

CRITERIA FOR SUSTAINABLE HOUSING AFFORDABILITY

Emma Mulliner¹, Vida Maliene²^{1,2}*School of the Built Environment, Liverpool John Moores University, Henry Cotton Building, 15-21
Webster Street, L3 2ET. Liverpool, United Kingdom.**E-mails: ¹E.K.Mulliner@2006.ljmu.ac.uk; ²V.Maliene@ljmu.ac.uk*

Abstract. The affordability of housing is a pressing problem that not only affects individual households but also has implications for the wider economy and environment, e.g. employment, health and sustainability. Thus it is evident that providing affordable housing is not simply about cheap and decent homes, it entails having regard for a broad range of factors. Housing affordability is traditionally defined and assessed in terms of economic criteria; namely housing costs in relation to incomes. Areas are therefore often regarded as affordable simply because they are low cost. However this indicates nothing about the quality of the housing or the environment in which the housing is situated. An integral part of the research is the theory that affordability is not only affected by housing costs and incomes, but by a wider range of criteria that also influence a household's quality of life.

It is the view of the authors that housing affordability must be evaluated in a wider context if more sustainable outcomes are to be derived from housing policy. In a bid to create more successful communities for the future the paper seeks draw closer links between affordability and sustainability issues, rather than viewing affordability as a purely monetary concern. The research aims to develop a criteria system that represents sustainable housing affordability. The paper presents findings from questionnaire surveys, distributed to housing and planning professionals, which sought to verify and prioritise the criteria that are important to sustainable housing affordability.

Keywords: affordable housing, housing affordability, sustainable communities, sustainable housing, sustainable living environment.

1. Introduction

The affordability of housing is a pressing problem that not only affects individual households but also has implications for the wider economy and environment, e.g. employment, health and sustainability. Housing affordability is thus a key issue that must be tackled in order to contribute to the UK government's sustainability agenda. The availability of decent and affordable housing is said to be an important factor in contributing to the sustainability of communities (HM Government 2005; Maliene *et al.* 2008). Likewise, the UK government's affordable housing policy recognises that a sustainable community is an imperative environment for affordable housing (CLG 2006a). There is also an increasing desire to make construction practices in housing developments more sustainable and reduce their environmental impact (CLG 2007).

It is evident that providing affordable housing is not simply about cheap and decent homes, there must be consideration for a broader range of factors, e.g. the sustainability of the housing and the environments in

which such housing is situated. Sustainability and affordability issues are now often discussed mutually and are recognised as being important to one another (CLG 2007; HM Government 2005; Maliene *et al.* 2008; ODPM 2005a; 2005b). Yet despite this, housing affordability is habitually defined and assessed in isolation from the community in which the housing is situated and without regard for the environmental, social and economic sustainability of the housing. Research suggests that we need a "...broader discussion and refinement of the criteria by which society judges the suitability of affordable housing..." (Fisher *et al.* 2009: 735).

Accordingly the paper begins with a discussion of the housing affordability concept, investigating what 'housing affordability' means. The principal purpose of the paper is to establish an initial system of criteria that represents 'sustainable housing affordability' via literature review and qualitative data collection. The paper will prove or reject the identified criteria via questionnaire surveys with professionals. The questionnaire surveys will also seek to determine how

important each identified criterion is to sustainable housing affordability. The initial criteria system for sustainable housing affordability proposed in this paper would be beneficial for local authorities and housing associations. It would assist in monitoring affordable housing development and at the same time promoting and maintaining quality life for sustainable communities, by which wider society would benefit.

2. What is housing affordability?

In many countries across the globe the affordability of housing has received considerable attention for a number of years. Nevertheless, international literature highlights the fact that a specific definition of housing affordability is unclear (Abelson 2009; Gan and Hill 2009; Ndubueze 2007; Stone 2005). It has been suggested that academic and policy environments are inconsistent with the notion of affordability (Stone 2005). Accordingly there are differing opinions on what 'housing affordability' means.

