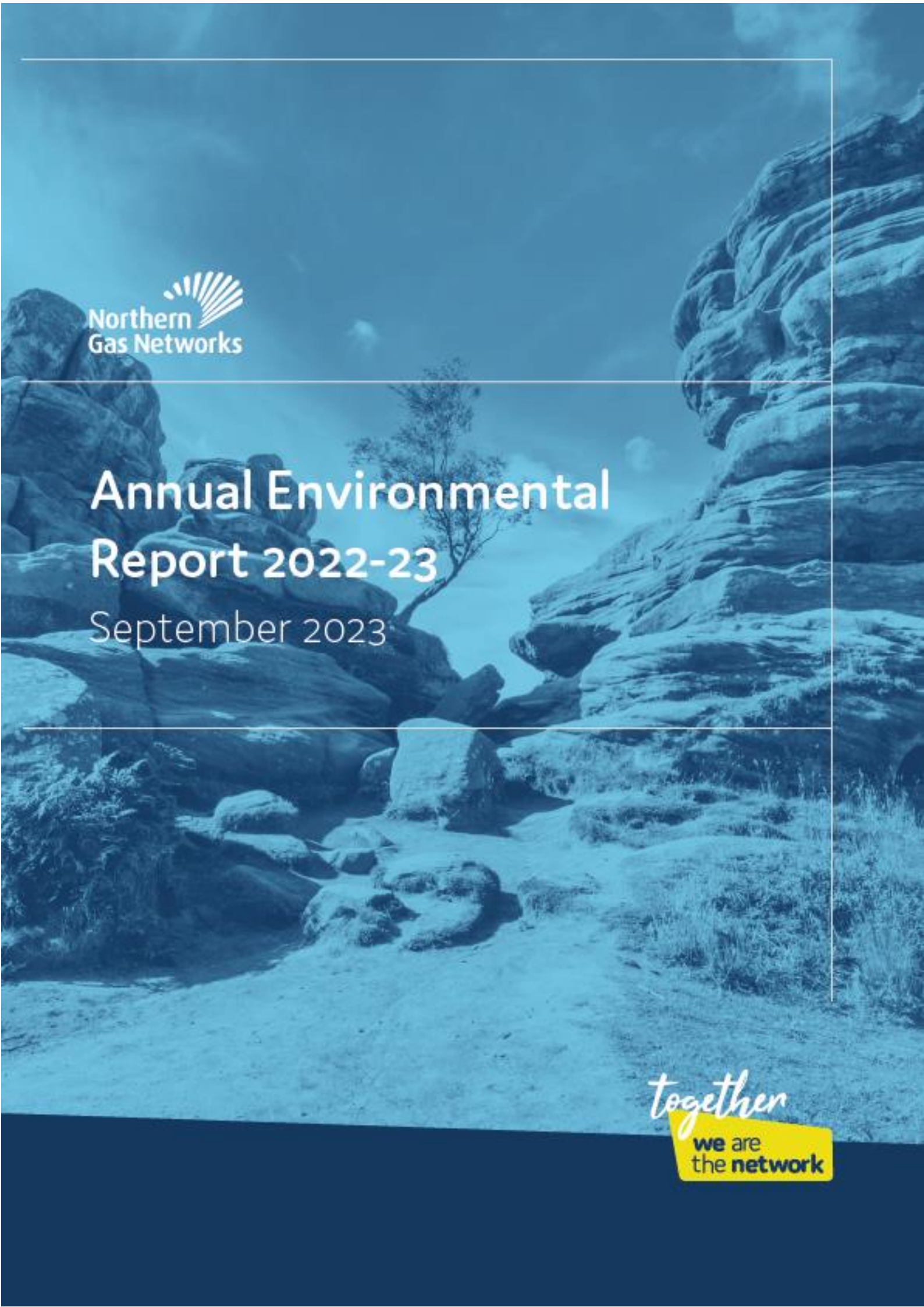

Northern
Gas Networks
Annual Environmental
Report 2022-23
September 2023
together
we are
the network

Contents

Report approved by:	Greg Dodd Regulation & Strategic Planning Director Northern Gas Networks
Date:	27 September 2023

A word from our CEO, Mark Horsley and our Head of Environment and Sustainability, Neil Whalley

The energy industry is changing at an incredible pace. Climate change, the cost-of-living crisis and geopolitical uncertainties pose significant challenges that our sector must rise to at an unprecedented rate.

Customers and stakeholders have told us they want networks to develop clean and sustainable forms of energy, and to identify a clear pathway towards net zero, whilst actively reducing the environmental impacts of our business operations now and keeping bills down.

Our Environmental Action Plan contains clear commitments that will transform our environmental performance, from reducing our gas leakage, decarbonising our vehicle fleet and producing less waste. We are working hard with our supply chain to achieve these commitments and we are showing pleasing progress which is delivering environmental improvements for our region, in particular our efforts to reduce gas leakage and improve sustainability in our supply chain. Meanwhile, our work to develop solutions that support the energy transition to net zero has continued to progress and provide vital answers to how network conversion to 100% hydrogen could happen.

As the RIIO-GD2 regulatory period continues, sustainable thinking and action remains more important than ever in supporting delivery of our overarching objectives: provide a safe, reliable gas service; support the transition to net zero; continue to modernise our operations and provide help to our vulnerable customers.

Mark Horsley

Chief Executive Officer, NGN

During 2022/23 we have continued to deliver on our Environmental Action Plan commitments, with specific focus on tackling our most significant environmental impacts. We have achieved excellent performance in gas leakage reduction, our biggest single greenhouse gas emission, and supply chain compliance with our new UN Sustainable Development Goals aligned Supplier Code of Conduct.

Our Environmental Action Plan was consciously ambitious and achieving our commitments remains challenging, in particular in the face of wider economic and geopolitical uncertainties. We believe they can be achieved through innovation, collaboration and long-term thinking to the benefit our stakeholders and region.

Our customers tell us that environmental performance remains a high priority to them, despite the cost-of-living crisis, and we work hard every day to meet this expectation. We have also listened to our stakeholders to improve the presentation of our environmental performance in this report to meet their requirements.

Neil Whalley

Head of Environment and Sustainability, NGN

1 Introduction

1.1 About us

We are Northern Gas Networks (NGN), the gas distributor for the North of England. We keep 2.7 million homes and businesses cooking on gas, through our vast underground pipe network.

We are committed to providing a safe, reliable and great value service to our customers and stakeholders, while exploring the potential for new technologies to deliver low carbon energy, such as hydrogen, through our network to support a greener future. Innovation underpins everything we do – whether we are replacing pipes, fixing leaks, developing low carbon energy solutions or supporting our most vulnerable customers.

By thinking differently, listening to our colleagues and stakeholders, working closely with our partners and considering our communities, we are pushing the boundaries of what a utility company is capable of.

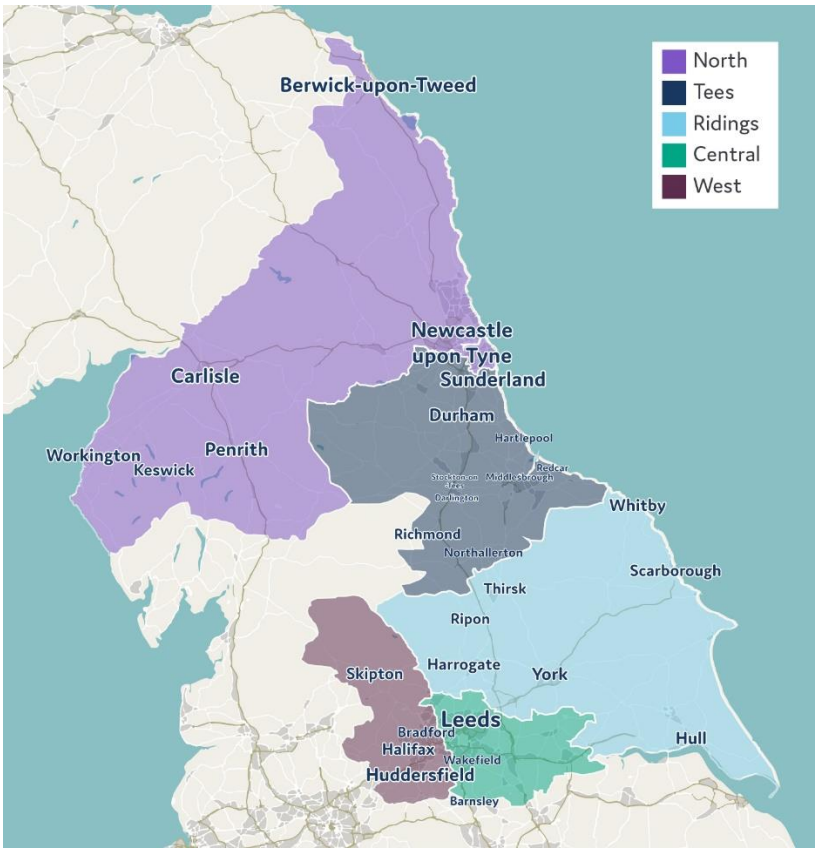


Figure 1 – Our network region

1.2 About this document

This document constitutes NGN's Annual Environmental Report for the period 1 April 2022 to 31 March 2023, publication of which is a licence obligation for the RIIO-2 gas distribution price control. This document has been completed in accordance with RIIO-2 Environmental Reporting Guidance,

Version 1.0, Ofgem, 2 March 2021[1] ('reporting guidelines' herein) and should be read in conjunction with our RIIO-2 Environmental Action Plan (EAP)[2].

Like other gas distribution networks in Great Britain, NGN is a regulated business and operates under a licence issued by the Office of Gas and Electricity Markets (Ofgem) and is also subject to common statutory requirements which are overseen by the Department for Business, Energy and Industrial Strategy (BEIS), the Health and Safety Executive (HSE) and the Environment Agency (EA). Allowed revenues for NGN, including for environmental protection, decarbonisation and adaptation to climate change, are currently set by Ofgem in periodic price reviews and require submission of a detailed business plan. Between 1 April 2021 and 31 March 2026 we are operating under the RIIO-Gas Distribution 2[3] ('RIIO-2' herein) price control framework. Prior to this we operated under the RIIO-Gas Distribution 1 ('RIIO-1' herein) price control framework between 1 April 2013 and 31 March 2021.

Our latest business plan included commitments to deliver an environmentally sustainable network[4], including an Environment Action Plan (EAP) which committed us to a series of actions to reduce the environmental impacts of our business operations, decarbonise our business, and support a net zero carbon future aligned to the United Nations Sustainable Development Goals (UN SDGs). Our EAP was built on strong stakeholder engagement evidence to ensure that we met the needs and expectations of our stakeholders. A summary of our RIIO-2 EAP commitments is provided in Figure 2.

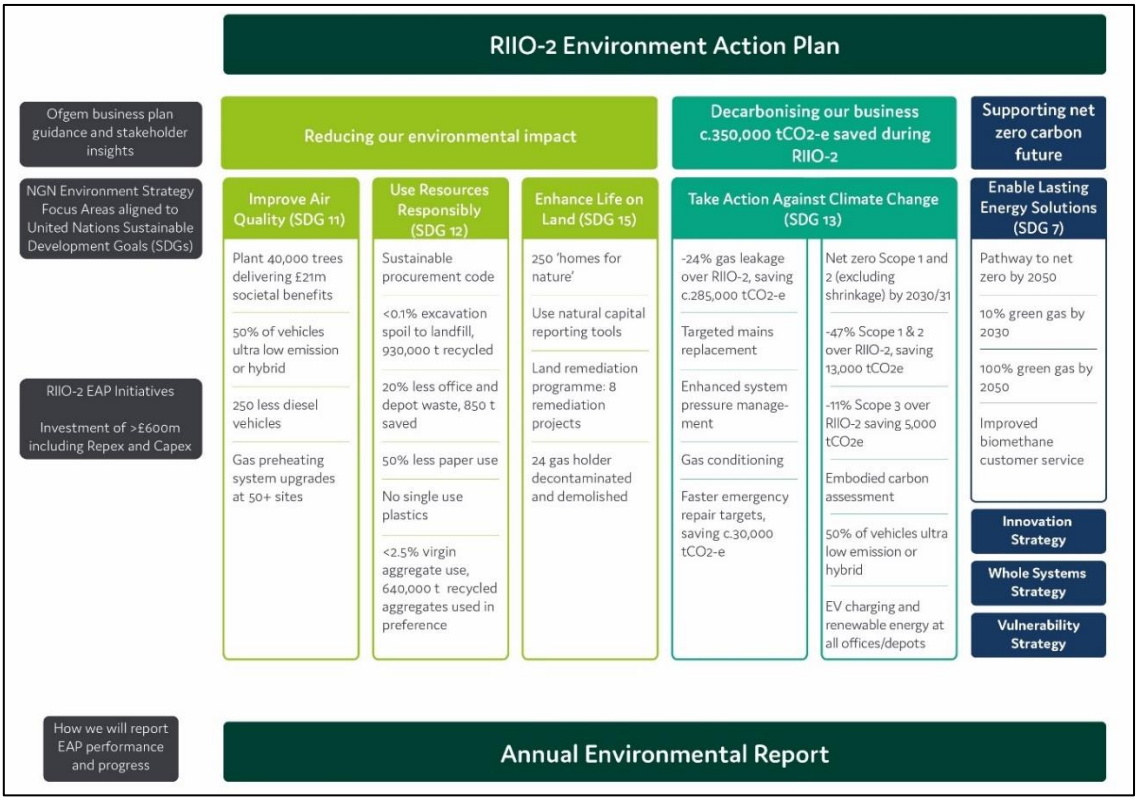


Figure 2 – Our Environment Action Plan for 2021 to 2026 (RIIO-GD2)

[1] https://www.ofgem.gov.uk/publications/riio-2-environmental-reporting-guidance

[2] https://www.northerngasnetworks.co.uk/wp-content/uploads/2019/12/A8-NGN-RIIO-2-Enviromental-Action-Plan.pdf

[3] https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/network-price-controls-2021-2028-riio-2

[4] See Section 4.4 of our RIIO-GD2 business plan: https://www.northerngasnetworks.co.uk/wp-content/uploads/2019/12/NGN-RIIO-GD2-Business-Plan-2021-2026.pdf

We have established a long term sustainability agenda for ourselves and our supply chain as demonstrated in our People and Planet Strategy[5] launched in November 2021. The purpose of this strategy is to set a universal sustainable direction for our decision making and wider business strategy so that together with our colleagues, partners and supply chain we can deliver positive changes. Our People and Planet Strategy includes a roadmap of short term goals (to 2026) that are aligned to our RIIO-2 regulatory commitments (including our EAP commitments), medium term (to 2030) goals that are aligned with the UN SDGs, and longer term commitments that stretch out to 2050 and beyond in some instances. A summary of our People and Planet Strategy commitments is provided in Figure 3. These commitments are confirmed in our Sustainability Policy[6].

Figure 3 – Summary of our People and Planet Strategy commitments

1.3 Our environmental responsibilities

1.3.1 Assessing our environmental impact

Since achieving ISO14001 accreditation for our environmental management system (EMS) in 2000[7], we have continually analysed and monitored our performance to understand, mitigate and reduce the adverse environmental impacts of our business. This process starts with understanding the context of our business as a regional GDN with core activities of operating and maintaining our infrastructure, responding to gas emergencies, providing new gas connections and replacing metallic gas mains. A summary of the key aspects of our business is provided in Table 1 below.

[5] https://www.northerngasnetworks.co.uk/wp-content/uploads/2022/06/People-and-Planet-Strategy_FINAL.pdf.
[6] https://www.northerngasnetworks.co.uk/wp-content/uploads/2022/06/Sustainability-Policy.pdf
[7] https://www.northerngasnetworks.co.uk/wp-content/uploads/2021/04/NGN-ISO-14001-2015-Certificate-V9-2020-2024.pdf

Key Aspects of Our Network and Business Operations			
Our Customers, Colleagues and Region	**Our Network**	**What We Do**	**Environment Performance and Innovation**
Deliver gas to 2.7m homes and businesses	36,000 km of pipe	>99% of uncontrolled gas escapes attended within 1 hour	c.0.5% of gas throughput lost as shrinkage per year
Varied network area – cities, towns and National Parks.	c.600 company vehicles – including cars, vans and HGVs	c.20,000 repairs to our gas pipes completed annually	20 biomethane production sites connected to our network enabling supply of green gas
c.1450 full time employees across 13 offices and depots	No gas holders connected to network, 39 decontaminated and demolished since 2013	>500km of iron mains replaced per year	Award winning hydrogen research and development projects, including H21 and HyDeploy; preparations for hydrogen village trial
55% of our domestic customers are reporting experiencing financial difficulties paying their energy bills during 2022/23, up from 46% in 2021/22^	c.150 asset sites built on known former gasworks sites	c.£200m of goods and services purchased per year	c.200,000t of waste generated per year; less than 0.5% disposed to landfill
Based on figures to end 2021/22. ^ Page 17: https://together.northerngasnetworks.co.uk/wp-content/uploads/2023/01/NGN-Customer-Perceptions-tracker-report-Wave-3.pdf			

Table 1- Summary of key environmental aspects of NGN business

With the help of our stakeholders, we identify aspects of our business that result in environmental impacts and then assign significance ratings to each based on a structured hazard-severity matrix. A summary of our current significant environmental aspects and impacts is provided in Table 2.

