GHG report

Basis of reporting for NATS' airspace, energy and environmental performance data 2017-18

Collectively responsible

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1. Introduction

1.1. Purpose

This document details the greenhouse gas (GHG) collection, conversion and reporting process used to report our annual GHG emissions. The scope of this report includes both conventional estate related environmental and energy metrics, as well as modelled enabled Air Traffic Management (ATM) related CO_2 emission performance.

GHG emission data is prepared with reference to the World Resources Institute's (WRI) Greenhouse Gas Protocol (GHG Protocol) Corporate Standard and ISO14061.

GHG emission data is reported in accordance with ISO14064-1.

1.2. Scope of verification

The extent of verification is set out in Table 1 below.

	Verified to 'reasonable level' of assurance	Verified to 'limited level' of assurance	Not verified
Scope 1	X		
Scope 2 (location based)	X		
Scope 2 (market based)	X		
Scope 3 (category 1)	X		
Scope 3 (category 3a)	X		
Scope 3 (category 3b)	X		
Scope 3 (category 3c)	X		
Scope 3 (category 4)	X		
Scope 3 (category 6)	X		
Scope 3 (category 11)			X
Scope 4 (avoided)		X	

Table 1 - Scope of verification of GHG emissions

1.3. GHG disclosure policy statement

To guarantee that the GHG assertion held within the annual GHG disclosure is a true and fair account, the principles of relevance, completeness, consistency, transparency and accuracy shall be applied.

- Relevance: Ensure the GHG inventory appropriately reflects our GHG emissions and serves the decision-making needs of users – both internal and external to the company. Relevant information is identified as potentially necessary for inclusion in the mainstream report, for the purposes of communicating the extent to which we contribute to and are affected (now or in the future) by environmental impacts. GHG emissions shall be treated as material in all cases as a contributor to climate change.

- Completeness: Account for and report on all GHG emission sources and activities within the chosen inventory boundary, with disclosure and justification for any specific exclusion. Disclosures are complete if it includes all information that is necessary for an understanding of the matter that it purports to represent and does not leave out details that could cause information to be false or misleading to users.

- Consistency: Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series. Consistency refers to the use of the same standards, policies and procedures over time. Comparability greatly enhances the value of information to users; consistency is the means to achieving that objective.

- Transparency: Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

- Accuracy: Ensure accurate and up-to-date records through the development and introduction of procedures to form a reporting framework aligned to the GHG Protocol. The quantification of GHG emissions shall systematically neither over nor under actual GHG emissions, as far as can be judged, and uncertainties shall be reduced as far as practicable. Information shall be verifiable, i.e. characterised by supporting evidence that provides a clear and sufficient trail from monitored data to the presentation of environmental information. The information shall be sufficiently accurate to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

We therefore are committed to:

- Subjecting the chosen inventory boundary to regular internal review;
- Continual improvement and update of its policy and procedures to ensure it meets and complies with changes to the GHG Protocol and best practice GHG reporting;
- Regular re-assessment of GHG emission sources or development of action plans to identify and address gaps in data;
- Management of systematic processes to ensure that it meets all relevant provisions within the GHG Protocol standards;
- Inclusion of all relevant GHG emissions and enable meaningful comparisons in GHG information;
- Disclosure of sufficient and appropriate GHG information to allow intended users to make decisions with reasonable confidence;
- Recording, management and reporting of reliable and timely GHG information;
- The reduction of bias and uncertainties as far as is practical;
- Appropriate levels of independent verification and/or assurance.

2. Reporting requirements

2.1. Description of NATS

We are the main air navigation service provider in the United Kingdom (UK). We provide en-route air traffic control services to flights within the UK Flight Information Regions and the Shanwick Oceanic Control Area in the North Atlantic, and provide air traffic control services to airports in the UK and Gibraltar.

2.2. Person responsible for GHG reporting

Head of Environmental & Community Affairs, Ian Jopson, is responsible for reporting GHG emissions resulting from our operations.

Management, governance and oversight of Scope 1, 2, 3 and 4 emissions is provided by a technical Environmental Performance Moderation Panel, an Environmental Benefit Delivery Panel and an overall Portfolio Management Meeting, with parallel reporting to a Steering Group on behalf of the NATS Executive. Additional oversight is provided by the Board audit committee.

The audit committee has requested annual external audit of our airspace, energy and environmental performance data. In 2017-18 this was provided by DNV GL under the ISO 14064 standard. The level of verification is set out in Table 1.

2.3. Competency & training

GHG emissions inventory management is led by the Environmental & Community Affairs team, with close support from Facilities Management, Analytics, Finance, Supply Chain and other teams, who have relevant experience in GHG emissions calculations, reporting and assurance. Subject matter experts are responsible for individual areas of activity and overall governance falls to the GHG Focal Group, with coordination managed by a single person reporting to the Head of Environmental & Community Affairs.

Training requirements are kept under regular review as part of annual appraisals and internal management review. The implementation of the GHG Protocol was supported by external training.

In seeking external verification, we have gone to tender to procure these services from a firm who is accredited to do the work for our Scope 1-2-3 emissions under 14064-3. Annual verification is kept under review by the Board audit committee, the Head of Internal Audit and the Quality team.

2.4. Report period covered

This document specifies our methodology for the preparation of airspace, energy and environmental performance data in the Annual Report & Accounts (AR&A) for the reporting period 1st April 2017 – 31st March 2018.

2.5. Base year

Although we have been actively collecting and monitoring performance data since 2006, for the purposes of the ISO14064 verification, 1st April 2017 – 31st March 2018 is the first year that we have undertaken full data verification and is therefore the base year. The base year has been generated in accordance with ISO14064-1.

2.6. Organisational boundary

We apply the operational control method in order to consolidate our organisational boundary in each reporting year.

