

Haruna Danladi Musa; Mohd Rusli Yacob; Ahmad Makmom Abdullah

Article

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Research Article

Delphi exploration of subjective well-being indicators for strategic urban planning towards sustainable development in Malaysia



Haruna Danladi Musa^a, Mohd Rusli Yacob^{a,*}, Ahmad Makmom Abdullah^b

^a Department of Environmental Management, Faculty of Environmental Studies, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia

^b Department of Environmental Science, Faculty of Environmental Studies, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia

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ABSTRACT

This study seeks expert consensus to determine indicators that could be used to assess subjective well-being for strategic urban planning in the context of sustainable development. For this purpose, a Delphi study including a panel of 45 academic experts was carried out. The study consisted of two rounds. At each round, experts were asked to rate key elements by assessing indicator as very low importance, low importance, moderate importance, high importance and very high importance. A 75% agreement was used as cutoff. The results at second round reveal that panelists agreed on 37 key indicators being essential to assess subjective well-being for sustainable urban development. Using these results as a framework to develop guidelines at local, state, and national levels would allow better assessing and comparing transition programs towards sustainability.

1. Introduction

The world has become increasingly urban with the vast population of people living in urban areas, and about 1.5million people added to the global urban population every week (United Nations, Department of Economic and Social Affairs, 2014). Urbanisation placed huge demands on infrastructure, services, job creation, climate and environment (World Bank, 2012). Though, urbanisation also offers significant opportunities, with vast potential for emerging cities to act as powerful and inclusive development tools.

As the world continues to urbanise, the urban sustainability must take a central stage in policy arenas (Huang, Wu, & Yan, 2015). Recent urban sustainability studies focused increasingly on the relationship between ecosystem services and human well-being (Nassauer & Raskin, 2014; Elmqvist et al., 2013). Wu (2014) defined urban sustainability as “an adaptive process of facilitating and maintaining a virtual cycle between ecosystem services and human well-being through concerted ecological, economic, and social actions in response to changes within and beyond the urban landscape”. Thus, the major weak interpretation of sustainable development is based on an human exemption paradigm that does not fully recognize the interconnectedness of human well-being and the vitality of ecosystems (Helne & Hirvilammi, 2015).

Human well-being is the ultimate goal of sustainable development and has been understood narrowly mainly in economic terms. Therefore, the understanding of well-being on the basis of a relational paradigm, in which the dependence of human well-being on ecosystems well-being is internalized is necessary to increase the chances of transition to sustainability (Helne & Hirvilammi, 2015).

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* Corresponding author.

E-mail address: mrusli.env@gmail.com (M.R. Yacob).

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The value of linking environmental health and well-being outcomes is now well recognized (McGranahan et al., 2005), but poorly understood not to mention guiding urban planning, policy, and governance (Rogers et al., 2012). The relationships are complex and in many instances, clear and measurable links are not available. Indicators are increasingly becoming a useful tool for policy-making and public communication (Heink & Kowarik, 2010). Different practices use different indicators according to their particular needs, and these have been selected under different methods. The process of urban sustainability requires measurable indicators (Haron, Paim, & Yahaya, 2005). Therefore, subjective well-being indicators are required for depth of analysis to summaries, understand and monitor sustainable progress to identify performances to improve services outcome for different segments of the community in urban areas. Also, help to inform policy design to assist the states, local authorities and communities with innovative ideas to solve developmental issues to promote subjective well-being.

Cities are determinant of future sustainability and human health and well-being (Cloutier, Jambeck, & Scott, 2014). Measure of well-being in the city in the context of sustainability is fundamental. Sustainability efforts deal with environmental resources and conditions that are part of regional and global systems but have local effects. Since a city's future and interests are tied to the future of the region and the world, sustainability cannot be parochial. Thus, sustainability efforts to be effective, it must recognize to improve environmental and social conditions that impact the communities (Thomas, 2013). Altogether, urban sustainability efforts must deal with the global and regional context of their own environmental, social, and economic issues; as well as the distributional effects of its policies across social divisions. However, these considerations and others should also be reflected in sustainability indicators. Sustainability is a well-being issue, and tracking well-being can help ensure a more sustainable approach to decision-making (Gourley, Prokosch, Sullivan, & Wangwongwiroj, 2013).

Making cities and human settlements inclusive, safe, resilient and sustainable' is one of the 17 new goals in the post-2015 sustainable development agenda (United Nations, 2015). Although these commitments are made by national governments, implementation is primarily a responsibility of local government and private organizations (Zoeteman, Mommaas, & Dagevos, 2016). Therefore, City governments should work with a wide range of stakeholders to build a political alliance for urban well-being. In particular, urban planners and those responsible for public well-being should be in communication with each other (Rydin et al., 2012). Subjective well-being is not only individual but also a community characteristic influenced by factors external to the individual (Cloutier & Pfeiffer, 2015). The development of indicators has become one of the key tasks of the local government's efforts for urban sustainability (Michael, Noor, & Figueroa, 2014a; Michael, Noor, & Figueroa, 2014b; Yanarella & Levine, 2011).

