Quality of Life and Compact Development Policies in Bandung, Indonesia

Sigit Dwiananto Arifwidodo · Ranjith Perera

Abstract The study explores whether Quality of Life (QOL) corresponds to the spatial pattern of urban system as a result of compact development policy practice in Bandung city, Indonesia. It examines the connection between QOL and selected attributes of compact development. A self-reported life satisfaction is used as a proxy for QOL based on a cross-sectional survey data from 400 respondents. The analysis shows that the changes in QOL significantly correspond to the change of different attributes of compact development. The result suggests that compact development policies in Bandung have not shown a desirable result in improving QOL of the urban residents. The result also indicates that the implementation of the policy is less beneficial in the context of developing countries. The study strengthens the existing argument that compact development policies need to be tailored to suit the context of developing countries, rather than just be taken for granted from the practices in developed countries.

Keywords Quality of life · Life satisfaction · Spatial planning ·
Compact development · Urban form

Introduction

Efforts to explain QOL have a long history. There has been an explosion of interest in the topic in the last decade, from psychology, medicine, public health, economics, and other disciplines (Easterlin 2001; Fritjers et al. 2004). Costanza et al. (2007)

S. D. Arifwidodo (✉) · R. Perera
Urban Environmental Management Field of Study, Asian Institute of Technology, PO. Box 4,
Klong Luang, Pathumthani 12120, Thailand
e-mail: st104715@ait.ac.th

R. Perera
e-mail: ranjithp@ait.ac.th

described QOL as a general term to represent how well human needs are met or the extent to which individuals or groups perceive satisfaction or dissatisfaction in various life domains. The term has been commonly expressed across multiple disciplines including psychology, medicine, economics, environmental sciences, public health, sociology and urban planning. The importance of QOL in development discourse lies in the question of effective allocation of scarce resources. Given the limited resources, local governments need to find the most efficient way of distributing them in line with the needs and the priorities of people. It is argued that understanding QOL before formulating actions and measures to allocate welfare among society will ensure sustainability of the process, while minimizing externalities (Di Tella et al. 2001). The recent development on the topic also explores on how spatial organization of cities could explain the differences in socioeconomic outcomes and QOL (Cutler and Glaeser 1997; Vemuri and Costanza 2006; Wilson 1987). Although many factors influence QOL, there is a growing conviction among urban and regional policy makers that the character of the built environment is one of them. The relationship of built environment and QOL mainly addresses the economic significance of a spatial structure in the city, despite the fact that improvement of QOL is not necessarily associated with the increase of income of individuals (Easterlin 1995). The broad idea is that a certain spatial arrangement of urban system is able to develop a new source of competitive advantage that will make it easier to plan and develop the city in a sustainable manner, which in turns will significantly improve the QOL of inhabitants. Initiatives in this area are international projects such as Healthy Cities that was started by WHO in late eighties and the Sustainable Cities Programme of UN-HABITAT/UNEP. The development of these efforts include the Millennium Development Goals (MDG), which is to some extent a worldwide attempt to improve QOL of the global population (Ulengin et al. 2001). UNDP has developed Human Development Index (HDI) in order to monitor the development of countries, mainly the improvement of QOL, using three dimensions of human development; a healthy life, knowledge, and a decent standard of living.

Despite the huge interest in the topic, empirical studies still have not reached a consensus on the effect of compact development on QOL. This is because there are many different methods in explaining and testing the existence of spatial factors. It means that different studies employ different definitions, variables and measurement methods, which make it difficult to generalise the findings. Moreover, the lack of similar studies in less developed countries has also raised the question as to whether a spatial pattern of urban system in the cities of developing countries also has similar effects in determining people's QOL Very little work has been done to identify the effects of urban form parameters on QOL with respect to its contextual setting; instead, this dimension of urban form is usually taken for granted as an integral part in advocating compact development. Therefore, the paper aims to explore on whether QOL correspond to the spatial pattern of urban system in the city. In other words, is there a significant relationship between compact development policies in developing countries and urban QOL? The answer to this question can help policy makers to craft better policies towards sustainability.

Compact Development and Quality of Life in the Literature

Different notions have emerged in literature when defining compact development. It usually refers to physical layout and spatial arrangement of the city (Williams 2000). Although there are many definitions available, we define the term as the result of a planning process that aims to increase built area and population densities, to intensify urban economic, social and cultural activities and to manipulate urban environment and structure and settlement systems in pursuit of the environmental, social and global sustainability benefits derived from the concentration of urban functions (Burgess 2000). It is not uncommon in literature to highlight that compact urban form is the ultimate panacea for achieving sustainable development. Based on this reasoning, advocates of compact development underline the importance of intensifying population densities and built environment. It is widely agreed that compact development is ineluctable in improving QOL of urban residents and achieving sustainability (Haughton and Hunter 1994). Many empirical researches (for example see Dawkins and Nelson 2003; Landis 2006; Massam 2002; Pendall 1999; Shen and Zhang 2007) have provided results in favour of compact development policies. These authors argue that compact development improves a city's competitive advantages and liveability. These improvements will in turn improve QOL of urban residents. High-density development improves the government efficiency in financing development and lowers the cost in providing the basic services (Bruegmann 2005; Caruthers and Ulfarsson 2008). Therefore, high-density development is believed to improve QOL better by concentrating residents and creating efficiencies in access and delivery, which can reduce costs and the use of natural resources. This improved efficiency will increase the competitive advantages of the city and in turn, will improve QOL of the urban residents. Policies on encouraging compact development have been evolving with different approaches such as new urbanism and smart growth in the urban planning practices. These approaches argue that urban densification combined with infill development and urban amenities provision would create a liveable city with a high quality of life.

The abovementioned examples highlight the benefit of compact development in improving QOL. However, empirical analyses of this paradigm have produced mixed results over time (for example, see Newman and Kenworthy 1999; Williams 2000). In terms of high-density development, several authors (Bramley and Powers 2009; Dujardin et al. 2008; Mulder et al. 2006) argue that people in the suburbs, in a low-density residential area, where many are in the form of large residential subdivisions with good amenities, are associated with higher QOL. These empirical evidences, which report a direct negative correlation between QOL and density, show that people are associated with higher level of QOL in a low-density sub urban area than in a congested city centre (Frey and Stutzer 2005a,b). Although critics say that low density development take up too much space and may increase driving time and lengthen commuting distances, many urban residents are indeed in favour of such development for better neighbourhood quality and less densely populated areas.

Studies on compact development define key measures differently, use different independent variables, exclude and include different non-physical variables, and rely on different levels of data aggregation, which make it very difficult to generalize the

main parameters to be used to measure compact development (Burton 2000). Furthermore, the empirical evidences that directly link QOL and compact development are scarce. Nevertheless, understanding QOL will certainly benefit cities. For example, a city reputed for its quality of life might find easier to promote its economic development by attracting certain industries or specifically skilled workers. A QOL survey can help policy makers monitor their communities and draft new plans or review existing ones accordingly. Despite the potential, local governments have been slow to embrace the QOL concept. The notorious ambiguity of the concept, its blatant political use, and the technical complexity of scientific research on the topic, all may have dissuaded professional planners from addressing it. Instead, planners have sought QOL improvements largely through separate facets of government activity: transportation, housing, parks, and other elements.

