

Chapter 92

Building Energy Codes Compliance: Practices Around the World



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Abstract Building energy codes are recognized worldwide as a proven policy for achieving economy-wide savings in buildings. While codes used across nations tend to vary in format and approach, several countries share the same key issues. These often include challenges such as the need for faster and easier methods to verify codes in practice, requirements for existing buildings, and the ability of codes to adapt to new and advanced technologies. The paper findings draw from interviews and surveys of different building energy codes practices found in member countries of the International Energy Agency's Energy in Buildings and Communities Programme (EBC) Building Energy Codes Working Group (BECWG), with a deeper look at practices related to codes compliance. The paper identifies and draws conclusions on emerging practices involving building energy codes across member countries.

Keywords Building energy codes and standards · Buildings · Energy efficiency · International

92.1 Introduction

Many countries are moving towards more ambitious building energy codes in light of a growing carbon footprint and an urgent need for decarbonization. As energy codes and standards become more widely adopted and increasingly stringent, further energy reductions may become less attainable and more expensive. This has prompted countries to broaden their strategy regarding building energy codes and their implementation. In 2018, the EBC BECWG was launched, dedicated to the consideration of building energy codes to foster stronger collaboration on codes and to address common challenges. The working group's activities provide a rare glimpse into impactful practices and emerging trends around the globe and forms a common basis for cross-national comparison that can lead to meaningful information-sharing among countries and local jurisdictions.

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92.2 Methods

The paper summarizes findings based on a 2020 assessment (Evans et al. 2020) of major practices in building energy codes in member countries of the EBC and a subsequent survey conducted in 2021 (Delgado et al. 2021) on codes compliance practices. A total of 38 representatives from eleven countries¹ provided information on their jurisdiction's building energy codes and enforcement practices via an online survey. In order to find common practices and noteworthy trends, the report development team reviewed current practices around four major topics: (1) code enforcement set-up, (2) capacity building and education on the code and code enforcement, (3) penalties and other mechanisms for improving compliance, and (4) code compliance assessments. The report team followed up with phone interviews as needed to gain clarification and elaboration and performed desk research.

92.3 Results and Discussion

The analysis of building energy code practices revealed the following emerging trends in the BECWG member countries:

Code revisions are more frequent: Code revisions bring improvements to the codes and the impact grows through compounded iterations. While a few countries have historically scheduled regular building energy code revisions, a growing number of countries have increased the frequency of their code revisions in recent years (e.g., India). There is also an emerging trend to adapt codes to warming climates, as what might seem to be adequate building envelope requirements now, may not be adequate in the future. In the United States, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) developed a new climate zone map in 2018 reflecting rising temperatures related to climate change. The changes were adopted by the International Energy Conservation Code (IECC) in 2021 for low-rise residential buildings.

Introduction of net/nearly zero energy building initiatives in codes: In the European Union, all member states must have codes that mandate nearly zero energy buildings by 2021. The California energy code requires that all new residential buildings must be net zero energy starting in 2020; commercial buildings must be net zero by 2030. Japan is also heavily investing in net zero energy building pilot projects and has targets for reaching net zero energy in all new buildings by 2030.

Development of codes dedicated to existing buildings: Many countries are starting to address their current building stock. However, there is significant variation among countries, and within countries, regarding thresholds or triggers when codes are

¹ Australia, Brazil, Canada, India, Italy, Japan, New Zealand, Portugal, Turkey, the United Kingdom, and the United States.

applied to existing buildings. For example, in Italy, minimum requirements are differentiated according to the extent of the renovation intervention split between major and minor renovations (Hinge and Brocklehurst 2021). In Japan, compliance is mandatory for additions and renovation greater than 300 m² of floor area of non-residential buildings (Hinge and Brocklehurst 2021). Some countries (e.g., France and the United Kingdom) have introduced performance standards for existing buildings which are based on a threshold of building energy or carbon performance linked to a performance rating (either calculated or measured), or a measure of energy or carbon intensity. Performance standards have the potential to drive more energy performance improvement in much larger numbers of existing buildings.

Increased implementation of building capacity on codes and training programs:

All of the countries are expanding their capacity to implement building energy codes and to innovate around training models. The survey on code compliance practices revealed that common challenges with capacity building include lack of exposure by building officials to more complex aspects of the codes, lack of mechanisms to ensure quality trainings, and overall low investment in trainings. In the European Union, the European Commission launched the Concerted Action for the Energy Performance Building Directive which includes in-depth, cross-national training on codes and related topics. In the United States, some utilities fund training on new building energy codes because the rigorous methodology lets them count the resulting future savings against their energy efficiency resource standards.

Emergence of post-construction code compliance checks: The survey on code compliance revealed that post-construction code compliance assessments, which can help jurisdictions understand the effectiveness of their building code implementation programs, are not widely or regularly conducted. However, the study revealed a few exceptions. Some jurisdictions are statistically evaluating code implementation by reviewing code documentation (China) or by assessing construction in sampled buildings (United States). Some jurisdictions in the European Union with codes based on overall energy performance have tried to assess actual energy use compared with predicted energy use.

92.4 Conclusions

Countries are pursuing advanced energy and climate goals, like zero net energy and building decarbonization. To achieve these goals, countries are relying on traditional policy instruments such as building energy codes that have a proven track record of cost-effectively saving energy on a large scale. In light of these broader goals, codes may need to adjust to factor in warmer and more extreme weather patterns, address the existing building stock, and adapt to many new jurisdictions, particularly in developing countries with rapidly expanding building stocks. There is also a need for new approaches for ensuring and assessing compliance, particularly by expanding

and improving code training and accreditation programs of code inspectors. International collaboration on research and development for building energy codes can play a critical role in speeding the development and adoption of best practices by further understanding common practices and emerging trends.

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