodland restoration schemes. Those maximising natural carbon capture on their land would be exempt.
- Expansion of native woodlands would have many additional public benefits: increased biodiversity, reduced flooding, better water quality, and recreational opportunities leading to improved mental and physical health.

INTRODUCTION

This paper has been developed by the John Muir Trust as a contribution to the extensive discussions now underway around Scotland's response to the global climate emergency. We see this as the start of a dialogue. Accordingly, we hope to work with relevant NGOs, scientists, policy makers and others to explore the practicalities and timescales involved in making headway with this proposal. We will also explore the practicalities on the land we manage.

BACKGROUND

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 sets a bold target to reduce our emissions of all greenhouse gases to net-zero by 2045 at the latest, with an interim target of a 75 per cent reduction by 2030. This will require a major shift in the use of our resources, not least in the way we manage our land. This proposal is not an alternative to phasing out fossil fuel consumption; it is a recognition that we also need to repair centuries of harm by harnessing nature to remove and store damaging greenhouse gases.

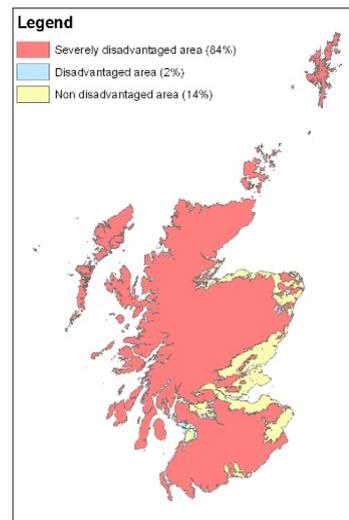
Proportionate to our population Scotland has an exceptionally large landmass. We have six and a half times as much land per head of population as our nearest neighbour England. The geographical Highlands, which accounts for more than half of Scotland's total landmass, is the most sparsely populated region in Europe apart from northern Scandinavia. Consequently, Scotland is in a stronger position than most to deliver major carbon reductions by transforming the way we manage our land.

Left to its own devices, land would be a natural carbon store. While we need farmland to produce food, much of Scotland's terrain consists of agriculturally less productive uplands and peatlands. For tens of thousands of years, these areas – apart from the highest, rockiest mountain tops – were home to vast pristine woodlands and peatlands which locked in immense quantities of carbon. But over many millennia, and especially in recent centuries, human activity has stunted the immense potential for carbon sequestration from our land.

Today, our poorest quality agricultural land is punching well below its weight when it comes to delivering public benefits, including climate targets. The geographic extent of this area is illustrated in the maps below.



RSPB map showing Scotland's proportion of 'UK uplands' (including low-lying coastal areas and peatlands)

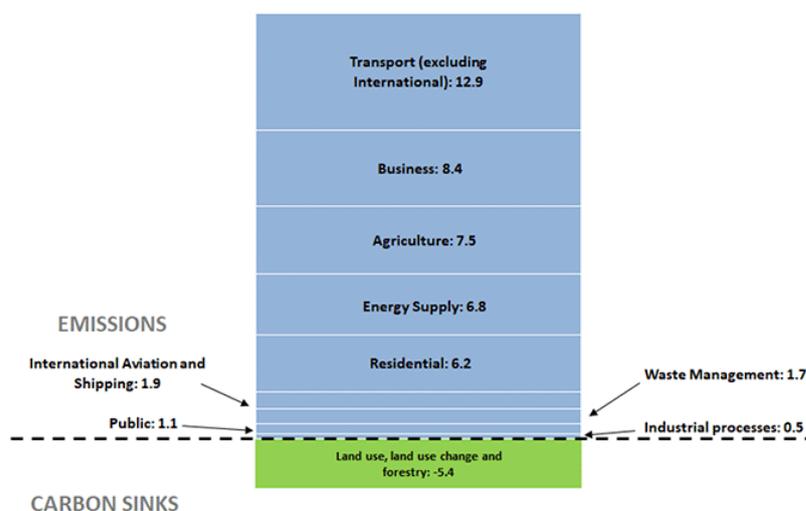


Scottish Government map of Scotland's agriculturally 'severely disadvantaged areas'