It is important to directly link QOL and compact development approach, especially in the cities of developing countries because the effect of high-density development might be different. Cities in the developing countries are more likely to face problems of managing the impact of intense compact development (as the quality of life dimension) rather than the spatial (sprawl) or energy dimension. For example, Bandung has higher population density than Los Angeles or Sydney, but perform worse in terms of energy consumption. It contradicts with the general understanding in literature that cities with higher density would consume less energy (Newman and Kenworthy 1999). De la Cruz (2009) using Florida as a case study, argues that cities in US where it is already densely populated, smart growth regulation work less effectively and less promoted by local government. These empirical evidences implies that city needs to be planned regarding to its context with respect to its existing social cultural diversity (Sandercock 1997).

QOL also can be seen as a part of a planning support system (PSS), since it is a combination of computer-based methods and models that support the planning functions (Yeh 2008). PSS comprise a whole suite of related information (e.g. GIS, spreadsheets, models and databases) that has different applications in different stages of planning. We argue that QOL can be an important component of PSS to support the decision-making processes. Furthermore, local government should not have doubt regarding data on QOL, since empirical evidences have shown that they are valid and can be used in academic analyses (Di Tella and MacCulloch 2006; Frey et al. 2009). A handful of studies on SWB have furthermore shown that wellbeing is not merely a personal issue, but external conditions such as income, unemployment, environmental quality, social relations and even spatial pattern of development can have strong impact on people's well-being (Clark and Oswald 1994; Easterlin 2001; Powdthavee 2008; Van Praag and Baarsma 2005).

A relatively small body of quantitative empirical studies have attempted to verify and quantify the link between QOL and environmental quality in particular, including the effect of air pollution (Welsch 2006), noise pollution (Van Praag and Baarsma 2005) and climate change (Rehdanz and Maddison 2008). Previous studies have provided similar measurements in establishing the relationship between self-reported well-being and social and environmental aspects of development. For example, there are studies that use different attributes of urban form, such as distance to city centre, urban transportation, and mixed land use variables (MacKerron and Mourato 2009; Rehdanz and Maddison 2008). Bramley and Power (2009) use

density, neighbourhood quality and urban facilities and services to measure social sustainability.

The major implication of exploring the spatial dimension of QOL is that quantitative expansion may be a lesser imperative than qualitative improvement, which represents a core theme of sustainable development (MacKerron and Mourato 2009). By using QOL measurement under the planning support system approach in policy decision-making process, it is argued that we consume less while safeguarding the built and natural environment, similar to what sustainability obliges us to (Bramley and Power 2009). It is because in the end the ultimate goal of a planning activity is to improve the QOL of people with concerning inter- and intra-generational equity and not depleting the natural resources beyond its regenerative capacity (Caruthers and Ulfarsson 2008; Dissart and Deller 2000; Massam 2002; Ulengin et al. 2001). We argue that QOL is one of the many important aspects that affects and is affected by this urban pattern. This study provides the link between QOL and compact development policies practices in developing countries, using Bandung as the case study.

Bandung as the Study Area

The analysis is focused on Bandung, Indonesia. The city is divided into 26 *kecamatan* (sub-district) and 136 *kelurahan* (village). According to socioeconomic census in 2007, the total population of Bandung is 2,296,548 with population density around 138 persons per hectare (Bandung CSA 2008). Presently, Bandung is one of the biggest growth centres in Indonesia with mixed land use and a concentric urban structure. Being one of the national and regional centres of economic, social, political and administrative activities, Bandung has been experiencing dramatic changes in its landscape. Many critical urban issues relating to urbanization such as urban infrastructure and basic service provision, decent housing and settlements, land for housing, are the few of things that urban planning in the city needs to tackle.

In the 1990s, the city implemented planning policies directed to strengthen the city centre, focusing the inner development of the city. The plan argues that improving urban environment through densification and centralised urban activity will reduce the urban problems and improve QOL in the city. The approach in the master plan is later on considered as a mistake and has resulted in many environmental problems in the city (Bandung PDA 2003). Rapid land use changes, unmanageable traffic condition, uncontrolled population growth, and environmental deterioration in the city centre have been some of the externalities that urban planning and management in Bandung have not been able to make adequate response to.

In 2003, there has been an explicit shift of focus in planning policies in the city. Local government tried to reverse previous policies by introducing a new master plan that adopted the compact development approach. The master plan laid stress on controlling development in the city centre and spreading the development into the other parts of the city. The argument is that providing new urban centres will increase the compactness of the city. To channel urban activities and leverage

environmental burden in the city centre, this master plan divided Bandung into six areas of growth and established six secondary urban centres and one new primary urban centre on the east side of the city (Fig. 1).

In 2007, local government claimed that the city has undergone the structural changes in terms of the urban form; that Bandung has evolved from a concentric city into a multiple nuclei model of a city, with total eight urban centres. Accordingly, Bandung as a case study represents the current typical conditions of development practices, especially in a developing country. The findings from the study can, to some extent, be generalised to understand what is the current status of development process in the cities of developing countries, especially in Asian cities.

Research Method

The analysis performed in this study uses QOL (measured as the life satisfaction variable) as the dependent variable. The way QOL is measured is important for the empirical analysis of this paper, because it directly influences the results. We adopt comprehensive measures of satisfaction using ordinal scale from 1 to 5, which are commonly used in the recent studies in QOL and happiness (Veenhoven 2006; Cummins et al. 2007; Powdthavee 2008; Moro et al. 2008). Although there are still ongoing debates on the subject, in this regard, however, there is a broad consensus among studies that a self-reported wellbeing is a satisfactory empirical proxy for measuring individual QOL (Layard 2006; Moro et al. 2008). In this study, we conduct an area sampling for survey questionnaire, which asks 400 randomly
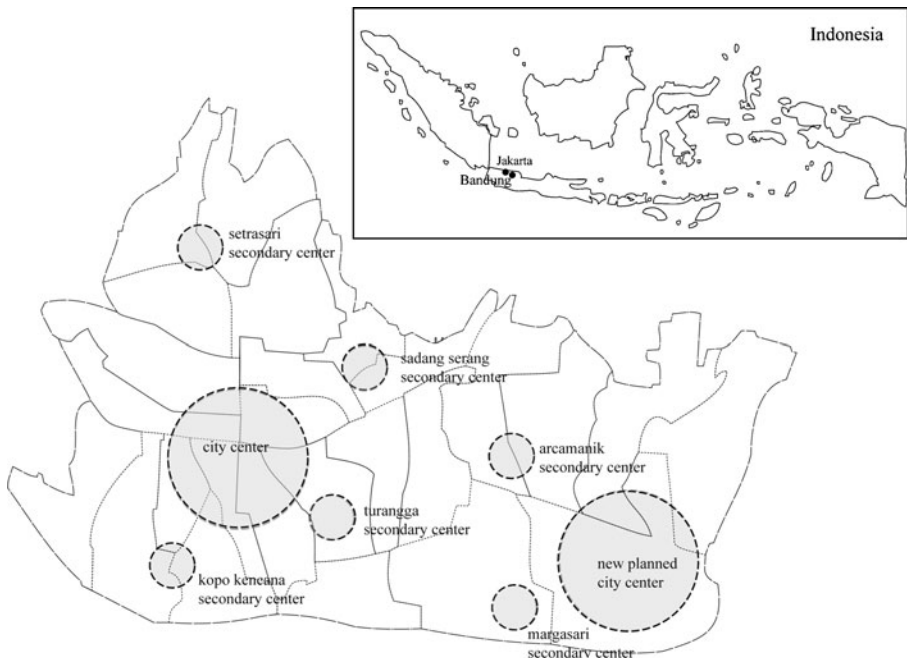

