ENERGY EFFICIENCY FOR SOCIAL INFRASTRUCTURE

A TOOLBOX

for Public Development Banks

Finance in Common

PEEB PARTNERSHIP FOR ENERGY EFFICIENCY IN BUILDINGS

Coalition for Social Investment

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A Toolbox for Public Development Banks

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About PEEB Cool PEEB Cool is a programme under the umbrella of the Partnership for Energy Efficiency in Buildings (PEEB) that provides technical assistance and financial support to 11 countries in hot climates across Africa, Asia, Eastern Europe, and Latin America.

PEEB Cool is co-funded by the Green Climate Fund (GCF), the Agence Française de Développement (AFD), the German Federal Ministry for Economic Affairs and Climate Action (BMWK) and its International Climate Initiative (IKI), and the Fonds Français pour l'Environnement Mondial (FFEM).

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Implemented by

ABBREVIATIONS

AFD	Agence française de développement (French Development Agency)
BIM	Building information modelling
BMS	Building management system
BREEAM	Building Research Establishment Environmental Assessment Methodology
CEB	Council of Europe Development Bank
DB	Development bank
DHW	Domestic hot water
EBRD	European Bank for Reconstruction and Development
EDGE	Excellence in Design for Greater Efficiencies
EE	Energy efficiency
EPA	Environmental Protection Agency (US)
ESCO	Energy service company
ESI	Energy Savings Insurance (program)
EU	European Union
FiCS	Finance in Common Summit
FI	Financial institution
GCF	Green Climate Fund
GEB	Green Energy Building
GGF	Green Growth Fund
GHG	Greenhouse gas
GIZ	German Agency for International Cooperation
GlobalABC	Global Alliance for Buildings and Construction
HVAC	Heating, ventilation, and air conditioning
IDB	Inter-American Development Bank
IDFC	International Development Finance Club
IFC	International Finance Corporation
IPMVP	International Performance Measurement and Verification Protocol
JET	Just Energy Transition
KPI	Key performance indicator
LAC	Latin America and the Caribbean
LED	Light-emitting diode
LEED	Leadership in Energy and Environmental Design
MENA	Middle East and North Africa
NMC	National Mortgage Company (Armenia)
NGO	Non-governmental organization
O&M	Operation and maintenance
PEEB	Partnership for Energy Efficiency in Buildings
PPP	Public-private partnership
PDB	Public development bank
PPIAF	Public-Private Infrastructure Advisory Facility
ProQEB	Promoting the Quality of Basic Education (in Chad)
PV	Photovoltaic
RE	Renewable energy
SDC	Swiss Agency for Development Cooperation
SDGs	Sustainable Development Goals
SMEs	Small and medium enterprises
SSA	Sub-Saharan Africa
TA	Technical assistance
UKGBC	UK Green Building Council
WHO	World Health Organization
WorldGBC	World Green Building Council

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ENERGY EFFICIENCY FOR SOCIAL INFRASTRUCTURE

A TOOLBOX

FOR PUBLIC DEVELOPMENT BANKS

The primary audience for this toolbox includes both newcomers and experienced practitioners in public development banks (PDBs), particularly decision-makers, operational teams, and departments tasked with **incorporating energy efficiency (EE) into institutional strategies and financing social infrastructure projects**. This infrastructure includes educational facilities such as schools and universities, hospitals and health centers, social housing, and municipal buildings, among others.

The toolbox includes:

- A background with useful arguments for integrating EE into social infrastructure projects to be financed and managed by PDBs.
- A collection of nine tools, categorized according to the different stages of the project lifecycle, to successfully and concretely integrate EE and sustainability into social infrastructure projects.
- Project sheets that present exemplary practices and success stories from various PDBs.
- Technical factsheet with key technical insights on EE measures and examples for different types of social infrastructure buildings.

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The document is intended to align EE investments with broader sustainability objectives, enhance collaboration among key stakeholders, and promote scalable solutions that achieve measurable reductions in energy consumption and greenhouse gas (GHG) emissions in social infrastructure buildings.

The initiative for the development of the toolbox originated from the collaborative efforts of the **Partnership for Energy Efficiency in Buildings (PEEB)** and the **Finance in Common Summit (FiCS) Coalition for Social Investment** whose strategic partnership has played a pivotal role in the development of this comprehensive toolbox. The toolbox is developed in close partnership with the Global Alliance for Buildings and Construction (GlobalABC) through its working group on finance.

The nine tools presented herein are only a selection acknowledging the continuous advancements in the energy-efficient social infrastructure sector. As such, this toolbox is a living document meant to serve as a reference and source of inspiration while encouraging ongoing exchanges of knowledge and best practices among PDBs.

Coalition for
Social Investment

About the FiCS Coalition for Social Investment

The FiCS **Coalition for Social Investment** is a collaborative network of organizations, including financial institutions, development agencies, and advocacy groups, that work together to promote and scale investments in social infrastructure. The coalition aims to address critical societal needs by mobilizing resources and expertise toward sectors like healthcare, education, and affordable housing. Through advocacy, research, and partnerships, the coalition seeks to create sustainable and inclusive social infrastructure that contributes to long-term socio-economic development and resilience, especially in underserved communities. Its efforts are focused on aligning social investment practices with climate goals to ensure these investments also support environmental sustainability.

The FiCS Coalition for Social Investment plays a key role in advancing sustainable social investments through PDBs. Through its network, the coalition fosters collaboration that enhances its alignment with the Sustainable Development Goals (SDGs), thus addressing critical issues such as resilience and social justice. The coalition facilitates dialogue, knowledge sharing, and financing opportunities, all crucial for building resilient social infrastructure.

PEEB
PARTNERSHIP FOR ENERGY EFFICIENCY IN BUILDINGS

About the Partnership for Energy Efficiency in Buildings

The Partnership for Energy Efficiency in Buildings (PEEB) is a global initiative promoting energy-efficient practices in the building sector, reducing carbon emissions, and supporting sustainable development. Launched by France and Germany and implemented by the French Development Agency (AFD, Agence Française de développement in French), the German Agency for International Cooperation (GIZ), and the French Agency for Ecological Transition (ADEME), PEEB now receives funding from the Green Climate Fund (GCF) and the European Commission to expand it as a multi-program partnership. PEEB works with governments, development banks, and private stakeholders to provide technical and financial support for Energy Efficiency (EE) in building design, construction, and retrofitting, particularly in developing countries to help lower energy demand in buildings and advance global climate goals.

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1. UNDERSTANDING THE LINK BETWEEN FINANCE AND ENERGY EFFICIENCY IN **SOCIAL INFRASTRUCTURE**

What is energy efficiency in social infrastructure and why does it matter for public development banks?

EE refers to the practice of using less energy to achieve the same tasks or functions. In other words, it is the energy we do not waste, but save. EE is so important to reach net-zero emissions and to keep global warming at or below 1.5 degrees Celsius that it is referred to as **"the first fuel"** by the International Energy Agency (IEA)[1] and other publications (Yang and Yu 2015). EE presents multiple benefits, as depicted in Box 1 below, making it one of the most cost-effective strategies for mitigating the impacts of climate change and fostering sustainability.

Box 1: Multiple benefits of EE improvements in social infrastructure

Investing in EE through social infrastructure projects allows PDBs to generate **energy savings**, which lowers operational costs and helps manage **energy prices** more effectively. EE projects are often less risky than traditional infrastructure projects as they typically reduce operational costs and have lower environmental and social impacts.

Reducing energy use not only eases the financial burden on **public budgets**, but also helps create a **more sustainable economy**. For example, ENERGY STAR® estimates that, in terms of financial profit, for *every 1 USD a non-profit healthcare organization saves on energy, it is equivalent to generating 20 USD in new revenue for hospitals or 10 USD for medical offices* (**ENERGY STAR 2010**).

1 EE is the world's "first fuel" and the main route to net zero, says IEA chief: www.weforum.org/stories/2022/01/iea-energy-efficiency-worlds-first-fuel-net-zero

Similarly, schools with better energy performance can use up to 40% less energy than traditional buildings (EPA, 2011), freeing up funds for improving education quality. Well-designed schools also provide better comfort for students and teachers, leading to improved learning outcomes.

Implementing sustainable measures also helps reduce **greenhouse gas (GHG) emissions**, which is essential in tackling climate change. By cutting the carbon footprint of social infrastructure projects, development banks promote a greener economy while supporting countries in meeting their GHG emission reduction targets. Reductions in emissions also improve **local air pollution**, creating healthier living conditions and benefiting public **health and well-being**. For instance, *better indoor air quality can reduce illnesses by up to 40% in some buildings or lower school absenteeism from respiratory issues by 15%* (**EPA 2011**). *Poor classroom ventilation affects both comfort and students' learning performance, with temperature-related effects sometimes reducing performance by up to 30% on certain tasks* (**Sadrizadeh et al. 2022**).

Additionally, EE can also have **macro-economic impacts**, by stimulating economic growth through job creation in energy-efficient technologies and services, while also boosting **industrial productivity**.

EE and renewable energy initiatives also strengthen **energy security** by reducing energy demand and diversifying energy sources, which helps reduce reliance on imported fuels and minimizes the risk of power outages that can disrupt social infrastructure operations.

Diversifying energy sources ensures a more stable supply so social infrastructure like schools and hospitals can continue operating even during periods of high demand or supply disruptions. Moreover, energy-efficient technologies improve the reliability of **energy delivery** to end-users such as students and patients, boosting overall system resilience.

Additionally, promoting sustainable initiatives such as energy-efficient building retrofits, renewable energy installations, and smart grid technologies is crucial for **poverty alleviation** as it provides access to affordable energy solutions, thereby increasing **disposable income** and enhancing quality of life for low-income communities.

As development banks and financial institutions fund EE projects, they help build **resource management** capabilities and create jobs, including the skills of workers to install and maintain energy-efficient systems. These projects not only generate **employment**, but also enhance **asset values** as properties well-designed in terms of energy performance and climate change resilience tend to appreciate over time.

For new social infrastructure, high energy and cost savings can be achieved over a long time with no or little additional costs. When evaluating buildings using lifecycle cost analysis, it becomes evident that operational costs often surpass initial investment costs. While the upfront construction expenses may seem significant, the long-term costs associated with operation, maintenance, and energy consumption typically account for a much larger portion of a building's total expenses over its lifetime.

What are the main challenges in financing resilient and energy-efficient social infrastructure?

Social infrastructure refers to assets that support the delivery of essential services and improve people's quality of life. Financing resilient and energy-efficient social infrastructure remains a significant challenge despite its importance in addressing climate change and growing social inequality.

Social infrastructure is often underserved or omitted when it comes to diligent maintenance or renovation investments; as a result, such buildings provide poor energy performance and low comfort, health, and safety conditions (LTIIA 2021). This neglect is mainly due to a lack of financing, institutional gaps, and a narrow focus on initial investment costs rather than lifecycle costs. **Public sector procurement rules often prioritize selecting projects based on the lowest investment cost** rather than considering quality, energy performance, or lifecycle cost.

Limited capital resources are a major barrier for social organizations, many of which operate with low capitalization and constrained budgets. These organizations face difficulties in financing the upfront investments required for EE and other climate initiatives. The challenge is further compounded by their reliance on unpredictable and irregular income streams such as fluctuating public budgets, international subsidies, and charitable donations. As a result, securing the necessary funding becomes all the more challenging. Additionally, the high upfront costs associated with integrating sustainable energy solutions deepen the financing gap, especially in low-income regions where access to capital is even more restricted.

The **inherent fragmentation** of the **social sector** also creates significant challenges. Social infrastructure encompasses a diverse range of building types from schools and healthcare facilities to cultural centers and social housing. Each type varies in size, ownership, and operational requirements, making it difficult to standardize projects or aggregate them to secure affordable long-term financing from institutional investors.

Regulatory and policy inconsistencies often hinder progress. A lack of clear frameworks for EE, carbon pricing, and green building standards complicates efforts to design cohesive funding programs and implement projects effectively. These challenges are compounded by limited awareness and capacity among both project owners and financial institutions. Insufficient knowledge about EE financing, combined with a lack of technical expertise for project assessment and risk evaluation, increases the perception of risk and reduces the attractiveness of such projects to potential investors. In addition to these sector-specific obstacles, many EE and resilient social infrastructure projects face a **mismatch between their long-term social and environmental benefits and the short-term financial objectives of public authorities**. Political cycles often lead to prioritizing immediate returns, which can discourage investments with extended payback periods. Developing compelling arguments to emphasize the long-term benefits of such projects is crucial to securing support from decision-makers.

To address these challenges, several international agreements and initiatives have been established. Box 2 below highlights a selection of those focused on promoting sustainable social infrastructure.

Box 2: Key international agreements or initiatives supporting sustainable social infrastructure

- GlobalABC: Multi-stakeholder alliance committed to delivering a zero-emission, efficient, and resilient building and construction sector.
- Global Infrastructure Facility: Initiative that supports the development of high-quality, sustainable infrastructure projects, particularly in emerging economies
- Net-Zero Banking Alliance: Group of leading global banks committed to aligning their lending, investment, and capital market activities with net-zero GHG emissions by 2050.
- The Global Renewables and EE Pledge: Social infrastructure can significantly contribute to achieving this pledge by doubling EE improvements from around 2% to over 4% every year until 2030. Public buildings, such as hospitals and schools, often consume large amounts of energy, making them ideal candidates for EE upgrades.
- The Marrakech Partnership for Global Climate Action Pathway for Human Settlements: This pathway identifies actions for sustainable urban development, directly influencing the design, construction, and operation of social infrastructure to meet climate and EE goals.
- The New Urban Agenda: The agenda emphasizes sustainable urban development, including adequate housing, resilient infrastructure, and access to essential services. Social infrastructure is central to achieving these goals, providing the backbone for equitable, sustainable cities.
- The Sendai Framework for Disaster Risk Reduction 2015-2030: Social infrastructure needs to be disaster resilient to protect vulnerable populations. This framework emphasizes reducing risks through better design and retrofitting buildings, particularly those serving essential community functions.
- The Universal Declaration of Human Rights: Article 25 recognizes adequate housing as part of the right to an adequate standard of living. Social housing and other forms of social infrastructure must meet efficiency and sustainability standards to fulfill this right.
- United Nations General Assembly Resolution 76/300: Declaring a human right to a clean, healthy, and sustainable environment underscores the need for environmentally friendly social infrastructure. Energy-efficient buildings contribute to improved air quality, reduced emissions, and better living conditions.
- United Nations Sustainable Development Goals (SDGs): A set of global goals, including SDG 9 (Industry, Innovation, and Infrastructure), aimed at promoting sustainable and resilient infrastructure.

What is the status of energy efficiency financing in social infrastructure?

Public investment in social infrastructure by G20 central governments was projected at USD 166,731 million in 2022, representing 17% of total infrastructure spending according to estimates from the Public-Private Infrastructure Advisory Facility (PPIAF 2022).

Figure 1 provides a detailed analysis of social infrastructure allocations during the same year, highlighting the distribution of investments across sectors and their prioritization within G20 countries.

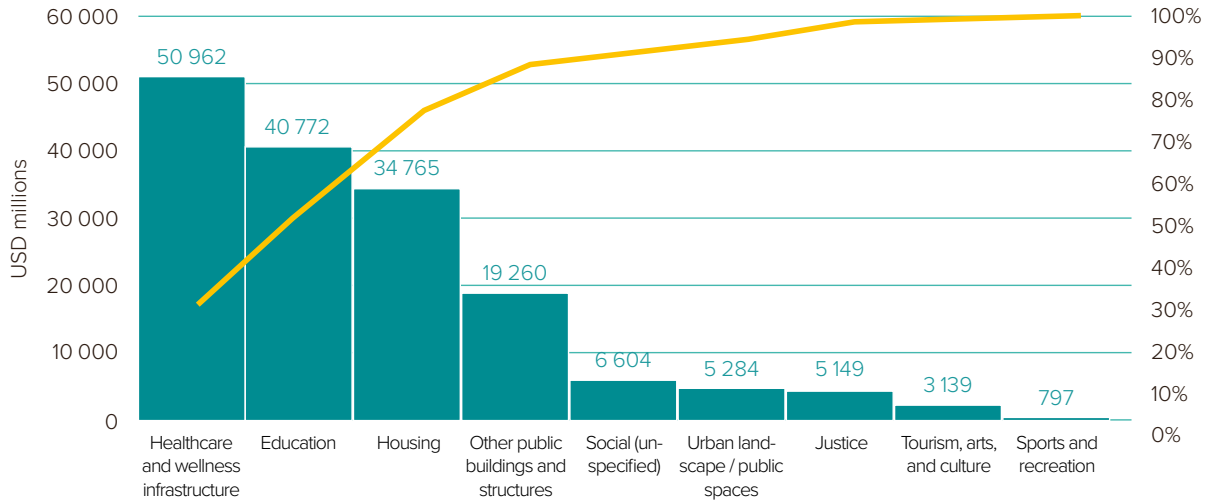

Figure 1: Breakdown of G20 Investment in Social Infrastructure for 2022.

Analysis of these investments highlights a clear prioritization of healthcare, education, and housing, which collectively accounted for 75.87% of the total budget. Healthcare received the largest share at 30.57%, followed by education at 24.45%, and housing at 20.85%.

Smaller allocations were directed toward categories such as public buildings, urban spaces, justice, and tourism, indicating that these areas are less emphasized compared to core social infrastructure. This distribution reflects the G20's strategic focus on addressing critical societal needs such as public health, education, and affordable living while leaving cultural and recreational infrastructure relatively underfunded.

What role do public development banks play?

PDBs are pivotal in addressing the financial, technical, and policy barriers that often hinder the implementation of resilient and energy-efficient social infrastructure. Their multifaceted role extends beyond financing, encompassing project development, stakeholder capacity building, and advocacy for systemic change. Specifically, their main contributions include:

Providing financing solutions: These address the financial barriers to resilient and energy-efficient infrastructure by offering concessional loans, grants, and blended finance mechanisms. Some of these instruments, such as grants, can lower the initial costs of projects, while others attract private sector investments by de-risking projects and enable the mobilization of additional capital through innovative instruments like green bonds.

Technical assistance and capacity building: Equip stakeholders with the tools necessary to design, implement, and manage EE and resilient infrastructure projects by offering technical assistance, training, and resources to contribute to building the capacity of governments, local authorities, and private sector actors.

Advocacy and policy support: Work closely with governments to develop policies and regulations that create an enabling environment for low-carbon and resiliency projects. This includes advocating for harmonized EE standards, incentives, and long-term strategies that encourage sustainable investments.

Project aggregation and scaling: By aggregating smaller projects into larger portfolios, PDBs reduce transaction costs and increase their appeal to institutional investors. This approach ensures that smaller-scale social infrastructure projects, such as schools or healthcare facilities, access the funding they need while achieving economies of scale.

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More in-depth information and guidance on the topics discussed in this section are provided in the relevant documents referred to in Box 3.

Box 3: Reference documents on EE in buildings and financing social infrastructure

- Boosting Investment in Social Infrastructure in Europe, the EU: Framework and recommendations for increasing investment in Europe's social infrastructure.
- Compendium of Good Practices on Quality Infrastructure 2024, OECD: Showcases effective strategies and case studies to enhance the development, management, and sustainability of quality infrastructure projects globally.
- EE 2023, IEA: Annual update on global EE trends, progress, and opportunities, including the construction and social infrastructure sectors.
- Social Impact Investment 2019, OECD: It depicts the state of play of social infrastructure investment approaches globally, comparing regional trends, and assesses its prospects with a special focus on data issues and recent policy developments
- Social Infrastructure: From Challenge to Opportunity for Investors, LTIIA: Insights into investment opportunities in social infrastructure for institutional investors. It highlights the potential of social infrastructure as an attractive asset class for institutional investors, offering strategies to address challenges, capitalize on investment opportunities, and contribute to sustainable development goals while ensuring long-term financial returns.
- The Global Status Report for Buildings and Construction, UNEP: Provides an overview of global trends in energy use and emissions in buildings, emphasizing EE as a cornerstone of climate action.
- WHO Guidance for Climate Resilient and Environmentally Sustainable HealthCare Facilities: Guidance to enhance the capacity of healthcare facilities to protect and improve the health of their target communities in an unstable and changing climate and to empower healthcare facilities to be environmentally sustainable by optimizing the use of resources and minimizing the release of waste into the environment.

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2. THE **TOOLBOX**

The categorization of practices selected for this toolbox is based on relevance and priority while reflecting a clear and logical flow so PDBs can effectively manage, finance, and implement EE in social infrastructure building projects. By focusing on the following four categories, readers can easily apply the practices, tools, strategies, and processes discussed to their own institutions or projects.

Institutional commitment and strategy of the PDB highlight the foundational need for institutional buy-in and the integration of EE building principles into the institutional and policy framework of the PDB itself. This is crucial for aligning long-term strategic goals, including climate objectives, with sustainable practices across the organization.

Financial instruments and mobilization address financial barriers by developing tailored financing options and mobilizing the necessary funds to integrate EE in social infrastructure projects. This category enables banks to explore innovative financial solutions and partnerships, ensuring that funding is accessible for the projects that matter most.

Capacity building and coordination underscore the necessity of enhancing both the internal and external capabilities of key stakeholders and ensuring effective coordination between those involved in social infrastructure project development. This ensures smooth implementation and facilitates knowledge sharing, ensuring that PDBs have the expertise and partnerships needed to carry out successful initiatives.

Project assessment and verification emphasize the importance of clear project selection criteria related to EE as well as tools to assess and track progress. This category provides the main elements needed for evaluating potential projects and verifying their success in achieving energy savings, GHG reduction, and resilience goals.

The following sections present and describe the practices identified within each of the four above-mentioned categories to provide a clear and detailed understanding of the proposed approaches.

A. Institutional commitment and strategy of the public development bank

EE in infrastructure should be clearly mentioned as one of the PDB's focus areas, and EE should also be mainstreamed across sectors since it applies to the public and private sectors as well as buildings and other types of infrastructure such as street lighting, water and wastewater facilities, and desalination plants, among others.

