Climate Action Plan 2020

DARTMOOR NATIONAL PARK AUTHORITY

MARCH 2020

Contents

Non-technical Summary

This carbon action plan has been produced in response to Dartmoor National Park Authority's (DNPA) declaration of a climate emergency and ambition to be carbon neutral by 2025.

The action plan analyses DNPA's carbon footprint and found the Authority's 2018/19 Scope 1 and 2 footprint (i.e. direct emissions from fuel burned and energy used) was 157.1 tonnes CO_2e. This is a 51.6% reduction in carbon emission compared to the 2009/10 footprint, 304.7 tonnes CO_2e.

More work needs to be done to understand the Authority's Scope 3 footprint (i.e. indirect emissions from the goods we buy and sell, the services we procure, our investments, waste production, land assets etc.).

Projects to help the Authority reduce its emissions are recommended and their potential emissions savings estimated where possible. Project costs are estimated where sufficient information is available, these are initial costs, based on assumptions and will be liable to change. The below summarises the project areas recommended in the action plan:

Project area	Summary
Purchase or generate renewable energy	Essential for a significant reduction in emissions and unlocking the benefit of electric vehicles. This will require partnership working.
Reduce fuel use	Using a variety of methods, including purchasing electric vehicles, promoting travel alternatives and enabling staff to commute sustainably.
Ensure efficient buildings and appliances	There has been lots of good work in this area already, but opportunities remain to improve our use of buildings and electrical equipment, including reducing our printing.
Unknown emissions	There are many emissions that the Authority cannot currently measure, more work is needed to close this gap.
Behaviour change	Success is reliant on the organisation as a whole working effectively and adjusting their behaviours.
Land assets	DNPA has large land assets relative to its size, but we know little about what they sequester or emit. More work is needed to understand this. Early estimations suggest it may be possible to offset the Authority's emissions through effective management of its land assets. This will be most robust when done in partnership.

The action plan should be considered an iterative exercise, it is inaccurate in places and it will need to change to respond to new opportunities. A review of the climate action plan is recommended at least every two years.

1. Introduction

1.1 Dartmoor National Park Authority (DNPA) was established in 1997 as an intergovernmental body to conserve and enhance the National Park's natural beauty, widlife, cultural heritage and special qualities, and promote their enjoyment and understanding.

1.2 In July 2019 Dartmoor National Park Authority joined the UK Parliament and many other Councils and organisations in declaring a climate emergency[1]. This was a response to the overwhelming and unequivocal evidence that human induced climate change is occurring. And that this climate change could fundamentally change life on earth, with potentially drastic consequences for our environment[2], our economy[3] and our quality of life[4].

1.3 There is no precise definition of what constitutes action to meet a climate emergency, but the purpose of the declaration is to put climate (and the environment) at the centre of policy and practice.

1.4 The declaration of a climate change emergency marks a renewed sense of urgency in tackling this issue. DNPA's climate emergency declaration included a commitment to work towards the National Park Authority (as an organisation) becoming carbon neutral by 2025, subject to a detailed action plan which sets out a strategy and course of action for addressing DNPA's greenhouse gas emissions.

1.5 This organisational action plan represents the first step in achieving this commitment. This climate action plan is the most detailed assessment of its climate impact the Authority has ever undertaken. It has been completed by officers with consultant support from Clearlead Consulting. The action plan does not address how climate change should be tackled across the National Park as a place, this is the role of the Dartmoor Local Plan, Management Plan and emerging Devon Carbon Plan.

What does it mean to be carbon neutral?

Carbon neutrality, or having a net zero carbon footprint, means achieving net zero carbon dioxide emissions by either balancing emissions with carbon removal or eliminating carbon emissions altogether.

Importantly, the emissions required to be reduced or offset to achieve carbon neutrality is not defined, but a decision made by the organisation, informed by their carbon footprint. Therefore the accuracy of the footprint, and what is included and excluded from it, is critical. Unfortunately these details are rarely made available by organisations and this can make it difficult to know what emissions are actually being reduced or offset.

[1] DNPA (2019) 'Authority report – Climate emergency declaration'
[2] US Global Change Research Program (USGCRP) 2017, Fourth Climate Assessment.
[3] House of Commons Environmental Audit Committee (2018) 'Greening Finance: embedding sustainability in financial decision making – seventh report of session 2017-19'
[4] IPCC (2018) 'Summary for Policymakers'

1.6 When declaring a climate emergency DNPA also signed the Devon Climate Declaration[5] and confirmed the Authority would support the Devon Carbon Plan, an inter-organisational climate plan for Devon which is considering the earliest credible date that should be set for net-zero emissions across Devon[6]. This work is on-going and is not within the scope of this organisational action plan.

What the Authority has achieved already

1.7 As part of the National Park 'family' in England, DNPA has monitored its carbon emissions since 2009 and has been working to reduce these emissions year on year. We have already achieved a 51.6% reduction in carbon emissions compared to the 2009/10 baseline (304.7 tCO_2e).

1.8 This has been achieved through a range of measures including:

- the installation of further insulation and secondary glazing where possible and appropriate;
- new, more energy efficient heating systems at key premises including a gas boiler at Parke and biomass boiler at Princetown sourcing woodchips from sustainable local forestry;
- LED lighting installation;
- removal of inefficient electric storage heaters and extension of wet water heating at Parke;
- server and desktop computer virtualisation significantly reducing the electrical consumption associated with ICT systems;
- smart meters at all premises, which are monitored remotely;
- improved emissions from electricity sourced from the grid; and
- the organisation's reduction in size.

2. Methodology

2.1 For transparency, the method the Authority use for monitoring its carbon emissions is provided below.

2.2 As part of the National Park family DNPA has monitored its emissions since 2009, in a way compliant with Government guidance for organisations[7]. Guidance requires that emissions monitoring is structured within 'Scopes'. A summary diagram below shows what is within each of the three Scopes. To summarise, Scope 1 is the emissions we produce directly (e.g. burning fuel), Scope 2 is indirect emissions from the energy we purchase (e.g. electricity) and Scope 3 is other indirect emissions from our activities which are not within our control (e.g. the goods we buy and sell, staff commuting, the services we procure, our investments, waste production, business travel etc.).

