

# Role of people-environment relationships in sustainable development

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**ABSTRACT:** Sustainable development aims to achieve environmental and human well-being. However, the current models of sustainable development give emphasis to environmental, social and economic aspects. The role of people-environment relationship and measure of human well-being in sustainable development is still unexplored. Although Quality of life (QoL) intends to assess well-being, conventional QoL metrics do not include environmental features. By including environmental qualities, we have defined a new measure, environmental Quality of Life (QoL<sub>e</sub>), which encapsulates satisfaction obtained from environmental quality of a place. The model contains attributes related to environmental quality (objective attributes), perceived residential environmental quality (subjective attributes) and environmental attitude of people (moderating variable). This approach allows the examination of the people-environment relationship in a residential setting. The testing of the model involved field work in a sustainable community (the Ecovillage) in South East Queensland and in a control group (conventional housing) in a nearby suburb. The Ecovillage demonstrates a high level of environmental consideration in planning and design of the community. The Ecovillage residents exhibited Preservation (pro-environmental) attitudes and expressed high levels of satisfaction with the residential environmental quality. Whereas, the conventional suburb lacks sustainable features, most of the residents preferred a Utilization attitude and were relatively less satisfied with their neighbourhood features.

Conference theme: Architecture and the Environment

Keywords: Sustainable community, People-environment relationships, Environmental Quality of life, and Residential satisfaction

## INTRODUCTION

In general, sustainable development aims at balancing environmental, social and economic issues. There are multiple methods / tools available to measure progress towards sustainability at different scales (Mawhinney, 2002). Global sustainability indicators may not be suitable for use at a local level. At the global scale, sustainable development uses indicators such as climate change impact and greenhouse gas emissions. At the community level, indicators such as well-being and Quality of Life sum up all the major issues that contribute towards local level sustainability (DETR, 1999; Girardet, 1999). Thus, a major challenge for sustainable development at the local level is largely dependent on how to harness social aspects and to satisfy people's aspirations. Neighbourhood satisfaction in sustainable communities is still largely unexplored. This paper investigates environmental quality and the level of satisfaction in sustainable communities using a people-environment relationship framework.

This paper explores the people-environment relationship, an important dimension of sustainable development and argues for its usage as a new method of evaluating sustainable development at local level. Empirical data is collected from two study sites, the Ecovillage at Currumbin in South East Queensland, and conventional housing from nearby suburb as a control group. The study examines both objective environmental features and perceived satisfaction expressed by the residents. This research uses attributes such as natural and built environmental conditions, infrastructure and services, and economic activities to assess the objective residential environmental quality. Residents report levels of satisfaction with the neighbourhood features and neighbourhood attachment. It also investigates if personal attributes, such as environmental attitude, play any role in perceived neighbourhood satisfaction.

## 1. REDEFINING CURRENCIES FOR SUSTAINABLE DEVELOPMENT

The most quoted definition of sustainable development from the Brundtland Report defines sustainable development as, 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Brundtland, 1987, p. 8). This definition not only addresses essential human needs but also recognises the interdependency of environmental, economic and social issues in meeting those needs. Moreover, the report emphasises that the well-being of humanity is highly dependent on the environment. The definition of sustainable development by the UK government's Department of the Environment, Transport and the Regions (DETR) is about 'ensuring a better quality of life for everyone, now and for generations to come' (1999, p. 1). In Australia, state and local governments are promoting sustainable built environment through ecologically sustainable development (ESD) principles to addresses environmental, social and economic issues as well as contributing to human well-being (Australian Government, 1992). Furthermore, sustainability gives emphasis to finding an alternative

way of living that sustains our basic biological and ecosystem functions and, at the same time, offers opportunities for a meaningful quality of life to all (Beatley, 1995; Trainer, 2010).

