



Building Energy Efficiency and the Importance of National and Local Coordination

Prepared by the Pacific Northwest National Laboratory in collaboration with the World Resources Institute and the International Partnership for Energy Efficiency Cooperation for the Building Efficiency Accelerator.

Buildings account for one-third of total global energy use, and that share is growing as incomes rise and populations urbanize. As the global footprint of buildings expands, we have a choice to lock in energy efficiency and low emissions.

This is particularly important because of rapid growth in the amount of floorspace and services like lighting, air conditioning and computers. For example, one recent study by the Pacific Northwest National Laboratory (PNNL) found that floorspace in India would quadruple by 2050; most other parts of the world are also expected to see significant growth in building stock. Locking in energy efficiency now would save owners and occupants significant money in the future in addition to ensuring a smaller carbon footprint for new buildings and appliances.

Building energy codes, appliance standards and policies to promote retrofits all help cities and countries ensure their buildings are efficient for the duration of their lives. In fact, many countries are aiming to require net-zero energy buildings in their codes by 2040 or earlier. Today, buildings that meet energy codes in the U.S. and China, for example, are designed to consume less than half the energy of those built in 1980. Appliance standards and retrofit policies are also significantly expanding the level of savings.

OVERVIEW

Essential elements for building energy efficiency initiatives:

1. Proactive coordination
2. Adoption of well-structured robust policies
3. Strong implementation

Case studies demonstrating these essential elements:

1. National-Local Coordination: Bogotá, Colombia
2. How China Accelerated Building Efficiency
3. Building Local Capacity: Rajkot, India

For any selected building energy efficiency action, it is important not to overlook the need for coordination between the national and local governments. As national governments set high-level targets and craft building energy efficiency policies, they also need to work with cities to ensure implementation is both feasible and effective.

The City-Scale Building Efficiency Action roundtable at the eighth Clean Energy Ministerial will focus on how national governments can help engage cities and businesses to work together to increase the efficiency of buildings. It brings together key stakeholders to discuss opportunities to scale up key initiatives that can accelerate city-scale building energy efficiency through city and private sector engagement, including the Sustainable Energy for All Building Efficiency Accelerator and the Energy Efficiency in Buildings Amplify initiative.

How do building-related emissions link to global energy and climate goals?

Because of the buildings sector's large share of global energy use, building energy efficiency plays a key role in global climate and energy goals, such as the Sustainable Energy for All Initiative (SEforALL) and countries' **Nationally Determined Contributions (NDCs)** to the Paris Agreement on climate. Fifty three countries mention building energy efficiency in their NDCs, and 38 specifically call out building energy codes. This includes large countries such as China, India, Japan and the U.S. as well as small and medium-sized countries like Afghanistan, Grenada, Ivory Coast and Saudi Arabia. If we look at the top 10 building energy consumers globally, all but Russia and Indonesia include building energy efficiency in their NDCs or climate action strategies. As a result, the countries that reference building energy efficiency in their NDCs represent 63 percent of global building energy consumption.

Countries mention several strategies in their NDCs for leveraging their building energy efficiency potential including building energy codes for new and existing stock, appliance standards, energy efficiency resource standards, rating systems, renovation targets and energy consumption goals. China, for example, mentions new and existing buildings in both urban and rural settings, as well as specific targets for green buildings. India mentions its building energy code and enhanced implementation.

NDCs tend to be high-level targets instead of detailed implementation plans, but as countries flesh out their NDC implementation strategies, a growing number of them are likely to describe how they are using building energy efficiency to meet energy and climate goals. For example, European Union members submitted a combined NDC with broad, economy-wide emission reduction targets, but individual EU members have begun issuing more detailed plans that include building energy efficiency. Australia, Canada and several other countries have taken a similar approach. Although most countries do not mention existing policies in their NDCs, most of the high-income countries have building energy codes in place, as do several of the middle-income countries (e.g., China, South Africa and India). Low-income nations generally do not, though there are serious efforts underway in several low-income countries to launch building energy codes, such as the World Bank's work with countries in West Africa. Today, building energy codes cover new buildings and, in some cases, major renovations. Some countries like China and the U.S. have voluntary standards for retrofits, but they are typically only used when the projects are subsidized.