In Malaysia, urbanisation and industrial processes have led to the emergence of big towns such as Kuala Lumpur, Shah Alam, Johor Bahru, Malacca and Penang (Choon et al., 2011) with the growing pressure on the living environment such as increase pollutions, increase mobility with consequences of traffic congestion, decrease in safety, decline in the well-being of the community. Rapid urbanization has also caused rising cost of living, the urban populace suffers from issues such as unemployment, inadequate public services, income inequality, affordable housing, urban poor, overburdened public amenities, public safety, declined health condition and well-being and other socioeconomic conditions (Rani & Mardiah, 2012; Rosly & Rashid, 2014). The situation threaten the nation's vision to achieve 'developed status' by the year 2020 (Federal Department of Town and Country Planning, 2013). Malaysia is an emerging economy (Dow Jones Indexes, 2011), and a newly industrialised country (Mankiw, 2008). The country has significantly achieved economic growth as well as socio-economic development over the years. Since the independence in 1957, Malaysia Growth Domestic Product (GDP) has annually increased at 6.5% for over the past 50 years (Bakar et al., 2015). The economic growth has placed pressure on the environment and caused negative effects on communities and the need for better living standards (Choon et al., 2011; Rosly & Rashid, 2014), by efficiently monitor urban progress through assessment of well-being in existing cities and community (Hamsa et al., 2015) using indicators (Kim and Lee, 2014).

Urbanisation, economic growth and dearth of public services affect quality of life of the community and threaten urban sustainability (Rosly & Rashid, 2014). Well-being relies on well-functioning communities, and several factors such as public security, education, transportation, health, housing, environment, social participation, culture and entertainment, population influence subjective well-being in urban areas (Hamsa et al., 2015; Hassan et al., 2013). Malaysia is committed to several approaches to measuring the impact of economic development on society progress through a set of social indicators categorised under economic well-being and social well-being. However, as the nation progresses towards a high-income economy, the dearth of comprehensive and reliable subjective indicators of well-being for sustainable development in the present national measures of well-being disregard the intangible aspects of well-being (Fakhruddin & Khan, 2011), and consequently disregarded the subjective well-being satisfaction of the citizen (Bakar et al., 2015). Therefore, creating coherent and consistent urban policy that promotes well-being and sustainability requires effective partnerships and collaboration between and within all three levels of government, and with the private and community sectors (Holden, 2012). Hence, there is the need to assess what factors are important in public service delivery and influence quality of life in urban communities? Subjective indicators record how people report their own well-being in terms of levels of life satisfaction in the domain specific. indicators (Seaford, 2013).

This paper offers Delphi studies that explore indicators of sustainable dimensions to assess subjective well-being for sustainable urban development that focuses on improved opportunities for happiness, and thus, to make the city a place that offer quality of life.

2. Materials and methods

2.1. Delphi techniques

Delphi approach is a research method that formally elicits expert opinions in a series of 'rounds' and feedbacks process for a complex research problem to develop informed solutions (Landeta, 2006; Balasubramanian & Agarwal, 2012). The method employs a

multistage process that seeks to combine individual opinions into group consensus (Keeney, Hasson, & McKenna, 2010). Delphi method is appropriate in developing indicators (Yigitcanlar, Dur, & Dizdaroglu, 2015a; Yigitcanlar, Kamruzzaman, & Teriman, 2015b; Boulkedid et al., 2011; Warner, 2013), and have been used in natural resources and environmental management research to assist interaction of diverse local, regional, and global issues among the stakeholders (Lemieux & Scott, 2011; Cole, Donohoe, & Stollefson, 2013). However, few studies have used the method to develop subjective indicators of well-being among the expert group.

The Delphi method has a range of weaknesses (Landeta, 2006). This includes dependence on a careful selection of expert participants, required lengthy time for multiple survey rounds, participant attrition, inability to handle discordance easily, and limited interaction between participants (Keeney et al., 2010). The choice of design and the methodological characteristics of a Delphi process dependent on the research question defined by the researcher and vary significantly among studies (Keeney et al., 2010). The Delphi study presented here was devised in a structured format to assess a list of pre-defined indicators drawn from the literature to assess subjective well-being in the context of urban sustainable development.

2.2. Email Delphi method

This study employed electronic mail to contact the selected participants and distribute the survey (Cole et al., 2013). Before the advent of email, researchers undertaking a Delphi study used posted mail surveys to contact participants and collect feedback (Linstone & Turoff, 2011). Email provides faster platforms, cost less and a more user-friendly approach to communication than regular posted mail approach. In Delphi study, participant attrition is an issue, hence to reduce participant attrition, it is recommended to explore email methods of delivery a Delphi survey.