Fig. 1 National, regional, and local setting of Bandung city

selected individuals to answer a question: "How dissatisfied or satisfied are you with your life overall?" with possible categories ranging from "1. Very dissatisfied" to "5. Very satisfied". A Diagram summarizing the methods used in this study is presented in Fig. 2.

Attributes of Compact Development Chosen for Analysis

In linking QOL to compact development, the study selects several attributes of urban form, which are considered important in the literature (for example, see Burton 2000). We combine the attributes from literature on both compact development and urban sprawl (for example, Shen and Zhang 2007; Ewing and Rong 2008; Meijers 2008), which are the widely acknowledged as important attributes in explaining urban form. We select the quantitative and qualitative urban form attributes, which represented the compact development policy foci in Bandung. These attributes include density, urban facilities, and distance to city centre and neighbourhood quality.

It must be noted that there are some limitations in the selection of attributes to define compact development in this analysis. It is realized that there are other important attributes to explain the term urban form. Nevertheless, we argue that the selection of attributes is appropriate for the following reasons. First is because they represented the implementation of planning policies and QOL improvement efforts in Bandung. Second, there are also a handful of empirical studies confirming the
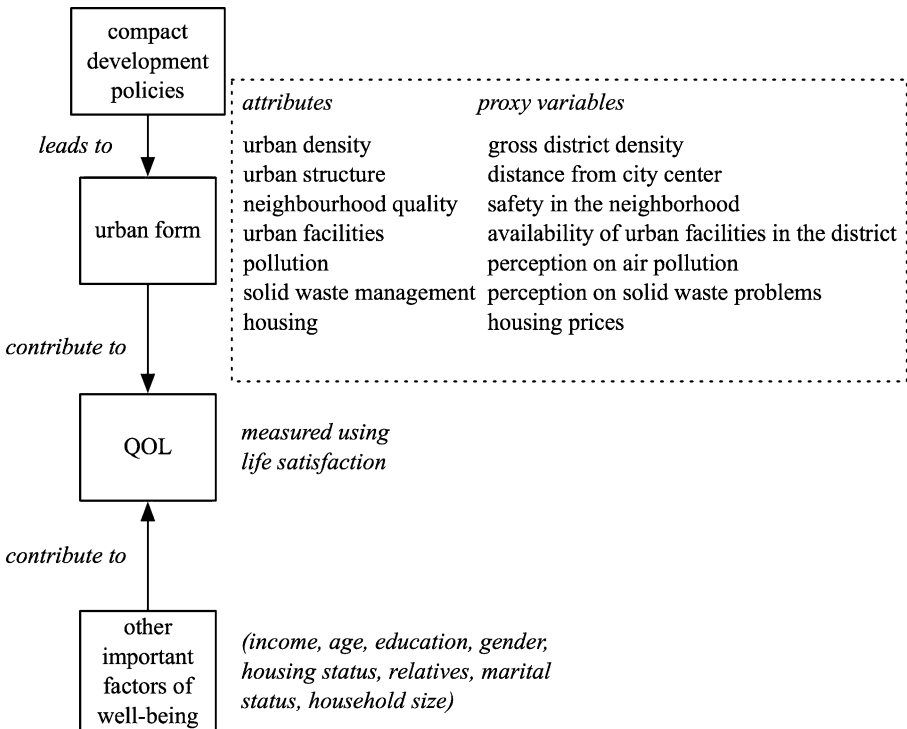

Fig. 2 Methods linking QOL and compact development policies in Bandung

importance of these attributes. Third, These attributes have the appropriate data at the *kecamatan* (sub-district) level, which is the unit of analysis. Most of the data related to urban form in Bandung are at the city level, which make it impossible to be used at the micro-level analysis (using individual data from the survey). For example, it is not possible to obtain the degree of mixed land use for each sub-district because the nature of mixed land use in the city of Bandung. It is not also possible to obtain data on the job opportunities for each sub-district, since the data are available only at the city level. Therefore, several attributes of urban form are not possible to be included from analysis.

a. Density

Density is the most commonly used proxy in measuring urban form (Bramley and Power 2009). Density is measured using a proxy of gross district population density. Although there are other better proxies, data corresponding to these proxies are not available in Bandung. For example, it is not possible to use the net residential density (habitable rooms/hectare) as a proxy since secondary data are not available. It is also impossible to use primary data from the survey since the data are correlated to gross-district density and made the model unspecified. Another good proxy for density, net district density (the ratio of built area and un-built area in the city) is dropped from the analysis for similar reason.

In Bandung, urban densification is an important feature in urban planning policies. Master plan 2013 has put emphasis on the urban densification and controlling a new development in the city centre. The master plan laid stress on controlling development in the city centre and spreading the development into the other parts of the city. The argument is that providing new urban centres would increase the compactness of the city. Local government limited the new developments in the city centre and encouraged the development in the urban fringe area. We argue that density is less beneficial to Bandung, since the gross population density is already high (more than 138 person per hectare). Furthermore, the urban densification policies in Bandung are not integrated with policies in other sectors. For example, it does not integrate with the transport sector policies, where literature points out as an important part in achieving a more compact urban form. Therefore, we expect that this variable will show a negative association with QOL. The data on gross district density is obtained from the socioeconomic survey of 2007. The basic unit of analysis for the data is the district level. We choose to use district level data as a proxy, since the dependent variable (QOL survey) uses the district as a basis for survey. The other reason is that it is the only smallest unit of data available in the city.

b. Distance to city centre

Distance to city centre is defined as the distance from the respondents' house to the city centre, i.e. Central Business District (CBD). This variable is included because of the broad perceptions that city centre is associated with many urban problems (Day, 2007). In Bandung, this attribute represents the current structure of the city. Bandung is claimed to be a city with multiple urban centres by the local government. The establishment of secondary urban centres is claimed will increase the compactness of the city. It is also argued that secondary urban centres will channel urban activities and leverage environmental burden in the

city centre. The establishment of secondary urban centres are emphasized in master plan 2013 and included as one of the policy objectives of long-term development plan 2025.

