## **Towards sustainable living in Australia's multicultural society:**

An exploration of cultural differences in attitudes to environment and consumption behaviours

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## Declaration

This is to certify that this thesis contains no material that has been accepted for the awarding to the candidate of any other degree or diploma, except where due reference is made in the text of the thesis.

To the best of my knowledge, this thesis contains no material previously published or written by another person except where due reference is made in the text of the thesis. Where the work is based on joint research or publications, the contributions of the respective workers or authors are disclosed and referenced in the thesis.

The thesis has been copy-edited and proof-read by Dr Jillian Graham (Articulate Writing Solutions), whose services are consistent with those outlined in Section D of the Australian Standards for Editing Practice (ASEP).

Christina Yion Ping Ting July 2015

#### Abstract

Increasing population and consumption, climate change and resource depletion are confronting issues for the world in the 21<sup>st</sup> century. In order to mitigate the resultant environmental impacts, there is a need to target individual consumption behaviours so that they align with more sustainable living – to adopt a simpler lifestyle that supports low-resource and low-carbon consumption. Individual behavioural factors (such as attitudes and intentions towards resource saving actions), structural socioeconomic factors such as income and household size, and dwelling size and type have been found to influence individual and household consumption levels. When individuals understand how these sets of factors influence their consumption levels, they are in a position to consider changes in behaviour directed towards more sustainable lifestyles that have less impact on the environment. For an increasingly multicultural Australia, with its high affluence and urban livability – high consumption and an ecological footprint (EF) which is one of the largest in the world - understanding these conventional factors is necessary but not sufficient. Its population is increasingly more heterogeneous due to migration from different countries and cultures, especially from Asian, non-English speaking countries. As culture impacts on a spectrum of behaviours and activities, there is a need to develop a deeper understanding of the influence of migrants' ethnic cultures on their postmigration consumption. Ethnic culture in this research refers to the distinctive cultures of different ethnic groups, and to the separation of these cultures from the broader host society's cultural context.

This thesis aims at a deeper analysis – at individual and household levels – of cultural influences on post-migration consumption behaviour of China-born migrants in Melbourne, Australia. These are compared with those of members of the host community. An explanatory model for individual consumption behaviour (measured by the ecological footprint) that includes a range of determinants (conventional and cultural) is developed.

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Quantitative and qualitative methods are applied in studying 61 China-born migrants and 72 Australia-born residents of the suburb of Box Hill in Melbourne. These focus on a range of consumption categories including energy, food, water, transport and waste management. Development of cultural indicators such as the CALD Index and acculturation level add insights into lived and cultural experiences, providing a greater depth of understanding of individuals' behaviours and values in relation to consumption and sustainability.

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## Abbreviations

ABS	Australian Bureau of Statistics
CCD	Census collection district
CO <sub>2</sub>	Carbon dioxide
CSE	Centre for Sustainable Economy
EF	Ecological footprint
FAO	Food and Agriculture Organisation of United Nations
GFN	Global Footprint Network
GHG	Greenhouse gas
IEA	International Energy Agency
IOM	International Organisation for Migration
IPCC	Intergovernmental Panel on Climate Change
IUNC	The World Conservation Union
OECD	Organisation for Economic Co-operation and Development
PV	Photovoltaic
SA1	Statistical area level 1
UNEP	United Nations Environment Programme
WWF	World Wide Fund for Nature

# Chapter 1 Pathway to Understanding Consumption in Multicultural Australia

This thesis addresses the issue of *consumption* in a multicultural society. The question is: to what extent is an individual's ethnic culture a contributing factor in shaping their consumption behaviour? This question is of particular importance for countries whose population is strongly affected by migration. This increasing global phenomenon is especially felt in countries such as Australia, with its high population growth increasingly fed by migrants. Currently, half of Australia's population consists of migrants or Australia-born children of migrants (Hugo, Njuki & Vas Dev 2012). This societal complexity is enhanced by an increasing percentage of the population coming from non-English speaking countries. Migrants from China and Vietnam are ranked in the top six countries of origin (ABS 2013). The question arises whether migrants who have moved from developing countries to developed countries like Australia increase their consumption to match that of the host society. Another question is whether migrants have a different pattern of consumption to that of their host population.

An improved understanding of the factors that influence resource consumption behaviour is crucial, due to the implications for related environmental issues like resource depletion, greenhouse gas (GHG) emissions and climate change (Dietz, Rosa & York 2007; Garnaut 2008; Newton 2008; Newton & Meyer 2012; United Nations 2009). Steps should also be taken to tackle climate change. For countries like Australia, 'climate change is a special challenge', as stressed by Garnaut in his foreword of '2020 Vision for a Sustainable Society' (Kippen & McDonald 2012, pp.v-vi). Australia has the highest level of greenhouse gas (GHG) emissions per person globally, but is also well endowed with fossil fuels. In view of this challenge, Australia has to embody policies that place a significant emphasis on the environment by encouraging low resource consumption that aligns with low GHG emissions. As Pearson (2012, pp.17, 26) aptly expressed: 'a sustainable society is a society that can continue ... to consume, create and recycle resources' and hence 'to achieve sustainability is to address our consumption of ... resources'. Governments have embarked on initiatives and campaigns over the past decade and before to

reduce consumption and conserve resources. However, it is 'only when we know why and how individuals consume and how they link their consumption to the environment, can we realistically set about changing consumption practices' (Hobson 2003, p.150). *Consumption* in multicultural Australia adds another layer of complexity and is a core issue in the 21<sup>st</sup> century.

Chapter 1 introduces the overarching rationale, purpose and importance of this research. It broadly explains consumption in relation to environmental challenges, such as increasing carbon dioxide (CO<sub>2</sub>) emissions and resource depletion. It has been established that the current high level of 'liveability' in cities such as those in Australia is underpinned by high levels of resource consumption (indirectly via inputs to construction of the built environment and directly by residents) (Newton 2012). The attainment of liveability, together with the growing population and the expected increase in consumption, is placing increased pressures on the environment. The current understanding of consumption behaviours and the environmental impact in a multi-cultural Australia is inadequate. This thesis explores the role of *cultural context*, in addition to other more established determinants of consumption, to investigate its comparative significance. A greater understanding of the level of ethnic influence on individual consumption behaviours will help to target better specific interventions and policies related to consumption and the environment, which need to penetrate *all* groups within Australian society.

The focus on urban consumption is imperative, as a range of forecasts from different national and international agencies indicates that by the mid- $21^{st}$  century – on current trajectories – our planet is likely to demonstrate the following:

- 66 per cent of the population will be living in cities by 2050 compared to 54 per cent in 2014 (United Nations 2014).
- A highly mobile global population will be moving in response to powerful regimes of push and pull factors. Seeking employment or better jobs and lifestyles are some of the pull factors, while social and political upheavals and environmental degradations are some of the push factors (Hugo 1996,

2011; IOM 2011). This increasing trend of international migration flow has influenced the predicted future growth of migrants to Australia (ABS 2013f).

- A global overshoot of resource use. This overshoot reached 36 per cent in 2000 and 50 per cent by 2008 (WWF 2014), due to increasing levels of consumption associated with urban development (indirect consumption) and population (direct consumption).
- Increasing levels of greenhouse gas (GHG) concentrations in the atmosphere: between 750 to 1000 ppm by 2050 compared to 370 ppm in 2000 (IPCC 2013).

Australia is a significant contributor to negative environmental externalities associated with its population and urban growth. These are intensified by it being a high income society with a high level of urban resource consumption and a high dependency on fossil fuels. Newton's (2012) Liveability-Sustainability nexus illustrates the significance of this challenge (Figure 1.1). Developed and developing countries seek to increase the liveability of their cities, and the impact this will place on future resource use and carbon dioxide (CO<sub>2</sub>) emissions is significant. These impacts are dependent on the urban development model adopted for the planning of cities, and the urban consumption lifestyles and behaviours adopted by *residents*.

Australia needs to identify the best ways to maintain the liveability of its cities, while significantly reducing the demands on resource use by its built environment (indirect consumption) and by its residents in relation to energy, water, housing, transport, and food (direct consumption). This thesis focuses on the latter challenge, which highlights population and consumption as two critical contributing factors to environmental impact, as defined by Ehrlich and Ehrlich (1991), where Environmental Impact (EI) = Population (P) x Consumption (C) or Affluence (A) x Technology (T).



Figure 1.1: Liveability-sustainability nexus for cities in 2010

Source: Newton 2012, p.88

In recent times, ecological footprint has become a widely accepted measure of environmental impact (Simmons & Chambers 1998; Wackernagel & Rees 1996). Environmental impacts can be addressed by technology innovation, and there is a significant body of research in this area (CSIRO 2002; Davidson et al. 2000; Feng, Hubacek & Guan 2009; Mills & Schleich 2012). The increasing challenge to transition more rapidly to more sustainable urban societies has resulted in research that has identified other factors that can contribute to the reduction of resource use by a community. These are: the design of the built environment (Newton 2008), and the potential for behaviour change (Dietz et al. 2009; Fielding et al. 2010; Stokes et al. 1994; Zacarias-Farah & Geyer-Allély 2003).

Australia's fast growing population is projected to reach between 30 and 43 million by 2056 (ABS 2012b). Its high population growth is largely due to international migration, which has been a constant component since the post-war period (Hugo 2013b). Data has shown that the migrant population increased from 18.4 per cent in 1966 to 27 per cent in 2011 (ABS). With over 80 per cent of new migrants settling in the capital cities (Department of Sustainability, Environment, Water, Population and Communities 2011), the impact on urban growth is significant. As a result, the population of Australia's capital cities is projected to increase to 74 per cent by 2061 (ABS 2014f) compared to 63 per cent in 2000 (ABS 2000).

Australia is also becoming a more heterogeneous society. Since the Second World War, the source of migrants has changed. While earlier, migrants were predominantly from European countries, more recently, they are from Asian countries such as China, India and Vietnam. For the past 19 years, the number of China-born migrants has been growing. In 2006 and 2011, China was ranked third in the top six countries of birth for migrants. The social, cultural and linguistic complexity of Australia's population and its cities is now among the highest in the world.

Public policy questions have been raised in relation to the impact of high rates of immigration on a sustainable Australia (Sobels et al. 2010). One example is the question of whether migrants from developing countries would increase their consumption to match that of host society's level of liveability. From a national

consumption perspective, interest lies not only in the number, but also in understanding migrants' motivations for consumption in their adopted country, as such behaviours will have significant impacts on Australia's environment and natural resources.

From an environmental perspective, the capacity of Australia to accommodate a projected additional 20 million people by 2051 (ABS 2010) has been the source of some significant debate. Some researchers, such as Foran and Poldy (2003), have argued for a smaller population in the future, with immigration being equal to emigration. The authors also pointed out that it is crucial to put in place population-environment policy that specifically focuses on both a reduction in individuals' resource consumption and waste generation, together with technology innovation that is within the capacity of Australia's environment to continue to absorb and support.

Others such as Hugo (1996) argue that for countries like Australia, limiting its population or migration numbers is not the solution to the alleviation of environmental problems. He proposes that there is a need to develop and adopt 'policies and practices which reduce per capita consumption levels .... (so as to) ensure that .... environments are managed and exploited in ways that are compatible with ecological sustainability'. In his latter paper on the growth of Australia's population, Hugo (2013a) reiterates that Australia's population policy should take into consideration the significance of migration and population growth, with a key emphasis on growth with environmental constraints. The author also highlights the effect of climate change, especially in south-east Australia and capital cities, where the population growth is most likely to occur.

In a major federally funded study that had population, *migration* and *environmental* impact as its focus, Sobels et al. (2010) examined the relationship between population growth and migration, and its implications for Australia's natural and built environments through to the mid-21<sup>st</sup> century. Sobels et al.s' study was based on the 2007-2008 Household Income and Labour Dynamics in Australia (HILDA) survey on consumption preferences and behaviours of non-English speaking migrants, and the 2007-08 Australian Bureau of Statistics (ABS) survey on

Environmental Views and Behaviour. The authors (Sobels et al. 2010, p.9) identified that progress towards Australia's environmental sustainability lies in the recognition of 'the impacts of rapid population change (that) are inextricably tied up with consumption behaviour by migrants and by households, location and scale, governance and institutions'. The authors also stressed that as attitudes and behaviours of individuals have a large impact on resource consumption and waste generation, it is critical to understand better migrants' consumption behaviours as well as those of the host society.

While Sobels et al. (2010) found that migrants were likely to adopt Australian consumption patterns, theirs was an aggregate-level study and was not able to explore the range of attitudes and behaviours related to everyday living capable of providing insights into consumption habits that could be targeted for change. Their measure of consumption was also not disaggregated into its major components. The other limitation in their work lies in the collective classification of migrants as one migrant group, despite their ethnic differences and country of origin. Importantly, they pointed out that migrants 'will have different preferences and behaviours inculcated from different social settings' (Sobels et al. 2010, p.17), but raised the question of uncertainty with regard to the extent of migrants' behavioural change after settling in Australia. As the *cumulative* impact of migrants is increasing, greater knowledge is required of their attitudes and behaviours relative to the host society in order to ensure better public communication and engagement in significant topics, such as consumption and conservation. Sobels et al. (2010, p.17) in fact raised the question: '(h)ow much change in behaviour is required, or accomplished after they (migrants) settle in Australia is uncertain'. This uncertainty suggests the need to investigate the difference in migrants' consumption behaviours prior to leaving their country of origin as well as upon settling in Australia.

This thesis enables a deeper analysis – at both individual and household levels – of the questions underpinning the Australian government's inquiry into the consumption patterns of migrants compared to host communities. First, studies on acculturation suggest a link between acculturation process and consumption. Acculturation process refers to a concept that 'deals broadly with changes in cultural attitudes, values and behaviours that result from contact with two distinct cultures'

(Phinney 1998, p.77). Changes in behaviours, such as consumption, are dependent on the extent to which migrants retain their ethnic culture versus adoption of the host culture (Laroche et al. 1998a). A range of other factors have been found to have an impact on the levels of acculturation of individual migrants (Berry, Trimble & Olmedo 1986; Phinney et al. 2006). Aspects such as length of residence in the host society have been found to have a significant impact on individuals' connectedness with their ethnic culture and their willingness to adopt the host culture (Page 2006). Other aspects, such as host language proficiency, are significant; for example, the usage of the host national language increases migrants' access to knowledge of a host society and adoption of the host culture (Sam et al. 2006). Social interactions of migrants within the host society prescribe their rate of acculturation due to their revealed preference for one culture over the other (Padilla 1980). It is through these interactions that migrants may explore changes in their behaviours such as in diet (Wiecha et al. 2001).

Second, the thesis explores whether there are *cultural factors* linked to differences in individual and household levels of urban consumption of energy, water, housing, transport, food and waste management – the principal components of an ecological footprint – issues yet to be firmly established. Cultural factors have not so far featured prominently in studies of urban consumption. Yet in the context of an Australian society, where about half of its population is born overseas or have a parent born overseas (ABS 2013), a multicultural influence on multiple aspects of Australian life is becoming evident.

In terms of links between culture and behaviour *generally*, a survey of the international literature reveals that many individuals' everyday behaviours are culturally linked. Culturally linked diet has implications on everyday food consumption and preferences (Lin 1981; Wong et al. 2003; Zhang & Baker 2008, p.14). Food preference is also related to religious practices (Breuilly, Martin & O'Brien 2002). In terms of communication, the use of the first language to communicate cultural words among individuals belonging to an ethnic group indicates language as the principal carrier of culture (Smolicz et al. 1990; Triandis 2001). It also indicates that better communication and understanding of local culture can result from using the local (ethnic) language (Cullen & Parboteeah 2008). From

a review of literature presented more comprehensively in Chapter 3, culture can be seen to exert a significant influence on everyday living behaviours.

### 1.1 The CALD Index

In this thesis, a range of *cultural indicators* has been identified that can be incorporated into a CALD Index, for inclusion in a multi-variant exploration and modelling of the determinants of urban resource consumption among a sample of 133 surveyed households in Melbourne. The term 'CALD Index', as a representation of cultural context and difference, is applied to characterise individuals 'who identify as having a specific cultural or linguistic affiliation by virtue of their place of birth, ancestry, ethnic origin, religion, preferred language, language(s) spoken at home, or because of their parents' identification on a similar basis' (The Victorian Multicultural Strategy 2002). The key components (indicators) of the CALD Index comprise the following:

- *Ethnicity:* identified by country of birth of individuals, and their parents.
- *Language*: where an individual's first language provides the connection with their culture. In Australia, where English is the official language, individuals' level of competency in spoken English is an indicator of their potential for interaction with others within society, and thereby have a bearing on their adoption of another culture.
- *Religion*: tends to create its own exclusive boundary (Zolberg & Woon 1999), and may inhibit individuals' adoption of another culture or even interaction with others from other cultures and a host society.
- *Food* consumption: is uniquely linked to traditional ethnic food and beliefs. Individuals' connectedness to their culture is identified in terms of food preference in a host society.
- *Festivals:* observed by ethnic groups to affirm their connectedness with their culture and thereby motivation to retain their culture. On the other hand, individuals' participation in other cultural festivals indicates their embracement of other cultures.

- *Social interactions:* in local community events such as talks and workshops; these are indicative of the types of activities people want to be involved in and also their preference of one ethnic culture over another (Padilla 1980).
- *Feeling of ethnic pride:* denotes individuals' sense of belonging and fitting in with the society. This feeling is akin to the degree of engagement with the local community and strong identification with their own ethnic group (Rotheram-Borus 1993), despite some exhibiting fewer ethnic behaviours and practices (Phinney 1991).

As these indicators of cultural context represent elements of cultural influence on individuals' everyday behaviours, the CALD Index is derived to elicit individuals' connectedness with their ethnic group compared to the host society. In this study, a high score in the CALD Index reflects a stronger connectedness between China-born people and their ethnic identity than with the host society. Among Australia-born people, a stronger connectedness with the host society is reflected by a low score in the CALD Index.

The indicators of acculturation and the CALD Index, as cultural factors, are featured in an explanatory model of individual consumption behaviour developed for this thesis (Figure 1.2). This framework depicts determinants of consumption on the left side, and sustainability living metrics as measured by the ecological footprint (and its components) on the right. It draws on a wide range of studies that have sought to identify the determinants of specific or combined consumption categories like energy, water, transport, and waste generation and management.



Figure 1.2: Conceptual framework for understanding an individual's (China- and Australia-born) contexts towards sustainable living and resource consumption

In this thesis, a range of individual and contextual factors have been identified from the literature as determinants. These factors can be categorised as follows:

*Individual structural attributes*. Based on the findings from past studies, individual structural attributes identified to have an influence on consumption include income, age, gender, employment, and education level. Included in this classification is car ownership, due to the research focus on sustainable living. The magnitude of individuals' ecological and carbon footprints are positively affected by their use of a car.

*Individual behavioural attributes*. As identified in the research literature, individual behavioural dispositions such as installing resource-efficient domestic technologies, exhibiting conservation behaviours and having environmental awareness do relate to the level of resource use and  $CO_2$  emissions. These three behavioural attributes are

computed as indexes: Resource-efficient Technologies Index (REI), Conservation Behaviours Index (CBI), and Environmental Awareness Index (AI).

*Cultural context* (CALD Index). As this research aims to better understand cultural influence on consumption in a multi-cultural society, *the CALD Index*, as a composite index, is derived specifically to measure individuals' connectedness with their ethnic culture. The CALD Index is a summation of individual indicators: ethnicity, language, religion, food, festivals, social interactions and cultural identity. These indicators are based on the classifications of '*what individuals say they are*', '*what individuals do*' and '*how individuals feel*'. The inclusion of the CALD Index in this framework as a cultural factor at the individual level enables its assessment as a determinant of consumption.

*Indicators of acculturation*. Acculturation occurs among migrants while residing in a host country. Indicators of acculturation, identified from the literature, are included in this framework. They are used in an analysis of *change* in ecological footprint of China-born migrants that is the difference between their footprints prior to their migration to Australia and their footprints in Melbourne at the time of this survey.

*Household and dwelling contexts*. Past studies suggest that household size can affect economy of scale associated with an individual's consumption (Dey et al. 2007; Zacarias-Farah & Geyer-Allély 2003). In other words, including household size as a determinant will allow an assessment of its impact on the magnitude of an individual's ecological footprint. The inclusion of dwelling size, as well as type and tenure, as a group of factors related to the *dwelling context* in the framework reflects the recognition of the impact these factors have on resource consumption.

While the principal objectives of this thesis rest with the creation of new knowledge connected with urban consumption, it is anticipated that a range of insights will emerge that are of relevance to behaviour change and environmental communications in a multicultural society. The identification of challenges and barriers that China-born migrants face in the host society will provide pathways to behavioural change towards sustainable living among individuals of this group. As Sofoulis and Willams (2008, p.55) have aptly expressed, 'change is easier if the new

information makes sense within the established framework of reference and prior self-understandings'. The resulting knowledge will also provide an evidence-based platform that governments and industries can effectively communicate regarding winding back resource consumption among individuals and households, not only of this China-born migrant group, but also among other ethnic groups.

#### 1.2 Thesis outline

In response to knowledge gaps in the depth of understanding of a migrant group's consumption behaviours, and in the context of concerns related to the nexus of consumption behaviours and environmental consequence, this thesis seeks to explore the consumption behaviours of China-born migrants as one of the largest culturally and linguistically diverse (CALD) migrant groups in Australia. There are clear cultural differences between Chinese and Australian host cultures. The differences in culture and societal experience of individual China-born migrants in the host society may be reflected in their everyday living behaviours, which may differ from Australia-born residents. Moreover, individual China-born migrants may behave similarly or differently in Australia compared with their behaviours prior to leaving China, their country of origin. There is very little research that actually examines how acculturation processes affect consumption behaviours (as reflected in magnitude of ecological footprint). In addition, there has been relatively little research that seeks to understand factors to explain both China-born migrants and Australia-born residents' footprints.

Accordingly, the two main areas of investigation in this thesis are:

• To examine the role of cultural and societal contexts in patterns and levels of consumption among China-born migrants to Australia. Specifically, the aim is to explore whether there is any significant difference in the level of consumption (as measured by ecological footprint) among China-born migrants *prior* to migrating to Australia compared to their *present* pattern of resource use and CO<sub>2</sub> emissions in Australia. The intention is also to analyse the extent to which *change* in ecological footprint has occurred as a result of acculturation or other factors (Chapter 5).

 To investigate the extent to which there are differences in relation to sustainable living practices and resource consumption between Australiaborn residents and China-born migrants (a culturally and linguistically diverse [CALD] group in Melbourne); and to analyse and account for difference in behaviours between CALD and Australia-born groups (Chapter 6).

These analyses will enable identification of the challenges and barriers this CALD group faces in relation to sustainable living and resource consumption. This knowledge will better inform and facilitate communication and engagement by governments and service providers within a multicultural society to encourage changes in behaviour directed towards more sustainable living.

#### 1.3 Structure of the thesis

This thesis is presented over seven chapters. Following this introduction, Chapter 2 explores key 21<sup>st</sup> century challenges and their impact on Australia. These include: climate change, resource depletion and increasing population and consumption. In order to mitigate climate change and resource depletion, Australia has to seize the opportunity to encourage sustainable living among *all*. With regard to the concept of sustainable living, the significance of consumption is highlighted in relation to its environmental impact. The ecological footprint is introduced as the key consumption metric in the research. The explanatory factors of consumption based on past research are then identified. This literature review informs the fundamental conceptual framework outlined in this thesis. The chapter concludes by describing the increasingly heterogeneous nature of migrants to Australia and its implications for understanding the nature of consumption in a multicultural nation.

Chapter 3 focuses on ethnic culture, which in this thesis refers to the culture that is distinctive for each ethnic group, and which separates it from the broader host society's cultural context (Rosenthal & Hrynevich 1985). Also examined is the extent to which culture plays a role in everyday activities and consumption. This examination draws on past research in order to identify the range of attributes that inform the basis for the proposed indicators of cultural context. The CALD Index is

developed as a predictor of individuals' connectedness with their ethnic culture. The chapter continues on to explore acculturation, and to identify a set of indicators that may constrain or facilitate migrants' consumption behaviours. The established conceptual framework of consumption determinants is expanded to include cultural indicators: the CALD Index and the indicators of acculturation.

Chapter 4 describes the technical aspects of this *survey-based* research as they relate to the conceptual framework and required multi-variant analyses. First, in view of the consumption and environmental focus, the ecological footprint is used as the principal consumption metric. An evaluation of available ecological footprint calculators is made, and selection of the most suitable tool for field survey application is undertaken. The chapter then presents the measurement of different determinants of consumption, the CALD Index, and the indicators of acculturation. These measurements are derived in a manner that permits multi-variant analyses, which are presented in Chapters 5 and 6. The chapter concludes with an explanation of the survey process and locational context, and a summary of survey demographics comparing participants' profiles to the general population in the survey area.

Chapters 5 and 6 present detailed empirical findings from the research questions addressed in the household survey. Chapter 5, which represents the first analysis of its kind, compares the China-born migrant group's past consumption behaviours with those in Melbourne at the time of this study, and focuses particularly on understanding the level of *change* in ecological footprint of the China-born group between the period prior to leaving China and that of settlement in Melbourne. Chapter 6 examines the ecological footprints and consumption behaviours of the China-and Australia-born groups in order to understand which factors best explain differences in the ecological footprints of these two groups of Melbourne residents.

Chapter 7 discusses the key findings and implications of these findings for the research questions outlined above, and concludes with future research directions.
## **Chapter 2** Exploring Consumption and its Determinants

This chapter aims to review literature that is pertinent to the scope of this thesis. It identifies the need for sustainable living and consumption in view of key 21<sup>st</sup> century environmental challenges and their impact on Australia. These challenges are global warming, climate change and resource depletion – all linked with increasing population and consumption. For Australia to mitigate climate change and resource depletion, it has to seize the opportunity to encourage sustainable living among *all*. The research employs the ecological footprint as a key consumption metric. This chapter identifies explanatory factors for consumption based on past research, with the literature review informing the fundamental conceptual framework outlined for this research. The chapter concludes by describing the increasing heterogeneous nature of culturally and linguistically different migrants to Australia and their implication for understanding the nature of consumption in a multicultural nation.

### 2.1 The challenge to sustainable living

Consumption is not only about what is consumed, but also why consumption occurs and what the environmental consequences of consumption are. In terms of the relationship between consumption and environment, Stern (1997, p.20) proposes the definition of consumption for environmental research as follows: 'Consumption consists of human and human-induced transformations of materials and energy. Consumption is environmentally important to the extent that it makes materials and energy less available for future use, moves a biophysical system toward a different state or, through its effects on these systems ....'. Contemporary consumption behaviour can be seen to have negative impacts on the environment and resources. The trend of increasing per capita consumption and total consumption, as population also grows rapidly, has consequently led to a wide spectrum of environmental problems: climate change, resource depletion (water, arable land) and biodiversity loss (Global Footprint Network 2009; Wackernagel & Rees 1996; WWF 2012). These issues are challenges that all countries, including Australia, have to deal with. For Australia, the strong link between climate change and its pattern of human activities (IPCC 2013; UNFCCC 2009), means that it has a significant responsibility

to tackle its high  $CO_2$  per capita emissions. In 2011, Australia emitted 396.8 million tonnes of  $CO_2$  – one of the highest per capita globally at 27 tonne/person/year (IEA 2013). Global climate change impacts (increased temperatures, rising sea level and rainfall variability) have consequential impacts on the Australian environment and its settlements (CSIRO & Bureau of Meteorology 2010; Garnaut 2008; IPCC 2013). Australia is not spared from climate change. For instance, from 1910 to 2007, Australia's annual average temperatures have increased by 0.9 degree Celsius (Garnaut 2008, 2011). It is projected that in the coming decades, Australia will continue to experience these variabilities of higher temperatures and lower rainfall (CSIRO & Bureau of Meteorology 2010). A recent report indicated that the 10 hottest years in Australia have been this century (Duncan 2015).

Australia's endowment of fossil fuels (coal, oil, and gas) has resulted in its heavy reliance on these fuels (Bureau of Resources and Energy Economics 2012b), which drive global warming. Fossil fuels provide for 95 per cent of the country's total energy consumption. In 2009-2010, coal provided 37 per cent of Australia's total primary energy supply (ABARRES 2011). This dependency on fossil fuels is compounded by its high energy demand –Australia as the world's eighteenth largest energy consumer is ranked fourteenth on a per person basis (Bureau of Resources and Energy Economics 2012b). Energy demand by households increased by 19.4 per cent from 2000-2001 to 2009-2010 (Bureau of Resources and Energy Economics 2012a). Australia's high demand for water cannot be ignored. As one of the highest users of water in the world (CSIRO 2010), and the driest inhabited continent, Australia is particularly vulnerable to the challenge of climate change (Department of Foreign Affairs and Trade 2008). These are environmental issues that Australia has to deal with in the midst of its increasing population and consumption.

Australia's population is predicted to increase. Its population of 23.2 million in 2013 (ABS 2014d) is projected to increase to between 30 and 43 million by 2056 (ABS 2012b). The challenge for Australia, especially among its capital cities such as Melbourne, –is increased demand on urban resources. Thus, to address the 21<sup>st</sup> century environmental issues, Australia needs to transition to a sustainable low carbon urban future through the implementation of new (energy) technologies in urban design and conservation behaviours among its population (Chetty, Tran &

Grinter 2008; Gardner & Stern 2008; Mont & Plepys 2008; Newton & Newman 2013).

### 2.1.1 Approach to sustainable living

In view of these 21<sup>st</sup> century issues that high consumption societies like Australia are facing, sustainability will become a critical issue despite current divergent political and economic perspectives. It is beyond the limits of the earth to sustain the continuation of high consumption behaviours among individuals in developed countries (Sitarz 1994) and increasing consumption in developing countries (Barton, Chen & Jin 2013; Kharas & Gertz 2010; WWF 2014). Australia has to encourage sustainable living in its pathway towards mitigating climate change and reduction in resource consumption. An approach to sustainable living is to limit individuals' resource consumption and GHG emissions (Chetty, Tran & Grinter 2008; Mont & Plepys 2008). These limitations are equated to significantly reduced use of resources and generation of waste. This approach aligns with Agenda 21, which calls for quality of life through more efficient use of the earth's natural resources, and protection of the environment through settlement and waste management policies (Sitarz 1994; World Resources Institute (WRI) et al. 2000). Migrants who move from developing countries to developed countries may also adopt the behaviours of host societies' high consumption levels (Sobels et al. 2010). The adoption of these behaviours and increasing population will place increased pressure on resources and the environment in host countries and cities. These environmental challenges and vulnerabilities are the cumulative results of urban consumption of energy, water, housing, transport, and waste generation. Sustainability practices related to consumption have to be confronted at both the individual and household levels as well as city and societal levels. Sustainable production is an issue that lies outside the scope of this thesis.

Sustainability 'characterises any process or condition that can be maintained indefinitely without interrupting, weakening, or loss of valued qualities' (Daily & Ehrlich 1992, p.992). It is thus consistent to define sustainable living as 'the use of goods and services that respond to basic needs and bring a better quality of life, whilst minimising the use of natural resources, toxic materials, and emissions of

waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations' (Norwegian Ministry of Environment 1995, p.1). Sustainable living for individuals in the  $21^{st}$  Century means that they need to demonstrate resource and carbon restraints by curbing high resource consumption and generating less waste. This means individual consumption behaviours need to shift from a consumption-based lifestyle to a simpler lifestyle, as depicted in the quadrants in Figure 2.1. A consumptive lifestyle is related to high resource consumption and carbon-dioxide (CO<sub>2</sub>) emissions. A simple or dematerialised lifestyle is less resource and carbon intensive and involves sustainable resource use that is 'sufficient for comfort, hygiene, efficiency', and convenience (Trainer 2008, p.671) with lower environmental impact.







An understanding of *what* and *how* households and individuals consume is vital for ensuring a sustainable future (OECD 2002). *What* individuals consume can be classified into five categories: energy, water, housing, food, travel, (and waste generation). These are consistently the main focus of studies (Fielding et al. 2010; Newton & Meyer 2012; OECD 2001, 2002, 2011; Troy & Randolph 2006) on issues relating to urban resource consumption, environment and sustainability. Critically, attempts can be made to reduce environmental impact and to advance low-carbon living by effecting changes in individuals' consumption patterns (Newton & Meyer 2012; Pedersen 2000) by targeting these categories to determine those factors associated with different levels of consumption.

### 2.1.2 Assessment of consumption as a holistic approach

A majority of studies on consumption have tended to focus on specific consumption categories such as in-dwelling energy use (Utley & Shorrock 2008; Wilhite et al. 1996); water (Syme, Thomas & Salerian 1983; Troy & Randolph 2006); travel (Carlsson-Kanyama & Lindén 1999) or food (Joos 1984; Siega-Riz, Popkin & Carson 2000). Other studies focus on dual consumption categories such as indwelling energy and travel (Poortinga, Steg & Vlek 2004; Stern & Gardner 1981; Stokes et al. 1994). Emphasis on an integration of housing and transport strategies, as two broad domains in terms of energy use and consequential direct environmental impact (Poortinga, Steg & Vlek 2004), was also the main focus of Crawford and Fuller's (2011) study on housing and occupant travel on energy demand and GHG emissions. An assessment that integrates both housing and travel is perceived as paramount. According to the Department of Climate Change and Energy Efficiency (2012), in-dwelling energy activities and consumption and household transport made up approximately one-fifth of all GHG emissions in Australia. In recent studies (Green 2010; Newton & Meyer 2012), the assessment of integrated consumption categories is seen as a holistic approach, where consumption in several categories is dealt with in aggregate as well as individually. An integration of the five key consumption categories is incorporated in the conceptual framework of this research as discussed in a following section and Figure 2.3.

#### 2.1.3 Consumption behaviour and environmental impact

The pathway to reduce resource consumption and GHG emissions is to better understand the link between individuals' aggregate consumption and environmental impact. One avenue is to use a consumption assessment tool that is able to quantify resource use and GHG emissions so that consumption patterns can be understood in quantitative terms. Consumption assessment tools that are commonly used for measuring environmental impacts are life cycle assessment, ecological footprint, energy requirements of consumption items, and input-output analysis (Lenzen, Dey & Foran 2004; Park & Heo 2007; Vattenfall, A-hus & Volvo 2011; Wackernagel &

Rees 1996). As this research's aim is to illustrate the connectedness between resource consumption, CO<sub>2</sub> emissions and their determinants, ecological footprint emerges as the most appropriate consumption metric. The suitability of the ecological footprint as a consumption metric is discussed further in Chapter 4. Conceptually, the ecological footprint represents consumption and emissions in terms of average global hectares of land and water per capita (Simmons & Chambers 1998; WWF 2014), 'required on a continuous basis to produce all the goods consumed and to assimilate all the wastes generated' (Wackernagel & Rees 1996, p.61). Ecological footprint calculators have been developed for this purpose. These calculations can be undertaken at national, regional, or individual levels. For instance, Table 2.1 shows the national average ecological footprint per person in selected countries, revealing considerable variability. Differences in footprints reflect variabilities in consumption behaviours and contexts, the focus of this research.

Table 2.1:	Ecological footprint	(in global	hectares,	gha) of selected	countries in
2010					

<b>Country</b> <sup>1</sup>	<b>Ecological footprint (gha) per person</b> <sup>2</sup>
Australia	6.3
China	2.1
India	0.8
Italy	4.4
New Zealand <sup>3</sup>	3.0
United Kingdom (including England)	4.3
Vietnam	1.5
World	2.5

Note: 1. Selected countries based on the most common countries of birth of migrants to Australia (ABS 2013h)

Estimated values taken from Living Planet Report 2014 (WWF 2014)
The EF of New Zealand varied across the years. It was ranked relatively high in 2005 and 2007 with 7.7 gha and 4.9 gha respectively (Global footprint Network 2011) and in 2013 it was smaller at 3.5 gha (Lawton & Lawton 2013).

### 2.1.4 Established determinants of consumption

Findings from past consumption studies, which used individual or aggregate data,

have shown that a range of determinants is associated with one or more consumption

categories. Determinants can be categorised as individual (structural attributes,

behavioural attributes), and contextual (household and dwelling).

### 2.1.5 Individual structural attributes

#### Income

Income has been consistently linked with consumption in general, and specifically with energy and water use, travel, food and waste management (Biesiot & Noorman 1999; Brandon & Lewis 1999; Dey et al. 2007; Hamilton, Denniss & Baker 2005; OECD 2011). Increasing income has been positively correlated with larger homes, in-dwelling energy use, and households' purchase of more electronic appliances (Zacarias-Farah & Geyer-Allély 2003). All these result in more *energy* use due to lighting, heating and cooling of dwellings (Druckman & Jackson 2008). In measuring Dutch households' direct and indirect energy consumption, Vringer and Blok (1995) and Biesiot and Noorman (1999) found that there was '(a)n almost linear relationship of expenditure and energy requirements' where there was an increase in household income: the more a household could afford to spend, the higher the corresponding energy consumption. Dey et al. (2007) also found that increasing annual per-capita income was directly correlated with increasing GHG emissions in a national study across Australia, where total household energy consumption was calculated in terms of GHG emissions. In a similar vein, highincome households tended to spend more on high-cost activities such as entertainment and high-greenhouse impact activities such as air travel (Dey et al. 2007). In Sweden, travel in private cars and larger homes was linked to higher income (Carlsson-Kanyama & Lindén 1999). The reverse relation was found by Weber and Matthews (2008) in the United States of America - that lower-income households tended to generate more GHG emissions due to less carbon efficient cars and dwellings.

Income was also found to influence in-dwelling *water* use. A positive correlation between income and amount of water used was found among households in Melbourne, Australia. Households in the wealthiest suburbs of inner Melbourne and wealthy coastal suburbs around Port Philip Bay accounted for the highest water use (Dey et al. 2007). This finding is in line with an OECD (2011) survey of 10 OECD countries including Australia, where higher household income was found to have a statistically significant and positive effect on per capita water consumption.

*Food* consumption and income were also found to be positively correlated in published studies. Reusswig, Lotze-Campen and Gerlinger's (2003) analyses of aggregate data from the World Bank's World Development Indicators and the World Resources Institute's Earth Trends found that households in high-income countries, such as Australia, the United Kingdom and the United States, tended to have a high level of consumption of calories and animal products. Developing countries with the strongest Gross Domestic Product (GDP), such as China, India, Indonesia and Brazil, were also found to have a fairly strong growth in consumption of animal products.

In terms of *waste management*, high-income households consumed more resources like food, and they were also associated with greater waste generation (depending on the goods and services purchased) than lower incomes based on an Australian national survey (Hamilton, Denniss & Baker 2005) and a study of OECD countries (Zacarias-Farah & Geyer-Allély 2003). On a more positive note, higher incomes were also 'historically linked to greater household participation in recycling schemes' (Zacarias-Farah & Geyer-Allély 2003, p.826). In sum, income is found to be a key determinant of resource consumption such as energy, water, housing, travel and type of food.

#### Gender

In terms of *travel* using private transport, females with higher incomes more often had a driver's licence compared to those from other income groups; and males from highest-income households were likely to travel the farthest in their cars as compared to those with low incomes (Carlsson-Kanyama & Lindén 1999). Males were also more likely to be the driver of a vehicle as compared to females who tended to travel as vehicle passengers, especially among the older age groups (NSW Department of Transport 2001). These findings correspond to OECD (2012, p.358) findings, which identified the most frequent private vehicle users to be: 'men, middle-aged people and those with higher incomes and education'. A National Travel Survey in Sweden found that males between 35 and 54 years old travelled more extensively than females using various modes of transportation such as private cars and airplanes (Carlsson-Kanyama & Lindén 1999). In terms of energy used for travelling, males were found to use 52 per cent more than females. When energy consumption was

calculated in CO<sub>2</sub> emissions, environmental impacts from males were found to be greater: 2.3 tonnes of CO<sub>2</sub> compared with 1.5 tonnes for females (Carlsson-Kanyama, Lindén & Thelander 1999).

These gender differences were also found in studies on home thermal comfort. Karjalainen (2007, p.1594) found that 'females prefer higher room temperatures than males, and feel both uncomfortably cold and uncomfortably hot more often than males'. Though Karjalainen's (2007) study found that females were more critical of their home thermal environments, males used thermostats more often than females. Gender was also found to be linked with *food* consumption. Gender differences in dietary behaviour in Australia were found to be significant (Turrell 1997). These notable differences were likely to be due to females' greater liking for the taste of healthy foods, their belief in following dietary guidelines for better health, and being more knowledgeable about food and nutrition than males (Turrell 1997).

A gender difference is also found in terms of *water* usage for the garden. A study of households living in detached homes in Perth, Australia, found that there was a difference between husbands and wives. Because of their appreciation of garden recreation, together with the fact that they are likely to be home more often, females were the primary users of the garden (Syme, Thomas & Salerian 1983). A study by Troy and Holloway (2004) in Adelaide, Australia, showed that it was not just garden and gender factors that determined the amount of water used by households. Their examination of water consumption showed that variations were likely to be due to other factors such as dwelling type and size, income and household size. Troy and Holloway (2004) also emphasised that besides other determinants such as garden size, the type of lawn or Australian native plants planted may also have an influence.

#### Age

Age was also a factor in understanding consumption, especially in energy use, travel and waste management; although published studies have demonstrated mixed results. Research by Brandon and Lewis (1999) showed that older individuals tend to use more in-dwelling *energy*, possibly because the home is where they spend most of their time. Older individuals also had more appliances (OECD 2011). In an aggregate study of household energy requirements in Australia, Brazil, Denmark,

India and Japan, Lenzen et al. (2006) found that age was a strong statistically significant variable in Japan only. Among the Japanese, age had a positive effect on per-capita direct energy consumption.

Perhaps the higher in-dwelling resource use among older individuals is not only as a result of their staying at home longer, but also due to their *conservation behaviours*. According to Wilhite and Ling (1995), younger households (compared to 50 years or older) were more likely to perform *conservation behaviours* such as only turning on the heaters in parts of their homes when it became colder. Another possible explanation for higher in-dwelling resource use among older individuals was their lower level of awareness of resource-efficiency; for example, they generally had less *awareness* of resource-efficient labelling (OECD 2011) and lower use of energy-efficient technologies (Mills & Schleich 2012).

In terms of *travel*, there were variations in relation to age and use of private vehicles and modes of transport. Among the 20-35 age group in OECD countries, the car was the main mode of transport due to its almost universal use (Schipper 1996). The use of the car increased for individuals aged over 20 year olds up until middle age, accounting for 60 per cent of their trips, and then decreased for the older age groups (NSW Department of Transport 2001). This finding shows that age was negatively related to transport energy use, which resonates with Poortinga, Steg and Vlek's (2004) study. An explanatory factor is that older people tend to spend more time at home (Lenzen et al. 2006). In terms of commuting by public transport 2001; OECD 2011) found that elderly and younger people, including teenagers (from 11 to 20 year olds), were the highest users.

Age was also likely to be an influence on *waste management*. According to Hamilton, Denniss and Baker (2005), food wastage fell sharply as age increased. For instance, 38 per cent of 18-24 year olds admitted to wasting more than \$30 on fresh food per fortnight as compared with only seven per cent of individuals aged 65 or over. Similarly, 26 per cent of 18-24 year olds admitted to buying more than \$100 worth of clothes per year, which they never or rarely wore, compared to only six per cent of respondents aged 65 and over. In a similar vein, Barr, Gilg and Ford (2001)

discovered that older age groups tended to have low levels of waste. Older individuals, especially retirees, were likely to understand composting compared to families with young children and those whose children had left home (Edgerton, McKechnie & Dunleavy 2009).

#### Education

Education has been investigated as a possible influence on consumption, and its effects were found to be related to a range of consumption categories. Several studies have shown that individuals with higher levels of education used less in-dwelling energy (Mills & Schleich 2012; OECD 2011; Poortinga, Steg & Vlek 2004). Households with higher education tended to own fewer television sets and set-top boxes but more personal computers (OECD 2011). Another explanation for lower in-dwelling energy use among households with a university education is their higher adoption of energy-efficient lighting compared to those with less education (Mills & Schleich 2012).

Moreover, in an experimental study in Norway on behavioural change regarding indwelling energy use, individuals who had higher levels of education (that is more than 12 years), were more likely to reduce energy consumption through *conservation behaviour (Wilhite & Ling 1995)*. However, this relationship did not correspond with that of conservation behaviours on *water* use. According to Gregory and Di Leo (2003), less well-educated households demonstrated more water conservation behaviours. In a similar vein, Cheruseril and Arrowsmith (2007) also found that individuals who were less academically qualified tend to use less water.

Unlike other studies (Russell & Fielding 2010) that rely on education as a proxy for knowledge, Mills and Schleich (2012) attempted to identify the relationship between an energy-use knowledge index and education. This index was based on three indicators: whether the household knew (1) its annual electricity consumption, (2) what the EnergyStar label (that is efficiency labelling) stands for, and (3) whether computer monitor screensavers save electricity. Mills and Schleich (2012) found that the knowledge index was highest for those individuals with a university degree and was significantly lower among those with a vocational degree. These findings reflect

that education increases the probability of recognising environmental labels, as documented in the study of ten OECD countries including Australia (OECD 2011).

Mills and Schleich's (2012) study has also demonstrated that the deployment of a *composite index*, such as energy-use knowledge index, is an important predictor of behaviour. In line with this, indexes are also developed in this research for conservation behaviours, resource-efficient technologies, and environmental awareness, which are elaborated in the section on individual behavioural attributes.

### Car ownership

Car ownership has been found to have the most significant influence on all choices of travel mode and purpose except for travel for education. It was notable that cars were the most common mode for shopping (OECD 2011). In a similar vein, Williams et al. (2001) showed that nearly 90 per cent of residents in Coventry, United Kingdom, performed their main grocery shopping by car. These high percentages of private car use for shopping relate to ease of use and to the geographical locations of freestanding superstores, warehouse parks and many leisure venues, which are less accessible by public transport (Linden 1994 (in Swedish) cited in Carlsson-Kanyama & Lindén 1999; Gilbert & Elias 2008).

Using aggregated data in Melbourne and Brisbane, Crawford and Fuller (2011) found that car ownership and location of dwelling did have an influence on individuals' modes of transport to work. Car was the main mode of transport for 91 per cent of households living in outer-suburban detached housing, with only nine per cent of them travelling by train. For those living in inner-suburban medium-density apartments, half made their trips by either car or train. Among households living in high-rise inner-city apartments, 75 per cent took trains while only 25 per cent used their car. These findings illustrate the importance of accessibility to public transport and extent of public transport infrastructure.

In other studies (OECD 2011; Poortinga, Steg & Vlek 2004; Williams et al. 2001), several socio-demographic variables have been consistently identified as determinants of transport mode and travel purpose. These variables are age, income, employment, car ownership and household size. Income had a positive and significant effect on both car ownership and driving distance (IEA 1997; OECD 2011). There is a higher probability that as income rises, there is less likelihood of choosing public transport (OECD 2011). Level of education and household size were also positively related to transport energy use (Poortinga, Steg & Vlek 2004). *Employment*, either full- or part-time, was also found to have a positive and significant effect on both car ownership and driving distance (OECD 2011). These findings reinforce the need for a multi-factor approach to studying the determinants of consumption.

### 2.1.6 Individual behavioural attributes

Understanding individuals' resource consumption patterns also necessitates an understanding of *behavioural predispositions (Fielding et al. 2010)* such as those related to the use or adoption of resource-efficient technologies, conservation behaviours and environmental awareness that could possibly induce actions to effectively lower individuals' resource use, and result in smaller ecological footprints. Stern (2000) and Leiserowitz, Kates and Parris (2005) point out that behavioural attributes have the capacity to translate attitudes into action, and have been shown to be important factors in understanding conservation behaviours in general, as well as decisions to adopt resource-efficient technologies (Stern 1992) and to retrofit homes (Dillman, Rosa & Dillman 1983). These findings are in line with Jochem et al.'s (2002) proposal that take-up of resource-efficient technologies and conservation behavioural predispositions linked with resource conservation.

#### Use of resource-efficient technologies

Today, home appliances and technologies have become so much a part of everyday living that their presence is taken for granted due to increased dependency on them. They are, however, significant resource-consuming (whether resource-efficient or not) devices (Shove et al. 1998). Their presence leads to an increase in total household in-dwelling energy and water demand and environmental impact (Jackson et al. 2006; OECD 2011; Poortinga, Steg & Vlek 2004). However, reduction in resource demand can be effected by the installation of resource-efficient technologies like roof insulation and dual-flush toilets. These technologies are longterm conservation measures as they reduce resource use and also enable ongoing resource conservation (Fielding et al. 2010; Stern & Gardner 1981). As an illustration, in a household of four, a single-flush toilet uses over 70 000 litres a year, whereas a dual flush uses 30 000 litres (Windust 2003). Another example is the installation of solar water heating. For instance, in an average three-bed semidetached home in the United Kingdom, the annual carbon dioxide savings was 0.33 tonnes (t)  $CO_2$  per year for a solar hot water heater (with a collector area of four square metre) and 0.91 t CO<sub>2</sub> per year for solar photovoltaic (PV) panels (2.5 kilowatt peak) (Department for Environment Food and Rural Affairs 2008). These findings are particularly relevant to Australia, where the percentage of solar hot water heater systems installed in homes increased by 66 per cent from 2001 to 2011 (Clean Energy Council 2013; SunWiz 2011), and the take-up rate of solar energy use increased from five per cent in 2002 to eight per cent in 2008 and 8.7 per cent in 2012 (ABS 2010b, 2013b). The latter was due to the substantial increase of solar PV systems installed in homes from less than 1 000 solar PV panels in 2001 to 1.8 million panels in 2011 (Newton & Newman 2013). In addition, studies also provide evidence that while high-income households in several developed countries were found to have larger carbon footprints compared to low-income households (Druckman & Jackson 2008; Kerkhof, Benders & Moll 2009; Wier et al. 2001), their footprints maybe reduced with the installation of resource-efficient technologies (Dillman, Rosa & Dillman 1983; OECD 2011). The inclusion of resource-efficient technologies in the conceptual framework allows the relationship between these technologies and the ecological footprint to be examined.

Level of education was another factor considered to be at work here. This was supported by Mills & Schleich's (2012) 11 country European studies, where households with a high-school degree or higher level of education had higher installation of energy-efficient lighting than those with a lower education level. However, the argument that adoption of resource-efficient technologies would potentially result in the reduction of individuals' resources use and subsequent reduction in GHG emissions is refuted by Stokes et al. (1994), who claimed that such adoption cannot be taken at face value. Data from Stokes et al.'s (1994) study showed there was no significant reduction in GHG emissions with the introduction of energy-efficient compact fluorescent light bulbs. Stokes et al.'s (1994) study also showed that households who insulated their homes had similar per capita GHG emissions to those whose homes were not insulated. There would seem to be a *rebound effect* operating. In line with Stokes et al.'s (1994) finding, though these technologies are resource-efficient, the maximum benefit from them would be attained through resource conservation behaviour by households.

In view of the fact that there are multiple resource-efficient technologies available for homes, a composite Resource-efficient technologies Index (REI) will be developed based on 11 items: have energy saving features - energy efficient bulbs and appliances, extra insulation, insulating blinds, solar panels and solar hot water; and water saving features - dual flush toilet, low flow shower heads and faucets, instant water heaters on sinks and showers, rainwater tanks, grey water recycling systems and water efficient watering systems (described further in Chapter 4).