[5] Devon County Council, Devon Climate Emergency Declaration
[6] Devon County Council, Devon Carbon Plan
[7] Defra (2009) 'Guidance on how to measure and report your Greenhouse Gas Emissions'

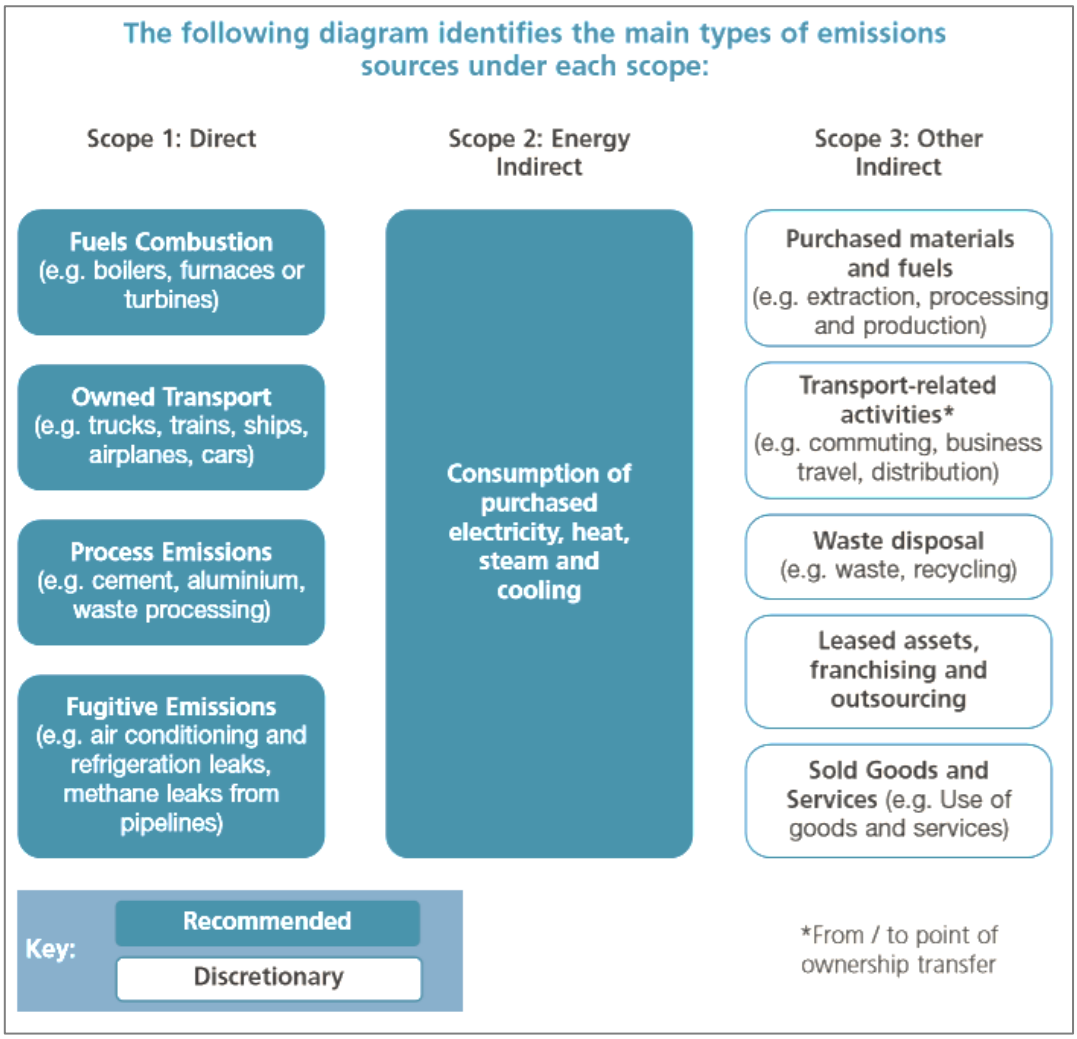


Figure 1 Summary of emission sources for Scope 1, 2 and 3 for all organisations (Source: Defra)

2.3 It is important to understand that an organisation's Scope 3 emissions will form part of another's Scope 1 and 2 emissions. Therefore there is the potential for double counting between organisations when monitoring Scope 3 emissions. Scope 3 emissions can also be difficult to measure because they rely on other organisations monitoring their emissions accurately. Scope 3 emissions are always not in direct control of the monitoring organisation. Nevertheless, tackling Scope 3 emissions allows collaboration both upstream and downstream of the Authority and can use the Authority's influence and buying power to encourage other organisations and companies to reduce their emissions.

How are greenhouse gas emissions measured and estimated?

A carbon footprint is measured in tonnes of carbon dioxide equivalent (tCO_2e). Carbon dioxide equivalent (CO_2e) allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO_2e. CO_2e is calculated by multiplying the emissions of each of the six greenhouse gases by its 100 year global warming potential (GWP).

A carbon footprint considers all six of the Kyoto Protocol greenhouse gases: Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).

Each year the UK Government publishes emission factors for converting activity data, such as fuel and energy use, into a value of tonnes of carbon dioxide equivalent (tCO_2e). This can be used for measuring Scope 1 and 2 emissions and some Scope 3 emissions in a carbon footprint. However, the factors are not exhaustive and do not generally consider the emissions involved in the production and manufacture of goods purchased. They are therefore of limited use for measuring Scope 3 emissions and, where available, up to date scientific studies or data from manufacturers are generally relied upon for this purpose.

Developing the National Park Authority's footprint

2.4 Dartmoor National Park Authority has a broad variety of land, property and machinery assets which all needed to be taken into conisderation when developing the footprint. The following lists significant assets leased, owned and rented by DNPA:

Property:

- Parke House, Bovey Tracey
- Duchy Hotel, Princetown
- 3 x Visitor Centres at Haytor, Princetown (Duchy Hotel) and Postbridge
- Works and storage depot at Bovey Tracey
- Heritage property at Uppacott Cottages, Poundsgate
- Various storage buildings, car parks, laybys and public toilets

Land holdings:

- Approximately 110Ha of woodland
- Approximately 1,015Ha of moorland and heathland with some woodland

Vehicle fleet:

- 3 small diesel pool cars
- 12 diesel 4x4s
- 6 diesel vans of various sizes

2.5 The following table summarises how DNPA monitors its Scope 1 and 2 emissions. It also includes Scope 3 emissions and whether they can be monitored at the current point in time.

2.6 The accuracy of the carbon footprint can always be improved, and calculating accurate emissions is an iterative exercise that should be repeated as more data and information becomes available. The Authority will work to improve the accuracy

of its carbon footprint and seek to accurately calculate emissions for activities it currently has no data for. This process forms part of the carbon action plan.

Scope		Accuracy (over / under estimate)
Scope 1		
Diesel and petrol	Consumption (Litres) in DNPA's vehicle fleet is monitored through the corporate fuel scheme, consumption is converted to carbon emissions using the government emission conversion factors.	High
Natural Gas	Consumption monitored through provider (kWh) and converted to carbon emissions using the government emission conversion factors.	High
Woodchip	Woodchip is purchased from local sustainable forestry (Brimpts Farm), emission factors are not available from the supplier so the government emission conversion factors are used (likely an overestimate).	Medium (overestimate)
Oil	Consumption is monitored through orders and converted to carbon emissions using the government emission conversion factors.	High
Scope 2		
Electricity	Consumption monitored through provider (kWh) and converted using the government emission conversion factors.	High
Scope 3		
Grey fleet	Staff use of personal vehicles for business is monitored through mileage claims and converted to carbon emissions using government emission conversion factors for a medium-sized Diesel car. There is the potential for over / under estimate where staff cars vary in size and type.	Medium (unknown)
Water supply	Consumption monitored through the provider (m^3) and converted using the government emission conversion factors.	High
Water treatment	Consumption monitored through the provider (m^3) and converted using the government emission conversion factors.	High
Business travel	Monitored through travel claims and converted to carbon emissions using the government emission conversion factors for coach, train and air travel.	High
Staff Commuting	Monitored through a staff survey (65% response rate) which asks staff and Members to summarise their commuting patterns including the type of vehicle used. The corresponding factors were then used to estimate annual carbon emissions for each	Low-medium (unknown)

