REFLECTION ON THE THEORY AND PRACTICE OF INTEGRAL SUSTAINABLE DESIGN IN RURAL CONTEXT: A LITERATURE REVIEW

Susan Ang[1], Gayani Karunasena[1*], Lalith De Silva[2] and Sachie Gunatilake[2]

[1]School of Architecture & Built Environment, Deakin University Geelong Waterfront Campus, Australia

[2]Department of Building Economics, University of Moratuwa, Sri Lanka

ABSTRACT

Sustainability is often discussed with regard to urban development. However, the prevailing system of developing rural areas with poor communities and numerous critical problems associated with the same are hardly in line with the concept of sustainability. In order to achieve a true rural development, the rural built environment should be provided with sustainability principles which produce economically, socially and environmentally responsible designs and constructions. In addition, the so called sustainable design and construction should respect the existing individual life style, cultural views, values and systems of the rural communities. Considering the need for addressing the aforementioned facts, this study aims at understanding the need for an integrated framework for sustainable building design and construction in the rural context. Accordingly, the Integral Sustainable Design theory is used to identify the multiple perspectives that should be addressed in sustainable rural development. The study is based on a comprehensive literature review on the rural community requirements and how they are adequately fulfilled with the application of sustainability in reference to the Integral Sustainability Design theory. The research findings reveal that an integrated framework for sustainable building design and construction can address a diverse range of issues available in the community such as poverty, lack of education, lack of protection for women and children, lack of protection in natural disasters and unstable living conditions while eliminating the prevailing short-termism and fragmentation of development. The research outcomes will provide a holistic view of application of sustainability in rural development through rethinking, design, construction and operation.

Keywords:*Design and Construction; Integral Sustainability Design Theory; Rural Context; Sustainability.*

1. INTRODUCTION

The rural communities all over the world come across with many demographic, economic, social and environmental challenges due to the geographic isolation, decreased young population, increased aged population and negative environmental impacts (Nicholls, 2004). These issues are often interconnected and have become the main reason for slow or no physical development in rural areas. Regardless of the efforts of the local governments and NGOs (Non-Governmental Organizations), the rural communities often maintain a stubborn reluctant behaviour with regard to a considerable change in their lifestyles (Murdoch, 2000). In fact, the migration of young generation and educated adults to urban areas with many financial benefits and multi-cultural attractions resulted underdevelopment of rural areas due to loss of human capital (Green, 2014). In such circumstances, sustainability is a novel concept to the rural communities. Even though it receives a significant academic attention, introducing sustainable development into rural areas cannot be often seen in practice (Scott *et al.,* 2000).

Rural sustainability obtains an equal importance as urban sustainability as rural areas often contribute to national economy; basically, by agricultural means (Marsden, 2006). However, the approach of achieving rural sustainability should be different from the approach of urban sustainability as rural communities value their traditions and culture. In fact, the rural sustainability should follow a locally defined context rather than a

*Corresponding Author: E-mail - gayani.karunasena@deakin.edu.au

universal definition, nevertheless, should include livelihood, social participation, justice and equity (Scott *et al.,* 2000). The key aim of rural sustainable development is not just preserving for future yet making the community capable of achieving welfare for its people, self-developing, protecting cultural values and preserving natural resources for reproduction and long-term usage for its economic activities such as manufacturing, trades, crafts, agriculture, recreation, tourism and other important areas (Belyaeva *et al.,* 2016).

The prevailing rural development strategies all over the world hardly consider about sustainable principles. In most of the third world Asian countries, sustainability is not completely addressed even though it has been used in design and construction (Kishnani, 2012). The design and construction processes are often fragmented and only focused on implementation of short-term solutions. Not having a long term sustainable plan will lead the communities to diverse issues such as availability of energy, cost increments and high maintenance (Mainali *et al.,* 2014). Hence, understanding the sustainability concept is essential and especially in this case, the concept of rural sustainability should be well understood. The so called fragmented and short-term development can be eliminated by using an integrated approach which provides a methodological and systematic framework for design and construction process (Kishnani, 2012). Accordingly, the aim of this study is to understand the need for an integrated framework for sustainable building design and construction in the rural context. Thus, paper intends to explain a systematic way of achieving rural sustainable development via an integral sustainable design approach.

