

FOOD, LAND AND SEA

Enhancing carbon storage in our landscapes and coasts, providing for the needs of Devon's citizens and enhancing wildlife

Devon's Landscapes of National Significance

As a mostly rural county with long stretches of coast, how Devon manages its land and seas is a crucial element of our response to climate change and the linked ecological emergency. The Climate change strategy for food, land and sea must consider the interlinked nature of actions to reduce Greenhouse Gas (GHG) and adaptations to climate change. Agriculture and fishing are key sectors of Devon's economy and have national importance for the delivery of food and the natural environment. In pursuing net-zero there will be new opportunities for land based and coastal livelihoods and farm diversification in Devon.

Farming and land management deliver a wide range of social and environmental benefits over and above food production. Devon is recognised for landscapes of national and international significance and 35% of its land area lies within nationally protected areas: Dartmoor and Exmoor National Parks and five Areas of Outstanding Natural Beauty (AONBs): the Backdown Hills, East Devon, North Devon, South Devon and Tamar Valley. There are also two World Heritage Sites, the Cornwall and West Devon Mining Landscape and Jurassic Coast, and an International Dark Skies Reserve in North Devon.¹ These landscapes and coasts are major attractions for tourists, another major component of Devon's economy. Exmoor and Dartmoor National Park Authorities have helped understanding of the distinctive challenges facing these landscapes and existing work to mitigate climate change.

Devon's Emissions from Agriculture, Forestry and Other Land Use

Agriculture, Forestry and Other Land Use (AFOLU) emissions accounted for 17% of Devon's total GHG emissions in 2018. The main AFOLU emissions include: enteric fermentation in livestock (e.g. from cow's digestion of grassfeed), the management of manures produced by livestock, the application of organic and inorganic fertilisers to land,² changes in land cover and the cultivation of organic soils. This makes agriculture Devon's third largest source of emissions, after buildings and transport. However, whilst this does account for the contribution of Devon's terrestrial landscape in sequestering carbon dioxide, it does not account for the role of its marine habitats.

A Source of Emissions and an Opportunity for Sequestration and Storage

AFOLU is a distinctive sector in that it is both a source of GHG emissions and provides significant opportunities for their removal.³ The challenge is to reduce the former and greatly increase the latter through carbon sequestration and storage. As one example, Dartmoor's peat soils store an estimated 10 million tonnes of carbon – equivalent to an entire year of carbon dioxide emissions from UK industry.⁴

Methane and Nitrous Oxide in AFOLU

AFOLU GHGs differ from other sectors of the economy as methane (CH₄) and nitrous oxide (N₂O) are the main emissions rather than carbon dioxide (CO₂) from fossil fuel use⁵ (although land use changes such as conversion of permanent pasture to arable can release significant amounts of CO₂). Some GHGs increase global warming proportionately more than others over a given time period, per unit, known as their global warming potential (GWP). Methane is considered to have a GWP of 25 times carbon dioxide and nitrous oxide a GWP of 298 times carbon dioxide over a 100-year period.⁶ Farming is the largest global source of nitrous oxide, which largely comes from manure and fertiliser use, as well as soil disturbance.⁷

GHGs also have varying atmospheric lifetimes, with some breaking down faster than others. Methane is a short-lived GHG compared to carbon dioxide and breaks down within approximately 12 to 15 years.⁸ The high global warming potential of methane and nitrous oxide makes them important gases for emissions' reduction. Methane's comparatively short lifetime gives the potential that atmospheric

concentrations of this gas could be stabilised or reduced quicker than more persistent gases. Methane emissions must be reduced to a new lower equilibrium, so that on a yearly basis Devon achieves net-zero emissions.

Acting Despite Uncertainty

The UK economy faces significant uncertainty and volatility, with the combined impacts of Covid-19 and Brexit. This situation poses acute challenges for farming. Lack of clarity around trade agreements and the final formulation of the Agriculture Bill and Environment Bill at the time of writing mean that where and how government will support decarbonisation and production is still not confirmed. However, 'tests and trials' of the new Environmental Land Management Scheme (ELMS) are underway in several locations across Devon providing opportunities to inform this Plan.

Additional uncertainty and technological unknowns remain as to how existing dominant agricultural practices can be decarbonised.

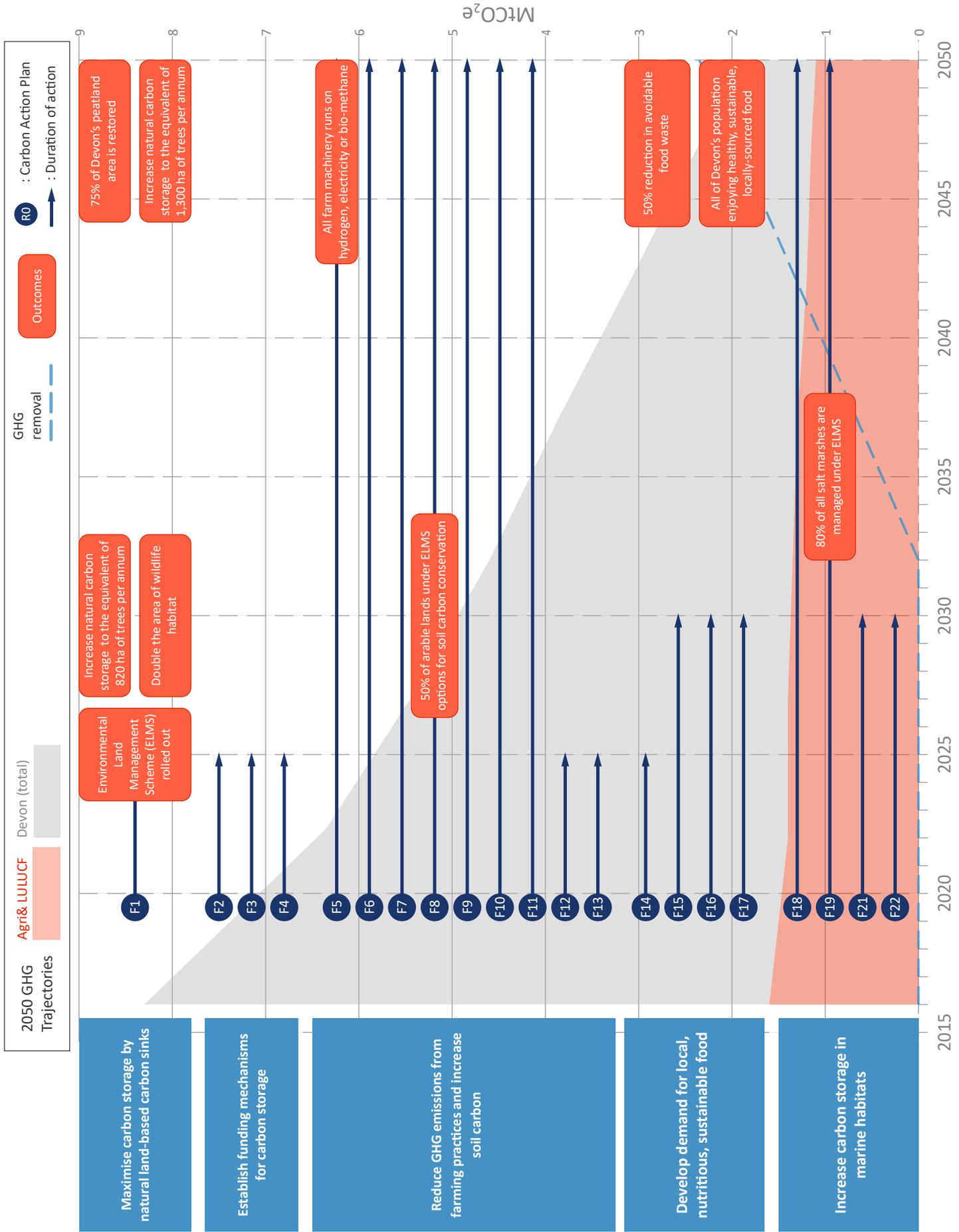
Despite uncertainty, it is imperative that action to mitigate climate change is taken now. But as an emerging and dynamic policy area, actions will need to adjust according to new evidence, science and best practice.⁵

11.1 WHAT NEEDS TO HAPPEN?

1. **Maximise carbon sequestration and storage by natural carbon sinks: trees, peat and other wetland habitats and soils.** To do so, establish a Land Use Framework, underpinned by a Nature Recovery Network, to promote coherent long-term land-use planning to meet our needs, nature recovery and climate change mitigation and adaptation.
2. **Establish funding mechanism for carbon sequestration and storage.** Funding mechanisms considered include working with government on the Environmental Land Management Scheme, environmental net-gain initiatives and the development of carbon sequestration accreditation systems locally, as well as the creation of a Devon Carbon Investment platform.
3. **Reduce GHG emissions from farming practices and increase soil carbon** by enabling farmers and land managers to have access to impartial advice to help them transition towards a mix of regenerative agriculture, agroforestry, pasture-based farming and making best use of farm wastes for energy purposes.
4. **Develop demand for and access to local, nutritious, sustainably produced food by:** providing shared retail, processing and marketing resources for Devon's food producers; offering engagement programmes to empower people to engage with food and its production; and use the spending power of Devon's anchor institutions to support farming businesses to have a positive impact on the environment.
5. **Increase carbon sequestration and storage in coastal and marine habitats.** Devon must protect its important marine ecosystems and their carbon sequestration and storage capacity to reduce and prevent blue carbon emissions arising from their loss and degradation. Equally, measures are needed to restore and enhance lost and damaged marine and coastal habitats such as seagrass beds and saltmarsh to increase carbon sequestration and storage.

11.1.1 Action Diagram for Food, Land and Sea





11.1.2 The Actions:

Maximise carbon sequestration and storage by natural carbon sinks: trees, peat and other wetland habitats and soils.

F1. Develop a Land Use Framework (LUF) for Devon to establish land use principles that embed carbon sequestration and storage and identifies opportunity areas for specific outcomes to guide land use decisions.

F1.1 Develop a Nature Recovery Network of joined-up places, on land and at sea, created from maps that identify opportunities for the protection, restoration, and creation of habitats that increase carbon sequestration and storage alongside bringing benefits for nature and people.

F1.2 As part of the Land Use Framework, and underpinned by the Nature Recovery Network, identify opportunities to implement a Trees for Devon initiative.

Establish funding mechanism for carbon sequestration and storage.

F3. Support the development of carbon sequestration accreditation systems locally for a range of carbon rich habitats and the creation of a Devon Carbon Investment platform.

F4. Work with government to ensure the effective delivery of carbon sequestration, alongside other public goods, through the design of ELMS, by engaging in public consultations and Devon Test and Trials.

Reduce GHG emissions from farming practices and increase soil carbon

F10. Work with the NFU and other representatives of the farming community to encourage approaches to conserve and rejuvenate soil carbon (organic matter) e.g. through ELMS.

F13. Establish a Devon Farm Advisory Service

Develop demand for and access to local, nutritious, sustainably produced food

F15. Implement a Sustainable Food Devon initiative to develop demand and supply chains for local, healthy food.

F15.4 Promote a balanced diet, in line with the government's Eatwell Guide and reconnect people with the origin and seasonality of food through "grow, cook, eat" programmes.

F15.5 Encourage catering in anchor institutions to provide sustainably produced, locally sourced and nutritious meals in line with the government's Eatwell Guide.

Increase carbon sequestration and storage in coastal and marine habitats

F20. Develop a South Devon Marine Natural Capital Plan, learning from the experience of the North Devon Natural Capital Plan.

F20.1 Establish and maintain an inventory of marine natural capital.

F20.4 Pilot specific initiatives which lead to marine carbon sequestration.

11.2 OPPORTUNITIES AND BENEFITS

The transition to a net-zero agricultural system and land-use, provides numerous opportunities for Devon including:

- **Enhance Habitats:** Storing more carbon will require the quality and extent of habitats across to Devon to be improved. Habitats of particular importance in Devon that are extremely effective at storing carbon are: upland peat bogs; woodlands; wetland habitats such as reedbeds and valley mires; wet Culm grasslands; salt marshes and mudflats; and sea grass meadows and kelp beds. Many of these habitats have been lost over the last 50 years and many that remain are in poor condition and are leaking rather than storing carbon. Restoring these habitats, and many others, to realise carbon storage provides a remarkable opportunity to address the ecological crisis for the benefit of nature.
- **Increase Resilience:** Although addressing the risks to the environment and communities associated with climate change are not the focus of this Plan (they will be addressed by the Climate Impacts Group through a Devon, Cornwall and Isles of Scilly Adaptation Plan) in many instances actions to reduce emissions and enhance carbon sequestration will help increase community resilience. For example, appropriately located tree planting or improvements to soil carbon will reduce the rate that water moves through landscapes and therefore reduce the risk of flooding in villages, towns and cities.
- **Improve our Health:** Following the diet advocated by the government's Eatwell Guide, which includes reducing consumption of animal products and eating a diet rich in vegetables, nuts, seeds and fruit, would produce significant environmental and health benefits.³⁰ The average person in industrialised countries eats twice as much meat than is considered healthy, and meat-rich diets are recognised to contribute to the rise of obesity, cancer, type-2 diabetes and heart disease.²⁹
- **Revitalise Local Economies:** Increasing people's engagement with food production, environmental standards and health benefits will raise demand for local, sustainable food. The procurement practices of anchor institutions have a key role to play alongside people's shopping choices on the high street. There is an opportunity for local producers and distributors to benefit from these changing attitudes. Furthermore, Devon's diverse environment, including its two coastlines, means it is well positioned to be a leader in providing carbon offsetting opportunities to organisations looking to invest to improve their corporate social responsibility.

