

Clays Carbon Footprint 2023 – Calculation Methods

The greenhouse gas inventory is prepared following the Greenhouse Gas Protocol (GHGP) Corporate Standard¹ and Value Chain Accounting and Reporting Standard². The operational control approach is used to define our organisational boundary between scopes 1&2 and scope 3 aligned with our financial accounting approach. All seven greenhouse gases listed in the Kyoto Protocol are accounted for measured as carbon dioxide equivalent (CO₂e), certain calculations without a complete CO₂e figure available are highlighted below. Our scope 3 inventory uses hybrid approach applying the supplier-specific method when available and otherwise uses the average data or spend-based methods. The GHGP defines 15 scope 3 categories companies are required to account for, 5 categories are deemed as not applicable to Clays and a further 2 categories are excluded from the inventory due to limited relevance. The calculation methods used for each category, the data sources used for activity data, the applied conversion factors with the justifications for category exclusions are detailed below. Any changes in the categories included or to the calculation methods are tracked according to the overall impact on emissions to enable us to qualify a significant change, requiring a recalculation and potential Science Based Targets initiative (SBTi) target resubmission according to the best available methods.

Scope	Activity/category	Description of method	Activity data	Conversion factors
1	1. Heating oils	Includes emissions from stationary onsite combustion of medium fuel oil, kerosene, propane and white diesel used for heating, calculated by multiplying our litre consumption from fuel bills by the corresponding conversion factors from DEFRA 2023. Further upstream indirect emissions from the extraction, production and transportation of fuel oils before onsite combustion are included within scope 3 category 3 (Fuel- and energy- related activities) under upstream purchased fuels.	Primary financial data	DEFRA 2023 ³
	2. Company vehicles	Includes mobile combustion emissions from the use of vehicles leased or owned by Clays calculated using the fuel-based method with primary data on litre consumption multiplied by the corresponding conversion factors from DEFRA 2023. Further upstream indirect emissions from the extraction, production and transportation of fuels before combustion are included within scope 3 category 3 (Fuel- and energy- related activities) under upstream purchased fuels.	Primary financial data	DEFRA 2023 ³
	3. Refrigerants	Includes fugitive emissions released from refrigeration equipment onsite, calculated with primary usages of refrigerants multiplied by global warming potential values (GWP) values from DEFRA 2023 (including non-Kyoto products).	Primary procurement data	DEFRA 2023 ³
2	Location-based	Location-based emissions are calculated considering the physical flow of electricity based on the production sources operating in a defined geographical boundary over a set period. This includes annual electricity consumption at our site in Bungay converted to emissions using the UK grid average production mix factor from DEFRA 2023.	Primary financial data	DEFRA 2023 ³

	Market-based	<p>Market-based emissions for purchased electricity are measured based on procurement choice, calculated using annual electricity consumption multiplied by a supplier or product-specific emissions factor.</p> <p>For 2023, Clays purchased a renewable energy tariff 100% backed by renewable energy certificates (RECs) including UK Renewable Energy Guarantees of Origin (REGOs) as well as EU Guarantees of Origin (GoOs). Given that the purchase of renewable energy certificates without the underlying renewable energy does not convey a direct link to renewable generation, the UK grid average production mix factor is applied to our consumption matched by unbundled certificates^{4/5/6/7}. All certificates purchased to match our consumption during 2023 were unbundled, therefore total electricity consumption is multiplied by the UK grid average production mix factor equal to location-based emissions for 2023.</p>	<p>Primary financial data</p> <p>Ofgem Recognised Guarantees of Origin⁸</p> <p>Renewables and CHP Register⁹</p> <p>Primary data from supplier</p>	DEFRA 2023 ³
3	1: Purchased goods and services	<p>Emissions in this category cover all upstream emissions from the manufacture of products and provision of services purchased by Clays. Purchased goods includes all cradle-to-gate emissions from purchased materials and chemicals covering paper, inks, glue, pallets, finishing materials and packaging. Approximately 30% of paper throughout is purchased by our publishers, therefore cradle-to-gate emissions are not included within Clays scope 3 inventory. Following the GHGP, upstream emissions from recycling processes for purchased goods with recycled content are accounted for in category 1. Purchased services include outworking (printing), engineering, postal, professional and further uncategorised residual services.</p> <p>Greenhouse gas emissions from paper production (1a – including i. Reels and ii. Sheets) are calculated following the methods in the hierarchy below based on availability:</p> <ol style="list-style-type: none"> 1. CEPI Ten Toes carbon footprint statements (fossil CO₂)¹⁰ or equivalent 2. Paper Profiles¹¹ or equivalent (including fossil CO₂ emissions and purchased electricity under the location-based method) and estimates for scope 3 categories. 3. DEFRA 2023 paper and board conversion factors (CO₂e) <p>In addition to the categories included within these statements, CO₂e estimates are also included for the below categories:</p> <ul style="list-style-type: none"> • Upstream indirect/well-to-tank purchased electricity • Electricity transmission and distribution (T&D) losses (upstream and generation) • Solid waste landfilled <p>The breakdown of the remaining materials, chemicals and services is illustrated below. When available, primary conversion factors from our suppliers are used and otherwise sector averages based on volume. The remaining procurement spend from our smaller suppliers of materials and services are calculated using a hybrid spend-based approach.</p>	<p>Primary procurement data based on weight or spend</p>	<p>Primary supplier data when available</p> <p>AIB production mix factors¹²</p> <p>Hybrid estimates</p> <p>Secondary averages</p> <p>DEFRA 2023³</p> <p>EuPIA Ecomatters 2020¹³</p> <p>IEA Life Cycle Emissions Factors¹⁴</p> <p>Hybrid spend-based factors</p>