2.3. Expert selection

The opinions of local expertise were sought. A minimum panel size of seven, or eight experts is suggested as suitable for Delphi study (Linstone & Turoff, 2011; Sourani & Sohail, 2014), and a range of 20 to 60 number of participants (Jeste et al., 2010) for the heterogeneous group (expertise from diverse social or professional groups but on a topic) which fit with the scope of this study. Thirty participants were targeted for the study. In overall, fifty academics were purposively identified and contacted for willingness to participate in the Delphi study. Academic experts were identified based on publication of relevant urban sustainability research including well-being research and have at least five years of work experience. Forty-five academics ($n = 45$) expressed interest in participating in the study and thirty-four returned the first-round survey. Similarly, thirty-four experts participated in round two survey and thirty-one returned the survey. The Delphi sample size for the study is appropriate enough to substantiate the useful amount of feedback and fulfilled a Delphi survey criterion for reaching consensus on the items checklist (Conroy, Elliott, & Burrell, 2013).

The study consisted of two rounds. At each round, all experts were contacted via e-mail explaining to them the task to be done to complete the questionnaire. At each round, participants were given 2 weeks to answer. Within this period, general reminders were sent to the entire participant who has not sent their response after every 2 weeks. In the round one, experts panel were asked to identify and rank the importance of each indicator items on a 5 - point Likert Scale (1 = 'very low importance', 2 = 'low importance', 3 = moderate importance, 4 = 'high importance', and 5 = 'very high importance' (Tinkler & Hicks, 2011). In the survey instrument, a free-text field was provided for the participants to suggest or to comment on the indicators. In round two, the result of responses in round one was included as the feedback to the expert panel in questionnaire to rate the indicators items.

2.4. Indicator selection

In the literature, there is general agreement that subjective well-being is a composite of satisfaction with a number of life domains. There is no one set of domain and dimension that will measure well-being across the spectrum of desired outcomes for all the desired population, nor is there currently a comprehensive well-being measure available for use by local authorities to capture peoples subjective experience of life (Oswald & Wu, 2010) for strategic planning towards sustainability. A common procedure for understanding the inclusion of sustainability dimensions is to review previous studies of related concepts, happiness, well-being, and quality of life (Olin et al., 2014) (see Table 1). Community well-being can be thought of as encompassing "the broad range of environmental, social, economic, cultural and governance, dimensions and priorities identified as importance by a particular community, population group or society (Cox et al., 2010), and also include cultural, and political conditions identified as essential for them to flourish and fulfil their potential (Wiseman & Brasher, 2008). We adopt the four dimensions of sustainability (social well-being, economic well-being, environmental well-being and urban governance) for urban development.

According to Norouziyan-Maleki et al. (2015), the initial set of items can be collected from the literature and used for evaluation as against the first round in the Delphi process. The study adopts a predefined list approach where initial items were generated from the review of related past studies and discussions to develop the questionnaire to start the Delphi study. Therefore, to start the first round of the Delphi survey, questionnaire was developed from the list of 50 indicator items obtained from the previously reviewed studies across four sustainability well-being dimensions. These items were presented for expert consensus in determining their scientific soundness, prioritization, and justification to assess subjective well-being of the citizens in urban areas towards sustainability (see Appendix A) (Table 2).

Table 1
Summary of community well-being indicators by dimensions.

Author	Aim	Indicator Name	Type	No Domain	No of Indicator	Dimension/Indicator Categories												Participants in design	Spatial Coverage		
						Economic		Social		Environmental		Governance		Health		Culture				Politic	
						Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj			Obj	Subj
Sirgy, Widgerly, Lee, & Yu (2010)	to evaluate the QoL with the integration of objective and subjective dimensions in the city of Noorabad	Community Well-Being Composite Index	Survey based indicator	14		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Citizens	Michigan, USA (1978–2001)			
						Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj		
Cummins et al. (2011)	Measure how satisfied Australians are with their lives and life in Australia.	Australian Unity Index	Survey indicator based	5		✓	✓		✓									Australia			
						Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj		
Cavric (2011)	to develop interdisciplinary indicator system mode based on National Association for Science (NZZ) research to investigate sustainable urban development measurement of Zadar.	Sustainable Urban Development Indicators (SUDI)	Participatory survey base GIS indicators	5	88	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Croatia			
						Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj		
Virola, Encarnacion, and Pascasio (2011)	to develop a happiness index among the poor	Philippine Happiness Index (PHI)	Composite index	18		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Philippines			
						Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj		
Ura et al. (2012)	to develop alternative framework of development to measure people's happiness and well-being	Gross National Happiness Index (GNHI)	Survey based indicator	9	33	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Citizens	Bhutan			
						Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj		

(continued on next page)

Table 1 (continued)

