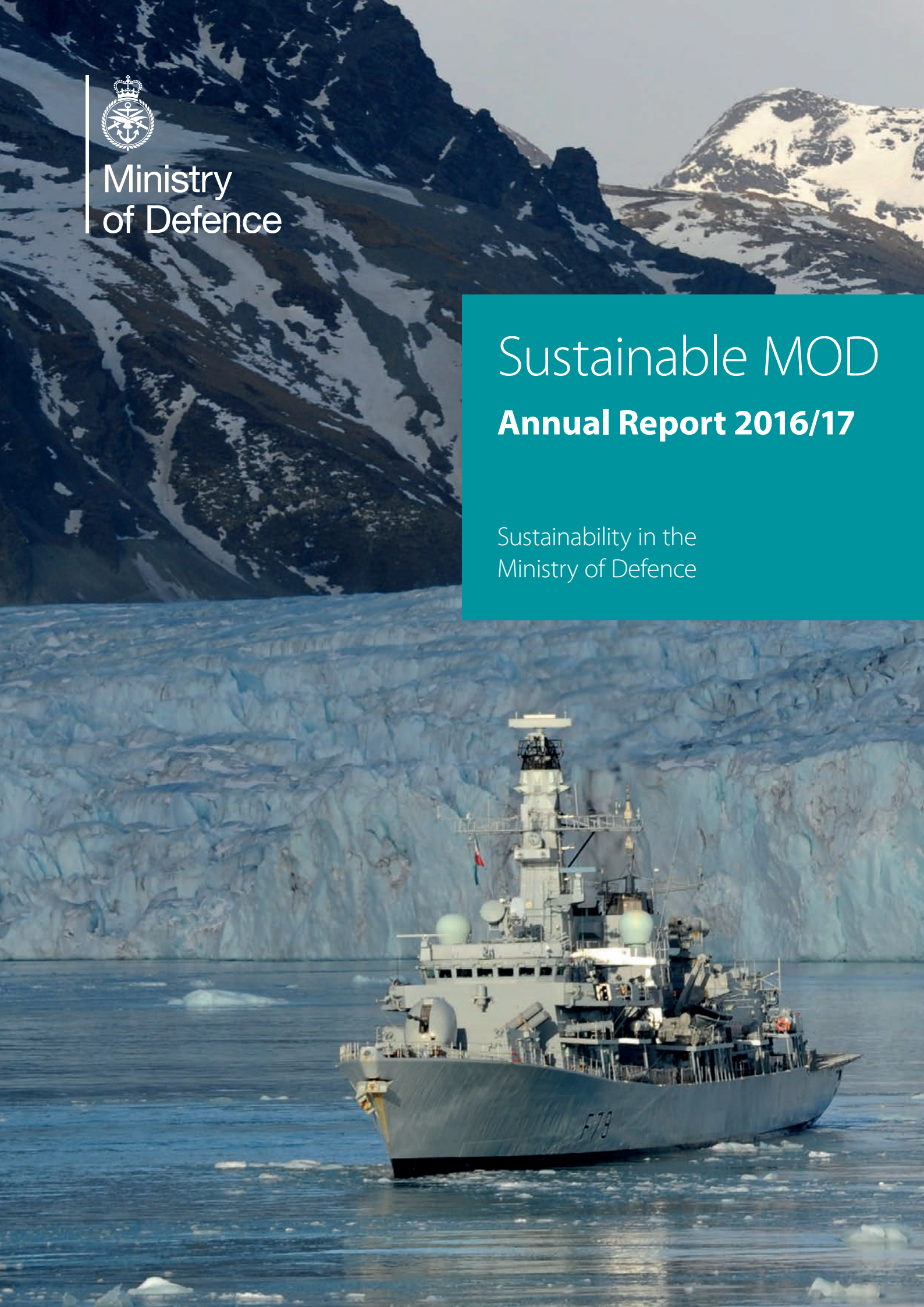

Ministry of Defence

Sustainable MOD

Annual Report 2016/17

Sustainability in the Ministry of Defence

As our energy demands increase, we will continue to drive effort to increase the efficiency of the estate

Foreword

Welcome to the Department's annual sustainability report. As the Ministry of Defence's energy and sustainability champions, we are pleased to be able to use this report to show our progress in making the MOD more efficient, resilient and sustainable, and against the Greening Government Commitment and targets, and show how we embed sustainability into Departmental business; as well as the contribution the Department makes to support the Global Sustainable Development Goals beyond the management of our estate and equipment assets.

Of note this year, is our progress in increasing recycling, a decrease in waste going to landfill, and reduction in carbon emissions, through the use of low carbon energy sources. As our energy demands increase, we will continue to drive effort to increase the efficiency of the estate, and look towards our energy security and resilience.

2016-17 has seen key progress in the MOD's strategic estate programmes; and the Better Defence Estate announcement in November 2016 was a major milestone for the Department in setting out our ambitions for a more efficient and sustainable estate; one that is optimised for the current and future demands that Defence places on it. The Defence Estate Optimisation Programme expands on the ongoing Army Basing Programme; and as you will see in this report and its case studies, will continue to provide a focus for our sustainability work and consideration of our environmental footprint and social impacts, and the resilience of our core sites.

Our challenge to the Department is to drive further improvements into how we consider sustainability and energy within our infrastructure and acquisition systems to deliver sustainable Defence capability, and to improve our transparency so our sustainability reporting shows best practice within the public sector.

Gen. Mark Poffley
Deputy Chief of Defence Staff (Military Capability) and Energy Champion

Julie Taylor
Director General of Head Office and Commissioning Services and MOD Sustainability Champion

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Performance at a glance

91%
of waste diverted from landfill, down from 90% diverted last year

TRIAD campaign delivered savings of 26,170kWh and £617,000

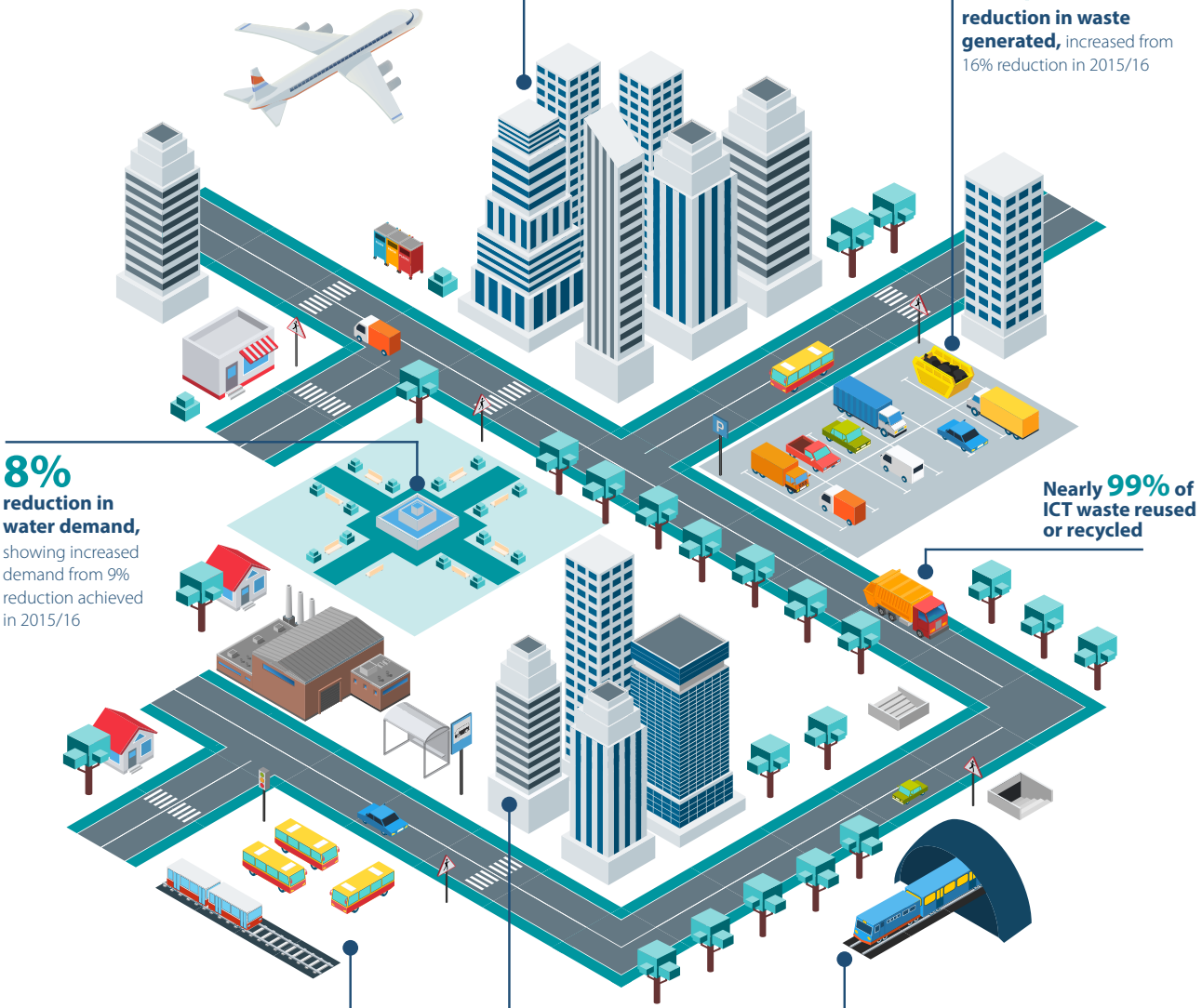
7%
increase in DREAM assessments undertaken assessed as 'excellent' compared to the previous year

5%
reduction in capability energy consumption achieved from 2015/16

17m³
office water benchmark, showing increased use from 13.8m³ in 2015/16

Our **100th establishment assessed** for climate risks using CIRAM

27%
reduction in waste generated, increased from 16% reduction in 2015/16



8%
reduction in water demand, showing increased demand from 9% reduction achieved in 2015/16

Nearly **99%** of ICT waste reused or recycled

18%
reduction in GHG emissions from all travel including international air travel compared to 2009/10, up from 13% reduction in 2015/16

24%
reduction in paper consumption, showing reduced demand from 23% in 2015/16

27%
reduction in GHG emissions from estate & business travel, up from 22% reduction in 2015/16

1. Introduction

1. Introduction

This annual report provides an overview of the Department's progress against both the Sustainable MOD requirements and the Greening Government Commitments and Targets (GGC) during 2016/17, and fulfils our obligations to report sustainability performance under the Department's Annual Report and Accounts. It also looks beyond the GGC targets, to wider activity within the MOD that supports creating a more sustainable Department.

1.1 Sustainability in the Ministry of Defence

At its most simple, sustainability in the MOD is about being efficient in the use of assets and resources, our material security and supply chain, and planning for the long term to take account of environmental and socio-economic risks and opportunities. Managing socio-economic and environmental effects in the MOD supports the achievement of the Department's strategic objectives and the contribution the MOD makes to the UN Global Sustainable Development Goals (see Table 1). This was reiterated in the National Security Strategy and Strategic Defence and Security Review 2015.

With major change programmes underway to how we manage the defence estate (see case study on page 11), alongside the "Better Defence Estate" strategy (announced in November 2016), a key focus of effort has been to drive further improvements in our management information, and embedding sustainability in decision-making processes to ensure we are able to take account of sustainability opportunities and risks in decision-making. In parallel to this, we have continued to drive improvements to deliver the GGC targets, and our estate stewardship.

1.2 Global Sustainable Development Goals

Whilst the MOD does not lead on the UK's commitments to the UN Global Sustainable Development Goals (SDGs), the Department contributes in numerous ways to these goals through Defence outputs and the management of the Department. The MOD's Annual Report and Accounts 2016 to 2017[1] highlights some of the activities that have contributed over the past year, from fisheries protection helping to ensure sustainable use of marine resources (Goal 14); Defence engagement and training internationally in approaches to the planning of defence activity with relation to accountability, transparency & corruption, gender & conflict, human rights and humanitarian law (Goals 10 and 16); work to make the defence estate and the strategic base resilient to climate and reduce carbon emissions from our infrastructure (Goal 13); to the Department's contribution to land release for housing to support sustainable cities and communities in the UK (Goal 11). The below table indicates where the MOD strategic objectives make a contribution to the SDGs.

1 MOD's ARAc can be viewed at: https://www.gov.uk/government/publications/ministry-of-defence-annual-report-and-accounts-2016-to-2017

a key focus of effort has been to drive further improvements in our management information

Table 1: MOD contribution to the Global Sustainable Development Goals

Global Sustainable Development Goals	Contribution by MOD Strategic Objective?			
	Protect Our People	Project Our Global Influence	Protect Our Prosperity	Maintain a Strategic Base
Goal 1: No Poverty - Ending poverty in all its forms everywhere	✓			
Goal 2: Zero Hunger - End hunger, achieve food security and improved nutrition and promote sustainable agriculture.		✓		
Goal 3: Good Health - Ensure healthy lives and promote well-being for all at all ages	✓			
Goal 4: Quality Education - Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.	✓			
Goal 5: Gender Equality - Achieve gender equality and empower all women and girls	✓	✓		
Goal 6: Clean Water and Sanitation - Ensure availability and sustainable management of water and sanitation for all				✓
Goal 7: Affordable and Clean Energy - Ensure access to affordable, reliable and modern energy services				✓
Goal 8: Decent Work & Economic Growth - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	✓	✓	✓	✓
Goal 9: Industry, Innovation and Infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation			✓	✓
Goal 10: Reduced Inequalities – Reduce inequality within and among countries		✓		✓
Goal 11: Sustainable Cities and Communities - Make cities and human settlements inclusive, safe, resilient and sustainable			✓	✓
Goal 12: Responsible Consumption and Production - Ensure sustainable consumption and production patterns				✓
Goal 13: Climate Action - Take urgent action to combat climate change and its impacts				✓
Goal 14: Life Below Water - Conserve and sustainably use the oceans, seas and marine resources for sustainable development	✓			✓
Goal 15: Life on Land - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt reverse land degradation and halt biodiversity loss				✓
Goal 16: Peace and Justice - Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	✓	✓		
Goal 17: Partnerships for the Goals - Strengthen the means of implementation and revitalize the global partnership for sustainable development	✓	✓		

We are able to report reductions in carbon emissions from our estate and business travel

Table 2: GGC Target 2016-2020 Performance (against 2009/10 baseline)

Target	Performance[2]
Reduce carbon emissions by 30%	27% reduction
Reduce domestic business flights by at least 30%.	19% reduction
Waste – send less than 10% waste to landfill	9% sent to landfill
Reduce paper use by at least 50%	24% reduction
Reduce water consumption	8% reduction

1.3 Greening Government Commitments (GGC)

The Greening Government Commitments 2016-2020[3] supersede the previous Greening Government Commitments 2011-2015 and they set out the actions UK government departments and their agencies will take to reduce their impacts on the environment in the period 2016 to 2020. The MOD has continued to work towards meeting the targets and we are able to report reductions in carbon emissions from our estate and business travel, and improvements to our waste management.