### **1.1. Currencies for measuring sustainable development**

There is no consensus among researchers about a common currency for sustainable development. At a macro level, social, economic and environmental approaches are most commonly used (Mawhinney, 2002). However, progress towards sustainable development has been measured in different currencies among various disciplines. For example, economists use Gross Domestic Product (GDP), social scientists prefer well-being or Quality of life (QoL), ecologists favour ecological footprints (Mawhinney, 2002), and eco-efficiency of resources are of interest to economists and environmentalists. The QoL approach can include a wide range of issues related to human well-being. However, the conventional model of QoL considers existential factors, such as social, economic, and health indicators (Cummins, Eckersley, Pallant, van Vugt, & Misajon, 2003) and does not include environmental factors. In the context of sustainability, long term human well-being cannot be achieved in a degraded environment. Thus, it is argued that environmental and human well-being should be achieved together for a sustained QoL (Moser, 2009).

A new currency of measuring progress towards sustainability recognises that human well-being is inter-dependent of environmental quality (Bonnes & Bonaiuto, 2002). Thus, it should include the relationship between people and the environment for sustainability (Moser, 2009) as human life is dependent on nature. Sustainable development seeks a balance between human and environmental well-being (Moser, 2009). However, the human dimension is generally not included in the sustainable development model. An individual's interaction with the environment, the society and the economy should be considered in an integrated way (Upadhyay, Hyde, & Wadley, 2010). Interactions between people and the environment should be considered holistically from an ecosystem approach rather than a sectoral or fragmented approach (Barton, Grant, & Guise, 2010; Bonnes & Bonaiuto, 2002). Environmental QoL (QoL<sub>e</sub>) includes environmental attributes, personal environmental preferences and perceived residential satisfaction in an integrated way to assess sustainable development at a local scale.

The authors proposed a comprehensive model, Environmental QoL (QoL<sub>e</sub>), to measure progress towards sustainable development at local level (Upadhyay et al., 2010). This model includes objective indicators (environmental attributes), subjective indicators (perceived neighbourhood satisfaction) and personal preference towards the environment (environmental attitude). The model uses people-environment relationships to understand environmental and human well-being. It emphasizes the place and the environment within which people live; it utilizes the distinction between external conditions which are represented by the 'objective environmental quality' and internal conditions, the 'subjective evaluation of the environment' mediated by 'personal characteristics' of people. Environmental and human well-being is determined by the extent of people-environment congruity. According to Moser (2009), people-environment congruity at a neighbourhood scale is determined by the degree of satisfaction with environmental attributes of one's neighbourhood. The proposed QoL<sub>e</sub> model can identify alignment or misalignment between environmental qualities, individuals' environmental attitudes and perceived neighbourhood satisfaction. A consistent alignment between them contributes to environmental and human well-being as a result of a congruent people-environment relationship. The model hypothesises that a vibrant sustainable community strives to achieve people-environment congruity by attracting environmentally responsive residents to ecologically designed settings.

## **2. SUSTAINABLE COMMUNITIES AND PEOPLE-ENVIRONMENT CONGRUITY/ INCONGRUITY**

Sustainable communities have been defined in many ways, but at the core they try to integrate environmental, economic and social capital and to formulate strategies to achieve sustainability at a local level along with QoL of residents (Barton, 2000; Roseland & Connelly, 2005). Sustainable communities envision a better life by fulfilling non-material dimensions such as quality of community services, intimate relationships with neighbours and a congruent relationship with nature. It is argued that sustainable communities achieve a high QoL by providing physical infrastructure and well-developed relationships with their environment and neighbours (Barton, 2000). Ecologically intentional communities, such as ecovillages, are examples of sustainable communities that are strongly motivated to preserve the natural capital of the environment and aim to achieve a high QoL by creating strong social networks and alternative lifestyles (Kasper, 2008). The main goal for ecovillages is to focus on achieving ecological sustainability while attaining a high QoL. A high people-environment congruity most often corresponds to a high QoL (Moser, 2009).