We argue that the establishment of secondary centres, including a new city centre on the east side of the city does not affect the QOL improvement of the urban residents in Bandung. This is because the secondary centres are not supported by the improvement of infrastructure. For example, the accessibility of public transportation in these centres is not improved, and the road improvement projects in these areas are delayed due to bureaucratic procedures.

We choose to measure the distance of respondents' home from city centre instead of the nearest secondary urban centre, because we want to know whether the city is still dependent on its CBD. We argue that Bandung is still a concentric city, contrary to the claim from the local planning agency. We also argue that the city centre still plays important roles in improving QOL of the urban residents, since the employment opportunities are still agglomerated in the city centre. We expect that this variable is significant and positively associated with QOL. We calculate the distance of the respondent's location to city centre in the city using its geocoded address to create a dummy variable on proximity to urban centre. There are four different distances used as proxies: in the city centre, less than 2 km, 2–4 km, 4–8 km and more than 8 km. The proxies are chosen according to the recent master plan, stating that the Central Business District (CBD) covers only around less than 2 km in radius (Bandung PDA 2003). This is why the city needed to establish secondary urban centres.

c. Quality of Neighbourhood

Quality of neighbourhood is included as a proxy for urban form because it represents the general environmental quality of the city. It also represents one of the important features of compact city (Neuman 2009). In Bandung, neighbourhood quality represents the social aspect of sustainability agenda of local government. Long-term development plan 2025 states that the local government needs to reduce the number of slums, especially in the city centre, while on the other hand, encourage the residential development in the urban fringe area. Master plan 2013 also states that the improvement of neighbourhood quality will eventually lead to the improvement of QOL. We argue that such strategies will lead to worsening urban QOL. We echo the argument of Bramley and Power (2009) that compact development policies and urban densification in Bandung worsen neighbourhood problems and lowered QOL, while improving access to urban services. In other words, the variable also serves as a control variable for density. It is expected that high quality of neighbourhood would mean the neighbourhood had a low population density.

In the analysis, we use safety in the neighbourhood as a proxy to measure the quality of neighbourhood, instead of asking the respondents to rate their satisfaction to their neighbourhood quality. This proxy is used to avoid tautological use of life satisfaction variables, for the respondents may not be able to distinguish between the life dimension and the neighbourhood dimension but rather evaluate their satisfaction as a whole. Robin et al. (2007) use the similar variable in measuring perceived environmental annoyances in urban areas in France. Pacione (2003) also uses safety in the neighbourhood to assess

the liveability of community in urban areas in Scotland, and found this variable has significant contribution in explaining environmental quality.

d.   Urban Facilities

Urban facilities variable is included in the analysis because it represents one of the planning policy foci in Bandung. It also represents the importance of qualitative attributes of urban form, namely urban amenities (i.e. urban open spaces, museums, public library, etc.) It is decided to include only two urban facilities (hospitals and schools) in the analysis. The main reason is the unavailability of data in the *kecamatan* level. We argue that the availability of these critical urban facilities also represent the availability of other secondary urban amenities in the city. The assumption is that if these facilities are not available in the district then the other secondary amenities (museums, library, cinema, parks) also are not available.

We make an inventory of the presence of two critical urban facilities, namely schools and health facilities. The data refer to number of facilities available in the districts and are obtained from a wide variety of sources. To reduce multicolinearity in the estimates, these data then are combined via principal component analysis into one factor that represents index of urban amenities. The factor is normalized using standardized z score.

e.   Other Control Variables

The study also includes several other variables in respect to both compact development and QOL. Housing price variable is included and calculated using a proxy of land and building tax paid by the respondents last year multiplied by a coefficient factor from the Land and Building Tax Law (100% for housing less than 1 billion IDR and 200% for housing the same or more than 1 billion IDR). To capture the importance of public transportation aspect in the model, the study creates a dummy variable whether the respondent travels using public transport in the past week, with one is coded as using public transport and zero if the respondents never use public transportation. The study also includes air pollution, because using density in the cities of developing countries might also capture the air pollution level in the city. This variable is measured by using only perception data, not real pollution exposures. This option is used because it is more intuitive to use a single proxy for pollution, since people may tend to care only about air quality in general and they may not be concerned with different particular type of pollutants (Rehdanz and Maddison 2008; Yusuf and Resosudarmo 2009).

The study also includes socioeconomic characteristics of the respondents such as income, education, and other personal traits as these are considered important in determining QOL. On the other hand, it is not possible to include all variables that ideally need to be entered since the number of observation is considerably small, while other variables have to be dropped for collinearity. For example, health variable is not included (respondent rates their own health, with one is coded for very good, good, fair, and zero for bad and very bad) since very few respondents identify themselves with poor health. The similar case happens with unemployment. Many respondents consider that they are employed, therefore the variable have to be dropped. When omitting variables, the variables are checked that they are not statistically significant when included separately in the model.

Survey and Data Analysis

The empirical analysis in this paper is based on two data sets, which differs with respect to the level of aggregation. The first data set is extracted from the 2007 socioeconomic census carried out by Local Bureau of Statistics (*Biro Pusat Statistik Bandung*), which has the basic statistical unit *kecamatan* (sub-district). The second data set is obtained from a survey conducted for 400 respondents in Bandung. The respondents chosen for the survey are adults and residing in the city of Bandung. The data provide the overall QOL each individual measured with one cross sectional question on personal life satisfaction. The smallest spatial unit for which the statistical data are usually available is *Kecamatan,* an equal to sub-district level with around 60,000 inhabitants. The budget of the research is the main factor that dictated the sample size. In fact, in a big and heterogeneous city like Bandung, the size of the sample must be much larger. Therefore, to reduce the impact of such drawback, the sample is chosen using stratified random sampling with *kecamatan* as the unit of analysis. The study obtains the list of registered households and their addresses from the *kecamatan* office as a sample frame, and randomly selects the respondents proportionally based on the number of population in each *kecamatan.*

This study uses an ordered-probit and ordinary least square (OLS) linear regression model to analyse the relationship between selected attributes of urban form and their influence on QOL, as can be seen in Eqs. 1 and 2.

$$Si = a_i + \sum_{n=1}^{N} b_{ni}.X_{ni} + u_i \tag{1}$$

$$\Pr(S_i = l) = \Phi\left(\mu_{l+1} - \sum_{n=1}^{N} b_{ni}x_{ni}\right) - \Phi\left(\mu_l - \sum_{n=1}^{N} b_{ni}x_{ni}\right) \tag{2}$$
$$\mu_0 = -\infty, \mu_0 = 0, \mu_j = \infty$$