1.4 Governance

The Director General Head Office and Commissioning Services (DG HOCS) and the Deputy Chief of Defence Staff for Military Capability (DCDS (Mil Cap)) are the Department's sustainability champions.

The sustainability agenda is coordinated through a senior Steering Group, chaired by the DG HOCS and DCDS (Mil Cap). This group is responsible for setting the direction for MOD's sustainability agenda and priorities; and also for monitoring and driving progress against our sustainability priorities, as set out in the Sustainable MOD Strategy 2015-2025 – Act and Evolve, and the Capability Energy Strategy.

The steering group members are drawn from across the Department's business areas including key Arm's Length Bodies and Trading Funds. The steering group is in turn supported during 2016/17 by a number of working groups (listed below) that focus on specific sustainability programmes;

- Sustainable MOD Working Group;
- Energy Programme Board;
- Defence Utilities Group;
- Sustainable Information and Communication Technology (ICT) Working Group;
- Equipment Energy Working Group;
- MOD-Industry Sustainable Procurement Working Group; and
- Climate Resilience Working Group.

1.5 Delivery and Assurance

The Department has a delegated model for delivering defence business and outputs (details about the model and structure of the Department can be found in How Defence Works 2015[4]). Within this model, strategy objectives and

2 See performance section for more detail.
3 The targets apply to 22 core Ministerial and non-Ministerial departments and their executive agencies and executive non-departmental public bodies (but not advisory NDPBs) employing more than 250 staff or occupying 1,000m^3 of floor space. Full details of the GGC targets can be found at: https://www.gov.uk/government/publications/greening-government-commitments-2016-to-2020/greening-government-commitments-2016-to-2020.
4 'How Defence Works" can be viewed here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/484941/20151208HowDefenceWorksV4_2.pdf

Aerial image of Larkhill Service Family Accommodation excavations, part of the Army Basing Programme to rebase 7,300 personnel from Germany

targets, including the GGC, are included in the annual Defence Plan, which is then cascaded into Command Plans by the different parts of the Department, known as Top Level Budget Holders. These set out the outcomes and standards for each top level budget holder (TLB) to plan and deliver against in the short, medium and longer term, within agreed resources, and TLBs are then required to report their performance on a quarterly basis against their Command Plan.

A Sustainable MOD team provides focussed scrutiny and oversight of performance against our sustainability objectives and priorities, which is monitored by the Steering Group. Our 2016/17 GGC reports were also scrutinised externally by BRE on behalf of Department for Environment, Food & Rural Affairs (Defra) to validate our reported performance against the GGC.

Case Study: The Army Basing Programme

The Army Basing Programme was established to rebase 7,300 personnel from Germany to the UK. This requires the development of over 200,000m^2 of new buildings on existing Garrison sites and 917 new Service Families Accommodation houses. The Defence Infrastructure Organisation's approach to planning for these Defence communities won the Royal Town Planning Institute's regional award for excellence in decision making in planning. These developments are now under construction.

The approach included sustainability at its heart and the development is designed to minimise waste whilst promoting energy and water efficiency. The development also utilised the MOD DREAM tool to assess new buildings and a target to achieve 'excellent' rating certificates in all 127 buildings assessed was met.

The development has benefitted from focused initiatives and innovations such as:

- The use of modular construction for Single Living Accommodation (SLA) which can mean carbon dioxide emissions are 30% lower than found in traditional construction;
- Sustainable drainage features designed to provide climate change resilience and enhance biodiversity;
- Using local contractors and working with a local college to employ six apprentices;
- Ensuring all non-hazardous waste is reused onsite; and
- The use of LED lighting in conjunction with dark zones located in woodlands and hedgerows.

The development also ensured that new families' housing was located adjacent to the bases and linked by new foot/cycle paths and gates to ensure that it is easier and quicker to gain access onto site than via private vehicles.

The new developments address a wide range of environmental constraints and incorporate supporting infrastructure and facilities that will deliver wider benefits for the local community. These include community access to military sports facilities, enhanced green space and a new recreational access network around the housing developments, improved public transport links and the removal of a sewage treatment works within Stonehenge World Heritage site.

2. Sustainable MOD Strategy

2. Sustainable MOD Strategy

2.1 Sustainable MOD Strategy 2015-2025 – "Act and Evolve"

The second edition of the strategy[5] was published in February 2016. It evolves our approach, bringing increased focus on the contribution sustainability can make to supporting Defence capability and outputs.

The two principles that guide us are to:

- **Act** to make our resource use and assets sustainable; and
- **Evolve** to make our business resilient to the current and future social, economic and environmental changes.

Following a materiality analysis, the strategy focuses on sustainability priorities that are not already covered by existing strategies and plans (see below), or where an additional focus of activity will provide benefits to reducing operating costs to address wider departmental risks, or support existing commitments.

It sets out short term objectives, including energy, waste and water savings; and longer term objectives which aim to evolve our equipment and infrastructure systems to embed sustainability into our decision making, and to enhance our business through modern working environments.

2.2 Related Strategies and Programmes

Of the MOD's priority areas, many already have mature strategies and programmes which contribute to the successful and sustainable functioning of the Department. Other strategies and programmes which contribute both directly and indirectly to the MOD's sustainability priorities include:

2.2.1 Capability Energy Strategy

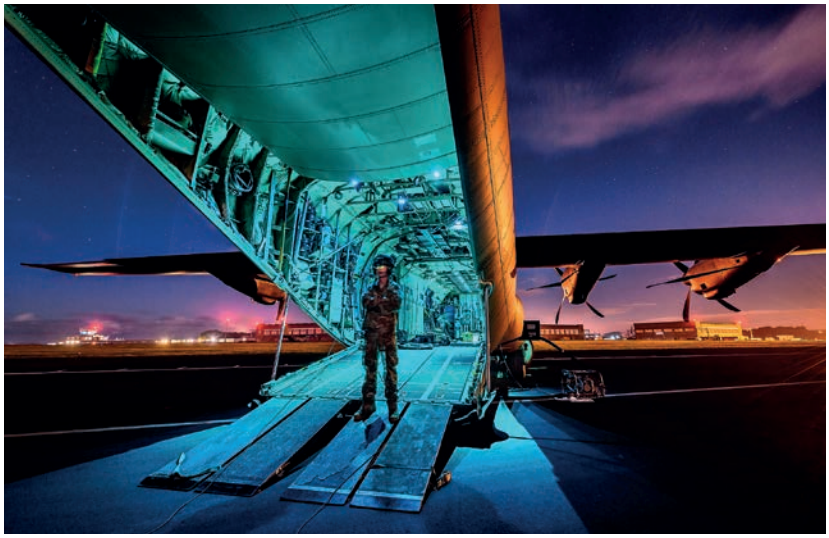
Energy is a critical capability, without which we would not be able to deliver military outputs. A strategy for our capability energy was developed in 2015/16 to provide a framework for the strategic direction of the MOD's energy portfolio, the priorities, and strategic objectives for the management of our energy portfolio.

The strategy sets out a range of short, medium and long term objectives to improve our understanding of our energy demand and ability to forecast, increase the use of alternative energy, and increase the energy efficiency of our current and future equipment capabilities, and construct stringent departmental energy targets (see also Section 3.1). These include a broad range of analysis to capture everything from cost modelling through to future fuels technology and the continued development and use of synthetic training.

Over the next year, we will be bringing together the Sustainable MOD and Capability Energy Strategies to drive greater coherence to our approaches to sustainability and equipment energy use.

5 Sustainable MOD Strategy 2015-2025 can be viewed here: https://www.gov.uk/government/publications/sustainable-mod-strategy-2015-to-2025.

Priority areas already have mature strategies and programmes which contribute to the successful functioning of the Department



2.2.2 Defence People and Training

People lie at the heart of Defence capability and the delivery of Defence outputs. Since April 2013, the Chief of Defence People (CDP), has overseen the policy framework for the management of the Defence workforce, whether Regular, Reserve or Civil Servant. This supports decision making using a 'Whole Force Approach' (WFA).

The recruitment and retention of a capable, motivated, balanced and sustainable workforce, to deliver Defence outputs provides the People component of Defence capability. This supports the Departmental Objective 'Protect our People'. The Defence People Strategy and Plan detail the key activity and work that underpins this intent. CDP manages delivery against these through his chairmanship of the Defence People and Training Board.

A range of major People Change Programmes are underway which will ensure we are well positioned for future strategic challenges. This includes the Future Defence Civilian Programme (FDCP) to re-shape the civilian workforce to fully establish a Whole Force and more cost-effective approach to our business while developing a modern employment offer to attract and retain the right mix of talent and diversity to meet the future needs of the Department.

We place heavy demands on our people and they will always be critical in achieving a culture of sustainability within the MOD. Under the Armed Forces People Programme we are continuing to develop new terms and conditions for our Service Personnel. This is being developed through four projects.

We know Service Personnel who have dedicated themselves to public service sometimes struggle to meet their full military commitment and this means that the only option is sometimes to leave the Armed Forces. This is reducing our ability to attract and retain the quantity, quality and diversity of people we need. To address this challenge we are developing a modern Flexible Engagements System (FES), whereby those personnel can temporarily change the nature of their Service, enabling part-time working or protection from deployment. This will be in support of an individual's personal circumstances and needs but not at the expense of operational capability or to avoid essential duty. We also intend to improve opportunities for Reservists to be employed in higher commitment jobs to add to this flexibility and add to the options for employment across Defence. The increased flexibility of FES will be underpinned by changes to legislation, which will take time to deliver; we expect FES implementation to commence before 2020.

Service Family Accommodation at Woolwich, London

The Future Accommodation Model (FAM) is looking at how to deliver a new accommodation model that improves choice and supports more Service Personnel to both rent private accommodation and better meet their aspirations for home ownership, whilst still fulfilling the needs of the Services and remaining affordable. A survey with over 24,000 responses from Service Personnel was conducted in September 2016, and the results published in January 2017 showed that over half of Service Personnel (55%) considered FAM proposals attractive. Options for the model have been developed from feedback received; these range from options similar to our current system with SFA widely available, to options where FAM will make more use of private market rentals. In the coming months the MOD will continue to engage with Service personnel and their families in further developing these options.

Responding to SDSR and supporting the wider People work, the Enterprise Approach (EA) aims to make it easier for people to move between the different elements of the 'Whole Force' over their careers and will work collaboratively with industry to explore how to make skills available across organisational boundaries when and where needed. Over the past year we have had continued engagement with industry over the potential career development path of trades such as nuclear engineers, and continue testing the concept of working with industry to collaboratively manage critical skills across the MOD and industry. We will continue to explore a range of policy options for EA, addressing those areas that threaten defence outputs of trades and skills, focussing on the future demand for skills out to 2040.

The New Joiner Offer project is developing a new Armed Forces offer for people who join after 2019, to better meet the expectations of future recruits and target resources on the people we need most. It will reflect the realities of modern life, and the UK's current financial position, whilst preserving those elements that reflect the unique demands that military service imposes on our people. Over the past 12 months we have entered the early stages of policy development, and begun to review all aspects of the offer, including pay, pensions, X-Factor (a pensionable addition to pay that recognises the special conditions of service experienced by members of the Armed Forces), personal development, and how we support our Personnel. We have explored how these can be better targeted through differentiation, by length of service, skill and the lived experience. The New Joiner Offer survey, launched in June 2017, will help inform decisions on the type and scale of financial and non-financial offer Service personnel value throughout their careers and an update will be forthcoming towards the end of the year.

In order to explain what sustainability means it may be better to explain what sustainability is not; it is not an add-on at the end of a project, it is not gold-plating a project.

It is about taking the right decisions to ensure that the environmental and sustainable risks to a project are identified and mitigated, preventing nasty shocks further downstream which often result in expensive sub-optimal solutions. It is about getting it right first time.

Helen Sheridan
FMC Cap Infra Sustainable Estate (MOD)

The Armed Forces Covenant is enshrined in law, and reports progress annually to parliament.[6] It puts our people at the front and centre of policy making and delivery. We have introduced a range of initiatives to improve Service life, including by launching the first Families Strategy, the £200M Forces Help to Buy Scheme and a £10M per annum Covenant Fund.

Our strategy for People, including the Armed Forces Families Strategy, and the Mental Health and Wellbeing Strategy all support the MOD's sustainability priorities, and focus on our people and the communities where we live, our Service Personnel and their families, Defence training and learning, equality and diversity, and the health and resilience of personnel (both military and civilian).

2.2.3 Armed Forces Families' Strategy

In early 2016, MOD launched the first UK Armed Forces Families' Strategy aimed at improving the lived experience of the families of serving personnel; an important factor in retaining personnel and improving the Service Offer. The strategy aims to coordinate activity to support Service families in having greater choice, removing disadvantage, empowering them, and engendering resilience in transition to civilian life. The supporting Families Strategy Action Plan details priority areas of activity including childcare, partner employment and accommodation, which have consistently remained areas of interest for both the Families' Federations and the Department.

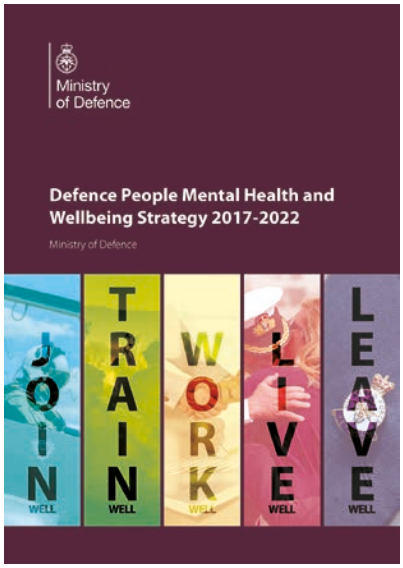
We are approaching the end of the second year of a Spousal Employment trial which has brought a sense of confidence, feeling valued, and opportunity for those who have participated.

We are now considering next steps for supporting spouse/partner employment. We are working to develop a tri-service policy for transition, which we aim to have published by the end of this year, support for the family as well as the service person to transition into civilian life is fundamental to the developing approach. MOD Directorate Children and Young People (DCYP) are conducting a review to explore whether Service families experience disadvantage in terms of availability, accessibility and affordability of early education and childcare. The key outcome will be to develop a tri-service childcare policy which establishes measures to reduce any identified disadvantage. Additionally, we have awarded funding to a number of worthwhile projects that will support Service families on a variety of issues through 2016/17 Covenant 'Families in Stress' funding strand and applications are now being processed for 2017/18 awards.