Author	Aim	Indicator Name	Type	No Domain	No of Indicator	Dimension/Indicator Categories												Participants in design	Spatial Coverage		
						Economic		Social		Environmental		Governance		Health		Culture				Politic	
						Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj			Obj	Subj
Kim, Kee, and Lee (2014)	Examines what factors citizens, public officials, and experts perceive as being important to community wellbeing	Measuring Community Wellbeing	Survey based indicator	3	13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Citizens	16 Metropolitan cities in Korea		
Community Indicators Victoria (2013)	to monitor key local community wellbeing indicators in Victoria with the aim of improving citizen engagement, community planning and policy making.	Community Indicators Victoria	Survey indicator based	5	74	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Citizens, public officers and experts	Australia		
Mohanty and Tanton (2012)	to identify the extent of wellbeing, vulnerability, resilience and adaptive capacity in the Murray Darling Basin	Well-being framework with adaptive capacity	Survey based indicator	5		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Australia		
Smale (2012)	To measure the well-being of the people of Guelph	Guelph Community Wellbeing Survey	Survey indicator based	8		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Canada		

(continued on next page)

Table 1 (continued)

Author	Aim	Indicator Name	Type	No Domain	No of Indicator	Dimensions/Indicator Categories												Participants in design	Spatial Coverage		
						Economic		Social		Environmental		Governance		Health		Culture				Politics	
						Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj	Obj	Subj			Obj	Subj
Fiksel and Frederikson (2012)	to develop a conceptual framework that could be used as a communication and research planning tool for EPA's Office of Research and Development Sustainable and Healthy Communities Research Program	EPA Sustainable and healthy community framework	Survey based indicator			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
Loewe, Bagherzadeh, Araya-Castillo, Thieme, and Batista-Foguet (2014)	Identify a number of life domains that previous research found to be relevant to the life satisfaction of most working adults.	Life Domain Satisfaction	Survey based indicator	7		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Citizens	Chile				
Cloutier et al. (2014)	Application of the Sustainable Neighbourhoods for Happiness Index (SNHI) to coastal cities	Sustainable Neighbourhoods for Happiness Index (SNHI)	Survey based indicator	9		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Expert	USA				
McAslan et al. (2013)	to develop an indicators approach to assess the bi-national quality-of-life of border cities.	Measuring Quality of Life	Survey based indicator	6	23	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Mexico				

Notes: Obj = Objective data, Subj = Subjective data

Table 2
Demographic of the expert panel in round 1 and round 2.

	Delphi Round 1, N (%)	Delphi Round 2, N (%)
Response rate ($N_{R1} = 45; N_{R2} = 34$)	34 (75.6)	31(91.2)
Gender		
Male	18 (52.9)	17 (54.8)
Female	16 (47.1)	14 (45.2)
Education Level		
Master Degree	3 (8.8)	–
PhD	26 (76.5)	26 (83.9)
Associate Professor	4 (11.8)	4 (12.9)
Professor	1 (2.9)	1 (3.2)
Years of work Experience		
< 4 years	9 (26.5)	6(19.4)
5 - 10 years	11(32.4)	11(35.5)
11 - 20 years	8 (23.5)	8 (25.8)
> 21 years	6 (17.6)	6 (19.3)

2.5. Determining consensus

Percentage $\geq 75\%$ of participant scored on item ≥ 4 on 5-point Likert scale (Zhao et al., 2015) is used for consensus as described in the literature. The Kendall Coefficient of Concordance (W) was used to calculate the level of agreement within expert (Azevedo et al., 2013). Kendall's W value ranges from 0 to 1 where $W > 0.7$ indicate a strong level of consensus, $W = 0.5$ (moderate consensus), and $W < 0.3$ (weak consensus) (Schmidt, 1997). However, Cohen (1975) suggests that a correlation coefficient (W) of 0.5 and above is considered as high correlation. A non-parametric analysis, Spearman rank correlation coefficient was used to test the potential impact of differences between expert groups' ratings between rounds (Rodrigues & Amaral, 2011). This predefined criteria were considered wholly to ensure robustness of the panel consensus (Hackett, Masson, & Phillips, 2006). There is no consensus for the item that failed to meet the set criteria at the same time (Giannarou & Efthimios, 2014). In addition, stopping criteria for the Delphi rounds have three rules: the Kendall's $W \geq 0.5$, Spearman's rho between rounds ≥ 0.9 , and If the criteria aforementioned are not met in the third round, then the study will stop at the end of the fourth round. Descriptive statistics were used to summarize the panelists' opinions for questions at each round. Data were analyzed with SPSS 22 (IBM Corp., Armonk, NY).

3. Results

Rounds one and two surveys were completed by 34 (response rate, 75.6%) and 31 (91.2%) expert participants respectively. All experts had 5–10 (32.4%) and 11–20 years (23.5%) of experience as full-time professionals in fields, mostly with Ph.D. degree (76.5%), and in senior officers (76.5%) and associate professors (8.8%) positions level.

