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Mohammad-Reza Namazi-Rad
*University of Wollongong*, mrad@uow.edu.au

Pascal Perez
*University of Wollongong*, pascal@uow.edu.au

Matthew Berryman
*University of Wollongong*, mberryma@uow.edu.au

Francois Lamy
*University Of Wollongong*, flamy@uow.edu.au

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**Keywords**
liveability, sydney, experimental, determination, perceived

**Disciplines**
Physical Sciences and Mathematics

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# An Experimental Determination of Perceived Liveability in Sydney

Mohammad-Reza Namazi-Rad*†, Pascal Perez*, Matthew Berryman*, and François Lamy*‡

** SMART Infrastructure Facility, University of Wollongong, NSW 2522, Australia*
*†Centre for Statistical and Survey Methodology, University of Wollongong, NSW 2522, Australia*
*‡Centre of Research in Complex Systems, Charles Sturt University, NSW 2750, Australia*

**Abstract:** The term liveability is used to evaluate the quality of life in a region based on the surrounding physical environment and different location-based social elements. Having a reliable measurement of general well-being of individuals and societies can help the government and non-government organizations planning for better infrastructure. However, a variety of factors can impact the social perception of local environmental conditions, many of which are difficult to measure. This makes different liveability concepts quite challenging to be evaluated. In collaboration with the IRIS Research, we have conducted a Computer Assisted Telephone Interviewing (CATI) survey on perceived liveability. This measures the existing individual perceptions of social and environmental elements in the Randwick and Green Square area of Sydney. These perceptions can be grouped according to six factors describing various aspects of liveability. A linear additive model is defined in order to calculate the required area-based liveability indices using available CATI survey data.

**Keywords:** *Liveable Community; Measures of Well-being; CATI Survey; Linear Mixed Model.*

## 1. Introduction

The increasing population in Australia is highly urbanized. There is no doubt that the rapid growth in the numbers of residents in the metropolitan areas can highly affect the conditions in the public realm, places where people naturally interact with each other and their community. The term liveability is used to evaluate the quality of life in a region based on the surrounding physical environment and different location-based social elements. However, there is no precise or universally agreed-upon definition for this broad term. Having a reliable measurement of general well-being of individuals and societies can help the planners to consider the quality of life for residents of a city and to come up with solid decisions for improving the quality of urban management. A variety of factors can impact the social perception of local environmental conditions, many of which are difficult to measure. This makes different liveability concepts quite challenging to be evaluated.

Surrounding environment is defined by Detwyler and Marcus (1972) as the external conditions which affect the total population life. Obviously, the quality of surrounding environments can differ significantly from one place to another (Omuta, 1988). Different social activities and the measurement of life satisfaction for a particular type of population are highly influenced by the features of their surrounding environment (Michelson, 1973). The quality of the local environment is defined by Cox (1972) based on eight major features. He believes a good local environment is the one which is nuisance free and healthful and provides proper housing, educational, employment, health and recreational opportunities, as well as modern amenities. Aked (2008) presented a set of evidence-based actions to improve the life satisfaction and recognise the importance of enhancing people's well-being, using the `Five Ways to Well-being' for population-level interventions. These actions were listed as: (*i*) *connect* and strengthen the social networks, (*ii*) *be active* in something you enjoy, (*iii*) *take notice* and be aware of yourself and world around, (*iv*) *keep learning* new skills and (*vi*) *give* time or any kind of kindness.

There are many efforts around the world in place to define a standard method for measuring the quality of life. However, most existing indices of well-being such as Human Development Index (HDI), developed by the United Nations Development Program (UNDP) do not include subjective data and can not provide location-based measures of life satisfaction (Michaelson, *et al.*, 2009).

The Victorian Competition & Efficiency Commission (VCEC) (2009) proposed a list of indicators to be evaluated individually against objective and subjective criteria: safety, sense of community, cultural diversity, access to services, connectivity (through ICT), transport and housing affordability. More recently, the Auspoll survey (Stopler, 2011) used seventeen indicators to compare major Australian capital cities: urban aesthetics, cleanliness, recreational outdoors, cultural venues, public transport, road network, safety, natural environment, sustainability, healthcare services, education facilities,

affordable housing, housing diversity, employment opportunities, standard of living, local climate and social diversity.