2. RESEARCH METHODOLOGY

This paper is a theoretical evaluation based on the findings of the "Building Ampara" project initiated by the iDiDe (Intercultural Dialogue Through Design) program of Deakin University. Deakin University's iDiDe delivered a global mobility study tour model with structured immersive learning that focused upon sustainable rural community development in the Eastern district of Ampara, Sri Lanka. It is a structured program offering intercultural immersive learning experiences which utilizes a multidisciplinary and integrated perspective in sustainable design, eco-tourism, cultural preservation, and rural community infrastructure development in the conceptualisation (feasibility and design) and project development for realisation of prototype buildings (Ang, 2017). According to the findings of this project, a new research direction is encountered to identify whether there is a need for an integrated framework for sustainable building design and construction in the rural context. Accordingly, the programme recommended Integral Sustainable Design (ISD) theory to be used in rural sustainable development as a future research direction. ISD is intellectual framework which simultaneously includes and excludes differences by performing cross-cultural comparison of human experience, systems and performance which can be effectively used in any discipline to demonstrate a holistic view of its particular context (Esbjorn-Hargens, 2010). This paper intends to explore the way of using ISD theory in rural sustainable development by conducting a thorough literature review regarding the theory and the rural community development. Based on the literature, this paper explains why ISD is suitable for rural sustainable design and construction, how it can be used and what kind of an arrangement of ISD should be introduced for successful achievement of true rural sustainability. Context analysis, intercultural dialogue, interpersonal communication and cross-cultural and multi-leveled collaboration alongside supervised participation in community engagement activities were used as research techniques when gaining hands-on experience through the iDiDe study program activities. Content analysis on theme based coding used for the mapping of findings for four quadrants of ISD.

3. INTEGRAL SUSTAINABLE DESIGN (ISD) THEORY

3.1. HISTORY AND APPLICATION OF ISD THEORY

Based on the Integral Theory introduced by Wilber (2000), DeKay and Bennett (2011) introduced Integral Sustainable Design (ISD) theory with the intention of providing a more holistic approach of sustainability appraisal in the built environment (Roetzel *et al.,* 2017). Wilber's theory is a philosophical approach which provides an outline to comprehend the intricacy of various contending theories, products and methods related to human knowledge (DeKay & Bennett, 2011). The key assumption of integral theory is that "everyone is right", at least partly (DeKay & Guzowski, 2006). In fact, the theory introduces an intellectual framework which simultaneously includes and excludes differences by performing cross-cultural comparison of human knowledge, experience and analysis. The main advantage of this theory is that it can be effectively used in any

discipline to demonstrate a holistic view of the its particular context (Esbjorn-Hargens, 2010). In fact, it has been used in disciplines such as economics, art, medicine, law, religious studies, education, design and construction, and psychology. In particular, DeKay and Bennett (2011) discussed how this approach can be effectively applied with general sustainability design (Roetzel *et al.,* 2017). Following the integral theory, ISD consists of four main quadrants representing the multiple perspectives. Figure 1 demonstrates these four quadrants and their respective perspectives.

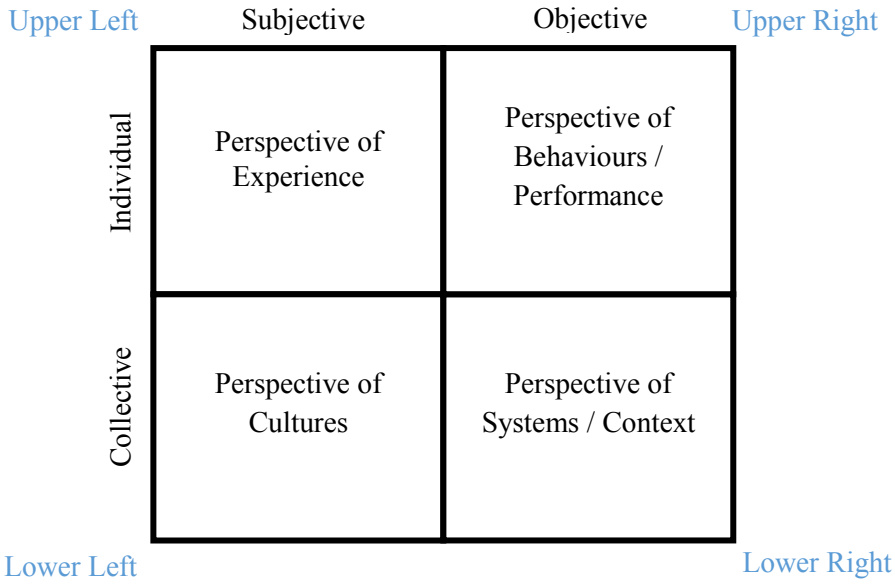

Figure 1: Four Quadrants of Integral Sustainable Design

Source: DeKay and Guzowski (2006); Roetzel et al. (2017)

According to Figure 1, the four quadrants represents; (1) perspective of experiences in which the main focus is on human senses, emotions, consciousness, feelings and experiences; (2) perspective of behaviours which focus on science, performance, mechanisms, measurements and calculations; (3) perspective of cultures in which the main focus is on mutual understanding, denotations, world views and symbolism; and (4) perspective of systems which focus on mapping, systems understanding, social and natural ecologies and contexts (DeKay & Guzowski, 2006; Roetzel *et al*., 2017; Roetzel *et al.,* 2015). In fact, these perspectives consider internal and external aspects of both individual and collective certainties of sustainable design development (Esbjorn-Hargens, 2010). The upper left quadrant signifies the subjective and individual aspects (experiences) whereas the lower left quadrant signifies the subjective and collective aspects (culture). On the other hand, upper right quadrant signifies individual and objective aspects whereas the lower right quadrant signifies collective and objective aspects. If further described, experiences represent "I" concept of ecological issues whereas cultures represent "we" concept. Similarly, the behaviours represent "it" concept of ecological issues whereas systems represent "its" concept (Roetzel *et al.,* 2017). Considering the aforementioned explanations, Roetzel *et al.* (2017) and Roetzel *et al.* (2015) put forward typical main questions that can be seen with regard to each quadrant. Table 1 provides a summary of these questions and the nature of each quadrant.