11.3 KEY OUTCOMES

- The landscapes of Devon are enriched by actions to increase the sequestration and storage of carbon through carefully located tree planting, habitat restoration for wildlife and a more diverse farmed environment
- Actions to aid carbon sequestration and storage are located appropriately to greatly aid adaptations to climate change, such as flood control measures.
- People are enjoying nutritious, healthy, high standard food, sourced locally where this provides a carbon benefit.
- Rural businesses are enjoying a renewed focus on food quality and rural materials and a new market in carbon offsets linked to the delivery of other environmental services
- Devon leads the UK in engaging with natural capital approaches and developing carbon-offset standards for marine and terrestrial habitats

11.4 GOAL: ESTABLISH A LAND USE FRAMEWORK TO PROMOTE COHERENT LONG-TERM LAND-USE PLANNING FOR CLIMATE CHANGE AND NATURE RECOVERY

Land is a finite resource and under increasing pressure from competing land uses such as food and timber production, development, wildlife habitats and water storage. For net-zero to be achieved, carbon sequestration and storage need to be a central part of this mix, achieved as part of and by different land uses, with the emphasis on individual land uses providing multiple outcomes, including mitigation of and adaptation to climate change.

Reports by the Committee on Climate Change (CCC) and the Centre for Alternative Technology, as well as a number of national scaled scenarios for achieving net-zero, highlight the need to increase carbon sequestration and storage, with particular emphasis on woodland creation. The CCC scenarios suggest that to achieve Net-Zero requires that UK woodland cover increases to an average of 19% by 2050.⁹ In practice, constraints on the ability of urban areas to increase tree cover significantly means that higher levels of tree cover will be needed in rural areas like Devon, whose current woodland area is approximately 79,000 Ha (12% of land area).

Decision making for these competing demands on land is not currently guided by a single framework at either a national or Devon scale. This results in land not necessarily achieving its potential to provide co-benefits for the climate, people and nature.

11.4.1 What Needs to Be Done?

A Land Use Framework is proposed to establish principles for land use that will embed carbon sequestration and storage in land-use decisions across Devon while also achieving other vital outcomes. These principles will provide guidance for subsequent reviews of existing land strategies in order to promote coherent long-term land-use planning for climate change.

The Land Use Framework will also identify suitable areas for prioritised outcomes, such as food production, tree planting, peatland restoration, energy generation, natural flood management and areas most likely to deliver multiple benefits. It will explore whether there is a case for spatially differentiated land uses around settlements, with a greater emphasis on local food production for local markets. In this way the Land Use Framework can help to ensure that climate change is fully factored into decisions about land use and will apply to a wide range of local policy, including Local Plans.

It will inform and support local priority setting in partnership with farmers and land managers to guide which opportunities they wish to pursue on their farms and seek funding for - the future Environmental Land Management Scheme (ELMS), currently being piloted and to be rolled out nationally from 2025, will be fundamental to the Framework's implementation. What is clear is that farmers have a special role in looking after carbon

already in soils and vegetation, as well as in nature recovery to enhance the level of carbon stored.

Preparation of the Land Use Framework will need extensive stakeholder involvement and engagement. Existing networks such as Natural Devon and the Local Nature Partnership, are well placed to lead this activity drawing extensively on the first-hand knowledge of farmers and land managers.

An initial step in developing the Land Use Framework will be the Devon Nature Recovery Network. This mapping of Devon's existing habitats will identify the opportunities for their enhancement, creation and interlinking to achieve further benefits for climate, nature and people.

In the case of tree planting the Land Use Framework will develop the concept of Trees for Devon guided by the government's emerging England Tree Strategy. It will consider the role of trees in both urban and rural environments and will identify types of location where trees can maximise the benefits provided - reducing soil erosion and flooding, enhancing water quality, providing shade, creating recreational opportunities and so on at the same time as sequestering and storing carbon - the right tree in the right place. Equally it will identify locations where tree planting could damage other important carbon sinks such as peat bogs and other deep peat soils and wetland habitats.

11.4.2 The Actions:

F1. Develop a Land Use Framework (LUF) for Devon to establish land use principles that embed carbon sequestration and storage and identifies opportunity areas for specific outcomes to guide land use decisions

F1.1. Develop a Nature Recovery Network of joined-up places, on land and at sea, created from maps that identify opportunities for the protection, restoration, and creation of habitats that increase carbon sequestration and storage alongside bringing benefits for nature and people

F1.2. As part of the Land Use Framework, and underpinned by the Nature Recovery Network, identify opportunities to implement a Trees for Devon initiative.

F1.3. Local Plan and Neighbourhood Plan reviews to integrate the principles of the LUF alongside other planning considerations.

11.4.3 Co-Benefits

The development of a Land Use Framework would have multiple benefits for Devon in addition to identifying opportunities and guiding land use for carbon sequestration and storage. These benefits include:

- Nature recovery, helping to address the ecological emergency at the same time as the climate emergency
- Enhanced ecosystem services, such as pollination to agricultural crops which could be boosted through the resulting nature recovery.
- The strategic enhancement and creation of habitats can help in risk reduction e.g. the planting of trees reducing flooding.

11.5 GOAL: RESTORE AND ENHANCE HABITATS AND SOILS SO THAT THEY FULFIL THEIR NATURAL POTENTIAL FOR CARBON SEQUESTRATION AND STORAGE

Carbon Sinks

Of particular importance to the sequestration and storage of carbon is the role of carbon sinks: 'habitats that absorb and store more carbon than they release'. Those carbon sinks of particular importance in Devon are upland peat bogs that store very large amounts of carbon laid down over millennia (primarily found on Dartmoor and Exmoor), woodlands and a range of other habitats that have very considerable carbon stores including: other wetland habitats – fen, reedbeds, valley mires, wet woodland; all permanent pastures especially the wet Culm grasslands of Devon; coastal habitats – salt and other coastal marshes and mudflats; and marine habitats – sea grass meadows (storing between 12-20% of global oceanic carbon¹⁰) and kelp beds. In addition, nearly all soils have the potential to be significant carbon stores if managed correctly.

Many of these habitats have been lost over the last 50 years and many that remain are in poor condition and are leaking rather than storing carbon. Many peat bogs and the wider peaty soils of the Dartmoor and Exmoor uplands have been drained in the past to improve forage. Resulting drying of the peat has led to the release of carbon and the loss of the blanketing bog plants that sequester carbon dioxide. For upland peat remedial action and appropriate management is happening under a range of initiatives but much more is required, including for those other important habitats that have not in the past been identified as important carbon sinks, such as Culm grasslands and lowland wetlands more generally, many of which have been drained.

A Natural Capital Approach

The Natural Capital Committee (NCC) recommended to government the use of a natural capital approach to attain net-zero. The NCC recommendations focus on a holistic, joined-up approach that link the implementation of the 25-Year Environment Plan, Agriculture Bill, Environment Bill and spatial planning with the local delivery of nature-based solutions.¹¹ We attempt to take such an approach in the Devon Carbon Plan. We recognise the vital importance of public funding in this endeavour including the Environment Land Management Scheme (ELMS) and the government's Climate for Nature Fund, which supports woodland creation and peatland restoration. But we also recognise that a diversity of approaches is needed to stimulate the enhancement of natural carbon sinks in Devon. One of these methods is the establishment of carbon markets.

11.5.1 What Needs to Be Done?

There are compelling arguments to restore and enhance habitats and soils so that they fulfil their natural potential for carbon sequestration and storage.

Funding Mechanisms for Nature-Based Carbon Sequestration

The absence of the final formulation of the Agriculture Bill and Environment Bill mean that where and how government will support decarbonisation and production is still not confirmed. However, 'tests and trials' of ELMS are underway in several locations across Devon providing opportunities to inform this plan and increase understanding of how public funding might support the delivery of nature-based carbon sequestration and storage. This scheme will be rolled out from 2025, so over the next few years we should work closely with government to ensure the effective delivery of carbon sequestration, alongside other public goods, in the scheme's design. Organisations, community groups and farmers in Devon also remain open to other opportunities for public funding, such as the Climate for Nature Fund.

There is significant interest and growing expertise within the County in market-based funding mechanisms for restoring and enhancing Devon's habitats. Funding mechanisms currently being explored as part of the Carbon Plan include carbon offset markets and biodiversity net-gain.

Carbon Offsets

A carbon offset is a compensatory measure by an individual or company for their carbon emissions, usually through sponsoring activities which absorb carbon dioxide, such as tree planting, or avoid it, such renewable energy schemes.

Many Devon based organisations wish to be able to offset their own emissions within the County, where they are unable to reduce them directly. The issues of carbon offsetting are complex and are considered further in The Potential Role for Carbon Offsetting in the Devon

Carbon Plan.¹²

Existing global carbon markets offering carbon offsetting use accreditation standards and mechanisms to verify the quality of carbon offsets, including ensuring that carbon savings would not have happened without the purchase of carbon credits. Accreditation has already been established for woodlands in the UK, through Woodland Carbon Units, via the Woodland Carbon Code. However, there is an opportunity to extend this to more naturally occurring carbon sinks in Devon. These potentially include peat, which is under development, culm grassland and other wetland habitats, and marine stores of carbon such as saltmarshes and seagrass beds.

The establishment of novel accreditation schemes will have to: resolve gaps in baseline data; provide reliable mechanisms and tools for measuring carbon sequestration over time; and account for spatial variability. Also, as the Woodland Carbon Code has done, they will have to offer adequate assurances of the permanence of carbon savings, along with other quality assurance measures. Additionally, a marketplace and trading platform needs to be established to facilitate the sale and purchase of accredited carbon offsets specific to Devon.

Biodiversity Net Gain

National Planning Guidance already requires developments to offset losses of habitat, above and beyond the equivalent area lost. However, such investments could deliver far more if they supported a landscape-scale approach, with local enhancements strategically contributing to the priorities for carbon sinks or priorities for flood management that simultaneously sequester and store carbon. Greater coordination and guidance will be needed to connect landowners interested in hosting biodiversity net-gain initiatives with those needing to offset losses of habitat.

Nature-based Carbon Sequestration and Storage is not a Silver Bullet

Through the holistic pursuit of the actions recommended in this Interim Carbon Plan, it is clear that nature-based carbon offsetting and net-gain mechanisms alone are wholly inadequate for achieving net-zero if not pursued alongside reducing emissions at source wherever possible. The role of such financing mechanisms will change overtime

and will need to be monitored for unintended consequences. There needs to be public policy support to ensure the price of carbon rises appropriately over the next 30 years to ensure the offsetting market drives investment in genuine carbon reduction measures first. If the carbon markets don't operate correctly and result in a low price for carbon then the availability of offsets may delay the pursuit of direct emission saving activity, which still must be enacted to achieve net-zero.

11.5.2 The Actions:

F2. Develop a Biodiversity Net-Gain Supplementary Planning Document that can be adopted by local planning authorities

F2.1. Enable landowners to express an interest in hosting biodiversity - net gain initiatives related to development

F3. Support the development of carbon sequestration accreditation systems locally for a range of carbon rich habitats and the creation of a Devon Carbon Investment platform.

Actions Beyond Devon

F4. Work with government to ensure the effective delivery of carbon sequestration, alongside other public goods, through the design of ELMS, engaging in public consultations and the Devon test and trials.

11.5.3 Co-Benefits

The protection and enhancement of Devon's natural capital to maximise potential for carbon sequestration would have many wider benefits including:

- Increased tree cover in upper parts of river catchments would contribute to the reduction of flood risk lower down the catchment, as would the restoration of peat bogs.
- The restoration of peat bogs contributes to cleaner water down stream, and so eases treatment of drinking water and benefits water quality in rivers and estuaries, helping protect blue carbon.
- Looking after Devon's biodiversity will also bring significant benefits for well-being with citizens deriving pleasure and relaxation from contact with nature.

11.5.4 Case Study

Woodland Carbon Code Facilitates Tree Planting in the Yorkshire Dales

The Yorkshire Dales Millennium Trust, working with local landowners, the National Park Authority and other interested parties have increased native broadleaf tree cover in the Dales, facilitated by the sale of accredited UK Woodland Carbon Units. New woodland was planted between 2007 and 2010 in 5 small projects throughout the Dales, amounting to 30 ha of mixed broadleaf woodland and shrubs. The land was previously unimproved grassland with stock grazing.

The resulting carbon sequestration that will occur is estimated to be 15,160 tCO₂e over 100 years. The sale of carbon rights linked to the trees has provided a welcome source of additional income to farmers. It is hoped that income through the sale of carbon will facilitate further increases in the amount of native broadleaf tree cover.¹³

11.5.5 Opportunities

There are obvious opportunities for farmers and landowners in Devon to diversify their incomes through offering environmental net-gain and carbon offsetting. Additionally, enhancing Devon's natural capital and biodiversity could have benefits for nature tourism.

11.6 GOAL : FARMERS AND OTHER LAND MANAGERS ARE AWARE OF THE OPTIONS AVAILABLE FOR HELPING MEET NET-ZERO ON THEIR LAND

The majority of Devon is farmland (Figure 11.2) – the local authority area with the highest proportion of land allocated to farming is Mid Devon where farmland covers 92%.