Scope		Accuracy (over / under estimate)
	respondent and extrapolated to estimate the total carbon emissions for the whole organisation.	
Internal Printing	Monitored with software and converted using emission factors from paper and ink manufacturers.	High
Enjoy Dartmoor	Electricity emissions provided by the manufacturer. Paper emissions calculated using government emission conversion factors. Emissions from ink not calculated.	Medium (unknown)
Investments	Not yet available. DNPA is in the process of transferring its Local Government Pension Scheme investments to the Brunel Pension Partnership. At the September 2019 Investment and Pension Fund Committee it was agreed to commission a carbon footprint analysis of the Fund's investments, a report is expected for the February 2020 committee.	-
Procured goods	Not yet available.	-
Procured services	Not yet available.	-
Land assets	Not yet available.	-

3. DNPA's 2018/19 Carbon Footprint

Emission source	Scope 1				Scope 2				Scope 3				Total	%
	Consumption	*Unit*	*Emission factor $kgCO_2e$/unit*	*tCO2e*	*Consumption*	*Unit*	*Emission factor $kgCO_2e$/unit*	*tCO2e*	*Consumption*	*Unit*	*Emission factor kgCO2e/unit*	*tCO2e*		
Natural gas	121,227	kWh	0.18	22.3					121227	kWh	0.02	2.9	25.2	7.7%
Oil	2,253	L	2.54	5.7					2253	L	0.05	0.1	5.8	1.8%
Diesel	28,948.9	L	2.59	75.1					28948.9	L	0.06	1.7	76.8	23.4%
Petrol	163	L	2.21	0.4					163	L	0.06	0	0.4	0.1%
Wood chip	191	tonnes	59.03	11.3					191	tonnes	30.4	5.8	17.1	5.2%
Electricity					165719	kWh	0.3	42.4	165719	kWh	0.02	3.6	46	14%
Grey fleet									44601	miles	0.28	12.2	12.2	3.7%
Water supply									1422	m^3	0.34	0.5	0.5	0.1%
Water treatment									1279.8	m^3	0.71	0.9	0.9	0.3%
Business travel flights									18847	pax.km	0.28	5.3	5.3	1.6%
Business travel coach									113	pax.km	0.03	0	0	0%
Business travel rail									37224	pax.km	0.05	1.8	1.8	0.6%
Commuting												114.2	114.2	34.7%
Enjoy Dartmoor Magazine												20.8	20.8	6.3%
Internal printing												1.5	1.5	0.5%
Total	114.7				42.4				170				328.5	100%

4. The Action Plan

Aim

4.1 This action plan seeks to identify actions that will enable DNPA to become a carbon neutral organsation by 2025. There is no established framework for calculating carbon neutrality or determining what emissions are and are not included. There is therefore a need for DNPA to clarify its objectives.

4.2 DNPA does not have a complete and accurate Scope 3 footprint, and therefore by definition DNPA cannot currently be carbon neutral against its Scope 3 emissions. Many Scope 3 emissions may also be monitored as Scope 1 and 2 by other organisations, albeit this risk is considered minimal because of the relatively few organisations currently completing carbon footprints and the relatively small size of organisation DNPA generally do business with.

4.3 DNPA propose to focus on becoming carbon neutral against Scope 1 and 2 emissions by 2025. DNPA will continue to monitor and calculate its Scope 3 emissions and reduce and offset them on a case by case basis where practical and appropriate.

Strategy

4.4 Various strategies can be employed to achieve carbon neutral status and there is very little concensus over their effectiveness. For example, it is still possible to achieve carbon neutrality by only offsetting emissions through projects such as tree planting, and not reducing emissions.

What does it mean to carbon offset?

A carbon offset is an action intended to compensate for the emissions of carbon dioxide and other greenhouse gas emissions into the atmosphere as a result of human activity.

Various commercial schemes exist (e.g. Voluntary Carbon Credits) from which carbon offset credits can be purchased. Offsetting may also be undertaken by an organisation directly on their own land assets. These will generally be considered as carbon sinks, unless they are formally registered under an offsetting scheme.

4.5 DNPA wants to ensure this action plan is used effectively to address climate change. On this basis, the action plan should be used to bring about change and help reduce DNPA's direct climate impacts, rather than offseting its impact and allowing emissions to remain unchanged. DNPA would like the action plan to eventually work towards the Authority being close to carbon zero (i.e. emitting 0 carbon) when the technology and processes allow. When implementing the action plan DNPA will therefore use the energy hierarchy to inform how projects are prioritised. The hierarchy prioritises actions as follows:

Be lean: reduce demand - e.g. use less fuel and electricity

Be clean: improve efficiency - e.g. use technology which allows less energy to be used

Be green: source requirements from low carbon and renewable sources - e.g. green electricity from solar and wind installations

Offset: offset the impact of unavoidable emissions - e.g. by helping someone else reduce their emissions or investing in a natural or mechanical way of removing carbon from the atmosphere, such as tree planting.

4.6 The target to be carbon neutral by 2025 can work to disrupt this hierarchy. To be carbon neutral DNPA will likely need to balance its resources between emission reduction, efficiencies, sourcing green energy and offsetting. Where insufficient resources are available to invest in emissions reduction, efficiencies and green energy to achieve the 2025 target, the temptation will be to invest in offsetting. In working to this hierarchy, DNPA will need to carefully consider at what point emissions are considered unavoidable and can reasonably be offset.There is no concensus on this, but it is recommended that DNPA consider the possibility of not meeting the 2025 target where it is clear that investment in emission reduction, efficiencies, and sourcing green energy, rather than offsetting, would deliver greater societal and environmental benefit for current and future generations.

4.7 In addition to this DNPA will as far as possible examine the lifecycle emissions of any projects so the full impact of actions can be appraised before they are committed to. As discussed above, the lifecycle emissions of products are not generally considered by government emission conversion factors, but can be criticially important to overall emissions. This is particularly the case with high-tech items such as electric vehicles, where much of a products' emissions over its lifetime are contained within its manufacturing stages at the beginning of the product's life.

4.8 There can also be a temptation to concentrate on visible leadership rather than invisible leadership. For example, prioritising purchasing electric vehicles that can be seen, rather than renewable energy which would have a greater impact but is invisible. DNPA will pursue the most effective strategies to reduce its climate impact, where these are invisible DNPA will work to promote them through its communications outlets.

4.9 The action plan has been compiled with input from staff and Members. It is an iterative piece of work and will continue to be refined as knowledge, data, innovations and budgets change.