In UK policy documents housing affordability is simply defined as the 'ratio of lower quartile house prices to lower quartile earnings' (ODPM 2005c). More specifically, the Communities and Local Government's (CLG) Strategic Housing Market Assessments Practice Guidance suggests that home ownership is considered affordable if it costs 3.5 times the gross household income for a single earner or 2.9 times the gross household income for dual-income households. Whereas the document suggests that rent payable for market rented housing should not constitute more than 25 percent of gross income if it is to be considered as affordable (CLG 2007). Internationally it appears that housing policies in many developed countries also advocate that housing affordability is the relationship between housing costs and incomes, with no more than a certain specified percentage of income (ranging between 25 to 35 percent) to be spent on housing for it to be considered as affordable, see for example Ireland (Affordable Homes Partnership 2007), Australia (Affordable Housing National Research Consortium 2001), USA (Dacquist and Rodda 2006), Canada (Engeland *et al.* 2005), New Zealand (Housing New Zealand Corporation 2005) and China (Hui 2001). In contrast to policy environments, a number of academics have proposed more in depth and comprehensive definitions of affordability. MacLennan and Williams (1990:9) provided a widely quoted definition of affordability as being "concerned with securing some given standard of housing (or different standard) at a price or a rent which does not impose, in the eye of some third party (usually the government) an unreasonable burden on household incomes". Bramley (1990:16) further advises that "households should be able to occupy housing that meets well established (social housing) norms of adequacy (given household type and size) at a net rent which leaves them enough income to live on without falling below some poverty standard". Chaplin *et al.* (1994:6) affirm that "...definitions of

affordability must clearly take account not only of the cost of housing, but of housing standards and the price of other necessities of life". Freeman *et al.* (1997:2) assert that "definitions of affordability concentrate on the relationship between housing expenditure and household income and define a standard in terms of that income above which housing is regarded as unaffordable". Comparing the relationship between housing expenditure and household income is one of the most common ways to define housing affordability (Kutty 2005; Whitehead 1991). Although, Bogdon and Can (1997) criticised the pre 1997 affordability literature for its focus on the price of housing rather than the condition, location and neighbourhood characteristics of the supposedly affordable housing. The affordability definitions proposed and utilised by many academics and policy makers certainly have little regard for what households get in return for what they spend on housing, in terms of housing quality, location and neighbourhood characteristics.

More recently, academics have deviated from the traditional way of defining and measuring affordability and have begun to have a broader perspective of the concept. Research in the USA suggests that housing may be considered affordable in terms of housing costs in relation to income; however location costs are often underestimated or ignored (CTOD and CNT 2006). The research suggests that the interaction between housing and location provides a more meaningful measure of housing affordability. To assess 'true' housing affordability location efficiency should be taken into account by measuring the transportation costs associated with place (CTOD and CNT 2006). Similarly researchers in Australia have attempted to link the concept of affordability with environmental sustainability, arguing that 'true' housing affordability must take into account, not simply housing costs but a wider range of costs that households face, e.g. energy and transport related costs (ACF and VCOSS 2008). Fisher *et al.* (2009) also suggest that a more thoughtful definition of affordability should consider the opportunity costs facing households due to housing location. The research "calls for a broader discussion and refinement of the criteria by which society judges the suitability of affordable housing, especially with respect to schools and other local amenities" (Fisher *et al.* 2009:735).

It is apparent from the literature studied that researchers are beginning to have wider consideration for the factors that influence housing affordability, rather than focusing exclusively on the price of housing as the principal determinant. If participants in the housing market were to begin thinking in a different way about affordability then considerable positive effects on households and communities could be derived (CTOD and CNT 2006). Continuing to focus entirely on the price of housing may lead to inaccurate conclusions about the affordability of different areas (Fisher *et al.* 2009). As well as the cost of housing, the literature advocates that further criteria may need to be taken into consideration in

order to determine ‘true’ housing affordability. Such findings have motivated the authors to carry out this research and identify a comprehensive range of criteria that influence housing affordability. In a bid to create more successful and sustainable communities for the future the authors wish to draw closer links between affordability and sustainability issues. Therefore the research focuses on ‘sustainable housing affordability’.

3. Research methodology

The initial objective of the paper is to identify a system of criteria that represents sustainable housing affordability. In order to do so, an extensive literature review and qualitative data collection were conducted. Semi-structured interviews were carried out with housing professionals from seven local authorities within Merseyside and Cheshire in 2010. The participants were asked for their opinions on the housing affordability concept, including the criteria that they believe influence housing affordability.

The subsequent aim of the paper is to prove or reject the identified criteria via questionnaire survey data and to determine the importance of the criteria to sustainable housing affordability. The identified criteria (Table 1) were proposed to a number of housing and planning professionals in the form of a questionnaire survey in 2010. The respondents were based within North West England and included members of local authorities (working in roles related to housing and planning), housing associations, affordable housing developers, urban regeneration and housing market renewal team members. The questionnaire was distributed to 110 professionals within the North West of England; a total of 58 responses were obtained which equates to a 53% response rate. Respondents ranked the criteria according to their importance to sustainable housing affordability. Criteria importance were rated using a 10 point scale, where a ranking of 1 represents ‘non important’ and a ranking of 10 represents ‘most important’ criterion. The respondents were also given the opportunity to suggest and rank additional criteria that they believe influence sustainable housing affordability. SPSS version 17 was used to analyse the survey data.