3.1. Round one

In Round 1, indicators remained on the list if they reached a 75% agreement as the minimal consensus. According to this guideline, of 50 potential indicators, 34 (66%) key indicators reached consensus, but panelists indicated that 17(34%) of indicators could not achieve consensus as described in Fig. 1. The Kendall's coefficient of concordance (Kendall's $W = 0.3, p < 0.001$) for the group agreement reveals a significant but not enough satisfactory value suggesting a weak agreement and low confidence across the expert's rankings of the indicators importance. Of 34 indicators, six were reformulated (green area and natural environment, waste management for waste generation and disposal, and land use and city growth/sprawl) and merged into three, and three new indicators proposed by participants were added up to 50 indicators for Round 2. The suggested new items include natural disaster (environmental well-being), and community value (social well-being) and time-use (social well-being).

3.2. Round two

In Round 2, all indicators were ranked on a scale 1 (very low importance) to 5 (very high importance). We considered that indicators reaching more than 75% of the total score (e.g., 4/5) would maintain as the key subjective indicator in the list. Fig. 2 show the entire subjective indicator items that reached the expert consensus in round two. The result shows that 37 (74%) key subjective indicators across sustainable dimensions - environmental well-being (11), economic well-being (7), social well-being (12) and urban governance (7) - had achieved consensus and retained, but 13 (24%) items could not reach consensus. The subjective indicators that could not gain unanimous expert consensus in promoting well-being across the dimensions were discarded. The result of Kendall ($W = 0.5, p < 0.001$) indicates a high and significant level of group agreement among expert's rankings. Cohen (1975), indicated that a $W = 0.5$ is a good consensus of responses in rounds. Also, the Spearman's rho result shows a very satisfactory and significant positive

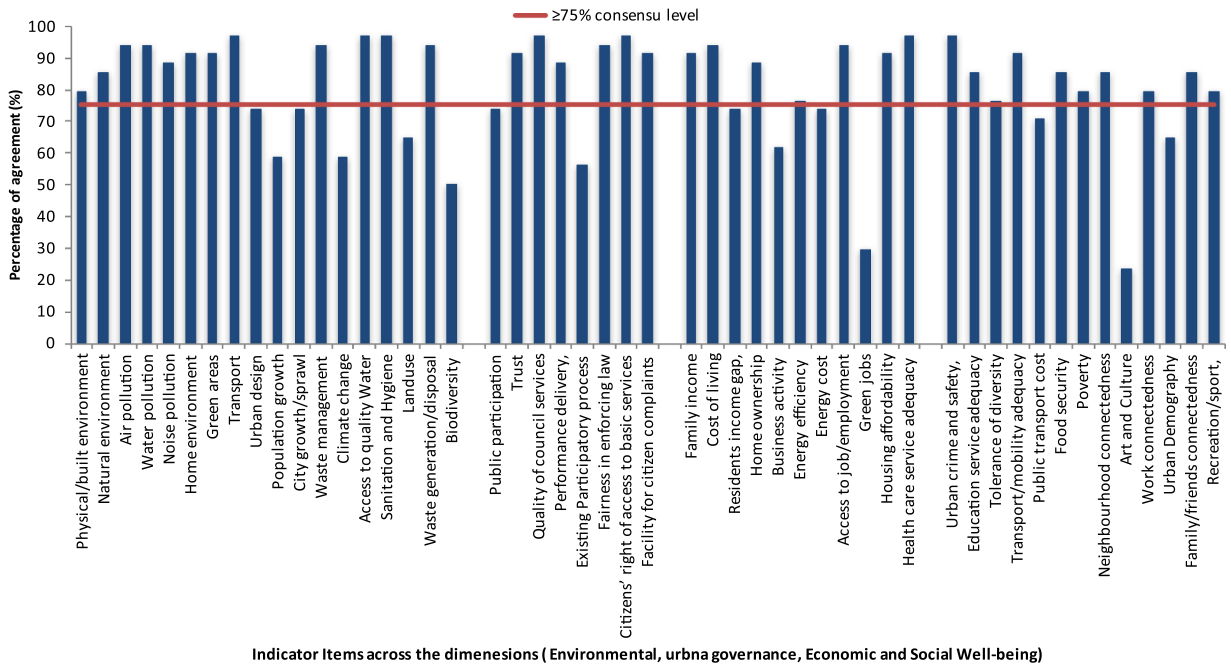


Fig. 1. Result of the expert rating of relevance of subjective indicators in Delphi round 1.

