Methodology and key assumptions for calculating our Greenhouse Gas emissions

FY 2023

Contents

1. Introduction

Glenveagh monitors its value chain GHG emissions year on year and reports annually in the Annual Report. This document outlines the scope, methodology and key assumptions used to assess Glenveagh's FY2023 footprint covering all relevant emissions from Scopes 1, 2 & 3.

2. Greenhouse gases

The assessment considers the six greenhouse gases covered by the Kyoto and Montreal Protocols: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs).

The total footprint is expressed as carbon dioxide equivalent (CO_2e) applying the Global Warming Potential (GWP) values provided by IPCC (2007). Table 1 lists the key emissions sources identified and the GWP used in the calculations.

Table 1 - Greenhouse gases global warming potential

Greenhouse gas	Key emissions sources	GWP
CO_2	Combustion of fossil fuels	1
CH_4	Combustion of fossil fuels Waste disposal (landfilled)	25
N_2O	Combustion of fossil fuels Waste disposal (landfilled)	298
HFCs	Refrigerant gas losses	R134a: 1,300 R404a: 3,943 R410a: 1,924 R507: 3,985 R32: 677

3. Scope

3.1 Organisational boundary

In line with Glenveagh´s wider sustainability reporting, operations are included within the GHG assessment boundary on the basis of financial control. Glenveagh has the full authority to introduce and implement its operating policies at the operation and it accounts for 100% of emissions from operations.

The scope covers all operations associated with Glenveagh's products:

- Single-unit houses.
- Multi-unit apartment blocks.
- External and common works associated with houses and apartments.

3.2 System boundary

A brief description of the GHG Protocol Scopes (consistent with the criteria used to define the organisational boundary) is provided below:

- Scope 1: Direct emissions occurring from sources controlled by Glenveagh, including emissions from fuel combustion on site, in offices and in manufacturing facilities.

- Scope 2: Indirect emissions associated with the generation of purchased electricity consumed by Glenveagh's operations.

- Scope 3: All other indirect emissions occurring as a result of Glenveagh´s activities from sources not directly controlled by Glenveagh. Scope 3 captures emissions resulting from upstream and downstream activities in Glenveagh's value chain.

In the context of whole life cycle analysis, the system boundary defined for this assessment is identified as "cradle-to-grave", including all life cycle stages from the extraction of raw materials through manufacturing of the construction materials, to energy consumed during the construction stage, to emissions arising from occupant energy usage, through to waste disposal of materials at end of life. Figure 1 presents a simplified overview of Glenveagh's value chain, showing the high-level life cycle stages under which all the emissions have been grouped.

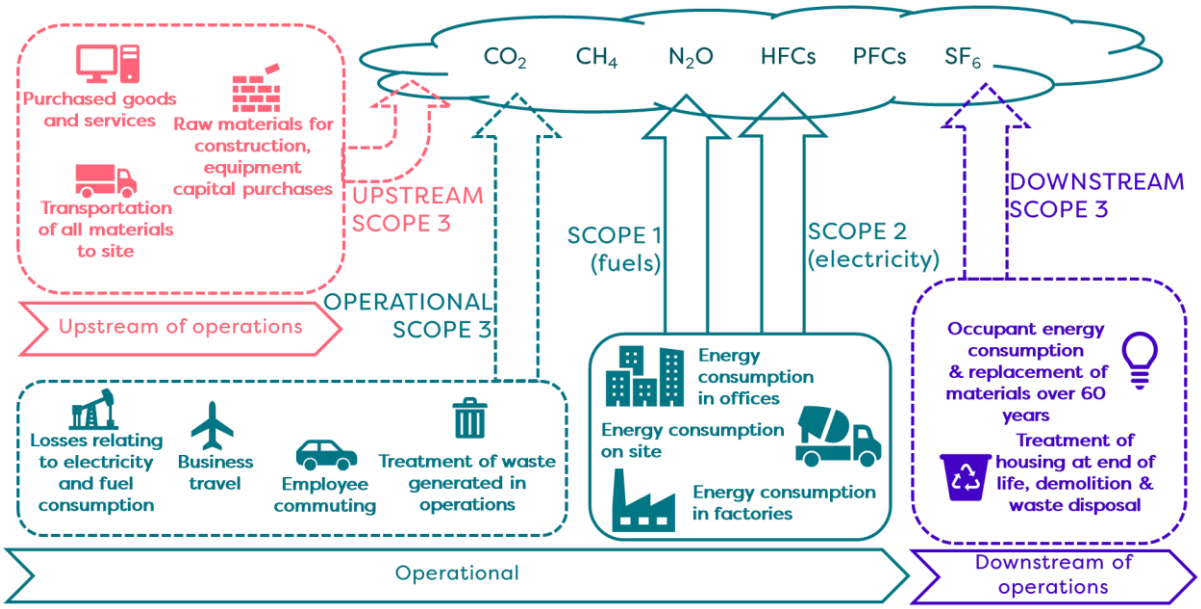

Figure 1 - Glenveagh's GHG emissions inventory

Glenveagh's Scope 3 boundary is outlined in more detail in Appendix 1 – definition of Scope 3 boundary, and includes activities from house and apartment construction and timber frame manufacturing. In line with the Greenhouse Gas Protocol, a materiality assessment has been performed on known attributable emissions within the boundary, and the system boundary was set based on the concept of materiality as defined by the GHG Protocol ensuring that over 95% of the anticipated life cycle GHG value chain emissions were covered by the scope.

