



# Research on differences in the factors influencing the energy-saving behavior of urban and rural residents in China—A case study of Jiangsu Province



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## ARTICLE INFO

### Keywords:

Energy-saving behavior  
Urban-rural differences  
Regional differences  
Policy implications

## ABSTRACT

As environmental problems grow increasingly prominent, energy-saving behavior research has gradually captured the attention of scholars throughout the world. This paper conducts a study of energy-saving behavior and the influencing factors using correlation analysis, multiple regression analysis and other research methods; it focuses first on urban and rural residents in Jiangsu Province and then regionally on North Jiangsu, Middle Jiangsu and South Jiangsu. The results show that (1) urban residents in Jiangsu Province tend to engage in more energy-saving activities than rural residents; regionally, the energy-saving tendencies of residents from the area can be ranked as follows: Middle Jiangsu residents > North Jiangsu residents > South Jiangsu residents. (2) Urban-rural differences and regional differences also exist in Jiangsu Province in terms of both buying choice behavior and daily use behavior. With regard to regional differences in the factors influencing buying choice behavior and daily use behavior to support energy saving, North Jiangsu residents are most influenced by a sense of responsibility for the environment, Middle Jiangsu residents by policies and regulations and energy-saving knowledge, and South Jiangsu residents by low-carbon energy-saving willingness and energy-saving knowledge. This paper offers differentiated guidance regarding policies based on its research conclusions.

## 1. Introduction

With the rapid growth of the economy and the improvement in the level of industrialization in China, environmental pollution is becoming worse, and most provinces' energy efficiency is low (Zhang et al., 2016). "Energy savings and emissions reduction" has been included in "the 12th Five-Year Plan" and is therefore one of the country's key strategies for the next few years, as improving energy efficiency is an effective way to reduce energy consumption (Zhang et al., 2015b). Research into energy-saving behaviors has gradually caught the attention of scholars throughout the world. Particularly in recent years, household energy consumption has begun to play a main role in China's total energy consumption (Zhang et al., 2015a). In 2013, energy consumption by residents of China accounted for 10.92% of total energy consumption, representing the second largest source after industrial consumption. With the rapid development of China's economy and the improvement of living standards, residents' energy consumption and its proportion in total energy consumption are showing increasing annual trends (Table 1). Therefore, the study of energy-saving behavior is gaining more attention and has become one of the main research directions in

the field of energy consumption behavior.

China has a clear dual urban-rural structure, and there are considerable differences in the economic status, habits and customs, degree of culture, energy consumption behavior and influencing factors in these two areas. With the further development of China's economy, the income level of rural residents shows a trend of rapid growth and an accompanying increase in consumption levels. Annual income per person increased from 2236.43 yuan in 2004 to 9892.20 yuan in 2014, and in 2014, rural residents had an average of 74.80 washing machines, 77.62 refrigerators and 34.21 air conditioners per 100 residents. In addition, with the increased level of urbanization, the energy consumption gap between urban and rural areas is also decreasing (Zhang et al., 2014). China's territory is vast; the natural environment, regional environment, culture, social economic conditions and so on differ greatly across the different areas and different provinces. However, even in the same province, certain differences in cultural traditions and economic development levels exist. Thus, clearly, urban and rural residents have differences in their energy-saving behaviors and their influencing factors based on the urban-rural structure and regional differences. The study of Chinese urban and

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**Table 1**

Residents' energy consumption within total energy consumption (unit: ten thousand tons of standard coal).

(Source: National Bureau of Statistics of the People's Republic of China).

Year	Total energy consumption	Residents' energy consumption	Residents' energy consumption / total energy consumption
2009	336126.00	33843.00	10.07%
2010	360648.00	36469.63	10.11%
2011	387043.00	39583.66	10.23%
2012	402138.00	42305.84	10.52%
2013	416913.02	45530.84	10.92%

rural residents' energy-saving behavior and its influencing factors has positive practical significance for guiding the corresponding low-carbon energy-saving policy.

As a representative province for China's economic development, Jiangsu Province is seated in a long and narrow geographic area, and its economy displays obvious regional differences. The north of Jiangsu (North Jiangsu), the middle of Jiangsu (Middle Jiangsu) and the South of Jiangsu (South Jiangsu) are characterized by very different levels of economic development and residents' living habits. In total, South Jiangsu has the highest economic level and educational level, second in Middle Jiangsu. North Jiangsu lags behind the former two while residents there are very straightforward and responsible. The urban-rural differences and regional differences in Jiangsu Province offer a certain representativeness for China as a whole. In view of the above, this research chooses Jiangsu Province in China as the object of study in order to make the conclusion has a reference value for the government to formulate policy.

