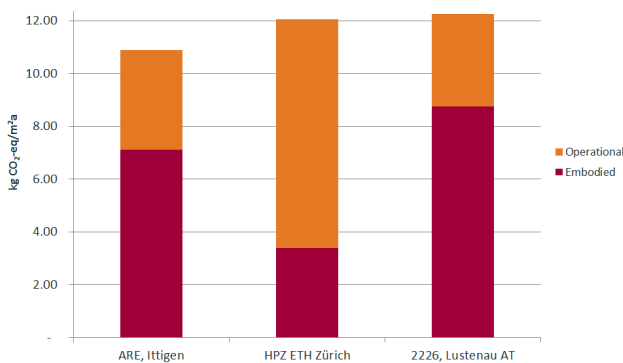


# Assessing Life Cycle Related Environmental Impacts Caused by Buildings

## ANNEX 72

Investment decisions for buildings made today largely determine their environmental impacts over many future decades due to their long lifetimes. Furthermore, such decisions involve a trade-off between additional investments today and potential savings during use and at end of life - in terms of economic costs, primary energy demand, greenhouse gas emissions and other environmental impacts. Since the economic system does not fully account for external environmental effects, environmental resources are used inefficiently. Life cycle assessment (LCA) is suited to complement economic information on buildings with information on their environmental impacts. LCA helps to take measures and action to increase the resource efficiency of buildings and construction.



Embodied and operational greenhouse gas emissions (kg CO<sub>2</sub>-eq per m<sup>2</sup> and year) of three office buildings in Switzerland and Austria (two new and one retrofit building); lifetime: 60 years  
Source: Tschümperlin et al. 2016

### PROJECT OBJECTIVES

- 1 establish a common methodology guideline to assess the life cycle based primary energy demand, greenhouse gas emissions and environmental impacts caused by buildings
- 2 establish methods for the development of specific environmental benchmarks for different types of buildings
- 3 derive regionally differentiated guidelines and tools for building design and planning such as BIM for architects and planners
- 4 establish a number of case studies, focused to allow for answering some of the research issues and for deriving empirical benchmarks
- 5 develop national or regional databases with regionally differentiated life cycle assessment data tailored to the construction sector; share experiences with the setup and update of such databases

### ACHIEVEMENTS

The project advanced the research already conducted within EBC Annexes 56 and 57. It broadened the scope of Annex 57 by including operational impacts of buildings in use and by addressing environmental impacts in addition to primary energy demand and greenhouse gas emissions. This covered residential, office and school buildings, hospitals and other public buildings, both new and retrofit.

The project researched harmonization issues arising

## INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA) was established as an autonomous body within the Organisation for Economic Co-operation and Development (OECD) in 1974, with the purpose of strengthening co-operation in the vital area of energy policy. As one element of this programme, member countries take part in various energy research, development and demonstration activities. The Energy in Buildings and Communities Programme has co-ordinated various research projects associated with energy prediction, monitoring and energy efficiency measures in both new and existing buildings. The results have provided much valuable information about the state of the art of building analysis and have led to further IEA co-ordinated research.

## EBC VISION

By 2030, near-zero primary energy use and carbon dioxide emissions solutions have been adopted in new buildings and communities, and a wide range of reliable technical solutions have been made available for the existing building stock.

## EBC MISSION

To accelerate the transformation of the built environment towards more energy efficient and sustainable buildings and communities, by the development and dissemination of knowledge and technologies through international collaborative research and innovation.

when applying LCA approaches on buildings. It functioned as a platform to exchange experiences and knowledge within partner countries and fostered the application of LCA on buildings in countries with little experience yet.

The following reports have been published as the official project deliverables:

- harmonised guidelines on the environmental life cycle assessment of buildings,
- establishing environmental benchmarks for buildings (basics, methods, examples),
- national LCA databases used in the construction sector, including standardised characterisation of all relevant LCA databases,
- guidelines for planners on how to optimise the life cycle performance of buildings during the design process using planning tools such as BIM,
- building case studies using a standardised template,
- how to establish national or regional LCA databases targeted to the construction sector, and
- default publicly available, national data sets of LCA-based environmental indicators.

## Project duration

Completed (2016 - 2022)

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Observers: Hungary, India, Slovenia

## Further information

[www.iea-ebc.org](http://www.iea-ebc.org)