Barriers in Development of Sustainable Neighbourhoods in Pakistan

By

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DEDICATION

To my beloved parents and sisters and my respected teachers!

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(Hassan Ali)

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LIST OF ABBREVIATION

BREEAM	Building Research Establishment Environmental Assessment Method
CASBEE-UD	Comprehensive Assessment System for Built Environment Efficiency - Urban Development
EPA	Environmental Protection Agency
FA	Factor Analysis
GBI	Green Building Index
GI	Green Infrastructure
IGBC	Indian Green Building Council
LEED-ND	Leadership in Energy and Environmental Design – Neighbourhood Development
NSAT	Neighbourhood Sustainability Assessment Tool
PEPAC	Pakistan Environmental Planning and Architectural Consultants
SoC	Sense of Community
SD	Sustainable Development
SN	Sustainable Neighbourhood

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ABSTRACT

By first quarter of 21st century, a large portion of population, more than two-billion-people, is expected to be living in the urban areas. This is happening because of rapid urbanization and shifting of people from rural to urban areas in quest of better facilities and job opportunities. Pakistan is one of the most urbanized country in South-Asian region. This accelerated the pace of urbanization has severe effects on urban area and causing the emergence of slums in urban fringes. Like a living organism, cell is basic unit of life; similarly neighbourhood is building block of urban fabric. Building sustainable neighbourhood is now the need of the hour. But there are bunch of hurdles in its development. This research aims to identify such barriers that were identified through extensive literature review followed by analysing the perceptions of experts from various background. Results drawn from various analysis techniques highlighted a number of barriers such as Regulatory & Policy Barriers , Lack of Social Capital & Sustainable Infrastructure, Inexperienced Professionals & Lack of Public Participation and Weak Industry / Professional – Academia Linkage were main domains where developing sustainable neighbourhood sees it course, also Lack of Public Awareness is highlighted in collected data. Based on results, a framework has been made and tasks has been assigned that needs to be done in various domains. Thus, there is a dire need to rationalize the policies at national and local level that encourage the development of sustainable neighbourhoods. Creating sustainable neighbourhoods would ultimately have positive effects liveability that will lead to making them sustainable.

CHAPTER 1 - INTRODUCTION

Almost half of the world's population currently inhabit in cities and over the next 3 decades an upsurge in world's population, of about more than two-billion person, is anticipated in urban areas of developing countries (Cohen, 2006). Cities are seen to be sustainable if, in the words of The Brundtland report: "Our Common Future" meet *"the needs of the present without compromising the ability of future generations to meet their own needs"*. To sedate the acquisitive demands arising from quest of sustainability, numerous definitions have been composed, policies at national level have been devised, specialized departments / institutions have been set-up to monitor the this concept of *"sustainability"* (Choguill, 2008). Achieving equilibrium on effects of development as a whole, in three basic dimensions: social, economic and environment, sustainable development has a hot topic of discussion among academic, professional and political for more than two decades (Zhang, Yung, & Chan, 2018).

Like cells are often called the "building blocks of life" similarly neighbourhoods, the basic planning unit in urban fabric, are becoming of centre of attention of both professionals and academics. The pioneer scholar, urbanist and activist, Jane Jacobs, clearly stated that sustainable neighbourhoods are those which are designed to ensure sustainable way of living having minimum impact on environment & are beneficial to community and individual as well (Jacobs, 1961). A good amalgamation of urban functions is essential for making neighbourhoods attractive, vital and socially stable (Price & Tsouros, 1996). Four measureable criteria (in domains of the environmental, the social, the economic and the technical by which an urban development is acronym as *sustainable*) must be met by urban policies to reach the desirable state of sustainability (Choguill, 1993)

1.1. Problem Statement

The third decade of 21st century is expected to be a very crucial phase for cities and human life particularly when 70% of the population will be living in urban settings. This has created a strong need for transitioning cities toward sustainable communities. As a result, several neighbourhood sustainability assessment tools have been developed worldwide (Komeily & Srinivasan, 2016).

