

# Low-carbon Behaviour in Older Chinese Migrants: Theoretical Models

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**Abstract:** The existing low-carbon behaviour change theories have not paid much attention to the particularity of the cultural values and experiences of older migrants in the UK. This paper reviews the relationship and role of the Low-carbon Behaviour Model, Theory of Planned Behaviour, Resilience Model, Acculturation Model, Ecological Systems Theory, Behavioural Change Wheel, and other relevant theories in the low-carbon behavioural transformation of older Chinese migrants. An integrated model was proposed to explore net-zero to Chinese older migrants.

## 1 Introduction

All consumer activities that contribute to reducing an individual's CO<sub>2</sub> emissions can be considered low-carbon behaviours (Dubois et al. 2019). Older adults have played a leading role in driving greenhouse gas emissions. Between 2005 and 2015, their contribution to total national consumption emissions increased from 25.2% to 32.7% in 32 developed countries (Zheng et al. 2022). Despite the widespread attention to this issue, a definitive analysis of the challenges of balancing the needs of an ageing society with climate change mitigation is far from complete. Migration can also contribute to high carbon emissions. Most migrants come from developing countries or regions with lower per capita footprints; when they move to host countries with higher per capita footprints, migrants' carbon footprints may increase (Zheng et al. 2022).

Chinese migrants are a rapidly growing minority in the UK; they are one of the main minority groups (Gao et al. 2021). Traditional cultural values in China have

an obvious role in promoting sustainable behaviour (Jiang et al. 2019). Context and environment influence and limit personal actions. When migrants have to adapt to different cultures, the language barriers they encounter, and the sense of well-being they experience all change with migration and the social environment of the place where they live (Suárez-Orozco 2012).

Most studies of older Chinese migrants focus on their physical health problems (Gao et al. 2021), mental health problems, and life navigation problems (Caidi et al. 2020). There are few studies on their carbon emissions. As the first step to understand low carbon behaviours of older Chinese migrants, we reviewed a number of theoretical models and frameworks.

## 2 Methods

This research involves concepts such as older Chinese migrants, acculturation, and low-carbon behaviour. To better understand and establish the connection between them, we searched the library database of Brunel University. A total of 540 journal articles were found through searching “Older Chinese Migrant\*” and “Elderly Chinese Migrant\*”, and 134 were related to theoretical models. In addition, a total of 214,000 journal articles were found by searching “Cultural Adapt\*” and “Acculturate\*”, of which 38,200 were related to theoretical models. Besides, a total of 217,600 journal articles were found by searching “low-carbon”, “Sustainable”, “Pro-environment”, and “Net-zero”, of which 38,108 papers were related to theoretical models. After skimming through titles and assessing their relevance, and reading the selected abstracts, the first author chose around 20 models. Through discussion with the co-authors, a dozen models were selected for understanding the cultural adaptation process and behaviour changes of migrants. After looking into details of these models, the first author selected the final six as the most useful models to guide her PhD research.

## 3 Results

The selected models include the Low Carbon Behaviour Model, Theory of Planned Behaviour, Resilience Model, Acculturation Model, Ecological Systems Theory, and Behaviour Change Wheel. They are explained in the following three sections.

### ***3.1 Low Carbon Behaviour Model and Theory of Planned Behaviour***

Factors influencing low-carbon behaviour include interacting demographic characteristics, internal factors such as attitudes and habits, and external factors such as social norms and economics (Wang, Shen et al. 2021). The theory of planned behaviour (TPB) is an extension of the idea of rational action and is widely used as the basic framework in low-carbon behaviour studies. TPB as a framework for studying environmental behaviour can explain most intentions and future behaviour (Kaiser, Hübner et al. 2005). According to TPB, personal attitudinal factors, normative factors, and perceived behavioural control determine one's intention to engage in a behaviour. Ajzen (1991) added behavioural, normative, and control beliefs as additional factors that influence these to form a new theoretical model.