At the legal structure level, it is considered that we have operational control over an operating entity if we or one of our subsidiaries has the full authority to introduce and implement our environment policy at the operating entity.

NATS is split into two main business units which provide two distinct services:

- NATS (En Route) plc (NERL) — the regulated part of the business which provides air traffic management services to aircraft within the UK and part of the North Atlantic.
- NATS (Services) Ltd (NSL) — the unregulated part of the business which provides air traffic control services at 15 of the UK's major airports. NSL Ltd also includes a number of subsidiary companies.

NATS Holdings Ltd has authority to implement its environment policy within NERL and NSL.

We also have joint ventures (AQUILA Air Traffic Management Services) and FerroNATS, with a 50% ownership in each. NATS Holdings Ltd does not have authority to implement our environment policy within AQUILA and FerroNATS. However, AQUILA's office is co-located within our head office and is included in energy and environmental performance reporting.

The same operational control approach at the legal structure level shall be applied at the facility level in order to define responsibility for energy and environmental performance within facilities. We are therefore responsible for reporting energy and environmental performance that occur within facilities over which we or one of our operations has the full authority to introduce and implement our environment policy.

NATS Holdings Limited's estate portfolio includes freehold title, rental, lease, service agreements or licences, which includes the provision of a contract service at a number of locations. All freehold sites are included in Scope, unless they are sub-let, as well as leasehold sites where we have operational control. The estate portfolio includes control centres, airports, offices and warehouses, as well various types of remote communication, navigation and surveillance sites — some of which are co-located.

Under the operational control approach, fuel combustion, process and fugitive emissions from all sites under our control should be categorised as Scope 1 and GHG emissions from consumption of purchased electricity are categorised as Scope 2. Exclusions are listed in the next section.

We own vehicles (mainly for transport, logistics or engineering purposes) and leases vehicles (allocated and pool vehicles mainly for engineering purposes) using providers such as Arval, Inchcape and Volkswagen. Under the operational control approach, fuel combustion for these vehicles are categorised as Scope 1. Additional 'benefit' cars or Zenith salary sacrifice car scheme are considered not under our control and are therefore not included in Scope 1.

2.7. Documentation control

All GHG related records are stored on SharePoint which are subject to document control and tracking.

3. GHG emission statement

Emission source		2017-18 Emissions (tCO_2e)	kg CO_2e	kg CO_2e of CO_2 per unit	kg CO_2e of CH_4 per unit	kg CO_2e of N_2O per unit
Scope 1 Emissions	Direct emissions from combustion of natural gas	2086	2,086,280	2,082,248	2,938	1,094
	Direct emissions from combustion of road vehicle fuel - owned fleet vehicles	8	7,890	7,810	1	79
	Direct emissions from combustion of road vehicle fuel - leased vehicles - Fuel card	225	225,338	223,695	235	1,408
	Direct emissions from combustion of stationary assets (e.g. oil boilors, Back up generators)	377	377,460	348,203	407	28,850
	Fugitive emissions	1285	1,284,909			
Total Scope 1 emissions		**3,982**	**3,981,877**	**2,661,956**	**3,581**	**31,431**
Scope 2 Emissions (Location based)	Emissions from generated electricity usage	21,223	21,223,217	21,059,618	37,429	126,171
Scope 2 Emissions (Market based)	Emissions from generated electricity usage			20,627,816		
Total Scope 1 and 2 (Location based) emissions		**25,205**				

Emission source		2017-18 Emissions (tCO_2e)	kg CO_2e	kg CO_2e of CO_2 per unit	kg CO_2e of CH_4 per unit	kg CO_2e of N_2O per unit
Scope 3 Emissions	Category 1: Purchased goods and service - Indirect emissions from the supply and treatment of water	57	57,464			
	Category 3a Well to tank Purchased fuel	81	80,522			
	Category 3a Well to tank Natural Gas	315	315,495			
	Category 3a Well to tank Owned vehicles	60	59,564			
	Category 3b Well to tank emissions of purchase electricity (Generation and T&D losses)	3,700	3,699,997			
	Category 3c Downstream T&D losses of purchase electrcity	1,984	1,984,319	1,968,623	3,622	12,074
	Category 4: Upstream transportaiton and distribution-Courier	5	5,091	5,034	0	57
	Category 6: Business Travel- Direct emissions from combustion of road vehicle fuel - private vehicles	121	120,709	119,750	110	850
	Category 6: Business Travel-Indirect emissions from business travel (flights, rail, ferry)	5,447	5,446,680	5,419,117	533	27,031
	Category 6: Business Travel-Indirect emissions from business travel (car hire)	224.89	224,886	223,246	234	1,405
	Category 11: Emissions resulting from services			14,627,205		
Total Scope 3 emissions		**11,995**	**11,994,727**	**22,362,975**	**4,499**	**41,417**

Scope 4	**Modelled enabled ATM related CO_2 emission reduction**	**231,790**

There have been no removals or sinks of Greenhouse gas emissions in this reporting period.

Scope 1 + 2 intensity metric: (tonnes CO_2e per £m of revenue)	27.6	31.0
Scope 1 + 2 intensity metric: (tonnes CO_2e per average FTE employee)	5.9	6.6
Scope 1 + 2 intensity metric: (kilo tonnes CO_2e per flight handled)	10.0	11.6

Table 3 - GHG emission intensity ratios

4. Scope 1, Scope 2 and selected Scope 3 emissions

4.1. Emission factors

For Scope 1, Scope 2 and selected Scope 3 GHG emissions, we follow the most common approach to calculating GHG emissions from emission sources, which is to take activity data (e.g. units of electricity consumed or distance travelled) and multiply it by an emission factor which gives an estimate of the GHG emissions figure.

tCO_2e = Activity Data x Emission Factor

We use the UK Government GHG conversion factors in order to convert activity data into tCO_2e. These are updated annually by the Department for Business, Energy & Industrial Strategy and are available online here: **www.ukconversionfactorscarbonsmart.co.uk**. For the current reporting year (1st April 2017–31st March 2018) the 2017 emission factors have been used.