TOOL 1: SECURING INSTITUTIONAL AND STRATEGIC COMMITMENT

For PDBs, making EE a priority requires embedding it into their everyday infrastructure operations. This means ensuring that departments like project evaluation, risk assessment, and portfolio management have the right tools and knowledge to support EE projects. Furthermore, PDBs should put in place supportive internal incentive systems to encourage staff to scale up climate action and reflect sustainability outcomes alongside financial targets.

Having a clear long-term strategy for sustainability is also important. PDBs can set measurable goals to help guide their projects and ensure they are aligned with larger environmental, climate, and social objectives. Related plans should be easy to follow and help make decisions at every level, from the design of projects to how they are evaluated. It is also important to appoint a dedicated person or team to focus on EE within each PDB to ensure that efforts are well coordinated and progress is tracked.

In addition, PDBs must allocate financial resources to support EE projects. This includes not only directly funding projects, but also developing financing programs to support both the construction of new energy-efficient buildings and the retrofitting of existing ones.

In addition, PDBs need to commit financial resources to support EE building projects. This includes not only funding the implementation and construction phases, but also the earlier stages such as design and planning as well as the later stages such as monitoring and verifying energy performance. These ensure that social infrastructure projects meet their energy efficiency goals over time.

The main challenges and proposed solutions for this practice are presented below.

Table 1: Challenges and solutions for securing institutional and strategic commitment

Main challenges	Proposed solutions
How do I secure institutional support and buy-in?	**Incorporate EE as a strategic pillar:** PDBs should be aware of EE potential to reach international and national climate goals in terms of mitigation and incorporate EE as a low-hanging fruit solution (see Case study 1: Inter-American Development Bank institutional strategy 2030, page 22).
How do I ensure commitment from leadership and across departments?	**Formalize EE in operational guidelines:** Revise operational guidelines and project evaluation criteria to integrate EE considerations. This integration ensures that all project proposals, particularly those related to social infrastructure, are assessed for their EE potential and additional co-benefits. By integrating EE as a standard part of project vetting and financing criteria, PBDs strengthen their commitment to sustainability and ensure alignment with the Paris Agreement, global sustainability goals, and other climate finance initiatives for mitigation.

CASE STUDY 1

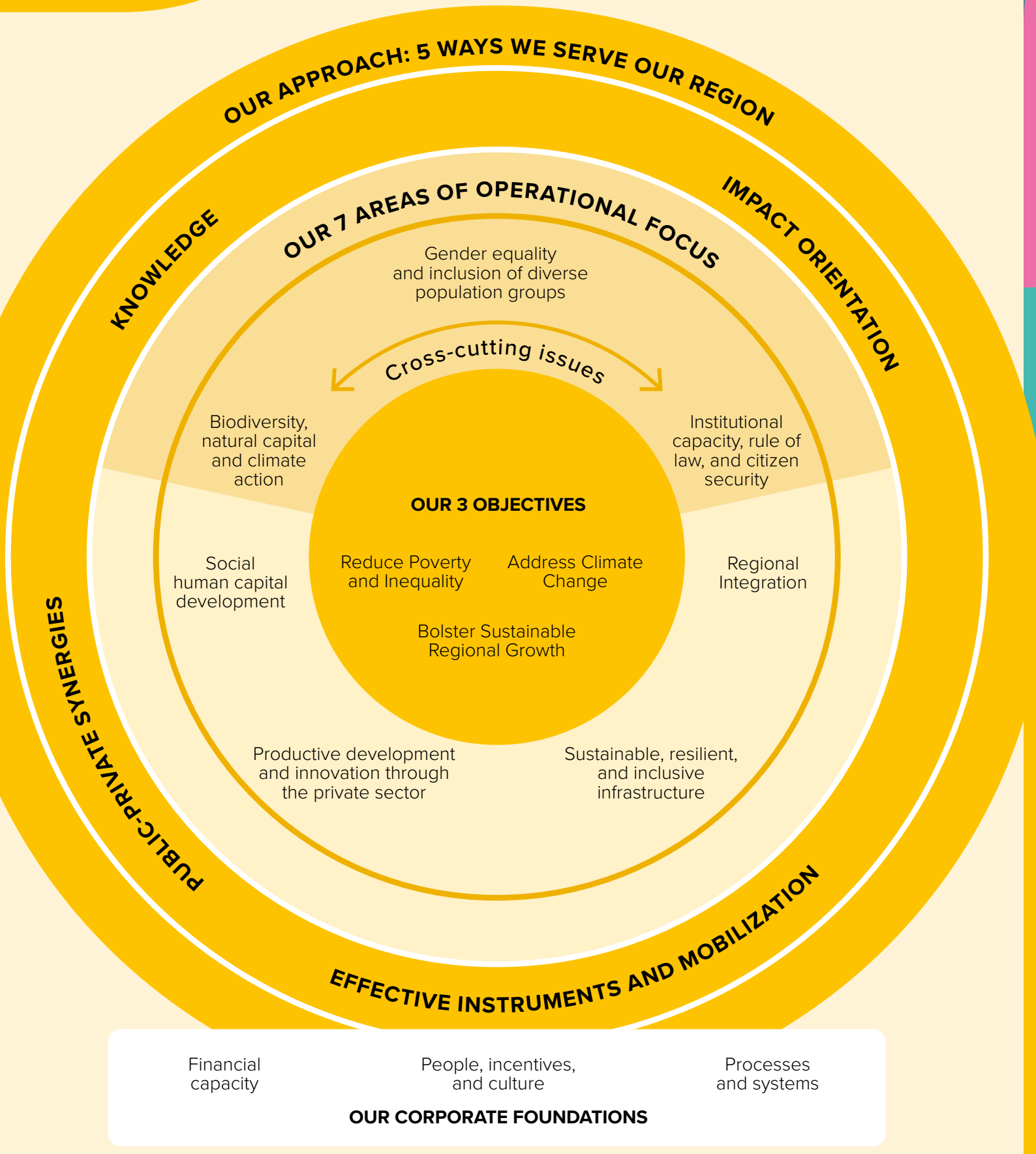
Inter-American Development Bank institutional strategy 2030

The Inter-American Development Bank (IDB) is a leading financial institution in Latin America and the Caribbean and provides funding for projects that include improving social infrastructure, promoting sustainable development, and addressing climate change. Over the past few years, the IDB has strengthened its institutional commitment to EE in social infrastructure, making it a core component of its financing strategies, ensuring long-term sustainability and supporting member countries in meeting their climate and development goals.

The latest institutional strategy, named "Transforming for Scale and Impact", provides a roadmap for guiding the IDB Group over the next seven years (2024-2030), aligning with the world's 2030 Agenda for Sustainable Development. The strategy positions the IDB Group to fulfill its final goal of improving lives by intensifying efforts to assist Latin America and the Caribbean region in realizing its potential while simultaneously tackling today's most daunting development challenges.

This strategy includes a strong commitment to incorporating EE into IDB projects, including those in sectors such as social infrastructure (schools, hospitals, public housing, etc.). This commitment is highlighted by the inclusion of sustainable, resilient, and inclusive infrastructure as one of the seven core areas of operational focus (as shown in Figure 2).

Figure 2: IDB institutional strategy at a glance
Source: IDB Group Institutional Strategy 2030, Transforming for Scale and Impact


OUR APPROACH: 5 WAYS WE SERVE OUR REGION
KNOWLEDGE
IMPACT ORIENTATION
PUBLIC-PRIVATE SYNERGIES
EFFECTIVE INSTRUMENTS AND MOBILIZATION
OUR 7 AREAS OF OPERATIONAL FOCUS
Gender equality and inclusion of diverse population groups
Cross-cutting issues
Biodiversity, natural capital and climate action
Institutional capacity, rule of law, and citizen security
Social human capital development
Regional Integration
OUR 3 OBJECTIVES
Reduce Poverty and Inequality
Address Climate Change
Bolster Sustainable Regional Growth
Productive development and innovation through the private sector
Sustainable, resilient, and inclusive infrastructure
Financial capacity
People, incentives, and culture
Processes and systems
OUR CORPORATE FOUNDATIONS

TOOL 2: MAINSTREAMING ENERGY EFFICIENCY AND GREEN BUILDINGS ACROSS OPERATIONS

Incorporating climate change considerations into the core operations, investment strategies, and lending activities of financial institutions enables them to achieve more sustainable and impactful outcomes – both financially and developmentally – over the short and long terms, especially for social infrastructure. This process, often referred to as mainstreaming, involves a transformative shift from treating climate-related initiatives as incremental efforts to embedding climate considerations – both risks and opportunities – into the foundation of investment decision-making. It requires aligning the development, financing, and evaluation of projects with green building principles, ensuring that sustainability is not just an isolated initiative but part of the institutional "DNA" or core principals.

Key actions for mainstreaming green buildings across operations include:

- **Promoting collaboration** among departments such as energy and infrastructure, climate change, housing and urban development, water and wastewater management, private sector and SMEs to ensure alignment with the institution's strategic goals.
- Ensuring that EE and **green building standards are embedded in all stages** of project design and development, including procurement and financing.
- **Establishing clear guidelines** that prioritize EE and sustainable design, construction, and operation practices for all building projects, aligning with the institution's long-term strategic goals.
- **Implementing financial or procedural incentives** to encourage the adoption of EE and green building practices, signaling the organization's commitment to sustainability.
- **Fostering coordination** among teams such as planning, project development, and finance, ensuring alignment with the institution's overarching strategic goals.
- **Ensuring that EE and green building efforts are aligned** with broader organizational objectives, such as sustainability, resilience, and climate change mitigation, demonstrating a clear institutional commitment to these priorities.
- **Aiming to scale successful projects** and replicate best practices in other regions or sectors.

The main challenges and proposed solutions for this practice are presented below.

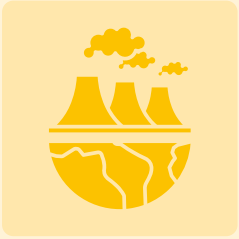
Table 2: Challenges and solutions for “mainstreaming EE and green buildings across operations”

Main challenges	Proposed solutions
How do I incentivize EE and green building adoption?	**Introduce financial incentives and rewards**, subsidies, or procedural benefits to encourage project teams to prioritize EE and green building practices and sustainability in their designs. **Follow established principles for mainstreaming climate change** to provide a clear, structured, and proven approach for integrating climate considerations into financial operations, ensuring that EE and green building adoption is prioritized effectively. These principles are grounded in global best practices that have been tested and refined by a variety of institutions over time (see Case study 2: Five voluntary principles for mainstreaming climate change, page 26).
How can I overcome siloed operations and improve cross-departmental coordination?	**Establish cross-departmental teams:** Create specialized teams composed of representatives from various departments (e.g. project evaluation, risk management) to ensure EE and sustainability are prioritized in every stage of project development and implementation. **Designate champions:** Appoint internal champions, in each department, who will advocate for EE initiatives, ensuring that EE considerations are consistently integrated into departmental goals and operations.

CASE STUDY 2

Five voluntary principles for mainstreaming climate change

Mainstreaming EE and sustainability means adopting dedicated approaches through which institutions allocate capital and assess potential investments. In 2015, 26 pioneer financial institutions came together at COP21 around five shared voluntary principles that provide guidance to financial sector actors on mainstreaming climate change. Currently, 53 participants (multilateral, international, bilateral, regional, and national development banks and commercial financial institutions) have endorsed the following Five Voluntary Principles for Mainstreaming Climate Change as a framework to guide and support institutions in advancing climate smart development and adapting their operations to align with sustainable practices.

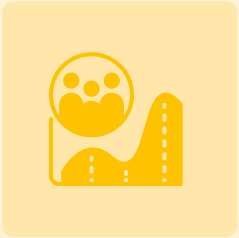


COMMIT TO CLIMATE STRATEGIES

Be strategic when addressing climate change. Institutional commitments to address climate change are demonstrated by senior management leadership, explicit strategic priorities, as well as policy commitments and targets, which allow for the integration of climate change considerations within a financial institution's lending and advisory activities over time.

MANAGE CLIMATE RISKS

Be active in understanding and managing climate risk. Assess your portfolio, pipeline, and new investments. Work with clients to determine appropriate measures for building resilience to climate impacts and improving the long-term sustainability of investments.



PROMOTE CLIMATE SMART OBJECTIVES

Promote approaches to generating instruments, tools, and knowledge on how best to overcome risks and barriers to investment in low-carbon and resiliency activities. These may include mobilizing and catalyzing additional financing and developing specialized financing vehicles/products such as green bonds, risk sharing mechanisms, or blended finance. Engage clients and other stakeholders (e.g. rating agencies, accounting firms) on climate change risks and resilience, and share lessons learned from experience to help further mainstream climate considerations into activities and investments.

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IMPROVE CLIMATE PERFORMANCE

Set up operational tools to improve the climate performance of activities. Financial institutions track and monitor indicators tied to climate change priorities, including GHG reporting, lending and advisory volumes supporting green investment, climate related asset allocations, and the institution's own climate footprint.

ACCOUNT FOR YOUR CLIMATE ACTION

Be transparent and report, wherever possible, on the climate performance of your institution, including increases in financing of clean energy, energy efficiency, climate resilience, or other climate-related activities and investments. Be transparent and report, wherever possible, the climate footprint of the institutions' own investment portfolio and how the institution is addressing climate risk.

Source: www.mainstreamingclimate.org

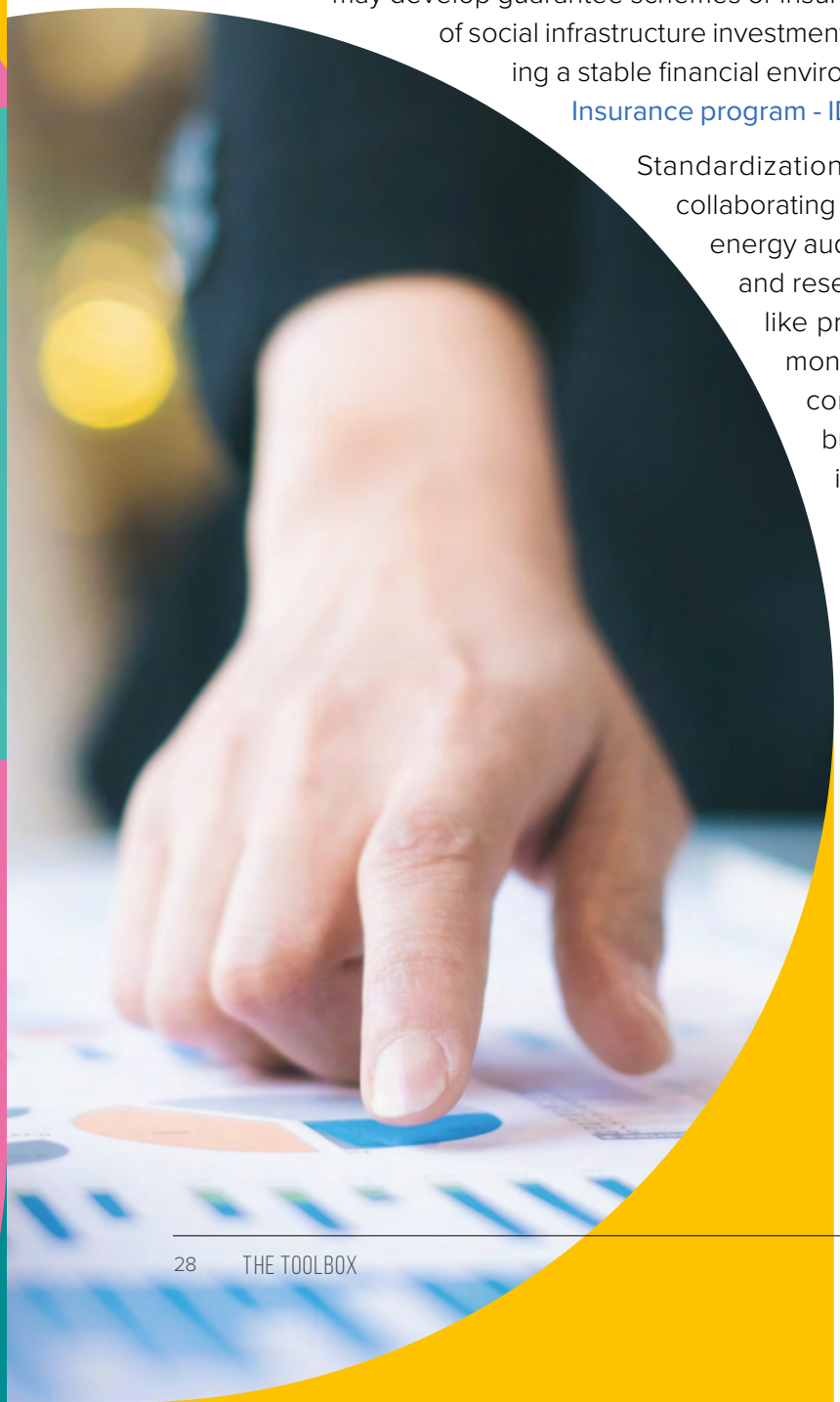
B. Financial instruments and mobilization

TOOL 3: DEVELOPING TAILORED FINANCIAL INSTRUMENTS AND PROGRAMS FOR ENERGY-EFFICIENT SOCIAL INFRASTRUCTURE

Adapted financial instruments, such as grants, low-interest loans, and revolving funds, are fundamental to supporting EE measures when building new social infrastructure and retrofitting existing ones. Innovative tools like blended finance, green bonds, and on-bill financing are also increasingly used.

Risk management plays a vital role in the development of those financial instruments by addressing uncertainties like regulatory changes, credit risks, and market fluctuations, thus enhancing the attractiveness of social infrastructure projects integrating EE. PDBs may develop guarantee schemes or insurance products tailored to the specific risks of social infrastructure investments, mitigating investor concerns and fostering a stable financial environment (see Case study 3: Energy Savings Insurance program - IDB, page 29).

Standardization and aggregation are also crucial. By collaborating with key stakeholders, such as engineers, energy auditors, energy service companies (ESCOs), and research institutions, PBDs simplify processes like pre-auditing, auditing, and energy savings monitoring. Standardized procedures reduce complexity, enabling smaller projects to be bundled and making them more attractive to investors and unlocking additional funding opportunities.



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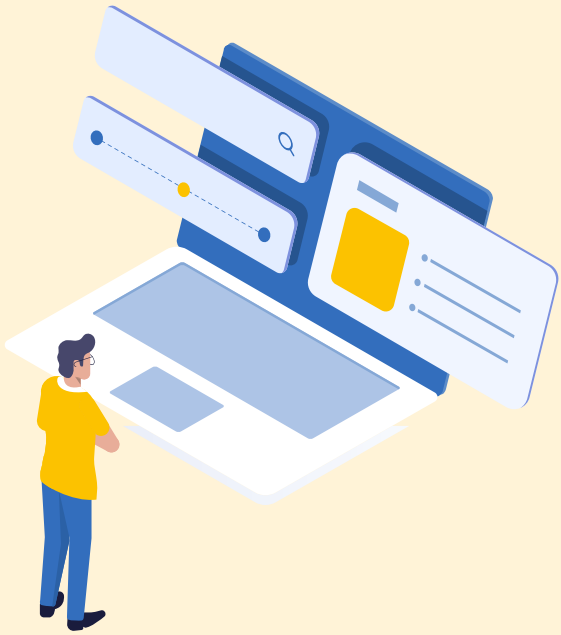
CASE STUDY 3

Energy Savings Insurance program - IDB

The Energy Savings Insurance (ESI) program is an innovative financial instrument designed to promote investment in EE projects by mitigating the risks associated with achieving expected energy savings. The program was developed by the IDB with support from various partners, including the Danish Energy Agency and local development banks. The ESI has been implemented in several countries, including Colombia, Brazil, Chile, El Salvador, and Peru, among others, and is aimed at fostering greater investment in energy-saving technologies and projects.

The key innovation of the solution is to provide an insurance product that covers projected energy savings for specifically defined and verifiable EE measures as agreed upon in a standard contract between small and medium businesses (SMEs) and EE services and technology providers. Compensation is paid to the client in the event that promised financial flows associated with EE savings are not realized. The participation of local insurance companies and international reinsurers in the ESI program is secured by the integration of third-party verifiers and EE services and technology providers, standardized forms, methodologies, and protocols for project structuring of projects, their monitoring, reporting, and verification as well as dedicated credit lines at adequate terms and conditions to promote a pipeline of EE projects.



For more detail, see Project sheet 3: Energy Savings Insurance (ESI) Program - IDB, page 60 and www.iadb.org/en/who-we-are/topics/financial-markets/financial-markets-initiatives/energy-savings-insurance-esi

The approach to developing tailored financial instruments for energy-efficient social infrastructure is aligned with specific project scopes. The following four sub-sections outline different approaches based on this scope.

Complete program development - national or regional level for existing social infrastructure

A successful program for integrating EE in social infrastructure at the national or regional level starts with a needs assessment that helps PDBs understand the dynamics of the social infrastructure sector. The results of this assessment allow PDBs to align their objectives with market realities and focus on the most impactful interventions.

The approach to new and existing social infrastructure differs. For existing buildings, energy audits and cost-benefit analyses help identify the most impactful EE measures in terms of energy savings, GHG reductions, and financial returns. For new buildings, EE considerations are incorporated as of the design phase, including the involvement of EE experts and the use of EE certification standards adapted to the local context.

Comprehensive program development for integrating EE in existing social infrastructure requires a structured approach tailored to the scale and scope of the interventions. The steps PDBs should follow to integrate EE in existing social infrastructure projects or programs are outlined in Figure 3 below.