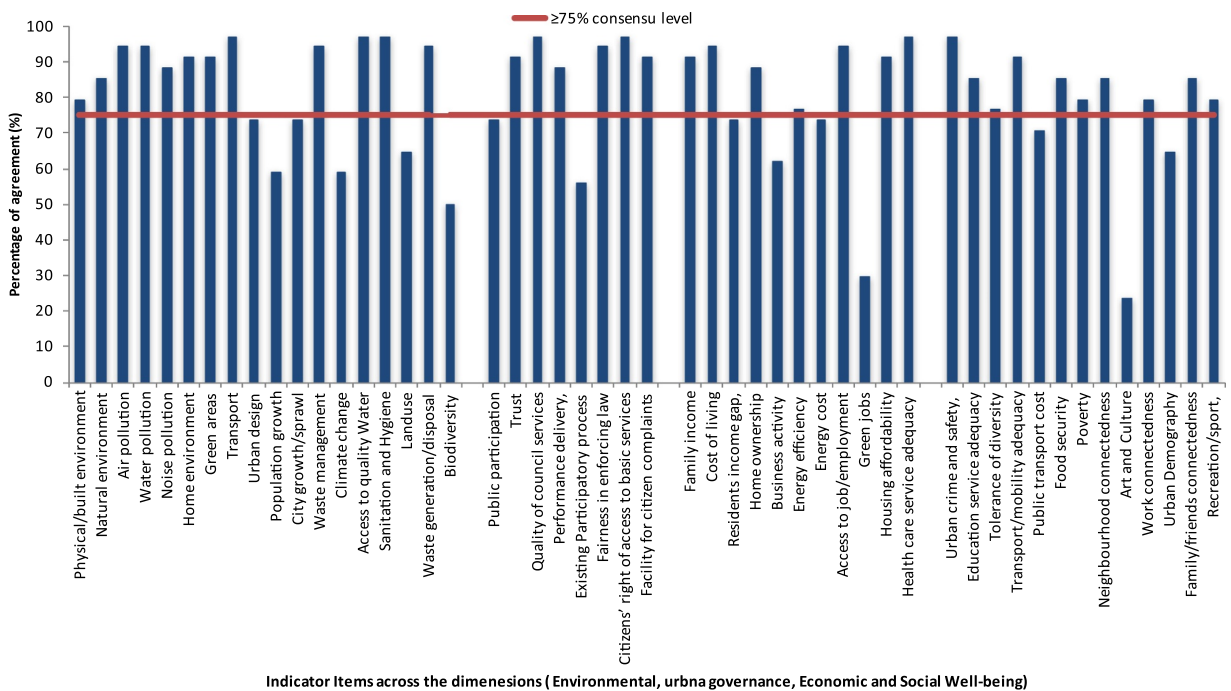


Fig. 2. Expert rating result of the importance of subjective indicator in Delphi round 2. Note: ** New items suggested in round 1.

correlation ($r_s = 0.95, p < .001$) among the experts' rankings of indicators importance between rounds. The Kendall's W and Spearman's rho result indicates a stopping condition is achieved in round two.

4. Discussion

Cities play vital role in delivering potential sustainable benefits and ensuring citizens well-being in urban areas across the world. This task is becoming increasingly important because of the challenges of uncontrolled rapid urbanisation which causes serious

financial constraint in delivering infrastructure, investment in service provision, proper planning and governance (Rydin, 2010). Cities are complex systems, with urban well-being outcomes dependent on many interactions and feedback loops, thus, making prediction within the planning process fraught with difficulties and common unintended consequences (Rydin et al., 2012). Indicators provide an analysis of how sustainable development outcomes can be improved to help urban planning delivering effective services to improve citizen's well-being. Indicators are quantitative descriptions of the environmental, social, economic, political, and physical qualities of an urban system (Juhola, 2014). Sustainable development indicators are designed to guide policy regarding sustainable goals by providing relevant data about characteristics of systems. Indicators are tools for monitoring progress to ensure sustainable use and management of economic, social, institutional and environmental resources (Bell & Morse, 2013).

The indicator system should be selected to address the sustainability needs of the city where it is being implemented (Shen et al., 2011a). Thus, the choice of indicators can have significant impact on the outcome of the evaluation (Gasparatos, 2010). Indicators of sustainable development should be selected and negotiated by the collective effort and interest of appropriate stakeholders (Choon et al., 2011). Sustainable decision-making involves political decisions at local, national and regional levels to create and promote a balanced social–environment system (Helliwell & Huang, 2008). The lack of consensus on which indicators accurately address urban sustainability result in a glut of indicators and selection methods (Tanguay et al., 2010). Subjective well-being indicators, therefore, should reflect community's well-being status and basic quality of life to assist communities to have a better understanding of where they live in relation to other communities (Miles et al., 2008).

However, one of the major problem municipalities faced regarding the selection of sustainable development indicators is whether to utilised expert experience or citizen oriented' outcome. Stakeholders participation in the processes for establishing sustainable development indicators is now well recognised and vital to the success of sustainable development indicator projects (United Nations Commission on Sustainable Development(UNCSD), 2013), particularly at the municipal and city levels (Bell & Morse, 2013; Fraser et al., 2006). Expert's participation remain absolutely indispensable if indicators are to be well selected/developed and monitored rigorously to ensures they achieve technical criteria for quality, feasibility, analytical, policy, and measurability (Bell & Morse, 2013). Thus, this study employed academic experts (Perveen, Kamruzzaman, & Yigitcanar, 2017) in the Delphi study to sought consensus on subjective well-being indicators for strategic urban planning considering their multidisciplinary, wide spectrum of knowledge and extensive experience in sustainable field, and also, to ensure that the selected indicator system achieved the technical criteria (Brezzi & Diaz Ramirez, 2016; OECD 2011).