Pakistan is one of the most rapidly urbanizing county in South-Asian region. With raising hidden and messy effect this urbanization, urban planning seeks improvement in the policy dialogue (Hina & Ijaz, 2017). According to "Trading Economics" data the population growth of urban area in 2016 was reported at 3.19%. With this rate a large number of Pakistanis are concentrating in urban areas than rest of South-Asian countries. With this rate Pakistanis are congregating to cities faster than any other country in South Asia. By first quarter of 21st century, an estimated population of 250 million people are anticipated in to be living in metropolitan areas that is more than half of Pakistan's population. The reasons of this urban growth trend are people migration from rural area and higher birth rates. People tend to move in cities in pursuit of better employment and access to quality basic infrastructure / amenities (Hina & Ijaz, 2017). Over the past few years, rapid urbanization raised numerous public concerns on sustainable development (SD) in the country owing to prevailing environmental and social issue. Consequently, making sustainable neighbourhoods tricky and amplified the level of meticulousness for both Industry and government.

1.2. Research Questions

This research will revolve around following research question:

a. What is sustainable neighbourhood?
b. What are the key indicators to define sustainable neighbourhood?

c. What are the tools to measure the neighbourhood sustainability?

What are the barriers in developing sustainable neighbourhood?

1.3. Research Objectives

This research comprises following objectives:

a. To identify key parameters / indicators for Sustainable Neighbourhood in developing countries
b. To identify the critical barriers toward development of Sustainable Neighbourhood in Pakistan
c. To develop framework for Sustainable Neighbourhood

1.4. Significance of Study

This research is unique as research on assessment and development of sustainable neighbourhood in Pakistan is very limited. However, some studies are done in other countries regarding development of Sustainable Neighbourhood based on selection of renowned Neighbourhood Sustainability Assessment Tools (NSATs) followed by identification of Sustainability Indicators (SIs)

1.5. Limitations of Study

The scope of study is limited to assess the sustainability at neighbourhood level. Keeping in view the limited time and resources the research is majorly relies on the literature and Primary data. Moreover, there is not much relevant data available regarding the neighbourhood sustainability in Pakistan.

1.6. Structure of Research

The thesis is organized into 6 Chapters. Chapter 1 provides a general introduction to research topic, problem statement, research questions followed by research objectives and limitation to the study. Chapter 2 comprises the literature review in light of proposed research topic and objectives. Chapter 3 explains the methodology of research in order to attain the required data, use of various analytical techniques and instruments. Chapter 4 embraces data collection and analysis. Chapter 5 encompasses the key findings based on collected data and discussion. Lastly Chapter 6 includes conclusion and recommendations.

CHAPTER 2 - LITERATURE REVIEW

Literature review is systematic process of reviewing the accumulated knowledge about research question and present it in logical manner to interconnect it with sense of purpose to proposed topic. The purpose of this chapter is to explain the concept of neighbourhood, characteristics of sustainable neighbourhood, identification of barriers that hinders the development of sustainable neighbourhood based on literature and brief explanation of tools that are used in measuring the sustainability of neighbourhood.

2.1. Defining the Neighbourhood

Neighbourhood terminology is very common in urban dwellers since ages. With considering the culture, there are shared traits among all sort of neighbourhood i.e. they are dwelling.

Neighbourhood is a basic unit of a city or town. There is no authentic and universally accepted definition of neighbourhood, however skimming and searching through internet some of the useful descriptions / definitions can be established for defining neighbourhood such as "the area of a town that surrounds someone's home, or the people who live in this area"[1] or "geographically localised community within a larger city, or town"[2] or "group of houses or buildings that are together in an area or that are grouped together as a unit"[3]. According to Bradley (2015) in English law definition of neighbourhood is " a political identity and recognized in statue as the space of collective participation. Place-based groups were to be

[1] https://dictionary.cambridge.org/dictionary/english/neighbourhood

[2] https://en.wikipedia.org/wiki/Neighbourhood

[3] https://www.yourdictionary.com/neighborhood

empowered but contained within boundaries enforced by the municipal authority and mediated by systems of representative and market democracy."

From above descriptions the definition of neighbourhood is basically in eyes of the beholder. The term can be explained is basically a matter of personal opinion or purpose based. It can be defined on the basis of socio-economic class, based on ethnicity or based on the functionality. There is not universal accepted population size or functionality a neighbourhood is anticipated to fulfil (Bijoux, Lietz, & Saville-Smith, 2007; Choguill, 2008).

