Exmoor 2022 Carbon Baseline and Targets

Small World Consulting
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Introduction

This report presents the results of the 2022 carbon footprint baseline and decarbonisation trajectory carried out by Small World Consulting (SWC) for Exmoor National Park.

For the most part, the results match those found in the National Parks UK Race to Zero report, but Exmoor's targets for capturing carbon have been adjusted to account for unique local challenges around increasing woodland and tree cover. For more information, see the accompanying "Exmoor Land Use Targets" summary document.

This carbon footprint assessment for Exmoor National Park includes emissions from a range of sources, such as fuel use, visitor travel, and local agriculture. The calculations cover both direct (production) emissions, like fuel burning, and indirect (consumption) emissions, such as those from refining and distributing fuel. This comprehensive approach ensures that emissions from key activities in the National Park are accurately represented.

The first section of the report will examine all emissions from residents, visitors, land use and agriculture in 2022, and the second section will look at the subset of the emissions which form the baseline footprint for the National Park which is used to set a target decarbonisation trajectory.

Results

Residents' footprint

Category	Exmoor total (tonnes)	% of total footprint	Exmoor per capita	UK average per capita	% diff. Exmoor vs UK
Goods and services	46,337	32%	4.7	4.0	15%
Food and drink	39,348	27%	4.0	3.2	19%
Travel: private cars	25,237	18%	2.6	1.9	26%
Household fuel	12,451	9%	1.3	1.0	20%
Travel: flying	7,982	6%	0.8	0.9	-15%
Household electricity	6,320	4%	0.6	0.4	42%
Travel: public transport, coaches and ferries	5,412	4%	0.5	0.4	19%
Total	**143,086**	**100%**	**14.5**	**11.8**	**18%**

TABLE 1: RESIDENTS' FOOTPRINT BY CATEGORY AND BY PROPORTION

Exmoor has a population of nearly 10,000 residents, with a total carbon footprint of approximately **143,000** tonnes of CO_2.

Table 1 shows that food and drink purchases have a particularly large carbon impact for National Park residents, making up 27% of their total footprint. Private car use follows, contributing 18%, which reflects residents' heavy reliance on cars in this rural area. Household fuel and electricity together account for 13%, as many homes use solid fuels for heating, which raises emissions above the UK average.

Figure 1 compares the carbon footprint of an average Exmoor National Park resident with that of an average UK resident in 2022. The per-person footprint in Exmoor is **14.5** tonnes of CO_2, compared to the UK average of **11.8** tonnes. The higher-than-average footprint for goods and services and food and drink likely reflects higher incomes and spending among wealthier National Park residents, while household fuel and car travel are more characteristic of rural areas without access to mains gas and longer distances to amenities.