The table below indicates the methodology for the calculation of environmental performance metrics subject to external verification. For each metric we have provided an overview.

4.2. Methodology for calculating Scope 1 emissions

Source	Data measurement and recording	GHG emissions quantification	Estimates and Assumptions
Natural gas	Natural gas combustion is measured through the natural gas meters included within NATS' operational boundary. NATS receives invoices from the suppliers based on actual meter reads or estimate reads. The invoice data is collected by TEAM (Energy Reporting Company) Ltd on behalf of NATS using their proprietary billing validation system (TEAM Sigma). The kilowatt hours of natural gas used on site, as recorded on the invoices, are captured on the TEAM Sigma system. Manual meter readings are taken for some manned sites and are submitted to NATS FM Systems team via email. Manual meter reads are not used for greenhouse gas reporting but are used to query anomalous billing.	NATS uses the UK Government GHG Conversion Factors for company reporting (2017) in order to convert activity data in kWh into tCO_2e. Emissions from on-site natural gas combustion where NATS has operational control are classified as Scope 1 emissions.	Natural gas supplied at the Corporate & Technical Centre is also used by the Joint Venture AQUILA ATMS, as it is co-located at this site. However it is not sub metered. Therefore while Joint Ventures are out of Scope, the proportion associated with AQUILA ATMS usage has not been removed from NATS Holdings Ltd Scope 1 GHG emissions. **Estimates** NATS seeks to use primary data to calculate emissions wherever possible, however, in some cases data may not be available or of sufficient quality (e.g. due to lack of measurement capability, equipment replacements, equipment failures or billing issues) in which case secondary data, such as proxy data and extrapolation, will be used. Estimation techniques are prioritised based on primary data and proxy data. Where there is a full month gap in primary evidence, the equivalent period in the year previous will be used to estimate the accrual, or if not available, the equivalent period of the most recent actual data is used to estimate the accrual. Where there is a partial month gap in primary evidence, an average of the previous 6 months actual data is used to replace that partial month data in its entirety. Where the previous 6 months includes unrepresentative data, e.g. due to missing data, a rebate, or some other identifiable material change above/below expected consumption, the months containing that unrepresentative consumption are excluded from the average used to fill the substantive partial month gap. For new acquisitions, accruals are estimated based on a comparable site, where supplier estimates from previous tenants are unavailable Gas cylinders for BBQ's. A small number of gas cylinders may be used in a year at NATS Corporate head office for office BBQ's. The emissions from these have not been captured but are considered to be de minimus.

Source	Data measurement and recording	GHG emissions quantification	Estimates and Assumptions
On-site fuel combustion	Fuel usage data such as gas oil or diesel used in machinery or in buildings is captured through invoices. It is assumed that all fuel that is delivered is combusted. Many of the remote sites that are fitted with back-up generators consume low levels of oil and often have no reports of oil consumption in any particular reporting period. Metering of remote site back up generation has been considered, but is not considered to be cost effective. This data is reported based upon the quantities and types of fuel delivered during the reporting period and it is assumed that all fuel that is delivered is combusted.	NATS uses the UK Government GHG Conversion Factors for company reporting (2017) in order to convert activity volume data into tCO_2e. Emissions from fuel combustion on sites where NATS has operational control are classified as Scope 1 emissions.	It is assumed that electricity generated from oil usage is only used by NATS and not exported to the grid. It is possible that welding does occur on NATS site. Currently the emissions from this activity are not captured. It is considered that the emissions from this activity is de minimus but efforts will be made to obtain this activity data in future reporting years.
Fugitive emissions	Fugitive emissions data is collected for all sites where we have operational control. There are two external contractors across all sites that maintain the asset register information of the equipment containing refrigerant gases. This includes information about the equipment type, the charge capacity and the refrigerant type. Details of refrigerant 'top-ups' during the reporting period are captured on record sheets used for compliance with the EU F Gas Regulations which are consolidated into F-Gas Log Sheets (the format of these log sheets are specific to each contractor).	NATS uses the UK Government GHG Conversion Factors for the relevant reporting period (2017) in order to convert activity data (kg) into the component greenhouse gasses. Specific emission factors are used for specific refrigerant gases.	
Road vehicle fuel combustion	Liquid fuel combustion (diesel and petrol) within owned and allocated (lease fully paid and controlled by NATS) leased company cars (both deemed to be 'controlled' by NATS) is measured and recorded using both the company expenses system and a fuel card system	NATS uses the UK Government GHG Conversion Factors for the relevant reporting period (2017) for the relevant reporting period in order to convert activity data (km) into GHG emissions. Where the car type is known, a specific emission factor relating to these will be used. Where the car type and fuel type is unknown, an average car unknown fuel emission factor is used. Emissions from road vehicle fuel combustion in both owned and leased vehicles are classified as Scope 1 emissions where mileage is conducted for business use.	**Exclusions:** NATS operates 4 vehicles at Stansted and Heathrow airports. The fuel invoices for these vehicles was reviewed during the verification process and the data contained on them appears to be spurious. The emissions from these vehicles has therefore been excluded from the 2017/18 reporting cycle. The data and use of vehicles at these sites will be investigated in readiness for reporting requirements for 2018/19.