Neighbourhood are centre of attention of urban designer & city planners for providing it certain a function (Choguill, 2008; Kallus & Law-Yone, 2000). However, the meaning attached to the concept is being taken to bits, shuffled and congregated as per situations and requirement. Neighbourhoods are ultra-local communities of town or city. In working paper by (The Young Foundation, 2010) tried to define neighbourhood in term of geographically and socially as homogeneous areas of similar size with fixed boundaries, according as far as possible with existing physical and administrative boundaries having high level of social interaction between its residents and sentiments attached to the area. However according to (Bijoux et al., 2007) neighbourhoods serves as spatial nodes where dwellings and households are clustered and usually provide residential functions.

In the local context of Pakistan, Neighbourhood is defined "محلہ - آس پاس کا علاقہ". According to Bianca's description of the development of Arabian villages, *mosque* aka *masjid* is main element in physical development of neighbourhood (Choguill, 2008). Pakistan being a Muslim country the catchment population of neighbourhood mosque (mohalla mosque) is around 5000 persons within walking distance of approx. (National Reference Manual on Planning & Infrastructure Standards, 1986, p. 366). Thus, a neighbourhood population is approx. 5000 in local context. Definition of Neighbourhood in PEPAC, (1986) report is *" An integrated, planned urban area related to the large community of which it is a part and consisting of*

residential districts, a school or schools, shopping facilities, religious buildings, open spaces and perhaps a degree of service industry."

2.2. Neighbourhood Chronology

The neighbourhood is a comprehensive residential system and its physical traces can be found in ancient cities (Benevolo, 1980). The beginning of modern urban planning is traced back and is recognized to (Howard, 1898) and his *garden city* movement. According to him, a neighbourhood is self-contained human settlements generating employment activities surrounded by concentric green belts that would be used for agriculture purpose defining neighbourhood limit to discourage encroachment. The concept of the this movement is to make a healthy community by giving detail spatial arrangement of various urban activities around the dwelling units of *neighbourhood*, to what he referred it as *ward*, in such way that shows the importance of neighbourhood as integral part of the urban planning.

Clarence Perry (1939) further refined concept of (Howard, 1898) and developed the ideal neighbourhood concept with more focus on public facilities i.e. school, park, shopping centre & church that are easily accessible in with walking and it bounded in between major arterial roads or thoroughfares. The main aim this concept is to increase social interaction and provide its residents a common meeting point. The influence of this concept is quite evident that many neighbourhood developed around the world is based on the very idea present by Perry.

In dawn of 20th century, Radburn represented many of the basic principle of planning theory (Birch, 1980). Clarence Stein and Henry Wright in 1929, on the intellectual base by Howard & Perry, created the master plan of Radburn by introducing the concept of *superblocks* with an aim to segregate the vehicular movement from pedestrian traffic in neighbourhood. The blocks are bounded by avenues and most interesting this about the master plan is that is developed in form of curvilinear pattern as compared to conventional grid iron pattern. Dwelling units were

developed around cul-de-sacs and communal facilities like schools, shops and parks are accessible by walkways (Choguill, 2008).

The idea of planning of neighbourhood is widely accepted, mostly in New British Towns, but it has taken place more in principle than in actual practice (Mumford, 1954). Mumford focused more on positive social value. According to him a neighbourhood is place that creates the sense of belonging among the residents. The idea is second by Fisher (1984), and he indirectly related defined the size of neighbourhood as the larger the community the less the social interaction and reduced sense of belonging.

2.3. Sustainable Neighbourhood

After the industrial revolution, perpetual environmental degradation, the core of sustainable development (SD) became sensitive concept for shaping the liveable communities and human settlements. No consensus has been made so far to define sustainability because of its complexity and obscurity in meaning (Lin & Shih, 2016; Sharifi & Murayama, 2014), which minister its explanation in various circumstances. However, global agreement on sustainability on three pillars i.e. social, economic and environmental, has been made as depicted in Fig 2.1. Some organizations and individuals want to develop a joint relationship between various aspects such as economy environment and society whereas on the other side a few stakeholders want to fetch a balanced situation among the above three dimensions. Some organizations and individuals are of the view that the issue of neighbourhood sustainability and self-development can be tackled at the grassroots point of the community ladder, that is, through effective involvement residents. The former group is of the mind-set that decision makers are the key stakeholders of a community, although other group want the responsibility for decisions to be shared between all the concerned groups or individuals or organization.