Business Aspect	**Environmental Impact**								**NGN RIIO-2 Mitigation**
	Depletion of resources	**Air pollution**	**Greenhouse gas emissions**	**Nuisance (eg odour, noise)**	**Water pollution**	**Land Pollution**	**Waste disposal to landfill**	**Ecosystem/habitat damage**	
Use of Virgin Aggregate in reinstatement	✓								EAP
Plastic gas pipe production	✓		✓						EAP
Use of Gas	✓		✓						EAP
Venting Gas			✓	✓					IS
Use of Electricity	✓		✓						EAP

Business Aspect	Environmental Impact								NGN RIIO-2 Mitigation
	Depletion of resources	Air pollution	Greenhouse gas emissions	Nuisance (eg odour, noise)	Water pollution	Land Pollution	Waste disposal to landfill	Ecosystem/habitat damage	
Use of Fuel	✓	✓	✓						EAP
Gas Transportation (upstream production, NGN losses, and downstream use)			✓	✓					EAP, WS & IS
Roadworks		✓	✓	✓					EAP, WS & IS
Contaminated Land				✓	✓	✓		✓	EAP
Disposal of Waste (excluding excavation spoil)							✓		EAP
Purchase of good and services	✓	✓	✓	✓	✓	✓	✓	✓	EAP

Significant aspects are those identified to have a significance of 15 out of 25 or greater on a 5 x 5 hazard-severity matrix.

Environmental impacts represents principal direct environmental impacts associated with the aspect, other secondary impacts may occur.

EAP = NGN RIIO-2 Environmental Action Plan. WS = NGN RIIO-2 Whole Systems Strategy. IS = NGN RIIO-2 Innovation Strategy.

Table 2 – Summary of NGN's most significant current environmental aspects and impacts

1.3.2 Incorporating stakeholder views

As detailed in our EAP (see Sections 5 and 6.1), we engaged with our stakeholders to inform the development of our EAP commitments to ensure they met their needs, priorities and expectations. Since then we have continued our stakeholder engagement as business as usual to ensure that we approach our environmental commitments in the most appropriate and effective manner, taking into account the values and priorities of our stakeholders. This has included:

- Annual customer perceptions survey incorporating environmental priorities research (2020/21[8], 2021/22[9] and 2022/23[10]).
- Regular engagement with the NGN Customer Engagement Group[11] to provide a forum for challenge and review of EAP performance.
- Engagement with regional informed stakeholders to review our 2021/22 AER and identify areas for improvement which we have applied to this document, including providing: an executive summary, more case studies, better breakdown of our waste disposal data, and better document signposting.

[8] https://together.northerngasnetworks.co.uk/wp-content/uploads/2021/03/Customer-Perceptions-Research-Presentation-Final-Report-Outcomes-Customer-Facing-v1.pdf
[9] https://together.northerngasnetworks.co.uk/wp-content/uploads/2022/03/Customer-Perceptions-Research-Presentation-2021-Wave-2-SHORT-SUMMARY-.pdf
[10] https://together.northerngasnetworks.co.uk/wp-content/uploads/2023/01/NGN-Customer-Perceptions-tracker-report-Wave-3.pdf
[11] https://ngnceg.co.uk/

- Participation in the Energy Networks Association Gas Environment Group and Climate Change Resilience Working Group where we work with the other energy networks of the UK to align reporting standards and metrics (notably Scope 3 emissions reporting), and share best practice.
- Participation in several regional sustainability focussed forums where we work with our fellow locally based organisations to share best practice and knowledge and identify synergies, including: Yorkshire and Humber Climate Commission[12], where NGN provide core funding; West Yorkshire Combined Authority Climate, Energy and Environment Committee[13]; and Leeds Anchors Network[14].

Our latest customer research from 2022/23[15] identified that sustainability and environmental actions remain high priorities to our customers after providing a reliable and safe service and keeping bills as low as possible. When reviewing our sustainability commitments from our People and Planet Strategy, customers continue to prioritise providing access to affordable energy solutions, ensuring our infrastructure is resilient, and enabling affordable decarbonised heat, power and transport solutions. We will continue to consider these priorities when delivering our EAP commitments during RIIO-2 and monitor how these priorities change for consideration when preparing subsequent business plans.

Our research identified that customers prefer to see sustainability performance data shared with them in written reports and infographics, with information regarding waste reduction and recycling performance and actions to promote low carbon energy prioritised[16].

1.3.3 Our strategic governance approach to delivering an environmentally sustainable network

As detailed in Section 1.2, our People and Planet Strategy sets a universal direction for our sustainable decision making and wider business strategy to ensure we deliver positive changes. Our People and Planet Strategy includes 12 commitments, of which six are related to protection of the environment and mirror the objectives of our RIIO-2 EAP.

Our shareholders pay close attention to our sustainability performance and activities, including delivery of our EAP commitments, and require regular performance and activity reporting. To formalise this, an NGN Board Committee on Environment, Social and Governance (ESG) was established in 2022/23 to provide oversight and scrutiny of the company performance against our People and Planet Strategy, including our EAP commitments, and other material sustainability items. This Committee meets three times per year.

Performance against our EAP commitments is measured and reported monthly to our senior management team to ensure that performance is kept on track, with progress updates regarding our medium- and long-term targets provided regularly, and also reviewed at our Sustainability Working Group. Our Sustainability Working Group comprises relevant senior managers to enable the

[12] https://yorksandhumberclimate.org.uk/
[13] https://westyorkshire.moderngov.co.uk/mgCommitteeDetails.aspx?ID=222
[14] https://news.leeds.gov.uk/leeds-spotlight/leeds-inclusive-anchors-network
[15] Page 24: https://together.northerngasnetworks.co.uk/wp-content/uploads/2023/01/NGN-Customer-Perceptions-tracker-report-Wave-3.pdf
[16] Page 25: https://together.northerngasnetworks.co.uk/wp-content/uploads/2023/01/NGN-Customer-Perceptions-tracker-report-Wave-3.pdf

identification and discussion of material sustainability related business aspects, and provide monitoring and oversight of business sustainability performance, including the performance of key individual sustainability initiatives/projects.

Corporate bonuses paid to NGN executives and colleagues include company environmental performance elements, most notably performance against our carbon reduction targets. This responsible approach further emphasises to our colleagues the importance of achieving our EAP commitments and contributed to us receiving full marks for climate action governance in the Responsible Business Tracker 2021 assessment by Business in the Community[17]. This assessment identified an overall responsible business score of 74% for NGN, well above the cohort average of 47%, and 100% with respect to climate action governance, strategy and risk analysis.

[17] See page 11 here: https://www.northerngasnetworks.co.uk/wp-content/uploads/2022/04/Northern-Gas-Networks-BITC-RBT-2021-Individual-Feedback-Report.pdf

2 Environmental performance dashboard

In accordance with the reporting guidelines, our performance against a series of identified key environmental performance indicators during the period 1 April 2022 to 31 March 2023 is presented below.

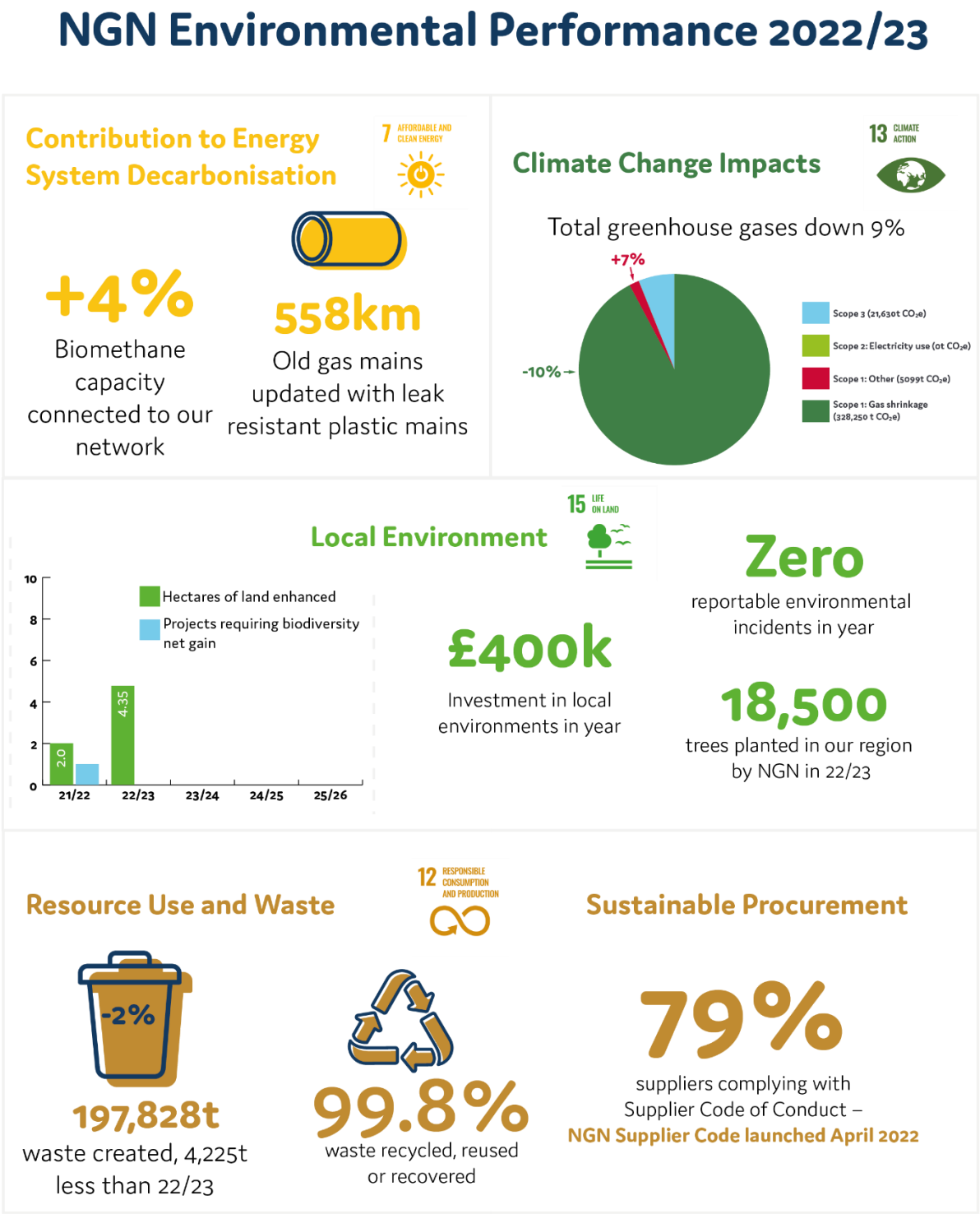


Figure 4 – Environmental performance dashboard for 2022/23.

3 Environmental Action Plan commitments performance

Table 3 contains a progress summary for each of our RIIO-2 EAP commitments as of 31 March 2023.

RIIO-2 EAP Commitment Performance Rating to 31 March 2023		
4% (1No.)	22% (6No.)	74% (20No.)

EAP Commitment	Description and Expected Benefit^	Target Year	Implementation Milestones	RAG Indicator*	RIIO-2 Status Update
Commitments to Reduce Our Environmental Impact					
Plant 40,000 trees in our region	>£21m of cumulative benefits over 50 years including reduced air pollution, carbon sequestration (2,450 tCO2e), biodiversity gain, flood alleviation and amenity gain	2026	n/a	Green	23,067 trees planted across West and East Yorkshire. Programme on track.
50% of vehicle fleet ultra low emission or hybrid (25% of commercial vehicles and 100% of company cars)	Vehicle fleet changes delivering reduced air pollutant and carbon emissions (4230 tCO2e saving); 250 diesel vehicles removed from NGN fleet	2026	n/a	Red	200 new diesel vans purchased during 2021/22 and 2022/23 although delivery has been delayed due to global supply chain issues. Total NGN vehicle fleet comprises 9% ultra low emission or hybrid vehicles, with 97% of leased company cars being ultra low emission or hybrid. NGN are yet to purchase any electric vehicles. The preparatory work needed to deliver this, most notably the installation of charging infrastructure has commenced, however NGN continue to search the market for a fit for purpose battery electric van. The programme for delivery of this target is under review in light of the constraints we face.
Gas preheating system upgrades at 50+ sites	Asset upgrades delivering reduced air pollution and carbon emissions (1890 tCO2e)	2026	n/a	Amber	29 units commenced or completed in 2021/22 and 2022/23, which is behind the forecast in our business plan but recoverable. We have adequate resources in replace to deliver our business plan commitments.

EAP Commitment	Description and Expected Benefit^	Target Year	Implementation Milestones	RAG Indicator*	RIIO-2 Status Update
80% compliance with new Supplier Code of Conduct	Development and implementation of Supplier Code of Conduct embedding sustainability in supply chain	2026	n/a	Green	Supplier Code of Conduct development and launched April 2022: https://www.northerngasnetworks.co.uk/wp-content/uploads/2022/04/Supplier-Code-of-Conduct_FINAL_compiled.pdf 79% compliance achieved for 2022/23
<0.1% excavation spoil to landfill	c.930,000 t of excavation spoil recycled saving 10 tCO2e	2026	n/a	Green	0.21% spoil to landfill performance in 2022/23, a slight increase vs 2021/22. We are working with our supply chain to ensure we achieve our RIIO-2 target despite work location based constraints accessing recycling facilities.
20% less office/depot waste (vs 2017/18)	850t waste reduction 4,800t waste diverted from landfill 480tCO2e saving	2026	n/a	Green	18% reduction in office and depot waste tonnage in 2022/23 compared to 2017/18 baseline.
0% office and depot waste to landfill		2026	n/a	Green	1.3% office and depot waste sent to landfill in 2022/23 down from 2.5% in 2021/22
50% less paper use	30t of paper use avoided; 30tCO2e saving	2026	n/a	Green	Paper use in 2022/23 73% less than 2018.
Eliminate avoidable single use plastics from offices and depots	Reduced carbon emissions, resource use and waste	2026	n/a	Green	Strategy to achieve this developed. Changes made already including phasing out plastic milk bottles at our head office and changing our bin bags to ensure they are biodegradable or recyclable.
<2.5% virgin aggregate use in reinstatement	640,000 t of recycled aggregate preferentially used, saving 80 tCO2e	2026	n/a	Green	9.5% virgin aggregate used in 22/23 compared to 8% in 2021/22. We are working with our supply chain to ensure we achieve RIIO-2 target despite work location based constraints accessing recycling facilities.
250 homes for nature	250 positive interventions to enhance biodiversity	2026	n/a	Green	Interventions made at 84 sites to end 2022/23 since 2018. Strategy to delivery 250 sites by 2026 created.
Development of natural capital assessment	Report natural capital valuation of ecosystem	2026	n/a	Green	Ecosystem services screening completed, bespoke natural capital valuation tool developed and utilised on baseline assessments at 32 infrastructure sites in 2021/22. Repeat

EAP Commitment	Description and Expected Benefit^	Target Year	Implementation Milestones	RAG Indicator*	RIIO-2 Status Update
	services provided at up to 50 NGN sites during 2021, 2023 and 2025.				assessments scheduled for 2023/24 as per EAP commitment.
Land remediation programme	Management programme including 8 remediation projects – reduced risk of pollution	2026	n/a	Green	Continuation of inspection, monitoring and investigation programme. No new remediation projects started, continuation of two existing remediation projects from 2021/22.
Gas holder decontamination and demolition programme	Decontaminate and demolish 23 gas holders – reduced risk of pollution	2026	n/a	Green	We are ahead of schedule with 15 out of 23 gas holders decontaminated and demolished by end 2022/23.
Commitments to Decarbonise Our Business					
Reduce gas leakage by 24%	Carbon savings of c.285,000 tCO2e	2026	n/a	Green	Gas leakage reduced by 10% (28 Gwh) in 2022/23 vs 2021/22 bringing us back on track to achieve our RIIO-2 commitments.
Repairing gas leaks faster – 89% within 7 days and 98% within 28 days	Carbon savings of c. 30,000 tCO2e	2026	n/a	Green	Targets achieved in 2022/23; repairs within 7 days = 90% and repairs within 28 days = 98%
Reduce Scope 1 and 2 emissions by 47% (excluding shrinkage)	Carbon savings of c.13,000 tCO2e	2026	n/a	Amber	2022/23 emissions were 7% higher than 2021/22 and 13% greater than our annual target. Our performance is impacted by the constraints we are experiencing with decarbonising our vehicle fleet. We have purchased equivalent certified carbon offsets to compensate for this and achieve our target on a net emissions basis.
Reduce key Scope 3 emissions by 11%**	Carbon savings of c.5,000 tCO2e	2026	n/a	Amber	2022/23 emissions were similar to 2021/22 and slightly (1.3%) greater than our annual target. We have purchased equivalent certified carbon offsets to compensate for this and achieve our target on a net emissions basis.
Development of embodied carbon assessment	Development of assessment methodology and metric	2026	2022	Green	Methodology developed and reporting completed for 2021/22 and 2022/23, and reduction targets established for 2025/26.

