A Framework for Evaluating Residential Built Environment Performance for Livability

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Abstract

Living condition is net resultant of intermingling of numerous parameters related to residential built environment at residential colony and residential area levels with respect to individual. The upgradation of residential built environment can be better managed after quantification of parameters that affect built environment characteristics and its influence on livability. The paper suggests quantitative frame work to assess the living conditions of residential areas with regard to their physical built environment that plays an important role in providing livable conditions to its inhabitants.

1.   INTRODUCTION

Built environment is the outcome of human needs and actions. All human beings are surrounded by abundance of physical and manmade elements which constitute the built environment and provide setting for human actions. A built environment includes all structures created by people, including infrastructure elements like streets, sidewalks, water and sewer lines, electric and other utilities (McClure and Bartuska, 2007). The built environment denotes the integrated built context in which individuals live.

According to Bartuska (2007) the built environment includes everything build and modified by humans and is a creation of human mind to fulfill his needs and requirements; built environment is created by humans for his comfort, well being and to have protection from adverse weather conditions; every component of the built environment is defined and shaped by context and each components contributes to the overall quality of environment. It is the physical attributes of residential colonies mainly the structural, environmental, proximity, infrastructure and service dimensions that make the primary component of residential built environment.Fig. 1 illustrates the definition of built environment as explained by Bartuska (2007) through four interrelated characteristics of human created environment.
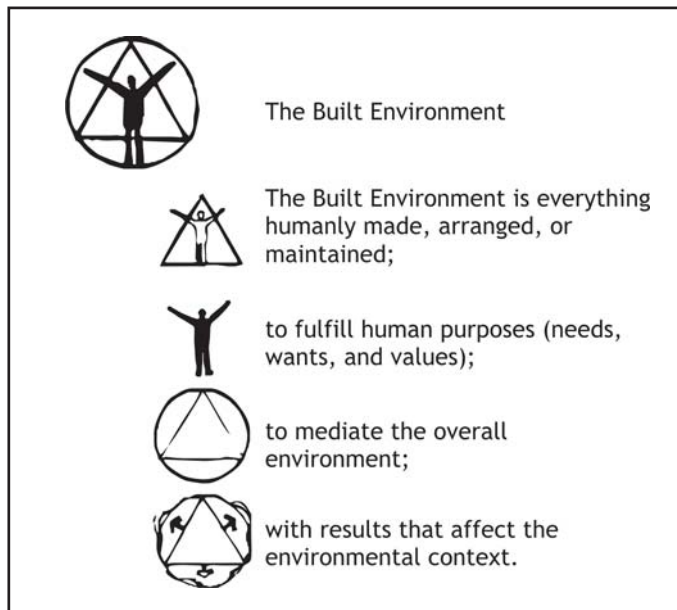
Livability is a concept that conveys an image that is full of life and creates living conditions in a locality that offers a desirable quality of life. In its broadest sense, livability relates directly to the quality of life and wellbeing experienced by inhabitants of a particular locale (Gerrardbown, 2006). The Merriam Webster

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Fig. 1 Definition of the Built Evironment and its Four Related Characteristics.

The Built Environment

The Built Environment is everything humanly made, arranged, or maintained;

to fulfill human purposes (needs, wants, and values);

to mediate the overall environment;

with results that affect the environmental context.

Source: The Built Environment, a collaboration inquiry into Design and Planning, second edition, 2007, edited by Wendy R. McClure and Tom J. Bartuska

online dictionary broadly refers to livability as 'suitability for human living' (Merriam Webster, 2009). In a residential colony, livability refers mainly to the immediate physical built environment that surrounds an individual as soon as he steps out of his home and walks or drives through the streets of his neighborhood to reach the nearest bus stop or main road (Gerrardbown, 2006). This perceived image of a locality determines the livability or the desire to live in a particular place.

According to Brook Lyndhurst the livability, though interpreted differently in different continents, still appears to be same as quality of life, well being and life satisfaction (Brook Lyndhurst, 2004). In Indian context the livability differs from developed countries though the essence remains same. Developed countries take certain facilities for granted while having the same facilities becomes important for Indian people (CII, 2010). For example a grocery store with home delivery services within walking distance in a colony, easy accessibility to a weekly vegetable market for fresh vegetables and fruits, are some of the important criteria for livability in India whereas these issues are not important in developed countries as the nearby departmental stores are there to serve the purpose of one stop shop. Brook Lyndhurst concluded in his research study that a good quality local environment is one of the key building blocks of sustainable cities and livability can help people to take small steps towards making the environment matter, and has the potential to catalyze wider sustainable behaviors (Brook Lyndhurst 2004). Livability in this paper refers specifically to the human needs and preferences leading to a better quality of life as experienced by the residents within a residential area.