#### Conservation behaviours

According to Stokes et al.'s (1994) argument, reduction in resource use is maximised when conservation behaviours are performed together with the installation of resource-efficient technologies. Conservation behaviours assist in reducing individuals' use of resources via frequently repeated behaviours like turning lights off, lowering of thermostat settings of space-and water-heating equipment, driving more efficiently and carpooling, among many others (Dietz et al. 2009; Fielding et al. 2010). How individuals go about their everyday activities involves deeply embedded routinised behaviours (Shove 2003d), which are ingrained in the form of repetitive actions performed with minimum thinking (Maréchal 2009). Conservation behaviours, if embedded within everyday activities, would prevent rebound effects (Moussaoui 2008) and could also lead to achievable GHG emissions (Dietz et al. 2009; Strang 2004; Zacarias-Farah & Geyer-Allély 2003) and waste reductions.

It is important to explore the reasons for the performance of conservation behaviours. These behaviours encompass what should be done, when and how. These behaviours are also dependent on individuals' perception of home and self, including practices related to comfort, cleanliness and convenience (Shove 2003a, e; Wilhite 2009). This is evident among Norwegian households, where the tendency is to heat all rooms except for the bedroom so that comfort is experienced when individuals move from one room to the next (Wilhite et al. 1996). In a similar vein, Gram-Hanssen (2010) discovered that despite similarities in dwelling type and size, and technologies that relate to heating and cooling of the house, there were differences in energy use due to household behaviours related to temperature control and ventilation within their homes. These behaviours were more likely to be linked to comfort, warmth and light (Iversen 1996 cited in Pedersen 2000).

Besides comfort, cleanliness and convenience also influence individuals' behaviours towards resource use. For instance, clothes dryers allow households to complete their washing whatever the weather and time of the day, but at the expense of higher energy use (Shove 2003c). In addition, convenience also plays an important part in the way cars are used when carrying out everyday activities, even where alternative transport is available (Wilhite & Lutzenhiser 1997). Consequently, as Shove (2003a, p.416) has stressed, 'the really big issues of sustainability and everyday life (are) ... associated with the overhauling of comfort, cleanliness and convenience'. This argument agrees with Stern and Gardner's (1981) proposition that *targeting* behaviours has a greater potential to reduce resource use. This association is consistent with Gregory and Di Leo's (2003) claim that individuals with more awareness of conservation issues are likely to have behaviours related to less water use. All of these point to the need for a consideration of conservation behaviours as part of the conceptual framework for this research. As individuals may carry out one or more such behaviours at home, the Conservation Behaviours Index (CBI) is a summation of a list of 12 items: have energy conservation behaviours - turn off lights and computers and monitors, use power strips, dry clothes outside, keep thermostat relatively low, unplug small appliances when not in use and minimal use of power equipment when landscaping; and have water conservation behaviours minimise shower time and toilet flushing, run clothes and dishwashers only when full, wash cars rarely, look for and fix leaks regularly and avoid hosing down walkways and driveways (and discussed in detail in Chapter 4).

#### Environmental awareness

Environmental awareness has been deemed to be important in determining resource conservation behaviours. This relationship is reflected in studies on resource

conservation campaigns and behavioural change: either 'unspecified', like saving the environment, or 'specified', such as using less electricity due to the installation of energy efficient lighting (Dahlstrand & Biel 1997; Voronoff 2005). Reviews of indwelling water reduction campaigns (Syme, Nancarrow & Seligman 2000) have shown that the effectiveness of such campaigns depends on individuals' awareness of water conservation issues and knowledge of specific conservation behaviours (example, turning off the tap while brushing teeth).

The link between individuals' resource conservation behaviours and their environmental awareness could not be more aptly put than by Markowitz and Doppelt (2009, p.2), who state that 'behavioural change must be the result of conscious decision-making on the part of the individual and have an outcome (example, reduced energy consumption) that has a clear and direct link with reduced GHG emissions' where every action is 'purposively and consciously' taken that leads to a reduction in GHG. Markowitz and Doppelt's (2009) statement and Syme, Nancarrow and Seligman's (2000) review clearly propose that there is a link between individuals' environmental awareness and resource conservation behaviours. How individuals and households behave towards the adoption and use of resourceefficient technologies also depends on their awareness of these technologies. This inclusion of environmental awareness is not only confined to studies of resource use such as energy conservation in Mills and Schleich's (2012) study, but was also observed by Barr (2004, p.40) in relation to waste management. Here, 'local waste knowledge' of recycling facilities within the city and at the kerbside (where applicable) had a strong influence on recycling behaviours.

The review of environmental awareness studies indicates that 'awareness' can be expected to have some impact on consumption. Environmental awareness is incorporated as part of the conceptual framework for this research, for which a composite index has been derived: the Environmental Awareness Index (AI). It is a summation of three items: familiar with ecological footprint calculator, have renewable energy source, and aware of governments' initiatives on resource conservation. This is further discussed in Chapter 4.

### 2.1.7 Household context

#### Household type

Household type is found to have an influence on in-dwelling energy use and travel, and also on waste management like composting.

Taylor and Todd's (1997) perspective on composting was based on the hypothesis that the activity was fundamentally a household activity and would thus be more susceptible to influence from household members. In a similar vein, Hamilton, Denniss and Baker (2005) looked at levels of wasteful consumption as influenced by household type. The authors found that with regard to wasteful consumption of fresh food, parents of young children tended to throw out more fresh food than any other household type. In relation to wastefulness of clothing, this was found to be the highest among young couples, which suggested the influence of income, particularly the increased disposable income available to young couples living together.

### Household size

Studies which have examined household size as a determinant of consumption have demonstrated mixed results in terms of energy use, given that household size may not be the only determinant of consumption, as income and dwelling type or size are other influencing factors.

Stokes et al. (1994), in calculating the average per capita household GHG emissions, discovered that the amount of GHG emissions decreased as the number of children increased in the household as a result of economies of scale in *energy* use for heating and cooling of space, lighting and cooking. However, the reduction was less if there were more than two adults in the household due to the GHG emissions in private car *travel* (Stokes et al. 1994).

Single-person households also seem to have a significant impact on the environment in terms of consumption and *waste management*. According to Zacarias-Farah and Geyer-Allély (2003), single-person households are important drivers behind increasing waste generation. This effect was also found to be true in terms of *water use*. Research by Birrell, Rapson and Smith (2005) and the OECD (2011) showed

that as the average household size decreased, the average per capita water used within households increased.

In Aitken et al.'s (1994) analysis of water consumption in metropolitan Melbourne, the authors concluded that household size, net annual property value and number of clothes washing machine loads per week explained 60 per cent of the variation in the data, with household size being the strongest predictor. Studies with similar correlations between household size and in-dwelling-energy use, as well as associated GHG emissions outcomes were also found by Dey et al. (2007) in Australia, Druckman and Jackson (2008) in the United Kingdom, and Lenzen et al. (2006) in Denmark. Due to economies of scale, households with larger numbers of people tended to share common living areas (Dey et al. 2007), which would lower the heating and electricity usage per person and thereby reduce energy use and carbon emissions. Similar findings were recorded by Newton and Meyer (2010). However, contrasting findings were discovered in Lenzen et al.'s (2006) study on Japanese households. It was found that in larger-sized Japanese households, economies of scale could not be achieved, as increasing household size was uniquely positively correlated with in-dwelling energy use. The reason was that resources were not commonly shared among Japanese people in the same household to effect the economies of scale. As heating and cooling in the Japanese home were not centralised, heating appliances and air conditioners were installed in each individual room. In addition, often each additional family member had their own equipment in the same house, such as kitchen, bath and television sets. This finding suggests that cultural context may be a determinant of consumption. This is discussed in Chapter 3.

In terms of *travel*, economies of scale may have little or no influence. In Poortinga, Steg and Vlek's (2004) study, household size was positively related to travel when considering transport energy use. Indeed, it could be argued that economies of scale could be achieved if the drivers carry one or more passengers (that is: carpooling effect).

#### 2.1.8 Dwelling context

#### Dwelling size

When it comes to dwelling context, size does matter when considering consequential resource use and environmental impact. This is because larger dwellings need more resources, not only in construction, but they also create greater demand for indwelling energy and water use during operation, especially for the heating and cooling of rooms, heating water, as well as for electronic appliances (Schipper et al. 2001; Wilson & Boehland 2005; Zacarias-Farah & Geyer-Allély 2003). As large dwellings have also been generally equipped with more appliances (OECD 2011), more in-dwelling energy and *water* are used. Space heating and cooling of dwellings has been identified as demanding the most *energy* in most western societies. Appliances create the next highest energy demand after space heating and cooling (Department of Climate Change and Energy Efficiency 2010; Schipper et al. 2001; Shove & Warde 2003) and are increasing at the fastest rate now that there are energy efficiency standards for thermal performance of new dwellings.

In relation to in-dwelling energy use, a study by Wilson and Boehland (2005) showed that size still matters, despite the installation of *resource-efficient technologies* like double-glazed windows. The authors' investigation was based on a small home of 139 square meters and a large home of 279 square meters with comparable resource-efficient technologies. The small home was found to use less energy than the large home.

#### Dwelling type

Past research has identified that the dwelling type, ranging from a single detached house to an apartment, as a factor in understanding resource consumption and waste management. Dwelling types such as detached and semi-detached homes are typically associated with larger sized-homes.

Studies have found that there are statistically significant differences between dwelling type and annual *energy* consumption (Lutzenhiser 1997), and also that the dwelling type affected in-dwelling energy consumption positively (Lenzen, Dey & Foran 2004). In a similar vein, Høyer and Holden (2001), in their investigation of households and consumption, discovered that dwelling type significantly influenced the total energy use for space heating and electrical appliances. Single dwellings had the highest energy use for both total energy use and energy use per cubic metre, while apartments or flats had the lowest. Semi-detached dwellings came in between. In terms of GHG emissions, variations were found among different dwelling types (Figure 2.2) based on Myors, O'Leary and Helstroom's (2005) study on residential dwellings in Sydney, Australia. The daily GHG emissions of detached dwellings were the highest, except for high rise dwellings, due to the inclusion of common area energy consumptions as well as in-dwelling consumption. In terms of per capita, the daily GHG emissions were the lowest for those living in townhouses and villas, and the highest in high-rise dwellings. For dwellings constructed before the introduction of energy efficiency ratings (2003) these dwelling type influences exist, but for new dwellings they should diminish or disappear (NatHERS).

In terms of water use, Cheruseril and Arrowsmith's (2007) study of sociodemographic factors on water consumption in Melbourne, Australia, found that where there was an increase in the number of separate dwellings, water consumption increased. This study also found that separate dwellings had a higher per capita water consumption than medium density housing. In line with the influence of dwelling type on the amount of *water* used, especially for those with gardens, Birrell, Rapson and Smith (2005) found that there was a very close correlation between detached dwellings and outdoor water usage for gardens. However, when dwelling type and garden factors were controlled, Syme, Thomas and Salerian (1983) found that gross family income and household size were significantly and positively related to increased water consumption; that is: multiple factors influence water use.



Figure 2.2: Dwelling type and in-dwelling GHG emissions

Source: Myors, O'Leary and Helstroom (2005, p.9)

# Tenure

Tenure has been advanced as a further influence on resource use. Brandon and Lewis' (1999) analyses of households in Bath, United Kingdom, found that there was a positive correlation between income-ownership and *energy* use. In this study, tenants of public housing, who were also from lower income groups, were found to use the least in-dwelling energy. This was followed by private renters and owner-occupiers, who had the highest energy consumption. On the contrary, in a study by Cheruseril and Arrowsmith (2007, p.14) on factors influencing water consumption in Melbourne, Australia, the authors concluded that 'an increase in owner occupied dwellings results in a reduction in water consumption'.

The relationship between home ownership and in-dwelling energy use is also influenced by installation of *resource-efficient technologies* such as energy-efficient lighting and home insulation. These installations subsequently have an impact on the amount of GHG emissions (OECD 2011; Utley & Shorrock 2008). Utley and Shorrock's (2008) investigation of this relationship on households in the United Kingdom showed that home owners were more likely to invest in ceiling insulation than tenants. About 96 per cent of home owners with accessible lofts had ceiling insulation compared to only 79 per cent of private tenants. Due to ceiling insulation, home occupiers were able to reduce energy use for space heating and cooling, and also GHG emissions. The reason why home owners rather than tenants were more willing to invest in these technologies like home insulation is the *split incentive issue* (Shove et al. 1998). There is little or no return on investment by landlords from investing in insulation and energy/water efficient appliances to reduce in-dwelling energy and water use – a cost borne by tenants. Landlords will have few incentives to undertake such investments in their rental properties since tenants will be primarily the beneficiaries through lower energy and water bills. Similarly, tenants, too, will have little incentive to make such an investment in a property they do not own, especially if they are planning to occupy for a short period of time and are also unlikely to recover the sunken costs associated with these installations (OECD 2011). However, a noticeable outcome from the OCED (2011) study showed that this seemed not to be the case with the installation of energy-efficient bulbs, which are relatively low-cost and transferable.

#### 2.1.9 Summary of review of past research

The literature review on consumption determinants has shown that multiple factors influence domestic consumption patterns and their associated ecological footprints. These factors range from individual structural and behavioural attributes to household and dwelling contexts. This review also points to the reality of a multi-determinant environment for understanding domestic consumption. Drawing on a synthesis of these reviews, the proposed conceptual framework for this thesis is represented in Figure 2.3. It is a framework including established determinants of consumption as well as sustainability metrics that measure the magnitude of an individual's ecological footprint.

Figure 2.3: Conceptual framework for understanding individual resource consumption in a multicultural urban society



It is proposed that an *extension* of this framework include culture as a determinant, because culture may accentuate these differences in ecological footprints among individuals as well as countries. The inclusion of a cultural component as an influencing factor on consumption is deemed appropriate to multicultural Australia. With its population increasingly fed by migrants from different ethnic groups, the intertwining of an heterogeneous ethnic culture within its social fabric is accentuated. The following section looks at Australia's changing cultural make-up. Chapter 3 explores the literature that further informs the proposition of integrating cultural context as one of the multiple factors influencing consumption.

# 2.2 Migration, multiculturalism and consumption in Australia

Australia's population has been changing in terms of size and composition. The population has more than doubled from 10.3 million in 1960 to 22.3 million in 2010 (ABS 2013f). In 2014, the population was 23.7 million (ABS 2014d). The recent growth rate is faster among developed countries. Though a natural increase is one cause of population growth, migration is seen as the main driver for the recent rapid population growth. These demographic changes are illustrated in Table 2.2, with migrants making up almost a quarter in 2006, increasing to 27 per cent by 2011. This

migration growth correlates with the increasing population in capital cities like Melbourne, Sydney, Perth and Brisbane. Based on the current population trend, the concentration of the urban population in these capital cities is projected to increase from 64 per cent in 2008 to 67 per cent by 2051 (ABS 2010). Through Australia's migration programs, migrant groups have continued to add to the heterogeneous nature of its multi-cultural society. The increasing heterogeneity is discussed below.

Table 2.2: Overview of Australia-born and overseas-born residents (percentage) from 1966 to 2011

Year	1966	1971	1981	1991	1996	2001	2006	2011
Country of birth								
Australia-born	81.6	79.8	79.1	75.5	77.2	76.9	76.0	73.0
Overseas-born	18.4	20.2	20.9	24.5	22.8	23.1	24.1	27.0
Total population	100	100	100	100	100	100	100	100

Source: derived from data supplied by Australian Bureau of Statistics (ABS 1966-2013)

#### 2.2.1 Ethnicity

Although Australia's history of migration up until the second world war mainly consisted of people of Anglo-European descent (Jupp 2001), there have been some significant changes in its recent demographic mix. These characteristics are illustrated in Table 2.3. The table shows the six countries generating the highest percentage of migrants. From the 1960s to early 1990, a majority of migrants came from England and European countries such as Italy. However, in recent times, migrants have increasingly come from Asia and non-English speaking countries like China, India and Vietnam. Over the last 10 years, the proportion of migrants from China and India has increased (ABS 2013h). With this increase, China overtook Italy as the third most common country of birth in 2006, and India overtook Italy in 2011. The reshaping of Australia's population by migration, especially in recent years, has resulted in a more heterogeneous culture in terms of ethnicity, language spoken and religious practice.

1966	1971	1981	1991	1996	2001	2006	2011
England	England	United	United	United	United	United	United
5.3	6.6	Kingdom <sup>a</sup>					
		5.6	6.6	6.0	5.5	5.2	5.1
Italy	Italy	Italy	New	New	New	New	New
2.1	2.3	1.7	Zealand	Zealand	Zealand	Zealand	Zealand
			1.6	1.6	1.9	2.0	2.2
Scotland	Greece	New	Italy	Italy	Italy	China <sup>b</sup>	China <sup>b</sup>
1.2	1.3	Zealand	1.5	1.3	1.2	1.0	1.5
		1.4					
Greece	Scotland	Scotland	Yugoslavi	Vietnam	Vietnam	Italy	India
1.1	1.3	1.0	a	0.9	0.8	1.0	1.4
			1.0				
Germany	Germany	Yugoslavi	Greece	Greece	China <sup>b</sup>	Vietnam	Italy
0.9	0.9	a	0.8	0.7	0.8	0.8	0.9
		1.0					
Netherlands	Netherlands	Greece	Italy &	China <sup>b</sup>	Greece	India	Vietnam
0.8	0.8	0.9	Vietnam	0.6	0.6	0.7	0.9
			0.7				

Table 2.3: Top six countries of birth for migrants, by year and percentage (in proportion of total population)

Note: a. United Kingdom includes England, Scotland, Wales, Northern Ireland, Channel islands, Isle of Man, and United Kingdom, not further defined

b. China (excludes SARs and Taiwan Province)

Source: derived from data supplied by Australian Bureau of Statistics (ABS 1966-2011)

### 2.2.2 Linguistic diversity

Australia's cultural heterogeneity is also accentuated by the numerous languages spoken by migrants. These linguistic diversities can be observed in the figures for main languages spoken at home, and the proficiency of spoken English and other languages among migrants. While the percentage of the population who spoke only English at home decreased (Table 2.4), there was an increase in the use of other languages (Table 2.5). The most commonly spoken languages besides English were Italian, Greek, Arabic, Cantonese, and Mandarin. Percentages of speakers of these non-English languages increased from 6.4 per cent of the total population in 2006 to 7.2 per cent in 2011 (Table 2.5). By 2011, Mandarin overtook Italian as the most common language spoken among migrants in Australia.

Table 2.4: Language spoken at home, as proportion of total population

Language spoken at home	2006	2011
	%	%
English only spoken at home	78.5	76.8
Households where two or more languages are spoken	17.7	20.4

Source: Australian Bureau of Statistics (ABS 2008 and 2013)

Table 2.5: Top five main languages spoken at home other than English in 2006 and 2011 (as percentage of total population)

Language spoken at home	2006	2011
(other than English)	%	%
Mandarin	1.1	1.7
Italian	1.6	1.5
Arabic	1.2	1.4
Cantonese	1.2	1.3
Greek	1.3	1.3
Total	6.4	7.2

Source: Australian Bureau of Statistics (ABS 2008, 2013h)

The changes in first language spoken by Australia's population reflect the establishment of a multi-lingual environment within its society. Before 1996, about half of all migrants spoke English only. By 2011, the percentage decreased to about 34 per cent (Table 2.6). Among those who spoke English and other languages, more migrants indicated that they spoke English 'Not well or not at all' in 2011 compared to 2006 and earlier. This percentage had more than doubled between 2006 and 2011. These percentages show the increasing incompetency of migrants to communicate in English. For Australia, where English is the national language, linguistic diversity is a societal challenge. The reason for this is that the presence of a multi-lingual environment creates a language barrier that limits the interaction and communication between non-English speaking individuals and the majority English-speaking population. These non-English speaking individuals may have difficulty assessing information and services (Ethnic Communities' Council of Victoria 2008).

Table 2.6: Proficiency in spoken English/Language by year of arrival in Australia

Proficiency in Spoken English/Language (%)	Before 1996	1996- 2000	2001- 2005	2006	2011
Speaks English only	55.0	40.3	39.3	36.3	33.9
Speaks other language and speaks English:					
Very well or well	35.5	48.9	52.8	55.1	42.9
Not well or not at all	8.9	10.2	7.3	7.9	18.6
Proficiency in English not stated	0.2	0.1	0.2	0.2	0.4

Note: Excludes migrants who did not state their country of birth and did not state language and proficiency in English

Source: Australian Bureau of Statistics (ABS 2012a)

# 2.2.3 Religious diversity

Not only is there linguistic diversity, but also increasing religious diversity in terms of religious affiliations (Table 2.7). As Australia's earlier migrants were predominantly of European descent, as recently as 1996, 70.9 per cent of the population were Christians. This percentage decreased to 64 per cent in 2006 and dropped further to 61 per cent in 2011. The reduction in the number of Christians was due to an increase in the number of Australian residents who were affiliated with non-Christian religions, such as Buddhism, Islam and Hinduism. These three non-

Christian religions were the most commonly stated religious affiliations. Residents' affiliations with these non-Christian religions increased from 2.6 per cent in 1996 to five per cent in 2006, and six per cent by 2011.

In 2001, 82 per cent of those affiliated with Hinduism were overseas -born, with 34 per cent born in India and 11 per cent in Sri Lanka. Similarly, about three-quarters of those affiliated with Buddhism were overseas-born - 26 per cent from Vietnam and eight per cent from China. While 62 per cent of those affiliated with Islam were overseas-born, about 11 per cent were born in Lebanon and nine per cent in Turkey. Similar trends were found in 2006. This multi-religious practice among Australian residents adds to the society's diversity and complexity.

Religion	1996	2001	2006	2011
	%	%	%	%
Catholic	27.0	26.6	26	25.3
Anglican	22.0	20.7	19	17.1
All other Christian	21.9	20.6	19	18.7
denominations				
Sub-total Christians	70.9	67.9	64	61.1
Buddhism	1.1	1.9	2	2.5
Islam	1.1	1.5	2	2.2
Hinduism	0.4	0.5	1	1.3
Sub-total non-Christians	2.6	3.9	5.0	6.0

Table 2.7: Most commonly stated religious affiliation in 2006 and 2011, in proportion of total population

Source: Derived data from Australian Bureau of Statistics (ABS 2006, 2008, 2013h)

### 2.3 Migrants and Australian cities' liveability

In the context of sustainable living in Australia, the challenge is not only to deal with its increasing population size, but also with an increasingly heterogeneous society due to the recent migration trends. One of the pull factors for migration is the liveability of Australian cities, which acts as a magnet for migrants (Newton 2011). However, attaining liveability comes with a cost. As Newton (2012) has aptly pointed out in his liveability-sustainability nexus, Australian cities' liveability comes with a huge environmental cost, due to their associated large ecological footprints

(refer to Figure 1.1). It is also projected that Australia's material living standard is likely to grow strongly (Garnett 2008), which will inevitably lead to further impacts on the environment.

According to Newton's liveability-sustainability nexus (Department of Infrastructure and Transport 2012; Newton 2012), developing countries currently have a lower liveability index and a corresponding smaller ecological footprint than developed countries – but the trend is up. If Australia's liveability is a pull factor for migrants, then the likelihood of migrants from developing countries wanting to attain Australia's level of liveability will also be reflected in their larger ecological footprints in Australia compared to previous footprints in their birth country. For example, the ecological footprint in Melbourne (with a liveability index of 98) is about eight hectares per capita, while it is about two hectares per capita in Qingdao (with a liveability index of 69), China (refer to Figure 1.1). The study by Sobels et al. (2010) was based on a synthesis of aggregate data at local and regional levels in Australia. It found that migrants mirror Australian's high consumption behaviours. Migrants' adoption of the host's consumption behaviours increases pressure on the environment. This connection between migration and environmental impact was the basis for the Federal government's commissioning of research into the long term implications of migration on Australia's natural and built physical environment (Sobels et al. 2010).

However, the finding by Sobels et al. (2010) only illustrates the level at which migrants as a *collective* group consume. A knowledge gap exists in relation to consumption across the five key domains of consumption as well as waste generation, why acculturation in consumption occurs, and how rapidly. By undertaking research at the level of the individual, it is possible to explore to what extent migrants' adoption of the host's culture of consumption is due to the acculturation process, or other factors. To wind back consumption – in host and migrant populations – the point of intervention needs to be informed by a better understanding of the *what* and the *how*, but also the *why* of consumption behaviours across different consumption categories. In Australia's multi-cultural society, it is also crucial to understand the extent to which cultural context is a factor influencing consumption, apart from the established conventional factors. The proposition is to

investigate to what extent ethnic culture influences consumption behaviour among the culturally and linguistically diverse (CALD) group of Chinese-born migrants in Australia, and the influence of the host culture on these migrants' consumption patterns as a result of acculturation.

This literature review has shown that multiple factors underpin domestic resource consumption. In the context of any transition to sustainable living, an extended conceptual framework (Figure 2.3) attempts to understand those factors underpinning urban resource use by urban residents in a high consumption, high income society that is becoming increasingly complex and multi-cultural. The overarching focus of this research is to investigate the extent to which cultural factors, as distinct from other factors identified in past research, influence consumption behaviours of urban population groups. Culture and acculturation appear to be missing factors in relation to sustainable consumption practices in a multi-cultural society. Drawing on the current literature addressing the significance of culture on behaviour, these factors are discussed in depth in Chapter 3.

# Chapter 3 The Role of Culture and Society in Shaping Behaviour

The aim of this chapter is to examine a spectrum of literature that explores links between cultural context and individual behaviours. This serves as a guide to understanding the role that cultural background and context may play in better understanding variability in resource consumption behaviour among a group of Australia-born and China-born residents in Melbourne – the focus of this thesis. Based on this examination, it is envisioned that the derivation of a CALD Index (as an Index of cultural difference) and indicators of acculturation of migrants may reveal the extent to which culture exerts an influence on consumption. This research investigates the extent to which cultural influences, in addition to an array of other established determinants, influence attitudes to conservation of environment and actual consumption. These cultural determinants of consumption are represented in the conceptual framework for the research (refer to Figure 2.3).

# 3.1 Variabilities in consumption among countries

This chapter begins with an examination of cultural difference in urban consumption by exploring patterns of consumption across countries, keeping in mind that variability may not be due to cultural differences but other factors related to climate, natural endowment, level of economic development and economic well-being. Variability in levels and patterns of resource consumption can be observed in terms of energy and water use, CO2 emissions, and of composite metrics such as the ecological footprint (Hanley et al. 1999, p. 57). This is illustrated in Table 3.1. The six selected countries – three developed and three developing countries – are the most common birth places among migrants to Australia (ABS 2013h).

Countries <sup>1</sup>	Electricity consumption (kWh/capita) 2011 <sup>2</sup>	Fuel CO <sub>2</sub> emission (t CO <sub>2</sub> per capita) 2011 <sup>2</sup>	Water consumption ( <i>l</i> /person/year) 1998-2002 <sup>3</sup>	Dietary Energy consumption (kcal/person/ day) 2006-08 <sup>4</sup>	Meat & fish % in dietary composition 2005-07 <sup>4</sup>	Fruit & vegetables % in dietary composition 2005-07 <sup>4</sup>	Food supply (kcal/capita/ day) 2009 <sup>6</sup>	Protein supply (g/ capita/day) 2009 <sup>6</sup>	Size of new home (m <sup>2</sup> )	No. of personal computers per 100 people 2002-2009 <sup>13</sup>	Passenger cars per 1000 people 2010 <sup>14</sup>
Australia	10,514	17.4	179,555	3,220	15	4	3,261	102	2147	60.3	556
China	3,312	6.0	26,393	2,990	15	6	3,036	93.8	116.4 <sup>11</sup>	5.7	44
India	673	1.4	38,578	2,360	NA <sup>5</sup>	2	2,321	56.6	46.8 <sup>12</sup>	3.2	12
Italy	5,393	6.5	156,525	3,4535	115	55	3,627	111.5	8210	36.7	602
New	9,378	6.9	257,446	2,810	15	8	3,172	93.5	205 <sup>9</sup>	52.6	599
Zealand											
Vietnam	1,073	1.6	13,056	2,780	12	5	2,690	74.5	NA	9.7	13
United	5,518	7.1	119,030	3,453 <sup>5</sup>	115	5 <sup>5</sup>	3,432	104.1	76 <sup>8</sup>	80.2	457
Kingdom											

Table 3.1: Variabilities in resource consumption and CO<sub>2</sub> emission per capita in selected developed and developing countries

Notes: 1.Selected countries based on the most common countries of birth of migrants to Australia (ABS 2013), where developing countries are shaded to differentiate them from developed countries.

2. International Energy Agency (2013)

3. Derived from Food and Agriculture Organisation of United Nations (FAO). Data was based on period 1998-2002, where all countries' data were available within this period.

4. Food and Agriculture Organisation of United Nations (2012).

5. Food and Agriculture Organisation of United Nations (2012). Based on EU average / For India, data was not available.

6. Food and Agriculture Organisation of United Nations (FAO 2013b).

7. Average new home size in 2009, Australia (CommSec Economics 2009).

8. Average new home size in United Kingdom (RIBA 2011).

9. Average new home size in 2010, New Zealand (New Zealand Property Investors 2013).

10. CommSec Economics (2009).

11. Average home size in 2011 China, based on data from Peking University (ChinaScope Financial 2012).

12. Urban homes in 2008, India from The Times of India (Thakur 2008).

13. UNDP (2013) report Data refer to the most recent year available during the period specified.

14. The World Bank (2013).

'NA' refers to 'No data is available'.

It is clear that residents of developed countries have higher levels of consumption and  $CO_2$  emissions than developing countries. In terms of energy use, Australia is the highest user of electricity, while India is the lowest. This difference in energy use reflects several factors such as dwelling size (Australians' homes are largest – five times the size of an Indian home). Homes that have more appliances also result in higher energy use. In terms of the number of personal computers owned, Australia has 19 times more than India, which has the lowest number. Australia also has one of the highest rates of passenger car ownership, and Vietnam the lowest.

Australia has one of the highest levels of water consumption: 14 times more per person than Vietnam. Among developing countries, Indians are the highest water users, consuming three times more than the Vietnamese (primarily a function of climate). A comparison among developing countries shows that China tends to have the highest levels of consumption in almost all the energy categories. The Chinese use five times more electricity and operate four times more passenger cars than Indians. These comparisons are also reflected by the higher  $CO_2$  emissions of China.

As shown in Table 3.1, although the variations in food consumption are not as broad as energy and water, differentiations are found among these countries. Australia and the other developed countries tend to have higher dietary energy consumption. Populations from these countries also tend to have higher protein diets. However, the diet of Australians consists of lower fruit and vegetable composition compared with the other developed countries, while Italians tend to have a lower level of meat and fish in their diet. Among developing countries, the diet of Chinese is higher in meat and fish, as well as protein.

This variability in consumption is reflected in national ecological footprints (refer to Table 2.1). A key question for this thesis is the extent to which the culture of an urban resident group can be advanced as a factor capable of explaining differences in consumption behaviour in their host city. Migrants in a host society may make changes to their original cultural/country of origin patterns as a result of a range of acculturation processes (Redfield, Linton & Herskovits 1936).

The following sections present evidence related to the influence of culture on a range of individual behaviours, including consumption. From these discussions, approaches to specifying connections between individuals' consumption and their ethnic culture and level of acculturation are outlined.

#### 3.2 Cultural influence on individual behaviours

Culture can be defined as 'the socially acquired life-style of a group of people including patterned repetitive ways of thinking, feeling and acting' (Fletcher & Light 2007, p.424). The influence of culture on individual behaviours is apparent in 'most areas of our life, such as the way we should dress and what we should eat', and in 'almost everything we do, see, feel, and believe' (Cullen & Parboteeah 2008, pp.46-7). Behaviours can reflect ethnic background, with individuals accepting each other's behaviour without realising the reasons behind it or the need to explain it. For instance, Japanese do not have to explain that by slurping their noodles or eating them noisily they are, through action and sound, showing appreciation of the food. However, this behaviour is not common among, or even acceptable to, Westerners, who consider it to be rude. Behaviours can be shaped by cultural settings.

## 3.2.1 Culture and the individual

Cultural influence does not only include the shared beliefs, norms and values of an ethnic group acquired while at home and growing up (Cullen & Parboteeah 2008, p.49; Gupta 2009, p.149), but pervades *the society* of which individuals are part. Unlike the need to understand and portray civic behaviours so as to live responsibly within a society, individuals display cultural behaviours, such as *language use* and *food consumption*, without having to understand the reasons behind them. This is because 'all societies are ordered by meaningful logics of which the people are more or less unaware' (Harris & Sahlih 1979, p.53). In addition, the pervasive influence of culture on individual behaviours is like a set of unwritten 'rules and symbols of interpretation' (Thomas 1993, p.12). These rules, which are known to have worked in the past, are routinely applied in everyday living, often without any reflection or justification (Geertz 1973, cited in Triandis 1989, p.511). For instance, in Asian culture it is common for junior staff in a company to address the manager by surname, that is, Mr Lin or Miss Lin. In western society, they may be addressed by
their given name, that is, John or Mary. These instances illustrate the differences in *verbal communication* between cultures. The former culture emphasises hierarchical status based on age, education and seniority, where titles are preferred and expected, while the latter has a more open structure where individuals are more frequently addressed by their first name (Cullen & Parboteeah 2008; Gupta 2009). These examples not only depict the visible differences in mannerisms of communication, but also an *underlying* pervasiveness of cultural influence among different ethnic groups.

Cultural influence thus has two expressions: the visible parts of cultural practices that can be observed through behaviour, and the *invisible* parts linked to inherent values and belief systems (Bhawuk & Sakuda 2009). The former has been referred to as the 'front stage' of culture, and the latter as the 'back stage' (Cullen & Parboteeah 2008). Culture is thus likened to an iceberg (Gupta 2009): the top, above water, refers to the visible parts of culture, while the majority of the iceberg, being under water, refers to the invisible parts. This embeddedness of an individual's 'front and back' stages of culture is reflected in everyday behaviour. For instance, in Malaysian and Singaporean cultures it would be considered polite and gracious for the host or hostess entertaining at home to ensure that there are leftovers after a meal as a sign that the guests have been well looked after or well fed. This leftover food is not considered a waste, as it may be seen in other cultures. Such visible contrasts can also be found between Norwegians and Japanese in term of home lighting: Norwegians use small table lamps, reading lamps and spot-lamps to create a mood in their homes, while Japanese prefer fluorescent light to ensure visibility (Wilhite et al. 1996). Another cultural distinction relates to the manner of eating. In Indian households, eating with one's hands is culturally and socially acceptable, while people from other cultures use chopsticks or knives, forks and spoons. In terms of domestic water use, research by Smith and Ali (2006) found that there are cultural and religious differences between the White-Christian and Jewish districts in the United Kingdom. In the White-Christian area, there were no clear high or low usage days in the week. Among the Jewish community there was a sizable peak at sunset on Fridays during preparations for Shabbat (Saturday). As no work is to be done on Shabbat, food preparation and cleaning are done on Friday. These individual activities and practices in everyday life are socially constructed within culture.

Culture shapes behaviour (Bhawuk, Landis & Munusamy 2009), as 'culture ... consists of standards for deciding what is ... what can be ... what one feels about it ... what to do about it, and ... how to go about doing it' (Simpson et al. 1961, p.522).

Culture has the potential to have an on-going influence on a spectrum of an individual's behaviours. To investigate the extent of this influence requires examination of different indicators of cultural context in everyday living. The focus in this research is on ethnic culture, as culture 'shapes a particular way of life' (Hill, Fortenberry & Stein 1990, p.1071) and is thus advanced as a key variable to be explored in the context of explaining individual consumption behaviour.

Phinney (1990) found a group of widely used components of ethnic identity. These were classified into '*what people say they are*' (ethnic identification), '*what they actually do*' (ethnic involvement) and '*how they feel*' (ethnic pride). The study by Phinney (1990, p.506) on ethnic identity dealt with aspects that were 'both common across (ethnic) groups and unique to ethnic identity for any group'. Common aspects, such as 'self-identification, a sense of belonging and pride in one's group', allow for comparisons across groups, as do specific cultural practices, that is, '*what individuals do*'.

In a multicultural society, this understanding of '*what individuals do*' in terms of consumption behaviours can be viewed from two perspectives. Firstly, cultural influence can be viewed in the context of connectedness to an individual's own ethnic culture, where the focus is on what individuals do in relation to their cultural practices and those of other cultures; viz: '*what individuals say they are*', '*what individuals do*' and '*how individuals feel*'.

Secondly, cultural influence can be viewed in the context of migrants' acculturation, which is the process of adapting to a new culture, and it may involve learning the host society language and adopting aspects of the host culture (Berry 2006); viz: to what extent migrants maintain their ethnic culture while at the same time adapting to the host culture (Laroche et al. 1998a). The classifications of '*what individuals do*'

and '*how individuals feel*' are applied to explore the context of migrants and their acculturation.

In the following sections, these two perspectives are discussed in terms of indicators of *cultural context* and indicators of *acculturation*. These indicators are drawn from literature on ethnic identity and ethnicity (Driedger 1975; Hui et al. 1997; Laroche, Kim & Tomiuk 1998; Makabe 1979; Phinney 1990; Woon 1985) and acculturation (Berry, Trimble & Olmedo 1986; Dohrenwend & Smith 1962; Olmedo 1979; Padilla 1980; Yinger 1981).

# 3.3 Indicators of cultural context

In this research, we need to examine the different indicators of cultural context associated with different population groups. These indicators are listed in Figure 3.1.

Figure 3.1: Influence of cultural context (indicators) on an individual



#### 3.3.1 Ethnicity

Ethnicity is a term which can be defined as a collective cultural identity, and is thus 'used for shared values and beliefs, and the self-definition of a group, *us*' (Spencer 2006, p.45). Different methods have been used to identify an individual's ethnicity. Some of these methods include self-identification and country of birth of individuals and/or their parents. In the case of self-identification, individuals select from a candidate list the option that best represents their ethnicity. This subjective method

means that individual identification is somewhat dependent on feeling, and is also a constrained choice within the given list. Using a forced-choice category approach can also pose problems to those who were born into inter-ethnic cultural marriages (Stephan & Stephan 2000). Self-identification by individuals may also differ from actual descent and also from how others assess them. For instance, Yinger (1981, p.253) reported that some American Blacks realised they were more American after having visited Africa. Thus self-identification as a subjective and social construct can constitute an evolving concept of individual ethnicity (Stephan & Stephan 2000). It is also likely that globalisation, and mobility of individuals in terms of travel, work, and residence, may also influence an individual's assessment of self (Giles et al. 1976; Hui et al. 1997; Phinney 1990; Stephan & Stephan 2000).

In other studies, individuals have been identified by their country of birth or their parents' country of birth (Driedger 1975; Driedger & Peters 1977; Laroche, Kim & Tomiuk 1998; Woon 1985). This method provides an objective way of identifying ethnicity, as subjective responses from participants may distort the findings (Phinney 1990, p.504). For example, the study by Woon (1985, p.535) on Sino-Vietnamese, who are Chinese by ancestry but Vietnamese by national origin, concludes that they identify themselves with their birth country, Vietnam, rather than with their ancestry. Having acquired certain physical, cultural and social traits in their birth country, they are permanently different from members of other ethnic groups. The identify by natural rather than social criteria' (Spencer 2006, p.35); that is, on the country of birth of individuals and their parents.

# 3.3.2 Language

Language is not only an important component of culture (Bhawuk, Landis & Munusamy 2009), but it also embodies and transmits culture (Keesing 1974). It constitutes both the visible (verbal) and invisible parts of culture in everyday communications. Most Asians believe that indirect communication is a more polite way of communicating than direct communication, which is preferred by Westerners. Non-verbal communication, such as facial expression, body language and tone, can be part of indirect communication (Cullen & Parboteeah 2008; Gupta

2009). This indirectness also ensures that an individual does not 'lose face'. 'Saving face' allows 'both parties to maintain their position of respect and a graceful way of conceding that does not cause any shame or lowering of prestige in their own and in others' views of them (Gupta 2009, p.158). Individuals may put those from a different culture in a difficult position when they do not realise the importance of saving face, which is an important aspect of the Chinese culture, for example.

Language also embodies culture in terms of the words used in everyday living. Uncooked and cooked rice are differentiated by two words in Chinese, *mi* and *fàn* (YellowBridge 2003), but not in English, where the same word 'rice' is used for both. Another terminology distinction in Chinese is the use of different words to address one's mother's brother, as *jiùjiu*, or one's father's elder brother, as *bóbo* (YellowBridge 2003). In English, only the term 'uncle' is used. These examples depict the visible and invisible parts of the Chinese language where no explanation is needed, though it may be required in English. Thus, language can also be seen as a principal carrier of culture (Smolicz et al. 1990; Triandis 2001) and the 'pivot around which the whole social and identification system of the (ethnic) group is organized' (Smolicz et al. 1990, p.230). Most ethnic groups use language as 'a symbol of ethnic identity and a defining value which acts as a prerequisite for authentic group membership' (Smolicz et al. 1990, p.231). It also means that individuals from another culture will communicate and understand the local culture better when they speak the local (ethnic) language (Cullen & Parboteeah 2008).

Language is also a principal carrier of religion, which is part and parcel of several cultures; for example, a Muslim recites the Koran in Arabic, a Jew prays in Hebrew, and a Hindu exercises devotion in Tamil. When a language is central to an individual's religious practice, it is common to practise the religious belief in that language (Smolicz et al. 1990). On the other hand, converting from a religion commonly linked with an ethnic group to another religion, individuals may lose some aspects of their ethnic culture. For instance, an Indian, who is a Christian convert, emphasised that the acceptance of Christian values had resulted in being separated from Indian culture and Tamil as a language, because these are intertwined with Hinduism (Smolicz et al. 1990). In this research project, the language/s used at

home and how well English is spoken represent key indicators of cultural context for an individual.

# 3.3.3 Religion

While individuals can master more than one language and internalise more than one culture, allowing them to switch or adapt from one to another, religion tends to create its own exclusive boundary (Zolberg & Woon 1999). Individuals may use a second language to communicate with others and may use it when working or living in another country. However, they may continue practising their religion when in another country where a different language is spoken. Religion may play a significant role in defining certain ethnic groups but not others (Dashefsky 1972). This is especially true when religious ideas and values help to create individual identity and behaviour (Mitchell 2006). Judaism is 'the heart of Jewish belief and practice', with traditions surrounding Judaism's history and teaching embodied in festivals and passed on from one generation to another in 'actions, (and) symbolic food' (Breuilly, Martin & O'Brien 2002, p.19). For instance, Jews have a special meal at home on Friday before they celebrate Sabbath or Shabbat every seventh day of the week (Breuilly, Martin & O'Brien 2002; Ingpen & Wilkinson 1994).

Similarly, religious practices are integrated into everyday life (Jacobson 1997; Koenig, Parkerson & Meador 1997; Lee, Miller & Chang 2006), ranging from diet to praying at home and interacting with others in society (Kala & Sharma 2010). For instance, in devout Catholic homes, images of the Virgin Mary or Christ are commonly found. Hindus believe in the sacredness of plants such as tulsi, a herb (Kala & Sharma 2010). Tulsi is planted in the courtyard of Indian houses, where it is commonly worshipped. Islam is an example of a religion that 'demand(s) that all (individuals') actions should have a religious orientation' (Jacobson 1997, p.249). For instance, devout Muslims pray five times a day, because this is one of the five tenets or pillars of the religion (Ingpen & Wilkinson 1994). Every Friday, devout Muslim males attend afternoon prayer at a mosque. These regular observances become routine behaviour. For some Muslim women, the Islamic veil or hijab, a visible part of their religious practice, has become part of their daily attire. Similarly, Jews are prohibited from working on the Sabbath. In Israel, Jews have their

'weekend' on Friday and Saturday, while Sunday is a working day (Ben-David 2011). It is evident that religion can be a significant 'ethnic marker' (Mitchell 2006, p.1138). Christianity has also influenced Australia's public life, although there is a separation of church and state (Frame 2006). Individuals get to enjoy public holidays like Christmas and Easter, which are the most important Christian holy days. Moreover, national ceremonies like Anzac Day commemorations and the opening of parliaments resonate with Christian ideals (Frame 2006). These behaviours and attitudes highlight the significant influence Christianity has on certain aspects of living.

Ethnic preferences and outlooks can be shaped and influenced by religion. In this research, an individual's religious practice is therefore identified as an indicator of cultural context.

#### 3.3.4 Food

Food consumption differs among ethnic groups. This could be due to religious influence, such as the fasting and abstinence from restricted foods observed in many religions (Sarri et al. 2003). 2003). For devout Hindus and Buddhists, no meat is consumed at all; Judaism and Islam prohibit consumption of pork, and Orthodox Christianity forbids meat on fasting days (Shatenstein & Ghadirian 1998). For Catholics, it has been common to have fish instead of meat on Fridays (Ingpen & Wilkinson 1994). During the period of Lent, some Catholics also practise self-denial by fasting or consuming less. To the Catholics, these are symbolic acts in preparation for Easter. Christian sects, such as the Mormons and Seventh-Day Adventists, prepare their Sabbath food the day before (Ingpen & Wilkinson 1994). Seventh-Day Adventists are encouraged to limit their meat consumption and to avoid coffee and other drinks with a high caffeine content, alcohol and tobacco (Hoff et al. 2008). For the Jews, at Yom Kippur, which means 'Day of Atonement', they fast without eating or drinking for a day (Breuilly, Martin & O'Brien 2002, p.26). For Muslims, their dietary habits consists of eating halal meat, which employs an Islamic slaughter method (Bonne, Vermeir & Verbeke 2009, p.19), and refrain from alcohol consumption. These dietary behaviours have become habitual processes that many

Muslims carry out, even when they are visiting or living in another country where such behaviours are not common.

Traditional ethnic beliefs also play an important part in diet. For Chinese, food consumption is historically based on the relationship between diet and health (Kaptuck 1983, cited in Satia et al. 2000, p.940). The belief encourages a balance of yin/yang (as a unity of opposites, 'yin' and 'yang' symbolise the 'female' and 'male' related forces respectively) (Zhang & Baker 2008, p.14) and hot/cold foods in order to balance the organs and thereby ensure good health and a long life: 'Eating yang foods leads to higher energy levels' and 'yin foods help get rid of internal body heat' (Satia et al. 2000, p.937).

Traditional ethnic food beliefs are also central for South Koreans (Kim, Moon & Popkin 2007). The low percentage of fat in the Korean diet and their low rates of obesity have been attributed to a traditional low-fat, high-vegetable diet and the manner in which food is prepared or cooked. Their diet consists of kimchi (pickled and fermented Chinese cabbage), fermented soybean foods, cooked or uncooked vegetables, roasted or broiled meat or fish, and soup. Similarly, the Turks' very strong sense of hospitality is reflected in their love of food. Most meals include dairy products such as yogurts and yogurt drinks. As required by Islamic tradition, pork is not permitted. The host family normally spends hours eating dinner over several courses. Dinner finishes with a cup of very strong Turkish coffee or tea, even if it is late in the evening (Abazov 2009). All these illustrate that it 'is not just to eat; it is to prefer certain foods cooked in certain ways' (Geertz 1973, p.53), and affirm that 'food takes on ... cultural meanings' (Hargreaves, Schlundt & Buchowski 2002, p.143-4) in everyday living. As the type of food consumed is intertwined with certain cultures, individual food preferences are identified in this research.

#### 3.3.5 Festivals

Cultural practices also include festive celebrations of customs and rituals (Ingpen & Wilkinson 1994), which have been observed over generations. Reasons for celebrating include the maintenance of cultural traditions and to showcase ethnic culture (McClinchey 2008). While some celebrations are linked to religious beliefs

and practices, other festivals may mark the birth of a deity or the passing of time, such as the coming of spring (Ingpen & Wilkinson 1994).

Greek Orthodox Christians observe three main periods of fasting before certain festivities throughout the year (Sarri et al. 2003), when they must abstain from specific types of food as part of their daily diet. For instance, in the 40 days before Christmas, the eating of meat, dairy products and eggs is not permitted, while fish and olive oil are allowed except on Wednesdays and Fridays. During Lent, fish can only be consumed on two days and olive oil on weekends, while meat, dairy products and eggs again are not allowed. The diet of Greek Orthodox Christians is therefore a periodic vegetarian one that includes fish and seafood.

For Chinese, traditional festive celebrations occur according to the lunar calendar, and are part of their cultural heritage (Dawson 1991; Ingpen & Wilkinson 1994). Popular festivals such as Chinese New Year (*Qunjie*) and All Souls' Day (*QingMing*) have specific cultural meanings and demonstrate togetherness (Chongqing Publishing House 2000; Tong, Ho & Lin 1992). Chinese New Year is a time for every member of the extended family to come together for a reunion and for celebratory meals to illustrate the cultural importance of family. All Souls' Day is marked by family members visiting the ancestral tombs to show their respect to the dead. The importance of family and ancestors is also reflected among those who practise daily offerings and prayers at the family altar at home, which may be symbolised in the form of a *li dai zhu xian* tablet (Chongqing Publishing House 2000; Tong, Ho & Lin 1992; Triandis 1989). One distinctive practice among Chinese is receiving *ang pow* or red packets, which contain money. As these red packets symbolise good luck and success, they are typically given to those who are leaving home to pursue study or work, as wedding and birthday gifts, and especially during Chinese New Year (Chongqing Publishing House 2000).

In Turkey, where diversity is one of the characteristics of modern culture, most people still observe Islamic traditions and symbols. Religious festivals are celebrated, such as *Seker Bayrami*, which ends the fasting month of *Ramazan*, and folk festivals such as *Nevruz*, a spring festival. These festivals and family occasions, such as the birth of a first child, the building of a new home or a wedding, are

celebrated with family and community, accompanied by music, dance and plenty of food and drink. The importance of family and community togetherness is also evident in leisure and entertainment activities. These usually occur on weekends where the extended families indulge themselves 'with never-ending feasts and gossip about family and community members' (Abazov 2009, p.171). Although this traditional practice has diminished over time, Turks still strongly believe that 'being with their family and community is an important part of their culture and of their Turkishness' (Abazov 2009, p.171). Cultural festivals are thus 'generally motivated by a desire to express, affirm and preserve a particular cultural heritage' (Dawson 1991, p.37).

Frequency of participation in cultural festivals and practices is used to identify the level of importance individuals assign to celebrating festivals and to retention of their culture.

# 3.3.6 Social interactions and cultural identity

Interaction between cultures is 'continuous and first hand' (Berry, Trimble & Olmedo 1986, p.293). It is through these conduits that individuals can 'successfully integrate cultural aspects of .. (ethnic) groups' and 'maintain a sense of connectedness and identity with ... (these) groups' (Cuéllar, Arnold & Maldonado 1995, p.279; Page 2006, p.271). Social interactions of migrants within a host society indicate the level at which individual migrants are at ease in engaging in activities within their local communities and wider society (Padilla 1980). Migrants' involvement in a host society's activities reflects their relations with that society (Phinney 1990). The extent of interaction also indicates their level of acceptance of, or adaptation to, the host society (Berry 2006), since socialisation with members of the host culture allows migrants to gain knowledge of the host culture (Padilla 1980).

*Cultural identity* can be defined as 'a sense of solidarity with the ideals of a given cultural group, and to the attitudes, beliefs, and behaviours manifested towards one's own (and other) cultural groups as a result of this solidarity' (Schwartz, Montgomery & Briones 2006, p.6). Lee (2010), in his study on the relationship of migrants' with their ethnic group and host society, uses two constructs to measure their

identification with each. The first construct consists of three items that measure identity with own cultural group: 'I feel proud to be a member of my own culture', 'I feel close to people of my culture of origin' and 'I don't like to tell others which culture I am from' (reversed wording). For identity with the host society, the construct consists of three items: 'desire to know about the life of people from the host culture', 'feel close to the people of the host culture' and 'I would not feel proud to be a member of the host culture' (reversed wording). Lee's (2010) study shows that migrants who identify strongly with the host society tend to interact more with the host society, and are able to identify with host values and ways of thinking and behaviour.