EAP Commitment	Description and Expected Benefit^	Target Year	Implementation Milestones	RAG Indicator*	RIIO-2 Status Update
Purchase of 100% zero carbon electricity	Only zero carbon electricity to be consumed at NGN premises from 2023, carbon savings of 7100 tCO2e	2023	2023	Green	Achieved in 2021/22 ahead of schedule and continued into 2022/23. 100% of electricity consumption at NGN offices, depots and infrastructure sites from zero carbon sources.
Purchase of 100% renewable gas for metered use	Only green gas to be consumed at NGN premises from 2024, carbon savings of 530 tCO2e	2024	2024	Green	NGN are continuing to explore the market availability of certified green gas
Install electric vehicle charging at all offices and depots	Enabler to achieve vehicle fleet decarbonisation and Scope 1 and 2 emissions reduction targets	2026	n/a	Amber	The COVID-19 pandemic delayed the preparatory work needed to deliver this commitment, however we now have a contractor appointed and installation works have commenced.
Install renewable energy production at all offices and depots	Carbon savings of 280 tCO2e	2026	n/a	Amber	The installation programme commencement was delayed as we reviewed our office and depot portfolio in consideration of post-COVID-19 return to office working. Pre-installation survey and assessment works are underway.
Gas network infrastructure capital investments	Carbon savings of 22,480 tCO2e	2026	n/a	Amber	Our overall 2022/23 expenditure in this area was lower than the allowance. We expect costs and workload to increase so that we are more in line our Business Plan over the five years of RIIO-2. We have experienced some delays with long lead items and a shortage of expert contractor resource, driven by general economic conditions. We are working hard with our supply chain to ensure we deliver our commitments during RIIO-2.
Commitments to Support a Net Zero Future					
Increased green gas capacity connected to network	Aspiration for 10% green gas flowing through network by 2030, 100% by 2050	2026	n/a	Green	Additional biomethane production site connected to NGN network during 2022/23. Total capacity connected is now 17,610 scmh from 20 sites.

EAP Commitment	Description and Expected Benefit^	Target Year	Implementation Milestones	RAG Indicator*	RIIO-2 Status Update
Improved customer service for biomethane providers	Green gas connection initial capacity studies within <=5 working days and detailed capacity studies within <=20 working days compared to <=15 and <=30 working days during RIIO-1	2026	2026	Green	During 2022/23 98% of initial capacity studies were issued within our <=5 working days voluntary target time and 100% of detailed capacity studies for new connections within our voluntary target of <=20 working days.
Whole Systems thinking	Enable the achievement of net zero greenhouse emissions in the UK by 2050	2050	n/a	Green	We have an active portfolio of innovation projects to support the net zero transition. Please refer to our Network Innovation Annual Summary Report for 2022/23 for full details of our innovation work: https://www.northerngasnetworks.co.uk/wp-content/uploads/2023/08/Annual-Innovation-Summary-2022-23.pdf

^ Reference: RIIO-2 EAP. Carbon savings reflect cumulative savings over RIIO-2.

***In accordance with the reporting guidance: Red = progress against milestones is at significant risk and highly likely to be missed; Amber = progress is delayed but likely to be achievable before the end of RIIO-2 price control period; Green = progress against the implementation milestones is on track.**

****** Contractor vehicles; production and transportation of polyethylene gas pipe and fittings; upstream emissions and transmission and distribution losses for electricity consumed; business travel via air and rail.**

Table 3 – Summary of progress against RIIO-2 EAP commitments

We continue to perform strongly against our RIIO-2 EAP commitments and are confident of our ability to deliver these where there are in our direct control. It is of note that significant global socio-economic and political changes have occurred since we prepared our EAP, most notably the COVID-19 pandemic and cost of living crisis. These events have impacted the business operations, and associated environmental impacts, of ourselves and our supply chain and continue to do so. The environmental impacts of these changes have been observed to present both opportunities (such as reduced avoidable business travel) and challenges (longer lead times for capital investment items, such as new vehicles), and both temporary and longer term. We will closely monitor our environmental performance against our EAP commitments throughout RIIO-2, including reviewing our commitments to ensure they remain relevant, valuable to our stakeholders, and feasible in the prevailing operating conditions we face.

4 Environmental impacts performance

4.1 Decarbonisation

Key annual performance summary:

- ***Connected biomethane capacity up 4%***
- ***Biomethane network injection up 6%***
- ***Wide ranging stakeholder engagement to increase biomethane injection***

This section provides a performance summary of our actions to deliver decarbonisation of the energy system.

4.1.1 Biomethane and Other Low Carbon Gas Connections

We recognise the value that biomethane and other low carbon gas sources can make now to the net zero transition and work hard to enable their connection to our network. In addition, our engineers work closely with producers to enable them to maximise their gas injection volumes and minimise down time.

Throughout RIIO-1 (2013 to 2021) we worked hard to develop our connection procedures for biomethane and other non-conventional gas producers, including development of a dedicated website[18], and we have continued this work into RIIO-2. Our time sequence of biomethane capacity connected is shown in Figure 5. During 2022/23 we connected a further biomethane production site to our network, bring our total to 20 with a maximum production capacity of 17,610 standard cubic metres of gas per hour (SCMH). Between 2021/22 and 2022/23 annual biomethane injection into NGN's network increased by 6.4% to 727 GWh, enough for approximately 61,000 typical UK homes, and meaning biomethane comprised 1.2% of network gas throughput.

It is of note that the development of new connection sites is typically significantly influenced by the availability of government subsidies / incentives.

[18] https://biomethane.northerngasnetworks.co.uk/

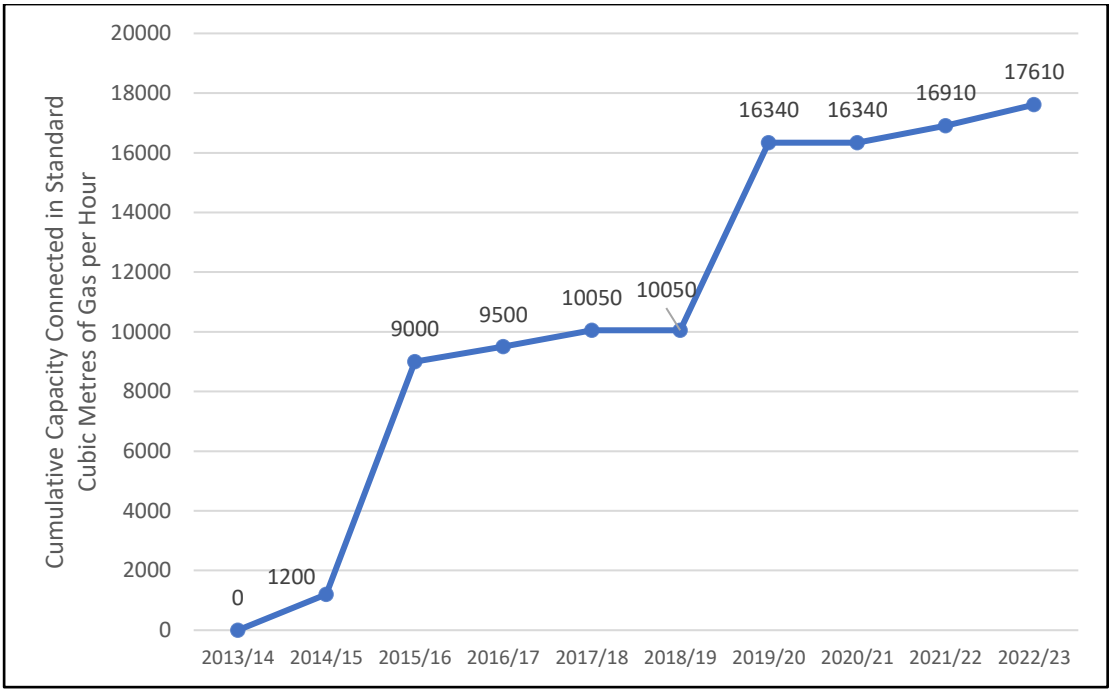


Figure 5 – Capacity of biomethane and low carbon gas injection capacity connected to NGN network

A summary of our RIIO-2 biomethane and low carbon gas connection workload is provided in Table 4.

	Unit	2021/22	2022/23	2023/24	2024/25	2025/26
Biomethane Connections						
Enquiries	Number	51	40			
Connection studies	Number	7	9			
Capacity of connection studies	SCMH	7,800	8755			
Connections	Number	1	1			
Capacity connected	SCMH	570	700			
Volume (energy value) of biomethane injected in year	Gwh	683	727			
Average monthly flow rate (all connections)	SCMH	5,177,255	5,595,934			
Other Green Gas Connections						

	Unit	2021/22	2022/23	2023/24	2024/25	2025/26
Enquiries	Number	3^	0			
Connection studies	Number	1^	0			
Capacity of connection studies	SCMH	1,000	0			
Connections	Number	0	0			
Capacity connected	SCMH	0	0			
Volume (energy value) of green gas injected	Gwh	0	0			
Average monthly flow rate (all connections)	SCMH	0	0			
^ All landfill gas sources.						

Table 4 – Biomethane and green gas connection performance

Helping Our Customers Get Connected

Our green gas connection process is detailed in our Biomethane Handbook[19] including:

- A description of the key stages involved in connecting a biomethane plant to our network;
- An overview of how a connection is designed, and the personnel involved;
- An explanation of how to reserve a connection point on the network;
- An overview of the construction process; and
- Details of the inspection process for a completed project.

Representatives from NGN attend the Energy Networks Association (ENA) hosted Entry Customer Forum (EnCF), along with the other gas networks and stakeholders. The EnCF exists to:

- ensure entry connections processes, standards and associated commercial arrangements are kept under review to promote standardisation across the networks, remove barriers, share best practice, enable efficiencies and improvements, and respond to industry developments;
- provide a forum for gas networks, biomethane customers and other relevant stakeholders to raise identified issues; and
- establish and maintain an activity schedule of improvements and required framework changes to action with associated deliverables and timescales. Items listed and reviewed on the EnCF Action Plan tracker include the standardisation of site acceptance testing, calorific value (CV) blips and flaring gas, in-grid compression, and blending strategy.

[19] https://biomethane.northerngasnetworks.co.uk/wp-content/uploads/2020/07/NGN_BiomethaneHandbook_0420_St04A.pdf

This encompasses the whole connection process, including initial application, assessment, building, commissioning of initial connection, operation and decommissioning. Further information about the EnCF, including minutes of the six meetings held during 2022/23, can be found on the Energy Networks Association's dedicated entry page[20].

As well as the EnCF, we attend the Entry Technical Working Group with other gas network representatives. This technical group supports in addressing the issues identified via the EnCF and those raised directly from our connected sites.

We are also actively engaged with Uniform Network Code Workgroups in relation to Reverse Compression, a licence modification raised to alleviate capacity constraints on the networks.

Improving Our Green Gas Connection Customer Performance

Ofgem have set us a target of a 7 day turnaround for initial capacity studies for biomethane connection customers. In our RIIO-2 Business Plan we committed to an internal target of <5 days so that customers know quickly if the selected location is suitable for their project. We have met the Ofgem target in 2022/23, with 40 of 40 studies delivered within time frame, with 39 out of 40 completed within our internal 5 day target.

In our business plan we also committed to produce detailed capacity studies within 20 working days, compared with 30 working days in RIIO-1. In 202/23 we completed all of our nine customer detailed studies within 20 days.

Listening to Our Stakeholders

In addition to the EnCF, we engage with our low carbon gas stakeholder by a range of methods summarised below to identify areas where we can improve.

Annual Operational Meetings

During 2022/23 we further strengthened our working relationships with our connected sites with the continuation of the annual operating meetings which take place each autumn. The meetings provide an opportunity for site owners and operators to share successes and challenges and help us identify where we can provide support.

Due to the positive support we have received from site operators, we're continuing with our strategy of adjusting down network pressures where possible to facilitate increased biomethane entry flow.

Biomethane Investor Workshop

Working with the other GDNs via the ENA Gas Goes Green group, in October 2022 we held a workshop with biomethane stakeholders to better understand:

- what the Green Gas Support Scheme means for a developer's future investment plans;
- if there are any barriers and challenges to overcome; and
- what GDNs can do to support investors in their future entry connection plans.

This event took place at the ENA offices in London with a range of stakeholders in attendance, including investors, producers, gas networks, UK Government departments and industry bodies[21].

[20] https://www.energynetworks.org/operating-the-networks/connecting-to-the-networks/connecting-to-the-gas-network
[21] Further details of event and outcomes here: https://together.northerngasnetworks.co.uk/events/biomethane-investor-workshop/

The actions derived from the workshop have been incorporated into our Entry Customer Forum work and a follow up workshop will take place during 2023/24, with the aim to help shape future policy post-Green Gas Support Scheme.

Propane Contamination issues

Propane is blended with biomethane to increase the CV to the required level to enable network injection. Through our operational meetings with sites and discussions with other networks via the Entry Technical Working Group, we identified an issue relating to propane quality. The issue relates to hydrocarbons 'dropping out' of the propane and contaminating meters and equipment on biomethane sites. NZERO are working on a report to share with industry and we hope this will help identify how to manage the issue.

Case Study – Stakeholder Engagement to Increase Biomethane Injection	
For three days in June 2021 the CVs entering our North Local Distribution Zone were particularly high, and our customers faced problems getting biomethane into our network as a result of not being able to meet the target CV issued from our Control Room (which we set to ensure Gas Safety Management Regulations obligations were met). Occurrences such as this hinders biomethane injection into our networks and result in flaring to atmosphere. In response during 2021/22 we worked with our connected production sites to discuss the issues in detail and help us understand how we could support increased flow to the network. To improve the situation during 2022/23 we trialled giving our connected production sites a more stable CV target to meet which is easier to achieve. So far this has proven to be a success as it has allowed increased biomethane flow into our network and reduced flaring to atmosphere from our producer sites.	

4.1.2 Innovating for Decarbonisation and Environmental Protection

We have an active portfolio of innovation projects to support the net zero transition and protect the environment, including trialling the blending of hydrogen (up to 20% by volume) with natural gas to 670 customers in our region (HyDeploy[22]), establishing the safety case for the use of 100% hydrogen as an affordable and sustainable alternative to natural gas (H21[23]), development of the feasibility study for the potential Hydrogen Village Trial in our network in Redcar[24], and numerous improvements to our operational procedures and equipment. Please refer to our Network Innovation Annual Summary Report for 2022/23[25] for full details of our innovation work.

[22] https://hydeploy.co.uk/
[23] https://h21.green/
[24] https://redcarhydrogencommunity.co.uk/
[25] https://www.northerngasnetworks.co.uk/wp-content/uploads/2023/08/Annual-Innovation-Summary-2022-23.pdf

4.2 Climate Change

Key annual performance summary:

- ***Total carbon emissions down by 9.5% saving 35,000 tCO2e***
- ***Gas shrinkage and leakage down 10%***
- ***Scope 1 and 2 business carbon emissions up by 6.6%***

This section provides a performance summary of our actions to reduce the carbon emissions associated with our business. As detailed in our RIIO-2 EAP, NGN commit to achieving net zero greenhouse gas emissions by 2050.

4.2.1 Shrinkage and Leakage

Shrinkage is a Scope 1 emission and comprises (based on 2022/23 values) gas leakage (93.5%), gas illegally taken by third parties (4.1%) and own use gas primarily for pre-heating gas at locations where the gas changes from one pressure tier to the next (2.4%) as measured in Gwh using the Shrinkage and Leakage Model agreed with Ofgem. Natural gas is principally composed of methane which is a potent greenhouse gas, and produces carbon dioxide (also a greenhouse gas) on combustion. Shrinkage comprises both combusted and uncombusted natural gas and is our primary greenhouse gas emissions source, contributing 92% of our total measured greenhouse gas emissions in 2022/23.