6 Covenant can be viewed at: https://www.gov.uk/government/publications/armed-forces-covenant-annual-report-2016

I see considerable potential in our drive for greater efficiency and exploitation of green technology to also help address the significant funding shortfall in running costs we face more broadly on the estate. Reducing our carbon footprint, supporting the decarbonisation of the grid and further enhancing the natural environment are not only the right things to do but they are financially attractive too.

Our extensive estate must be worked for the common good and not left to lie fallow; the



2.2.4 Defence People Mental Health and Wellbeing Strategy

There remains a focus on the delivery of MOD priorities and objectives by a workforce, both military and civilian, of motivated, engaged and healthy people. The Defence People Mental Health and Wellbeing Strategy and Plan are the means by which direction is given in terms of outputs and activities to deliver the health and wellbeing agenda within the Department.[7]

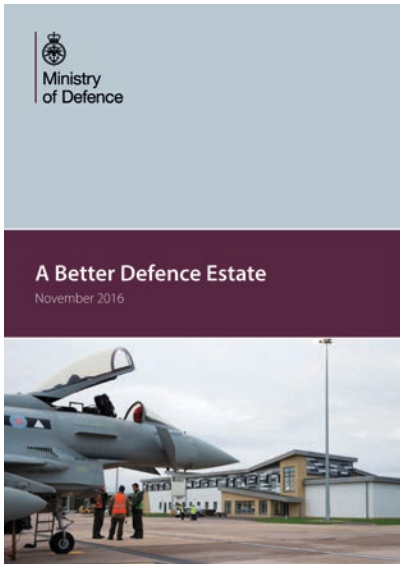
It must be recognised that health and wellbeing is all about taking care of yourself rather than waiting for something to go wrong and having to see a doctor. Therefore paying attention to yourself, adopting a healthy lifestyle and keeping yourself active is an important part of health and wellbeing. Clearly, the organisation also has an influence on how individuals feel so the leadership has a responsibility to make sure we are well supported in what we do.

A successful mental health and wellbeing strategy needs everyone to be engaged, it requires time and commitment. It requires strong leadership and role models which, in turn requires good communication. Without these, the strategy will have no effect. The strategy is wide ranging and ambitious; it cannot be delivered quickly, but steady progress is being made and with continued effort widespread cultural change can be achieved. Defence is viewed as a fit and healthy organisation and, on the whole, it is, but there are some unhealthy behaviours that we must address. A number of data gathering activities were initiated in 2016 and over the next few years it will be possible to demonstrate the impact of some of the strategy.

7 Defence People Health and Wellbeing Strategy and Plan can be viewed at: https://www.gov.uk/government/news/mod-launches-defence-people-mental-health-and-wellbeing-strategy

productive value of this asset can be greatly enhanced through the wider exploitation of green technology and in so doing service our long term vision for sustainability and efficiency: a win win!

Major General Richard Wardlaw
Director Army Basing & Infrastructure



2.2.5 Strategy for Defence Infrastructure & Defence Estate Optimisation Programme

The defence estate is a key enabler of defence capability and outputs. The MOD is transforming the management of our estate, as well as major estate programmes including the rebasing of the Army from Germany. Continuing pressure to drive further efficiency from our infrastructure and its management so that it is sustainable within the available resources has led us to produce a new Strategy for Defence Infrastructure (SDI)[8] during 2016/17.

The strategy was developed to provide direction on our approach to achieving 'infrastructure that is affordable and optimised to enable Defence capabilities, outputs and communities both now and in the future'.

It considers the whole estate, and the full range of supporting services required to develop, manage, operate and dispose of the defence estate, to maximise value in support of delivering Defence outputs and capabilities.

The SDI is supported by the Defence Estate Optimisation (DEO) programme to implement changes to achieve a smaller but better estate by 2040, as set out in "A Better Defence Estate" announcement in November 2016, and to release land for housing in support of the Government's target to reduce the housing deficit.[9]

8 Strategy for Defence Infrastructure can be viewed at: https://www.gov.uk/government/publications/strategy-for-defence-infrastructure-2015-to-2030
9 Better Defence Estate strategy can be viewed at: https://www.gov.uk/government/publications/better-defence-estate-strategy

3. Performance 2016/17

3. Performance 2016/17

3.1 Energy Efficiency and Security

Energy efficiency and security, is critical to our business and military capability. We have established metrics and targets to ensure operational, equipment, estate and infrastructure energy efficiency continues to improve.

3.1.1 Capability and Equipment Energy

The MOD is working to reduce its reliance on fossil fuels. This objective is supported by our target to reduce capability energy and fuel use, and in 2016/17 we achieved a reduction of 44% from a 2009/10 baseline, far exceeding our target of 18% reduction.

The MOD's fuel demand is heavily dependent on our operational activity. The level of demand is and will continue to be affected by operational requirements, and by the introduction of new equipment into service such as the Carrier HMS Queen Elizabeth. We will continue to focus on various measures from identifying potential modifications to existing platforms, to utilising them in a more efficient manner.

These include innovative measures such as modifying our fleet of destroyers and frigates with hydrodynamic improvements resulting in greater vessel efficiency, potentially up to 18%. We have also realised 7% fuel efficiency on flights between Brize Norton and Akrotiri by redesigning the route and flying profile. Our future approach to targets requires a more refined approach, and during 2016/17 the MOD has been constructing new TLB-specific targets. We have adopted an interim target of a 10% reduction from a 2015/16 baseline.

The MOD continues to work alongside NATO partners and the European Defence Agency (EDA) along with other partner nations to promote collaborative working on energy and environmental issues in military capability. One successful outcome of this is the NATO Energy Security Centre of Excellence development of a transportable Hybrid Power Generation System for deployed bases which was proven to reduce fuel consumption by 37% during initial trials.

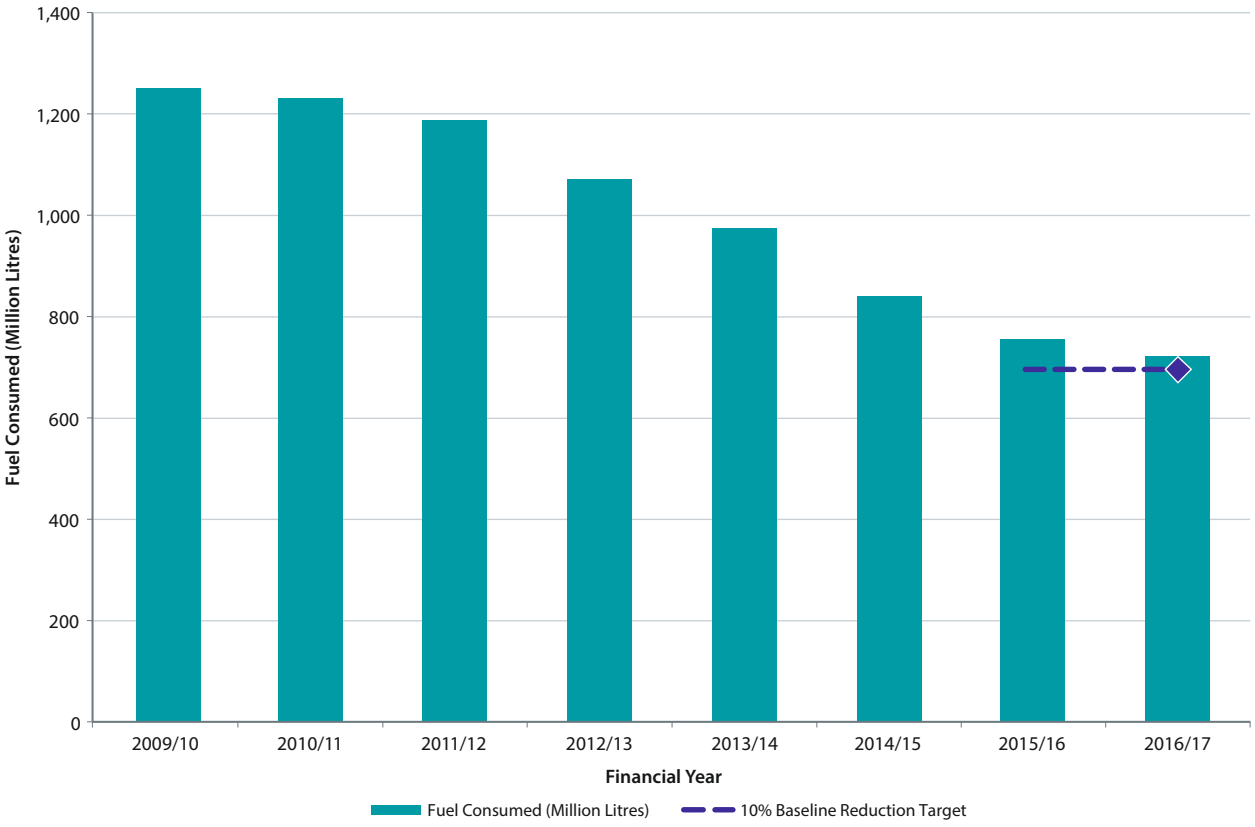
Table 3: Capability & equipment energy consumption – Annual performance against 2009/10 baseline[10]

Capability & Equipment Energy	2009/10 baseline	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Fuel in million litres	1,250	1,231	1,187	1,071	975	832	738	703
% change compared to 2009/10 baseline		-2%	-5%	-14%	-22%	-34%	-41%	-44%

10 Some of the figures in this table have been updated

A Challenger 2 MBT & Chinook Helicopter on the Salisbury Plain Training Area

Figure 1: Capability & equipment energy consumption – Annual performance against 2009/10 baseline[11]



11 A new target was set of a 10% reduction against a 15/16 baseline

Case Study: Sustainable design incorporated in the new High-G Centrifuge

The High-G project was initiated to provide a next generation Human Training Centrifuge for the RAF, thereby replacing the current facility in Farnborough that was built in the early 1950s. The ultimate aim of the project was to deliver a facility with an operational life of at least 25 years that could meet demanding performance and operational requirements, including sustainability.

The primary requirement of the project is the delivery of a large, high energy piece of equipment, and unsurprisingly, energy consumption was identified at an early stage as being one of the central challenges.

Where possible, the focus has been on reducing energy consumption through the introduction of low energy heating and lighting and passive elements e.g. use of natural daylight and insulation. Photovoltaic arrays have also been proposed for local energy generation. Elsewhere, building materials will be from sustainable sources, with recycled materials utilised where possible.

Also, as the chosen site is an active airfield, to prevent outside activities impacting on the training, noise insulation was a critical design consideration.

3.1.2 Estate Energy and Greenhouse Gas Emissions (GHG)

The MOD's estate energy consumption for 2016/17 decreased compared to the previous year, although overall consumption remained higher than in 2014/15. Carbon emissions continued to decrease across the estate in 2016/17 from 22% to 27% relative to the 2009/10 baseline for the 398 core sites covered by the Greening Government Commitment (GGC) target, a reduction of 389,519 tCO_2e. This progress is in part due to a variety of energy efficiency programmes we have implemented, but also reflects the on-going work by the Department for Business, Energy and Industrial Strategy (BEIS) to decarbonise the National Grid.

Throughout this period, the Defence Infrastructure Organisation (DIO) led the Department's work to deliver greater energy efficiency across the estate and reduced carbon emissions. This involved a combination of targeted investment together with co-ordinated awareness and behaviour change campaigns. Initiatives included the annual TRIAD and Red DuOS[12] campaigns in November 2016 and February 2017 to target the periods when charges for using grid electricity are at their highest. Together they produced a combined saving of 26,170 kWh and £617,000. This represents a reduction in energy consumption of 4,744 kWh compared to the same period last year. The introduction of an element of competition into the TRIAD campaign has increased the level of participation with the contribution of individual sites being formally recognised.

The Utilities' Built Environment Improvement Measures (BEIM) Programme for 2016/17, has invested over £12M in energy efficiency, including: LED lighting initiatives, building energy management systems (BEMS) and heating ventilation and air conditioning (HVAC). This investment has targeted opportunities with the most advantageous payback periods, and the savings are anticipated to save approximately 12,000 tCO_2e. However, the key challenge for the MOD is to reduce consumption and increase efficiency whilst maintaining operational effectiveness. As a result, the energy savings we have achieved in the UK have in part been offset by increased demand and consumption from new assets and an increased use of virtual training. During 2017/18, a further £8M will be invested in energy efficiency through the BEIM Programme.

Data is a key enabler in terms of targeting future investment and interventions together with measuring improvements in efficiency and consumption. The DIO is developing better analytical and forecasting tools, and sub-metering programmes in partnership with the TLBs as well as progressing the roll out of Automated Meter Reading (AMR) which will continue throughout 2017/18. Key to success has been the network of Area Utilities Managers who have driven behaviour change at local and regional levels and supported the investment in improvement energy efficiency.

Looking forward, we are working with: Re:Fit; BEIS; Cabinet Office; Crown Commercial Sercives and the Front Line Commands to assess the feasibility of third party investment in energy efficiency such as the use of Energy Performance Contracts (EPCs) and how to roll this out across the MOD estate.

12 DUoS significantly increases the MOD electricity costs during red hours (approximately 16:00 -19:00) every weekday (Monday to Friday)

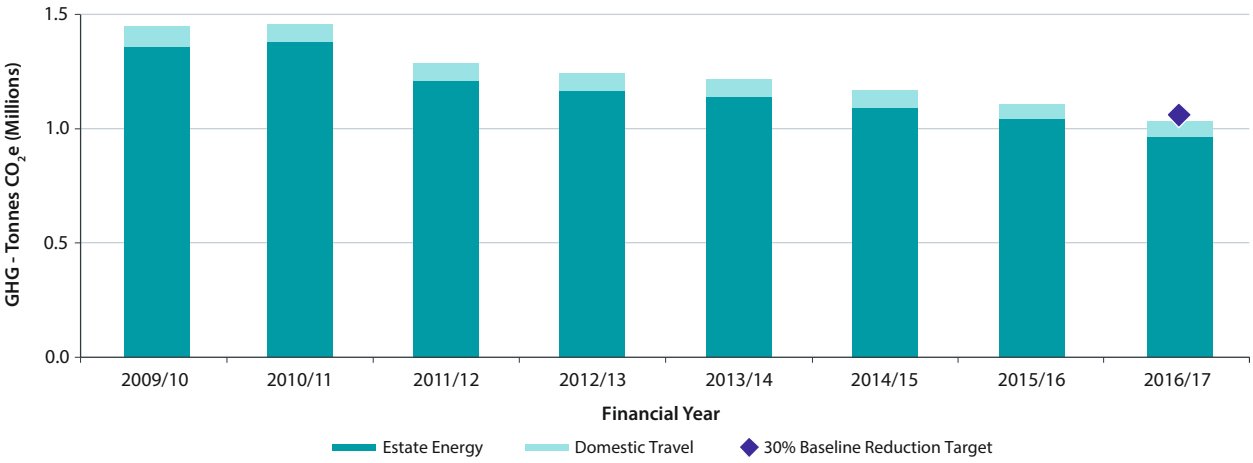
An integrated heat pump system allied with heat recovery energy cells in the ventilation system will avoid the need for any direct cooling or heating requirement for the fresh-air system and eliminates the need for boilers.