PEATLANDS AND WETLANDS

Scotland's blanket bogs and lowland raised bogs cover more than 20 per cent of our total landmass. They are our largest terrestrial carbon store, holding about 1.6 billion tonnes of carbon in the ground – equivalent to over 180 years of Scotland's entire greenhouse gas emissions at current rates.ⁱ Over 80 per cent of our peatlands are damaged or degraded.ⁱⁱ Recent estimates by the Scottish Government suggest that these damaged peatlands release around six million tonnes of carbon (6 MtCO₂e) every year.ⁱⁱⁱ

As the following chart illustrates, that figure of 6 MtCO₂e is almost as high as the 6.2 MtCO₂e greenhouse gas emissions from Scotland's 2.5 million residential households.



Sources of Scottish Greenhouse Gas Emissions, 2018. Values in MtCO₂e – Scottish Government 2020

While Scotland is famous for its peatlands, we also have other types of wetlands, mainly around our lochs, rivers, and coastline. As well as playing a vital role in flood defence, our swamps, fens, salt marshes, wet grassland, wet woodland and wet heathland are vital carbon stores. Coastal wetlands such

as salt marshes, although smaller in scale than peatlands, have the highest rates of carbon sequestration per hectare of all our natural systems. Yet these and other sensitive wetlands are under constant threat of damage and destruction, from built development, agricultural drainage, vehicle damage and rising sea-levels as a result of climate change.^{iv}

WOODLANDS

A new study focused on Scotland's uplands by the School of Earth and Environment at the University of Leeds has demonstrated the colossal potential for carbon removal and storage that could be achieved by native woodland regeneration and planting beyond areas currently identified. It estimates that "native woodland could expand to cover an additional 3.9 million hectares of the Scottish uplands removing an average of 6.96 Mt CO₂e a year".^v

This suggests Scotland's lower productivity agricultural land has the potential through woodland and peatland restoration **to reduce our national carbon emissions by just under 13 Mt CO₂e a year – which is the equivalent of removing every single vehicle from our roads.**

Until recently, much of the assessment of carbon sequestration potential for woodlands has focused on commercial timber, which is generally faster growing than native woodland. The wrong type of tree planting in the wrong place, however, can be counterproductive in the long term. A report in October 2020 for the Irish Department of Agriculture found that the country's forest estate has turned from a carbon sink into a net emitter of greenhouse gases.^{vi} Industrial-style commercial planting with large-scale soil disturbance during the mechanical planting operation, followed by clear-felling, produces a huge loss of carbon by changing soil dynamics far into the future.^{vii}

Conversely, recent international research has shown that forests containing various tree species can store twice as much carbon as the average monoculture plantation.^{viii} While native woodland generally takes longer to remove greenhouse gases, it can store carbon for many centuries through natural regeneration. It also has multiple other benefits to society such as improved soil fertility; flood alleviation; enhanced landscapes; recreational opportunities; high-quality sustainable wood products; and crucially, increased biodiversity and flourishing wildlife.

GRASSLANDS AND FARMLAND

Scotland has lost much of its carbon-rich grasslands as a result of centuries of ever-intensifying agriculture. Yet that damage can be reversed through better managed farmlands – for example, by returning to rotational natural grazing. Our remaining healthy grasslands survive only in places where traditional farming and crofting is practised.^{ix}

With the end of the Common Agricultural Policy, the future of Scottish farming may best be secured by embracing change. As Donald MacKinnon, the chair of the Scottish Crofting Federation, recently pointed out: "The climate emergency is going to dominate all we do and crofters have an important part to play, having a very sound record in good management of our environment. A significant proportion of high nature value areas in Scotland are under crofting tenure, for example the machair, known for its incredible biodiversity, and peatlands, which are the best ecosystem for sequestering carbon. Crofting is starting from a good position, but we can always do more to reduce our greenhouse gas emissions."^x

DELIVERING CARBON CAPTURE

We are now in a climate emergency. The urgency of the crisis demands that we introduce regulatory measures to maximise the carbon storage potential of Scotland's uplands. By taking bold action on carbon sequestration, Scotland can become a global leader in natural climate solutions.