A survey is conducted in our study for monitoring the area-based perceived liveability factors. The City of Randwick (a Local Government Area in the Eastern Suburbs of Sydney) and Green Square (a district in the inner-city of Sydney) are the target areas in this study. The key aim of this survey is to produce reliable estimates for effective liveability factors within the target areas based on demographic characteristics. From a subjective perspective on liveability, individuals tend to shape their preferences according to six factors describing various aspects of living conditions: (1) home, (2) neighbourhood, (3) transport, (4) entertainment, (5) services and (6) work. Each factor can be described through a series of attributes. The mix of attributes and their associated valence depend on individual perceptions. We have synthesized these different sources of information into the diagram below.

**Figure 1. Environmental and social living elements**

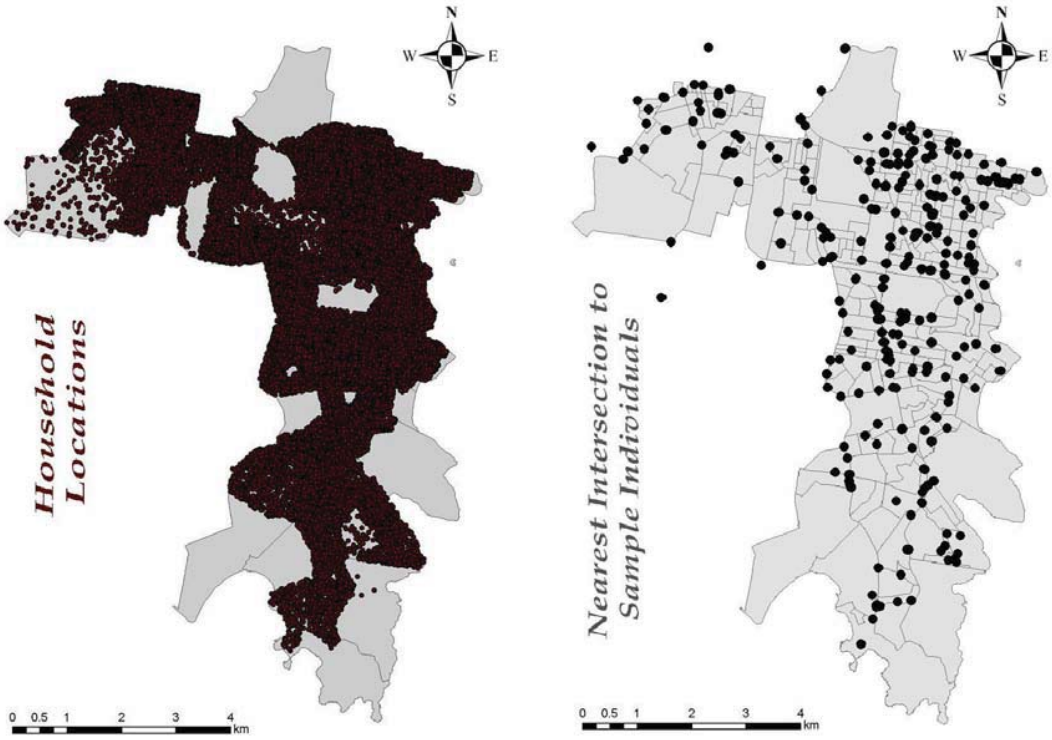
## 2. Survey Design and Conceptual Framework

As mentioned, there are increasing demands for comprehensive statistical information about different liveability factors in Australia. Sampling design is a key device for efficient estimation and other forms of inference about a large population. Computers have been used increasingly during the last decades in various research topics as a tool for data collection. As an example, Computer Assisted Telephone Interviewing (CATI) employs interactive computing systems as an efficient tool being used by interviewers instead of paper and pencil. Using the CATI system, data is automatically recorded for administrative and analytical purposes (Farrell, 2000; Niemann, 2003).

In order to estimate required aspects of liveability within the study area (Randwick and Green Square), a survey was conducted by Illawarra Regional Information Service (IRIS) Research using Random Digit Dialling (RDD). All possible telephone numbers in the target area are considered in RDD as a sampling frame. This is a cost efficient approach to get a complete or near-complete coverage of the target geographic survey area. RDD selects sampled individuals in a statistical survey by generating random telephone numbers (Lepkowski, 1988; Massey et al., 1997).