1	**Stakeholder mapping and regulatory review** Identify key stakeholders in the EE sector, such as government bodies, utilities, and private sector players, and review relevant regulations, building codes, energy standards, and financing incentives.
2	**Identification of potential beneficiaries of financing** Identify key beneficiaries of EE financing for social infrastructure projects, such as public sector organizations, infrastructure managers, and local authorities, that require funding for improvements

3	**Analysis of existing market barriers** Identify and assess the barriers that hinder the uptake of EE in social infrastructure projects, such as insufficient knowledge of EE technologies, limited access to financing, and regulatory or institutional obstacles. Address both the demand-side (e.g. lack of awareness) and supply-side (e.g. inadequate financial products) challenges.
4	**Target building types and EE opportunities** Identify social infrastructure buildings with the most potential for energy savings and GHG emission reductions. Simple simulations can be used to estimate this potential, helping to focus resources on the areas that will have the biggest impacts.
5	**Quantifying investment needs for EE improvements** Estimate the costs of implementing the project, including the EE measures in the selected buildings, retrofitting, upgrading systems like HVAC and lighting, and making necessary infrastructure changes. Also, consider the costs of monitoring and verifying the results of these improvements.
6	**Overview of financing sources and funding gap analysis** Identify available funding sources for sustainable social infrastructure, including EE measures, and assess any financing gaps.
7	**Recommendations for financing mechanism design** Propose the optimal structure for financing mechanisms that address market barriers, meet demand, and complement existing financing offer.

Figure 3: Main program development steps

CASE STUDY 4

Energy transition in public institutions in Tunisia – TEEP Program – KfW

EE and solar photovoltaic (PV) systems in buildings represent key pillars of Tunisia's energy transition strategy given their potential for energy savings and significant mitigation capacity.

In this context, the Tunisian government decided to develop an EE and solar PV program specifically targeted at public buildings for several reasons:

1. **Public leadership:** Inspire the private sector by leading with investments in EE and renewable energy (RE) in public buildings.
2. **Cost reductions:** Ease the financial burden of energy costs on the state budget.

KfW supported this initiative by conducting a technical and economic study to assess the feasibility of promoting EE and RE in public buildings in Tunisia. The study formed the basis for an agreement between Tunisia and Germany to implement the program with technical and financial support from KfW.

For more detail, see Project sheet 6: Energy Transition in Public Institutions in Tunisia – "TEEP Program"-KfW, page 68.

Streamlined program development for existing social infrastructure

When climate conditions are homogeneous in a given country, from a design point of view, it is possible to develop a template EE design based on the analysis of few buildings, for highly replicable social infrastructure such as schools or public buildings.

CASE STUDY 5

Promoting the quality of basic education in Chad (ProQEB) – AFD and Swiss Agency for Development and Cooperation (SDC)

The design of classrooms in rural regions of Chad is based on a multi-factor approach rather than a purely technical-economical method (more widely used in developed countries), as follows:

- ✓ Social acceptability: Local perceptions of what is considered "modern" and "appropriate" differ from the Western perspective. For example, locals in Chad prefer to use corrugated iron for school roofs instead of sun-dried mud bricks, the former providing better insulation and increased thermal comfort.
- ✓ Maintenance: A model should be identified/developed to ensure proper maintenance and operation with the support of the local community, in particular women.
- ✓ Bioclimatic architecture: As schools do not have electricity supply, bioclimatic design will improve thermal comfort (less overheating thanks to natural ventilation) and natural lighting.
- ✓ Use of local material: Local material might differ from village to village.
- ✓ Inclusivity: Design of adapted latrines for boys and girls must be incorporated.
- ✓ Socio-economic situation of the local community.
- ✓ Selection of the most adapted location for the community.

For more detail, see Project sheet 7: Promoting the Quality of Basic Education in Chad (ProQEB)–AFD and Swiss Agency for Development and Cooperation (SDC), page 72.

Standalone existing social infrastructure

For standalone projects, it is recommended that an energy audit be carried out and then selecting EE measures based on predetermined criteria that include energy savings, GHG emission reductions, costs, returns on investment, and co-benefits (comfort, health, safety, maintenance, resilience, etc.).

New social infrastructure

It is suggested that EE considerations be included in the early design phase of social infrastructure, leading to low energy consumption with limited additional investment or even no additional investment. Several approaches can be followed by requiring EE experts in the design team or hiring EE experts to oversee the design of several buildings.

CASE STUDY 6

Kokshetau hospital public-private partnership (PPP), Kazakhstan – EBRD

Following the success of several hospital projects, in particular in Türkiye, the European Bank for Reconstruction and Development (EBRD) recently signed its first PPP healthcare sector project in Central Asia. This first PPP will be a Greenfield development for a 110,000 m^2 facility that will provide services to more than 730,000 people living in the City of Kokshetau, in Kazakhstan, and the wider region of Akmola. The new hospital will seek to receive a Silver rating under the Leadership in Energy and Environmental Design (LEED) green building certification program that recognizes best-in-class building strategies and practices. It will also aim to obtain an Excellence in Design for Greater Efficiencies (EDGE) certification for water and energy savings.

For more detail, see Project sheet 11: EBRD Approach, page 82.

The main challenges and proposed solutions for this practice, which include the four approaches presented above, are presented in Table 3.

Table 3: Challenges and solutions for "developing tailored financial instruments and programs for EE and green buildings"

Main challenges	Proposed solutions
How can we access and leverage funding for EE investments in social infrastructure?	**Establish partnerships and use blended finance:** Collaborate with international climate funds, development agencies, and private investors to secure concessional funding and structure blended finance solutions. These approaches lower costs and make EE projects more financially viable.
How can we address the lack of early-stage support for project development?	**Provide grant programs for early stages:** Introduce grants to subsidize feasibility studies, energy audits, and project development costs. These reduce upfront financial burdens and help build a pipeline of viable projects.
How can we reduce the financial risks and long payback periods of EE investments?	**Implement risk-sharing and de-risking mechanisms:** Develop guarantees, insurance products, and other tools to manage risks associated with EE projects. These instruments build investor confidence and make long-term investments more attractive.
How can we align financing products with the unique needs of public institutions?	**If deemed relevant, design flexible and performance-based financial products:** Use mechanisms like on-bill financing and energy performance contracting, enabling repayment through energy savings and adapting to public sector financial constraints.

Togo ©Plan International Togo

How can we ensure access to reliable data that accurately reflects both market demand and energy savings potential?	**Engage consulting firms for data-driven insights:** Partner with experienced international or local consulting firms specializing in market assessments, sustainable energy, and advisory services for financial institutions. These experts can provide the analytical foundation needed to design comprehensive programs, identify investment opportunities, and address key barriers in the social infrastructure sector. **Integrate sustainable energy specialists into design teams:** Ensure experts are actively involved in the planning and design phases of both new constructions and renovations of social infrastructure. Their expertise can help identify opportunities for energy savings, recommend suitable technologies, and align designs with energy performance goals, ensuring long-term sustainability. **Build a reliable data framework:** Collaborate with sector experts, government agencies, and research institutions to conduct detailed energy audits and baseline studies tailored to social infrastructure. This collaborative effort will create a robust data foundation, enabling informed decisions about energy savings potential and helping design customized financing and implementation strategies.

TOOL 4: MOBILIZING AND STRUCTURING FUNDING FOR ENERGY-EFFICIENT BUILDINGS

This practice involves strategically aligning diverse funding sources, such as public funds, private sector investments, international climate finance, and blended finance mechanisms, to finance the development, retrofitting, and ongoing operation of EE solutions in social infrastructure buildings.

For social infrastructure, financing coordination must address the specific challenges such projects face, such as long-term and stable energy demand levels coupled with budgetary constraints. A key step is identifying financial gaps and structuring attractive financial packages that cater to both public and private investors. These packages may include grants, low-interest loans, green bonds, guarantees (first-loss, second-loss, performance, etc.), and performance-based contracts tailored to the distinct needs of social infrastructure. Additionally, financing mechanisms must be aligned with the social impact objectives of such projects, ensuring they enhance accessibility, resilience, and community well-being while promoting EE.

An essential aspect of financing EE social infrastructure building projects is the timely and adequate disbursement of funds. Agreements governing disbursements should clearly outline schedules and conditions to avoid delays that often arise from non-compliance with suspensive conditions. Delays can significantly hinder the implementation of crucial energy-saving measures such as insulation upgrades, efficient heating or cooling systems, and renewable energy installations. These measures not only reduce operational costs over time but also improve the sustainability and functionality of essential public services.

Social housing projects require careful financial structuring to balance affordability with the need for energy-efficient retrofits. Since these projects often serve vulnerable populations, financing strategies should enable cost-effective improvements without imposing additional financial burdens on low-income tenants. Financing strategies may involve subsidized loans, grants, or performance-based incentives that ensure EE upgrades are both accessible and sustainable.

Monitoring and evaluation are vital components of successful financing coordination. PBDs should track metrics such as the volume of capital mobilized, the diversity of financial instruments employed, and the completion rates of projects in addition to energy savings and GHG emissions avoided/reduced. These data allow for ongoing assessments and refinements of financing strategies to ensure future projects are better supported. By continuously improving their approach, PDBs enhance their ability to mobilize funds effectively, thereby advancing the integration of EE in social infrastructure projects and maximizing their social and environmental impacts.

CASE STUDY 7

Warm House lending program of the National Mortgage Company (NMC) of Armenia

AFD finances the NMC through two credit lines with the aim of encouraging Armenian financial institutions to grant smaller loans for household renovations as well as introducing awareness and good practices in energy-efficient housing and related finance.

The on-lending program is implemented in cooperation between AFD and NMC. AFD provides an unsecured loan at concessional terms to NMC, and NMC then extends the funds to its partner financial institutions (FIs) (i.e. banks and non-bank FIs in Armenia) to finance renovations of existing housing buildings, the construction of new single-family homes, and the acquisition of residential real estate. NMC extends funding by refinancing eligible loans underwritten by partner FIs. Partner FIs commit to participating in the program based on eligibility criteria and other conditions set forth by NMC. They finance eligible projects under predetermined concessional loan terms and then refinance these loans at NMC.

For more detail, see Project sheet 12: Warm House lending program of National Mortgage Company (NMC) of Armenia, page 86.

The main challenges and proposed solutions for this practice are presented below.

Table 4: Challenges and solutions for “mobilizing funds for EE buildings”

Main challenges	Proposed solutions
How can various funding sources be aligned with project requirements?	**Comprehensive financing strategy:** PDBs should develop a clear strategy, map available funding sources, and design a project-specific financing blueprint. For example, a hospital retrofit may combine public health funds, green bonds for EE, and grants from climate finance initiatives.
How can co-financing from multiple sources be secured?	**Targeted co-financing platforms:** Establish joint funding platforms that bring together local banks, development agencies, and private investors. For instance, a revolving fund supported by local governments and international climate finance could co-finance school retrofitting projects (see Case study 7: Warm House lending program of the National Mortgage Company (NMC) of Armenia, page 39).
How can inconsistent application processes across funding sources be addressed?	**Unified financing portals and streamlined application processes:** Develop a single digital platform where project managers can apply for multiple funding sources simultaneously. For example, an online portal led by PBDs could integrate grant applications, loan approvals, and guarantee requests for social infrastructure.
How can financing terms be made more adaptable to project changes?	**Adaptive financing instruments:** Introduce financing options like performance-based contracts that adjust disbursements based on project milestones. For example, additional funding could be released after achieving energy-saving targets during a hospital retrofit.

C. Capacity building and coordination

TOOL 5: BUILDING INTERNAL AND EXTERNAL CAPACITY

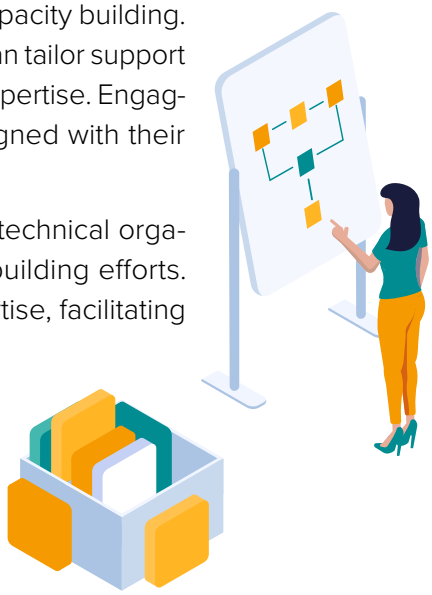
For PDBs, building internal and external capacity equips stakeholders with the knowledge and resources needed to implement and sustain EE initiatives effectively, fostering long-term impacts and scalability. This dual approach is essential to ensure that organizations and individuals possess the necessary skills, knowledge, and resources to support and engage with the program effectively, fostering a culture of EE that extends beyond the immediate project scope.

Internally, tailored training programs enhance expertise in EE financing, policy compliance, and project evaluation, enabling informed decision-making and resource allocation. Such internal development empowers banks to advocate for and integrate EE practices into their operations.

Externally, capacity building engages stakeholders such as users, operators, and maintenance staff. Awareness-raising initiatives and targeted training ensure the proper adoption and sustained use of energy-efficient practices and technologies. This external focus promotes long-term energy savings and efficient system operation.

Assessing technical assistance needs is a key component of capacity building. By identifying knowledge gaps and resource constraints, PDBs can tailor support that includes training, project design assistance, and technical expertise. Engaging stakeholders in this process ensures that solutions are aligned with their requirements and fosters active participation.

Collaboration with funding agencies, financial institutions, and technical organizations enhances the reach and effectiveness of capacity-building efforts. Partnerships mobilize resources and provide specialized expertise, facilitating the successful implementation of EE initiatives.



The main challenges and proposed solutions for this practice are presented below.

Table 5: Challenges and solutions for "building internal and external capacity"

Main challenges	Proposed solutions
How can we address limited knowledge and skills regarding EE financing among staff?	**Support the development of internal knowledge on EE financing instruments:** Invest in developing the internal capacity of staff by offering training programs and resources that are focused on EE financing particularly in relation to social infrastructure projects. This ensures that staff are well-equipped to understand and implement EE strategies and financial tools for successful project execution.
How can we enhance market understanding of the financial products we offer for EE projects?	**Conduct workshops and seminars on financial instruments for EE projects:** Organize educational workshops and seminars for public institutions to raise awareness about the range of financial products available for EE projects, such as grants, concessional loans, and financing mechanisms tailored specifically to EE initiatives. These will help stakeholders make informed decisions on financing options for their projects.
How can we over-come insufficient resources for raising awareness about EE in social infrastructure projects?	**Incorporate awareness-raising components into funded projects:** Ensure that financed projects, particularly in social infrastructure, incorporate a dedicated component for awareness-raising. This should target both the users and maintenance and operations staff, educating them on EE benefits and best practices, ensuring long-term success and impacts.
How can we over-come the high costs of technical assistance for EE projects?	**Secure dedicated grant funding from international donors or climate funds:** PDBs should actively seek grants from international donors or climate funds to finance technical assistance (TA) activities. These funds can support the design and implementation of EE projects as well as capacity building of PDBs staff and awareness of stakeholders. For example, the Partnership for EE in Buildings (PEEB) leverages funding from the GCF and the EU, totaling 245 million EUR in grants and concessional loans to integrate EE measures into buildings, including social infrastructure (see Case study 8: Technical Assistance provided by the Partnership for Energy Efficiency in Buildings (PEEB), page 44).

CASE STUDY 8

Technical Assistance provided by the Partnership for Energy Efficiency in Buildings (PEEB)

As part of PEEB, the "PEEB Cool" program supports countries in improving both energy efficiency in buildings and resilience to extreme climate events, economic crises, and energy scarcity. The program uses a unique combination of financing and policy to bring ambitious projects to scale and achieve long-lasting sector transformation.

The PEEB Cool Enabling Facility, implemented by GIZ, works closely with the national governments of the eleven PEEB Cool partner countries to improve the strategic, regulatory, and financial conditions for implementing large-scale projects for climate mitigation and adaptation. The Cool Enabling Facility objectives are to remove barriers to investment, shape policies for success, and build capacity in the private and public sectors.

- ✓ **Sectoral investment frameworks:** Laying the foundation for private sector actors to develop investment programs for the energy transition in buildings.
- ✓ **Public policies:** Providing support to ensure sound buildings sector policies and help remove barriers to implementation in partner countries.
- ✓ **Capacity building:** Helping expand existing skills and knowledge to create strong foundations at the institutional and individual levels.
- ✓ **Knowledge:** Sharing experiences through international platforms, fostering collaboration and knowledge exchange, and upscaling tools.

Among many such initiatives, PEEB – in an initial phase – trained 45 professionals in the Senegalese buildings sector in financing energy efficiency in buildings. Participants ranged from architects, engineers, and project developers to university lecturers and bankers. They engaged in online discussions and joined weekly live sessions with teachers. Key covered topics included the cost of green buildings, methods for calculating the lifetime cost of a project, strategies for securing financing, as well as national and international support for energy efficiency in buildings. Similar training has been delivered in Mexico, Morocco, Tunisia, and Vietnam. Under the PEEB Cool Enabling Facility, 10 training modules have been developed to train a total of 1,350 participants.

The PEEB Cool Enabling Facility complements the technical and financial assistance carried out by the AFD-led PEEB Cool Investment Facility, setting the ground for systematic upscaling. Technical support granted by AFD to project owners at all phases of buildings projects includes:

- ✓ Feasibility and market studies for building construction or renovation projects.
- ✓ Support in the tendering process for recruiting architects and/or contractors.
- ✓ Support in the integration of sustainability practices in detailed project design.
- ✓ Support in project implementation and ensuring that best construction or renovation practices are integrated.
- ✓ Training for project owners, financial intermediaries, and contractors to sustain integrated measures in the operation and maintenance (O&M) phase.

TOOL 6: COORDINATION ON PROJECT DEVELOPMENT AND FINANCING

Effective coordination among several stakeholders (national and local governments, PDBs, non-governmental organizations [NGOs], technical experts, community organizations, civil society, private sector entities, and end-users) is critical for successfully developing and financing EE projects in social infrastructure.

Social infrastructure projects require tailored stakeholder engagement strategies to balance diverse interests and ensure inclusive participation. These projects often take place in unique local contexts demanding solutions that account for cultural nuances, institutional capacities, and community priorities. Community involvement is especially important to ensure that EE measures meet the real needs of end-users such as students, patients, and tenants. PDBs play a key role as facilitators ensuring that underserved or vulnerable groups have a voice in decision-making processes.

Technical challenges frequently arise during the development and implementation of EE projects, such as compatibility issues with existing systems or difficulties in meeting performance targets. Addressing these challenges requires a coordinated approach with technical experts actively involved in troubleshooting and establishing contingency plans to minimize delays. Early identification and resolution of such challenges keep projects on track and aligned with their objectives.

Maintaining alignment with regulatory requirements and permitting processes is another critical aspect of coordination. Regional or sectoral variations in regulations as well as unexpected changes can lead to delays. Early engagement with regulatory bodies and a thorough understanding of the legal framework help mitigate these risks and ensure compliance with all necessary standards.

Financial and technical alignment is equally important for project success. Detailed financial planning and resource allocation are necessary to maintain cost effectiveness and ensure timely implementation. Allocating a contingency budget for unforeseen costs, such as regulatory changes or integrating advanced energy-efficient technologies, is vital for maintaining financial sustainability. Close collaboration between financial and technical teams prevents delays and ensures cohesive project execution. For instance, securing timely funding for EE retrofits in schools or social housing can significantly impact project outcomes.

The main challenges and proposed solutions for this practice are presented below.

Table 6: Challenges and solutions for "coordination on project development and financing"

Main challenges	Proposed solutions
How can we prevent delays in project timelines due to inadequate planning and coordination?	**Develop detailed project timelines and monitor regularly:** Create timelines with clear milestones and incorporate regular check-ins to identify and address potential delays proactively to ensure projects remain on track and meet deadlines. Implement a centralized project management system: A centralized system enables real-time tracking of project progress, financial disbursements, and performance metrics across various initiatives. This approach ensures that all stakeholders have access to up-to-date information, making it easier to coordinate efforts and address challenges as they arise.
How can we ensure consistent application of risk assessment methodologies across projects?	**Standardize risk assessment frameworks:** Develop a uniform risk assessment framework to evaluate and manage financial risks consistently across all EE projects.
How can we address resistance from stakeholders to adapt to changing project requirements?	**Foster early and continuous stakeholder engagement:** Communicate the reasons for changes and their benefits early and often, building stakeholder buy-in and cooperation throughout the project lifecycle. **Simplify technical information and enhance understanding:** We should translate complex technical concepts into clear, insights using visual aids such as charts and infographics. This makes the information more accessible to non-technical stakeholders to ensure they grasp the importance and potential benefits of EE projects in social infrastructure. Also, keep some technical assistance funds for awareness-raising among all stakeholders involved.
How can we ensure compliance with financing conditions set by multiple stakeholders?	**Establish clear communication and reporting structures:** Create transparent communication channels and regular reporting mechanisms to keep all parties informed about compliance requirements, reducing confusion and enhancing accountability.

Main challenges	Proposed solutions
How can we ensure technical and financial teams collaborate effectively throughout the project lifecycle?	**Integrate multidisciplinary teams from the start:** Form project teams with both technical and financial experts as well as other relevant stakeholders, ensuring seamless collaboration. Regular cross-departmental meetings and shared performance goals foster synergy and reduce miscommunication (see Case study 9: Zenata Eco-city – Caisse de dépôt et de gestion du Maroc (CDG), Technical Assistance provided by the Program for EE in Buildings (PEEB), page 43).

CASE STUDY 9

Zenata Eco-city – Caisse de dépôt et de gestion du Maroc (CDG), Technical Assistance provided by the Partnership for Energy Efficiency in Buildings (PEEB)

The Zenata Eco-City is a town designed with the well-being of its residents in mind, placing people and innovation at the center of its urban planning approach. It is the first city to be awarded the "ECO-CITY LABEL" for performance. A total of 35 social infrastructure buildings were or are in construction since 2017. These buildings must meet the Haute Qualité Environnementale (HQE) or "high environment quality" certification level[2].