The holistic approach to the building design will ensure that it has a significantly lower energy footprint than the existing facility. Whole-life costs will be reduced and the new building will provide a high quality training environment.

Table 4: Total GHG emissions - Annual performance against 2009/10 baseline

GHG - tonnes CO_2e[13]	**2009/10 baseline**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Estate Energy	1,342,257	1,364,055	1,210,328	1,168,036	1,141,033	1,090,872	1,050,627[14]	973,802
Domestic Business Travel[15]	89,748	78,338	75,347	76,447	76,956	75,116	69,486[14]	68,684
GHG Total	**1,432,006**	**1,442,393**	**1,285,675**	**1,244,483**	**1,217,989**	**1,165,988**	**1,112,113**[14]	**1,042,487**
% change from 2009/10 baseline		1%	-10%	-13%	-15%	-19%	-22%	-27%

Figure 2: Total GHG emissions - Annual performance against 2009/10 baseline[16]



13 Conversion factors for estate energy and GHG are calculated and set by BRE on behalf of Defra
14 The figures have been updated
15 Domestic business travel: emissions from air flights, white fleet, grey fleet and rail travel. See Annex C item 11 for definitions
16 A new target was set for 2016/17 against an 09/10 baseline

Case Study: 100th CIRAM Assessment

The DIO's Sustainability team delivered its 100th CIRAM assessment in March 2017 at Norton Manor. This highlighted issues with overheating, rainwater ingress and potential localised flooding impacting staff travel to work. Despite reaching this milestone, the team has recognised that there are still issues with embedding climate resilience across the estate and are therefore committed to improving the CIRAM process.

One improvement is around data management. Work is ongoing with estate contractors to look at severe weather response data to evidence weather related damage, and the team are placing more attention on monitoring CIRAM progress with establishments, and notifying sites when reviews and updates are due.

These changes being made to CIRAM will improve the ease of embedding climate risks into existing processes and maintenance of the climate resilience risk register, and ultimately will improve the climate resilience of the estate.

3.2 Climate Resilience

3.2.1 Estate and Infrastructure Adaptation

Delivering an estate that is able to maintain operational capacity and defence output as well as being resilient to withstand the predicted effects of a changing climate remains a priority for Defence.

CIRAM (Climate Impacts Risk Assessment Methodology) is the MOD's key tool for improving climate resilience of the estate, by firstly identifying and scoring the potential climate risks to a site, and then assigning each risk a suitable action to mitigate the risk. During 2016/17 we completed nine initial CIRAM workshops including assessing our 100th establishment for climate risks. The programme for 2017/18 will look at 79 CIRAM assessments. A training programme has also been developed which will enable sites to conduct their own reviews, and guidance is currently under review to make it more streamlined and user friendly.

An audit in 2016 found that, despite increasing CIRAM assessments on MOD sites, this has not always led to improved climate resilience, and identified barriers to embedding climate risks into site processes once a CIRAM has been conducted. In response, we have developed a plan to tackle those barriers, including;

- Clear climate resilience roles and responsibilities;
- Improved climate data and evidence and access to it; and
- Improvements to the inclusion of climate risks in the risk management processes.

DIO have been working with Carillion-Amey to improve the severe weather response data, and changes are being made at help desk and tradesperson level in order to improve how maintenance responses are recorded. This will result in more accurate data which allow better management of severe weather impacts and costs spent.

The Department has also been involved in the MET Office's consultation process to update the UK's climate projection figures (called UKCP18),[17] these projections form the basis of the CIRAM process, and therefore the MOD's input is crucial to ensuring that the data and user interface for the next update suits our needs.

Our focus for the coming year will be on strengthening climate resilience in our infrastructure planning. We have a growing repository of information and knowledge of climate risks across Defence and this information will continue to be reviewed to inform our decision making. Work will also continue to ensure that the CIRAM process is updated and improved in order to reflect the changes of UKCP18, and aligns with MOD risk and resilience policy, and will be supported by an updated training programme.

3.2.2 Equipment

In the future, the effects of climate change and adverse weather are likely to be more noticeable.[18] As the lead times for procuring new equipment, particularly major platforms can be very long, addressing these issues in acquisition decision making will be increasingly important. The Defence Equipment and Support (DE&S) is working with customers in the Front Line Commands (FLCs) together with industry partners to ensure that equipment is capable of operating in harsher climatic and environmental conditions.

17 The UK Climate Projections can be viewed here: http://ukclimateprojections.metoffice.gov.uk/24125
18 Source: DCDC Global Strategic Trends 5 Out to 2045

Officer's Mess, Norton Manor, Somerset.

> The capacity of the guttering on the Officer's Mess is insufficient and has caused damage resulting in major restoration costs

3.2.3 Resilience Research

Resilience research, provides a sound technical evidence base to support decision making around resilience issues such as energy use and targets, critical and strategic materials, stewardship and the impacts of climate change and global legislation on MOD activity. During the past year, the Defence Science and Technology Laboratory's (Dstl) research supported analysis of fuel use in each of the Front Line Commands, and tools such as the Maritime Future Energy Use Assessment Tool used by the Royal Navy to help predict and manage its future energy demand.

Other work has included analysis to understand the implications to UK air platforms from the introduction of alternative (synthetic) fuel blends; and the development of the Defence Security of Supply Model; and the final phase of a project to improve Defence energy behaviours, which has already identified some significant areas for savings by running deep dives in various different areas. For example, a building in Catterick demonstrated 19% reduction in energy use compared month by month with previous years; and "trigger trials" on Royal Navy vessels were identified to make savings of around £132,000 per ship per year.

3.3 Utilities

Ensuring our utilities are efficient not only helps the Department save money and improve facilities, but also helps us reduce our environmental footprint and achieve greening government commitments.

A Strategic Behavioural Change Programme spanning energy, waste and water use has been delivering a range of initiatives including monthly campaigns, including a "sustainability challenge" initiative to raise awareness of waste management, recycling and sustainability.

3.3.1 Waste

The amount of waste the MOD generates continues to fluctuate relative to the level of operational and business activity during the year, including the disposal this year of two ships which weighed around 20,000 tonnes. Although most was recycled this represents 12% of our total waste generated and reported under the GGC and represents around 8% of the total waste reported by the whole of government in 2016/17.

Our performance shows a reduction in the amount of waste generated to an 11% reduction this year. We diverted 91% of waste from landfill through a mix of reuse, recycling and recovery.

A significant amount of our total waste is re-used, and in 2016/17, 16% (26,314 tonnes) of the waste we generated went to re-use and we recycled 53%, a 9% improvement compared to last year.

Some of our successes in improving waste management across the estate are:

- The management of waste generated by the replacement of three accommodation buildings in the Falkland Islands. Waste is returned to the UK and is an extremely challenging, costly, and time consuming. By changing how waste has been managed, through segregating waste, minimising hazardous waste, and maximising reuse and recycling, the project has both reduced its environmental impact, and provided savings to the Department of over £4 million over the life of the project; and

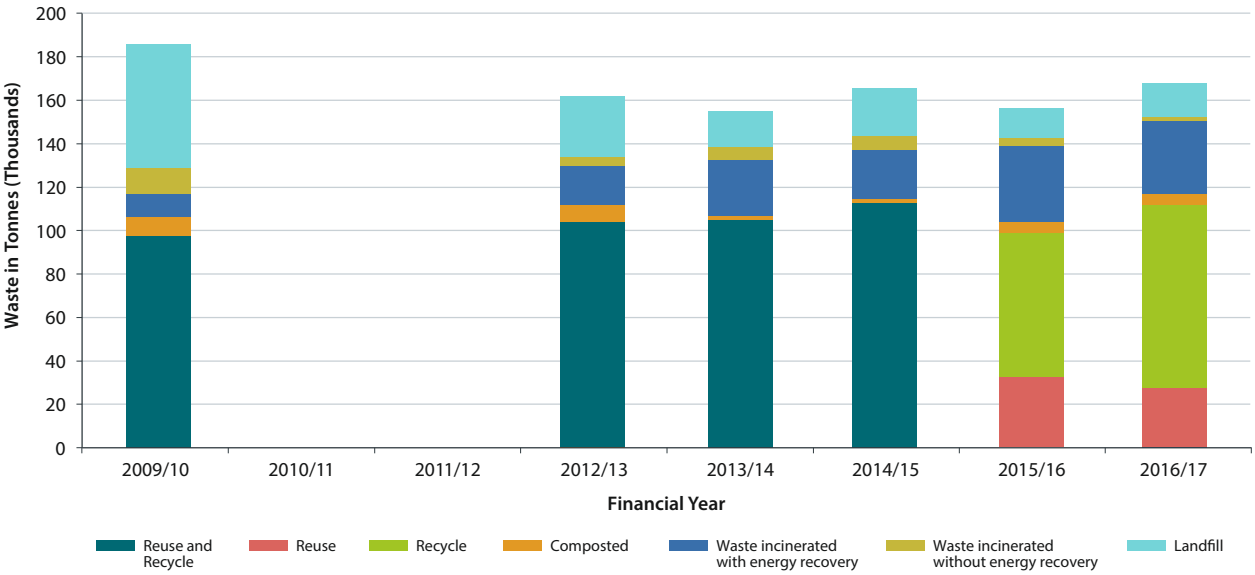
Case Study: BAE Systems Naval Ships Climate Resilience

Climate change impacts are taken into account as part of the capability requirements setting for DE&S equipment acquisition projects. For example, BAE Systems Naval Ships has included qualitative consideration of climate resilience within its Environmental Assessment for the Type 26 Global Combat Ship. This includes a requirement to design for a 2 degree increase in temperature through the life which has been reviewed against the International Panel on Climate Change 4th and 5th Assessment Reports. The design of all equipment and systems are reviewed against this requirement including the key cooling systems of HVAC (heating, ventilation, and air conditioning), chilled water and sea water systems. The need for additional cooling provision to the mast was also identified to meet the ship's through life air temperature requirements. Future trials will be required.

Table 5: Waste generated - Annual performance against 2009/10 baseline[19, 20]

	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Reuse and Recycle	97,814	-	-	103,033	103,258	111,704		
Reuse							30,994	26,314
Recycle							68,544	88,102
Composted	8,233			7,616	600	1,012	2,801	2,715
Waste incinerated with energy recovery	10,176			18,352	11,458	25,050	37,311	33,496
Waste incinerated without energy recovery	11,673			2,784	4,157	5,321	1,781	879
Landfill	57,542	-	-	29,563	36,111	20,247	14,956	14,282
Total	185,437	-	-	161,348	155,584	163,334	156,387	165,787

Figure 3: Waste generated - Comparison to 2009/10 baseline



19 Waste generated data by waste hierarchy is not available for 2010/11 and 2011/12
20 We were not able to separate reused waste from recycled waste until 2015/16

The Type 26 Global Combat Ship

- In the UK, Aspire Defence Services Limited, has been working with Sodexo and Hills Waste Solutions to trial waste measuring sensor technology and food waste recycling at Salisbury Plain. This has reduced the number of waste collection vehicle trips with a subsequent 25% reduction in vehicle carbon emissions; and has improved management of around 6 tonnes of food waste per week which is now 100% recycled using anaerobic digestion, and the resulting slurry is used as fertiliser on fields around the facility.

We are confident of meeting the GGC target of less than 10% to landfill target by 2020 and we will continue work to increase the amount of waste we reuse and recycle. Our progress to date has been supported by improvements to data. This is further supported by a standard reporting requirement embedded into new contracts and regular contact with data providers.

Our continued focus of effort over the coming year will be on improving waste management requirements in our facilities management contracts, working with our industry partners on data improvements and stakeholder engagement, with site road shows to engage site users and waste producers.

3.3.2 Water Use

The MOD aims to reduce estate wide water consumption. Our target is to achieve a 15% reduction in UK water demand by 2020 (against a 2009/10 baseline), through a combination of technological improvements and behavioural change. Key to this is the Water Consumption Reduction Programme (WCRP), which is reducing water consumption at 150 high demand sites across the three Aquatrine Private Finance Initiatives (PFI), each with an annual consumption of more than 10,000m^3.

In September 2016, the site survey programme was completed, and by the end of March 2017, delivery of technical interventions had been completed at 48 sites (including the 18 sites reported last year). This involved the replacement of over 1,500 replacement water management systems (Cistermisers) which had been identified as faulty with constant flows of water, and which has reduced water consumption by approximately 171,000m^3. Work on the remaining sites will continue throughout 2017/18. The programme is also raising awareness of water efficiency including during induction training for personnel, advice sheets, and posters to encourage the reporting of faults and leaks as part of the behavioural change strategy.

In 2016/17 we recorded an overall increase in water demand of 361,225m^3 which represents a 1% increase compared to 2015/16. A range of factors have affected our water demand and performance against our target, including:

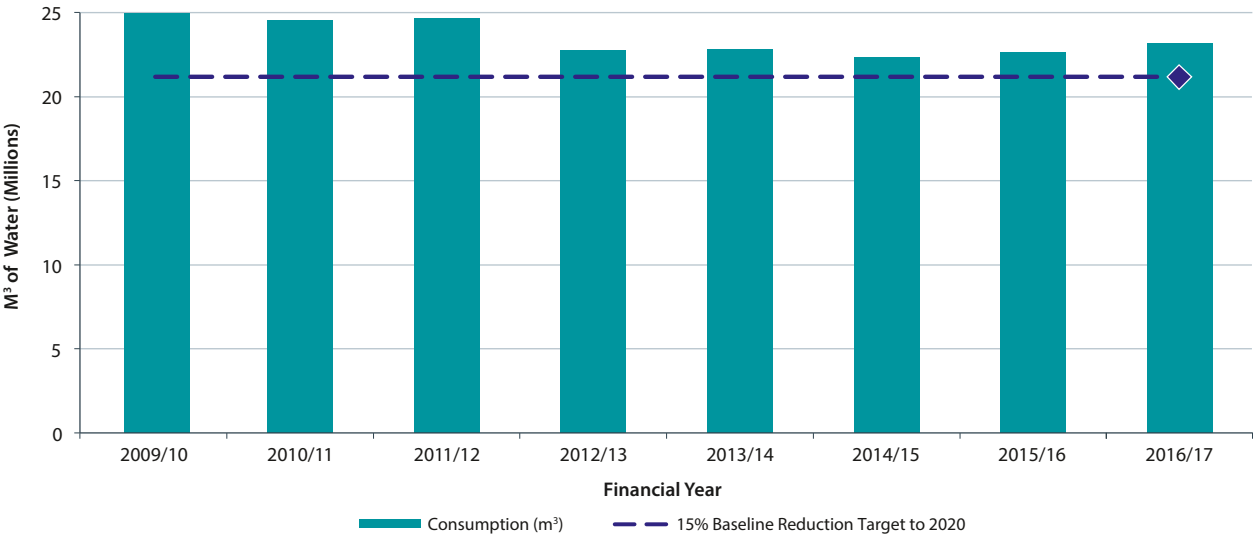
- Improved accuracy of consumption measurement - the implementation of the WCRP and other water efficiency initiatives has highlighted additional consumption;
- Dilapidations - analysis and measurement has evidenced wastage through constant flows of water;
- Increased operations in Scotland – the ongoing increase in operations at both HMS Caledonia and HMNB Clyde have resulted in an increase in consumption at these sites; and
- HMNB Portsmouth Jetty leak – a significant pipe burst at HMNB Portsmouth Jetty, together with several other less serious leaks have resulted in an increase in consumption at the site. It was discovered that the ducting housing the burst pipe contained asbestos, resulting in lengthy delays before the pipe could be accessed and repaired.

