Facilitating, Enabling, and Triggering Sectoral Transitions: Türkiye

Case Study 15. Energy Efficiency in Türkiye's Public Buildings

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Context

The building sector consumes about 30 percent of global final energy consumption and is responsible for about 27 percent of CO_2 emissions (IEA 2022a). Almost all the growth in energy demand in buildings will come from the developing world. As these countries develop, construction and energy demand from buildings will continue to rise. The rising middle classes demand larger housing units, more energy-using appliances, and, in tropical countries, air conditioning. This all requires more energy infrastructure and, is not sustainable. Within the building sector, there are publicly owned and operated buildings and private commercial and residential buildings. Among the former, government facilities—which can include central and municipal administrative buildings, universities and schools, hospitals and clinics, orphanages, museums, and other publicly owned facilities—are, collectively, the largest energy users in most countries. Available data suggest that the public sector typically accounts for 2 to 5 percent of a country's total energy consumption, although this figure is much higher (up to 30 percent) in countries with large heating loads (such as China, the EU, and the Europe and Central Asia region) or low energy access (as in many Sub-Saharan African countries).

The public sector represents a strategically important market segment for energy efficiency (EE). Public buildings, which are collectively large and visible consumers, can set examples for EE improvements in other sectors and demonstrate good energy management practices and high-performance technologies. The inclusion of energy-efficient criteria for products purchased for public offices, for example, can stimulate manufacturers to seek the necessary certifications for their products to compete in public tenders. The public sector can also use its purchasing power to stimulate EE markets; by purchasing in large volumes, it can bring down costs for all energy users. Businesses and institutions can also develop practices that promote public sector EE—such as standard contracts, tools, and protocols—while public campaigns can showcase the benefits of, and build confidence in, EE among citizens. Reducing government energy costs can open up fiscal space to invest in other socioeconomic priorities, such as improving the quality of and access to basic services, such as health care, education, and infrastructure.

Finally, public sector EE makes for a more resilient energy supply and lowers local and global emissions.

Barriers

Unfortunately, despite high potential and often attractive payback periods, the public sector, particularly in LMICs, often lags the rest of the economy on efficient energy use due to several barriers. Although the market barriers to EE in general are relevant here—low energy prices, high up-front and transaction costs, and limited access to data and information—other barriers are specific to the public sector. These include the following:

- Restrictive government policies and procedures, from budgeting to public procurement
- Limited financial resources for capital upgrades
- A lack of incentives, since government agencies are often unable to retain cost savings at all, or from one budget year to the next
- Behavioral inertia, as public employees have incentives to do things the same way and avoid taking risks.

Government Response

Governments have developed a range of policies, institutional setups, programs, and approaches to help overcome these barriers. Although they tend to rely on regulations, incentives, or market-based mechanisms, there are some universally applicable approaches. It is important to tailor solutions to each country's (or local government's) context and circumstances. Differences might stem from policy and regulatory frameworks, institutional setups, available resources, income levels, cultural norms, or other factors. A summary of tested approaches can be found in table 3.3.

In terms of legal frameworks, policies, and regulations, most countries have enacted overarching energy efficiency legislation, including building codes for new buildings and energy performance certificates for existing buildings, which are critically important to set performance standards and norms. Many countries also mandate annual reporting on energy use for larger facilities, periodic energy audits (typically every three to five years) to identify EE measures, appointment of energy managers, and other requirements.

Building codes and renovation programs also require strong institutional support structures to set standards, enforce regulations, share information, and train the market. Many governments have so-called nodal agencies, such as EE agencies or departments, to provide an overall framework for government programs, advise on policies and norms, provide technical information and training, develop tools such as EE calculators and model tender documents, implement awareness campaigns, and other actions to help public agencies reduce their energy use.