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Research efforts have been made to improve the explanatory power of the theory. For example, the extended TPB model that includes moral obligations helps to explain Taiwanese energy-saving and carbon-reduction behavioural intentions to mitigate climate change (Chen 2016). Psychological factors are the focus of low-carbon behaviour. Cultural values as an antecedent variable of TPB have been validated in some cases (Wang and Wu 2016). Specifically, Chinese cultural values (e.g., man-to-nature orientation and collectivism) were added to the TPB model to better explain the home low-carbon consumption behavioural intention in China, and to look into the specific role of cultural values in the model. Anticipatory pride and guilt was also introduced to compensate for neglecting emotional factors (Jiang et al. 2020).

The above conceptual models explain what determines an individual's behaviour from different perspectives. The two theories (i.e., Low carbon behaviour model and the TPB) complement each other and have different emphases.

### ***3.2 Resiliency Theory, Ecological Systems Theory and Acculturation Theory***

Resilience is the process by which individuals use their abilities, strengths, and resources to bounce back by overcoming or actively adapting to various risky or ad-

verse experiences that increase susceptibility to mental health symptoms. The components of resilience according to Mattelin et al. (2022) are courage, self-esteem, competence, self-confidence, capacity, trust, self-image, communication skills, and intelligence.

Ageing has been described as a time of resilience. Some negative factors of Resilience Theory are associated with migrants' backgrounds (Mattelin et al. 2022). For instance, the accumulation of factors such as limited English proficiency, withdrawal from the labor market, lack of social benefits, social isolation, cultural differences, and social status (Temple et al. 2022). These resilience-related negative factors appear decisive for older migrants. High resilience is significantly associated with positive outcomes, including successful ageing, lower depression, and a more active longevity (MacLeod et al. 2016).

Ecosystems describe multi-person and multi-system interactions between individuals and the environment at different levels (Bronfenbrenner 1992). For example, the microsystem includes interactions that affect the individual most directly, e.g., family, peers, and workplace. At increasingly distant levels, there are the mesosystem (interactions between microsystems), exosystem (e.g., social services, local politics, and mass media), macrosystem (attitudes and ideologies of the culture) and chronosystem (time). Ecological Systems relate to the interactions between migrants and different people and the macro-level and time-level factors that affect migrants (Tolentino et al. 2022). Migration will bring about changes in these. Different environments and cultural atmospheres may bring about changes in values for the older people (Kallis et al. 2022), such as changes in eating habits and changes in consumer habits. Changes in immigrant ecosystems will also affect carbon emissions in the lives of older migrants.

For migrants, cultural adaptation involves physical, psychological, cultural and social changes as they adapt (Liu 2019). The acculturation model (Ward et al. 2020) incorporates a wide range of variables. At the individual level are the characteristics of both the person (e.g., personality, experience, and values) and the situation/environment (e.g., cultural distance, and the amount and quality of intra- and inter-group contact). At the societal level are the variables of the society of origin and the society of settlement, including social, political, economic and cultural factors. All of these contribute to cross-cultural transition, stress, stress coping strategies, responses and outcomes.

### ***3.3 The Behaviour Change Wheel***

The Behaviour Change Wheel (Michie et al. 2011) is often used in the analysis and research of intervention design. It incorporates three levels. At the centre are the sources of behaviour (covering capability, opportunity and motivation). At the next

level, there are intervention functions, such as education, incentivisation, and restrictions). At the outermost level lie the policy categories, such regulation, fiscal measures, and service provision.

With the emergence of behavioural change on low carbon politics and knowledge agendas, the question of how to understand and intervene in carbon-intensive practices becomes critical (Schwanen et al. 2012). Consumer behaviour is key to society’s impact on the environment. Changes in social practices and behaviours will lead to a reduction in carbon-intensive lifestyles (Moloney et al. 2010).

#### 4 Synthesis and Discussion

Low-carbon targets can be divided into different levels; they correspond to different goals which have various degrees of impact on social development and the living environment (Figure 1). The high-level goals represent global sustainability, the middle-level goals represent the contributions that the community can make, and the low-level goals represent individuals, that is, those who have the long-term goal of net zero and will explore and practise low-carbon behaviours.