Past studies (Verkuyten & Thijs 2002) have shown that individual migrants' orientation towards the host society is likely to have important implications on attitudes to multiculturalism, because the more people identify with their own ethnic group, the more likely they will consider it important to preserve their own culture. Migrants may become more orientated towards the host culture, with more exposure to it over time (Hong, Roisman & Chen 2006).

In drawing on these past studies, it can be seen that migrant involvement in local community interactions is related to the extent to which they feel they belong and fit well into the host society. According to Phinney (1998, p.82), 'it is important to assess the feeling of belonging', as individuals 'may use an ethnic label when specifically asked for one and yet may not have a strong sense of belonging to the group chosen'. This research investigates both the China- and Australia-born participants' social interactions and their identification of *sense of belonging and fitting into host society*.

#### 3.4 CALD Index

A review of literature has revealed how cultural influence on individual behaviours in everyday living can be examined using different indicators of cultural context. This raises the question of what influence connectedness to ethnic culture has on everyday activities in the context of sustainable living. It is proposed that a measure of connectedness to ethnic culture can be represented by the CALD (culturally and

linguistically diverse) Index: in relation to 'who individuals say they are', 'what individuals do' and 'how individuals feel'.

The adoption of the term 'CALD' in this research is due to the unique reference to the 'culturally and linguistically diverse' (CALD) communities found in Australia today. CALD is used to acknowledge a multi-ethnic or 'culturally diverse' society (National Multicultural Advisory Council 1999) due to the changing demographics of its population, which increasingly comprises migrants from various ethnic groups with linguistic and religious diversity. This terminology refers to individuals 'who identify as having a specific cultural or linguistic affiliation by virtue of their place of birth, ancestry, ethnic origin, religion, preferred language, language(s) spoken at home, or because of their parents' identification on a similar basis' (The Victorian Multicultural Strategy 2002). In acknowledging the diverse nature of communities in Australia, governments have aligned policies and programs with reference to the CALD populations. These aim at building social and community cohesion and promoting events and activities of relevance to these groups. The CALD community is also taken into consideration when communicating government policies in various ethnic languages (Department for Immigration and Citizenship 2012; Ethnic Communities' Council of Victoria 2008). For example, organisations such as the Moreland City Council and Moreland Energy Foundation have embarked on programs that inform CALD communities in relation to climate change and domestic energy and water conservation (Ethnic Communities' Council of NSW 2014; Ethnic Communities' Council of Victoria 2008; Moreland City Council 2014; Moreland Energy Foundation 2011). Targeting messages has also proven to be attractive in the context of health and family issues relevant to the CALD population (Caperchione et al. 2011; Kaur 2009). However, very little research has been identified in relation to the use of CALD in the context of consumption and the environment.

The CALD Index derived for this study comprises the seven components illustrated in Figure 3.1. The CALD Index, as a multi-factor index, can be expected to be a more powerful indicator of consumption behaviour than each individual component, due to the inter-related and potentially additive nature (Rosenthal & Hrynevich 1985) of ethnic identity and cultural influence. Calculation of the CALD Index in this study is based on a summation of the seven indicators identified above:

# CALD Index = $\sum$ Ethnicity + Language + Religion + Food + Festivals + Interactions + Cultural identity

The CALD Index is a scale depicting distinctiveness of ethnic culture. From the summation of the seven indicators, a minimum score of 12 indicates strong connectedness with the host culture while a maximum score of 48 indicates strong connectedness with Chinese culture.

## 3.5 Migrants and acculturation

Cultural influence on an individual's lifestyle and behaviour is likely to occur when migrants settle in a society different to that of their place of origin. It is possible that migrants from different countries of birth (especially those migrating from developing to developed countries) would develop consumption behaviours different from those of their country of origin, and more aligned with the host society. Migrants not only have to set up new homes, but may also adopt the host's consumption behaviours, which are common to everyday living practices in the host society, and may be dissimilar to past behaviours in their country of origin. From a migrant's perspective, they now carry out their everyday behaviours in a multicultural Australian environment, where they relate such behaviours to their ethnic *and* host cultures. Zolfagharian and Sun (2010) have identified individuals who practice these behaviours of integrating and/or alternating between two sets of cultures as *biculturals*. Studies (Laroche et al. 1998a) have shown that consumption behaviour is a function of both adoption of the host culture *and* retention of the ethnic culture.

Living in a new society, migrants may choose to adapt to or adopt certain aspects of the host culture, while at the same time retaining all or some aspects of their own ethnic culture (Hong et al. 2000; Phinney 1998). This refers to a process of acculturation, a concept which 'deals broadly with changes in cultural attitudes, values and behaviours that result from contact with two distinct cultures' (Phinney 1998, p.77). In other words, changes in behaviour due to acculturation are likely to occur. Individuals' behavioural changes are dependent on 'the extent to which they wish to retain their ethnic culture and the extent to which they wish to become

involved with the .... (host) society' (Phinney et al. 2006, p.72). In a similar vein, Berry, Trimble and Olmedo (1986, p.296) stress that individuals' participation in, and response to, acculturation vary because not every individual 'will necessarily enter into the acculturation process in the same way or to the same degree'. Acculturation is thus seen as a two-dimensional process (Phinney 1998), where migrants are retaining their culture while adapting to the host culture at the same time (Laroche et al. 1998a). The approach taken in this research reflects this twodimensional perspective on acculturation. Here, the focus is on China-born migrants, and on examining the extent to which their patterns of consumption change when they permanently relocate to Australia.

#### 3.5.1 Indicators of acculturation

Levels of acculturation vary among individual migrants due to the relative influence of different aspects of the ethnic and host cultures (Berry, Trimble & Olmedo 1986; Phinney et al. 2006). It is important to understand what these aspects are in terms of their level of influence in an acculturation process. Laroche et al.'s (1998a) study of Italian-Canadians living within the English-Canadian culture found three indicators of Italian-Canadians' acculturation in relation to food consumption. These are: media exposure in either the English or Italian languages (watching television, listening to radio, reading newspapers, and magazines or books), social interaction with friends and neighbours and participation in activities and organisation, and language used with family members. In another study, Page (2006) found that although the length of residence in a host society does have a significant impact on the acculturation process, individuals' strength of connectedness with their own ethnic culture and their relative eagerness to adopt the host culture also affects this process.

The literature has shown that there are several indicators of the acculturation process. These are: ability to speak host society's language, length of residence in host society, generation (age), and social interaction with host society. They have been applied in acculturation studies related to food, mental health, social, psychological and physical health of migrants (Laroche et al. 1998a; Makabe 1979; Park et al. 2003; Rissel 1997; Rogler 1994; Rosenthal & Hrynevich 1985; Suinn, Khoo & Ahuna 1995; Wiecha et al. 2001). These studies demonstrate the multidimensional

nature of acculturation, and align with Phinney's (2006) proposal that acculturation is multifaceted and dynamic, and cannot be understood in any depth unless this is recognised. In this research, the proposed indicators for examining China-born migrants' acculturation in the Australian context are: language as medium for communications and mass media, social interactions, feeling of ethnic pride, length of residence in host society, and age at arrival (Figure 3.2). They form part of the conceptual framework for the analysis of the determinants of migrants' *change* in consumption (ecological footprint) between the country of origin and the destination.

## Figure 3.2: Indicators of acculturation

# **Indicators of Acculturation:**

- Language as medium of communications
- Language as medium of mass media
- Social interactions
- Feeling of ethnic pride
- Length of residence in host society
- Age at arrival

#### Language as medium of communications and mass media

In several studies on acculturation, language is acknowledged as central (Makabe 1979; Rissel 1997; Rosenthal & Hrynevich 1985; Wiecha et al. 2001), as language is the conduit for communication and understanding in multicultural settings (Poppitt & Frey 2007). Due to the important influence of language, Laroche et al. (1998i) proposed the measure of linguistic acculturation as the acquisition of the host culture through language use. This is also emphasised by Suinn et al.'s (1995, p.45) study on acculturation. The authors found that an individual's level of acculturation could be predicted based on their 'language skills and preferred language in which to communicate and to be entertained'. The latter is in line with Marin et al.'s (1987) research on linguistic acculturation associated with mass media, such as television and radio. In Omar et al.'s (2004) survey of food shopping behaviour among ethnic and non-ethnic communities in Britain, the authors found that ethnic-minority based

newspapers were an important source of information for the majority of ethnic consumers.

As English is the official language in Australia, it is necessary to investigate the extent to which China-born migrants speak or make use of the English language in their everyday activities. Living in an English-speaking society, China-born migrants need to use the English language out of necessity during their interactions with the host society and in accessing information through mass media. Only with such information and knowledge can migrants 'operate effectively in a specific social or cultural milieu' (Sam et al. 2006, p.118). One such example in relation to the consumption (of energy) is viewing advertising on the 'Household Assistance Package under The Clean Energy Plan', an Australian government initiative. This initiative is broadcasted in the English language over free-to-air television and via newspapers. Its aim is to raise awareness of some aspects of low carbon living so that residents can make them applicable to their everyday lives. In addition, having knowledge of this initiative may encourage them to access the internet to find out more about the 'Clean Energy Plan', and other related issues on how to save energy and money, including reduction in their GHG emissions. The intended effect is a change in behaviour in the context of sustainable living. However, access to this information to effect behavioural change may be limited among migrants who do not speak English, or speak it with limited proficiency (Ponce & Comer 2003).

The continuous use of the English language as the medium for communication and mass media would assist migrants in gaining knowledge of a host society and adapting to its culture. This continuous use may result in 'loss' of migrants' ethnic identity, as supported by Laroche et al.'s (1998i, p.429) study, which has shown that as individuals '(acculturate) linguistically, there then (occurs) an increasing marginal loss of ethnic identification'. While Laroche et al.'s (1998b) findings have shown that migrants do lose some of their cultural behaviour during the acculturation process, it left unanswered the question of whether loss of some aspects of cultural identity has any influence on changes in other aspects of behaviour.

In this research, English language use is explicitly used in exploring the acculturation process of China-born migrants in two domains of communications

and mass media: 'use of English language in speaking, writing and thinking' and 'use of English language in mass media'.

## Social interactions

As language is the conduit for broad-based communication and social interaction, a high correlation between language use and social interaction has been established by previous studies, for example on Japanese-Canadians (Makabe 1979) and Turkish-Dutch migrants (Arends-Tóth & van de Vijver 2004). Both language use and social contact were identified by Turkish-Dutch migrants as the two main difficulties in dealing with Dutch culture (Arends-Tóth & van de Vijver 2004). This finding, which is consistent with Suinn et al.'s (1992) study on the underlying factors in level of acculturation, stresses the importance of the association between language use and ethnicity of friends. A preference for social interaction with individuals from specific ethnic groups and/or the host society will impact upon an individual migrant's degree of acculturation. In other words, it is an individual's 'preference of one cultural orientation over the other' (Padilla 1980, p.48), in terms of types of activity they want to be involved in, that dictates the rate of acculturation.

As acculturation is a two-dimensional process, participating in the host society's cultural festivals and celebration of holidays are seen as avenues for migrants to get involved with and learn about the host culture (Cuéllar, Arnold & Maldonado 1995; Page 2006). It is through these interactions that migrants may explore change in their own behaviours (Cuéllar, Arnold & Maldonado 1995). At the same time, social interaction within an individual's ethnic group is another avenue through which individual migrants can retain their ethnic culture. These interactions could involve participation in community activities organised by their ethnic clubs or associations (Rosenthal and Feldman 1992). Perhaps another less apparent way in which individuals maintain their ethnic culture is in gathering to celebrate traditional ethnic activities and festivals as part of their cultural heritage. Celebrations of these monoethnic festivals are 'generally motivated by a desire to express, affirm and preserve a particular cultural heritage' (Dawson 1991, p.36). Participation in these festivals with family and friends and getting involved in ethnic community clubs or associations, is akin to renewing individuals' commitments and ethnic affinity with the ethnic group (Dawson 1991). Ponce and Comer (2003) have postulated that

performing these traditions and holding on to ethnic culture is seen as a 'survival' mechanism by migrants. This is further supported by Padilla (1980, p.48), who identifies that a 'lesser acculturated individual will prefer ethnic activities and will maintain a network of close friends, including spouse, of the same ethnicity'.

In leaving their countries of birth, migrants lose most of their social relationships and subsequently need to re-establish them in a different socio-cultural context (Rogler 1994). From a migrant's perspective, social interactions occur with their own ethnic group *and* host society. In order to elicit the importance of social interaction in the acculturation process of China-born migrants, social interaction is examined in two aspects. First, social interaction with the host society is a measure of the extent to which migrants wish to engage with Australian society. Second, social interaction within migrants' own ethnic groups is indicative of their preference for some retention (small or large) of aspects of their ethnic culture. In this research, social interaction as an indicator of acculturation is measured by individual China-born migrants' involvement in Chinese clubs or organisations and traditional ethnic festivities.

#### Feeling of ethnic pride

The acculturation process is also affected by an individual's feeling of ethnic pride. Ethnic pride refers to the degree to which individuals consider it desirable to continue to be a member of their ethnic group (Liebkind 2001), and is indicative of their positive attitudes towards, and contentment with, the group (Phinney 1998). In line with this, Rotheram-Borus (1993) proposed that individuals who strongly identified with their ethnic group reportedly had more ethnic pride towards their own group and less frequent social contact with other ethnic groups.

However, studies on ethnic identity by Phinney (1991) indicate that although some individuals exhibit fewer ethnic behaviours and practices, they may still have a strong sense of belonging to their cultural group. In this research, individual migrants' feeling of ethnic pride is applied as an indicator of acculturation process. The affirmation of their ethnic pride is based on the question, 'Are you proud of being Chinese?'.

#### Non-cultural and established factors

Past research has shown that studies on acculturation should also include noncultural and conventional factors, and should not be confined to ethnic culture. Works by Ponce and Comer (2003) and Suinn et al. (1987) have stressed the importance of non-cultural factors such as age of migrant and socio-economic status in the acculturation process. The non-cultural factors commonly applied in acculturation studies are: present age of migrant, age at arrival, length of residence in host society, and several factors like gender, educational level, generation (age cohort), and income (Berry, Trimble & Olmedo 1986; Marín et al. 1987; Padilla 1980; Ponce & Comer 2003; Rissel 1997; Wiecha et al. 2001).

According to past studies (Park et al. 2003; Rissel 1997), length of residence in a host society does influence the migrant acculturation process. Migrants' length of exposure to the host culture is connected with the length of residence in the host society (Page 2006; Park et al. 2003; Rissel 1997; Suinn, Khoo & Ahuna 1995). Berry et al. (1986) indicated that migrants who resided longer in a host society experienced greater acculturation than those who resided for a shorter period. The number of years since migration to a host society is a distinguishing time marker, as it 'provides a more sensitive index of time' (Phinney 2006, p.85). Data from several studies (Cabassa 2003; Marín et al. 1987; Page 2006; Rissel 1997) have indicated that migrants' length of residence in their host societies was statistically significant and positively associated with their acculturation.

*Age at arrival* in the host society has also been found to have an influence on the rate and level of acculturation (Berry, Trimble & Olmedo 1986; Marín et al. 1987). Berry et al. (1986) proposed that younger migrants are usually more open to acculturative influences, while the older ones, with a longer history in their own ethnic culture, may be more resistant. According to Padilla (1980), this high resistance among those who migrated late in life is due to their higher cultural awareness, which affects their acculturation process. The proposed acculturation context measurement consists of six individual indicators (again, see Figure 3.2).

Non-cultural factors such as socio-economic status are also found to correlate with acculturation (Cuéllar, Arnold & Maldonado 1995). In a study of Hispanic migrants

by Ponce and Comer (2003), the inclusion of level of education and income was considered important, in that migrants who do not have a high school education and do not speak English, or speak it with limited proficiency, will be uninformed, as they are excluded from many information platforms. Rissel (1997) suggested that more years of formal education enable better English language skills to develop and also increases exposure to a variety of cultures. Outcomes from Padilla's (1980, p.77) analysis also revealed that acculturation was positively related to income level and education. The established factors as they relate to consumption were discussed in the previous chapter.

This chapter has explored the manner in which culture shapes practices and behaviours across a wide ranging set of cultures and actions, as a basis for strengthening an underlying proposition in this thesis, that culture may well exert an influence on consumption behaviours. Taking into consideration the above discussion on the role of culture in shaping behaviour, the framework as illustrated in Figure 3.3 is an *extension* of the established conceptual framework (refer to Figure 2.3). The extended framework is employed in an examination of the extent to which the CALD Index (as a measure of cultural difference), and indicators of acculturation, influence patterns of consumption among China-and Australia-born residents of Melbourne.

# Figure 3.3: Conceptual framework for understanding cultural influences in sustainable living and resource consumption



# **Chapter 4** Conceptual Framework and Research Methodology

To a large degree, the exploratory nature of research on individuals from different cultures and languages defined the research methods undertaken. The research questions as set out in Chapter 1 aimed to provide new insights into cultural influences on individuals' consumption behaviours and environmental impacts. These have not previously been studied in depth. In the first part of this chapter, the discussion focuses on the application and suitability of the ecological footprint as a measure of an individual's resource consumption. The ecological footprints of the China- and Australia-born participants were measured using the Ecological Footprint Quiz, which was developed by the Centre for Sustainable Economy (CSE). The choice to use the Ecological Footprint Quiz was based on an evaluation of webbased ecological footprint calculators that could be used in the field, and were available at the time.

Household surveys lend themselves to both objective and subjective research in the form of quantitative and qualitative methods. These two methods were applied in the formulation and administration of the questionnaires that were developed. This is followed by a discussion about participant selection. The subsequent section details the measurement of individual factors of consumption that feature in the conceptual framework of this research (refer to Figure 3.3). These comprise socio-economic and demographic factors, among others. However, little is known about the influence of cultural context on consumption. The first perspective covered relates to how acculturation may change individual migrants' consumption behaviours, and how this can be measured. The second perspective addresses the relative impact of cultural influence on domestic resource consumption behaviour. The measurement construction of the CALD Index is subsequently explained. These sections also include discussions about data validation and coding.

The next section, on survey fieldwork, looks at the research methodology, which includes a pilot survey, the control of locational context and the way interviews are conducted. The chapter concludes with an examination of the degree to which the surveyed population is representative of the population in the studied area.

## 4.1 Ecological footprint calculation

One of the aims of this research was to examine whether there is any significant difference in consumption patterns (as measured by ecological footprint) among the China-born migrants between those in the period prior to migration to Australia and those at the time of survey in Australia. Another aim was to explore the variability of resource consumption between the China-born migrants and the Australia-born group. An understanding of the groups' consumption patterns can be derived from individual consumption behaviours, but a composite measure was also desirable. Consumption metrics such as ecological footprint are an aggregate of an individual's resource consumption in five major consumption categories – food, housing, transport, consumer goods and services – as indices expressed in global hectares, representative of the area of the earth's surface needed to supply these services: 'how much land and water area is required on a continuous basis to produce all the goods consumed, and to assimilate all the wastes generated by that population' (Wackernagel & Rees 1996, p. 61).

# 4.2 Review of strengths and weaknesses of ecological footprint calculators

The simplicity and communicability of the quantifiable result from the ecological footprint calculation has given rise to the ecological footprint's popularity and influence. This is reflected in its application in a large number of studies, such as one on urban development (Hurley, Horne & Grant 2007), in a commercial project assessment (Nicholson, Chambers & Green 2003), sustainable consumption (Barrett et al. 2005), and transport (Muñiz & Galindo 2005). The application of the ecological footprint across different study areas relating to policy highlights the strength and usefulness of ecological footprint calculators as tools of measurement. The ecological footprint's popularity has also attracted its fair share of contentious debates on its methodology. These have included issues such as the need to include the multi-use of land and the calculation of the energy footprint (Venetoulis & Talberth 2008), and the usefulness of the ecological footprint calculator as a tool for the promotion of sustainable behaviours (Franz & Papyrakis 2010). Although the ecological footprint may have its weaknesses, its effectiveness as a tool overrides these stated weaknesses, especially in the absence of any superior alternative, which

would require development, validation and application beyond the scope of the research in this thesis.

The suitability to this research of the ecological footprint calculator as a consumption metric tool can be summarised as follows: First, the calculator could convert an individual's consumption across the categories of food, housing, transportation, consumer goods and services, into a single integrated consumption index (global hectares). Second, the calculator's quantified results – conducted in real time during the survey – could allow individuals to better understand their own patterns of consumption. This was a precursor to discussions on how to effect change in their everyday consumption behaviours in order to attain more sustainable patterns of living. Third, the computed results could be used to explore and quantify the differences between groups (for example, China-born versus Australia-born). Policy makers can also use the ecological footprint results to communicate the need for change in national and individual consumption behaviours.

# 4.2.1 Justification for selection of ecological footprint calculator

The success of the concept of ecological footprint has spurred the development of numerous footprint calculators apart from the ecological footprint calculator originated by Wackernagel and Rees (1996). For a calculator to be considered suited to the research in this thesis, it had to have the following capabilities:

1) Ability to calculate the pre- and post-migration ecological footprints of the China-born migrants to Melbourne. This refers to the capability of comparing the two sets of individual migrants' footprints when both footprints were calculated based on the same set of resource-consumption based questions and on the background national contextual data (Chinese and Australian) held by the calculator. Given the cross cultural dimensions of the research, it was important to use a calculator that contains representative data on different countries given the cross cultural dimensions of the research.

 Support investigations of variation between the China-born migrants and the Australia-born residents in their living and resource consumption behaviours as measured by their footprints.

The Ecological Footprint Quiz (Centre for Sustainable Economy 2011) was selected as the ecological footprint calculator for this research, based on an evaluation of eight online calculators. This evaluation was based on five criteria: ease of access (that is, it is available free online), unit of measurement, applicable across countries, ease of use, and applicability of the calculator to the research topic (Table 4.1).

## Ease and cost of access

The calculators needed to be available free online to allow respondents to input their consumption information at their place of residence. All these individuals then had the potential to inform and influence others regarding their experience with the EF calculator, especially if it was free and easy to use.

# Ease of use - Unit of measurement

The calculators listed in Table 4.1 use 'metric' as the unit of measurement, except for the Centre for Sustainable Economy (CSE), which offers imperial *and* metric units of measurement. In terms of the monetary measurement, most of the calculators provide the user's own country's currency. For example, Australian dollars and British pounds are used by the WWF-Australia and WWF-United Kingdom respectively in their calculators. One unique feature of the Global Footprint Network (GFN) calculator is the use of country-specific currency. For instance, the currency of the country is used in questions relating to expenditure. This makes it easier for individual users to answer questions that relate to their everyday activities. For the calculator by CSE, only the user's total annual household income needs to be converted into US dollars. However, this did not inhibit ease of use, due to the availability of a web link for currency conversion.

Organisation	Ease and cost of access	Applicability	Ease of Use	
	(Website)	across	Language Options	Unit of
		countries		measurement
Centre for	Free on-line	Yes	• Five languages: English, Chinese,	US dollars
Sustainable Economy	(http://www.myfootprint.org/)		Spanish, French and Russian	• Imperial or
(CSE)				Metric
Global Footprint	Free on-line	Yes	• English and national language used	Local currency of
Network (GFN)	(http://www.footprintnetwork.org/en/index.php/GFN/p		in each country, where applicable.	each country
	age/calculators/)		• 11 languages: English, Spanish,	Metric
			Portuguese, Afrikaans, Italian, German,	
			French, Turkish, Hindi, Chinese, and Japanese	
Australian	Free on-line	No	English only	Australian dollars
Conservation	(http://www.acfonline.org.au/custom_greenhome/calcu			Metric
Foundation (ACF)	lator.asp?section_id=86)			
Environment	Free on-line	No	English only	Australian dollars
Protection Authority	(http://www.epa.vic.gov.au/ecologicalfootprint/globalf			Metric
(EPA), Australia	ootprint/index.asp)			
The Powerhouse	Free on-line	No	English only	Australian dollars
Museum	(http://www.powerhousemuseum.com/education/ecolo			Metric
	gic/bigfoot/bigfoot2007/)			
WWF-Australia	Free on-line	No	English only	Australian dollars
	(http://www.wwf.org.au/footprint/calculator/)			• Metric
BioRegional	Free on-line	No	English only	• No unit of
	(http://calculator.bioregional.com/)			measurement applied
WWF - UK	Free on-line	No	English only	Pounds
	(http://footprint.wwf.org.uk/)			Metric

# Table 4.1: Summary of review of footprint calculators

## Applicability across countries

Some calculators, such as the GFN calculator, include country-specific questions. The disadvantage is that comparison between countries is not possible due to the difference in the number and nature of questions asked. For example, individual users who choose Australia as the country of residence answer twenty-seven questions, compared with seventeen questions if China is selected. With the CSE calculator, users respond to the same number and nature of questions, independent of the country selected from the list in the calculator. This consistency across countries in the number and type of questions asked allows comparison across countries. This feature aligns with the aim of this research, which is to examine whether there is any significant difference in resource consumption in relation to pre-and post-migration footprints of the China-born migrants to Melbourne.

#### Ease of use - Language

The Centre for Sustainable Economy (CSE) and Global Footprint Network (GFN) use English as the medium for communication. For the GFN, users can choose their preferred language from a list of eleven languages, while five languages are available for the CSE calculator. The ability to choose their preferred language allows users to opt for the language that they are most comfortable with and confident in using. This provides the potential for the production of the most reliable responses. For the CSE calculator, the availability of Chinese is a significant advantage in this research, which focuses on China-born migrants.

## Applicability of calculator to current research project

The above evaluation shows that the CSE calculator was the most applicable to this research, due to the consistency in the number and type of questions asked across countries, allowing comparison between countries. The nature of the questions in the CSE calculator is also in line with research exploring consumption in specific consumption categories, namely home energy use, transportation, food, housing, home water use, and goods and services.

The questions in the CSE calculator also permit a more detailed exploration of consumption domains. For example, the question on water saving features

(Questionnaires III, Part I, Q28, Appendix A): 'Which water saving features and habits do you have in your home? Please check all that apply'. The choices assist in the comparison between the two countries of the respondents' behaviours. To further explore the influence of culture on consumption, additional questions were included in the questionnaires. These additional questions relate to culture, society, and government initiatives and regulations. These additional questions were designed to provide a greater understanding of the influence of established and cultural factors on individuals' consumption behaviours.

# 4.3 Calculation of ecological footprint

The questions that form part of the online ecological footprint calculator are contained in Questionnaires II, III and IV (Appendix A). Responses from the China- and Australia-born participants were used to compute their ecological footprints. The outputs from the ecological footprint calculator consist of an individual's total ecological footprint and the four components of the ecological footprint: Carbon, Food, Housing, and Goods and Services. The associated main contributing consumption categories with the footprint components are listed in Table 4.2.

Component of ecological footprint	Main consumption categories	
Carbon footprint	• Energy	
	• Travel	
Food footprint	• Food	
Housing footprint	• Dwelling type & size	
	• Water use	
Goods and Services footprint	Purchasing	
	behaviours	
	• Waste management	

Table 4.2: Classification of the four footprint components and their associated consumption categories

The different items that comprise the four components of footprint by the ecological footprint calculator are illustrated in Tables B-1 to B-4 (Appendix B). The following discussion focuses on how these items were specifically dealt with in each footprint component.

#### 4.3.1 Calculation of Carbon footprint

The Carbon footprint is based on the estimated area needed to absorb  $CO_2$  emissions in two consumption categories of energy use at home, and travel. The items as defined in association with these two consumption categories are illustrated in Table B-1 (Appendix B).

## Energy

As climate influences how individuals use energy at home, the selection of climatic zone for the China-born migrants was based on the town or city they lived in prior to leaving China. For the China- and Australia-born participants in Melbourne, 'Temperate' climate was the selected climatic type.

# Travel

In terms of travel, the distance travelled for a typical week was calculated based on participants' accounts of their preferred mode of transport in a typical week for activities ranging from workplace to shopping. The distance travelled per week was multiplied by 52 weeks to derive the total distance travelled in a year.

Steps were also taken to ensure the authenticity of the distance travelled by public transport, and domestic and international air travel based on available sources of information. In Melbourne, for example, the average distance between two tram stops was 260 metres (derived by Yarra Trams). For those travelling by train, the distance between stations was calculated based on Metro and V/Line data (Public Transport Victoria). For travel within China, various websites were sourced to work out the approximate distances travelled on public transport and by domestic air travel. For example, data on the distances travelled by trains within Shanghai is derived from Shanghai Metro, which operates the train system (Shanghai Metro). Travelmath – an online flight calculator – was used to calculate the distance travelled by air, based on the airports specified for departure and arrival (Travelmath). In terms of the item 'Location of dwelling', the preselected location in Australia was "older suburb" as all the respondents resided within the study area. In the case of location of the China-born participants' homes prior to leaving China, the selection was dependent on their dwelling location in China.

## 4.3.2 Calculation of Food footprint

The Food footprint relates to the range of food consumed, and is calculated based on the area needed to grow crops, graze animals and supply fishing grounds. The calculation also includes the amount of  $CO_2$  emissions related to food processing and transport (Table B-2, Appendix B).

## 4.3.3 Calculation of Housing footprint

An estimation of Housing footprint (Table B-3, Appendix B) is based on water use, dwelling type and size, and the land area occupied by the dwelling. If a garden is part of the land that the dwelling occupies, the size of the garden is also included as part of the calculation of this footprint.

# 4.3.4 Calculation of Goods and Services footprint

The estimation of Goods and Services footprint (Table B-4, Appendix B) includes the area needed to supply consumer goods that individuals purchase, and the amount of  $CO_2$  emissions from the manufacturing, transportation and disposal of these goods. This calculation also includes the purchase of recycled and organic goods, and waste management behaviours.

# 4.4 The questionnaires

The questionnaires were designed to elicit information that enabled the calculation of ecological footprints and the measurement of the factors influencing attitudes to environment and consumption. The first aspect was addressed in the previous section: the CSE's ecological footprint calculator. To realise the second aspect, the questionnaires were constructed to measure both the influential established factors – ranging from individual structural attributes like socio-economic status – and indicators of cultural context, such as ethnicity, language, food, religion, festivals, social interaction, cultural identity, and indicators of acculturation. The inclusions of questions on cultural context enabled formulation of the CALD index and the acculturation process. The Questionnaires are found in Appendix A.

The questionnaires supported analysis by both quantitative and qualitative methods by using both closed- and open-ended questions. This integration is what Tashakkori and Teddlie (2009, p.289) refer to as mixed methods, where inferences made have been shown to be stronger and more trustworthy. In the research, besides quantitative data derived from the closed questions, the qualitative data elicited from the open-ended questions were beneficial for gaining further insight into the 'how' and 'why' of resource consumption behaviours at home. According to López and Tashakkori (2006), each quantitative and qualitative method provides different levels of insight into the data and are also seen as a means of maximising the opportunities for analysing the data from these two methods.

# 4.5 The administration of questionnaires

The procedures used in recruiting the participants and administering the questionnaires are explained in this section. Four questionnaires (see Appendix A) were employed. The administration of the questionnaires is outlined in Table 4.3 below:

Participants		Questionnaire			
	Ι	II	III	IV	
China-born Australia- born	This questionnaire was administered to potential participants to <i>assess their</i> <i>eligibility</i> for participation in this research.	This questionnaire focuses on the consumption behaviours of migrants while living in China prior to their migration to Australia.	This questionnaire was administered based on consumption behaviours of China-born <i>migrants living</i> <i>in Melbourne</i> at the time of survey.	This questionnaire was administered based on consumption behaviours of Australia- born residents <i>living in</i> <i>Melbourne</i> at the time of survey.	

Table 4.3: Questionnaires and their administration to China- and Australia-born participants

- Questionnaire I was used to select potential participants for the research.
- Questionnaires II and III were used during face-to-face interviews with the China-born participants. While both Questionnaires II and III were structured to relate to the China-born participants' everyday consumption behaviours, Questionnaire II was based on their behaviours *prior to* their migration to Australia, and Questionnaire III on behaviours in Melbourne, after settling in Australia.

Questionnaires II and III were available in English and Chinese. As the Chinaborn migrants were the focus of the research, it was deemed necessary to have a Chinese version of the survey materials. The translation was done in anticipation that the China-born migrants might only understand Chinese or have a high preference for Chinese. Also, the translated written versions of the Letter to Residents and the Consent Form (Appendix A) were provided to ensure that the China-born respondents were making informed decisions to participate rather than having to rely on the researcher's verbal explanation. The translation meant that the conditions of data collection among the China- and Australia-born participants were as consistent as possible (Osgood, May & Miron 1975).

The materials that were translated into Chinese (or Simplified Chinese as is used in China) included the letter to Residents outlining the aims and details of the interview, the Consent form, and Questionnaires II and III, which were administered to the China-born participants. The translation was done by a professional translation agency. This agency also provides translation services to Swinburne University of Technology.

Back-translation was undertaken by a bilingual expert skilled in this task. The aim of back-translation was to check for translation equivalence (Osgood, May & Miron 1975) and also to ensure ease of understanding by the China-born participants.

As English and Chinese versions of all the documents were made available to all China-born participants, they were able to choose their preferred language for the interviews.

Both Questionnaires II and III were administered in one sitting. The durations of the interviews with the China-born participants ranged between forty-five minutes and one hour.

• Questionnaire IV was used during face-to-face interviews with the Australiaborn participants. This questionnaire was structured to relate to their everyday consumption behaviours in Melbourne. The duration of the interviews with the Australia-born participants ranged from twenty to thirty minutes.

# 4.5.1 Selection of participants based on Questionnaire I

Questionnaire I was administered to ensure that the respondents fitted the criteria for the research. It was administered via telephone, email or mail correspondence, or in person. The key criteria are listed in Table 4.4. Upon identifying potential participants who met the requirements, they each signed a consent form, an appointment was made, and an interview venue arranged. The venue was either the participant's home or a mutually-convenient place.

Questionnaire I		China-born participants	Australia-born participants	
Questions for potential	1)	Country of birth – mainland China	1) Country of birth - Australia	
participants	2)	Year left China (during or after 1995)	2) Age: 18 years or older	
	3)	Age: 18 years or older	3) Resident within	
	4)	Resident within survey area	survey area	

Table 4.4: Criteria used to assess participant's eligibility

# 4.6 Measurement of determinants

Studies on consumption have found that a range of factors influence household and individual consumption behaviour. In this research, the range of factors is classified as follows:

- Individual structural attributes such as age, gender, individual annual income, education level, employment, and car ownership.
- Individual behavioural attributes, which are categorised into Environmental Awareness Index (AI), Resource-efficient technologies Index (REI), and Conservation Behaviours Index (CBI). Respectively, each Index is a summation of components that pertain to awareness of environment-related issues,

installation of energy and water efficient technologies, and energy and water conservation behaviours.

- Cultural context the CALD Index is an aggregation of seven cultural components: ethnicity, language, religion, food, festivals, social interaction, and cultural identity.
- Indicators of acculturation process on consumption behaviour change among migrants: English language as medium for communication, English language as medium for mass media, social interaction with Chinese, length of residence in Australia, age at arrival, and ethnic pride.
- Household context, such as household size.
- Dwelling context, such as dwelling size, dwelling type, and tenure.

For the application of multi-variate analysis, independent variables have to be metric (continuous) and/or dichotomous variables (de Vaus 2002). In the research data, it is necessary to convert the categorical variables such as age, individual annual income, education level and employment into dichotomous variables using the distribution recoding method (median split). As each dichotomous variable takes only two values after the conversion (de Vaus 2002; Francis 2007), value 'one' was coded as '0' and value 'two' as '1'. If a dichotomous variable has a positive coefficient that is statistically significant in the regression, it means that value 'two' is indicative of a higher value for the dependent variable (example: size of ecological footprint), while a value 'one' is indicative of a lower value for the dependent variable. If the coefficient is negative and statistically significant, the opposite applies. The following sections describe how the different factors are coded and recoded for multi-variate analysis, as discussed in Chapters 5 and 6.

# 4.6.1 Measurement of Individual Structural Attributes

Prior research has established that socio-economic factors like age, gender, individual income, education level and employment are determinants of consumption at an individual level. These conventional factors are classified as Individual Structural Attributes as listed in Table C-1 (Appendix C).
#### 4.6.2 Measurement of Individual Behavioural Indexes

The three Individual Behavioural Attributes are the Environmental Awareness Index (AI), Resource-efficient technologies Index (REI) and Conservation Behaviours Index (CBI). They attempt to measure what individuals do in relation to consumption and in the context of sustainable living. The measurements of these attributes are discussed individually as follows.

#### Measurement of Environmental Awareness Index (AI)

The Environmental Awareness Index (AI) is the summation of three items (Table C-2, Appendix C). The first is the respondents' knowledge of the ecological footprint calculator, which is an indicator of their awareness of resource consumption behaviours and their relation to environmental impacts. The second item measured whether individuals subscribe to or use renewable energy. The third item focuses on individuals' awareness of governments' initiatives on resource conservation programs like the rainwater tank rebate, shower exchange program, and the Energy and Water Efficiency Labelling and Standards scheme (WELS) for white goods such as refrigerators, washing machines and dishwashers. A high score of AI thus signifies a heightened awareness of behaviours that can support more sustainable living. With this awareness, the respondents may be encouraged to adopt a range of resource efficient technologies and practices in order to reduce their resource conservation and GHG emissions.

### Measurement of Resource-efficient Technologies Index (REI)

The Resource-efficient Technologies Index (REI) measures the extent of domestic installation of energy and water efficient technologies that enable individuals to conserve their resource consumption. For example, the installations of energy efficient lighting and grey water recycling systems will reduce energy and water use respectively. Another example is the installation of solar (photovoltaic) panels, which will reduce GHG emissions significantly, due to less reliance on the coal-based electricity grid. Table C-3 (Appendix C) illustrates the measurement for Resourceefficient Technologies Index (REI). The Index is a summation of eleven energy and water saving features. A high REI score signifies that steps have been taken to reduce resource use at home.

#### Measurement of Conservation Behaviours Index (CBI)

The Conservation Behaviours Index (CBI) comprises several energy and water conservation behaviours, such as turning off lights when leaving a room, maintenance of lower temperatures for home heating, taking shorter showers, and washing cars less regularly. Table C-4 (Appendix C) shows the measurement for Conservation Behaviours Index (CBI). The CBI is a summation of twelve energy and water conservation behaviours. A high CBI score signifies that individuals are more proactive with respect to resource conservation. Subjective reporting of behaviour is commonly used in social science research and is the approach followed in this thesis.

## 4.6.3 Measurement of CALD Index

The CALD Index comprises seven cultural components, which collectively have an aggregate of 12 indicators, as summarised in Table C-5 (Appendix C). These components are: Ethnicity, Language, Religion, Food, Festivals, Social interactions, and Cultural identity. As the CALD Index represents different facets of cultural life, the Index was designed to measure an individual's strength of connectedness with culture.

In order to ensure that the summation of the CALD Index was equivalent across the seven cultural components, each indicator was scaled from '1' to '4'. The scale of '1' is coded to reflect Australia and the host culture, and '4' relates to China and Chinese culture. As each indicator (response) has four categories, the minimum possible score of the CALD Index is 12 and the maximum is 48. A high score reflects a stronger connectedness with the Chinese than with the host culture. A low score reflects a stronger connectedness with the host society than with the culture of their birthplace.

The following section discusses how each cultural component is derived.

#### Ethnicity

In this study, the respondents were preselected to ensure that they were either China- or Australia-born and were 18 years of age or older. As age at migration possibly influences adaptation to a host society, the other two categories of Ethnicity are classified into China-born and baby migrant, and China-born and adolescent migrant. According to studies that examine the acculturation and health of migrants in host societies (Costigan & Dokis 2006; Huang 1994), there are three significant age categories: baby, adolescent and adult. Those who migrated as infants or toddlers, or those below school age, have longer social interactions with the host society and 'greater exposure to diverse transmitters of the host culture' (Costigan & Dokis 2006, p.735; Huang 1994) during their developing years. These factors may result in a stronger connectedness with the host culture than adolescent and adult migrants might have. As adolescent migrants spend time in Australian secondary schools or higher education, the host society and peers may influence their connectedness with their culture of birth place. However, as an ethnic minority in the host society, at a stage when they have not yet developed a stable sense of identity, their perception of differences between themselves and many of their peers may encourage stronger ethnic culture connectedness. Connectedness to the host society may not be as strong among those who migrated as adults (Costigan & Dokis 2006; Driedger 1975). In the research, *all* the participants were classified as adults, since they were 18 years or older. The four categories of Ethnicity are listed in Table C-5 (Appendix C).

## Language

As English is the official language in Australia, the respondents were asked to indicate their proficiency in spoken English. The participants also responded to the question of whether they spoke other languages besides English and/or Chinese at home. In this research, there are individuals who speak only their first language at home. Two of the four categories used are: speak 'Only English' and 'Only Chinese'. The third category consists of other non-Asian languages like French and Italian, which are classified as Western languages. The fourth category comprises Chinese, Cantonese and other Chinese dialects. The measurement of Language is outlined in Table C-5 (Appendix C).

#### Religion

For the Australia-born participants, their connectedness to European identity is deeply rooted in Australia's history of settlement. Despite significant multiculturalism, Australia's culture remains closely connected to its European origins. These early migrants brought Christianity with them, which remains the dominant religious tradition today (Henry & Kurzak 2012). The Christian tradition is deeply embedded in Australian

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society (Lu, Gilmour & Kao 2001; Zolberg & Woon 1999), in spite of the fact that Australia has a secular tradition of separation of church and state.

Among the China-born participants, Chinese belief systems, such as Buddhism or traditional Chinese religions, incorporate Buddhist, Taoist, Confucian and folk traditions (Gladney 1994; Lagerwey 2010; Tong, Ho & Lin 1992). As a result, the interrelationship between religion and other practices can be seen in the influence of Taoist traditions on traditional Chinese medicine and folk healing practices (Lin 1981). Potentially, they could also influence consumption practice.

Globalisation and migration may have influenced traditional practices among the Chinaand Australia-born participants. For example, some Australia-born participants may practise Buddhism, while several China-born participants converted to Christianity while living in Australia. The latter is reflected in the responses of those who claimed religious affiliation while living in China. Half of those who had religious affiliations indicated that their religious practices in Melbourne were different from when they were in China (Figure 4.1). The measurement for Religion is classified into four categories as specified in Table C-5 (Appendix C).

Figure 4.1: Comparison of religious practices of China-born participants prior to leaving China and after settlement in Melbourne



Source: Questionnaire III, Part 2, Question 18 (Appendix A)

## Food

Diet is typically linked to traditional ethnic food. In this research, therefore, the diets of the China-born participants were related to their food preferences. These preferences were calculated based on the percentage of the total number of meals cooked in a week that were Chinese. For the Australia-born group, their food preference was calculated based on the types of cuisine they consumed in a week. Those participants who indicated that they consumed Western or Chinese food only are seen as having a strong connectedness with the host or Chinese culture respectively. Thus, consuming 'Western food only' and 'Chinese food only' are two of the four categories in the food component. Other participants indicated consuming mostly Western food or mostly Chinese food, which indicates their preference for other food besides their traditional ethnic food. The other two categories are: 'Mostly Western food' and 'Mostly Chinese

food'. The measurement for Food is classified into four categories as specified in Table C-5 (Appendix C).

#### Festivals

The frequency of participants' involvement in Australian cultural activities like Australia Day and Australian Rules Football (Footy) are indicative of their connectedness to Australian life and culture. For the China-born participants, their involvement in these activities signifies their preference to adopt the host culture, while for the Australia-born participants, their participation shows their connectedness to local culture. The measurement for Festivals is classified into four categories as specified in Table C-5 (Appendix C).

## Social interaction

Participating in local community environmental activities and visiting public places like the local library increases opportunities for social interaction and the gaining of knowledge about the host culture. The frequency of participation in these activities is indicative of a desire to interact with local people and become involved with local culture. The measurement for Social interaction is classified into four categories as specified in Table C-5 (Appendix C).

## Cultural identity

Cultural identity signifies whether the participants feel that they belong in and fit well into the Australian culture and society. As summarised in Table C-5 (Appendix C), when the participants responded that they felt they belonged and fitted in well, this was deemed to indicate a stronger connectedness with the host society. Negative responses from the participants suggest that they neither felt that they belonged, nor fitted well into the host culture. The category 'Neither' was excluded, as it was not chosen by any of the respondents.

#### Developing the CALD Index for China- and Australia-born groups

The CALD Index as a representation of ethnic culture is employed in this research, and has been discussed conceptually in Sections 3.3 and 3.4. This section addresses three issues: the distribution of the participants' scores on the CALD Index; correlations

between the Index and the four footprint components, and the total ecological footprint; and a comparison of the CALD Index and *country of birth* as measures of cultural difference. Past studies (Poppitt & Frey 2007; Woon 1985) have used *country of birth* to identify individuals' ethnicity. In Chapters 5 and 6, the strength of the correlation between the CALD Index and *country of birth* is examined to establish the Index as a preferred discriminator in the multi-variate analyses.

## Distribution of scores of the CALD Index

The distribution scores of the total set of the respondents on the CALD Index (Figure 4.2) indicates that as a measure of connectedness with ethnic culture, there is a clear separation between the China- and Australia-born groups. Table C-6 (Appendix C) shows the statistical test of difference between the two groups.

## Correlation between the CALD Index and country of birth

Correlation between the CALD Index and *country of birth* was examined, and a very strong correlation (r= 0.921) (Table 4.5) was exhibited. Further analyses of the seven cultural components of the CALD Index and *country of birth* were also carried out. The analyses show that, on the one hand, the relations between the three cultural components of Language, Religion, and Ethnicity were more strongly correlated with *country of birth* than with the CALD Index. On the other hand, the other four cultural components of Food, Festivals, Interactions, and Belong and fit were found to have stronger correlations with the CALD Index than with *country of birth*.

Though most studies use *country of birth* as an indicator of culture (Driedger 1975; Woon 1985), the CALD Index was chosen as the preferred determinant, due to its added dimensionality. As outlined above, the Index engages with more elements of culture than does place of birth, providing a more comprehensive measure of cultural depth and difference.



Figure 4.2: Distribution of individual participants' scores on the CALD Index for China- and Australia-born groups (total sample)

**Table 4.5:** Pearson correlations between four footprint components and total ecological footprint of China- and Australia-born groups, the CALD Index and country of birth

		CALD Index	Country of birth	Carbon footprint	Food footprint	Housing footprint	Goods & Services	Total Ecological
							footprint	footprint (total)
	Country of birth	0.921**		0.412**	0.191*	0.225**	-0.473**	0.140
	Language	0.925**	0.939**	0.369**	0.147***	0.187*	-0.489*	0.082
Cultural components of the CALD Index	Food	0.527**	0.462**	0.100	0.019	0.053	-0.151***	0.004
	Festivals	0.606**	0.406**	0.147***	0.056	0.219*	-0.230**	0.047
	Religion	0.930**	0.966**	0.417**	0.134	0.146	-0.493**	-0.058
	Interactions	0.571**	0.335**	0.307**	0.213*	0.281**	-0.145***	0.256**
	Ethnicity	0.934**	0.971**	0.395**	0.188*	0.269**	-0.446**	0.152***
	Belong and fit	0.608**	0.540**	0.205*	0.056	0.073	-0.276**	0.024

Note: \* Correlation is significant at the 0.05 level

\*\* Correlation is significant at the 0.01 level

\*\*\* Correlation is significant at the 0.10 level

## 4.6.4 Measurement of household context

Household size affects economies of scale in consumption at home. This determinant is classified under Household context (Table C-7, Appendix C). Household size is employed as a continuous variable in the multi-variate analysis.

## 4.6.5 Measurement of dwelling context

Dwelling context has three dimensions: dwelling type, dwelling size and tenure. These factors influence the consumption of resources such as energy and water. Dwelling size and dwelling type were recoded as dichotomous variables using the distribution recoding method (median split) (de Vaus 2002). The computations are detailed in Table C-8 (Appendix C).

## 4.6.6 Measurement of indicators of acculturation

Acculturation, as reviewed in Chapter 3, can be represented as a two-dimensional process (Phinney 1998). That is, migrants retain their ethnic culture while adapting to the host culture (Laroche et al. 1998a). Acculturation is 'multifaceted and dynamic, (and) it cannot be understood in any depth' if it is a single variable (Phinney 2006, p.94). Consequently in this research, as listed in Table C-9 (Appendix C), the approach to representing acculturation consists of multiple indicators: use of English in communications, use of English in mass media, social interactions with Chinese, age at arrival, ethnic pride, and length of residence in Australia. The measurement of each indicator is discussed individually as follows.

## Use of English in communications

As 'language competency is seen as a major building block of (multicultural) ... competence' (LaFromboise, Coleman & Gerton 1998, p.141), writing and thinking in English are included as indicators of migrants' adaptation to the host culture. The extent English is used is thus explored in the context of verbal and non-verbal communications. Details of the coding used for the dichotomous determinants for multi-variate analysis are outlined in Table C-9 (Appendix C).

#### Use of English in mass media

For migrants in Australia, it is possible to access various mass media, both in English and in other languages. There are also community radio stations that broadcast in a range of international languages common to Australian migrants to cater to the needs of the various local ethnic groups. With the wide-spread use of the internet, migrants also have easy access to world-wide information in their preferred language, which is not necessarily English. In this research, the use of English in the mass media is measured by how much of the China-born migrants' time (percentage) was spent watching television programs, listening to radio programs and music, reading newspapers and using the internet (Table C-9, Appendix C). The sum of the percentages of the five components was divided by five. The use of English in the mass media is thus a continuous variable.

## Social interaction with Chinese

Having left China, the China-born group participants are divorced from most, if not all, of their previous social relationships. This group thereby re-establishes relationships in different contexts in Australia. As migrants, the frequency of their interactions with Chinese and the rest of the community define the extent of their interactions with Chinese and the host society. In this research, the migrants' frequent interactions with Chinese, and participation in ethnic festivals, community activities and clubs, indicate their preferred choice of which ethnic group to be associated with. Social interaction with Chinese is a summation of the four components summarised in Table C-9 (Appendix C). With a continuum from a possible minimum score of '0' to a maximum of '4', a high score reflects a high frequency of interacting with Chinese, while a low score reflects little or no interaction with Chinese.

#### Age at arrival

The China-born migrants were preselected based on the criteria detailed in Table 4.4. The participants were thus adult migrants aged 18 years or older (Table C-9, Appendix C).

## *Ethnic pride*

Individual migrants' feelings of ethnic pride provide an indication of their desire to be a member of their ethnic group. This feeling is also indicative of their positive attitudes and contentment with the group (Liebkind 2001; Phinney 1998). In this study, the question 'Are you proud of being Chinese?' was to elicit China-born migrants' sense of pride of their Chinese heritage. The 'Yes' category was recoded as '1', and 'No' and other categories as '0' (Table C-9, Appendix C) to ensure Ethnic Pride was a dichotomous determinant for multi-variate analysis.

## Length of residence in Australia

The China-born migrants' length of residence in Australia is indicative of their exposure to the host culture. Their exposure may result in adoption of various aspects of the host culture. Their length of residence Table C-9 (Appendix C) was calculated from the year they left China until the survey in 2012. Length of residence is employed as a continuous variable in the multi-variate analysis.