Our RIIO-2 EAP identified reduction targets to be achieved over RIIO-2 for both shrinkage (-23%) and leakage (-24%) compared to the values we had forecast for end of 2020/21 in our EAP.

Our shrinkage and leakage volumes and emissions are summarised in Tables 5 to 8 as specified in the reporting guidelines.

Gas Leakage Volumes in Gwh	2021/22	2022/23	2023/24	2024/25	2025/26
Low pressure mains	171	148			
Medium pressure mains	25	25			
Services	37	31			
AGIs	59	59			
Interference	1	2			
Total	293	265			
Target total	283	273			
Targets were forecasts prepared at the end of the previous reporting year, eg 2021/22 forecast prepared at end of 2020/21.					

Table 5 – Gas leakage volumes performance

Gas Leakage in tCO2e	2021/22	2022/23	2023/24	2024/25	2025/26
Total	359,482	324,874			
Target total	346,689	334,217			
Volumes of gas leakage in Gwh converted into tCO2e using conversion factor of 1,226.42 tCO2e/Gwh as per reporting guidelines (page 24) Targets were forecasts prepared at the end of the previous reporting year, eg 2021/22 forecast prepared at end of 2020/21.					

Table 6 – Gas leakage in tCO2e performance

Other Gas Shrinkage Volumes in Gwh	2021/22	2022/23	2023/24	2024/25	2025/26
Own use	7.6	6.7			
Theft	13.4	11.8			
Total	21.0	18.5			

Table 7 – Other gas shrinkage volumes performance

Other Gas Shrinkage in tCO2e	2021/22	2022/23	2023/24	2024/25	2025/26
Own use	1,394	1,219			
Theft	2,468	2,157			
Total	3,863	3,376			
Volumes of gas leakage in Gwh converted into tCO2e using conversion factor of 182.54 tCO2e/Gwh as 2022 UK Government Greenhouse Gas Conversion Factors					

Table 8 – Other gas shrinkage in tCO2e performance

Our long-term shrinkage and leakage reduction performance is summarised in Figure 6, demonstrating that between 2013 and 2023 NGN's annual gas leakage reduced by 35%. Cumulatively this represents a saving of 778 GWh of natural gas over the period compared to our baseline position, equivalent to approximately 950,000 tCO2e[26] of Scope 1 NGN emissions.

[26] 778 Gwh at 1226.42tCO2e/Gwh.

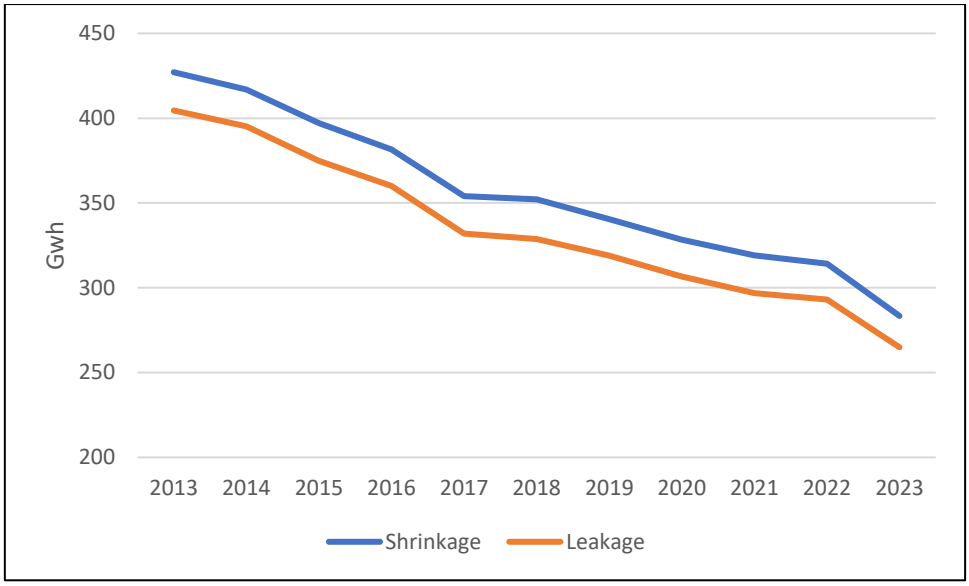


Figure 6 – Shrinkage and leakage performance since start of RIIO-1

Performance Summary

During 2022/23 we have continued our shrinkage reduction strategy which includes our optimised mains replacement programme which prioritises the leakiest metallic pipes, the installation of equipment to enable proactive system pressure management and conditioning our gas with Monoethylene Glycol (MEG) to saturate and swell metallic joints which might otherwise leak gas. Our gas shrinkage and leakage volumes reduced by 31 Gwh (10%) and 28 Gwh (10%) respectively compared to 2021/22, saving 35,100 tCO2e. Our shrinkage gas volume continues to comprise less than 0.5% of the gas transported through our network annually.

Our shrinkage performance during 2021/22 was behind our original business plan target, however targeted action to increase our MEG saturation levels and reduce our system pressures during 2022/23 has brought us back on track with our target. This focus will continue into the future, with further infrastructure refurbishment and replacement works planned for 2023/24.

Repairing Gas Leaks Faster

Whilst not included within the Shrinkage and Leakage Model, it is recognised that gas escapes result in emissions of natural gas to the atmosphere. As detailed in Part 4.2.2 of our RIIO-2 business plan document, we voluntarily committed to repairing emergency gas escapes quicker during RIIO-2. These commitments will reduce the amount of gas lost to atmosphere and deliver real-world carbon emission savings that whilst difficult to estimate, could amount to 30,000 tCO2-e over RIIO-2. During 2022/23 we have continued to exceed or meet our end RIIO-2 performance targets as shown in Table 9.

	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2025/26 Target
Outstanding gas emergency repairs completed within 7 days (%)	86%	91%	90%				>89%
Outstanding gas emergency repairs completed within 28 days (%)	95%	98%	98%				>98%

Table 9 – Gas emergency repair performance

4.2.2 Business Carbon Footprint - Scope 1 and 2

Scope 1 (direct) and Scope 2 (indirect) business carbon emissions (excluding shrinkage) comprised approximately 1% of our total greenhouse gas emissions during 2022/23. Despite this imbalance, our stakeholders have told us that they expect us to reduce all elements of our carbon emissions, not just gas shrinkage[27], and we agree with this view.

Working with the Carbon Trust in 2018/19 we were the first UK gas network to establish and adopt science-based aligned carbon reduction targets for a well below 2 degree warming scenario in 2050[28]. This analysis also informed the targets that we set for key Scope 3 emissions. As detailed in our RIIO-2 EAP, after developing and adopting our carbon reduction targets, we subsequently adopted more ambitious short and long term targets following the UK's commitment to achieving net zero greenhouse gas emissions by 2050. These targets, underpinned by our EAP initiatives and coupled with anticipated developments in technology, mean we are targeting the achievement of:

- 47% reduction in Scope 1 and 2 non-shrinkage business carbon emissions by 2025/26 vs 2017/18 baseline; and
- net zero non-shrinkage Scope 1 and 2 business carbon emissions by the end of the 2030/31.

These targets directly support the achievement of net zero emissions in our network regions and the UK. Our business carbon footprint reduction targets are presented in Appendix A. It should be noted that our carbon reduction targets are not currently approved by the Science Based Targets Initiative (SBTi) as there is currently no approved target development methodology for the oil and gas sector. Further, the SBTi are not currently accepting commitments from oil and gas sector companies such as NGN. Our Scope 1 and 2 business carbon emissions are summarised in Table 10 and Figure 7.

As referenced in Table 10, in agreement with Ofgem we have amended some of our Scope 1 emissions targets from those contained in our EAP to ensure we are reporting in accordance with best practice whilst also achieving the same percentage emissions reduction and trajectory over RIIO-2 as included in our EAP. Our Scope 1 and 2 targets for RIIO-2 are presented in Appendix A.

[27] Customer Insight 43, RIIO-2 EAP.

[28] As defined by the International Energy Agency for a global emissions trajectory that represents a 50% chance of limiting average future temperature increases to 1.75^{O}C above pre-industrial levels. Our 2017/18 non-shrinkage carbon emissions form the baseline of this modelling.

Emissions in tCO2e	Specific Area	2021/22	2022/23	2023/24	2024/25	2025/26
Building energy use	Building – electricity*	0	0			
	Building – natural gas	317	322			
	Substation electricity	0	0			
Operational transport	Road**	4,468	4,477			
	Sea	0	0			
	Air	0	0			
Fugitive emissions	IIGs^	n/a	n/a	n/a	n/a	n/a
	F-gases	Not measured	0			
Fuel combustion	Diesel	0^^				
	Gas	Included in gas shrinkage^^^				
Gas shrinkage		363,344	328,250			
Total excluding shrinkage						
Target		4,943	4,527	4,011	3,688	3,612
Emissions		4,785	5,099			
Certified carbon offsets purchased (see Appendix B)		0	572			
Net emissions		4,785	4,527			
Total including shrinkage		368,129	333,350			
Total including shrinkage per £m turnover (tCO2e/£m – market based)		874	661			
Total including shrinkage per Gwh gas transported (tCO2e/Gwh – market based)		5.48	5.64			

^ Insulation and interruption gas - not relevant to gas distribution networks

^^ Fuel combustion in stationary and mobile plant included in Operational Transport – Road category as it cannot be distinguished from vehicle fuel consumption in source data (fuel card sales receipts).

^^^ Own use gas emissions included in shrinkage emissions: 2021/22 = 1394 tCO2e; 2022/23 = 1,219 tCO2e

*** Value reported in table is as per marked based methodology. Value for location based methodology = 714 tCO2e**

**** Including electricity used to charge electric vehicles**

***** Business plan targets amended in May 2023 in agreement with Ofgem to bring Scope 1 emissions reporting in line with best practice methods and match reporting undertaken in 2021/22 and 2022/23:**

Emissions in tCO2e	Specific Area	2021/22	2022/23	2023/24	2024/25	2025/26
• Reported Scope 1 business mileage emissions to include only emissions arising from business travel in cars provided by NGN (company lease cars and those where the employee is provided a with cash payment towards the vehicle upkeep and maintenance by NGN ('cash option') colleagues). • Emissions from business mileage in hire cars and casual mileage in employees' own cars which is reimbursed by NGN at a mileage rate will be reported in Scope 3 as per published guidance. • Emissions from business travel in cars calculated using published UK Government carbon conversion factors by vehicle size and fuel type instead of using individual vehicle emissions ratings from registration documents. Targets retain the same percentage reduction and trajectory over RIIO-2 as the targets contained in our RIIO-2 EAP. Full details of our business carbon reduction targets for the period 2021 to 2026 are contained in Appendix A.						

Table 10 – Scope 1 and 2 greenhouse gas emissions

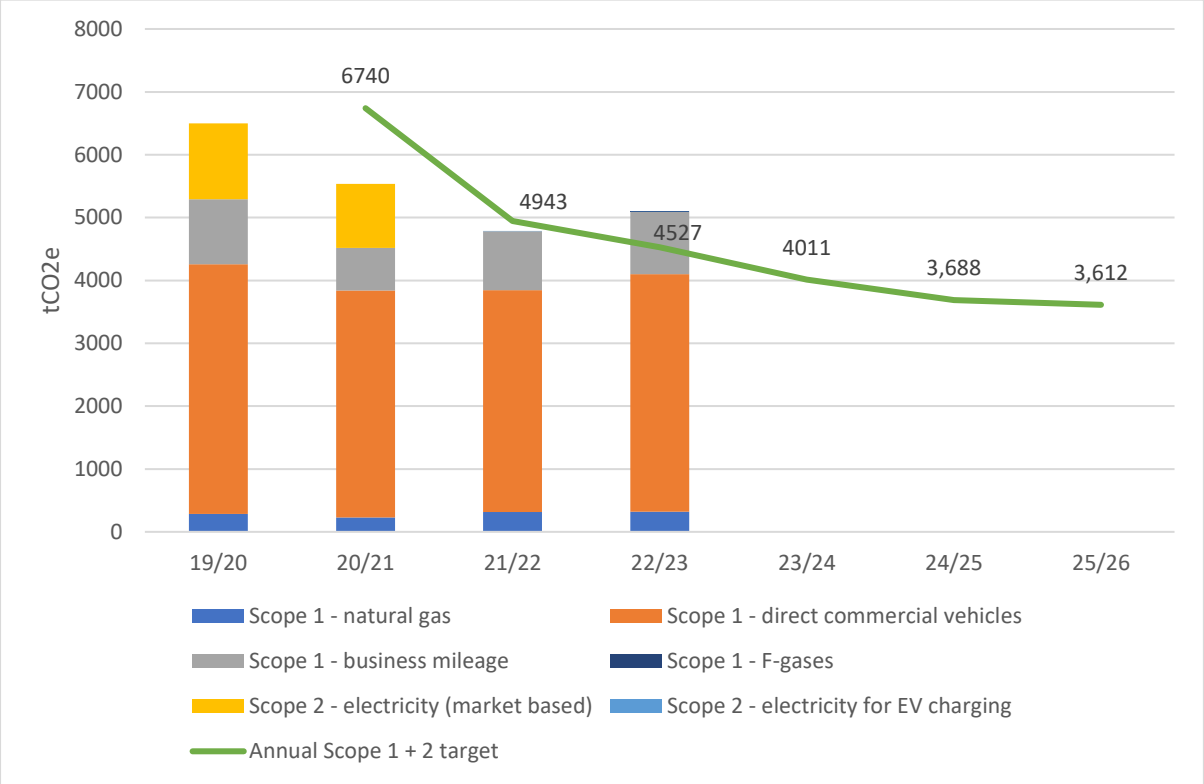


Figure 7 – Composition of Scope 1 and 2 greenhouse gas emissions excluding shrinkage and carbon offsets.

The EAP reporting guidelines request networks report the CO2e intensity of an operational mile travelled over the duration of RIIO-2. This data is presented for the first time in Figure 8 based on NGN fuel purchasing records and travel data from our vehicle telematics system. It is noted that NGN's commercial vehicle fleet are fuelled using company fuel cards which provide total fuel consumption data in litres for all fuel purchases, including that purchased for use in vehicles and portable field equipment (such as generators), with fuel consumption purpose being indistinguishable in the purchasing data. In addition, our larger commercial vehicles often directly power field equipment (such as hydraulic breakers) and thus consume fuel whilst stationary.

Figure 8 demonstrates that the carbon intensity of our operational vehicle fleet has decreased by 11% since 2020/21. This change may be associated with our new vehicle purchases or potentially COVID-

19 related impacts, but we will continue to report this data to capture the benefits of our vehicle fleet transformation.

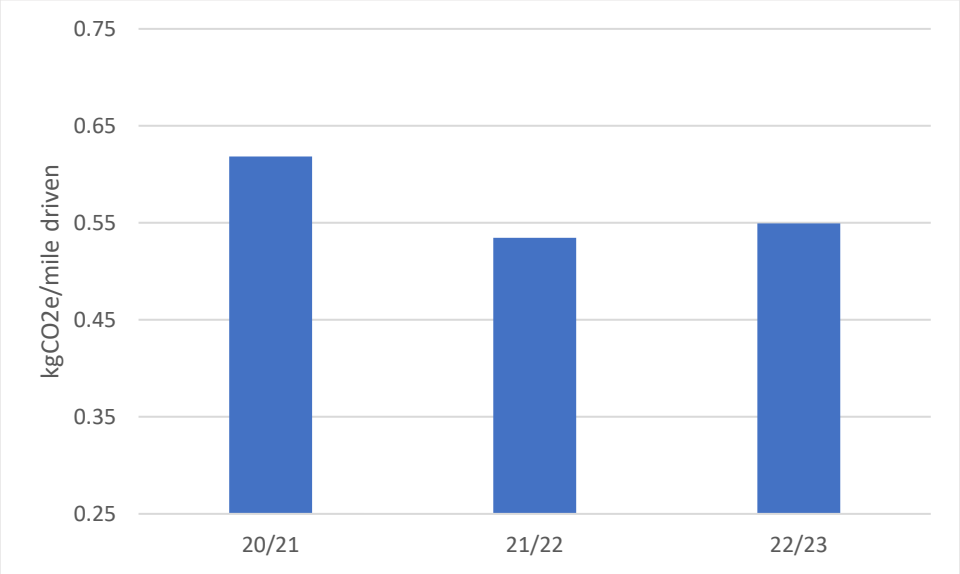


Figure 8 – Carbon intensity of operational vehicle travel (kgCO2e/mile driven)

Performance Summary

The impacts of the Covid-19 pandemic temporarily influenced our Scope 1 and 2 business carbon footprint (BCF) during 2020/21 and 2021/22 as our business travel habits changed and energy consumption fell. Our 2022/23 Scope 1 and 2 BCF (market-based excluding shrinkage) has stabilised and was 438 tCO2e (8%) below our pre-COVID value from 2019/20 (location-based), but 13% (572 tCO2e) in excess of our revised annual target for 2022/23, and 6.6% greater than 2022/23.