		<table><tr><th>Ref</th><th>Material/service</th><th>Description</th><th>Conversion factor</th></tr><tr><td>1bi.</td><td>Inks and toner</td><td>Pigments mixed with oils for printing text, covers and jackets.</td><td>EuPIA Ecomatters 2020/hybrid</td></tr><tr><td>1bii.</td><td>Varnish</td><td>Lacquer applied to covers/jackets for protection and appearance</td><td>EuPIA Ecomatters 2020</td></tr><tr><td>1biii.</td><td>Glue</td><td>Adhesives used to bind book blocks and covers together</td><td>DEFRA 2023/hybrid</td></tr><tr><td>1biv.</td><td>Foil</td><td>Aluminium foil applied to covers/jackets for appearance</td><td>Supplier-specific/DEFRA 2023</td></tr><tr><td>1bv.</td><td>Pallets</td><td>For transportation and distribution</td><td>DEFRA 2023</td></tr><tr><td>1bvi.</td><td>Plates</td><td>Aluminium sheets used for lithographic printing</td><td>DEFRA 2023</td></tr><tr><td>1bvii.</td><td>Laminate</td><td>Plastic film applied to covers for protection and appearance</td><td>DEFRA 2023</td></tr><tr><td>1bviii.</td><td>Blocks</td><td>Metal dies used for cover/jacket finishes</td><td>DEFRA 2023</td></tr><tr><td>1bix.</td><td>Slip cases</td><td>Cardboard covers for sets</td><td>DEFRA 2023/hybrid</td></tr><tr><td>1c.</td><td>Packaging</td><td>Materials used to package products including carton board and plastic film</td><td>DEFRA 2023/hybrid</td></tr><tr><td>1di.</td><td>Printing services</td><td>Outworking including finishing and pre-retail</td><td>Hybrid spend-based factors</td></tr><tr><td>1dii.</td><td>Engineering services</td><td>Servicing and maintenance of onsite machinery</td><td>Hybrid spend-based factors</td></tr><tr><td>1diii.</td><td>Postal services</td><td>Courier services</td><td>Hybrid spend-based factors</td></tr><tr><td>1div.</td><td>Professional services</td><td>Other professional services</td><td>Hybrid spend-based factors</td></tr><tr><td>1ei.</td><td>Residual services</td><td>All other uncategorised services</td><td>Hybrid spend-based factors</td></tr><tr><td>1eii.</td><td>Residual materials</td><td>All other uncategorised materials</td><td>Hybrid spend-based factors</td></tr></table>	Ref	Material/service	Description	Conversion factor	1bi.	Inks and toner	Pigments mixed with oils for printing text, covers and jackets.	EuPIA Ecomatters 2020/hybrid	1bii.	Varnish	Lacquer applied to covers/jackets for protection and appearance	EuPIA Ecomatters 2020	1biii.	Glue	Adhesives used to bind book blocks and covers together	DEFRA 2023/hybrid	1biv.	Foil	Aluminium foil applied to covers/jackets for appearance	Supplier-specific/DEFRA 2023	1bv.	Pallets	For transportation and distribution	DEFRA 2023	1bvi.	Plates	Aluminium sheets used for lithographic printing	DEFRA 2023	1bvii.	Laminate	Plastic film applied to covers for protection and appearance	DEFRA 2023	1bviii.	Blocks	Metal dies used for cover/jacket finishes	DEFRA 2023	1bix.	Slip cases	Cardboard covers for sets	DEFRA 2023/hybrid	1c.	Packaging	Materials used to package products including carton board and plastic film	DEFRA 2023/hybrid	1di.	Printing services	Outworking including finishing and pre-retail	Hybrid spend-based factors	1dii.	Engineering services	Servicing and maintenance of onsite machinery	Hybrid spend-based factors	1diii.	Postal services	Courier services	Hybrid spend-based factors	1div.	Professional services	Other professional services	Hybrid spend-based factors	1ei.	Residual services	All other uncategorised services	Hybrid spend-based factors	1eii.	Residual materials	All other uncategorised materials	Hybrid spend-based factors		
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2: Capital goods	Includes all upstream emissions from purchases of machinery. Following the GHGP, upstream emissions from recycling processes for capital goods with recycled content are accounted for in category 2. When available, the approximate weight of the machinery is multiplied by DEFRA 2023 conversion factors and otherwise a spend-based method is applied using conversion factors from HEPA.	Primary procurement data on weights (if available) or spend	DEFRA 2023 ³ HEPA 2020 ¹⁵ DEFRA 2011 ¹⁶																																																																					