4.3. Methodology for calculating Scope 2 emissions

Source	Data measurement and recording	GHG emissions quantification	Estimates and Assumptions
Electricity consumption- Location based method	Electricity consumption is measured through the electricity meters included within NATS' operational boundary. NATS has partnered with Siemens Metering Services and now has automatic meter reader (AMR) technology installed across the majority of sites. Manual electricity meter reads for non-AMR sites are obtained when required and passed onto the supply company as required for billing. NATS receives invoices from the suppliers based on actual meter reads or estimate reads. The invoice data is collected by TEAM (Energy Auditing Agency) Ltd on behalf of NATS using their proprietary billing validation system (TEAM Sigma). The kiloWatt hours (kWh) of electricity used on site, as recorded on the invoices, are captured on the TEAM Sigma system. Manual meter readings are taken for some manned sites and are submitted to NATS FM Systems team via email. Manual meter reads are not used for greenhouse gas reporting but are used to query anomalous billing.	NATS uses the UK Government GHG Conversion Factors for the relevant reporting period (2017) in order to convert kWh activity data into tCO_2e under the location based method.	Electricity supplied at the Corporate & Technical Centre is also used by the Joint Venture AQUILA ATMS, as it is co-located at this site. However it is not sub-metered. Therefore while Joint Ventures are out of Scope, the proportion associated with AQUILA ATMS usage has not been removed from NATS Holdings Ltd Scope 2 GHG emissions. Electricity generated at four sets of on-site Photo Voltaic panels is used to supplement NATS' energy usage and not exported to the grid. **Estimates** NATS seeks to use primary data to calculate emissions wherever possible, however, in some cases data may not be available or of sufficient quality (e.g. due to lack of measurement capability, equipment replacements, equipment failures or billing issues) in which case secondary data, such as proxy data and extrapolation, will be used. Estimation techniques are prioritised based on primary data and proxy data. Where there is a full month gap in primary evidence, the equivalent period in the year previous will be used to estimate the accrual, or if not available, the equivalent period of the most recent actual data is used to estimate the accrual. Where there is a partial month gap in primary evidence, an average of the previous 6 months actual data is used to replace that partial month data in its entirety. Where the previous 6 months includes unrepresentative data, e.g. due to missing data, a rebate, or some other identifiable material change above/below expected consumption, the months containing that unrepresentative consumption are excluded from the average used to fill the substantive partial month gap. For new acquisitions, accruals are estimated based on a comparable site, where supplier estimates from previous tenants are unavailable.
Electricity consumption- Market based method	Same as for location based	Where the electricity contract has a published CO_2 factor this has been applied to the associated consumption from that contract. Where the electricity contract does no provide a suitable factor the residual UK factor has been applied. This is in accordance with the Market based hierarchy detailed in the GHG Reporting protocol.	

4.4. Methodology for calculating selected Scope 3 emissions

Source	Data measurement and recording	GHG emissions quantification	Estimates and Assumptions
Category 1: Purchased goods and service- Indirect emissions from the supply and treatment of water	Water data is collected through water meters included within NATS' operational boundary. NATS receives invoices from the suppliers based on actual meter reads or estimate reads. The invoice data is collected by TEAM (Energy Auditing Agency) Ltd on behalf of NATS using their proprietary billing validation system (TEAM Sigma). The volume of water used on site, as recorded on the invoices, are captured on the TEAM Sigma system. Limited sites are billed on rateable value (RV) rather than metered consumption and are not included in Scope but are considered de minimis.	NATS records water consumption in cubic metres (m^3) as recorded on invoices from third party providers. The consumption figures are converted into GHG emissions using the UK Government GHG Conversion Factors for the relevant reporting period (2017) for the supply and treatment of water. m^3 x Defra conversion factor for supply of water + m^3 x Defra conversion factor for the treatment of water.	Limited sites are billed on rateable value (RV) rather than metered consumption and are not included in Scope but are considered de minimis.
Category 3: Fuel-and energy-related activities-T&D losses	See Scope 2 for the collection of electricity data	The electricity data is converted into T&D losses using the UK Government GHG Conversion Factors for the relevant reporting period (2017) kWh x conversion factor for T&D losses for UK electricity	
Category 3: Fuel-and energy-related activities- Well to tank (Electricity	See Scope 2 for the collection of electricity data	The electricity data is converted into T&D losses using the UK Government GHG Conversion Factors for the relevant reporting period (2017). kWh x conversion factor for Well to tank electricity losses for UK electricity	
Category 3: Fuel-and energy-related activities- Well to tank (Natural Gas)	See Scope 1 for the collection of Natural Gas	Natural Gas activity data multiplied by the conversion factor for Well to Tank- natural gas using the UK Government GHG Conversion Factors for the relevant reporting period (2017)	
Category 3: Fuel-and energy-related activities-Well to tank (Fuel)	See Scope 1 for the collection of fuel activity data	Fuel data multiplied by the conversion factor for Well to tank for the relevant fuel using the UK Government GHG Conversion Factors for the relevant reporting period (2017)	
Category 4: Upstream transportation and distribution- Courier	Courier emissions data refers to the emissions generated as a result of courier deliveries for NATS business purposes. Courier vehicle and miles travelled data is made available in monthly reports by the NATS courier company CitySprint. Data is sent from CitySprint on a monthly basis. The Courier Carbon Calculator monthly reports are sent to the Environment Manager who then aggregates this data into a spread sheet entitled Courier Total Miles	The Courier Total Miles spread sheet containing the validated courier data for the reporting period is converted into GHG emissions by multiplying the activity data by the UK Government GHG Conversion Factors for the relevant reporting period (2017).	