This study employs Delphi techniques to sought consensus of experts in sustainability and quality of life fields in Malaysia to select indicators to gauge subjective well-being in urban environment. Two round Delphi survey was conducted among the panel of local experts from various academia. The panellists in the second round of the Delphi survey reached consensus on 37 indicators across sustainability dimensions - environmental, social, economic and urban governance - to assess subjective well-being in an urban environment for effective urban planning, policy and management. The variables identified in the findings are consistent to those obtained in studies for assessing well-being in urban areas and cities (Hanna & Noble, 2015; Panagopoulos, Duque, & Dan, 2016; McCrea et al., 2011; OECD, 2011; Hamsa et al., 2015; Rosly & Rashid, 2014).

Urban environment is increasingly recognized as a condition for local competitiveness (Kloosterman & Trip, 2011). Policy makers and urban planners in cities are eager about the creative city policies that boost city's competitiveness while making it more liveable (Russo & van der Borg, 2010). However, not much can be said about the importance of quality of place in present planning practices (Kloosterman & Trip, 2011). A significant consideration of urban happiness discourse is the notion that location plays a fundamental role in pursuit of subjective well-being. According to Florida (2002), to be innovative cities need creativity which is embodied in people. Many people take great joy and fulfilment in where they live (Florida, 2008). Community amenities and environmental conditions contribute to the subjective well-being of the residents (Campbell & Wiesen, 2011; Leyden, Goldberg, & Michelbach, 2011; Morrison, 2011). The characteristics of immediate surroundings or locality influence their well-being. According Florida, Mellander, and Stolarick (2008), 'happiness and place' has three functions: 1) Place has an effect on the activation as creative, and engaging places allow people to be personally fulfilling and economically productive; 2) Sense of self, that is capability to adapt to a place and environment to make it an expression of self, and 3) Sense of belonging (that is place give people something to belong to and provides an avenue of attachment). Consequently, the manner the cities and neighbourhoods are designed and sustained can have a significant effect on the subjective well-being or happiness of its communities (Leyden et al., 2011).

Delphi method was used to establish formal consensus among the expert panel in selecting robust subjective indicators that are evidence-based and linked to urban planning policies through expert consensus to ensure that they apply to policies and practices in decision-making (Lowe et al., 2015). The technique is applicable in this study context due to its underlying assumptions that lead to consensus among multidisciplinary range of expert's respondents spread over a significant geographic distance (Kalaian & Kasim, 2012). Delphi method is used for developing rank evaluation of criteria and indicators (Yigitcanlar et al., 2015a, 2015b; Smith et al., 2013; Boulkedid et al., 2011). This paper, therefore, presented an expert-based set of criteria derived from a Delphi process for exploring subjective well-being for effective urban planning, strategic policy and governance. The panellists with their extensive experience and verse knowledge from a wide range of planning, ecological, social, economic, and governance contexts came to consensus on a set of indicators to gauge subjective well-being in urban areas towards sustainable development.

This study therefore, has identified a set of indicators based on the most important social, economic, environmental and urban governance factors to measure and monitor subjective well-being of community in urban environment. Literature has highlights the needs for most international well-being frameworks and measurement methodologies to integrates approach that include social, economic, environmental, cultural, and governance issues (Gourley et al., 2013) These indicators identified to measure residents subjective well-being context will provides essential information on urban performances and help to improve services outcome for different segments of the community. Consequently, the study has provided a tool for depth of analysis for government, policymakers

and planners in monitoring sustainable progress in cities and urban areas. A city or region cannot be sustainable if its principles and actions towards local level sustainability do not scale up to sustainability globally (Gourley et al., 2013). Sustainability refers to balance between the key social, economic, and environmental dimension as a way of meeting the needs of the present without compromising the need of the future generation (Brunthland, 1987). Well-being is what sustainability should sustain now and for the future, paying attention to social sustainability and equity concerned (p.6) (Salvaris & Wiseman, 2004). The integration of wellbeing indicators provide a powerful means to portray the connection between environmental, economic, social and urban governance aspect of sustainability (Giovanna Boccuzzo & Mario Fordellone, 2015; OECD 2013; Nardo et al., 2008).

5. Conclusion

There are increasingly many measures of subjective well-being indices developed to measure and rate quality of life in different cities or countries. However, these indicator systems do not employ holistic sustainability frame (Hák, Moldan, & Dahl, 2012). For example, the Gallup-Healthways Wellbeing Index (2011), UN Development Index (UNDP, 2013), Better Life Index (OECD, 2013) and the Happy Planet Index (Abdallah et al., 2012) included many different specific methods and focused on one or two pillars of the sustainability rather than the holistic term. Others address one particular aspect of sustainability (e.g., Ecological Footprint) (Wackernagel et al., 2006). Communities are not only physical but also social, economic, political, psychological and cultural settings (Mutisya & Yarime, 2014; McCrea, Walton, & Leonard, 2015).