This paper conducts a comparative study of urban-rural differences in energy consumption activities and the influencing factors in Jiangsu Province using correlation analysis, multiple regression analysis and other research methods to develop findings that can help guide China's low-carbon energy consumption policy. The contributions of this research are as follows: (1) it offers a comparative study of urban-rural differences in the factors influencing energy consumption behavior in Jiangsu Province; and (2) it studies regional differences in residents' energy-saving behavior by dividing Jiangsu Province into three sections: North Jiangsu, Middle Jiangsu and South Jiangsu.

The remaining parts of this paper are organized as follows. [Section 2](#) is the related literature and the methods. [Section 3](#) presents the results and detailed discussions. Finally, [Section 4](#) focuses on the conclusion and policy implications.

## 2. Methods

### 2.1. Related literature review

In the related literature addressing China and other countries and focused on residents' energy consumption, the treated concepts include "residents' energy behavior", "home energy behavior", "residents' energy-saving behavior", etc., but they are primarily referring to the energy conservation and consumption behavior of individual citizens ([Zhang and Niu, 2013](#)). According to [Van Raaij and Verhallen \(1983\)](#), residents' energy consumption is divided into buying choice behavior and daily use behavior. The existing research on energy-saving behavior and its influencing factors is based on [Ajzen's \(1991\)](#) Theory of Planned Behavior and [Stern's Value–Belief–Norm Theory](#); these relate to environmental psychology, consumer economics, sociology and industrial ecology ([Zhang and Wei, 2010](#)). Scholars divide the factors influencing residents' energy-saving behavior into three groups: individual, social, and sociodemographic factors. Individual factors include environmental values; environmental responsibility; comfort preferences; conformity; low-carbon interest; energy-saving knowl-

edge, habits and lifestyle; and so on. Social factors include publicity, education and information, policies and regulations, economic cost, social technologies and so on. The sociodemographic variables include gender, age, marital status, education, occupation, income, family structure, housing type, etc. ([Hiller, 2015](#)). This paper will review the latest research progress in this area based on the standard division into three types of factors affecting energy consumption behavior, including individual, situational and sociodemographic factors.

#### 2.1.1. Individual factors

Individual factors refer to accumulated experience, ideas formed, and the habits that residents develop, which are strongly stable compared with other factors. Scholars studying these factors primarily investigate using questionnaires and analyzing their research results based on environmental psychology. Based on a questionnaire survey conducted on downtown streets in Dalian and Shenyang, [Sun and Jiang \(2013a\)](#) found that energy conservation attitude was significantly associated with urban energy consumption behavior. They also found that urban Chinese commonly held more positive energy consumption intent but that their sense of environmental responsibility was relatively low, which somewhat hindered city residents' efforts to implement energy-saving behavior ([Sun and Jiang, 2013a](#)). [Mi et al. \(2016\)](#) also pointed out that inspiring residents' willingness to engage in low-carbon energy consumption is the key to guiding urban residents' low-carbon energy behavior. Some scholars also believe that habit plays a decisive role in people's daily energy consumption behavior ([Darnton et al., 2013](#)). However, Chinese residents' energy-saving consciousness is weak, and their living habits tend include treating comfort as an important pursuit; this results from the embedded concept that China has a "vast territory and abundant resources", which leads to a lack of emphasis on energy saving ([Shi, 2015](#)).

#### 2.1.2. Situational factors

Situational factors refer to external factors such as interpersonal influence (such as persuasion and demonstration, etc.), social norms, costs, policies and regulations, and material incentives. These factors primarily have external influence over individual energy consumption behavior ([Hiller, 2015](#)). According to rational economic theory, the key to changing people's energy consumption behavior is to provide enough information and "new, feasible and easily understood information about energy consumption" ([Darby, 2010](#)). [Cao et al. \(2015\)](#) found that informational policy tools can provide significant positive guidance for farmers' low-carbon energy consumption by conducting a clustering analysis based on survey data of peasant households in the ecological economic zone of Lake Poyang. Some scholars' research proves that energy consumption policies have a significant positive influence on the energy consumption behavior of urban residents in China ([Yang, 2015](#)). [Ouyang and Kazunori \(2009\)](#) compared Hangzhou residents' energy-saving potential and pointed out that to promote family energy saving, focus should be moved from technical measures to changing consumer behavior; energy-saving education is an important way to accomplish this. Just as information and policy factors have important effects on the energy consumption behavior of residents, the influence of the economic cost and social technology factors should not be disregarded. By establishing a multivariate regression model, some scholars found that an increase of energy prices will significantly reduce residents' energy consumption, and further note that economic cost has a negative regulatory role in energy consumption ([Webb et al., 2013](#)). [Christie et al. \(2011\)](#) found that residents who do not want to install solar homes still tend to not install solar homes even after being told that the installation of new equipment will be free and will lower their costs. He conducted further research and found that in addition to economic considerations, the reliability of the new technology (reliability of solar panels) and concerns about negative impact on existing situation are also important factors when people implement energy consumption behaviors.

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