4. Sustainable housing affordability criteria

Derived from literature review and interviews conducted with local authorities, a number of criteria influencing sustainable housing affordability were identified (see Table 1). The 17 criteria provide a starting point to the development of a criteria system which represents sustainable housing affordability. A summary of each identified criterion, its derivation and reason for inclusion are provided in this section.

Table 1. Criteria for sustainable housing affordability

Affordable sustainable housing criteria	Criteria derivation: literature/interview
C1. House prices in relation to incomes	Local authority interviews; CLG (2007); Whitehead <i>et al.</i> (2009).
C2. Rental costs in relation to incomes	Local authority interviews; CLG (2007); Whitehead <i>et al.</i> (2009).
C3. Interest rates and mortgage availability	Local authority interviews; NHPAU (2010); Shelter (2006).
C4. Availability of rented accommodation	Maliene and Malys (2009); ODPM (2005b); Winston (2010).
C5. Availability of affordable home ownership products	Maliene and Malys (2009); ODPM (2005b); Winston (2010).
C6. Safety (low crime levels)	Fisher <i>et al.</i> (2009); ODPM (2005a; 2005b); Winston (2010).
C7. Access to employment opportunities	Fisher <i>et al.</i> (2009); ODPM (2005a; 2005b); Winston (2010).
C8. Access to and quality of transport services	CLG (2007); CTOD and CNT (2006); ODPM (2005a; 2005b); Winston (2010).
C9. Access to and quality of schools	CLG (2007); Fisher <i>et al.</i> (2009); ODPM (2005a; 2005b); Samuels (2005); Zhu <i>et al.</i> (2005).
C10. Access to shops (local shops, fresh produce, supermarket)	ODPM (2005a; 2005b); Samuels (2005); Zhu <i>et al.</i> (2005).
C11. Access to health services (hospitals and GP's)	CLG (2007); ODPM (2005a; 2005b); Zhu <i>et al.</i> (2005).
C12. Access to child care	ODPM (2005a; 2005b).
C13. Access to leisure facilities	ODPM (2005a; 2005b).
C14. Access to open green public space	CLG (2007); Maliene and Malys (2009); ODPM (2005a; 2005b); Winston (2010); Zhu <i>et al.</i> (2005).
C15. Quality of housing	Local authority interviews; CLG (2006a); Maliene and Malys (2009); Winston (2010).
C16. Energy efficiency of housing	Local authority interviews; ACF and VCOSS (2008); Maliene and Malys (2009); Pullen <i>et al.</i> (2010); Winston (2010).
C17. Availability of waste management facilities	Maliene and Malys (2009); ODPM (2005b); Winston (2010).

C1/C2. House prices/rental costs in relation to income: Housing affordability is often expressed by the relationship between housing expenditure (rent or mortgage) and household income (CLG 2007; Whitehead

2009). The cost of purchasing or renting housing in relation to income will directly influence the accessibility of an area, with higher house price (rent) to income ratios being less accessible (affordable) for some households. Interviews with local authorities in Merseyside and Cheshire revealed that each authority considered housing costs in relation to incomes to be the principal determinant of housing affordability.

C3. Interest rates and mortgage availability: Mortgage payments and interest rates directly impact a household's ability to save and increase their housing consumption in the future. For housing to be affordable it is important the households can afford the ongoing costs of owning housing (NHPAU 2010). Also, the interviews conducted with local authorities revealed that obtaining a mortgage is one of the principal barriers for many wishing to get a foot on the property ladder, especially with the current requirements for large initial deposits.

C4/C5. Availability of rented accommodation and affordable home ownership products: Communities should provide a diverse and sufficient range of affordable housing within a balanced housing market (CLG 2006a; ODPM 2005b). Supply constraints may limit the ability of an area to provide housing for those who need it. An area may be considered as affordable by any means, but this factor alone is insufficient unless there is suitable available accommodation on the market. Also, a good supply of affordable housing tenures ensures the social mix and sustainability of a community (Winston 2009).

C6. Safety (low crime): Safety has been identified as an important factor in making an area a good place to live (Fisher *et al.* 2009; ODPM 2005a; 2005b). High crime levels may cause households to feel vulnerable inside and outside of their homes and may negatively impact on affordability. Households who live in areas with high crime levels may need to spend extra income on security and safety measures in comparison with those households who live in areas with low crime levels. Also, for housing to be sustainable it should be located in a safe residential environment (Winston 2010).