Source	Data measurement and recording	GHG emissions quantification	Estimates and Assumptions
Category 6: Business Travel- Direct emissions from combustion of road vehicle fuel - private vehicles	This refers to transportation in vehicles owned by employees and not NATS. Mileage data is extracted from the NATS expenses system.	Extracted milage data is multiplied by the relevant GHG factor. NATS uses the UK Government GHG Conversion Factors for the relevant reporting period (2017) in order to convert mileage data (km) into GHG emissions. Where the car type is known, a specific emission factor relating to these will be used. Where the car type and fuel type is unknown, an average car unknown fuel emission factor is used.	
Category 6: Business Travel-Indirect emissions from business travel (public transport)	This refers to transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by NATS) and includes the Scope 1 and Scope 2 emissions of transportation carriers that occur during use of vehicles (e.g. from energy use). The requirements for air travel data, from the NATS travel agent, are as follows (in addition to the normal personal & booking information): All public transport (air, train and ferry) data is reported to NATS by a single travel provider. An annual report for each transport type is produced which details the mode, distance and class of travel to allow for GHG conversion.	**Air travel** Flights shall be organised into three categories according to distance to match with the DEFRA methodology for calculating flight emissions: – Any passenger km journey 755 km or less shall be considered "domestic", regardless of country origin/ destination i.e. the longest flight in the UK is Inverness-Gatwick 754 km; – Any passenger km journey 756-3,700 km shall be considered "short haul", regardless of country origin/ destination; – Any passenger km journey 3,700 km or greater shall be considered "long haul"; – Each category corresponds to an equivalent "Haul" in the DEFRA conversion factors in Table 1, i.e. domestic, short haul or long haul. Flights shall also be categorised according to class of travel: – Each flight shall list the class of travel. Where this is unavailable and/ or unknown, the average passenger conversion factor shall be used as outlined by DEFRA in Table 1. Radiative Forcing: – The GHG emissions for each flight are calculated with RF (Radiative Forcing) Equation: 1. **Flights**: Domestic/short/long haul x Class x passenger.km x with RF emissions factor (kg CO_2e) 2. **Flights**: Domestic/short/long haul x Class x passenger.km x without RF emissions factor (kg CO_2e)	

Source	Data measurement and recording	GHG emissions quantification	Estimates and Assumptions
		Train travel The requirements for the train travel data are as follows (in addition to the normal personal & booking information): Each journey shall be split up into different legs where more than one type of rail transport is used, i.e. national, international, light rail & tram and London Underground journeys; Each journey will indicate the distance (km) travelled; Each leg will indicate the class of travel; The staff traveller categories should be clearly differentiated i.e. NATS, Aquila/ MoD, etc. **Rail**: National / International / Light Rail & Tram / LU passenger.km x emissions factor (kg CO_2e) **Direct business ferry travel** The requirements for the ferry travel data are as follows (in addition to the normal personal & booking information): Each journey should be split up into different legs where more than one type of ferry transport is used, i.e. foot passenger, car passenger, average; Each journey should indicate the distance (km) travelled; – The staff traveller categories should be clearly differentiated i.e. NATS, Aquila/MoD, etc. Calculation steps Equation: Ferry: Foot / Car / Average passenger.km x emissions factor (kg CO_2e)	
Cat. 6 Business Travel- Car hire	This refers to the emissions generated from the use of car hire. NATS uses a single car hire provider. An annual report detailing the mileage covered on the NATS contract is provided.	Kilometre data is generated from our car hire provider and converted into GHG emissions using the appropriate emission factors. Where the vehicle type is not known an average vehicle and average fuel conversion figure is applied.	

4.5. GHG inventory quality management & calibration requirements

NATS has no calibration duties.

Emission source	Quality management process	Uncertainties and calibration requirements
Electricity, gas and water data	TEAM (Energy Auditing Agency) Ltd performs an on-going validation process on electricity, gas and water data which is designed to highlight: – Meters without data when data is expected – Meters where invoiced and AMR (Automatic Meter Reads) data do not align – Meters where consumption variance outside of tolerance – Meters where Year on Year variance is outside of tolerance The validation results in queries being generated directly with suppliers. Where necessary queries will be address to the NATS FM Systems team to validate discrepancies identified. This is an on-going process which results in a monthly query report.	**Gas** As Swanwick (one of our major sites) is included in the EU Emissions Trading Scheme, we feel it appropriate that the principles (detailed below) are followed with respect to statements of our overall uncertainty. As a "low emitter" [from the consumption of gas], there is a principle described on page 57 of the document "European Union Emissions Trading System (EU ETS) Phase III: Guidance for installations" to assume all gas metering has an accuracy class of 1.5 and therefore to adopt 6% as its Maximum Permissible Error in Service (MPES) for gas consumption. **Electricity** For the consumption of electricity in the UK, "The Meters (Certification) Regulations 1998" [21] state that: The permitted margins of error shall be an error not exceeding plus 2.5 per cent. or minus 3.5 per cent. at any load at which the meter is designed to operate
On-site fuel combustion	The NATS Finance team check the fuel invoicing as part of the standard financial internal audit process. In addition, the fuel combustion data is checked via both internal and external audit at the Swanwick site (the largest consumer of fuel) which is included within the EU-ETS.	EU ETS gas oil is 0.5% for de minimis.
Fugitive emissions	NATS completes regular compliance audits across the estate as part of the management of ISO14001:2015, this includes an assessment of the compliance with fluorinated gas regulations.	
ATM related CO_2 emissions	NATS has two primary internal standards for quality management, in addition to governance systems. The first standard focuses on ATM fuel / CO_2 emissions benefits from small scale airspace changes and inventory management. The second standard focuses on all remaining ATM fuel/CO_2 emission benefit claims, other than large scale airspace change benefits, and includes the process for internal auditing of data and controls.	For ATM related CO_2 emissions savings the majority of assessments are modelled. As industry standards and best practice is followed when undertaking this assessment, uncertainty is minimised. Other assessments are based on full year actual data with the exception of FUA analysis. In the latter case the analysis is deliberately conservative in order to avoid overestimation of fuel savings. None of the potential sources are thought to be material.

5. Scope 3 category 11 and Scope 4 emissions

5.1. Acknowledgements

ATM related fuel/CO_2 emissions data is prepared using the Base of Aircraft Data (BADA) models and data. This product has been made available by the European Organisation for the Safety of Air Navigation (EUROCONTROL). All rights reserved.