### **2.1. Meaning of people-environment congruity**

A congruent people-environment relationship means that both people and the environment complement each other for their well-being. Daniel Stokols (1990) argues for a spiritual view of the people-environment relationship, which values place and considers the socio-physical environment as the end in itself rather than as a tool. This philosophy conceptualises a context in which fundamental human values can be cultivated and the human spirit can be enriched. A recent study of an intentional community in the US indicated some evidence that people could achieve a high QoL with a low income and consumption patterns (Mulder, Costanza, & Erickson, 2006). It was also observed that intentional communities enable their residents to pursue a more sustainable lifestyle resulting in a high QoL despite lower income by substituting social capital - community interaction and the importance of friends and families - for built capital - purchased or rented goods (Mulder et al., 2006). A sustainable community can provide a balance between environmental well-being and personal satisfaction that can in turn; contribute towards people-environment congruity. Sustainable communities integrate community capital by their intentional design. However, not everyone in a society may find such design features appealing. There is a general consensus that if people hold pro-environmental attitudes, that they are most likely to be involved in environmental preservation / conservation

activities, and are presumably satisfied with such actions (Wanden-Hannay, 2005) and the available sustainable features.

## **2.2. Meaning of people-environment incongruity**

An incongruent people-environment relationship is due to a misalignment between personal preferences and environmental attributes. Principles of sustainable development emphasise environmental considerations, social relationships and economic opportunities. An incongruent people-environment relationship may occur if people do not hold pro-environmental attitudes in sustainable housing. Similarly, people who exhibit pro-environment attitudes who live in conventional housing can also have an incongruent people-environment relationship as they find the infrastructure and services in such places do not allow for the practice of environmentally friendly behaviours. Thus it is important to understand personal preferences towards the environment for people-environment relationships. Jackson (2005) suggests that pro-environmental behaviours are motivated by various value orientations such as self-interest, altruism and biospheric values. However, Bonnes and Carrus (2004) argue that people with ecocentric attitudes are more likely to behave coherently with the pro-environmental attitudes compared to people with anthropocentric attitudes. Similarly, people with egoistic value orientation are less likely to engage in pro-environmental behaviours than those with pro-social or biospheric value orientations (Stern & Dietz, 1994).

## **3. THE STUDY**

In Australia, environmental consideration in housing schemes can vary significantly based on state or local planning legislation, developers' willingness and their market appraisal. In ESD principles, economic and social issues are not highlighted but embedded within a broad ecological consideration. The State Government of Queensland introduced the Integrated Planning Act (IPA) to promote ESD by integrating state and local planning systems, and to deliver more liveable communities and a better Quality of Life (McCauley 1997 cited by Johnson, 2008). The IPA legislation placed sustainable development on the agenda for developers too (Hyde, Wadley, Gardner, Walton, & Rutherford, 2008). Recently, the IPA has been replaced with the Sustainable Planning Act 2009 (SPA), which forms the foundation of Queensland's planning and development assessment legislation. The SPA mandated for developers to include ecologically sustainable features in new developments to ensure environmental and human well-being.

A comparative study was designed to investigate if the environmental attributes and the ethos of an ecologically sustainable community contribute to perceived satisfaction and well-being among residents. The research method involves comparing a group of people from the Ecovillage at Currumbin, with a control group of more conventional suburban dwellers from the nearby master planned estate.

### **3.1. The Ecovillage**

The Ecovillage at Currumbin represents state of the art, developer-led ecological housing in Australia. It has been hailed by government and industry as a leading example of Ecologically Sustainable Design (ESD) (Hyde et al., 2007). Strict regulations have been imposed through its Architectural and Landscape Code (ALC) to maintain the ecological and aesthetic vision, while its Community Management Statement (CMS) underscores the ecological intentions. A community title scheme allows people to participate in community management and decision making processes. The Ecovillage is situated on a site of 110 hectares, subdivided into 147 lots ranging in size from 450m<sup>2</sup> to 6000m<sup>2</sup> with substantial open space (Landmatters, 2009). It incorporates wide range of sustainability features such as preservation of natural environment, energy and water efficient built environment, infrastructure and services to enhance environmental quality, support social relationships and economic opportunities. The Village has introduced a few concepts from traditional communities such as clustering of five to seven houses to form an 'ecohamlet'. The ecohamlet houses are grouped within common open space/ greenways to foster social engagement. The concept has made provision for small scale commercial and institutional facilities within the precinct.

