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Analysis of factors influencing residents' habitual energy-saving behaviour based on NAM and TPB models: Egoism or altruism?

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ABSTRACT

At present, China is paying more and more attention to sustainable development. Saving energy is an important guarantee for sustainable development. At the same time, many studies have found that changing people's energy consumption behaviours can contribute to solving the high energy consumption problem. Thus, this research chooses the urban residents in China as its object, and studies the factors influencing residents' habitual energy-saving behaviours. We establish a comprehensive theoretical model suitable for this study based on TPB and NAM model. Through on-the-spot investigation, data collection, and model establishment, we find that the daily energy-saving behaviours of urban residents in China are mostly motivated by "altruism". In addition, the external factors (social norms and policy environment) have a significant impact on residents' daily energy-saving behaviour. Based on this, we put forward some specific policy suggestions from three aspects: policy effectiveness, information behind the big data and the publicity by the Internet.

1. Introduction

Over the past three decades, with China's reform, opening up, and rapid economic development, great achievements have been made in China's economic construction (Bi et al., 2012; Zhu et al., 2016). But at the same time, the cost of resources and the environment has increased, and the contradiction between economic development and the resource environment has become increasingly prominent (Chen and Jia, 2016; Song et al., 2015). If the Chinese Government cannot coordinate the relationship between the environment and the economy, it may be difficult to achieve sustainable economic development.

Thus, China government attaches great importance to the issues of energy saving, from the beginning of 2004, the state proposed to establish a fundamental policy of economical society, and various energy-saving regulations and policies are carried out continuously, which promote China's energy-saving emission reduction process. For example, in 2014, the total electricity consumption of the whole country increased by 5.52 trillion kwh, an increase of 3.8% over the same period last year, and the growth rate dropped by 3.8% points compared with that of the previous year. The life electricity consumption of urban and rural residents increased by 2.2% compared to the same period last year, and also decreased by 6.7% points compared with the same period last year (China Energy Statistics Yearbook, 2015). This shows that the implementation of the policy has a certain effect on the macro level, but does the policy implementation affect the energy saving behaviour of the residents?

Steg and Vlek (2009) have mentioned that changes in human behaviour are believed to be needed because technical efficiency gains resulting from, for example, energy-efficient appliances, home insulation, and water-saving devices tend to be overtaken by consumption growth. At the same time, many studies have found that changing people's energy consumption behaviour can contribute to solving the high energy consumption problem (Abrahamse et al., 2007; Ouyang and Hokao, 2009; Dianshu et al., 2010; Wang et al., 2011). Therefore, the energy-saving behaviour of individual residents has gradually become a focus of world-wide study. In China, The energy consumption of residents has been a large proportion in recent years and continues to rise. (see Fig. 1). The energy consumed in urban life accounted for about 57% of the total amount of energy consumed in China (China Energy Statistics Yearbook, 2015), and this urban energy consumption is the representative of the terminal energy consumption in modern

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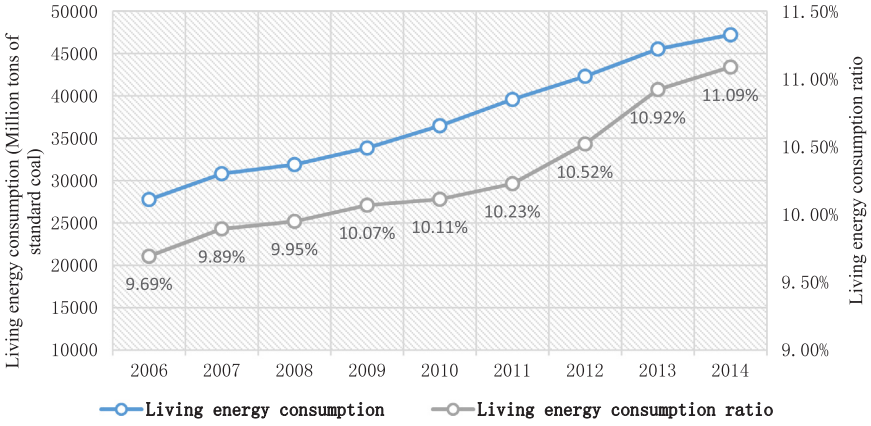

Fig. 1. Living energy consumption and living energy consumption ratio map.

Chinese society, so the impact of urban residents on energy consumption is enormous. Therefore, it is sensible to choose urban residents as a research object and the energy-saving behaviours of individual residents as research content.