Table 1: Summary of ISD Quadrants

ISD Quadrant	Nature	Main Question
Upper left - Experiences	Qualitative	How does an individual experience nature through the building?
Upper right - Behaviours	Quantitative	How does the building perform?
Lower left – Cultures	Qualitative	What collective interpretation of nature does the building suggest?
Lower right- Systems	Quantitative	What is the nature of the relationships of the building with nature?

Source: Roetzel et al. (2017); Roetzel et al. (2015)

3.2. INTEGRAL SUSTAINABLE DESIGN APPROACH

ISD is a way of clarification of the sustainable design development with regard to the Integral Theory introduced by Wilber (2000) (Roetzel *et al.,* 2017). It basically provides a map of four quadrants which should be considered by the designers when they make a particular sustainable design (O'Brien & Hochachka, 2010; Roetzel *et al.,* 2017). In fact, it assists designers and practitioners to re-evaluate the scope, comprehensiveness and multidimensional facets of sustainability (DeKay & Guzowski, 2006). If further elaborated, the aim of ISD is to perform as a reminder that multiple perspectives have to be addressed when dealing with nature and adhering to sustainable development (Roetzel *et al.,* 2017). Moreover, the most concerning perspective will be decided by the most specific challenge faced by a designer. ISD not only provides four different perspectives to be considered yet it also explains these perspectives in four different levels (DeKay & Bennett, 2011). Therefore, each quadrant will have four levels and all together, there will be 16 different levels of perspectives to be considered when developing a sustainable design (Roetzel *et al*., 2017).

According to Roetzel *et al.* (2017)'s explanation regarding the aforementioned four levels, level 1 is a traditional comprehension of nature which concentrates on the ways of using local forces within the site perimeter or how to be protected from them. Passive solar design and dialect architecture are two examples for this level of consideration. Level 2 represents the modern comprehension of nature where the nature is considered and utilized as a resource. Since, there is a limited amount of non-renewable resources, the focus in this level is to optimize the available resource usage such as non-renewable energy. Low energy buildings are an example for this level. Level 3 is the post-modern comprehension of nature which focus on protecting nature with regard to its magnitude and complexity in ecosystems. The main focus in this level is to interact the diverse elements of the ecosystem with each other and maintain a significant balance between them. Green buildings could be a proper example for this level as it uses various parameters to protect nature while maintaining an adequate balance between them. Level 4 represents the future beyond the post-modern comprehension of nature which not only focus on one ecosystem yet consider multiple ecologies and living systems. This level demonstrates more dynamic patterns than linear relationships. Figure 2 demonstrates the way of aforementioned four levels are associated with the four quadrants of ISD.

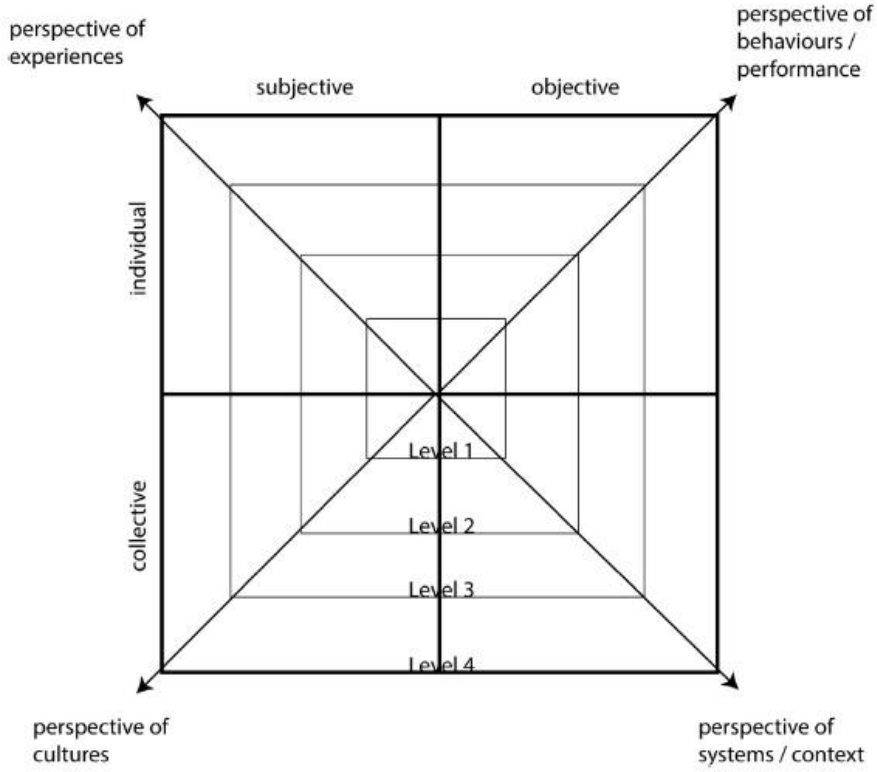

Figure 2: Quadrants and Levels of ISD

Source: Roetzel *et al.* (2017)