Where b_{ni} is the regression coefficient, X_{ni} are N selected variables, including urban form variables, policy variables, and socioeconomic and personal characteristics and u_i is a random error term. Using this model, the direct and indirect effects of urban planning policies are investigated. In summary, QOL is seen as a function of attributes of compact development, control variables and socioeconomic and personal characteristics of an individual. The basic regressions that are estimated based on the above equations are of the form:

Life Satisfaction$_i$ = f (compact development attributes$_i$, control variables, socioeconomic and personal characteristics$_i$)

Since the QOL scale cannot be assumed cardinal, the ordered-probit model is usually used in the analysis. On the other hand, as several researches (Ferrer-i-carbonell and Fritjers 2004; Moro et al. 2008) have noted, the differences between OLS and ordered-probit estimates are negligible, and furthermore the coefficients from ordered response model and OLS usually have the same sign and roughly the same trade-offs. The result from both models is compared to confirm the analysis. The data used in the analysis are weighted to account for different probabilities and

survey response. Finally, because the estimates combine data at different levels of disaggregation (individual, village and sub-district), the standard errors in all estimates are corrected for clustering (Moulton 1990).

Linking Urban Form with Quality of Life: Empirical Findings

The sample appears biased towards the middle age, educated and relatively higher income group. The original data on household monthly income are in the range of 1,000,000–5,000,000 IDR, which are slightly different to the average income obtained from socioeconomic survey of 2007 (711,138 IDR). In terms of education, most of the respondents (70.8%) have graduated from high school. Table 1 shows the socio-demographic characteristics of respondents, compared to the socio-economic survey in 2007.

Table 2 summarizes variables used for the analysis. The location of the respondents are distributed throughout the city, with 59% of the respondents are located less than 2 km from the city centre. The original data on health and education facilities show that most of the facilities are located in the city centre and its vicinity. This is due to the high number of population in the area.

Table 3 presents the cross sectional QOL satisfaction in the city of Bandung. The data show that more than 50% of the respondents are satisfied with their life in general.

Table 4 summarizes results of the regression analysis. In general, both estimates show similar results and consistency, as it has been noted in the aforementioned section. For further analysis, the coefficients on the OLS model are used to assess the magnitude of the independent variables' effect, since it provides a more direct and straightforward interpretation of the result. Several major findings emerge from the analysis.

Table 1 Socio-demographic characteristics of respondents

	This survey	Socio-economic survey (2007)
Date	2008	2005/2006
Age		
19–29	Average: 36.7 years old	29%
30–39		25%
40–49		22%
50–59		13%
60+		11%
Education		
Below high school	29.2%	56%
High school level +	70.8%	44%
Gross household income		
0–1,000,000	17.5%	711,138 IDR
1,000,000–5,000,000	36.8%	
5,000,000–10,000,000	34.5%	
10,000,000 +	11.2%	

Table 2 Description of variables used in the analysis

	Variable	Definition	Mean (std. dev.)	% of 1s
1	Age	Respondent's age	36.17 (12.88)	
2	Air	1 if respondent rated air pollution in the neighbourhood as 3, 4, or 5 on a scale 1–5, where 1 is no problem at all, 0 otherwise		19.8
3	Density	Gross district density, in square km	16,723 (7731.182)	
4	Distance	1 if respondent lives in the city centre, 0 otherwise		21.8
5	Education	1 if respondent has graduated from high school, 0 otherwise		70.8
6	Gender	1 if respondent is female, 0 otherwise		23.5
7	HHsize	The number of person lives in the household	5 (2)	
8	Hospital	The number of hospital available in the district	1.095 (1.303)	
9	Houseprice	Housing price, in million Indonesian Rupiah (IDR), calculated as of land and building tax paid by the respondents last year multiply by a coefficient factor from the Land and Building Tax Law (100% for housing less than 1 billion IDR and 200% for housing the same or more than 1 billion IDR)	131.3 (95.40)	
10	Housestat	1 if a member of the respondent's household owns the house, 0 otherwise		56.5
11	Income	Respondent's gross individual income, in million IDR, calculated as gross household income divided by a household size equivalence factor $(a+0.7c)^{0.5}$, a being the number of adults and c the number of children in the household, following MacKerron and Mourato (2009) Gross household income was calculated as the mid-point of the selected income bracket	2.868 (2.072)	
12	Married	1 if respondent is married, 0 otherwise		69
13	Neighbour	1 if respondent rated safety in the neighborhood as 3, 4 or 5 on a scale 1–5, where 1 is no problem at all		78.2
14	Relatives	1 if respondent meet or speak to relative outside the household at least once in a week, 0 otherwise		5
15	School	The number of schools (from elementary to high school) in the district	75.66 (20.516)	
16	Solidwaste	1 if respondent rated solid waste problem in the neighbourhood as 3, 4 or 5 on a scale 1–5, where 1 is no problem at all		46.2
17	UrbFac	The factor score of the result from principal component analysis of school and hospital	0 (1)	
18	UrbTrans	1 if respondent travels using public transport in the past week, 0 otherwise		6
	Visitpark	1 if respondent visited public park in the past week, 0 otherwise		55.8

The results from both models show that several independent variables significantly contribute to the condition of respondents' QOL. The low value of R square is not uncommon in QOL regression model, since there are so many variables influencing QOL, and it is impossible to include all the important variables in a

Table 3 Descriptive statistics on QOL

QOL	Men	Women	Age under 21	Age 21–50	Age 51 or more	All
Very dissatisfied	4.7	8.2	10.9	5.64	4.6	6.0
Dissatisfied	25.7	27.2	21.8	26.3	29.2	26.2
Neither nor	30.8	34.0	38.2	33.2	21.5	32.0
Satisfied	28.9	23.8	16.4	26.6	38.5	27.0
Very Satisfied	9.9	6.8	12.7	8.33	6.2	8.8

The figure represents proportion (%). $n=400$

single model (MacKerron and Mourato 2009). Nevertheless, R square produced in this paper is still in the range of existing QOL researches. Given the objective of the paper, the finding suggests that the selected attributes of compact development are of significance for explaining the condition of QOL. In both of the estimates, quality of

Table 4 Estimated parameters for QOL regression: ordered probit and OLS

Variable	Ordered-probit		OLS	
	Coefficient	Std. Error	Coefficient	Std. Error
Income	.001**	.0005	0.001**	.000
Education	−.457***	.1246	−.426***	.113
Air	−.082	.0543	−.077	.049
Density	−3.892E-6	7.0253E-6	−3.623E-6	.000
Married	.763*	.3881	.652*	.342
Solidwaste	−.051	.0367	−.049	.034
Neighbour	.284**	.1320	.264**	.120
Distance	.230*	.1361	.205*	.124
UrbTrans	−.198	.2250	−.195	.207
UrbFac	.251**	.1153	.224**	.105
Houseprice	.003**	.0002	.003**	.000
HHsize	−.149	.1179	−.131	.108
Relatives	.208	.1317	.183	.120
Gender	.143	.1150	.122	.105
Visitpark	.014	.0572	.006	.052
Housestat	−.005	.0045	−.001	.074
Age	.002	.0805	.005	.004
N	400		400	
Log pseudo-L	−548.705			
Wald x2	48.387***			
F			2.999***	
Adjusted $R2$			0.080	