C7. Employment: The availability of employment opportunities is an extremely important factor in making an area a good place to live and to assist in creating sustainable housing/communities (Fisher *et al.* 2009; ODPM 2005a; 2005b; Winston 2010). Having access to employment opportunities is an important factor to consider as it can have a direct impact on household income. Having little or no job opportunities in an area may put increasing strains on the ability to afford housing, but also, commuting long distances to jobs will negatively impact on income and the environment. Furthermore, it has been suggested that individuals who live in locations with poor accessibility to jobs are less likely to be employed in the future (Aslund *et al.* 2006).

C8. Public transport services: Access to good transport services is essential in order to make an area a

good place to live and to create a thriving community (CLG 2007; 2005a; 2005b). Sustainability demands that housing be located close to good public transport (Winston 2010). Additionally research suggests that transportation costs directly impact on housing affordability; in the majority of cases a transit-rich environment can have a positive effect on a household's disposable income (CTOD and CNT 2006).

C9. Schools: Successful and sustainable communities ought to have good access to schools (CLG 2007; ODPM 2005a; 2005b). Access to good schools has been shown to be a characteristic that individuals care about when deciding on an area to live (Fisher *et al.* 2009; Samuels 2005; Zhu *et al.* 2005). The availability of a good education may also directly affect an individual's future prospects and quality of life.

C10. Shops: Shopping facilities have been identified as an important factor for creating a thriving community (ODPM 2005a; 2005b). For home buyers, the presence of shops has been found to enhance the attractiveness of a housing location (Samuels 2005; Zhu *et al.* 2005).

C11. Health services: Access to health care services has been shown to be an important factor for potential home buyers when considering a housing location (Zhu *et al.* 2005). Additionally, the availability of health services has been identified as an important attribute in making an area a good place to live and for creating sustainable communities (CLG 2007; ODPM 2005a).

C12. Child care: Sustainable communities should have access to early years child care (ODPM 2005a; 2005b). Poor access to child care facilities may negatively impact on affordability since households may subsequently have to travel greater distances to access such services or it may ultimately affect a parents' ability to go out to work if such services are inaccessible.

C13. Leisure facilities: The ODPM (2005a; 2005b) suggests that sustainable communities should have access to leisure facilities. It is important for households, both adults and children, to have access to areas where they can spend their free time and participate in activities that support a healthy lifestyle. Such facilities may also contribute to increased social interaction and community cohesion.

C14. Open green public space: Zhu *et al.* (2005) identified access to parks as one of the factors that potential home buyers consider when choosing a housing location. Households should have access to good quality public areas where they can relax and interact (Maliene and Malys 2009); this may encourage community cohesion. Furthermore, for housing to be sustainable and in order to create thriving communities, households should have access to green spaces (CLG 2007; ODPM 2005a; 2005b; Winston 2010).

C15. Quality of housing: A principal aim of the UK government's affordable housing policy is to provide high quality homes (CLG 2006a). There was a general

consensus in the interviews carried out with local authorities in Merseyside and Cheshire that affordable housing must meet certain quality standards. Also, for housing to be sustainable it should be of a high quality (Maliene and Malys 2009; Winston 2010).

C16. Energy efficiency of housing: Research suggests that housing affordability ought to take into account a broad range of costs facing households, e.g. energy costs (ACF and VCOSS 2008). Making improvements to the energy efficiency of housing can provide ongoing economic benefits for lower-income households (Pullen *et al.* 2010). Additionally, for housing to be sustainable it must be energy efficient (Maliene and Malys 2009; Winston 2010). The majority of local authorities interviewed revealed that new affordable housing must meet certain sustainability criteria; new affordable housing in England must currently meet Code 3 of the Code for Sustainable Homes (CLG 2006b).

C17. Availability of waste management facilities: Sustainable communities should minimise waste and dispose of it according to good practice (ODPM 2005b). For housing to be sustainable it must be designed for sustainable usage, including waste management and minimisation facilities (Maliene and Malys 2009; Winston 2010).

5.Results: prioritising sustainable housing affordability criteria

The 17 criteria identified via literature review and interviews (Table 1) were verified by questionnaire survey data. The survey data determined the importance of the criteria to sustainable housing affordability. The results obtained from the questionnaire surveys are laid out in this section. The questionnaire process has been described further in the methodology section.