Two tendering processes were launched to integrate sustainable experts as of the design phase of social infrastructure buildings:

- ✓ **2017/2018:** A consulting firm specialized in sustainability was hired to oversee this aspect in all building development, including social infrastructure. The mandate included design and monitoring during construction.
- ✓ **2020:** The tendering process for 15 social infrastructure buildings required that the consortium include a consulting firm specialized in sustainability. A local firm won that tender.

For more details, see Project sheet 8: Zenata Eco-city – Caisse de dépot et de gestion (CDG) - Morocco, page 74.

2 www.hqegbc.org/en/qui-sommes-nous-alliance-hqe-gbc/la-certification-hqe

D. Project assessment and verification

TOOL 7: DEFINING ELIGIBILITY CRITERIA

This practice is an essential component of EE integration in social infrastructure, focused on establishing clear guidelines and implementing robust mechanisms for ongoing evaluation and assessment.

Initially, the development of eligibility criteria such as minimum energy savings to be achieved, a checklist of eligible EE measures, or compliance with a specific regulation or certification involves defining specific requirements that projects must meet to qualify for financing. Factors such as project size, project type, expected energy savings or impacts, cost effectiveness, and alignment with sustainability goals are considered to ensure that only the most relevant and impactful projects are selected.

Alongside eligibility criteria, a comprehensive monitoring framework is established to evaluate the performance and impacts of the selected EE projects over time. This framework outlines the key performance indicators (KPIs) that will be used to measure progress such as achieved energy savings, cost reductions, and avoided GHG emissions. By setting clear KPIs, the program can ensure that project outcomes are aligned with its overarching objectives and can be effectively communicated to stakeholders.

The main challenges and proposed solutions for this practice are presented below.

Table 7: Challenges and solutions for “defining eligibility criteria”

Main challenges	**Proposed solutions**
How can we standardize eligibility criteria for EE projects in social infrastructure?	**Develop clear, standardized eligibility criteria for EE projects:** PDBs should create clear, standardized eligibility criteria for EE projects to ensure that public institutions understand and comply with requirements. These criteria should be communicated in an easily understandable and accessible format, helping institutions align their projects with national and international EE goals (see Case study 10: Supporting green buildings in Latin America and the Caribbean - IDB Invest, page 46).

Main challenges	Proposed solutions
How can we assess the financial viability of EE projects across different types of social infrastructure?	**Establish sector-specific eligibility criteria for financial viability assessments:** Develop eligibility criteria tailored to the different types of social infrastructure such as schools, hospitals, and public offices. These sector-specific criteria will allow for more accurate financial assessments and ensure that potential energy savings are fully considered in the evaluation process
How can we clarify what qualifies as an energy-efficient project?	**Align eligibility criteria with international EE standards or certifications:** PDBs should ensure that definitions of energy-efficient projects are aligned with widely recognized international standards such as ISO 50001 on energy management or certifications such as LEED, Building Research Establishment Environmental Assessment Methodology (BREEAM), EDGE or others that are locally recognized. This approach provides a clear framework for what constitutes an energy-efficient project, helping project developers and financial institutions align their work with global best practices.
How can we integrate EE criteria into existing financial approval processes?	**Integrate EE criteria into credit risk and approval frameworks:** Revise credit risk assessment and project approval processes to incorporate EE criteria. By ensuring that financial evaluations include energy-savings potential and long-term benefits, PDBs ensure that EE considerations are integrated into financial decision-making without disrupting the approval process.
How can we manage the risk of non-compliance due to changing regulations or operational environments?	**Build flexibility into eligibility and monitoring frameworks:** Design flexible eligibility and monitoring frameworks to adapt to changes in regulations, technological advances, or shifts in external factors. This adaptability ensures that projects can remain compliant and relevant despite evolving external conditions, ensuring the long-term effectiveness of EE measures.

CASE STUDY 10

Supporting green buildings in Latin America and the Caribbean - IDB Invest

IDB Invest has developed a sustainable infrastructure framework to define how to support and develop projects. This framework is composed of four pillars: Economic, environmental, social, and institutional.

The incorporation of EE in infrastructure projects is addressed in the environmental pillar whereby the following conditions must be met:

- ✓ Projects must be aligned with the Paris Agreement.
- ✓ They preserve, restore, and/or integrate the natural environment.
- ✓ They make efficient use of resources such as energy, water, and materials.
- ✓ They feature advanced pollution control.
- ✓ They integrate climate resilience measures.
- ✓ They develop sustainable value chains.

For more detail, see Project sheet 2: Supporting Green Buildings – IDB Invest, page 56.

TOOL 8: ADOPTING TOOLS FOR ASSESSING ENERGY EFFICIENCY AND GREEN BUILDINGS

The use of tools for assessing green buildings is essential to ensure that projects are aligned with climate objectives, enhance energy performance, and promote environmental sustainability. Such tools enable banks to evaluate building compliance with established green standards such as LEED, BREEAM, or EDGE, thus ensuring that projects meet rigorous criteria for EE, water conservation, waste management, and indoor environmental quality. Furthermore, the use of such tools helps mitigate risks by identifying design or operational shortcomings early in the project lifecycle while providing verifiable data that demonstrate accountability to stakeholders and investors.

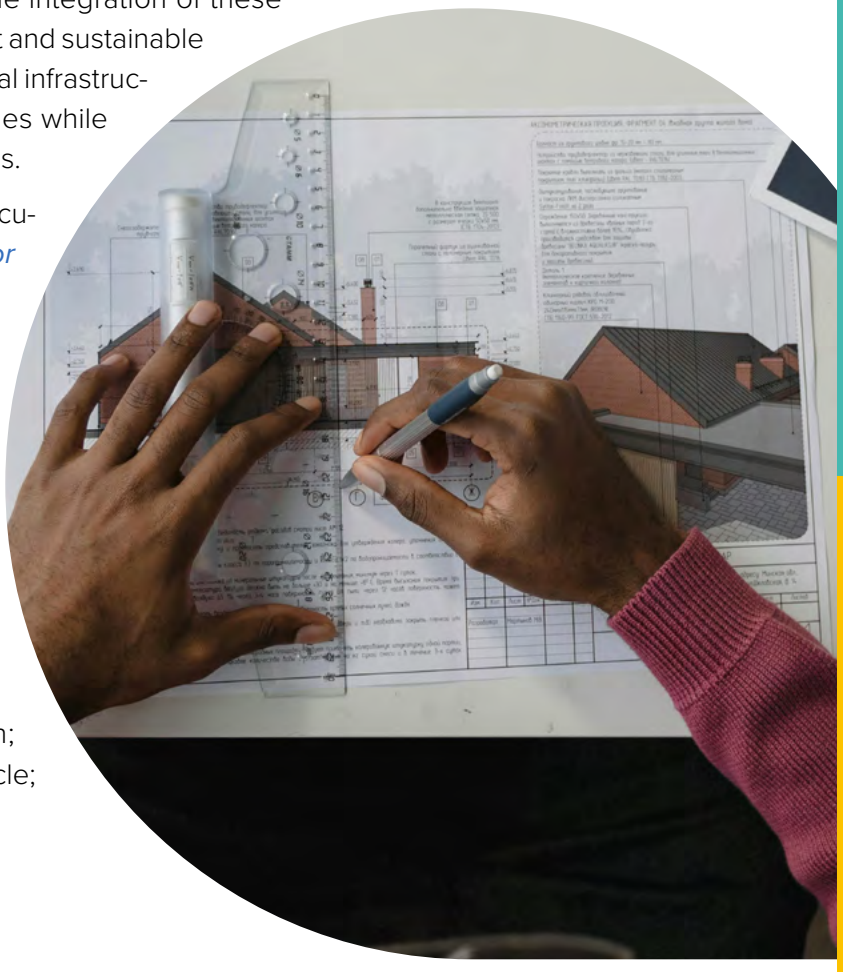
To maximize their impact, PDBs should adopt standardized tools and methodologies that are globally recognized and regionally adapted to address local climatic, cultural, and regulatory conditions. Integrating such tools early in the project lifecycle is critical as assessments conducted during the design phase can influence key decisions and improve overall project outcomes. Iterative assessments throughout the process allow for continuous refinement and optimization of designs to meet sustainability goals.

The adoption of digital and automated solutions further enhances the efficiency and accuracy of assessments. Building information modelling (BIM) integrated with green building assessment tools streamlines data collection, modelling, and reporting, thereby reducing time and costs while improving precision. Collaboration and transparency are also key. By fostering knowledge sharing among stakeholders and aligning on project criteria and goals, banks create a shared vision for sustainable outcomes. Publishing assessment findings not only highlight success stories, but also builds market confidence in green infrastructure projects, encouraging broader adoption.

For PDBs, the use of green building assessment tools is not merely an operational necessity but a strategic imperative. These tools align projects with institutional sustainability targets and broader climate commitments, reinforcing the credibility of banks. They also enhance decision-making by providing detailed insights into environmental performance, allowing for better resource allocation. Demonstrating the use of credible tools builds confidence among donors and investors, attracting additional funding for green projects. Moreover, comprehensive assessments strengthen risk management by minimizing the likelihood of underperformance, cost overruns, or reputational harm.

By promoting the adoption of green building assessment tools like EDGE,[3] RETScreen Expert,[4] or LEED,[5] PDBs also support broader market transformation. As leaders in sustainable financing, these institutions can inspire the private sector to adopt similar practices, driving systemic change in the construction and infrastructure sectors. The integration of these tools is not only critical for achieving resilient and sustainable infrastructure, but also for ensuring that social infrastructure projects meet the needs of communities while being aligned with global sustainability goals.

It is recommended that PDBs refer to the document *"Tools for EE in Buildings: A Guide for Policy-Makers and Experts"* developed by the Copenhagen Centre on EE for a comprehensive analysis and detailed insights into available tools. This resource provides valuable information for understanding and selecting the most appropriate tools for assessing EE in buildings. That document maps the existing range of tools to facilitate building EE improvements and presents an overview and categorization of current tools. It further classifies these tools into four key categories: Approach; scope; stage of the policy development cycle; and city focus.



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3 edgebuildings.com
4 natural-resources.canada.ca/maps-tools-and-publications/tools/modelling-tools/retscreen/7465
5 usgbc.org/leed

The main challenges and proposed solutions for this practice are presented below.

Table 8: Challenges and solutions for “tools for assessing green buildings”

Main challenges	Proposed solutions
How can we integrate green building assessment tools into the early stages of project development?	**Make the use of tools in the project evaluation process mandatory:** Revise the project development framework to mandate the use of green building assessment tools during the project design phase. Establish internal guidelines and workflows that embed these tools as a standard practice from project inception. Adopt digital solutions, such as BIM, integrated with green building tools to streamline data collection and facilitate early-stage evaluations. Provide training to project teams to ensure they can effectively apply these tools at the conceptual stage. The best existing tool should be selected based on project or program objectives and associated costs (see Case study 11: IFC support using EDGE certification, page 49) or develop a custom tool if necessary.
How can we address the high initial costs of implementing green building assessments tools?	**Provide financial incentives and cost-sharing models:** Develop financial mechanisms, such as grants, subsidies, or concessional financing, to offset the upfront costs associated with green building tools. Partner with international organizations or donors to secure funding for assessment implementation. Highlight the long-term financial benefits, such as reduced operating costs and increased building value, to build a strong case for initial investment. Integrate cost-sharing models with project developers to distribute the financial burden.

CASE STUDY 11

IFC support using EDGE certification

An innovation of the IFC, a member of the World Bank Group, EDGE makes it easy to design and certify resource efficient and zero carbon buildings of every type, everywhere. EDGE is free multilingual global software, a standard, and a certification system that proves that everyone wins financially by building green. EDGE creates intersections among developers, building owners, banks, governments, and homeowners to jump start the mainstreaming of green buildings and help tackle climate change.

IFC provides clients with investment support and advisory services to facilitate the development of resource-efficient buildings. Direct investments are made in green homes and hospitals for social infrastructure.

All relevant information is available here: edgebuildings.com

For more detail, see Project sheet 13: IFC support using EDGE certification, page 88.

TOOL 9: VERIFYING PROJECT PERFORMANCE

This practice is essential for confirming that EE projects deliver expected results in terms of energy savings and overall performance and for PDBs to further report to governments and donors on GHG emission reductions due to specific finance products or programs.

This process involves the systematic verification of project implementation, the collection and monitoring of energy performance data, and the communication of results to stakeholders. This verification should be preferably executed by third parties with expertise in EE performance measurement and verification. By ensuring that projects meet their energy-saving goals and operate as intended, performance verification plays a critical role in the long-term success and sustainability of EE initiatives.

A core aspect of performance verification is the thorough examination of how well a project has been implemented. This includes verifying that all planned EE measures were properly installed and that they function according to intended design specifications. Ensuring that each project element was completed to the required standard is key to achieving the anticipated energy savings and environmental benefits. The verification process often involves on-site inspections, reviews of technical documentation, and direct engagement with project developers to confirm that all components meet the agreed upon criteria.

Collecting and monitoring relevant energy performance data are also critical aspects of this practice. By gathering real-time data on energy consumption before and after project implementation, the actual performance of installed systems can be measured using utility or additional meters. These data provide insights into how effectively projects reduce energy use, improve efficiency, and contribute to broader environmental goals such as GHG emission reductions. Monitoring data over time is crucial to understanding the long-term impacts of EE measures and identifying any areas for improvement.

Verification of energy savings is a key outcome of this practice. To ensure accuracy and credibility, robust protocols and methodologies must be considered, such as the International Performance Measurement and Verification Protocol (IPMVP) developed by the Efficiency Valuation Organization (EVO). This protocol provides standardized methods for quantifying energy savings, ensuring that the performance verification process is both reliable and transparent.

Performance verification is also an opportunity to identify lessons learned and apply them to future projects. By analyzing the data and outcomes of the verification process, approaches to EE can be refined by improving the design, implementation, and monitoring of subsequent projects.

The main challenges and proposed solutions for this practice are presented below.

Table 9: Challenges and solutions for "verifying project performance"

Main challenges	Proposed solutions
How can we accurately quantify the energy savings achieved by projects?	**Use robust measurement and verification protocols:** Implement complete or simplified versions of protocols such as the IPMVP to ensure accurate and reliable quantification of energy savings. These protocols offer a standardized method for assessing energy savings, ensuring that results are comparable across projects and meet international best practices.
How can we ensure consistency in performance verification methodologies across projects?	**Implement a uniform methodology for performance verification:** Establish a consistent and standardized methodology for performance verification that applies to all projects. This ensures that performance data are comparable, reliable, and aligned with project objectives, making it easier to evaluate results across different initiatives and ensuring transparency.
How can we improve access to relevant data for performance verification?	**Invest in data-collection tools and processes:** Invest in systems and tools to efficiently gather and access necessary energy performance data for verification. The tools should ensure that the correct data are captured in a timely and accurate manner, facilitating easy access for verification purposes and enhancing the reliability of performance assessments.
How can we clarify the financial implications of performance outcomes?	**Develop a framework linking performance outcomes to financial impacts:** Create a clear framework that connects the verified performance outcomes of EE projects to their financial implications. By showing how energy savings translate into cost savings or revenue generation, PDBs better demonstrate the financial viability of projects and encourage continued investment.

CASE STUDY 12

Verification of project performance - EE in public buildings in Western Balkans countries – KfW

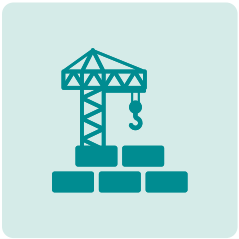
This was a comprehensive initiative consisting of multiple country-specific programs implemented by KfW and aimed at improving EE in public buildings across the Western Balkans. The initiative started with a successful project in Montenegro and was then replicated (with some modifications) in other countries in the region.

KfW performs annual progress revisions through on-site visits to sub-project sites. These on-site visits serve to verify the physical progress of building rehabilitation works. If the sub-projects are proven to have been implemented in compliance with the approved design, the estimated savings are considered achieved.

For more detail, see Project sheet 9: EE in public buildings in Western Balkan countries – KfW, page 76.

Left: Podgorica, Montenegro ©Yana Marudova, Unsplash. Right: ©Getty images

3. PROJECT **SHEETS**



This section provides an overview of both completed and ongoing key projects and initiatives that have successfully incorporated EE into the development of social infrastructure projects.

These projects and initiatives are categorized by geographical location, allowing for a clear presentation of activities in different regions.

PROJECT SHEET 1: BRAZIL APPROACH

Sector: All

Brazil is a pioneer in EE policies and programs. In 1998, the regulator Agência Nacional de Energia Elétrica (ANEEL) issued a resolution mandating electricity distribution companies to invest a minimum of 1% of their net annual revenues in EE and research and development (R&D) programs. These revenues have been the largest and most constant flow of financing (more than BRL 300 million per year) for EE investments in the country during the last decades. The percentage dedicated to EE projects has fluctuated over time, and this policy was later renamed the Programa de EE (PEE, the EE Program).

Several electricity distribution companies created ESCOs to identify and implement EE projects at client facilities. In 2006, to support the emergent ESCO market, the Brazil National Development Bank (BNDES) created a credit line called ProESCO for ESCOs in partnership with local banks committed to sustainable development. Conditions of the credit line included the following:

- Risk sharing (80% – 20%).
- ESCOs only offer personal guarantees.
- Risk bearing fee.
- Fast track operational procedure.
- PROCEL provides technical support for free.

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In 2012, ANEEL, with the support of GIZ, evaluated the PEE and published the **PROPEE (Procedimentos do Programa de EE)** with the following changes made to PEE regulations:

Call for Projects – Changes the PEE focus from the electricity distribution companies selecting projects from sectors of interest to seeking projects from the market. As of 2012, the market proposed projects under a competition regime that would lead to the approval of the most cost-effective projects.

Counterpart financing – The possibility of an incentive blended with funding between the PEE, consumers, and third parties (financial institutions in general) turns the PEE into a market driver and not a market substitute, which had been the case thus far. In the Call for Projects, the project with the highest counterpart financing will require that PEE's R$/MWh and R$/kW values be reduced to ensure more competitiveness during the bidding process (40% of the criteria carry economic weight).

Energy Performance Contracts – Several changes were made to make such contracts more attractive to consumers. The changes included loans at no interest (only monetary adjustment), energy diagnoses, management of the project at no cost to consumers, and cost benefit ratios of up to 0.9.

Over the years, the PEE has funded hundreds of EE projects in the public sector with free money, leaving little space for BNDES financing.

The BNDES PROESCO credit line was transformed into an EE credit line that is now offered to a wider audience. BNDES offers a number of other credit products supporting EE, such as Fundo Clima, Fundo Clima automático, and FGEnergia, a pilot initiative from which ESCOs may ask for funding to finance EE projects in the private and public sectors.

BNDES has no dedicated credit line for buildings. The social area of BNDES centralizes financing for the state and municipalities. There is no systematization for the inclusion of EE for greenfield projects. BNDES, being a federal bank, cannot directly fund federal buildings, but it can do so through ESCOs. Still, when summing all initiatives from the last 15 to 20 years, BNDES has provided R$5 billion in credit (USD 1 billion).

Currently, blended finance from PEE, BNDES, and other banks would be a more effective way to increase EE projects implemented in social buildings.

PROJECT SHEET 2: SUPPORTING GREEN BUILDINGS – IDB INVEST

Sector: Building

The IDB Group has developed a sustainable infrastructure framework to define how to support and develop projects. This framework is composed of four pillars: Economic, Environmental, Social, and Institutional.

The incorporation of EE in infrastructure projects is addressed in the Environmental pillar, which encompasses other elements such as resiliency, CO_2 mitigation and biodiversity. IDB Invest requires that building must be aligned with the following concepts:

- They preserve, restore, and/or integrate the natural environment.
- They make efficient use of resources such as energy, water, and materials.
- They feature advanced pollution control.
- They integrate climate resilience measures.
- They develop sustainable value chains.

IDB Invest defines a green building as a structure that meets the criteria set by a recognized international or national certification system. For a certification system to be acknowledged by IDB Invest, it must meet the following requirements:

(1) Climate Performance Standards: The system must have clear, comprehensive, and stringent climate-related performance criteria.

(2) Independent Quality Control: The certification process must involve quality assessments from at least two independent parties, ensuring both the design and construction phases meet standards.

(3) Post-Construction Certification: Final certification must be granted after the construction phase is completed.

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International certifications recently supported by IDB Group:

Certification	Description	Main applicable infrastructures	IDB Requirement
EDGE	Green building certification system by the IFC, which ensures at least 20% savings in energy, water, and embodied materials and is appreciated for being performance-oriented, having widely available experts, and offering cost-effective solutions.	Habitable infrastructure	EDGE
LEED	Green building certification system that promotes sustainability in energy, water, air quality, and materials. With different certification levels (certified, silver, gold, platinum), it encourages environmentally responsible practices in construction. Known for its widespread adoption and comprehensive criteria, LEED targets mainly developed markets but also emerging markets.	Habitable infrastructure	LEED Gold
Fast-Infra	Globally recognized sustainability certification label for a broad range of infrastructure assets, beyond buildings. The label evaluates projects based on 14 criteria covering environmental, social, governance, and climate resilience dimensions, helping to attract private investment by signaling their contribution to sustainable development See www.fastinfralabel.org/how-can-you-get-the-label	Non-habitable infrastructure	Minimum criteria + at least 2 positive contributions

LATIN AMERICA AND THE CARIBBEAN

Successful project in the education sector:

Project	Financing type	Total Investment (USD)	Financing amount (USD)	Comments
San Cristobal Green Academics and Sports Campus	CAPEX loan	59,000,000	23,240,000	The project was financed with a 37.76 MUSD syndicated loan that also included a blended finance tranche from the Climate Canadian Fund for the Private sector in Latin America and the Caribbean. The blended finance was directly associated to all additional capex required to increase climate resilience of the campus. The project is FAST Infra certified at design stage, construction will be done between years 2025 and 2026.
Texas Tech University Costa Rica (2018)	CAPEX Loan	28,000,000	12,067,200	The financial plan will be completed with the participation of B-Lenders and/or parallel lenders and through capital contributions. The building is pending LEED Silver certification for its exterior and LEED Platinum for its interior, meeting sustainable standards.