5.2. Emission factors

For Scope 3 category 11 and Scope 4 emissions, we take activity data and multiply it by an emission factor which gives an estimate of the CO_2 emissions figure.

tCO_2 = Activity Data x Emission Factor

NATS uses a fuel: CO_2 ratio of 1:3.18 as specified by our regulator[1] in order to convert activity data into tonnes CO_2. This conversion factor is consistent over time.

5.3. ATM CO_2 emissions baseline

Estimates of the CO_2 emissions that resulted from the operation of aircraft handled in 2006 were generated so that we can track progress towards a March 2020 target of reducing ATM related CO_2 emissions by 10% on average per flight. This information demonstrated the performance towards this target through the separate assessment of the three forms of our operations, namely:

- Ground movements at UK airports where we provide a tower service
- UK domestic airspace (London and Scottish Flight Information Regions)
- North-Atlantic operations (Shanwick sector)

5.4. Principles of ATM related CO_2 impact assessments

5.4.1. ATM related CO_2 emissions and the GHG protocol

ATM related CO_2 emissions, i.e. the CO_2 emissions from fuel burnt in aircraft engines in the UK FIR, Shanwick airspace and airports where we provide a tower service. Under the GHG Protocol, we interpret that these emissions fall within Scope 3 category 11.

We have opted to refer to the outcome of our efforts to reduce these Scope 3 category 11 emissions as Scope 4 emissions.

To date the corporate sector mainly reports Scope 1 and Scope 2 emissions which they are directly responsible for. However there are a growing number of companies reporting Scope 4 emissions, i.e. indirect avoided emissions. While we wait for agreed guidance and standards to catch up with this innovation, we seek to be transparent and consistent in our approach to GHG inventory management and reporting of Scope 4 emissions.

Aircraft fuel burn/CO_2 emissions avoided as a result of our actions are modelled for the domestic UK FIR, airports where we provide a tower service and Shanwick airspace. Using various data sources, tools and assumptions avoided ATM related CO_2 emissions are calculated for a given year (as set out in section 5.5).

1 CAA CAP1616a Airspace Design: Environmental requirements technical annex

5.4.2. Enabled savings

NATS' focus for environmental benefit analysis of ATM related GHG is to identify 'enabled benefits'. Enabled benefits are those attributable to changes in our procedures of operation (for example the introduction of more efficient routes).

The modelled enabled savings delivered during the financial year are aggregated on the basis of the project having been implemented in the given year, i.e. the changes we have implemented have enabled savings which are available to airlines to flight plan accordingly.

We have no direct control over how the airlines flight plan across our network, but we can estimate how much traffic is likely to take advantage of the change we have enabled. As a result, and with the agreement of our stakeholders who are interested the pace of implemented change, benefits from airspace projects (i.e. safety, cost, fuel/CO_2, capacity, etc.) are accrued in full in the year of implementation, typically aligned with the AIRAC cycle , rather than split pro-rata based on the implementation date in the reporting year.

The majority of enabled savings are calculated by comparing the new flight procedures/plans versus the old procedure/plans and are based on flight plans rather than the actual tracks flown. In doing so the metric aims to reflect the improvements we are able to implement to the ATM network structure and operating procedures available to airlines.

5.4.3. Actual savings

A subset of enabled savings take into account 'tactical' changes such as controllers facilitating more direct routes through the current structure of controlled airspace, and actual aircraft movement data (e.g. in the assessment of changes in taxi-time performance).

5.4.4. Data modelling

All ATM related fuel/CO_2 emission data is modelled based on the best available data, tools and estimation techniques, in the absence of access to airline flight management system data.

Model output is calculated in tonnes of fuel, and may be abbreviated in reports to the kilo tonne (kT), which is aggregated and then converted to CO_2. As a result some rounding may occur, but is de minimis.

5.4.5. Primary data sources

We use a number of data sources to undertake these assessments. The primary sources are:

- Central Flow Management Unit (CFMU) flight plan data, sourced from EUROCONTROL and stored in NATS' data warehouse;
- Radar data and stored in the our data warehouse;
- Airspace data, covering routes and navigation points, sourced from the CFMU and stored in our data warehouse.

5.4.6. Fuel uplift

Fuel uplift is fuel which is burned merely to carry other fuel. For example, an airspace change may save 50 kg of fuel per flight, but extra fuel would have been uploaded and burned merely transporting that 50 kg until it was burned. We have analysed the relationship between distance flown and the percentage of fuel uplift using flight planning software and found it to be linear. We use this linear relationship to calculate the percentage of fuel uplift which should be applied to fuel savings based on the distance flown from the origin airport to the end of the procedural change that is being quantified.

5.4.7. Toolset

A number of industry standard and bespoke tools are used to model ATM fuel/CO_2:

- Aviation CO_2 emissions data is prepared using the EUROCONTROL Base of Aircraft Data (BADA) models and data. This product has been made available by the European Organisation for the Safety of Air Navigation (EUROCONTROL). All rights reserved.
- We have implemented the BADA aircraft performance and fuel models in an in-house toolset called NEMO (NATS Environmental Model). NEMO is used to calculate fuel burn for all aircraft trajectories held within our data warehouse.
- To make comparisons between a current procedural profile and a proposed procedural profile (for example for Airspace Efficiency Database), we have also created a Profile Generating Tool that uses the BADA aircraft performance data to generate 4D flight profiles. NEMO is also used to calculate the fuel burn for these simulated procedural profiles.
- NEMO calculates the fuel using: altitude; speed; aircraft type; phase of flight (i.e. cruise, climb or descent); and aircraft mass. NEMO uses these inputs combined with the BADA performance models to calculate the mean fuel flow for each radar point.
- Simulated trajectories, from the Profile Generating Tool, are defined by a series of 'flight legs' — sections of the flight profile for which the height, speed and phase of flight of the aircraft is constant. NEMO uses the same inputs (altitude, speed, aircraft type, phase of flight, aircraft mass) and BADA performance models and calculates the fuel flow for each flight leg.
- The Oceanic Air Traffic Simulator (OATS) is a bespoke fast-time simulation model which estimates the environmental performance of flights crossing the North Atlantic under various operational concepts. The tool simulates daily demand and optimises the routes for total fuel burn, using meteorological data to adjust aircraft speed, flight time and calculates the changes to fuel burn as a result of airspace network changes.
- The FUA profile generating tool was developed to improve the accuracy of Special Use Areas usage and maximise network efficiency for airlines. The tool analyses the relevant airspace sectors and calculates the benefits.