### **3.2. The conventional suburb**

The (hereafter) Conventional suburb is located very close to a major motorway (M1) that links the Gold Coast to Brisbane and is marketed on the basis of its proximity to shopping centres, beaches and other local attractions. The housing is set in a 300 hectare residential area with 880 home parcels; more than 60% is dedicated to natural bushland and parks (Stockland, 2012). This concept reflects a typical approach of lot creation in the mainstream Australian housing sector, but site topography is somewhat problematic. The planning approach has not taken consideration of the local topography and the majority of streets run across contour lines which make it hard to walk or cycle due to the prevailing gradients. Most of the lots do not benefit from northern (sun) exposure as the houses are very close to each other and occupy, in general, more than 50% of the lot. Apart from a large open space around high voltage overhead transmission towers, this neighbourhood does not have a sports field or other play areas. However, a few small outdoor activity areas such as barbeque facilities and children's playgrounds are available. The houses barely reflect climate responsive features. The neighbourhood design does not provide any infrastructure to foster social relationships, nor does it provide for economic opportunities in the way of stores or cafes.

### **3.3. Data collection**

In early 2011, a request letter was sent by post to all households who have been living in the Ecovillage or in the conventional suburb for more than six months. Initial information about the suburb and houses was obtained from RP data - an online database for property information in Australia ([www.rpdata.com](http://www.rpdata.com)). Households were asked to nominate one adult to participate in the survey. A questionnaire was administered to 75 households (35 from the Ecovillage and 40 from the conventional suburb) in March and April 2011. The Ecovillage had 46 and the conventional housing had 427 valid houses as of January 2011.

Objective environmental data were obtained through field study and secondary sources whereas, subjective evaluation was determined through the questionnaire. The questionnaire was comprised of three parts that related to: demographic and personal information, environmental attitudes (EA), and Perceived Residential Environmental Quality (PREQ) and Neighbourhood Attachment (NA) questions.

### 3.4. Framework for evaluating people-environment congruity

The combination of both subjective and objective QoL measures allows comparison of the possible variations between the two perspectives. Interaction of these two approaches gives four states of QoL that are defined as *well-being*, *deprivation*, *adaptation*, or *dissonance* (Table 1). Zapf (1984) explains that a state of *well-being* can be achieved with good living conditions and positive well-being; bad living conditions combined with negative well-being highlight a state of *deprivation*; bad living condition and positive well-being is termed as *adaptation* and this is also known as 'satisfaction paradox'; *dissonance* refers to the inconsistent combination of good living conditions and dissatisfaction which is also known as 'dissatisfaction dilemma' (Noll, 2000). Currently a combined approach, i.e. using both objective and subjective measures, is gaining a higher priority in QoL research (Felce & Perry, 1995; Türksever & Atalik, 2001).

**Table 1: States of Quality of Life** (modified after Noll, 2000)

Objective condition (Environmental and existential features)	Subjective condition (Perceived satisfaction)	
	Good	Bad
Good	Well-being	Dissonance
Bad	Adaptation	Deprivation

This paper presents results of the objective residential attributes and perceived satisfaction expressed by the residents and environmental attitudes of the residents from the two housing schemes.