Table 2 displays the average ranking (score) of importance obtained for each criterion and also reveals the overall rank order of the sustainable housing affordability criteria, commencing with the most important criterion and descending in importance. The average results reveal that all 17 criteria are perceived to be important, to some extent, to sustainable housing affordability. Thus, each criterion identified by literature review and interviews has been proved by the survey data. The results demonstrate that the criteria perceived to be of highest average importance to sustainable housing affordability are monetary criteria; house prices in relation to incomes (C1), followed extremely closely by rental costs in relation to incomes (C2). This is not surprising since housing affordability is often defined and assessed exclusively by such criteria. However, housing quality (C15) followed very narrowly behind as the third most important criterion. With regard to the availability

of different housing tenures, the availability of rented accommodation (C4) ranked as the fourth most important criterion, whereas the availability of affordable home ownership products (C5) ranked lower, as the eighth most important criterion. However, the difference in average scores between the two criteria was only very minor. Availability of rented accommodation may be perceived to be slightly more important than that of home ownership products since the latter is often associated with being more difficult to obtain for lower-income households. In terms of access to key services - represented by criteria C7, C8, C9, C10, C11, C12, C13 and C14 - access to employment opportunities (C7) was perceived to be of highest importance to sustainable housing affordability. This criterion (C7) ranked as the fifth most important overall. This may be attributed to the fact that access to employment will have a direct affect on a household's potential income stream. Access to transport (C8), health services (C11), schools (C9) and shops (C10) obtained similar scores to one another. Although, access to open green space (C14), child care (C12) and leisure facilities (C13) were given slightly lower scores of importance, with leisure facilities perceived to be the least important key service/facility. Overall, availability of waste management facilities (C17) ranked as the criterion with the lowest average score of importance. This may be due to the fact the waste management facilities may have no direct economic savings for households, but more a sustainability and quality of life criterion. However, in comparison, energy efficiency of housing (C16) obtained a fairly high average score and ranked as the sixth most important criterion to sustainable housing affordability. This may be credited to the view that energy efficiency is a sustainability criterion, but additionally has subsequent economic savings in the long-term for households.

In order to identify if the respondents' area of employment (Fig. 1) had any influence on the rankings of criteria importance given, a one-way between subjects ANOVA was conducted. Respondents were assigned to one of four employment groups; 1) local authority; 2) housing association; 3) urban regeneration/housing market renewal; 4) affordable housing developer. The four employment groups were then compared using one-way ANOVA to test for any statistically significant differences between mean rankings of criteria. The results revealed a statistically significant difference between employment groups as determined by one-way ANOVA for C1: house prices in relation to incomes ($F(3,54) = 5.168, p < .01$), C2: rental costs in relation to incomes ($F(3,54) = 5.340, p < .01$), C3: interest rates and mortgage availability ($F(3,54) = 4.276, p < .01$) and C14: access to open green public space ($F(3,53) = 4.515, p < .01$). There was no statistically significant difference between the employment groups' means for all other criteria.

Table 2. Average rankings (scores) and overall rank order of sustainable housing affordability criteria (descending in order of importance)

Rank order	Criterion	Criterion description	Average ranking of importance	Standard deviation
1	C1	House prices in relation to incomes	8.69	1.930
2	C2	Rental costs in relation to incomes	8.64	1.672
3	C15	Quality of housing	8.32	1.560
4	C4	Availability of rented accommodation	7.64	2.238
5	C7	Access to employment opportunities	7.48	2.028
6	C16	Energy efficiency of housing	7.44	1.881
7	C3	Interest rates and mortgage availability	7.28	2.4408
8	C5	Availability of affordable home ownership products	7.14	2.365
9	C8	Access to and quality of transport services	6.81	1.986
10	C11	Access to health services	6.67	1.855
11	C9	Access to and quality of schools	6.63	1.896
12	C10	Access to shops	6.61	1.868
13	C6	Safety (low crime levels)	6.48	1.818
14	C14	Access to open green public space	5.65	2.048
15	C12	Access to child care	5.26	2.192
16	C13	Access to leisure facilities	4.84	2.042
17	C17	Availability of waste management facilities	4.38	2.336