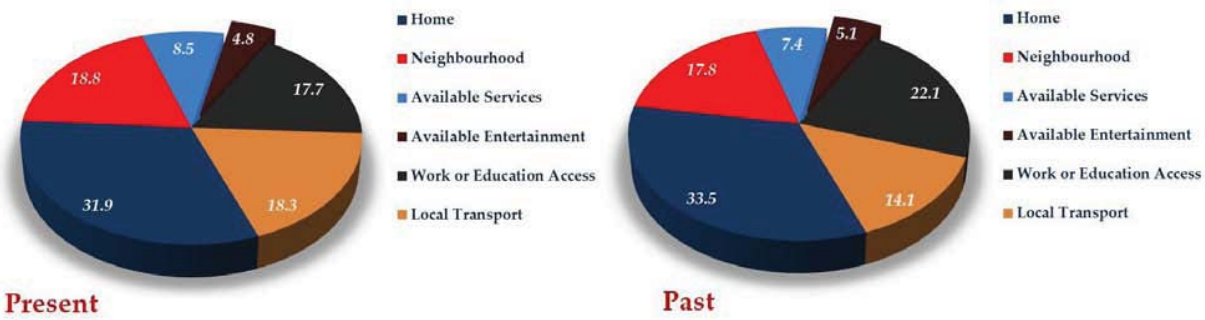
In 2011, approximately 170,000 individuals were living within the study area. A sample of size 500 was interviewed using the CATI system developed by IRIS Research. Figure 1 presents the 2011 density population map of the target areas based on the TDC Travel Zone Population Forecasts released by the Bureau of Transport Statistics (BTS) in October 2009. The sample density map is also presented in Figure 1. As shown in Figure 1, the sample data is gathered from different Travel Zones (TZs).

Figure 2. Population density map of Randwick & Green Square




The sampled individuals in our study tend to shape their preferences from subjective perspective on liveability according to six factors describing various aspects of living conditions. Figure 3 shows the most important features based on the perception of sampled individuals at present and in the past.

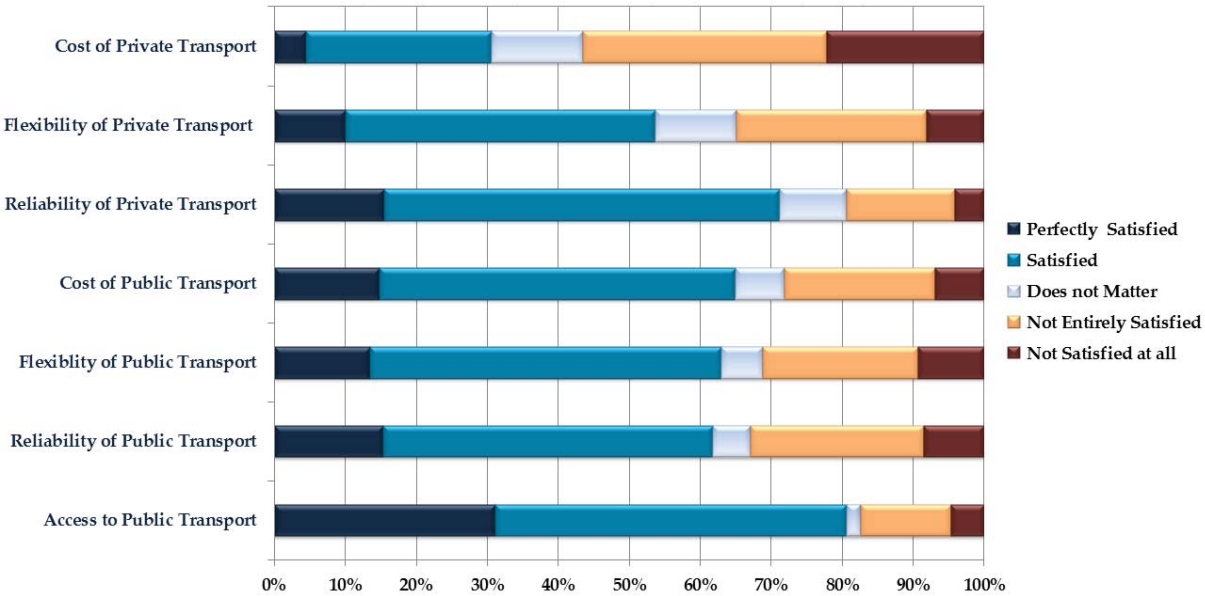
Figure 3: Most important lifestyle aspects at the current and previous residential address



As shown in Figure 3, home features and available work and education facilities were more important at the previous address. In an overall look, we can see that people are more concerned about available transport choices at the current residential address comparing to the past.