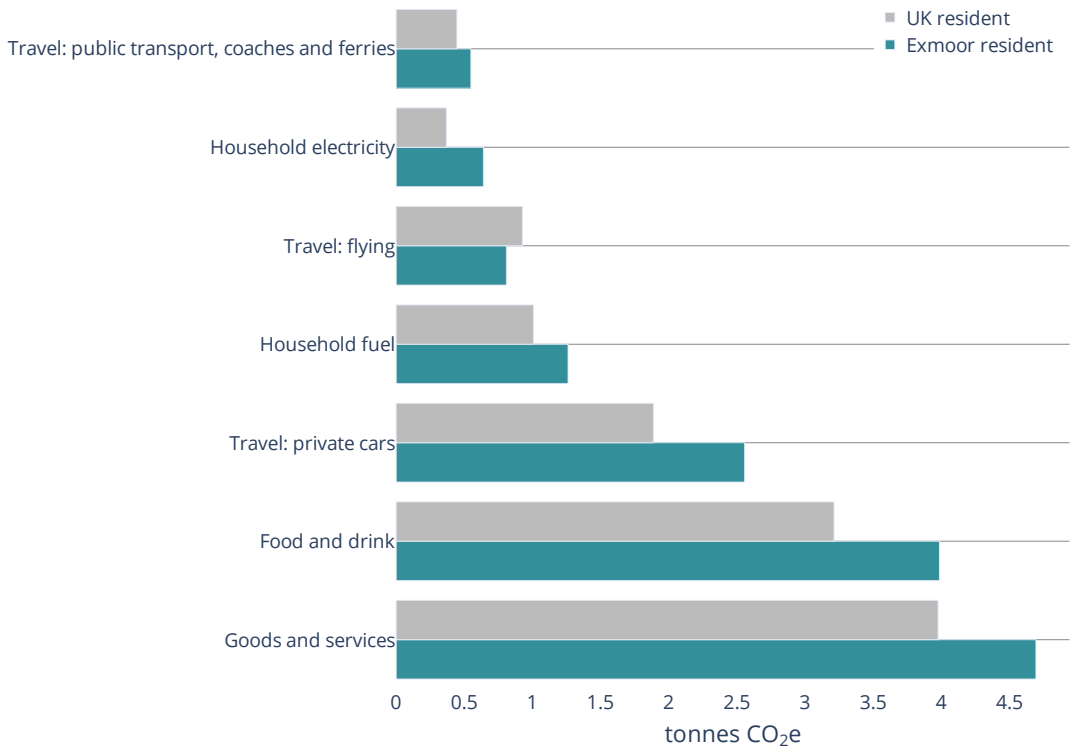

FIGURE 1: COMPARISON BETWEEN AN AVERAGE UK RESIDENT'S FOOTPRINT PER YEAR, AND THAT OF A RESIDENT OF EXMOOR NATIONAL PARK.

Visitors' footprint

The carbon footprint of visitors to Exmoor is primarily driven by their travel to and from the National Park, predominantly through car use, which encompasses both fuel emissions and the embedded carbon footprint of the vehicles. Nearly **80%** of total visitor emissions stem from vehicle fuel and the emissions embedded in cars, when including car manufacture and maintenance. The emissions generated from visitors travelling to Exmoor and returning home significantly exceed those from travel within the National Park during their stay. Perhaps unsurprisingly the footprint from train travel is extremely small, but the footprint from visitors who flew as part of their trip to the UK is not insignificant. A full breakdown of the data is given in Table 3.

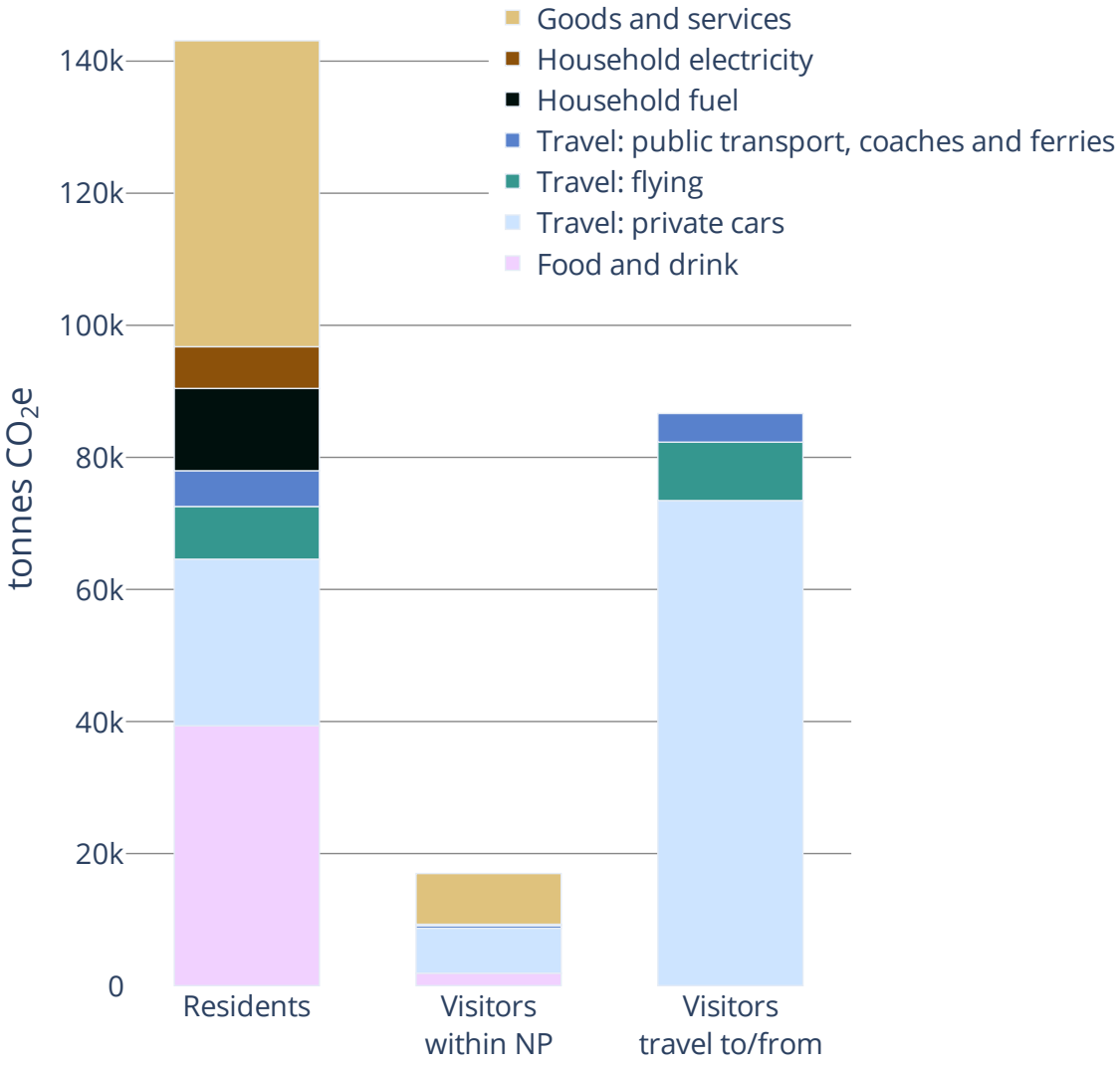

FIGURE 2: RESIDENTS' AND VISITORS' FOOTPRINT BROKEN DOWN BY CATEGORY, AND VISITOR TRAVEL TO AND FROM THE NATIONAL PARK, AND THEIR FOOTPRINT DURING THEIR STAY.

Not every visitor footprint category is carried over to the baseline footprint but totalling the subset of categories that do contribute to the baseline shows that visitors contribute **37%** of the total footprint.

Figure 2 shows the breakdown of the residents' footprint in comparison to that of visitors while they are within the National Park, and their travel to and from the National Park.

Land use and agriculture

The land use and agriculture footprint is made up of emissions (gross emissions **187,710** tonnes CO_2e) and sequestration (**84,963** tonnes CO_2e), leaving overall net emissions of **102,747** tonnes CO_2e. The largest contributor to this is the emissions associated with livestock farming, and agriculture as a whole dominates the sources of emissions. The sinks are provided by woodlands and some grasslands, with peatlands and other wetlands being the largest non-agricultural source of emissions.

Category	Within NP			Travel to/from			Sector total	
	Footprint	% of within	% of visitor total	Footprint	% of to/from	% of visitor total	Footprint	Sector % of visitor total
Travel: private cars	6,799	40%	7%	73,462	85%	71%	80,261	77%
Travel: flying				8,840	10%	9%	8,840	9%
Goods and services	7,678	45%	7%				7,678	7%
Travel: public transport, coaches and ferries	346	2%	0%	4,333	5%	4%	4,680	5%
Food and drink	1,892	11%	2%			0%	1,892	2%
Household fuel	174	1%	0%				174	0%
Household electricity	88	1%	0%				88	0%
Total	**16,976**	100%	**16%**	**86,635**	100%	**84%**	**103,612**	**100%**

TABLE 2: VISITORS' FOOTPRINT BROKEN DOWN BY CATEGORY AND THE FOOTPRINT DUE TO TRAVELLING TO AND FROM THE NATIONAL PARK, AND THE FOOTPRINT FROM ACTIVITIES WITHIN THE NATIONAL PARK

Carbon footprint baseline: 2022

Footprint categories

The footprint assessment breaks emissions down into detailed categories, like the emissions from residents' train use or from visitors' eating out during their visit, before combining these into broader groups to create a baseline for the National Park's overall footprint. Due to constraints on the ability of the National Park Authority to directly influence some of the emissions from residents and visitors presented above, not all of those categories are carried forward to the target-setting categories.

Here's a quick overview of the main categories:

Energy use
Emissions from energy sources like gas, electricity, and fuels for homes, transport, and industry, including fuel refining and transport.

Food and drink
Emissions from all food and drink purchases, including meals eaten out by residents and visitors.

Other shopping
Emissions from goods like clothing, electronics, and vehicles.

Visitor travel
Emissions from travelling to and around the park, including the impact of vehicle manufacture.

Land use (excluding agriculture)
Emissions or carbon absorption from land use, like forests and grasslands.

Table 2 shows the baseline footprint of the National Park, broken down into broad categories. The categories for food and drink and other shopping include the carbon footprints of both residents and visitors. The energy category encompasses all vehicle fuel use, travel by residents and visitors within the National Park, as well as domestic and non-domestic electricity and fuel consumption, along with emissions from industrial processes. This footprint is also shown in Figure 3.

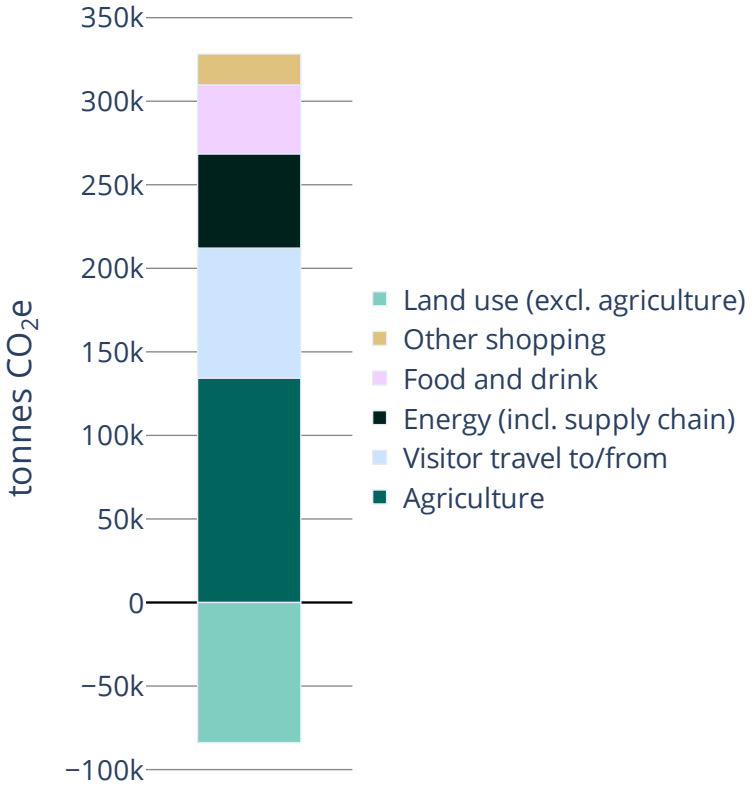

FIGURE 3: BASELINE FOOTPRINT OF EXMOOR NATIONAL PARK BY CATEGORY IN 2022

The largest contributor to the National Park's carbon footprint is agriculture, accounting for approximately **134,000** tonnes of CO_2 equivalent, which represents about **41%** of total emission sources. Visitor travel to and from the National Park follows closely, contributing around **78,000** tonnes of CO_2e. Additionally, energy consumption, which includes supply chain emissions, adds roughly **56,000** tonnes CO_2e, followed by the emissions from food and drink and other shopping. Overall, nearly **328,000** tonnes of CO_2 equivalent are associated with emissions sources from the National Park. However, when accounting for carbon sinks in the local land use, this total footprint is reduced to approximately **244,400** tonnes.

Category	tonnes CO_2e	% of sources
Agriculture	134,301	41%
Visitor travel to/from	77,795	24%
Energy (incl. supply chain)	56,418	17%
Food and drink	41,240	13%
Other shopping	18,487	6%
Sources	**328,242**	**100%**
Land use (excl. agriculture)	- 83,834	
Total	**244,408**	

TABLE 3: DATA FOR EXMOOR'S 2022 BASELINE FOOTPRINT, SEPARATING SINKS AND SOURCE

Science-based decarbonisation pathway

The decarbonisation pathway has been calculated by using a 1.5°C-aligned carbon budget for the UK, as well as using input from the UK's Sixth Carbon Budget sector-specific pathways where appropriate. We treat the two main greenhouse gases – carbon dioxide and methane – separately due to their differing effects on global temperature rise.

We apply our methodology to the 2022 baseline, and project emissions out to 2050. Although emissions cuts are needed immediately, we recognise that it takes time to roll-out and scale-up interventions, so the first 5 years of the pathway include a gradual increase in action from today's levels.

The sequestration pathway is calculated separately, as detailed in the accompanying "Exmoor Land Use Targets" report.

Energy use

Energy use in Exmoor, covering emissions from gas, electricity, and fuels across homes, transportation, and industry, makes up **23**% of the National Park's total carbon footprint. The biggest energy-related contributors are vehicle fuel for both residents and visitors, household heating fuels, and electricity use, followed by residents' public transportation.

To tackle these emissions, a targeted reduction of 10% each year to 2050 is proposed. This ambitious but achievable target would be reached through:

- **Energy Efficiency in Homes**: Replacing oil and gas boilers with electric heat pumps, improving insulation, and setting thermostats to lower temperatures can make homes both more sustainable and energy efficient.
- **Low-Carbon Transportation Options**: An overhaul of the transport system away from private cars and towards active travel and public transport is required, which will also involve changes to how services are provided, allowing more local amenities wherever possible. Where car use is unavoidable they must be switched to electric vehicles, along with the rest of the vehicle fleet.
- **Transition to Renewables**: Shifting to renewable energy sources like solar, wind, tidal, and hydroelectric power is key. Verified green energy tariffs can provide access to clean energy backed by Power Purchase Agreements, ensuring a sustainable energy supply.
- **Building and Infrastructure Enhancements**: Increasing demand from electric heat pumps and electric vehicles will require better grid connections and local renewable energy production to ensure reliability.

Additional activities include building new structures with lower-carbon materials, like timber instead of conventional concrete and steel.

Food and drink

Emissions from food and drink reflect the full impact of what residents and visitors consume across Exmoor, whether bought in grocery stores, enjoyed in restaurants, pubs, and as takeaway, or served in hotels and B&Bs. This includes the environmental toll of producing, processing, and transporting these items.

Food and drink make up **17**% of Exmoor's total carbon footprint, with residents responsible for a larger share since they consume a greater volume overall. Notably, nearly 90% of these emissions come from the food residents buy in grocery stores and other shops, while the emissions from eating out and visitor food purchases represent a much smaller fraction. To bring down food and drink emissions, a targeted reduction of **3**% each year is suggested, aiming for a **50**% decrease in 2050 from current levels. This goal breaks down into three primary approaches:

- **Shifting to Lower-Carbon Diets**: Shifting diets to include more plant-based foods such as fruits, vegetables, nuts, and legumes, and consuming less meat, could greatly reduce emissions, especially in the UK which imports a lot of its food. Plants mostly require far fewer resources and generate lower emissions compared to animal products. This gradual dietary shift supports both environmental goals and health. For locally produced food, farming will still reflect the particular characteristics of the land and its productive potential.
- **Reducing Emissions from Food Production and Transportation**: Focusing on sustainable practices in food production and sourcing items closer to Exmoor, can cut emissions tied to long-distance transport and high-intensity farming methods.
- **Cutting Food Waste**: Reducing food waste offers emission reductions, potentially lowering an individual's food-related carbon footprint by up to 12%. This can be achieved through better storage, portion management, and creative meal planning.

Navigating food choices that balance climate, biodiversity, local livelihoods, health, and affordability is complex. Achieving these reductions will require collaboration among policymakers, farmers, food producers, public health organisations, and Exmoor's residents and visitors. As long as the livelihoods of food producers are protected, the transition can be a positive one with benefits for local wildlife, flood protection and resilience, healthier diets, and more direct relationships between communities and local farmers. These issues are explored in greater detail in our recent paper "UK Farming & Land Use: Addressing the Climate and Ecological Emergencies while Supporting Farmers."[1]

[1] https://www.sw-consulting.co.uk/food-and-land/uk-farming-land-use

Other shopping

Beyond food and drink, spending on goods like clothing, furniture, electronics, and vehicles also generates emissions—from production and transport to eventual disposal. These non-food shopping emissions contribute **8**% of Exmoor's total carbon footprint, making it the smallest category among the National Park's main emissions sources.

The target is to reduce these emissions by **12**% annually. Other shopping emissions can be targeted through two main measures:

- **Adopting a Circular Economy**: Moving toward a circular economy is essential to achieving this goal. This approach emphasises sharing, leasing, reusing, repairing, refurbishing, and recycling materials and products to extend their life cycle. By rethinking consumption patterns and reducing raw material use, residents and visitors can minimise waste and save money.
- **Greener Supply Chains**: Encouraging manufacturers and retailers to reduce emissions across the supply chain, from production methods to logistics, will lower the footprint of goods purchased by residents and visitors.

Building a more circular economy not only cuts emissions but also reduces resource use and waste, supporting Exmoor's wider environmental and sustainability goals.

Visitor travel

Visitor travel emissions account for both how people reach the National Park and how they get around once they are there. The majority of these emissions come from fuel used in personal vehicles, along with a smaller portion from vehicle manufacturing and maintenance. Travel by bus, coach, and train contributes a relatively small share of these emissions. Altogether, visitor travel accounts for **32**% of Exmoor's total carbon footprint. The emissions reduction target is iming for a **10**% reduction annually, based on stable visitor numbers. Achieving this goal involves several strategies that will rely on engaging visitors and travel agencies:

- **Promoting Public Transport:** providing the infrastructure to allow visitors to travel more easily to the National Park via public transport will significantly reduce travel-related emissions. Enhancing bus or shuttle services within the National Park will then allow visitors to enjoy the National Park without relying on cars.
- **Promoting Active Transport**: Tying into the changes mentioned in the Energy use section, converting infrastructure from car-oriented to walking- and cycling-oriented will allow visitors to explore the National Park in the cleanest ways possible. This would include providing secure and sheltered cycle parking at the most popular destinations.
- **Encouraging Electric Vehicles:** For any trips which cannot be made by public transport or active travel, EV charging points must be available to encourage the switch to electric vehicles.
- **Encouraging Longer Stays**: By promoting longer visits, the National Park can help lower the relative emissions per trip, as each visit would involve fewer individual travel journeys.

Through these measures, Exmoor can offer visitors a more sustainable way to experience the National Park, preserving its natural beauty while reducing the environmental impact of travel.

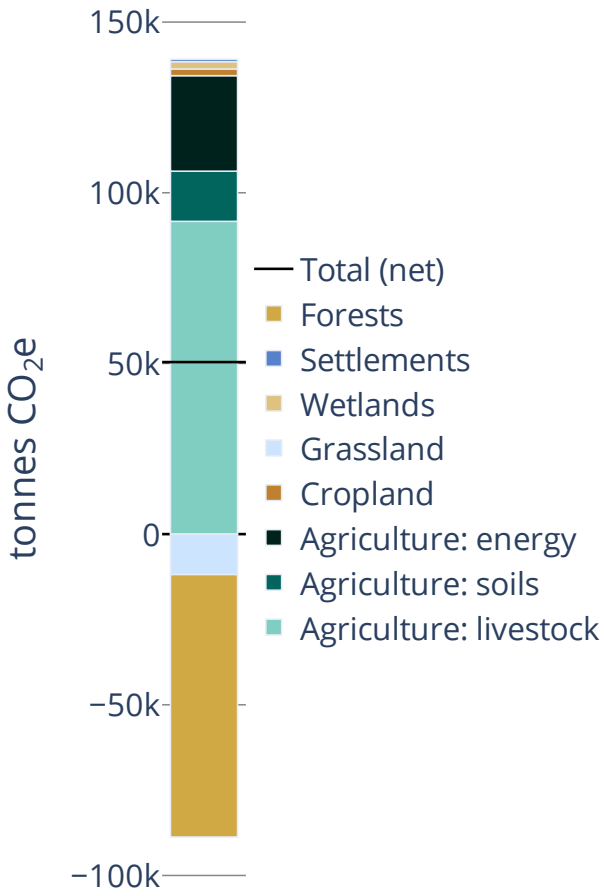

FIGURE 4: LAND USE FOOTPRINT OF EXMOOR IN 2022. NOTE THE SINKS BELOW ZERO, AND THE BLACK LINE AT APPROXIMATELY 50,000 TONNES OF CO2E SHOWING THE NET FOOTPRINT.

Agriculture

Agricultural activities, like livestock rearing, application of artificial fertilisers, and machinery use, are the largest source of greenhouse gas emissions in Exmoor, contributing **55**% of the National Park's total carbon footprint. This is primarily due to methane emissions from livestock, which have a higher global warming potential than carbon dioxide. Other contributors include emissions from soil management and machinery fuel, though these represent a smaller share.

To reduce agricultural emissions, a target of **5**% reduction annually is set, aiming to bring emissions down to **50**% of current levels. Achieving this will require further shifts toward sustainable farming practices.

Key strategies include:

- **Reducing Livestock Numbers**: As part of a broader dietary shift, a reduction in livestock numbers will reduce emissions, aligning agricultural practices with evolving consumer demands.
- **Adopting Regenerative Farming Practices**: These practices prioritise soil health and biodiversity, reducing the need for synthetic fertilisers and cutting down on emissions from intensive soil and crop management.

This transition to climate- and nature-friendly farming requires collaboration and support, allowing farmers to lead in conservation while maintaining sustainable productivity in Exmoor's agricultural landscape.

Land use

While farming presents one of the key challenges in addressing Exmoor's emissions impact, land management is also part of the solution, since carbon can be sequestrated (absorbed) by trees, hedgerows, grasslands and other healthy soils. Increasing sequestration through these options, as well as reducing emissions from degraded peat by restoring it, is essential not only for mitigating climate impacts but also for enhancing biodiversity and creating valuable habitats for wildlife.

The total emissions footprint for land use, which includes agricultural emissions and the carbon absorbed by natural areas, shows gross emissions of about 139,000 tonnes of CO_2e, which is reduced to a net footprint of around 50,000 tonnes through carbon sequestration. Carbon sinks across Exmoor capture about 34% of the emissions from sources covered in this analysis, with the majority absorbed by trees and woodlands.

The amount of sequestration will have to increase in order to reach net zero. Actions that can help to boost carbon sequestration and also support climate resilience include:

- **Woodland Expansion**: Increasing forest cover by planting nearly 200 hectares of new woodland annually is one of the most impactful ways to boost sequestration. This could enhance habitat quality and resilience while absorbing significant amounts of CO_2 over the years. Planting native broadleaf trees like oak and beech, which absorb more carbon over time and benefit wildlife, is a priority.
- **Restoring Degraded Peat**: Restoring over 100 hectares of degraded deep peat a year will prevent further emissions from peat which has been drained or modified.
- **New Hedgerows and Agroforestry**: Expanding hedgerow networks and adopting agroforestry, where trees are integrated into farmland, contribute additional carbon storage and soil health benefits. Cover crops and legume planting can further improve soil carbon and reduce the need for artificial nitrogen, supporting regenerative agriculture practices.
- **Climate-Resilient Planting**: Choosing species that can withstand future climate conditions is essential as rising temperatures and variable rainfall patterns will impact tree survival and carbon uptake over the long term.

Land-use changes must consider local livelihoods, particularly where fields used for grazing might transition to woodland or agroforestry. Farmers' roles in shaping Exmoor's landscapes and economies are integral, and shifts toward carbon sequestration will need support, either through public funds or private investment in offsetting projects.

Acting swiftly to plant and manage new woodlands, hedgerows, and soil-friendly crops will help Exmoor reach its carbon sequestration goals while ensuring a sustainable, food-secure, vibrant landscape for future generations.

Decarbonisation trajectory

The baseline footprint is fed into the target-setting calculation, with targets set according to the sectors as outlined above. This is then combined with the total sequestration curve from the woodland regeneration and increasing tree cover, peatland restoration, and regenerative agriculture targets, described in the accompanying report "Exmoor Land Use Targets", which have been updated compared to the recent UK-wide National Parks Synthesis Report to reflect the constraints and sensitivities of Exmoor's landscape character, and natural and historic environment.

The resulting trajectory is shown in Figure 5, and shows a rapid decrease in most sectors, although emissions from agriculture and food remain significant. By 2050, Exmoor's residual emissions are estimated at **86,282** tonnes of CO_2 equivalent, while sequestration efforts aim to absorb around **177,890** tonnes of CO_2 equivalent.

Near-term rises in energy and visitor travel emissions are anticipated as part of post-COVID recovery, a trend largely outside the direct control of the National Park Authority.

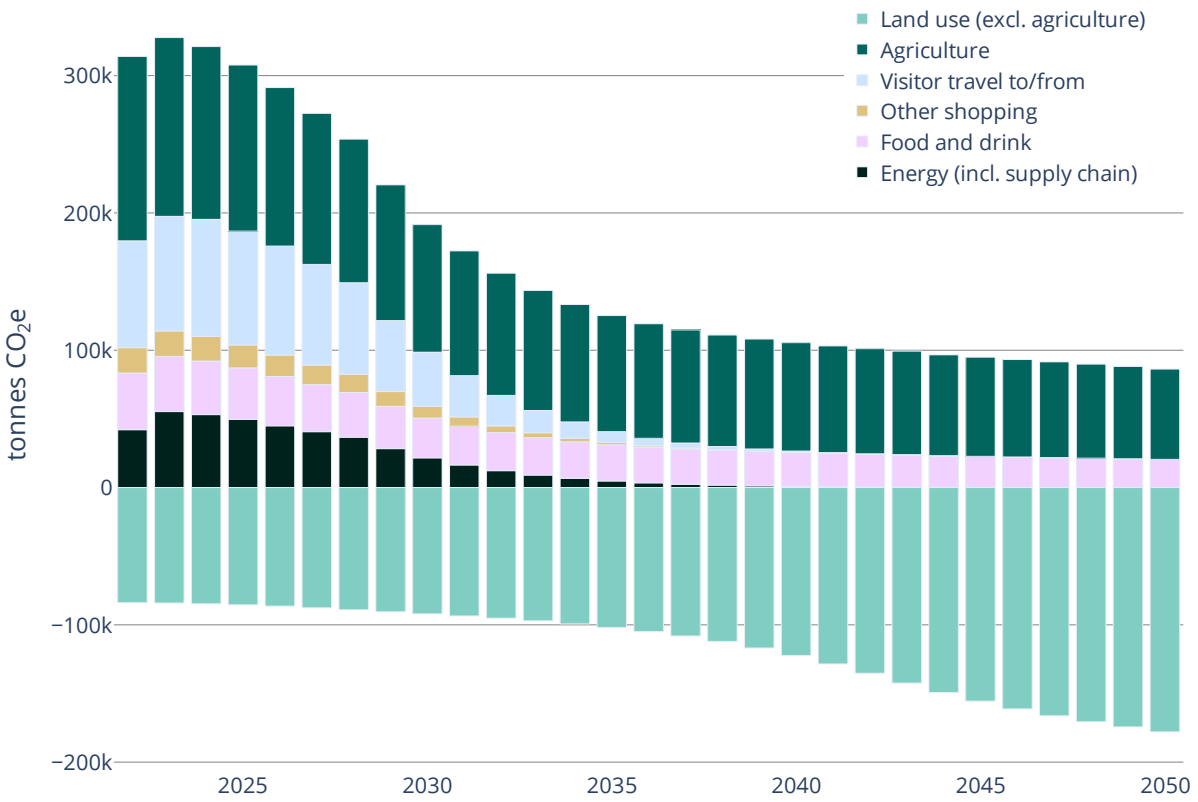

FIGURE 5: DECARBONISATION TRAJECTORY FOR EXMOOR NATIONAL PARK, STARTING FROM THE BASELINE FOOTPRINT IN 2022

However, this should not be seen as “allowable” growth but rather as an anticipated outcome given current conditions.

The decreases in the emissions targeted here will require fundamental changes to our provisioning systems and current way of life, but the nature of the crisis we face demands action at this scale. We should also bear in mind that the interventions which will affect these emissions reductions will also improve our well-being in other ways, as well as the well-being of the natural world.

The sequestration part of the trajectory has been updated to reflect the time lag between planting a tree sapling, and that tree beginning to substantially sequester carbon. Since increasing tree and woodland cover dominates the total sequestration from the land use interventions, the whole curve follows the S-shape which characterises this time lag between intervention and effect.

The projected path aims for “net zero” by 2038, but it’s essential to stay realistic about the limits of this goal. Rising temperatures could damage forests or dry out peatlands, which would release stored carbon back into the atmosphere, potentially negating any progress. This is why it is crucial to focus on cutting emissions quickly and significantly, while also boosting carbon capture through methods like tree planting and peatland restoration. The sequestration methods come with the added benefit of supporting biodiversity, meaning they contribute to both solving the climate crisis and protecting ecosystems.

SMALL WORLD CONSULTING

This report was prepared by
Tom Higgs
Mira Kracke
Dmitry Yumashev

Small World Consulting are world-leading experts in measuring the environmental impact of organisations and landscapes. We help organisations see how they could become truly sustainable. We measure the carbon footprint of living landscapes and show how to reduce emissions from the land and the communities who live, work and visit there.

We work with clients across retail, telecoms, finance, manufacturing, food and hospitality, and landscapes. We look at the smallest details to the global big picture. We help you see yourself thriving in a low-carbon future.

A dedication to truth is at the heart of all our work.

Small World Consulting Ltd
Lancaster Environment Centre
Gordon Manley Building
Lancaster University, Lancaster LA1 4YQ

info@sw-consulting.co.uk | 01524 510272 | www.sw-consulting.co.uk