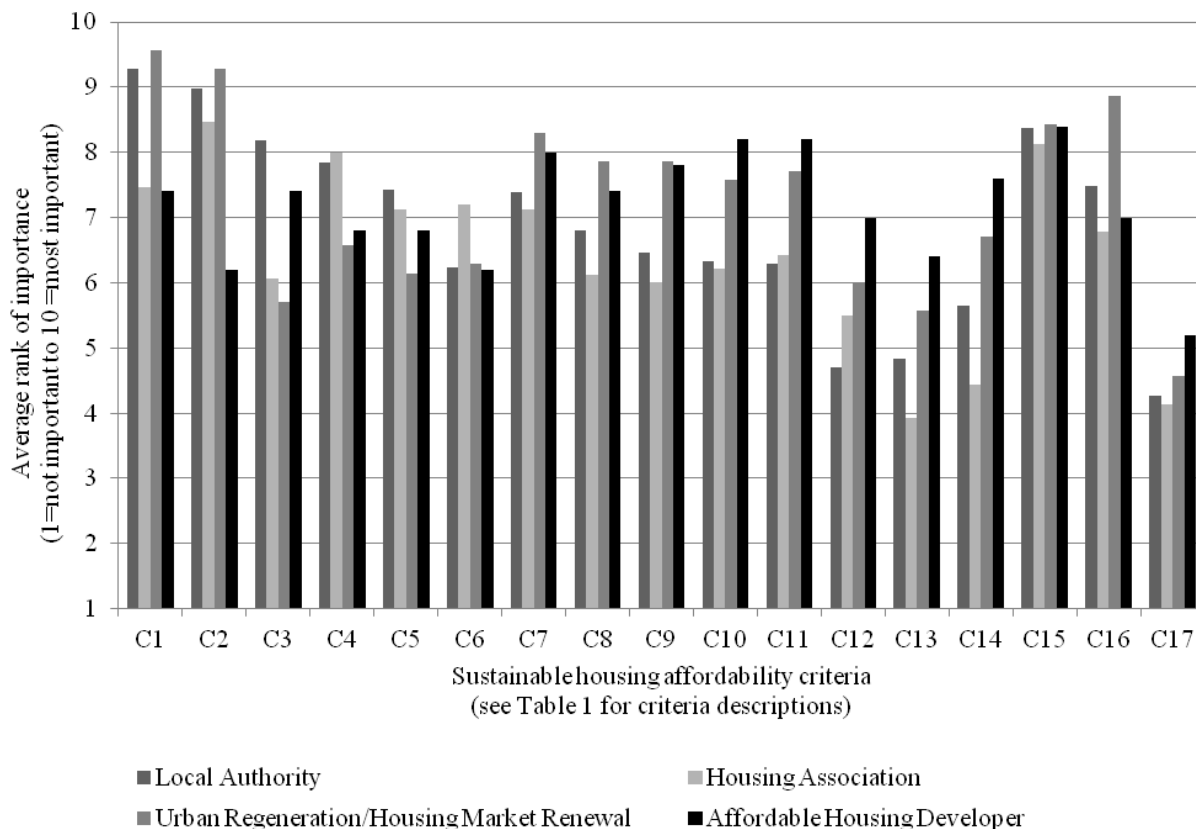


Fig 1. Average rankings of sustainable housing affordability criteria by employment group. A higher rank value shows higher importance of the criterion to sustainable housing affordability

The means, separated by employment group, are presented in Fig 1. Post-hoc Tukey's HSD test showed that local authorities gave statistically significantly higher

rankings to C1 (house prices in relation to incomes) than housing associations at the .01 level of significance. Local authorities and urban and urban regeneration/housing market renewal teams gave

statistically significantly higher rankings to C2 (rental costs in relation to incomes) than affordable housing developers at the .01 level of significance. Housing associations gave statistically significantly higher rankings to C2 (rental costs in relation to incomes) than affordable housing developers at the .05 level of significance. Local authorities gave significantly higher rankings to C3 (interest rates and mortgage availability) than housing associations at the .05 level of significance. Affordable housing developers gave significantly higher rankings to C14 (access to open green public space) than housing associations at the .05 level of significance.

In addition, the respondents suggested a number of criteria that they consider to also be of importance to sustainable housing affordability. The following criteria are those that were suggested most frequently by the respondents: 17 respondents (29%) suggested a balanced housing market with different levels of housing and different sizes and types of housing to meet identified needs of residents; eight respondents (14%) suggested adaptability of housing to suit changing needs/changing life; five respondents (9%) suggested community cohesion, consultation and involvement; two respondents (3%) suggested access to skills, training and higher education; two respondents (3%) suggested regeneration, refurbishment and demolition of existing poor housing stock; two (3%) respondents suggested development of housing on previously developed/brownfield land.

6. Conclusions

Affordable housing and sustainable development are major challenges currently facing many countries across the globe. This paper has highlighted that housing affordability must be defined and evaluated by a broader range of criteria if more sustainable outcomes from housing policy are desired. It is important that housing affordability and sustainability issues have closer association in order to provide households with a high quality of life and to assist in creating sustainable communities. Currently, efforts to tackle housing affordability typically revolve around making housing economically viable. Other important issues, such as housing location, quality of life and sustainability are sometimes ignored. Although new affordable housing is now required to meet Code Level 3 of the Code for Sustainable Home (in England and Wales), this focuses primarily on improving environmental sustainability. However, it is also important that focus is placed on improving the social sustainability of both new and existing affordable housing. The authors believe that housing affordability must not be conceived and evaluated exclusively by economic criteria; the quality of life provided by the housing and the residential environment also needs to be taken into consideration. Making affordable housing more sustainable should also decrease indirect costs that households may face. For example, more energy efficient housing that is well-located close to employment, public transport, education, key services and facilities should have a positive effect on

household income owing to a reduced need for transport and savings on energy costs.