For these projects, technical assistance (TA) was provided to support the engineering designs, ensuring compliance with certification criteria, incorporating resiliency measures, and implementing an inclusive scholarship program.

Source: Towards 30% Climate Finance: How can buildings contribute to it? Guide for the incorporation and accounting of mitigation and adaptation measures to climate change[6] and Attributes and Framework for Sustainable Infrastructure Consultation Report[7]

6 publications.iadb.org/es/hacia-el-30-de-financiamiento-climatico-como-pueden-contribuir-los-edificios-lineamientos-para-la
7 publications.iadb.org/en/publications/english/viewer/Attributes_and_Framework_for_Sustainable_Infrastructure_en_en.pdf

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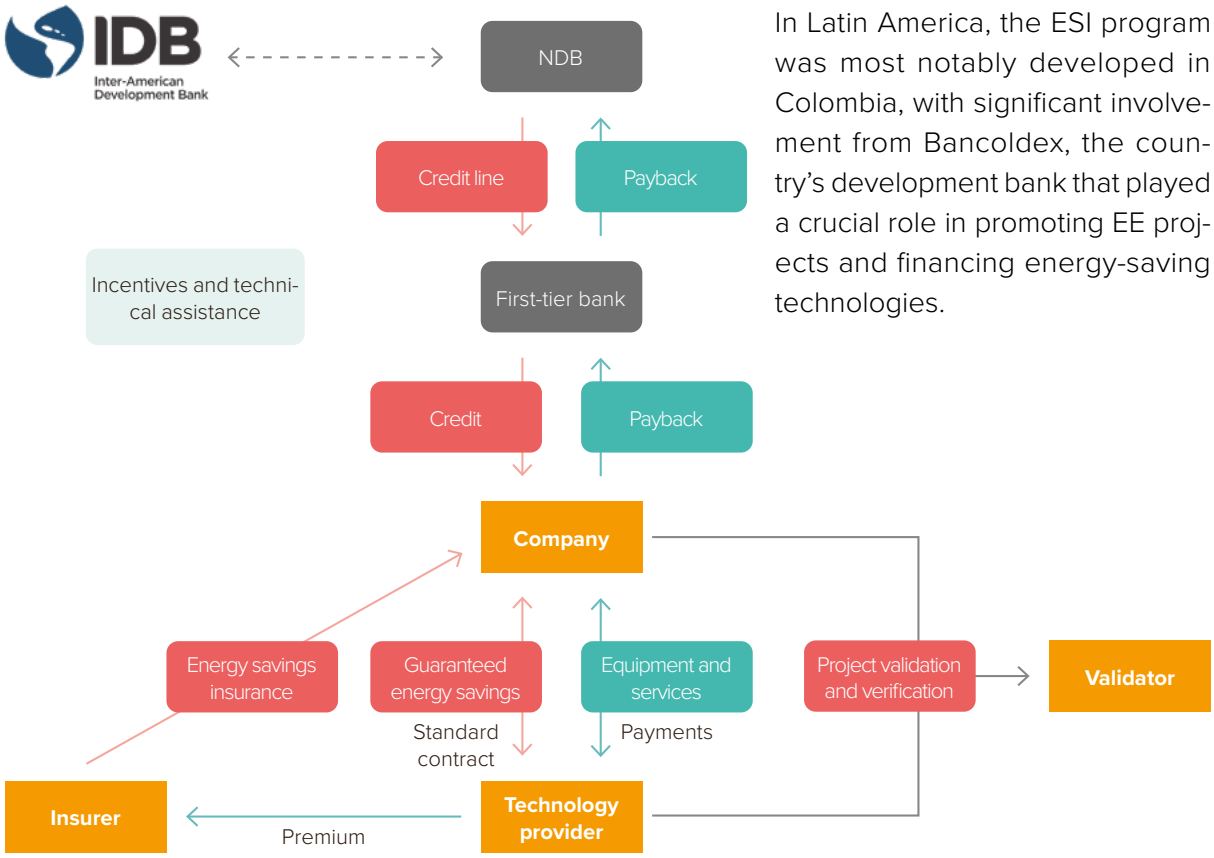
PROJECT SHEET 3: ENERGY SAVINGS INSURANCE (ESI) PROGRAM - IDB

Sector: Hospitals and clinics

The Energy Savings Insurance (ESI) program is an innovative financial instrument designed to promote investment in energy efficiency (EE) projects by mitigating the risks associated with achieving expected energy savings. The program was developed by the Inter-American Development Bank (IDB) with support from various partners, including the Danish Energy Agency and local development banks. ESI has been implemented in several countries, including Colombia, Brazil, Chile, El Salvador, Peru, Italy, Portugal, and Spain among others, and is aimed at fostering greater investment in energy-saving technologies and projects.

Flow of operations: As shown in the following figure, the ESI model includes four key instruments to mitigate project risks and build investor confidence: A standardized contract, energy savings insurance, energy savings validation, and financing. The contract ensures the project energy savings or power generation, backed by insurance in case of underperformance. Validation is performed by an independent body with expertise in energy certification, and its decisions are binding. Financing is provided by financial institutions that create a portfolio of insured energy savings projects. The client or investor applies for credit from the bank, while the technology provider arranges the insurance. The model guarantees energy savings through a client-provider agreement with insurance and validation, while bank financing, if needed, is independent but connected by the energy savings insurance that secures credit repayment.



In Latin America, the ESI program was most notably developed in Colombia, with significant involvement from Bancoldex, the country's development bank that played a crucial role in promoting EE projects and financing energy-saving technologies.

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Lessons learned from the implementation of the ESI program in Colombia:

- ✓ **Successful introduction in the market:** Despite delays, implementation issues, financing burdens due to exchange rate risks, the ESI program managed to build trust within the market. A template contract was developed, and insurance policies for energy savings (SURA) were successfully introduced.
- ✓ **Capacity enhancement:** To explain the products, commercial banks received training on procedures, conditions.
- ✓ **Adjusting the approach for better results:** A key lesson was that a simplified, phased approach would have been more effective. Starting with a limited number of technologies and expanding gradually would have ensured smoother development and validation processes. Additionally, using a more structured validation system (like a Super ESCO or private capital fund) might have improved project implementation.

Achieved results in Colombia[1]:

ESI program in Colombia:
+ USD 27.4 million

Invested in ESI projects:
+ 212 projects[2]

Solar photo-voltaic, air conditioning, solar thermal technologies and engines.

1 greenfinancelac.org/our-initiatives/financial-mechanisms-for-sustainable-energy/esi-colombia
2 Data as of May 2022

PROJECT SHEET 4: MI VIVIENDA VERDE IN PERU, FONDO MI VIVIENDA (FMV)

Sector: Housing

The Fondo MiVivienda (FMV) operates as a second-tier financial institution working with first-tier banks to offer accessible financing products for home purchases, especially for low and middle-income families. FMV also collaborates with international financial institutions, such as AFD and KfW, to mobilize funds and resources for sustainable housing to address the housing deficit and promote long-term solutions.

FMV addresses a critical housing issue in Peru where there is a significant quantitative and qualitative housing deficit – the third largest in Latin America. Despite efforts in recent years by public authorities to increase housing construction and expand the share of social housing (which accounted for 11% of new constructions in 2020), the demand for adequate housing continues to outpace supply. This deficit requires sustained investment in both the construction of new homes and the rehabilitation of existing ones.

To address the quantitative and qualitative housing deficit, it is estimated that 190,000 additional formal housing units need to be built annually over a period of at least 10 years. This need is not evenly distributed across the country. While the Lima region accounts for a significant portion of demand (85,000 units per year), secondary cities like Cusco, Puno, Arequipa, and Chiclayo face the highest proportional housing shortages.

FMV's market assessment began with a detailed analysis of housing needs across different regions of Peru. Recognizing regional disparities, FMV has identified areas with the greatest deficits and targeted resources to ensure funding reaches regions with the highest demand. Additionally, FMV has developed tailored financial products for diverse socio-economic groups, including subsidized loans and favorable financing conditions to improve access to finance by vulnerable populations such as low-income families, people with disabilities, and women in vulnerable situations.

FMV also takes a long-term approach by forecasting future housing demand, ensuring that housing solutions are aligned with national objectives and address the ongoing housing deficit while contributing to the sustainable development of housing infrastructure.

Peru ©Marie Tihon, AFD

©Yunus Tug, Unsplash

Credit lines

FMV funds and provides subsidized loans for the **MiVivienda Verde** program, promoting affordable, energy efficient housing to address Peru's housing deficit and sustainability goals.

Credit Line	Period	Funding	Purpose/Key Features	Criteria for Selected Housing
FMV1	2016–2018	€120 million from AFD	Launched the MiVivienda Verde program to promote sustainable and energy efficient housing.	FMW elaborated technical criteria for EE and water efficiency.
FMV2	2019–2021	€105 million from AFD + €45 million from KfW (Mutual Reliance Initiative)	Introduced refined segmentation for housing developers with three levels of commitments.	More stringent technical criteria were introduced in line with the three levels as well as environmental criteria.
FMV3	2022–2024	€80 million from AFD + €70 million from KfW	Consolidated and expanded the MiVivienda Verde program to influence construction practices in the long term. Maintained previous structure without significant changes.	Stricter environmental criteria, including bioclimatic design.
FMV4	2024	€60 million from AFD + €90 million from KfW (JEFIC agreement)	50% of funds for MiVivienda Verde. The other 50% targets vulnerable populations, focusing on people with disabilities, least expensive housing types (1-3), vulnerable women, and 25% allocation to provinces outside Lima.	Same environmental criteria, more demanding social criteria focused on vulnerable people, lower-middle class.

In addition to the €365 million financed by AFD and KfW through the four credit lines, a €10 million grant requested by AFD and KfW and granted by the EU in 2019 under the Latin American Investment Facility (LAIF) covered the interest rate subsidy (€9.25 million) and a technical assistance program (€750,000).

Since October 2024, FMV certification is recognized by the Climate Bond Initiative (CBI). This certification only applies to new projects. To comply with CBI, natural gas cannot be used. This international accreditation was requested by the market.

Main lessons:

- ✓ Partnering with private banks and international financial institutions is essential to mobilize funding and scale EE solutions in social infrastructure projects.
- ✓ A phased approach should be adopted when implementing EE initiatives in public infrastructure by building on pilot projects and refining strategies for long-term sustainability and impacts.
- ✓ Clear segmentation for contractors and developers should be established to ensure that EE standards are consistently met and resources are effectively allocated to key social infrastructure projects.
- ✓ Using well adapted EE and water efficiency criteria allowed high participation of project developers while progressively adapting and improving their construction practices.

Achieved results:

- ✓ More than 600 projects certified as sustainable, meeting efficiency ratios according to international standards based on evaluations carried out by third-party auditors using the IFC's online calculator called Edge. From 2025 onwards, Mivivienda Verde will use its own calculator for efficiency in accordance with the CBI accreditation and Peruvian Green Construction Technical Code.
- ✓ Enabled 110,800 households to be certified as sustainable quality social housing, with 10,500 receiving support from LAIF.
- ✓ Partnered with 15 first-tier banks to deliver targeted financial products, including those focused on green and affordable housing, expanding the availability of financing options.
- ✓ Influenced construction practices toward sustainability and eco-friendliness, supporting the development of energy efficient buildings in both urban and rural areas.
- ✓ Contributed to sustainability by saving 20,723 m^3 of water annually, 3,727,211 kWh in energy per year, and reducing CO_2 emissions by 1,387.80 tons annually.
- ✓ Created 14,000 jobs in the green construction sector.

Aguas Calientes, Peru ©Giancarlo Revolledo, Unsplash

PROJECT SHEET 5: "ECOCASA" - MEXICO'S GREEN MORTGAGES PROGRAM – CTF, IDB, KFW

Sector: Housing

Mexico's housing sector lacks affordable, energy efficient homes for low and middle-income families, with most low-cost housing built without essential features like thermal insulation, natural ventilation, energy efficient appliances or solar heating. This leads to higher than necessary energy consumption, placing a significant financial strain on low-income families that face high utility bills relative to their income. Mexico's residential sector currently accounts for 17.8% of total energy use and 23.7% of total electricity use (SIEA 2022).

Furthermore, unsustainable construction practices in such developments contribute to elevated carbon emissions, which conflicts with Mexico's climate commitments to reduce greenhouse gas emissions. Addressing these housing issues is crucial for improving affordability, reducing household energy costs, and advancing environmental goals.

The EcoCasa program offers financial incentives and technical support to developers for the implementation of green technologies and provides funding to local financial institutions (LFIs). This enables LFIs to offer energy efficient mortgages, making sustainable housing more accessible to low-income residents. This case study illustrates how government financing can promote affordable, energy efficient homes for low and middle-income households.

The program uses four key evaluation tools: DEEVi for energy performance; SAAVi for water conservation; HEEVi for housing environment evaluations; and ACV for analyses of environmental impacts throughout building lifecycles.

Financial products:

Financial Product	Description
Loans for Developers	These loans provide developers with favorable financing terms to incorporate green technologies, such as enhanced insulation, energy efficient appliances, and solar heating systems, into their housing projects. By easing the financial burden on developers, these loans encourage the construction of sustainable homes particularly for low and middle-income families.
Loans for LFIs	The goal of these loans is to ensure that the energy efficient homes built under the EcoCasa initiative can be made available to eligible families through affordable mortgage options, thereby reducing their long-term energy costs while contributing to the country's broader climate goals.

Main lessons learned:

- ✓ Offering low-interest bridging loans to commercial developers along with financial incentives for buyers has proven highly effective in promoting energy efficient construction in social housing.
- ✓ Transparent calculation tools with clear award criteria provide developers with planning certainty, aiding informed investment decisions.
- ✓ User behavior significantly influences building energy efficiency. To optimize energy use, consumer awareness programs are essential and should be incorporated into complementary measures.
- ✓ Verifications of the savings calculated using simulation tools and actual measurements allow a more robust evaluation of impacts.
- ✓ Analysis of the profitability of energy efficiency measures is pivotal for buyers and project developers.
- ✓ Information campaigns for buyers are important to develop the market.
- ✓ The construction of energy efficient housing did not promote individual technologies but instead consisted of a full building approach.

Achieved results:[8]

- ✓ 71,440 homes constructed by the Mexican government as of December 2023, with a key success factor being cost neutrality for buyers.
- ✓ End-beneficiaries experience improved thermal comfort and energy savings of USD 200 annually.
- ✓ 2.62 $MtCO_2e$ mitigated through sustainable construction practices and reduced energy consumption.
- ✓ 1,700 green mortgages granted.

In 2020, the EcoCasa program was approved as a Proxy for Green Bond Certification under the Climate Bonds Standard low-carbon residential criteria, with support from the UK Government. The projects must achieve a minimum of 20% reduction in CO_2 emissions compared to the baseline, measured using the DEEVi tool.

8 initiatives.weforum.org/equitable-transition-initiative/case-study-details/%E2%80%9Cecocasa%E2%80%9D---mexico's-green-mortgages-program/aJYTG0000000HdZ4AU

PROJECT SHEET 6: ENERGY TRANSITION IN PUBLIC INSTITUTIONS IN TUNISIA – "TEEP PROGRAM"-KFW

Sector: Public buildings (Schools, Hospitals, Universities, Administrative buildings)

EE and solar photovoltaic (PV) systems in buildings represent key pillars of Tunisia's energy transition strategy given their potential for energy savings and significant mitigation capacity.

In this context, the Tunisian government decided to develop an EE and PV program specifically for public buildings for several reasons:

(1) Public leadership: Inspire the private sector by leading with investments in EE and renewable energy (RE) in public buildings.

(2) Cost reductions: Ease the financial burden of energy bills on the state budget.

KfW supported this initiative by conducting a technical and economic study to assess the feasibility of promoting EE in public buildings in Tunisia. The study formed the basis for an agreement between Tunisia and Germany to implement the program with technical and financial support from KfW.

To ensure synergy, these two loan programs were merged into a single program, the **Energy Transition in Public Institutions in Tunisia Program (TEEP)**, aimed at encouraging public sector buildings to adopt EE measures and produce their own electricity through solar PV systems.

Funding agreement:

KfW signed two loan agreements and a financing agreement (grant) with the Ministry of Foreign Affairs and a separate agreement with the National Agency for Energy Management (ANME) designated as the **program executing agency**.

- **EE component funding:** EUR 15 million as a concessional loan to the Tunisian state and EUR 1.5 million as a grant for technical assistance support.
- **PV component funding:** EUR 34 million as a concessional loan to the Tunisian state and EUR 2.5 million as a grant for technical assistance support.
- **Tunisian contribution:**

  (a) **In-kind contribution:** Personnel provided by the ANME and the use of its services and equipment, estimated at EUR 1 million.

  (b) **Financial contribution:** The Energy Transition Fund (ETF) covered taxes on program-related services and supplies, amounting to approximately EUR 3 million.

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Implementation modalities:

The first phase of TEEP (TEEP1) is set to be implemented between 2021 and 2026. ANME acts as the Delegated Project Manager (Maitre d'ouvrage délégué) for public buildings. A dedicated Project Management Unit (PMU) has been established within the ANME to oversee and implement the program, supported by a Technical Assistance Group (GAT) recruited through the technical assistance grant. Any ministry wishing to participate in the program must first sign a framework Delegation of Project Management Agreement with the ANME.

The program is governed by a steering committee (COPIL) that includes representatives from key stakeholders such as the Ministry of Energy, the Ministry of Finance, STEG, and the ANME, with KfW serving as an observer member.

The GAT provides support to the PMU/ANME in carrying out all program implementation activities, including site selection, identification and evaluation of key actions (in terms of energy, financial, and environmental performance), procurement, quality assurance and monitoring of suppliers and service providers (including performance validation), fund management, reporting to all stakeholders, and awareness-raising campaigns.

Priority sectors and eligibility criteria

The priority sectors for the TEEP are **public health, national education, and higher education**. Beneficiaries need to meet the following criteria:

- The buildings and services involved must be owned by the state or a public institution.
- Beneficiaries must express their interest and submit an application of interest.
- Each EE action plan investment must demonstrate an average energy savings potential exceeding 20% based on the results of an energy audit.
- Beneficiaries must prove their capacity (budget and staff) to operate and maintain the proposed measures.
- Only approved EE technologies available on the market, including advanced ones, will be eligible, such as lighting, air conditioning, energy management, and integrating PV systems, to meet part of the electricity demand (envelope measures are excluded from this phase but may be considered in future phases).

The ANME ensures project implementation in line with the World Bank's environmental and social standards and international best practices. Supported by the GAT, ANME developed a waste management plan for the disposal of de-installed equipment (light bulbs, ACs).

EE assessment tools:

EE measures for buildings are identified through preliminary or detailed energy audits, depending on building complexity. The program has also developed a data-collection platform to gather energy consumption data from various beneficiaries. That platform calculates energy performance indicators, enabling the monitoring of building energy efficiency by activity type, facilitating comparisons, and identifying potential energy savings and opportunities for adopting RE solutions.

Monitoring and verification:

All establishments involved will be equipped with an energy monitoring and management system (EMS). Data will be consolidated at both the supervising ministry and the ANME, enabling evaluations of the EE impacts in targeted buildings.

Lessons learned:

- ✓ The TEEP1 has established a solid institutional and legal framework supported by the ANME and a dedicated Project Management Unit (PMU), with funding from the KfW and Tunisia's Energy Transition Fund (FTE). However, before scaling up the program to the national level, conducting an evaluation of the TEEP1 is recommended to refine governance structures, streamline tendering processes, and enhance the impacts of funded projects.
- ✓ Strengthening local SME capacity is critical to building a sustainable ecosystem for EE and PV services.
- ✓ In a program with multiple institutional beneficiaries, communication efforts must be strengthened through strategic planning and proactive stakeholder engagement. Additionally, customized training programs are essential to ensure effective knowledge transfer and foster long-term ownership of program objectives
- ✓ Operationally, prioritizing EE measures before PV deployment and integrating performance monitoring tools are essential to optimizing energy management. These insights highlight the importance of a holistic approach to scaling the program nationally by addressing both technical and market challenges.

Expected results:

The €15 million EE investment in the first phase is expected to achieve:

- Energy savings of 20 GWh per year.
- Emission reductions totaling 11.5001 tCO_2eq.per year.

The €34 million PV investment in the first phase is expected to achieve:

- Clean energy production of 42,75 GWh per year after full implementation.
- Emission reductions totaling 23.500 tCO_2eq per year.

Chad ©Marie Tihon, AFD

PROJECT SHEET 7: PROMOTING THE QUALITY OF BASIC EDUCATION IN CHAD (PROQEB)— AFD AND SWISS AGENCY FOR DEVELOPMENT AND COOPERATION (SDC)

Sector: Education

In Chad, the situation in primary education is alarming. Beyond the temporary challenges of public finances, the root causes of low coverage and retention in basic education can be analyzed in terms of insufficient school infrastructure, low internal efficiency, poor qualifications, a lack of motivation among teaching staff, often rudimentary teaching conditions, as well as a low supply of textbooks and educational materials. Enrollment and completion rates are very low. Through the ProQEB program, AFD and SDC are contributing to improving the environment and conditions for access to education and learning for children in the Batha, Moyen-Chari, Mandoul, and Wadi Fira regions, particularly for girls.

The project, under the aegis of the Ministry of National Education and Civic Promotion (MENPC), was launched in 2013 and is in its third phase. As part of Phase 3, the AFD mobilized the Partnership for Energy Efficiency in Buildings (PEEB) to oversee the construction of 20 classrooms, two buildings for the Provincial Delegations of Education and Youth (DPEJ), a teacher training college (ENI), and five non-formal basic education centers.