A bird's-eye view of the Submarine Escape Training Tank at the former HMS Dolphin in Gosport. All submariners are trained at the facility to learn how to escape from a submerged submarine

Table 6: Estate-wide water consumption - Annual performance against 2009/10 baseline

Estate Water Demand	2009/10 baseline	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Consumption m^3	24,973,623	24,549,642	24,659,000	22,726,362	22,826,349	22,391,762	22,642,615	23,003,840
% change compared to 2009/10 baseline		-2%	-1%	-9%	-9%	-10%	-9%	-8%

Figure 4: Estate-wide water consumption - Annual performance against 2009/10 baseline



Large numbers of MOD sites are located in East Anglia and the South East, which are among the most water stressed areas of the UK. The MOD is implementing a combination of technical and behavioural interventions across numerous sites not only in these regions but across the UK, to reduce water demand in order to achieve sustainable water supplies to these sites.

Adam Doig
Water Policy Lead (DIO)

Table 7: Office Water Consumption per Full Time Equivalent (FTE)

Office Water Consumption	2009/10 baseline	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Total consumption in m^3	206,029	186,101	190,101	172,354	183,490	228,040	220,535	275,835
FTE	16,629	15,710	15,710	14,658	15,111	16,002	15,990	16,239
Cubic metres (m^3) use per FTE	12.4	11.8	12.3	11.8	12.1	14.3[21]	13.8	17.0

Table 8: Offices in scope for GGC office water reporting

Offices in scope as at Mar 2017
Abbey Wood North, Bristol
Abbey Wood Main, Bristol
Cheadle Hulme, Cheshire
Kentigern House, Glasgow
MOD Main Building, London
St Georges House, Sutton Coldfield
Tomlinson House, Blackpool

Over the coming few years, there are various strategic programmes which will support further reduction of water consumption both currently underway and due to start in 2017/18. Implementation of the WCRP will continue, and a programme to fix water leaks under buildings on 30 sites. The Defence Estate Optimisation Programme has identified 91 sites for disposal by 2040, which will reduce consumption in some areas, though receiver sites for personnel and activities will see increases in water demand.

3.3.3 Office Water Use

There are seven MOD office sites in scope for the GGC office water benchmark reporting and the current combined water demand across these sites is 17 cubic metres (m^3) per full time equivalent (FTE) per year. This is an increase of 3.2m^3 from 2015/16 and continues to be significantly higher than the best practice benchmark. The main reason for this increase was the lake at MOD's Abbey Wood site, which forms part of the security features was refilled twice during 2016/17 due to the dry weather conditions, resulting in an increased consumption at this site of nearly 53,000m^3. This continues to create challenges to reducing our office water consumption.

21 An error was identified in Mar 2016, that the previously 2014/15 performance of 12m^3 had excluded some of the figures for offices. A revised benchmark is 14.3m^3, leading to an inaccurate end of year performance figure. This has been corrected in the table.

I see sustainability as having an important role in every day decision making which enables us not only to meet our environmental commitments and drive a sustainable supply chain, but also to provide FLC customers with more efficient and adaptable equipment through life.

Richard Straw
S&EP Asst Hd – Environment (DE&S)

3.4 Acquisition and Infrastructure Systems

3.4.1 Supply Chain

A key element of our approach to achieving our sustainability objectives is identifying the sustainable procurement risks affecting supply chain security, such as our as reliance on sustainable supplies of energy and raw materials essential for manufacturing and maintaining our military capability. Our focus this year has been to work with our Industry Partners to develop and embed sustainable procurement principles into acquisition and through life capability management policy and practices, and examining potential measures to improve our understanding and reporting of supply chain impacts.

To support our objectives to make our equipment and infrastructure systems more sustainable, we continue to build and expand our two well established joint engagement forums:

- The **Joint MOD / Industry Sustainable Procurement Working Group (SPWG)** allows us to continue to work with industry partners at a strategic level, in order to better understand the different approaches being taken on sustainable procurement within the Defence industry supply chain as well as identifying sustainable procurement risks and opportunities and a through life approach to capability acquisition; and
- The infrastructure **Suppliers' Sustainable Development Working Group (SDWG)** works to update our infrastructure industry partners with DIO and MOD policy changes and initiatives, share best practice, and identify delivery barriers. The main Hard FM and Soft FM partners are represented, along with some PFI providers.

3.4.2 Sustainable Equipment Acquisition

MOD operates in an increasingly financially and resource constrained environment, whilst continuing to deliver the most effective military equipment and support solutions to front line users. This includes understanding and addressing key sustainability challenges.

We contiue to look at where we can exploit sustainable solutions across the Defence acquisition cycle. This includes embracing new and emerging technologies in equipment design and production, influencing behaviours and specifying sustainable requirements for equipment, support and infrastructure. This approach offers an important range of benefits to military capability, including cost reduction, energy efficiency, resilience to climate change, material recovery, recycling and also achieving enhanced equipment longevity, mission endurance and equipment interoperability.

The need to embed sustainability in MOD acquisition and across the Defence supply chain is identified in the Sustainable MOD Strategy 2015-2025 and key elements of our approach include:

A computer graphic simulation of the Novel Air Concept showing prototype equipment of the future

- Identifying sustainable procurement risks affecting both capability performance and supply chain security. Key topics include energy and raw materials security of supply, legislative, commercial considerations and climate impacts resulting from increased frequency and intensity of weather events on the defence supply chain and changing equipment operating environments;
- Working with industry to make it easier to apply sustainable procurement criteria and embed sustainability requirements in contract deliverables and commercial mechanisms;
- Developing internal policy levers and tools to enable the benefits of through-life costs and risk minimisation to inform decision making, as well as undertaking sustainability risk assessments; and
- Complying with the Greening Government Commitments that mandate Government Buying Standards (GBS) are appropriately addressed as part of product specification.

The joint MOD-Industry Sustainable Procurement Working Group provides a valuable mechanism for the MOD and its equipment suppliers to collaborate on how best to embed sustainable procurement into equipment acquisition business practices. This includes identification of material supply chain risks and the development of a sustainable procurement strategic plan. The work has been used to inform some analysis of the Defence sector's approach to sustainability risks affecting military capability, and used to ensure sustainable military capability requirements are taken into account through the acquisition cycle.

DE&S has also been working with its equipment Operating Centres and Project Teams to improve how sustainable procurement is understood and embedded as well as sharing ideas and best practice. Key initiatives include:

- A new version of the DE&S Acquisition Safety and Environment Management System has been rolled out which includes a revised version of the Project Oriented Environmental Management System (POEMS);
- The development of the new Environmental Defence Standard 00-051, which is designed to improve coherence for environmental requirements in contracts;
- Updating the sustainability content of the acquisition systems equipment environmental courses delivered by Cranfield University, together with on-going work to refresh the sustainable procurement training courses delivered by Defence Academy; and
- Working with DE&S Operating Centres and Project Teams to strengthen awareness around the importance of sustainable procurement as well as sharing best practice affecting new equipment and legacy projects.

Case Study: Engagement is the key to an effective partnership – Sustainable Development Training

In November 2016, the Defence Infrastructure Organisation (DIO) Sustainability Team held an engagement day to familiarise both asset and project management teams with their operational requirements. The day brought together personnel from across DIO with an objective of developing a clear understanding of the policy requirements relating to the Environment and Sustainability, and the variety of Subject Matter Experts (SME) available to assist projects and programmes in achieving these and demonstrating good practice.

To assist with decision-making and to assess (appraise) the effects of all programmes, plans and projects, the MOD has produced the MOD Sustainability and Environmental Appraisal Tools Handbook ("The SEAT Handbook")

The Department is transforming its approach to estate management with a new Infrastructure System Operating Model (ISOM) with increased delegation to TLBs, and the Defence Infrastructure Organisation (DIO) becoming the main Delivery Agent and the Technical Authority for Infrastructure for the whole of Defence. As part of this process the roles and responsibilities for delivering sustainability are being reviewed and embedded within the new operating system with the aim of strengthening governance, holding to account and driving effective behaviours and efficiencies.

The MOD's infrastructure systems are managed by the DIO, who are responsible for strategic estate planning, the delivery of Capital Works (new build) Projects, Hard Facilities Management (building and estate maintenance and management) and Soft Facilities Management (cleaning, catering, retail & leisure etc.). Sustainability and environmental teams provide advice across all estate business areas, and work with Commercial and Finance teams to enable sustainability through the letting and management of estate contracts. Collaboration and engagement, both internal and external, continued to be a focus this year to embed sustainability within the infrastructure system.

The Department has strengthened the scrutiny of sustainability within its investment approvals policy and processes and this has delivered improvements in the delivery of sustainability. Scrutineers review project documentation and ensure that relevant sustainability and environmental appraisals (or equivalents) are carried out when required. During 2016/17, 218 business cases were reviewed with 67% considered to have minor or no sustainability issues. DIO have introduced Business Case training sessions and are updating a Sustainability Training Plan, which will be implemented this coming year, to increase awareness and understanding of sustainability appraisal tools across infrastructure procurement.

As part of on-going contract development work, sustainability has been embedded within all new and renewed Capital Works and Hard and Soft Facilities Management contract arrangements. DIO have improved their scrutiny and assurance mechanisms for holding Industry Partners to account for delivering sustainability.

3.4.3 Sustainable Construction

We continue to work to embed sustainability and efficiency requirements into our construction projects, to support a more sustainable infrastructure system and as required by the Government Construction Strategy. Over the past year, effort has centred on five key areas of activity:

- Aligning the supply and specification of our built assets with industry norms, and updating specific Defence infrastructure standards, which will see the publication of updated MOD Building Performance Standards. These standards will reduce the time and cost of construction and provide more accurate estimating information to inform early decisions and infrastructure programmes and reduce designer and contractors risks by providing more certainty in the requirements;
- Improving the understanding of how military capability and outputs drives the demand for and on these assets, the spatial and performance characteristics and utilisation;

With over 11 different SMEs from the Safety, Environment & Engineering branch and the Utilities branch delivering a range of presentations case studies and question and answer sessions across a whole day, the attendees were challenged to soak up the wider variety of information. This included:

- Town and Environmental Planning (TEP)
- Environmental Support and Compliance (ES&C)
- Explosive Ordnance Clearance (EOC)
- Environmental Liability Management (ELM)
- Utilities
- Safeguarding
- Byelaws and Programme Support
- Business Case Scrutiny

The key theme of the day was effective engagement, identifying the resources available to personnel and encouraging them to make contact early during their respective workflows. The session highlighted the effectiveness of having a single point of contact and how working together, planning effectively and communicating requirements; SMEs could be used at the right time and to the right effect without unnecessary impacts on project schedules.

Table 9: DREAM assessments undertaken in 2016/17

Result	Number	Percentage
Excellent	37	95%
Very Good	2	5%
Good	0	0%
Total	**39**	**100%**

- Delivering improvements in-house and supply chain productivity and to drive value for money improvements through the whole asset lifecycle;
- Building greater asset knowledge, understanding and associated tools within the MOD to deliver more sustainable construction and operational outcomes; and
- Acquiring and using high quality data through all our procurement activity to support our business understanding, the activities identified above and consequently our decision making and performance measurement.

3.4.4 Appraisal Tools

To identify and manage the sustainability impacts of its business, and improve our decision-making, the MOD developed the MOD Sustainability and Environmental Appraisal Tools Handbook (SEAT) in 2003 to assess the effects of programmes, plans and projects. The toolkit covers a range of tools from broad sustainability appraisal, which also identifies the need for more specific assessments including Defence-Related Environmental Assessment Method (DREAM) or SEAT screening, and provides guidance on the various tools and how and when to apply them.

During 2016/17 we have been reviewing and updating all the tools in the SEAT Handbook and will be publishing updated sections to the Handboook later on, including new guidance on 'MOD Principles for Habitat Banking', and the DREAM question sets, which were released as DREAM Version 6.0 in April 2017. This new version brings the DREAM methodology up to date with industry best practice, current building regulations and MOD policy.

The DREAM tool is used to assess all new builds and major refurbishment construction activities and provide an equivalent to the industry standard Building Research Establishment's Environmental Assessment Methodology (BREEAM) for Defence-specific buildings. All new projects are to achieve an "excellent" rating and all major refurbishment projects are to achieve a "very good" rating, unless site constraints or project objectives mean that this requirement conflicts with the obligation to achieve value for money. In 2016/17 there were 39 DREAM assessments completed, of which 37 (95%) met or exceeded the target standard. The remaining two buildings were both specialist manufacturing facilities whose design and security constraints made meeting the target impossible, and a rating of very good was achieved.

Given the fast changing nature of ICT we are actively horizon scanning with innovation teams to exploit emergent technologies

3.5 Smarter Working

The MOD works collaboratively with our industry partners and other government departments to make improvements to the work place through improvements in technology and our ways of working both as a means to deliver our business more sustainably and also to help meet our GGC targets.

3.5.1 Information and Communication Technology (ICT)

The MOD is working towards a cost effective and energy efficient ICT estate, which is fully exploited, with reduced environmental impacts to enable new and sustainable ways of working for the public sector. By changing the way we work and by understanding the benefits of our new IT system MODnet, and other ICT programs, we are more able to support reductions in paper use and domestic air travel targets, and to identify suitable measures or targets around ways of working.

The MOD is currently rolling out MODnet across the Department with 25,000 users able to access collaborative features such as Skype for Business, online meetings and conference calls and also video for calls and conferencing. Within the learning portal, jointly developed with Microsoft we have included a specific scenario on working sustainably.