5.5. Types of operational changes assessed

On an on-going basis we operate a number of different project types which contribute to the enabled savings through planned and tactical changes.

5.5.1. Airspace Efficiency Database

Airspace Efficiency Database (AED) changes are small-scale proposed changes that relate to routings or level restrictions, usually developed by controllers at our units. For example, a minor re-definition of a high-level route to remove a dog-leg, or raising a standing agreement level for traffic to improve fuel efficiency. The methodology for calculating the change in fuel burn is to compare the current planned route to the proposed planned route. We enable fuel benefits through AEDs by making changes to the airspace structure, within controlled airspace. As such the enabled savings performance reported is based on changes to planned routes. The metric is not designed to validate emission reductions based on actual flight routes taken.

5.5.2. Continuous Climb and Descent

Arrivals and departures to and from airfields are most fuel efficient if aircraft can perform continuous climbs and descents (termed CCOs and CDOs). We enable improvements in this performance through engagement at a strategic level with airlines and airports providing data on achievement levels to target improved performance, through Sustainable Aviation. Controllers also enable improved performance in their day-to-day control and through provision of distance-to-run information to pilots.

5.5.3. Taxi-time

Fuel burnt whilst taxiing between stands and the runway at airports (taxi-time) can be reduced by initiatives to reduce ground holding times. We seek to minimise taxi-times at the airfields we operate a service at and so includes any changes in this ground fuel use in the annual assessments.

5.5.4. Tactically Enhanced Arrivals Mode (TEAM)

At Heathrow Airport, the Department for Transport recognises that arrival demand may exceed capacity and we are permitted to employ Tactically Enhanced Arrivals Mode (TEAM) which allow aircraft to land on the designated departure runway to reduce stack-holding delay. We optimise TEAM operations to reduce this delay and its associated fuel burn.

5.5.5. Flexible Use of Airspace

We work closely with the military to maximise both the amount of time that Special Use Areas (SUA) are available for civil use and the amount of notice that civil aircraft are given to enable airlines to plan efficiently. When a Special Use Area is available to civil aircraft, this enables flights to plan shorter routes. NATS and the MOD work to improve both the availability of these routes and the notice period of their availability so that the airspace can be used as flexibly and efficiently as possible. Our assessment estimates the fuel/CO_2 impact of changes in the availability of Special Use Areas for civil use. This is also known as Flexible Use of Airspace (FUA).

5.5.6. North Atlantic improvements

Improvements to Oceanic airspace (Shanwick is the section of the North Atlantic airspace under our control) include the Reduced Lateral Separation Minima (RlatSM) project, which implemented a smaller lateral separation standard in oceanic airspace. This allows the track structure to be laterally concentrated so that it improves the efficiency of the oceanic tracks.

The STAMPER project deployed further reduced separation standards, improvements to controller tools and concluded oceanic reduced longitudinal and lateral separation minima operational trials.

5.6. Methodology for calculating Scope 3 category 11 and Scope 4 emissions

The initiatives which contribute to the CO_2 enabled benefit claim for the financial year 2017–18 are from small-scale projects and tactical improvements including: Airspace Efficiency Database (AEDs), Flexible Use of Airspace (FUA), changes to continuous climb and descent (CCO/CDO), taxi-time changes, and TEAM. For all changes that can affect airline flight planning, the benefit to fuel uplift is also calculated and claimed.

5.6.1. Airspace Efficiency Database

The changes assessed during the 2017-18 financial year were:

- Route changes
- Level restriction changes

The methodology is to compare the current flight procedures/ plan to the proposed (or scenario) flight procedures/ plan. Our data warehouse is used to identify the total number of aircraft per year that would be affected by the change. A summary of the methodology is:

- Extract traffic that would be affected by the route/level change for the most recent complete calendar year from the BI Data Warehouse
- Obtain the current flight procedures and create 'scenario' procedures for each aircraft type
- Calculate the fuel of the current procedures and scenario procedures for each aircraft type
- Calculate the total enabled benefit by summing the (benefit) × (annual number of aircraft) over all aircraft types
- Calculate the additional fuel uplift benefit

Data and models used:

- Data source: Flights in NATS data warehouse
- Data sample: All flights that used the route in the most recent calendar year
- Tools: NEMO and NATS Profile Generator
- Models: BADA aircraft performance and fuel models as contained in NEMO; NATS fuel uplift equation.

5.6.2. Continuous Climb and Descent

Changes in continuous climb and descent (CCO and CDO) performance, and the resulting impact on fuel burn, are captured in our annual assessment. A summary of the methodology is:

- The radar data within the data warehouse is queried to identify whether climbs and descents out of and into airfields are continuous or whether a level-off occurs
- Continuous climbs are generally measured up to 10,000 ft and continuous descents are measured from variable altitudes which take into account the configuration of airspace around the airfield
- The fuel benefit based on the fuel difference between a typical CCO/CDO versus a non-CCO/CDO with a 5 nautical mile level-off for the most frequent aircraft type at the airfield in question
- Year on year comparisons can be either positive i.e. fuel saving benefit, or negative i.e. fuel saving disbenefit and are recorded accordingly

Data and models used:

- Data source: Flights in the data warehouse
- Data sample: All flights in the financial year at each of the NATS-controlled airfields
- Tools: NEMO and NATS Profile Generator
- Models: BADA aircraft performance and fuel models as contained in NEMO

5.6.3. Taxi-time

Changes in performance year-to-year are monitored and captured in annual assessments. A summary of the methodology is set out below.