4. RURAL BUILT ENVIRONMENT

A rural area was initially defined as an area with less than 2000 residents, yet the latest definition established by the Organization for Economic Cooperation and Development (OECD) describes a rural area as an area with less than 150 people per km^2 of population density (European Commission, 2017). In many Asian developing countries such as Sri Lanka, the rural areas are often defined geographically; that the areas outside the borders of local administrative authorities such as urban councils and municipal councils are the rural areas (Wickramasinghe, 2010). These authorities are set as per the availability of developed infrastructure on particular areas which define the urban living and established by the Urban Development Authority (UDA). The local governments and private organizations all over the world are continuously engaged in rural development with the initial idea of providing them with basic common amenities (Kleemeier, 2000; Murdoch, 2000) yet hardly concerned of addressing sustainability. In particular, one of the most common issues of countries with civil wars and social conflicts is the huge rise in community displacement and infrastructure destruction; especially in rural areas (Seneviratne *et al.,* 2015). This leads the local governments to reconstruction with limited time, finance and social resources, thus the focus is mainly on providing basic facilities. Hence, long term sustainable constructions cannot be often seen in such rural areas.

The traditional attitudes, believes and living styles of rural communities often obstruct the systematic development of rural areas (Murdoch, 2000). Moreover, the fear of losing their assets and living conditions often generate local reluctance to rural development. Therefore, an effective way has to be introduced which simultaneously address the physical development, preservation of prevailing life styles and avoidance of common issues which barricade the upgrading of rural areas. In fact, there are much to do with regard to rural development and poverty elimination all over the world regardless of the current initiatives taken by different authorities (The World Bank, 2015).

4.1. COMMON RURAL ISSUES TO BE CONSIDERED IN RURAL DEVELOPMENT

Rural communities are often hit by similar issues, despite of the geography, culture and population (Falk, 2001). Poverty is one such issue. According to the International Monetary Fund, there are many causes of rural poverty such as yet not limited to attitudes on gender, cultural beliefs, adverse weather and climate, market conditions and public policies (Khan, 2001). The physical and environmental conditions of rural areas are often suitable for agriculture (Tassinari et al., 2008), thus, most of the rural inhabitants all over the world are cultivators (Khan, 2001). Nevertheless, there is a significant number of non-cultivators who work on other fields such as miners, craftsmen, carpenters, masons and unskilled labourers who work for daily and sessional demands (Khan, 2001). Most of these occupations demand physical fitness and a supportive climate which are highly subjective by nature, thus, hardly provide a job security and a regular income. The uncertainties of income, unaccommodating economic policies which exclude the rural communities from national development procedures, corrupted local politics and public bureaucracies and negative civil conditions such as civil wars, riots and conflicts often drag rural inhabitants towards poverty (Khan, 2001).

Health issues are another common problem that can be often seen in rural communities (University of Minnesota Libraries Publishing, 2010). Lack of medical facilities, hospitals and medical centres, medical professionals, emergency transportation and equipment obstruct providing a high-quality service to the general public in rural areas (National Rural Health Association, 2012; Nicholls, 2004). On the other hand, the elderly population is considerably high in comparison to young and middle-aged population due to migration to urban areas looking for diverse job opportunities (Center for Rural Affairs, 2009). It adds up an additional burden to the prevailing health care problems since looking after the health requirements of elderly people is considerably expensive (University of Minnesota Libraries Publishing, 2010). Moreover, the geographic isolation of rural areas barricades providing effective medical services and other facilities (Black et al., 2000). Most of the rural areas are being rural for a long time due to their isolated location and lack of facilities. Professionals of various disciplines are reluctant to work in these areas due to the lack of facilities, thus, providing a high-quality service in relevant fields is very difficult and hardly acquire a development (Center for Rural Policy and Development, 2009). In fact, the voice of rural people is hardly reach the ears of political parties and governing bodies (Khan, 2001).