$*p<0.1$, $**p<0.05$, $***p<0.001$

neighbourhood, urban facilities and distance to urban centre show positive correlation. The result also clearly indicates that income is one of the most important variables. While this is not surprising, one possible explanation is that per capita income in Bandung is below the per capita income in the previous researches that are conducted in developed countries. The widely acknowledged argument about the relationship of life satisfaction and income states that once the individual has risen from a subsistence level or above a poverty line, the main attributes to improve QOL is not income, but rather friends and a good family life (Costanza et al. 2007). This subsistence level can be as low as 10,000 USD per annum, as argued by Frey and Stutzer (2002) and McMahon (2006). It can also be inferred that economic growth is still the main determinant in the development paradigm in the city. Education, which also appears significant in the model, seems to be the most important variable in repressing QOL. The model shows that people with higher education are associated with lower QOL. One plausible explanation is that education raises expectation; therefore a comparison effect happens, where highly educated people have higher QOL expectation, which lowers the actual condition of QOL (Clark and Oswald 1996). As expected, availability of urban facilities is positively and significantly associated with self-rated QOL. Respondents with higher QOL are located where the higher number urban facilities are present in the district. The model confirms the argument that urban facilities, especially the important and critical ones have a significant influence towards QOL, assuming that there is an equal opportunity in accessing those facilities.

The study shows that QOL is positively associated with the urban centre ($p<0.1$). This variable needs to be interpreted carefully. The significance of this variable is probably due to the availability of urban facilities in the city centre. It does not mean that people in the city centre is considerably happier than people in the suburbs. But the high value of the variable is mostly because the availability of amenities and urban facilities in the city centre. This argument is strengthened by the fact that the housing price variable (which also serves as control variable for the distance and density) is also significant and negatively influences QOL. It means that people prefer to live in a less dense area. But the facts that in the less dense area urban facilities (and job opportunities) are scarce, they prefer to live in the city centre despite the degrading environmental condition. This finding shows a contradiction with the general understanding that environmental problems in the city are always associated with city centre (Burgess 2000). This may mean two things. First, it can be inferred that the city centre in Bandung still plays an important role in urban development. It means that most urban activities, opportunities and amenities are still agglomerated in the city centre, despite its degrading environmental condition. A plausible explanation is that there has been a persistent spatial distribution of such agglomeration for quite a long time due to the employment concentrations and fixed infrastructure investment pattern in the central business district (Redfearn 2009). Secondly, it can also be inferred that despite local government's efforts to establish secondary urban centres, the absence of infrastructure provision in these secondary centres might have been one of the reasons why many investors are reluctant to move their commercial activities from the city centre.

The fact that air pollution and solid waste problem are insignificant in the model is probably due to the following reasons. One is that the subjective measure of

pollution is equivalent with the measurement of QOL. It is worth noting that air pollution and solid waste problem are negatively correlated with self reported QOL, meaning that both variables lower QOL condition. The other is that most people are adept to environmental conditions through the maintenance of established life routines that make their daily experiences with environmental problems are manageable (Cummins et al. 2003). Urban transportation variable is not significant, although it is an important feature in the urban form, especially in promoting compact development. This is because Bandung does not have an efficient public transportation system. The main public transportation means in Bandung is called *angkot*, which is a small bus, which operates through a fixed route. The difference is that it does not have a formal *angkot* stop; meaning passengers can stop almost anywhere they want along the route. This kind of public transportation system is considered as one of the main causes of the traffic congestion in the city (Bandung PDA 2003).

Gross district density variable is insignificant in the model. The insignificance of this variable is probably because urban densification in the city is not supported by improvement of infrastructures and amenities, such as an efficient public transportation system, as aforementioned. The finding similar to Newman and Kenworthy (1999) who suggest that high-density development is one of the solutions to the problems faced in wealthy developed nations especially those with high automobile dependence and that Asian cities have little to gain from such development approach. Furthermore, density increases will be best achieved if development areas are located in well-served public transportation (Petersen 2002). The finding also shows that the merits of urban densification, which advocated as an important factor in urban development paradigm, are less beneficial in the context of Bandung.

The housing price variable reflects the value of neighbourhood quality, which is also significant in the model. The significance of the variable shows that most people in the city prefers to live in the less dense area. This finding is not uncommon in the empirical studies of QOL and housing price (for example, see Newman and Kenworthy 1999; Bramley and Power 2009). However, due to the lack of availability of urban facilities in the urban fringe, as suggested by the urban facilities variables, people have two choices: move to urban centers to be close with those urban facilities or commute. In Bandung, where urban facilities, amenities and opportunities are located mostly in city centre, both choices bring negative impacts to the urban environments (i.e. traffic congestion, more crowded and polluted city centre). This finding also implies that wealthier household can buy good public services by purchasing houses in areas with good services, which usually is in the form of low-density residential housing. This type of housing development mostly happens in the fringe areas of Bandung (Bandung PDA 2003). Table 5 shows the increasing number of low residential housing development in Bandung. This development would generally require higher energy consumption for transportation, which means that urban densification, which aims to reduce energy consumption, has have not been successful to achieve its purpose.

Neighbourhood quality (using the safety in the neighbourhood as a proxy) shows significant relationship with QOL. In fact, the coefficients of perception of neighbourhood quality account to a significant importance in explaining QOL. Respondents with higher QOL are associated with high satisfaction towards their

Table 5 The number of low residential housing development in Bandung (1981–2006)

Period	Number of houses built	Area	
		Corresponding period	Cumulative
1981–1990	8,829	783.00	1,022.00
1991–2000	1,6743	5,213.00	6,235.00
2001–2006	3,285	519.00	6,745.00

Permana 2009

neighbourhood and vice versa. The finding implies that the respondents with higher income (and also with higher housing price) will live in a better neighbourhood. Consistent with the significance of housing price variable, it means that the spatial structure of the city suggests that there is an indication of residential segregation in the population. It is not an uncommon pattern, especially where opportunities and amenities are still centralised in the urban centre (Selod and Zenou 2006). While this finding needs further research using more sophisticated methods to confirm it, the development pattern in Bandung supports the idea, and local government needs to mitigate this trends.