The data warehouse contains records from the airports' electronic flight strips (EFPS) which record the instructions which controllers give to aircraft. The average arrival taxi-time is calculated as the difference between the touch down and arrival at the stands. The average departure taxi-time is calculated as the time between push-back from the stand and the line-up at the runway.

The yearly fuel burn change at each airport is calculated by multiplying:

- Average ground fuel burn
- The change in taxi time from the previous year
- The number of movements.

Year on year comparisons can be either positive i.e. fuel saving benefit, or negative i.e. fuel saving dis-benefit and are recorded accordingly.

Data and models used:

- Data source: Flights in the data warehouse
- Data sample: All flights in the financial year at each of the NATS-controlled airfields with EFPS
- Tools: No bespoke tools
- Models: BADA aircraft performance tables

5.6.4. Tactically Enhanced Arrivals Mode (TEAM)

Changes in performance year-to-year are monitored and captured in annual assessments. A summary of the methodology is:

- The data warehouse is used to identify the number of TEAM arrivals per hour i.e. flights that landed on the designated departure runway
- The average stack holding time in these hours is also calculated from records in the data warehouse
- The total number of minutes of stack holding saved as a result of TEAM is then estimated by multiplying the average holding time by the number of TEAM arrivals
- The total number of minutes saved is multiplied by the average stack fuel burn to give to total amount of fuel saved in the year
- Year on year comparisons can be either positive i.e. fuel saving benefit, or negative i.e. fuel saving disbenefit and are recorded accordingly

Data and models used:

- Data source: Flights in the data warehouse
- Data sample: All Heathrow arrivals in the financial year
- Tools: No bespoke tools
- Models: BADA fuel models as calculated by in NEMO and stored in the data warehouse

5.6.5. Special Use Airspace

For this analysis each of the SUA groups across the UK is analysed. The benefit in each group is calculated using the methodology:

- For each departure-destination routing that uses the SUA, identify the best available planned route through the SUA
- Calculate the track extension between the best available planned route though the SUA and the routes that do not use the SUA
- Calculate the proportion of flights that used the SUA in the baseline and in the current financial year
- The track distance saving of the SUA compared to the alternative route is calculated using the fuel burn per nautical mile at the average requested flight level of the aircraft type
- The overall fuel impact is calculated for each departure-destination pair in each SUA as (change in track extension) x (number flights in the year) x (average fuel burn)
- Year on year comparisons can be either positive i.e. fuel saving benefit, or negative i.e. fuel saving dis-benefit and are recorded accordingly

Data and models used:

- Data source: Flights in the data warehouse
- Data sample: All flights that used the SUA groups in the most recent calendar year
- Tools: NEMO and FUA profile generating tool
- Models: BADA aircraft performance tables

5.6.6. Reduced Lateral Separation Minima (RLatSM Phase 2)

For this analysis, a bespoke Oceanic airspace simulator was used to calculate the optimal track structure both before and after the change in separation minima. A sample of 14 days data was used which were selected to cover the key variables (summer/winter; weekday/weekend, northerly, southerly or split tracks). For each day, the methodology was:

- Calculate the optimal route profile for each aircraft
- Assign aircraft using the oceanic track structure to an oceanic track. For the baseline, the track structure is separated by 50.5NM. This is reduced to 23NM for the RLatSM Phase 2 scenario
- Simulate each day using both scenarios, applying the appropriate separation standards.
- Calculate the average fuel burn per flight for both scenarios
- The fuel benefit per flight is the difference between the two
- The fuel impact in the 14-day sample is then annualised using a weighted sum where the weightings reflect the distribution of day-types throughout the year (summer/winter, weekday/weekend, etc.)

Data and models used:

- Data sources: Flights in the data warehouse, GRIB meteorological data
- Data sample: 14 days to capture the key variables in demand
- Tools: Oceanic Air Traffic Simulator
- Models: BADA aircraft performance tables

5.6.7. STAMPER

The methodology for the benefit assessment is similar to that used for RLatSM above, with the technical changes STAMPER delivers for ADS-C/CDPLC/RNP4:

- Longitudal from 10 to 5 minutes
- Lateral no change (23 NM or 0.5 degrees)
- Vertical no change (1,000 ft)
- Intersecting tracks from 10 to 5 minutes

For operational reasons, the STAMPER benefit assessment used a sample of 7 days of traffic compared to a sample of 14 days used with RlatSM in the OATS model. The STAMPER data was then extrapolated based on the average of the days that were modelled.

5.6.8. UK ATM related CO_2 emissions

Aircraft fuel burn/CO_2 emissions are modelled for the domestic UK FIR and six airports equipped with Electronic Flight Progress Strips (EFPS), but other airports where we provide a tower service and Shanwick airspace are excluded at this time. Using a Business Intelligence platform, EFPS, radar data and tools reviewed in this section, the CO_2 emissions are calculated for actual traffic in a given year.

5.7. Changes to quantification methodologies previously used

ATM GHG data marked * has been restated to reflect improvements in the accuracy of modelling and in the quality and availability of industry data, updates to traffic forecasts, and changes to NATS' airport portfolio. In particular:

- The TEAM methodology has been revised
- The FUA methodology and tool has been revised
- Actual traffic has replaced forecast traffic for the reporting year

In addition, there has been a change in the source reference of the CO_2 emissions factor of 3.18 from our Regulator, the CAA. Previously the source was document CAP725 which has now been replaced by document CAP1616 and CAP1616a. The emissions factor remains unchanged.