We welcome and support the programmes of woodland expansion and peatland restoration that are already underway and their ambitious targets. By boosting that action, we can achieve and even far exceed the greenhouse gas targets set by the Scottish Government, thus making an exceptionally large contribution from a small country to the global struggle to halt climate change.

As a nation we need to play our part in delivering environmental, social and inter-generational justice both at home and globally. We believe it is imperative that large landowners who are not currently supporting woodland and peatland restoration take their share of responsibility for delivering these necessary targets and achieving a just transition to a net zero economy.

To that end, we propose phasing in a carbon tax for large-scale landowners in every part of Scotland starting with a pilot scheme on properties in excess of 10,000 ha before rolling it out to all landholdings in excess of 1,000 ha. Land owned by local authorities, housing associations, community land trusts and other agencies that supports essential services such as housing, schools and hospitals would be exempt from the tax.

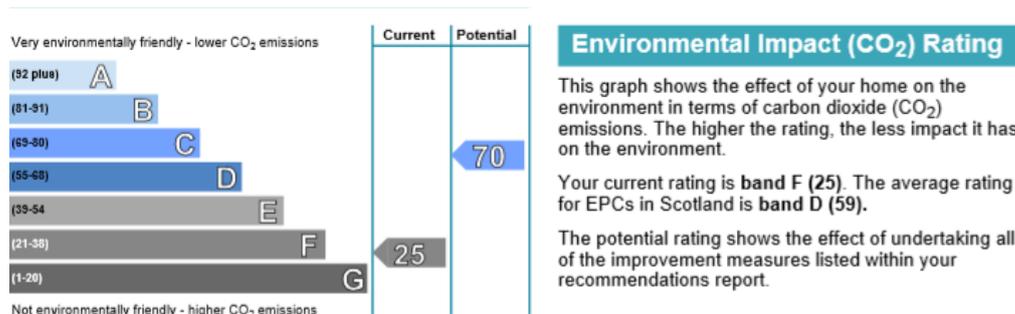
We also recognise the economic and cultural importance of Scotland’s agricultural sector. In assessing those larger farms that may be eligible for a carbon tax, it will be necessary to avoid unintended consequences, such as replicating the experience of the industrial sector, in which carbon production was effectively exported to other parts of the world. It would be counter-productive, for example, to increase imports of beef from countries whose agricultural practices are extremely damaging at the expense of high-quality Scottish beef. It should also be noted that at least 93 per cent of farms in Scotland fall under the 1,000ha threshold and would therefore be exempt from taxation under our proposal.

ASSESSING CARBON EMISSIONS

Based on hectareage, every landowner would be assessed for actual and potential carbon emissions, sequestration and storage by relevant public agencies (SEPA, NatureScot), local authorities and expert consultants (along broadly similar lines to the scheme used to rate the environmental impact of domestic properties, as depicted in the graph below).

They would then be placed in a graduated natural land carbon tax banding scheme collected and administered by local authorities, building upon existing systems for collecting non-domestic rates for sports shooting (which currently varies from £2 to £5 per hectare depending on land type) and other land-based businesses.

The scheme would focus solely on natural carbon removal and storage. We recognise the role of renewables in replacing fossil fuels, but electricity-generating schemes are covered by existing incentives and regulation.



Based on 2014 figures published by the Scottish Parliament Information Centre (SPICE) on private landholdings exceeding 1,000 hectares, we estimate that upwards of 39,000 sq.km of private land – half our total land area – would be assessed for natural carbon storage.^{xi} Together with an additional 12,000 sq. km owned by government agencies and NGOs, around 60 per cent of Scotland’s land would be liable for assessment.