The design of the classrooms in rural regions of Chad is based on a multi-factor approach rather than a purely technical-economical method (more widely used in developed countries), as follows:

- **Social Acceptability:** Local perceptions of what is considered “modern” and “appropriate” differ from the Western perspective. For example, locals in Chad prefer to use corrugated iron for school roofs instead of sun-dried mud bricks, the former providing better insulation and increased thermal comfort.
- **Maintenance:** A model should be identified/developed to ensure proper maintenance and operation. The support of the local community, in particular women.
- **Use of local material:** Local material might differ from village to village.
- **Inclusivity:** Design of adapted latrines for boys and girls must be incorporated.
- **Socio-economic situation of the local community.**
- **Selection of the location.**
- **Bioclimatic architecture:** As schools do not have electricity supply, bioclimatic design will improve thermal comfort (less overheating thanks to natural ventilation) and natural lighting.

©USGS, Unsplash

Lessons learned:

- ✓ The Western approach focusing on technical solutions analyzed in highly sophisticated software might not be adapted to certain circumstances.
- ✓ Stakeholder engagement has been key to find appropriate solutions with local presence and dialogue.

Impact:

- ✓ A contextualized solution was developed that suits local communities and the central government. A template design was developed to be implemented in any rural area in Chad as the climate is similar in all regions of this country.

Photo: Example of a classroom
©TDR BET Ecole/AFD

PROJECT SHEET 8: ZENATA ECO-CITY – CAISSE DE DÉPOT ET DE GESTION (CDG) – MOROCCO

Sector: All

The Zenata Development Company (SAZ) is tasked with the design and overall development of the Zenata Eco-City. It is also responsible for ensuring overall project coherence, development, and implementation. SAZ was created by CDG in 2006.

The Zenata Eco-City is a town designed with the well-being of its residents in mind, placing people and innovation at the center of its urban planning approach. It is the first city to be awarded the "ECO-CITY LABEL" for performance. The Zenata Eco-City is composed of several community hubs organized according to the traditional principles of Moroccan medinas. All essential local facilities for education, healthcare, commerce, sports, and leisure are readily available.

Buildings are oriented to make use of natural lighting. The planning channels wind flows to cool the city during the hottest months. Up to 30% of the land is reserved for public parks to moderate high temperatures and promote biodiversity. Energy efficient lighting and building construction are being deployed.

Social housing: To the north of Casablanca lies Zenata, a commune where more than 30,000 people had settled in housing without land titles across 26 informal slums. Their resettlement followed the World Bank standard. The households relocated from informal settlements were given self-construction opportunities and received some information to raise awareness on thermal comfort.

Other SIs: 35 SIs were or are in construction since 2017. These buildings must meet the HQE certification level.[9] HQE certification reflects a balance between respect for the environment (energy, carbon, water, waste, biodiversity, etc.), quality of life, and economic performance through a global and multi-themed/multi-criteria approach. Currently, only one building has been certified, the other buildings comply with the standard but did not undergo the certification process by the Government's Departments Operating those SIs.

9 www.hqegbc.org/en/qui-sommes-nous-alliance-hqe-gbc/la-certification-hqe

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Two tendering processes were launched:

- ✓ **2017/2018:** A consulting firm specialized in sustainability was hired to oversee this aspect in all building development including SIs. The mandate included design and monitoring during construction. A French international firm won this contract.
- ✓ **2020:** The tendering process for 15 SIs required that the consortium (Architect/Engineer) included a consulting firm specialized in sustainability. A local firm won that tender.

Financing arrangement

The EIB provided a EUR 150 M loan, with another EUR 150 M by AFD, to support the development of Zenata.

Lessons learned

- ✓ The selection of certification to be used for integrating sustainability in the SI should be made based on the knowledge of technical stakeholders in the market and who will support the client in developing sustainable buildings.
- ✓ The project developer should be supported by specialists in EE, sustainability, etc. to ensure proper design and construction of low environmental impact buildings
- ✓ The project developer can require compliance with a standard to ensure the quality and sustainability of the buildings. However, it should not be required to process with the certification of the buildings due to the additional certification cost.

Impacts

- ✓ 300,000 inhabitants in total
- ✓ 40,000 low-income inhabitants
- ✓ 16,000 ha
- ✓ 35 SIs built using the HQE standard. 19 delivered; 16 under construction

Marocco, ©Mourad Saadi, Unsplash

PROJECT SHEET 9: EE IN PUBLIC BUILDINGS IN WESTERN BALKAN COUNTRIES – KFW

Sector: Public buildings (Schools, Hospitals, Dormitories, Administrative buildings)

This is a comprehensive initiative consisting of multiple country-specific programs implemented by KfW and aimed at improving energy efficiency in public buildings across the Western Balkans. The initiative started with a successful project in Montenegro and was then replicated (with some modifications) in other countries in the region.

Countries covered by the initiative: Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia.

Total amount of the initiative so far is EUR 535 million, EUR 270 million of which are still under disbursement.

The funding model for partner countries is blended and differs by partner country, but on average consists of 75% loan and 25% grant.

KfW usually signs a loan agreement with the ministry of finance of the respective partner country, while the separate agreement, which specifies the implementation details may be signed with sectoral ministries or government agencies (e.g. ministry of education, ministry of healthcare, etc.). A project executing agency (PEA - some countries have more than one) is nominated by the respective partner government and is always involved in program implementation. KfW signs a separate agreement with the PEA to detail the features of the program in each country. The PEA then manages the funds on behalf of the respective partner government (under an on-lending or on-granting agreement).

The PEA is usually supported by a project implementation consultant. The budget of that consultant is paid from the blended mechanism. The consultant supports the PEA in a multitude of tasks, including sub-project selection, design, procurement, monitoring, implementation control, etc.

An additional TA component is also provided for some countries and funded by grants from KfW or other donors. The TA provider is tasked with various activities most often related to capacity building, environmental and social (E&S) management, policy development, as well as gender related activities.

The financial mechanism used to pass on the financing to end-beneficiaries is subject to a decision by the partner government and is usually a 100% grant for the final beneficiary and on-lending by the ministry of finance of the respective country. The end-beneficiaries (hospitals, schools, etc.) are usually not required to pay the grant back to the PEA, not even partially, so all generated savings and other benefits are retained by end-beneficiaries.

The scope of the funding program differs by partner country but generally covers EE and structural improvements in public buildings:

- Rehabilitation of 19 student dormitories in Albania.
- Rehabilitation of up to 50 educational facilities, two social facilities and two ministerial buildings in Montenegro.
- Complete retrofit of the largest Balkan hospital in Serbia and more than 25 schools.
- Rehabilitation of up to 20 educational facilities in Bosnia and Herzegovina.
- Rehabilitation of nine student dormitories in North Macedonia.

The focus of the initiative is not only improving energy performance in public buildings, but also overall structural and comfort improvements. Funding at the sub-project level is usually distributed in the following proportion:

- EE improvements – 50% of the funds are allocated for EE measures (building envelopes, windows, HVAC, lighting, etc.).
- Structural improvements (for the extension of live cycle) – 35% of the funds.
- Comfort and accessibility improvements (e.g., renovation of sanitary installations) – 15% of the funds.

The buildings subject to rehabilitation under the initiative have been selected in coordination with the respective partner government following a country-specific feasibility or pre-feasibility study.

EE assessment software tool

For the needs of this initiative, KfW and the Fraunhofer Institute developed a specialized software tool for building energy assessments (before and after the implementation of EE measures) as well as for technical designs of identified measures and technologies to reduce energy consumption. This EE data management tool is based on the EU standards (EPBD), aligned with the ISO 52000 series, but is adaptable to take into account local regulations and standards in each partner country as long as they are in line with the relevant European directives. It also serves as a tool for enhancing the sophistication of local building energy standards and policies. The ability to adapt the software to the individual countries' circumstances is highly dependent on contributions from local stakeholders (energy agencies and regulation/policy makers). A regional TA component is available to all countries to have the software adapted and local energy auditors trained.

Every sub-project funded under the initiative should be assessed and designed by using the Fraunhofer EPC software tool.

The software tool can be used free of charge by energy auditors and project designers in each respective country and is being hosted by the respective country PEA. The tool adapted for Montenegro can be downloaded upon creating a user account from the following website: www.meec.me/index.php/en

Monitoring and verification

KfW performs annual progress revisions through visits to sub-project sites. These onsite visits serve to verify the physical progress of building rehabilitation works. If the sub-projects are proven to have been implemented in compliance with the approved design, the estimated savings are considered achieved.

Lessons learned

- ✓ The capacity of PEA staff is of utmost importance for program success. The internal experience and level of involvement of the PEA in the various partner countries were crucial to the success of the program. In cases where more than one PEA was involved, overall coordination and communication between key stakeholders were complex and therefore, more difficult.
- ✓ Cost increases during project implementation need to be considered in seriously in advance. This is especially important for prioritization of the measures.
- ✓ Competition and availability of qualified firms for implementation of the measures is often limited. This needs to be duly considered in advance when designing the tender process.
- ✓ The availability of the professionally designed and standardized software tool to assess sub-projects greatly enhanced the successful selection of buildings due for EE renovation.

Energy efficiency in buildings and social infrastructure goes far beyond mere reduction of energy consumption and CO_2 emissions. It needs to be planned and implemented in a holistic way to address needs of users and generate multiple benefits.

Almaty, Kazakhstan, ©Darya Jum, Unsplash

PROJECT SHEET 10: RENOVATION OF PUBLIC BUILDINGS IN MOLDOVA – KFW/AFD

Sector: Vocational Schools, Universities and Regional hospitals

A joint initiative of AFD and KfW, this program is designed to secure financing for deep renovations in 30 buildings across Moldova – 16 regional hospitals and 14 educational buildings (universities and vocational schools). Total renovated area is expected to be approximately 92,000 square meters.

The total amount of the program is EUR 73 million.

The funding model is blended – A EUR 30 million loan from AFD is complemented by a EUR 38.7 million grant from the German government provided through KfW. Both resources are provided within the Joint European Financiers for International Cooperation (JEFIC) framework. AFD is the lead financier and KfW the co-financier. In addition, a EUR 4,3 million grant is provided by the Republic of Moldova.

A loan agreement will be signed between AFD and the Ministry of Finance of Moldova, while KfW will sign a grant agreement with the Moldavian Ministry of Energy. A project implementation unit (PIU) will be established at MEPIU (an independent executive agency established by the Government of Moldova). The PIU will manage the two designated loan and grant accounts.

As this project will be implemented as a blended mechanism, each disbursement will concurrently draw a portion of the loan and a portion of the grant (on pro-rata and pari passu bases). The PIU will procure services and make payments to relevant subcontractors - energy auditors, project designers and installers/constructors.

The PIU will be supported by a project consultant paid from the blended mechanism budget.

End-beneficiaries (schools, universities and hospitals) will receive financial support as a 100% grant. They will not be required to pay back to the PIU or the Government of Moldova. Their annual budget allowances and transfers will also not be reduced by the amount of the expected energy savings. End-beneficiaries will enjoy 100% of the achieved savings. The Government of Moldova will repay the loan to AFD.

The scope of the renovation of 32 public buildings funded under this project is rather broad and will stretch beyond plain EE, covering the following components:

- EE improvements – 50% of the funds will be allocated for EE measures.
- Structural improvements – 35% of the funds will be used for enhancing the structural resilience of the selected buildings.
- Comfort, water savings and accessibility improvements – 15% of the funds will be allocated for measures leading to improved accessibility for people with disabilities, better comfort, reduced water consumption and gender related amenities.

Oncological Institute, Strada Nicolae Testemițanu, ©Sasha Pleshco, Unsplash

The buildings subject to this project were selected in coordination with the Ministries of Healthcare and Education respectively. The selection process was a multi-step:

- Elaboration of priority lists by the Ministry of Health and the Ministry of Education and Research
- Clarification of the sectorial priorities and specific requirements of the line Ministries and Financiers
- Definition of the general scope of the Project: the number of buildings that can be chosen within the budget and under which conditions
- Collection of technical data regarding the prioritized buildings through remote investigations
- Analysis of the pool of prioritized buildings and preliminary selection of potential candidates based on political priorities and qualitative criteria
- Walkthrough energy audits and E&S screening of the buildings from the reduced list
- Recommendation of a shortlist and backup list based on the results of the walkthrough energy audits
- Final iteration following AFD and KfW's appraisal mission

Implementation project approach:

- The PIU, supported by the project consultant, procures detailed energy and structural audits for the selected buildings as well as asbestos assessments.
- Based on the audit results, the PIU selects technical designers to prepare project drawings and specifications.
- Then construction companies are recruited to perform the renovation works and installations.
- Maintenance contracts shall also be procured by building owners post implementation of renovation works for certain complex systems such as heating systems and/or solar electric and thermal systems and shall be financed from the building's operation and maintenance budget,
- Each payment to a subcontractor is drawn from both accounts and is comprised of the respective share of loan and grant funds.

Monitoring and verification of project achievements and progress:

The PIU will track, evaluate, and report on the implementation and performance of each renovated building. The project consultant will be tasked with developing feasible monitoring, evaluation, and reporting methodologies as part of its mandate.

PROJECT SHEET 11: EBRD APPROACH

Sector: All

Public buildings in the regions where EBRD operates consume more than twice as much energy per square meter as those in advanced EU member states. Poor energy performance, outdated construction standards, delayed maintenance, and decaying public buildings are the most common challenges in the public buildings sector. Current building renovation rates and practices in the regions are far below Paris Agreement targets. Furthermore, most of these efforts in building renovation are not cost-optimal due to capacity and supply chain limitations as well as regulatory and policy constraints. Green social buildings are often difficult to finance at scale due to the fragmented nature of the market, capacity constraints, information asymmetries, and split incentives between building owners and those in control of public assets and energy budgeting.

Combining a decade of green finance experience with technical assistance and policy dialogue, the EBRD aims to turn challenges into solid investment opportunities with clear economic, environmental, and social benefits. The EBRD uses both direct and indirect green building investments through a range of channels and financial instruments that include:

- Direct finance including debt, equity, or quasi-equity financing with a focus on green investments and the use of advanced resource efficiency techniques.
- Intermediated finance through local financial institutions or through non-financial intermediators such as utilities under energy efficiency obligations, energy service companies (ESCOs), and supply chain actors.
- Large-scale public-private partnership (PPP) framework programs (greenfield and brownfield public buildings).
- Sustainable property funds and labelled green property bonds.
- Performance-based finance and other market-based climate finance products that provide additional revenues for EBRD clients.
- Structured financing: EPC/ESCOs/forfeiting (residential and public buildings, etc.).

Direct Finance: Improving Public Buildings – Chisinau, Moldova

The City of Chisinau presents an ageing building stock. Due to lack of major investments and outdated construction standards, municipal buildings in Chisinau are characterized as having low energy performance.

The EBRD has engaged with the City of Chisinau to support the energy efficiency rehabilitation of the municipal building stock. The EBRD has provided comprehensive technical assistance involving energy audits and the analysis of energy performance of the city's existing building stock. Thanks to the study, 119 buildings including kindergartens, schools, and hospitals were prioritized under a long-term energy efficiency renovation plan. As a result of a financial package provided by the EBRD, EIB, and donors, the first 22 public buildings have already been modernized with achieved reductions in heat consumption of 40% and electricity consumption of 23%.

Highlights:

- Technical assistance to support the identification, prioritization and implementation of public buildings EE renovation.
- Significant improvement of buildings performance, health and comfort levels through energy efficient rehabilitation of the buildings envelop and heating systems.

Investment:

- Total project of €25 million.
- EBRD loan of €10 million, EIB loan of €10 million, and E5P grant of €5 million.

Expected impacts:

- Energy savings of up to 50% (37, 000 MWh per year).
- Emission reductions of 9,500 tons of CO_2 per year.

Chișinău, Moldova ©Sasha Pleshco, Unsplash

Finance To Energy Service Companies – Municipal Energy Service Company – Dnipro, Ukraine

Building on the success of policy dialogue activities for the introduction ESCO legislation in Ukraine and a pilot project, in 2020, the EBRD supported the central Ukrainian City of Dnipro to improve the energy efficiency of its public buildings with a €25 million loan to municipal energy management company Dniprovska Municipalna Energoservisna Kompanya. The proceeds of the EBRD loan were used to co-finance the refurbishment of about 100 buildings, including kindergartens, schools, and outpatient clinics, which all has the potential for considerable energy efficiency and greater tenant comfort.

Highlights:

- The project uses elements of the EPC concept to select private companies that offered the most cost-effective energy saving solutions.
- The project is expected to support significant social value as schools and kindergartens become a visible good example of the efficient use of energy.
- Since the start of the war in Ukraine, the EBRD secured an additional €2 million in donor funds to support the resilience of building infrastructure to disruptions in energy supply.
- The scheme of engaging with municipal ESCOs has been replicated in other Ukrainian cities.

Investment:

Senior loan to municipal ESCOs with guarantee from the city.

- EBRD loan of €25 million + €2.5 million from the City of Dnipro.
- E5P grant of €5.5 million + additional €2 million for energy security.

Expected impacts:

- Estimated energy savings of 42% compared to the baseline.
- Estimated emission reductions of 7,107 tons of CO_2 per year.
- Estimated energy savings of 35,270 MWh per year.

Facilitating Public-Private Partnerships example: Kokshetau hospital PPP, Kazakhstan

Following the success of several hospital projects, in particular in Türkiye, the EBRD recently signed a first PPP healthcare sector project in Central Asia. This first PPP in the healthcare sector of Kazakhstan will be a Greenfield development for a 110,000 m^2 facility that will provide services to more than 730,000 people living in the City of Kokshetau and the wider region of Akmola. The new hospital will seek to receive a Silver rating under the Leadership in Energy and Environmental Design (LEED) green building certification program that recognizes best-in-class building strategies and practices. It will also aim to obtain an EDGE certification for water and energy savings.

Financial arrangements:

- Financing package of €365 million provided by six financial institutions for the construction and operation of a 630-bed multidisciplinary hospital in the city of Kokshetau.
- EBRD loan of €105 million.
- The project will be co-financed through parallel loans for a total amount of up to €260 million provided by the Asian Infrastructure Investment Bank (AIIB), the German Investment Corporation (DEG), the Islamic Corporation for the Development of the Private Sector (ICD), Proparco, a subsidiary of the Agence Française de Développement, and the Development Bank of Kazakhstan (DBK).

Expected impacts:

- 22.7% reduction in energy costs compared to baseline building conditions.
- 47% reduction in water consumption, both indoors and outdoors for garden, compared to baseline values

Source: www.ebrd.com/news/2016/making-chisinau-greener-.html; www.ebrd.com/news/2020/ukraines-dnipro-to-upgrade-public-buildings-with-ebrd-loan.html; www.ebrd.com/news/2024/ebrd-supports-first-healthcaresector-ppp-in-central-asia.html

Dnipro, Ukraine in 2020, ©Diana Vyshnia-kova, Unsplash

PROJECT SHEET 12: WARM HOUSE LENDING PROGRAM OF NATIONAL MORTGAGE COMPANY (NMC) OF ARMENIA

Sector: Social housing

Lack of thermal insulation standards, the intensity of winter, and limited financial resources make lower-income Armenian households spend a significant portion of their budget on energy. The most vulnerable households do not have access to credit facilities for needed renovations.

AFD finances the NMC through two credit lines with the aim of encouraging Armenian financial institutions to grant smaller loans for household renovations as well as introducing awareness and good practices in energy-efficient housing and related finance.

The Warm House (Jerm Ojakh) program started as a cooperation between AFD and NMC in 2014, initially focused on supporting low-income families in rural Armenia, but not specifically targeting EE. The EE component in financed projects was introduced through small financial grants, but the EE component was not mandatory. Gradually, AFD and NMC agreed to make EE compulsory in the on-lending program, and it was a key requirement until the completion of the program in 2024.

Financial model: The Jerm Ojakh was an on-lending program implemented in cooperation between AFD and NMC. AFD provided an unsecured loan at concessional terms to NMC, NMC then extended the funds to its partner FIs (i.e. banks and non-bank FIs in Armenia) to finance renovations of existing housing buildings, the construction of new single-family homes, and the acquisition of residential real estate. NMC extended its funding through refinancing of eligible loans underwritten by partner FIs.

Lending model: Partner FIs commit to participating in the program based on eligibility criteria and other conditions set forth by NMC. They financed eligible projects under predetermined concessional loan terms and then refinanced these loans at NMC.

Partner FIs extended consumer credits to final beneficiaries in two forms: either as a conventional consumer loan or as a loan based on a financing contract with the assignment of a monetary claim. Under the former financing scheme, borrowers received a loan directly from a partner FI and invested in eligible measures. Under the latter scheme, borrowers received eligible products from suppliers, and the supplier subsequently sold the claim to a partner FI (most of the loans were disbursed under this scheme). The loans were complemented by a financial incentive (grant) for borrowers provided by EU. Jerm Ojakh financed projects were required to have an EE component. Depending on how the loan related to EE, there were two loan categories:

- ✓ Loan with a basic bonus – the EE component accounts for at least 40% of the loan amount.
- ✓ Loan with a higher-grade bonus – the EE component accounts for at least 70% of the loan amount.

Yerevan, Armenia, ©Alexandr Hovhannisyan, Unsplash

Eligibility checks were made by the partner FIs using a tool developed by NMC. This tool also computed the expected savings and CO_2 emission reductions. Each loan application had to be accompanied by a certificate developed via this tool. The tool was used for eligibility assessments of home renovations.

Upon disbursement of a loan, partner FIs performed monitoring and tracking for diligent project implementation. The information was then reported to NMC. NMC performed monitoring checks (including site visits) on at least 10% of financed projects of each partner FI.

Upon successful verification of project completion (partner FIs collected proof – documents and pictures of the buildings), NMC released the grant to the respective FI. The FI used the grant to partially redeem part of the loan (reduced the loan principal due by the end-borrower).

Upon successful completion of the program, AFD and NMC launched a larger green initiative. Jerm Ojakh loans are now refinanced under this new program, which includes green purchase loans and single-family house construction loans in addition to Jerm Ojakh loans. The applicable EE requirements under the new program are stricter than those in the previous two phases. The tool used for Jerm Ojakh loans has been upgraded and is publicly available at green.nmc.am/en.