It is clear that providing low cost housing is not enough to sustainably satisfy affordability. The data presented in this paper reveals that there are a broad range of criteria which are important to sustainable housing affordability; not simply housing costs and incomes. Thus, it is important that further research is conducted in order to create new measures of housing affordability that take into account the full range of criteria that influence a household's quality of life. The paper has presented an initial criteria system, which has been proved and ranked by professionals, by which housing affordability could be defined and assessed in a sustainable manner. The results presented in this paper are representative of the local context in North West England. However, the criteria could be verified and ranked in any region, nationally or internationally, to gather data that is relevant for the local situation.

The authors intend to carry out further research to gather data on housing consumers' views of the importance of the sustainable housing affordability criteria presented in this paper (Table 1). Moreover, collecting supplementary data from professionals is also projected. The combined data would provide a comprehensive criteria system and would assist in providing an overall weighting for each sustainable housing affordability criterion. The final criteria system will then be utilised to create a new assessment tool for sustainable housing affordability. Overall the research will be beneficial for local authorities, governments, affordable housing investors, housing consumers and wider society, both nationally and internationally. It would assist investors, housing consumers and other interested parties to make decisions on house purchase and to monitor affordable housing development that is also sustainable.

Acknowledgements

The authors would like to show gratitude to Liverpool John Moores University for funding and supporting the research. Furthermore, the authors would like to sincerely thank the professionals who participated in the interviews and those who responded to the questionnaire survey.

References

- Abelson, P. 2009. Affordable Housing: Concepts and policies. *Economic Papers*, 28(1), 27-38.
- ACF and VCOSS (Australian Conservation Foundation and Victorian Council of Social Service). 2008. *Housing affordability: More than rents and mortgages* [online], [cited 10 July 2010]. Available on the Internet: <vcoss.org.au/documents/VCOSS%20docs/Housing/REP_ACF_VCOSS%20Housing%20Affordability%20October%202008%20.PDF>.
- Affordable Homes Partnership. 2007. *Increasing Affordable Housing Supply*. Dublin: Affordable Homes Partnership.
- Affordable Housing National Research Consortium. 2001. *Affordable Housing in Australia: Pressing Need, Effective Solution* [online], [cited 17 December 2009]. Available on