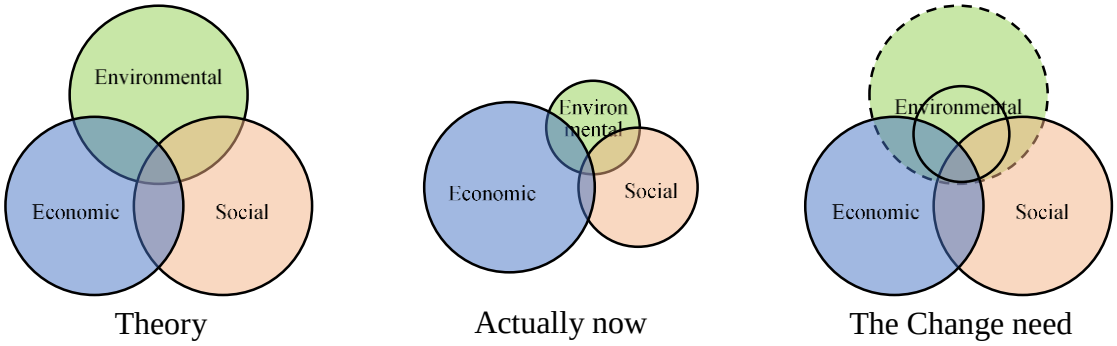

Figure 2. 1 – Inter-relation between three pillars of Sustainability (Lin & Shih, 2016; Yoon & Park, 2015)

A sustainable neighbourhood[4] is a functional place where residents want to live for today and if its functionality is maintained, the people plan to live for tomorrow. It would be characterized by the factors of social safety, environmental protection and economical health and a place that is providing a safe living environment with adequate physical planning and built to last ("City of Pickering"). Choguill (2008) defined the characteristics of sustainable neighbourhood, is one that is socially, economically, environmentally and technically sustainable. However according (Sharifi & Murayama, 2014), there is another dimension of sustainability which also considered as another pillar sustainability i.e. institutional sustainability and its inclusion is very crucial because of interactions between various factors like stakeholders, norms & values of people, rules & regulations of local authorities.

[4] Sustainable neighbourhoods:

- are diverse and cohesive socially, with a mix of employment opportunities and housing types
- give importance to health activities like cycling and walking and transit as well
- encourage energy efficiency
- efficiently promote the use of resources
- have good linkage to recreational and commercial services near residential areas with pedestrian and cycling connections

In consonance with UN Habitat, (2015) article, owing to rapid urbanization, increased population growth, urban sprawl, deletion of scarce land in suburbs, increased pollution & congestion ,a sustainable should follow 5 principles :

- Enough space for streets and an efficiently designed street layout and network.
- High density development i.e. compact development through vertical buildings
- Mixed land-use
- Provision of Social interaction places
- To bring the element of robustness through less or limited land-use fixation

According to (Lietz, Bijoux, K., & Howell, 2006) a sustainable neighbourhood is one that enhances the living quality of community by improving the built and protecting the natural environment.

In creation of a sustainable neighbourhood, multiple guidelines were developed but the core guidelines are same and mentioned in multiple researches and policy documents. These were first developed by the Smart Growth Network on the principles of Smart Growth and Sustainable Development (Wey, 2013)**.** Upon analysis, these can be divided into two main sections; neighbourhood location and neighbourhood design.

2.3.1. Neighbourhood Location

Location of the neighbourhood or a city is an important step in achieving sustainability and to create sustainable neighbourhood. Selecting the location depends on the available facilities present for the housing and the cost to reach these facilities. If the existing infrastructure is far away, it will take more money to connect it and vice versa. The location also helps in the level of social interaction between other communities and their trip lengths. In the same way the neighbourhood location plays a very important role in the effects of climate in the area and ultimately on global perspective.

The following principles can be analysed while selecting the town or neighbourhood location to accomplish the objective of sustainable Neighbourhood:

2.3.2. Re-Use of Previously Developed Land

The landuse efficiency can be enhanced to maximum level if certain consideration be kept in mind while in mind while development of land that either it should be developed previously developed area, an in fill site or neighbouring existing developed area. Beside that

- **Development Towards Existing Communities**

Smart and ecological growth guide development in direction of existing localities, have sound infrastructure, tends to utilize the resources that existing localities possess and safeguard open space and precious natural resources at periphery of urban area.