TABLE 3.3 Improving Public Sector Energy Efficiency: Dismantling Barriers

Barrier	Indicative action
Lack of information/awareness, including opportunities, costs, benefits, and risks	Initiate awareness campaigns and demonstrations; publish and disseminate information such as case studies, procurement guidelines, product catalogues, and specifications
Lack of technical capacity for audits, project design, procurement, implementation, monitoring; trust in EE potential	Create nodal agency to provide technical assistance for EE projects; appoint energy managers; develop training programs for facility operators and energy managers; encourage the formation and prequalification of ESCOs; develop EE analytical tools, audit and procurement guidelines, and measurement and verification protocols
Limited incentives to implement EE (potential loss of budget), try new approaches, and take risks	Revise budgeting to allow retention of energy savings; issue awards for agencies/staff; include EE in management performance reviews; develop risk sharing/financing programs; set EE targets
Lack of agency accountability for energy savings	Create public sector/agency targets with monitoring; set penalties for nonperformance; establish program to label energy performance of buildings, benchmark energy performance, and publish results
Restrictive procurement, contracting, and financing rules	Revise public policies on purchase of EE products (for example, to mandate the purchase of products with energy efficient labels or to make purchasing decisions based on life-cycle costing) and services; develop local ESCO models; create public EE funds
Lack of funding for up-front energy audits and project funding	Earmark public EE budgets; create dedicated grant/subsidy programs, public revolving funds; levy a demand-side management surcharge or "electricity surcharge" to mobilize funds for free energy audits
Small size and high transaction costs	Bundle public EE projects; generate model documents/templates to streamline projects; develop ESCO umbrella contracts; practice bulk procurement of EE products through cooperative purchasing agreements

Source: Singh 2018.

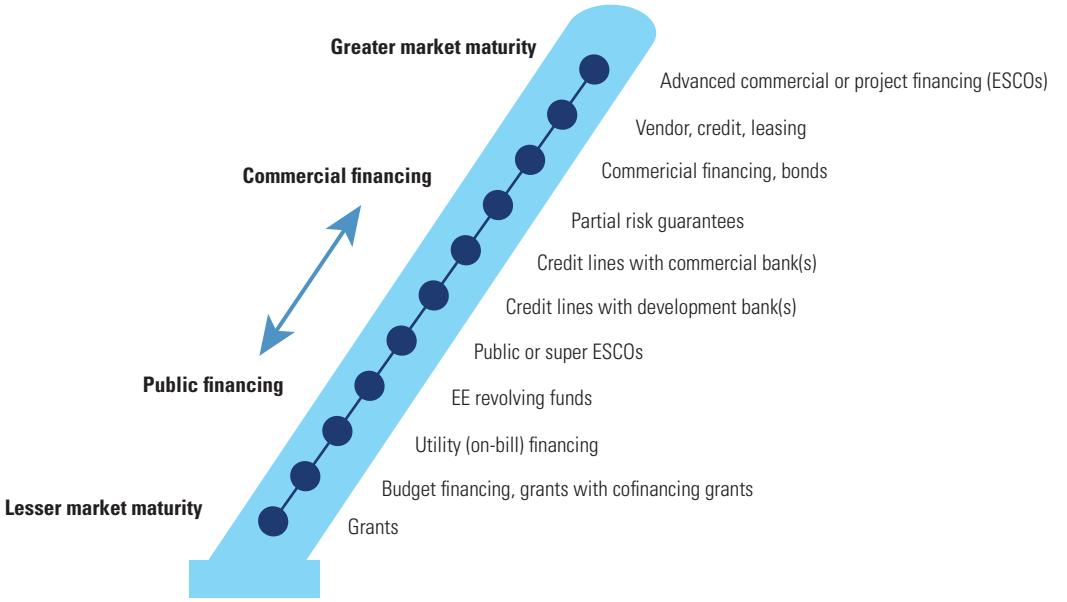
Note: EE = energy efficiency; ESCO = energy service company.

Financing

Financing is one of the most difficult challenges for public building EE. The financing ladder (figure 3.13) identifies options that policy makers can adapt to provide products suited to their country's needs. Over time, as local markets evolve, countries can move up the ladder to more commercial financing mechanisms. Once a country selects a mechanism, its design should include elements to facilitate transition to schemes that are higher up the ladder. Selecting and designing appropriate, locally relevant mechanisms depends on several factors, including the following:

- Legislative and regulatory conditions
- Maturity of financial and public credit markets
- State of local EE service markets, including energy service companies (ESCOs) and energy auditors
- Technical and financial capabilities of public entities for EE
- Local market and context

FIGURE 3.13 Financing Energy Efficiency in Public Buildings: A Ladder of Options



Source: World Bank 2014b.
Note: EE = energy efficiency; ESCOs = energy service companies.