Figure 4 summarizes the current satisfactory conditions in the available local transport facilities. As can be seen, more that 50% of all survey individuals are satisfied or perfectly satisfied with local private and public transport facilities at their current residential address. However, more than a quarter of people were not happy about the public transport affordability and flexibility, and more that 55% of all sampled individuals are not satisfied with the cost of private transport options.

Figure 4: Current transport condition




## 3. Liveability Indices

Each sampled individual was asked to rank different life aspects and allocate a value between one and six to each aspect based on the order of their importance to the person. Here, H, N, S, E, WE, and T respectively denote the ranking for six main aspects in (H: Home, N: Neighbourhood, S: Services, E: Entertainment, WE: Work and Education, and

T: Transport) for a certain individual. Using the given rankings, we define a weighting method as follows:

$$W_1 = \frac{7-H}{21} \;;\; W_2 = \frac{7-N}{21} \;;\; W_3 = \frac{7-S}{21} \;;\; W_4 = \frac{7-E}{21} \;;\; W_5 = \frac{7-WE}{21} \;;\; W_5 = \frac{7-T}{21} \qquad \textbf{(1)}$$

Note that,

$$\sum_{i=1}^{6} W_i = 1. \qquad \textbf{(2)}$$

Using this method, a larger weight is allocated to the factor with a higher ranking in the life performance of each individual. For example, if a person selects the local transport as the most important factor, the weight allocated to the local transport by this individual will be equal to: $6/21$. If another person selects this factor as the least important one, the allocated weight will be equal to: $1/21$.

Each aspect can be described through a series of attributes. Table 1 summarizes the attributes considered in this study. The satisfaction level of each attribute is specified then by each individual based on the current residential facilities and services. In order to assess the current level of well-being within the target area, a value is allocated to each feature shown in Table 2.

**Table 1: Environmental features in the CATI survey**

| | |
|---|---|
| **H: Home** | $h_1$: Home Size |
| | $h_2$: Home Affordability |
| | $h_3$: Home Quality |
| | $h_4$: Communication Networks |
| **N: Neighborhood** | $n_1$: Neighborhood Safety |
| | $n_2$: Neighborhood Attractiveness |
| | $n_3$: Neighborhood Cleanliness |
| | $n_4$: Neighborhood Friendliness |
| | $n_5$: Neighborhood Cultural Diversity |
| **S: Services** | $s_1$: Access to Childcare Centres/ Schools/ Higher Education Facilities |
| | $s_2$: Quality of Education Services |
| | $s_3$: Access to Essential Shopping Facilities |
| | $s_4$: Access to Healthcare Facilities |
| **E: Entertainment** | $e_1$: Access to the Recreational Outdoors |
| | $e_2$: Access to the Indoor Sporting Venues |
| | $e_3$: Access to Social Venues |
| | $e_4$: Access to Cultural Venues |
| | $e_5$: Access to Leisure Shopping Venues |
| **WE: Work and Education** | $we_1$: Access to Work or Education Locations |
| | $we_2$: Possibility to Explore other Job Opportunities |
| | $we_3$: Possibility to Preserve the Job Security |
| | $we_4$: Possibility to Keep a Rewarding Job |
| **T: Transport** | $t_1$: Access to Public Transport |
| | $t_2$: The Reliability of Public Transport |
| | $t_3$: The Flexibility of Public Transport |
| | $t_4$: The cost of public Transport |
| | $t_5$: Reliability of Private Transport |
| | $t_6$: The Flexibility of Private Transport on a Daily Basis |
| | $t_7$: Cost of Private Transport |