2.   THE DESIRABLE

People want to spend their lives in residential colonies which are congenial for raising and nurturing their families, and have good connectivity with the rest of the city to enable them to access various amenities with ease (Sustainable Seattle, 2008). People examine various available options in terms of types of housing, recreation facilities, open spaces, proximity of shopping areas, etc. Easy accessibility to schools and hospitals, availability of water and other essential

services are also important criteria for selecting the place to live. Above all, a person prefers place that ensure safety and offers clean environment. The built environment is livable when residential colonies are safe, affordable, attractive, clean and convenient to live in (Sustainable Seattle, 2008). In short, it is the physical built environment consisting of planned urban spaces of a residential locality along with socio economic factors affects the livability of that locality. Livability being a very subjective notion argues various opinions of how to assess the quality of life because each person has different values on the important aspects of one's life (Carmichael, Gleason, Lehrmitt and Luppino, 2007). Mahbub ul Haq, founder of Human Development Reports along with Amartya Sen, the famous economist developed the human Development Index (HDI) in 1990 for the UNDP to measure the wellbeing and quality of life prevailing in various countries. Mahbub ul Haq highlighted that the objective of development should be to create an enabling environment for people to enjoy long, healthy and creative lives.

3.   THE PROBLEM

The Confederation of Indian Industry or CII has recently prepared a livability index 2010 for Indian cities after studying 37 cities. The mission of the index is to measure significant drivers of the overall health and welfare of the residents. The parameters making an impact on livability are shown in Fig. 2 with a component of built environment. The importance of built environment in effecting the livability is established by the study.

Human Development Report 2009 of United Nations covers 180 UN member states along with Hong Kong and Palestinian territories to measure well being of the population in these countries through Human Development Index or HDI. India is placed at 134th rank with HDI of 0.612, whereas the highest and lowest HDI are 0.971 and 0.340 respectively. This low rank of HDI for India clearly indicates inadequate status of well being of its populace and hence it requires attention.

Fig. 2 CII Model of Livability Index
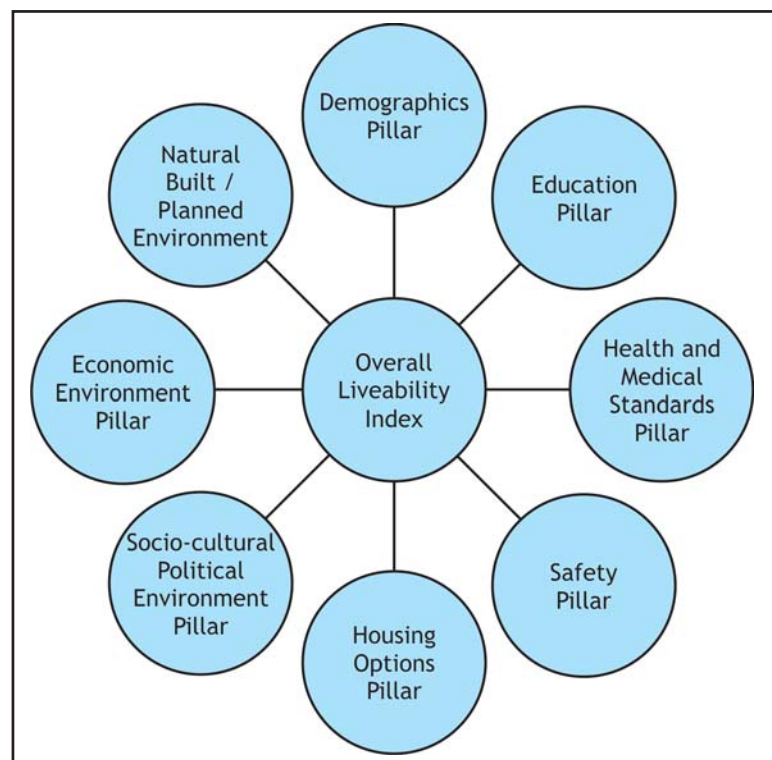
Source: Confederation of Indian Industry (2010), Liveability Index 2010: The Best Cities in India