We measured and reported fugitive F-gas losses from office/depot air conditioning systems for the first time in 2022/23 and these were found to be de minimis.

We continue to purchase only 100% certified renewable electricity for our premises, and our electricity consumption fell by 17% compared to the previous year. In 2022/23 we commenced the design and structural assessments to enable delivery of our EAP commitment to install rooftop solar photovoltaics (PV) at our offices and depots. Emissions from natural gas consumption in our premises remained stable and during 2023/24 we will be working on improving our collation of meter readings.

During 2022/23 we have continued to transform our company lease car fleet and have achieved 97% hybrid, plug-in hybrid or battery electric vehicles in our fleet in readiness for our 2026 target of 100%. In late 2022/23 we also launched of a new electric and hybrid vehicle leasing salary sacrifice scheme to enable colleagues to make sustainable vehicle choices. Non-operational business mileage is now a focus area for the NGN Senior Management Team to encourage sustainable business travel practices.

The main influences on our Scope 1 and 2 BCF performance are the external constraints we have experienced with delivery of our commercial vehicle fleet investment plans, most notably delayed delivery of 200 new diesel vehicles that we ordered during RIIO-2, and the limited availability of

suitable zero emission commercial vehicles. As a consequence, our operational vehicle fleet emissions intensity remained stable between 2021/22 and 2022/23 as shown in Figure 8. This area remains challenging for us to reduce emissions, and our performance in this area will significantly influence our ability to achieve our end RIIO-2 Scope 1 and 2 BCF target. Further discussion of this, the challenges we face, and the implications are provided below.

Ensuring Delivery of Our Scope 1 and 2 BCF Reduction Target

We remain committed to achieving our Scope 1 and 2 BCF target. Where this isn't achievable over the duration of RIIO-2 we will mirror our customer service standards by purchasing compensatory certified carbon offsets, at no extra cost to the gas customer, so we achieve our end RIIO-2 target on a net emissions basis. As detailed in Table 10 we have adopted this approach for the first time during 2022/23 by the purchase of equivalent certified carbon offsets to compensate for the 572 tCO2e which our Scope 1 and 2 business carbon emissions exceeded our annual target to ensure our net emissions are equal to our annual target. Full details and certification of the carbon offsets purchased are included in Appendix B. The carbon offset project supported was consciously selected from a range of schemes because it is supportive of our People and Planet Strategy commitments to *Provide access to affordable energy solutions* and *Eliminate Emissions*.

Vehicle Fleet Decarbonisation Programme Progress Summary

Our RIIO-2 vehicle replacement strategy includes replacing 146 small and medium diesel vans with electric vehicles (EVs) and installing 182 EV charging points. Our plan was to begin installing the EV charging points in the first year of RIIO-2 and to purchase two EVs to fully trial and understand the impact on operations of adopting EVs. The Covid-19 pandemic delayed the preparatory work needed to deliver this. During 2022 a successful tender exercise was completed where we appointed an EV charger supplier and we have now completed all the required surveys to ensure our offices and depots have the necessary electrical capacity to support the EV charging points. In addition, we have now secured approval by the local electricity network operator to install them at NGN depots and offices and will proceed to do so.

NGN has continued to search the market for a fit for purpose battery electric van and has undertaken research and surveys across the network to understand suitability for operational use and emergency response. We are aiming to purchase a batch of EVs in 2023, with the delivery date subject to worldwide supply chain issues that are still being experienced by fleet operators. Further orders will be placed in RIIO-2 subject to suitability assessments and availability of vehicles and this will significantly influence our ability to achieve our EAP BCF targets. At this stage we consider that our RIIO-2 vehicle decarbonisation targets are still achievable in the near term, but may take longer than anticipated in our EAP due to external factors, including extending beyond the end of RIIO-2.

Case Study – Enabling Our Colleagues to Drive Down Their Emissions	
To enable our colleagues to reduce the environmental impact of their driving we have: • Changed our company policy to include only electric, plug-in hybrid and hybrid vehicles only. By March 2023 our company lease car fleet contained only 1 internal combustion engine vehicle, giving us a 97% ultra low emission or hybrid car fleet. • In late 2022/23 partnered with a specialist provider to offer our colleagues a new electric and hybrid vehicle leasing salary sacrifice scheme. This scheme makes it more affordable for our colleagues to make sustainable vehicle choices whilst also helping reduce NGN's business travel carbon emissions and we will report the outcomes in future AERs.	

4.2.3 Business Carbon Footprint - Scope 3

Scope 3 greenhouse gas emissions are those associated with an organisation's value chain across 15 defined categories, including goods and services purchased, leased assets and waste disposal. As reported in our 2021/22 AER[29], our screening assessment identified that Scope 3 emissions categories 1 to 7 are considered to be relevant and material to our business operations. This assessment identified that Scope 3 emissions typically comprise approximately 15% of NGN's total greenhouse gas emissions (Scope 1 = c.85% and Scope 2 = <0.5%).

Reporting Improvement Programme

Building on our 2021/22 AER we have expanded our Scope 3 emissions reporting for 2022/23 to include:

- Expansion of contractor vehicle emissions reported under Category 1 to include our landscape maintenance contractor;
- Expansion of purchased goods emissions reported under Category 1 to include batteries used in operational equipment and electrical consumables issued to customers who are temporarily off gas (hot plates and fan heaters);
- Expansion of the range of business travel emissions reported under Category 6 to include hotel stays; and
- Reporting employee commuting and homeworking emissions under Category 7.

All Scope 3 emissions reported by NGN during 2022/23 are based on actual consumption data (such as tonnes of product purchased or litres of fuel consumed) multiplied by the relevant published carbon conversion factor, with none estimated from financial spend based factors/indices. This is the same approach as applied for our 2021/22 AER.

Throughout RIIO-2 we will continue to work to expand the range of our Category 1 (goods and services) and Category 2 (capital goods) reporting as supply contracts are renewed. Engagement with

[29] https://www.northerngasnetworks.co.uk/wp-content/uploads/2022/09/NGN-21-22-AER_final.pdf

our supply chain to date has identified a general absence of carbon/environmental data availability for many of the capital products that we purchase, hence we are currently reporting the emissions from our consumption of uniform materials (such as polyethylene, copper and steel pipe) for which published carbon conversion factors are available and emissions can be readily calculated based on mass of product purchased.

Performance Summary

Table 11 and Figure 9 identify the Scope 3 categories identified as material to NGN and their emissions for 2022/23.

Scope 3 Category	Data Content	Approx. Data Coverage in 2022/23 (%)	Emissions tCO2e				
			2021/22	2022/23	2023/24	2024/25	2025/26
1 – Goods and services	Gas mains replacement and helicopter survey contractor fuel emissions; Contractor reinstatement material (WTW) ***New for 2022/23***: Landscape maintenance contractor vehicle emissions; batteries; and electrical consumables	41%*	14,590	12,233			
2 – Capital goods	Polyethylene gas pipe and fittings^^; steel pipe; copper pipe		6,163	6,490			
3 – fuel and energy related activity not included in Scope 1 and 2	WTT emissions and transmission and distribution losses for Scope 1 and 2 emissions (fuel use in direct commercial vehicles and company owned/controlled cars; metered natural gas use; electricity use)**.	100%^	1,154	1,215			
4 – upstream transportation and distribution	Logistics contractor emissions	100%^	102	99			
5 – waste generated in operations	Office and depot waste, excavation spoil and polyethylene pipe waste	100%^	314	297			
6 – business travel	Business travel via air, rail, hire cars and in personal cars ***New for 2022/23***: hotel stays	100%^	83	155			
7 – employee commuting and homeworking	***New for 2022/23***: Employee commuting and homeworking emissions	100%^	Not available	1,141			

Scope 3 Category	Data Content	Approx. Data Coverage in 2022/23 (%)	Emissions tCO2e				
			2021/22	2022/23	2023/24	2024/25	2025/26
Total Emissions			22,406	21,630			
Certified carbon offsets purchased (see Appendix B)		39%*	0	203			
Net emissions			22,406	21,427			
Total per £m turnover (gross tCO2e/£m)			53	43			
Total per Gwh gas transported (gross tCO2e/Gwh)			0.33	0.37			

*** 2022/23 emissions for data content shown divided by estimated emissions for 2020/21.**

**** WTT emissions for gas shrinkage excluded as per Ofgem Table 11.06 format. 2022/23 gas shrinkage WTT emissions = 283.39 Gwh x 31.1 tCO2e/GWh = 8,813 tCO2e.**

^ Source data available and included in emissions calculation for all relevant emissions sources.

^^ Polyethylene pipe and fittings emissions based on carbon conversion factor for high density polyethylene published by UK government and includes manufacture and transportation of products. Pipe manufacturer's bespoke emissions calculations may vary.

Emissions from Downstream Customer Gas Consumption

It is of note that NGN do not own or control the gas that we transport and as such downstream emissions associated with customer gas combustion are not attributable to NGN as a Scope 3 emission. For completeness these emissions have been estimated as 12.6m tCO2e on the assumption that all gas transported through NGN network and not lost to shrinkage is subject to combustion by customers with carbon emissions generated as per carbon conversion factors published by UK Government Department of Business, Energy and Industrial Strategy for 2022:

Gas consumption by NGN customers = 59,092 Gwh (NGN throughput) – 283 Gwh (NGN shrinkage) = 58,808 Gwh

Gas consumption = 58,808 Gwh x (182.54 + 31.1) tCO2e/Gwh = 12.6m tCO2e

Table 11 – Scope 3 greenhouse gas emissions

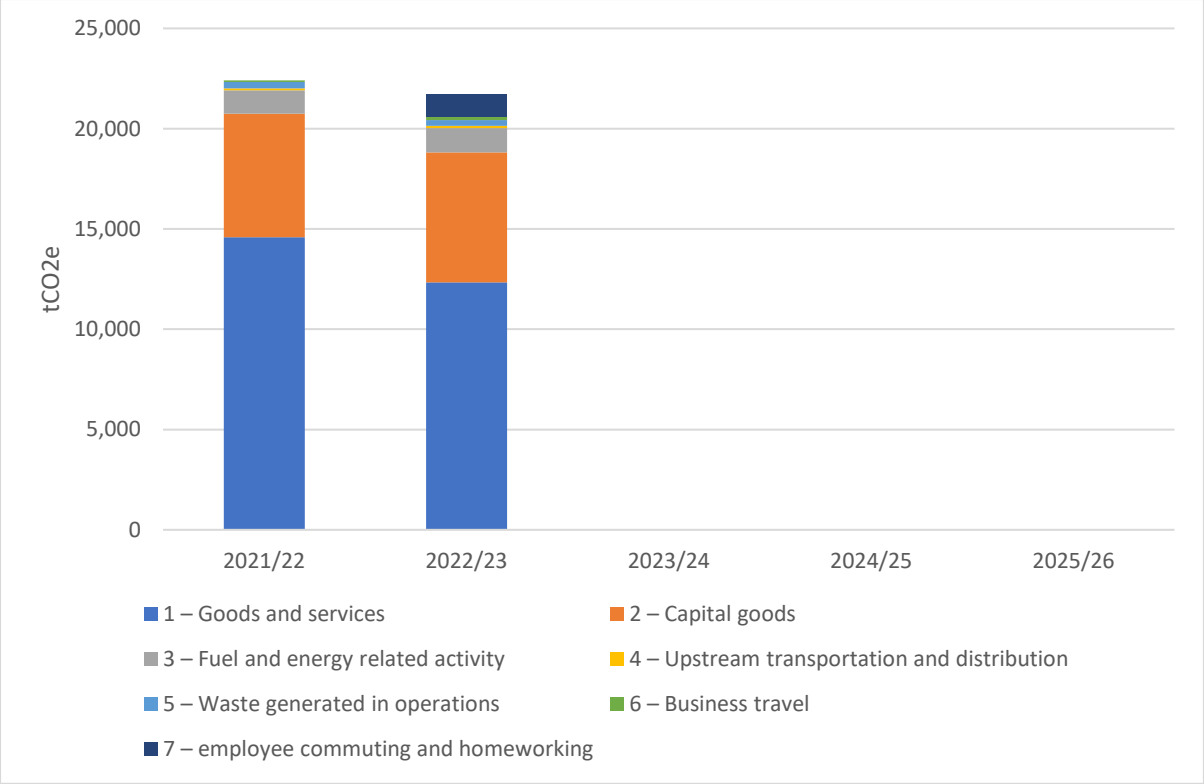


Figure 9 – Scope 3 greenhouse gas emissions by Scope 3 category

As referenced above, we continuously expand the range of Scope 3 emissions that we measure and report as a matter of best practice. This makes gross Scope 3 emissions performance comparisons with previous reporting years problematic as we are not comparing like with like.

Our RIIO-2 EAP included reduction targets for a consistent set of key Scope 3 emissions sources as measured during RIIO-1. Our performance against these targets is shown in Table 12 and identifies that our emissions were similar to 2021/22 (+0.2%) and slightly in excess of our annual target (+1.3%, +203 tCO2e). Contractor vehicles emissions fell by 2.8% compared to the previous year and rail and air travel emissions remained very low. However emissions associated with the purchase of PE pipe increased to service the workload, offsetting this performance.

Ensuring Delivery of Our Scope 3 BCF Reduction Target

We remain committed to achieving our Scope 3 BCF target. Where this isn't achievable over the duration of RIIO-2 we will mirror our customer service standards by purchasing compensatory certified carbon offsets, at no extra cost to customers, so we achieve our end RIIO-2 target on a net emissions basis. As detailed in Table 12 we have adopted this approach for the first time during 2022/23 by the purchase of equivalent certified carbon offsets to compensate for the 203 tCO2e which our Scope 3 business carbon emissions exceeded our annual target to ensure our net emissions are equal to our annual target. Full details and certification of the carbon offsets purchased are included in Appendix B. The carbon offset project supported was consciously selected from a range of schemes because it is supportive of our People and Planet Strategy commitments to *Provide access to affordable energy solutions* and *Eliminate Emissions*.

Scope 3 Emissions (tCO2e)		2021/22	2022/23	2023/24	2024/25	2025/26
Contractor Vehicles – Mains Replacement Contractors Vehicle Emissions (Category 1 – Goods and Services)	Emissions	9,062	8,821			
	Target	8,490	8,260	8,029	7,799	7,568
Contractor Vehicles – Helicopter Surveys (Category 1 – Goods and Services)	Emissions	53	35			
	Target	77	77	77	77	77
Polyethylene gas pipe and fittings (Category 2 – Capital Goods)	Emissions	6,084	6,368			
	Target	6,470	6,436	6,402	6,367	6,334
Electricity Generation and Transmission and Distribution Losses (Category 3 – fuel and energy related activity not included in Scope 1 and 2)	Emissions	0	0			
	Target	41	38	0	0	0
Business travel – air (Category 6 – business travel)	Emissions	0	1			
	Target	198	196	194	192	190
Business travel – rail (Category 6 – business travel)	Emissions	2	8			
	Target	22	22	22	22	22
Total	Emissions	15,200	15,233			
	Certified carbon offsets purchased (see Appendix B)	0	203			
	Net emissions	15,200	15,030			
	Target	15,298	15,030	14,724	14,457	14,191

Table 12 – Scope 3 emissions reduction targets and performance

4.2.4 Embodied Carbon

As identified in the reporting guidelines, embodied carbon (EC) is commonly defined as the whole life ('cradle to grave') total greenhouse gas emissions generated to produce a built asset, including emissions associated with extraction, manufacture/processing, transportation, assembly and end of life decommissioning.

As detailed in our 2021/22 AER, we have completed a scoping assessment of the EC associated with our principal areas of work expenditure, namely: gas mains replacement, diversions and

reinforcements (<7 barg); new connections; and gas emergency repair. This assessment was aligned to PAS2080[30] and included consideration of asset lifecycles.

Process mapping of our work projects was completed to identify sources of EC associated with our works for inclusion in our EC calculation based on assessment of their materiality and source data quality, resulting in c.90% of identified emissions sources being included based on 2020/21 data. A summary of our EC assessment methodology is included in Appendix C of our 2021/22 AER[31].