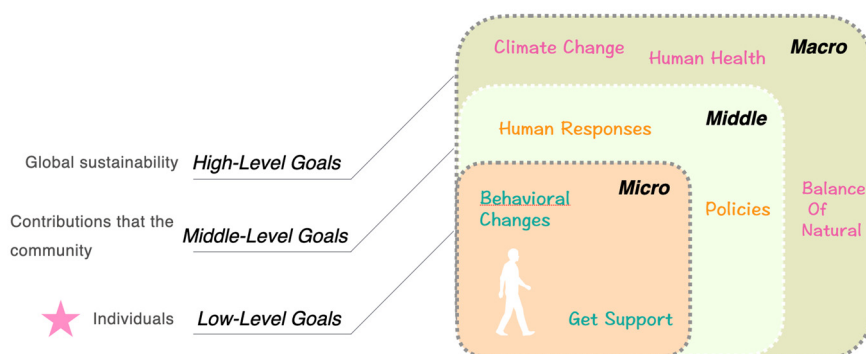


Fig. 1. Different levels of low-carbon behaviour goals

Most of the internal factors that affect low-carbon behaviour are also the influencing factors of TPB. The external factors that affect low-carbon behaviour change with society, and there are different variables in different situations. Situational factors (also known as external factors) influence variables that do not occur within an individual but come from elsewhere (Boldero 1995).

The influencing factors of Low Carbon Behaviour and Acculturation models have a lot in common. Therefore, they can be integrated into one for micro-level, individual behaviours. Ecological Systems Theory can provide a holistic perspective for other levels of action needs and the roles of relevant stakeholders. Figure 1

synthesises the factors influencing low carbon behaviour at different points in the system.

In TPB, the subjective norm refers to the impact of social pressure on individual intentions and behaviours. This is more important than other factors in China, which is based on the influence of traditional Chinese collectivist values and culture (Wang et al. 2014). Perceived behavioural control variables imply that factors such as opportunity, resources, time, knowledge, and skills are not under the control of the individual, thus influencing action intensively. Both morality and knowledge enable people to overcome barriers to engage in low-carbon behaviours (Chen 2016). Attitude refers to the understanding of behaviour results and the estimation of value. The traditional Chinese man-to-nature orientation value has an impact on attitudes.

Situational factors refer to external factors such as interpersonal influence (e.g., persuasion.), information, social norms, policies, economics, and technology. These external factors have mainly effects on individual energy consumption behaviour.

The diverse characteristics of the population also affect energy consumption behaviour (Echegaray and Hansstein 2017). Numerous studies have shown that age, income, living environment, and education level significantly impact on low-carbon behaviour.

The integrated model in Figure 2 illustrates that low-carbon behaviour is affected by different factors at different levels (from the individual to the chronosystem); it provides a more comprehensive theoretical framework for studying low-carbon behaviour in older Chinese migrants.

Low-carbon research on older Chinese migrants should consider their changing cultural adaptability and the change in perceptions caused by their migration experience. A preliminary model (Figure 2) was proposed to utilise relevant theories at different stages of the PhD research.

In Figure 3, Ecological Systems Theory ‘oversees’ the whole process. Individuals’ resilience changes with the social and psychological changes caused by migration. Their consumption habits (e.g., eating, shopping) may change due to mental and environmental changes which Acculturation Theory can explain. TPB can predict changes in low-carbon behaviour. The Behaviour Change Wheel can be used to design interventions at a later stage.