Methodology

4.10 The proposed carbon reduction projects are presented in the next section. The projects are presented by scope and each project has costs, carbon saving estimations and other calculations which allow the projects to be compared. A description of the structure used for each project is provided below:

Project Number: Project title

Cost:	The overall cost of the project (any assumptions or items not included are noted in the project summary).
Potential emission savings per annum:	Estimate of how much CO_2e the project will save each year.
Cost saving:	Estimate of how much money the project will save through efficiency savings.
Mitigated offsetting cost:	The estimated cost of offsetting the project's carbon savings were it not pursued. Based on £190/tonneCO_2e.
Payback:	The number of years it will take the project to pay for itself through efficiency savings and mitigated offsetting costs.
£/CO_{2e}:	How much each tonne of CO_2e saved will cost for the project. Where the project requires a single one-off investment this improves with time, and so a number of values are given at various years in the project. It should be acknowledged however that the value is calculated using today's emission conversion factors, these will change with time and so the £/CO_2e value will change too.

Project Summary:

Description of the project, assumptions made and any need for further work.

Scope 1 Projects

Project 1: Purchase electric vehicles

Cost:	£142,656
Potential emission savings per annum:	17.84 tCO_2e (assuming renewable energy)
Cost saving:	£1,815/year
Mitigated offsetting cost:	£3,389/year
Payback:	27 years
£/CO_{2e}:	Year 1: £8,000 Year 5: £1,600

Project Summary:

Purchase electric vehicles to reduce fuel use on current DNPA vehicles, current emissions are:

- 12 x 4x4s - 48.9 tCO_2e (71%) [25mpg]
- 4 x Vans - 13.2 tCO_2e (19.4%) [29mpg]
- 3 x Pool Cars - 6 tCO_2e (8.8%) [51mpg]

The initial proposal involves reducing emissions from the ranger 4x4 vehicles by 20-30% over 5 years. 4x4 capacity is required to be maintained to maintain an effective Ranger service. The Land Rover Defenders would be replaced with a mix of more efficient diesel vehicles (Toyota Hilux, Isuzu, and Suzuki Jimny vehicles) and one electric hybrid (Mitsubishi Outlander PHEV). This would keep most of the Ranger's existing capacity (electric vehicles cannot currently achieve 100% of what DNPA Rangers require) whilst also trialing the performance of alternative vehicles. The proposal also involves replacing one of the pool vehicles with an electric alternative, a staff transport survey suggested that a vehicle with a 100 mile range would be adequate for the vast majority of users.

Lifecycle analysis studies[8] compare emissions from the manufacture and use of electric and traditional vehicles. Whilst there is significant variation, studies generally show the benefit of electric vehicles becomes negligible if charging vehicles from the UK grid, the majority of benefit is achieved when charging using 100% renewable electricity. The emissions from production of the battery are a high proportion of the lifecycle carbon emissions and the case for electric vehicles is particularly worsened if a replacement battery is needed after 8-10 years' service.

Project costs do not currently factor in potential savings from maintenance of the current vehicle fleet. It also does not consider costs for installation of charging points at various sites to support charging. The carbon savings stated are based on renewable energy being used to charge the vehicles. The cost of renewable energy is assumed at a renewable tariff of 20p/kWh.

[8] https://www.eea.europa.eu/publications/electric-vehicles-from-life-cycle
https://theicct.org/publications/EV-battery-manufacturing-emissions

In summary:

- Significant overall emission savings are unlikely to be considerable unless electric vehicle purchase is combined with renewable energy purchase
- Purchasing early can help support an emerging sector
- Costs and benefits of electrifying further DNPA vehicles needs to be considered.

Project 2: Promote travel alternatives

Cost: £0
Potential emission savings per annum: 1.83 tCO_2e
Cost saving: £783/year
Mitigated offsetting cost: £348/year
Payback: 0 years
£/CO_{2e}: £0

Project Summary:
Discourage travel to unnecessary meetings and on avoidable trips. Promote existing dial-in and video conferencing options as suitable alternatives. Encourage home-working where appropriate, bearing in mind this can lead to additional emissions from heating and electricity use at home during the winter. This needs to be carefully implemented and it acknowledged that not all staff will be able to work from home or avoid trips and meetings due to the nature of their work. Face to face meetings and a populated work environment are essential to much of DNPA's work and it will often not be appropriate to discourage them. An appropriate balance will need to be struck between each Officer and managers.

10% saving has been assumed to show potential emission savings. Current emissions from grey fleet and pool vehicles combined is 18.3tCO_2e. This may overestimate potential savings.

Project 3: Review Buildings Efficiency

Cost: To be assessed
Potential emission savings per annum:
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
Significant improvements have already been made. This project seeks to ensure the potential for further improvement is always under review and cost/benefit analysis of options is always being considered. Potential opportunities include:

- Monitoring building use patterns

- Draft proofing
- Air tightness
- Improved room layouts relative to heating sources
- Secondary glazing / insulation
- Replace remaining gas / oil boilers
- Conduct data analysis to review baseline
- Heating controls review

Identified projects will then form individual projects on the action plan.

Project 4: Purchase electric land management equipment

Cost:	To be assessed
Potential emission savings per annum:	0.36 tCO_2e (assuming renewable energy used)
Cost saving:	£180.93/year
Mitigated offsetting cost:	£68/year
Payback:	to be assessed
£/CO_{2e}:	to be assessed

Project Summary:
Purchase electric tools, such as strimmers, chainsaws etc., to prevent use of fuel in traditional tools.

The Authority use 121L of petrol in 2018/19, equivalent to 268kgCO_{2e}. The vast majority of this is from land management tools.

Cost of electric alternatives to be looked at and cost-benefit analysis completed. Given emissions are very small and costs likely to be high, this is not considered a priority. Costs of replacement electric equipment should be considered when existing equipment has reached the end of its useful life.

The emission savings assume renewable electricity is used to charge equipment. Cost savings do not take into consideration the additional electricity cost for charging machinery.

Scope 2 projects

Project 5: Purchase renewable energy (3 options)

There a 3 options within this project:

- Option 1: purchase a green tariff which use traded Renewable Energy Guarantee of Origination (REGO) certificates.
- Option 2: purchase renewable energy via a combined public sector Power Purchase Agreement (PPA)
- Option 3: purchase renewable via a private supplier who guarantees supply from their own infrastructure or PPA

Option 1:

Cost:	Negligible
Potential emission savings per annum:	42.4tCO_2e
Cost saving:	£0
Mitigated offsetting cost:	£8,056/year
Payback:	No payback
£/CO_{2e}:	to be assessed

Project Summary:
Purchase green tariff via existing energy provider. This is very low cost (appx £80/year).