## 4.7 Research methodology

## 4.7.1 Pilot Survey

The questionnaires were pilot tested from October to December 2010. The aims of the pilot study were to test the clarity of the questions and to establish the interview time with the China- and Australia-born groups. The pilot survey was carried out by the researcher in the manner anticipated for the actual survey. Thus during the pilot survey, the researcher had face-to-face interviews using the questionnaires and the electronic recording device. Details of the pilot survey are found in Appendix D.

## 4.7.2 Selection of study area

The study area was selected to maximise opportunities for contact with both Chinaborn migrants and Australia-born residents.

An understanding of the significance of China-born migration to Australia is reflected in the China-born participants' responses to the question that probed their reasons for settling in Australia (Table 4.6). They were largely due to familial factors, such as their children were living in Australia (20%), their husbands were working in Australia (15%), or they were seeking a better education and future for their children (37%). Living in Australia was also seen to be better than in China (Figure 4.3) due to environmental and societal factors, namely a better living environment, including air (42%), food security (11.6%), a fairer society and more freedom (10.1%), and larger living spaces and homes (5.8%).

The emphasis on post 1995 migration was to enable a focus on that cohort associated with the major recent surge in migration of China-born people to Australia – characteristics of a trend which is expected to continue. Hence it is an important subject for study.





Source: Questionnaire III, Part Two, Question 10 (Appendix A)



Figure 4.3: Reasons why living in Australia is better than in China

Source: Questionnaire III, Part Two, Question 31 (Appendix A)

With this rationale, the selection of the study area within Melbourne was based on the Australian Bureau of Statistics 2006 Census (ABS 2006). From the census data, the concentration of more than 100 China-born residents per census collection district (CCD) was mainly in the east and south-east of Melbourne (Table 4.7). These CCDs are located the local government areas (LGAs) of City of Monash, City of Whitehorse, City of Boroondara, and City of Manningham. In view of this approach, it could be possible that more isolated/geographically dispersed Chinaborn migrants may have different consumption behaviours and also differences in the CALD Index and acculturation process than those in this more 'concentrated'. The impact of cultural isolation and consumption is an area for future research.

Census Collection	Number of China-	Local Government	Suburb
District (CCD)	born migrants	Area (LGA)	
2250908	106	City of Monash	Chadstone
2251805	141	City of Monash	Clayton
2251903	139	City of Monash	Clayton
2251904	111	City of Monash	Clayton
2251905	247	City of Monash	Clayton
2251906	190	City of Monash	Clayton
2251909	111	City of Monash	Clayton
2252204	141	City of Monash	Clayton
2351903	105	City of Boroondara	Balwyn
2351905	106	City of Boroondara	Balwyn North
2361802	131	City of Whitehorse	Box Hill
2361803	164	City of Whitehorse	Box Hill
2361811	123	City of Whitehorse	Box Hill
2362111	177	City of Whitehorse	Box Hill

Table 4.7: Concentration of 100 or more China-born migrants by census collection district

Source: Australian Bureau of Statistics 2006 Census

Box Hill was the suburb with the greatest number of China-born residents in a relatively concentrated area, and as a result was selected as the area for household surveys. Restricting the survey geographically to a relatively small area represented an attempt to control for the influence of *urban location* factors on consumption, which is significant with regard to transport (Newton & Meyer 2012).

The map in Appendix E shows the study area, including the suburbs within a five kilometre radius of the Box Hill Activity Centre, which is approximately 15 km from Melbourne's CBD.

## 4.7.3 Recruitment of respondents

The recruitment of participants was carried out in the survey area defined above. The Letter to Residents and Consent Form, in both English and Chinese (Appendix A), were distributed within the survey area. The Letter to Residents also spelt out the authenticity and approach, which abide by the university's ethics requirements (Appendix F).

The first recruitment process was by letterbox-drop in the designated survey areas with higher concentrations of China-born residents, as detailed earlier. From the 1200 letters distributed to residences, less than one per cent responded (all Australia-born residents). This was a strong indication that it would be a difficult task to recruit China-born participants. What added to the complexity of recruiting China-born participants was the more stringent requirement that they had migrated during or after 1995 (as outlined in Table 4.4). More time and different recruitment methods were required to recruit a minimum sample of 60 China-born residents.

The poor response from China-born migrants was attributed to the fact that they might not have heard of or been involved in any kind of interviews before in Australia or when living in China. Conversations between the researcher and the participants revealed that some may never have been involved in any academic research except for studies conducted by the Chinese government. Also, as migrants living in Melbourne, they felt that they had to safeguard their personal details from strangers (as most of them had not met the researcher before) and might not want to reveal anything that may jeopardise their settlement in Australia. This concern was brought up by several respondents during the interviews.

Due to the poor response to the letterbox-drop, the challenge lay in recruiting a sufficient number of participants from the survey area. There was thus a demand for

flexibility in recruitment through the employment of other methods. One such method was to target multicultural societies and various community clubs or organisations that have connections with China-born residents within the designated survey areas. For example, the Chinese Elderly Club, the City Councils, the Neighbourhood Centres, and various religious organisations such as churches, were also approached. Emails were sent to these organisations, clubs and societies. Another recruitment method was to publish articles in community local newsletters inviting participation by residents within the survey areas. These articles were published in newsletters such as *The Leader* in the City of Whitehorse, and the *Surrey Hills Neighbourhood News* (Appendix G). Participants for both the Chinaand Australia-born groups were also recruited through participants' recommendations – relatives, friends, neighbours or fellow members of organisations or social networks.

The low response in this research reflects a trend increasingly observed in research work, particularly when the surveyed population is under no compulsion to participate (Pepper, Jackson & Uzzell 2011). Despite the difficulties in recruiting the participants, the research has actually thrown some light especially on the Chinaborn group's culture and social interactions, with possible implications for the acculturation process (discussed in Chapters 5 and 6).

#### Setting up interviews

Before the interviews took place, the researcher negotiated the research contract with each participant, which comprised the Letter to Residents and the Consent Form. The conversation included an overview of the objectives of the thesis, what the interview would entail, a guarantee of anonymity, assurance that the interview could be terminated at any point, and exclusion of electronic recording or records of anything that the participants did not want recorded (Banister et al. 1995). Questions raised by the participants in relation to the interview were clarified. The above procedures were undertaken to ensure that the respondents' voluntary participation was based on informed consent.

For the China-born participants, there was the flexibility to choose the interview language as either English or Chinese so that they felt comfortable and could

participate fully (Hearst & Hulley 2001). At the end of the interview, the participants were asked whether they would like to receive the result of their ecological footprint calculation either by email or post. The participants were also asked whether they would like to receive a copy of the findings of the research upon completion of the thesis.

## Face-to-face interviews

Face-to-face interviews were conducted, since they 'offer more flexibility in terms of question content and target population, tend to generate higher response rates, (are) more appropriate for long interviews with complex questions, ... and enable unobtrusive interviewer observations of the respondents and their surroundings' (Singleton & Straits 2002, p.60). The benefits of these interviews in relation to this research are outlined below:

- The flexibility in terms of question content enabled greater accuracy in responses from participants of 'different races, gender, and levels of educational attainment' (Schober & Conrad 1997, p.95). This approach was well suited to the different cultural and societal backgrounds of the participating groups, because it drew out participants' responses to the question as intended, and also ensured their understanding, especially when there were 'ambiguous correspondences between questions and situations' (Schober & Conrad 1997, p.579). For example, those China-born migrants who had not lived in Melbourne long were more likely to seek clarification on certain issues.
- The two-way communication between researcher and participants allowed greater clarity of ambiguous items such as the 'place of work' (Questionnaire III, Part One, Question 7 and Questionnaire IV, Part One, Question 9, Appendix A). The ambiguity lay in whether participants were working from home or working on contract with different companies. The nature of their jobs and workplace impacts on how they travel to work.

- It also ensured authenticity of participants' responses, providing a deeper glimpse into participants' 'actual, lived ... experiences' (Dunbar, Rodriguez & Parker 2002, p.295).
- The method allowed the researcher to understand participants' behaviours at home better, since participants could take the researcher for a tour around their home to explain their green fixtures and fittings, such as water tanks and double-glazed windows. This deeper understanding could also be attained through the researcher's observations of the home setting.
- The researcher's Chinese ethnicity and cultural resemblance to China-born migrants meant more ready acceptance by China-born migrants, as some are more comfortable communicating with Chinese than with other races. The face-to-face interview thus allowed these participants to provide more genuine responses, as pointed out by Singleton and Straits (2002, p.62): 'An interviewer who resembles the respondent will obtain more valid data than one who does not'.

In sum, though the face-to-face approach had the potential to result in longer interviews for some participants than prescribed, this approach is highly appropriate to research like this, where culture is the crux.

## Recording and transcription

Interviews were only electronically recorded with the participants' written consent. Despite being reassured of the confidentiality of the recorded information, only 60 per cent of the China-born participants gave consent compared to 80 per cent of the Australia-born participants. This difference suggests two things: differences in social and political experiences between the China- and Australia-born groups; and the China-born participants' discomfort with interviews for academic research, which highlights a culturally-influenced attitude towards such interviews.

The reason for making audio recordings was to have a back-up that could be crosschecked with the written responses. During the process of transcription, the researcher had to retain the originality and essence of the participants' responses. This was especially so for some China-born participants' responses, which required translation from Chinese into English. The retention of the authenticity of the participants' responses, which may offer significant cultural details, provided an invaluable insight into the cultural influence on their consumption behaviours. The participants' responses were used as supporting qualitative evidence to the quantitative findings outlined in Chapters 5 and 6.

## Data entry and editing

Data entry and editing was carried out by the researcher using SPSS (Statistical Package for the Social Sciences, version 21) and Microsoft Excel. These were carried out progressively during the interview period in order to monitor the profile of respondents to achieve a representative demographic sample. Details of the survey demographics are discussed in the following section.

## 4.7.4 Survey demographics

In this section, the demographics of the suburb of Box Hill are examined against those of the surveyed population of 133 participants. This is done to gauge the level to which the sample and evidence are representative, thereby indicating the extent to which the results of the survey can be extrapolated more broadly to a wider context.

*Comparison of migration trends between the study area and survey populations* During the year this research fieldwork commenced, the Australian Bureau of Statistics 2011 Census was conducted. Therefore, the examination of the socioeconomic profiles of the survey population to the study area population was based on the 2011 Census data. Comparisons of socio-economic profiles are summarised in Table 4.8.

Attributes /	Categories	Study area	Survey
Variables		<b>population</b> <sup>1</sup>	population
		(%)	(%)
Gender	Male	47.9	29.0
	Female	52.1	71.0
Age group	18-44	47.4	44.0
8.8.1	45-64	31.1	34.0
	65 and over	21.5	22.0
Income	0-19.999	29.3	50.4
range <sup>2</sup>	20.000-29.999	8.6	13.5
(annual)	30.000-64.000	20.0	18.8
	65,000-99,999	10.4	10.5
	100,000 or more	8.2	6.9
Level of	Postgraduate	9.7	24.4
education	Bachelor degree	20.0	36.7
	Diploma education	16.7	15.6
	Other/Not applicable	$46.0^{3}$	$23.3^4$
Car	Yes	85.6	92.5
Ownership	No	9.2	7.5
Household	1 family with family members	62.6	73.7
type	1 family with non- family members	4.6	3.8
J 1 -	2 families with family members	2.0	7.5
	2 families with non-family members	0.2	0
	3 or more families with family members	0.1	0.8
	Single, living alone	22.7	9.8
	Single, house share/ Group household	4.1	4.5
Household	1 person	22.7	9.8
size	2 persons	28.7	41.2
	3 persons	16.4	17.3
	4 persons	18.4	19.6
	5 persons	7.5	9.8
	6 persons	2.0	1.5
	7 persons	0.5	0
	8 persons	0.2	0.8
Dwelling	Separate dwelling	66.2	67.8
type	Semi-detached/ terrace/ town house with one	12.8	1.1
	storey		
	Semi-detached/ terrace/ town house with two or	5.9	4.4
	more storey		
	Flat or apartment	14.6	26.6
Tenure	Own	39.1	43.6
	Mortgage	27.8	25.6
	Rent	25.2	24.1
	Other	3.0	6.8 <sup>5</sup>
Proficiency	Very well	16.0	4.5
in spoken	Well	9.7	6.8
English <sup>6</sup>	Not well	4.3	26.3
	Not at all	1.3	8.3
	Not applicable (For all Australia-born)	64.9	54.1

Table 4.8: Comparison of socio-demographic of study area and survey populations

#### Notes:

- 1. Data derived from ABS 2011 comprised 95 Statistical Area Level 1 (SA1) spatial units, which are listed in Appendix H.
- 2. Study area population's income adjusted to survey population income range.
- 3. Include those who indicated completion of primary or secondary education and did not complete/attain postgraduate, bachelor degree or diploma education.
- 4. In the survey population, 3.3 per cent attained primary education, 15.6 per cent secondary education, 3.3 and 1.1 per cent had not completed college/TAFE and university respectively.
- 5. Include those living with children, and in company's residence.
- 6. For each person who speaks a language other than English at home.

The total sample did not reflect that of the study area in terms of gender. There were more females in the survey population. As the research seeks to better understand individuals' everyday resource consumption behaviours at home, gender did not matter, as long as the participants were the decision-makers in their households. The survey population closely resembled the study area population in the three age groups.

In terms of individual structural attributes, individual annual incomes of the survey population resemble the study area population quite closely, except in the two lowest income ranges. This suggests that a large number of the surveyed population were retirees or students. The survey population's car ownership resembled that of the study area population, which reflects the dependency on cars in Australian cities.

A higher percentage of the survey population had attained postgraduate and bachelor degree than the study area population. In the attainment of diploma education, the survey population resembled the study area population. Despite the higher level of education attained among the total sample, a majority of the China-born migrants indicated that they did not speak English well (26.3%) or did not speak English at all (8.3%). These percentages suggest that they were educated in China, and Chinese was the medium for education, which affects their level of competency in spoken English.

In terms of household context, a larger percentage of the study area population than the survey population lived in a single household. For household size, most of the survey population indicated living in a household consisting of two people. With regard to types of dwelling, the survey population and the study area population were similar in all dwelling types except for semi-detached home/town house and flat/apartment.

In sum, the survey population does represent the study area population in many respects: age, higher annual income (\$65,000 or more), car ownership, separate dwelling, and tenure.

# Chapter 5 Acculturation and Consumption Behaviour of Chinaborn Migrants

Consumption is part of individuals' everyday activities, and occurs no matter where an individual lives. In migrating to a new host society, however, migrants carry out these activities in a different context. For China-born migrants settling in Australia, this means going about their activities in a multi-cultural society and residing in a society with a high level of affluence. As part of this shift, China-born migrants have to deal with the cultural differences between their birth place and host culture. These changes may cause China-born migrants to adopt certain aspects of the host culture, which may lead to changes to their behaviours when living in China.

Migrants tend to make changes to their past activities when living in a new host society. Making these changes does not necessitate a loss of their ethnic culture. A number of studies (Arends-Tóth & van de Vijver 2004; Costigan & Dokis 2006; Rosenthal & Hrynevich 1985) have shown that migrants living in a multi-cultural environment are often able to retain aspects of their ethnic culture while adopting aspects of a host culture. Some migrants may be more motivated to retain elements of their ethnic culture, while others do not feel committed to do so (Costigan & Dokis 2006). When living in an environment with a high average income and high consumption, migrants may be especially motivated to imitate a host society's consumption behaviours, which may differ from those in their past.

This chapter begins with an examination of consumption (via the ecological footprint metric) of the China-born group in *China*, prior to their migration, and their ecological footprint once settled in Australia. As discussed in Chapter 4, the surveyed population was China-born residents of the middle class suburb of Box Hill in Melbourne, which was selected due to its high concentration of China-born people (ABS 2006). The examination focuses on whether there has been a change in their pre- versus post-migration ecological footprints, and whether a set of determinants, including a set of cultural factors (as represented by the CALD Index and the indicators of acculturation) can explain the differences that emerge (refer to Figure 3.3). This chapter specifically investigates *how* and *why* the China-born migrants

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may have changed their consumption patterns after migrating to Melbourne. Specific research questions examined include the following:

- Do China-born migrants have ecological footprints in Melbourne similar to those they had in China?
- Which aspects of consumption behaviours change following migration to Australia?
- What factors explain the change in the size of the China-born group's ecological footprint? (With particular emphasis on exploring the role of culture in addition to a set of more conventionally employed determinants.)

To address these three questions, both quantitative and qualitative data from the surveyed population are examined over three sections. In section 5.1, quantitative data representing ecological footprints of the China-born respondents in China and in Melbourne are analysed to elicit the degree of change. Descriptive statistics and qualitative data from the China-born respondents' views are used to examine differences in consumption behaviours, focusing on the four components of ecological footprint, namely Carbon, Food, Housing, and Goods and Services, and their constituent consumption categories. In section 5.2, the *degree of change* in the China-born ecological footprints is analysed, as well as the factors that explain that change. In the final section, 5.3, further correlation and regression analyses are conducted to examine the determinants of *change* in the China-born residents' ecological footprints between China (pre-migration) and Melbourne.

5.1 Contrasting China-born migrants' ecological footprints in China and in Melbourne

Analysis of the ecological footprints derived from the survey showed that the Chinaborn migrants' average ecological footprints in China and in Australia contrasted (see Figures 5.1 and 5.2). In Figure 5.1, the distribution of ecological footprints in China illustrates that their mean footprint was 20.9 global hectares (gha). In Melbourne (Figure 5.2), their mean footprint increased to 69.8 gha. This reflects a

significant, three-fold growth in their consumption. *All* the China-born respondents exhibited a growth in footprint, although there were significant variations. These large differences in mean and growth in footprint raise further questions regarding the basis of the changes in resource consumption (and amount of GHG emissions).

There was a wider distribution of footprint size in Australia than in China. For their footprints in China, the difference between the largest (54.5 gha) and smallest (8.0 gha) was 46.5 gha. However, in Australia, a larger difference of 59.2 gha was found, the largest footprint being 100.4 gha and the smallest 41.2 gha. These findings are now discussed in detail with regard to the four components of ecological footprint, namely Carbon, Food, Housing, and Goods and Services, and their constituent consumption categories.

Figure 5.1: Frequency distribution of China-born group's ecological footprints prior to migration



Figure 5.2: Frequency distribution of China-born group's ecological footprints in Australia



5.1.1 Comparison of the four components of ecological footprint and the total ecological footprint

Table 5.1 reveals that the mean size of the four footprint components and the total ecological footprint of China-born respondents were significantly larger in Melbourne compared to the mean of the equivalent components in China. Overall, the China-born group's consumption behaviours in Australia resulted in an overall increase of 3.3 times that of their total average ecological footprint in China.

Table 5.1: Mean footprint (in global hectares) and ratio of four components of ecological footprint of China-born group between Melbourne and China prior to their migration to Australia

	Carbon footprint	Food footprint	Housing footprint	Goods & Services	Total Ecological
				footprint (Purchasing	footprint
			(Dwelling	behaviours,	
_	(Energy, Travel) <sup>1</sup>	$(Food)^1$	type & size, water use) <sup>1</sup>	waste management) <sup>1</sup>	
In China	9.2	5	1.9	4.8	20.9
In					
Melbourne	24.6	23.7	10.3	11.3	69.8
Ratio of					
China:					
Melbourne	1:2.7	1: 4.7	1: 5.4	1: 2.4	1:3.3

Note: 1 refers to main consumption categories of components of ecological footprint

5.1.2 Variations in China-born migrants' pre- and post-migration ecological footprints

*The degree of change* of the China-born respondents' ecological footprints between China and Melbourne is illustrated in Figure 5.3. For only two of the 61 respondents was there a negligible growth in the consumption footprint.

In the following section of the analysis, consumption categories are identified in relation to the level of change (variations) in the China-born group's pre- and post-migration ecological footprints. Comparative analysis is based on descriptive statistics from the quantitative data and on the qualitative data derived from the participants' responses to the survey.



Figure 5.3: Variations of change in ecological footprints among China-born group

Difference (growth) of China-born sample's ecological footprints (gha) in China and in Melbourne

# Changes in Carbon footprint

Changes in domestic energy use and travel behaviours of the China-born participants resulted in a change in Carbon footprint.



Figure 5.4: Changes in China-born group's resource use behaviours in Melbourne compared to those in China

In terms of total energy use (Figure 5.4), the survey found that about half (56 %) of the China-born respondents indicated that there was no change in their energy use in Melbourne compared to their use in China. Others (26 %) indicated that they used less energy in Melbourne, and only 18 per cent indicated a higher energy use. Thirty per cent of the participants indicated that they possessed more domestic electrical appliances in Melbourne than they had in China. The increased ownership of electrical appliances was likely to have an impact on their total energy use. This increase also indicated the availability of a wider choice of goods and services in Australia. Evidence of adoption of the host society's affluent lifestyle is illustrated by the respondents' views as follows:

I have more appliances. I have a dishwasher and an electric oven now, which I did not have when I was in China. (Case 57: female, 47 years old, living with own family, migrated in 2001 at age 36, professional, small change in ecological footprint)

*I use more energy for heating and cooling, and I also have more appliances.* (*Case 22: male, 35 years old, living with own family, migrated in 2003 at age26, manager, large change in ecological footprint*)

As I cook more often now compared to the time when I ate at the canteen in China, I use more energy (and water). (Case 26: male, 29 years old, living with family and other non-family members, migrated in 2008 at age 25, professional, medium change in ecological footprint)

When the respondents were asked to make a comparison of their energy use, their views indicated that many of them *retained* their past behaviours, and they mentioned familial and religious reasons for attempting to limit their energy (and water) use:

I keep my old habits. The way I use resources is because I want to save money and the environment. I remember what my mother (who is a Catholic) always says: 'Don't waste, just use. Don't waste things just because they are cheap. If there is a need to use expensive things, use them'. (Case 16: female, 44 years old, living with own family, migrated in 2011 at age 43, not working, medium change in ecological footprint)

I use less energy now as it is more expensive. I switch off the appliances frequently as it is also my family habits not to waste. (Case 17: female, 40 years old, living with own family, migrated in 2010 at age 38, not working, small change in ecological footprint)

As I am working and frequently out, I spend less time at home so my energy use is less. I also watch less television and I only turn on the television to watch news. (Case 52: female, 43 years old, living with three or more families with family members, migrated in 2009 at age 43, personal services, medium change in ecological footprint)

Others found it difficult not to form new habits:

For myself, I carried out little energy conservation for I find it difficult to change my habits. (Case 54: female, 43 years old, living with two families and only family members, migrated in 2010 at age 41, own business, large change in ecological footprint)

When asked to compare their everyday travel behaviours between those when they were in China and those in Melbourne, a number of the China-born respondents indicated that having a car was undoubtedly a more convenient means of getting around in Melbourne. This is reflected in the increase of car ownership from 67 per cent in China to 90 per cent in Melbourne (Figure 5.5). This increased percentage reflects the car-dependency of middle and outer suburban areas of Melbourne (including the survey area of Box Hill). Car ownership was seen by many respondents as part of attaining a better lifestyle. The participants mentioned societal structures and infrastructures as factors that influenced the way they travelled. Evidence of this dependency on the car was expressed by the respondents as follows:

Having a car is more convenient here. (Case 34: female, 48 years old, living with own family, migrated in 1995 at age 31, not working, large change in ecological footprint)

I find it more convenient to drive and I do it often now. (Case 33: female, 52 years old, living with own family, migrated in 2007 at age 47, own business, small change in ecological footprint)

I use my car more often now as I use it to get to work. Moreover, the shops are further away and getting around is not as convenient as in China for the shops were all close by. (Case 37: female, 51 years old, living with own family, migrated in 2005 at age 44, not working, medium change in ecological footprint)





Other factors that were also frequently cited were the cost and convenience of public transport between China and Melbourne. Evidence of the participants' views is as follows:

In comparison to Australia, traveling by public transport was cheaper and better in China. (Case 8: female, 28 years old, living with extended family, migrated in 2001 at age 17, manager, large change in ecological footprint)

Taking bus is more convenient in China than in Melbourne. (Case 33: female, 52 years old, living with own family, migrated in 2007 at age 47, own business, small change in ecological footprint)

Although there was some variation, other factors that influenced the change in travelling behaviours were alterations in personal circumstances, and also in age. Personal comments regarding these changes included the following:

I travel more often now for as a senior I am able to make use of the free public transport during weekends. (Case 6: female, 65 years old, living with extended family, migrated in 2007 at age 60, retired, medium change in ecological footprint)

Now I travel more often as I regularly participate in activities carried out by a senior club. (Case 12: female, 68 years old, living with own family, migrated in 2010 at age 66, retired, medium change in ecological footprint)

Despite the varying responses in energy use, the mean China-born group's Carbon footprint in Melbourne was 2.7 times higher than when they lived in China (Table 5.2). This increase in Carbon footprint was mainly due to increased dependency on a car, and associated travel behaviours.

#### Changes in Food footprint

Results from the survey also show that there were changes in the China-born respondents' diets in Melbourne. As illustrated in Figure 5.6, 54 per cent indicated a change in their diet in Australia, and there were also differences in the food they
bought (59 % of the respondents). Primary reasons related to new food landscapes of non-Chinese food (for example, pasta) and the availability of different types of local food such as cereal, lamb and cheese. The following comments show evidence of these factors:

There are more varieties of food here. Now my diet is different as I eat beef and cheese. (Case 21: female, 36 years old, living with own family, migrated in 2008 at age 32, sales and services, small change in ecological footprint)

I do eat local food such as beef and lamb as they are better here. Moreover, I do eat pasta as it is part of the local culture. (Case 34: female, 48 years old, living with own family, migrated in 1995 at age 31, not working, large change in ecological footprint)

What have changed is that I eat lamb here and sometimes I cook pasta. (Case 58: female, 41 years old, living with own family, migrated in 2005 at age 34, manager, medium change in ecological footprint



Figure 5.6: Change in diet and food bought by China-born group in Melbourne compared to when in China

Respondents also indicated changes in their eating out and shopping habits. A number commented that they seldom ate out in Melbourne compared to more frequent dining at restaurants when they were in China. A common reason cited was the higher cost of eating out in Melbourne. Other participants expressed changes in their shopping habits. They mentioned that instead of buying fresh food daily as they did in China, they tended to bulk buy for the week. Some showed displeasure with having to refrigerate food in Melbourne in order to maintain stocks of food for the week. Some explicit views from the respondents illustrate these points:

I used to buy fresh food daily in China but now I only shop less frequent and have to store the food in the refrigerator. (Case 58: female, 41 years old,

*living with own family, migrated in 2005 at age 34, manager, medium change in ecological footprint)* 

In China I bought rice and oil in loose weights but here I buy them in package forms. (Case 5: male, 78 years old, single, living alone, migrated in 1999 at age 65, not working, medium change in ecological footprint)

A number of respondents mentioned that they still retained their diet of Chinese food due to the availability of Chinese food. Others indicated a similar or higher quantity of Chinese food consumed in Australia. Comments on *retaining* their traditional ethnic diets included the following:

My diet is about the same as in China, except that I eat more seafood now. (Case 59: female, 41 years old, living with own family, migrated in 2009 at age 38, not working, medium change in ecological footprint)

There are more food choices here. I have no difficulty in buying Chinese food and I do not like western food. (Case 15: female, 43 years old, living with own family, migrated in 2004 at age 35, professional, medium change in ecological footprint)

I have more of Chinese vegetables now. (Case 6: female, 65 years old, living with extended family, migrated in 2007 at age 60, retired, medium change in ecological footprint)

Overall, the changes in respondents' diets in Melbourne resulted in an increase in their average Food footprint in China by 4.7 times. A principal cause would appear to be the introduction of meats such as beef and lamb: both have a large environmental impact.

## Changes in Housing footprint

Changes in the China-born migrants' housing footprint between China and Melbourne were explored with regard to dwelling type and size, and water use. The survey data shows that there was a substantial difference in dwelling types occupied by the China-born migrants in China compared to Melbourne. In Australia, housing is prominently in detached dwellings. They are also larger. 'McMansions', which are gaining in affordability (per square meter) and popularity, affect migrants' choices of new homes (especially with an extended family), and are also a demonstration of 'achievement'. Figure 5.7 indicates that the China-born respondents had rapidly adopted the host society's housing structures after migration to Australia. The percentage living in detached housing rose from seven per cent in China to 62 per cent in Australia. This was reflected in an increase of 5.4 times in the mean Housing footprint (Table 5.1).

The increased housing footprint was also associated with living in a dwelling with a garden. These findings are in line with studies by Troy and Randolph (2006), who found that households with gardens increased their use of water as part of their property investment and enjoyment (Syme, Thomas & Salerian 1983; Syme et al. 2004).



Figure 5.7: Comparison of dwelling context in China and in Melbourne of Chinaborn group

In comparing dwelling sizes between China and Melbourne (Figure 5.8), 80 per cent indicated that their dwelling size, including a garden, was larger, and 59 per cent had larger dwellings excluding garden. These increased percentages were also related to having more bedrooms (39 %) and bathrooms (37 %).



Figure 5.8: Comparison between China-born group's dwelling context in Melbourne and China

In their qualitative responses, participants were asked about changes in their housing consumption behaviours since migrating to Australia. Despite differences in their lengths of residence in Melbourne, the respondents' views provided evidence that

they had adopted many aspects of Australian lifestyle with regard to housing. Comments relating to bigger homes included the following:

*My* house is larger (in Melbourne) and I have a garden. (Case 61: female, 35 years old, living with extended family, professional, migrated in 2000 at age 23, large change in ecological footprint)

My rooms are bigger now. (Case 28: female, 37 years old, living with own family, migrated in 2008 at age 33, not working, medium change in ecological footprint)

There are more rooms in my house here. (Case 14: male, 48 years old, living with own family, migrated in 2006 at age 42, manager, small change in ecological footprint)

Other participants' views refer to living in homes with gardens in Melbourne, which resulted in their increased water usage:

I use more water now as I have a garden because I used to live in an apartment without any garden. (Case 58: female, 41 years old, living with own family, migrated in 2005at age 34, manager, medium change in ecological footprint)

I have a garden now, which means I use more water for gardening. (Case 61: female, 35 years old, living with extended family, professional, migrated in 2000 at age 23, large change in ecological footprint)

When it comes to water use (Figure 5.4), about 50 per cent of the China-born respondents felt that there was no change in their total amount of water use between China and Melbourne. While 34 per cent indicated a lower amount of water use in Melbourne, four per cent said they used a higher amount. The respondents cited various views and reasons in assessing their behaviours.

Some of the respondents' views showed that they had made behavioural changes post- migration. Several mentioned that they had more showers in Melbourne, which they attributed to the influence of the host culture: Though I am environmentally conscious and saving money is a family habit, I am using more water now as I shower every day in Melbourne. I used to shower once every two days and only once in a week for cleanliness during winter in China. Now I shower every day as I am used to the local lifestyle and this is also due to the higher quality of life here. (Case 34: female, 48 years old, living with own family, migrated in 1995 at age 31, not working, large change in ecological footprint)

I used to take shower two to three times a week, but now I take one every day. (Case 26: male, 29 years old, living with family and other non-family members, migrated in 2008 at age 25, professional, medium change in ecological footprint)

There was a mixture of influences at work:

I used not to bother to conserve water as water was cheap in China. My husband (who is an Australia-born resident) influences me to reduce water use here in Melbourne. For instance, I do not water the garden. In addition, compared to the time when I was in China, I use more water now, as I have to look after the house – doing all the cleaning and washing. (Case 52: female, 43 years old, living with three or more families with family members, migrated in 2009 at age 43, personal services, medium change in ecological footprint)

I am using more water for the garden. I feel that I am already using the minimum. Neither government initiatives and water restrictions nor drought has any influence in the way I use water. (Case 39: female, 45 years old, living with own family, migrated in 2009 at age 41, own business, large change in ecological footprint)

*I use* (restricted – three minutes) *shower time due to the government's initiatives to conserve water.* (*Case 28: female, 37 years old, living with own family, migrated in 2008 at age 33, not working, medium change in ecological footprint*) Some respondents mentioned that their persistence in carrying on with their past habits of conserving water in Melbourne was due to familial and/or religious factors. Another familial factor mentioned was frugality with money. These points were expressed by the participants as follows:

I still use a pail of water while taking shower as I have been doing this while in China. I am used to this old habit. (Case 41: female, 57 years old, living with two families and family members, migrated in 1997 at age 42, labourer, medium change in ecological footprint)

My saving habits are similar to the time I was in China partly due to the influence from China, and my family habits. These habits are also partly due to my religious practice (as a Buddhist). I am already using less water. I am extra careful with my shower time and I also reuse used water. (Case 33: female, 52 years old, living with own family, migrated in 2007 at age 47, own business, small change in ecological footprint)

Evidence from the participants' responses shows that only some of them made major changes in their water use behaviours. Therefore, the increase by 5.4 times in their Housing footprint, the largest increase among the four footprint components, was mainly due to the changes in dwelling type and size.

## Changes in Goods and Services footprint

In the survey, the China-born group's Goods and Services footprint was measured mainly in the consumption categories of purchasing behaviours, as well as waste generation and management.

Data on migrants' purchasing behaviours (Figure 5.9) revealed a higher percentage (73.7%) in Melbourne tended to use things until they were replaced, compared to their past behaviours in China (52.5%). This higher percentage indicates that there was likely to be less waste generated. A smaller amount of waste is also likely, given that fewer of them mentioned that, while living in Melbourne, they replaced items before needing to, and when they were still in good condition, than when they lived in China. Creating less waste in Melbourne was reflected in the small increase in

their Goods and Services footprint (2.4 times), compared to the larger increases in the other three footprint components.



Figure 5.9: Purchasing behaviours in China and Melbourne of China-born group

Data from the survey also shows that there were changes in the way the China-born respondents managed their waste (Figure 5.10): they were more likely to recycle and reduce their amount of garbage in Melbourne than they were when living in China.

Evidence of these behavioural changes among the migrants is contained in their responses below.

Figure 5.10: China-born group's waste generation and management behaviours in Melbourne compared to those in China



The higher amount of waste recycling undertaken in Melbourne seemed to be mainly due to the host's societal structures. Council recycling systems and opportunity shops (that is: second-hand shops) allowed the respondents to get involved in recycling. Some examples are set out below: There is less garbage now as there are fewer people in the house. I recycle newspapers now as everyone here is doing so. (Case 44: female, 57 years old, living alone, migrated in 2009 at age 54, manager, medium change in ecological footprint)

*I follow the local habits in the way they recycle and having a recycling bin is convenient. (Case 47: female, 48 years old, living with own family, migrated in 2001 at age 37, not working, medium change in ecological footprint)* 

Some of the China-born participants found these structures convenient, and viewed them as different avenues to effecting positive environmental change:

When I was living in the dormitory in China, I only had the opportunity to recycle batteries as there was no other waste recycling system. Now, I am able to recycle as there is a recycling system. I also give away my old clothes as second hand to opportunity shops. I also cook more at home. (Case 60: female, 30 years old, living with finance, migrated in 2002 at age 20, professional, large change in ecological footprint)

I share the rubbish bin with three other families. I feel that there is more waste now as I cannot sell newspapers for cash as I was able to in China. In fact, I find the yearly distribution of phone books a waste of paper in Australia as I hardly use them. I will keep meat as leftovers but not vegetables as they cannot be kept overnight. (Case 3: male, 79 years old, living with own family, migrated in 1996 at age 63, retired, small change in ecological footprint)

Overall, though there was an increase in the Goods and Services footprint of the China-born migrants, their responses revealed that they showed restraint in their purchasing behaviours, and in waste generation and management. These restraints resulted in the smaller increase in this footprint than in the other three footprint components.

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In summary, the preceding analysis reveals that the China-born respondents living in Melbourne do not form a homogeneous group with regard to changes in the different consumption categories, except that overall, footprints increased more than three-fold. The following section explores the significance of cultural factors (as represented by the CALD Index and the indicators of acculturation) as explanatory factors in *changes* in consumption behaviour.

## 5.2 Determinants of level of change in ecological footprint

The degree of change in the China-born group's ecological footprint between Melbourne and China can be characterised by three categories: small change – 10-40 global hectares (gha), medium change – 41-60 gha and large change – over 61 gha. These three levels (categories) of change are established by the natural break points in the histogram representing the change in ecological footprint of the respondents (Figure 5.2). This part of the analysis explores potential explanatory factors associated with the *degree of change* in footprint. This exploration is based on the conceptual framework (Figure 5.11) as adapted from the fundamental conceptual framework (refer to Figure 3.3).

Mean values of each indicator were used to explore variations across the three levels of change in footprint. The tabulation for each differentiating factor across the three categories of change is presented in Tables 5.2 to 5.6. Table 5.7 summarises the variations in the ability of the determinants to provide clear explanations across the three categories of *change* in ecological footprint. However, to elicit a better understanding of the differences across the three categories of change, the discussion which follows focuses on *small* and *large* change footprint groups.

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Figure 5.11: Conceptual framework for understanding China-born migrants' change in ecological footprint between country of birth and host society



			Change in total ecological footprint											
			Small		Me	dium	La	arge	Т	otal				
			change		ch	ange	ch	ange						
Determinant	Mean	Value	N %		Ν	%	Ν	%	Ν	%				
			16	100	34	100	11	100	61	100				
CALD	37.3	< 37	9	56.3	12	35.3	5	45.5	26	42.6				
Index <sup>i</sup>	(SD=3.9)													
		$\geq$ 37	7	43.8	22	64.7	6	54.5	35	57.4				

Table 5.2: Aspects of relationship between the CALD Index and level of change in China-born group's total ecological footprint

Note: i = interval (continuous) level variable;  $X^2(30) = 23.96$ , p=0.774

Table 5.3: Aspects of relationship between indicators of acculturation and level of change in China-born group's total ecological footprint

			Sr	nall	Me	dium	L	arge	Т	otal	Comparison		
	r		cha	ange	cha	ange	ch	ange			between		
Indicator	Mean	Value	Ν	%	Ν	%	Ν	%	Ν	%	variables		
			16	100	34	100	11	100	61	100	(Chi-		
A	40.7	< 12	6	27.5	17	47.1	10	00.0	22	50.5	square) $V^2(4)$		
Age at arrival to	42.7	< 43	0	37.5	10	4/.1	10	90.9	32	52.5	X (4)		
Melbourne											=4.464,		
											p=0.347		
	(SD=12.8)	$\geq$ 43	10	62.5	18	52.9	1	9.1	29	47.5			
Length of	7.5	< 7	11	68.7	22	64.7	3	27.3	36	59.0	$X^{2}(4)$		
residence in	(9D - 4.9)	< 7	5	21.2	10	25.2	0	70 7	25	41.0	=11.742,		
<b>Melbourne</b> <sup>1</sup>	(SD-4.8)	$\leq 1$	5	51.5	12	33.3	0	12.1	23	41.0	p=0.019		
English in	1.7	< 1	7	43.8	13	38.2	4	36.4	24	39.3	$X^{2}(2)$		
<b>communications</b> <sup>1</sup>	(SD=1.6)	$\geq 1$	9	56.3	21	61.8	7	63.6	37	60.6	=0.189,		
	× /										p=0.910		
English in mass	30.6	< 30	11	68.8	20	58.8	5	45.5	36	59.0	$X^{2}(2)$		
media <sup>1</sup>	(SD=27.7)	$\geq$ 30	5	31.3	14	41.2	6	54.5	25	41.0	=0.146,		
	· · · · · ·										p=0.481		
Social interaction	0.95	< 1	2	12.5	1	2.9	-	-	3	4.9	$X^{2}(2)$		
with Chinese <sup>1</sup>	(SD=1.1)	$\geq 1$	14	87.5	33	97.1	11	100	58	95.1	=2.82,		
	× /										p=0.244		
Feeling of ethnic	-	No=0	3	18.8	1	2.9	-	-	4	6.6	$X^{2}(2)$		
<b>Pride</b> <sup>2</sup>											=5.379,		
	-	Yes=1	13	81.3	33	97.1	11	100	57	93.4	p=0.068		

Note: 1. Interval (continuous) level variable

2. Dichotomous variable – refer to Table C-9, Appendix C.

				Chan	ige in	total e	colog	gical fo	otprin	t	Comparison
			Sı	nall	Me	dium	L	arge	Т	otal	between
			ch	ange	ch	ange	ch	change			variables
Determinant	Mean	Value	Ν	%	Ν	%	N %		Ν	%	(Chi-square)
			16	100	34	100	11	100	61	100	
Conservation	9.2	< 9	3	18.7	11	32.4	4	36.4	18	29.5	$X^2(4) = 3.13,$
Behaviours	(SD=1.7)	$\geq 9$	13	81.3	23	67.6	7	63.7	43 70.5		p=0.54
Index (CBI) <sup>1</sup>											
Resource-	5.1	< 5	2	12.5	17	50	4	36.4	23	37.7	$X^{2}(4) = 7.55,$
efficient	(SD=2.2)	$\geq 5$	14	87.5	17	50	7	63.7	38	62.3	p=0.11
Technologies											
Index (REI) <sup>1</sup>											
Environmental	1.0	< 1	3	18.7	9	26.5	4	36.4	16	26.2	$X^{2}(4) = 1.78,$
Awareness	(SD=0.7)	$\geq 1$	13	81.3	25	73.5	7	63.7	45	45 73.8	p=0.78
Index (AI) <sup>1</sup>											

Table 5.4: Aspects of relationship between individual behavioural indexes and degree of change in China-born group's total ecological footprint

Note: 1. Interval (continuous) level variable

			Chang	ge in	total e	colog	ical foo	tprir	nt	Comparison
		S	mall	Me	dium	L	arge	T	otal	between
		ch	ange	ch	ange	ch	ange			variablas
Determinant	Measurement	Ν	%	Ν	%	Ν	%	N %		variables
	scale	16	100	34	100	11	100	61	100	(Chi-
										square)
Gender	Female	13	81.3	26	76.5	9	81.8	48	78.7	$X^{2}(2)$
	Male	3	18.7	8	23.5	2	18.2	13	21.3	=0.227,
										p=0.893
Age group	18-44 yrs	6	37.5	14	41.2	9	81.8	29	47.5	$X^2$
	45yrs or older	10	62.5	20	58.8	2	18.2	32	52.5	(2)=6.381,
										p=0.041
Education	Diploma level	5	31.3	19	55.9	4	36.4	28	45.9	$X^{2}(2)$
	education or									=3.15,
	below									p=0.207
	University or	11	68.7	15	44.1	7	63.6	33	54.1	
	postgraduate									
	degree									
Employment	Employed	10	62.5	16	47.1	8	72.7	34	55.7	$X^2$
	Not employed	6	37.5	18	52.9	3	273	27	44 3	(2)=2.622,
	i tot employed	Ŭ	57.5	10	52.7	5	21.5	27	11.5	p=0.270
Individual	Lower income	14	87.5	25	73.5	3	27.3	42	68.9	$X^{2}(2)$
annual	(\$19999 or less)									=11.809,
income <sup>1</sup>										p=0.003
	Higher income	2	12.5	9	26.5	8	72.7	19	31.1	
	(\$20,000 or									
	more)									
Car	Yes	14	87.5	31	91.2	10	90.9	55	90.2	$X^{2}(2)$
ownership										=0.174,
-	No	2	12.5	3	8.8	1	9.1	6	9.8	p=0.917

Table 5.5: Aspects of relationship between individual structural attributes and degree of change in China-born group's total ecological footprint

Note: 1. The median (\$20,000) was used to define the binary split for income.

		С		Comparison						
		Sı	nall	Me	dium	L	arge	Т	otal	between
		ch	ange	ch	ange	ch	ange			variables
Determinant	Number of	Ν	%	Ν	%	Ν	%	Ν	%	variables
	person per	16	100	34	100	11	100	61	100	Chi-square)
	household									
Household	1	-	-	2	5.9	-	-	2	3.3	$X^{2}(12)$
size	2	8	50.0	13	38.2	5	45.5	26	42.6	=7.459, p=0.826
	3	4	25.0	9	26.5	2	18.2	15	24.6	
	4	4	25.0	4	11.8	2	18.2	10	16.4	
	5	-	-	4	11.8	2	18.2	6	9.8	
	6	-	-	1	2.9	-	-	1	1.6	
	8	-	-	1	2.9	-	-	1	1.6	
Dwelling type	Detached home	12	75.0	26	76.5	9	81.8	47	77.0	$X^{2}(2)$
	Other type	4	25.0	8	23.5	2	18.2	14	23.0	=0.186, p=0.911
Dwelling size	Small dwelling(150 square meters or smaller )	8	50.0	15	44.0	1	9.0	24	39.3	$X^{2}(2)$ =5.305, p=0.070
	Large dwelling (150 square meters or larger)	8	50.0	19	56.0	10	91.0	37	60.7	
Home ownership	Home owner	12	75.0	17	50.0	9	81.8	38	62.3	$X^{2}(2)$ =5.073,
	Tenant/Other	4	25.0	17	50.0	2	18.2	23	37.7	p=0.079

Table 5.6: Aspects of relationship between respondents' household and dwelling contexts and degree of change in China-born group's total ecological footprint

Change of total	Small change	Medium change	Large change			
ecological footprint	_	_				
Descriptors						
Individual structural attributes	<ul> <li>Are older</li> <li>(45 years or older)</li> <li>with university or postgraduate</li> <li>education</li> <li>Are employed</li> <li>Have low income</li> <li>Own a car</li> </ul>	<ul> <li>Are older</li> <li>(45years or older) with diploma level education or below</li> <li>Are unemployed</li> <li>Have low income</li> <li>Own a car</li> </ul>	<ul> <li>Are younger (18- 44 years) with university or postgraduate education</li> <li>Are employed</li> <li>Have high income</li> <li>Own a car</li> </ul>			
Individual behavioural indexes <sup>1</sup>	<ul> <li>Most have conservation behaviours and environmental awareness</li> <li>Most have resource-efficient technologies</li> </ul>	<ul> <li>Some have conservation behaviours and environmental awareness</li> <li>Fewer have resource-efficient technologies</li> </ul>	<ul> <li>Fewer have conservation behaviours and environmental awareness</li> <li>Some have resource-efficient technologies</li> </ul>			
CALD Index (connectedness	• Weaker	• Stronger	• Stronger			
with their own ethnic	connectedness with	connectedness with	connectedness with			
culture)	Chinese culture	Chinese culture	Chinese culture			
Acculturation process <sup>1</sup>	<ul> <li>Most older age at arrival</li> <li>Most less than 7 years of residence</li> <li>Fewer have frequent use of English in mass media</li> <li>Fewer have social interactions with Chinese</li> </ul>	<ul> <li>Most older age at arrival</li> <li>Most less than 7 years of residence</li> <li>Some have frequent use of English in mass media and communications</li> <li>Some have social interactions with Chinese</li> </ul>	<ul> <li>Most younger age at arrival</li> <li>Most more than 7 years of residence</li> <li>Most have frequent English in communications</li> <li>Most have social interactions with Chinese</li> </ul>			
Household and dwelling contexts	<ul> <li>2-person household</li> <li>Owned detached homes</li> <li>Homes are either less or more than 150 square meters</li> </ul>	<ul> <li>2-person household</li> <li>Either owned or non-owner of detached homes</li> <li>Homes are either less or more than 150 square meters</li> </ul>	<ul> <li>2-person household</li> <li>Owned detached homes</li> <li>Homes larger than 150 square meters</li> </ul>			

Table 5.7: Descriptors of the three levels of change in China-born group's total ecological footprint

Note: 1. Comparison of higher percentage across the three categories

The main differentiating features between the *small* versus *large* change footprint groups are summarised as follows:

The *small* change in the China-born group's ecological footprint was found to be related most strongly to the following:

- A predominance older migrant respondents (62.5% were 45 years or older, Table 5.5). Most also migrated at an older age (62.5%, Table 5.3). About 88 per cent of them had low incomes (Table 5.5). These findings suggest that older participants were likely to be retirees with fixed incomes. Their low amounts of disposable income could have resulted in their frugality in resource use and conservation. Despite having low incomes, a high percentage (87.5%, Table 5.5) indicated owning a car, reflecting their adoption of a car-dependent lifestyle while living in Melbourne. Their *small* change in footprint suggests restrained use of the car.
- Demonstrating conservation behaviours and installing resourceefficient technologies. Among this group, 81.3 and 87.5 per cent respectively indicated carrying out these two behaviours (Table 5.4). These behavioural attributes reflect their frugality in resource use. Though this frugality may suggest a wish to save money, most of them (81.3%, Table 5.4) also acknowledged having more environmental awareness. These attributes and low incomes were likely to have influenced the *small* change group's consumption level, despite half of them indicating that they were living in large dwellings (Table 5.6), which in some cases were shared with other household members or family/non-family groups.
- Weak connectedness with Chinese culture (lower CALD scores). For half of the group (56.3%, Table 5.2), their small increase in consumption level in Melbourne was related to limited retention of certain aspects of Chinese culture. Their weak association symbolised their relinquishment of one of the core elements of the Chinese thought process '*mien-tzŭ*' (face), which is a Confucian concept that

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stands for 'a reputation achieved through getting on in life, through success and ostentation' (Hu 1944, p.45; Zhang & Baker 2008). On the other hand, a majority of them (87.5 %, Table 5.3) indicated having social interactions with Chinese, and indicated feelings of ethnic pride (81.3%, Table 5.3). The frequency of interactions with Chinese is likely to be associated with individual migrants' maintenance of '*Chinese connectedness*' or '*guanxi wang*' (a network of contacts), which is also one of the core elements of the Chinese thought process (Zhang & Baker 2008). These findings revealed that though they were likely to maintain constant and close intimacies with Chinese, they were not keen – or able to – retain other aspects of Chinese culture. The findings thus suggest that they chose not to live their lives 'relative' to others, which meant they felt less social pressure in Australia (Da 2003). It also meant that they did not have to feel pressured to accumulate material possessions, which were symbolic of their maintenance of 'mientzŭ' and success in their migration.

- Those who had a short length of residence in Melbourne 68.7 percent indicated living in Melbourne for less than 7 years (Table 5.3). This suggests a shorter period of time for the China-born respondents to accumulate possessions. Also their weak connectedness with Chinese culture, and strong association with the host culture (low CALD Index score, Table 5.2) suggest that they did not feel they had to emulate other Chinese migrants in building up their possessions and wealth in order to establish the success of their settlement in the host country (Larin 2013).
- A smaller percentage frequently used English in mass media (31.3%, Table 5.3) compared to a larger percentage of the respondents who exhibited a *large* change (41.0 %, Table 5.3). These results reflect Phinney's (2006, p.87) finding that older migrants are 'slower to learn a new language and rarely give up their ethnic language'. As older migrants from China, they were likely to be monolingual, as they were not likely to have learnt English. They also had less prior exposure to an English speaking environment.