This year we have been successful in ensuring that Sustainable ICT is considered by our acquisition systems. During 2016/17, building on the Greening Government ICT Strategy and the creation of the Sustainable ICT policy leaflet within the Defence Manual of ICT, we have included sustainability principles within many internal processes and documents with the key document being the Defence Information Strategy.[22]

Through these we are building sustainability principles into our future ICT solutions. For example our Defence Hosting Programme included the following environmental/sustainability related requirements to select vendors at beta stage:

- We used the G-Cloud to shortlist only data centres that adhere to the EU code of conduct for energy-efficient data centres;
- Stipulated that our Service Provider shall have procedures so that hardware is disposed of in a secure and environmentally sound manner to recognised standards at the end of its life; and
- Stipulated that our Service Provider shall provide an auditable Environmental Management System that directs and controls the activities necessary to ensure the safety of the environment throughout the life of the contracted service provision.

Given the fast changing nature of ICT we are actively horizon scanning with innovation teams to exploit emergent technologies that could help sustain Defence business in the digital age.

3.5.2 Infrastructure Management System (IMS)

Over the past couple of years, the DIO has been developing a fully integrated Infrastructure Management System to assist in managing the Defence estate in a more strategic and efficient way.

22 The Defence Information Strategy can be viewed here: https://www.gov.uk/government/publications/defence-information-strategy

Whenever I use the term Sustainability, I am still often met with expressions of disinterest, lack of understanding of its significance or some misguided reference to 'tree hugging'. To make this important acquisition topic more relevant to our acquisition community, I have started to use the phrase "Design for Life". This means design for the whole acquisition lifecycle, including disposal; design for our operating environments and the people who live there; design for the lives of the people in our supply chain. Who could argue against the need to "Design for Life"

David Hawken – Design Strategy Deputy Head (Information Systems and Services)

The DIO IT system for strategic management of the Defence estate is the IMS. The IMS has been implemented incrementally since May 2014 and offers a wide range of planning capabilities including but not limited to, utilities consumption and forecasting, strategic space planning and safety, environment and engineering legislative compliance. A key benefit of IMS is that it replaces more than 70 legacy IT systems, which were out of warranty and unsupported by maintenance contracts, and to date 85% of legacy systems have been successfully decommissioned, generating cost savings for the DIO of £30M in this area alone.

The IMS supports the monitoring and achievement of our targets by providing accurate and up to date information on infrastructure assets, their condition, utilisation and maintenance costs. In turn, this facilitates evidence-based decision-making and actively contributes to the MOD's vision of equipping Defence with a significantly smaller, more efficient and better quality estate.

New IMS capabilities released in 2016/17 includes functionality to capture Space Utilisation Data within existing Level 2 Assets and full assimilation of the Interim Disposals Database (IDD) into the Real Estate (e-Terrier) Transaction Document. Both of these measures serve to improve information sharing across the organisation and enable consistent ways of working. The DIO also anticipated that full use of the beneficial Utilities Forecasting Tool within IMS would have realised enduring annual savings of £700,000. However, although the tool has been successfully populated and run to date, the results are currently being validated by external Finance SMEs to establish the baseline for future comparison. This work will conclude towards the end of 2017.

The aircraft carrier HMS Queen Elizabeth under construction at Rosyth Dockyard, Scotland. Whilst the MOD travel policy discourages avoidable business travel, sometimes our people need to be onsite, wherever that may be

3.5.3 Business Travel

The MOD travel policy discourages avoidable business travel and encourages personnel to use existing technologies such as video teleconferencing and/or telephone conferencing wherever practicable. When travel is necessary, value for money should be the primary consideration.

The MOD operates UK wide (and overseas), which is reflected in level of our business travel requirements. Our efforts and challenge is to find the right balance of travel avoidance, methods of travel around the UK to often remote locations, and the best value for money choices where travel is required. Table 10 shows CO_2e emissions performances by different modes of transport used by our people for administrative business travel.

In 2016/17, we reduced GHG emissions from all travel including international air travel by 18% compared to 2009/10. All UK domestic business travel achieved a 31% reduction in GHG emissions compared to 2009/10.

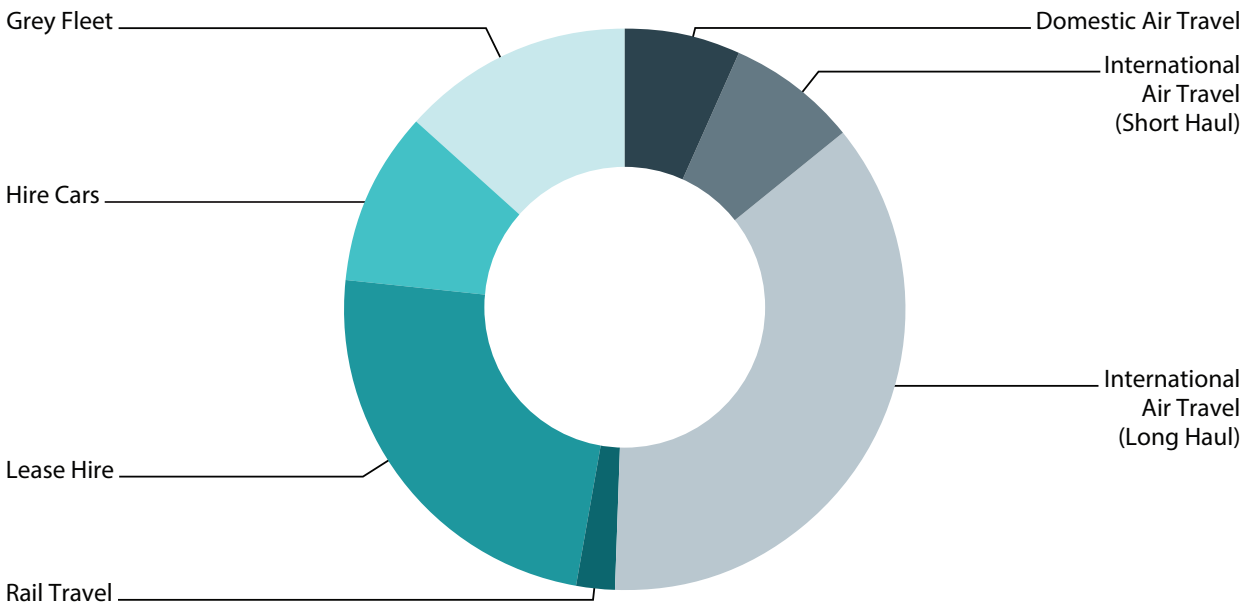
Table 10: Carbon emissions from administrative business travel

Type of Business Travel tCO_2e	**2009/10 baseline**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2015/16**
Domestic Air Travel	10,508	8,310	8,310	8,390	8,382	7,380	7,246	7,719
Rail Travel	4,546	2,937	3,210	2,747	2,553	2,529	2,477	2,542
Lease Hire	27,842	27,229	26,706	26,715	26,360	28,128	28,078	26,506
Hire Cars	14,920	13,090	14,013	19,517	17,386	17,065	14,248	11,230
Grey Fleet	31,931	26,773	23,107	19,078	21,606	19,408	17,974	14,637
GGC Reportable	**89,747**	**78,339**	**75,346**	**76,447**	**76,287**	**74,510**	**70,023**	**62,634**
International Air Travel - short haul[23]	6,008	4,761	8,345	5,904	6,985	7,492	7,651	8,189
International Air Travel - long haul[23]	40,215	32,269	42,184	42,435	42,419	41,365	40,940	40,501
Other Business travel	**46,223**	**37,030**	**50,529**	**48,339**	**49,404**	**48,857**	**48,591**	**48,690**
All	**135,971**	**115,368**	**125,876**	**124,785**	**125,691**	**123,367**	**118,616**	**111,324**

23 International short haul and long haul is not in scope for the GGC targets

The MOD's ongoing business and operational requirements continue to affect our levels of domestic air travel

Figure 5: All business travel tCO_2e – Comparison of 2016/17



3.5.4 Domestic Air Travel

The MOD's ongoing business and operational requirements continue to affect our levels of domestic air travel, particularly for the FLCs. A significant majority of our domestic air travel is to and from Scottish and Northern Ireland destinations where air travel provides the best value for money.

The new GGC target for domestic air travel is a 30% reduction. For the MOD, this target is applied to the administrative parts of the Department; and the FLCs, who have a higher degree of irreducible travel requirements, apply their own targets.

The administrative parts of the MOD reduced their domestic air travel by 19% during 2016/17, a 1% increase in domestic air travel from 2015/16 (see table 12 and figure 6 below). Our Front Line Commands (who took over 78% of the domestic flights reported for 2016/17) continue to see an increase in domestic air travel due to ongoing major organisational changes and Defence programmes, including army rebasing and ship building programmes.

Case Study: Heathland Management

Much of the UK's lowland heathland habitats have been lost to urban development or agriculture, or damaged by fragmentation, conifer plantations and invasive weeds. Many of the largest remaining heaths are on the defence estate, and in particular the 'Home Counties' training areas and firing ranges of Hampshire, Surrey and East Sussex, which form a large part of the internationally important Thames Basin Heaths and Wealden Heaths, and also include large areas that are ecologically important at the local and county scale.

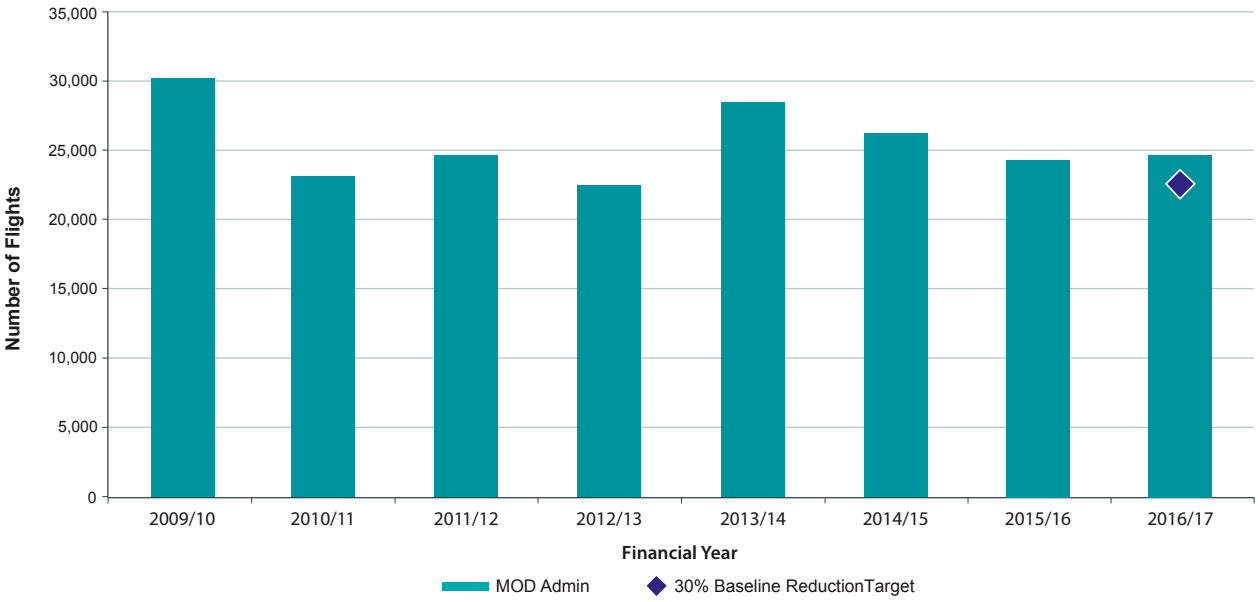
Management of these heathlands can be particularly challenging, even when compared to other parts of the defence estate. The training areas and range complexes are relatively small, 200ha to 2,000ha, but have very varied topography and historic management patterns, resulting in complex mosaics of habitats, and they are heavily used for military training and subject to high levels of public access demand.

Continuous management is undertaken by MOD's contractors, tenants, and licensees to maintain an optimal balance between bare sands and gravels, open grass and heath, scattered scrub and trees, and denser scrub and tree cover. Management techniques include grazing, manual and mechanical mowing and cutting, spraying or pulling out invasive weeds, thinning or clearing trees and scrub, and creating bare ground scrapes.

Table 11: Domestic (UK) air travel – number of flights split between the FLC and the Administrative organisations in MOD

Domestic Air Travel (no. of flights)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
MOD Front Line Commands	79,064	60,677	64,424	82,593	89,308	90,837	86,973	90,672
% change compared to 2009/10 baseline		-23%	-19%	4%	13%	15%	10%	15%
MOD Administrative	30,422	23,153	24,797	22,504	28,250	25,765	24,247	24,756
% change compared to 2009/10 baseline		-24%	-18%	-26%	-7%	-15%	-20%	-19%
Total	109,486	83,830	89,221	105,097	117,558	116,602	111,220	115,428
% change compared to 2009/10 baseline		-23%	-19%	-4%	7%	6%	2%	5%

Figure 6: Domestic air travel (administrative organisations in MOD) – Annual performance against 2009/10 baseline[24]



24 A new target was set for 2016/17 against an 09/10 baseline

Over the past two years the DIO lead ecologist for the region has led a series of habitat management assurance reviews. At the heart of the process has been site meetings bringing together the military users, statutory advisers, contractors, tenants, licensees, MOD Conservation Group members and DIO colleagues, to consider how well military training, nature conservation and public access objectives are being delivered on the ground, identify and address conflicts and agree localised management plans.

The assurance reviews have been very warmly welcomed, with letters of appreciation received from all parties. Areas where too much scrub had been removed or where management had been neglected are being brought back into optimal condition for training and wildlife; a number of rumbling issues have been resolved by bringing parties together in the field to literally see each other's perspectives; in some instances management responsibility has been transferred from tenants to contractors; and there is improved understanding on what will happen as the current round of agri-environment schemes and contracts come to an end in the next two years. The on-site reviews are quite resource intensive, but the investment of time and effort is considered essential given the value of the estate.