Achieved results (under the two phases of the Jerm Ojakh program)

- ✓ Total amount of AFD loans for the two phases: USD 38 million.
- ✓ Total number of loans and number of households that benefitted from the program: 17,199 beneficiaries.
- ✓ Total amount of loans disbursed to final borrowers: USD 38 million, which is equivalent to AMD 18.2 billion.
- ✓ Total volume of energy savings generated under the program: 74,685 MWh/year.
- ✓ Total volume of GHG reductions generated (tonnes of CO_2 emission equivalent per year): 29,060 teq-year.

PROJECT SHEET 13: IFC SUPPORT USING EDGE CERTIFICATION

Sector: All

An innovation of IFC, a member of the World Bank Group, EDGE makes it easy to design and certify resource efficient and zero carbon buildings of every type and everywhere in the world. EDGE is a global software tool, a standard, and a certification system that proves that everyone wins financially by building green. EDGE creates intersections among developers, building owners, banks, governments, and homeowners to jump start the mainstreaming of green buildings and help tackle climate change.

IFC provides clients with investment support and advisory services to facilitate the development of resource efficient buildings. Direct investments are made through local financial institutions or in green housing, schools and hospitals to develop social infrastructure.

For more information, click here: edgebuildings.com

Belhar Gardens – South Africa[10]

Located in Cape Town, Belhar Gardens was developed by the Madulammoho Housing Association, a social housing company that has partnered with the City of Cape Town. The project, the first EDGE-certified social housing in South Africa, was financed by Nedbank Corporate and Investment Banking's (NCIB) Affordable Housing Development Finance Division and South Africa's Green Fund. The Green Fund originated from a public-private partnership between the Development Bank of South Africa and the government's Department of Environmental Affairs. EDGE has partnered with the development arm of the Swiss government, the State Secretariat for Economic Affairs (SECO), to develop more social housing properties such as Belhar Gardens in the South African market.

Belhar Gardens provides 630 units to low-income residents, with nearly 70% of the units allocated to households earning a monthly income of between R3,500 (USD 200) and R7,000 (USD 400). The remaining 30% are allocated to households with a combined income of less than R3,500 per month (USD 200/month).

The project incorporates energy efficiency measures including heat pumps instead of conventional geysers.

10 edgebuildings.com/project-studies/belhar-gardens

Malabo, Equatorial Guinea ©Santi Vedri, Unsplash

Impacts:

- 21,866 m^2 in floor space.
- 630 units.
- 41% reduction in energy use.
- 30% reduction in water use.
- 734 tCO_2/year saved.
- 36% reduction in embodied energy in materials.

Institution Mexicano del Seguro Socia (IMSS) Hospital – Mexico[11]

EDGE is helping healthcare facilities to target areas where resource efficient technologies can be installed reduce energy and water use. In response to the COVID-19 pandemic, a new EDGE-certified 40-bed IMSS hospital was opened in the City of Puebla in the neighborhood of La Margarita to provide needed healthcare services to the community. Due to the urgent need for the hospital, construction was expedited in 2020. The hospital comprises high thermal insulating materials with acoustic properties as a requirement. The hospital was built in only six weeks by using an innovative, prefabricated construction system.

Resource efficient design and technologies, such as reflective paint, occupancy sensors, and low-flow plumbing fixtures, lower the hospital's utility costs. The operational savings are then used to provide greater care for patients, including medical equipment, training, and high-quality doctors and nurses. After the pandemic, the hospital continues to provide care in response to the needs of the community. This is particularly important given the history of earthquakes that have damaged hospitals in Puebla.

Impacts:

- 1,532 m^2 of floor space.
- 27% reduction in energy use.
- 29% reduction in water use.
- 23 TCO_2/year saved.
- 66% reduction in embodied energy in materials.

11 edgebuildings.com/project-studies/imss-hospital-emergente-COVID-19

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5. APPENDIX: **TECHNICAL FACTSHEET**

Turkey ©Marie Tihon, AFD

A. Technical energy efficiency approach

Integrating energy efficiency into social infrastructure requires a structured approach to maximize impact and cost effectiveness. The following figure presents the key steps to be considered.

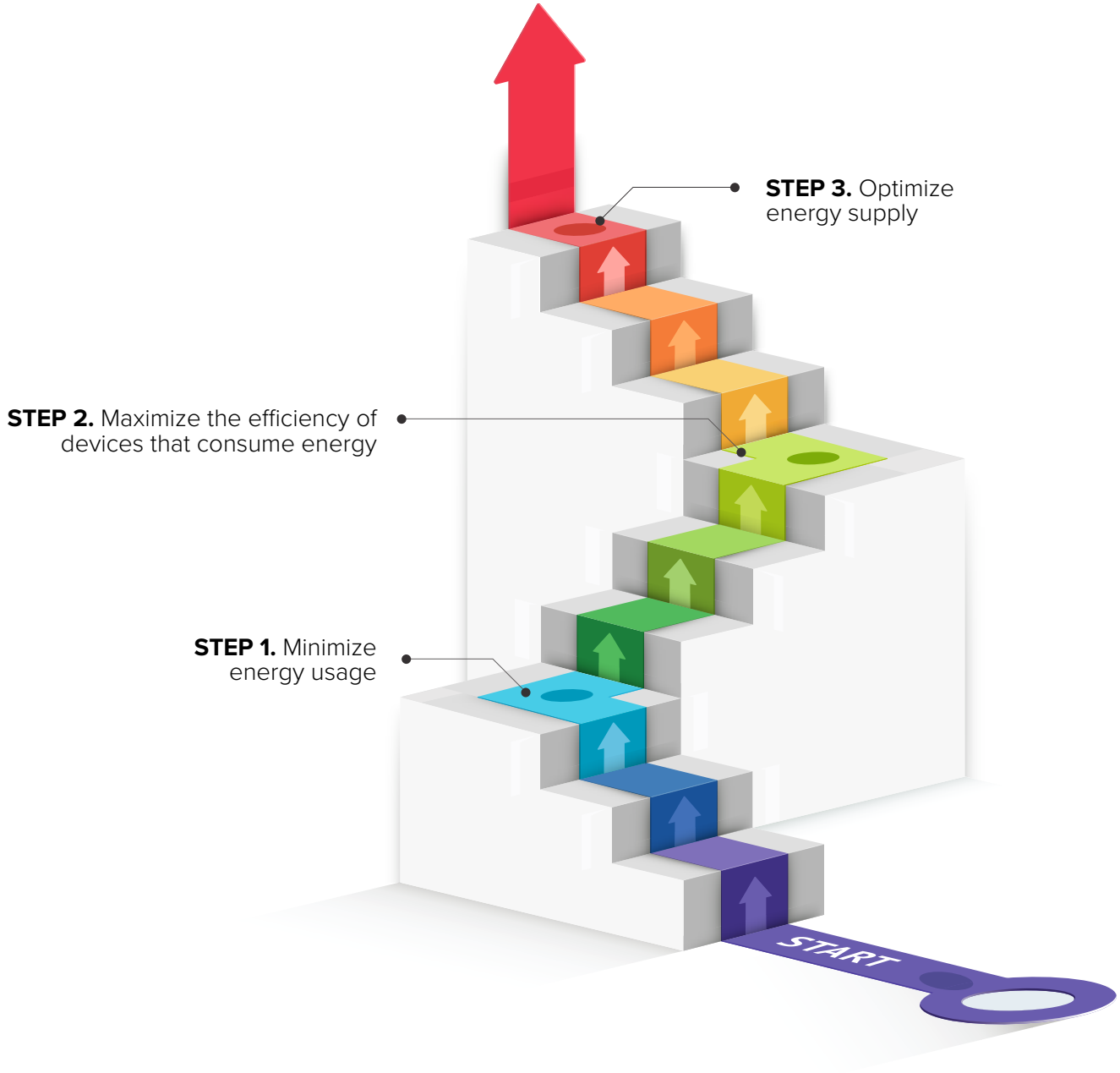
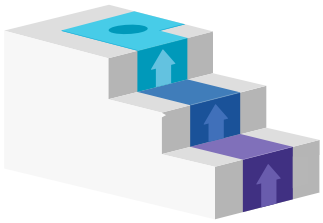


Figure 4: Steps to integrate energy efficiency in social infrastructure buildings

Energy demand is reduced by following this approach, first starting with bioclimatic design to make it easier and more cost-effective to select EE equipment and appliances such as HVAC or lighting and then integrating renewable energy solutions within social infrastructure buildings.

The cascading effect of each step enhances the effectiveness and financial viability of the next. Minimizing energy usage decreases the required capacity of systems, allowing for smaller and more affordable installations. Maximizing efficiency ensures that existing systems operate at their optimal performance, further reducing energy consumption and operational costs. Finally, optimizing the energy supply by incorporating renewable sources lowers long-term energy expenses and improves sustainability. This strategy effectively balances technical feasibility, environmental benefits, and financial sustainability, ensuring that social infrastructure projects are both cost-efficient and aligned with long-term goals for energy resilience.

1. Minimize energy usage



This step starts with a climatic analysis based on specific climatic zones. Assessing local climate factors such as temperature, humidity, solar radiation, and wind patterns allows designs that optimize energy use, reduce environmental impacts, and enhance occupant comfort. It ensures that each project is tailored to its unique environmental context, leading to improved performance, cost savings, and long-term resilience.

Climatic zone classifications are typically included in national or regional legislation associated with building codes or they are established according to climatic zone maps such as the Köppen climate classification (see Figure 5) or the ASHRAE thermal climate zones.

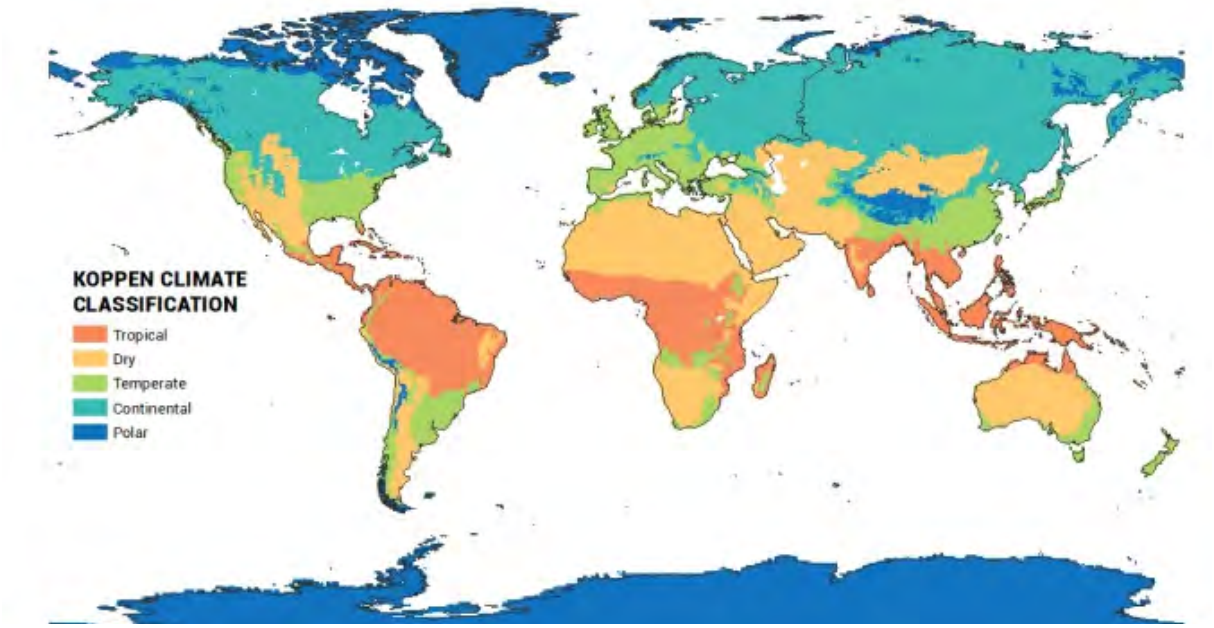


Figure 5: Köppen climate classification

Bioclimatic building design (also passive design) is based on local climate conditions and building culture and is aimed at providing thermal and visual comfort by making use of solar energy and other environmental sources.

Using climatic zone information and relevant meteorological data, designers can employ models or simulations to determine the most effective bioclimatic design for sustainable and resilient buildings, considering at least:

Orientation: The building orientation plays a critical role in optimizing solar gains as well as passive heating and cooling. By analyzing local climate data, such as solar radiation patterns, buildings can be positioned to take advantage of the sun's path to reduce reliance on mechanical heating and cooling systems. This ensures EE throughout the year, especially in extreme weather conditions. The optimal orientation of a building is determined by its geographic location, climatic conditions, and intended use. For example, in cold climates, the primary objectives are to maximize solar gains and protect against prevailing winds to enhance passive heating. Conversely, in hot climates, the focus shifts to minimizing solar gains by prioritizing shading strategies and facilitating cross-ventilation to maintain thermal comfort.

Compactness: The Compactness of Building Indicator is a metric used to assess the geometric efficiency of building design by focusing on how effectively the building form minimizes energy loss. It is calculated by comparing the surface area of a building to its volume. A more compact building, characterized by a smaller surface area relative to its volume, generally exhibits higher energy efficiency as it has less external surface through which heat can be lost or gained. Building compactness is optimized through simulations informed by local climate data to enhance energy performance and help reduce operational costs.

Construction materials: Material selection is crucial to building energy performance. Insulating materials such as fiberglass, mineral wool, or foam reduce heat transfer, improving thermal efficiency. Additionally, materials with reflective or absorptive properties help regulate temperature based on the local climate. In hot climates, heat-reflective materials, like light-colored roofing, minimize solar heat gain, while in colder climates, heat-retaining materials, such as wood or brick, reduce heating needs. Choosing the appropriate materials based on the climate optimizes energy use and reduces operational costs. The selection of construction materials must also consider the availability of materials in the market to ensure practical implementation and cost effectiveness.

Thermal inertia: This refers to the ability of a material to absorb, store, and gradually release heat. Materials with high thermal inertia such as concrete, brick, or stone help stabilize indoor temperatures by reducing rapid fluctuations. In warm climates, they absorb heat during the day and release it at night, preventing overheating. In colder climates, they retain heat during the day and release it at night, reducing the need for artificial heating. Incorporating materials with suitable thermal inertia improves energy efficiency by reducing reliance on active heating and cooling systems, resulting in energy savings and greater occupant comfort.

Window-to-wall ratio: This is the proportion of total glazed area, including frames, to the gross area of the exterior wall. Glazed areas may include windows, doors, and curtain walls. The amount and placement of glazing (windows) directly affect building natural lighting, heat gain, and thermal comfort. Using climate data, designers determine the optimal glazing ratio to maximize daylighting while minimizing unwanted heat gains in the summer or heat losses in the winter. This also reduces the need for artificial lighting and mechanical heating.

Natural ventilation: Proper ventilation is crucial for maintaining indoor air quality and thermal comfort. Climate models serve to identify optimal ventilation strategies, such as window placement and airflow patterns, to enhance natural cooling in hot climates or ensure adequate air circulation in temperate regions. These strategies minimize reliance on energy-intensive air-conditioning systems to improve energy efficiency while maintaining a comfortable indoor environment.

Vegetation: Integrating vegetation into building design is an effective strategy for regulating temperatures and improving air quality. By analyzing local climate conditions, such as prevailing winds and sunlight patterns, designers can strategically position trees and plants to provide shade, mitigate heat islands, and enhance thermal comfort. Additionally, incorporating green roofs and walls offers benefits such as improved insulation and efficient water management, further contributing to building sustainability and energy efficiency.

Water management: Effective water management is essential for sustainability, particularly in regions with fluctuating precipitation patterns. By leveraging climate data, designers can plan for measures such as rainwater harvesting, efficient irrigation systems, and proper drainage to manage stormwater runoff, reduce water consumption, and prevent flooding. While some of these measures can be costly, such as installing rainwater harvesting systems or advanced irrigation technologies, they significantly improve building resilience by enhancing water efficiency and reducing reliance on external water sources.

Passive/bioclimatic design strategies help to:

- Reduce energy consumption by reducing the need for artificial heating, cooling, and lighting systems.
- Reduce size/cost of HVAC equipment.
- Increase occupant comfort and well-being by improving indoor air quality and quality of light, all of which improves mental and physical health.
- Reduce building operation costs. Passive design strategies usually require less maintenance.
- Achieve sustainability certifications and comply with regulations and standards, enhancing the market value of buildings.

2. Maximize the efficiency of devices that consume energy

Improving the EE of equipment and appliances is a key step in reducing overall energy consumption, especially in critical systems like HVAC and lighting. By focusing on upgrading and optimizing these devices, social infrastructure buildings can achieve significant reductions in energy use, lower operational costs, and enhance environmental sustainability.

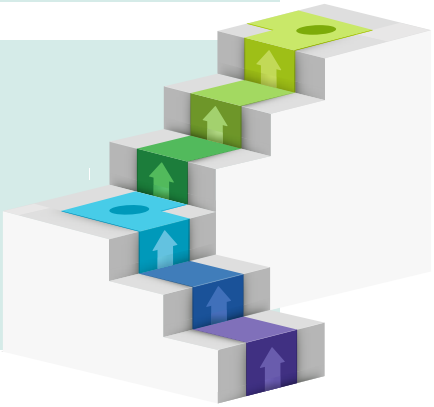
In ventilation, using energy-efficient fans and motors helps lower power consumption. Heat recovery systems reuse heat from exhaust air to warm incoming air, reduce the need for additional heating or cooling. Systems that adjust airflow based on occupancy or air quality ensure that energy is only used when needed.

For heating and cooling, using systems that adjust heating and cooling supply based on demand avoids wasting energy. Installing smart thermostats allows better control over temperatures in different areas, making sure energy is used efficiently according to needs and time of day.

Lighting is made more efficient by switching to light-emitting diode (LED) bulbs that use less energy and last longer. Motion sensors automatically turn lights off when rooms are unoccupied, ensuring energy is not wasted.

Domestic hot water supply is more efficient with high-efficiency boilers that use less energy to provide the same amount of hot water. Low-flow faucets and showerheads also help reduce water use and the energy required to heat it.

Using **EE appliances** reduces electricity consumption without sacrificing performance. For instance, hospitals can upgrade refrigerators, freezers, sterilizers, and laundry machines to more efficient models, reducing energy use and operational costs while maintaining essential functions.



3. Optimize energy supply

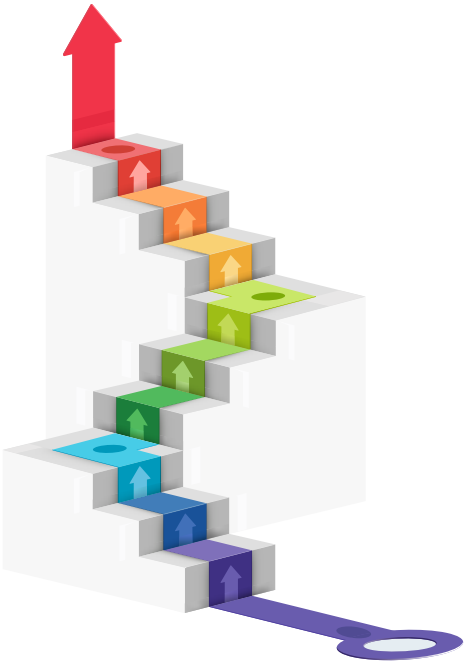
Optimizing the energy supply in social infrastructure buildings can be achieved by integrating renewable energy sources, such as PV systems and solar water heating equipment, into building energy supplies.

PV systems convert sunlight into electricity, which significantly reduces reliance on the grid and lowers electricity bills. In public schools or social housing, installing solar panels on rooftops provides clean renewable energy to power lighting, heating, and other building systems.

Solar water heating systems that capture solar energy to heat water further reduce reliance on electricity or gas for water heating. These systems are especially beneficial in projects related to social housing for which large quantities of hot water are needed for activities such as showers and cleaning.

It is strongly recommended that certified high-quality equipment be selected for the above systems as they are designed to perform reliably over many years. Investing in top-tier equipment not only guarantees long-term durability, but also fosters trust with users who can have confidence in system performance and longevity. Prioritizing quality ensures optimal system efficiency and enhances end-user confidence, contributing to long-term operational success and reliability.

In some cases, optimizing energy supply can result in achieving a net-zero building, meaning the building generates as much energy as it consumes over the course of a year. This is typically accomplished through a combination of energy-efficient design, such as high-performance insulation, efficient lighting, and HVAC systems, and renewable energy solutions like photovoltaic systems. By producing clean renewable energy on site, a net-zero building reduces or even eliminates its reliance on the grid.



Several global initiatives are driving the adoption of **net-zero buildings**. The World Green Building Council (WorldGBC) advocates for a decarbonized built environment through its Advancing Net Zero program targeted at all new buildings to achieve net-zero carbon by 2030. Additionally, the UK Green Building Council (UKGBC) is working on updates to its Net Zero Carbon Buildings Framework, providing clear criteria for achieving net-zero carbon buildings.

B. Energy efficiency measures for social infrastructure buildings

Table 10 presents the main EE measures that can be implemented in sustainable infrastructure buildings and financed by PDBs.

