EXPERT PERSPECTIVE FOR THE NDC PARTNERSHIP

Building Energy Efficiency and the Nationally Determined Contributions

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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 the amount of floorspace and services like lighting, air conditioning, and computers are growing rapidly. 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 at the same time that it locks in 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. Already today, buildings that meet energy codes in the United States 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.

This expert perspective is part of a series that invites internationally recognized experts to explore key issues countries face as they implement their Nationally Determined Contributions (NDCs) under the Paris Agreement on climate change. The views expressed are the authors' own, and do not necessarily represent the views of the NDC Partnership Support Unit, its member countries or organizations. Read the series at **www.ndcpartnership.org/perspectives**

NDC PARTNERSHIP
ACCELERATING CLIMATE AND DEVELOPMENT ACTION

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WHAT DO THE NDCS SAY ABOUT BUILDING ENERGY EFFICIENCY?

53 countries mention building energy efficiency in their Nationally Determined Contributions (NDCs), and 38 specifically call out building energy codes, indicating the importance of building energy efficiency to our climate future. 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 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.

Among these countries with building energy efficiency commitments, few NDCs mention existing policies in general, though this is partly a reflection on the high-level nature of NDC commitments. When we look at the policies on the ground, most of the high-income countries have building energy codes in place (the U.S. and Japan mention their codes in their NDCs); several of the middle-income ones also do (e.g. China, South Africa, and India). Low-income nations generally speaking 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 climate goals, differences in construction rates may play a role in policy. For example, construction is booming in Asia, and buildings there tend to have relatively short lifespans (30-40 years). In Europe, buildings tend to last much longer (100 years or more), while North America is in between. These differences mean that codes 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 usually 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, 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. Likewise, 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 possible for building owners on their own, 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 contractsrather than a specific technology purchase. Often, contracts with multiple technologies installed at the same time require that the cost-benefit analysis cover a multi-year period, rather than a focus on just the upfront cost of the technology, which will result in significantly lowered cost after the equipment is paid off. 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.

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, or former Planning Commission) is working to create advisory boards for dialog 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 and implementation still need concerted effort. Regarding adoption, countries can run into 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 adoption, which can also be difficult because of 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 demonstrating this based on analysis and examples can take time. Costs tend to be higher when countries first adopt building energy codes, but they quickly decline after because of scale. The same can be true for appliance standards, where standards may have an impact on the sales price even if they save the consumer significant amounts of money over the lifetime of the product. In the case of retrofit policies, an additional adoption challenge is that most jurisdictions with strong retrofit policies provide incentive funding to encourage participation.

Additionally, energy audits and baseline data on past energy use, both of which are helpful for retrofits, can be expensive to prepare. Without robust planning and adequate funding, these incentive and project preparation costs can create barriers to retrofits. Audits and baselines are an important challenge that countries need to consider around retrofits. 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 one. For example, in the U.S., the Weatherization Assistance Program has developed a series of standards for audits, retrofits and technical training that allow certified retrofit teams to conduct an audit and quickly use this information for a

Country Spotlight: China

China has made building energy efficiency a central focus of its energy policy and planning in recent years, and green buildings feature prominently in China's NDC.

Today, China has the largest energy performance contracting market in the world, fueled by both private sector financing and government incentives. 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, the idea for which originated in practices in California. 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 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.

government-funded retrofit of low-income housing. In more complex projects with multi-year paybacks, energy service companies are averse to using simple, third-party audits to structure investments.

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 because some buildings or measures are built above code, though 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 reviews of new construction plans when it comes to energy efficiency, 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 appliances producer than there are builders. Still, implementation requires robust testing capacity and consistent testing rules for that reflect real-world conditions. Appliance labeling also relies on consumers to change their purchases when they have better information. While labels may be easier to require than minimum energy performance in appliances, appliance labels tend to be most effective where energy prices are high, and 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 climate goals. As countries move forward with developing their NDC implementation 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 involve 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 several issues, including:

- What are the first steps they should undertake?
- What are the policy and programmatic options and the relative benefits and challenges with each?
- What kind of analysis can help them 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. The international Collaborative Labeling and Appliance Standards Program (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 policies that look at the buildings sector. 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 NDC Partnership can play an important role in linking building energy efficiency with NDCs in several ways. The NDCP can provide guidance and models on how countries can improve coordination to achieve building energy efficiency goals. Likewise, the partnership can help countries understand how they may be able to link climate financing with their needs regarding building energy efficiency strategies, including how to link these strategies with their NDCs in a coherent manner.

In summary, the buildings sector accounts for a large share of global energy use and CO_2 emissions. Most countries have tremendous opportunities to save money and improve productivity through energy efficiency investments in buildings at today's costs. However, because the construction and buildings sectors are made up of so many actors at so many levels, greater coordination and policy direction can help in unlocking these savings. NDCs can play a pivotal role by linking local needs with climate financing and by providing a platform for countries to think through concrete steps, including adopting and implementing policies, developing stronger coordination and building capacity for large-scale change.

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