## 4. RESULTS AND ANALYSIS

### 4.1. Objective Residential Qualities

Objective residential qualities in this study incorporate the natural environment, built environment, social aspects, infrastructure and services, and economic opportunities / benefits. Table 2 presents a comparison of residential qualities between the Ecovillage and the conventional suburb. It illustrates that the Ecovillage development has evolved around enhancing the natural ecosystem and also providing necessary infrastructure to fulfil residents' needs. The Ecovillage has many sustainable features integrated in the planning of the estate, design of houses and Community Management Statement (CMS). The neighbourhood is not yet fully developed and some basic services such as local shops, café, pre/primary school, GP clinic and office spaces are still to come. The planning aims to complement the natural environment with built environment, at the same time fostering social engagement with neighbours and offering economic opportunities too.

The conventional suburb is purely designed as a residential block and discourages mixed land use options to provide essential services for the residents. The suburb is designed for car dependency and does not encourage social interactions with neighbours. The design of the neighbourhood does not promote any kind of commercial activity or provide economic opportunities. Services in the suburb include easy access to a nearby suburb and commercial centres, and well maintained residential areas. However, it lacks environmental consideration in its planning and design.

**Table 2: Comparison of objective residential qualities between the Ecovillage and the conventional suburb**

The natural environment	The Ecovillage	The conventional suburb
1. Preservation of existing natural features	Yes	No
2. Provision to protect wildlife and endanger species	Yes	No
3. Plans to protect biodiversity and natural hydrology	Yes	No
4. Protection of existing flora and fauna	Yes	No
5. Minimum disturbance to existing land forms	Yes	No
6. Future agricultural potential of the site	Yes	No
7. Provision for local food production	Yes	No
8. Community gardens	Yes	No
The Built environment		
1. Walkable street	Yes	No
2. Connected and Open community	Yes	No
3. Mixed land use	Yes	No
4. Access to sports fields on foot	Yes	No
5. Building energy efficiency	Yes	No
6. Building water efficiency	Yes	No
7. Water efficient landscaping	Yes	No
8. Existing building reuse	Yes	No
9. Stormwater management	Yes	No

The Built environment (Contd...)	The Ecovillage	The conventional suburb
10. Heat island reduction	Yes	No
11. Solar orientation of lots	Yes	No
12. On site renewable energy sources	Yes (mandatory)	Not mandatory
13. Wastewater management	Yes	No
14. Recycled content in building materials	Yes	No
15. Solid waste management	Yes	No
16. Light pollution reduction	Yes	No
<b>Social aspects</b>		
1. Community title	Yes	No
2. Involvement of community in the management	Yes	No
3. Frequent community meetings	Yes	No
4. Community hall	Yes	No
5. Bulk buying and sharing with community members	Yes	No
<b>Infrastructure and services</b>		
1. Public transport	No	Yes
2. State of art telecommunication service	Yes	Yes
3. Neighbourhood school	Yes (in plan)	No
4. Communal facilities	Yes	No
<b>Economic benefits</b>		
1. Small scale commercial services within precinct	Yes (in plan)	No
2. Low operational cost for water and energy usage at homes	Yes	No
3. Income generation from solar panels	Yes	No

#### 4.2. Perceived Residential Environmental Quality (PREQ) and Neighbourhood Attachment (NA)

The PREQ framework, proposed by Bounaito and colleagues (2004; 1999) and later cross-validated with abbreviated version by Fornara and colleagues (2010), consists of four main areas to evaluate inhabitants' perceived residential quality that are: spatial features (architecture and urban planning), human and social features (population and social relations), functional features (available services), and contextual features (lifestyle, pollution, maintenance and care). The existing PREQ literature does not include environmental features such as environmental considerations in the planning of the neighbourhood and, water and energy efficiency. The existing questionnaire was modified to suit an Australian context and environmental features were updated to determine if they had any influence on the perceived residential quality. More recently, houses and neighbourhoods with environmental features are gaining higher recognition in society and also they attract high economical returns based on such qualities (Miller, Spivey, & Florance, 2008; Tan, 2011).