3: Fuel- and energy-related activities	<p>Emissions in this category include emissions related to the production of fuels and energy purchased by Clays, covering three activities:</p> <ul style="list-style-type: none"> a. Upstream purchased fuels: Emissions from the production of fuels for heating and company vehicles included within scope 1, calculated with DEFRA 2023 well-to-tank conversion factors. b. Upstream purchased electricity: Indirect/well-to-tank emissions from the production of fuels used for the generation of electricity with the split described under scope 2 market-based emissions. Electricity purchased through unbundled certificates are considered as grid average calculated with DEFRA 2023 factors. Electricity purchased through bundled certificates are calculated using an adjusted supplier-specific emissions factor. c. Transmission and distribution (T&D) losses: Includes upstream/indirect and direct emissions from additional electricity consumed in the T&D network calculated using DEFRA 2023 grid average production mix factors. 	Primary financial data	<p>DEFRA 2023³</p> <p>Primary supplier data</p>
4: Upstream transport	<p>Emissions in this category cover the transportation and distribution of purchased goods included within category 1, in addition to third-party transportation and distribution services purchased by Clays for customer deliveries. All sub-categories are calculated using the distance-based method including well-to-wheel emissions:</p> <ul style="list-style-type: none"> a. Transportation of paper (ai. reels and aii. sheets): Emissions from the upstream freight of reels and sheets included within category 1, estimated from the location of the original manufacturing site and via points. The weight of each material is multiplied by the one-way distance travelled and multiplied by DEFRA 2023 well-to-wheel conversion factors by the mode of transport. b. Transportation of materials: Emissions from the upstream freight of all other production materials included within category 1, estimated from the location of the original manufacturing site and via points. The weight of each material is multiplied by the one-way distance travelled and multiplied by DEFRA 2023 well-to-wheel conversion factors by the mode of transport. c. Downstream deliveries: Following the GHGP, this category also includes emissions from our outbound transport in the delivery of our finished products to our customers as a purchased service. This is calculated with the distance-based method applying sector average DEFRA 2023 well-to-wheel conversion factors. 	<p>Primary procurement data</p> <p>Primary internal data</p>	<p>DEFRA 2023³</p> <p>Primary supplier data</p>

5: Waste	<p>This category covers the emissions from two activities:</p> <ul style="list-style-type: none"> a. Disposal of waste generated in operations: For the portion of waste generated in operations sent for recycling, emissions are calculated following the recycled content method whereby emissions in the recycling process are allocated to the life cycle that uses the recycled material. Weights of individual materials were obtained from our waste management contractor multiplied by the corresponding conversion factor from DEFRA 2023, including optional emissions from the transportation of waste material sent for recycling. b. Water supply and treatment: Consumption and sewerage volumes were obtained from internal financial data and multiplied by DEFRA 2023 supply and treatment conversion factors. 	Primary financial data	DEFRA 2023 ³
6: Business travel	Emissions in this category cover the transportation of all full-time employees for business-related activities in vehicles not controlled by Clays. This includes all well-to-wheel emissions from automobile, air, rail and bus travel calculated using expense claims reported in financial data and DEFRA 2023 conversion factors.	Primary financial data	DEFRA 2023 ³
7: Employee commuting	This category includes emissions from the transportation of all full-time employees between homes and worksites in vehicles not controlled by Clays. This is calculated using the number of employees and UK average commuting distances across modes of transportation multiplied by DEFRA 2023 well-to-wheel conversion factors.	<p>Primary number of full-time employees</p> <p>Secondary UK average survey data¹⁷ (adjusted)</p>	DEFRA 2023 ³
8: Upstream leased assets	Emissions in this category cover the scopes 1 and 2 emissions from a leased storage and pre-retail services site. As Clays do not have control over the operating policies of the site, emissions are allocated to scope 3 following the operational control consolidation approach. This includes emissions from the onsite combustion of fuels and the generation of purchased electricity calculated with DEFRA 2023 conversion factors.	Primary procurement data	DEFRA 2023 ³
9: Downstream transport	<p>This category includes emissions from the transportation and distribution of sold products to the end-consumer not paid for the reporting company. Outbound logistics (customer deliveries) are allocated to upstream transportation and distribution (category 4) following the GHGP. As Clays provide printing and distribution services to publishers, emissions in this category reflect the percentage of paper purchased by Clays in printed books.</p> <p>Emissions are screened using production quantities and the activity-based method from publisher distribution data covering well-to-wheel emissions. Based on these methods, emissions are estimated at less than 2% of total scope 3 emissions. As emissions in this category are insignificant, and Clays has limited visibility or capacity to influence reductions in this area, category 9 is excluded from the scope 3 inventory consistent with SBTi criteria.</p>	-	-