This study developed a framework, including a list of key sustainable indicators to assess subjective well-being towards urban sustainable development in a two-round Delphi survey. Experts in the Delphi study has identified set of indicators across the four sustainability dimensions to aid strategic urban planning to promote human well-being. As Michael et al. (2014a, 2014b) argue, indicators could be used to understand better performance of a sustainable urban interventions in the city and to effect human well-being using sustainable metric. These indicators as inputs can be helpful in guiding strategic urban planning when planning sustainable interventions schemes. Urban monitoring requires a frequent analysis of factors that promote well-being to determine changes over time, and to assure cities are sustainable in the future (Panagopoulos et al., 2016). Monitoring SWB is important to inform policy design to ensure that other changes that affect society do not reduce overall well-being. Therefore, the identified subjective indicators integrate sustainability assessment to help strategic urban planning in directing interventions, target resources appropriately and efficiently in the direction of urban sustainability. Also, the indicators identified may compliment in the on-going research such as Malaysia Well-being Index (MWI) and Malaysia Urban Rural Indicator Network (MURINet) by the Economic Planning Unit (EPU) that target to determine suitable social indicators in assessing the subjective well-being of the citizens to achieve policy goals of creating healthy, liveable and sustainable cities.

Conflicts of interest

The authors have no conflicts of interest relevant to this article to disclose.

Appendix A. : Existing subjective indicators to assess well-being

Variables

Environmental well-being dimension

Physical/built environment (McCrea et al., 2011; OECD, 2011)
 Air pollution (McCrea et al., 2011; Larson, Jennings, & Cloutier, 2016)
 Water pollution (McCrea et al., 2011; Summers et al., 2012)
 Noise pollution (McCrea et al., 2011; Summers et al., 2012)
 Waste generation and management (Summers et al., 2012)
 Housing/Home environment (Tichy, 2013)
 Green areas (Oktay & Rustemli, 2011; Rezvani, Mansourian, & Sattari, 2012)
 Transport (McCrea et al., 2011)
 Urban design (Panagopoulos et al., 2016)
 Population growth (McCrea et al., 2011)
 Biodiversity (McCrea et al., 2011)
 Climate change (McCrea et al., 2011)
 Water quality & accessibility (Larson et al., 2016)
 Sanitation and Hygiene (Rezvani et al., 2012)
 Waste management (Rezvani et al., 2012)
 Landuse (Shen et al., 2011)
 City growth/sprawl (McCrea et al., 2011)
 Natural environment (McCrea et al., 2011)
 Natural disaster (Diener & Chan, 2011)

Variables

Urban Governance

Public participation/forum (OECD, 2011)
 Existing Participatory process (Attwood, 2013)
 Performance delivery (Attwood, 2013)
 Facility for citizen complaints (Insch & Florek, 2008; Kenny, 2005)
 Trust (Veenhoven, 2011; Cummins et al., 2003)
 Fairness in enforcing law (Veenhoven, 2011)
 Citizens' Charter (right of access to basic services) (Greyling, 2013)
 Appropriate range and quality of council services (Potter, Cantarero, & Wood, 2012)

Economic well-being dimension

Family income (Summers et al., 2012)
 Cost of living (Cummins et al., 2003)
 Residents income gap (Cummins et al., 2003)
 Home ownership (Hu, 2013)
 Housing price/affordability (Summers et al., 2012; Oktay & Rustemli, 2011)
 Access to job/employment (Oktay & Rustemli, 2011; Summers et al., 2012)
 Energy efficiency (Shen et al., 2011)
 Energy cost (Shen et al., 2011)
 Business activity (Attwood, 2013)
 Green jobs (Furchtgott-Roth, 2012)

Social well-being dimension

Urban crime and safety (OECD, 2011; Oktay & Rustemli, 2011; Rezvani et al., 2012)
 Health care service adequacy (OECD, 2011; Oktay & Rustemli, 2011; Rezvani et al., 2012)
 Recreation/sport (Oktay & Rustemli, 2011)
 Transport/mobility adequacy (McCrea et al., 2011; Oktay & Rustemli, 2011)
 Public transport cost (McCrea et al., 2011)
 Food security (Schimmack & Diener, 2003)
 Poverty (Shen et al., 2011)
 Education service adequacy (OECD, 2011; McCrea et al., 2011; Rezvani et al., 2012)
 Art and Culture (Shen et al., 2011b)
 Urban Demography (Amato & Zuo, 1992)
 Neighbourhood connectedness (Cummins et al., 2003; OECD, 2011)
 Family/friends connectedness (OECD, 2011)
 Work connectedness (OECD, 2011)
 Tolerance of diversity (Sirgy et al. 2010a, 2010b)

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