Since our 2021/22 AER we have improved our data gathering and refined our calculation method to include all relevant business mileage emissions. Consequently we have recalculated our 2021/22 EC emissions as presented in Figure 10 below[32].

Using our methodology, estimated baseline total and normalised 'as built' EC values for 2020/21 have been calculated for our principal workload, in addition to actual performance values for 2021/22 and 2022/23 (normalised to 2020/21 cost basis for consistency to remove inflationary effects). EC reduction targets to be achieved by end RIIO-2 based have also been developed based on our relevant EAP commitments (such as our excavation spoil recycling and vehicle fleet decarbonisation targets) and 2020/21 waste and material consumption volumes. This information is shown in Figures 10 and 11. We will continue to review our EC data collection throughout RIIO-2 to identify areas to improve this new area of reporting.

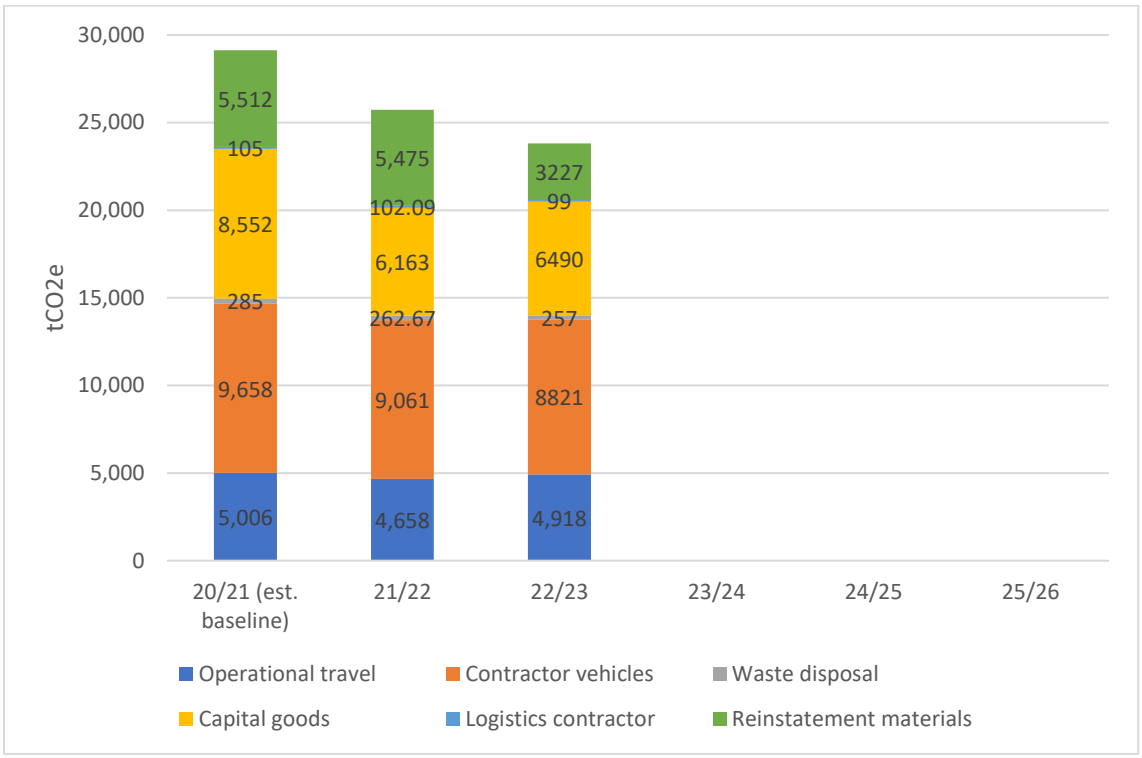


Figure 10 – Embodied carbon emissions for gas mains replacement, diversions and reinforcements (<7 barg), new connections and emergency repair work

[30] PAS2080 Carbon Management in Infrastructure Verification: https://www.bsigroup.com/en-GB/our-services/product-certification/product-certification-schemes/pas-2080-carbon-management-in-infrastructure-verification/
[31] https://www.northerngasnetworks.co.uk/wp-content/uploads/2022/09/NGN-21-22-AER_final.pdf
[32] Based on the revised methodology, our 2021/22 EC emissions are 473 tCO2e (+1.9%) greater than those reported in our 2021/22 AER.

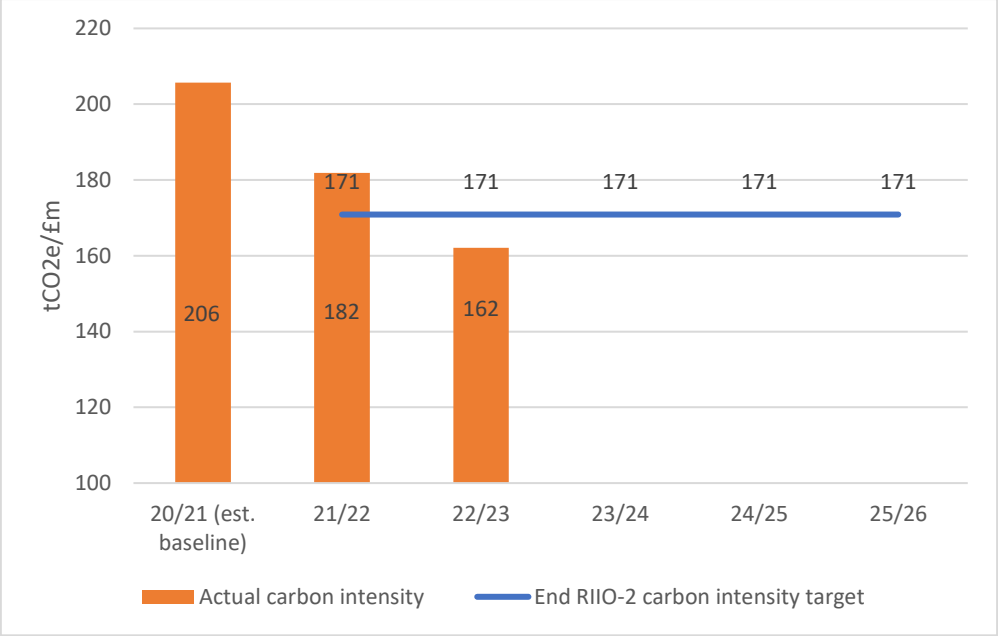


Figure 11 – Estimated embodied carbon emissions intensity for gas mains replacement, diversions and reinforcements (<7 barg), new connections and emergency repair work in 2020/21 prices.

As shown in Figure 10, total EC reduced by c.8% (1900 tCO2e) between 2021/22 and 2022/23 for a similar workload[33].

Figure 11 demonstrates that the EC for our main work types was 162 tCO2e/£m during 2022/23, a c.11% reduction compared to 2021/22 and 21% reduction versus our estimated baseline for 2020/21. Based on our RIIO-2 EAP commitments we are targeting a 17% reduction in this value by end 2025/26 compared to our baseline, which we achieved during 2022/23. We will continue to monitor our performance against this target throughout RIIO-2 whilst delivering our EAP commitments to ensure we achieve consistently achieve our target and where possible outperform.

The workload included in our EC calculation is varied and includes repair of gas leaks, installation of new gas connections, replacement of gas mains and associated services for a wide range of diameters, and network reinforcement (<7 barg). Estimated emissions for mains replacement, diversions and reinforcements workload based on expenditure identified that the carbon intensity of this work reduced from approximately 50 tCO2e per km of pipe installed in 2020/21 to approximately 35 tCO2e per km in 2021/22 and 2022/23. Equivalent comparison values from other utility works are difficult to establish, however these values are similar to (but less than) those reported from the water industry (approximately 90-190 tCO2e per km for new polyethylene mains laid in roads[34]), with the difference anticipated to be due to NGN gas mains replacement being predominantly done by insertion techniques utilising the existing gas mains rather than traditional open trench methods anticipated to be utilised for new water mains.

We are looking to expand the scope of our embodied carbon data capture during RIIO-2 to include capital projects such as fixed asset site upgrades and diversions undertaken for third parties to enable a wider scope of EC reporting in the future.

[33] 2020/21 = 29,118 tCO2e; 2021/22 = 25,722 tCO2e; 2022/23 = 23,813 tCO2e.
[34] Carbon curves for the assessment of embodied carbon in the wastewater industry; Smyth, Davison and Brow; *Water and Environment Journal* **31** (2017) 4-11.

4.3 Sustainable procurement, resource use and waste

Key annual performance summary:

- ***79% expenditure with Supplier Code of Conduct compliant suppliers***
- ***99.8% waste recycled, reused or recovered; 0.2% to landfill***
- ***Excavation spoil to landfill increased slightly to 0.2%***
- ***5% less office and depot waste down; disposal to landfill halved***
- ***Virgin aggregate use increased slightly to 9.5%***

4.3.1 Supply Chain and Sustainable Procurement

Our EAP recognised the need for us to develop a sustainable approach to procurement and resource consumption to reduce the environmental impact of our business operations and the c.£200m of goods and services that we buy each year from our over 700 strong supply chain.

During 2022/23 we spent £216m on goods and services from nearly 800 suppliers, 80% of which by value was with 61 suppliers, and 17% were known to be small and medium sized enterprises (SMEs). Our principal area of expenditure was mains replacement and reinstatement contractors which accounted for 40% of expenditure on goods and services.

For core business procurement events we preferentially engage suppliers who have been approved via the Achilles Utilities Vendor Database, an independent supply chain assurance assessment. In addition, potential suppliers for procurement events are typically required to complete a pre-qualification questionnaire (PQQ) which as standard includes questions regarding their environmental management systems, past environmental performance, corporate environmental objectives, how they meet our EAP objectives and their sustainable business practices, and are awarded scores accordingly. It is of note that we aware that many of our suppliers have set their own sustainability metrics and targets but we do not have access to data regarding the proportion of suppliers that have these and as such cannot provide performance data on this.

During 2021/22 we worked with our stakeholders[35] to finalise our Supplier Code of Conduct ('supplier code') and associated compliance process. Our supplier code is aligned to the UN SDGs and requires our suppliers to operate to high standards of environmental management and sustainable business practices. We expect the implementation of our supplier code to ensure delivery of our RIIO-2 commitments in the most sustainable manner for both our stakeholders and the planet, including with respect to ethical working practices and reducing greenhouse gas emissions. We have an EAP commitment to achieve at least 80% of our suppliers (by value) meeting complying with our supplier code by the end of RIIO-2.

Performance Summary

Following launch in April 2022[36], our supplier code has subsequently been communicated with existing and potential suppliers and compliance tracked by our Procurement Team. During 2022/23 79% of our expenditure was with suppliers who have agreed to our supplier code, a total of 200 suppliers, thereby substantially achieving our target set for end RIIO-2. This is an excellent achievement within 12 months of launch of our supplier code.

[35] [35] https://together.northerngasnetworks.co.uk/wp-content/uploads/2021/11/Supplier-code-of-conduct-Workshop-12-January-2022-v2.pdf

[36] https://www.northerngasnetworks.co.uk/wp-content/uploads/2022/04/Supplier-Code-of-Conduct_FINAL_compiled.pdf

During 2022 we joined the Supply Chain Sustainability School and are currently exploring how we can harness this to improve the sustainability performance of our supply chain. Of note this will involve sharing of best practice amongst members via discussion groups and by providing our suppliers with access to free to use training materials to help them develop their awareness of sustainability issues and how they can improve their own sustainability performance.

4.3.2 Efficient Resource Use and Waste

Our business operations inherently involve consumption of resources and generation of waste by ourselves and our contractors.

A summary of our primary material/resource consumption types by volume/mass is presented in Table 13 including data from ourselves and our main contractors.

Material/Resource Type	Unit	2021/22	2022/23	2023/24	2024/25	2025/26
Secondary (recycled) aggregates	tonnes	107,344	114,439			
Asphalt	tonnes	98,149	39,743			
Primary (virgin) aggregates*	tonnes	31,744	28,095			
Soil	tonnes	11,492	4,372			
Concrete and concrete products (eg kerbstones)	tonnes	7,782	7,316			
Polyethylene pipe and fittings	tonnes	1,861	1,947			
Diesel**	Litres	3,746,881	4,256,051			
Red diesel (gas oil)	Litres	463,358	1,191			
Petrol**	Litres	65,370	76,487			

Materials/resources presented are those with annual consumption >1000 tonnes or litres.

Data represents consumption for NGN, gas main replacement contractors and reinstatement contractors.

*** All aggregates including sand; not just stone as required in Ofgem reporting definition for 'virgin aggregate' for Table 11.07.**

**** Excludes consumption associated with travel in cars claimed as mileage as actual fuel consumption unknown.**

Table 13 – Primary material/consumption volumes for NGN and contractors

In addition to the information provided in Table 13, we have an EAP commitment to use less than 2.5% primary (virgin) aggregate (crushed stone) in reinstatement by 2025/26. During 2022/23 our virgin aggregate consumption increased slightly from 8% in 2021/22 to 9.5% associated with changes

in mains replacement workload locations to areas with constrained access to aggregate recycling centres (notably Yorkshire East Coast region) and city centre/major highways working with more restrictive reinstatement requirement. We are working with our supply chain to identify solutions to improve this performance, however we anticipate that some of these constraints may continue in the long term impacting our performance.

We typically generate c.200,000 t of waste annually, >99% of which is excavation spoil and >99% of it is recycled, reused or recovered. We have improved our waste disposal data reporting for 2022/23 in response to stakeholder feedback on our 2021/22 AER and are now able to provide a breakdown of disposal into landfill, recovery and recycling/reuse. A summary of waste production and disposal performance to the best available detail is provided in Table 14 below.

Waste Type	Unit	2021/22	2022/23	2023/24	2024/25	2025/26	2025/26 Target
Waste Production							
Excavation spoil	tonnes	201,061	196,887				n/a
Mixed recycling	tonnes	57	60				n/a
General waste	tonnes	583	526				n/a
Metals	tonnes	53	73				n/a
Wood	tonnes	39	47				n/a
Plastics (inc gas pipe waste)	tonnes	206	191				n/a
Green waste	tonnes	13	8				n/a
Hazardous	tonnes	3	3				n/a
Other	tonnes	38	32				n/a
Total	tonnes	202,053	197,828				n/a
Total office and depot waste^	tonnes	981	936				916*
Total waste per £m turnover	Tonnes/£m	480	392				n/a
Waste Disposal Performance							
Total waste: **disposed to landfill** **recycled/reused** **recovered**	%	 0.12 99.88** 0	 0.22 99.52 0.26				n/a
Excavation spoil:	%						

Waste Type	Unit	2021/22	2022/23	2023/24	2024/25	2025/26	2025/26 Target
disposed to landfill		0.11	0.21				<0.1%
recycled/reused		99.89**	99.79				n/a
recovered		0	0				
Office and depot waste:							
disposed to landfill	%	2.48	1.34				0%
recycled		97.52**	44.03				n/a
recovered		0	54.63				

*** Equates to 20% reduction compared to 2018 baseline (1145 t)**

****2021/22 data only available as disposal to landfill and diversion from landfill (recycled or recovered).**

^ Waste disposed at office and depot sites only (excludes waste generated at infrastructure sites and temporary work sites).

Waste data from our leased office at Doxford Park, Sunderland could not be obtained from our landlords. In response the waste data for our head office at Thorpe Park, Leeds has been duplicated as a proxy for the missing Doxford Park data as the offices typically have similar numbers of colleagues working there.

Table 14 – Waste disposal performance

During 2022/23 the amount of excavation spoil we sent to landfill increased slightly from 0.11% in 2021/22 to 0.21% associated with changes in mains replacement workload locations to areas with constrained access to aggregate recycling centres (notably Yorkshire East Coast region). We are working with our supply chain to identify solutions to improve this performance. Our long-term performance since the start of RIIO-1 remains excellent and we have significantly improved from our outset performance of 37% excavation spoil to landfill in 2013/14.

In addition, during 2022/23 we achieved 1.3% office and depot waste to landfill, down c.50% compared to 2021/22, and achieved a 18% reduction in office and depot waste mass compared to our 2018 baseline. As such we remain on track to achieve our end of RIIO-2 targets as shown in Table 14 and are working with our supply chain to achieve these at the earliest opportunity. We have a range of initiatives to enable us to achieve our waste targets. For example, during 2022/23 we launched a new collection scheme in our depots for end of life personal protective equipment, such as worn out overalls and hard hats, which provides secure recycling of these items which would otherwise go in the general waste disposal. This scheme is available to our colleagues and our mains replacement contractors.