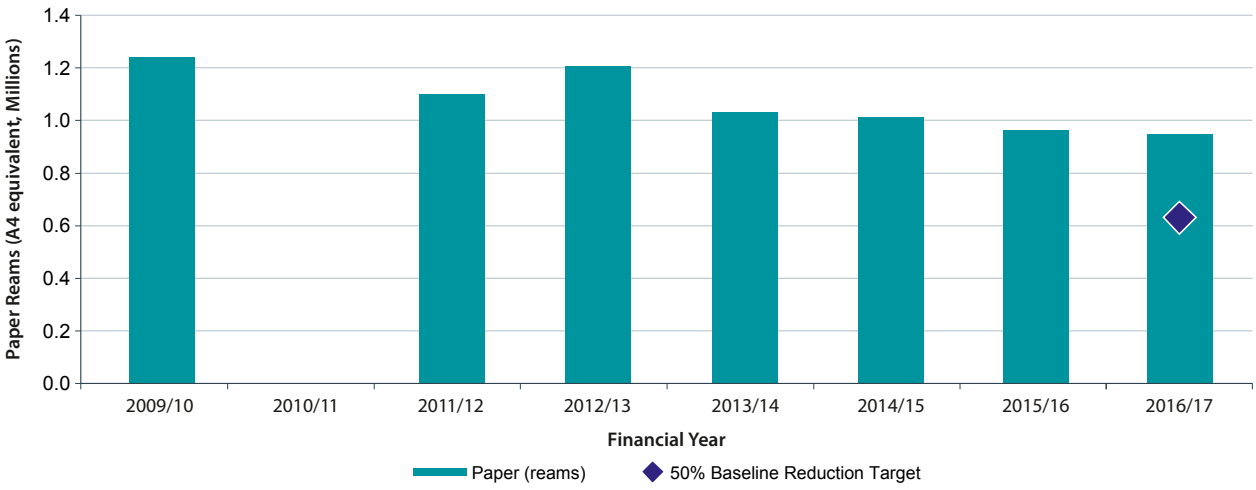
3.5.5 Paper Demand

In 2016/17, a more ambitious GGC target for paper demand was introduced to reduce its paper demand by 50%, and the MOD has achieved a 24% reduction compared to the 2009/10 baseline. This is an improvement of 1% compared to the previous year.

Table 12: Paper demand - Annual performance against 2009/10 baseline[25]

MOD Paper Purchased	2009/10 baseline	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Paper reams (A4 equivalent)	1,242,363	1,099,866	1,206,435	1,030,417	1,012,637	951,072	940,487
% change compared to 2009/10 baseline		-11%	-3%	-17%	-18%	-23%	-24%

Figure 7: Paper demand - Annual performance against 2009/10 baseline[26]



25 Paper consumption data was not collected in 2010/11
26 A new target was set in 2016/17 against an 09/10 baseline

Canadian Whitetail Deer are pictured mingling with a Challenger 2 tank on the prairies of BATUS (British Army Training Unit Suffield) in Alberta

3.6 Estate Stewardship

3.6.1 Biodiversity

The MOD has responsibility for some of the most unspoilt and remote areas in Britain with about a third of the estate designated as nationally and internationally important for wildlife. The presence of rare and threatened species and habitats makes much of the remainder of the estate, including training areas and test and evaluation ranges often exceptional for biodiversity, but in addition many barracks and fuel and munitions depots include ancient woodlands and species-rich grasslands and hedgerows.

In addition to our statutory obligations the MOD has also set its own standards for biodiversity:

- To be an exemplar in the management of designated sites where compatible with military requirements;
- All MOD establishments with a significant biodiversity interest to have an integrated land/ rural management plan;
- To contribute, as appropriate, to the UK Biodiversity Action Plan (and Country Biodiversity Strategies); and
- To ensure natural environment requirements and best practice are fully integrated into the estate management.

To achieve these objectives we work with an array of stakeholders, in particular the statutory nature conservation agencies who primarily advise on management of designated sites; non-governmental organisations such as the Wildlife Trusts, Amphibian and Reptile Conservation Trust and RSPB, and other individual members of MOD Conservation Groups who provide survey information and advice; and our contractors, tenant farmers and licencees who are responsible for implementing agreed management plans.

In 2016/17, we updated our Memorandum of Understanding with Defra (relating to internationally important sites and European

Table 13: SSSI and ASSI condition in 2016/17[27, 28]

England	44.8% of MOD SSSI area (total area is 71,375 ha) was in Favourable Condition and 98.4% in Unfavourable Recovering condition.
Scotland	98.3% of MOD SSSI area (4687 ha) was meeting objectives.
Wales	96.3% of MOD features (273) were meeting objectives. This shows an increase of 1.3% in meeting objectives.
Northern Ireland	100% of MOD ASSI features (12) are in at least Unfavourable Recovering condition. This shows no change since the last reporting year.

27 Direct comparison is difficult because each devolved administration monitors site condition in a different way.

28 Target in England is to maintain 95% in at least Unfavourable Recovering condition and achieve 50% in Favourable condition by 2020; in Scotland to achieve 80% of notified features in Favourable condition by 2020; in Wales to achieve 95% in Favourable recovering condition by 2020 and 100% in Favourable condition by 2026. Northern Ireland does not currently include specific targets for ASSI condition.

Case Study: MOD West Freugh

The condition of Sites of Special Scientific Interest (SSSI's) is monitored externally by each country's Statutory Nature Conservation Organisation, and is viewed as a key indicator of how well a landowner is managing their land. In Scotland, 96.3% of SSSI on the MOD estate is classed as meeting objectives.

The Torrs Warren to Luce Sands SSSI in Dumfries and Galloway, forms a large part of MOD West Freugh. The site is designated among other things for the biology and geomorphology of the extensive sand dunes on the range which have been assessed for more than a decade as being unfavourable and declining, mainly because of colonisation by invasive bracken and scrub at the expense of more botanically diverse dune vegetation.

Since 2015, DIO have invested in the control 300ha of bracken and 40ha of scrub, and enclose 180ha of designated land so that cattle grazing can provide a sustainable low cost management system to ensure a favourable condition status for the future. The restoration phase of the work is not yet complete but DIO and QinetiQ have made significant progress and what was one of the largest declining SSSI's in MOD ownership is now firmly on the road to recovery.

West Freugh before, during and after the scrub removal process

The MOD estate has been described as the most important estate for wildlife in the country. Delivering government targets for the condition of Sites of Special Scientific Interest demonstrates MOD is a knowledgeable and responsible landowner that takes stewardship of the estate very seriously. This in turn helps deliver the consents required from Statutory Bodies to train across almost 85,000 ha of SSSIs across the UK.

Oliver Howells
Senior Ecologist (Defence Infrastructure Organisation)

Protected Species); and our Declaration of Intent with Natural England (including new statements on working at a landscape scale, taking account of natural capital and ecosystem services, working together on Integrated Risk Management Plans (IRMPs), and assessing impacts of activities outside the defence estate such as low flying and amphibious landings).

The MOD is on track to meet all current government and devolved administration targets for SSSI condition, and we continue to invest in capital works on SSSI/ASSIs that are as part of the MOD SSSI Condition Improvement project. During 2016-17, the DIO invested £960,000 in SSSI and ASSI management as part of the MOD SSSI Condition Improvement project. This project has been funding SSSI management since 2005 and the condition of habitats and species is responding to the management interventions.

Addressing some outstanding management actions is limited by site access and in a very few cases limitations imposed by military training (e.g. unexploded ordnance). DIO is working closely with all Statutory Bodies (SBs) to actively support and facilitate site condition monitoring where this is the case. The delivery of SSSI management by MOD tenants is dependent on agri-environment schemes funded by Defra. A programme is also being developed to refresh IRMPs across the estate over the next couple of years.

Sanctuary Magazine highlights some of our other recent biodiversity achievements, initiatives and projects.[29]

3.6.2 Heritage

The MOD is steward of the largest historic estate in Government ownership and is responsible for a wide range of heritage and historic assets across our UK and overseas estate. In 2016/17 there continued to be a major focus on ensuring that the heritage requirements have been integrated into the Army Basing Programme (where we are bringing personnel back from Germany), and the DIO completed site surveys and undertook fieldwork components of sites such as Larkhill, Bulford and Tidworth.

During 2016/17, the overall number of Scheduled Monuments under our management decreased slightly from 770 to 769 last year through disposal of estate, and Listed Buildings have increased from 836 to 839.

29 Sanctuary Magazine can be viewed at https://www.gov.uk/government/publications/sanctuary.

Case Study: Operation Nightingale

Operation Nightingale uses archaeology and heritage to aid the recovery of service personnel, has been running since 2011 and is a project trademarked to the Ministry of Defence. The programme has included elements as diverse as the excavation of an Anglo Saxon cemetery, a Roman villa and a Spitfire, a survey of Bronze Age burial mounds, and the building of a 2/3 scale replica of a First World War tank (in wood). Several of the participants have gone on to jobs in archaeology or to study the subject at University and much of the work has enabled the Ministry of Defence to fulfil commitments to the care of the Government's historic estate.

A number of tasks have been performed on sites that were deemed to be 'heritage at risk' by Historic England, and the good work accomplished enabled the statutory body to remove those particular monuments from that list. As a result of these endeavours Operation Nightingale was awarded a 'Heritage Angel' award for the Best Community Action Project by Historic England and the Andrew Lloyd Webber Foundation at a ceremony in London in 2016.

Table 14: Condition of MOD Scheduled Monuments - Comparison[30]

Year	Good		Fair		Poor		Unknown		Total
2009/10	364	49%	222	30%	149	20%	2	<1%	**737**
2010/11	357	49%	224	31%	151	21%	2	<1%	**734**
2011/12	359	49%	222	30%	155	21%	2	<1%	**738**
2012/13	355	47%	250	33%	158	21%	0	0	**763**
2013/14	363	48%	244	32%	154	20%	1	<1%	**762**
2014/15	364	48%	246	32%	154	20%	2	<1%	**766**
2015/16	311	41%	295	38%	164	21%	0	0	**770**
2016/17	314	41%	292	38%	159	21%	4	<1%	**769**

Protecting and improving Heritage at Risk remains an important part of our work, and we have been working with Historic England and other devolved administrations to address these important, but often difficult, issues. The Historic England Heritage at Risk (HAR) register is published every two years, and in their 2013/15 report, the MOD had 65 assets on the register. Further details of the MOD's heritage management can be seen in the MOD Biennial Heritage report which will be published later this year.

3.6.3 Access and Recreation

The MOD has a policy presumption in favour of public access to the defence estate where it is compatible with Defence needs; although byelaw restrictions apply where there are matters of safety and security.

2016/17 saw the fourth consecutive National MOD access forum taking place at Castlemartin, Pembrokeshire, where representatives from the stakeholder and interest groups gathered to look at how the site is used, discuss projects, updates and share information, including awareness of the importance of safety across the training estate this positive engagement with key interest groups to revisiting the purpose of the red flag, the differences between dry and live training and what dangers are present even on those sites not using live ammunition and how we can work with interest groups such as the Ramblers Association and the British Horse Society to better educate visitors, enabling them to to use and enjoy our estate safely.

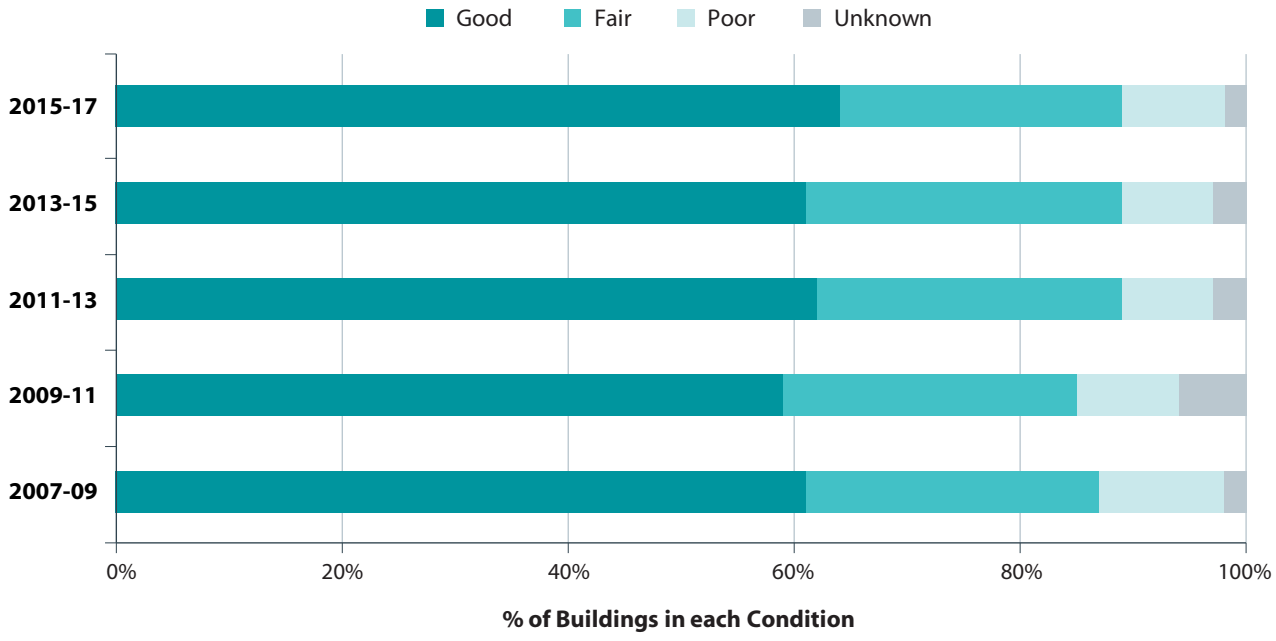
30 Percentages may not add to 100% due to rounding

King Henry the VIII's Wine Cellar underneath the Ministry of Defence Main Building, Whitehall

Table 15: Condition of Listed Buildings - Comparison

Year	Good		Fair		Poor		Unknown		Total
2007-09	489	61%	206	26%	87	11%	15	2%	**797**
2009-11	477	59%	210	26%	77	9%	51	6%	**815**
2011-13	519	61%	231	27%	69	8%	26	3%	**845**
2013-15	507	61%	232	28%	64	8%	22	3%	**825**
2015-17	536	64%	213	25%	72	9%	18	2%	**839**

Figure 8: Condition of Listed Buildings - Comparison



The fossil forest at Lulworth has been closed during 2016/17. . . it is hoped the site will be reopened early 2018

We published a national advisory leaflet for people wishing visiting the training estate with their dog, one of the most common pastimes undertaken across the estate all year round. The leaflet provides important safety and good practice advice for visitors and their animals.

The fossil forest at Lulworth has been closed during 2016/17 for safety reasons due to rock fall. Recognising that the site is an important visitor destination for the general public and scientists alike the DIO have been working in tandem with the Dorset Council Jurassic Coast Team, the Lulworth Estate and Natural England to find a way to reopen the site. The cliffside location has proved a challenge, but sensitive landscaping works are to be carried out, along with some improvements to infrastructure and it is hoped the site will be reopened early 2018.

4. Next Steps and Challenges

4. Next Steps and Challenges

We have several challenges to our sustainability agenda, two of which are key to achieving our sustainable MOD objectives. Short term efficiency targets and financial constraints can risk us making short term affordability decisions at the expense of longer term value for money, and with many major and complex change programmes underway, having the right information to inform our decisions becomes increasingly important. To help address these challenges, there are four key areas will will be looking at during 2017/18.

We intend to bring together our capability energy and sustainable MOD strategies, to focus our objectives, and give greater clarity on priorities for the Department.