As countries consider their options to tap building energy efficiency in meeting energy and climate goals, differences in construction rates may play a role in policy. For example, construction is booming in Asia, where buildings tend to have relatively short lifespans (30-40 years). In Europe, buildings tend to last much longer (100 years or more), while North America falls somewhere in between. These differences mean that codes for new buildings are particularly critical in Asia, while retrofit policies tend to dominate in Europe. In the long run, achieving maximum savings means that all economies need to focus both on their new construction and retrofit opportunities.

Achieving the targets: what we have learned from past policy and three essential elements

Several countries have demonstrated renewed focus on building energy efficiency policies since the Paris Agreement negotiations. Still, we know from recent experience that three common elements are essential for achieving climate targets through building energy efficiency initiatives: proactive coordination, adoption of well-structured robust policies and strong implementation.

Essential Element #1: The role of coordination

Coordination is essential for strong NDC implementation. In most countries, the environment ministry develops the NDC and related implementation plans, while other ministries and local governments typically have a much larger role in oversight of construction and policy implementation. Environment ministries can better assess the potential scale of savings when working in concert with these other government actors.

Likewise, energy and climate goals related to building energy use become more attainable when local governments have support from their national governments in terms of financial resources and tools. NDC implementation plans can serve as a conduit to help match climate financing with local needs, and communication is critical to help national governments understand the needs at the local level. Similarly, coordination with the private sector can help in aligning private financing and expertise with public goals. Seeking feedback from private stakeholders can also strengthen policy design and acceptance of new policies.

For example, large-scale building retrofits typically require combining private financing and know-how with public sector policies. In government buildings such as schools, hospitals and government offices, policy changes are essential to be able to attract private investment. Performance contracting is a good example of an approach to upgrading buildings that helps bring in investment and technical expertise and can create greater energy savings than would be possible for building owners depending on a building's own engineers, facility managers and budget.

But many cities and governments have found they are not able to explore the option of larger investments without external technical expertise and scope. For many governments, changes that would improve efficiency may require modifying budget rules to allow multi-year contracts. In addition, government departments need to be able to keep their budgets for the buildings constant in order to repay investments, even if their energy bill is dropping. Likewise, procurement rules may need modification to make it easier to sign contracts that specify a certain level of energy savings—performance-based contracts—rather than a specific technology purchase. Often, contracts with multiple technologies installed at the same time require that the cost-benefit analysis cover several years to account for the significantly lower costs after the equipment is paid off, rather than a focus on just the upfront cost of the technology. Seeking input from the private sector can help in designing rules that will attract large-scale investment.

Performance contracting is not yet widespread but, where it is strong, innovations in government procurement have helped drive significant investments. High and middle-income countries like China and the U.S. have the most experience with performance contracting and other retrofit mechanisms. Thus far, low-income countries have much less experience with energy performance contracting, and may need additional international assistance to guarantee risks and adapt business models.

National-Local Coordination: Bogotá, Colombia

Colombia adopted a building energy and water code in 2015. Bogotá will serve as a leader in implementing this code, providing a model for broad implementation across Colombia to transform new construction nationwide. However, the city had an initial challenge to overcome. The code was written based on sustainability goals and principles, but with few concrete details on what would constitute compliance and the institutional framework to enforce the code. They now have a code already in force, but no agency capable to say whether a building is code compliant. As compliance is typically handled at the local level, better coordination with the cities might have prevented this issue. Bogotá is now working to develop a technical solution in collaboration with the Building Efficiency Accelerator (BEA) and PNNL. Under the BEA, the city coordinators first worked with local stakeholders to gain buy-in for this solution, and now they are working to ensure that this solution would be acceptable at the national level. (In Colombia, only the national government has jurisdiction to adopt a building code.) Close coordination between different levels of government and with the private sector will be important to moving the code implementation forward.

Stakeholder coordination is also essential for the success of building energy codes. This is particularly true in developing a new version of a code, ensuring that local stakeholders have a chance to share feedback to make the code both strong and implementable. Local stakeholders can benefit from resources and tools developed by the national government; coordination can ensure that the tools are designed to best meet current gaps and that local governments and stakeholders are aware of them.