We communicate our EAP waste and material targets with our colleagues via briefing videos and digital signage in our offices and depots, in addition to sharing them with our contractors. Our contractors are required to submit a detailed monthly waste, materials and fuel consumption report which identifies their performance against our EAP commitments. The performance data is subject to challenge and scrutiny at contractor performance review and meetings, and since April 2022 is included as scored criteria in our financially incentivised contractor 'Champions League' with similar weightings to health and safety and customer service performance.

Case Study – Encouraging our contractors to protect the environment	
Each of our 17 regional gas mains replacement contractors are included in our 'DSP Champions League' table. Each contractor is awarded points on a monthly basis for their performance across a number of areas including health and safety, customer service, environment and productivity, with financial prizes for the best performers over the year. Since April 2022 the following environmental criteria has been included to drive improvements for our customers and support achievement of our EAP commitments: • Site tidiness complaints received; • % excavation spoil to landfill; • % virgin aggregate use; and • Timeliness of environmental data submission.	

NGN's paper consumption remains low at approximately 0.8m sheets per year compared to a 2018 baseline of 3m, comfortably on track to achieve our target to halve our consumption by 2026. Our paper usage increased between 2021/22 and 2022/23 interpreted to be associated with a greater return to office working following the COVID-19 pandemic.

Our EAP included a commitment to eliminate avoidable single use plastics from our offices and depots by the end of RIIO-2. During 2022-23 we have undertaken a baseline assessment of our single use plastics consumption across our facilities and identified areas for improvement. We have since made improvements including:

- successfully trialling the use of glass milk bottles instead of single use plastic milk containers at our head offices (saving >1000 bottles and c.40kg of plastic waste per year);
- changing our office bin liners to recyclable or biodegradable bags; and
- ensuring we have recycling facilities for used printer ink and toner cartridges.

Next we are targeting removing single use plastic items from our stationery supplier catalogues and providing our operational colleagues with refillable water bottles as a sustainable alternative to ready bottled drinking water which would save c.60,000 single use plastic bottles weighing 2-3 tonnes annually.

Case Study – Milking the benefits to save plastic	
Our head office in Leeds typically consumes 40 litres of milk each week. This was delivered to us in over 1000 single use plastic containers each year. Whilst these containers are recyclable they are an avoidable single use plastic item. To proactively avoid this waste we have worked with our Facilities Management provider (Apleona) and their local milk provider to make the switch to glass milk bottles which can be easily cleaned and reused many times over. We have now made this a permanent change, saving approximately 40kg of single use plastic each year and are looking to make the same change at our other offices and depots where we can.	

4.4 Local environment

Key annual performance summary:

- ***Continuous review of severe weather management procedures***
- ***Continuation of land remediation works at two former gasworks sites***
- ***Planting of more than 18,500 trees in our community to improve air quality***
- ***'Homes for natures' at a further 18 NGN sites***
- ***Zero reportable environmental incidents***

4.4.1 Climate Change Resilience

NGN is designated as a reporting authority under the Climate Change Act (2008). During December 2021 we published our latest climate change adaptation and risk assessment report in response to the third round of the Climate Change Adaptation Reporting Power (CCARP)[37]. Our report details the climate change scenario analysis that we have completed collaboratively with the other energy networks of Great Britain and how we have used this to complete climate change risk assessments for our operations and assets in 2021 and 2050. Our assessments did not identify high risks in either 2021 or 2050. In addition, our report includes a case study of a riverbed erosion remediation project completed in summer 2021 to protect and improve the resilience of a high pressure pipe crossing. The UK Climate Change Committee noted that the third round submissions from gas network operators consistently demonstrated monitoring and evaluation and consideration of actions in the context of risks[38]. Our Round 3 report includes a Climate Change Adaptation Action Plan which we have worked on during 2022/23 and into 2023/24 and we will provide an update on our activities in our Round 4 report expected to be prepared in late 2024.

[37] Report available here: https://www.northerngasnetworks.co.uk/wp-content/uploads/2021/12/NGN-CCA-Rnd-3-Report-FINAL-DECEMBER-2021.pdf

[38] See page 41: https://www.theccc.org.uk/wp-content/uploads/2022/07/Understanding-climate-risks-to-UK-infrastructure-Evaluation-of-the-third-round-of-the-Adaptation-Reporting-Power.pdf

During 2021/22 our network area was subject to the effects of several significant storms, including Storm Arwen and Storm Malik. Whilst these events did not substantially negatively impact the operation of our network we have since undertaken a formal review of our severe weather operational management procedure to ensure it remains robust and appropriate, undertaken a review of back-up power generation facility requirements at our critical infrastructure sites, and developed an infrastructure site access risk assessment to ensure we can continue to serve our customers and meet our regulatory obligations regardless of the weather conditions. We continue to review our severe weather resilience processes and preparedness to ensure they remain appropriately robust.

4.4.2 Enhancing the Local Environment

A summary of our principal scheme to enhance the local environment is provided in Table 15 with commentary provided below.

Scheme Name	Location	Description	Environmental Benefit	Timescales
Land remediation programme	Knottingley AGI, West Yorkshire	In situ remediation of former gasholder tank	Recovery of c.1,900 litres of hazardous coal tar for disposal	2017 to January 2023
	Howdon Holder Station, Tyne and Wear	In situ remediation of former gasholder tank	Recovery of c.4,700 litres of hazardous coal tar for disposal	March 2020 to date (on-going)
Tree planting scheme	West Yorkshire and East Yorkshire	Planting of >20,000 trees	Air quality, carbon sequestration, water retention and biodiversity	April 2021 to date (on-going)
Homes for Nature	Various NGN asset sites	Creation of habitat and changing vegetation management to encourage biodiversity	Changes made at 84 sites	2017 to date (on-going)

Table 15 – Schemes to enhance the local environment

<u>Land Remediation</u>

As detailed in our EAP, our stakeholders were strongly of the view that NGN should be doing more in relation to land remediation. During RIIO-2 we committed to continuing our award winning land remediation programme which was initiated in RIIO-1 to proactively manage our portfolio of approximately 150 asset sites built on former gasworks. This programme involves targeted inspection, investigation and monitoring works, with bespoke remediation where necessary, to ensure our sites are maintained in statutory compliant conditions, posing no significant pollution risks.

Our land remediation workload for RIIO-2 is summarised in Table 16.

Land Remediation Monitoring and Maintenance Works at Gasholder and Non-Gasholder sites		Statutory Land Remediation at Gasholder and Non-Gasholder Sites
On-going periodic site condition reviews for all sites within the portfolio (currently 148) to ensure conditions remain stable and existing environmental risk assessments regarding site pollution potential remain valid.	Environmental monitoring works at up to nine sites, and intrusive survey works at up to a further seven sites, to confirm site conditions and refine the existing site environmental risk assessment.	Remediation works at up to eight sites where RIIO-GD1 intrusive survey and monitoring works have identified potentially non-compliant conditions, or where remediation would deliver environmental betterment to reduce the long term contamination risks associated with the sites to ensure compliance.

Table 16 – RIIO-2 land remediation workload summary

During 2022/23 we continued our programme of managing our portfolio of sites with potential for land contamination, and land remediation monitoring and maintenance works were completed across 72 sites. This included desk top assessments at one site, intrusive land contamination survey at three sites, and environmental sampling at a further 12 sites to provide an updated assessment of the environmental risk and potential liability associated with each site. In addition, site inspections were completed at a further 61 former gasworks sites to ensure their conditions remain stable and their existing environmental risk assessments remain valid. It is of note that some sites had more than one work activity undertaken. Total expenditure on our land remediation programme during 2022/23 in current year prices was £355,000.

We completed long-term remediation works at Knottingley AGI with a total of c.1,900 litres of hazardous liquid coal tar recovered from the ground beneath the site's live gas apparatus for safe disposal. In addition, we continued our long-term remediation project at Howden Holder Station which is due to complete in autumn 2023 and have recovered c.4,700 litres of hazardous liquid coal tar recovered from an infilled former gas holder tank for safe disposal to date.

We also commissioned site specific remediation feasibility assessments and design works during 2022/23 to enable completion of our scheduled land remediation projects during 2024/25 and 2025/26.

We remain on target to achieve our RIIO-2 land remediation commitments.

Case Study – Land Remediation at Knottingley High Pressure Gas Site

NGN operate a high pressure (38 barg) gas site at Knottingley, West Yorkshire. Prior to conversion to natural gas use, the site comprised a town gas production and storage site.

Ground investigation identified a 4.7 m deep, 13.6 m diameter infilled former gas holder tank to be present beneath the site gas infrastructure. Historic hazardous coal tar ranging in thickness up to 1.55m thick was identified to be present in the tank base which could leak in future and impact local groundwater and the nearby river. Live gas infrastructure covers approximately 85% of the surface area of the former tank.

To deliver long-term environmental betterment during 2017/18 we commenced a land remediation project to recover coal tar from beneath the gas infrastructure using specialist pumps installed in boreholes which had been drilled into the former tank structure. The objective was to recover the coal tar in a slow sustained manner to minimise the chances of ground movement in the overlying live gas infrastructure. The works completed in January 2023 by which time c.1,900 litres of coal tar was successfully recovered for specialist licenced off-site disposal without impact on the performance of the overlying gas infrastructure.

Congested works area – accessible portion of tank under gravel cover adjacent to live gas infrastructure

Pumping equipment installed around gas infrastructure

In addition to our strategic land contamination remediation programme, we are decontaminating and dismantling all of our gas holders which are now redundant and no longer required for gas network operation. This permanently removes the maintenance cost and safety and environmental liability associated with these historic structures. We committed to remove all of our 23 gas holders by the end of RIIO-2 and are ahead of schedule to achieve this commitment, with 15 having been decontaminated and dismantled during 2021/22 and 2022/23.

Tree Planting in Our Communities

Our EAP and 2021/22 AER describe how our shareholders are funding the planting of 40,000 trees in our region during RIIO-2 to help tackle air pollution. To enable this we have established a bespoke partnership with the Community Forest Trust[39], White Rose Forest[40] and Humber Forest[41] to deliver the tree planting and after care maintenance, including funding the appointment of a dedicated Project Officer for a five-year period. The Project Officer also supports our partners in enabling other tree planting activities, such as completing planting funding applications to other third party sources.

[39] https://www.communityforest-trust.org/
[40] https://whiteroseforest.org/
[41] https://www.humberforest.org/

NGN have valued the societal and environmental benefits delivered by the planting scheme at over £22m over 50 years[42].

During 2022/23 we directly funded the planting of 18,491 trees across 30 sites in East and West Yorkshire, including three school sites in East Yorkshire (see Figure 12 for an example scheme). The total net area of land planted during 2022/23 was 4.35 hectares. Since the programme started in 2021 we have planted 23,067 trees[43] meaning that we remain on target to achieve our RIIO-2 tree planting commitments.

As detailed in Section 1.3.2 of our 2021/22 AER, we engaged with our stakeholders during the design of the site selection methodology for the planting scheme and took on board their feedback by expanding it to include hedgerow creation to deliver broader environmental benefits. In addition to the direct outputs of our own tree planting scheme, the project officer funded by NGN has also secured:

- Funding for the planting of an additional 600 large (standard) trees across our region during 2022 to 2024 following a successful funding Urban Tree Challenge Fund application to the Forestry Commission; and
- £200,000 funding for further urban tree planting in West Yorkshire following a successful application to the West Yorkshire Combined Authority.

The cost to NGN shareholders of our tree planting during 2021/22 was £56,400.

Figure 12: NGN tree planting scheme outputs – new hedgerow in Hull, East Yorkshire

[42] CV6: https://www.northerngasnetworks.co.uk/wp-content/uploads/2019/12/A13-NGN-RIIO-2-Customer-Value-Proposition.pdf

[43] Our 2021/22 planting numbers have been revised since production of our 2021/22 AER.

Homes for Nature

It is well established that biodiversity in the UK and worldwide is facing significant threats as a result of land use and climate changes. Our 'Homes for Nature' commitment involves making positive changes at 250 of our fixed asset sites by the end of RIIO-2 to encourage biodiversity, all at no additional cost to gas customers. These changes could include installing habitats or changing vegetation management techniques to promote conditions in which biodiversity can increase. To support this, we have developed a catalogue of biodiversity enhancement methods suitable for our infrastructure sites and shared this with our landscape management team to enable implementation.

By the end of 2022/23 we had made positive changes to create 'Homes for Nature' at a further 18 of our asset sites, bringing our total to 84. This included successfully trialling 'No Mow May' at five of our asset sites during May 2022, with the outcome being to apply this across a wider number of sites in 2023-24.

We remain on target to achieve our RIIO-2 commitments.

Case Study – No Mow May, 2022	
NGN's landscape management procedures for operational gas sites currently include a prescriptive regime of regular grass cutting to maintain safe site access and egress, minimise fire risks, and maintain a 'tidy' appearance. To help biodiversity, most notably pollinators, during May 2022 NGN trialled consciously not cutting the grass at five of our infrastructure sites for the duration of the month ('No Mow May'). The outcomes were successful and pretty to see, with the growth of wild flowers visible on site without practical detriment to operational safety and as such the trial has been widened to 10 sites during May 2023, with the intention to apply these principles across our larger gas infrastructure site portfolio thereafter.	 *Cooper Bridge AGI, West Yorkshire, May 2022*

Ecosystem Services and Natural Capital Evaluation

As described in our 2021/22 AER, we developed a bespoke natural capital evaluation methodology and conducted baseline assessments at 32 of our infrastructure sites during 2021/22. The next round of natural capital assessment is scheduled for autumn 2023 and will be reported in our 2023/24 AER.

4.4.3 Biodiversity Net Gain

We have not undertaken further projects requiring biodiversity net gain calculation during 2022/23 beyond those included in our 2021/22 AER.

4.4.4 Environmental Incidents

Neither NGN nor contractors working on behalf of NGN experienced any environmental incidents which necessitated reporting to the Environment Agency or local authorities during 2022/23. In addition, we did not receive any enforcement action from environmental regulators (such as warning letters, enforcement notices, financial penalties or prosecutions) during 2022/23.

	2021/22	2022/23	2023/24	2024/25	2025/26
Number of reportable environmental incidents	0	0			
Enforcement action received from environmental regulators	0	0			

Table 17 – Reportable environmental incidents by NGN and contractors

5 Statement on scope and quality of data

The data contained in this report is presented to the best of our knowledge and capabilities in accordance with RIIO-2 Environmental Reporting Guidance, Version 1.0, Ofgem, 2 March 2021. All data contained in this report is subject to our own data assurance procedures prepared in accordance with the Ofgem Data Assurance Guidelines[44]. It is recognised that this is our second Annual Environmental Report prepared under the requirements of RIIO-2 and reporting may evolve in subsequent publications.

The scope of the environmental data presented (such as fuel consumption, tonnages of waste etc) is limited to that associated with our principal typical network workload activities, namely gas mains replacement, network reinforcements (<7 barg) and diversions, gas connections, and emergency repair. NGN do not currently hold data associated with abnormal workload activities such as infrastructure site capital installation / upgrades, gas holder demolition or land remediation projects, however we are looking to improve our collection of this data during RIIO-2. Any other additional exclusions associated with each data set is identified in the relevant section of the report. Wherever possible reported values are based on actual consumption data.

Greenhouse gas emissions reported have been calculated using conversion factors published by the UK Government for 2022[45], with the exception of gas leakage which utilises a bespoke conversion factor provided by Ofgem.