- **Use of Previously Developed Property**

Brown field redemption is also a good practise while making a development in an area that was developed previously. In this method area is reclaimed that was previously left due to contamination. Local authorities or developer can debug the site while ensuring protective measures and use it for future development with great profit and maximizing land-use.

- **New Development Close to Existing Infrastructure and Development**

The success of development of new neighbourhood is highly possible it has link to existing infrastructure like roads, water supply, sewerage and other amenities. This will not only minimize the cost of new construction but also integrated with existing infrastructure. Moreover, public spaces and commercial activities should be along exiting major roads and smart linkages near existing localities so that inter-communal trips & vehicular traffic can be reduced. (Marian Keeler and Prasad Vaidya, 2016)

2.3.3. Connectivity

The most essential part neighbourhood design is its connectivity and general street layout. A myriad researches, around the globe, on street networks have indicated that shaping land use pattern and densities is highly correlated to pedestrian travel levels over a certain period of time. (Stangl & Guinn, 2011). Stangl & Guinn (2011) also highlighted the significance of connectivity among professional planners in US. Watts, Ferdous, Moore, & Burns (2015) defined connectivity, with in a defined distance, as linkages to number of streets, paths, businesses or homes to an individual's home. Like a person living in rural area has low connectivity to the person living in urban neighbourhood have access to footpaths streets etc.

2.3.4. Mixed Land-use and Diversity

Co-existence of multiple land-uses such as residential, commercial, Parks / open spaces, educational etc. in a specified area is attributed as mixed land-use development where diversity & intensity of land-uses is given emphasis (Bahadure & Kotharkar, 2015). Mixed land-uses under zoning regulations in a neighbourhood increases density and encourages walkability (Jacobs, 1961; Zuniga Teran, 2015). LEED-ND also recommends to have a mixed land-use in a neighbourhood with in a distance of 400m or a five-minute walk to and from a certain destination (Zuniga-Teran et al., 2016; Zuniga Teran, 2015).

2.3.5. Urban Design & Quality Architecture

Different counties and city governments have devised sustainable urban design guidelines based on various NSATs like LEED-ND, BREEAM Communities & CASBEE-UD for achieving sustainable urban design at neighbourhood level (Yoon & Park, 2015). Achieving a balance between human and environmental needs result in improving the economic competitiveness and quality of life. Success of neighbourhood sustainability depends on the

incorporation of urban design elements in designing / planning process (Ameen, Mourshed, & Li, 2015).

2.3.6. Compact Development

In sustainable urban form, compact development is very important dimension. Adaptive reuse of existing building, redevelopment and infill development results in proficient delivery of public services and maximum utilization of land resources and result in more compact urban areas (Mobaraki, 2017; Talen & Koschinsky, 2011).

2.3.7. Green Infrastructure

Infrastructure is defined as *"the substructure or underlying foundation, especially the basic installations and facilities on which the continuance and growth of a community depends,"* imitates the social priorities of vibrant cultures around the globe and over the period of time change in society and scientific advancement have moulded the forms of infrastructure (Williamson, 2003). On a neighbourhood scale Green Infrastructure (GI) can be termed as mix of built systems, green space, low-impact development, innovative storm water management, urban forest, road side green verges, green roofs & walls to restore and maintain subsurface hydrology by ensuring infiltration of storm water in the ground that contributes to human benefits and ecosystem resilience (Arshad & Routray, 2018; Demuzere et al., 2014; Hammitt, 2010; Williamson, 2003). The whole idea about GI is spatially and strategically planned and well managed network of greenways, park / open spaces, wilderness that protects air, water and ecological processes and improves the quality of life and health of human being and native species (Kim, 2018). In United States, 11 elements of GI, by The United States Environmental Protection Agency (US EPA), are suggested that can be included a neighbourhood development which are *raingardens, planter boxes, rain water harvesting, downspout disconnection, bio-swales, permeable pavements, green alley and streets, green parking, urban*

tree canopy, green roofs and land conservation. GI has numerous economic, social and ecological benefits (Kim, 2018).