A *large* change in the China-born group's ecological footprint was found to be related most strongly to the following:

- Younger migrants (18-44 years, 81.8% Table 5.5) with high incomes, which had a major influence on consumption and *change* in footprint. Over 70 per cent of respondents in the *large* change category had higher incomes (Table 5.5). This outcome aligns with past studies, which have shown that the participants' increasing income correlates positively with energy and water use, consumption of food with high level of calories and animal products, and waste generation (Dey et al. 2007; Hamilton, Denniss & Baker 2005; Reusswig, Lotze-Campen & Gerlinger 2003; Zacarias-Farah & Geyer-Allély 2003). These findings also suggest that the *large* change in footprint among the younger respondents was likely to be due to their financial capacities to own energy-intensive possessions such as large homes and more appliances, compared with the participants with lower incomes. The younger respondents were likely to have younger families, which meant there was more 'familyrelated' consumption as well as 'conspicuous' consumption. There was a high level of car ownership (90.9%, Table 5.5), reflecting the migrants' adoption of a car-dependent lifestyle while living in Melbourne.
- Associations between the respondents' behavioural attributes and magnitude of footprint. These respondents tended to exhibit fewer conservation behaviours, lower rates of installation of resource-efficient technology, and had less environmental awareness than the *small* change group. Among the *large* change group, 63.7 per cent displayed these attributes compared with more than 80 per cent of the *small* change group (Table 5.4). Thus, these three behavioural attributes combined to effect a large increase in footprint, as expounded in past research (Gregory & Di Leo 2003; Markowitz & Doppelt 2009; Stokes et al. 1994; Syme, Nancarrow & Seligman 2000). A majority of the *large* change group who lacked these behavioural attributes also indicated living in large dwellings (91%, Table 5.6). Their high consumption levels echoed that of past research, which has shown that a large detached dwelling is a perfect receptacle for house fixtures, furniture, and appliances (Dey et al. 2007; Mills & Schleich 2012; Newton 2011; OECD 2011; Syme, Thomas &

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Salerian 1983). The larger space also requires more energy for heating and cooling. Consequently, exhibiting fewer conservation behaviours and environmental awareness while living in large dwellings is likely to result in more resource use and GHG emissions.

- Strong connectedness with Chinese culture (higher CALD scores, Table 5.2). This connectedness indicates that the reason for higher levels of consumption in a Western society was to reflect aspects of Chinese culture. Their high incomes provided the financial capability to consume more and to own possessions such as detached homes (81.8%, Table 5.6) and large dwellings (91%, Table 5.6). These acquisitions represent physical evidence of their achievements and the attainment of a prosperous lifestyle as migrants in a developed country (Larin 2013, p.41). The acquisitions were also necessary to maintain their reputation, and thereby 'mien-tzu'. This maintenance of 'mientzŭ' was also enhanced by all of those respondents who maintained constant and frequent interactions with Chinese while living in the host society and exhibited ethnic pride (Table 5.3). Their responses show that they wanted to maintain their relationships with the Chinese community in Australia while retaining their relationship with China as the home country (Zhou 2012). All these cultural factors demonstrate the continuation of 'values and practices which were shaped in the county (in which) they grew up' (Hinglis 1991 cited in Da 2003, p.379). The upholding of these values and practices is likely to result in them feeling social pressures in the new environment as they did in China.
- Long length of residence in Melbourne 72.7 per cent had resided in Melbourne for seven or more years (Table 5.3). In other words, during this period, this group of migrants was able to build up possessions and wealth. These accumulations were symbolic of the success of their settlement in the host country (Larin 2013). A large percentage also frequently used English in communications (60.6%, Table 5.3). The use of English is likely to be due to the younger average age of this group. Higher percentages of younger migrants tended to make use of English more than the older migrants. As the younger migrants were expected to have knowledge of the English language, living and working in an English-speaking environment increased their usage of English.

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With this ability, they did not experience language barriers; thus it would be easier for them to adapt and fit into the host society and workplace, without having to weaken their associations with Chinese culture.

The following section further explores those factors that may in some way be linked to these changes in consumption. This is done in order to obtain a better understanding of the reason for the increase by 3.3 times of the ecological footprint of a representative group of the China-born migrants (Table 5.1). This exploration is undertaken because of the strength and statistical significance of the consumption determinants related to the dependent variable, *change in footprint*. The multi-variate analysis is applied to establish the relative importance of the determinants as predictors of the China-born migrants' *change in footprint*. Insights gained here are critical to understanding the likely trajectories of consumption in Australia and also in rapidly developing societies like China. A set of potential determinants has been identified in the conceptual framework in relation to understanding individual migrants' *change in ecological footprint* between China and Australia (Figure 5.12).

5.3 Exploring determinants of change in ecological footprint in a multi-variate modelling context

5.3.1 Preliminary analyses of determinants and change in ecological footprint This section first examines the relationships between each of the determinants and *change in ecological footprint* (the dependent variable) using Pearson correlation analysis. These correlations between the list of determinants and *change in ecological footprint*, as defined in Figure 5.11, were derived using SPSS analysis. Table 5.8 illustrates these correlations. Secondly, multiple regression analysis is undertaken to discover the relative significance of each determinant in relation to the magnitude of *change in ecological footprint*.

	С	ontext		Individual structural attributes			Individual behavioural indexes			Household	Dwelling context			Indicators of acculturation								
Context		Determinant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	1	Change in ecological		-0.001	-0.280	-0.110	0.051	-0.402	0.055	-0.134	-0.032	-0.056	0.078	-0.066	0.221	0.002	-0.184	-0.284	0.209	0.045	0.137	0.204
		footprint		(0.496)	(0.015)	(0.199)	(0.349)	(0.001)	(0.336)	(0.151)	(0.403)	(0.333)	(0.276)	(0.306)	(0.043)	(0.495)	(0.078)	(0.013)	(0.053)	(0.367)	(0.146)	(0.057)
	2	Gender			0.095	0.078	-0.100	-0.082	-0.366	-0.065	0.028	-0.044	0.248	-0.339	-0.482	-0.192	0.293	0.251	-0.024	0.345	0.026	0.057
					(0.234)	(0.276)	(0.221)	(0.264)	(0.002)	(0.310)	(0.415)	(0.368)	(0.027)	(0.004)	(0.000)	(0.069)	(0.011)	(0.026)	(0.428)	(0.003)	(0.420)	(0.332)
	3	Age				-0.152	-0.254	0.352	-0.314	-0.112	-0.010	0.116	-0.228	0.004	-0.229	-0.129	0.339	0.633	-0.252	-0.006	-0.374	-0.216
Individual structural	4	Education				(0.121)	0.024)	0.005)	(0.007)	0.010	(0.409)	0.180)	(0.038)	(0.480)	0.068	0.100)	0.022	0.000)	0.111	(0.482)	(0.002)	(0.047)
attributes	-	Education					(0.008)	(0.020)	(0.145)	(0.443)	(0.417)	(0.003)	(0.058)	(0.101)	(0.300)	(0.060)	(0.430)	(0.010)	(0.197)	(0.218)	(0.000)	(0.000)
	5	Employment						-0.599	0.260	0.169	0.140	0.257	0.255	0.192	0.161	0.220	-0.181	-0.498	0.031	-0.014	0.423	0.458
	-	1.2						(0.000)	(0.022)	(0.096)	(0.141)	(0.023)	(0.024)	(0.069)	(0.108)	(0.044)	(0.082)	(0.000)	(0.407)	(0.457)	(0.000)	(0.000)
	6	Income							-0.222	-0.040	0.036	-0.214	-0.301	-0.085	-0.034	0.054	0.085	0.415	0.108	-0.042	-0.412	-0.430
									(0.043)	(0.379)	(0.391)	(0.049)	(0.009)	(0.257)	(0.396)	(0.340)	(0.257)	(0.000)	(0.204)	(0.374)	(0.000)	(0.000)
	7	Car ownership								0.299	0.120	0.070	0.255	0.425	0.410	0.474	-0.427	-0.436	0.135	-0.164	0.208	0.243
										(0.010)	(0.178)	(0.297)	(0.023)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.150)	(0.103)	(0.054)	(0.030)
	8	CBI <sup>2</sup>									0.401	-0.024	0.082	0.255	0.238	0.296	-0.124	-0.146	0.227	0.003	-0.107	0.002
Individual		DEI2									(0.001)	(0.427)	(0.266)	(0.024)	(0.032)	(0.010)	(0.170)	(0.131)	(0.039)	(0.492)	(0.205)	(0.495)
hehavioural indexes	9	KEI <sup>-</sup>										(0.252)	-0.166	(0.001)	(0.004)	(0.120	0.085	-0.055	(0.206)	0.128	-0.006	(0.381)
benaviourar muexes	10											(0.252)	0.071	0.172	-0.019	0.152	0.052	-0.133	-0 378	0.045	0 291	0 327
	10												(0.293)	(0.093)	(0.444)	(0.122)	(0.344)	(0.155)	(0.001)	(0.364)	(0.011)	(0.005)
Household context	11	Household size												-0.026	0.026	0.332	0.034	-0.218	0.102	0.071	0.264	0.341
														(0.421)	(0.421)	(0.005)	(0.396)	(0.046)	(0.216)	(0.295)	(0.020)	(0.004)
	12	Home ownership													0.620	0.299	-0.114	-0.182	0.204	-0.125	-0.015	0.073
															(0.000)	(0.010)	(0.192)	(0.080)	(0.058)	(0.169)	(0.455)	(0.287)
Dwelling context	13	Dwelling size														0.279	-0.179	-0.314	0.329	-0.120	-0.086	-0.039
	14	Druglling turns														(0.015)	(0.083)	(0.007)	(0.005)	(0.179)	(0.255)	(0.382)
	14	Dwennig type															-0.087	-0.294	(0.095)	-0.078	(0.137	(0.024)
	15	Length of residence															(0.255)	0 199	0.011	0.161	0.046	0.115
	15	Eengen of residence																(0.062)	(0.466)	(0.108)	(0.362)	(0.188)
	16	Age at arrival																	-0.220	0.249	-0.575	-0.509
		, and the second																	(0.044)	(0.026)	(0.000)	(0.000)
Indicators of	17	Feeling of ethnic pride <sup>3</sup>																		0.032	-0.149	-0.137
acculturation																				(0.403)	(0.126)	(0.146)
	18	Social interactions with																			0.152	-0.204
	10	Chinese En allah in mana an dia																			(0.122)	(0.058)
	19	English in mass media																				-0.783
	20	English in																				
		communications																				
Cultural context	21	CALD Index	0.026	-0.098	0.263	-0.216	-0.279	0.307	0.001	0.098	-0.163	-0.456	-0.062	-0.062	0.089	0.200	-0.031	0.200	0.143	-0.133	-0.498	-0.481
			(0.420)	(0.226)	(0.020)	(0.047)	(0.015)	(0.008)	(0.497)	(0.226)	(0.105)	(0.000)	(0.317)	(0.318)	(0.247)	(0.061)	(0.407)	(0.061)	(0.135)	(0.154)	(0.000)	(0.000)

## Table 5.8: Correlations between determinants and change in total ecological footprint of China-born group

Notes:

 Figure in boldface signifies correlation (r in bracket) is significant at the 0.10 level (1-tailed).
 CBI (Conservation Behaviours Index), REI (Resource-efficient Technologies Index), AI (Environmental Awareness Index). Have high level of feeling of ethnic pride.

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Due to the small sample size (N=61) of the China-born group, a lower threshold of p=0.1 is considered for the purposes of statistical significance. According to de Vaus (2002), the required sample size depends on the degree of accuracy and the level of confidence in generalisations from the sample. In the research with a sample size smaller than 100, the degree of accuracy is 10 per cent at 95 per cent level of confidence. All significant correlations are shown in bold font (Table 5.8). The following examines the correlations between the set of determinants and the *change in total ecological footprint*.

Within the *individual context*, age (r = -0.3) and income (r = -0.4) were found to have a statistically significant relationship with *change in ecological footprint*. The negative correlation between income and the footprint was because low income was coded as '1' and high income as '0' (Refer to Table C-1, Appendix C; a more typical reverse recoding would have produced the expected positive correlation). Younger and high income migrants tended to be associated with higher levels of consumption (that is, greater *change* in their ecological footprint) than older respondents. These findings were in line with other studies, which found that younger individuals were likely to be employed, and employment correlates positively with car ownership and driving distance (OECD 2011; Schipper 1996). They also have high amounts of waste generation (Barr, Gilg & Ford 2001; Hamilton, Denniss & Baker 2005), which adds to the magnitude of their footprint.

The strong relationship between *change in ecological footprint* and income indicates that respondents with high incomes were linked to higher levels of consumption (that is, larger *change in ecological footprint*). This finding is consistent with studies that have shown that income is associated with consumption categories such as energy, water, and waste generation (Dey et al. 2007; Hamilton, Denniss & Baker 2005). Increasing disposable income allows individuals to purchase more goods and appliances, and larger homes, thereby demanding more resource for space heating and cooling, and subsequently resulting in an increase in total household resource consumption (Druckman & Jackson 2008; Zacarias-Farah & Geyer-Allély 2003). Therefore, as expected, dwelling size was found to have a statistically significant relationship with *change in ecological footprint* (r= 0.2). The relationship suggests

that a larger change in ecological footprint was found among those living in larger dwellings.

As the magnitude of ecological footprint was also associated with the amount of GHG emissions, the finding was in line with past studies, which have found that high income households tend to carry out high-greenhouse impact activities such as air travel and use of private cars (Carlsson-Kanyama & Lindén 1999; Dey et al. 2007).

Four *indicators of acculturation* were found to have statistically significant relationships with a *change in ecological footprint*. Migrants with longer residency were associated with a larger *change in ecological footprint* compared to those with shorter residency. It was likely that their longer exposure to Australia's high affluence increased the opportunities for their higher consumption levels (that is, greater *change in their footprint*). This finding is in line with other studies, which have shown that migrants' length of residence in a host society and their acculturation are statistically significant and positively associated with each other (Marín et al. 1987; Rissel 1997).

The statistically significant relationship (r=0.2) between *change in ecological footprint* and *feeling of ethnic pride* suggests that those who expressed a *feeling of ethnic pride* tended to be associated with higher consumption levels (that is, greater *change* in footprint). This positive feeling suggests their desire to retain Chinese culture and to continue their culturally-linked consumption, which is documented by Mo, Roux and Wong (2011) in their study of acculturated Chinese in the United States. They found that acculturated Chinese continue to practise a Chinese materialism that encourages spending on *material consumption* such as clothing, and on *experiential consumption* such as vacations and restaurant visits. These consumption behaviours are unlike those of Americans, who exhibit *experiential consumption* only. It is likely that those who made a *large change in ecological footprint* want to establish a prosperous life overseas (Larin 2013) through their persistent maintenance of aspects of Chinese culture such as '*mien-tzŭ*' (Hu 1944), and through practising 'Chinese' materialism.

There were statistically significant relationships between *change in ecological* footprint, and age at arrival (r= - 0.3), and English in communications (r= 0.2). Thus those associated with higher levels of consumption (that is, greater *change in footprint*) tended to be migrants who arrived at a younger age and spoke English frequently. It is expected that younger migrants would tend to communicate in English more due to their opportunities to learn English and their competency in English. Greater *change in ecological footprint* was also likely to be associated with those migrants who spoke both Chinese and English. According to Earle's (1969) study on Chinese students, those who speak both Chinese and English exhibit two distinct cultures – Chinese and Western – reflecting the two languages' cultures. In line with this, López and Tashakkori (2006) suggested that bilingualism enables individuals to communicate between groups and to maintain their cultural heritage. The bilingual China-born respondents were more at ease communicating with Chinese and with the host community. Their ability to communicate with Australiaborn residents was likely to enhance their chances to acquire higher income jobs and lifestyles, as reflected in their large *change in ecological footprint*. In sum, the China-born migrants' retention of aspects of Chinese culture, while adapting to the host culture, reflect the two-dimensional process of acculturation (Laroche et al. 1998a; Phinney 1998).

As presented in Table 5.8, the remainder of the determinants of consumption did not correlate with a *change in ecological footprint*. However, some of the determinants correlated with each other, which indicated the possibility for a differentiated influence of each determinant and multi-determinants on consumption. Multi-variate analysis can be applied to the survey data 'in which the independent variables (that is, the determinants of consumption) are correlated with one another and with the dependent variable (that is, *change in ecological footprint*) to varying degrees' (Tabachnick & Fidell 2007, p.117). The following sections describe the preliminary steps taken to perform the multi-variate analysis and the analytical findings.

#### 5.3.2 Selection of variables for modelling

The survey and its analysis to date found a number of correlations between the selected determinants of consumption and *change in ecological footprint*. There are

some considerations to be made before using multiple regressions to explore the influence of the determinants on *change in ecological footprint*. The first consideration was the small sample size of the China-born group, which limited the total number of determinants able to be employed in the multiple regressions. Secondly, multicollinearity and outliers were checked to ensure the validity of the data for multiple regressions (Phalant 2011).

The first consideration was the small sample size of 61 China-born respondents. The small size limited the maximum number of determinants permissible in the regression. As this research is exploratory in nature, the maximum number of determinants was set at 11 based on five cases for each determinant. This number of cases corresponds with Francis' (2007) proposal that a minimum of five cases is required for multiple regression.

Second, multicollinearity was checked against the tolerance value, which must be more than 0.10, and the VIF (Variation inflation factor), which must be less than 10. There was also an absence of outliers, which was checked using the Mahalanobis distance factor. For the absence of outliers, the Mahalanobis distance must be equal or less than the critical value of  $X^2 = 31.3$  (for p<0.001) for 11 predictors (Phalant 2011; Tabachnick & Fidell 2007).

As the maximum number of determinants permissible in the multiple regression of the China-born group's change in ecological footprint is 11, a reduction in the number of determinants as originally proposed in the conceptual framework (Figure 5.11) was required. The key determinants were selected, as follows:

- The CALD Index. The CALD Index is required in the regression model given its centrality to an examination of cultural influence on consumption.
- Individual structural attributes. Within the set of individual structural attributes, *income* and *age* are included in the model as they correlate with *change in ecological footprint*. However, due to the strong correlation (*r*= 0.6) between *employment* and *income*, *employment* is excluded from the

model. Francis (2007, p.28) indicated that with any 'strong correlation among the predictors, the regression analysis becomes unstable'.

Other determinants excluded from the model were *gender* and *car ownership*, for several reasons. Firstly, there was a gender imbalance in the survey, with more female respondents (79%) than male (refer to Table 4.8). Secondly, past studies (Troy & Holloway 2004) have shown that gender has a limited influence on consumption. Thirdly, with 90 per cent of China-born respondents having said that they owned a car; *car ownership* may not be a good predictor of the respondents' change in footprint.

Past studies (Mills & Schleich 2012; Wilhite & Ling 1995) have shown that *education* has a varying influence on consumption categories. It is this varying influence that this research wanted to explore. Studies (Rissel 1997) have found that individuals with a greater number of years of formal education may have better English language skills, and are more likely to have been exposed to a variety of cultures. This is particularly applicable in this research where the host society's language is English. The moderate correlations between *education* and *English in communications* (r= 0.4) and *English in mass media* (r= 0.4), also show that education is likely to have some influence on acculturation.

Individual behavioural attributes (indexes). In terms of individual behavioural indexes, the *Conservation Behaviours Index* (CBI) was selected as part of the model, but not the *Resource-efficient Technologies Index* (REI) or the *Environmental Awareness Index* (AI). As shown in Table 5.4, a similar percentage of respondents indicated having more conservation behaviours, more environment awareness, and installing more resource-efficient technologies. The CBI was selected for several reasons. The first is that these environmentally significant behaviours are known to be the hardest for individuals to change, compared with installing resource-efficient technologies (as measured in REI). Past research (Dillman, Rosa & Dillman 1983) has shown that the adoption of REI does not necessitate any change in behaviour, as these technologies are alternatives to resource conservation.

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The second reason is that while conservation behaviours are considered to be 'matters of personal habit or household routine (like turning off the tap while brushing teeth), they are rarely considered' (Stern 2000, p.415).

Household and dwelling contexts. *Household size* is part of the model because the number of people living together is likely to have an effect on economies of scale in the consumption of urban resources (Stokes et al. 1994). Household size therefore has a subsequent impact on the magnitude of *change of ecological footprint*.

*Dwelling size* and *home ownership* were found to be very strongly correlated (r=0.6). This very strong correlation could cause the regression analysis to become unstable (Francis 2007). Large percentages of *home ownership* were also found with both *small* and *large changes* in footprint (Table 5.7). Based on these two pieces of evidence, *home ownership* was excluded from the model. Past studies (Brandon & Lewis 1999; Wilson & Boehland 2005) have shown that dwelling type and dwelling size have an impact on resource consumption. Past research (OECD 2011) has also shown that detached dwellings tend to have larger dwelling spaces. In taking all these assessments into consideration, *dwelling size* has been selected as part of the model.

Indicators of acculturation. There were high correlations between several indicators of acculturation. *Age at arrival* to Australia and age of participants are highly correlated (r= 0.6). *Age at arrival* also has a strong correlation with *English in communications* (r= - 0.5) and *English in mass media* (r= 0.5). As these strong correlations can cause the regression analysis to become unstable (Francis 2007), *age at arrival* has been excluded from the model.

The strong correlation (r=0.8) between *English in communications* and *English in mass media* indicated that one of them can be removed. *English in communications* is deemed to be more appropriate in this model for two reasons: English is the lingua franca in Australia; and the China-born migrants, in carrying out their everyday activities and working in the host society, Australia, might have to converse at least in simple English. As the

usage of language also depends on with whom the respondents interact, social interactions with Chinese was selected as one of the determinants. These interactions are also dependent on their feeling of *ethnic pride* towards their ethnic group. It is expected that when the China-born migrants interact with each other, they identify strongly with their ethnic group and have a tendency to speak Chinese. *Length of residence* in a host society is part of the model, as it has been found to have an influence on migrants' acculturation processes (Park et al. 2003; Rissel 1997). It is therefore fitting to investigate, within the context of acculturation, the influence of *social interaction with Chinese*, the use of *English in communications, length of residence*, and *feeling of ethnic pride* on consumption behaviour (ecological footprint).

The model determinants selected for multiple regression analysis are presented in Figure 5.12.

Figure 5.12: Multiple regression model to explore the predictors of China-born migrants' change in (total) ecological footprint



# 5.3.3 Multiple regression model for change in total ecological footprint

The regression model found that eight out of 11 determinants were significant explanatory variables of *change* in (total) ecological footprint among the China-born respondents. The total explained variance of *change* in ecological footprint was 38.6 per cent (Table 5.9). This is statistically significant.

Context	Determinant	Beta	Sig fig <sup>1</sup>	
		value		
-	(Constant)	-	0.370	
Cultural context	CALD Index <sup>2</sup>	0.325	0.014	
	Age <sup>3</sup> (Older migrants)	-0.241	0.067	
Individual	Income <sup>3</sup> (Low)	-0.461	0.000	
structural attributes				
	Education <sup>3</sup> (University or	-0.231	0.047	
	postgraduate)			
Individual	Conservation Behaviours	-0.246	0.026	
behavioural	Index $(CBI)^2$			
attribute (Index)				
Household context	Household size <sup>2</sup>	-0.172	0.143	
Dwelling	Dwelling size <sup>3</sup> (150 square	0.190	0.098	
context	meters or larger)			
	Length of residency in	0.257	0.031	
	Australia <sup>2</sup>			
Indicators of	Feeling of ethnic pride <sup>3</sup>	0.169	0.157	
acculturation				
	Social interactions with	0.164	0.154	
	Chinese <sup>2</sup>			
	English in communications <sup>2</sup>	0.295	0.050	
	R Square	0.4	.99	
	Adjusted R Square	0.3	86	
	Sig. F Change	0.0	000	
	R	0.7	'06	
	F	4.428 (	(0.000)	

Table 5.9: Modelled determinants of level of change in China-born group's total ecological footprint post migration

Notes:

<sup>1.</sup> Standardised Beta coefficients are indicated in boldface for coefficients that are statistically significant at 0.10 level (which is a lower threshold for small sample)

<sup>2.</sup> Interval (continuous) level variable

<sup>3.</sup> Dichotomous variables - refer to Tables C-1, C-8, and C-9, Appendix C

This analysis shows that a number of determinants were seen to make a statistically significant contribution to the prediction of the China-born participants' *change in footprint*. Three were individual structural attributes, namely *age*, *income*, and *education*. *Conservation Behaviours Index* (CBI) and *dwelling size* were also found to be explanatory variables. The CALD Index and two indicators of acculturation were also predictors demonstrating a cultural influence on the China-born group's consumption behaviours in their pre-and post- migration to Australia.

Among these eight determinants, high *income* (beta = -0.461) made the most significant contribution. The negative correlation between income and the footprint was because low income was coded as '1' and high income as '0' (Refer to Table C-1, Appendix C). The next two predictors were the strong connectedness with Chinese culture (high score of CALD Index, beta= 0.325) and frequent use of *English in communications* (beta =0.295). The other predictors with a moderate influence on the increase in ecological footprint are longer *length of residence* in Australia (beta= 0.257) and low *Conservation Behaviors Index* (CBI; beta = -0.246). Predictors found to contribute less are younger *migrants* (beta = -0.241), and attainment of diploma level or below *education* (beta = -0.231). Large dwellings of 150 square meters or more (beta = 0.190) is the least important predictor. It is possible to expand on how the eight determinants are linked to an increase in the China-born group's ecological footprint in Melbourne.

Income was found to make the most significant contribution statistically to the *change in footprint* of the China-born migrants. This finding reveals that the increase in the China-born group's ecological footprint post-migration (that is, higher consumption level) was linked primarily to higher annual incomes (\$20,000 or more). The threshold for higher income was based on the median of \$20,000 for the sample. This finding is consistent with past studies (Carlsson-Kanyama & Lindén 1999; Dey et al. 2007), showing that the availability of disposable income increases individuals' purchasing power of larger homes, consumption of more goods and appliances and more resource use. With their financial capabilities, this group's relatively higher consumption level in Melbourne than in China mirrored that of the host society's high consumption behaviours as identified by Sobels et al. (2010).

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With respect to cultural factors, an important aim of this research was to determine whether individual migrant's connectedness with Chinese culture and level of acculturation contribute to changes in their consumption level in Australia. Importantly, this analysis has shown that culture had a significant link with an increase in the China-born group's change in footprint. Their strong connectedness with Chinese culture (a high score of the CALD Index), and thereby weaker connectedness with the host culture, had an influence on their increased consumption levels in Melbourne. This reflects their continued association with Chinese culture though living in another country. The findings suggest this migrant group's relatively higher levels of consumption in Melbourne than in China were not merely due to mirroring the host society's high consumption behaviours, but also to aspects of Chinese culture. Their consumption behaviours demonstrated the relevance of the Confucian practice of 'mien-tzu' (Wong & Ahuvia 1998). The persistence of this practice, to 'save face', was deemed important to the migrants, as they were expected to earn more and to attain an improved 'material life' in Australia (Da 2003). Continuation of this practice suggests migrants' 'attachment and solidarity with their homeland', which, as Yoon (2012, p.432) identified in a study on ethnicity, affects the lifestyles of Korean migrants in countries such as the United States and Canada.

Acculturation, as the other cultural factor, was also found to make a significant contribution to the change in the migrants' consumption behaviours. Two of the indicators of acculturation – *English in communications*, and *length of residence* – are significantly associated with the increase in the *change in ecological footprint* of the China-born group. Changes in individual migrants' behaviours due to acculturation has been documented (Berry 2005). The finding regarding a long length of residence in Australia also confirms the conventional belief that migrants' length of residence in host societies is statistically significant and positively associated with their acculturation (Cabassa 2003; Marín et al. 1987; Page 2006; Rissel 1997). These findings suggest that, firstly, an increase in consumption levels was found among respondents who frequently used English in communications, and had resided longer in Melbourne. Secondly and notably, they show that a longer length of residency meant that the migrants' frequent contact with Australians resulted in their adoption of aspects of the host's consumer lifestyle. These acquired consumption behaviours of the China-born group echoed that of Sobels et al.'s
(2010, p.16) proposition that 'migrants adopt similar consumption patterns of natural resources and generate similar waste streams as the broad Australian community'. Additionally, the findings provided further insight into the change in consumption behaviours of this migrant group in terms of cultural factors: their association with Chinese culture and the acculturation process. The findings reveal that there was a *mixture* of influences of these cultural factors: migrants' retention of Chinese culture and acculturation to the host society's affluence.

In line with studies on consumption, this research also found that other established determinants besides income, such as the practice of conservation, age, education and dwelling size (in descending order of relative significance) were linked to the respondents' change in consumption behaviours in the host society. The increase in change in ecological footprint was found among younger respondents, as well as those who had diploma level education or below, and exhibited fewer conservation behaviours (a low score of CBI). These findings of younger migrants' high consumption levels have been documented. Schipper, Haas and Sheinbaum's (1996) study among OECD countries found that the 20-35 age group tends to use a car as the main mode of transport. It was also likely that this group's high income and long length of residence were associated with their adoption of the car dependent lifestyle in Australia's cities. Past studies on waste generation have also found that younger individuals generate more waste (Barr, Gilg & Ford 2001; Hamilton, Denniss & Baker 2005). This finding is in line with past studies, which found that individuals with lower levels of education exhibit fewer conservation behaviours (Mills & Schleich 2012; Poortinga, Steg & Vlek 2004). On the other hand, the finding in this research that the younger participants' large increase in footprint was influenced by exhibiting fewer conservation behaviours (a low score of CBI) differs from Wilhite and Ling's (1995) finding that younger households are more likely to perform more conservation behaviours.

A large dwelling size was found to make a small but significant contribution to the increase in ecological footprint. This finding is consistent with other studies, in that these respondents adopted the consumer lifestyle of the broad Australian community, such as living in large dwellings. Large dwellings act as a trojan horse for consumption (Newton 2011), and are associated with more energy for space heating

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and cooling, water for gardening, and the possession of more domestic goods and appliances (Troy & Randolph 2006; Wilson & Boehland 2005; Zacarias-Farah & Geyer-Allély 2003). For these migrants, large dwellings are 'publicly visible markers ... needed to concretize and communicate (the participants') financial achievement' (Hu 1944, p.10). Their strong connectedness with Chinese culture suggests that they were affected by the cultural and social pressures of having to "keep up with the Joneses". These 'public visible markers' symbolise the success of their migration. They were also means to retain certain elements of Chinese culture, such as maintaining *'mien-tzŭ*', while living overseas, and demonstrating their financial capabilities to retain 'Chinese' materialism in Australia. This outcome echoes findings in Chen et al.'s (2005, p.125) study of Taiwanese-Chinese migrants in Toronto, that 'Chinese consumers who identify with and have a strong attachment to the Chinese culture ostentatiously display their wealth, are materialistic, and strongly prefer status-oriented products'.

The above findings have provided an insight into the increase of the China-born respondents' ecological footprint, which was due to the significant contribution made by established determinants such as high income and dwelling size. The research also found that the increase in their footprint was linked to cultural factors. Those respondents who had a stronger connectedness with Chinese culture (high score of the CALD Index) also used English in communications frequently, and had been in Melbourne longer. Specifically, this analysis has shown that these participants had adopted the host culture's high consumption lifestyle. Importantly, they had maintained their Chinese culture at the same time. These possessions are the 'front stage' of culture: outward signs of success and achievement in their shift to Australia. The adoption of Australia's consumer lifestyle boosted their prestige. These possessions are also symbolic of the 'back stage' of culture in their retention and practice of aspects of Chinese culture such as 'Chinese' materialism and maintaining '*mien-tzŭ*'.

#### 5.4 Summary

This chapter has compared the ecological footprints of the China-born respondents' pre- and post-migration to Australia. Findings that emerged addressed the three

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questions. The first question was: *do China-born migrants have similar ecological footprints in Melbourne compared to those when living in China?* The study found that there was a significant increase in the total ecological footprint of the Chinaborn group following their residence in Australia. Their mean ecological footprint was found to have increased 3.3 times from 20.9 global hectares (gha) in China to 69.8 gha in Australia (Table 5.1). The range of this increase was 10 gha to a maximum of 78 gha. These variations are revealed in increase across *all* four components of ecological footprint, namely Carbon, Food, Housing, and Goods and Services:

- The largest increase was in relation to the Housing footprint, from 1.9 gha in China to 10.3 gha in Australia.
- The increase in the Goods and Services footprint was the smallest, from 4.8 gha in China to 11.3 gha in Australia, which was 2.4 times that of China's average.
- The Food footprint increased from 5 gha to 23.7 gha, and
- The Carbon footprint from 9.2 gha to 24.6 gha.

The second question was: *which aspects of consumption behaviour changed following migration to Australia*? The survey found the most change in the consumption categories of housing, transport, and food. For housing, 62 per cent of China-born respondents lived in detached dwellings in Melbourne compared to only seven per cent in China. Eighty per cent had a larger home size and a garden. There was an increase of car ownership from 67 per cent in China to 90 per cent in Melbourne. Having a car influenced the way migrants travelled, and was a reflection of the migrants' move to a car dependent Australian city with low density housing.

The change in dietary landscape resulted in an increase in the Food footprint and changes to the China-born group's food consumption habits. Adapting to the host society's food landscapes resulted in some changes to the China-born migrants' diets. Examples include eating non-Chinese food such as pizza and pasta, and local produce such as beef and lamb. However, the change in diet among these China-born participants in the host society contrasts with a past study (Kelder et al. 1994), which claims that individuals' dietary practices formed during their adolescence may be retained in adulthood. It is likely that their larger disposable incomes had made the consumption of beef and lamb more affordable. It is also due to the prestige gained in adopting multiple facets of Australia's consumer lifestyle.

The changes in the China-born participants' consumption behaviours revealed that the prevailing host societal structures related to housing (mainly detached dwellings) and transport systems (car dependency) had worked to their advantage. An accumulation of these 'physical' possessions demonstrates the financial achievements of these migrants, many of whom have had the opportunity to earn higher incomes in Australia as a developed country than in China. Their possessions also symbolise their success and desire to 'establish a prosperous life abroad' (Larin 2013). In particular, they symbolise the maintenance of aspects of Chinese culture such as 'mien-tzu' and 'Chinese' materialism. By adopting aspects of the 'frontstage' of the host culture, they were able to maintain the 'back-stage' of their Chinese culture. These revelations show that changes in consumption behaviours occur not only because of socio-economic factors, but also because of cultural factors. This maintenance of Chinese culture while living in the host society supports Verkuyten and Thijs' (2002, p.94) argument that individuals can still identify strongly with their ethnic group, while at the same time having 'made important cultural adaptations for effective living'.

The third question was: *what factors explain the change in the size of China-born group's ecological footprints, with particular emphasis on exploring the role of culture in addition to a set of more conventionally employed determinants?* Two approaches were used to elicit a better understanding of the explanatory factors for the migrants' *change in ecological footprint.* Firstly, differentiating factors were explored in terms of a *small* versus *large* change in footprint. Secondly, a multivariate analysis was applied to seek the relative significance of the determinants to change in ecological footprint of the China-born group. The following highlights the major findings from these analyses: This exploratory research found that cultural factors – the CALD Index and indicators of acculturation – as well as established factors, play dominant roles in influencing the way China-born migrants consume in a host society. This resulted in a larger post- than pre-migration footprint. These factors are found to operate concurrently, resulting in a dual-process. Those who had a large increase in postmigration consumption level were those with strong ties to Chinese culture, who also demonstrated high acculturation with the host society. The reverse was true for those who had a small increase in post-migration consumption level – weak ties with Chinese culture and low level of acculturation. They also tended to be older age groups or those with lower incomes: in combination, a group with lower prospects – or motivation – to pursue a high consumption lifestyle. The research confirms that it is critical to target specific ethnic groups rather than a collective migrant group in policies or programs directed at different consumption behaviours. It reinforces the need for a 'granular understanding' of different socio-cultural groups in consumer research (SSI Premier Research Solutions 2013). This revelation posits that a deeper understanding of each ethnic culture poses a challenge in a multicultural society like Australia.

In the next chapter, the ecological footprints and consumption behaviours of the China-born migrants and Australia-born group are examined, in an effort to understand which factors best explain the differences in ecological footprint between these two groups of Melbourne residents. In this examination, the CALD Index is also employed to explore the extent to which culture differentiates the two groups' consumption behaviours.

# **Chapter 6** Exploring Resource Consumption for China- and Australia-born Populations in Melbourne

Australia is a highly affluent society with associated high levels of consumption. This high consumption level makes major demands on the environment and resources. This demand, as measured by ecological footprint, relates consumption to the amount of renewable resources consumed and waste generation, including CO<sub>2</sub> emissions (Simmons & Chambers 1998, pp.27; Wackernagel & Rees 1996; WWF 2014). In view of its high income levels, Australian citizens have one of the largest ecological footprints in the world (WWF 2012, 2014). This large ecological footprint poses a major challenge for Australian society: the need to reduce the negative environmental impacts by encouraging individuals to reduce resource consumption and associated GHG emissions. This involves finding ways to bring about a shift in consumption behaviour among its growing and diversifying population. In recent times, Australia's population has become more diverse as a result of the settlement of migrant groups from a variety of ethnic backgrounds, most recently Asian. This increasing societal complexity is reflected in various cultural factors such as languages spoken, and religious and other practices. In view of the increasingly multicultural nature of metropolitan populations in particular, it is important to explore factors that may influence and distinguish resource consumption behaviours among Australia's various population groups. An understanding of these factors is fundamental to any information provision or community engagement strategies, and to programs designed to address consumption in a multi-cultural society.

At present, the China-born migrant group represents the fastest growing immigrant group in Australia where English is not the first language. Upon settling in a high income, English-speaking country, the China-born migrants are exposed to the host culture in most of their everyday activities. Various studies (Arends-Tóth & van de Vijver 2004; Costigan & Dokis 2006; Rosenthal & Hrynevich 1985) have shown that over time, migrants may take on many of the behavioural norms of the host society due to acculturation. In relation to the consumption behaviours explored in the previous chapter, the China-born participants' average ecological footprint in Melbourne was found to be 3.3 times higher than that when living in China. Findings

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based on the quantitative and qualitative research data suggest that this migrant group has adopted aspects of the host culture associated with consumption, while retaining aspects of Chinese culture. Established determinants such as income and education, as well as cultural factors specific to this research (as represented by the CALD Index and some of the indicators of acculturation), were found to have statistically significant associations with these migrants' *change in ecological footprint*.

In view of the magnitude of change in the China-born migrants' ecological footprint, the aim of this section of the thesis is to investigate whether there are differences in patterns of resource consumption between individuals from China- and Australiaborn groups, residents of the same locality in Melbourne. A better understanding of consumption behaviour across different socio-cultural groups can aid progress towards more sustainable living. Findings from this investigation are fundamental to governments and agencies in tackling and communicating challenges such as climate change and resource use among its fast growing and increasingly heterogeneous population.

The investigation of variability in resource consumption (as measured by ecological footprints) for the China- and Australia-born groups is based on an adaptation of the fundamental conceptual framework of this thesis presented initially in Figure 2.3 and depicted in Figure 6.1. This chapter focuses on the following two research questions:

- Do the China-born migrants differ from the Australia-born residents in terms of:
  - *i) Ecological footprints, and*
  - *ii)* Specific consumption behaviours.
- What factors can explain the nature of the ecological footprints of the Chinaand Australia-born groups? (With a particular focus on the CALD Index as a potential differentiating factor.)

Figure 6.1: Conceptual framework for exploring determinants of sustainable living and resource consumption among China- and Australia-born groups



To address these two questions, both quantitative and qualitative data from the surveyed population are examined from three perspectives. In section 6.1, the magnitude of the ecological footprints of the China- and Australia-born groups in Melbourne are examined. An exploration is also carried out of the distribution of the total sample's score on the CALD Index. In section 6.2, descriptive statistics and qualitative data representing the China- and Australia-born respondents' views are used to examine the four footprint components. This examination looks at the similarities and differences in consumption behaviours, focusing on the four components of ecological footprint, namely Carbon, Food, Housing, and Goods and Services, and their constituent consumption indicators. In the final section 6.3, multivariate analyses are conducted to examine the relative strength of determinants of the four footprint components and the total ecological footprint across the China- and Australia-born groups.

## 6.1 Exploring consumption behaviours of China- and Australia-born groups

This section compares the ecological footprints of the China- and Australia-born participants, residents of the middle class suburb of Box Hill in Melbourne. The ecological footprint was calculated by the Ecological Footprint Quiz (The Centre for Sustainable Economy, www.myfootprint.org) using inputs from China- and Australia-born participants' responses to Questionnaires III and IV (Appendix A).

6.1.1 Comparison of China- and Australia-born groups' components of ecological footprint and the total ecological footprint

Table 6.1 reveals that, overall, the China-born group's footprints were larger than those of the Australia-born group – 69.8 gha versus 65.3 gha – but not statistically different as measured by the t-test. However, the Carbon, Food and Housing footprints of the China-born group were all (statistically) significantly larger than those of the Australia-born group. With reference to the Goods and Services footprint, the opposite was found. These differences represent a starting point for exploring the underlying reasons for dissimilarities in consumption behaviours.

		Total sample N=133		Australia- born N= 72		<b>China-born</b> N=61		Comparison between China- and Australia- born groups	
		$\frac{\text{Mean}}{(\text{gha})^2}$	$SD^3$	Mean (gha)	SD	Mean (gha)	SD	(sig. dif.)	
	Total ecological footprint	67.4	16.4	65.3	19.3	69.8	11.8	t (119.9)=-1.68, p < 0.10	
	<b>Carbon footprint</b> (Energy, Travel) <sup>1</sup>	21.0	8.0	18.0	8.2	24.6	6.1	t (128.7)=-5.30, p <0.05	
Component of	<b>Food footprint</b> (Food) <sup>1</sup>	22.0	8.3	20.5	8.9	23.9	7.4	t(131)=-2.26, p <0.05	
the ecological footprint	Housing footprint (Dwelling type and size, water use) <sup>1</sup>	9.4	3.5	8.7	3.4	10.3	3.6	t(131)=-2.65, p <0.05	
	Goods & Services footprint (Purchasing behaviours, waste generation and management) <sup>1</sup>	14.9	7.1	18.0	6.1	11.3	6.6	t(131)=6.15, p <0.05	

Table 6.1: Mean and standard deviation of four footprint components, and total ecological footprint of China- and Australia-born groups and total sample

Note: 1. Main consumption categories of components of ecological footprint 2. Gha refers to global hectares 3. SD refers to Standard deviation

6.1.2 Correlations between the CALD Index, the four footprint components and the total ecological footprint

Table 6.2 shows that the CALD Index had a consistently statistically significant relationship across *all* footprint measures. The strongest correlation (r= - 0.4) was found between the CALD Index and the Goods and Services footprint. This indicates that individuals who had a stronger connectedness with the host culture had a significantly larger Goods and Services footprint, due to their purchasing behaviours, in terms of type and frequency of good purchased; *and* higher levels of waste generation. Positive correlations between the CALD Index and the other three footprint components and total ecological footprint also indicate that those who had stronger connectedness with the Chinese culture had:

- Larger Carbon footprint (r=0.4); meaning that they had higher energy consumption and also higher levels of CO<sub>2</sub> emissions, associated primarily with their travel behaviours. This is due to mode use and frequency of travel.
- Larger Food footprint (r= 0.2); meaning that they had adopted a regular meatbased diet, which is associated with greater GHG emissions. In addition, purchased food (eating out), rather than eating home grown and prepared food, is also associated with higher CO<sub>2</sub> emissions.
- Larger Housing footprint (r=0.3), meaning that they tended to live in larger detached homes, which are associated with higher energy and water use. In addition, detached homes with gardens result in more water use.
- Larger total ecological footprint (r=0.2), reflecting higher consumption levels across most of the consumption categories.

Table 6.2: Pearson correlations between the CALD Index and the four components of ecological footprint and the total ecological footprint of China- and Australia-born groups

	Carbon footprint	Food footprint	Housing footprint	Goods & Services footprint	Total ecological footprint	
CALD	0.4**	0.2*	0.3**	-0.4**	0.2***	
Index						
Note: * Correlation is significant at the 0.05 level ** Correlation is significant at the 0.01 level						

\*\*\* Correlation is significant at the 0.10 level

6.2 Exploring variability in components of ecological footprint of China- and Australia-born groups

The differences in the four footprint components and the total ecological footprint between the China-born and Australia-born groups as represented in Table 6.1 need to be further examined. An exploration of the four footprint components in the following section will include:

- For Carbon and Housing footprints :
  - Installation of resource-efficient technologies;
  - Energy and water conservation behaviours; and
  - Travel behaviours.
- For Food footprint:
  - Type of diet;
  - Snacking between meals; and
  - Home grown food.
- For Goods and Services footprint:
  - Purchasing and spending habits; and
  - Waste generation and management behaviours.

### 6.2.1 Exploring Carbon and Housing footprints

The magnitude of Carbon and Housing footprints is linked with the amount of resource use, the user's conservation behaviours and the choice of efficient technologies. The choice of installing resource-efficient technologies and carrying out conservation behaviours can aid in reducing energy and water use at home. The China- and Australiaborn groups' responses showed that there were differences in behaviours between these two groups.

Survey responses indicated that a majority of the China-and Australia-born groups had installed energy-efficient lighting, energy-efficient appliances and dual flush toilets (Table 6.3). Australia-born respondents were significantly more likely than the Chinaborn group to live in dwellings where multiple energy and water efficient technologies had been installed. Examples of these installations were: extra insulation such as floor insulation and insulating blinds and curtains; water saving fixtures such as low flow shower heads and taps; water conservation devices such as rainwater tanks, and grey water recycling. Collectively, these technologies lower energy and water use, and this is reflected in the lower mean Carbon and Housing footprints of the Australia-born group (Table 6.1).

The Resource-efficient Technologies Index (REI) – a summation of individuals' installation of resource-efficient technologies – is illustrated in Figure 6.2. More Australia-born respondents (39.1 %) had an REI score of six or more compared to the China-born group (21.8 %). Only the Australia-born group had the maximum REI score of 10 (3.0%). Past studies (Gabriel et al. 2011; Shove et al. 1998) have found that installing eco-efficient technologies is related to home ownership. In line with this, as illustrated in Figure 6.3, there was higher percentage of home owners among the Australia-born group (40.6 %) than the China-born group (28.5 %). The issue of split incentives (OECD 2011) diminishes the attractiveness for renters to invest in enhancing the resource efficiency of their dwellings.

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		China-	<b>Comparison between</b>
<b>Resource-efficient</b>	Australia-	born	Australia- and China-
technology	born (%)	(%)	born groups (sig. dif.)
	N=72	N=61	
Energy efficient bulbs	91.7	85.2	$X^{2}(1)=1.361, p=0.243$
Energy efficient			
appliances	86.1	75.4	$X^{2}(1)=2.478, p=0.115$
Extra insulation	65.3	41.0*	$X^{2}(1)=7.850, p=0.005$
Insulating blinds	56.9	39.3*	$X^{2}(1)=4.094, p=0.043$
Solar panels &solar hot			_
water	22.2	9.8	$X^{2}(1)=3.670, p=0.055$
Water saving fixtures	70.8	44.3*	$X^{2}(1)=9.163, p=0.002$
Dual flush toilets	93.1	90.2	$X^{2}(1)$ =.364, p =0.546
Low flow shower heads			_
& taps	73.6	49.2*	$X^{2}(1)=8.401, p=0.004$
Instant water heaters on			
sinks & shower	12.5	44.3*	$X^{2}(1)=16.876, p=0.000$
Rainwater tanks+	52.8	18.6*	$X^{2}(1)=16.137, p=0.000$
Grey water recycling			
system	20.8	6.6*	$X^{2}(1)=5.496, p=0.019$
Water wise gardening	87.1	57.1*	$X^{2}(1)=14.484, p=0.000$

Table 6.3: Percentage of China- and Australia-born groups installing resource-efficient technologies

Note: 1. \* Correlation is significant at the 0.05 level; Technologies that are statistically significant are in bold-face.

2. + indicates N=72 Australia-born respondents and N=59 for China-born respondents, as applicable to those who had rainwater tanks in their gardens





Figure 6.3: Housing tenure between China- and Australia-born groups



Turning now to energy and water conservation behaviours, the China- and Australiaborn participants' responses to a set of behaviours at home were tabulated (Table 6.4). This revealed that there were significant differences between these two groups. The Australia-born respondents were found to engage in greater resource conservation. For example, they were more likely to keep thermostats relatively low in winter, and to fix water leaks regularly.

Responses from the Australia-born participants indicated that they used various means to reduce their water consumption in and around the house. Evidence of these behaviours is found in the following comments by several Australia-born participants: I use water from the rainwater tank to wash my car. (Case 110)

I use rainwater to wash my car and the driveway. (Case 120)

I collect rain water and grey water from shower to water the garden. (Case 117)

Reuse water from the washing machine for toilet flushing. (Case 108)

Table 6.4: Percentage of China- and Australia-born groups who report engaging in conservation behaviours

Conservation behaviour	Australia- born (%) N=72	China- born (%) N=61	Comparison between Australia- and China- born groups (sig. dif.)
Turned off lights when			
leaving rooms	69.8	59.2	$X^{2}(1)=3.494, p=0.062$
Turned off computers &			
monitors when not in use+	81.9	93.2*	$X^{2}(1)=3.651, p=0.056$
Dry clothes outside whenever			
possible	97.2	96.7	$X^{2}(1)=.028, p=0.866$
Kept thermostat relatively			_
low in winter	92.6	78.6*	$X^{2}(1)=5.143, p=0.023$
Unplugged small appliances			_
when not in use	48.6	67.2*	$X^{2}(1)=4.666, p=0.031$
Minimised shower time &			
toilet flushing	94.4	88.3	$X^{2}(1)=1.600, p=0.206$
Run clothes & dish washers			
only when full	98.6	96.7	$X^{2}(1)$ =.557, p =0.455
Washed cars rarely	97	82.3	$X^{2}(1)=1.310, p=0.252$
Looked for & fix leaks			$X^{2}(1)=13.704, p$
regularly	79.2	48.3*	=0.000

Note: 1. \* Correlation is significant at the 0.05 level; Behaviours that are statistically significant are in bold-face.

2. + indicates N=72 Australia-born respondents and N=59 for China-born, as applicable to those who had computers

The Conservation Behaviour Index (CBI) is a summation of individuals' exhibition of conservation behaviours. Figure 6.4 reveals a distribution of scores with a natural break point of nine or greater, which highlights some distinctions in behaviour. More

Australia-born respondents (45.1%) had a CBI score of nine or higher compared to the China-born group (32.3%). However, the wide range of CBI scores among the China-born group (Figure 6.5) suggests that while some of them exhibited more conservation behaviours, others did not. More exploration (in section 6.3) of other influencing factors may elicit further explanation for the differences between the two groups.

Figure 6.4: Conservation Behaviours Index (CBI) score of China- and Australia-born groups



Figure 6.5: Box plot for scores of Conservation Behaviours Index (CBI) among Chinaand Australia-born groups



Past studies (Wilson & Boehland 2005; Zacarias-Farah & Geyer-Allély 2003) have shown that dwelling type and size have an influence on the level of resource use. Figures 6.6 and 6.7 respectively show the distribution of dwelling type and size among the surveyed population. A larger percentage of the Australia-born group indicated living in a detached dwelling (41.4 %) and a dwelling size of 100 square meters or larger (47.4 %), compared to 28.6 per cent and 36.8 per cent of the China-born group respectively. However, while three per cent of the China-born respondents indicated living in the smallest dwelling size, 7.5 per cent indicated living in the largest dwelling size. In comparison, 5.3 per cent of the Australia-born group indicated living in larger size dwellings (250 square meters or more). There is also a tenure factor at work here. Within Australian cities, including the location studied here, renters are more likely than purchasers or outright owners to live in flats/units/apartments, which are typically smaller than detached or semi-detached dwellings (ABS 2013b).