The PREQ and NA questionnaire has 64 items under eight broad neighbourhood attributes. Residents were asked to express their level of satisfaction about eight different aspects of neighbourhood attributes. At the end of each neighbourhood attribute, a general question was asked, for example "How satisfied are you with overall aesthetic qualities and form of buildings in this neighbourhood?" All the responses were recorded in a 7 point Likert scale from "Extremely Dissatisfied" to "Extremely Satisfied". The respondents were also asked to elaborate briefly why they were satisfied or dissatisfied with the neighbourhood attributes in a summative open ended response.

#### 4.3. Overall neighbourhood satisfaction

Overall satisfaction with eight broad aspects of neighbourhood attributes were combined to get an overall neighbourhood satisfaction. The scale had an acceptable alpha score (0.82) and a mean inter-item correlation coefficient (0.359) with a mean score of 5.68 (~5.7) and a standard deviation 0.85. Table 3 lists the items that contribute towards the overall neighbourhood satisfaction.

**Table 3: Items for Overall neighbourhood satisfaction**

Overall Neighbourhood Satisfaction
1. How satisfied are you with overall aesthetic qualities and form of buildings in this neighbourhood?
2. How satisfied are you with overall accessibility within the neighbourhood?
3. How satisfied are you with overall connection of this neighbourhood with city and nearby shopping centre?
4. How satisfied are you with infrastructure and services available in the neighbourhood?
5. How satisfied are you with overall social relationship with neighbours?
6. How satisfied are you with environmental consideration in design and planning of this neighbourhood?
7. How satisfied are you with overall upkeep and maintenance of this neighbourhood?
8. How satisfied are you living in this neighbourhood?

The t-test revealed a statistically significant difference between the two neighbourhoods for the Overall neighbourhood satisfaction. The score was higher for the Ecovillage sample (M=5.95, SD=0.622) than for the conventional suburb sample (M = 5.442, SD = 0.965) and  $t(67.388) = 2.760, P = 0.007$ . Table 4 compares Overall neighbourhood satisfaction between the two neighbourhoods with reference to the total sample average score (5.7). Around 75% of the Ecovillage residents were highly satisfied with their neighbourhood whereas, it is less than half in the conventional suburb.

**Table 4: Overall neighbourhood satisfaction in the Ecovillage and the conventional suburb**

Overall neighbourhood satisfaction	The Ecovillage	The conventional suburb
Less than 5.7 (Low level of satisfaction)	9 (26%)	22 (55%)
More than 5.7 (High level of satisfaction)	26 (74%)	18 (45%)
Total	35 (100%)	40 (100%)

**4.4. Factor analysis**

Factor analysis was performed to determine if there were multiple variables within the neighbourhood attributes and eliminating any item(s) that did not contribute in explaining the neighbourhood attributes. The principal component analysis with varimax rotation revealed that there was more than one dimension in three neighbourhood attributes, i.e. infrastructure and services, social relations and neighbourhood qualities and attachment. Cronbach's alpha was then used to test the reliability of the variables. The combination of items that produce an alpha above 0.7 is considered to be reliable variables (Briggs & Cheek, 1986). Mean inter-item correlation can be used if the scale has fewer than 10 items (Pallant, 2011) and Briggs and Cheek (1986) recommended 0.2 for the mean inter-item correlation. Altogether 12 variables were discovered from eight neighbourhood attributes that contribute towards neighbourhood satisfaction. Table 5 illustrates valid items for each variable with corresponding alpha, mean inter-item correlation. Overall, all the scales achieved the mean inter-item correlation higher than 0.3. The items that satisfied the reliability were collapsed into a single (mean) score for that variable.