2.3.8. Walkability

Talen & Koschinsky, (2013) has studied on importance of walkable neighbourhood and defined it as a walkable neighbourhood is one that safe and separate from vehicular movement, and motivates walking by making sidewalk, street and footpaths (routes for pedestrian) interesting and comfortable. Wood, Giles-Corti, & Bulsara, (2012) studied walkability in neighbourhood design to measure the social capital of residents of selected neighbourhood. New urbanism advocates to develop neighbourhood that are pedestrian oriented and more walkable. Having a walkable neighbourhood chance of increased social encounter, exchanging favours, talking casually will ultimately establishes trust and reciprocity among the residents and increase their social capital (Jun & Hur, 2015; Wood et al., 2012). A study by Lund (2002) found that there is a greater likelihood of walking and sense of community (SoC), among the residents in their neighbourhood, in traditional neighbourhood than the ones who live in modern neighbourhoods built in suburbs. A study by Leyden (2003) suggests that there are significant effects on social capital, mental and physical health on the residents that live in walkable neighbourhoods. Moreover, there is a tendency among the residents they know their neighbours and in communal and political activities (Jun & Hur, 2015; Leyden, 2003).

2.3.9. Neighbourhood Design

After the selection of location another important aspect is the design of the neighbourhood. Sustainability can never be achieved without a proper neighbourhood design or in a bigger scenario city planning. Neighbourhood design not only considers the social interaction among people but it also considers the environmental and economic aspects of sustainability.

The design of Smart neighbourhoods or sustainable neighbourhoods creates communities that offer health, social, economic, and environmental benefits for all. By encouraging the construction of resource-efficient building and civic designs, green building practices, low-impact development (LID), and mixed-use and walk able neighbourhoods a trend for making SN be achieved.

2.3.10. Housing

Neighbourhood forms have countless effects on the life of its residents. Researches in the last 10 years have ascertained that forms of neighbourhood has significant effects on mental & physical health, accessibility, safety, crime and social interaction, each one of them are important elements of neighbourhood quality of life. Particularly the ones for low-income group who rely more on neighbourhood / community based-resources than those of high-income residents(Talen & Koschinsky, 2011, 2013). Number of issues raised when emphasis is made on single type of housing usually the single-family home (Smart Growth for Small Towns). Variation in housing types in city neighbourhood is better and complement each other (Jacobs, 1961). A smart and sustainable neighbourhood encourages compact and mixed-use development while integrating a variety of housing and serve people from various income levels (Geller, 2003). This involves fusion of various forms and sizes i.e. single-family vs multi-family, detached vs semi-detached houses. Blending new housing type with existing housing stock because older housing units are more affordable to low income people than new one (Talen & Koschinsky, 2011).

2.4. Neighbourhood Sustainability Assessment Tools (NSATs)

Policy makers and urban planners began to apprehend the significance of neighbourhoods as the basic unit and building block of overall urban fabric, without giving due consideration to neighbourhood sustainability, sustainable cities goals cannot be achieved (Choguill, 2008;

Komeily & Srinivasan, 2015; Sharifi & Murayama, 2013, 2014). To check how developed neighbourhoods are performing in terms of sustainability various Neighbourhood Sustainability Assessment Tools aka NSATs are developed by professionals from industry, a fewer by government departments and non- government organizations. NSATs are basically the ultramodern form of Environmental Impact Assessment (EIA) that came into being as outcome of 1969's National Environmental Policy Act (NEPA) (Komeily & Srinivasan, 2015; Sharifi & Murayama, 2013). The purpose of NSATs is to access the functionality of neighbourhood against certain theme or a set of criterion and appraise the neighbourhood's position in terms of sustainability in achieving overall sustainability goals. But there is no tool that can considered to be applied universally. NSATs be flexible and adaptive as per local characteristics of community rather than following a fixed sets of rules and criteria (Lin & Shih, 2016)

After far-reaching realization of the concept of SD, a new movement has emerged during early 90s, among several groups who are the practitioners and researchers of urban development. In spite of appearance, this movement has been seeking to encourage, through mix of neighbourhood planning principles, green building & construction techniques and SD, the creation of more liveable communities which is equally environment friendly.

In 1990, BREEAM was begun in UK initially with main focus on the building scale to offer construction industry with a set of guidelines / standards for design of sustainable building. The movement has expanded since then and numerous other assessment tools have been introduced and transformed from building level to neighbourhood level. There are several implications of this transformation because it is not only about individual building but also there is a complex interrelationship of humans and other species, infrastructure, features and activities needs due consideration in assessment process.