Figure 6.6: Dwelling type of China- and Australia-born groups



Figure 6.7: Dwelling size of China- and Australia-born groups

A possible explanation for smaller Carbon and Housing footprints among the Australiaborn group is that most of the Australia-born respondents indicated installation of more resource-efficient technologies (as reflected by the higher REI), and exhibited more conservation behaviours (as indicated by the higher CBI scores). These behaviours aided in reducing their Carbon and Housing footprints. Installation of technologies such as solar photo voltaic (PV) panels and roof insulation, would require know-how, and would also involve an understanding of incentives and regulations. The China-born group appeared to lack understanding, or were ignorant of the host society's regulations and structures in relation to the installation of resource-efficient technologies. The larger Carbon and Housing footprints among the China-born group may be related to living in apartments. Other studies (Myors, O'Leary & Helstroom 2005; Newton & Meyer 2012) have shown that more energy is used (on a per capita basis) when living in apartments than in detached dwellings. For the China-born group, 20.4 per cent indicated living in apartments, compared with only 3.8 per cent of the Australia-born group (Figure 6.6).

The other explanation for the difference in the footprints between the two groups is the variation in environmental awareness, as illustrated in Figure 6.8. Responses from the two groups highlight their differences in environmental views. Among the China-born group, several respondents explained that cold weather usually induced them to have the thermostat on high to keep them warm, instead of trying to save money. As one Chinaborn participants' views suggested that personal comfort in keeping warm during winter is more important to them than a reduction in GHG emissions in relation to the increased energy use. On the other hand, an environmentally conscious (and physically hardy!) Australia-born respondent (Case 108) pointed out that during winter, he switched off the refrigerator, as the home environment was cold enough to keep food fresh without refrigeration. He also put on layers of clothing to keep himself warm.

Another explanation for the difference in Housing footprint is the way households are billed for energy and water use in Australia. For detached homes, energy and water are billed to each household, while for other types of housing (for example, older apartments), energy and water use is charged at the building level (no separate metering) (Sharam 2010). In the latter case, this means that residents or tenants have no first-hand information of their utilities usage, which can remove the incentive to conserve resources. Figure 6.8: Box plot for scores of Environmental Awareness Index (AI) among Chinaand Australia-born groups



Note: 1. 'o' indicates an outlier, which is more than 1.5 box-lengths from the edge of the box.

A range of travel behaviours were investigated, including use of car, public transport and air travel. Car travel has a greater environmental impact in terms of greenhouse gas (GHG) emissions than do modes of public transport (Stern & Gardner 1981; Stokes et al. 1994). The surveyed population was asked to estimate the total number of local trips they made in a week using different modes of transport, as a basis for estimated annual travel. Respondents were also asked the number of trips they made locally and overseas by air. Table 6.5 summarises the estimated total distances travelled in a year using different modes of transport.

Total distance	Austr N	<b>alia-born</b> = 72	<b>China-born</b> N=61		Comparison between China-and Australia-
(km) travelled (annual) by:	Mean	SD	Mean	SD	born groups (sig. dif.)*
Car	6874.5	5964.0	5172.0	5610.6	F (1,131)=2.8, p =0.094 Eta squared=0.02+ (small effect size)
Bus	247.4	811.8	570.7	1884.2	F (1,131)=1.7, p=0.189, Eta squared=0.13+ (close to large effect size)
Rail/Tram	2217.2	3691.8	1441.4	3165.4	F (1,131)=1.7, p=0.200, Eta squared=0.01+ (small effect size)
Air	7858.3	13817.8	15408.3	18553.8	F (1,131)=7.2, p=0.008, Eta squared=0.05+ (close to moderate effect size) Box plot (Figure 6.12)

Table 6.5: Total kilometres per year travelled by China- and Australia-born groups using different modes of transport

Note: 1. \* Correlation is significant at the 0.100 level (which is a lower threshold for small sample)

2. + Cohen (1988, pp.284-7) classifies 0.01 as a small effect, 0.06 as a moderate effect, and 0.14 as a large effect.

Analyses revealed that there was a statistically significant difference in the average distance travelled by car between the China- and Australia-born groups. On average, the Australia-born group travelled further than the China-born group (6874.5 km per year by the Australia-born group versus 5172 km per year by the China-born group). This was despite high proportions of both the Australia-born (94%) and China-born (90%) respondents owning a car (Figure 6.10). This is consistent across all activity groups, except travel for study (Figure 6.9).



Figure 6.9: Use of private car (as a driver) for various activities by China- and Australia-born groups

In relation to car travel, the respondents were also asked about other environmentally sustainable behaviours, such as ride-sharing and type of vehicle purchased. These behaviours of sharing the car ride with at least one other person, and owning a hybrid car, are illustrated in Figure 6.10. These travel-related behaviours suggest the potential for GHG emissions reduction in terms of economies of scale, particularly with ride-sharing. Their responses indicated that almost equal percentages of participants – 68 per cent of the Australia-born group and 64 per cent of the China-born group – shared rides with at least one person. There are low percentages of participants owning a hybrid car (compared with the registered data for Australia: an average five per cent of cars registered in the period 2009-2014 were hybrids (ABS 2014c)).



Figure 6.10: Percentage of China- and Australia-born respondents in relation to car travel

Note: 1. \* refers to N=68 Australia-born and N=55 China-born who owned a car.

There was no statistically significant difference between the two groups with regard to travel by bus and rail/tram in Melbourne. When both forms of transport were taken into account, the Australia-born group generally used public transport more often than the China-born group to travel to work, and for other activities such as travel to shops and services (Figure 6.11).

Figure 6.11: Use of public transport for various activities by China- and Australia-born groups



The study also investigated air travel behaviours. In terms of air travel (Table 6.5 and Figure 6.12), the China-born respondents travelled significantly longer distances each year than the Australia-born group: approximately twice the distance. Most of the China-born respondents indicated that they flew back to their hometown in China at least once a year or more frequently (a common experience among migrants (Lee, Kearns & Friesen 2010; Liu 2014)). In contrast, the Australia-born respondents indicated that they purpose of holidays or business.





## Country of birth

Note: 1. 'o' indicates an outlier, which is more than 1.5 box-lengths from the edge of the box 2. '\*' indicates an extreme point, which extends more than three box-lengths from the edge of the box.

Greater air travel is the principal reason for the larger Carbon footprint among the China-born group (24.6 global hectares, gha) than the Australia-born group (18.0 gha) as illustrated in Table 6.1.

## 6.2.2 Exploring Food footprint

In exploring food consumption among the surveyed population, there was a particular focus on diet, and on food-related behaviours such as food source and snacking (Table 6.6). It is known that a diet that consists mainly of meat products such as beef has a higher environmental impact than a diet comprising vegetables (Carlsson-Kanyama & González 2009). Production of animal products is recognised as a major contributor to GHG emissions from the agricultural sector (Friel et al. 2009). In a similar vein, consuming home grown vegetables, instead of imported or processed food from supermarkets, or eating out, would result in smaller Food footprints. Processed food and imported food are both seen as 'energy-hungry processes' (McKay & Ford 2011, p.145) with higher GHG emissions.

	Australia-	China-born	Comparison between
Food-related	born (%)	(%)	China- and Australia-
behaviour	N=72	N=61	born groups (sig. dif.)
Vegetarian diet	40	14.8*	$X^{2}(1)=10.541, p=0.001$
Meat, seafood, or			
diary diet	60	85.2*	$X^{2}(1)=10.541, p=0.001$
Select foods certified			
organic or			
sustainably produced	61	57	$X^{2}(1)=.191, p=0.662$
Snack between			
meals	81	42.6*	$X^{2}(1)=20.420, p=0.000$
Has garden to grow			
vegetables	75	27.9*	$X^{2}$ (1)=29.477, p =0.000

Table 6.6: Percentage of China- and Australia-born groups who indicated engaging in food-related behaviours

Note: 1. \* Correlation is significant at the 0.05 level

Analysis of the participants' food-related behaviours reveals a number of significant differences (Table 6.6). There were statistically significant differences in relation to vegetarian and meat-based diets between the two groups. The difference in vegetarian diet was likely to be due to the larger percentage of the Australia-born group (40 %)

indicating 'Vegan-plant based foods only' and 'Vegetarian-primarily plant based foods, but some diary', than of the China-born group (14.8%). The large percentage of Australia-born participants contrasted with 3.7 per cent of adults who self-identified as vegetarians in the National Nutrition Survey Selected Highlights (ABS 1995). This high percentage may be due to the Australia-born participants' interpretation of the survey question on choice of diet as referring to the major food groups, instead of identifying themselves as vegetarians. This was found to be the case in the Australian Health Survey 2011-12 (ABS 2014a), where three-quarters of the Australian population indicated consuming vegetable products and dishes.

A higher percentage of the China-born respondents than of the Australia-born group indicated a meat or dairy diet. This high percentage of meat composition among the China-born migrants echoes the findings in a study of Chinese Dutch in the Netherlands, who indicated eating meat every day (Schösler 2014). This frequency of meat-based consumption was likely due to the availability of different types of local meat produce, namely lamb and beef, which are not commonly found in China. This change in dietary habits suggests that the China-born migrants also ate food that reflects the Australian diet. This finding is consistent with Crane and Green's (1980, p.593) study, which found that there was a change in Vietnamese refugees' diets after settling in the United States, with their adoption of an American diet consisting of milk, beef and soft drink. For the Australia-born group, the percentage (60%) that indicated having a meat diet was smaller than the percentage (69%) of participants in the Australian Health Survey (ABS 2014a).

Other food-related behaviour, namely snacking between meals, was also found to be significantly different between the two groups. The lower percentage of the China-born group that indicated snacking between meals suggests that this behaviour is not common in the Chinese diet. This aligns with Satia et al.'s (2000) finding regarding less-acculturated Chinese-American women snack less, as Chinese have a strong belief that healthy eating means having regular meals with no snacks in between.

Another food-related behaviour considered was the consumption of home grown vegetables. Table 6.6 shows that a higher percentage of the Australia-born group (75%)

than the China-born group (27.9%) indicated growing vegetables in their gardens. The percentage of the Australia-born group is in line with the finding from an online, Australia-wide survey conducted by Wise (2014, p.1), which suggests that more than half (52%) of all Australian households are growing some of their own food, and a further 13 per cent report that they intend to start. This finding is also indicative of the fact that more Australia-born (49.7%) than China-born participants (35.4%) were living in detached and semi-detached homes, which were likely to have a garden (Figure 6.5). Another reason is that the China-born migrants had no experience of growing vegetables, as most of them used to live in apartments (93%) in China (Refer to Table 5.4).

In Wise's (2014) study, one of the incentives for households to grow their own food was the environmental benefits of a reduction in GHG emissions. The link between this environmental benefit and the growing of one's own food is reflected in the difference in the scores of the Environmental Awareness Index (AI) between the China- and Australia-born respondents, as shown in Figure 6. 8. Having more environmental awareness is also likely to have an influence on the smaller percentage of the Australiaborn group who indicated a choice of meat-based meals.

Due to these differences in food-related behaviours, the mean Food footprint of the China-born group was found to be larger than that of the Australia-born group (Table 6.1).

## 6.2.3 Exploring Goods and Services footprint

The difference in size of the China- and Australia-born groups' Goods and Services footprint relates to differential spending and buying habits, and waste generation and management behaviours. In terms of spending and buying practices, individuals who spend within their income, have saving habits, and buy new things only to replace old ones would be more likely to have a lower environmental impact than those who did otherwise. The survey shows that a majority of the Australia- and China-born participants (99 % and 93 % respectively) indicated that they spent within their means and had saving habits (Figure 6.13).

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Figure 6.13: Profile of waste generation and management and purchasing behaviours among China- and Australia-born respondents

Waste generation and management behaviours have ecological consequences. One way to reduce this impact is by minimising waste. This minimisation is identified with various behaviours, namely using recycled materials and products, recycling, and composting.

The survey responses to waste generation and management behaviours involved three categories of activity, namely recycling building materials and furnishings, spending and buying habits, and recycling domestic waste and composting (Figure 6.13).

The first set of waste generation and management behaviours, as shown in Figure 6.13, involved using recycled materials as building materials and buying second-hand furnishings. These two behaviours differ from the other two sets of behaviours in terms of environmental impact, as they are likely to occur less frequently, and may even involve a one-off purchase. More Australia-born respondents indicated participation in these two activities than did China-born. Twenty-four per cent of the Australia-born participants, compared to three per cent of the China-born group, indicated that their home had been built – at least in part – with some recycled materials. The fact that a larger percentage of the Australia-born participants exhibited this behaviour could be because a significant percentage (40.6%) owned homes, compared to 28.5 per cent of the China-born group (Figure 6.3). In addition, as migrants, the China-born group was living in dwellings where they had little or no idea of what materials were used in the original construction.

In terms of purchases of second-hand furnishings, a larger percentage (74%) of the Australia-born group indicated exhibiting this behaviour than did the China-born group (54%). The smaller percentage of the China-born group could be explained by their diverse views on buying new furnishings. Several China-born respondents (Cases 42 and 56) felt that living in their new homes in Melbourne meant they should have 'all things new', such as furniture. However, other China-born respondents (Case 6) said that the furniture in Australia was shipped from their homes in China.

Another set of waste generation and management behaviours refers to domestic waste recycling and composting. In terms of recycling behaviours, *all* of the Australia-born

participants indicated that they recycled paper and plastic (Figure 6.13). Large percentages of the China-born group also indicated that they recycled paper (98 %) and plastic (97 %). All municipalities in Melbourne now *require* households to separate paper and plastic waste prior to collection.

The set of behaviours to reduce waste can also be associated with composting food and garden waste. Composting of materials such as leaves and food waste generates organic products. Such activities also lead to a reduction in garbage and the amount of GHG produced in landfill (Department of Industry and Science 2014). More Australia-born participants (75%) than China-born (25%) mentioned that they carried out composting activities. Evidence of this as expressed by the Australia-born respondents is as follows:

'I do not use a green bin as I compost the garden waste'. (Cases 64, 65, 85, 92 and 119).

'I have less garbage as I do composting now. I also consciously sort the garbage.' (Case 72).

Because we have a worm farm, there is less garbage. (Cases 103 and 116)

The large percentage of the China-born group who did not carry out composting suggests that this behaviour was not a common practice when living in China, as well as a lack the knowledge about composting while living in Australia.

In terms of eating leftover food, high percentages of the Australia-born group (99 %) and the China-born group (95%) indicated carrying out this behaviour (Figure 6.13). Though there was only a small percentage difference between the two groups, there were still some differences in societal practices. Some Australia-born respondents mentioned that if they did not eat the leftovers the next day, they would either feed them to the chickens or compost them (Cases 72 and 110 respectively). Several China-born respondents indicated that they mostly ate leftovers the next day (Cases 3, 4, 14 and 15), and some (Cases 3, 4, and14) specifically stated that they only ate leftover meat but not vegetables. Though no Australia-born participants shared this view, research by Baker, Fear and Denniss (2009) found that fruit and vegetables, as well as meat and fish, were
in the top three of food categories, along with 'restaurant and take-away food', discarded by Australians. An online survey in Australia found that generally, 'the higher a household's income and the lower its number of occupants, the greater the amount of food waste generated per person' (Baker, Fear & Denniss 2009, p.12). In Sweden, no correlation was found between household income and food waste (Williams et al. 2012). However, research by Qu et al. (2009, p.2623) among households in China suggested that the reason why food waste decreased with increased income could be 'that affluent families have more opportunities to dine in restaurants'.

The following section explores a set of determinants that may be associated with the four footprint components and the total ecological footprints. These associations suggest differences in consumption behaviours in the two groups. The insights gained are critical to understanding the likely trajectories of consumption among the increasing volume of China-born migrants in Australia. A set of potential determinants, including the CALD Index, is listed in the conceptual framework outlined in Figure 6.1.

### 6.3 Multi-variate analysis of ecological footprint

As outlined in the conceptual framework (Figure 6.1), a range of determinants have been identified as having an influence on consumption behaviours in the context of sustainable living across the China- and Australia-born groups as a total sample. Multivariate analysis (Hair et al. 1995) is applied to the total sample population in order to better understand the different explanatory power of each variable in relation to the total ecological footprint and the four footprint components. In the following sections, the suitability of the survey data for multiple regressions is determined by examining the correlations between the set of determinants and the dependent variables. Multicollinearity and outliers were also checked to ensure the validity of the data for multiple regressions (Phalant 2011).

As the total sample size is 133 (consisting of 61 China-born and 72 Australia-born participants), all 14 determinants as identified in the conceptual framework were selected for the analyses. This selection adheres to Francis' (2007, p.128) proposal that a minimum of five cases per determinant is considered suitable for multiple regression. The correlations between the determinants and the four footprint components and the

total ecological footprint are summarised in Table 6.7. The strength of these correlations ranged from the weakest (r=0.1) between Carbon footprint and car ownership to the strongest (r=0.6) between Housing footprint and Dwelling size. These findings show that there are few very strong correlations between any of the individual determinants and the dependent variables, confirming the suitability of the application of all 14 determinants in the analyses.

The outputs from the analyses of the four footprint components and the total ecological footprint were also checked for multicollinearity and outliers. The outputs show that there was no multicollinearity, as all tolerance values were more than 0.10, and the VIF (Variation Inflation Factor) less than 10. There was an absence of outliers, as the Mahalanobis distance was equal or less than the critical value of  $X^2 = 36.1$  (for p<0.001) for the 14 predictors (Phalant 2011; Tabachnick & Fidell 2007).

The following section examines and explains the outputs of the analyses for each of the four components of the ecological footprint, as well as the total ecological footprint.

	Cultural	al Individual structural attributes				Individual behavioural attributes			Household	Dwelling context				
	context										context			
Footprint	CALD	Gender	Age	Education	Employment	Income	Car	Conservation	Resource-	Environmental	Household	Tenure	Dwelling	Dwelling
	Index						ownership	Behavioural	efficient	Awareness	size		size	type
								Index (CBI)	Technologies	Index (AI)				
									Index (REI)					
Carbon	0.392	-0.055	065	-0.214	131	144	.125	101	-0.266	442	093	063	.084	055
footprint	(0.000)	(0.264)	(0.228)	(0.007)	(0.066)	(0.049)	(0.076)	(0.124)	(0.001)	(0.000)	(0.143)	(0.235)	(0.168)	(0.263)
Food	0.175	0.248	-0.068	-0.056	-0.049	-0.022	0.002	-0.268	-0.210	-0.227	0.057	-0.123	0.024	-0.097
footprint	(0.022)	(0.002)	(0.220)	(0.261)	(0.287)	(0.400)	(0.490)	(0.001)	(0.008)	(0.004)	(0.257)	(0.079)	(0.390)	(0.132)
Housing	0.280	-0.107	-0.180	-0.064	-0.015	-0.074	0.337	0.041	-0.044	-0.330	0.234	0.259	0.599	0.347
footprint	(0.001)	(0.109)	(0.019)	(0.230)	(0.433)	(0.197)	(0.000)	(0.320)	(0.307)	(0.000)	(0.003)	(0.001)	(0.000)	(0.000)
Goods &	-0.421	0.108	-0.127	0.179	0.136	-0.436	0.226	-0.004	0.107	0.159	0.027	0.057	0.157	0.124
Services	(0.000)	(0.109)	(0.073)	(0.020)	(0.059)	(0.000)	(0.004)	(0.482)	(0.110)	(0.033)	(0.380)	(0.258)	(0.036)	(0.077)
footprint														
Total	0.157	0.123	0.160	-0.069	-0.033	-0.147	0.234	-0.179	-0.199	-0.333	0.046	-0.013	0.251	0.053
Ecological	(0.036)	(0.078)	(0.033)	(0.215)	(0.354)	(0.045)	(0.003)	(0.020)	(0.011)	(0.000)	(0.301)	(0.442)	(0.002)	(0.273)
Footprint														

Table 6.7: Correlations between determinants (including CALD Index) and the four components of ecological footprint of China- and Australia-born groups (total sample)

Note: Correlations are indicated in boldface for coefficients which are statistically significant at 0.10 level (which is a lower threshold for small sample)

6.3.1 Multi-variate analyses of the four components of footprint and the total ecological footprint

Table 6.8 illustrates the outputs of the multi-variate analyses that identified the respective strengths of influence of the set of determinants on the four footprint components and the total ecological footprint (dependent variables).

Across the footprint components, different factors were found to exert an influence. All the predictors, except education, were found to have a significant contribution across the footprints. The Housing footprint has the most number of determinants, at nine. Six determinants were found to have a significant influence on the total ecological footprint. The Food footprint has the least number of significant determinants, at two.

Seven of the factors that make a statistically significant contribution to the four footprint components were not predictors of total ecological footprint. These seven predictors are as follows:

- The CALD Index (as the cultural factor)
- Age
- Employment, and
- Resource-efficient Technologies Index (REI), which were measured at individual levels;
- Household size
- Tenure, and
- Dwelling type, which were assessed as household and dwelling contexts

Those determinants measured at individual levels have been shown to exert more influence on these footprint components than those at the household level and in the dwelling context. This detailed breakdown by footprint components representing the key consumption categories creates an avenue for a better understanding of an individual's consumption behaviours, as opposed to one that focuses on the total ecological footprint.

The relative contribution (Beta value) of each factor also differs. For the total ecological footprint, the most significant determinants were the individual behavioural factors (CBI, AI) and income, with dwelling and car ownership also being important contributors. The gender factor appears to play a highly significant role in one of the footprint components – Food.

	-	Total ecological footprint	Carbon footprint	Food footprint	Housing footprint	Good and Services footprint
Context	Determinant	Beta value	Beta value	Beta value	Beta value	Beta value
-	(Constant)	-	-	-	-	-
Cultural context	CALD Index <sup>2</sup>	-0.033	0.195*	0.092	0.167*	-0.484***
	Gender <sup>3</sup> (Male)	0.196**	0.048	0.307***	0.048	0.014
	Age <sup>3</sup> (45 years or older )	-0.104	-0.050	-0.026	-0.136**	-0.086
Individual	Education <sup>2</sup> (University or postgraduate)	-0.036	-0.112	-0.040	-0.028	0.103
structural	Employment <sup>2</sup> (Employed)	-0.090	-0.048	-0.032	-0.130*	-0.052
attributes	Income <sup>2</sup> (Low)	-0.192**	-0.022	-0.032	-0.170**	-0.295**
	Car ownership <sup>2</sup>	0.192**	0.154*	0.093	0.043	0.137
Individual	Conservation Behaviours Index (CBI) <sup>2</sup>	-0.189**	-0.028	-0.254*	-0.066	-0.071
behaviours	Resource-efficient Technologies Index (REI) <sup>2</sup>	-0.166	-0.201*	-0.070	-0.173**	0.011
indexes	Environmental Awareness Index (AI) <sup>2</sup>	-0.314**	-0.217*	-0.092	-0.236**	-0.253**
Household context	Household size <sup>2</sup>	-0.083	-0.196**	0.028	0.026	-0.015
Dwelling	Tenure <sup>3</sup> (Home owner)	0.041	0.063	0.021	0.200**	-0.100
context	Dwelling size <sup>3</sup> (150 square meters or larger)	0.295**	0.106	0.146	0.496***	0.142
	Dwelling type <sup>3</sup> (Detached dwelling)	0.037	0.041	-0.059	0.227***	-0.005
	R Square	0.360	0.297	0.211	0.619	0.364
	Adjusted R Square	0.284	0.214	0.118	0.573	0.289
	Sig. F Change	0.000	0.000	0.009	0.000	0.000
	R	0.600	0.545	0.460	0.786	0.604
	F	4.747 (0.000)	3.568 (0.000)	2.256 (0.009)	13.666 (0.000)	4.833 (0.000)

Table 6.8: Influence of the CALD Index and other expected predictors on total ecological footprint and four components of footprint of China- and Australia-born groups

Notes: 1. Standardised Beta coefficients are highlighted in bold face for coefficients which are statistically significant at \*\*\* p<0.01, \*\* p<0.05, \*p<0.100 level (which is a lower threshold for small sample)

2. Interval (continuous) level variable

3. Dichotomous variables – refer to Appendix C

#### 6.3.2 The CALD Index as an explanatory factor

The CALD Index, which represents a key cultural factor in the research framework, was found to be a determinant of Carbon, Housing and Goods and Services footprints (but not Food footprint and total ecological footprint). This specific finding affirms the presence of a cultural influence on the China- and Australia-born groups' consumption behaviours in Australia. Individuals who indicated a stronger connectedness with Chinese culture than with the host culture (high scores of CALD Index) were likely to be higher consumers of energy, travel, housing and appliances. The strong connectedness with Chinese culture is a key factor in the display of reputation attained through their success, and in the ostentatious display of possessions such as large dwellings. In other words, these individuals display the Confucian concept of '*mein-tzu*' (Hu 1944) and 'keeping up with the Joneses'.

#### 6.3.3 Established determinants as explanatory factors

In line with past research, income was found to make statistically significant contributions to total ecological footprint, Housing, and Good and Services footprints. These findings indicate that individuals' purchasing capacities increase when they have more disposable income (Hamilton, Denniss & Baker 2005; Zacarias-Farah & Geyer-Allély 2003). However, the relative contributions of income differed with each footprint. As previously indicated, *income* was a binary variable with low income (counter-intuitively) coded as '1' and high income as '0', hence the negative sign indicates that high income was found to have a positive influence on the Goods and Services footprint (which includes waste generated) This was reflected by total ecological footprint and Housing footprint. More waste is generated as a result of more consumption. A high income was also associated with fewer conservation behaviours (low scores of Conservation Behaviours Index, CBI). The strength of the AI (Environmental Awareness Index) and CBI indexes as predictors of the total ecological footprint partly aligns with De Oliver's (1999, p.385) study in the United States, which showed that residents with higher incomes respond more poorly to urban water conservation programs.

Gender was the most important predictor of the Food footprint. This distinction between males and females is as expected. According to the National Nutrition

Survey (ABS 1995), Australian males on average consume a higher quantity of food and beverages than females. Another study has shown that male participants are likely to consume more food and have greater appetites for meat and fish (Kerr & Charles 1986). As discovered by Lea and Worsley (2001, 2003) in their studies on the frequency of meat consumption in Australia, the main reason for males' large appetite for meat was that they simply enjoy eating meat. Males' consumption of more 'heavy foods' overall, including meat and potatoes, are often linked to masculinity (Wang, Worsley & Cunningham 2008, p.3). While females tend to eat less meat, they are also likely to have a vegetarian diet, as they have been found to be more health conscious than males (Kerr & Charles 1986; Lea & Worsley 2001; Turrell 1997).

The association of a large footprint and lower levels of conservation behaviour with the male gender is supported by Roberts' (1993) study, which has suggested that females were more socially responsible consumers, and also more environmentally active than males. As conservation behaviours aid in reducing resource use, these behaviours are likely to be related to the amount and frequency of food consumption. Thus lower levels of 'conservation behaviours' are likely to be associated with eating larger amounts of food and consuming food more often: for example, eating snacks between meals. Kerr and Charles (1986) found that males consume more snacks and suppers than females.

A larger total ecological footprint was also found among males with a high annual income, and with those who owned cars. This concurs with the results of the OECD's (2011) study of gender and travel, which showed that males with a high income were found to use private vehicles more often than females, and to travel further. These findings illustrate that a dependence on the car increases energy use and GHG emissions (and size of Carbon footprint). This is echoed in the research finding that car ownership was an important influence on the large increase of Carbon footprint and total ecological footprint, as a majority of Australia-born (94 %) and China-born (90 %) participants owned a car (Figure 6.10).

Unemployment was also found to influence the size of the Housing footprint. One explanation is that being on a low income discourages residents from paying for

energy and water saving technologies. Households on low incomes are likely to occupy rental homes, which may have both low thermal efficiency and inefficient appliances, and the residents are unlikely to upgrade these (Gabriel et al. 2011; Sharam 2010).

Of the three behaviour indexes, the Environmental Awareness Index (AI) was the only one that was found to have an important influence on four of the five footprints (not the Food footprint). These findings were to be expected, as having lower environmental awareness (a low score of AI) influences the key consumption categories. It has been documented that individuals with more awareness of resource conservation, resource-efficient technologies, and waste generation and management know how to effect resource and carbon restraints (Dahlstrand & Biel 1997; Syme, Nancarrow & Seligman 2000; Vattenfall, A-hus & Volvo 2011; Voronoff 2005). Thus, individuals with less environmental awareness may be less able to link their consumption behaviours with environmental perspectives, and this may also hinder their capacity and commitment to the installation of resource-efficient technologies. Large Carbon and Housing footprints are linked with fewer installations of these technologies (a low score of REI), because such installations reduce the amount of resource use, such as energy and water, and GHG emissions.

Household size was found to be a predictor of the Carbon footprint. This finding is in line with previous studies, as economies of scale (Dey et al. 2007) can aid in reducing the amount of resource use at home, as can the sharing of domestic appliances and equipment in households containing two or more people. Larger households also have the capacity to share car rides. In addition, they result in less impact on the environment, and reduce the size of *individual* participants' footprints. As documented, a smaller size household uses more energy and incurs more waste than a larger one (Zacarias-Farah & Geyer-Allély 2003). Economies of scale are a positive feature of larger households.

In line with past studies, living in a large dwelling (150 square meters or larger) was found to be an important predictor of an increase in Housing footprint, and a key predictor of total ecological footprint. Studies have shown that not only do large dwellings have more space requiring heating and cooling, and more rooms and

toilets, they are also ideal depositories for fixtures and appliances (Newton 2011; Schipper et al. 2001; Wilson & Boehland 2005; Zacarias-Farah & Geyer-Allély 2003).

Home ownership (tenure) was only found to make a statistically significant contribution to the Housing footprint. This finding is in line with the work of other researchers, who have found that owners use more energy and water, especially if they have a garden (Brandon & Lewis 1999; Syme, Thomas & Salerian 1983). A low level of installation of resource-efficient technologies (a low score of REI) was also found to be linked to a large Housing footprint. These findings suggest that a home owner's financial standing (that is high annual income) and environmental perspective (low Environmental Awareness Index, AI) had more influence on the consumption categories of dwelling type and size, and water use.

Taken together, levels of consumption (ecological footprint) and different consumption categories (categorised into four components of footprints) are influenced by multiple determinants, both established and cultural (CALD Index). While these findings are in line with past research, an examination of the influence of the CALD Index on several categories of ecological footprint highlights the importance that connectedness with ethnic culture has on individuals' consumption behaviours. With these insights, the potential pathways to behaviour change and communication of more sustainable living practices among the China- and Australiaborn groups need to be highlighted. These pathways will be discussed in the following chapter.

### 6.4 Conclusion

This chapter has compared the ecological footprints of a sample of China- and Australia-born residents of Melbourne, Australia. Two questions stimulated the research. First, whether the China-born migrants differ from the Australia-born residents in in terms of: (i) Ecological footprints, and (ii) Specific consumption behaviours; and second, what factors explain the ecological footprints of the Chinaand Australia-born group? (With a particular focus on the CALD Index as a potential differentiating factor of consumption patterns.) With regard to the first question, the study found that there were statistically significant differences between the China- and Australia-born groups in relation to the four components of the ecological footprint and the total ecological footprint. These findings add further insights to Sobels et al.'s (2010) aggregate-level study, which found that an increasing migrant population to Australia would have an impact on the environment, as migrants could be expected to adopt Australian consumption patterns. All the migrants' footprints (except for Goods and Services) were *larger* than those of the Australia-born group. These statistically significant differences were linked to a high adoption by the migrants of dwelling type (detached housing) and car ownership. The magnitude of the migrants' Carbon footprint was exacerbated by the amount of air travel, which was significantly greater than that of the Australia-born group. As migrants, they travelled to their country of birth frequently, which is common for migrants (Lee, Kearns & Friesen 2010; Liu 2014).

Australia's food landscape had also encouraged changes in the China-born migrants' diet – which now includes more beef and lamb – enhancing their Food footprint. Their larger Food footprint was also related to their low environmental awareness (a low score of Environmental Awareness Index, AI). However, the Australia-born group's Goods and Services footprint was larger than that of the migrants. This difference suggests that the China-born migrants were selective in consumption: they preferred expenditure on their dwellings and cars rather than on everyday goods and services. Being more recent migrants, acquiring shelter and mobility are more basic requirements.

Overall, there were differences between the China- and Australia-born groups in total ecological footprint and in the four footprint components. The higher levels of consumption by the China-born group in most consumption categories reflect their adoption of Australian lifestyles, and their desire to achieve status in the host society as a reflection of their belonging. Indeed, their higher consumption levels demonstrate their efforts to be better than the average 'Joneses'. These consumption behaviours clearly reveal that the China-born participants were keen to exhibit their wealth and financial capabilities so as to demonstrate their success in another

country. There is also evidence of their retention of certain aspects of Chinese culture, such as '*mein-tzu*' and 'Chinese' materialism.

The second question was: *What factors explain the ecological footprints of the China- and Australia-born group? (With particular focus on the CALD Index as potential differentiating factor.)* The multi-variate analyses of the surveyed population found that different sets of determinants operated for the four components of ecological footprint and the total ecological footprint. These included wellestablished determinants, such as income, environmental awareness and dwelling size, but also encompassed cultural context – the CALD Index that indicates individuals' connectedness with ethnic culture. The varying relative statistical strengths (Beta value) of these predictors provide clear indications of the level of importance of each explanatory factor of consumption. It is through understanding these determinants, (illustrated in Table 6.9), and their links to China-born and Australia-born groups' consumption behaviour, that prospects for more sustainable living can be better addressed.

The CALD Index, as an explanatory factor in key consumption categories, is able to differentiate between consumption by China-born migrants and Australia-born residents. The China-born migrants' larger Carbon and Housing footprints, which result from their strong ties with Chinese culture *and* adoption of aspects of the host culture, are directed towards attaining status in an affluent society. They also result from a lower awareness of the host country's societal norms, and the peculiar challenges of its natural environment. The Australia-born residents' large Goods and Services footprint also reflects their low environmental awareness and the high number of purchases made.

Table 6.9: Summary of order of similar predictor (beta value) across total ecological footprint and four footprint components of China- and Australia-born groups

Total	Housing	Carbon	Good and	Food
ecological	footprint	footprint	Services	footprint
footprint		*	footprint	•
•	CALD Index	CALD Index	CALD Index	
	(0.167*)	(0.195*)	(-0.484***)	
Environmental	Environmental	Environmental	Environmental	
Awareness	Awareness	Awareness	Awareness	
Index (AI)	Index (AI)	Index (AI)	Index (AI)	
(-0.314**)	(-0.236**)	(-0.217*)	(-0.253**)	
Income	Income	<i>, , , , , , , , , , , , , , , , ,</i>	Income	
(Low)	(Low)		(Low)	
(-0.192**)	(-0.170**)		(-0.295**)	
Dwelling size	Dwelling size		X	
(150 square	(150 square			
meters or	meters or			
larger)	larger)			
(0.295**)	(0.496***)			
Car ownership		Car ownership		
(0.192**)		(0.154*)		
		. ,		
Gender				Gender
(Male)				(Male)
(0.196**)				(0.307***)
Conservation				Conservation
Behaviours				Behaviours
Index (CBI)				Index (CBI)
(-0.189**)				(-0.254*)
( 0010) )	Resource-	Resource-		( 00201 )
	efficient	efficient		
	Technologies	Technologies		
	Index (REI)	Index (REI)		
	(-0.173**)	(-0.201*)		
	Dwelling type	(0.201)		
	(Detached			
	dwelling)			
	(0.227***)			
	Tenure			
	(Home owner)			
	(0.200**)			
	(0.200)	Household		
		size		
		(-0.196**)		
	Age	(		
	(45 years or			
	older)			
	(-0.136**)			
	Employment			
	(Employed)			
	(-0.130*)			

As culture has been found to have an impact on the consumption behaviours of the two groups studied, the challenge for subsequent research is to further unravel migrants' ethnic cultures in the context of the host culture – both the 'front' and 'back' stages of culture. Culture, as documented, influences individuals' actions by 'shaping the tool kit of habits, skills, and styles from which people construct strategies of action' (Swidler 1986, p.273). As culture 'is intimately integrated with action', to unravel what is uniquely cultural will be difficult, as 'cultural retooling (is needed) to adopt new patterns of action' (Swidler 1986, pp.278, 284). The challenge of altering culturally-linked consumption behaviours requires a great deal of effort (Cogoy 1999). There is thus a need to identify specific pathways that focus on culturally-induced behavioural change among ethnically identified individuals. There exists a wider societal challenge for Australian society to develop a mode of living that reflects a heightened environmental awareness and a lower ecological impact.

The final chapter contains a discussion of this study's key findings and their implications for policies directed towards sustainable development and consumption. It also includes suggestions for future research.

### **Chapter 7** Conclusions: Contributions, and Future Directions

Climate change, resource depletion, increasing population and consumption are global sustainability issues for the 21<sup>st</sup> century. For Australia, these issues are associated with its high affluence and urban livability: high consumption, and an ecological footprint (EF) among the largest in the world. The EF is a widely accepted measure of consumption and its environmental impact. These issues cannot be ignored. Australia's fast growing urban population is also continuously and significantly fed by migrants from different ethnic groups, who add more diversity and complexity to its multi-cultural society. If we are to remedy these 21<sup>st</sup> century issues, we have to understand consumption and its drivers better, as a basis for intervention and change. Research has shown that environmental impacts can be reduced by *technology* innovations, more innovative *design* of the built environment, and through *behaviour change* (Dietz et al. 2009; Fielding et al. 2010; Newton 2008, p.55; Stokes et al. 1994; Zacarias-Farah & Geyer-Allély 2003). In relation to consumption, behaviour change is proving to be the most intractable issue (Newton 2011).

Scholars have found that a range of factors influences consumption. A number of these operate at the level of the individual. One well established determinant is income, which has been consistently linked with the consumption of energy and water, travel, food and waste generation (Biesiot & Noorman 1999; Brandon & Lewis 1999; Dey et al. 2007; Dillman, Rosa & Dillman 1983; Hamilton, Denniss & Baker 2005; OECD 2011; Shove et al. 1998). Generally, increasing income is associated with increasing resource use and waste. Other determinants at an individual level, such as age and gender, have been found to have varying influences on consumption. Older individuals use more energy and water at home compared to younger individuals (Mills & Schleich 2012; OECD 2011; Wilhite & Ling 1995). There is evidence that the frequency of private car usage varies by age group (Poortinga, Steg & Vlek 2004; Schipper, Haas & Sheinbaum 1996). These consumption behaviours can be directly linked with CO<sub>2</sub> emissions. In terms of conservation, individuals with higher education levels are generally linked with greater environmental awareness and conservation behaviours. It has been

demonstrated that those with higher education levels tend to install more resourceefficient technologies (Mills & Schleich 2012; Wilhite & Ling 1995).

Context is also an important determinant of consumption (Newton 2013). In terms of household and dwelling contexts, household type and size influence in-dwelling energy use, travel, and waste management such as composting. Households with young families and couples tend to discard more fresh food and clothing than older households (Hamilton, Denniss & Baker 2005). Household size enables economies of scale in consumption: larger households tend to use fewer resources per capita, while single-person households use more per capita (Dey et al. 2007). However, larger households with higher incomes use more energy compared to smaller, low income households (Brandon & Lewis 1999; Druckman & Jackson 2008; Gatersleben, Steg & Vlek 2002; Utley & Shorrock 2008). Dwelling size and type are also determinants of consumption. Large dwellings and detached homes are generally associated with more resource use, especially space heating and cooling. Due to the split incentive issue (Gabriel et al. 2011; Shove et al. 1998), renters tend not to install resource-efficient technologies that aid in resource conservation, as they are not likely to recover the sunken costs associated with these installations, and the landlords do not benefit from these installations. In sum, there is a mix of determinants operating at an individual and household level that influence consumption.

These established determinants can be viewed as providing the basis for interventions that attempt to change individuals' patterns of consumption in the context of more sustainable living – to aid in the transition towards a low-carbon, low-resource-use environment. A review of contemporary research has provided the basis for a conceptual framework for this thesis, which, in an era of high international migration and multicultural cities, needed to be augmented with a cultural dimension. In Australia, 27 per cent of the total population was born overseas, and the level of migration is increasing (ABS 2013h). Immigration accounts for over half the nation's annual population increase (which is the highest in the OECD after Israel and Luxemburg). From an economic and social perspective, this has had a beneficial impact (for example, increasing the supply of working age people; more cosmopolitan living). However, are there environmental consequences? Sobels et al. (2010) questioned whether migrants' consumption behaviours and conservation attitudes are similar to those of the Australia-born population: do they drive higher or lower levels of consumption? This raised a question for this research. For migrants who move from developing to developed countries approximately 25.9 per cent of recent annual immigration totals (ABS 2013a) – to what extent might settling in Australia result in their adoption of the nation's high consumption lifestyles? It is likely that embracing host consumption behaviours would make more demands on Australia's environment. An understanding of the factors influencing migrant consumption is likely to assist in the development of more effective communications by governments towards sustainable living for a fast growing and increasingly diverse multi-cultural urban society. The conceptual framework (Figure 7.1) developed for this research is based on factors that influence consumption identified by other scholars, and was augmented by a set of cultural factors, including the CALD Index and indicators of acculturation developed for this research project. An exploration of the relative significance of these cultural elements represents the focus for this thesis. The two main areas of investigation were:

- To examine the role of cultural and societal contexts in patterns and levels of consumption among China-born migrants to Australia. Specifically, the aim was to explore whether there was any significant difference in levels of consumption (as measured by ecological footprint) among China-born migrants *prior* to migrating to Australia compared to their *present* pattern of resource use and CO<sub>2</sub> emissions in Australia. The intention was also to analyse the extent to which *change* in ecological footprint has occurred as a result of acculturation or other factors (Chapter 5).
- To investigate the extent to which there were differences in relation to sustainable living practices and resource consumption between Australiaborn residents and China-born migrants (a culturally and linguistically diverse [CALD] group in Melbourne); and to analyse and account for differences in behaviours between the CALD and the Australia-born groups (Chapter 6).

Figure 7.1: Conceptual framework for understanding determinants of consumption in a culturally diverse developed society



All the chapters in this thesis were designed to address these two questions. Chapter 1 revealed that increasing liveability in Australian cities increases resource consumption and carbon dioxide emissions. These demands are intensified by Australia's increasing urban population, driven by higher levels of migration from Asian and non-English speaking countries like China and India. The chapter identified three key knowledge gaps. First, to what extent does cultural context influence consumption behaviours among different ethnic groups in Australia's urban society? Second, upon settling in Australia, to what extent are there changes in migrants' consumption behaviours; third, how different are migrants' consumption behaviours from those of Australia-born residents?

Chapter 2 reviewed the existing literature on consumption and its determinants. This provided the basis for identifying those determinants of consumption which influence behaviour related to resource use, as reflected in an individual's ecological footprint (as a consumption metric). The chapter also identified the potential role of a cultural influence on consumption. A synthesis of these reviews informed the

development of a conceptual framework for better understanding patterns of living and resource consumption in a multicultural society.

Chapter 3 explored the role of cultural context more broadly, as reflected in individual behaviours. This provided the basis to confirm the desirability of including cultural factors in an explanatory model for consumption in modern, advanced multicultural societies. Specific cultural elements explored in this research were the CALD Index and indicators of acculturation process. The CALD Index is a composite measure of individuals' connectedness to their ethnic culture. Acculturation potentially influences changes in consumption behaviour that occur when individuals from different cultures come into contact with each other (Redfield, Linton & Herskovits 1936). The CALD Index and the indicators of acculturation represent an extension of the traditional framework on consumption determinants, which was articulated in Chapter 2. In this thesis, consumption was measured by the size of an individual's ecological footprint and its key components.

Chapter 4 reviewed the ecological footprint calculators available, and outlined the research methodology for the household survey, the questionnaires and the measurement and coding processes undertaken in order for consumption determinants to be subject to multi-variate analyses (in Chapters 5 and 6). The chapter also detailed the sampling strategy, research participants' characteristics, interview approach, and survey process. The focus for this research was China-born migrants and Australia-born residents in Melbourne. The suburb of Box Hill in Melbourne was selected as the study area due to its high concentration of China-born migrants (ABS 2006).

The analyses presented at Chapters 5 and 6 were based on 133 interviews. In Chapter 5, pre-and post-migration consumption behaviours of the China-born migrants were compared in terms of changes in their ecological footprints. Chapter 6 investigated the extent to which there was variability among the determinants of consumption (ecological footprint) across the China-and Australia-born groups in Melbourne.

### 7.1 Key findings

This thesis has provided a more detailed perspective than previous research regarding Australia's growing population, increasingly fed by migrants, and the impact this is having on consumption, and by extension on the environment (Bartlett 2006; Foran & Poldy 2003; Hugo 1996, 2013b; Sobels et al. 2010). This research has added more detail and depth to the national aggregate-level study by Sobels et al. (2010), which established a connection between immigration and environmental impact – especially in Australia's capital cities.

### 7.1.1 Key findings on change in the China-born migrants' ecological footprint

The total ecological footprint of the China-born migrants increased three-fold after their migration to Melbourne. As illustrated in Figure 7.2, *all* four components of their ecological footprint increased in magnitude. The largest change was in their Housing footprint, which increased by approximately 5.4 times, followed by Food footprint and smaller contributions from Carbon, and Goods and Services footprints. These results were directly related to changes in the migrant group's consumption behaviours – higher consumption levels and different consumption patterns after migrating from China and upon settling in Melbourne. Figure 7.2: Ratio of China-born group's four footprint components and the total ecological footprint in China to Melbourne



The averages of *all* footprint components were significantly higher in Australia than those prior to their migration from China. The increases in the China-born group's footprint components reflected their adoption of key aspects of Australian societal structures, urban infrastructures, and culture. Melbourne's urban sprawl and lack of public transport infrastructure had a direct influence on the migrants' need to own cars. New travel behaviours in a low density, car dependent city inevitably increased the migrants' Carbon footprint. Occupancy by the migrants of predominantly single, detached dwellings reflected the ubiquity of this dwelling type in Australian cities. As detached dwellings tend to be large and have gardens, more resource use is also likely, and this increased the Housing footprint of these migrants. The migrants' assumption of meat-based diets consisting of beef and lamb reflected another aspect of Australian culture. Adoption of this diet was reflected in an increase in the migrants' Food footprint in Melbourne. Australia's societal structures and built environments provided a framework of constraints, as well as opportunities, within which the migrants had to work and live.

The level *of change* in the total ecological footprints of the China-born group varied. A majority of those who exhibited a *large* change in their footprint had strong connectedness with Chinese culture, as reflected by their high scores in the CALD

Index. This connectedness revealed a retention of their '*mien-tzŭ*', as one of the core elements of the Chinese thought process (Zhang & Baker 2008), representing the need to portray the success of their migration. The exhibition of consumption ('success') was particularly evident for those individuals in the 18 to 44 age group with higher annual incomes. Due to their age and employability nexus, and the likelihood of higher disposal incomes, this group had the ability to consume widely.

In relation to the indicators of acculturation, the majority of the group who demonstrated *large* increases in ecological footprint had longer lengths of residence in Melbourne, and frequently used English in communications – indicators facilitating easier integration into the host society's more affluent lifestyle. Combined, this group's socio-economic status and selected acculturation factors were found to induce a *large* change in ecological footprint. Retention of strong feelings of ethnic pride would have enhanced their maintenance of '*mien-tzŭ*' and '*guanxi wang*' (Zhang & Baker 2008) – two Chinese cultural features that combine to reinforce the China-born group's need to portray their success as migrants.

The multi-variate analysis of determinants of the China-born group's level of *change* in ecological footprint established that some of these determinants – especially those pertaining to cultural contexts – were significant predictors of the migrants' *degree of change* in ecological footprint. The relative strength of the top five key determinants of *change in ecological footprint* post-migration, in order of significance, were:

- Income,
- The CALD Index (the cultural factor),
- English in communications (an indicator of acculturation),
- Length of residency (an indicator of acculturation), and
- Conservation Behaviours Index (CBI).

The analysis found that the migrants' retention of Chinese culture had made a significant contribution to their *large* increase in total ecological footprint while living in Melbourne. Established determinants were also found to have made

significant contributions to the migrants' *large* increase in footprint. These factors include: high annual income and education level, fewer conservation behaviours and large dwelling size. These findings are consistent with past research on the determinants of consumption (Dey et al. 2007; Gram-Hanssen 2010; Mills & Schleich 2012; Wilson & Boehland 2005).

In sum, these research findings identified that the migrants' consumption behaviours are due to the *dual* influence of Chinese culture *and* adoption of Australia's affluent high-consumption lifestyles. The migrants' connectedness with Chinese culture in this context poses a challenge to effecting change in their consumption behaviours, as migrants 'are said to act in culturally determined ways when they preserve traditional habits in new circumstances' (Swidler 1986, p.277). These urban consumption challenges are compounded by Australia's societal structures, transport and housing infrastructures. It is likely that migrants from other ethnic groups behave like the China-born group upon settlement in Australia – that is, in their use of consumption to demonstrate 'standing' in a high income, materialistic society. If so, migrants' resource consumption will likely equate to that of their host population and further exacerbate environmental pressures. In the context of a transition to more sustainable living, government and service providers need to put in place policies and programs that are capable of curbing consumption and promoting low carbon-and resource-conserving lifestyles among Australia-born *and* migrant groups.

Cultural, socio-economic and structural factors represent three areas for intervention. Past research has shown that culture is 'intimately integrated with action' (Swidler 1986, p.278). Thus, elements of individuals' ethnic cultures have to be considered in order for more effective interventions to occur. For instance, programs that promote sustainable living can encourage lower meat consumption by reducing the frequency of meat eating, a less meat-oriented food pattern for human health, as well as the health of the environment. Encouraging these dietary changes may be difficult among the China-born migrants, as their motivations for eating meat regularly relate to taste and 'the traditional fit of meat within the dishes that they normally eat' (Schösler 2014, p.86). Moreover, protecting their specific food habits is seen as retention of their Chinese identity, as pointed out by Schösler (2014, p.55). An alternative approach towards more sustainable living is to encourage meat

substitutes. For example, tofu, a soy-derived product (represents the 'front' stage of culture), is commonly used as a meat substitute (represents the 'back' stage of culture) among Chinese, especially those who are vegetarians and Buddhists. These instances show that when dealing with cultural intervention, there is a need to address both the 'front' and 'back' stages of culture.

Besides dietary interventions, households can be encouraged to upgrade or install eco-efficient technologies – in particular energy- and water-efficient appliances – which also have the potential to reduce domestic resource consumption. Since this research has shown that the China-born migrants were not familiar with certain aspects of their dwellings and built-in appliances, it is opportune to inform them about the economic and environmental advantages of home insulation, weather proofing, using cold water instead of warm water when using washing machines, and that they should ignore the default setting for particular cycles. In a similar vein, they can be encouraged to use clothes dryers only when necessary.

More challenging is the transition to a less car dependent lifestyle. Here, policies and programs need to make a connection between transport infrastructures, convenience and ease of use to motivate individuals to use public transport. More generally, governments can put in place programs that motivate individuals to be more receptive to ideas directed towards sustainable consumption, and which facilitate a change in ingrained behaviours (habits). However, awareness programs regarding more sustainable living in a multicultural society are likely to be more effective if they are better connected to the cultural factors and ethnic communications channels in operation.

7.1.2 Key findings from comparison of the China-and Australia-born groups' ecological footprints

A significant finding in this research was that the overall size of the China-born group's footprints was larger than the Australia-born group in Melbourne at the time of this study: 69.8 global hectares (gha) versus 65.3 gha. There were differences in the four components of footprint involving consumption of energy and water, food, housing, goods and services, and waste generation and management. Higher energy

and water usage among the China-born migrants compared to the Australia-born group were discovered to be due to lower levels of installation of resource-efficient technologies, and to individuals exhibiting fewer conservation behaviours. These findings were consistent with other studies (Mills & Schleich 2012), which suggest that as migrants, they 'encounter new rules, ..., understandings and requirements for practical knowledge' (Maller 2011, p.249), which result in their lack of knowledge or ignorance of the host society's regulations and opportunities in relation to the conservation of resources. As a majority of the migrant group were also tenants, these resource conserving installations would not have benefited them directly and financially, due to the split incentive issue (Gabriel et al. 2011; Shove et al. 1998).