Table 2: The values assigned to the satisfactory levels

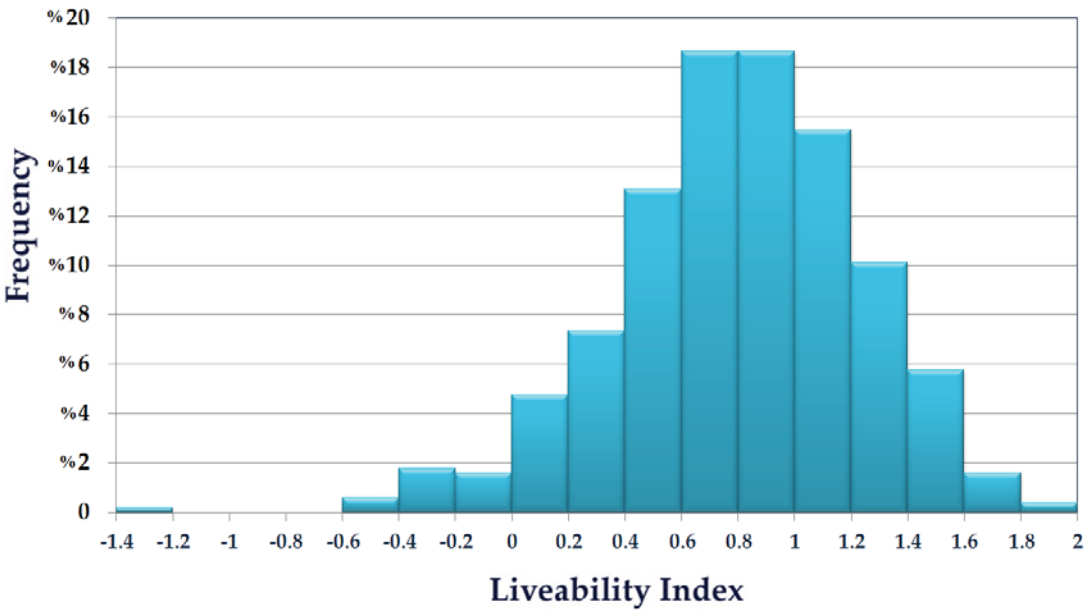
| Response | Allocated Value |
|---|---|
| satisfied | 2 |
| Satisfied | 1 |
| Does not matter | 0 |
| Not entirely satisfied | -1 |
| Not satisfied at all | -2 |

A measurement for the level of well-being and happiness for each sampled individual can be then calculated using the equation we used in this study as follows:

$$\text{Liveability Index} = W_1 \times \sum_{i=1}^{4} h_i / 4 + W_2 \times \sum_{i=1}^{5} n_i / 5 + W_3 \times \sum_{i=1}^{4} s_i / 4 + W_4 \times \sum_{i=1}^{5} e_i / 5 + W_5 \times \sum_{i=1}^{4} we_i / 4 + W_6 \times \sum_{i=1}^{7} we_i / 7 \quad \textbf{(3)}$$

Figure 5 summarizes the distribution of perceived liveability indices calculated based in the survey data. The calculated liveability indices for more that more than 95% of all sampled individuals are positive which shows that the target areas are liveable based on the perception of most sampled individuals.

Figure 5. Distribution of liveability indexes calculated for the survey individuals



Here, we want to test whether the observed differences in the category-related means of liveability indices are statistically significant. We used a t-test to compare the index means calculated for male and female individuals. Based on the survey results (p-value= 0.746), the difference between the means of liveability indices allocated to males and females is not statistically significant. A one-way ANOVA test is used to compare the mean liveability indices for different age groups. The results show that age was an effective factor in the perception of liveability in our target area (p-value= 0.028). Their annual household income and the amount time they have lived in Randwick and Green Square are other important factors in their perceived measure of well-being.