Work force migrating to urban areas is another issue in rural areas as it will lower the local labour availability (Green, 2014). In particular, the labour market will be affected negatively with reduced return on human capital investment, unemployment and the workers with same educational status in urban areas will earn more

compared to local workers (Falk, 2001; Green, 2014). It will again create the necessity of settling in urban areas leaving the rural communities. Lack of education is another critical issue which has become a root cause for a number of issues. There are relatively limited number of schools in rural areas and the student count is relatively low (Center for Rural Policy and Development, 2009). Moreover, the facilities, school teachers, required level of education, diverse educational opportunities are not adequate in rural areas. Local students either enrol in urban schools with much facilities or leave school early due to the extreme poverty. On the other hand, rural schools are not capable of providing a wide range of course offerings thus, creating new job opportunities within rural community is hard and has not been given much attention (Green, 2014).

Lack of protection to women and children can be often seen in rural areas. Sexual abuse and domestic violence is relatively high in rural areas and human rights are not well understood or known by the female population of rural areas (Campo & Tayton, 2015; United Nations, 2007). Legal implications, social and legal services with regard to domestic violence in rural areas are not well established in rural areas as they are in urban areas (Campo & Tayton, 2015). Women hardly engage in family decision making especially about their children and family planning. When consider the children, lack of health care, lack of education, child workers and malnutrition can be often seen (Arloc, 1992). Women are not involved in financial control and leadership. The majority of them are not independent and employed due to lack of education, training and skills. Adverse weather and extreme climate is another issue encountered by rural people (Khan, 2001). Since agriculture is one of the main sources of income, adverse weather will damage their crops and even dwellings, resulting financial losses. This will ultimately diminish the economic growth of rural areas. On the other hand, most of the rural areas all over the world are often affected by civil wars, riots and conflicts which create a huge impact on the local economy as well as the social life of rural people (Seneviratne et al., 2015). Due to such circumstances, rural development is highly difficult and require a lot of time.

4.2. WHY SUSTAINABLE DESIGN AND CONSTRUCTION IS REQUIRED IN RURAL AREAS

Sustainable development in rural areas is not just carefully utilizing available resources and preserving them for future generations. It is now a broader concept which can be defined as "*a stable socio-economic development of rural areas, volume increasing of agricultural output, improvement of agricultural effectiveness, achievement of full-employment of rural population and increase in their level of living, rational land use*" (Belyaeva et al., 2016, p.6890). As per the aforementioned definition, rural sustainability should be achieved considering social, environmental and economic aspects of the area. If further described, the sustainable policies related to rural built environment should hold the environmental responsibility, economic profitability and social awareness (Ali & Nsairat, 2009). The effort to achieve rural sustainability will obviously be long term with the involvement of numerous industries and cover a wider community. There are several key objectives of rural sustainable development; (1) to preserve natural resources while using them effectively in long term economic activities such as tourism, agriculture, recreation, crafts and other trades, (2) to provide standard and high-quality living condition for rural community assuring community development and welfare, (3) to enable self-development, and (4) to protect cultural values and behaviour (Belyaeva *et.al.,* 2016). Section 3.1 clearly indicate the current social, economic and environmental issues of rural areas which should be promptly addressed via rural sustainable development. In fact, policies should be made to increase the agricultural productivity and to provide a fair share in the national economy (Global Monitoring Report, 2013). Non-agricultural occupations should be encouraged and introduced to rural areas to maintain a stable economy and a market. On the other hand, infrastructure, health care and common amenities should be adequately provided to rural areas to increase their contribution to the national economy (United Nations, 2015). Since there are many areas to be addressed, it is effective to adopt an effective framework to successfully achieve true rural sustainability. When consider the key objectives of rural sustainability and prevailing issues in rural areas, ISD theory can be used to achieve a holistic view regarding this matter and accordingly develop the design and construction of rural buildings, infrastructure and common amenities.

5. ISD FOR RURAL SUSTAINABILITY DEVELOPMENT

ISD is highly effective in providing a holistic approach to sustainable development (Roetzel *et al.,* 2017). It considers experiences, behaviour, culture and systems in designing and construction of rural built environment. As identified through iDiDe study tours, poor economies of scale, low investment levels resulting from poor financial services, inappropriate or limited technology, fragmented landholding, inequality of income and

disparities in opportunities available for secondary education (especially for girls), gender equality, clean water & sanitation are the most evident concerns in most of the rural areas of Ampara. The aforementioned information regarding the rural communities emerge several critical questions for which the answers must be found in order to achieve true rural sustainability. Accordingly referring to IDF theory, following four key questions are formulated to determine the need for an integrated framework for sustainable building design and construction in the rural context as illustrated at Figure 3.