This research also found that there were differences in travel behaviours between the China-born migrants and the Australia-born group. Overall, there was a larger Carbon footprint for China-born migrants than for the Australia-born group. The average distance travelled by car was greater for the Australia-born group than the China-born group. On the other hand, the data showed that the mean distance travelled by air was greater among the China-born group than the Australia-born group. The frequent use of air travel among the China-born group had a major impact on their GHG emissions. Their responses highlighted that they travelled back to China frequently. This air travel behaviour is characteristic of Chinese migrants' desire to return to their country of origin due to familial, social and cultural connections with their country of birth (Lee, Kearns & Friesen 2010; Liu 2014). Liu (2014, p.23), in her study of Chinese migrants in New Zealand, found that ties with their birth country were due to their 'strong identification with China as (their) cultural origin'. The other reason could be their need to maintain 'guanxi wang' (that is, a network of contacts) (Zhang & Baker 2008) with their family members and friends in China. As the China-born group's air travel is somewhat related to their culture and attachment to their country of birth, government initiatives would be likely to have little impact on these travel behaviours. On the other hand, it is essential that the policies and strategies undertaken by governments to reduce transport CO<sub>2</sub> emissions address local transport infrastructures. This is principally to make public transport more accessible to the urban population as a whole.

The average Food footprint of the China-born migrants was also larger than that of the Australia-born group. The difference was due to the China-born group's adoption of a more meat-based diet and consumption of fewer vegetables: factors related to higher GHG emissions (Carlsson-Kanyama & González 2009; Friel et al. 2009). These differences are a reflection of Australia's food landscape – dominated by supermarkets and eating out, with a decline in the domestic growing of fruits and vegetables.

The results from the multi-variate analysis show that different sets of factors made varying contributions to an understanding of the relative size of the China- and Australia-born groups' total ecological footprint and the four footprint components. Table 7.1 presents a summary of the relative strength of these predictors of the total ecological footprint and the four footprint components. In order of relative significance, the CALD Index made a major contribution to the Goods and Services, Carbon, and Housing footprints, confirming that there were cultural factors operating in distinguishing levels of consumption between the China- and Australia-born groups. The strong cultural distinctiveness between the two groups' Goods and Services and waste generation/management behaviours. Those individuals more closely associated with the host culture (a low score of CALD Index) – the Australia-born group – tended to exhibit stronger purchasing behaviours and higher waste generation. These behaviours are also significantly linked to this group's higher income.

Cultural influences on Carbon and Housing footprints were also at play, whereby those with a strong connectedness with Chinese culture (a high score of CALD Index) had larger Carbon and Housing footprints. Contextual factors, such as the wide availability of detached dwellings, constrained the migrants' choice of size and type of homes. Despite this, their choices suggest that these possessions symbolise their financial achievements, attainment of, and alignment with, Australia's affluent lifestyle. They are also symbolic of the 'back' stage of culture, in the maintenance of aspects of Chinese culture such as '*mien-tzŭ*' and 'Chinese' materialism'. Similar explanations can be applied to their large Carbon footprint in relation to car

ownership – a reflection of the urban structure of Australian cities, and the associated car dependency in their suburb of residence.

Behavioural attributes such as environmental awareness (Environmental Awareness Index, AI), exhibiting conservation behaviours (Conservation Behaviours Index, CBI), and installing resource-efficient technologies (Resource-efficient Technologies Index, REI), were also found to have links with these footprint components and the total ecological footprint. These findings indicate that these issues are significant when targeting different population groups in relation to their consumption levels of energy and water. Table 7.1: Summary of relative strength of the predictors (Beta value) differentiating total ecological footprint measurements of China- and Australia-born groups

Total	Housing	Carbon	Good and	Food
ecological footprint	footprint	footprint	Services	footprint
Environmental	Dwelling size	Environmental	CALD Index	Gender
Awareness	(150 square	Awareness	(-0.484***)	(Male)
Index (AI)	meters or	Index (AI)		(0.307***)
(-0.314**)	larger)	(-0.217*)		· · · · ·
	(0.496***)			
Dwelling size	Environmental	Resource-	Income	Conservation
(150 square	Awareness	efficient	(Low)	Behaviours
meters or	Index (AI)	Technologies	(-0.295**)	Index (CBI)
larger)	(-0.236**)	Index (REI)		(-0.254*)
(0.295**)		(-0.201*)		
Gender	Dwelling type	Household	Environmental	
(Male)	(Detached	size	Awareness	
(0.196**)	dwelling)	(-0.196**)	Index (AI)	
	(0.227***)		(-0.253**)	
Income	Tenure	CALD Index <sup>2</sup>		
(Low)	(Home	(0.195*)		
(-0.192**)	owner)			
	(0.200**)			
Car ownership	Resource-	Car ownership		
(0.192**)	efficient	(0.154*)		
	Technologies			
	Index (REI)			
	(-0.173**)			
Conservation	Income <sup>2</sup>			
Behaviours	(Low)			
Index (CBI)	(-0.170**)			
(-0.189**)				
	CALD Index			
	(0.167*)			
	Age <sup>3</sup> (45 years			
	or older )			
	(-0.136**)			
	Employment			
	(Employed)			
	(-0.130*)			

The findings also indicate that a focus on the *four* footprint components that represent different consumption categories is necessary to a fuller understanding of urban consumption, and to the targeting of interventions that can effect positive change in consumption behaviours.

## 7.2 Reflections and future directions

With increases in population and consumption globally, an understanding of consumption drivers is crucial. Solutions need to be found in Australia that will lead to a significant reduction in its ecological footprint. A key area for focus is the behaviour of individuals within Australia's multicultural urban society.

The research findings presented in this thesis add further insights to Sobels et al.'s (2010) aggregate-level findings of migration, consumption and environmental impact commissioned by the Australian government. Specifically:

#### 7.2.1 Augmentation of cultural context

This research extends previous study on factors influencing consumption in a host society by including cultural factors comprising ethnic culture and the acculturation process of migrants, and also by incorporating the CALD Index as a measure of individuals' connectedness with ethnic culture, as well as the indicators of acculturation. These key findings provide evidence, first, that migrants' strong ties with their ethnic culture, together with acculturation, exert important influences on their consumption behaviour; and second, how the CALD Index, as a cultural factor, aids in differentiating consumption behaviours between a migrant group and Australia-born group.

Importantly, these findings have shown that cultural context is a significant factor in the study of consumption among population groups in a multi-cultural society – especially in Australia as the second most multi-cultural country globally (Griffiths 2010).

#### 7.2.2 Methodological advances:

This research has demonstrated that cultural influence can be converted into a quantifiable factor – the CALD Index. The development of the CALD Index and its application to this research is a response to the proposal by Jasti, Siega-Riz and Bentley (2003, p.2012S) that 'one challenge is how to transform a cultural belief into a quantifiable variable and go beyond descriptive or ethnographic data'. As the term 'CALD' (Culturally and Linguistically Diverse) is acknowledged by governments and authorities in Australia as referring to individuals' diversities based on country of birth, preferred language(s) and religion, the success of the CALD Index as a quantifiable measure adds to its potential as an index for measuring individuals' connectedness with their ethnic culture, and for other aspects of behaviour of relevance to government policy. The CALD Index is thus an effective means of gaining deeper insights into cultural influence on consumption – the focus of this research.

This research has made important conceptual contributions to research on urban consumption by incorporating (augmenting) cultural context (viz. the CALD Index and indicators of acculturation) into the conceptual framework of determinants of individual resource consumption in a multicultural society. The proposed conceptual framework was applied to examine and explain the resource consumption of (i) an ethnic group: China-born migrants and their acculturation in a host society (in Chapter 5), and (ii) two cultural groups: comparative investigation of the China- and Australia-born groups in a high income western society (in Chapter 6).

The use of both quantitative and qualitative methods in this study has facilitated enhanced understandings of these cultural dimensions. The introduction of qualitative analysis extends the quantitative research that has been undertaken to date in the field of migration and consumption. It has been demonstrated that the use of qualitative analysis added to the insights into the differences in lived experiences and ways of life of China-born migrants and Australia-born group. 7.2.3 Value of Ecological Footprint as a core measure of sustainability – on all scales

Migrant consumption levels increased three-fold following residence in Australia. Furthermore, the China-born migrants' consumption level was seven per cent higher than the Australia-born group when living in the same suburb in Melbourne in 2011.

Moreover, the explosive growth of China's emerging middle class is also projected to 'power' growth in consumption in the 21<sup>st</sup> century (Barton, Chen & Jin 2013). In China, ecological footprints are increasing as its population becomes more affluent and urban. They are mirroring what is happening to Chinese who have migrated to Australia. It suggests that the next wave of China-born migrants settling in Australia may have even higher consumption levels compared with those documented in this study.

In view of these findings, to encourage culturally-induced change, it will be necessary to consider differences in the strength of ties with ethnic culture, in the acculturation process, as well as socio-economic status and demography, among individual migrants from other ethnic groups – do they consume differently from those of China-born migrants?

This scenario can be applied globally in cases where migrants from developing countries choose to migrate to developed countries. For the majority, the pull factors are better employment and income, and a higher standard of living. These pull factors are likely to increase their post-migration consumption levels, as shown in this study on China-born migrants.

7.2.4 Intervention pathways focusing on cultural, socio-economic and structural factors

One of the specific pathways for intervention is a *culture-sensitive* approach that identifies aspects of culture that support or hinder sustainable behaviours. For instance, to reduce the magnitude of Food footprints, Chinese can be encouraged to consume more meat substitutes such as tofu, which is a highly concentrated protein

food and a common ingredient of oriental cookery. Moreover, meat substitutes are regularly included in Chinese cuisine (Schösler 2014). Such an understanding of the 'back' stage culture may make it easier to change the habitual diet of Chinese.

Another pathway involves the Australian built environment – the context in which behaviour occurs. Here, the fact that detached housing and car-dependent suburbs are common in Australia is a barrier to low-carbon and low-resource living for Australia-born *and* migrant groups. These structures and lifestyles, which are different from those in the migrants' country of origin, limit their choices for alternative (lower carbon) lifestyles.

The current study offers the importance of understanding values shift, specifically, how bicultural consumers integrate in broader context while still maintaining some elements of their past cultural values. The largest change in ecological footprint is by the bicultural Chinese consumers groups (affluent, bilingual, bicultural consumers). This finding indicates an area that is promising for further studies.

A further pathway is eco-efficiency. As income is an influential factor on high levels of consumption, it is fitting to encourage residents with disposable income to invest in *resource-efficient technologies* and home retrofits to reduce the resource-intensity of housing. For migrants, the acquisition of a better understanding of the host societal structures and lifestyles, as well as its environment, is a challenge faced in settling into a new country. Among non-English speaking migrants, this challenge is compounded by their inability to communicate effectively, and by extension, the host society's (and governments') ability to engage with them.

7.2.5 Advocacy for change: government policy / programs / development

The findings in this research have shed light on the challenges and barriers faced by governments at federal, state and municipal levels in Australia to reduce levels of urban resource consumption, which are currently running at unsustainable levels in the context of 21<sup>st</sup> century global constraints. As a developed, high income country

with an increasingly culturally diverse population, avenues must be found for governments to advocate for consumption behaviours that align with low-resource and low-carbon living:

• Environmental awareness (and concern) is a key predictor of consumption. It is critical to link Australia's liveability and sustainability with its natural environment. This has to be communicated to all residents, and especially to new migrants. This communication must take into account new migrants' understanding of the host society and its environment, as their understanding is 'influenced by discourses within their country of origin' (Department of the Environment Water Heritage and the Arts 2009). A better understanding of Australia's climate and biodiversity would heighten all residents' awareness and enable them to work alongside governments to enhance the living environment of all residents.

To convey these messages effectively to CALD migrants, it is crucial to communicate in their first *language*. Focus must also be directed on the development of an understanding of the host socio-legal systems, from relatively commonplace systems such as waste separation at source, to systems of energy rating, and the multi-faceted aspects of environmental conservation relative to Australia.

• It is necessary to go beyond language. Acculturation of migrants to Australia's consumption patterns, and the differences between migrants and Australia-born groups' consumption and conservation behaviours, suggest that for governments in Australia to promote more sustainable living, it will also be necessary to focus on the *influence and role of culture* among different population groups. This is in addition to the traditional foci of socioeconomic factors, which have been illustrated in the previous chapters.

This thesis has identified a need to better *target* policies and programs for more sustainable living. In an increasingly globalised urban world, the influence of *culture* must become part of any initiative that attempts to address behaviour – not least urban consumption behaviour. This thesis has included an explicit focus on culture

in relation to migration and consumption behaviour in Australia, and in doing so contributes to this emerging field of inquiry.

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Ms Christina Ting Institute for Social Research Level 1, EW Building, H 53 Swinburne University of Technology Hawthorn, Victoria 3122

18 May 2011

Dear Householder

You are invited to participate in a Swinburne University of Technology research survey: Towards sustainable living in Australia's multicultural society: an exploration of cultural, social and linguistic differences in attitudes to consumption and environment.

This is an important research project on patterns of household living and consumption being undertaken by Christina Ting (a PhD candidate from Swinburne University of Technology, Institute for Social Research). This project focuses on the everyday behaviour of households in terms of their consumption of food, energy, water, transportation, housing and their waste management practices. All these consumption groups make demands on the natural resources and the environment of the region. As Melbourne continues to grow, it is important to understand how our utilities and services need to respond to the consumption needs of households.

Your participation will be very important in building a picture of how various households in our increasingly complex and multicultural society (ie different cultural backgrounds, age generations, household types and sizes, occupations, attitudes and values) consume. Your area has been selected as the focus for this survey since its population contains a good range of households (eg. Australian versus overseas born, renting and owning, younger as well as older households, etc).

The project will involve a face-to-face survey of approximately 60 minutes and is in two parts. Part One involves the application of the Ecological Footprint Calculator, which will be undertaken using Ms Ting's laptop. Part Two involves a survey. The calculator will estimate the total amount of land on earth (in hectares) required to support the living patterns of your household, and the survey will discuss your thoughts and the reasoning behind these practices.

We expect that this project will generate new knowledge of benefit to the participants when they understand what aspects of their culture and style of living is associated with their ecological footprints. They may be able to pass on the acquired knowledge to their family members, friends and neighbours. In addition, this project will inform policy makers and service providers.

Participation in this project is voluntary. Participants must be adults (18 years or older) and will be required to sign the consent form, which will be collected at the time of interview. Participants can withdraw consent at any time, with no question nor explanation required.

The privacy of all participants will be guaranteed as the names will not be recorded anywhere, at any time in the survey form. In this project, the findings will be combined into one aggregated set of data for analysis. In addition, the consent form, the survey forms and the electronic recording (used to verify data coding post- interview) will be kept in a locked filing cabinet in the Institute for Social Research.

As part of the PhD's requirement, a thesis based on this project will be submitted to the university. In addition, the aggregated data will be used in scientific publications and presented in conferences.

As your responses are important to understanding consumption at a household level, we would greatly appreciate your participation in this project. To register your interest to participate, please contact me at this office number: 9214-5739, or email: cting@swin.edu.au.

We look forward to your participation in this important project. Thank you for your time and assistance.

Yours sincerely Ms Christina Ting PhD candidate Tel: 9214-5739 E-mail: cting@swin.edu.au

(Professor Peter Newton, Coordinating Supervisor)

This project has been approved by or on behalf of Swinburne's Human Research Ethics Committee (SUHREC) in line with the *National Statement on Ethical Conduct in Human Research*. If you have any concerns or complaints about the conduct of this project, you can contact:

> Professor Peter Newton Institute for Social Research (H53), Swinburne University of Technology, PO Box 218, Hawthorn Vic 3122 Phone: (03) 9214 4769 or +61 3 9214 4769 or pnewton@swin.edu.au Or

> Research Ethics Officer, Swinburne Research (H68), Swinburne University of Technology, PO Box 218, Hawthorn Vic 3122



Christina Ting (陈女士) Institute for Social Research Level 1, EW Building, H53 Swinburne University of Technology Hawthorn, Victoria 3122

2011年5月18日

尊敬的住户,

这是一项有关家庭生活和消费模式的重要研究项目,由斯威本科技大学社会研究 学院(Institute for Social Research)的博士生除女士(Christina Ting)主持。本项目 把焦点聚集在饮食、能源、水、交通、住房、垃圾管理等消费方面的日常家庭行 为。所有这些方面的消费对自然资源和本区域的环境提出了要求。随着墨尔本的 不断扩大,了解我们基础设施和服务应如何适应家庭的消费需求显得十分重要。

我们的社会日趋复杂和文化多粹化(即不同文化背景、年龄人群、 家庭 类别和 规 模、 职业、态度和价值等), *他*的参与为构建一幅各家庭如何 消费的 图画非常重 要。 您住的区是本次调查的焦点,因为其人口中包括了范围广泛的家庭(即澳洲 出生的人相对海外出生的人、租房和自住房、年轻的家庭和年长的家庭等)。

本 项目将分两部份进行,第一部份是使用除女士的便携电脑里的生态足迹 计算器 (Ecological Footprint Calculator)进行应用。第二部份是问卷调查。全个项目需要 约60分 绊的面对面谈话。计算器将估 计需要多少公顷的土地来支持 您家庭的生活 模式;而 问卷 调查是用来 讨论您的想法以及 这些做法背后的推理。

我 们预计,当参加人了解到其文化和生活方式哪方面和他们的生态足迹相 关时, 这个 项目将为他们帮来新知识。他们也许能够将获得的知识传授 给他们的家人、 朋友和 邻居。此外,本 项目的 调查结果会 对有关决策机构和服务机 构作出影响。

参加本 项目是自愿性的。参加人必须是成人(年滿18岁或以上)及需要 盜同意 书 。 陈女士在面谈时收集同意书。参加人可以在任何时候撤销同意书,无需做任何 解释。

参加人的 隱私将得到保障,因为名字不会在任何时候 记录在调查表里。本 项目将 把所有 调查记录综合成一套 资料进行分析。此外,同意书、调查表和 电子 录音( 用于面 谈后 确 认资料 编码)将 锁存在社会研究院的档案 框中。

作为博士研究生学业的一部分要求,一篇基于本项目的论文将交给大学。此外, 在科学刊物上和会议上有可能会使用<u>这些综合资</u>料。 您的参与为了解家庭展面的消费非常重要,为此我们十分感谢。要登记参加本 项目调查,请和陈女士联系,方公电话 9214-5739,或电子邮件: cting@swin.edu.au.

感谢您的时间和伤助。我们期待您参加这个重要项目。

您真 诚的

除女士 (Christina Ting) 博士生 电话: 9214-5739 电子 邮件: cting@swin.edu.au

(Peter Newton教授, 协调导师)

本项目经斯威本人文研究道德委员会(SUHREC)根据 *金国人文研究中的道德行为声 明*批准。如果*想*对本项目行为有任何顾虑或投诉。可以联系:

Peter Newton数 授

Institute for Social Research (H53), Swinburne University of Technology, PO Box 218, Hawthorn Vic 3122 电话: (03) 9214 4769或 +61 3 9214 4769或 <u>pnewton@swin.edu.au</u>

或

Research Ethics Officer, Swinburne Research (H68), Swinburne University of Technology, PO Box 218, Hawthorn Vic 3122 电话: (03) 9214 5218 或 +61 3 9214 5218 或 <u>resethics@swin.edu.au</u> Swinburne University of Technology

Consent Form

Towards sustainable living in Australia's multicultural society: An exploration of cultural, social and linguistic differences in attitudes to consumption and environment

Principal Investigator(s): Student Investigator: Christina Ting Supervisor: Professor Peter Newton



have read and understood the information provided in the form of disclosure. I have been provided a copy of the project information statement and this consent form and any questions I have asked have been answered to my satisfaction.

2.Please circle your response to the following:I agree to be interviewed by the researcherYesYesNoI agree to allow the interview to be recorded by electronic deviceYesNo

3.I acknowledge that:

(a)my participation is voluntary and that I am free to withdraw from the project at any time without explanation;

(b)the project is for the purpose of research and not for profit; my personal information will be collected and retained for the purpose of carrying out this project;

(d) my anonymity and confidentiality will be maintained.

By signing this document I agree to participate in this project.

Signature & Date: .....

Address: .....



INSTITUTE FOR SOCIAL RESEARCH

#### 斯威本科技大学

#### 同意书



FOR SOCIAL RESEARCH

#### 迈向澳大利亚多元文化社会的可持续性生活-探索对消费和环境态度上的文化、社会和语言差异

主要 调研人:

博士生: Christina Ting(陈女士) 鄂师:Peter Newton 教授

同意书

我(参加人姓名).....

*已经阅读并理解了披露书中的信息。我已经收到了一份项目信息声明和这份同意书。我提出的问题已经 得到了满意的答复。* 

#### 2. 请在以下您的回答上画圈:

•	我同意接受研究人员的提问	是	쟘
•	我同意对问答内容进行电子录音	是	쟘

3. 我知道:

(a) 我的参与是自愿性的,我可以在任何时候自由退出参与本项目并无需做任何解释;

- (b) 本项目的目的是研究而不是盈利;
- (c) 为实施本项目,需要收集和保存我的个人信息;
- (d) 我的身份和个人资料将予保密.

通过在本文件上签字,我同意参加本项目.

#### Questionnaire I: Pre-interview: Assessment with China- born and Australiaborn respondents

#### **Pre-interview: Telephone Assessment with respondents**

Good morning / afternoon. I am Ms Christina Ting from the Swinburne University of Technology. Thank you for contacting me. I will be conducting this research project 'Living in Melbourne'.

How do I address you? / I would like to know how I address you.

Date of call		
Time of call		
Household name		

Thank you for calling (NAME) and how are you today.

As you do understand that this interview requires me to meet up with you in relation to the growing population in Melbourne and in order to maintain its <u>liveability</u> (Note: to explain ....) and enhance its <u>sustainability</u> (Note: to explain ....). Therefore the focus of this interview is to focus on how it is possible to do so by looking at households' everyday behaviour related to the use of energy, and water, transportation, housing and waste management.

With reference to the letter that you have received, this interview is to better understand how householders like yourself go about carrying out their daily activities inside and outside home.

Before I carry out the interview with you, I would like to ask you the following questions to let us know more about you and your background. This information will help me to prepare my interview with you.

I would like to know whether

1. Were you born in Australia?

Yes	Go to 6
No	

# 2. In which country were you born? *Country of birth*:

China	
Other	<b>END of conversation II</b> and thank caller for responding

## 3. What was the name of the town or city and region that you lived in China?

Region	Name of town or city

#### List of regions in China with capital cities

Beijing- Beijing	Liaoning -Shenyang	Shanghai -Shanghai	Henan -Zhengzhou	Chongqing -Chengqing	Shaanxi -Xian
Tianjin -Tianjin	Jilin -Changchun	Jiangsu -Nanjing	Hubei -Wuhan	Sichuan -Chengdu	Gansu -Lanzhou -Yumen
Hebei -Shijiazhuang	Heilongjiang -Harbin	Zhejiang -Hengzhou	Hunan -Changsha	Guizhou -Guiyang	Qinghai -Xining -Golmud
Shanxi -Taiyuan		Anhui -Hefei	Guangdong -Guangzhou -Zhanjiang	Yunnan -Kunming	Ningxia - Yinchuan
Inner Mongolia -Hothot		Fujian -Fuzhou	Guangxi -Nanning	Tibet / Xizang -Lhasa	Xinjiang – Urumqi
		Jiangxi -Nanchang Shandong -Jinan	Hainan -Haikou		

4. In what year did you leave China? [In 1995 or after for CALD]

Year:

For respondents who have left China earlier than 1995,
END of conversation III and thank caller for responding

- 5. For how many years have you lived in Australia? *Number of years:*
- 6. Have you lived anywhere else besides Australia?

Yes	<b>END of converstion I</b> for Australian residents who were born elsewhere and thank caller for responding
	Go to 7 for those China-born and left China in 1995 or after
No	Request for time and date for interview END of converstion IV

7. Name the country/countries in which you resided before living in Australia.

Period of Stay DD/MM/YYYY		CITY / TOWN	COUNTRY
From	То		

#### **End of conversation IV**

#### End of conversation I:

For this project, we are looking for Australians who have not lived anywhere else besides Australia. I must apologise that I will not be able to conduct the interview with you. I really appreciate your interest in making this call and also for your time.

Is there any other question you would like to ask?

If there is no question, thank you again for your time. Goodbye (NAME).

#### End of conversation II:

For this project, we are looking for participants who were born in China. I must apologise that I will not be able to conduct the interview with you. I really appreciate your interest in making this call and also for your time.

Is there any other question you would like to ask?

If there is no question, thank you again for your time. Goodbye (NAME).

#### End of conversation III:

For this project, we are looking for Chinese who left China not earlier than 1995. I must apologise that I would not be able to conduct the interview with you. I really appreciate your interest in making this call and also for your time.

Is there any other question you would like to ask? If there is no question, thank you again for your time. Goodbye (**NAME**).

#### **End of conversation IV:**

We have come to the end of this conversation.

Thank you (**NAME**) for your interest in this project and for your call. I appreciate your effort and would like to make an arrangement with you today regarding the date and time for the interview for this project. [Write down <u>TIME and</u> <u>DATE</u> for interview.]

I would need information regarding your address and contact number. [Write down NAME, ADDRESS AND CONTACT NUMBER for interview.]

I would like to know whether you would be the one whom I would be doing the interview with. If not, who would be the person whom I would do the interview with? What is his or her name?

Please be assured that this information will be kept confidential.

#### **Background information**

Date of interview		Remarks
Time of interview		
Household name		
Household		
address		
<b>Contact number</b>	Home:	
	Mobile:	

Please let me repeat the date and time of interview [TIME, DATE].

And the address is ...... and the contact number / mobile number is .....

Thank you again for calling. I would be at your home on <u>TIME</u> and <u>DATE</u>. Thank you. Goodbye.

CCD Code	Name of street	House number	Remarks
Eg 2361801	As above	As above	
Study ID			

# Questionnaire II: China-born residents in China

1	iounic Oniversity	of recimology		
	CCD Code	Name of street	House number	Remarks
	Eg 2361801			
				1

Swinburne University of Technology

Study ID	CB / MELB	СВ
Date of interview:		
Time of interview		

## Part One: YOU AND YOUR ECOLOGICAL FOOTPRINT

1. Are you familiar with the Ecological Footprint Calculator?

1	Yes
2	No
3	Don't know

# YOU AND YOUR HOUSEHOLD in China:

2. How many people lived in your household in China?

1	
2	
3	
4	
5 or more	State number:

3. Which of these best described your household situation in China?

1	One family household with only family members
2	One family household with other non-family members
3	Two family households with only family members
4	Two family households with other non-family members
5	Three or more family households with only family members
6	Three or more family households with other non-family members
7	Single, sharing accommodation with friends / flat mates / co-tenant
8	Single, living with own parent/s
9	Single, living alone
10	Extended family / other (please specify: son-in-law, grand-daughter, uncle, boarder)

4. Please tick the appropriate category for your total annual household income before tax (in Yuan).

	Yuan
1	800,000 or more
2	600,000 - 799,000
3	400,000 - 599,000
4	200,000 - 399,000
5	199,000 or less
6	30,000 or more
7	20,000 - 29,999
8	10,000 – 19,999
9	5,000 - 9,999
10	4,999 or less

5. Were you employed when you were in China?

1	Yes	
2	No	Go to 7

6. What was your last job title in China?

1	Manager
2	Professional
3	Technician and Trades Worker
4	Community Services
5	Personal Services
6	Clerical and Administrative Worker
7	Sales Worker
8	Labourer
9	Other ( <i>please specify</i> ):
# YOU AND HOME ENERGY

Climatic zones in the World	Climatic zones in China	
Arctic of high cold mountain regions (like	Plateau climate Zone: Qinghai-	
northern Siberia or the high Himalayas	Tibet Plateau (Lhasa)	
High latitudes with cold winters and cool summers (like Moscow or Stockholm)	Inner Mongolia (Hothot)	
High desert (like Kabul or Mexico City)	Severe cold:	
	Northern Tibet (Shiquanhe)	
	Heilongjiang (Harbin )	
	Qinghai (Xining; Golmud)	
Temperate or Mediterranean (like New	Humid Mid-latitute / Cold	
York, Rome, Buenos Aires or Hong Kong)	Shaanyi (Vian)	
	Gansu (Lanzhou: Vumen)	
	Ningxia (Vinchuan)	
	Xinijang (Urumgi)	
	Beijing (Beijing)	
	Tianjin (Tianjin)	
	Hebei (Shijiazhuang)	
	Shanxi (Taiyuan)	
	Inner Mongolia (Hothot)	
	Liaoning (Shenyang)	
	Henan (Zhengzhou)	
	Hot summer cold winter	
	Shanghai (Shanghai)	
	Jiangsu (Nanjing)	
	Zhejiang (Hengzhou)	
	Anhui (Hefei)	
	Fujian (Fuzhou)	
	Jiangxi (Nanchang)	
	Shandong (Jinan)	
	Sichuan (Chengdu) Hubei (Wuban)	
	Hunan (Changsha)	
Warm to hot lowland desert (like Phoenix of Dubai)	-	
Tropical and wet, including rainforests (like	Humid subtropical / Hot summer,	
Rio de Janeiro or Manila)	warm winter	
	Guangdong (Guangzhou;	
	Zhanjiang)	
	Guangxi (Nanning),	
	Haınan (Haikou)	
I ropical, but relatively dry, including savannahs (like Bhopal, Brasilia or Nairobi)	-	

7. What best described the climate zone you lived in?

# 8. What was the size of your home?

1	Less than 30 square meters
2	30-50 square meters
3	50 -100 square meters (apartment or studio)
4	100 - 150 square meters (small home, approximately 2-3 bedrooms)
5	150 - 200 square meters (average home, approximately 3 bedrooms)
6	200 – 250 square meters (large home, approximately 4 bedrooms)
7	250 square meters or larger (very large home)

# 9. What energy sources did you use in your home? [Please check all that applied.]

1a	Electricity
1b	Coal and coal products
2	Natural gas, propane, or liquefied petroleum gas (LPG)
3	Heating oil (Gasoline, Kerosene, Diesel oil)
4	Wood or biomass / traditional fuel (animal and plant materials such as wood, vegetal waste, ethanol, animal materials/wastes)
5	Other (please specify):

10. If your house used electricity, what percentage was generated from renewable hydropower, wind, biomass, or solar sources?

1	Know	%
2	Don't know	

#### YOU AND TRANSPORTATION

11. In a typical week (7 days), how many return trips did you make based on the different modes of transport?

		Public transport (train, tram, or bus)	Private car – as a driver	Private car – as a passenger (3)	Bicycle (4)	Taxi (5)	Walk (6)	Other (please specify) (7)
		(1)	(2)					
а	Place of work							
b	Place of study							
С	To shops and services							
d	To venues for leisure and recreational activities							
е	Attend social events							
f	Attend to family matters							

12. Please enter the number of kilometers you travelled on the average **per week** and include any big trip for the year for each mode of transportation.

	Mode of transportation	Km/ week	(x52) Km / year
а	Automobiles, including personal vehicles, taxies, and carpools		
b	Bus, including metro and long distance service		
С	Rail, including subways, inner-city light rail, cross country trains		
d	Air travel		

13. What best described the vehicle you most often drove or rode in?

1	A hybrid
2	A small or compact (2 door)
3	A mid-size car (4 door sedan)
4	A large car (including vans and minivans)
5	A pickup truck or Sport Utility Vehicle (SUV)

14. Did you usually or more often than not share rides with at least one other person?

1	Yes
2	No

15. Which energy saving features and energy saving habits did you (i.e. yourself) have in your home? [Please check all that applied.]

	ENERGY SAVING FEATURES	Yes	No	Don't know
а	Compact fluorescent / Energy efficient bulbs	1	2	3
b	Energy efficient appliance	1	2	3
С	Extra insulation	1	2	3
d	Insulating blinds	1	2	3
е	Solar panels and solar hot water	1	2	3
f	Storm doors and windows (which are installed in front of or inside doors and windows for protection against bad weather)	1	2	3
g	Water saving fixtures (such as low flow water taps, water efficient showerheads)	1	2	3

	ENERGY SAVING HABITS	Yes	No	Don't know
а	Turned off lights when leaving rooms	1	2	3
b	Use power strips, which are devices that will automatically turn off stand-by lights	1	2	3
С	Turned off computers and monitors when not in use	1	2	3
d	Dry clothes outside whenever possible	1	2	3
е	Kept thermostat relatively low in winter	1	2	3
f	Unplugged small appliances when not in use	1	2	3
g	Minimal use of power equipment when landscaping	1	2	3

16. What best described where your home was located?

1	Inner city / CBD
2	Older suburb
3	Newer suburb
4	Rural

17. Had you purchased offsets for carbon emissions associated with your home energy and transportation?

1	Yes
2	No
3	Don't know

# YOU AND FOOD

18.	Which bes	t described	vour diet in	a typical	week?
10.				a cypicai	neen.

	Diet	No. of times
1	Vegan – plant based foods only	
2	Vegetarian – primarily plant based foods, but some diary	
3	Omnivore – an assortment (meat, seafood, vegetables, dairy, and grains) (mainly vegetables, dairy and greens)	
4	Carnivore – meat, seafood, and dairy several times a week	
5	Top of the food chain – meat, seafood, or diary at almost every meal	
	Total (based on the number of meals per day) in a week	

# 19. In **a typical week**, where did you obtain most of your food?

	Source of food	Percentage
1	All local, fresh food (Farmers markets, gardens,	
	cooperatives, neighbourhood butcher, green grocer shop)	
2	Supermarkets for some items, fresh food stores (e.g.	
	neighbourhood butcher, green grocer shop) for others	
3	Supermarkets, convenience stores, and prepared restaurant	
	foods	
4	Restaurants, fast foods, and take out	
	Total percentage	100%

20. How often did you select foods that were certified organic or sustainably produced?

1	Most of the time
2	Sometimes
3	Almost never
4	Don't know

- 21. Which choice best described how much you normally ate?
- a. Number of large meals per day

b. Size and number of snack (e.g. morning tea, afternoon tea) per day

	Size of snack	Number of times a day	
а	Light (eg beverage, biscuits)		
b	Medium (eg beverage, a slice of		
	cake)		
С	Large (ie more than the medium		
	size)		

22. Did you have a garden or share one to grow your own vegetables and herbs?



23. What proportion of the produce from your garden was:

	Items	Percentage
а	Consumed by you and your household	
b	Made up your total food consumed	

24. What was the approximate size of your garden plot?

Length =	
Width =	square meters

#### YOU AND HOUSING

25. Which best described your home?

1	House on a farm	
2	A free standing single family house	
3	A house or building (with 4 or fewer units)	Go to 27
4	A small apartment building (5-20 units)	Go to 27
5	A large apartment building (20+ units)	Go to 27

26. What was the approximate area of land occupied by your home, structures, and yard? If you lived on a farm, please don't count grazing lands, croplands, or wild lands.

Length =	square meters
Width =	

27. Did you own or rent your home?

1	Own
2	Mortgage
3	Rent
4	Other

28. Was your home or any portion of it built with recycled materials, wood certified as sustainably harvested, or any other green design features?

1	Yes
2	No
3	Don't know

29. Approximately what share of your home furnishings were second hand or made of either recycled or sustainably produced materials?

1	Almost none
2	A few
3	A fair amount
4	Almost all

#### YOU AND WATER

30. Had you had any piped water system (i.e. water from the mains) to your house?

1	Yes
2	No
3	Don't know

31. Which water saving features and water saving habits did you (i.e. yourself) have in your home? [Please check all that applied.]

	WATER SAVING FEATURES	Yes	No	Don't
				know
a	Low flow / dual flush toilets	1	2	3
b	Low flow shower heads and faucets	1	2	3
c	Instant water heaters on sinks and on shower	1	2	3
d	Rainwater tanks / catchment system	1	2	3
e	Grey water recycling system	1	2	3
f	Drought tolerant landscaping/ water efficient watering system / using a trigger head on the water hose	1	2	3

	WATER SAVING HABITS	Yes	No	Don't
				know
а	Compost rather than use garbage disposal	1	2	3
b	Minimised shower time and toilet flushing	1	2	3
с	Run clothes and dish washers only when full	1	2	3
d	Washed cars rarely	1	2	3
e	Looked for and fix leaks regularly	1	2	3
f	Avoided hosing down decks, walkways, driveways	1	2	3

32. How often did you select cleaning products that were biodegradable?

1	Almost never
2	Sometimes
	Most of the time
3	
4	Don't know

#### YOU AND GOODS AND SERVICES

33. What best described your spending and saving habits?

1	I spent all of my income and then some.
2	I generally lived within my means.
3	I was frugal spender, and regularly saved money for the future.

34. How often did you buy new things to replace old ones?

1	I used things until I genuinely needed to replace them.
2	I used some items for years, others I replaced before I needed to.
3	I frequently replaced belongings even if they were in good condition.

35. How many standard size garbage bins did your household fill each week?

1	Less than one	
2	One or two	State number of bins:
3	More than two	

36. If the area you lived in did not have any garbage collection system, how did you dispose of household garbage or waste?

Please specify:

37.	What proportion of the following wastes did you recycle?	

		None	A fair amount	Almost all
a	Paper	1	2	3
b	Aluminum	1	2	3
с	Glass	1	2	3
d	Plastic	1	2	3
e	Electronics	1	2	3
f	Other (please specify):	1	2	3

38. When you bought clothing or paper products, how often did you select items labelled as recycled, natural, organic, or made of alternative fibers such as hemp or Tencel?

1	Almost never	
2	Sometimes	
3	Almost always	
4	Don't know	

## Questionnaire III: China-born residents in Melbourne, Australia

Swinburne University of Technology

CCD Code	Name of street	House number	Remarks
Eg 2361801			

Study ID	CB / MELB	СВ
Date of interview:		
Time of interview		

#### Part One: YOU AND THE ECOLOGICAL FOOTPRINT

#### YOU AND YOUR HOUSEHOLD in Melbourne, Australia

1. How many people live in your household?

1	
2	
3	
4	
5 or more	State number:

2. Which of these best describes your household situation in Melbourne?

1	One family household with only family members
2	One family household with other non-family members
3	Two family households with only family members
4	Two family households with other non-family members
5	Three or more family households with only family members
6	Three or more family households with other non-family members
7	Single, sharing accommodation with friends / flat mates / co-tenant
8	Single, living with own parent/s
9	Single, living alone
10	Extended family / other (please specify: son-in-law, grand-daughter, uncle, boarder)

3. Please tick the appropriate category for your total annual household income before tax.

	A \$
1	6,999 or less
2	7,000 – 12, 999
3	13,000 - 19,999
4	20,000- 29,999
5	30,000 - 64,000
6	65,000 – 99,000
7	100,000- 129,000
8	130,000 or more

#### YOU AND HOME ENERGY

#### 4. What is the size of your home?

	Square meters	No. of squares
1	50 square meters or smaller	less than 5
2	50 -100 square meters or less (apartment or studio)	5 - 11
3	100 - 150 square meters	11 – 16
	(small home, approximately 2-3 bedrooms)	
4	150 - 200 square meters	17-21
	(average home, approximately 3 bedrooms)	
5	200 – 250 square meters	22 - 28
	(large home, approximately 4 bedrooms)	
6	250 square meters or larger (very large home)	More than 28

5. What energy sources do you use in your home? [Please check all that apply.]

1	Electricity
2	Natural gas, propane, or liquefied petroleum gas (LPG)
3	Heating oil
4	Wood or biomass
5	Other (please specify)

6. If your house uses electricity, what percentage is generated from renewable hydropower, wind, biomass, or solar sources?

1	Know	%
2	Don't know	

# YOU AND TRANSPORTATION

7. In a **typical week**, how many return trips do you make based on the different modes of transport?

		Public transport (train, tram, or bus) (1)	Private car – as a driver (2)	Private car – as a passenger (3)	Bicycle (4)	Taxi (5)	Walk (6)	Other (please specify) (7)
а	Place of							
b	Place of study							
С	To shops and services							
d	To venues for leisure and recreatio nal activities							
e	Attend social events							
f	Attend to family matters							

8. Please enter the number of kilometers you travel per **week** and include any big trip for the year for each mode of transportation.

	Mode of transportation	Km/ week	(x52) Km / year
а	Automobiles, including personal vehicles,		
	taxies, and carpools		
b	Bus, including metro and long distance		
	service		
С	Rail, including subways, inner-city light rail,		
	cross country trains		
d	Air travel		

9. What best describes the vehicle you most often drive or ride in?

1	A hybrid
2	A small or compact (2 door)
3	A mid-size car (4 door sedan)
4	A large car (including vans and minivans)
5	A pickup truck or Sport Utility Vehicle (SUV)

10. Do you usually or more often than not share rides with at least one other person?

1	Yes
2	No

	Mode of	More	No	Less	Don't	Not
	transportation	often	change	often	know	applicable
a	Public transport, such as train, tram and bus	1	2	3	4	5
b	Private car – as a driver	1	2	3	4	5
c	Private car – as a passenger	1	2	3	4	5
d	bicycle	1	2	3	4	5
e	taxi	1	2	3	4	5
f	walk	1	2	3	4	5
g	Other (please specify)	1	2	3	4	5

11. Compared to the time when you were in China, has the frequency you use the following mode of transportation changed:

12. Which energy saving features and energy saving habits do you (i.e. yourself) have in your home? [Please check all that apply.]

	ENERGY SAVING FEATURES	Yes	No	Don't know
а	Compact fluorescent / Energy efficient bulbs	1	2	3
b	Energy efficient appliance	1	2	3
С	Extra insulation	1	2	3
d	Insulating blinds	1	2	3
е	Solar panels and solar hot water	1	2	3
f	Storm doors and windows (which are installed in	1	2	3
	front of or inside doors and windows for			
	protection against bad weather)			
g	Water saving fixtures (such as low flow water	1	2	3
	taps, water efficient showerheads)			

	ENERGY SAVING HABITS	Yes	No	Don't know
а	Turned off lights when leaving rooms	1	2	3
b	Use power strips, which are devices that will automatically turn off stand-by lights	1	2	3
С	Turned off computers and monitors when not in use	1	2	3
d	Dry clothes outside whenever possible	1	2	3
е	Kept thermostat relatively low in winter	1	2	3
f	Unplugged small appliances when not in use	1	2	3
g	Minimal use of power equipment when landscaping	1	2	3

13. What best describes where your home is located?

1	Inner city / CBD
2	Older middle suburb
3	Newer suburb

14. Have you purchased offsets for carbon emissions associated with your home energy and transportation?

1	Yes
2	No
3	Don't know

#### YOU AND FOOD

15. What best describes your diet in **a typical week**?

	Diet	No. of times
1	Vegan – plant based foods only	
2	Vegetarian – primarily plant based foods, but some diary	
3	Omnivore – an assortment (meat, seafood, vegetables, dairy, and grains) (mainly vegetables, dairy and greens)	
4	Carnivore – meat, seafood, and dairy several times a week	
5	Top of the food chain – meat, seafood, or diary at almost every meal	
	Total (based on the number of meals per day) in a week	

16. In **a typical week**, where do you obtain most of your food?

	Source of food	Percentage
1	All local, fresh food (Farmers markets, gardens,	
	cooperatives, neighbourhood butcher, green grocer shop)	
2	Supermarkets for some items, fresh food stores (e.g.	
	neighbourhood butcher, green grocer shop) for others	
3	Supermarkets, convenience stores, and prepared restaurant	
	foods	
4	Restaurants, fast foods, and take out	
	Total percentage	100%

17. How often do you select foods that are certified organic or sustainably produced?

1	Most of the time
2	Sometimes
3	Almost never
4	Don't know

- 18. Which choice best describes how much you normally eat?
- c. Number of large meals per day / one main large meal a day
- d. Size and number of snack (e.g. morning tea, afternoon tea) per day

	Size of snack	Number of times a day
а	Light (eg beverage, biscuits)	
b	Medium (eg beverage, a slice of	
	cake)	
С	Large (ie more than the medium	
	size)	

19. a) Compared to time when you were in China, is there any difference in:

		No difference	Different	Don't know
a	Your diet now	1	2	3
b	The food you buy now	1	2	3

b) What is your preference for Chinese food?

1	Not at all
2	Not really
3	Somewhat
4	Very much

c) In a typical week, what is the proportion of Chinese meals cooked and eaten at home?

Total number of meals per week	Number of Chinese meals per week

d) What is your preference for Western food?

1	Not at all
2	Not really
3	Somewhat
4	Very much

e) If you have leftovers from the previous day, what do you do with them?

20. Do you have a garden or share one to grow your own vegetables and herbs?

1	Yes	
2	No	Go to 23

21. What proportion of the produce from your garden is:

	Items	Percentage (%)
a	Consumed by you and your household	
b	Makes up your total food consumed	

22. What is the approximate size of your garden plot?

Length =	square meters
xx71.1.1	
Width =	

#### YOU AND HOUSING

23. Which best describes your home?

		Equivalence in Melbourne, Australia	]
A free standing single family house	1a	Separate house	Go to 24
	1b	Semi-detached, row or terrace house, townhouse etc with one storey	Go to 24
	<i>lc</i>	Semi-detached, row or terrace house, townhouse etc with two or more storeys	Go to 24
A house or building (with 4 or fewer units)	2	Flat, unit or apartment in a one or two storey block	Go to 25
A small apartment building (5-20 units)	3	Flat, unit or apartment in a three storey block	Go to 25
A large apartment building (20+ units)	4	Flat, unit or apartment in four or more storey block	Go to 25
	5	Other (please specify): e.g. caravan, houseboat, house or flat attached to a shop or office	Go to 25

24. What is the approximate area of land occupied by your home, structures, and yard?

Length =	square meters
Width =	

25. Do you own or rent your home?

1	Own
2	Mortgage
3	Rent
4	Other

26. Was your home or any portion of it built with recycled materials, wood certified as sustainably harvested, or any other green design features?

1	Yes
2	No
3	Don't know

27. Approximately what share of your home furnishings are second hand or made of either recycled or sustainably produced materials?

1	Almost none
2	A few
3	A fair amount
4	Almost all

#### YOU AND HOME WATER

28. Which water saving features and water saving habits do you (i.e. yourself) have in your home? [Please check all that apply.]

	WATER SAVING FEATURES	Yes	No	Don't know
а	Low flow / dual flush toilets	1	2	3
b	Low flow shower heads and faucets	1	2	3
c	Instant water heaters on sinks and on shower	1	2	3
d	Rainwater tanks / catchment system	1	2	3
e	Grey water recycling system	1	2	3
f	Drought tolerant landscaping / water efficient watering system / using a trigger head on the water hose	1	2	3

	WATER SAVING HABITS	Yes	No	Don't know
а	Compost rather than use garbage disposal	1	2	3
b	Minimised shower time and toilet flushing	1	2	3
c	Run clothes and dish washers only when full	1	2	3
d	Washed cars rarely	1	2	3
e	Looked for and fix leaks regularly	1	2	3
f	Avoided hosing down decks, walkways, driveways	1	2	3

29. Compared to the time when you were in China , indicate how your use has changed:

		Higher	No change	Lower	Don't know	Not applicable
a	Total amount of energy use	1	2	3	4	5
b	Total amount of water use	1	2	3	4	5
c	The way you water your garden	1	2	3	4	5

30. How often do you select cleaning products that are biodegradable?

1	Almost never
2	Sometimes
	Most of the time
2	
3	
<u> </u>	Don't know

#### YOU AND GOODS AND SERVICES

31. What best describes your spending and saving habits?

1	I tend to spend all of my income and then some.
2	I generally live within my means.
3	I am frugal spender, and regularly save money for the future.

32. How often do you buy new things to replace old ones?

1	I tend to use things until I genuinely need to replace them.
2	I use some items for years, others I replace before I need to.
3	I frequently replace belongings even if they are in good condition.

33. How many standard size garbage bins does your household fill each week?

1	Less than one	
2	One or two	State number of bins:
3	More than two	

34. What proportion of the following wastes do you recycle?

		None	A fair amount	Almost all
a	Paper	1	2	3
b	Aluminum	1	2	3
с	Glass	1	2	3
d	Plastic	1	2	3
e	Electronics	1	2	3
f	Other (please specify):	1	2	3

35. When you buy clothing or paper products, how often do you select items labelled as recycled, natural, organic, or made of alternative fibers such as hemp or Tencel?

1	Almost never
2	Sometimes
3	Almost always
4	Don't know

36. Compared to the time when you were in China, has there been any change in the following:

	Currently,	More	No change	Fewer	Don't know	Not applicable/ State reason
а	The size of your home (excluding the garden)	1	2	3	4	5
b	The size of your home (including the garden)	1	2	3	4	5
c	The number of bathrooms	1	2	3	4	5
d	The number of bedrooms	1	2	3	4	5
e	The number of domestic appliances	1	2	3	4	5
f	The amount of household garbage	1	2	3	4	5
g	The amount of waste you recycle	1	2	3	4	5

37. How have your experiences in China influenced you with regard to:

		How has it changed	Why
a	Travel		
b	Energy consumption		
c	Water usage		
d	Food purchases		
e	Shopping		
f	Waste generated		

# Part Two: ABOUT YOU

1. What age category do you belong to?

1	18 - 24 years
2	25 – 44 years
3	45 – 64 years
4	65 – 84 years
5	85 years or older

2. Are you:

1	Male
2	Female

3. What is your present marital status?

1	Never married	Go to 6
2	Widowed	
3	Divorced	
4	Separated but not divorced	
5	Married	
	(Sourc	e: ABS 2006)

4. Was your spouse / ex-spouse born in the same country as you?

1	Yes	Go to 6
2	No	

5. Where was your spouse / ex-spouse born?

Country of birth:

6. In which country was your father born?

Country of birth:

7. In which country was your mother born? *Country of birth*:

8. In which year did you leave China? [1995 or after]



9. At what age did you arrive at Australia?

Years of age:

10. Why did you decide to leave China and live in Australia?

11. To what extent was the following statement true about you?

I felt that I belonged and fitted in well in the Chinese society in China.

Strongly disagree	Somewhat disagree	Neither	Somewhat agree	Strongly agree

- Completed Primary 1 Completed Secondary 2 Started college but not completed [or equivalent] 3 Started University degree but not completed 4 Completed college degree/diploma/certificate 5 6 Completed University degree Postgraduate (Masters / PhD) 7 Other (please specify): 8
- 12. What was the highest education level you attained in China?