The design and planning of residential colonies invariably aim to achieve the goal of good quality of life of residents but the studies carried out by Charles J. Kibert and Tom J. Bartuska to evaluate the built environment indicates that the built environment thus created lacks the much needed vision for future growth and results in situations that are unhealthy for human activities (McClure and Bartuska, 2007). The McKinsey Global Institute (MGI) report published in April 2010 clearly mentions that 'across all major quality of life indicators, India's cities fall well short of delivering even a basic standard of living for their residents' (MGI, 2010). This is aggravating problems manifold.

At present in India, the norms for residential development specify certain minimum criteria of livability like provision of open and green spaces, internal roads, building byelaws and social infrastructure such as educational and health facilities, utilities and services. The aim of development norms has always been to provide the minimum basic facilities to inhabitants, but at times these norms fall well short on measures that are critical in determining the livability of residential colonies. There are certain elements that affect the livability of a colony but government norms for residential development fail to cover these. For example, as highlighted by the Board of Earth Sciences and Resources or BESR, the important indicators of livability other than mentioned above at a residential colony level are connectivity to important places of cities; recreational and health facilities within convenient reach of elderly people and children; proximity to shopping centres and schools; housing conditions and transport facilities (BESR, 2002).

4.   COMPLEXITY OF THE PROBLEM

Residential built environment is a vast subject with diversified aspects in different contexts, which is also dynamic-changing over time, space and social groups (OECD, 1978). The design and planning of residential colonies therefore varies with the time, and the character of the socioeconomic settings. For example, the mere provision of essential services, efficiently performing infrastructure, open and green space, and good connectivity to important places in the city would be good enough for a certain specific class of socioeconomic group to consider the locality livable but for other socioeconomic groups the convenience, recreational and health facilities would be equally important. Similarly, as the time changes, the technology and lifestyle also changes and with this the factors affecting livability may also change.

Performance on the other hand is the outcome of day to day relationship of humans with its immediate built environment. Performance of the residents in a colony can be evaluated for daily productivity of a family; electrical energy requirement; fitness and health of residents; behavioral and psychological aspects of residents, etc. The relationship of various components of the residential built environment like density of built form, roads, green and open space, cleanliness, safety, noise and convenience, etc; on the performance of humans, play an important role in designing and planning for a livable residential place.

Jackson explained the effects of green space on humans both at the psychological level as well as on physical level. Visual and physical accessibility to green space is important to human welfare at the neighborhood scale as well as the individual parcel (Jackson, 2003). Insufficient greenery in residential colony reduces the aspirations and opportunities for natural experiences of residents outside the domestic setting, which may result in lower physical activity, behavioral problems, and social isolation (Lindheim and Syme, 1983). As per Emmanuel, the built form geometry and density is one of the influential variables affecting outdoor thermal comfort (Emmaneul, 2005). According to Angelotti (2007) outdoor spaces that offer thermal comfort conditions are characterized with high levels of livability. This is possible as a better thermal comfort condition enhances the productivity of humans affecting their performance.

Road networks also play an important role in creating a congenial built environment for social interaction and exchange. Well defined driveways, street crossings and footpath for pedestrians are important to encourage walking among the residents. The conveniences offered by strategic location of public facilities and services to meet day to day needs of the residents discourage the use of vehicles within residential colonies. Better pedestrian conveniences in a residential colony not only reduces pollution caused by vehicular use but also reinforces local networks of support and the sense of community through frequent meeting among neighbors on the streets, which are important for psychological health (Barton *et al*, 2003).

The clean environment relates to general sanitation conditions within the residential colony and satisfaction of residents with the surrounding physical built environment. The built environment that discourages littering on outdoor spaces and helps in collection of domestic garbage efficiently does affect the living quality of residents. Built environment factors like close proximity of a residential area to a noise generating establishments or activities in the vicinity, is influential in determining the satisfaction of residents with the living conditions in a colony. Noise affects human both physically and mentally and results in improper communication, sleeplessness and reduced efficiency (Singh and Davar, 2004). The noise above certain tolerance limits would affect human health which in turn will influence the performance of humans. Visual character of a residential colony forms a positive or negative image of wellbeing of residents. Visual landmarks and logical transit pathways also assist people in reaching their destinations (Jackson, 2003). According to Austin, housing quality too has a positive affect on satisfaction with the local physical environment, which has an impact on perception of safety (Austin *et al*, 2002).