Green tariffs use the trading of Renewable Energy Guarantees of Origination (REGOs). When a renewable generator produces green energy they receive a REGO from Ofgem which can then be kept (if they want the carbon credential) or sold. Prices for REGO certificates on the market are very low, far too low to incentivise the installation of more renewable energy infrastructure. For this reason they are not seen as being sufficient to increase the overall supply of renewable energy supply in the UK. The Committee on Climate Change has concluded we need a quadrupling of renewables in the UK if we're to achieve our climate targets[9]. Ofgem has stated that it has seen no evidence that green tariffs "could materially support the production of renewable energy over and above what is already in place".

Option 2:

Cost:	Negligible (risk of £2,000 per year)
Potential emission savings per annum:	42.4tCO_2e
Cost saving:	Negligible (potential for £1,700 per year)
Mitigated offsetting cost:	£8,056/year
Payback:	No payback
£/CO_{2e}:	Worst case: £47 Best case: -£40

[9] Committee on Climate Change (2019) 'Net Zero: The UK's contribution to stopping global warming'

Project Summary:
Combine with other Local Authority bodies and purchase renewable energy via a power purchase agreement (PPA). A PPA is a contract between the supplier and consumer of energy, it can set out how the electricity should be generated and the price it will be bought for as well as other details. This allows a group of energy purchasers to get certainty they will generate renewable energy equivalent to their consumption and also that the price they purchase energy at will be utilised for the development of renewable energy infrastructure.

This approach is currently being pursued in partnership with Devon County Council and other Councils and public bodies in Devon. Initial cost estimates suggest costs will be neutral over 17 years. However, the PPA is effectively hedging and there is financial risk involved. Against current BEIS price forecasts this risk is currently estimated to be an average £2,000 cost or £1,700 saving per year over a 17 year period, assuming DNPA's 2018/19 consumption remains constant (it is forecast to rise).This risk can be mitigated to some degree by only purchasing a portion of electricity through the PPA, in which case were electricity prices from the grid to be lower than forecast, this would serve to compensate the costs associated with the PPA. This approach would not however allow DNPA to reduce emissions associated with its electricity consumption to zero.

It's important to understand that the PPA will not provide DNPA with renewable electricity on an electron by electron basis. The renewable energy produced will be fed into the National Grid and used by general consumers and DNPA will continue to draw its energy from its existing electrical connections to the National Grid. There is no way of knowing the precise source of the grid electricity that DNPA uses. The PPA enables DNPA to:

- generate an amount of renewable energy which is equivalent to its annual consumption; and
- have confidence this arrangement has led to additional renewable energy infrastructure which will feed into the National Grid, that would not otherwise be justified by the energy market.

Option 2 requires further investigation and scoping which is kindly being led and supported by officers at Devon County Council. At this stage, this is the preferred option for sourcing renewable energy.

Option 3:

Cost:	£8,286/year
Potential emission savings per annum:	42.4tCO_2e
Cost saving:	£0
Mitigated offsetting cost:	£8,056/year
Payback:	No payback
£/CO_{2e}:	£195/year

Project Summary:
Purchase electricity via Ecotricity or similar supplier who guarantees purchase of renewable electricity through their own infrastructure or power purchase agreement. This option is complex and requires DNPA to withdraw from the DCC framework agreement which has long been financially advantageous.

There would be an approximate 5p/kWh premium (assuming 20p/kWh tariff), and so annual premium of £8,286 based on 2018/19 usage, and £41.5k cost over 5 years.

Project 6: Installation of Solar PV at Haytor Visitor Centre

Cost:	£6,000
Potential emission savings per annum:	0.606tCO_2e
Cost saving:	£540/year
Mitigated offsetting cost:	£131/year
Payback:	9 years
£/CO_{2e}:	Year 1: £9,360 Year 5: £1,980 Year 10: £990

Project Summary:
Installation of solar PV panels to generate electricity for use at premises. Ensures energy is renewable and potential for electricity cost savings, particularly at higher renewable energy rate.

Other potential installation sites to be reviewed include:

- Haytor Visitor Centre
- Bovey Tracey Works Depot
- Parke Offices

Insufficient electrical load capacity or installation opportunities at other sites.

For the Haytor Visitor Centre, estimates have been obtained for a 3kWh system (10 x 300W+ panels). Similar units are known to generate approximately 2,700kWh per year in Bovey Tracey (sourced from private systems). This equals a cost saving of £405/year and £2,025 over 5 years.

Lifecycle emissions to be taken into consideration when accounting for potential emissions savings[10]. Maintenance costs need to be considered. Carbon savings assume electricity would otherwise be sourced from the grid, emission conversion factors for the National Grid are due to improve and so it is likely the £/CO_2e figure will worsen with time. Cost savings assume electricity would otherwise need to be sourced from renewable sources at a tariff of 20p/kWh.

Project 7: Audit of high demand electrical items

Cost:	To be assessed

[10] Ricardo AEA (2013) Current and Future Lifecycle Emissions of Key „Low Carbon" Technologies and Alternatives
Nugent, Benjamin and Suvacool (2014) Assessing the lifecycle greenhouse gas emissions from solar PV and wind energy: A critical meta-survey

Potential emission savings per annum:
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
Review all electrical items rated over 1kW and determine whether these are necessary or can be replaced by more efficient alternatives. Where specific items have been identified already they form distinct projects within the action plan.

Project 8: Convert Parke electric shower to wet system

Cost:	£500
Potential emission savings per annum:	0.607tCO_2e
Cost saving:	£475/year
Mitigated offsetting cost:	£115
Payback:	1 year
£/CO_{2e}:	£824

Project Summary:
Remove high use electrical item and install shower which makes use of hot water already created by immersion boiler.

Consider whether there is an opportunity to use shower refurbishment as a way to encourage staff to commute by more sustainable means. This would likely provide higher overall emissions savings.

Project 9: Install LED lighting to Parke Car Park

Cost:	£2,000
Potential emission savings per annum:	0.608tCO_2e
Cost saving:	£488/year
Mitigated offsetting cost:	£116
Payback:	3.5 years
£/CO_{2e}:	£3,289

Project Summary:
Parke car park comprises 6 x 1kW lights used for 4 hours each day Monday to Friday during winter months (2,640kWh consumed annually assuming 5.5 months use). LED alternative would be 6 x 100W LED lights (264kW consumed annually assuming 5.5 months use).

Cost savings based on renewable tariff of 20p/kWh. Carbon savings assume electricity sourced from grid.

Project 10: Install LED lighting to Princetown Duchy Hotel

Cost: To be assessed
Potential emission savings per annum:
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
Consider installation of LED lighting to frequently used rooms at the Duchy Hotel Princetown, 1st Floor (Ground floor already converted to LED).

Scope 3 projects

Project 11: Carbon footprint Land Assets

Cost: To be assessed
Potential emission savings per annum:
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
Calculating emissions from the use and management of DNPA land assets is likely to be large source of carbon emissions and/or sequestration. A detailed assessment of the carbon footprint of DNPA's land assets will provide essential information to support DNPA's ambition to be carbon neutral. Identifying where there are opportunities, issues to address and action that could support further sequestration to support the Authority's ambition to be carbon neutral, potentially even carbon negative. The Authority own approximately 1300Ha of woodland, moorland and other assets.