- the Internet:
<communityhousing.org.au/Publications/Submissions/CH_Inquiry/D1%20Affordable%20Housing%20National%20Research%20Consortium.pdf>.
- Åslund, O.; Östh, J. and Zenou, Y. 2006. How important is access to jobs? Old question - improved answer. *Journal of Economic Geography*, 10(3), 389-422.
- Bogdon, A. S. and Can, A. 1997. Indicators of Local Housing Affordability: Comparative and Spatial Approaches. *Real Estate Economics*, 25(1), 43-80.
- Bramley, G. 1990. Access, affordability and housing need. Paper presented at *ESRC Housing Studies Conference*, University of Surrey, September 1990. Mimeo, Bristol: SAUS, University of Bristol.
- Chaplin, R.; Martin, S.; Yang, J. H. and Whitehead, C. 1994. *Affordability: Definitions, Measures and Implications for Lenders*. Discussion Paper 45, Cambridge: Department of Land Economy, University of Cambridge.
- CLG (Communities and Local Government). 2006a. *Delivering Affordable Housing*. London: CLG.
- CLG (Communities and Local Government). 2006b. *Code for Sustainable Homes: A step-change in sustainable home building practice*. London: CLG.
- CLG (Communities and Local Government). 2007. *Strategic Housing Market Assessments: Practice Guidance Version 2*. London: CLG.
- CTOD and CNT (Center for Transit-Oriented Development and Center for Neighborhood Technology). 2006. *The Affordability Index: A New Tool for Measuring the True Affordability of a Housing Choice* [online], Washington: Urban Markets Initiative, The Brookings Institution [cited 19 June 2010]. Available on the Internet: <brookings.edu/metro/umi/20060127_affindex.pdf>.
- Dacquist, D. J. and Rodda, D. T. 2006. *Housing impact analysis* [online], U.S. Department of Housing and Urban Development, Office of Policy Development and Research [cited 2 January 2010]. Available on the Internet: <<http://www.dca.state.fl.us/fdcp/dcp/affordablehousing/Files/hsgimpact.pdf>>.
- Fisher, L. M.; Pollakowski, H. O. and Zabel, J. 2009. Amenity-Based Housing Affordability Indexes. *Real Estate Economics*, 37(4), 705-746.
- Freeman, A.; Chaplin, R. and Whitehead, C. 1997. *Rental Affordability: A Review of International Literature*. Discussion Paper No. 88, Cambridge, England: Cambridge University, Department of Land Economy.
- Gan, Q. and Hill, R. J. 2009. Measuring housing affordability: Looking beyond the median. *Journal of Housing Economics*, 18(2), 115-125.
- HM Government. 2005. *Securing the future: delivering UK sustainable development strategy*. London: The Stationery Office.
- Housing New Zealand Corporation. 2005. *Building the Future: New Zealand Housing Strategy*. Wellington: Housing New Zealand Corporation.
- Hui, E. C. M. 2001. Measuring Affordability in Public Housing from Economic Principles: Case Study of Hong Kong. *Journal of Urban Planning and development*, 127(1), 34-49.
- Kutty, N. K. 2005. A New Measure of Housing Affordability: Estimates and Analytical Results. *Housing Policy Debate*, 16(1), 113-142.
- MacLennan, D. and Williams, R. 1990. *Affordable housing in Britain and America*. York: Joseph Rowntree Foundation. 92p. ISBN 1-872470-09-2.
- Maliene, V.; Howe, J. and Malys, N. 2008. Sustainable communities: affordable housing and socio-economic relations. *Local Economy*, 23(4), 267-276.
- Maliene, V. and Malys, N. 2009. High-quality housing-A key issue in delivering sustainable communities. *Building and Environment*, 44(2), 426-430.
- NHPAU (National Housing and Planning Advice Unit) (2010) Housing affordability: a fuller picture [online], [cited 15 February 2010]. Available on the Internet: <<http://www.communities.gov.uk/documents/507390/pdf/14657171.pdf>>.
- Ndubueze, O. 2007. Measuring Housing Affordability: A Composite Approach. Paper presented at *ENHR International Conference Sustainable Urban Areas*. Rotterdam, The Netherlands, June 2007.
- ODPM (Office of the Deputy Prime Minister). 2005a. *Sustainable Communities: People, Places and Prosperity*. London: The Stationery Office.
- ODPM (Office of the Deputy Prime Minister). 2005b. *Sustainable communities: Homes for all*. London: The Stationary Office.
- ODPM (Office of the Deputy Prime Minister). 2005c. *Affordability targets: Implications for housing supply*. London: ODPM. ISBN: 1851127992.
- Pullen, S.; Arman, M.; Zillante, G.; Zuo, J.; Chileshe, N. and Wilson, L. 2010. Developing an Assessment Framework for Affordable and Sustainable Housing. *Australasian Journal of Construction Economics and Building*, 10(1/2), 48-64.
- Samuels, I. 2005. *What home buyers want: Attitudes and decision making among consumers*. London: Commission for Architecture and the Built Environment (CABE).
- Shelter. 2006. *ROOF Affordability Index 2006*. London: Shelter.
- Engeland, J.; Lewis, R.; Ehrlich, S. and Che, J. 2005. *Evolving Housing Conditions in Canada's Census Metropolitan Areas, 1991-2001*. Catalogue No. 89-613-MWE2004005. Ottawa: Statistics Canada, Canada Mortgage and Housing Corporation. ISBN: 0-662-38868-2.
- Stone, M. E. 2005. *Housing Affordability: One-Third of a Nation Shelter Poor*: In Bratt, R.; Stone, M. E. and Hartman, C. 2005. *A Right to Housing: Foundation for a New Social Agenda*. Philadelphia: Temple University Press. 448p. ISBN 1-59213-432-7.
- Whitehead, C. 1991. From need to affordability: an analysis of UK housing objectives. *Urban Studies*, 28(6), 871-887.
- Whitehead, C.; Monk, S.; Clarke, A.; Holmans, A. and Markkanen, S. 2009. *Measuring Housing Affordability: A Review of Data Sources*. Cambridge: Cambridge Centre for Housing and Planning Research.
- Winston, N. 2010. Regeneration for Sustainable Communities? Barriers to Implementing Sustainable Housing in Urban Areas. *Sustainable Development*, 18(6), 319-330.
- Zhu, X.; Liu, S. and Yeow, M.C.A. 2005. GIS-Based Multi-Criteria Analysis Approach to Accessibility Analysis for Housing Development in Singapore. In *Proc. of SSC 2005 Spatial Intelligence, Innovation and Praxis: The national biennial Conference of the Spatial Sciences Institute, September 2005*. Melbourne: Spatial Sciences Institute. ISBN 0-9581366-2-9