The relationship of numerous built environment parameters affecting the performance of humans thereby influencing the livability is very complex and needs to be examined thoroughly to find out ways through which livability can be measured scientifically. Table 1 show the list compiled from literature survey

Table 1 Parameters and Indicators of Built Environment for a Residential Area

Parameters of Built Environment	Indicators of Built Environment	
Green Space	1.	Total green space to site ratio
	2.	Green space per capita
	3.	Hard surface to site ratio
	4.	Green surface to built surface area density
	5.	Open space to building volume ratio
Density	1.	Population density
	2.	Total builtup area to site area
	3.	Built form(height to perimeter of building ratio)
	4.	Outdoor thermal control
Road	1.	Road area to total site area
	2.	Road width and building height
	3.	Road width (area of particular width) to total road area
Convenience	1.	Distance to bus stop/ taxi stand
	2.	Distance to provision store and day to day items shop
	3.	Distance to play school
	4.	Distance to internet café
Clean Environment	1.	General sanitation condition
	2.	Number of skips (for collection of garbage) to number of households.
	3.	Average distance to skip from households
	4.	Municipality garbage collection vehicle trips per week
	5.	Proximity to nallah or any other obnoxious factory.
	6.	Housing quality
Noise and Safety	1.	Average distance of households from highway and main road
	2.	Proximity to noise generating activities in the vicinity
	3.	Feeling of walking safely at night.
Visual Character	1.	Building materials used in façade
	2.	Glass façade to solid building surface ratio
	3.	Colour and texture

of parameters and indicators of residential built environment having significant role in affecting the performance of humans.

5.   A SUGGESTIVE SCHEMATIC FRAMEWORK

The living conditions offered by a residential area are livable, when residents perform better and produce optimum work to their capacity in a given physical built environment. Fig. 3 depicts the schematic concept for evaluating residential built environment performance for livability showing the interrelation between built environment, built environment performance, humans and livability.

The relationship and interrelationship amongst various factors influencing livability is depicted through a conceptual framework as shown in Fig. 4. The conceptual

framework shows the dynamics of socio-economic factors along with prevailing technology in a given time period, which is responsible for the lifestyle of residents of a given space. The interaction of lifestyle with the specified space results in a residential built environment which in turn affects the humans both physically as well as psychologically. The physical and psychological impact of built environment on humans influences the performance of residents thereby affecting the livability. The residential built environment performance combined with space defines the

Fig. 3 Conceptualizing Evaluation of Residential Built Environment Performance for Livability
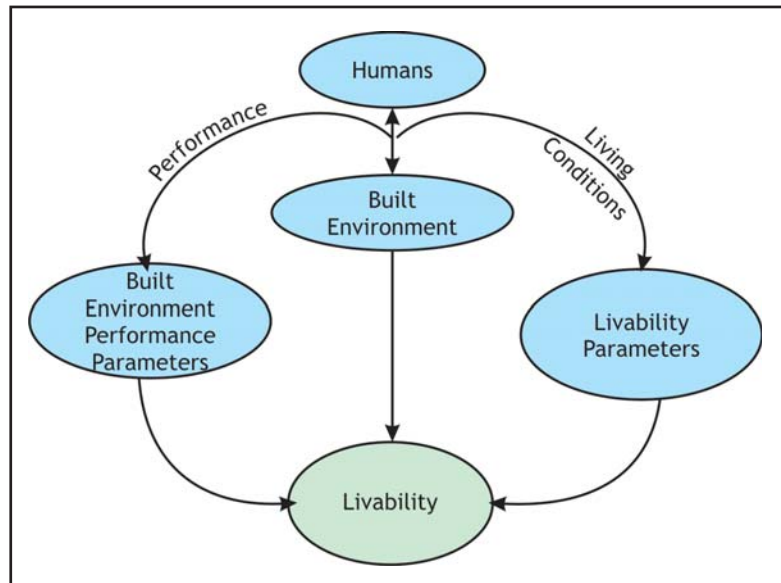
living conditions of the residential area. The relationship of built environment performance and livability along with interrelationship between each parameter