Sustainable neighbourhood development has a special emphasis on protecting green-fields, controlling urban sprawl, and re-use / redevelopment of inner urban areas. LEED-ND, BREEAM-Communities, and CASBEE-UD are three NSATs that are pretty much renowned in the industry. (Sharifi, 2013)

2.4.1. Brief of various NSATs

Each tool is briefly described here

2.4.1.A. Leadership in Energy and Environmental Design – Neighbourhood Development (LEED-ND)

LEED is one of the most prevalent green building certification across the globe began in 1993. Started as non-profit organization United States Green Building Council (USGBC) in collaboration with Congress of New Urbanism (CNU) and the Natural Resources Defence Council (NRDC), in 2007, developed LEED-ND a voluntary tool for evaluating the neighbourhood design and guidance of development of sustainable neighbourhood. (Boeing, Church, Hubbard, Mickens, & Rudis, 2014; Sharifi & Murayama, 2014). It pilot was launched in 2007 and it final standard was launched in 2009 (Szibbo, 2015). Its current version LEED v4 for Neighbourhood Development its currently being used updated in 2018 (LEED-ND). LEED-ND looks sustainability beyond from building scale to community as whole. LEED-ND assessment criteria is distributed into 5 themes: “Smart Location & Linkage”, “Neighbourhood Pattern & Design”, “Green Infrastructure & Buildings”, “Innovation & Design Process” and “Regional Priority Credit”. Which are further delineated in individual criteria.

2.4.1.B. Building Research Establishment Environmental Assessment Method (BREEAM COMMUNITIES)

Building Research Establishment simply “BRE”, in 1990 in UK, started its first environmental certification scheme “BREEAM” for offices buildings. In 2011, BREEAM expanded its

working to the variety of stakeholders involved in its future development, both at the local level and strategically. On the basis of BREEAM methodology, BREEAM-Communities was introduced as an independent tool for certification standard and third-party assessment. The main aim this framework is to address opportunities and issue, at the early stages of design process for development, which would affect the sustainability of project. The scheme addresses three sustainability objectives i.e. social, economic and environmental that have effects / influence on large-scale development (BREEAM, 2012). The assessment is carried out in five thematic areas i.e. “Governance”, “Social and economic wellbeing”, “Resource and energy”, “Landuse and ecology” and “Transport and movement”.

2.4.1.C. Comprehensive Assessment System for Built Environment Efficiency - Urban Development (CASBEE-UD)

With support of the Housing Bureau, CASBEE has been established in 2001, a branch of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). CASBEE-UD is a collaborative product of Japan Green Building Council (JaGBC), and Japan Sustainable Building Consortium (JSBC). Representatives from government, industrial, and academia sectors were involved in the development of CASBEE-UD. Enhancing the scope from single building CASBEE for Urban Development was initially started, as a part of research in 2006, for evaluation of urban-planning projects. After the results, tool was fine-tuned and CASBEE-UD 2007 edition was released. Its current edition is CASBEE-UD 2014 which possess the same essence of basic principles of 2007 edition with revised and modified evaluation. (IBEC, 2014). Assessment done is CASEE-UD by setting a virtual boundary to the project boundary. It has two main themes:

i. Environmental quality inside the virtual boundary (Q_{UD})
ii. Environmental load outside the boundary (L_{UD})