13. Which of these now best describes your highest level of study/education since leaving China?

1	Completed Year Primary
2	Completed Year Secondary
3	Started college / TAFE but not completed
4	Started University degree but not completed
5	Completed college/ TAFE degree/diploma/certificate
6	Completed University degree
7	Postgraduate (Masters / PhD)
8	Other (please specify):

#### 14. Are you employed?

1	Yes	
2	No	Go to 16

15. What is your current job title, or, if you are retired or are currently not employed, what was your last job title?

1	Manager
2	Professional
3	Technician and Trades Worker
4	Community Services
5	Personal Services
6	Clerical and Administrative Worker
7	Sales Worker
8	Labourers
9	Other ( <i>please specify</i> ):

16. Have you lived anywhere else besides Australia?

Yes	
No	Go to 18

17. Name the country/countries in which you resided besides Australia.

Period of Stay DD/MM/YYYY		CITY / TOWN	COUNTRY
From	То		

# 18. What is your religion?

		1
1	No religion	Go to
2	Buddhism	
3	Taoism	
4	Islam	
5	Catholicism	
6	Protestantism	
7	Uniting Church	
8	Presbyterian	
9	Hinduism	
10	Judaism	
11	Baptist	
12	Anglican	
13	Other ( <i>please specify</i> ):	
	1	1

19. Is this the same religion that you practised in China?

21

20. How frequent do you participate in religious services and activities?

1	Very regularly
2	Sometimes
3	Rarely
4	Not at all

## **LANGUAGE**

21. Is English your first language?

1	Yes
2	No

22. Do you speak a language/s other than English at home?

1	Yes	
2	No	Go to 24

Items		Percentage
1	廣東話 Cantonese	
2	普通话 Mandarin	
3	Chinese dialects	
4	English	
5	Việt Ngú (Vietnamese)	
6	Bahasa Indonesia (Indonesian)	
7	Italiano (Italian)	
8	Español (Spanish)	
9	Türkçe (Turkish)	
10	Soomaali (Somali)	
11	Ελληνικά (Greek)	
12	Other ( <i>please specify</i> ):	
	Total	100 %

23. What language/s do you speak at home? [Please check all that apply.]

24. How well do you speak English?

1	Very well
2	Well
3	Not well
4	Not at all

# 25. How often do you

		Very	Sometimes	Rarely	Not at all
		regularly			
a	Speak Chinese	1	2	3	4
b	Speak Chinese with your	1	2	3	4
	friends				
c	Write in Chinese	1	2	3	4
d	Think in Chinese	1	2	3	4
e	Speak English	1	2	3	4
f	Speak English with your friends	1	2	3	4
g	Write in English	1	2	3	4
h	Think in English	1	2	3	4

26. Which language/s is applied when you do the following:

		English (percentage)	Chinese (percentage)
a	Watching television programmes		
b	Listening to radio programmes		
c	Listening to music		
d	Reading newspapers and books		
e	Using the internet		

# SOCIAL INTERACTION AND PARTICIPATION

27. How often do you do the following activities:

		Very	Sometimes	Rarely	Not
		regularly			at all
а	Interact with the Chinese	1	2	3	4
b	Interact with friends from non-Chinese	1	2	3	4
	groups				
c	Celebrate ethnic Chinese traditional	1	2	3	4
	festivals (e.g. Chinese New Year,				
	Mooncake Festival) at home and with				
	family				
d	Participate in community activities	1	2	3	4
	like the Chinese New Year				
	Celebration and other Chinese				
	festivals				
e	Participate in Chinese (ethnic) clubs,	1	2	3	4
	societies and organisations				
28. With reference to the following, have you:

		Very	Sometimes	Rarely	Not at
		regularly	(2)	(3)	all
		(1)			(4)
9	Visited the local library and	1	2	3	4
a	community activity	1	2	5	7
b	Participated in local council	1	2	3	4
-	community activities and events such			-	
	as Harmony Day and Heritage Week				
c	Participated in environmental	1	2	3	4
	activities such as Whitehorse				
	Sustainability Living Week and				
	workshops such as Living for Our				
	Future Workshop				
d	Participated in activities that relate to	1	2	3	4
	Australian culture such as Australia				
	Day, sports such as Australian Rules				
	Football (Footy), and cricket,				
	barbeques in the parks, picnics				
e	awareness of rainwater tank rebate,				
	shower exchange program and	Very	Somewhat	Not	Not at
	Energy and Water Efficiency	aware	aware	really	all
	Labelling and Standards scheme			aware	aware
	(WELS) for household appliances				
	such as refrigerators, washing				
	machines, dishwashers				

### 29. Where does your current cultural identity sit now?

	Chinese culture	The Australian culture	
А			Far apart
В			Somewhat separate
С			Moderate overlap
D			Large overlap
Е			Complete overlap

#### 30. Are you proud of being a Chinese?

1	Yes	
2	No	
State	the reason/s for	your choice:

#### 31. How do you compare your life in Australia with life in China?

1	Life in China is better	
2	No big difference	
3	Life in Australia is better	
State the reason/s for your choice:		

- 32. Which aspects of Chinese way of life do you feel are important and which do you would want to retain while living here in Australia?
- 33. To what extent is the following statement true about you?

I feel that I belong and fit in well in the Australian culture and society here.

Strongly disagree	Somewhat disagree	Neither	Somewhat agree	Strongly agree

#### END OF SURVEY

# ------THANK YOU FOR PARTICIPATING IN THIS SURVEY------

Time ended:	
Interview length	
To send results	

#### Questionnaire IV: Australia-born in Melbourne, Australia

Swinburne University of Technology

CCD Code	Name of street	House number	Remarks
Eg 2361801			

Study ID	EFL / MELB	AB
Date of interview:		
Time of interview		

\_\_\_\_\_

----

1. Were you born in Australia?

1	Yes
2	No

#### Part One: YOU AND THE ECOLOGICAL FOOTPRINT

2. Are you familiar with the Ecological Footprint Calculator?

1	Yes
2	No
3	Don't know

#### YOU AND YOUR HOUSEHOLD

3. How many people live in your household?

1	
2	
3	
4	
5 or more	State number:

1	One family household with only family members
2	One family household with other non-family members
3	Two family households with only family members
4	Two family households with other non-family members
5	Three or more family households with only family members
6	Three or more family households with other non-family members
7	Single, sharing accommodation with friends / flat mates / co-tenant
8	Single, living with own parent/s
9	Single, living alone
10	Extended family / other (please specify: son-in-law, grand-daughter, uncle, boarder)

4. Which of these best describes your household situation?

5. Please tick the appropriate category for your total annual household income before tax.

	A \$
1	6,999 or less
2	7,000 – 12, 999
3	13,000 - 19,999
4	20,000- 29,999
5	30,000 - 59,999
6	60,000 - 89,999
7	90,000- 119,999
8	120,000 or more

#### YOU AND HOME ENERGY

#### 6. What is the size of your home?

	Square meters	No. of
		squares
1	50 square meters or smaller	less than 5
2	50 -100 square meters or less (apartment or studio)	5 – 11
3	100 - 150 square meters (small home, approximately 2-3 bedrooms)	11 – 16
4	150 - 200 square meters (average home, approximately 3 bedrooms)	17 – 21
5	200 – 250 square meters (large home, approximately 4 bedrooms)	22 -28
6	250 square meters or larger (very large home)	More than 28

7. What energy sources do you use in your home? [Please check all that apply.]

1	Electricity
2	Natural gas, propane, or liquefied petroleum gas (LPG)
3	Heating oil
4	Wood or biomass
5	Other (please specify)

8. If your house uses electricity, what percentage is generated from renewable hydropower, wind, biomass, or solar sources?

1	Know	%
2	Don't know	

#### YOU AND TRANSPORTATION

9. In a **typical week**, how many return trips do you make based on the different modes of transport?

		Public transport (train, tram, or bus) (1)	Private car – as a driver (2)	Private car – as a passenger (3)	Bicycle (4)	Taxi (5)	Walk (6)	Other (please specify) (7)
a	Place of work							
b	Place of study							
С	To shops and services							
d	To venues for leisure and recreationa l activities							
e	Attend social events							
f	Attend to family matters							

10. Please enter the number of kilometers you travel on average per **week** and include any big trip for the year for each mode of transportation.

	Mode of transportation	Km/ week	(x52) Km / year
а	Automobiles, including personal vehicles, taxies, and carpools		
b	Bus, including metro and long distance service		
С	Rail, including subways, inner-city light rail, cross country trains		
d	Air travel		

11. What best describes the vehicle you most often drive or ride in?

1	A hybrid
2	A small or compact (2 door)
3	A mid-size car (4 door sedan)
4	A large car (including vans and minivans)
5	A pickup truck or Sport Utility Vehicle (SUV)

12. Do you usually or more often than not share rides with at least one other person?

1	Yes
2	No

13. Compared to the previous year, has the frequency you use the following modes of transportation changed:

Mode of transportation		More	No	Less	Don't	Not
	-	often	change	often	know	applicable
a	Public transport, such as	1	2	3	4	5
	train, tram and bus					
b	Private car – as a driver	1	2	3	4	5
с	Private car – as a	1	2	3	4	5
	passenger					
d	bicycle	1	2	3	4	5
e	taxi	1	2	3	4	5
f	walk	1	2	3	4	5
g	Other (please specify)	1	2	3	4	5

14. Which energy saving features and energy saving habits do you (i.e. yourself) have in your home? [Please check all that apply.]

	ENERGY SAVING FEATURES	Yes	No	Don't know
а	Compact fluorescent / Energy efficient bulbs	1	2	3
b	Energy efficient appliance	1	2	3
С	Extra insulation	1	2	3
d	Insulating blinds	1	2	3
е	Solar panels and solar hot water	1	2	3
f	Storm doors and windows (which are installed in front of or inside doors and windows for protection against bad weather)	1	2	3
g	Water saving fixtures (such as low flow water taps, water efficient showerheads)	1	2	3

	ENERGY SAVING HABITS	Yes	No	Don't
				know
а	Turned off lights when leaving rooms	1	2	3
b	Use power strips, which are devices that will	1	2	3
	automatically turn off stand-by lights			
С	Turned off computers and monitors when not in use	1	2	3
d	Dry clothes outside whenever possible	1	2	3
е	Kept thermostat relatively low in winter	1	2	3
f	Unplugged small appliances when not in use	1	2	3
g	Minimal use of power equipment when landscaping	1	2	3

15. What best describes where your home is located?

1	Inner city / CBD
2	Older middle suburb
3	Newer suburb

16. Have you purchased offsets for carbon emissions associated with your home energy and transportation?

1	Yes
2	No
3	Don't know

#### YOU AND FOOD

17. What best describes your diet in **a typical week**? (based on number of meals per day)

	Diet	No. of times
1	Vegan – plant based foods only	
2	Vegetarian – primarily plant based foods, but some diary	
3	Omnivore – an assortment (meat, seafood, vegetables, dairy, and grains) (mainly vegetables, dairy and greens)	
4	Carnivore – meat, seafood, and dairy several times a week	
5	Top of the food chain – meat, seafood, or diary at almost every meal	
	Total (based on the number of meals per day) in a week	

18. In **a typical week**, where do you obtain most of your food? (Please select one.)

	Source of food	Percentage
1	All local, fresh food (Farmers markets, gardens, cooperatives,	
	neighbourhood butcher, green grocer shop)	
2	Supermarkets for some items, fresh food stores (e.g.	
	neighbourhood butcher, green grocer shop) for others	
3	Supermarkets, convenience stores, and prepared restaurant foods	
4	<b>Restaurants, fast foods, and take out</b>	
	Total percentage	100%

19. How often do you select foods that are certified organic or sustainably produced?

1	Most of the time
2	Sometimes
3	Almost never
4	Don't know

- 20. Which choice best describes how much you normally eat?
- e. Number of large meals per day
- f. Size and number of snack (e.g. morning tea, afternoon tea) per day

	Size of snack	Number of times a day
а	Light (eg beverage, biscuits)	
b	Medium (eg beverage, a slice of	
	cake)	
С	Large (ie more than the medium	
	size)	

21. Has there been any change in your diet since a year ago?

		No difference	Different	Don't know
a	Your diet now	1	2	3
b	The food you buy now	1	2	3

22. In a typical week, how many different kinds of cuisine would you eat?

Day of week	Kind of cuisine
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	
Sunday	

23. If you have leftovers from the previous day, what do you do with them?

24. Do you have a garden or share one to grow your own vegetables and herbs?

1	Yes	
2	No	Go to 27

25. What proportion of the produce from your garden is:

	Items	Percentage (%)
а	Consumed by you and your household	
b	Makes up your total food consumed	

26. What is the approximate size of your garden plot?

Length =	
Width =	square meters

#### YOU AND HOUSING

27. Which best describes your home?

		Equivalence in Melbourne, Australia	
A free standing	1	Separate house	Go to 28
single family house	a		
	1	Semi-detached, row or terrace house, townhouse	Go to 28
	b	etc with one storey	
	1	Semi-detached, row or terrace house, townhouse	Go to 28
	С	etc with two or more storeys	
A house or building	2	Flat, unit or apartment in a one or two storey	Go to 29
(with 4 or fewer units)		block	
A small apartment building (5-20 units)	3	Flat, unit or apartment in a three storey block	Go to 29
A large apartment	4	Flat, unit or apartment in four or more storey	Go to 29
building (20+ units)		block	
	5	Other (please specify);e.g. caravan, houseboat,	Go to 29
		house or flat attached to a shop or office	

28. What is the approximate area of land occupied by your home, structures, and yard?

Length =	square meters
Width =	hectares

29. Do you own or rent your home?

1	Own
2	Mortgage
3	Rent
4	Other

30. Was your home or any portion of it built with recycled materials, wood certified as sustainably harvested, or any other green design features?

1	Yes
2	No
3	Don't know

31. Approximately what share of your home furnishings are second hand or made of either recycled or sustainably produced materials?

1	Almost none	
2	A few	
3	A fair amount	
4	Almost all	

#### YOU AND HOME WATER

32. Which water saving features and habits do you (i.e. yourself) have in your home? [Please check all that apply.]

	WATER SAVING FEATURES	Yes	No	Don't
				know
а	Low flow / dual flush toilets	1	2	3
b	Low flow shower heads and faucets	1	2	3
c	Instant water heaters on sinks and shower	1	2	3
d	Rainwater tanks / catchment system	1	2	3
e	Grey water recycling system	1	2	3
f	Drought tolerant landscaping / water efficient watering system / using a trigger head on the water hose	1	2	3

	WATER SAVING HABITS	Yes	No	Don't know
а	Compost rather than use garbage disposal	1	2	3
b	Minimised shower time and toilet flushing	1	2	3
с	Run clothes and dish washers only when full	1	2	3
d	Washed cars rarely	1	2	3
e	Looked for and fix leaks regularly	1	2	3
f	Avoided hosing down decks, walkways, driveways	1	2	3

33. Compared to the previous year, indicate how your use has changed:

		Higher	No	Lower	Don't	Not
			change		know	applicable
a	Total amount of energy use	1	2	3	4	5
b	Total amount of water use	1	2	3	4	5
c	The way you water your garden	1	2	3	4	5

34. How often do you select cleaning products that are biodegradable?

1	Almost never		
2	Sometimes		
	Most of the		
3	time		
4	Don't know		

#### YOU AND GOODS AND SERVICES

35. What best describes your spending and saving habits?

1	I tend to spend all of my income and then some.
2	I generally live within my means.
3	I am frugal spender, and regularly save money for the future.

36. How often do you buy new things to replace old ones?

1	I tend to use things until I genuinely need to replace them.
2	I use some items for years, others I replace before I need to.
3	I frequently replace belongings even if they are in good condition.

37. How many standard size garbage bin/s does your household fill each week?

1	Less than one	
2	One or two	State number of bins:
3	More than two	

		None	A fair amount	Almost all
a	Paper	1	2	3
b	Aluminum	1	2	3
с	Glass	1	2	3
d	Plastic	1	2	3
e	Electronics	1	2	3
f	Other (please specify):	1	2	3

38. What proportion of the following wastes do you recycle?

39. When you buy clothing or paper products, how often do you select items labelled as recycled, natural, organic, or made of alternative fibers such as hemp or Tencel?

1	Almost never	
2	Sometimes	
3	Almost always	
4	Don't know	

40.	Compared to the	previous year, l	has there been a	iny change	in the following:
-----	-----------------	------------------	------------------	------------	-------------------

		More	No	Fewer	Don't	Not
	Currently,		change		know	applicable/
						State reason
a	The size of your home (excluding	1	2	3	4	5
	the garden)					
b	The size of your home (including	1	2	3	4	5
	the garden)					
с	The number of bathrooms	1	2	3	4	5
d	The number of bedrooms	1	2	3	4	5
e	The number of domestic	1	2	3	4	5
	appliances					
f	The amount of household	1	2	3	4	5
	garbage					
g	The amount of waste you recycle	1	2	3	4	5

41.	How have your experiences during the previous year influenced you with
	regard to:

		How has it changed	Why
a	Travel		
b	Energy consumption		
c	Water usage		
d	Food purchases		
e	Shopping		
f	Waste generated		

#### Part Two: ABOUT YOU

1. What age category do you belong to?

1	18 - 24 years
2	25 – 44 years
3	45 – 64 years
4	65 – 84 years
5	85 years or older

2. Are you:

1	Male
2	Female

3. What is your present marital status?

1	Never married	Go to 6
2	Widowed	
3	Divorced	
4	Separated but not divorced	
5	Married	(Source: ABS 2006)

4. Was your spouse / ex-spouse born in the same country as you?

1	Yes	Go to 6
2	No	

5. Where was your spouse / ex-spouse born?

Country of birth:

6. In which country was your father born?

Country of birth:

7. In which country was your mother born?Country of birth:

8. Which of these now best describes your highest level of study/education?

1	Completed Year Primary
2	Completed Year Secondary
3	Started college / TAFE but not completed
4	Started University degree but not completed
5	Completed college/ TAFE degree/diploma/certificate
6	Completed University degree
7	Postgraduate (Masters / PhD)
8	Other ( <i>please specify</i> ):

9. What is your current job title, or, if you are retired or are currently not employed, what was your last job title?

Job title:

10. Have you lived anywhere else besides Australia?



11. Name the country/countries in which you resided besides Australia.

Period of Stay DD/MM/YYYY		CITY / TOWN	COUNTRY
From	То		

12. What is your religion?

1	No religion	Go to 14
2	Buddhism	
3	Taoism	
4	Islam	
5	Catholicism	
6	Protestantism	
7	Uniting Church	
8	Presbyterian	
9	Hinduism	
10	Judaism	
11	Baptist	
12	Anglican	
13	Other ( <i>please specify</i> ):	

13. How frequently do you participate in religious services and activities?

1	Very regularly
2	Sometimes
3	Rarely
4	Not at all

#### LANGUAGE

14. Is English your first language?

1	Yes	Go to 16
2	No	

15. How well do you speak English?

1	Very well
2	Well
3	Not well
4	Not at all

16. Do you speak a language/s other than English at home?

1	Yes	
2	No	Go to 18

	Items	Percentage
1	廣東話 Cantonese	
2	普通话 Mandarin	
3	Chinese dialects	
4	English	
5	Việt Ngú (Vietnamese)	
6	Bahasa Indonesia (Indonesian)	
7	Italiano (Italian)	
8	Español (Spanish)	
9	Türkçe (Turkish)	
10	Soomaali (Somali)	
11	Ελληνικά (Greek)	
12	Other ( <i>please specify</i> ):	
	Total	100 %

17. What language/s do you speak at home? [Please check all that apply.]

#### SOCIAL INTERACTION AND PARTICIPATION

18. With reference to the following, have you:

		Very	Sometimes	Rarely	Not at
		regularly	(2)	(3)	all
		(1)			(4)
	x7 <sup>.</sup> 1,1 1 111 1	1	2	2	
a	visited the local library, and	1	2	3	4
1	community activity	7		2	,
b	Participated in local council	1	2	3	4
	community activities and events				
	such as Harmony Day and				
	Heritage Week				
c	Participated in environmental	1	2	3	4
	activities such as Whitehorse				
	Sustainability Living Week and				
	workshops such as Living for Our				
	Future Workshop				
d	Participated in activities that relate	1	2	3	4
	to Australian culture such as				
	Australia Day, sports such as				
	Australian Rules Football (Footy),				
	and cricket, barbeques in the parks,				
	picnics				
e	awareness of rainwater tank rebate,				
	shower exchange program and	Very	Somewhat	Not	Not at
	Energy and Water Efficiency	aware	aware	really	all
	Labelling and Standards scheme			aware	aware
	(WELS) for household appliances				
	such as refrigerators, washing				
	machines, dishwashers				

19. To what extent is the following statement true about you?

I feel that I belong and fit in well in the Australian culture and society here.

Strongly disagree – Somewhat disagree – Neither – Somewhat agree – Strongly agree

-----END OF SURVEY-----

#### THANK YOU FOR PARTICIPATING IN THIS SURVEY

Time ended:	
Interview length	
To send results	

# Appendix BInput items for calculation of four components offootprint

Items	Questionnaire			
	Number	Part	Question number	Remarks
Climatic zone	II		7	Selected based on the town that China-born participant came from.
	III & IV			Preselected based on climatic zone of Melbourne
			Q	Melooume.
Q:		One	8 5	
Size of dwelling		One	5	
	1 V	One	0	
Home energy source		2	9	
		One	5	
		One	10	
Renewable energy		0	10	
source		One	6	
TT + 11 + 1		One	8	
l otal km travel in		0	12	The sum of travel in
the year		One	8	typical week x 52 weeks;
T ( 1		One	10	air travel for the year
Type of car used		One	13	
		One	9	
Shara aar ridaa		Olle	11	
Shale cal files		Ono	14	
		One	10	
Energy solving		Olle	12	
features and		One	13	
behaviours	III	One	12	
Location of dwelling	<u> </u>	One	14	Dependent on location of
Location of dweining	11		10	dwelling in China
				dweining in eining
				Preselected as all
	Ш	One	L 13	participants are within
			$\uparrow$	study area, i.e. older
	IV	One	L 15	suburb
Purchased carbon	II		17	
offsets	III	One	14	
	IV	One	16	

 Table B- 1: Input items for calculation of Carbon footprint

Items	Questionnaire			
	Number	Part	Question number	
Typical diet	II		18	
	III	One	15	
	IV	One	17	
Source of food	II		19	
	III	One	16	
	IV	One	18	
Select organic or	II		20	
sustainably produced food	III	One	17	
	IV	One	19	
Size of meal & snack	II		21	
	III	One	18	
	IV	One	20	
Grow own vegetables	II		22	
	III	One	20	
	IV	One	24	
Size of garden plot	II		24	
-	III	One	22	
	IV	One	26	

Table B- 2: Input items for calculation of Food footprint

Table B- 3: Input items for calculation of Housing footprint

Items	Questionnaire			
-	Number	Part	Question number	
Dwelling type	II		25	
	III	One	23	
	IV	One	27	
Size of land	II		26	
	III	One	24	
	IV	One	28	
Dwelling built with recycled	II		28	
/ sustainably-produced	III	One	26	
materials	IV	One	30	
Second hand/ recycled	II		29	
furnishings	III	One	27	
	IV	One	31	
Water saving features and	II		31	
behaviours	III	One	28	
	IV	One	32	
Buy biodegradable cleaning	II		32	
products	III	One	30	
	IV	One	34	

Table B- 4: Input items for calculation of Goods and Services footprint

Items	Questionnaire				
_	Number	Part	Question number		
Spending & saving habits	II		33		
	III	One	31		
	IV	One	35		
Frequency in buying new	II		34		
things to replace old ones	III	One	32		
	IV	One	36		
No. of garbage bin filled per	II		35		
week	III	One	33		
	IV	One	37		
Proportion of waste recycled:	II		37		
paper, electronics, aluminum,	III	One	34		
glass, plastic,	IV	One	38		
Frequency in buying recycled,	II		38		
natural or organic clothing /	III	One	35		
paper products	IV	One	39		

#### Appendix C Measurement of determinants

Table C-1: Measurement of Individual Structural Attribute
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Determinant	Recoded to	Questionna		ire	
	dichotomous variable	Number	Part	Question number	
Age (5 categories) <sup>1</sup>	1=18-44 years	III	Two	1	
	0=45 years or older				
		IV	Two	1	
Gender	1=Male	III	Two	2	
	0=Female			2	
		IV	Two		
Individual income	1=Low income	III	One	3	
(8 categories) <sup>1</sup>	(\$19,999 or less) 0= High income	IV	One	5	
Education loval	(\$20,000 or above)	III	Trres	12 8-12	
(7 categories) <sup>1</sup>	above	111	TWO	$12 \approx 13$	
	0= College or below	IV	Two	8	
<b>Employment</b>	1= Employed	III	Two	15	
(various categories) <sup>2</sup>	0= Not employed	IV	Two	9	
Car ownership <sup>3</sup>	1=Yes	II	One	13	
	0= No	III	One	9	
		IV	One	11	

Note: 1. The categorical variable was converted into dichotomous variable using median split.

- 2. Responses to holding a current job title were recoded as '1' and '0' for those unemployed and retired.
- 3. Responses to one of categories of 'type of vehicle most often drive or ride in' were recoded as '1' and 'No' response was recoded as '0'.

Determinant	Recoded to	Questionnaire			
	dichotomous variable	Number	Part	Question number	
Familiar with ecological	1=Yes	II	One	1	
footprint calculator	0=No				

1=Yes

0=No

1=Yes

0=No

IV

III

IV

III

IV

One

One

One

Two

Two

2

6

8

28e

18e

Table C- 2: Measurement of Environmental Awareness Index (AI)<sup>1</sup>

footprint calculator

Renewable energy source

Awareness of governments'

initiatives on resource

(2 categories)

(2 categories)

conservation (4 categories)<sup>2</sup>

1. Environmental Awareness Index (AI) is calculated based on the summation Note: of the scores of three variables. Reliability analysis of AI shows a Cronbach alpha of 0.52. In exploratory research like this, it may be acceptable for the Cronbach alpha to be as low as 0.60 (Robinson, Shaver & Wrightsman 1991). 2. Responses to categories 'Very regularly' and 'Sometimes' were recoded into '1' and categories 'Rarely' and 'Not at all' into '0'.

Have Saving Feature	Recoded	Questionnaire			
	to dichotomous variable	Number	Part	Question number	
<b>Energy Saving Feature<sup>2</sup></b>					
<ul> <li>Energy efficient bulbs</li> <li>Energy efficient appliance</li> <li>Extra insulation</li> <li>Insulating blinds</li> <li>Solar panels and solar hot water</li> </ul>	} 1=Yes 0=No	III       IV	One One	12 14	
<ul> <li>Water Saving Feature<sup>2</sup></li> <li>Dual flush toilets</li> <li>Low flow shower heads and faucets</li> <li>Instant water heaters on sinks and on shower</li> <li>Rainwater tank</li> <li>Grey water recycling system</li> <li>Water efficient watering system</li> </ul>	1=Yes 0=No	) III IV	One One	28 28	

Table C- 3: Measurement of Resource-efficient Technologies Index (REI)<sup>1</sup>

Note:

1. Resource-efficient technologies Index (REI) is calculated based on the summation of the scores of 11 variables. Reliability analysis of REI shows a Cronbach alpha of 0.67.

2. Responses to category 'Yes' was recoded into '1' and categories 'No' and 'Don't know' into '0'.

<b>Have Conservation</b>		Recoded	Questionnaire			
	$\mathbf{Behaviour}^1$	to dichotomous variable	Number	Part	Question number	
Ene	ergy Conservation <sup>2</sup>					
• • • • • •	Turned off lights Use power strips Turned off computers and monitors Dry clothes outside Kept thermostat relatively low Unplugged small appliances when not in use Minimal use of power equipment when landscaping	} 1=Yes 0=No	III IV	One One	12 14	
Wa	ter Conservation <sup>2</sup>					
• • • •	Minimised shower time and toilet flushing Run clothes and dish washers only when full Washed cars rarely Looked for and fix leaks regularly Avoided hosing down walkways, driveways	$\left. \right\} \begin{array}{c} 1 = Yes \\ 0 = No \end{array} \right.$	<pre> III  IV </pre>	One One	28 32	

Table C- 4: Measurement of Conservation Behaviours Index (CBI)<sup>1</sup>

Note: 1. Conservation Behaviours Index (CBI) is calculated based on the summation of the scores of 12 variables. Reliability analysis of CBI shows a Cronbach alpha of 0.37. Further analysis shows that the Cronbach alpha for Energy Conservation is 0.24 and Water Conservation is 0.40.

2. Response to category 'Yes' was recoded into '1' and categories 'No' and 'Don't know' into '0'.

Component Ethnicity	Determinant	Code or Recoded	Questionnaire			
			Number	Part	Question number	
	Country of birth (2 categories)	1=Australia 2=China-born and baby migrant 3=China-born and adolescent migrant	Ι		1	
		4=China-born and adult	I		12	
		migrant	Î		9	
	Father's country of birth (open-ended	1=Australia 2=Western country, e.g.	III	Two	6	
	question) <sup>2</sup>	England, Italy 3=Eastern/Asian country, e.g. India, Turkey 4=China	IV	Two	6	
	Mother's country of birth (open-ended	1=Australia 2=Western country, e.g.	III	Two	7	
	question) <sup>2</sup>	England, Italy 3=Eastern/Asian country, e.g. India, Turkey 4=China	IV	Two	7	
Language	Language spoken at home	1=Only English 2=English and other	III	Two	23	
	(various categories) <sup>2</sup>	Western language, e.g. French 3= Chinese, Cantonese and other Chinese dialects as well as English 4=Only Chinese, and/or Cantonese, other Chinese dialects	IV	Two	17	
	Spoken English proficiency	1=Very well 2=Well	III	Two	24	
	(4 categories)	3=Not well 4=Not at all	IV	Two	15	
Religion	<b>Religious affiliation</b> (various categories) <sup>2</sup>	1=Australia-born and are Protestant, Catholic (or	III	Two	18 & 19	
		other Western religions) 2=Australia-born and practise Chinese beliefs like Buddhism, Taoism 3=China-born and are Protestant, Catholic (or other Western religions) 4=China-born and practise Chinese beliefs like Buddhism, Taoism	IV	Two	12	

## Table C- 5: Measurement of CALD Index<sup>1</sup>

Component	Determinant	Code or Recoded	Questionnaire			
			Number	Part	Question number	
Food	Food preference <sup>3</sup>	1=Western food only 2=Mostly Western food	III	One	19c	
		3= Mostly Chinese food 4=Chinese food only	IV	One	22	
Festivals	Participated in Australian cultural	<u>_</u>	III	Two	28d	
	activities (4 categories)	1=Very regularly 2=Sometimes	IV	Two	18d	
	Participated in Australian	3=Rarely 4=Not at all	III	Two	28b	
	community activities (4 categories)		IV	Two	18b	
Social interaction	Visit local library (4 categories)		III	Two	28a	
		1=Very regularly 2=Sometimes	IV	Two	18a	
	Participated in local environmental	3=Rarely 4=Not at all	III	Two	28c	
	activities (4 categories)		IV	Two	18c	
Cultural identity	Relate to Australian culture and society	1= Strongly agree 2=Somewhat agree	III	Two	33	
	(4 categories)	3=Somewhat disagree 4=Strongly disagree	IV	Two	19	

#### Table C-5 (continue): Measurement of CALD Index<sup>1</sup>

- Note: 1. CALD Index is calculated based on the summation of scores of the six components. A high score reflects a stronger connectedness between China-born resident and their ethnic identity than there is to their host culture, while a low score reflects a stronger connection with the host society. The continuum therefore ranges from a possible minimum score of '12' to a maximum of '48'. Reliability analysis of CALD Index shows a Cronbach alpha of 0.91. The Cronbach alpha is above 0.70, which is the agreed upon lower limit for most types of statistical analyses (Hair et al. 1995).
  - 2. The categories were reclassified manually into four codes.
  - 3. Diet of China-born participants was calculated based on the number of Chinese meals cooked at home out of the total number of meals in a week. Food preference of Australia-born participants was calculated based on the types of cuisine they had in a week.

Table C- 6: Statistical output of the CALD Index between the China- and Australia-born groups (total sample)

	Independent Samples Test									
		Levene's Equality of	Test for Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Differ	e Interval of the ence
									Lower	Upper
	Equal variances assumed	.586	.445	-27.021	131	.000	-18.178	.673	-19.508	-16.847
CALD Index	Equal variances not assumed			-26.986	126.769	.000	-18.178	.674	-19.511	-16.845

Determinant	Questionnaire					
	Number	Part	Question number			
Household size	II		2			
	III	One	1			
	IV	One	3			

Table C- 7: Household size as computed in the ecological footprint calculator

Table C- 8: Measurement of determinants in dwelling context

Determinant	Recoded	Questionnaire			
	to dichotomous variable	Number	Part	Question number	
Dwelling size (6 categories) <sup>1</sup>	1=150 square meter or larger	II		8	
	0= smaller than 150 square meter	III	One	4	
		IV	One	6	
Dwelling type (7 categories) <sup>2</sup>	1=Detached/semi- detached house	II		25	
	0=apartments/others	III	One	23	
		IV	One	27	
Tenure (4 categories) <sup>3</sup>	1=Owner 0=Others	II		27	
		III	One	25	
		IV	One	29	

Note: 1. The categorical variable was converted into dichotomous variable using median split.

2. Responses to categories 'separate house' and 'semi-detached' were recoded into '1' and the other categories into '0'.

3. Responses to categories 'Own' and 'Mortgage' were recoded into '1' and categories 'Rent' and 'Other' into '0'.
| Component                   | Determinant  | Recoded           | Qu     | estion | naire              |
|-----------------------------|--|-------------------|--------|--------|--------------------|
|                             |  |                   | Number | Part   | Question<br>number |
| Use of English in           | <b>Speak English (4 categories)</b> <sup>5</sup>                   |                   | III    | Two    | 25                 |
| communications <sup>1</sup> | Speak English with friends (4 categories) <sup>5</sup>             | -<br>             |        |        |                    |
|                             | Write in English   | l = Yes<br>0 = No |        |        |                    |
|                             | (4 categories) <sup>5</sup>  | 0-110             |        |        |                    |
|                             | Think in English   | -                 |        |        |                    |
|                             | (4 categories) <sup>5</sup>  |                   |        |        |                    |
| Use of English in           | Watching television  |                   | III    | Two    | 26                 |
| mass media <sup>2,3</sup>   | Listening to radio   |                   |        |        |                    |
|                             | Listening to music   |                   |        |        |                    |
|                             | Reading newspapers & books   |                   |        |        |                    |
|                             | Using internet   |                   |        |        |                    |
| Social                      | Interact with Chinese  |                   | III    | Two    | 27                 |
| interaction 4               | (4 categories) <sup>6</sup>  | <u>-</u>          |        |        |                    |
| with Chinese                | Celebrate Chinese traditional fostivels $(4 \text{ sategories})^6$ |                   |        |        |                    |
|                             | Participate in community   | 1=Yes             |        |        |                    |
|                             | activities like Chinese New  | 0 = No            |        |        |                    |
|                             | Year (4 categories) <sup>6</sup>                                   |                   |        |        |                    |
|                             | Participate in Chinese clubs,                                      | -                 |        |        |                    |
|                             | societies (4 categories) <sup>6</sup>                              |                   |        |        |                    |
| Age at arrival <sup>3</sup> | At what age did you arrive at                                      |                   | III    | Two    | 9                  |
|                             | Australia?   |                   |        |        |                    |
| Have high level             | Are you proud of being   | 1=Ves             | III    | Two    | 30                 |
| of prine                    | $(4 \text{ categories})^7$   | 0 = No            |        |        |                    |
| Length of                   | In which year did you leave  |                   | III    | Two    | 8                  |
| residence in                | China?   |                   |        |        |                    |
| Australia°                  | (open-ended question)  |                   |        |        |                    |

Table C- 9: Measurement of indicators of acculturation

Note: 1. English as medium for communications is calculated based on the summation of scores of the four components. A high score reflects a higher frequency of usage of spoken English, while a low score reflects little or no usage of the language. The continuum therefore ranges from a possible minimum score of 0 to a maximum of 4. Reliability analysis of English in communications shows a Cronbach alpha of 0.86.

- 2. English as medium for mass media is the sum of the percentages of English applied in the five components divided by five. A high score (percentage) reflects a higher frequency of application of English in mass media, while a low score reflects little or no usage of the language. Reliability analysis of use of English in mass media shows a Cronbach alpha of 0.77.
- 3. Interval (continuous) level variable.
- 4. Social interaction with Chinese is calculated based on the summation of scores of the 4 components. A high score reflects a higher frequency of interacting with Chinese, while a low score reflects little or no interaction. The continuum therefore ranges from a possible minimum score of 0 to a maximum of 4. Reliability analysis of Social interaction with Chinese shows a Cronbach alpha of 0.69.
- 5. Responses to categories 'Very well' and 'Well' were recoded into '1' and categories 'Not well' and 'Not at all' into '0'.
- 6. Responses to categories 'Very regularly' and 'Sometimes' were recoded into '1' and categories 'Rarely' and 'Not at all' into '0'.
- 7. Responses to category 'Yes' was recoded into '1' and categories 'No', 'Neither' and 'Not stated' into '0'.
- 8. Length of residence was calculated from the year participants left China till time of survey in 2012.

## Appendix D **Pilot Survey**

The participants of the pilot survey were also identified based on the criteria of eligibility as listed in Table 4.4 except for location of residence. As location of residence was not a key emphasis in the pilot survey and also to ensure easier recruitment, these participants were either living or working within the vicinity of Swinburne University of Technology's Hawthorn campus (approximately two kilometers from the survey area). The researcher interviewed six Australia-born participants, who were colleagues at the Swinburne University of Technology, and five China-born participants, who were sourced adjacent to the campus.

The outcomes of the pilot study were as follow:

- 1) The time taken for interview was established:
  - a. For each Australia-born participant, the duration was estimated to be twenty to thirty minutes.
  - b. For each China-born participant, it was estimated to be an hour.
- 2) Due to the estimated interview time, and the anticipated amount of information each participant may give, the input of their responses for the ecological footprint calculator were to be carried out after the interviews.
- 3) Due to the estimated time taken to conduct the pilot study, several steps were taken to reduce the time required when conducting the survey proper. One step was to convert the range of total annual household equivalent to Yuan in Questionnaire II. The second step was to exclude some questions, such as the selection of climate zone of the participants' residence. This was noted and dealt with outside the interview. Another example is leaving out the list of companies which dealt with purchases of carbon offsets. This question was found to have no impact on the calculation of the ecological footprint as tested by the researcher.
- 4) Based on the participants' feedback, changes were made to Questionnaires II, III and IV. Wordings were changed to terms commonly used in Australia to ensure better comprehension by the participants. The changes were made to ensure that the essence of the original questions was not altered. For example, 'low flow' toilet was replaced by 'dual flush' toilet and 'Rainwater catchment system' by 'Rainwater tank'.

# Appendix E Map of the study area



## Appendix F Ethical clearance

To: Prof P Newton Miss Yion Ping/Christina Ting FLSS CC: Ms Robyn Watson, Research Administration Coordinator FLSS

Dear Prof Newton and Christina,

SUHREC Project 2010/233 Towards sustainable living in Australia's multicultural society: An exploration of cultural, social and linguistic differences

Prof P Newton Miss Yion Ping/Christina Ting ISR Approved duration 21/01/2011 To 30/06/2011 [Adjusted]

I refer to the ethical review of the above project protocol undertaken by a SUHREC Subcommittee (SHESC3). Your responses to the review, as e-mailed on 11/17 November, 9/21/22 December 2010 and 18 January 2011, were approved in line with the guidelines set by a SUHREC delegate(s).

I am pleased to advise that, as submitted to date, the project may proceed in line with standard on-going ethics clearance conditions here outlined.

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the current *National Statement on Ethical Conduct in Research Involving Humans* and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor requires timely notification and SUHREC endorsement.

- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/ clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project.

- A duly authorised external or internal audit of the project may be undertaken at any time. Please contact me if you have any queries about on-going ethics clearance. The SUHREC project number should be quoted in communication. Chief Investigators/Supervisors and Student Researchers should retain a copy of this email as part of project record-keeping.

Best wishes for project.

Yours sincerely, Ann Gaeth, PhD Secretary, SHESC3, Administrative Officer (Research Ethics) Swinburne Research (H68), Swinburne University of Technology P.O. Box 218, HAWTHORN VIC 3122 Tel: +61 3 9214 5935 Note: All conditions pertaining to the clearance were properly met, and that the annual/final progress report has been submitted.

# Appendix G **Publicity of survey**

Publication of articles in the:						
1)	Leader Whitehorse 2011	.349				
2)	Surrey Hills Neighbourhood News 2011	350				

## Community news

#### AUGUST 2011

15

# Help a young driver through L2P

Do you love driving? Do you have a spare hour or two every week? Wesley Mission L2P driver-mentor program needs you.

Wesley Mission L2P volunteer-based driver-mentor program assists disadvantaged young people living under Department of Human Services care to obtain their drivers licence.

These young people have been separated from their family for their own protection and have no one to provide driving supervision. On leaving care at age 18, they must live independently and, without a licence and support networks, many struggle to find work or study opportunities.

Volunteer L2P mentors are matched with learners who take them out in Wesley cars for an hour or more a week so that they can acquire their 120 log-book hours and eventually obtain their probationary licence.

Since the program began in February 2010, four learners have obtained their drivers licences. L2P is experiencing a massive growth in demand and is in need of more volunteers to assist



young people obtain their licence and

live independently. Mentors receive

- training from VicRoads
- · use of a Wesley car
- free fuel and associated costs · free Police Check and Working With
- Children Check freedom to choose session days and
- times support from Wesley Mission.
- HALF-PRICE FLICKS WITH THE WHITEHORSE FILM SOCIETY

7.45pm in the Whitehorse Civic

here is still time to enjoy some great flicks with the Whitehorse Film Society in 2011.

Half-price memberships are currently available at \$27.50, or \$25 for concession.

The Whitehorse Film Society screens movies on the first and third. Saturdays of the month, starting at

Centre (Willis Room), 379 Whitehorse Road, Nunawading, The society offers a warm, friendly atmosphere to view quality films. Supper is served at the end of each

discussion. This month's screenings are Broken Embraces on 6 August and Up In The Air on 20 August.

screening, with opportunities for

provided many young people with a strong role model. This allows them to build up the self esteem and confidence to take up opportunities such as university, training or full-time work For more information, phone

The opportunity to learn to drive has

9871 5333 or email grant.hunter@wesley.org.au

Films to follow include The Kite

Runner (3 September), The Young

Victoria (17 September), The White Ribbon (1 October), In Search of

Beethoven (15 October), Micmacs

http://home.vicnet.net.au/~whfs/ or phone 9877 1474.

(5 November) and Bran Nue Dae

For more information on the

Whitehorse Film Society, visit

(19 November).

### **CUPCAKES FOR** CANINES

Put on your apron, grab your wooden spoon and get creative for the RSPCA's Cupcake Day.

Thousands of budding cupcake cooks are joining in one of the biggest bake-offs in the southern hemisphere on 15 August to raise funds for animals in need

Cupcake Day relies upon generous and fun-loving participants to hold a cupcake event and donate the proceeds to the RSPCA.

The event presents a great opportunity for a fun group activity that contributes to a worthwhile charitable cause.

Since Cupcake Day was launched in 2008, the RSPCA has experienced amazing growth in the event's size. After raising \$16,500 in 2008, the event went on to raise \$194,298 in 2010

This year the target is \$210,000 get your workplace to jump on board and support the 37,000 animals that will need the RSPCA's help this year. Every \$30 will microchip an animal to send to a new home

To register, visit w/w/w.rspcacup cakeday.com.au. For more information, phone 9224 2222



ENROL NOW FOR BOOT CAMP

Get in shape for summer with Aqualink Nunawading's Boot Camp program starting in September.

Forget commando crawling through mud, Aqualink Nunawadings Boot Camp is a team exercise program that focuses on increasing training intensity to achieve results. It encourages participants to push themselves beyond what they thought was their limit. Boot Camp starts in September and

sessions will be held three times a

week for four weeks. Week day sessions start at 6am and Saturday sessions start at 7am. All sessions run for 60 minutes and use the external facilities around Aqualink Nunawading, including surrounding parklands

Activities include running and sprint drills, boxing and cycling sessions, deep water running and weight training -

all in a focused and motivating team environment.

All participants receive a Boot Camp T-shirt as well as fitness testing and progress monitoring.

Bookings are essential, phone Aqualink Nunawading on 9878 4576 or email stephen.kenna@whitehorse.vic.gov.au

#### WHITEHORSE RESIDENTS WANTED

o you live in Surrey Hills, Mont Albert, Box Hill, Burwood, Blackburn or Forest Hill? Do you want to take part in a research project to calculate your ecological footprint?

Swinburne University of Technology's Institute for Social Research is looking for local residents to take part in a survey on patterns of household living and attitudes to consumption and the environment. Participants need to be born in China or Australia

The survey will take about 20 minutes for Australian-born participants and 40 minutes for Chinese-born participants. To register your interest to participate, email PhD candidate Christina Ting on cting@swin.edu.au or phone 9214 5739.



ACADEMY, GLEN WAVERLEY Contact Email: malbro@mayd. Phone: 0438-301-430 Fax: 1300-403-839 ors: Victoria Police, K R Peters Real Estate, Crown Coaches, Bendigo Bank

The project will involve a face-to-face interview. Participants can choose either an English or Chinese survey form.

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#### Colombos turns 40!

birthday. For many Neighbourhood Newsreaders, Colombo's is a household Newsreaders, Colombo sisa household name, and it is often their children who get their first job waiting there. From a simple shop-front in Whitehorse Road Balwyn, the Kurban family has developed a small business into a large suburban family restaurant.

suburban farming restautant. When the business began, there were very few take-away food shops in the local area. Raif Kurban amwed from Lebanon in 1069 and had begun working with a printing company in Heidelberg. In 1970, his wife Antoinette and their children followed. It was Antoinette's interest and skill in cooking that shaped the family's future interests. Firstly in Adelaide, then back in Mebourne. 'My Mum's cooking was great' away 'My Mum's cooking was great,' says

#### **Ecological footprint study**

Swinburne University of Technology's Institute for Social Research is looking Institute for social Research is tooking for residents to take part in a survey which aims to better understand what aspects of individual's culture and style of living is associated with their ecological footprints. Participants must live in the local area or nearby suburbs, be between 18 and 64 years and be either Australian-born or China-born (who left mainland China in 1995 or later)

#### Local vegie swap

For the last few months, the Balwyn/ Surrey Hills and Surrounds Garden Swap has been in action. The idea is that anything you have grown yourself, and that you have too much of, can be brought along and swapped with someone else's excess! Fruit, fresh or dired herbs, vegies, eggs, seeds and seedlines composit, worm usice, chook seedlings, compost, worm juice, chook manure, jams and pickles and garden magazines are all on the menu.

Not happy with your TV pictures?

Equipment not set up

for best results?

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deeperimage.com.au - www.deeperimage. 207-207A Elgar Road, Surrey Hills, 3127

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cnr Union Road Surrey Hills 9078 6231

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of our

community n Road, Surrey Hills Ph 9

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NA

son Fadi and he has been involved in making pizzas since he was nine has his own secret recipe!

In 1986, the Kurban family took over Colombo's and it has been a thriving Colombo's and it has been a thriving business ever since. Even though they have expanded (now about 700 seats as well as the take-away) you have often had to queue. But it must be worth it, because local people just keep coming back. We have even heard that some people as the wide variety of meals from Colombo's three or four times a vareble week

The five sons - Simon, Bill, Gaby, Wally and Fadi - are all involved in the business, and live in the local area. Their older sister Claudette's children are now also getting involved. The chief chef, Vince, has been with the family for 30 years. It is truly a local family affair.

The project will be a face-to-face interview. Participants can choose either the English or the Chinese survey

form. The survey will take twenty minutes for Australian-born and forty minutes for China-born participants. For further information or to register

your interest to participate, please email PhD candidate Christina Ting at cting@ swin.edu.au or phone 9214 5739.



A Papa Kurban and the five brothers at Colombo's

#### A new era for Surrey Clothing

Surrey Clothing, local school uniform manufacturer, designer and supplier (and long-time advertiser in Neighbourhood News), are relocating their factory and warehouse. But the uerr ractory and warehouse. But the good news is that they will keep a presence in Surrey Hills at their new shop at 161 Union Road, Surrey Hills, just up from the Neighbourhood Centre, and will continue to supply and support local schools and businesses.

After 40 years of manufacturing in After 40 years of manufacturing in the old Survey Hall, just up from the Bendigo Bank, Survey Clothing has leased new premises in Scoresby. School wear supply has changed over the years, but the production line will continue to cater for small runs and the new facility will also house the online dispatch area to streamline the orders

processed through the online shop www.surreyonline. $\infty\,m.au$ 

The last order to be completed in the Union Road factory will be trousers for Geelong Grammar. The first pair of school shorts was made for Merv Brown back in the 1970s. Surrey Clothing has also made gamments such as the Victorian and South Australian Police trousers, NT Correction Facilities, and all the Melbourne Tramways workers and Army uniforms in the 1960s.

Over the 40+ years, the Classon family business have made for a wide range of labels and also supplied many primary and secondary schools with trousers and shorts with the 'Surrey' label. For more information, call in at the shop or phone Michael Classon on 98903487.



# Appendix H List of 95 Statistical Area Level 1 (SA1) spatial units in the study area (ABS 2011 Census)

2114709	2115528	2116145	2116427
2114711	2115535	2116203	2116429
2114716	2115537	2116304	2116435
2114719	2115539	2116308	2116436
2114735	2115602	2116309	2116501
2114802	2115730	2116310	2116513
2114805	2115734	2116312	2116515
2114807	2115741	2116313	2116524
2114812	2115814	2116317	2116526
2114813	2115852	2116319	2116622
2114819	2115869	2116322	2116702
2114832	2115902	2116324	2116704
2114842	2116102	2116330	2116707
2114908	2116108	2116335	2116711
2114928	2116115	2116336	2126902
2114937	2116117	2116340	2126909
2114939	2116120	2116402	2127103
2115004	2116121	2116404	2127114
2115413	2116122	2116409	2131914
2115503	2116123	2116411	2132302
2115510	2116125	2116413	
2115511	2116132	2116415	
2115512	2116134	2116416	
2115522	2116136	2116417	
2115523	2116140	2116422	

## Appendix I Publication related to the thesis

Christina Yion Ting, 2013, An exploration of cultural influence on domestic practices in the context of sustainable living, *International Journal of Environmental, Cultural, Economic, and Social Sustainability*, vol. 8, no.1, pp. 13-29.



### Swinburne Research

## **Authorship Indication Form**

For PhD (including associated papers) candidates

#### NOTE

This Authorship Indication form is a statement detailing the percentage of the contribution of each author in each associated 'paper'. This form must be signed by each co-author and the Principal Coordinating Supervisor. This form must be added to the publication of your final thesis as an appendix. Please fill out a separate form for each associated paper to be included in your thesis.

#### DECLARATION

We hereby declare our contribution to the publication of the 'paper' entitled:

An exploration of cultural influence on domestic practices in the context of sustainable living

#### First Author

Name: CHRISTINA YION P TING

Percentage of contribution: 100 %

Date: 11\_/\_12\_/2013\_\_\_\_

\_Signature: \_

Brief description of contribution to the 'paper' and your central responsibilities/role on project:

The concept and ideas of culture were conceptualised with reference to literature. I was the sole author from the conception to the writing including the tabulation of the data.

#### Second Author

N

lame:				

FEIGEILIGUE UL GUITHIDUIGUE 70	Percentage of contribution:	%
--------------------------------	-----------------------------	---

Brief description of your contribution to the 'paper':

#### Third Author

Name:		

Percentage of	f contribution:
---------------	-----------------

Brief description of your contribution to the 'paper':

\_%

Fourth Author

Mana

Brief

Name:		_
Percentage of contribution:	%	

description of	vour	contribution	to	the	'naner'	
description of	your	continuation	w	uie	paper.	

Date: \_\_/ \_\_/

Principal Coordinating Supervisor: Name: PROFESSOR PETER NEWTON Signature: Date: 3 17, 2015

In the case of more than four authors please attach another sheet with the names, signatures and contribution of the authors.

Authorship Indication Form

Date: \_\_/\_\_/\_\_\_

Signature:

Date: \_\_/\_/\_\_/

Signature:

Signature: