



# Building Energy Codes

## Key Points

- China has substantially stepped up its enforcement of energy-saving building codes since 2007.
- Current energy codes call for improving the efficiency of new structures by 50% over pre-code buildings.
- Although rigorous, multi-step evaluations are ensuring high compliance with energy codes in major urban areas, buildings in rural areas often fail to meet the standards.
- More stringent standards and continued enforcement of energy efficiency codes can help China curb future energy demand in residential and commercial buildings.

**It's becoming an annual tradition. Each fall, expert teams arrive in dozens of China's cities to review newly-constructed buildings. The government inspectors ask for blueprints, review permits and tour completed offices and residences. One task: to make sure designers and builders are meeting China's increasingly stringent energy-saving building codes, which call for increasing the efficiency of new structures by 50%, over pre-code buildings -- or 65% in urban areas like Beijing and Tianjin.<sup>i</sup>**

The inspection teams are just a final touch in what a multinational team of researchers describe as a remarkably complex and rigorous system of building code enforcement in China. In a recent study\*, the team – led by researchers from the U.S. Department of Energy's Pacific Northwest National Laboratory (PNNL) – took a close look at the implementation of China's building efficiency regulations, and found an effective, multi-step compliance process. It requires extensive third-party evaluation and comprehensive documentation from building design to finish.

Buildings are a crucial player in China's energy use. They account for 28% of China's total consumption, according to the latest estimate by the International Energy Agency, and that share is expected to grow.<sup>ii</sup> By 2020, builders are expected to add some 20 billion square meters of new construction, the equivalent of constructing more than 33,000 new buildings the size of the Pentagon in just 10 years.<sup>iii</sup> To prevent

this unprecedented building boom from overwhelming efforts to improve energy use, China has adopted building energy efficiency codes.

Although the codes are making a difference, concerns remain. For instance, though China's regulations compare favorably to those in developed nations, they tend to be on the weaker end of the spectrum. And compliance can be low in rural areas, where nearly 50% of construction takes place. Still, "China has a great opportunity to positively shape global building energy use in coming years," concludes the PNNL study.

## BUILDING UP ENERGY SAVINGS

In the 1980s, China was one of the earliest developing nations to adopt country-wide regulations to conserve energy in buildings. Over the last few years, these codes have taken on greater importance as China set new targets for improving energy efficiency. Its 2005 11th Five-Year Plan, for instance, identified six priorities for improving building efficiency as part of a larger push to improve "energy intensity" – the amount of energy used to produce a dollar of Gross Domestic Product – by 20% by 2010.

Today, China has several national codes that set out mandatory and recommended energy-saving measures for commercial and residential buildings; some are tailored to specific climate zones.

Overall, Chinese officials have focused their efforts on developing codes in areas they believe are ripe for big efficiency gains. For example, the codes focus on “the two factors widely believed to have the greatest influence on building energy efficiency.... the building envelope and HVAC [Heating, Ventilation & Air Conditioning] systems.”

## CHECKS AND BALANCES

China’s Ministry of Housing and Urban-Rural Development (MOHURD) writes and oversees these rules, but day-to-day enforcement is left to local officials. Local regulators, in turn, often rely on independent agencies that the government has certified to review and approve blueprints for new construction. Local regulators typically will not allow construction to begin unless one of these certified groups approves the design.

The PNNL researchers were surprised by the required level of documentation, and the elaborate, multi-stage process of checking and verification. At most large construction sites, they found, a team of supervisors from a third-party inspection agency is continuously on-site during construction to ensure compliance. These independent supervisors are similar to managers in U.S. construction companies, the researchers say, but in the Chinese system they provide an additional check on the builders because they don’t have an incentive to gloss over mistakes to keep the project moving.

Other rules that encourage compliance with energy standards include an “acceptance code” that sets out the design, construction, and testing requirements that a building must meet before it can be approved for use. And, in 2007, China stepped up penalties for violating the rules. Third-party inspectors can have their licenses suspended for not following through on regulations. Builders can and have been forced to correct non-compliant buildings, and developers can be fined or barred from selling,

renting or occupying their buildings without extensive documentation and final approval.

Despite such improvements, some disparities remain. “Compliance is much better in major cities like Beijing and Shanghai, in the north and in developed regions... It is less satisfactory in smaller cities and towns, in the south and in less developed regions.” To further help even-out compliance, MOHURD began in 2005 to dispatch the fall inspection teams mentioned above. In 2008 the teams visited 55 large Chinese cities, picking 12 projects at random in each for review. In addition, some provinces, such as the booming eastern coastal province of Zhejiang, have begun conducting their own annual compliance reviews. Such moves, the authors conclude, demonstrate China’s “clear commitment to improving building energy efficiency.” The continued success of these enforcement efforts will be crucial to putting China on a lower-carbon track.

This fact sheet is based on:

- Evans, Meredydd, Bin Shui, Mark Halverson and Alison Delgado. 2010. “Enforcing Building Energy Codes in China: Progress and Comparative Lessons.” Technical Report. Pacific Northwest National Laboratory, Richland, WA.
- Shui, B et al. “Country Report on Building Codes in China.” Pacific Northwest National Laboratory, April 2009

**This fact sheet is a product of ChinaFAQs, a joint project of the World Resources Institute and experts from leading American universities, think tanks and government laboratories. Find out more about the ChinaFAQs Project at: <http://www.ChinaFAQs.org/>.**

## Notes

<sup>i</sup> Shui, B et al. “Country Report on Building Codes in China.” Pacific Northwest National Laboratory, April 2009., page 2.

<sup>ii</sup> Evans, Meredydd, Bin Shui, Mark Halverson and Alison Delgado. 2010. “Enforcing Building Energy Codes in China: Progress and Comparative Lessons.” Technical Report. Pacific Northwest National Laboratory, Richland, WA., page 2.

<sup>iii</sup> The Pentagon in Arlington, Virginia has a total floor area of 6,636,360 square feet, or 616,538 square meters, according to the U.S. Department of Defense.

## ChinaFAQs

World Resources Institute  
10 G St NE  
Washington, DC 20002  
202-729-7600  
[www.ChinaFAQs.org](http://www.ChinaFAQs.org)