In reviewing the abovementioned findings, it appears that there is a connection between QOL and compact development. QOL in Bandung is found correlates with many of the determinants of compact development, but shows different importance. For example, the distance to the city centre is found positively significant, when the city should be less depending to its centre because of the establishment of secondary urban centres. While on the other hand, several other important determinants of compact development such as public transportation, density, air pollution, and solid waste problem are insignificant in the model. The result shows that urban densification in Bandung has not shown a desirable result and proves to lower QOL of the urban residents. The result of the analysis indicates that the compact development, as advocated for the cities in developed countries, is less beneficial in the context of Bandung. Therefore, instead of continuing the implementation of urban densification policy, local government should put more emphasis on other important attributes such as basic services and urban facilities provision, and controlling densification in the city. These measures could avoid the worsening environmental condition in the city centre and could distribute urban activities to the other parts of the city.

Concluding Remarks

The paper explores a basic question: do compact development policies implementation in Bandung, Indonesia have a significant effect in determining people's QOL? The study uses OLS and ordered-probit regression to establish a correlation between QOL and selected compact development attributes. The finding suggests that there is no definite answer; some compact development attributes appear to have positive effects, while other attributes shows negative effects and less beneficial. Although

the findings cannot yet be generalised with confidence, mainly because the sample is not demographically representing the population of Bandung, the result could plausibly represent a significant lower bound on the effect of compact development to QOL. In other words, the effect of compact development policies to the whole population of Bandung, which has lower socioeconomic status, could be more severe compared to what the study has found.

The wider significance of the study is that it strengthen the existing argument that compact development policies need to be tailored to suit the context of developing countries, rather than just be taken for granted from the practices in developed countries. The finding shows that in order to generate a reliable basis for the conception of a compact city, empirical evidences should be focusing on many aspects, from energy efficiency, transportation to quality of life. Understanding the process of building cities and the processes of living, consuming, and producing in cities is more desirable because different cities are formed by different factors such as topography, history, demography and socioeconomic condition, which need different solutions when it comes to a question of a sustainable urban form (Frey 1999; Neuman 2005). It is more important to consider whether the process of building cities and the process of living, consuming, and producing in cities are sustainable (Sandercock 2000; Neuman 2005). The attempt to attain the sustainability via physical means alone is not appropriate. Using QOL concept, city is envisioned as the manifestation of many co-evolutionary processes: between the city and its inhabitants and between the city and its environments.

Local government argues that pursuing compact form would impart significant advantages. This includes lower land consumption, cheaper infrastructure and utility costs, and resources protection. This argument needs to be revised since recent development of the discourse of compact form has shifted into a more livable city than just pursuing an efficient physical urban system. Following this argument, the measures of QOL can be seen as a subset of planning support system that can be applied in the decision-making processes. This study also supports the argument that people evaluate their consumption levels relative to other people consumption and to their own consumption in the past. In other words, the result of this study represents a proof that it is possible to achieve a high (and a more sustainable) QOL while consuming at fewer rates than in the past. Successful implementations of using QOL as a part of planning support system are found in many cities in Europe such as Randstand, Holland and Singapore (Dijst 2000). A recent successful experience in adopting QOL in the national level development is shown by Bhutan, with its Gross National Happiness (GNH) index. Therefore, Planning and designing city like Bandung necessitates the formulation of a series of documents and guidelines that will inform urban development and ensure the cities to remain vibrant and attractively developed as conceived. By incorporating QOL design strategies can help achieve the city's vision to be the sustainable, livable, attractive and prosperous areas by residents, business and visitors.

It needs to be mentioned that the analysis presented is subject to important limitations. Because of data limitations, this study could not account for some factors that might confound the relationship between compact development and QOL. For example it is difficult to capture the differences in housing type to explain the quality of neighbourhood. This is an important factor, since neighbourhood quality is also

influenced by housing type (Mulder et al. 2006), and due to the leapfrog development pattern in the city, it is important to understand the impact of residential segregation in the city to QOL of inhabitants as a whole. Many theoretical and empirical works still need to be done to understand the spatial aspects of QOL and compact development. Investigation on the matters may reveal different patterns and broaden the current discourse of sustainable cities.

References

Bandung CSA. (2008). *Bandung in figures 2008*. Bandung: Central Statistic Agency of Bandung City.

Bandung PDA. (2003). *Bandung city master plan 2003–2013*. Bandung: Planning and Development Agency of Bandung City.

Bramley, G., & Power, S. (2009). Urban form and social sustainability: the role of density and housing. *Environment and Planning B: Planning and Design, 36*, 30–48.

Bruegmann, R. (2005). *Sprawl: A compact history*. Chicago: University of Chicago Press.

Burgess, R. (2000). The compact city debate: A global perspective. In M. Jenks & R. Burgess (Eds.), *Compact cities: Sustainable urban forms for developing countries* (pp. 9–24). London: Spon.

Burton, E. (2000). The compact city: just or just compact? A preliminary analysis. *Urban Studies, 37*(11), 1969–2006.

Caruthers, J. I., & Ulfarsson, G. F. (2008). Does smart growth matter to public finance? *Urban Studies, 45*(9), 1791–1823.

Clark, A. E., & Oswald, A. J. (1994). Unhappiness and unemployment. *Economic Journal, 104*, 648–659.

Clark, A. E., & Oswald, A. J. (1996). Satisfaction and comparison income. *Journal of Public Economics, 61*(3), 359–381.

Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., et al. (2007). Quality of life: an approach integrating opportunities, human needs, and subjective well-being. *Ecological Economics, 61*, 267–276.

Cummins, R. A., Eckersley, R., Pallant, J., van Vugt, J., & Misajon, R. (2003). Developing a national index of subjective wellbeing: the Australian unity wellbeing index. *Social Indicators Research, 64*(2), 159–190.

Cummins, R. A., Walter, W., & Woerner, J. (2007). *Australian unity well-being index: Report 16.1—The well-being of Australians—Groups with the highest and lowest well-being in Australia*. Melbourne: Australian Centre on Quality of Life, School of Psychology, Deakin University.

Cutler, D., & Glaeser, E. L. (1997). Are ghettos good or bad? *Quarterly Journal of Economics, 112*, 827–872.

Dawkins, C. J., & Nelson, A. C. (2003). State growth management programs and central city revitalization. *Journal of the American Planning Association, 72*(1), 19–31.

Day, R. (2007). Place and the experience of air quality. *Health and Place, 13*, 249–260.

De La Cruz, E. E. R. (2009). Local political institutions and smart growth: An empirical study of the politics of compact development. *Urban Affairs Review, 45*(2), 218–246.

Dijst, M. V. (2000). Compact urban policies in Randstand Holland. In G. D. Roo & D. Miller (Eds.), *Compact cities and sustainable development: A critical assessment of policies and plans from an international perspective*. Hampshire: Ashgate.

Dissart, J. C., & Deller, S. C. (2000). Quality of life in the planning literature. *Journal of Planning Literature, 15*, 135–159.

Di Tella, R., & MacCulloch, R. J. (2006). Some uses of happiness data in economics. *Journal of Economic Perspectives, 20*(1), 25–46.

