



WHAT IS AN ENERGY EFFICIENT BUILDING?

PEEB's Criteria for Buildings

The building sector consumes about half of the electricity worldwide, representing an energy reduction potential of 60% for heating and cooling needs (IEA 2016). Using air conditioners and electric fans for cooling account for nearly 20% of the total electricity used in buildings worldwide today, and is projected to triple by 2050 under a Business as Usual (BAU) scenario (IEA 2018). Measures to reduce energy consumption can provide ample win-win opportunities. They contribute massively to the fight against global warming, while leading to a reduction in capital and operation costs and improved thermal comfort. Energy savings can be achieved through climate responsive and passive design features, appropriate and ambitious technologies and an optimized facility management throughout the entire building life cycle.

The Programme for Energy Efficiency in Buildings (PEEB) facilitates technical and financial support to large-scale programmes in the building sector in developing and emerging countries. PEEB focusses primarily on new construction, but energy retrofit projects for existing buildings may also qualify.

As minimum criteria, Projects shall:

- Adhere at least to the existing building codes and regulations in the respective countries,
- Apply the most efficient locally available technologies and systems and
- Demonstrate the possibility for large-scale replication and duplication.

This document outlines PEEB's basic criteria for energy efficient buildings. They serve as a compass or guidance for decision-making, as generally not all criteria may be fulfilled in one single project. This is a living document and will be updated or amended as needed.

BUILDING NORMS AND REGULATIONS

- As a prerequisite, Projects must acknowledge and adhere to the existing construction guidelines, building codes and regulations in the respective countries.
- In the second place, Projects should pursue more ambitious energy saving goals compared to conventional buildings of the same building type and located in a similar climate and, thus, aiming at a higher level than the existing building codes and standards.

BUILDING DESIGN

- Projects shall apply bioclimatic design features based on the local climate conditions and building culture, thus, reducing the future energy demand of a building (also referred to as “passive” design features). Approaches may include:
 - Suitable building shape (form and grade of compactness) and appropriate building orientation maximizing or minimizing solar gains,
 - Adequate thermal mass of the building envelope, e.g. low thermal mass with lightweight permeable construction for ensuring ventilation and responding fast to temperature variants or high thermal mass with masonry for heat absorption and storage,
 - Suitable roof design with generous awnings to minimize solar exposure to walls and windows and increased insulation to improve energy efficiency and thermal comfort,
 - Light coloured and reflective coatings on roofs and facades to reduce solar heat gains transferring into the building,
 - Appropriate design and positioning of windows and glazing to ensure shading and minimizing exposure to solar radiation and facilitating the use of natural daylighting,
 - Ventilation systems, which allow for natural cross-ventilation, ensuring constant air circulation and cooling internal areas of the building.
- Projects shall respect the local building design, culture and contribute to the local cultural diversity and, thus, to the sustainable urban development of cities and human settlements.
- The building design shall be functional, optimizing the building floor area for the different uses of the project and allow for a flexible and adaptable use throughout the life span of the building, and thus, reducing the need for additional floor area.
- Projects shall contribute to reduce or limit the urban heat island effect, for example through green roofs, lighter-coloured and high reflectance surfaces and limiting the rain run-off.

ENERGY AND RESOURCE EFFICIENCY

- Projects shall apply **highly efficient technologies, systems and appliances** which are appropriate for the local conditions, such as climate, adequate operational and maintenance costs and acceptance by users.

- If building typology and climate conditions allow, projects may integrate the use of on site or nearby **renewable energies**, such as solar or geothermic energy, for water heating, space cooling and/or heating, and/or electricity generation for the building.
- Projects shall aim for a **low water footprint** by adopting options such as efficient water distribution systems; low water-consuming devices, rainwater harvesting and use, and innovative wastewater reuse/recycling technologies.
- Projects shall focus on the use of locally available and sustainable building materials and systems in the first place and imported materials and systems only in the case of non-availability at local level and if so, with a focus on contributing to the introduction of new sustainable materials or systems to the local market.
- Projects shall apply materials and systems with a low carbon footprint throughout the entire **product life-cycle**, i.e. as little as possible energy used to extract raw resources, process materials, assemble product components, transportation to the building site, construction techniques, maintenance and repair and, deconstruction and disposal.

INDOOR ENVIRONMENTAL QUALITY

- Projects shall achieve an adequate indoor air quality with a minimum ventilation airflow to ensure a sufficient fresh air supply to keep occupants healthy and to protect the building condition especially adverse effect from moisture.
- Projects shall apply low emitting indoor equipment, materials and furnishings to reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

FACILITY MANAGEMENT

- Projects shall provide permanently installed connected metering systems for monitoring the total energy (electricity, gas, others) and water consumption of the entire facility.
- Projects should additionally include, where appropriate, intelligent building systems for the rational use of energy and water (e.g. lighting, cooling and heating).
- Projects shall apply materials and systems which provide an optimum performance with a minimum of long-term operation and maintenance efforts and costs. Taking into account local conditions, maintenance and repair works shall be manageable without the need for importing parts or expertise.

URBAN SUSTAINABILITY AND RESILIENCE

- Projects shall contribute to a sustainable local urban planning and/or regional development planning, being integrated in the existing urban structure or located in future urban or regional development corridors.

- Projects shall be integrated into existing or potential new public transport infrastructure, including soft mobility options (e.g. walking, cycling) and / or shall provide a good accessibility to clean mobility infrastructures to the occupants.
- Projects shall pursue the efficient land use of the available city area and/or building development zone, applying the principles of compact building design and mixed use as well as considering brownfield re-development or re-densification of inner-city areas when relevant.
- Projects shall respect the local environmental protection, disaster prevention and climate adaptation planning to avoid building in natural disaster risk zones, to ensure resilience to events such as flooding, (e.g. near river or coastal zones) landslides, earthquakes or fires and to respect urban fresh air corridors.

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