LOCAL AUTHORITY	% FARMLAND	% NATURAL SPACE	LOCAL AUTHORITY	% FARMLAND	% NATURAL SPACE
Mid Devon	92%	6%	Teignbridge	69%	24%
Torridge	87%	10%	West Devon	63%	35%
East Devon	84%	10%	Torbay	34%	6%
North Devon	83%	14%	Exeter	29%	7%
South Hams	79%	17%	Plymouth	9%	5%

Figure 11.2 The percentage of land which is farmland and natural space by local authority in Devon. Natural space includes moors, heathland, natural grassland etc. the figures draw on 44 different land use codes used by the Co-ordination of Information on the Environment (Corine).

Farmers and land managers are and will be vital players in the delivery of net-zero in Devon. This has been recognised by the NFU which has set the national goal of “reaching net-zero greenhouse gas (GHG) emissions across the whole of agriculture in England and Wales by 2040”.¹⁵ As commercial operations, farmers need to generate income from their holdings. The Devon Carbon Plan seeks to encourage and support the increase of on and off farm carbon capture and storage and a significant reduction in the generation of Green House Gases (GHG) through actions that include: additional funding for the appropriate management of carbon sinks; the roll out of ELMS and advice to farmers; and increasing demand for sustainably produced food. Issues and opportunities that are of particular relevance to farming systems in Devon are:

Loss of Soil Carbon

Soil is one of the most important and universal carbon sinks and forms the second-largest carbon reservoir worldwide after the oceans. In England the primary custodian of these soils is the farming and land managing community. Soil organic matter (the primary carbon store) is made up of: decaying plant materials, manures, and soil micro-organisms. Scientific evidence points to the increasing loss of these carbon reserves through a combination of regular ploughing that over time reduces soil organic matter and micro-fauna, and the replacement of manures with inorganic fertilisers. Ploughing can erode soil 10 – 100 times faster than it forms. In turn soil compaction that may result from the loss of organic matter can lead to waterlogging and reduced microbial activity. It also increases the likelihood of soil erosion even on relatively shallow slopes. This, combined with the steep slopes of Devon and more regular intense rainfall events and high winds linked to climate change, can

lead to significant soil loss from open grown crops such as maize, polluting rivers and coastal waters. In turn this can damage blue carbon sinks, such as seagrass communities, through eutrophication and sedimentation. One estimate in South West England indicates that up to half of all river sediment comes from maize fields. Soil loss threatens farm profitability.

Climate changes are also making it more difficult to identify safe working windows for agriculture that avoid soil damage. In addition, the amalgamation of farms to achieve economies of scale can, unless carefully managed, add further pressure to adopt agri-industrial management systems that can rely more heavily on chemical inputs.

The situation in Devon is not as acute as in many other counties in England because: Devon retains significant areas of permanent pasture that protect the soil's carbon store; there are a few remaining mixed farms working with rotations that allow the build-up of soil organic matter; and the County has a growing number of organic farms (certified by the Soil Association) that aim to sustain and enhance the health of soils. There is also a growing small-farm community exploring the concept of Sustainable Intensification, that aims to increase the productivity of farmland where possible: increase outputs (yields) relative to agricultural inputs (e.g. water, energy, land) and reduce environmental impacts (e.g. greenhouse gas emissions and water pollution). However, soil loss remains a problem and there is no room for complacency. It threatens farm profitability whereas building soil carbon can positively contribute to farm profitability potentially reducing the need for purchased inputs.

Use of Inorganic Fertilisers

As already identified, the availability of inorganic fertilisers has encouraged the alteration of farming systems to the detriment of the soil's stores of carbon. The use of inorganic nitrogen fertilizer is also a significant source of GHGs. Its manufacture is energy intensive and when applied to the soil as fertiliser any excess is taken up by soil microbes and converted into nitrous oxide (N₂O) a potent greenhouse gas. This is exacerbated when applied in saturated soil conditions, since most of the nutrients cannot be absorbed right away.

Use of Diesel as the Primary Fuel Source

Farms are currently both significant users of carbon-based fuel (diesel) as a result of increased mechanisation but also increasingly producers of bio-methane, a carbon neutral fuel and source of heat and potential future vehicle fuel – a product of on-farm anaerobic digestion (AD).

The Committee on Climate Change (CCC) has identified that to achieve an 80% reduction in GHGs nationally, will require almost complete decarbonisation of on-farm machinery by 2050 through switching away from diesel and biofuels and replacing these with hydrogen, electricity, bio-methane or robotics.⁹

This suggests a growing role for AD plants on farms, offering a number of advantages for climate mitigation: (a) feedstocks for AD can utilise agricultural wastes such as manures and crop residues (including damaged fruit and vegetables, trimmings and other parts of plants which are not the intended end product, such as straw, leaves or tops);¹⁶ (b) AD can help ensure that methane, a powerful GHG, is captured from slurries and manures rather than entering the atmosphere; (c) a bi-product of AD is an inert digestate which is a nitrogen rich fertiliser that can be used to displace inorganic

fertilisers offering further GHG savings; and (d) AD can help in the management of slurries which should not be spread on fields at certain times of year.

AD plants may also utilise crops, such as maize, grown as a feedstock. This is potentially problematic because maize growing can be damaging to soil carbon by encouraging soil erosion. Such crops may also displace food production and can replace valuable habitats. It is likely that Devon will need to grow some bio-methane feedstocks but this should be according to land capacity and guard against ecological impacts.

Need for Supporting Labour, Skills and Businesses

There are many types of rural business that will be needed to support net-zero in the land sector, such as more tree nurseries. It is also possible that there will be changes in the balance between labour and mechanisation. For example, trends towards increased mechanisation may continue among larger farm enterprises, but some farm enterprises may follow a more labour-intensive route as a way of reducing reliance on emissions-generating machinery and artificial fertilisers. This may, in turn, require a greater emphasis on affordable housing in rural areas where house prices are beyond the reach of rural workers.

Support for New Entrants and Sustainable Livelihoods

Small farm / food growing enterprises offer an opportunity for new entrants to demonstrate different approaches to net-zero farming. These can take many forms from urban and peri-urban food production to small-scale integrated farms. Such systems demonstrate a prevalence of practices such as crop rotation, a high diversity of crops grown, and the integration of livestock with arable production – in combination enhancing soil fertility without inorganic fertilisers. In addition, a high proportion of livestock feed is produced on farm, and farm wastes are recycled and re-used creating a more self-sustaining system.

Such labour-intensive agriculture, including market gardening, primarily based on the efforts of new entrants, can produce low carbon, nutritious food. However, such approaches may have distinct requirements such as horticultural polytunnels, small barns and occasionally the need to live on site that can be out of kilter with current planning policy. Additional barriers to the success of these enterprises include prohibitive land prices closer to settlements and a more general lack of access to land, training and finance.

11.6.1 What Needs to be Done?

Rejuvenating Soils

In addition to organic farming, there are a number of emerging approaches that could be embraced, in part, singly or in different combinations, with the aim of restoring soil health by building soil organic matter and reducing the need for inorganic fertilisers thereby potentially increasing farm profitability.¹⁷

These include:

Conservation or Regenerative Agriculture: A suite of farming principles and practices that together aim to improve soils, increase biodiversity, protect the environment and enhance ecosystem services.

Its over-arching principles are:

- Limiting soil disturbance: minimal or no tillage, with direct drilling of seeds.
- Building diversity through rotation: moving from simple rotations to longer rotations embracing more and different plant types.
- Keeping the soil covered: preventing bare soil by keeping a cover of vegetation or plant residues such as stubbles or planting cover crops or companion crops to reduce soil erosion and draw in and store soil nutrients.
- Integrating animals: using grazing animals to add manure as part of the farm rotation.
- Using legumes in swards: these fix atmospheric nitrogen avoiding the application of manufactured fertilisers.

Agroforestry: This brings together arable crops or pasture with trees that are harvested for timber, fruit or fuel to harness the benefits of, and synergies between, farming and forestry. This can take different forms:

- Forest farming: planting crops in layers or multiple storeys under the tree canopy
- Tree belts / hedgerows: planted as windbreaks, riparian strips or to serve other functions
- Silvopasture: adding trees to pasture providing shade
- Silvoarable: combining arable/horticulture with trees

All these options add organic matter to the soil through leaf litter that helps improve soil structure. Tree roots can also penetrate more deeply and into different soil layers than most annual crops or grasses, drawing up water and minerals from these deeper soil layers and can capture leached nutrients and return them to surface layers as leaf litter. Research shows that nitrogen losses under Agroforestry can be up to 50% lower than under conventional cropping. Grazing in these areas also benefits animal welfare and returns organic manures to the soil.

Pasture-based Farming: Devon is renowned for its ability to grow grass. Animals raised solely on grass and grass forage such as hay or haylage for the whole of their lives, with no use of grains or food concentrates, produce meats with significant health benefits. Such animals can be certified by the Pasture Fed Livestock Association with their meats attracting a significant price premium. This system justifies retaining permanent pasture that conserves soil carbon by avoiding tillage and the need to grow supplementary feedstuffs.

Energy

Bio-methane is likely to become a more prominent on-farm fuel as more bio-methane tractors are introduced onto the market. Optimistically, this may enable energy independent farming. Nevertheless, its production via AD needs to be pursued judiciously to ensure a strong focus on environmental benefits and in conjunction with measures to reduce energy demand. The priority should be to use local agricultural and food wastes that are unfit for human or animal consumption and do not require long distance haulage. If additional feedstock crops are essential this should not be at the expense

of soil erosion, especially associated with maize. Hearings identified that maize may also reduce soil fertility and can require heavy doses of agro-chemicals when best practice is not followed. For these reasons more suitable feedstocks, such as grass silage, are considered advisable for soil carbon conservation in Devon.

Supporting Labour, Skills and Businesses

In order to promote land-based carbon sequestration and reduce agricultural emissions, support is needed for immature businesses with the potential to accelerate the delivery of a net-zero Devon. Such supporting businesses include: the growth of Devon-based tree nurseries, arboriculturists, forestry contractors, timber processing, vegetable seed growers, food processing, the use of hemp, flax and linseed in clothing and building materials, repair shops, and local food box schemes. It might even include green low carbon burial sites. If supported these could contribute to a low carbon rural economy and a reduction in consumers' carbon footprints. Support can be provided in a variety of ways, for instance through the offer of land, finance, advice or training. The provision of affordable local housing may also be necessary.

Supporting New Entrants Wishing to Promote Low Carbon Integrated Farming

There is evidence that net-zero land based regenerative livelihoods and lifestyles are possible and produce beneficial effects but they are not currently widespread and are hindered by current planning policies which tend to be more supportive of larger holdings and enterprises. There are opportunities to create a more enabling planning approach in keeping with net-zero ambitions by (a) allocating land for horticultural use close to settlements; and (b) developing a One Planet Development policy approach, similar to that in Wales, with its stringent measures required to achieve planning consent. While applications are likely to remain low, based on the experience in Wales, its value would be in facilitating net-zero lifestyles. In principle planning policy should enable individuals who wish to follow net-zero lifestyles to do so.

11.6.2 The Actions:

- F5.** Support development of on-farm bio-methane collection from agricultural wastes to supply bio-methane for farm machinery.
- F6.** Support immature industries with the potential to contribute to delivering a net-zero Devon.
- F7.** Local plans to allocate land for horticulture near to settlements where suitable.
- F8.** Local Plans to incorporate policies based on the Welsh One Planet Development updated to reflect the requirements of net-zero living.
- F9.** Work with the NFU and other representatives of the farming community to encourage approaches to conserve and rejuvenate soil carbon (organic matter) e.g. through ELMS.
- F10.** Identify funding (through the Agriculture Bill) that can support the purchase / shared use of machinery for direct drilling.
- F11.** Raise awareness of the options for low carbon funerals and burials.

11.7 GOAL: FARMERS AND LAND MANAGERS HAVE ACCESS TO IMPARTIAL ADVICE OR DEMONSTRATION MODELS

Farmers and other land managers will play a central role in: maximising terrestrial carbon sequestration and storage; protecting marine carbon affected by land-based activities; and reducing AFOLU Greenhouse Gas emissions in Devon. In this role, it is important that farmers and land managers have access to well-informed, impartial and well-researched advice that takes business viability into account when identifying opportunities for achieving net-zero.

Availability of Current Advice

Most current farm advice relates to the sale of products or services and so is not impartial. Research findings and examples of good practice are often not well disseminated, nor is there adequate support in the development of business skills to enhance the financial viability of farms. There is also a lack of support and tools to enable understanding of approaches to the management of carbon stored in biomass and soils. There are some impartial advice services in Devon but their capacity is limited and often sectoral.

11.7.1 What Needs to Be Done?

This Plan recommends the creation of a Devon-wide integrated farm advisory service dedicated to delivering net-zero. This service would seek to look across farm businesses to identify how to reduce emissions in ways that maintain or increase farm income and that have the potential to deliver a wider range of other benefits. A central part of this advice would be knowledge of available funding sources: including ELMS,

the Climate for Nature Fund, Environmental Net Gain and opportunities for carbon offsetting. Advisors could coordinate groups of landowners to access larger funds collectively for landscape-scale initiatives, such as establishing upper river catchment approaches to restore peat to maintain carbon stores, reduce downstream flooding, and protect coastal 'blue carbon' such as kelp beds. Devon has world leading agricultural research institutes including Rothamsted's North Wyke Farm Platform 'farm lab'¹⁸ and advisors could help to disseminate research findings locally including engagement activities on farm to exchange knowledge. Another key element of the service would be to encourage and retain younger farmers and help them to lead initiatives to achieve net-zero.