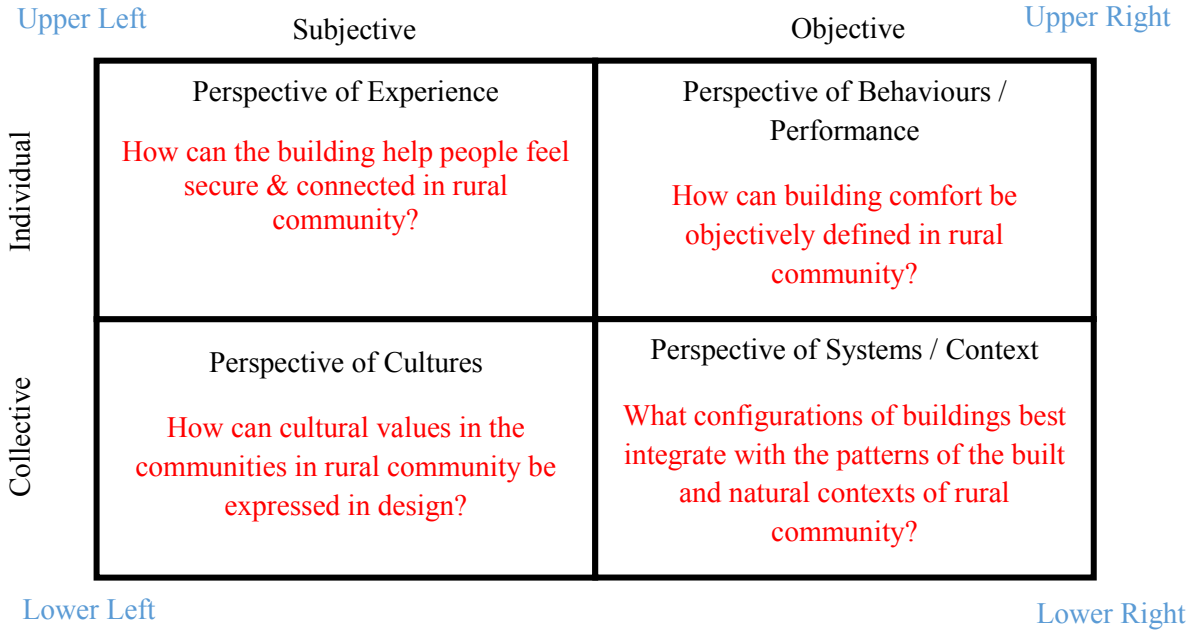

Figure 3: Key research questions formulated based on ISD theory

Source: Roetzel *et al*. (2017)

Following sections discuss how formulated key research questions can effectively address the need for an integrated framework for sustainable building design and construction in the rural context based on comprehensive literature review findings.

5.1. How can the Building Help People Feel Secure & Connected in Rural Community?

A house is a more personal object thus should be designed according to the personal requirements. In fact, the individual experiences should be taken into consideration when designing houses for rural people. Moreover, there needs will be different from each other, thus, require adding personal features to designs based on their thoughts, feelings and experiences (Roetzel et al., 2017). A mutual understanding between the designer and the resident is necessary and the houses should symbolize the resident's lifestyle. As per the findings of Roetzel et al. (2017) and Roetzel et al. (2015), these new house designs should allow the residents to experience and interpret nature through the house while providing comfort and protection. In particular, the issues such as lack of health care and protection for women and children should be addressed in these designs.

5.2. How can Building Comfort be Objectively Defined in Rural Community?

This question should be addresses quantitatively as it concerns the methods used for design and construction of buildings in rural areas. Based on DeKay and Guzowski (2006)'s ISD theory, perspective of behaviours and perspective of systems should be considered in deciding the methods. Following the findings of Roetzel et al. (2017) and Roetzel et al. (2015), scientific approaches, performances and mechanisms should be used for design and construction with accurate measurements and calculations. On the other hand, these designs should follow a systematic approach which understand the value of social and natural ecologies. Moreover, the designs should be done considering and defining the performance of the building and its relationship with nature (Roetzel et al., 2017). The rural issues such as poverty and the harm that can be done by adverse weather can be effectively reduced via this kind of approach.

5.3. WHAT CONFIGURATIONS OF BUILDINGS BEST INTEGRATE WITH THE PATTERNS OF THE BUILT AND NATURAL CONTEXTS OF RURAL COMMUNITY?

In terms of perspective of systems, mapping, systems understanding and social and natural ecological contexts should be used. Accordingly, the types of material resources should be measured by using science and technology and properly calculated to define the amount of usage which ensures the sustainability. Moreover, the resource areas should be accurately mapped and their natural content should be well understood. Most importantly, the usage of natural resources should not disturb the ecological systems. On the other hand, the rural issues such as young population migrating to urban areas due to unemployment and lack of education with regard to diverse disciplines can be addressed via this kind of integrated approach. Further, unemployment, poverty, lack of diverse education can be eliminated effectively if the skills of local community can be utilized and improved. On the other hand, using local skill will assist in producing an area specific designs with real requirements. The active participation of local community in rural development will enhance the local facilities as well as the local life quality. Having sufficient employment will reduce a number of problems such as domestic violence, poverty, lack of health facilities, young people migrating to urban areas and lack of education.