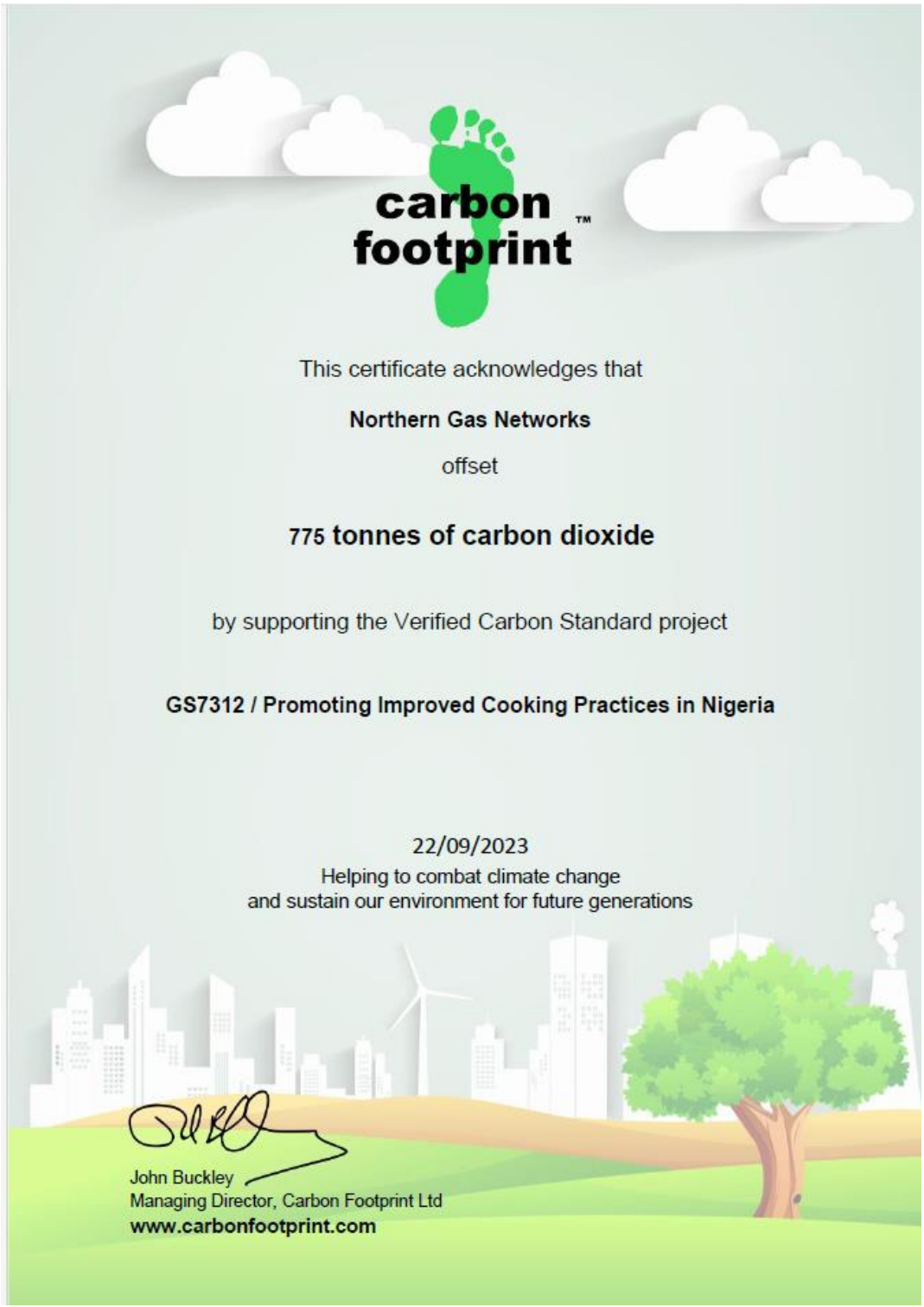
The process followed in the preparation of this report has been subject to audit by NGN's independent Internal Audit team. NGN's greenhouse gas emissions as contained in this document are also replicated in the Annual Report and Accounts of Northern Gas Networks Holdings Limited and as such are subject to independent third party audit[46] (by Deloitte for the period 1 April 2022 to 31 March 2023).

[44] https://www.ofgem.gov.uk/publications/data-assurance-guidance.
[45] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022
[46] See Statutory Accounts for period 1 April 2022 to 31 March 2023 here: https://www.northerngasnetworks.co.uk/wp-content/uploads/2023/08/NGN-H-Mar-23.pdf

Appendix A – RIIO-2 carbon reduction targets

Scope	Item	RIIO-2 Target (tCO2e)				
		21/22	22/23	23/24	24/25	25/26
1	Metered gas use	220	205	191	0	0
1	Operational vehicles	3,441	3,156	2,917	2,795	2,729
1	Business mileage	1013	797	588	579	570
2	Electricity use – offices, depots and gas sites	165	158	0	0	0
2	Electricity use – electric vehicle charging (operational vehicles)	80	162	242	242	242
2	Electricity use – electric vehicle charging (business mileage)	24	49	73	72	71
3	Contractor vehicles - road vehicles	8,490	8,260	8,029	7,799	7,568
3	Contractor vehicles - helicopter	77	77	77	77	77
3	PE Pipe	6,470	6,436	6,402	6,367	6,334
3	Rail	22	22	22	22	22
3	Air	198	196	194	192	190
3	Transmission and distribution losses	41	38	0	0	0
Total Scope 1		**4,674**	**4,158**	**3,696**	**3,374**	**3,299**
Total Scope 2		**269**	**369**	**315**	**314**	**313**
Total Scope 1 & 2		**4,943**	**4,527**	**4011**	**3,688**	**3,612**
Total Scope 3		**15,298**	**15,030**	**14,724**	**14,457**	**14,191**
Total Scope 1, 2 & 3		**20,241**	**19,557**	**18,735**	**18,145**	**17,803**

Appendix B – Carbon Offsets Certification



Recommended High Quality Carbon Offset Projects

Promoting Improved Cooking Practices in Nigeria

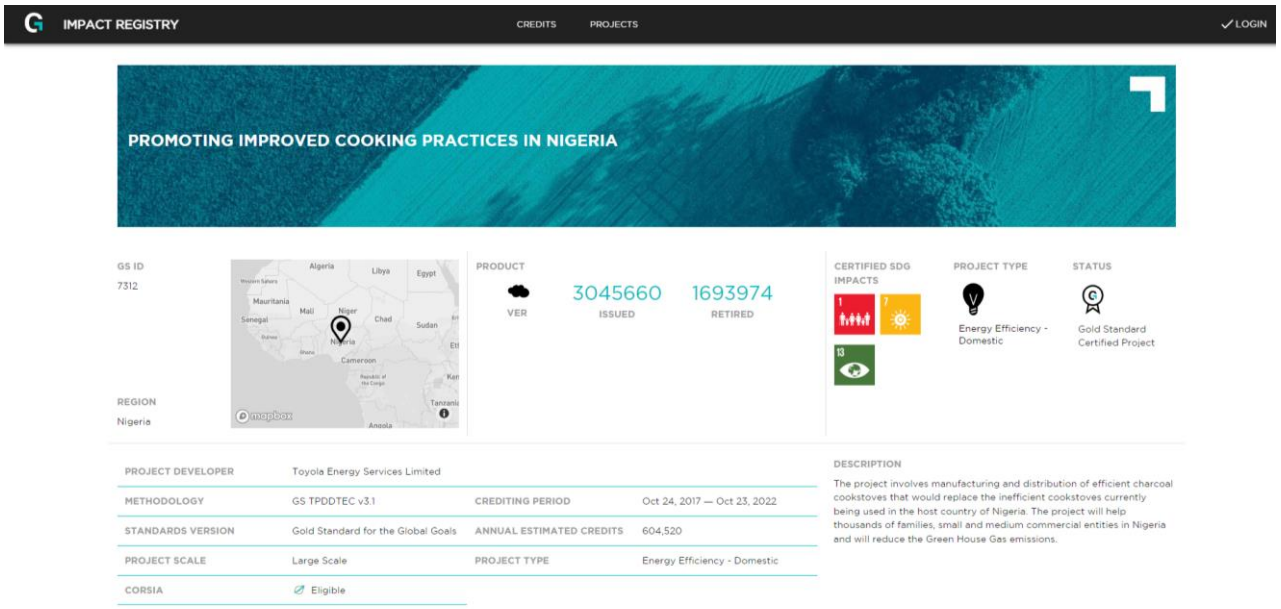
Type: Cookstove
Country: Nigeria
Reference: GS7312

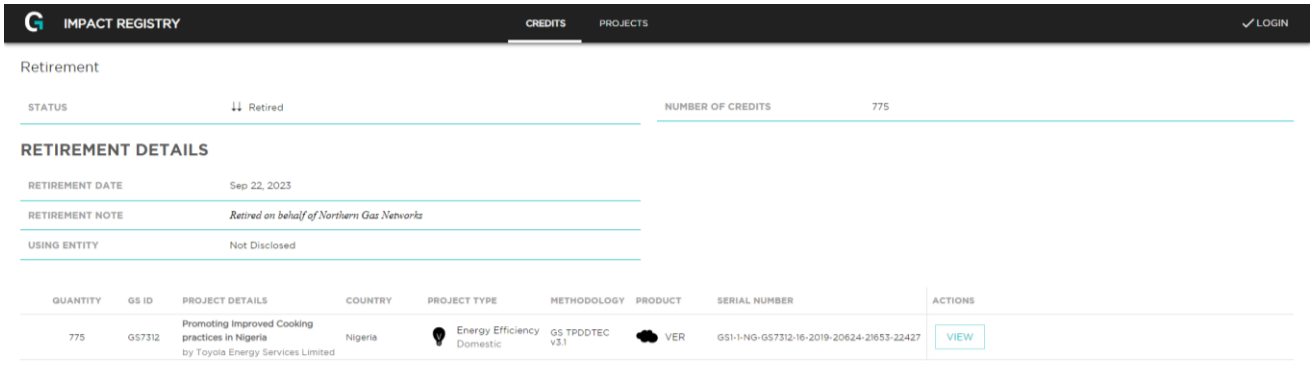
Gold Standard
Climate Security & Sustainable Development

The project activity involves replacement of existing in-efficient cookstoves being used by majority of Nigerian population with highly efficient Toyola Cookstoves.

Over 71% of Nigeria's population, mainly poor people, cooks with solid fuel in inefficient traditional Cookstoves and open fires resulting in serious indoor air pollution. Due to this, Nigeria records the highest number of indoor air pollution related deaths, averaging 64,000 annually, especially among women and children in poor families (Source: Clean Cooking Alliance). This is why Toyola Cookstoves is primarily target at the majority, the poor part of the population.

From the initial concept, women have been the driving force of this project. The problems of rudimentary stoves affect women disproportionately as they carry out the greater part of cooking and child-rearing activities, which centre around the kitchen and the hearth. By enlisting the help of female Community Agents, women have been empowered with new information, new skills and ownership of a new asset. The stove is made available to both men and women equally.


IMPACT REGISTRY
CREDITS
PROJECTS
LOGIN
PROMOTING IMPROVED COOKING PRACTICES IN NIGERIA
GS ID
7312
REGION
Nigeria
PRODUCT
VER
3045660
ISSUED
1693974
RETIRED
CERTIFIED SDG IMPACTS
PROJECT TYPE
Energy Efficiency - Domestic
STATUS
Gold Standard Certified Project
PROJECT DEVELOPER
Toyola Energy Services Limited
METHODOLOGY
GS TPDDTEC v3.1
CREDITING PERIOD
Oct 24, 2017 — Oct 23, 2022
STANDARDS VERSION
Gold Standard for the Global Goals
ANNUAL ESTIMATED CREDITS
604,520
PROJECT SCALE
Large Scale
PROJECT TYPE
Energy Efficiency - Domestic
CORSIA
Eligible
DESCRIPTION
The project involves manufacturing and distribution of efficient charcoal cookstoves that would replace the inefficient cookstoves currently being used in the host country of Nigeria. The project will help thousands of families, small and medium commercial entities in Nigeria and will reduce the Green House Gas emissions.


IMPACT REGISTRY
CREDITS
PROJECTS
LOGIN
Retirement
STATUS
Retired
NUMBER OF CREDITS
775
RETIREMENT DETAILS
RETIREMENT DATE
Sep 22, 2023
RETIREMENT NOTE
Retired on behalf of Northern Gas Networks
USING ENTITY
Not Disclosed
QUANTITY
GS ID
PROJECT DETAILS
COUNTRY
PROJECT TYPE
METHODOLOGY
PRODUCT
SERIAL NUMBER
ACTIONS
775
GS7312
Promoting Improved Cooking practices in Nigeria
by Toyola Energy Services Limited
Nigeria
Energy Efficiency Domestic
GS TPDDTEC v3.1
VER
GS1-1-NG-GS7312-16-2019-20624-21653-22427
VIEW

Glossary of Terms

Biomethane	Renewable or low carbon gas that is a gas mixture predominantly comprising methane and is sourced from organic material (biomass). This gas has similar thermal characteristics to natural gas and may be cleaned and injected into the natural gas network.
Carbon offset	An activity that compensates for the emission of carbon dioxide or other greenhouse gases by providing for an emissions reduction elsewhere. As greenhouse gases are widespread in the Earth's atmosphere the wider global climate benefits from emissions reductions regardless of where the emissions and reductions actually occurred.
Calorific value (CV)	A measure of the energy contained within a gas and is dependent on the composition of the gas. The CV is used to calculate the energy that may be released when a known volume of gas is completely combusted under specified conditions.
Capital expenditure (capex)	Expenditure on investment in long-lived assets, for example gas pressure reduction infrastructure.
Carbon footprint	Total amount of greenhouse gas emissions caused directly and indirectly by a business or activity.
Diversion (gas)	Diverting part of the gas pipeline away from its current route in order to facilitate safe working, for example in association with an infrastructure scheme such as a new road construction.
Ecosystem services	The direct and indirect contributions of ecosystems to human wellbeing which have an impact on our survival and quality of life. There are four types of ecosystem services: provisioning (for example provision of food), regulating (for example noise mitigation), cultural (for example enabling recreation) and supporting services (for example biodiversity and maintenance of genetic diversity).
Gas distribution networks	Eight individually licenced gas network areas in Great Britain, known as East of England, North West, West Midlands, London, Northern, Scotland, Southern, and Wales & West.
Gas Transporter	The holder of a Gas Transporter's Licence in accordance with the provisions of the Gas Act 1986.
Gigawatt Hours (Gwh)	Equal to one million Kilowatt Hours.
The Health and Safety Executive (HSE)	A public body responsible for regulating health and safety in Great Britain with the primary function to secure the health, safety and welfare of people at work and to protect others from risks to health and safety from work activity.
Kilowatt Hours (Kwh)	A unit of energy equal to the work done by the power of 1000 watts operating for one hour.
Land remediation	Work activity which reduces the degree of soil and water contamination at a site to a point whereby the site no longer presents significant risks to human health, controlled waters and the wider environment.
Licence Condition (obligation)	An obligation placed on the network companies to meet certain standards of performance. The authority (see Ofgem) has the power to take appropriate enforcement action in the case of failure to meet these obligations.
Natural capital	The world's stocks of natural assets which include geology, soil, air, water and all living things. It is from this natural capital that humans derive a wide range of services, often called ecosystem services, which make human life possible.
Northern Gas Networks (NGN)	The gas transporter licence holder for the Northern gas distribution network.
Ofgem	The Office of Gas and Electric Markets, which supports the Gas and Electricity Markets Authority (GEMA), the body established by Section 1 of the Utilities Act 2000 to regulate the gas and electricity markets in Great Britain
Operating expenditure (opex)	The costs of the day to day operation of the network such as staff costs, repairs and maintenance expenditures, and overhead.
Price control	The control developed by the regulator (see Ofgem) to set targets and allowed revenues for network companies over a defined duration.
Price Control Deliverable	A specific investment for which funding has been provided to a network by Ofgem under a price control period (such as RIIO-2) and must be delivered or the funding returned to Ofgem. Examples could include purchase of a specified number of electric vehicles.
Reinforcement (gas)	The installation of new assets to accommodate changes in the level or pattern of gas supply and demand.
Replacement (gas)	The replacement or refurbishment of assets which are at the end of their useful life due to their age or condition, or need to be replaced on safety or environmental grounds. For gas distribution networks the primary component of replacement work is the HSE enforced iron gas mains replacement programme.
Replacement expenditure (Repex)	Expenditure related to the replacement or decommissioning of gas assets, in practice predominantly iron gas mains for gas distribution networks.
RIIO	Revenue = Incentives + Innovation + Outputs Ofgem's regulatory framework for gas and electricity networks.
Shrinkage	A term used to describe gas either consumed within or lost from a transporter's system. For gas distribution networks this comprises gas lost via leakage (c.95%), gas illegally taken by third parties (c.3-4%) and gas used in the operation of the network infrastructure, for example pre-heating prior to pressure reduction (c.1-2%).
Stakeholder	Those parties that are affected by, or represent those affected by, decisions made by network companies and Ofgem. As well as consumers, this would for example include Government and environmental groups.

Tank to wheel (TTW)	The greenhouse emissions arising from the use of a specified fuel from the point of purchase by the consumer.
Total expenditure (Totex)	All expenditure related to a licensee's regulated activities but with the exception of some specified expenditure items.
United Nations Sustainable Development Goals (UN SDGs)	17 goals which aim to end poverty and other deprivations, improve health and education, reduce inequality, and spur economic growth, all while tackling climate change and working to preserve our oceans and forests. https://sdgs.un.org/
Well to tank (WTT)	The greenhouse emissions arising from the extraction, production, refining and transportation (including any losses during transportation) of a specified fuel prior to the purchase and consumption by the consumer.
Well to wheel (WTW)	The sum total of well to tank and tank to wheel greenhouse gas emissions for a specified fuel thereby providing the whole life emissions for the use of this fuel.