First Steps towards an Integrated Devon Advisory Service

The initial step would be to review the range of advice currently available and to learn from best practice in Devon and elsewhere. This will inform how existing advisory services can be enhanced and potentially incorporated into a coordinated advisory scheme, such as through signposting or sub-contracting, in order to enhance the quality, availability, access and impact of advice available. For example, the Devon Wildlife Trust with a team of 16 farm advisors offers free advice on a range of topics from habitat creation and assistance with agri-environment applications to infrastructure upgrades, soil restoration and reduction in use of agrochemicals.

How this service might operate is illustrated by the Farm Advisory Services provided by Teagasc, the Irish Agriculture and Food Development Authority. This offers independent, professional and research backed advice on a broad spectrum of topics from herd management to business planning, with the option of on farm visits. A Devon Farm Advisory service would co-ordinate evidence-based, impartial, personal advice on an individual farm basis, and would involve existing advisors and the co-ordination of knowledge and advice.

Role of County Farms as Exemplars

The longevity of county farms in Devon, which together account for 3,873 hectares (9,570 acres) of land within the County, offers an opportunity to provide exemplars of different models for contributing to net-zero. The Estate currently comprises 68 fully equipped residential dairy and mixed livestock farms, categorised into starter and progression units ranging from 37 to 301 acres in size. The Estate already aims to provide people with their first opportunity to farm, from which they can move on to secure an independent livelihood and so is well placed to nurture innovation in agriculture for a net-zero Devon.

11.7.2 The Actions:

F12. Review existing farm advisory services within Devon and best practice elsewhere.

F12.1. Establish a Devon Farm Advisory Service

F13. Explore how the county farms estate could encourage and enable tenants to practice innovative regenerative low carbon agriculture by learning from the Dartington estate and other like-minded agricultural estates. Share experience in tenancy agreement innovations to encourage wider adoption.

11.7.3 Co-Benefits

In addition to achieving carbon savings, providing quality advice services to farmers could help support the mental health of farming communities. Farmers face a period of major change as a result of the transition to ELMS, Brexit, and climate change. There are concerns over rising suicide rates among farmers as a consequence of financial pressures and rural isolation.²¹

11.7.4 Case Study



Agricology

Agricology is a network whose purpose is to share practical information on sustainable approaches with farmers and growers. It is a free platform and is open to everyone. Knowledge is also shared in the field, in discussion sessions at agricultural events such as the Oxford Real Farming Conference, Groundswell and Cereals, and through on-farm field days. All knowledge exchanged in the field focuses on specific agroecological

practices and brings together insights from farmers, researchers and farming organisations, allowing the sharing of ideas.²²

Agricology facilitates farm visits in the South West, such as to Kipscombe Farm, Lynmouth, Devon. During the visit farm manager Josey Field explained their planting of wood pasture for grazing benefits and wildlife management.

11.7.5 Case Study

Soil Health and Water Management in Devon

Healthy soils are at the heart of future food security, while also providing a host of other benefits including carbon storage, filtration of pollutants, and flood water retention. The Devon Wildlife Trust's teams have been working with farmers across Devon to help improve soil health.

In 2015, through knowledge-exchange workshops arranged as part of the East Devon Catchment Partnership, Devon Wildlife Trust, the Environment Agency and partners identified the increasing risk to soils and water from maize production in high-risk locations across East Devon. Thirty farm holdings exhibiting such risks were visited by advisors, supported by expert soil scientists, to provide soil and agronomy advice.

This work highlighted the need for a greater understanding of soil hydrology. As a result, Devon Wildlife Trust, in partnership with the Environment Agency and Westcountry Rivers Trust, produced a manual on Soils and Natural Flood Management - 1,500 copies of which were distributed to landowners, managers, advisors and decision-makers across Devon. The manual was supported by East Devon Catchment

Partnership with funding from partner organisations and is available online.²³

In addition to 1:1 farm advice on soils, which Devon Wildlife Trust continues to deliver through its advisory projects, the restoration of healthy soils may require specialist machinery such as soil aerators to manage compaction. In target areas the Devon Wildlife Trust, supported by South West Water, runs a machinery pool to reduce costs to farmers in adopting soil restoration activities. This soil aerating equipment has so far enhanced 1,600 hectares of heavily compacted soils.

11.7.6 Case Study

The Dartington Estate

In the Thematic Hearings, the Dartington Estate's approach to tenancies was given as an example of innovation which has enabled regenerative agriculture projects. Following a land use review to plan for a more environmentally, socially and financially sustainable future for the Estate, a steering group recommended that a mosaic of best practice land management and rural re-generation be pursued. They proposed offering tenancies for small parcels of land to projects such as community growing (10 acres), community supported agriculture (16 acres), education and schools projects (6 acres),

renewable energy, agroforestry and orchards (48 acres) and horticulture (11 acres), a campsite (14 acres), plus larger tenancies for woodland enterprises (335 acres) and a mixed farm with a low-carbon dairy unit (456 acres).²⁴

The Estate is now home to a range of enterprises, such as School Farm which provides organic vegetables to the surrounding communities from their market garden. Another example is the national Forestry Commission trial on the Estate, which is exploring the energy potential of short rotation forestry, with the aim of feeding an onsite biomass boiler.²⁴

11.8 GOAL: DEVON HAS A THRIVING SUSTAINABLE LOCAL FOOD CULTURE. DEMAND FOR LOW-CARBON, LOCAL AND NUTRITIOUS FOOD HAS INCREASED BENEFITING CITIZENS AND FOOD PRODUCERS.

Demand-side Influences on Emissions

Farming and food production are influenced by dietary choices. Opportunities exist to work with farmers on supply side emissions from food production, but work is equally needed with citizens on demand-side influences on emissions, such as food waste and diet.

Figure 11.3 shows how environmental impacts, including greenhouse gas emissions, can be influenced at different stages of the food supply chain and how changes on farms, by food processors, retailers and consumers interact with each other. What people eat and the food produced in Devon occur within national and global food systems, so choices in Devon can have impacts far away, as well as close to home. Food and drink make up around 15% of the average person's carbon footprint in the UK.²⁶

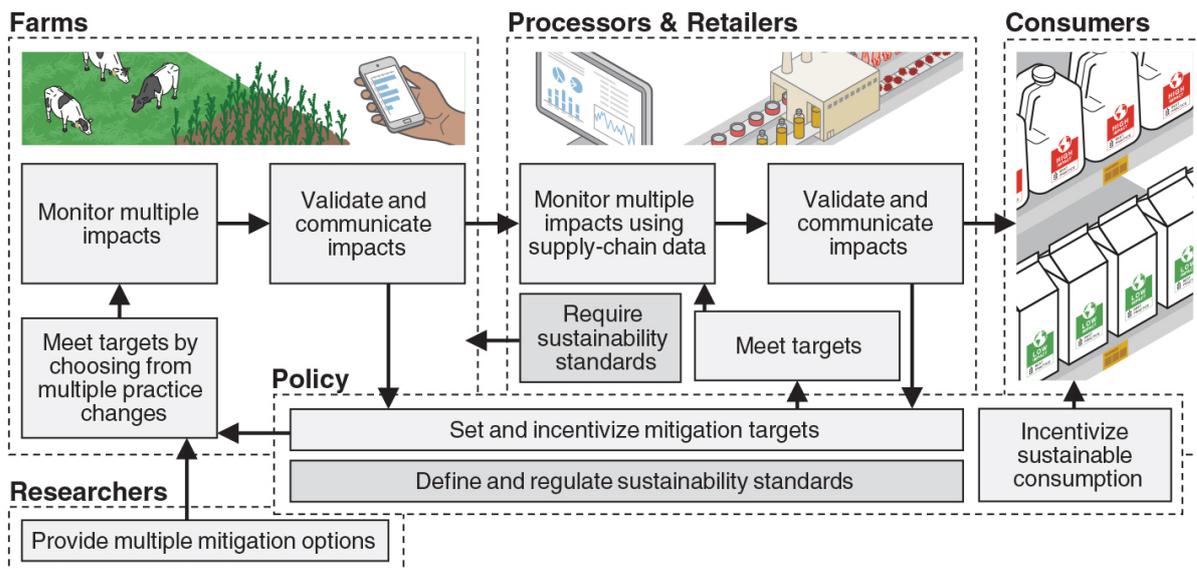


Figure 11.3 A graphical representation of a mitigation framework for the food chain ²⁵

The global industrial food system is energy intensive as a result of tractor fuel, fertiliser, transportation, processing, packaging materials, wholesale and retail, food services, household storage, food preparation, and food waste.

National Legislation and Trade Deals

New national legislation to replace European Union policy, such as the Environment Bill, Agriculture Bill and Environmental Land Management Scheme, will influence Devon’s food production, land management and effects on marine areas, as will post-Brexit trade deals governing food imports and exports. Some of the actions needed to tackle emissions from the food supply chain require national legislation, while there are local points of influence much will be shaped by national government.

Access to Markets by Devon’s Producers

Much of the food we eat comes from around the globe, at the same time as many local Devon-based producers experience difficulties in accessing local markets.

The dominance of large food retailers is a barrier to reducing emissions from the food sector, due to the effects of their business models on local food cultures and supply chains.²⁷ Such forces have contributed to declining access in many communities to alternative local shops offering sustainable food.

Influences on the Type of Food People Buy

There are multiple influences on food choices, including: information on, and awareness of, the relative carbon impacts of foods, public norms, cookery and food growing skills, and lifestyle factors such as working hours.²⁷ These drivers shape not only the carbon footprint of citizens, but also their wellbeing. Challenges such as low wages and food poverty mean that not all Devon’s citizens have equal access to sustainable food, which can be more expensive. The poorest 10 percent of English households would need to spend close to three-quarters of their disposable income on food to meet the guidelines in the NHS’s Eatwell Guide, compared with only six percent of income for households in the richest decile shown

in Figure 11.4. This highlights the challenge of making sure the messages provided and actions taken empower and enable those most socially disadvantaged to take action.²⁸ This also limits the impact of consumer choice as a sole driver of change.²⁵

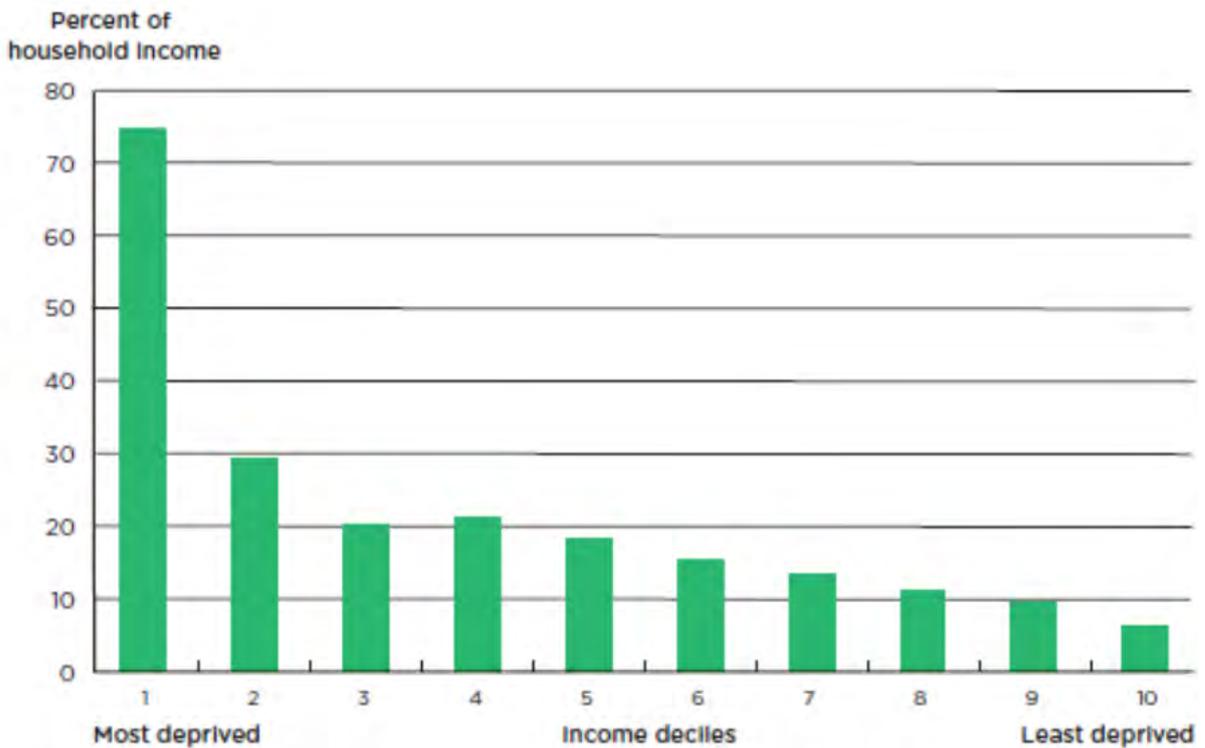


Figure 11.4 The proportion of disposable income (after housing costs) spent on food if the NHS’s Eatwell Guide was implemented by all households in England, by income deciles 2016/2017.