4. Methodology

The assessment of Glenveagh´s emissions is carried out in line with the principles and guidelines provided by the two relevant GHG Protocol standards: GHG Protocol Corporate Accounting and Reporting Standard (2004) and its supplement GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard. The calculation of the embodied carbon of the construction materials is aligned with the EU's Level(s) framework for sustainable buildings, and follows the Royal Institute of Chartered Surveyors (RICS) professional standards and guidance for the whole life carbon assessment for the built environment (2017).

4.1 Activity data

The activity data sources are listed in Table 2 below:

Table 2 - Activity data sources

Category	Activity data sources
Scope 1	• Primary data (e.g. invoices from suppliers, fuel card data for company cars) • Consumption of fuel for generators and machinery used onsite provided by Glenveagh • Refrigerant volumes
Scope 2	• Primary data (invoices from suppliers, meter readings and fuel card data for company cars)
Purchased goods & services	• Annual procurement spend data • Glenveagh calculations of sub-contractor fuel-use onsite
Embodied carbon of construction materials	• Annual completions by housing unit type • Bills of quantities for 6 reference house types: - 3 bed semi-detached/end terrace brick & block - 3 bed semi-detached/end terrace timber frame - 3 bed mid-terrace brick & block - 3 bed mid-terrace timber frame - brick & block maisonette - brick & block duplex • Bill of quantities for curtilage, external common works to houses including services, and compound and site works for a representative site. • Greater London Authority whole life-cycle carbon assessments draft guidance - embodied carbon benchmarks for apartment buildings and hotels
Capital goods	• Annual CAPEX spend data
Fuel & energy related activities	• Scope 1 & 2 energy data

Upstream transportation & distribution	• Annual completions by housing unit type
	• Bills of quantities for 6 reference house types:
	  - 3 bed semi-detached/end terrace brick & block
	  - 3 bed semi-detached/end terrace timber frame
	  - 3 bed mid-terrace brick & block
	  - 3 bed mid-terrace timber frame
	  - brick & block maisonette
	  - brick & block duplex
	• Bill of quantities for curtilage, external common works to houses including services, and compound and site works for a representative site.
	• Greater London Authority whole life-cycle carbon assessments draft guidance - embodied carbon benchmarks for apartment buildings and hotels
	• RICS guidance for standard assumptions for upstream transport & distribution of the materials listed above including average distance, fuel type, loading factor etc.

Waste generated during operations	• Annual waste data • Supplier specific % of waste to each waste stream (landfill/reuse/recycling/energy from waste etc)
Business travel	• Company car & car allowance mileage dataset • Taxi, Luas and train spend • Number and origin-destination of flights
Employee commuting	• Full time employee numbers • Employee commuting survey
Use of sold products	• BER dataset for all homes completed in the reporting year

End of life	• Annual completions by housing unit type Bills of quantities for 6 reference house types:
	  - 3 bed semi-detached/end terrace brick & block
	  - 3 bed semi-detached/end terrace timber frame
	  - 3 bed mid-terrace brick & block
	  - 3 bed mid-terrace timber frame
	  - brick & block maisonette
	  - brick & block duplex
	• Bill of quantities for curtilage, external common works to houses including services, and compound and site works for a representative site.
	• Greater London Authority whole life-cycle carbon assessments draft guidance - embodied carbon benchmarks for apartment buildings and hotels
	• RICS guidance for standard end of life assumptions of the materials listed above.

4.2 Emissions and energy factors

Emissions factors are updated annually.

A hierarchy of emission and energy factor sources has been established and is listed below. When updating factors, strong preference is given to non-monetary units. Factors are only taken from lower steps in the hierarchy where the previous step did not identify an appropriate emissions factor.

1. Government (SEAI) and International Energy Agency emissions factors for annual GHG reporting
2. Supplier specific emission factors where available
3. Lifecycle database information (via the OneClick LCA database), with a preference for locally relevant processes
4. Industry publications or academic literature.
5. Spend-based factors from public GHG inventories, industry publications, or academic literature.

4.3 Scope 3 model and calculations

The reporting tools used by Glenveagh are set up for year-on-year reporting and from 2024 will be set up for quarterly interim reporting. Each GHG category has an individual excel sheet which is used to calculate the total emissions arising from this category in tCO_2e.

The model is updated annually with the relevant activity data and emissions factors. Data is visualised for reporting at company level, with the reports broken down to value-chain segment level. The footprint is reported on an absolute (tCO_2e) and intensity ($tCO_2e/100m^2$) basis.

4.4 Calculation methodology

Category	Methodology
Scope 1	Depending on the fuel type, the activity data for energy consumed is multiplied by the appropriate emissions factor. For refrigerants, the activity data is multiplied by the corresponding GWP emission factor.
Scope 2	The activity data for electricity consumed is multiplied by the appropriate electricity emissions factor to give the tCO_2e emitted on a location basis. Where there are gaps in the data, e.g. missing months, the actual data was used to gap-fill or extrapolate as appropriate. Where actual energy consumption is not available for standing charge invoices for small use (e.g. public lighting), the carbon estimate provided on the invoice is used. This represents <1% of total emissions from electricity consumption.

Scope 3	
Purchased goods & services	• Emissions are calculated on a spend-basis for overhead items. • Spend relating directly to construction materials and subcontractors that provide materials were calculated separately using a different methodology outlined below. • Glenveagh provided calculations for fuel usage by sub-contractors onsite, which was extrapolated up to cover all of Glenveagh's operations. The appropriate fuel emission factors are applied.
Embodied carbon of construction materials	Embodied carbon of construction materials was calculated based on the number of housing units and apartment blocks completions. The material quantities and specifications were compiled in OneClick LCA software for each representative house type, curtilage, external common works to houses, services, and compound and site works. The emission factor hierarchy for each material was 1. Supplier specific emission factor where product EPD was available 2. Local industry average emission factor for product type 3. Regional industry average emission factor for product type The final tCO2e/m2 for the standard house types were uplifted to allow for any materials that did not appear on the bill of quantities, following the RICS guidance. For apartment blocks, in the absence of a bill of quantities for a representative apartment block, the embodied carbon emissions were calculated using total floor area and following the 'Whole life-cycle assessments Guidance' and benchmark data from the Greater London Authority. This category also includes the embodied carbon of waste material generated onsite.
Capital goods	Emissions are calculated on a spend-basis for CAPEX items.
Fuel & energy related activities	Depending on the fuel type, the activity data for energy consumed is multiplied by the appropriate Transmission & Distribution and Well-to-Tank emissions factor to give the amount of CO_2e emitted.
Upstream transportation & distribution	Upstream transportation of construction materials was calculated based on the quantity of materials for housing and apartment blocks completions. The material quantities and specifications were compiled in OneClick LCA software for each representative house type, curtilage, external common works to houses, services, and compound and site works. OneClick LCA uses Irish average factors for distances travelled, modes of transport, and average loading factors for each material type. The final tCO2e/m2 for the standard house types were uplifted to allow for any materials that did not appear on the bill of quantities, following the RICS guidance. For apartment blocks, in the absence of a bill of quantities for a representative apartment block, the upstream transportation emissions were calculated using

	total floor area and following the 'Whole life-cycle assessments Guidance' and benchmark data from the Greater London Authority.
Waste generated during operations	Emissions associated with waste generated in operations were calculated using the types and amounts of waste provided by Glenveagh and following the supplier specific disposal routes for different types of waste. Depending on whether recycled or landfilled, the appropriate emission factors were applied.
Business travel	Emissions are calculated based on business travel data records collected by Glenveagh and appropriate emission factors were assigned by mode of transport.
Employee commuting	The emissions associated with employee commuting were calculated using the responses from an employee commuting survey in which a sample of Glenveagh employees were asked the mode of transport used and the distance. The appropriate emissions factors were assigned by mode of transport. This was then pro-rated to the total number of Glenveagh full-time employees.
Use of sold products	The BER dataset for each completed home in 2023 gives the regulated kWh/m^2/yr and the main heating system. The projected grid emissions factor was then applied to the electricity consumption looking forward 50 years, aligned with the EU Level(s) framework. The unregulated loads were calculated following the RICS (2017) recommendation that in the absence of any measured data unregulated energy demand should be assumed to be equal to the regulated energy demand. Because the emissions are calculated over a period of 50 years, emission factors projections were used as per the EU reference scenario 2020 – Energy, transport and GHG emissions: trends to 2050.
End of life	End of life of construction materials was calculated based on the quantity of materials for housing and apartment blocks completions. The material quantities and specifications were compiled in OneClick LCA software for each representative house type, curtilage, external common works to houses, services, and compound and site works. OneClick LCA uses Irish average factors for distances travelled, modes of transport, and average loading for each material type. For apartment blocks, in the absence of a bill of quantities for a representative apartment block, the end-of-life emissions were calculated using total floor area and following the 'Whole life-cycle assessments Guidance' and benchmark data from the Greater London Authority.

5. Recalculation policy

The following changes should trigger a footprint and target recalculation:

- Significant changes in company structure and activities (e.g. acquisitions, divestitures, mergers, insourcing or outsourcing, shifts in product or service offerings) that would affect the company's target boundary or ambition.
- Significant changes in data used to calculate the targets such as growth projections (e.g. the discovery of a significant error or several cumulative errors that are collectively significant).
- Other changes to projections or assumptions.

Glenveagh defines its threshold for significance as a cumulative change of 5% or larger in the base year emissions (tCO2e).

6. References

- Greenhouse Gas Protocol, Corporate Standard (https://ghgprotocol.org/corporate-standard)
- Greenhouse Gas Protocol, Corporate Value Chain (Scope 3) Accounting and Reporting Standard (2011) (https://ghgprotocol.org/standards/scope-3-standard)
- SEAI conversion factors 2023 (https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/)
- International Energy Agency (IEA) Factors 2022 Report (https://www.iea.org/data-and-statistics/data-product/emissions-factors-2022)
- Dept. for Environment, Food & Rural Affairs (DEFRA) Conversion Factors 2023 Report (https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023)
- RICS professional standards and guidance – whole life carbon assessment for the built environment (https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf)
- GLA Whole life-cycle carbon assessments benchmarks (https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/london-plan-guidance/whole-life-cycle-carbon-assessments-guidance)
- OneClick LCA EPD database (https://www.oneclicklca.com/)

Appendix 1 – definition of Scope 3 boundary

Scope 3 category	GHG protocol definition	Boundary
1. Purchased goods and services	Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in Categories 2 - 8	**Inclusions:** All purchased goods and services including construction materials e.g. subcontractor activities, groundworks, construction services (incl. architects, council, consulting fees), etc. **Exclusions:** Materials used for temporary works for construction e.g formwork
2. Capital goods	Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year	**Inclusions:** Any purchased capital assets.
3. Fuel- and energy-related activities (not included in scope 1 or scope 2)	Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in scope 1 or scope 2, including: **a.** Upstream emissions of purchased fuels (extraction, production, and transportation of fuels consumed by the reporting company) **b.** Upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling consumed by the reporting company) **c.** Transmission and distribution (T&D) losses (generation of electricity, steam, heating and cooling that is consumed (i.e., lost) in a T&D system) – reported by end user **d.** Generation of purchased electricity that is sold to end users (generation of electricity, steam, heating, and cooling that is purchased by the reporting company and	**Inclusions:** Extraction, production, and transportation of fuels and electricity for sites, factories, and offices.

	sold to end users) – reported by utility company or energy retailer only	
4. Upstream transportation and distribution	Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company) Transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g., of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company)	**Inclusions:** Transport of all construction materials to site
5. Waste generated in operations	Disposal and treatment of waste generated in the reporting company's operations in the reporting year (in facilities not owned or controlled by the reporting company)	**Inclusions:** Emissions from the transport and disposal of waste from site, offices, and factories
6. Business travel	Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company)	**Inclusions:** Emissions from flights, taxi, rail & fuel card travel
7. Employee commuting	Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company)	**Inclusions:** Emissions from employee commuting to offices, sites, and factories.
8. Upstream leased assets	Operation of assets leased by the reporting company (lessee) in the reporting year and not included in scope 1 and scope 2 – reported by lessee	N/A – Glenveagh does not have any emissions from upstream leased assets
9. Downstream transportation and distribution	Transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end	N/A – Glenveagh does not have any emissions from downstream transportation and distribution

	consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company)	
10. Processing of sold products	Processing of intermediate products sold in the reporting year by downstream companies or customers	N/A – Glenveagh does not have any emissions from the processing of sold products
11. Use of sold products	End use of goods and services sold by the reporting company in the reporting year	**Inclusions:** Emissions arising from the regulated and unregulated energy consumption of the occupants of the housing over the 50-year calculation period.
12. End-of-life treatment of sold products	Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life	**Inclusions:** Emissions arising from the treatment of waste materials from the housing at end of life (assumed to be 50-years for the purposes of carbon accounting).
13. Downstream leased assets	Operation of assets owned by the reporting company (lessor) and leased to other entities in the reporting year, not included in scope 1 and scope 2 – reported by lessor	N/A – Glenveagh does not have any emissions from downstream leased assets
14. Franchises	Operation of franchises in the reporting year, not included in scope 1 and scope 2 – reported by franchisor	N/A – Glenveagh does not have any emissions from franchises
15. Investments	Operation of investments (including equity and debt investments and project finance) in the reporting year, not included in scope 1 or scope 2	N/A – Glenveagh does not have any emissions from investments