Energy-saving behaviour is generally divided into two types: habitual energy-saving behaviour and purchasing energy-saving behaviour (Dillman et al., 1983; Black et al., 1985; Stern, 1992; Barr et al., 2005). Habitual energy-saving behaviour (also known as daily energy-saving behaviour) refers to the reduction and adjustment of certain behaviours, or changes to certain habits which can reduce the use of energy directly, such as turning off the lights, reducing the use of air-conditioning, or appropriate adjustments to air-conditioner thermostat settings. Purchasing energy-saving behaviour means reducing the use of energy indirectly by investing in new technologies or energy-efficient equipment without changing lifestyles (Gyberg and Palm, 2009). For example, consumers are willing to pay more for appliances with energy-efficiency labels (Gaspar and Antunes, 2011). Purchasing energy-saving behaviour are influenced by the level of science and technology development, product price, subsidy policy, and other objective factors, while habitual energy-saving behaviour can be controlled and changed by people's subjective motivations, so the methods of studying the two types of energy-saving behaviour will be different. Here, the habitual energy-saving behaviour of residents is chosen as the research content, and the influencing factors of daily energy-saving behaviour of residents are analysed. It needs to be emphasized that the “habitual” mentioned in this paper is different from the “habit” mentioned in many studies (Maréchal, 2010; Quaglione et al., 2017; Steg and Vlek, 2009). In this paper, the definition of habitual energy-saving behaviour is the daily energy-saving behaviour that can directly reduce energy consumption. In addition, this article is based on the assumption that individuals make reasoned choices.

There are many types of motivation of residents’ energy-saving behaviour. Steg and Vlek (2009) summarized in their review that individual motivations to engage in environmental behaviour is influenced by weighing costs and benefits, and environmental and motivations. That is, there is both the needs of egoism and the consideration of altruism. This research will take the motivation of energy saving as the starting point, through the analysis of the impact of the daily energy-saving behaviour of residents, to explore the daily energy-saving behaviour of Chinese urban residents is out of “egoism” or “altruism”. Through the analysis of the energy saving motivation of the residents, it is concluded that the starting point of the government's energy saving policy is to start with the promotion of energy saving or the incentive subsidy. Steg and Vlek (2009) also refers to the current literature do not pay due attention to contextual factors, so in this paper, we will combine the internal factors and external contextual factors to comprehensively analyze the influencing factors of habitual energy-saving behaviour of residents. Finally, on the basis of this, the corresponding policy suggestions are put forward.

2. The literature reviewed and the hypothesis postulated

2.1. The combination of Normative Activation Theory and Planned Behaviour Theory

In the study of pro-environmental behaviour, Planned Behaviour Theory (PBT) and Normative Activation Theory (NAM) are widely used (De Groot and Steg, 2009; Cordano and Welcomer et al., 2011; Wang and Zhang et al., 2011; Onwezen and Antonides et al., 2013; Zhang and Wang et al., 2013; Chen, 2016). Among them, the theory of normative activation only comes from the heart, to explore the activation process of individual moral norms, standardised activation theory posits that pro-social behaviour is derived from personal norms (Personal Norm) activation, when the individual recognition of the implementation of pro-social behaviour will benefit others and the individual is responsible for any adverse consequences, the individual norms will be activated; the theory of planned behaviour theory is more external and objective, both from the individual within the individual to take into account the individual objective of the behaviour (Attitude), and from the external factors to take into account the individual conducting a behaviour concomitant with external restrictions (Perceived Behavioural Control) and external social environmental impact (Subjective Norms). Based on the combination of subjective moral level and objective reality, this research combines normative activation theory with planned action theory. Based on the most basic NAM model and TPB model, this work will expand and perfect the model on a step-by-step basis.

2.2. Factors affecting residents’ energy-saving behaviours

According to “attribution theory” proposed by Hyde (1958), the cause of the event is nothing more than two thing: first, internal factors, such as emotions, attitudes, personality, ability, *etc*.; second, external factors, such as external pressure, weather, *etc*. Fan and Guo (2007) have also mentioned that the formation, and changes, of energy-saving behaviour at the same time are influenced by psychological factors, habits, and other internal factors and economic, cultural, and other external factors (Fan and Guo, 2007). Therefore, on the basis of NAM and TPB model, this paper divides those factors influencing energy-saving behaviour into internal and external factors.