The Türkiye Energy Efficiency in Public Buildings Project

A 2016 study estimated that there are over 175,000 public buildings (including central, regional, and municipal facilities) in Türkiye, with an annual technical EE potential of over 10,000 GWh, requiring about $18 billion in investments (Econoler International 2016). The government recognized that a strong public building renovation program could help develop and spur the market for the estimated 10 million public and private buildings across the country. In 2019, the World Bank, together with the Ministry of Energy and Natural Resources and Ministry of Environment and Urbanization (now the Ministry of Environment, Urbanization and Climate Change) developed an Energy Efficiency in Public Buildings Project designed to renovate 400 to 500 central government buildings and develop the market for a broader national public building renovation program. The project includes a $150 million International Bank for Reconstruction and Development (IBRD) loan, a $46.2 million concessional loan from the Clean Technology Fund (CTF), and a $3.8 million CTF grant (World Bank 2019a).

While the project includes many conventional aspects for public building renovation programs—such as selection of buildings with high energy savings potential, energy audits, technical designs, renovation works, and measurement and verification—it also has the following innovative features:

- *Deep renovations:* While the project has used the IBRD loan to support conventional renovations—that is, those that save a minimum of 20 percent energy and have simple payback periods of less than 12 years—the CTF loan has allowed support for deeper renovations that save at least 30 percent energy with longer payback periods, encouraging larger investments with thicker insulation, triple-pane windows, and newer technologies such as air-source heat pumps.
- *Energy service companies:* For a subset of eligible buildings, renovations can be done under energy performance contracts. Unlike traditional audit-design/works contracts, these involve an initial audit followed by a design-build contract, with some payments tied to verified energy savings. To defray the higher risks and uncertainties associated with ESCO contracts, the initial $10 million worth of ESCO contracts are financed by the CTF loan, subsequently replicated with $20 million in ESCO contracts financed and scaled up using the IBRD loan.
- *Near-zero energy buildings (NZEBs):* The project also uses the CTF loan to renovate 5 to 10 buildings with high demonstration value to showcase the concept of NZEB integrated design and renovation techniques, such as cool/green roofs, ventilated facades, daylighting/shading, water recycling/harvesting, advanced controls, and newer technologies, such as building-integrated solar photovoltaic (PV) and geothermal heat pumps. These renovations will also inform the introduction of a national NZEB standard and models for the broader buildings market.

To date, the project has completed renovations of 30 buildings, with average energy savings of 30 percent, with a range from 22 to 80 percent. It also successfully completed Türkiye's first publicly tendered ESCO contract—the Bursa Anatolian Girls' High School—with about 80 percent savings and 23 percent electricity generation from rooftop solar, making it essentially a net-negative energy building, as annual electricity consumption is being fully offset by rooftop solar PV generation, with some excess PV power being sold to the grid. Another 120 buildings started renovations in 2023, including additional ESCO contracts and NZEB pilots.

The project also includes critical technical assistance to capture experiences and lessons from the project to provide training for energy auditors, design companies, and construction firms, to learn from early experiences, share good practices, and build market capabilities. It will share case studies, model audit terms of references and reports, bidding documents, measurement and verification protocols, and so on with market actors to allow replication in the private building market.

Key Takeaways

Although the project is ongoing, the following important lessons have emerged:

- *Developing a clear and transparent screening methodology* is crucial to identify and prioritize eligible buildings that offer the greatest potential for energy savings.
- *Careful review and supervision of early subprojects—for example, energy audits, technical designs, and construction*—are important to ensure sound methodologies, consistent technical quality, and adherence to approved technical designs and material and equipment specifications.
- *Developing digestible case studies and targeting outreach* helps build project credibility and increases demand to join the project in later years.
- *Deeper renovations are possible under World Bank-financed building renovation programs.* Although they have longer payback periods, they can save substantially more energy (often 50 to 70 percent savings) compared with conventional renovations.
- *Developing alternative financing and business models is necessary to ensure sustainability, scale, and leverage.* Developing a renovation program as a way to inform a broader national program with sustainable financing mechanisms and different business models (that is, ESCOs) helps ensure sustainability beyond the project period.
- *Energy efficiency combined with rooftop solar systems allow buildings to reach net zero energy and emissions.* Demonstrating and then mainstreaming deep renovations alongside on-site RE generation can help make buildings carbon neutral while bringing their energy bills close to zero.

Looking to the Future

Despite these successes, the work is far from over. The project also provides funding to develop a national program for EE in public buildings, including schemes to introduce revolving financing to capture the energy cost savings from renovated buildings and use this to renovate additional buildings. This will be vital to demonstrate that building renovations can pay for themselves, allow for scale-up, and help bring commercial financing into the building renovations market. A national-scale program will also introduce greater consistency and predictability to the market, allowing new service providers and building materials and equipment suppliers to enter the market, which will ultimately drive down costs for everyone.