5.4. HOW CAN CULTURAL VALUES IN THE COMMUNITIES IN RURAL COMMUNITY BE EXPRESSED IN DESIGN?

The type of buildings required by the rural community is highly depended on the individual needs and cultural values. The buildings must fulfil the requirements of the inhabitants while protecting and emerging their cultural values. According to the findings of DeKay and Guzowski (2006), Roetzel et al. (2017) and Roetzel et al. (2015), this question should be addressed with a qualitative approach which considers human experiences, emotions, feelings and senses while ensuring mutual understanding of social and natural ecologies, symbolism, denotations and public views. In fact, it is crucial to identify the ways of making rural people experience the nature and culture through the new constructions. In addition, these new designs and constructions collectively should provide an interpretation of nature (Roetzel et al., 2015). Further, the knowledge of local people regarding their inheritance, cultural values and customs can be used for more innovative and unique designs which go along with nature and ensure sustainability.

6. CONCLUSIONS AND RECOMMENDATIONS

This paper is a theoretical analysis of one of the future research directions introduced by the iDiDE programme conducted by Deakin University. Accordingly, the need (why, how and what) for an integrated framework for sustainable building design and construction in the rural context is hypothetically evaluated. ISD theory is introduced as the integrated framework for rural sustainable development since it provides a holistic view of sustainable design and construction. The four quadrants of ISD address both qualitative and quantitative perspectives of sustainability by considering the individual and collective output. In addition, the four levels of each quadrant provide a scale at which the nature should be understood. The study identified several common issues faced by rural communities all over the world such as poverty, lack of health facilities, lack of education, unemployment, young generation migrating to urban areas, adverse weather and extreme climate, destruction caused by civil wars and conflicts and lack of protection for women and children. In order to achieve true rural sustainability, these issues should be socially, economically and environmentally addressed for which ISD can be effectively used. Four questions are emerged with regard to rural sustainability which have been explained using ISD theory. Accordingly, the study highly recommends the use of ISD or an equivalent theory for understanding and achieving rural sustainable development in the fields of design and construction. However, without conducting a field study it is difficult to carry out an in-depth analysis of all of these questions. In particular, addressing sustainability with levels of ISD is not effective in a theoretical analysis as there is no case study to be analysed. As the way forward, Deakin University, Australia collaboration with University of Moratuwa, Sri Lanka is conducting, research project on how ISD theory can be applied to improve rural community building in Amapara, Sri Lanka. Eventually, outcomes of this case study will be helped to establish the need for an integrated framework for sustainable building design and construction in the rural context.

7. REFERENCES

Ali, H.H. and Nsairat, F.A., 2009. Developing a green building assessment tool for developing countries - case of Jordan. *Building and Environment*, 44(5), 1053-1064.

Ang, S., 2017. Chapter 11: Intercultural dialogue through design (iDiDe): a model of intercultural collaboration and student engagement, In Tucker, R., ed. *Collaboration and student engagement in design education*, IGI Globle, 230-256

Arloc, S., 1992. *Falling by the Wayside: Children in Rural America* [online]. Available from: https://eric.ed.gov/?id=ED367528 [Accessed 15 December, 2017].

Belyaeva, G.I., Ermoshkina, E.N., Kosyakova, I.V., Pankratova, L.E., and Zotova, A.S., 2016. *Strategic Analysis of Sustainable Socioeconomic Situation of Rural Areas in the Samara Region of the Russian Federation*. International Journal of Environmental and Science Education, 11(14), 6889-6897.

Black, A., Duff, J., Saggers, S., Baines, P., Jennings, A., and Bowen, P., 2000. *Rural Communities and Rural Social Issues: Priorities for Research.* Rural Industries Research and Development Corporation. Joondalup: RIRDC Publication

Campo, M. and Tayton, S., 2015. *Domestic and family violence in regional, rural and remote communities: An overview of key issues* [online]. Available from: https://aifs.gov.au/cfca/publications/domestic-and-family-violence-regional-rural-and-remote-communities [Accessed 10 December, 2017].

Center for Rural Affairs., 2009. *Top 10 Rural Issues for Health Care Reform* [online]. Available from: http://www.beefmagazine.com/health/0514-rural-issues-health-care [Accessed 08 December, 2017].

Center for Rural Policy and Development., 2009. *A region apart: A look at challenges and strategies for rural K–12 schools.* Saint Peter, MN: Center for Rural Policy and Development.

Dekay, M. and Bennett, S., 2011. Integral Sustainable Design: Transformative Perspectives. *Integral Review*, 9(1), 106-109.

DeKay, M. and Guzowski, M., 2006. *A model for integral sustainable design explored through daylighting*. ASES Conference, Boudler July 2006. CO: ASES.

Esbjörn-Hargens, S., 2010. An ontology of climate change: Integral pluralism and the enactment of environmental phenomena. *Journal of Integral Theory and Practice*, 5(1), 183-201.

European Commission, 2017. *Urban-rural typology* [online]. Available from: http://ec.europa.eu/eurostat/statistics-explained/index.php/Urban-rural_typology [Accessed 07 December, 2017].