Several countries have taken steps to create ongoing mechanisms for coordination. France, for example, merged several ministries into its **Ministry of Environment, Energy and Sea** to improve coordination on sustainable development issues, including climate, environment and construction. In India, the **National Institution for Transforming India** (NITI Aayog, formerly Planning Commission) is working to create advisory boards for dialogue across government and with the state and local governments on key issues related to sustainability, including building energy codes.

Essential Element #2: Adopting new policies

While coordination can smooth the path for new policies and their implementation, adoption of new policies still needs concerted effort. Countries can run into policy adoption challenges for several reasons. The first is jurisdiction, given the complex nature of land use and building policy. For example, in countries like the U.S. and India, only local or regional governments have the right to adopt a building code, which can mean it takes time to build support across an entire country.

The second is market acceptance, which poses concerns about higher construction or manufacturing costs. Generally, studies have found that increased construction costs from building energy codes are small (from 0 to 7 percent) and savings can be substantial, but it can take time to demonstrate this based on analysis and examples. Costs tend to be higher when countries first adopt building energy codes, but they quickly decline due to their scale. The same can be true for appliance standards, which may cause an initial increase on the sales price, even while consistently saving consumers money over the lifetime of the product.

In the case of retrofit policies, an additional barrier to policy adoption is the private cost of project preparation and the public cost of incentives. Most jurisdictions with strong retrofit policies provide incentive funding to encourage participation. Additionally, energy audits and baseline data on past energy use, the first steps for retrofits, can be expensive to prepare. Some countries have tried to pay for simple audits to overcome this barrier. This seems to work better for small projects than for large, complex ones. In more complex projects with multi-year paybacks, energy service companies are averse to using simple, third-party audits to structure investments.

How China Accelerated Building Efficiency

China has made building energy efficiency a central focus of its energy policy and planning in recent years. Green buildings feature prominently in China's NDC, and their most recent Five Year Plans lay out specific national targets that will help connect it with implementation.

Today, China has the largest energy performance contracting market in the world, fueled by both private sector financing and government incentives. High-level targets for each province and many cities have fostered coordination mechanisms to be built up over time. China is also investing to retrofit apartment buildings and rural homes, particularly in colder northern regions.

The country has a multi-decade history of improvements to its building energy codes and, importantly, China has two significant mechanisms for progress in code implementation. One is a detailed Acceptance Code, or set of rules for documenting compliance, which is set at the national level and implemented at the local level. Second is the use of certified third parties to help with the compliance checking process. As a result, China was able to go from relatively low compliance rates to a robust compliance framework in a matter of a few short years.

China also has national minimum energy performance standards for appliances, and incentive programs to encourage consumers to purchase high efficiency products.

The Chinese government is also seeking to develop a roadmap to get to net-zero energy buildings.

Essential Element #3: Robust Implementation

Countries must also work systematically at implementation to achieve high levels of compliance and energy savings. Regarding building energy codes, countries such as China, France and the U.S. have all found that they can achieve energy savings by consistently reviewing building plans and conducting checks on buildings during construction. These steps are similar to those undertaken to ensure that buildings are safe and structurally sound. **Recent building energy code compliance research** in the U.S. residential sector indicates buildings in the states surveyed, on average, are built to consume no more energy than one would expect based on the code. Some buildings or measures are built above code, and there are still opportunities to save more through specific measures where compliance lags. This analysis indicates that consistent enforcement works to achieve large-scale savings. The same pattern appears in China, which adopted a detailed set of rules for inspecting buildings and documenting compliance in 2007, then saw compliance grow significantly in the following years.

Some countries only conduct energy efficiency reviews of new construction plans, but interviews with national experts indicate that compliance gaps exist when buildings are not inspected. At the same time, an important challenge with implementation is that many local governments are short-staffed and have limited time to review new buildings for energy performance, given other priorities. Many jurisdictions have begun using certified, private third parties to help expand capacity for building energy code checks.

Most countries have found that providing training and tools improves compliance. City officials and building owners who understand the benefits and details of a building energy code are more likely to take the steps needed to implement it. International support can also potentially help cities with planning, capacity building and building up staffing for implementation.