Fig. 4 Conceptual Framework to Evaluate Residential Built Environment Performance for Livability
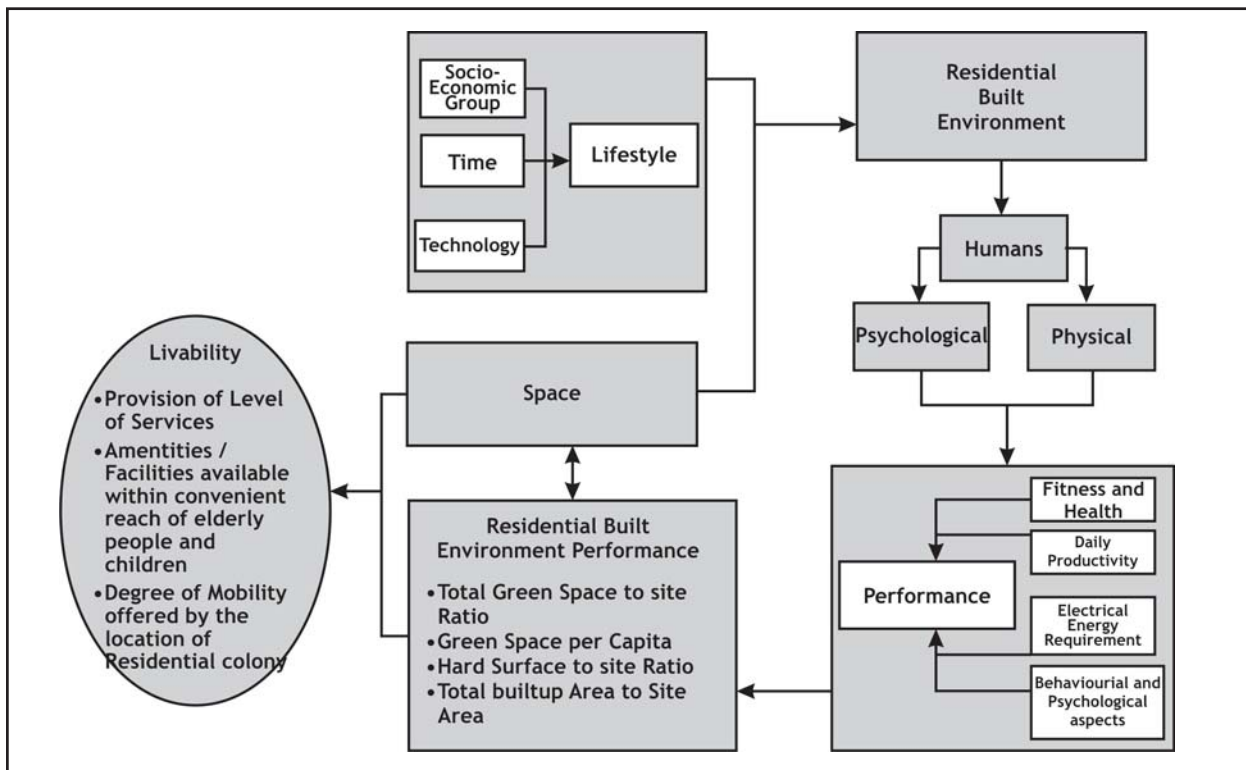
of built environment performance and indicators of livability can be measured comprehensively to benchmark the desired livability for a residential area. By focusing on the entire set of interrelationships, a framework can be formulated to evaluate the performance of residential built environment in relation to humans for identifying their contribution in achieving the desired livability. Accordingly prioritized built environment parameters depending on their contribution to performance could be identified.

A quantitative framework would factor in key dimensions of livability. This includes local environmental conditions, the quality of social interactions, opportunities for recreation and entertainment, aesthetics, safety and health, and existence of unique cultural and environmental resources. Livability will thus benefit the local residents and people who will visit the place through increased property values, public safety and healthy living conditions.

6. CONCLUSIONS

A country's economic and social growth is reflected in the form of its GDP and other social indicators. These parameters will show a positive trend if the people of the country have access to a healthy and congenial living environment, amongst other factors. The need of today is to identify and then prioritize the parameters affecting livability of residential colony on scientific and technological footing not only to upgrade the existing residential areas but also to plan better residential developments of future.