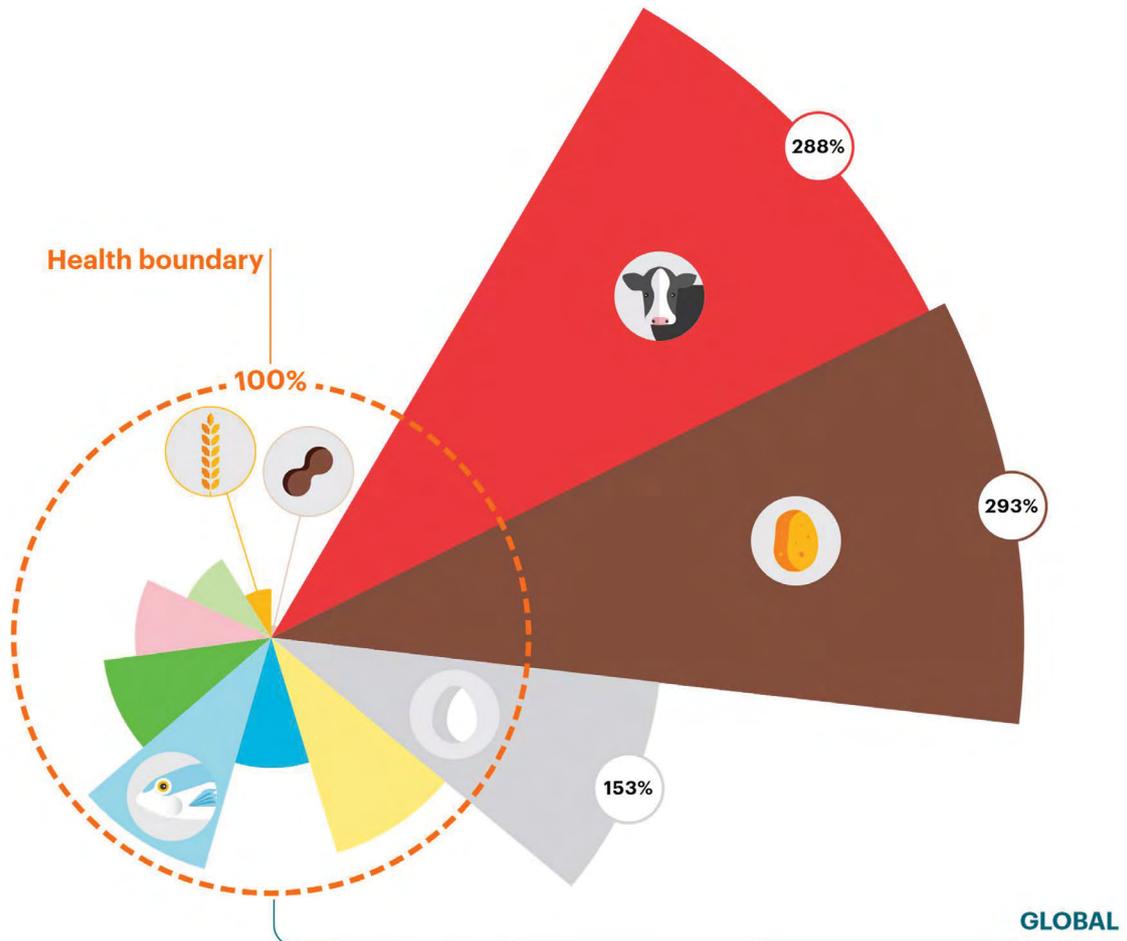
Transparency in How Food is Produced

Clear information about the carbon impact of food production and retailing is needed to enable lower carbon choices. Current food systems encourage cheap food that does not adequately incorporate the contribution of food to climate change in its pricing. Shorter supply chains and strong local food cultures can increase the visibility of the impacts of food production, as citizens can speak to producers directly and see the landscapes where food is grown. But if this is not possible, how can consumers quickly and easily understand and compare the carbon and environmental impacts of foods they are choosing? Two varieties of the same product may have very different environmental and carbon impacts depending on where and how they were produced.²⁵

Lower Carbon is Healthier

The Public Health Devon Annual Report for 2019–20, Planetary and Human Health, argues that the health of the planet is vital to individual health, and proposes promoting lower impact diets through “...healthy eating advice which advocates a diet rich in vegetables, nuts, seeds and fruit.”²⁹ The average person in industrialised countries eats twice as much meat than is considered healthy, and meat-rich diets are recognised to contribute to the rise of obesity, cancer, type-2 diabetes and heart disease.²⁹ Analysis by the Carbon Trust indicates that following the government’s Eatwell Guide including reducing consumption of

animal products would produce significant environmental and health benefits, a view supported by the Lancet Commission on Planetary Health Diet (Figure 11.5).³⁰



Limited intake



Optional foods



Emphasized foods



Figure 11.5 The “diet gap” between current dietary patterns and recommended intakes of food in the planetary health diet. Credit: The EAT Foundation. This graphic was prepared by EAT and is included in an adapted summary of ‘Food in The Anthropocene: the EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems’. Reproduced with permission ³⁰

Food procurement by institutions

Prioritising environmental impact and social value in food procurement can influence supply chain emissions by increasing demand for local sustainable food and shortening supply chains. Onerous procurement processes are perceived as a barrier to local producers securing contracts and simplifying procurement procedures could enhance market access for Small and Medium Enterprises (SMEs).

Institutional procurement, especially by ‘anchor institutions’, such as the NHS, local authorities and schools, also have the potential to produce major reductions in food carbon footprints. This can also be used to combat food poverty and the nutritional and health issues noted earlier for example, through meals provided by the NHS and school meals.

11.8.1 What Needs to Be Done?

A Sustainable Food Devon Initiative

A Sustainable Food Devon initiative should be implemented to develop demand and supply chains for low carbon, local, healthy food.

Local Food Processing and Retail Infrastructure

A Sustainable Devon Food initiative would support local food retail areas, such as covered food markets and food hubs, which could lower costs for producers by offering shared functions, such as processing facilities, joint marketing and assisted access to local markets. Support could take multiple forms as appropriate, such as the provision of land, expertise or finance and funding. A good example is the South West Food Hub³¹ which was launched in May 2020, as a Community Interest Company, to support the region’s food network in establishing sustainable, shorter supply chains across the South West’s food sector, focusing primarily on public procurement. See Case Study 11.8.4.

processing facilities, such as slaughterhouses, which has led to increases in livestock transportation distances. Sweden’s mobile slaughterhouses are an example of how small-scale farm processing infrastructure can be modernised to improve animal welfare by reducing transport and to improve the viability of locally produced food.

Food Education Programmes: Benefits for Health, Wellbeing and Carbon Footprints

The initiative would offer food education programmes to engage people with the enjoyment, health and environmental benefits of locally and sustainably produced food. Empowering people to engage with food production through grow, cook, eat programmes has the potential to increase understanding of seasonality and strengthen local food chains. There are already successful examples of this in Devon, which could be expanded to reach more people.

There has also been a loss of local food

Procurement by Devon's Anchor Institutions

The Sustainable Devon Food initiative foresees procurement by Devon's 'anchor institutions' as a key lever for supporting farming businesses to have a positive impact on the environment and climate change. In turn, people using these institutions will have a greater opportunity to develop sustainable consumption habits, supporting shorter supply chains and seasonal ingredients.

Working with Government to roll out Carbon Footprint Labelling Systems

The Net-Zero Task Force recommends that Devon works with government to roll out carbon footprint labelling systems. The Carbon Trust has already developed a standard that is used by Quorn and was used by Tesco before being dropped because

competitors did not follow its lead. This underlines why food carbon labelling requires national leadership. Devon should also work with national government to ensure that replacements to EU food legislation, post Brexit, give high priority to ensuring that the ecological and carbon cost of domestic and imported food, including animal feed, is reflected in the market price of products.

Whilst national action is needed for consistent carbon footprint labelling schemes, wider adoption of the existing 'Made in Devon' brand for businesses would help customers identify quality local produce. The mark is part of the 'Buy with Confidence Trading Standards Approved' scheme. The mark assures customers that the products and services and any claims they make have been thoroughly vetted and checked by professionals.³²

11.8.2 The Actions:

F14. Implement a Sustainable Devon Food initiative to develop demand and supply chains for local, healthy food:

- F14.1.** Support the development of attractive central local food retail areas.
- F14.2.** Provide support for intermediaries to bring together local produce in food hubs, support processing and perform marketing.
- F14.3.** Encourage the region's anchor institutions to buy local through the South West Food Hub which will establish sustainable, shorter supply chains across Devon's food sector.
- F14.4.** Promote a balanced diet, in line with the government's Eatwell Guide and reconnect people with the origin and seasonality of food through "grow, cook, eat" programmes.
- F14.5.** Encourage catering in anchor institutions to provide sustainably produced, locally sourced and nutritious meals in line with the government's Eatwell Guide.

Actions beyond Devon

F15. Work with government to introduce a mandatory carbon footprint labelling system for food products.

F16. Work with government to ensure the carbon and ecological costs of domestic and imported food, including animal feed, are reflected in their market price.

F17. Work with government to revise slaughter regulations to allow on farm slaughter for commercial meat production, where high animal welfare and food hygiene are ensured, to enable localised food production infrastructure.

11.8.3 Co-Benefits

Following the diet advocated by the government's Eatwell Guide would produce significant health benefits.³⁰ The average person in industrialised countries eats twice as much meat than is considered healthy, and meat-rich diets are recognised to contribute to the rise of obesity, cancer, type-2 diabetes and heart disease.²⁹ This in turn would reduce the strain on the National Health Service and Public Health budgets.³³

11.8.4 Case Study

There are already many food projects in Devon which can be used to provide inspiration and practical advice on the development of local, sustainable and healthy food networks. This includes Nourishing Families, which runs workshops and courses for parents and children around Devon to transform how families experience food and mealtimes.³⁴ Many farms are also involved in education work with communities and visitors such as Occombe Farm.³⁵ Others participate in the annual Open Farm Sunday.³⁶ Devon's towns and cities also offer many projects to build upon, such as Incredible Edible food growing in public spaces in Ilfracombe, Totnes and Crediton.³⁷

South West Food Hub

The South West Food Hub³⁸ was launched in May 2020, as a Community Interest Company to support the region's food network in

establishing sustainable, shorter supply chains across the South West's food sector, focusing primarily on public procurement.

The South West Food Hub will prepare the region for a pilot platform to open up public sector food procurement to local producers and suppliers. The South West Food Hub will work with anchor institutions such as schools and hospitals during the pilot, whilst supporting food and drink SMEs to meet entry criteria to supply through the platform.³⁹

The initiative is supported by local organisations including the Heart of the South West LEP, University of Exeter, Exeter City Futures, POM Support and the NFU.

11.8.5 Opportunities

Increasing people's engagement with food production, environmental standards and health benefits will raise demand for local, sustainable food. The procurement practices of anchor institutions have a key role to play alongside people's shopping choices on the high street. There is an opportunity for local producers and distributors to benefit from these changing attitudes.

11.9 OPPORTUNITY FOR DISCUSSION AT THE CITIZENS' ASSEMBLY - ISSUE FOR DISCUSSION AT THE CITIZENS' ASSEMBLY:



The Committee on Climate Change scenarios for achieving net-zero require a 20% reduction in beef, lamb and dairy consumption nationally. What does this mean for Devon?

Reducing livestock emissions has been widely debated as an action to mitigate climate change. The Committee on Climate Change scenarios for achieving net-zero recommend a 20% reduction in beef, lamb and dairy consumption nationally.⁹ What does this mean for Devon? Livestock farming is a significant part of Devon's economy, landscape and heritage.

The Committee on Climate Change anticipates that some land currently used for livestock farming would be converted to other uses, such as woodland, energy crops and peatland restoration.

Emissions from Agriculture, Forestry and Land Use (AFOLU) in Devon

Agriculture, forestry and land use (AFOLU) accounted for 16% of Devon's emissions in 2017 (for the jurisdictions of Devon County Council, Plymouth and Torbay, excluding Exeter City Council).² Livestock are a significant contributor to Devon's agricultural emissions. The digestive process by which ruminants, such as cows and sheep, break down grass, results in

methane, a powerful greenhouse gas. Farming is also the largest global source of nitrous oxide, which mostly comes from manure and fertiliser use, as well as soil disturbance.⁴⁰

Some GHGs increase global warming proportionately more than others over a given time period, per unit, known as their Global Warming Potential (GWP). Livestock emissions are a focus of global efforts to minimize the extent of climate change due to the high Global Warming Potential (GWP) of methane and nitrous oxide. Methane is considered to have a GWP of 25 times carbon dioxide and nitrous oxide a GWP of 298 times carbon dioxide over a 100-year period.⁴¹

Benefits of Animal Grazing

Grazed pasture can contribute to the accumulation and maintenance of significant pools of soil carbon but, conversion of grazing land to arable crops or horticulture could result in soil carbon losses. Soil is the second largest store of carbon globally after the oceans.

In some places, conservation grazing is

necessary to maintain priority habitats in favourable conservation status. Livestock also make important contributions to land fertility and usually form part of the rotation on mixed farms.

Devon’s Citizens should be Encouraged to Eat a Healthy Diet

Red meat and dairy products have a range of health benefits and can be important sources of iron, protein and calcium. However, the Public Health Devon Annual Report for 2019–20 highlights that the average person in industrialised countries eats twice the recommended daily quantities of meat and that excessive meat consumption is contributing to the rise in obesity, cancer, type-2 diabetes and heart disease.²⁹

It seems reasonable that Devon citizens should be supported to consume healthy and climate friendly diets. Consumers need to have the information to make informed choices, so they can understand where food comes from, how it was produced and its ecological and carbon impact.