Appliance standards and labeling on the surface appear easier to implement, as there are many fewer appliance producers than there are builders. Still, implementation requires robust testing capacity and consistent testing rules that reflect real-world conditions, as well as compliance checks to ensure that noncompliant products are not being sold. To achieve energy savings, appliance labeling also relies on consumers

Building Local Capacity: Rajkot, India

The Government of India developed the Energy Conservation Building Code (ECBC) in 2007, setting the minimum energy performance standard for large commercial buildings. Although ECBC was developed at the national level, it needs to be adopted at the state and local level in order to be effective. Rajkot is in the process of adopting ECBC. With the help of the Building Efficiency Accelerator and PNNL, Rajkot is developing a technical guidebook on codes and standards for building efficiency and is planning to amend the General Development Control Regulation to incorporate ECBC into the permitting process for construction projects.

The appropriate design of incentive mechanisms is considered a key method to mainstream ECBC implementation. Some examples of incentives include increasing the allowed floor area ratio, reducing approval time for developers of code-compliant buildings, and recognizing builders and developers with awards to create leaders in the field.

To prepare for code adoption and implementation, Rajkot realized that lack of awareness and capacity among stakeholders is one of the major challenges. Therefore, the city is putting strong emphasis on training and capacity building, particularly regarding how to use existing educational resources to scale up the implementation of building energy policies. It plans to build a SMART Energy Lab, which is a local initiative to link policy makers, private sector, educational institutions and citizens to promote energy efficiency in Rajkot, and to train third-party inspectors to assist local code officials in plan review, building inspection and energy audit. Although there are abundant resources available at the national and international level, tailoring these resources to the city's needs and circumstances is critical to capacity building activities in Rajkot. Close coordination between national and local governments in resource development and information sharing can help facilitate capacity building and code implementation at the local level.

to change their purchasing decisions when they have better information. While it may be easier to achieve consensus between the public and private sectors about requiring labels than minimum energy performance in appliances, appliance labels tend to be most effective where energy prices are high. A wide range of countries across different income levels have mandatory appliance standards or labels.

How can the international community help?

Countries have begun tackling these questions of adoption, implementation and coordination in the context of their energy and climate goals. As countries move forward with developing their sustainable development strategies, the international community can provide advice and analysis in several areas to help countries strengthen their plans.

Clear examples of effective outreach can be helpful, with options to reflect how needs and design can differ depending on the nation's policy approach and level of domestic experience with energy efficiency. Communication and outreach involves effort, so understanding what is most effective in specific situations can help, as can templates or case studies. Countries that are adopting new policies for the first time also need guidance on answering several questions, including:

- What are the first steps they should undertake?
- What are the policy and programmatic options, and the relative benefits and challenges of each?
- What kind of analysis can help develop policies that are cost-effective and most likely to gain traction with stakeholders?
- What resources and tools exist from other countries that might be helpful in quickly scaling up?

Having clear, concise answers to these questions in the form of a toolkit for major policy options could be very helpful. International NGO **CLASP** has developed many such materials for appliance standards and labels, but building energy codes and retrofits do not yet have the same type of consolidated guidance drawing on global experience with sufficient detail for countries to develop plans. This same type of guidance can be helpful for countries regarding implementation of building energy codes, retrofits and other building sector policies. The PNNL is developing an initial toolkit on codes to assess the potential for such a resource to meet city needs and to identify gaps where more information is needed.

The buildings sector accounts for a large share of global energy use and emissions. Most countries have tremendous opportunities to save money and improve productivity through energy efficiency investments in buildings at today's costs. Because the construction and buildings sectors are made up of so many actors at different levels, greater coordination and policy direction can help in unlocking these savings. Members of the Clean Energy Ministerial are in an opportune position to facilitate stronger coordination, particularly between national and subnational governments and between the government and private sector, and to build capacity for large-scale change.

This report is excerpted and adapted from "Building Energy Efficiency and the Nationally Determined Contributions" by Meredydd Evans at the Pacific Northwest National Laboratory, which was part of the NDC Partnership series.

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