The quantitative framework to evaluate 'Residential Built Environment Performance for Livability' can be useful to planners, urban designers, stakeholders and all decision making authorities concerned with the future livability of residential areas in the cities. The various permutation and combinations of parameters can be worked out to achieve the desired level of livability. Residential colonies which satisfy some aspects of the wellbeing can be further upgraded by benchmarking the desirable level of livability with this framework. Similarly for proposed residential colonies pre-assessment of livability on account of physical built environment parameters contribution can be made mandatory before the implementation of development project, as the state has an important role to play in establishing a congenial living environment for the people. Better built environment results in increase productivity, and overall wellbeing of the populace can improve social relationships and reduce delinquency rates. Framework suggested for identifying and benchmarking of various parameters can be used to assess the gaps for chalking out the roadmap for the future.

REFERENCES
Acioly, C.C. Jr. and Davidson, F. (1996 Density in Urban Development, *Building Issues*, Vol.8, No.3, Lund Centre for Habitat Studies, Lund University, Lund.

Angelotti, A., Dessi, V. and Scudo, G. (2007) *The evaluation of thermal comfort conditions in simplified urban spaces: the COMFA+ model,* Second PALENC Conference and 28th AIVC Conference on Building Low Energy Cooling and Advanced Ventilation Technologies in the 21st Century, , Crete island, Greece.

Austin, D.M., Furr, L.A. and Spine, M. (2002) The effects of neighborhood conditions on perceptions of safety, *Journal of Criminal Justice,* Vol.30, pp. 417-427.

Barton H, Grant, M & Guise, R 2003, *Shaping Neighborhood: A Guide for Health, Sustainability and Vitality*, Spon press, London & New York.

Carmichael, A., Gleason, D., Lehrmitt, R. and Luppino, C. (2007) *City of Westminster livability index,* Worcester Polytechnic Institute, London, viewed 2 July 2010,< http://www.wpi.edu/Pubs/E-project/Available/E-project-022207-134352/unrestricted/City_of_Westminster_Livability_Index_Final_Report.pdf>

Confederation of Indian Industry (2010) *Livability index 2010: The best cities in India,* Confederation of Indian Industry, Northern Region, accessed 17 June 2010, http://www.competitiveness.in/wp-content/uploads/2010/03/Liveability-Report.pdf

Emmanuel, M.R. (2005) *An Urban Approach to Climate Sensitive Design: Strategy for the Tropics*, Taylor and Francis, New York.

Gerrardbown (2006) *Capitalizing on Melbourne's status as one of the world's most livable cities,* Committee for Melbourne: Livability report, viewed 18 June 2010, <http://melbourne.org.au/static/files/assets/89b7362e/CFM_2006_Liveability_Report.pdf>

Jackson, L.E. (2003) The relationship of urban design to human health and condition, *Landscape and Urban Planning*, Vol.64, pp.191-200.

Lindheim, R. and Syme, S.L. (1983) Environments, people, and health, *Annual Review of Public Health*, Vol.4, pp. 335-359.

McKinsey Global Institute, 2010, India's *Urban Awakening: Building Inclusive Cities*, *Sustaining Economic Growth,* McKinsey and Company, *viewed* 24 June 2010, http://www.mckinsey.com/mgi/reports/freepass_pdfs/india_urbanization/MGI_india_urbanization_fullreport.pdf

Singh, N. and Davar, S.C. (2004) Noise pollution- sources, effects and control, *Journal of Human Ecology*, Vol.16, No.3, pp.181-187.

Sustainable Project (2008) *Goal: livable neighborhood*, Sustainable Seattle: Healthy communities, economics and ecosystems, Accessed on 7 July 2010, < http://www.b-sustainable.org/built-environment/livable-neighborhoods-and-communities>

Organization for Economic Co-operation and Development (1978) *Urban Environmental Indicators,* OECD Environment Committee, Paris.

United Nations (2009) *World Urbanization Prospects: The 2009 Revision*, Population Division, Department of Economics and Social Affairs, United Nations, New York, accessed 22 June 2010, http://esa.un.org/unpd/wup/Documents/WUP2009_Highlights_Final.pdf

United Nations Development Programme, (2009) *Human Development Report 2009, Overcoming barriers: Human mobility and development*, New York, accessed 25 June 2010, http://hdr.undp.org/en/media/HDR_2009_EN_Complete.pdf

McClure, W.R. and Bartuska, T.J. (2007) *The Built Environment: A Collaborative Inquiry into Design and Planning,* second edition, John Wiley and Sons, Hoboken, New Jersey.