Uncertainty over the Implications of Changes in Diet in Devon

Devon is part of a global food system and it is unclear how changes in diet and trade in Devon and further afield might translate into land-use and landscape changes. There is the risk that reductions in livestock farming in Devon could lead to increases in livestock production

elsewhere resulting in higher overall emissions. The UK’s high-quality production must not be replaced by cheaper production overseas that may have greater environmental and animal welfare costs.

Views Expressed in the Thematic Hearings and Public Call for Evidence on Food, Land and Sea

The Thematic Hearings and the Public Call for Evidence on Food, Land and Sea, highlighted the divergent views within the county – there is both resistance to reduced numbers of livestock from producers and consumers, as well as support for reduced meat or meat and dairy free diets. They also highlighted the uncertainty about the level of livestock that might be considered sustainable in the county.

Given the importance of the issue of livestock emissions to Devon’s landscape, livelihoods and culture, as well as achieving Net-Zero, the Net-zero Task Force recommends that this issue should be deliberated by a Devon Citizen’s Assembly.

Questions proposed to be discussed at the Citizen’s Assembly:

Devon is famed for being a livestock farming county, but the committee on climate change scenarios for achieving net-zero require a 20% reduction in beef, lamb and dairy consumption nationally. What does this mean for Devon?

Should Devon adopt and promote a red meat and dairy consumption target?

11.10 GOAL: DEVON’S COASTAL ECOSYSTEMS AND THEIR SIGNIFICANT CARBON STORES ARE PROTECTED, RESTORED AND ENHANCED

Devon’s coastal waters store significant amounts of carbon, known as “blue carbon”.

What is Blue Carbon?

Blue carbon is the carbon stored in coastal and marine ecosystems. 83% of the global carbon cycle

is circulated through the oceans, while 50% of total carbon sequestered in the oceans is found in coastal habitats. These important ecosystems sequester and store more carbon per unit area than terrestrial forests and are now being widely recognised for their role in mitigating climate change.⁴²

The full extent and potential of Devon's blue carbon ecosystem stock remains largely unknown, making it difficult to calculate its carbon storage potential. Knowledge of blue carbon habitats and their role in carbon sequestration is improving but further work is needed to understand and address threats to, and opportunities for, enhancement of Devon's blue carbon.

Devon's Coasts, Habitats and their Carbon Stores

Devon's long and much indented coastline has many important and protected coastal and estuarine habitats with blue carbon stores including significant areas of seagrass meadows, salt marshes, maerl beds, kelp forests, coastal sand dunes and coastal shelf sediments (Figure 11.6).⁴³ However, greater volumes of greenhouse gases could be removed from the atmosphere if degraded blue carbon was restored and new areas established. This degradation is as a result of many factors, not least direct damage to the seabed and the effects of soil erosion, agricultural run-off and domestic waste upstream contributing to sedimentation and eutrophication of estuaries and the coast.

Climate Change will Impact Blue Carbon Habitats

Climate change will impact blue carbon habitats in a variety of ways. Rising sea levels will lead to 'coastal squeeze' where some intertidal habitats are unable to move further landward due to coastal defences or natural topography. Sea level rise and the intensification of extreme weather events will result in increased inundation, erosion and fragmentation of coastal habitats. The acidification of seawater as it absorbs more atmospheric carbon dioxide is also detrimental for maerl beds while rising seawater temperatures can be harmful to seagrass ecosystems.

A Lack of Mechanisms for Facilitating Enhancement of Blue Carbon

It is unclear how opportunities to enhance blue carbon might be facilitated and funded because mechanisms for carbon offsetting in the marine environment are not yet developed. The equivalent of a national agri-environment scheme might be needed for the marine environment, or a 'Blue Carbon Code' to provide verified offsets to corporate investors, but in the first instance greater resources are needed for the enforcement of existing legislation²⁷ as evidenced by the reasons given for the condition of South West River Basins.⁴⁴

The Role of Fishing Practices in Protecting Blue Carbon and Reducing Plastic Emissions

Small-scale, sustainable and traditional fishing methods have a lower impact on blue carbon than large-scale commercial fisheries. Bottom trawlers drag heavy fishing gear along fragile sea-beds disrupting sea-shelf carbon storage.⁴⁵

The new concept of 'fish carbon' recognises the contribution of marine vertebrates to carbon sequestration in the oceans. Marine creatures store large amounts of carbon in their bodies which, when they die, sinks to the ocean floor, where it can remain buried for millennia,⁴⁶ highlighting the

importance of managing fish stocks sustainably and protecting populations of marine species. Furthermore, the breakdown of marine plastics is recognised as a significant source of greenhouse gases. For example, polyethylene, one of the most commonly used plastics produces methane and ethylene when exposed to ambient solar radiation which causes degradation.⁴⁷ A substantial proportion of marine macro-plastics is related to lost fishing tackle.

Devon has approximately 550ha of saltmarsh habitat, particularly located in the Tamar and Exe estuaries.

Mud Flats

Mudflats are found in coastal areas sheltered from waves, such as estuaries. They are covered at high tide and exposed during low tide and become saltmarshes towards land. New sediment is brought in on tides and contains carbon. As the soil remains wet decomposition of organic material is slow and the carbon accumulates.

Devon has approximately 3000 ha of intertidal mud and sand flats within estuaries and the sub-tidal range.

Saltmarshes

Saltmarshes in some locations have been found to sequester carbon 35 times faster than tropical rainforests. Calculations from Beaumont et al. value this carbon sequestration service in England at £622 per hectare per year.¹⁰

Devon has approximately 550ha of saltmarsh habitat, particularly located in the Tamar and Exe estuaries

Maerl Beds

Maerl is a purple-pink hard seaweed that forms spiky underwater 'carpets' on the seabed, known as 'maerl beds'. Maerl deposits lime in its cell walls as it grows, creating a hard, brittle skeleton, which is an effective carbon store. These maerl beds are slow growing, very fragile and do not recover from damage.

In Devon, maerl beds are found in Lyme Bay and off the coast of Lundy

Seagrass

Seagrass beds are sometimes described as the rainforest of the sea. They trap sediment in the water creating carbon-rich mattes, raising the seafloor by approximately 1mm per year. The seagrass and their mattes store between **12-20% of global oceanic blue carbon** (at a rate of about 2000t of carbon per hectare), locking it away for thousands of years. When seagrass habitats are destroyed, degraded or damaged their ability to sequester carbon is reduced and carbon dioxide is released and their other benefits compromised. NOTEREF Ref52895933/h/MERGEFORMATIO

Around UK there has been a significant long-term reduction in seagrass extent and quality, reflecting that seagrass beds are one of the most rapidly declining habitats on earth.

In Devon, the most extensive seagrass bed is found around Torbay.

Sand Dunes

A sand dune is a hill or ridge beyond the reach of the tides, formed from sand over many years and are home to a variety of vegetation.

Braunton Burrows is the largest dune system in England at 1 mile wide and nearly 4 miles long

Kelp Forests

Kelp is a large seaweed which can form dense underwater forests, **capturing 75% of the net carbon fixed annually in the sea.**

11.10.1 What Needs to Be Done?

Protect, Restore and Enhance these Important Marine and Coastal Ecosystems

Devon must protect its important marine ecosystems and their carbon sequestration and storage capacity to reduce and prevent blue carbon emissions arising from their loss and degradation. Equally measures are needed to restore and enhance lost and damaged marine and coastal habitats such as seagrass beds and saltmarsh to increase carbon sequestration and storage.

Build on Existing Work and Networks

To be effective we should build on existing initiatives and networks in the county, such as the work of the Devon Maritime Forum and Devon's estuary partnerships in preparing and contributing to Marine Plans and other local strategies being prepared by the Marine Management Organisations along the Devon coast. The Local Nature Partnership could also play an important role in coordinating initiatives, but further investigation is required to identify potential partners and funding opportunities for carrying out the work itself.

Devon has internationally recognised centres of research on marine issues at the universities of Plymouth and Exeter, Plymouth Marine Laboratory and Marine Biological Association, and a wealth of experience in marine policy, practice and management. Work currently being undertaken to understand the potential of blue carbon in the county includes the Ocean Health Index for South West England, while the 2020 Local Nature Partnership Conference held a dedicated session on 'Blue Carbon'.

Establish and Maintain an Inventory of Marine Natural Capital

An inventory of marine natural capital needs to be established and maintained in order to understand the scope of opportunities for marine carbon sequestration in Devon, and risks to these habitats. This should track the distribution, stock, health and enhancement opportunities for Devon's blue carbon.

Marine Natural Capital Plans

Devon has much to learn from the implementation of the North Devon Marine Natural Capital Plan as a foundation for a South Devon Marine Natural Capital Plan. The North Devon Marine Natural Capital Plan was commissioned by the North Devon UNESCO Biosphere Reserve and the North Devon Marine Pioneer project to pilot a natural capital approach to the management of the marine environment.

The North Devon Marine Natural Capital Plan will support delivery of robust protection of marine

biodiversity, and enhanced resilience to natural hazards and climate change, in addition to improving well-being and the sustainability and viability of the local marine economy.

Building Capacity to Restore and Re-Establish Blue Carbon

A clearer picture of Devon's Blue Carbon potential and the practicalities of restoration and re-establishment is emerging but has yet to be fully explored. Devon should be proactive in supporting initiatives which progress practical capacity to restore and re-establish blue carbon in Devon.

There is an opportunity to learn from demonstrations of habitat restoration and management techniques, including seagrass restoration such the LIFE Recreation ReMEDIES project (Reducing and Mitigation Erosion and Disturbance Impacts affecting the Seabed), in the Plymouth Sound and Estuaries.⁴⁸

Blue carbon enhancement can offer economic opportunities, for example current demand for seaweed exceeds what is being produced. There is an opportunity to farm kelp which is highly productive, capturing 75% of the net carbon fixed annually in the sea.⁴⁹ This is being explored in Devon by Biome Algae, an off-shore seaweed farming research trial backed by the University of Exeter and Plymouth.⁵⁰ Macroalgal aquaculture is a growing industry worldwide, with evidence that this managed production of biomass can enhance carbon sequestration.¹⁰

Increased Opportunities for Citizen Engagement

Engaging citizens with marine issues can make important contributions to managing people's impacts on blue carbon. Devon already has some important initiatives, such as the National Marine Aquarium and the Wembury Marine Centre, while the Plymouth Sound National Marine Park, the UK's first national marine park, offers a multitude of new education opportunities for Devon's citizens. These opportunities need to be developed and expanded to help understanding of how we all affect the marine environment both indirectly, such as by what households put on their gardens or down their sinks and directly, such as by where recreational water users drop anchor.

Whole Catchment Opportunities

Blue carbon enhancement mechanisms need to follow a whole catchment approach covering land, estuarine and coastal areas to manage the effects of upstream activities (from farming to effluent and waste management) on our estuaries and coasts. In this context it is important that the new River Basin Management Plans consider effects on blue carbon.

At a practical level a whole catchment approach is being demonstrated by the Upstream Thinking project supported by South West Water. This is a catchment management scheme which applies natural landscape-scale solutions to improve water quality being implemented by the Wildlife Trusts and the West Country Rivers Trust. Other existing catchment-based approaches and partnerships include Connecting the Culm which, amongst other things, is seeking to improve water quality throughout the Culm catchment. These and other catchment approaches need to be extended and may well be assisted in the future by the new Environmental Land Management Scheme.

Enable Migration of Important Habitats Inland – through the Shoreline Management Plans

In response to changing sea levels and increased intensity of waves and storms, options for enabling saltmarshes, sand dunes and other carbon rich marine and coastal habitats to survive and expand by migrating inland should be explored. This will involve managed retreat of coastal habitats by avoiding repair to, or intentionally breaching, existing coastal defences in appropriate locations to allow seawater to inundate the land behind and encourage the development of mudflats and saltmarsh. Nevertheless, it takes approximately 100 years for newly created saltmarsh to obtain the same carbon stock as natural sites. The Shoreline Management Plans are well placed to identify opportunities where this is appropriate.

Mechanisms to Fund Blue Carbon Restoration: Carbon Offsetting and Marine Net Gain

Mechanisms and schemes for carbon offsetting in the marine environment lag behind their terrestrial equivalents. Opportunities to create and expand such mechanisms for the marine environment should be explored, drawing on and adapting experiences with net-gain and carbon offsetting for land-based carbon sequestration. For example, marine net-gain mechanisms could facilitate the restoration of habitats affected by offshore renewable energy installations. This will require new national legislation to provide the regulatory framework.

Promoting Sustainable Fishing and Boating to Protect Blue Carbon

Given the importance of fishing and recreational boat use to Devon's economy and culture and their impacts on the marine environment, we must work with national government to establish and expand the necessary regulatory mechanisms and incentives to protect blue carbon and promote sustainable practices. We must also work with sailing clubs, boat users and the local fishing sector to avoid inadvertent damage to sea floor habitats and enable them to safely dispose of wastes, including fishing wastes much of which is plastic.

11.10.2 The Actions:

F18. Devon Maritime Forum and Devon's estuary partnerships to continue supporting and engaging with the development of Marine Plans by the Marine Management Organisation along the Devon coast

F19. Develop a South Devon Marine Natural Capital Plan, learning from the experience of the North Devon Natural Capital Plan. This will include:

F19.1 Establish and maintain an inventory of marine natural capital.

F19.2 Use local regulatory levers and enhance public awareness to discourage activities contributing to marine and coastal habitat fragmentation and degradation

F19.3 Future reviews of the Shoreline Management Plans covering the Devon coast to identify opportunities for carbon rich marine and coastal habitats to survive and expand by migrating inland with sea level rise.