Falk, I., 2001. *Learning to Manage Change: Developing Regional Communities for a Local-Global Millennium*. National Centre for Vocational Education Research Ltd and University of Tasmania Kensington Park: National Centre for Vocational Education Research Ltd.

Global Monitoring Report, 2013. *Rural-Urban Dynamics and the Millennium Development Goals.* International Bank for Reconstruction and Development / The World Bank. Washington DC: World Bank and the International Monetary Fund.

Green, G.P., 2014. *Sustainability and Rural Communities* [online]. Available from: http://law.ku.edu/sites/law.drupal.ku.edu/files/docs/law_journal/v23/10%20Green_Formatted_FINAL.pdf [Accessed 07 December, 2017].

Khan, M.H., 2001. *Rural Poverty in Developing Countries Implications for Public Policy* [online]. International Monetary Fund. Available from: https://www.imf.org/external/pubs/ft/issues/issues26/ [Accessed 15 December, 2017].

Kishnani, N., 2012. *Chapter 10 – Integration. Greening Asia: Emerging Principles for Sustainable Architecture*, Singapore: BCI Asia.

Kleemeier, E., 2000. The Impact of Participation on Sustainability: An Analysis of the Malawi Rural Piped Scheme Program. *World Development*, 28(5), 929-944.

Mainali, B., Pachauri, S., Rao, N.D., and Silveira, S., 2014. Assessing rural energy sustainability in developing countries. *Energy for Sustainable Development*, 19, 15–28.

Marsden, T., 2006. *Pathways in the sociology of Rural Knowledge* [online]. Available from: https://books.google.com.au/books?hl=en&lr=&id=zi6xMWKHXCMC&oi=fnd&pg=PA3&dq=MARSDEN+2006+RURAL+AGRICULTURE&ots=IWtDHFAIdg&sig=kHjEGsPEcRycEM6dCAem3h5dwZ4#v=onepage&q=MARSDEN%202006%20RURAL%20AGRICULTURE&f=false [Accessed 08 December, 2017].

Murdoch, J., 2000. Networks * a new paradigm of rural development?. *Journal of Rural Studies*, 16, 407-419.

National Rural Health Association, 2012. *What's different about rural health care* [online]. Available from: http://www.ruralhealthweb.org/go/left/about-rural-health [Accessed 13 December, 2017].

Nicholls, K.R., 2004. Health and sustainability of rural communities. *The International Electronic Journal of Rural and Remote Health Research, Education, Practice and Policy* [online]. Available from: https://www.rrh.org.au/journal/article/242 [Accessed 12 December, 2017].

O'Brien, K. and Hochachka, G., 2010. Integral adaptation to climate change. *Journal of Integral Theory and Practice* 5(1), 89-102.

Roetzel, A., Fuller, R., and Rajagopalan, P., 2017. Integral sustainable design – Reflections on the theory and practice from a case study. *Sustainable Cities and Society*, 28, 225–232.

Roetzel, A., Fuller, R., Rajagopalan, P., and Luther, M., 2015. *The use of Integral Theory to evaluate architectural sustainability: a case study.* Living and Learning: Research for a Better Built Environment, The Architectural Science Association.

Scott, K., Park, J., and Cocklin, C., 2000. From 'sustainable rural communities' to 'social sustainability': giving voice to diversity in Mangakahia Valley, *New Zealand. Journal of Rural Studies*, 16, 433-446.

Seneviratne, K., Amaratunga, D., and Haigh, R., 2015. Post conflict housing Reconstruction. *Built Environment Project and Asset Management,* 5(4), 432-445.

Tassinari, P., Carfagna, E., Benni, S., and Torreggiani, D., 2008. Wide-area spatial analysis: A first methodological contribution for the study of changes in the rural built environment. *Bio Systems Engineering*, 100, 435-447.

The World Bank, 2015. *Poverty* [online]. Available from: http://www.worldbank.org/en/topic/poverty/overview [Accessed 11 December, 2017].

United Nations, 2007. *Rural Women Face Problems of Discrimination and Manifold Disadvantages: Prioritizing Rural Development Fundamental to Advancement of Women* [online]. Available from: https://www.un.org/press/en/2007/gashc3887.doc.htm [Accessed 10 December, 2017].

United Nations, 2015. *Decisions by Topic: Rural Development* [online]. Available from: https://sustainabledevelopment.un.org/topics/ruraldevelopment/decisions [Accessed 08 December, 2017].

University of Minnesota Library Publishing, 2010. *Problems of Rural Life* [online]. Available from: http://open.lib.umn.edu/socialproblems/chapter/14-4-problems-of-rural-life/ [Accessed 11 December, 2017].

Wickramasinghe, W., 2010. Rural development measures: Indicators and indices for Sri Lanka. *Sri Lanka Journal of Agrarian Studies,* 14(1&2), 23-44.

Wilber, K. 2000. *Integral psychology: Consciousness, spirit, psychology, therapy*. Massachusetts: Shambhala Publication.