

Romell Espalier - Executive Summary

1. Project Overview

The Carbon Footprint Analysis (CFP) will be conducted for the **proposed Romell Espalier Residential Development** located at Vile Parle (East) Mumbai, with a site area of **4,909.13 m²** and a total built-up area of **33,013.16 m²**. The assessment will represent a Whole Building Life Cycle Assessment (WBLCA) that will quantify greenhouse gas (GHG) emissions associated with both embodied carbon (construction stage) and operational carbon (use stage) over the projected 45-year life cycle of the asset. This assessment will also evaluate the effectiveness of carbon reduction measures and renewable energy interventions that will be incorporated into the project design.

2. Methodology

The assessment will follow the principles of Whole Building Life Cycle Assessment (WBLCA) in accordance with EN 15978, ISO 14044, & the carbon footprint results are aligned with ISO 14064 and GHG Protocol. Life-cycle emissions will be modelled using the ecoinvent v3.11 database through SimaPro software. The assessment boundary will include:

Product Stage (A1-A3): Raw material extraction, processing and manufacturing of construction materials (Embodied Carbon).

Construction Stage (A4-A5): Material transportation, workforce transportation, construction energy use and waste management.

Use Stage (B1-B7): Building operation including electricity consumption, transportation, wastewater treatment, organic waste management and refrigerants (Operational Carbon).

Carbon Reduction Measures: Renewable energy generation, landscape sequestration and energy efficiency initiatives.

3. Construction Phase Carbon Footprint

The total embodied carbon associated with the construction phase is estimated at **12,167.6 tCO₂e**, corresponding to an Upfront Carbon Intensity of **0.37 tCO₂e/m²** of built-up area. Building materials are expected to contribute **11,304.61 tCO₂e** and will represent the dominant source of construction-related emissions. Material transportation, construction energy consumption, workforce transportation and construction waste management will account for the remaining emissions. Adoption of AAC blocks, fly ash-based concrete, recycled steel content and local material sourcing results is expected to result an **18% savings** in embodied carbon compared to the baseline scenario.

4. Operational Phase Carbon Footprint

The operational phase carbon footprint is estimated to be **2,213.91 tCO₂e/year**, which corresponds to a per-capita operational emission intensity of **2.06 tCO₂e/person/year**. Purchased electricity consumption is expected to contribute **2,191.69 tCO₂e/year**, thereby making operational energy use the dominant contributor to the project's annual carbon footprint. Additional emissions will arise from site transportation, wastewater treatment, organic waste management, and refrigerant usage.

5. Mitigation Measures

The project will incorporate renewable energy and carbon reduction measures, including a **30 kWp Solar Photovoltaic (PV) system**, Solar Hot Water System, on-site wastewater recycling, organic waste treatment and landscape-based carbon sequestration. These initiatives are expected to collectively provide annual carbon savings of **80.52 tCO₂e/year** and contribute to an estimated **05% savings** in operational carbon emissions compared to the baseline scenario.

6. Life Cycle Carbon Footprint

Over the assumed 45-year service life, the project is expected to generate a total life-cycle carbon footprint of **1,11,793.58 tCO₂e/yr**, comprising:

Upfront Emissions (Construction Phase - A1–A5): **12,167.63 tCO₂e**

In-Use Emissions (Operational Phase - 45 Years): **2,213.91 tCO₂e**

The project is expected to demonstrate approximately **05% savings** in life-cycle emissions compared to the baseline scenario through sustainable material selection, renewable energy deployment, energy-efficient systems, on-site waste treatment and landscape carbon sequestration.

7. Key Indicators

Construction Duration: 3 Years

Construction Stage Emissions: 12,167.63 tCO₂e

Annual Operational Emissions: 2,213.91 tCO₂e/year

Building Service Life Considered: 45 Years

Total Life Cycle Carbon Footprint: 1,11,793.58 tCO₂e

Construction Carbon Intensity: 0.37 tCO₂e/sq.m²

Per Capita Operational Emissions: 2.06 tCO₂e/person/year

Annual Carbon Savings from Renewable Energy & Sequestration: 80.52 tCO₂e/year

Overall Carbon Reduction Achieved: 05% compared to the Baseline Scenario