F19.4 Pilot specific initiatives which lead to marine carbon sequestration.

F19.5 Provide advice on how care of gardens and what goes down the sink affects the sea.

F19.6 Engage and support the fishing sectors to improve access to and incentivise shoreside disposal of old fishing equipment.

Actions Beyond Devon

F19. Develop a South Devon Marine Natural Capital Plan, learning from the experience of the North Devon Natural Capital Plan. This will include:

F19.7 Work with government to introduce more Marine Conservation Zones and provide the resources necessary to be effective.

F19.8 Work with government for greater monitoring and enforcement of the dumping of fisheries waste at sea.

F19.9 National Marine Park and Devon and Severn IFCA to trial new ecosystem approaches to fisheries management.

F19.10 Work with government to provide further support for smaller fishers, including redistribution of UK quotas, based on social value.

F19.11 Identify investment opportunities for, and work with government to trial a system that rewards environmentally sensitive fishing activities.

F20. Work with government to introduce legislation to require net gain in the marine environment.

F21. Work with government to improve the effectiveness of pollution legislation and enforcement of existing.

F22. Work with the government to increase funding to enhance the effectiveness of the Catchment Based Approach, which provides coordination of conservation measures between landowners and potential funders at a catchment scale for improved water quality and nature.

11.10.3 Co-Benefits

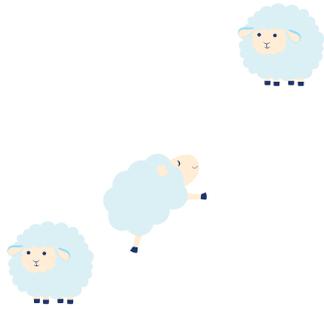
We can help address both the ecological and the climate emergency by restoring blue carbon and enhancing biodiversity. Devon's blue carbon provides numerous other benefits that are essential for climate change adaptation along coasts, including: protection from storms and sea level rise; prevention of shoreline erosion; regulation of coastal water quality; and the provision of habitat for commercially important fisheries and endangered marine species. Kelp has considerable commercial benefits and can be harvested for use in a wide range of products.

11.10.4 Opportunities

Protecting restoring and enhancing Devon's blue carbon presents a number of opportunities beyond carbon sequestration, these include:

- Kelp and algae farming: demand for seaweed exceeds what is being produced and macroalgal aquaculture is a growing industry.
- Tourism: blue carbon habitats such as maerl beds, seagrass and kelp forests are important for wildlife. Healthy eco-systems contribute to Devon's beauty and appeal, attracting tourists to enjoy our coasts such as divers and fishing trips.
- Blue carbon codes: there is the potential for habitat restoration to be funded by the sale of carbon credits if accredited 'blue carbon codes' can be developed.





11.11 FOOD, LAND AND SEA ACTION SUMMARY TABLE

Cross Cutting Theme	Action Number	Action	Prioritisation Score
Spatial Planning	F1	Develop a Land Use Framework (LUF) for Devon to establish land use principles that embed carbon sequestration and storage and identifies opportunity areas for specific outcomes to guide land use decisions	
Spatial Planning	F1.1	Develop a Nature Recovery Network of joined-up places, on land and at sea, created from maps that identify opportunities for the protection, restoration, and creation of habitats that increase carbon sequestration and storage alongside bringing benefits for nature and people	
	F1.2	As part of the Land Use Framework, and underpinned by the Nature Recovery Network, identify opportunities to implement a Trees for Devon initiative.	

KEY				
Potential Carbon Impact				
High	3			
Medium	2			
Low	1			
		1	2	3
	Ease of implementation	Hard e.g. requiring change in	Medium e.g. requires multi-agency	Relatively easy e.g. local actions

	Who Does this Action Involve?	Where Should This Action Take Place?	Financial Status	Potential Funding Stream Where Identified
	Businesses, Community Organisations, County Council, District and Borough Councils, Environmental Organisations, Farmers, National Park Authorities, Town and Parish Councils, Unitary Councils	Will occur everywhere	New local resource required - yet to be identified	
	Businesses, Community Organisations, County Council, District and Borough Councils, Environmental Organisations, Farmers, National Park Authorities, Town and Parish Councils, Unitary Councils	Will occur everywhere	New local resource required - yet to be identified	
	Businesses, Community Organisations, County Council, District and Borough Councils, Environmental Organisations, Farmers, National Park Authorities, Town and Parish Councils, Unitary Councils	City and Town	Within existing resources	

Cross Cutting Theme	Action Number	Action	Prioritisation Score
Spatial Planning	F1.3	Local Plan and Neighbourhood Plan reviews to consider the principles of the LUF alongside other planning considerations.	
Spatial Planning	F2	Develop a Biodiversity Net-Gain Supplementary Planning Document that can be adopted by local planning authorities	
Spatial Planning	F2.1	Enable landowners to express an interest in hosting biodiversity net-gain initiatives related to development	
Finance, economy & resource access	F3	Support the development of carbon sequestration accreditation systems locally for a range of carbon rich habitats and the creation of a Devon Carbon Investment platform.	
Finance, economy & resource access	F4	Work with government to ensure the effective delivery of carbon sequestration, alongside other public goods, through the design of ELMS, by engaging in public consultations and Devon Test and Trials.	
Knowledge sharing, skills and learning	F5	Support development of on-farm bio-methane collection from agricultural wastes to supply bio-methane for farm machinery and the use of digestate.	

	Who Does this Action Involve?	Where Should This Action Take Place?	Financial Status	Potential Funding Stream Where Identified
	District and Borough Councils, National Park Authorities, Town and Parish Councils, Unitary Councils.	Will occur everywhere	Within existing resources	
	County Council, Unitary Councils, District and Borough Councils, Environmental Organisations	Will occur everywhere	Within existing resources	
	Environmental Organisations, County Council, Unitary Councils, District and Borough Councils	Will occur everywhere	New local resource required - yet to be identified	
	Businesses, Community Organisations, County Council, District and Borough Councils, Environmental Organisations, Farmers, Local Enterprise Partnership, National Park Authorities, Unitary Councils	Rural, Coast	New local resource required - yet to be identified	
	Businesses, Community Organisations, County Council, District and Borough Councils, Environmental Organisation, Farmers, National Park Authorities, Unitary Councils	Rural	Within existing resources	
	Businesses, County Council, Education Establishments, Environmental Organisations, Farmers	Rural	New local resource required - yet to be identified	

Cross Cutting Theme	Action Number	Action	Prioritisation Score
Finance, economy & resource access	F6	Support immature industries with the potential to contribute to delivering a net-zero Devon.	
Spatial Planning	F7	Local plans to allocate land for horticulture near to settlements where suitable.	
Spatial Planning	F8	Local Plans to incorporate policies based on the Welsh One Planet Development updated to reflect the imperatives of Net Zero.	
Knowledge sharing, skills and learning	F9	Work with the NFU and other representatives of the farming community to encourage approaches to conserve and rejuvenate soil carbon (organic matter) e.g. through ELMS.	
Finance, economy resource access	F10	Identify funding (through the Agriculture Bill) that can support the purchase / shared use of machinery for direct drilling.	
Behaviour transformation and community engagement	F11	Raise awareness of the options for low carbon funerals and burials.	
Knowledge sharing, skills and learning	F12	Review existing farm advisory services within Devon, as well as best practice elsewhere.	
Knowledge sharing, skills and learning	F12.1	Establish a Devon Farm Advisory Service	

	Who Does this Action Involve?	Where Should This Action Take Place?	Financial Status	Potential Funding Stream Where Identified
	Businesses, County Council, Environmental Organisations, Local Enterprise Partnership	Will occur everywhere	New local resource required - yet to be identified	
	District and Borough Councils, Town and Parish Councils, Unitary Councils	Will occur everywhere	Within existing resources	
	District and Borough Councils, National Park Authorities, Unitary Councils	Rural	Within existing resources	
	Businesses, County Council, Environmental Organisations, Farmers, National Park Authorities, Individuals	Rural	New local resource required - yet to be identified	
	Businesses, County Council, Environmental Organisations, Farmers	Rural	New local resource required - yet to be identified	
	Businesses, Community Organisations, District and Borough Councils, Unitary Councils, Individuals	Will occur everywhere	Within existing resources	
	Businesses, Community Organisations, County Council, Environmental Organisations, Farmers, Local Enterprise Partnership, National Park Authorities	Rural	New local resource required - yet to be identified	
	Businesses, Community Organisations, County Council, Environmental Organisations, Farmers, Local Enterprise Partnership, National Park Authorities	Rural	New local resource required - yet to be identified	

Cross Cutting Theme	Action Number	Action	Prioritisation Score
Knowledge sharing, skills and learning	F13	Explore how the County farms estate could encourage and enable tenants to practice innovative regenerative low carbon agriculture by learning from the Dartington estate and others. Share experience in tenancy agreement innovations to encourage wider adoption.	
Finance, economy & resource access	F14	Implement a Sustainable Food Devon initiative to develop demand and supply chains for local, healthy food.	
Finance, economy & resource access	F14.1	Support the development of attractive central local food retail areas.	
Finance, economy & resource access	F14.2	Provide support for intermediaries to amalgamate local produce in food hubs, support processing and perform marketing.	
Procurement and commissioning	F14.3	Encourage the region’s anchor institutions to buy local through the South West Food Hub, which will establish sustainable, shorter supply chains across Devon’s food sector.	
Knowledge sharing, skills and learning; Behaviour transformation and community engagement	F14.4	Promote a balanced diet, in line with the government’s Eatwell Guide and reconnect people with the origin and seasonality of food through “grow, cook, eat” programmes.	

	Who Does this Action Involve?	Where Should This Action Take Place?	Financial Status	Potential Funding Stream Where Identified
	Council Council, Environmental Organisations, Farmers	Rural	Within existing resources	
	Businesses, County Council, Community Organisations, District and Borough Councils, Farmers, NHS and Public Health, Unitary Councils	Will occur everywhere	New local resource required – identified but not secured	Sustainable Food Places grant funding and Devon County Council
	Businesses, Community Organisations, District and Borough Councils, Unitary Councils, County Council	City and Town	New local resource required – yet to be identified	
	Local Enterprise Partnership, Community Organisations, County Council, Unitary Councils	Will occur everywhere	New local resource required – identified and secured	South West Food Hub project
	Local Enterprise Partnership, County Council, Unitary Councils, District and Borough Councils, National Park Authorities, Businesses, Community Organisations, Education Establishments, NHS and Public Health	Will occur everywhere	New local resource required – identified and secured	South West Food Hub project
	Community Organisations, County Council, District and Borough Councils, Education Establishments, Environmental Organisations, National Park Authorities, NHS and Public Health, Unitary Councils	Will occur everywhere	New local resource required – yet to be identified	

Cross Cutting Theme	Action Number	Action	Prioritisation Score
Procurement and commissioning	F14.5	Encourage catering in anchor institutions to provide sustainably produced, locally sourced and nutritious meals in line with the government’s Eatwell Guide.	
Behaviour transformation and community engagement	F15	Work with government to introduce a mandatory carbon footprint labelling system for food products	
	F16	Work with government to ensure the carbon and ecological costs of domestic and imported food, including animal feed, are reflected in their market price.	
	F17	Work with government to revise slaughter regulations to allow on farm slaughter for commercial meat production, where high animal welfare and food hygiene are ensured, to enable localised food production infrastructure.	
Spatial Planning	F18	Devon Maritime Forum and Devon’s estuary partnerships to continue supporting and engaging with the development of Marine Plans by the Marine Management Organisation along the Devon coast	

	Who Does this Action Involve?	Where Should This Action Take Place?	Financial Status	Potential Funding Stream Where Identified
	Businesses, Community Organisations, County Council, District and Borough Councils, Education Establishments, Local Enterprise Partnership, National Park Authorities, NHS and Public Health, Unitary Councils	Rural	Within existing resources	
	Businesses, County Council, Unitary Councils, District and Borough Councils, Environmental Organisations, Farmers	Will occur everywhere	Within existing resources	
	Businesses, County Council, District and Borough Councils, Environmental Organisations, Local Enterprise Partnership, Unitary Councils	Will occur everywhere	Within existing resources	
	Businesses, Community Organisations, County Council, District and Borough Councils, Farmers, Unitary Councils	Will occur everywhere	Within existing resources	
	Businesses, County Council, District and Borough Councils, Environmental Organisation, Town and Parish Councils, Unitary Councils	Coast	Within existing resources	

Cross Cutting Theme	Action Number	Action	Prioritisation Score
Procurement and commissioning	F19	Develop a South Devon Marine Natural Capital Plan, learning from the experience of the North Devon Natural Capital Plan.	
	F19.1	Establish and maintain an inventory of marine natural capital.	
Behaviour transformation and community engagement	F19.2	Use local regulatory levers and enhance public awareness to discourage activities contributing to marine and coastal habitat fragmentation and degradation	
	F19.3	Future reviews of the Shoreline Management Plans covering the Devon coast to identify opportunities for carbon rich marine and coastal habitats to survive and expand by migrating inland with sea level rise.	
Knowledge sharing, skills and learning	F19.4	Pilot specific initiatives which lead to marine carbon sequestration	
Behaviour transformation and community engagement	F19.5	Provide advice on how care of gardens and what goes down the sink affects the sea.	

	Who Does this Action Involve?	Where Should This Action Take Place?	Financial Status	Potential Funding Stream Where Identified
	County Council, District and Borough Councils, Town and Parish Councils, Community Organisations, Environmental Organisations, Local Enterprise Partnership	Coast	New local resource required - yet to be identified	
	County Council, District and Borough Councils, Unitary Councils, Education Establishments, Environmental Organisations	Coast	New local resource required - yet to be identified	
	County Council, District and Borough Councils, Town and Parish Councils, Community Organisations, Environmental Organisations	Coast	New local resource required - yet to be identified	
	County Council, District and Borough Councils, Environmental Organisations, Unitary Councils	Coast	Within existing resources	
	County Council, District and Borough Councils, Community Organisations, Education Establishments, Environmental Organisations, Businesses	Coast	New local resource required - yet to be identified	
	County Council, Community Organisations, Education Establishments, Environmental Organisations, Unitary Councils	Will occur everywhere	Within existing resources	

Cross Cutting Theme	Action Number	Action	Prioritisation Score
Behaviour transformation and community engagement	F19.6	Engage and support the fishing sectors to improve access to and incentivise shoreside disposal of old fishing equipment.	High
	F19.7	Work with government to introduce more Marine Conservation Zones and provide the resources necessary to be effective.	Medium
	F19.8	Work with government for greater monitoring and enforcement of the dumping of fisheries waste at sea.	Medium
Knowledge sharing, skills and learning	F19.9	National Marine Park and Devon and Severn IFCA to trial new ecosystem approaches to fisheries management.	Medium
	F19.10	Work with government to provide further support for smaller fishers, including redistribution of UK quotas, based on social value.	Medium
	F19.11	Identify investment opportunities for, and work with government to trial, a system that rewards environmentally sensitive fishing activities.	High
Finance, economy & resource access	F20	Work with government to introduce legislation to require net gain in the marine environment.	Medium
	F21	Work with government to improve the effectiveness of pollution legislation and enforcement of existing.	Medium

	Who Does this Action Involve?	Where Should This Action Take Place?	Financial Status	Potential Funding Stream Where Identified
	Community Organisations, Unitary Councils, District and Borough Councils, Environmental Organisations, Businesses	Coast	New local resource required - yet to be identified	
	County Council, Unitary Councils, Environmental Organisations, Businesses	Coast	New local resource required - yet to be identified	
	Community Organisations, County Council, Unitary Councils, Environmental Organisations	Coast	New local resource required - yet to be identified	
	Businesses, Community Organisations, County Council, Environmental Organisations, Unitary Councils	Coast	New local resource required - yet to be identified	
	County Council, Environmental Organisations, Unitary Councils, Businesses	Coast	Within existing resources	
	County Council, Environmental Organisations, Unitary Councils, Businesses	Coast	New local resource required - yet to be identified	
	County Council, Environmental Organisations, Unitary Councils	Coast	Within existing resources	
	County Council, Environmental Organisations, Unitary Councils	Will occur everywhere	New local resource required - yet to be identified	

Cross Cutting Theme	Action Number	Action	Prioritisation Score
	F22	Work with the government to increase funding to enhance the effectiveness of the Catchment Based Approach, which provides coordination of conservation measures between landowners and potential funders at a catchment scale for improved water quality and nature.	

	Who Does this Action Involve?	Where Should This Action Take Place?	Financial Status	Potential Funding Stream Where Identified
	Community Organisations, Unitary Councils, District and Borough Councils, Environmental Organisations, Businesses	Will occur everywhere	Within existing resources	

¹ Westcountry Rivers Trust and Local Nature Partnership, 2020, Climate Change and Devon's Natural Environment

² T.A.Mitchell, 2019, Greenhouse Gas Inventories for SWEEG: Methodology Paper, Centre for Energy and Environment, University of Exeter

³ Smith P., M. Bustamante, H. Ahammad, H. Clark, H. Dong, E. A. Elsidig, H. Haberl, R. Harper, J. House, M. Jafari, O. Masera, C. Mbow, N. H. Ravindranath, C. W. Rice, C. Robledo Abad, A. Romanovskaya, F. Sperling, and F. Tubiello, 2014: Agriculture, Forestry and Other Land Use (AFOLU). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf

⁴ Dartmoor National Park, 2020, South West Peatland Project <https://www.dartmoor.gov.uk/wildlife-and-heritage/our-conservation-work/the-south-west-peatland-project#:~:text=The%20South%20West%20Peatland%20Project%20is%20a%20truly%20combined%20effort,contributed%20funds%20or%20staff%20time.>

⁵ NFU, Devon Climate Emergency - Farming and food Workstream, Draft - 24th February 2020

⁶ United Nations Climate Change, 2020, Global Warming Potentials (IPCC Second Assessment Report) . Accessed 13/8/20 <https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials>

⁷ Farm Carbon Toolkit, 2020, Greenhouse gas emissions, accessed 13/8/2020 <https://www.farmcarbontoolkit.org.uk/toolkit/greenhouse-gas-emissions>

⁸ United Nations Climate Change, 2020, Global Warming Potentials (IPCC Second Assessment Report) . Accessed 13/8/20 <https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials>

⁹ Committee on Climate Change, 2019, Net-zero: The UK's contribution to stopping global warming, <https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/>

¹⁰ Stevenson, E. ,2020, Blue Carbon Literature Review

¹¹ Natural Capital Committee, 2020, Advice on using nature based interventions to reach net-zero greenhouse gas emissions by 2050 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878265/ncc-nature-based-interventions.pdf

¹² D. Lash, 2020, The Potential Role for Carbon Offsetting in the Devon Carbon Plan, Centre for Energy and Environment, University of Exeter, <https://www.devonclimateemergency.org.uk/studies-and-data/carbon-offsetting/>

¹³ Woodland Carbon Code, 2020, Yorkshire Dales Woodland Restoration, <https://woodlandcarboncode.org.uk/buy-carbon/woodland-carbon-projects/yorkshire-dales-woodland-restoration>

¹⁴ Devon Live, 2017, How Much Land In Your Area Is Built On? <https://www.devonlive.com/news/devon-news/how-much-land-your-area-752168#:~:text=The%20area%20of%20Devon%20with%20the%20most%20farmland,space%20is%20West%20Devon%2C%20with%2035%20per%20cent.>

¹⁵ NFU, 2019 Achieving NET-ZERO: Farming's 2040 goal, <https://www.nfuonline.com/nfu-online/business/regulation/achieving-net-zero-farmings-2040-goal/>

¹⁶ NNFFCC, 2020, Feedstocks, accessed 13/8/2020 <http://www.biogas-info.co.uk/about/feedstocks/>

¹⁷ CPRE, 2018, Food and Farming Foresight Paper 3. Back to the land: rethinking our approach to soil.

¹⁸ Rothamsted Research, 2020, About the Farm Platform, <https://www.rothamsted.ac.uk/north-wyke-farm-platform>

- ¹⁹ The Agriculture and Food Development Authority, 2017, Advisory Services, <https://www.teagasc.ie/about/farm-advisory/advisory-services/>
- ²⁰ Devon County Council, 2020, County Farms <https://www.devon.gov.uk/economy/business-support/county-farms/>
- ²¹ Guardian, 2019, Brexit and Bad Weather Puts Farmers at Risk of Suicide Say Charities, <https://www.theguardian.com/environment/2019/mar/03/brexit-and-bad-weather-puts-uk-farmers-at-risk-of-suicide-say-charities>
- ²² Agricolgy, About Us <https://www.agricology.co.uk/about-us>
- ²³ East Devon Catchment Partnership, 2017, Soils and Natural Flood Management. www.eastdevon.gov.uk/flooding/soils-and-natural-flood-management.
- ²⁴ Dartington, 2016, Land Use Review, 3 years on: our objectives, achievements and strategy,
- ²⁵ Poore, J. and Nemecek, T. ,2018, SP – 987, EP – 992, Reducing food’s environmental impacts through producers and consumers, VOL 360, Science (New York, N.Y.)
- ²⁶ Thorp, C. 2019, Can you cut the carbon footprint of your weekly meals? Telegraph <https://www.telegraph.co.uk/technology/zero-carbon/food-carbon-footprint/>
- ²⁷ Devon Climate Emergency, Thematic Hearing on Food, Land and Sea, <https://www.devonclimateemergency.org.uk/food-land-and-sea-2/>
- ²⁸ The Health Foundation, 2020, Health Equality in England: The Marmot Review 10 Years On <https://www.health.org.uk/publications/reports/the-marmot-review-10-years-on>
- ²⁹ Devon County Council, Planetary and Human Health: Public Health Annual Report 2019–20, <https://www.devonhealthandwellbeing.org.uk/aphr/2019-20/> , accessed 5/10/2020
- ³⁰ EAT–Lancet Commission, 2020, The Planetary Health Diet and You, accessed 12/8/2020 <https://eatforum.org/eat-lancet-commission/the-planetary-health-diet-and-you/>
- ³¹ The South West Food Hub <https://www.thesouthwestfoodhub.co.uk/>
- ³² Trading Standards, 2020, Made in Devon <https://www.devonsomersettradingstandards.gov.uk/made-in-devon/#:~:text=Made%20in%20Devon%20is%20part%20of%20the%20well-established,is%20a%20business%20that%20takes%20fair%20trading%20seriously>
- ³³ Jennings, N, et al, 2019, Co-benefits of climate change mitigation in the UK: What issues are the UK public concerned about and how can action on climate change help to address them? Grantham Institute Briefing Paper No. 31, Imperial College, London <https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/Co-benefits-of-climate-change-mitigation-in-the-UK.pdf>
- ³⁴ Nourishing Families, 2020, Why nourishing families? Accessed 13/8/2020 <https://www.nourishingfamilies.co.uk/#:~:text=Nourishing%20Families%20runs%20workshops%20and%20courses%20for%20parents,face%20sessions%20or%20via%20Skype%20across%20the%20country.>
- ³⁵ Ocombe Farm, 2020, Explore, accessed 13/8/2020 <https://www.countryside-trust.org.uk/explore/occombe-farm/>
- ³⁶ Open Farm Sunday, Homepage, accessed 13/8/2020 <https://farmsunday.org/>
- ³⁷ Incredible Edible, 2020, Find an Incredible Edible Group, accessed 13/8/2020 <https://www.incredibleedible.org.uk/find-a-group/#list>
- ³⁸ The South West Food Hub <https://www.thesouthwestfoodhub.co.uk/>
- ³⁹ Heart of the south west local enterprise partnership, 20 May 2020, Launch of the South West Food Hub CIC, accessed 13/8/2020 <https://heartofswlep.co.uk/news/launch-of-the-south-west-food-hub-cic/>
- ⁴⁰ Farm Carbon Toolkit, 2020, Greenhouse gas emissions, accessed 13/8/2020 <https://www.farmcarbontoolkit.org.uk/toolkit/greenhouse-gas-emissions>

⁴¹ United Nations Climate Change, 2020, Global Warming Potentials (IPCC Second Assessment Report) . Accessed 13/8/20 <https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials>

⁴² IUCN, 2020, Issues Brief: Blue Carbon, Accessed 17/8/2020 <https://www.iucn.org/resources/issues-briefs/blue-carbon>

⁴³ Guilbert,S. 2019, Devon Local Nature Partnership (Sustainable Seas) Submission to the Public Call for Evidence, under the Theme of Food, Land and Sea

⁴⁴ Environment Agency, 2019, Catchment Data Explorer, South West River Basin District, Download Reasons for environmental issues. Accessed 18/8/20 <https://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/8>

⁴⁵ Legge Oliver, Johnson Martin, Hicks Natalie, Jickells Tim, Diesing Markus, Aldridge John, Andrews Julian, Artioli Yuri, Bakker Dorothee C. E., Burrows Michael T., Carr Nealy, Cripps Gemma, Felgate Stacey L., Fernand Liam, Greenwood Naomi, Hartman Susan, Kröger Silke, Lessin Gennadi, Mahaffey Claire, Mayor Daniel J., Parker Ruth, Queirós Ana M., Shutler Jamie D., Silva Tiago, Stahl Henrik, Tinker Jonathan, Underwood Graham J. C., Van Der Molen Johan, Wakelin Sarah, Weston Keith, Williamson Phillip, 2020, Carbon on the Northwest European Shelf: Contemporary Budget and Future Influences , *Frontiers in Marine Science*, VOL. 7, P143 URL=<https://www.frontiersin.org/article/10.3389/fmars.2020.00143>

⁴⁶ UN Environment Programme, 2018, Business unusual: How “fish carbon” stabilizes climate , accessed 17/8/2020 <https://www.unenvironment.org/news-and-stories/story/business-unusual-how-fish-carbon-stabilizes-our-climate#:~:text=The%20fish%20carbon%20concept%20has%20been%20recently%20profiled,value%20of%20carbon%20beyond%20the%20coasts%2C%E2%80%9D%20says%20Lutz.>

⁴⁷ Royer S-J, Ferrón S, Wilson ST, Karl DM (2018) Production of methane and ethylene from plastic in the environment. *PLoS ONE* 13(8): e0200574. <https://doi.org/10.1371/journal.pone.0200574>

⁴⁸ LIFE Recreation ReMEDIES, 2019, Reducing and Mitigating Erosion and Disturbance Impacts affecting the Seabed

⁴⁹ The Wildlife Trusts, unknown, Kelp Beds and Forests. <https://www.wildlifetrusts.org/habitats/marine/kelp-beds-and-forests>

⁵⁰ Biome Algae, accessed 26/11/2020 <https://www.biomealgae.co.uk/>