**Table 5: 12 variables contributing in neighbourhood satisfaction**

Variables	Reliability ( $\alpha$ )	Mean inter-item correlation
1. Building quality	0.791	0.450
2. External connection	0.699	0.432
3. Sports and recreation	0.806	0.443
4. Transportation	0.774	0.512
5. Green areas	0.767	0.561
6. Local schools and shops	0.658	0.522
7. Sociability	0.781	0.642
8. Discretion	0.588	0.425
9. Upkeep	0.825	0.616
10. Neighbourhood vitality	0.633	0.301
11. Neighbourhood liveability	0.750	0.647
12. Neighbourhood attachment	0.899	0.675

**4.5. Contribution of variables to overall neighbourhood satisfaction**

Multiple regression analysis was used to understand how different variables obtained from the factor analysis predict the overall neighbourhood satisfaction for the Ecovillage and the conventional suburb sample. An entry method multiple linear regression was performed independently for the Ecovillage and the conventional suburb samples. There was a significant difference between these two groups in considering importance of a range of variables for neighbourhood satisfaction (see Table 6). The regression analysis showed that Neighbourhood attachment ( $\beta = 0.421$ ), Sports and recreational facilities ( $\beta = 0.366$ ), Schools and shops ( $\beta = 0.305$ ), External connection ( $\beta = 0.275$ ) and Upkeep ( $\beta = 0.273$ ) were significant in determining overall neighbourhood satisfaction in the Ecovillage. Neighbourhood attachment explains 14% of the variance in Overall neighbourhood satisfaction followed by Sports and recreation facilities (10%).

**Table 6: Multiple linear regression for the Ecovillage and the conventional suburb sample**

Variables	Std. Coefficients		Correlations			Collinearity Statistics	
	Beta	Sig. <sup>a</sup>	Zero-order	Partial	Part	Tolerance	VIF
<b>The Ecovillage sample (Adjusted R<sup>2</sup> = 0.738)</b>							
Neighbourhood attachment	.421	.000	.452	.631	.378	.808	1.238
Sports and recreational facilities	.366	.000	.414	.602	.350	.919	1.089
Schools and shops	.305	.012	.425	.452	.236	.598	1.673
External connection	.275	.029	.599	.400	.203	.544	1.837
Upkeep	.273	.009	.470	.471	.248	.824	1.214
<b>The conventional suburb sample (Adjusted R<sup>2</sup> = 0.740)</b>							
External connection	.407	.001	.685	.563	.304	.560	1.785
Discretion	-.304	.013	-.594	-.433	-.215	.501	1.994

Dependent variable: Overall neighbourhood satisfaction

a. Two tailed test

In the conventional suburb, the regression analysis revealed that External connection ( $\beta = 0.407$ ) and Discretion ( $\beta = -0.304$ ) achieved statistically significant regression coefficients. Other variables did not make a significant

contribution to the model. External connection explains 9% of the variance in Overall neighbourhood satisfaction followed by Discretion (4%).

#### **4.6. Environmental attitudes**

This research collected environmental attitude data to infer behavioural aspects of sustainability. The results are reported elsewhere (refer Upadhyay & Hyde, 2012 for detail). Environmental attitudes were measured with two higher order dimensions i.e. Preservation and Utilization. Preservation reflects a biocentric dimension that considers conservation and protection of the environment, and Utilization that represents an anthropocentric dimension that considers the utilization of natural resources (Wiseman & Bogner, 2003). The study revealed that more than two-third of Ecovillage residents demonstrated a Preservation attitude and less than 10% hold a Utilization attitude. The environmental attitudes from the conventional suburb sample are very different as more than half of the respondents support a Utilization attitude and less than 10% hold a Preservation attitude.

### **5. KEY FINDINGS**

The study revealed some interesting findings in relation to the objective environmental quality and perceived residential satisfaction and environmental attitudes of residents in sustainable housing and the conventional suburb. The Ecovillage has many environmental attributes that display its commitment towards ecologically sustainable development whereas, the conventional suburb clearly lacks a response to the immediate environmental problem, does not encourage social engagement among residents, and also excludes economic benefits/opportunities for the residents.