Secondly we will continue to improve our management information, and increase the level of detail which will allow us to make the most efficient use of the estate and inform decisions. This will help us to target resources where the most benefit can be achieved. This is vital at a time when the MOD is working to delegate infrastructure budgets to TLBs, who will be able to reinvest the savings made through efficiencies, innovation or behaviour change.

Thirdly we will continue to progress existing programmes; both key defence programmes such as Army Basing and the Defence Estate Optimisation Programme, and specific sustainability and environmental programmes for energy demand, waste, water, and our climate resilience activity.

And finally to drive further improvements into our infrastructure and acquisition systems, to embed sustainability within our decisions.

Annexes

Annexes

Annex A: Energy and Carbon Emissions data 2009/10 - 2016/17

GREENHOUSE GAS EMISSIONS		2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Note
Non-Financial Indicators tCO_2e 000's	Total gross emissions for scopes 1, 2 & 3 (Estate)	1,432	1,442	1,286	1,244	1,218	1,166	1,114	1,043	13a &13f
	Total gross emissions for scopes 1, 2 & 3 (Capability)	1,432	3,217	3,069	2,780	3,060	2,208	1,935	1,811	
	Total net emissions for scopes 1, 2 & 3	1,420	1,430	1,211	507	549	509	1,114	1,043	13a &13f
	Total gross emissions scope 1	593	579	487	476	514	477	472	471	13a &13f
	Total gross emissions scope 2 & 3	839	900	849	768	709	689	648	572	13a
Related Energy Consumption KWh 000's	Electricity: Non-renewable	1,460,770	1,464,106	1,282,421	0	0	0	1,235,763	1,208,524	13b
	Electricity: Renewable	20,440	20,486	142,491	1,481,564	1,384,227	1,223,272	0	0	
	Gas	2,482,020	2,475,352	1,952,488	1,740,426	1,971,184	1,804,037	19,463,671	1,992,575	
	LPG	80,070	80,403	82,000	79,391	79,425	53,247	40,187	50,555	
	Other	290,598	289,877	314,428	337,572	338,153	324,558	238,802	193,242	
Related Equipment Energy Consumption Litres 000's	Aviation fuel	827,800	792,400	767,100	694,652	628,601	566,943	503,395	481,338	
	Diesel (retail blend & mineral blend)	340,500	354,300	339,300	0	0	0	0	0	13c
	Diesel (retail blend)	0	0	0	121,951	114,410	73,070	60,371	44,501	
	Diesel (100% mineral)	0	0	0	254,387	232,023	191,909	174,598	177,290	
	Gas oil	74,300	79,700	74,900	40,602	34,329	33,976	Not known	Not known	13e
	Petrol	7,000	4,600	5,800	4,462	8,882	3,975	Not known	Not known	13e
Financial Indicators £000's	Expenditure on energy	195,715	280,563	294,676	243,266	261,124	317,074	267,979	292,201	13a
	CRC license expenditure (2012 onwards)	-	-	17,925	16,082	18,046	16,522	17,536	16, 229	13g
	Expenditure on GCOF offsets	220	78	12	12	12	18	Not known	Not known	13e
	Expenditure on official business travel	198,747	165,467	161,632	161,632	163,107	163,859	Not known	Not known	13d &13e
	Expenditure on equipment energy (fuel)	481,934	627,850	635,354	758,809	731,045	574,681	332,502	295,993	
Normalisation	Total scopes 1, 2 & 3 - tCO_2e 000	1,432	1,442	1,286	1,244	1,218	1,166	1,114	1,043	13a
	Defence total Spend £000's	37,994,285	38,116,370	38,946,782	37,740,973	36,448,452	35,105,038	35,252,526	35,422,775	
	Normalisation - Scope 1 & Scope 2 emissions '000 / budget '000	0.00004	0.00004	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	

Annex B: Water and Waste data 2009/10 - 2016/17

FINITE RESOURCE CONSUMPTION - Water		2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Non-Financial Indicators 000's m^3	Water consumption (office estate)	206	186	190	172	183	228	220	276
	Per Full Time Equivalent	12.4	11.8	12.1	11.8	12.1	14.3	13.8	17
	Water consumption (office & non office estate)	24,974	24,550	24,659	22,726	22,826	22,392	22,643	23,004
Financial Indicators £000's	Water supply costs (whole estate)	100,236	98,667	107,369	104,804	101,043	112,869	116.6	109.2
Normalisation	Department total spend £000's	37,994,285	38,116,370	38,946,782	37,740,973	36,448,452	35,105,038	35,252,526	35,422,775
	Normalisation - emissions m^3 '000 / budget £000's	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.00006

WASTE			2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Non-Financial Indicators tonnes 000's	Total waste		185	190	197	161	156	1631	156	177
	Hazardous waste		14	11	6	4	18	19	0.6	0.5
	Non-hazardous waste	Landfill	55	48	43	29	35	18	15	12
		Reused/Recycled	91	95	122	101	94	99	100	91
		Composted	8	9	9	8	1	1	3	2
		Incinerated with energy recovery	10	18	12	18	5	24	37	30
		Incinerated without energy recovery	8	8	5	2	2	3	2	0.8
Financial Indicators £000's	Total disposal cost		Not known	Not known	Not known	Not known	Not known	Not known	Not known	Not known
Normalisation	Department total spend £000's		37,994,285	38,116,370	38,946,782	37,740,973	36,448,452	35,105,038	35,252,526	35,422,775
	Normalisation - waste generated tonnes 000's / total spend £000's		0.000005	0.000005	0.000005	0.000004	0.000004	0.000005	0.000004	0.000005

Annex C: Caveats and Explanatory Notes

1. The data in these tables are not Official Statistics because they have not been assessed as such by the Defence Authority for Statistics.
2. GGC data contained in this report is based on agreed baselines. The GGC targets are for UK data. The MOD has tried to include as much of the UK data as possible and for some data sets, we have included data from our overseas estate.
3. A double line separating years in a table indicates a break in the series. This is where an error has been identified in the data which is significant enough to affect comparison. In a graph a break in the series is indicated by a dashed line.
4. An 'R" indicates that a table has been revised due to improvements in data availability
5. Definition of emission scopes:
   a. Scope 1 emissions occur from sources owned or controlled by the organisation. Examples include emissions as a result of combustion in boilers owned or controlled by the organisation. This includes emissions from organisation-owned fleet vehicles.
   b. Scope 2 emissions result from energy consumed which is supplied by another party (e.g. electricity supply in buildings or outstations), and purchased heat, steam and cooling.
   c. Scope 3 relate to official business travel directly paid for by an organisation (i.e. not business travel re-charged by contractors).
6. DEFRA conversion rates have been used to account for carbon. A conversion factor review took place in 2013 and MOD updated all of its GHG figures back to the baseline year at the request of Defra.
7. Carbon data in this report is shown as CO2e; this is the six greenhouse gases covered by the Kyoto Protocol. They are: Carbon Dioxide (CO2); Methane (CH4); Nitrous Oxide (N2O); Hydro fluorocarbons (HFCs); Perfluorocarbons (PFCs) & Sulphur Hexafluoride (SF6).
8. The MOD is large and complex with around 400 main sites and around 4,000 sites in total. A site may contain a single building or dozens of buildings. MOD's baselines include as much of the estate as possible but for reasons that include insufficient manpower and old contracts that do not provide the data required, our baselines covers from around 75% to 90% of the Defence estate. The finance data covers spend for a budget item and this may exceed the scope of the data being reported.
9. Sustainability data for: (1) travel, (2) waste and (2) water includes data from MOD's Trading Fund Agencies i.e. Defence Electronic Components Agency, Defence Science and Technology Laboratory and United Kingdom Hydrographic Office.
10. **Estate Energy**
    a. The Department of Energy and Climate Change agreed that the Greenhouse Gas target should apply to the 398 core establishments which MOD has decided to retain for the long term, and that MOD's contribution would be 19h, with an expected 6% being achieved from decarbonisation of the National Grid.
    b. The 398 sites are located in the UK and overseas. These core sites account for around 80% of MOD's energy consumption.
    c. MOD's Trading Fund Agencies are not included in the 398 core sites.
    d. Estate energy data is not weather corrected.
11. **UK Business Travel**
    a. The GGC target is for administrative business travel by Departments. We have defined business administrative travel as business journeys on behalf of MOD. Greenhouse gas emissions from other travel i.e. operations, support for operations, training for operations, welfare, etc. have been removed where possible.
    b. Road travel consists of administrative businesses car journeys in either (1) a leased fleet vehicle; (2) personnel using their own personal car (grey fleet); and (3) hire cars
       i. Leased fleet vehicles: This data includes some non-business administrative use because it is not possible to separate out all journeys. Calculation of the lease fleet emissions are estimated based on an average mileage of 18,000 miles per car (from sampled data) multiplied by the average CO2 emissions of all the vehicles in the fleet.
       ii. Grey Fleet includes travel by civilian and Armed Forces personnel using their own cars. Emissions are calculated using an "average" car from the Defra GHG conversion factors and the motor mileage distance claimed.
       iii. Hire car fleet emissions are based on an estimated journey of 250 miles per hire (based on sampled data) and DEFRA GHG conversion factors for the size of vehicle hired. If a vehicle type is unavailable any upgrade is not recorded.

c. Rail travel. We monitor rail travel mileage booked centrally using the mandated contract. The emissions data is calculated for all journeys but we are able to exclude travel related to armed forces recruitment.

d. The travel data is from live databases. The data is correct on the date the report was made and cannot be replicated.

e. The data given is for commercial air travel, it does not include:

i. Military aircraft or

ii. Charter aircraft i.e. used for troop transport.

f. The travel data includes travel by MOD civilians, Armed Forces personnel and the Trading Fund Agencies (Defence Science and Technology Laboratory; UK Hydrographic Office and Defence Electronic Components Agency).

g. The number of UK domestic flights includes journey that start and finish in the UK. Domestic flights for onward connection to international flights have also been included.

12. **Waste**

a. Waste data shown is against the agreed GGC baseline, this is around 75% of MOD known waste. The 25% excluded is unreliable data because:

i. the waste contractor does not provide weighed waste data. The current contracts were signed before weighed waste data was required

ii. sites have insufficient manpower to monitor waste and estimate tonnage based on volume.

b. The waste data is from weighed waste data and volumetric conversion factors. Volumetric conversion estimates the weight of the waste based on the type of waste and size of the skip.

c. The waste data excludes the scrapping and recycling of ships. Ship recycling is not a regular occurrence and their large tonnage would adversely skew figures in either the baseline or the reporting year.

d. The 10/11 waste data excludes the disposal of the Nimrod aircraft fleet. This was a one-off exceptional disposal. We have included disposals that are part of fleet upgrade/replacement i.e. Hercules c-130 aircraft and truck fleet replacement.

e. Waste data covers the UK, Trading Fund Agencies and sites in Germany.

f. Where data has not been provided then suitable estimates have been used based on historic data for that business area.

g. Data not collected.

13. **Water**

a. Water is provided by Aquatrine, an MOD-wide Water and Wastewater Private Finance Initiative (PFI) project delivered through three separate contracts known as 'Packages'. Package A covers the Midlands, Wales and South West England, Package B covers Scotland, and Package C covers the North and East of England. Aquatrine provides water to over 4,000 site groups, which is approximately 90% of the Department's consumption.

b. The Department's office estate (administrative buildings that are not part of a military establishment) is relatively small, and in 2015/16 comprises 8 sites. The full Time Equivalent (FTE) is the number of personnel established at these sites and does not include (1) on site contractors and (2) visitors (MOD/Armed Forces personnel based elsewhere, public and other contractors).

14. **Sustainable Development Performance Data, Annex A**

a. Air travel data - due to data improvements this data has been revised for all years

b. All purchased electricity is from a renewable source.

c. Data improvement has allowed us to report separately retail diesel and mineral diesel from 2012-13.

d. This data has been estimated

e. This data is unavailable at this time

f. 2009/10 and 2015/16 do not include emissions from operational energy

15. **MOD Arm's Length Bodies in scope for GGC.**

MOD Arm's Length Bodies in scope for GGC

MOD ALB	Status	GGC Reporting status
Defence Science and Technology Laboratory (DSTL)	Executive NDPB	Full within MOD core
Defence Electronics and Components Agency (DECA)	Executive NDPB & Trading Fund	Full within MOD core
Service Personnel and Veterans Agency (SPVA)	Executive NDPB	Full within MOD core
UK Hydrographic Office (UKHO)	Executive NDPB & Trading Fund	Full within MOD core

Annex D: List of Acronyms

AMR	Automated Metre Reading
ARAc	Annual Report and Accounts
ASSI	Area of Special Scientific Interest
BEIM	Built Environment Improvement Measures
BEIS	Department for Business, Energy and Industrial Strategy
BEMS	Building Management Energy System
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Methodology
CIRAM	Climate Impact Risk Assessment Methodology
CDP	Chief of Defence People
DCDS(MilCap)	Deputy Chief of Defence Staff (Military Capability)
DCYP	Directorate of Children and Young People
DECA	Defence Electronics and Components Agency
Defra	Department for Environment, Food and Rural Affairs
DE&S	Defence Equipment & Supply
DG HOCS	Director General of Head Office and Commissioning Services
DIO	Defence Infrastructure Organisation
DREAM	Defence Related Environmental Assessment Method
Dstl	Defence Science and Technology Laboratory
DuOS	Distribution Use of System
EA	Enterprise Approach
EDA	European Defence Agency
EPC	Energy Performance Contract
FDCP	Future Defence Civilian Program
FES	Flexible Engagements System
FTE	Full Time Equivalent
FAM	Future Accommodation Model
FLC	Frontline Command
GBS	Government Buying Standards
GGC	Greening Government Commitments
GHG	Greenhouse Gas
HVAC	Heating, Ventilation and Air Conditioning
ICT	Information and Communications Technology
IRMP	Integrated Risk Management Plan
IMS	Infrastructure Management System
ISOM	Infrastructure System Operating Model
kWh	Kilowatt Hour
MOD	Ministry of Defence
NATO	North Atlantic Treaty Organisation
PFI	Private Finance Initiative
POEMS	Project Orientated Environment Management System
RAF	Royal Air Force
RSPB	Royal Society for the Protection of Birds
SDG	Sustainable Development Goals
SDI	Strategy for Defence Infrastructure
SDSR	Strategic Defence and Security Review
SEAT	Sustainability & Environmental Appraisal Tools
SSSI	Sites of Special Scientific Interest
tCO_2e	Tonnes of carbon dioxide, equivalent
TLB	Top Level Budget
TRIAD	Tri Annual Demand
UKHO	United Kingdom Hydrographic Office
WCRP	Water Consumption Reduction Programme
WFA	Whole Force Approach