10: Processing of sold products	This category includes emissions from the processing of sold intermediate products by third parties subsequent to sale by the reporting company. Intermediate products are products that require further processing, transforming or inclusion in another product before use by the end consumer. As the sold products do not involve any further processing before use by the end-consumer, there are no emissions to calculate under this category.	N/A	N/A
11: Use of sold products	This category includes emissions from the use of goods and services sold by the reporting company. This includes two types; Direct use-phase emissions refer to products that directly consume energy during use, fuels and feedstocks, or emissions released during use. Indirect use-phase emissions are optional to include and refer to products that indirectly consume energy during use. There are no direct use phase emissions for the sold products and indirect-use phase emissions are optional and are excluded due to the limited relevance for Clays.	N/A	N/A
12: End-of-life treatment of sold products	<p>This category includes emissions from the disposal and treatment of sold products. As Clays provide printing and distribution services to publishers, emissions in this category reflect the percentage of paper purchased by Clays in printed books.</p> <p>Emissions are screened using production quantities, regional waste management scenarios and emissions factors from secondary life cycle databases. For products sent for recycling, the emissions calculation followed the recycled content method. Based on these methods, emissions are estimated at 2% of total scope 3 emissions. Clays has a limited ability to measure, track progress against or influence reductions to these categories. This is likely to be determined by the final end-user of the product, therefore we are unable to reasonably measure or set credible targets in this area. As emissions in this category are insignificant with limited relevance to Clays, category 12 is excluded from the scope 3 inventory consistent with SBTi criteria.</p>	-	-
13: Downstream leased assets	This category includes emissions from the operation of assets that are owned by the reporting company and leased to other entities. As Clays do not own any leased assets, there are no emissions to calculate under this category.	N/A	N/A
14: Franchises	This category includes emissions from the operation of franchises not included in scopes 1 and 2. As Clays do not operate any franchises, there are no emissions to calculate under this category.	N/A	N/A
15: Investments	This category includes scope 3 emissions from investments applicable to investors and companies that provide financial services. As Clays neither invest in this way nor provide financial services, there are no emissions to calculate in this category.	N/A	N/A

GHG Intensity Ratio

Our greenhouse gas inventory details our total or 'absolute' emissions to reflect our overall contribution to global greenhouse gas emissions, however this potentially hides changes to our production levels which may be expected to increase or decrease our total emissions even if our performance has remained similar. Therefore to contextualise the changes in our absolute emissions across years, we have reported an intensity ratio expressing our greenhouse gas emissions between each scope per 1,000 tonnes of paper throughput as a consistent benchmark for our performance across years.

Our total paper throughput is calculated using purchasing data combined with internal usage reports including paper purchased by Clays as well as by our publishers. As our scope 3 emissions inventory covers approximately 30% of our total paper throughput, we have also estimated our GHG intensity ratio including producing and transporting paper purchased by publishers for perspective against other categories.

Sources

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2. [Corporate Value Chain \(Scope 3\) Standard | GHG Protocol](#)
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4. [GHG Protocol to assess the need for additional guidance building on existing corporate standards | Greenhouse Gas Protocol](#)
5. [The evolution of scope 2 accounting, target setting and monitoring - Science Based Targets](#)
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9. [Renewables & CHP \(ofgem.gov.uk\)](https://www.ofgem.gov.uk/renewables-and-chp)
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16. [Table 13 Indirect emissions from supply chain 2007-2011.xls \(live.com\)](#)
17. [Commuting trends in England 1988 - 2015 \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/government/statistics/commuting-trends-in-england-1988-2015)