Moreover, the study highlighted that the overall neighbourhood satisfaction was distinctively higher for the Ecovillage residents than for that of the conventional suburb residents. Ecovillage residents displayed a congruent relationship with most of the environmental qualities by expressing a high level of satisfaction with aesthetic qualities and the form of buildings, internal accessibility, social relationships with neighbours, upkeep and maintenance, environmental consideration in design and planning, and liveability aspects of the neighbourhood. However, there were a few items with which they were less satisfied such as external connection to city, and available infrastructure and services. It demonstrates an incongruity with those aspects. The location of the Ecovillage necessitates that residents rely on cars for their everyday needs. Car dependency is a common feature of Australian cities in general and particularly, in suburbs and semi-rural neighbourhoods like Currumbin Valley. However, the idea of living in such ecologically sustainable housing with such a high level of car dependency reflects a conflict in the value system.

Multiple regression analysis revealed that the most important predictors of neighbourhood satisfaction were not the same for both neighbourhoods. The Ecovillage residents valued neighbourhood attachment, and sports and recreational facilities as top priorities. Other variables such as green areas, sociability, neighbourhood liveability and vitality did not achieve significance in contributing to overall neighbourhood satisfaction; however, residents expressed a high level of satisfaction with them too.

External connection to the city and shopping centres received a high priority in the conventional suburb. It is located about 10-15 minutes driving distance from a major shopping centre, a high quality beach, and an international airport. But most importantly, the residents must drive to access those facilities. The residents preferred limited social relationships with neighbours as most of them mentioned that they would socialise formally in front yards and streets. The planning of the suburb places no emphasis on social integration, thus it is ideal for those who want to keep to themselves or just want to maintain a formal relationship.

This study did not find a statistically significant relationship between neighbourhood satisfaction and demographic variables. The demographic characteristics (such as age group, education attainment, income, length of stay) of both neighbourhoods were similar. However, this study discovered a statistically significant difference ( $p < 0.05$ ) in household size, lot area and house size between the two neighbourhoods. For example, average lot size in the Ecovillage is around 25% larger than the conventional suburb, whereas house size in the Ecovillage is around 40% smaller than in the conventional suburb.

### **6. CONCLUSIONS**

The results suggest that there is a high level of people-environment congruity found in the Ecovillage and that this can form an important currency to evaluate sustainable development. People's value systems, objective environmental quality and perceived neighbourhood satisfaction in the Ecovillage are well articulated, which suggests that both environmental and human well-being can be achieved (Table 1). In the conventional suburb, the objective environmental quality clearly lacks sustainable features, the residents also hold a Utilization attitude towards the environment and moreover, they are not as satisfied as the Ecovillage residents with the residential environmental quality. This highlights the incongruent people-environment relationship in the conventional suburb. Environmental psychologists argue that attitude plays a vital role in behaviour and perceived satisfaction, as people's actions are motivated by such an attitude (Ajzen, 1991; Bonnes & Carrus, 2004) and it can be inferred that people motivated by a Utilization attitude may not find sustainable features appealing.

The role of people-environment relationships captures all essential elements of sustainable development including human well-being which is somehow missing from recently available currencies. This study supports that the new model QoL<sub>e</sub> approach, employs a comprehensive method to evaluate progress towards sustainable development at a local scale. Inclusion of environmental attributes and personal environmental preference in the conventional QoL<sub>e</sub>

model promote an understanding of the level of people-environment interaction in a residential setting. The integration of an objective environmental quality, personal attributes and perceived satisfaction in sustainable housing highlights the necessity to align these factors to ensure environmental and human well-being. It would be naïve to expect that sustainable infrastructure would work anywhere without considering personal characteristics of people. It creates a great challenge for policy planners and developers to determine what type of people would live in sustainably designed neighbourhoods. If people do not value the environment and possess a Utilization attitude then the sustainably designed neighbourhood may not satisfy them and thus person-environment congruity may not be achieved.

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