This will likely be an iterative exercise as research and understanding of DNPA's land assets and their carbon credentials improves over time. Various studies review recent data on emissions from land assets and can be used to begin to understand DNPA's land assets[11][12], albeit there can be significant scope for error when applying these studies in different contexts.

Project 12: Investments

Cost: To be assessed
Potential emission savings per annum:
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
DCC is in the process of transferring its Local Government Pension Scheme (LGPS) investments to the Brunel Pension Partnership. At the September 2019 DCC Investment and Pension Fund Committee it was agreed to commission a carbon footprint analysis of the Fund's investments. This is now underway and a report is expected for the 28 February 2020 committee. Dependent on the results, a project may be required to help influence how the LGPS is invested.

Significant progress has already been made by the Brunel Pension Partnership and DNPA are currently committed to working with the Partnership and other

[11] Natural England (2012) 'Carbon storage by habitat'
[12] RSPB (2017) 'Accounting for nature: A natural capital account for the RSPB's estate in England: Annex 7'

local government bodies to influence how investment decisions are made and shareholder voting rights are used. Various recent articles and news updates summarise Brunel's recent actions to address climate change in the finance sector[13].

Project 13: Carbon Footprint of procured items

Cost: To be assessed
Potential emission savings per annum:
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
DNPA is currently unable to monitor the carbon footprint of items that it procures. DNPA therefore doesn't currently know the emissions associated with work it outsources. As a first step in understanding this, it is proposed to request that contractors submit carbon emissions information when responding to Tenders and Invitations to Quote. They will be required to provide their annual footprint and a forecast of the likely emissions involved in completion of the contract.

This requirement will be voluntary at first, with the potential to become compulsory in the future. Importantly, any new approach or request for information must ensure that SMEs and micro businesses are not over-burdened.

Project 14: Digital by default

Cost: To be assessed
Potential emission savings per annum: 0.3326tCO_2e
Cost saving: £350/year
Mitigated offsetting cost: £63/year
Payback: To be assessed
£/CO_{2e}: To be assessed

Project Summary:
DNPA prints approximately 28,000 sheets of paper each month and approximately 350,000 sheets per year. Although we have tested recycled paper, good print quality has so far only been achieved through use of non-recyclable paper.

Savings of 20% have been assumed to show potential benefits of a digital by default project.

[13] Brunel Pension Partnership (2020) 'Brunel clients collaborate with ShareAction to demand lenders address climate change'
Brunel Pension Partnership (2020) '£30bn Pension Partnership calls finance sector 'not fit for purpose' for addressing climate change'
The Guardian (2020) '£30bn pension fund: we'll sack asset managers that ignore climate crisis'
The Guardian (2020) 'Pension funds urge Barclays to stop lending to fossil fuel firms'

Project options, include:

1. Purchase technology to allow staff and members to use digital devices, rather than paper
2. Review all DNPA processes which rely heavily on printing and develop processes which avoid printing, including purchasing software where necessary
3. Use certified carbon neutral paper stocks where printing is necessary

Project 15: Encourage sustainable commuting

Cost: To be assessed
Potential emission savings per annum: 11.59tCO_2e
Cost saving: £350/year
Mitigated offsetting cost: £2,202/year
Payback: No payback
£/CO_2e:

Project Summary:
Ensure staff have sufficient access to facilities which allow them to travel sustainably and are encouraged to do so.

Commuting patterns were analysed through a staff survey and options for reducing this are:

- Improve shower and changing facilities
- Subsidise public transport costs
- Install one or more electric vehicle charging points
- Encourage staff to purchase fuel through offset schemes
- Facilitate car sharing by promoting a car share map
- Consider how home working could reduce commuting emissions
- Promote the cycle to work scheme

A carbon saving of 10% has been assumed to show the potential benefit of the projects identified.

Project 16: Review procurement strategy for Visitor Centres

Cost: To be assessed
Potential emission savings per annum:
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_2e:

Project Summary:
Review strategy for ensuring goods sold in shops are, where possible, locally sourced, plastic free, recyclable and have limited carbon emissions.

Project 17: Review waste strategy

Cost: To be assessed
Potential emission savings per annum:
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
Review existing contractor to ensure they are the most efficient and recycle where possible.

Explore the possibility of installing sorting bins to allow recycling of currently non-recyclable items via Terracycle.

Project 18: Review Enjoy Dartmoor magazine distribution strategy

Cost: To be assessed
Potential emission savings per annum: 10.4tCO_2e
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
Currently 100,000 copies of Enjoy Dartmoor are printed and distributed and this contributes to 6.3% of DNPA's footprint as currently calculated.

Options for reviewing how effective this distribution format is include:

- Survey readers to establish their view of the content and how they would prefer to consume it
- Shorten and digitise all or part of the magazine
- Monitor wastage through distributors and revise total print numbers

50% savings have been assumed to approximate potential carbon savings following an ambitious project.

Project 19: Behaviour change campaign

Cost: To be assessed
Potential emission savings per annum: 10.4tCO_2e

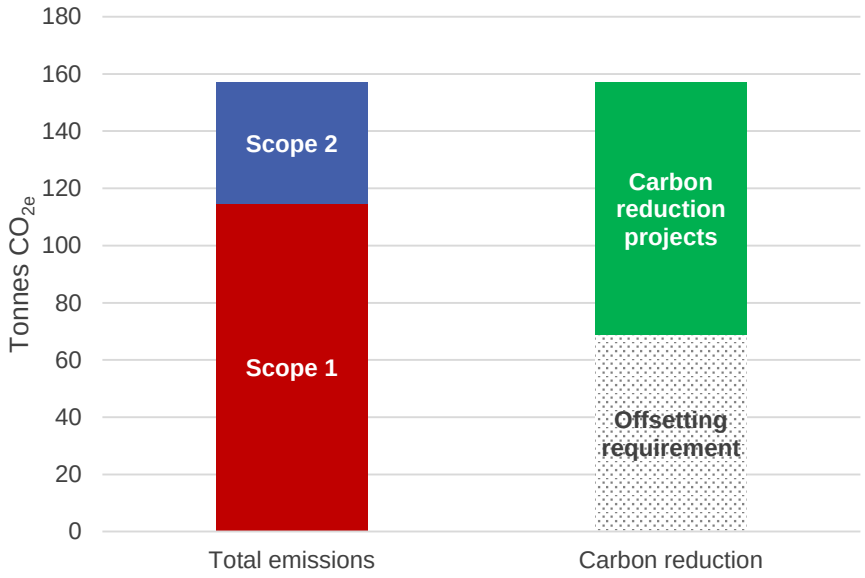
Cost saving:
Mitigated offsetting cost:
Payback:
£/CO_{2e}:

Project Summary:
Raise awareness of the impact of DNPA and how this can be reduced by actions from the staff. Encourage behavior change in key areas, such as:

- Driving - to meetings and commuting
- Switching off equipment - lights and office equipment
- Printing
- Heating controls - turning down heating, shutting windows, shutting doors etc.
- Reducing overnight consumption
- Procurement

5. Project summary and carbon offsetting

5.1 The below summarises DNPA's total Scope 1 and 2 carbon emissions. It also shows the combined effect of the discussed carbon reduction projects from this action plan, where emission savings data is currently available. As a result of implementing the discussed Scope 1 and 2 projects DNPA's footprint would reduce from 157.1 tCO_2e to 69.28tCO_2e, a reduction of 44% over the 2018/19 baseline and 77.3% over the 2009/10 baseline.



5.2 Importantly, the proposed projects are not sufficient on their own to achieve carbon neutral status. As it stands it will be necessary to offset DNPA's remaining scope 1 and 2 emissions with carbon offsetting projects to achieve carbon neutrality. As the plan and projects are implemented, new ideas may be added which would further reduce carbon emissions, however, it is likely that there will always be a small proportion of emissions which require offsetting.

5.3 Various carbon offsetting options exist, these options and their relative merits are discussed below in further detail.

Offsetting projects

Offsetting Project 1: Community Climate Fund

Cost required to offset: £30,000 annually
£/CO_{2e}: £191

Project Summary:
Establish a fund to support community projects which would reduce carbon emissions. The first year's carbon savings from each funded project could be claimed as an offsetting credit and subtracted from DNPA's footprint. The costs and savings would be dependent on what works were funded.

The Authority could set its own funding criteria and a maximum value for money threshold of approximately £190/tCO_2e (equivalent to Salix Finance Ltd. funding which is a BEIS funded independent company[14]). At this level it would cost approximately £30,000 annually to offset the Authority's current emissions. This could be a significant underestimate if high quality value for money projects are not forthcoming.

Offsetting Project 2: Purchase renewable energy

Cost required to offset: £98,286 annually
£/CO_{2e}: £626.03

Project Summary:
Purchasing renewable energy to feed-in to the grid and offset the energy use of others is a valid way offset carbon emissions. 450MWh would be needed to offset DNPA's Scope 1 footprint (115tCO_2e). DNPA's Scope 2 footprint would not need to be offset if this was covered by renewable energy at a cost of approximately £8,286 per year as proposed in the action plan.

Offsetting Project 3: Generate renewable energy

Cost required to offset: To be assessed
£/CO_{2e}:

Project Summary:
Costs of DNPA investing directly in various electricity generating infrastructure are currently being investigated.

Offsetting Project 4: Land purchase for tree planting

Cost required to offset: £730,080 one-off investment (will not achieve 2025 target)

£/CO_{2e}: Year 5 (1.1 tCO_2e/Ha): £22,468

Year 10 (4.5 tCO_2e/Ha): £5,492

Year 30 (164.9 tCO_2e/Ha): £150

Year 100 (560.7 tCO_2e/Ha): £44

Project Summary:
Purchase sufficient land to plant trees that will sequester enough carbon to offset the impact of DNPA's Scope 1 and 2 emissions.

[14] Salix Finance

A study by Exmoor National Park[15] estimates that 1Ha Native Woodland sequests 560.7tCO_2e over 100 years with most of this occurring between 15 year and 60 year maturity.

Assuming an average of 5.6tCO_2e per hectare per year. DNPA would need 28Ha of woodland to offset its current Scope 1 and 2 emissions. However, trees sequester far less CO_2 at the beginning and end of their life. The reality is that in the first 5 years of a broadleaf planting scheme only 0.2tCO_2 is likely to be sequestered per hectare per year. So roughly 142Ha of trees would be needed for the Authority to be carbon neutral by 2025. This does not take into consideration emissions associated with planting, managing and monitoring these assets.

80% funding for planting is available through the Woodland Carbon Fund[16] for planting schemes of 10Ha or more, comprising 70% productive tree species and with costs capped at £6,800 per hectare, this is considered conservative and unlikely to cover labour.

Land costs would likely be in the region of £10,000 per acre, with 28 Ha costing approximately £692,000 and 142Ha costing £3.5m.

Planting costs for 28Ha would be £190,400. £38,080 with 80% grant funding.

Capital costs for land and planting 28Ha would therefore be very roughly £730,080. Capital costs would be one off and therefore the benefit improves with time. The emission savings above have been calculated using the more accurate variable sequestration rate within the Exmoor study.

Ongoing management, maintenance and other revenue costs would also need to be assessed and their potential emissions fully considered.

Offsetting Project 5: Habitat restoration on DNPA land assets

Cost required to offset: To be assessed
£/CO_{2e}:

Project Summary:
The potential to use DNPA's existing land assets to sequester carbon is currently being appraised and costs calculated. This is a complicated exercise. The carbon footprinting exercise discussed in project 11 of the action plan has been included to help identify opportunities for carbon sequestration on DNPA's land assets to offset our emissions and also understand the likely emissions which occur from the management of those assets in accordance with DNPA's existing land management plans and agri-environment schemes for each asset.

Where possible, it is likely that completing offsetting projects on DNPA's existing land assets will be more cost effective than purchasing energy or new land. To

[15] Exmoor National Park Authority (2013) 'Quantifying carbon storage and sequestration in woodlands in Exmoor National Park'
[16] UK Government Woodland Carbon Fund

provide some examples of how this might work the below table summarises some scientific studies that have studied the carbon sequestration rate of different habitat changes. The table shows how much land area would be required to offset DNPA's 2018/19 Scope 1 and 2 emissions by targeting a selection of example habitat changes. Data for this exercise is taken from a 2012 Natural England publication[17].

Habitat change	Annual carbon sequestration rate (tCO_2e /Ha /year)	Area needed to offset Scope 1 and 2 emissions in 1 year ($157tCO_2e$)
Improved grassland to woodland	-7.83 to -13.7	20 - 11Ha
Grassland to wetland	-2.39 to -14.3	66 - 11Ha
Restore unimproved grassland	-6.96	23Ha
Improved grassland to pollen and nectar mix	-5.87	27Ha

It is important to note that this is a very rough exercise and the level of detail given in the above table provides a misleading impression of the accuracy which can be achieved when estimating carbon sequestration rates. Even in the case of habitat areas, it can often be difficult to define the extent of a particular habitat to any great level of accuracy. There are also considerable levels of uncertainty associated with the matching of habitat types with published sequestration values, and also in the precision of measurement within studies. The ability of this type of approach to ever establish precisely the sequestration rate of a habitat change is very limited and should be treated with caution and likely considerable over supply of land to ensure the stated benefits are achieved in reality. Establishing accurate and robust sequestration rates will present a significant knowledge gap for the Authority and likely prove a major obstacle to pursuing this offsetting strategy. There is no nationally agreed carbon accounting framework. However, many are facing similar issues and there is an opportunity for the Authority to work in partnership and help bring more clarity to this area of study.

To put this into practice as a rough example, the existing management plans for DNPA's five major land holdings at Holne and White Moor, Haytor, Plaster Down, Hawnes and Dendles and at the Wray Valley Woodlands are looking to create approximately 120Ha of scrub and woodland, 25Ha of heathland and 6Ha of valley mire by 2030. By using published sequestration rates, such as those above, it appears that, in theory at least, more than enough land exists to offset the Authority's unavoidable emissions on its existing land assets. However, more detailed analysis is required of the habitat changes occurring, the condition of the habitats establishing, and the relevance of the sequestration rates being applied before we can have any certainty of what is occurring in reality.

What is clear is that pursuing this project in a way which balances carbon sequestration objectives with biodiversity, climate change adaptation, water resources, air quality and other environmental indicators would use and build on the wealth of knowledge and experience within the Authority. It could better

[17] Natural England (2012) 'Carbon storage by habitat'

position DNPA to advise across the National Park and beyond, and prepare DNPA for the Government's emerging focus on nature recovery, emphasised in the Environment Bill, emerging Environmental Land Management Schemes framework, Glover Review, and emerging biodiversity net gain and Local Nature Recovery policies.

Offsetting Project 6: Purchase fuel from Shell

Cost required to offset: £0 (75.1tCO_2e maximum offset)
£/CO_2e:

Project Summary:
Shell have committed to offsetting the emissions associated with production and consumption of its business Shell Card customers.

Businesses are eligible for using the Shell Card and it would replace DNPA's current fuel scheme. Limited Shell garage availability is a concern. Feasibility, costs and emissions of increased journey times to garages to be further considered.

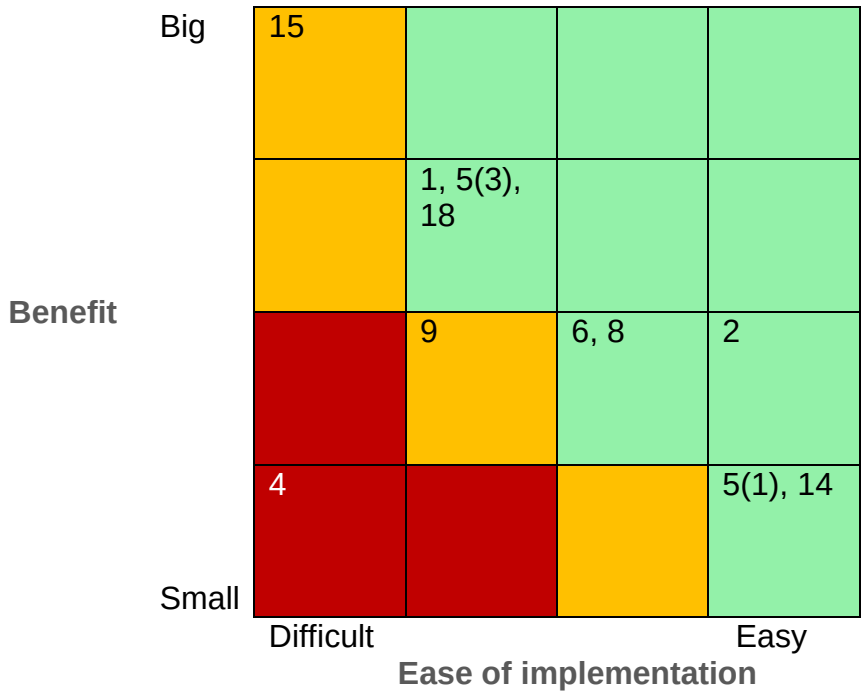
Offsetting costs

5.4 The below summarises the costs of offsetting for each costed scenario before and after implementation of the proposed action plan. It serves to emphasise the need to prioritise carbon reduction over offsetting.

Offsetting costs	Offsetting for 2018/19 Scope 1 and 2 emissions	Offsetting for Scope 1 and 2 emissions after project implementation
Total tCO_2e	157	69
Community fund cost required	£29,830	£13,089
Purchasing renewable electricity	£98,286	£43,125
Tree planting within the park	£730,080	£303,630

Prioritising projects

5.5 Using project numbers from the action plan, the below evaluates how easy it would be to implement each of the proposed projects (where carbon saving information is available) against the potential climate benefit. It assists in project prioritisation, showing those projects that are a clear priority for action and those which are less so.



5.6 When further detail about the proposed projects is available it is recommended that projects are mapped on a Marginal Abatement Cost Curve (MACC) which more accurately estimates the volume and cost of opportuniteis to reduce emissions in a given year.

5.7 Using this prioritisation it is possible to begin to establish a timeline for implementing the proposed projects.

Year	Projects
2020	Project 1: Purchase more fuel efficient vehicles Project 2: Promote travel alternatives Project 5: Purchase renewable energy (option 1) Project 6: Installation of Solar PV at Haytor Visitor Centre Project 7: Audit of high demand electrical items Project 9: Install LED lighting to Parke Car Park Project 11: Carbon footprint Land Assets Project 14: Scope digital by default Project 15: Scope encourage sustainable commuting Project 19: Scope Behaviour change campaign
2021	Project 1: Consider case for electric vehicles Project 5: Purchase renewable energy (option 2) Project 8: Convert electrical shower (consider refurbishment) Project 14: Implement digital by default Project 15: Implement encourage sustainable commuting Project 16: Review procurement strategy for Visitor Centres Project 18: Review Enjoy Dartmoor magazine distribution strategy Project 19: Implement behaviour change campaign Offsetting Project: Scope habitat restoration on DNPA Land Assets
2022	Review Carbon Action Plan

Year	Projects
	Project 1: Consider case for electric vehicles Offsetting Project: Evidence habitat restoration on DNPA Land Assets
2023	Pursue alternative offsetting project if necessary

6. Conclusions and discussion

6.1 This climate action plan has broadly assessed Dartmoor National Park Authority's carbon emissions. The plan should be seen as 'work in progress' in that it will need to be reviewed and up-dated on a regular basis as our knowledge increases and we become clearer about feasible actions and priorities to reduce our carbon footprint.

6.2 The following offers a summary of the plan's findings a reflection on how the action plan should be viewed internally and externally, and how it should be embedded within the organisation.

- DNPA's existing carbon footprint is small, particularly when considered against the positive climate impacts inherent in the Authority's work seeking to conserve and enhance Dartmoor National Park
- DNPA's work to tackle its carbon emissions over the last decade is impressive, already exceeding international targets for emission reductions
- More can and must be done to continue this good work
- DNPA should prioritise securing renewable energy, reducing vehicle emissions, assisting staff to reduce their emissions, and promoting behaviour change
- DNPA should seek to better understand how its land assets are now and can in the future sequester carbon to offset emissions
- Implementing the projects in this action plan needs to be a corporate priority and be built into the work programmes of all teams and staff. This process has started. Our aim is for 'low carbon' to be part of our organisational culture
- We will need to keep the Action Plan under review
- The Plan will change as our knowledge increases, we will need to embrace constructive criticism and learn from others
- Whilst the focus of this plan has been on the organisation we need to be careful that our desire to be low carbon does not impact on our wider work programmes to make Dartmoor low carbon