

Building sector – a significant source of CO₂ emissions in Europe

- Building account for ~ **40%** of the EU's energy consumption
- ~ **75%** of them are **not** energy efficient
- Achieving **climate neutrality** by 2050 requires a transition to **zero-emission** buildings

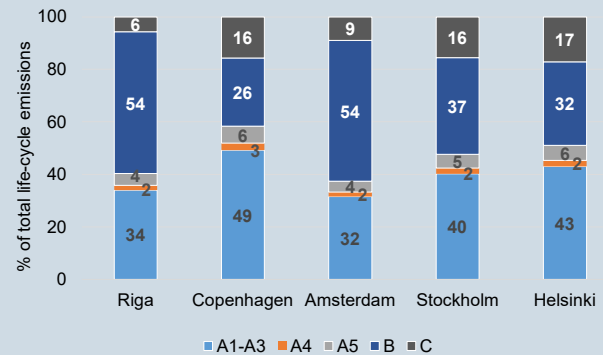


Fig.1. Comparison of residential complex LCA (A–C), %, over a 50-year period

- Life-cycle emissions of buildings are primarily driven by operational energy use (B6) and material production (A1–A3).

Introduction

A unified approach to assessing life-cycle CO₂ emissions and applying limit values is still lacking, particularly in Latvia. This study analyzes life-cycle CO₂ emissions of a multi-apartment residential building complex in Riga and evaluates their compliance with CO₂ limit values in selected Nordic countries.

Life Cycle Assessment (LCA) Framework

Method	Life Cycle Assessments (LCA)
Standards	ISO 14040/14044, EN 15804
Software	SimaPro 10.3
Database	Ecoinvent 3.10 + EPD
Impact assessment method	IPCC GWP100
System boundary	A1-C (stage D excluded)
Reference study period	50 years
Functional unit	1 m ² of floor area over 50 years

Conclusions

- **Operational energy use (B6)** is the dominant contributor to life-cycle CO₂ emissions.
- **Life-cycle CO₂ emissions** are determined by **external factors – energy sources and waste management scenarios.**
- **Climate determines energy demand distribution**, influencing energy sources and emissions.

Results

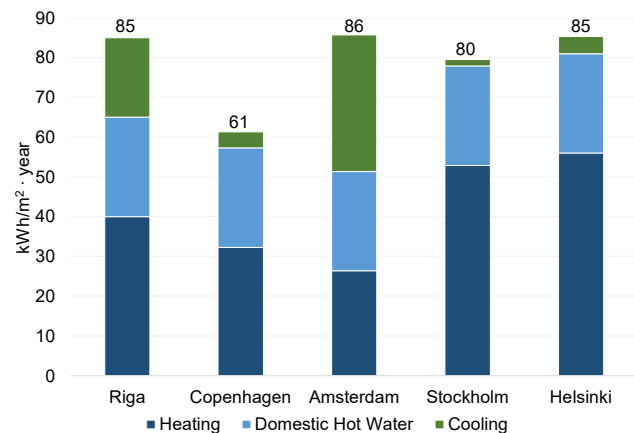


Fig.2. Climate-adjusted building energy consumption

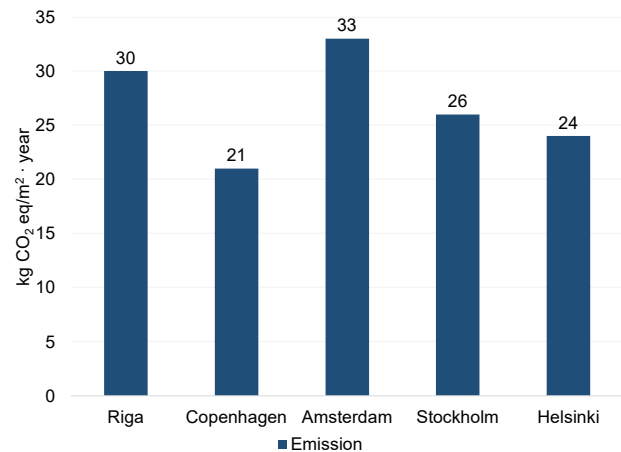


Fig.3. Calculated emissions