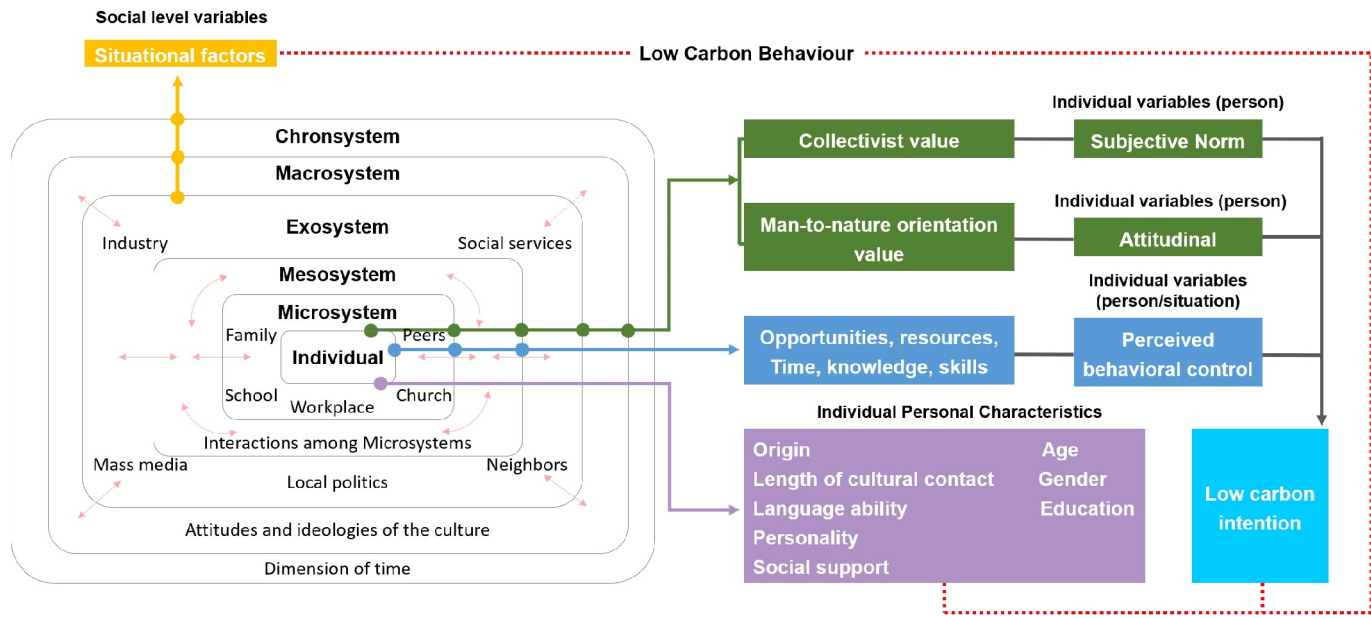


Fig. 2. An integrated model

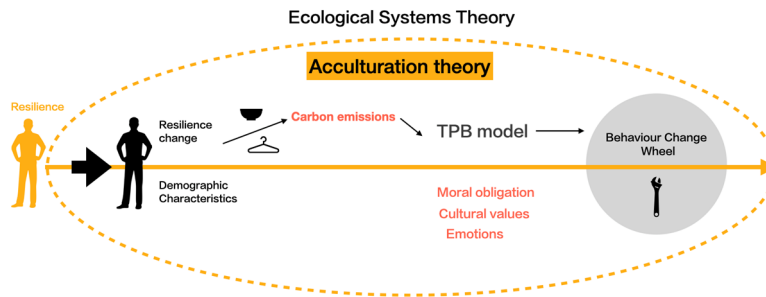


Fig. 3. Low-carbon to older Chinese migrants – a preliminary model

## 5 Conclusions and Future Work

Older people have been shown to generate excessive carbon emissions. There is evidence that Chinese migrants, with their increased cultural adaptability, are accompanied by higher-carbon dietary consumption, such as highly processed convenience food (Jin et al. 2017). However, there is not much research on the low carbon behaviour of older Chinese migrants, or on what low carbon means to them.

The authors conducted reviews of theoretical models relating to low-carbon behaviour, migration and acculturation, and synthesised these models to guide future research on low-carbon behaviour in older Chinese migrants. By integrating different models into a single one (Figure 2), the authors created a comprehensive framework to understand the influencing factors at different levels. The preliminary model (Figure 3) illustrates that different models can be utilised at various stages of the research to understand the factors and their relationships, and guide the design of interventions.

Future studies will focus on qualitative studies of the factors influencing older Chinese migrants' carbon behaviours. The theoretical models have provided the potential factors, and the findings (e.g., relationships between the factors) will help refine the integrated model.

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