Table 3: Comparisons among the means of calculated liveability indices in different categories

| | Comparing Means (P-Value) |
|---|---|
| Gender | 0.746 |
| Age | 0.028 |
| Income | 0.025 |
| Duration Living in the Area | 0.044 |
| Living Household Structure | 0.063 |

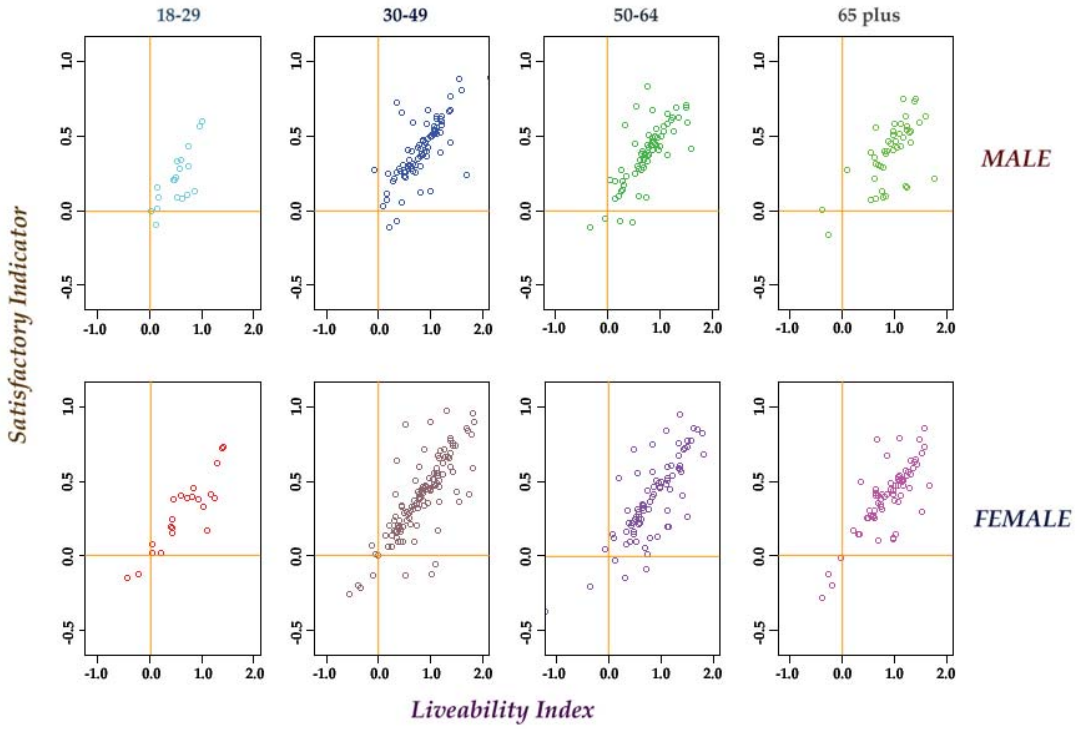
During the survey, each sampled individual was also asked to compare the life facilities at the current residential address with the previous place of living. For each environmental feature presented in Table 1, sampled individuals could say if the current situation was better, the same, or worse than the previous residential address. Here, we want to calculate an indicator for each sampled individual representing the satisfaction level about the current place of living comparing to the past. Table 3 shows the values allocated to each response from a sampled individual.

Table 3: Satisfaction (comparison between current and previous address)

| Response | Allocated Value |
|---|---|
| Worse | -1 |
| The Same | 0 |
| Better | 1 |

Using these values recorded for each sampled individual, an indicator is then calculated based on a formula similar to the one presented in (3). In our study, this value is considered as the satisfaction indicator for re-location. The satisfaction indicators and liveability indices calculated based on the CATI survey data are plotted for each gender and age group shown in Figure 6.

**Figure 6: Scatter plot of liveability index vs satisfactory indicator**




As can be seen in the graphs, the calculated satisfactory indicators and liveability indices for most sampled individuals are positive which means that the majority of people are satisfied with the quality of their life in the target areas. Looking at the individuals whose satisfactory indicators are negative, (which means they believe the current residential address is worse than the previous one,) most of them believe that they are still living in a liveable place as the their perceived liveability indices are positive.

## Discussion

Concept of liveability is a broad term encompasses human needs whose factors include many complex characteristics and states (National Research Council, 2002). Here, a new experimental method is proposed for measuring the existing individual perceptions of social and environmental elements in the Randwick and Green Square area of Sydney using the CATI survey. These perceptions can be grouped according to six factors describing various aspects of liveability. A linear additive model is defined in order to calculate the required area-based liveability indices using available CATI survey data.

The results show that the liveability indices differ for different age groups and income levels. It is also shown that there is a relationship between the satisfaction level of sample individuals about their living area and their perceived liveability indices. Therefore, valid estimation of individual-level liveability indices can help the planner to predict the residential movements.

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