



# Analysis of existing building energy saving policies in Japan and China



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## ABSTRACT

Building sector accounts for a large percentage of the total national energy consumption in most of the countries, thus it is critical to formulate and implement appropriate energy saving policies in the building sector. This paper focuses on energy saving policies in the building sector by conducting a comparative study between Japan and China. The existing Building Energy Saving (BES) policies, actual effectiveness of policy implementation and obstacles to the effective policy implementation are compared in sequence. Related policies are categorized into four groups: control and regulatory instruments; economic/market-based instruments; fiscal instruments and information and voluntary actions. Policy effect analysis identifies that BES policies have promoted building energy saving in both Japan and China. Obstacles comparison reveals that Japan and China shared many obstacles including high transaction costs and lack of applicable methodology. Compared with Japan, China is suffering more obstacles such as inefficient enforcement, insufficient levels of information and awareness and immature financial regulation system. Based on the previous findings, common suggestions for overcoming these obstacles of BES policies in Japan and China are presented, such as the accurate methods of baseline identification and emission accountings, innovative incentives, and more capacity building activities. Distinct suggestions for Japan and China are also added by considering their own situations so that both countries can further improve their BES policies.

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## 1. Introduction

In order to effectively address the issue of climate change, it is necessary for both developed and developing countries to move toward low-carbon development by fully adopting low carbon technologies and employing market instruments through Public–Private Partnership (PPP) so that an international framework on combating climate change can be established. In this regard, the obligations of the Kyoto Protocol can be seen only as a politically but not scientifically agreed minimum standard in quantitative terms (Mauerhofer, 2008; IPCC, 2014).

Japan and China, the two largest economies in Asia, are facing increasing pressures on responding to climate change. China has

been the country with the largest CO<sub>2</sub> emission since 2007 and will continue to increase its total emission at least for the next decade (Guo et al., 2014) while Japan in 2012 was responsible for almost one fifth of the net global CO<sub>2</sub> increase (Olivier et al., 2013). In order to address such a challenge, both countries have implemented abundant of measures by considering the local realities. For instance, Japan announced its plan of becoming a low carbon society in 2007, with the aim of making a transition from a fossil fuel-dependent industrial society to a low carbon one (Lau et al., 2009). According to the Kyoto Protocol, Japan committed to a 6% carbon reduction during the period of 2008–2012 compared to the 1990 level (Lau et al., 2009). Long term goals were established in order to reduce 60–80% of CO<sub>2</sub> emissions by 2050, expecting that the peak emission level will occur within the next 10–20 years (Kono, 2010). However, the 2011 Fukushima earthquake significantly influenced Japan's energy policies. There have been many debates among politicians, entrepreneurs, power companies and the general public, leading to that energy security, energy efficiency, and environmental friendliness become the most important concerns (Policy

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Innovations, 2012; Tseng et al., 2013). In order to deal with energy shortage caused by the Fukushima disaster, Japan has to rely on fossil fuels for its energy supply, resulting in that the country had to buy CO<sub>2</sub> credits from international carbon market and significantly invested in alternative energy sources. China also initiated its innovative efforts. China's first White Paper on climate change was published by the Chinese government in 2008, stating the past and current emission patterns and related activities, as well as proposing future emission scenarios and potential reduction pathways (Jiang et al., 2013). A national emission reduction plan was released in 2009, in which China committed to cutting the intensity of its carbon dioxide emissions per unit of GDP by 40–45% in 2020 relative to 2005 level (Geng, 2011). In addition, the National Development and Reform Commission (NDRC, a ministry leveled agency in charge of low carbon development) allocated regional energy saving and emission reduction targets to all the provinces in its twelfth five-year plan (2011–2015). Other efforts include low carbon pilot projects in five provinces and eight cities, low carbon industrial parks, carbon markets, carbon trade and various capacity building projects across the whole country (Geng and Sarkis, 2012).