Di Tella, R., MacCulloch, R. J., & Oswald, A. J. (2001). Preferences over inflation and unemployment: evidence from surveys of happiness. *American Economic Review, 91*, 335–341.

Dujardin, C., Selod, H., & Thomas, I. (2008). Residential segregation and unemployment: the case of Brussels. *Urban Studies, 45*(1), 89–113.

Easterlin, R. E. (1995). Will raising the income of all increase the happiness of all? *Journal of Economic Behaviour and Organization, 27*, 342–353.

Easterlin, R. A. (2001). Income and happiness: towards a unified theory. *Economic Journal, 111*, 465–484.

Ewing, R., & Rong, F. (2008). The impact of urban form on U.S. residential energy use. *Housing Policy Debate, 19*(1), 1–30.

Ferrer-i-carbonell, A., & Fritjers, P. (2004). How important is methodology for the estimates of the determinants of happiness? *Ecological Economics, 60*(3), 509–516.

Frey, H. (1999). *Designing the city: Towards a more sustainable urban form*. London: E. & F. N. Spon.

Frey, B. S., & Stutzer, A. (2002). What can economists learn from happiness research? *Journal of Economic Literature, 40*, 402–435.

Frey, B., & Stutzer, A. (2005a). Happiness research: state and prospects. *Review of Social Economy, 62*(2), 207–228.

Frey, B. S., & Stutzer, A. (2005b). Stress that doesn't pay: the commuting paradox. *Review of Social Economy, 62*(2), 207–228.

Frey, B. S., Luechinger, S., & Stutzer, A. (2009). The life satisfaction approach to valuing public goods: the case of terrorism. *Public Choice, 138*, 317–345.

Fritjers, P., Haisken-DeNew, J. P., & Shields, M. A. (2004). Money does matter! Evidence from increasing real incomes and life satisfaction in East Germany following reunification. *American Economic Review, 94*, 730–740.

Haughton, G., & Hunter, C. (1994). *Sustainable Cities*. London: Jessica Kingsley.

Landis, J. D. (2006). Growth management revisited. *Journal of the American Planning Association, 72*(4), 411–430.

Layard, R. (2006). Happiness and public policy: a challenge to the orofession. *Economic Journal, 116* (510), C24–C33.

MacKerron, G., & Mourato, S. (2009). Life satisfaction and air quality in London. *Ecological Economics, 68*(5), 1441–1453.

Massam, B. H. (2002). Quality of life: public planning and private living. *Progress in Planning, 58*, 141–227.

McMahon, D. M. (2006). *Happiness: A history*. New York: Atlantic Monthly.

Meijers, E. (2008). Summing small cities does not make a large City: Polycentric urban regions and the provision of cultural, leisure and sport amenities. *Urban Studies, 45*(11), 2323–2342.

Moro, M., Brereton, F., Ferreira, S. J., & Clinch, P. (2008). Ranaking quality of life using subjective well-being data. *Ecological Economics, 65*, 448–460.

Moulton, B. R. (1990). An illustration of a pitfall in estimating the effects of aggregate variables on micro units. *Review of Economics and Statistics, 72*(2), 334–338.

Mulder, K., Constanza, R., & Erickson, J. (2006). The contribution of built, human, social and natural capital to quality of life in intentional and unintentional communities. *Ecological Economics, 59*, 13–23.

Neuman, M. (2005). The compact city fallacy. *Journal of Planning Education and Research, 25*(11), 11–26.

Neuman, M. (2009). The compact city fallacy. *Journal of Planning Education and Research, 25*(1), 1–26.

Newman, P., & Kenworthy, J. (1999). *Sustainability and cities: Overcoming automobile dependence*. Washington D.C.: Island.

Pacione, M. (2003). Urban environmental quality and human wellbeing—a social geographical perspective. *Landscape and Urban Planning, 65*(1–2), 19–30.

Pendall, R. (1999). Do land use controls cause sprawl? *Environment and Planning B, 26*, 555–571.

Petersen, R. (2002). *Land use planning and urban transport. A sourcebook for policy-makers in developing cities*. Eshborn: GTZ.

Powdthavee, N. (2008). Putting a price tag on friends, relatives, and neighbours: using surveys of life satisfaction to value social relationships. *The Journal of Socio-Economics, 37*(4), 1459–1480.

Redfearn, C. L. (2009). Persistence in urban form: the long-run durability of employment centers in metropolitan areas. *Regional Science and Urban Economics, 39*(2), 224–232.

Rehdanz, K., & Maddison, D. (2008). Local environmental quality and life-satisfaction in Germany. *Ecological Economics, 64*, 787–797.

Robin, M., Matheau-Policea, A., & Couty, C. (2007). Development of a scale of perceived environmental annoyances in urban settings. *Journal of Environmental Psychology, 27*(1), 55–68.

Sandercock, L. (1997). *Towards cosmopolis: Planning for multicultural cities*. London: Wiley.

Sandercock, L. (2000). Cities of (in) difference and the challenge for planning. *DISP, 140*, 7–15.

Selod, H., & Zenou, Y. (2006). City structure, job search, and labor discrimination: theory and policy implications. *Economic Journal, 116*, 1057–1087.

Shen, Q., & Zhang, F. (2007). Land use changes in a pro smart growth state: Maryland, USA. *Environment and Planning A, 39*(6), 1457–1477.

Ulengin, B., Ulengin, F., & Guvenc, U. (2001). A multidimensional approach to urban quality of life: the case of Istambul. *European Journal of Operational Research, 130*, 361–374.

Van Praag, B. M. S., & Baarsma, B. E. (2005). Using happiness surveys to value intangibles: the case of airport noise. *The Economic Journal, 115*(500), 224–246.

Veenhoven, R. (2006). Quality of life in modern society. In Y.-K. Ng & L. S. Ho (Eds.), *Happiness and public policy, theory, case studies and implications* (pp. 19–44). New York: Macmillan.

Vemuri, A. W., & Costanza, R. (2006). The role of human, social, built, and natural capital in explaining life satisfaction at the country level: toward a national well-being index (NWI). *Ecological Economics, 58*(1), 119–133.

Welsch, H. (2006). Environment and happiness: valuation of air pollution using life satisfaction data. *Ecological Economics, 58*(4), 801–813.

Williams, K. (2000). Does intensifying cities make them more sustainable? In K. Williams et al. (Eds.), *Achieving sustainable urban form: An introduction* (pp. 30–45). New York: E & FN Spon.

Wilson, W. J. (1987). *The truly disadvantaged: The inner city, the underclass and public policy*. Chicago: The University of Chicago Press.

Yeh, A. G. (2008). *GIS as a planning support system for planning of harmonious cities*. Nairobi: Un-Habitat.

Yusuf, A. A., & Resosudarmo, B. P. (2009). Does clean air matter in developing countries' megacities? A hedonic price analysis of the Jakarta housing market, Indonesia. *Ecological Economics, 68*(5), 1398–1407.