Table 10: Main energy sustainability measures for social infrastructure buildings

1. Minimize energy usage		
System	**Measure**	**Comment / Example**
Passive design of the building	Optimize solar exposure	Align buildings to maximize solar exposure in cold climates, minimize in hot climates, and balance in temperate zones to optimize energy efficiency.
	Distribute solar energy efficiently	Use windows, walls, and floors to collect, store, and distribute solar energy effectively across the building.
	Use overhangs and shading devices	Use overhangs or shading devices to prevent overheating in summer while allowing sunlight in winter.
	Modify zoning	Divide large areas to improve heating and cooling efficiency; use separate controls for different zones based on occupancy and function.
	Facilitate natural ventilation	Strategically place windows and vents to facilitate cross-ventilation and improve indoor air quality. Use stack ventilation or wind catchers to enhance natural airflow, reducing mechanical ventilation needs.
	Use compact building forms	Compact designs reduce heat loss in winter and minimize heat gain in summer, promoting stable internal temperatures.
	Design with high thermal inertia	Design buildings with high thermal inertia to buffer temperature fluctuations. This involves using materials that can store and slowly release heat.
	Improve seals and install air curtains	Upgrade door/window seals and install air curtains at entrances to reduce energy loss and improve air quality.
	Improve envelope insulation	Install or replace windows with energy-efficient models and improve insulation in walls, roofs, and floors to reduce heating/cooling demand.
	Manage solar heat gain	Use external blinds, low-emissivity window coatings, and shading devices to manage solar heat gain across seasons.

1. Minimize energy usage		
System	**Measure**	**Comment / Example**
Materials selection	Use sustainable materials	Choose sustainable locally sourced materials to reduce environmental impacts and embodied energy.
	Use high thermal mass materials	Incorporate materials like concrete, stone, or brick for heat storage, reducing temperature fluctuations.
	Use lightweight materials	Use lightweight materials that reduce heat retention, particularly in hot climates.
	Incorporate light-colored materials	Use reflective or light-colored materials to minimize heat absorption and cooling loads.
Greenery and landscaping	Plant vegetation	Use vegetation around buildings to provide natural shading and cooling to reduce heat gain.
	Use of deciduous trees	Plant deciduous trees for seasonal shading; leaves block sunlight in summer and the absence of leaves allows sunlight through in winter.
Reduce energy consumption of key energy systems	Change of habits in operators and end-users	Optimize indoor temperatures, minimize equipment idle times, and use energy-efficient practices in HVAC operation. Promote awareness campaigns to encourage staff to turn off lights when not needed and maximize natural lighting. Educate staff on water-saving practices and efficient water management in bathrooms and kitchens.
	Apply control systems for indoor temperatures	Install smart thermostats and building management systems (BMS) for adaptive heating/cooling adjustments based on occupancy.
	Operational control of systems	For HVAC systems, adjust air renewal rates according to real-time CO_2 and humidity levels to maintain air quality while saving energy. For lighting, install motion sensors, timers, and daylight sensors in hallways, patient rooms, and common areas to minimize unnecessary lighting. For water supply, use thermostatic valves to ensure appropriate water temperatures, especially in patient areas, to improve comfort and reduce waste.
	Implement standby in equipment	Enable standby modes for non-essential equipment when not in use to reduce energy consumption.

2. Maximize the efficiency of devices that consume energy		
System	**Measure**	**Comment / Example**
HVAC	Replace/add efficient equipment	Upgrade to efficient systems like heat pumps (geothermal or air-source), condensing boilers, and variable frequency drives; add buffer tanks for optimized heat storage and distribution.
	Reduce losses in conduction or accumulation of thermal losses	Insulate ductwork and hot water storage tanks to minimize thermal losses in distribution systems.
	Energy storage	Use hot water storage tanks to balance demand and supply in centralized systems, reducing loads on primary heating equipment.
	Heat recovery	Install economizers or energy recovery ventilators in ventilation systems to recapture waste heat and improve system efficiency.
Lighting	Replacement of equipment	Upgrade to LED lighting systems in high-use areas for improved efficiency and lower maintenance requirements.
Water supply	Incorporate flow restrictors and efficient equipment	Install flow restrictors on faucets, showers, and other fixtures to reduce water usage while maintaining comfort. Additionally, consider installing low-flow toilets or dual-flush systems in bathrooms.
	Decrease losses in conduction or accumulation	Insulate hot water pipes in distribution systems to prevent heat loss, especially for long piping runs within large hospital buildings.
	Replacement or addition of equipment	Install energy-efficient water heating solutions such as condensing boilers or heat pump water heaters to lower operational costs.
Appliances	Upgrade to energy-efficient appliances	Replace old appliances with energy-efficient models, such as those with ENERGY STAR ratings, to reduce energy consumption and operational costs.
Vertical conveying systems	Use variable frequency drives and smart controls	Use variable frequency drives and smart controls in elevators and escalators to reduce energy consumption when usage is low.
	Install energy recovery systems	Install regenerative drives in elevators to capture energy generated during breaking, which can be used to power other systems.

3. Optimize energy supply		
System	**Measure**	**Comment / Example**
Renewable energy generation	Installation of photovoltaic systems	Install photovoltaic solar panels on hospital rooftops to generate electricity. This can power hospital operations, reducing reliance on the grid and lowering energy costs.
	Installation of solar thermal systems	Install solar thermal systems on hospital rooftops to generate hot water. This can provide a sustainable and cost-effective solution for hospital hot water needs, reducing reliance on traditional heating methods and lowering energy costs.
	Installation of wind energy systems	For rural or off-grid hospitals, consider micro-wind systems to supplement energy supply, especially if local wind conditions are favorable.
	Installation of geothermal systems	Employ geothermal systems for heating and cooling. Use geothermal heat pumps to provide heating and cooling for hospitals. These systems are energy efficient and can reduce dependency on conventional HVAC systems, particularly in areas with stable geothermal conditions.
Energy storage	Installation of energy storage systems	Install batteries to store excess energy generated from PV panels or wind turbines, enabling hospitals to use renewable energy even during non-generating periods.

C. Examples of energy considerations for social infrastructure buildings

The following boxes provide the key energy characteristics of three types of social infrastructure buildings to be considered in energy-efficient social infrastructure projects.

Box 4: Public schools – energy efficiency measures

Public schools serve as foundational institutions in communities, providing a safe and supportive learning environment for students of all ages. Most public schools are structured as multi-faceted buildings designed to accommodate numerous classrooms, administrative offices, and communal areas like libraries, gyms, and cafeterias. These school facilities are typically designed with multiple floors, incorporating shared walls, floors, and ceilings to maximize spatial efficiency. Each classroom operates independently within the school, allowing for focused learning environments while maintaining cohesion with the broader school structure. An example of energy usage in a school building is presented in Figure 6.

Average School Baseline Energy Usage

Source: Advanced Energy Retrofit Guide- K–12 Schools

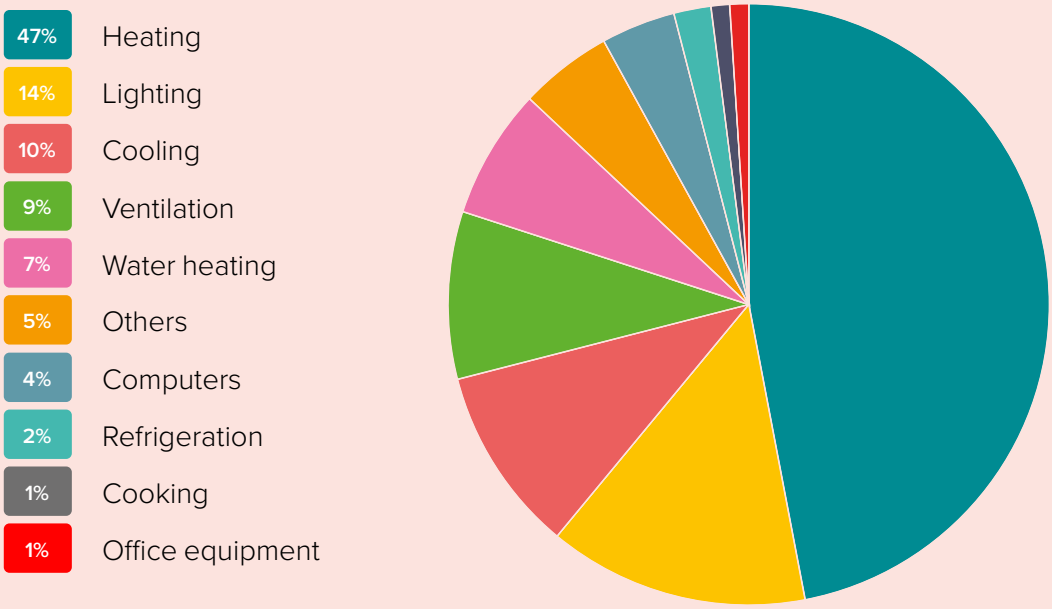


Figure 6: Example of a school building energy balance[12]

Energy use in public schools is shaped by multiple systems essential for creating comfortable and functional learning environments. One of the main drivers of energy demand is space heating, especially in colder regions.

12 www.nrel.gov/docs/fy14osti/60913.pdf

Heating requirements vary based on factors like insulation quality, type of heating system (e.g. central heating, gas boilers, or electric heaters), and local climate. In areas with cold winters, schools often rely on electricity, natural gas, or district heating to keep indoor spaces warm.

Lighting is another substantial source of energy use in schools as classrooms, hallways, gyms, and other shared spaces require bright and continuous lighting throughout the school day. In older buildings or those with limited access to natural light, demand for artificial lighting can be particularly high. Adequate lighting is critical to support both teaching and student activities, especially in schools that host evening events.

Office equipment, including computers, printers, and projectors, also adds to a school's energy profile. These devices are essential for both educational and administrative tasks, and their energy consumption is tied to the number of devices in use and the duration of use each day.

Water heating is important for schools with cafeterias, locker rooms, or science labs. The energy needed for hot water depends on the type of heating system and the specific needs of the school, including kitchen operations, shower facilities, or cleaning.

Ventilation and cooling systems play a significant role in ensuring a healthy indoor environment. In warm climates, cooling systems are key to maintaining comfort in classrooms, and cooling demand is influenced by factors like building insulation and outdoor temperatures. Ventilation systems are also critical to maintain indoor air quality and contribute to energy demand, especially in larger or high occupancy schools.

Finally, refrigeration systems, primarily in cafeterias or kitchens, operate constantly to keep food and beverages stored safely, making them a consistent source of energy use. These systems are essential for food storage, adding to the daily energy requirements of school facilities.

Key operational characteristics:

- **Scheduled occupancy and peak energy demand during school hours:** Public schools typically operate on a fixed schedule, with peak energy demand during school hours when classrooms, offices, and facilities are fully occupied. A typical public school operates for about six to eight hours per day due to lectures. This high occupancy rate requires adequate heating, cooling, and lighting to maintain a comfortable and conducive learning environment.
- **Lighting for large common areas and classrooms:** Schools often have large, multi-use spaces such as gyms, auditoriums, and cafeterias that require significant lighting. Additionally, classrooms need bright and consistent lighting to support reading and writing activities.
- **Heating and cooling needs for seasonal comfort:** Many schools are in session year-round and require both heating in winter and cooling in summer to maintain a comfortable learning environment. Demand from HVAC systems varies with seasonal and regional climate changes impacting overall energy use.
- **After-hours events and community use:** Many schools host extracurricular activities, community events, and meetings after regular hours, leading to additional energy consumption outside typical school hours.

Box 5: Social housing – energy efficiency measures

The primary goal of social housing is to ensure that everyone has access to safe, decent, and affordable living spaces. Most social housing is built as multifamily buildings, meaning multiple housing units are housed within a single structure. Such buildings take the form of apartment complexes, townhouses, or high-rise buildings wherein each unit is self-contained but shares common walls, floors, or ceilings with neighboring units. An example of multifamily building energy usage is presented in Figure 7.

Average Multifamily Building Energy Usage

Source: US Department of Energy

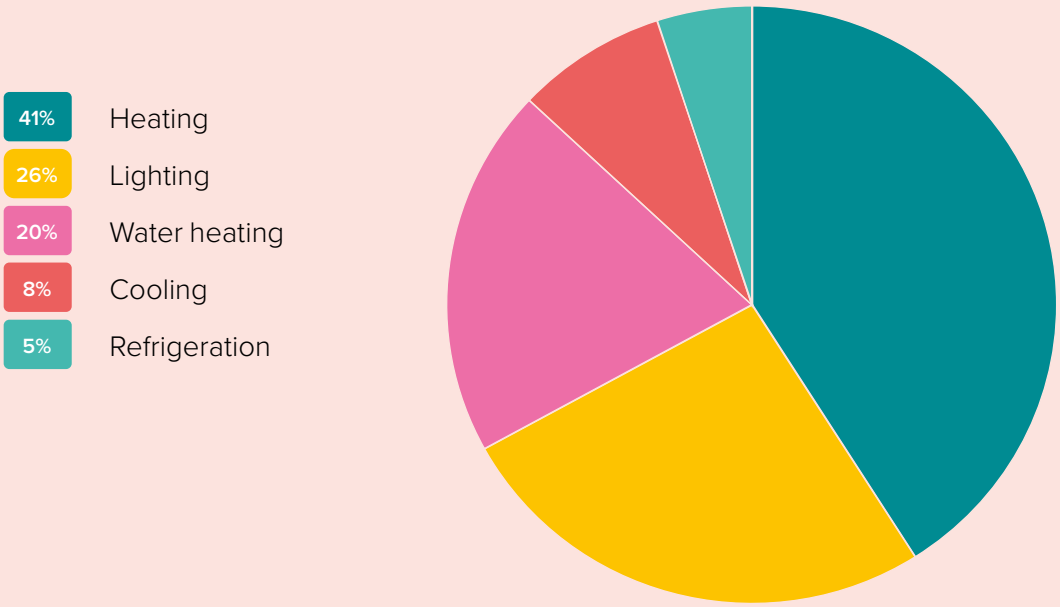


Figure 7: Example of a multifamily building energy balance[13]

Energy consumption in social housing is primarily influenced by several systems that contribute to overall energy demand. The most significant of these is space heating, particularly in colder climates. The energy required for space heating depends on various factors such as building insulation, the type of heating system (e.g. gas boilers, electric heaters, or heat pumps), and external climate conditions. In regions with harsh winters, space heating typically relies on electricity, natural gas, or district heating.

Lighting and appliances also represent a considerable portion of energy consumption in residential multifamily buildings. Lighting in both private units and common areas is essential for daily living, and in older or inadequately illuminated buildings, the energy required for lighting can be especially high. Common areas like hallways, staircases, and entryways often require continuous lighting, which increases overall demand. Appliances such as televisions, ovens, washing machines, and dryers contribute significantly to energy use.

13 www.esource.bizenergyadvisor.com/article/multifamily-residences

The efficiency of these appliances and household usage patterns has a strong impact on total energy consumption.

Water heating is another major factor as domestic hot water (DHW) systems account for a large portion of energy use in social housing. These systems may be powered by electricity, natural gas, or renewable energy sources like solar thermal. Energy consumption for water heating depends on the number of occupants and their usage habits, with larger households requiring more hot water, which increases energy demand.

Space cooling is an important consideration in warmer climates. In these regions, air-conditioning systems contribute substantially to overall energy use. Energy demand for cooling depends on factors like the type of cooling system, whether centralized or individual units, and external temperatures. Building thermal properties, such as insulation and shading, also play a role in the efficiency of space cooling systems.

Finally, refrigeration is a consistent contributor to energy use in social housing as refrigerators and freezers run twenty hours per day, seven days per week. These essential household appliances consume significant amounts of energy, particularly in larger households or buildings with high occupancy.

Key operational characteristics:

- **Quality construction strongly influences energy consumption:** The energy consumption of social housing buildings is heavily influenced by the quality of construction. Factors like wall insulation, window quality, and air-tightness impact how well buildings retain heat in winter or stay cool in summer. Well-insulated buildings with high-performance windows reduce the need for constant heating and cooling, helping to reduce energy costs and improve overall energy efficiency.
- **Energy-intensive shared services:** Many social housing buildings feature shared services like communal lighting, elevators, and laundry rooms. These areas can be energy intensive, especially in larger buildings. Energy-efficient designs and the use of smart systems (e.g. occupancy sensors or motion detectors) minimizes energy use in these common areas, reducing costs for both residents and housing providers.
- **Appliance and equipment energy use:** Social housing units typically include appliances like refrigerators, stoves, washing machines, and dryers that contribute significantly to energy consumption. Promoting the use of energy-efficient appliances and providing residents with incentives or access to low-energy models help reduce overall building energy demand.
- **Water heating and conservation:** DHW systems are major energy consumers in social housing, particularly in units with larger families. Installing energy-efficient water heaters (such as solar thermal or heat pump water heaters) and encouraging water conservation through low-flow fixtures reduces energy use significantly. In addition, reducing hot water usage through behavioral changes further enhances efficiency.
- **Occupant behavior and awareness:** Residents' behaviors have a direct impact on energy consumption. Raising awareness about energy-saving habits, such as turning off lights, using appliances efficiently, and adjusting thermostats appropriately, contributes to lowering overall energy demand. Providing residents with tools or incentives to track and reduce their energy use helps encourage more sustainable living.

Box 6: Public hospitals – energy efficiency measures

Public hospitals consume significant amounts of energy due to their complex infrastructure and the continuous operations required to provide essential healthcare services. An example of a baseline for a hospital is presented in Figure 8.

Average Hospital Baseline Energy Usage

Source: The Targeting 100! program

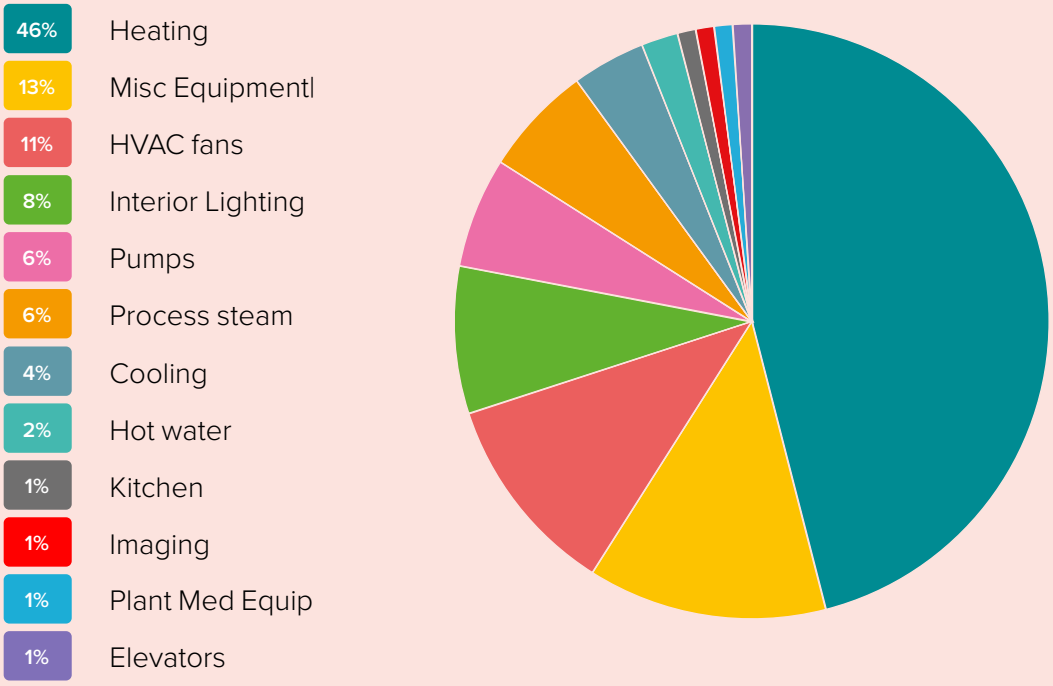


Figure 8: Example of a hospital energy balance[14]

HVAC systems are among the primary energy consumers in hospitals. HVAC systems are crucial for maintaining comfortable and safe environments for patients and staff, yet many hospitals face challenges with outdated equipment, which lead to inefficiencies.

Miscellaneous equipment, especially medical devices like MRI machines, CT scanners, and laboratory equipment, also plays a critical role in energy consumption. These devices require substantial power not only for operation, but also for cooling systems that prevent overheating.

14 www.aceee.org/files/proceedings/2014/data/papers/4-423.pdf

Interior lighting is another major contributor to energy consumption. Effective lighting is vital for patient care and staff productivity, encompassing ambient lighting for general areas, task lighting for specific medical tasks, and emergency lighting systems. Modernizing these lighting systems improves visibility and reduces energy consumption.

Pump, process steam, and hot water systems are crucial to hospital operations, supporting essential functions such as sterilization, water distribution, and patient care. These systems require a continuous and reliable energy supply representing a substantial portion of total energy consumption.

Key operational characteristics:

- **24/7 operation:** Hospitals operate continuously and thus require constant support for HVAC, lighting, and essential services. This constant energy demand makes EE critical, and even small improvements in equipment efficiency or operation can lead to substantial savings over time without compromising patient care or comfort.
- **Critical HVAC and environmental control needs:** Hospitals have strict requirements for air quality, humidity, and temperature, especially in areas like operating rooms and intensive care units. These systems often run at high capacities and require advanced filtration and humidification.
- **Intensive lighting requirements:** Hospitals require high levels of lighting in patient care areas, such as inpatient rooms and nursing stations, to ensure safe examinations, medication administration, and patient monitoring. Emergency rooms also depend on bright, reliable lighting to support rapid responses, accurate assessments, and effective procedures in critical situations.
- **Energy-intensive medical equipment:** Specialized medical equipment, such as MRI machines, X-ray machines, sterilizers, and life-support systems, require significant amounts of energy. These systems are often operated continuously.
- **Varied temperature requirements:** Different areas, such as operating rooms, intensive care units, and patient rooms, require precise temperature and humidity controls. The energy needed to maintain the required conditions constitutes a significant portion of overall consumption.

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WHO WE ARE

Finance in Common is the global network of all Public Development Banks (PDBs), which aims to align financial flows on the 2030 Agenda and Paris Agreement for Climate Change.

Our objective is to strengthen partnerships among PDBs to accelerate the convergence towards shared standards and best practices, to support banks' commitments to shift their strategies towards sustainability, and to give PDBs more visibility in the global fora discussing international policy issues. By mobilizing PDBs and crucial stakeholders, from private sector to civil society organizations, we aim to encourage more coherent approaches to make the whole development finance system consistent with our common climate and sustainability objectives.

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