Until tax rates are set and carbon assessment of land is underway, it is difficult to forecast revenues with any precision. But with around 50,000 sq. km (five million ha) meeting the minimum hectare threshold, and most of that land falling far short of its carbon capture potential, a notional average tax of £3 per hectare could theoretically raise up to £15million per year.

We would further propose that all tax revenues raised be paid into a dedicated carbon capture fund to provide additional funding streams to support woodland expansion and peatland restoration programmes to assist farmers, crofters, community land trusts and other small landholders to make the transition to net zero land use. Landowners eligible for the tax could move to lower tax bands by changing land use to maximise carbon sequestration.

Because of the complexities of measuring peatland emissions, and their potential for future carbon sequestration, we recognise the challenges involved in devising a fair and robust banding scheme.

Research is already well-advanced in Scotland, with for example the evolving ECOSSE (Estimation of Carbon in Organic Soils – Sequestration and Emissions) model which simulates soil carbon and nitrogen dynamics in both mineral and organic soils based on climate, land use, land management and soil data. Satellite imagery and other developing technology could also be utilised.^{xii}

The introduction of such a system would present a challenge to estates whose primary land management objective is currently sport shooting. Landowners who maintain unsustainably high deer densities to maximise the number of stags available for trophy hunting, and those who manage land for driven grouse shooting to the detriment of carbon capture, would be taxed at the high end of the scale. A natural carbon land tax could become a major driver of change towards more responsible land management that contributes to climate and biodiversity targets.

OTHER PUBLIC BENEFITS

A major transformation in our stewardship of the land along these lines would have other major spin-offs of local, national, and international significance. A crescendo of alarm bells is now ringing over another great global emergency: the loss of biodiversity at a rate unprecedented in human history. As David Attenborough recently declared: “Together we can build a better future if we make the right political decisions at a critical moment.”

Ecological restoration across thousands of square kilometres of Scotland’s uplands to combat climate change could concurrently bring back an abundance of life to many of Scotland’s depleted landscapes. Expanding habitats would also allow species greater freedom to spread out of confined areas and more easily adapt to the impacts of climate change. In addition, healthy peatlands improve water quality by removing atmospheric pollutants, and alleviate flooding by soaking up water and slowing down the flow of rivers from uplands into more populous lowland areas.

Restoring ecosystems to prioritise carbon storage could also help jump-start new forms of nature-based economic activity across many of our most fragile and sparsely populated areas, building upon the expansion of this sector between 2015 and 2019, when employment grew at five times the rate for the wider Scottish economy.^{xiii} There are already 195,000 nature-related jobs – more than in the entire construction industry and almost three times more than are employed in the energy sector.

A recent report published by three wildlife charities (Scottish Wildlife Trust, RSPB and WWF) suggests that a major programme of restoring, protecting and expanding Scotland’s peatlands and woodlands could create up to 3,500 direct jobs and a similar number of indirect jobs.^{xiv}

Most of these 7,000 new jobs would be located in some of Scotland’s most sparsely populated areas, giving a boost to fragile local economies. At the same time, transformed landscapes could over time help spread the benefits of tourism beyond our most famous beauty spots to other less favoured rural areas. And at national level, removing 13 MtCO₂ would be worth £390m a year to the Scottish economy at current EU Emissions Trading System (ETS) prices.

We believe that a collective effort to multiply the natural capital of our uplands, involving the Scottish Government, the Scottish Land Commission, Community Land Scotland, Forestry and Land Scotland, the Just Transition Commission, environmental NGOs, and individual landowners, could bring new hope and optimism to rural Scotland, and drive forward the re-peopling of our glens. And last but not least, a bold programme of carbon capture underpinned by regulation and incentives could become an international showcase contributing to progressive global change in land use and management.

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March 2021

For further information please contact Alan McCombes, Public Affairs Adviser, John Muir Trust
alan.mccombes@johnmuirtrust.org 0771 744 2805