From sectoral point of view, among all the high energy consumption sectors, the building sector accounts for a significant portion of the total energy use in both Japan and China (Jiang and Yang, 2012; Lau et al., 2009). Due to China's rapid industrialization and urbanization, the building sector experienced unprecedented fast development, leading to that the proportion of energy consumption from the building sector accounts for around 30% of the national consumption (Jiang and Yang, 2012). In Japan such a proportion is also at least 30% of the total energy consumption, with much higher increasing rate compared to the industrial and transportation sectors (Doshi and Zahur, 2013). Consequently, the emission from the building sector received more attentions both in Japan and China. To date, many studies have been published. For instance, Zhang and Wang (2013) investigated the barriers of building energy saving policies in China and concluded that the most essential way to promote building energy efficiency in China is the government's involvement, as well as economic and financial incentives. Moreover, Lau et al. (2009) undertook a comparative study on the energy policies between Japan and Malaysia. Mochizuki (2011) analyzed the effectiveness of Japan's emission trading schemes. However, none of these studies offered a comprehensive review of the BES policies in China and Japan, nor can any of them offer any policy comparisons between the two countries, leading to less valuable policy implications. Under such circumstances, it is critical to conduct a comparative study so that similarities and differences of the BES policy barriers in the two countries can be clearly identified and help to better understand the underlying reasons. Particularly, since China can be considered a developing country and Japan a developed country, the potential findings may provide insightful policy implications to those decision makers in countries at different economic development levels. Hence, they can learn from each other and collaborate to enhance their abilities on making appropriate policies. This paper focuses on the related BES policies in China and Japan by conducting a comparative analysis. Two questions are discussed, namely 1) How effective are BES policies? 2) What are the obstacles preventing the policies from being effectively applied and how to overcome them?

In order to address these issues, the whole paper is organized below. After this introduction section, we describe our research methods and present the current BES policies both in Japan and China. Then, the BES policy effect is analyzed and the main obstacles in two countries are identified. A comparative analysis is further conducted in order to clearly recognize the similarities and differences of policy obstacles in the two countries. Finally,

recommendations for promoting the effectiveness of BES policies are given based on the previous findings.

## 2. Methods

Japan and China were selected for this BES policy comparison. The description of the policy instruments is based on literature reviews, following a typology provided by the United Nations Environmental Programme (UNEP-SBCI, 2007) which allocates various policy actions into four main groups. Policy instruments in Japan and China are reviewed at both national and regional levels. In this review, general BES policies are presented at the national level, and particular BES policies, such as carbon trading programs, are presented at the regional level because these regional initiated programs have played an important role in promoting building energy saving in cities of both countries (Ma, 2008).

Regarding the analysis of policy effect and obstacles, both stakeholder interviews and literature reviews based on Scopus database were undertaken. The likely policy obstacles to BES were first found from literature review and then collected from questionnaire respondents. In order to answer the first question – how effective are Building Energy Saving policies, the two issues need to be addressed, namely the effectiveness of existing BES policies and the regulation system in charge of the implementation of BES policies. In order to answer the second question – what are the obstacles preventing the policies from being even more effectively applied and how to overcome them, the following two issues need to be addressed, namely the identification of the significant obstacles for BES policies and the possible suggestions to overcome these obstacles.

With these considerations, the most relevant stakeholders were chosen for both questionnaire survey and oral interviews according to the principles described by Zhang and Wang (2013). Table 1 lists the details of our interviewees. A total amount of 150 questionnaires were sent out, with 65 in Japan and 85 in China. The response rates were 76.92% in Japan and 82.35% in China, respectively. Among them, valid questionnaires that contain feedbacks with detailed and cognizable answers were further selected for our analysis. After serious selections, 30 valid questionnaires from Japan and 50 valid questionnaires from China were screened. Besides the valid questionnaires, around 20 in-depth face-to-face interviews were also conducted (10 from Japan and 10 from China). Such an arrangement can guarantee a fair and credible observation.

Although the total number of valid questionnaires is limited for both countries, we believe that they are useful since all the valid questionnaires are from key stakeholders in such a field. Especially, it is usually difficult to conduct such an international analysis since the survey is both expensive and time-consuming. Also, cultural differences always exist, which may lead to different understanding on the same question. Therefore, the in-depth interviews are quite critical so that valuable insights can be obtained for such a comparative study and potential misunderstanding can be avoided.

## 3. Policy analysis

Our policy analysis distinguishes between reviews, effects, obstacles as well as comparisons. In such a way it relates to implementation theory (e.g. Carlford et al., 2010; Kapsali, 2011; Holum, 2012; Peer and Stoeglehner, 2013; Ullrich et al., 2014). It also acknowledges along with Damschroder et al. (2009) that there had been described many implementation theories to promote effective implementation in the literature but have differing terminologies and definitions.

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