

EXECUTIVE SUMMARY

State of the art of definitions of net zero energy buildings and net zero carbon emission buildings in the international regulatory context

Objectives

This document contains the basis for the "State of the art of definitions of net zero energy buildings (NZEB) and net zero carbon emission buildings (NZCB) in the international regulatory context", and it is part of the framework of the agreement between the Ministry of Energy, the Ministry of Public Works and the Construction Institute. This collaboration is focused in two specific objectives:

- To develop the definition of Net Zero Energy Building for Chile and integrate it into the CES certification.
- To support the creation, development and strengthening of a Carbon Footprint database and baseline for the entire life cycle of the building, for projects that are in planning and design phase, aligned with international standards.

This executive summary corresponds to the results of the first study prepared by the Construction's Technological Innovation Center, CTec and EBP Chile SpA.

Context

The initial stage of the project addresses a literature and regulatory review of nine countries (or states) that have different strategies or approaches to the definition and adoption of NZEB/NZCB buildings: Norway, Switzerland, the Netherlands, Finland, Australia, England, France, Spain and California.

In addition to the scope of the Energy Performance of Buildings Directive (EPBD), which establishes a framework of definitions as part of the objectives of the European Union (EU) regarding the reduction of greenhouse gas emissions, the EPBD defines the following concepts that have a high relevance for this study: **"energy efficiency of the building"**, **"nearly zero-energy building"**, and **"optimal level of profitability"**.

From the review of the international context, the following points of relevance were identified:

- A strong public policy that communicates to the industry the goals for the construction sector, in the short, medium and long term.
- A general regulatory framework for the definition of net-zero energy and net-zero carbon buildings, containing defined targets and reviewed periodically in a continuous improvement scheme.
- A methodology that brings the regulations, technical and technological criteria, together with a strategy for measuring and monitoring the implementation of net-zero energy and net-zero carbon buildings.
- Encouraging renovations and adoption of technological solutions in buildings.

Gaps

The second report identifies and analyzes possible organizational, regulatory, technical, technological, social and financial gaps with respect to the adoption, of the NZEB/NZCB definitions buildings in Chile. The report also identifies the measurements undertaken to tackle such gaps in the regulatory frameworks of the nine countries studied. For each of them, a solution, opportunity scheme or mitigation measure has been proposed, prioritized in the short, medium and long term, highlighting those measures that can serve as accelerators for more than one gap.

Field of action	Gaps identified
ORGANIZATIONAL	Reduced power in local governments
	Resistance of the construction sector to changes in regulations
	Prevalence of short-term policies in some state entities
REGULATORY	Lack of a public policy focused on the renovation of existing buildings
	Lack of periodic review of habitability and energy regulations in construction
	Lack of definition of a minimum renewable energy threshold
	Lack of baselines and limits on energy consumption
TECHNICAL	Lack of skills in technicians and professionals to facilitate the design, implementation of NZEB and NZCB buildings.
	Lack of experience in building management (public sector)
TECHNOLOGICAL	Lack of market development in low carbon solutions
	Scarce availability of environmental product declarations (EPD)
	Lack of dissemination of good practices for NZEB and NZCB buildings
FINANCIAL	Lack of financial support and incentives directed to the supply and demand of NZEB and NZCB buildings.
	High cost of technologies in the implementation stage
SOCIAL	Unawareness of the environmental and social impacts and costs of not making changes.

Finally, the third report specifically addresses the proposed definition of net zero energy consumption buildings and net zero carbon buildings, identifying regulations associated with the consolidation of both definitions in Chile and establishing a scope recommendation for materials and building life cycle.

Net Zero Energy Consumption Buildings

"Building that, thanks to its passive design, achieves high energy efficiency, and its annual high energy efficiency, and its annual net energy energy consumed is covered by renewable energy sources generated on or near the site".

Net Zero Carbon Building

"Net-zero net-zero energy consumption building, that during its life cycle (production, construction, operation, end-of-life), minimizes its embodied and operational carbon emissions, and offsets any remaining carbon balance".

Definitions

The definition of zero net energy buildings is accompanied by a general description of the hierarchy of actions leading to a zero net energy building. According to what has been analyzed in the experiences studied, the elements part of this hierarchy are: passive design, efficiency in the performance of the systems, generation of renewable energy and monitoring of energy consumption. This, in addition to recommendations on technical aspects of the building. These are based on the national regulatory framework, where there are already consistent tools (rules, regulations, standards, etc.) from which a methodology of calculation and verification for this type of buildings can be established.

In the case of the definition of net zero carbon buildings, it is proposed that this should be approached based on the life cycle concept and the integration of two essential indicators: the carbon footprint and the embodied and operational carbon, considering also its **link with the definition of net zero carbon buildings**.

It is concluded that in order to enable this type of buildings at a national level, it is key to be able to develop and/or adapt tools for the quantification of embodied carbon.

In this sense, the tools already in use, such as ABACO, could be potential carbon calculators in the construction stages for the construction stages for the building sector, which could be fed with quality information, from product environmental product declarations (EPD). This, taken to the national context, is already being incipiently addressed by the voluntary requirements contemplated in the CES and CVS certifications.