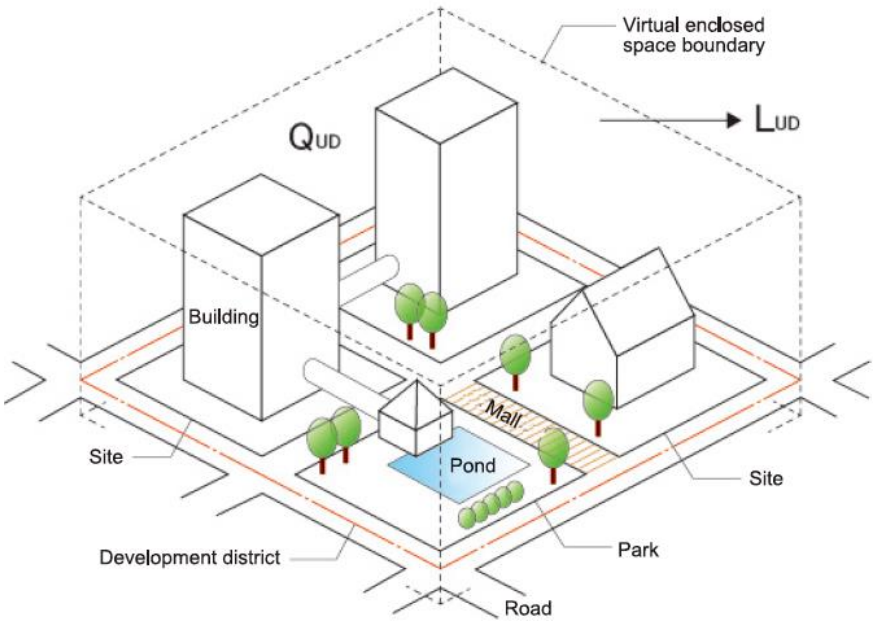

Figure 2. 2 : Assessment object of CASBEE for Urban Development (IBEC, 2014)

Q_{UD} consist of three major themes ($Q_{UD}1$ to $Q_{UD}3$) corresponding to triple bottom lines of environment, society and economy which are further subdivided into sub-criteria and indicators. Each sub-criterion is evaluated and scored in five ranks from level 1 to level 5. While L_{UD} is represented as the effort level of reduction of carbon emissions.

2.4.1.D. Green Building Index (GBI) for Township

The Green Building Index (GBI) is Malaysia's green rating tool for buildings to promote sustainability in the built environment and raise awareness among practitioners from various background i.e. Planners, Architects, Engineers, Developers, Designers, Contractors and the Public. GBI Malaysia is developed in 2009 by Pertubuhan Akitek Malaysia / Malaysian Institute of Architects (PAM) and the Association of Consulting Engineers Malaysia (ACEM) (GBI, 2017; Muhammad Ashraf Fauzi & Nurhayati Abdul Malek, 2013). First Version of GBI for Township is developed in 2011 and its recent version 2 is published in 2017. Purpose of making tool is to evaluate the performance based on six core categories to encourage the development of more sustainable townships (GBI, 2017). The categories are "Climate",

"Energy and Water", "Community Planning and Design", "Transportation & Connectivity", "Building & Resources", and "Business and Innovation".

2.4.1.E. Indian Green Building Council (IGBC) - Green Residential Societies

In year 2001 through extensive deliberation, a pilot Green Residential Society rating system was established, to monitor the efficiency of existing multiple housing units and devising the standards for sustainable Residential Societies, by Technical committee of the Indian Green Building Council (IGBC) as a part of Confederation of Indian Industry (CII). The aim of this tool is to monitor and incorporate the environmental friendly concepts that would enable the existing residential societies and new development to provide tangible and intangible benefits to its residents (Indian Green Building Council, 2015). The tools is divided in 5 thematic areas i.e. "Facility Management", "Sustainable Water Practices", "Energy Conservation", "Waste Management" and "Innovative Practice".

2.5. Neighbourhood Planning Process: International vs Local Practise

2.5.1. Neighbourhood Planning Process in UK

Developed countries promoting neighbourhood planning as tool to enhance sustainability at local level (Zhang et al., 2018). Under the Localism Act 2011, communities are given control over location, type, pace, size and design of development for a neighbourhood plan. Town and parish councils is in authority to make neighbourhood plans while engaging stakeholders form public in the planning process. The plans developed by council becomes part of development plan of the area scrutinized the examiner and ratified by the community through a referendum (Local Government Association, 2013). The sequential steps involved in this process are shown in Table 2.1 and Figure 2.3 for clear understanding.

Sequential Steps	Steps involved in preparation of Neighbourhood Plan	Links with Sustainability Appraisal
1	Getting Started	
2	Identifying the issue	Identify key economic, social and environmental issues
3	Develop a vision and objectives	Identify key national planning framework and local planning objectives Develop the sustainability framework (objectives and criteria)
4	Generate options	Appraise the options using the sustainability framework
5	Draft your neighbourhood plan	Appraise the draft policies using the sustainability framework
6	Consultation and submission	Prepare the sustainability appraisal report
7	Independent examination	
8	Referendum and adoption	

Table 2. 1 : UK neighbourhood planning process and its link to neighbourhood sustainability

Source : (Zhang et al., 2018)

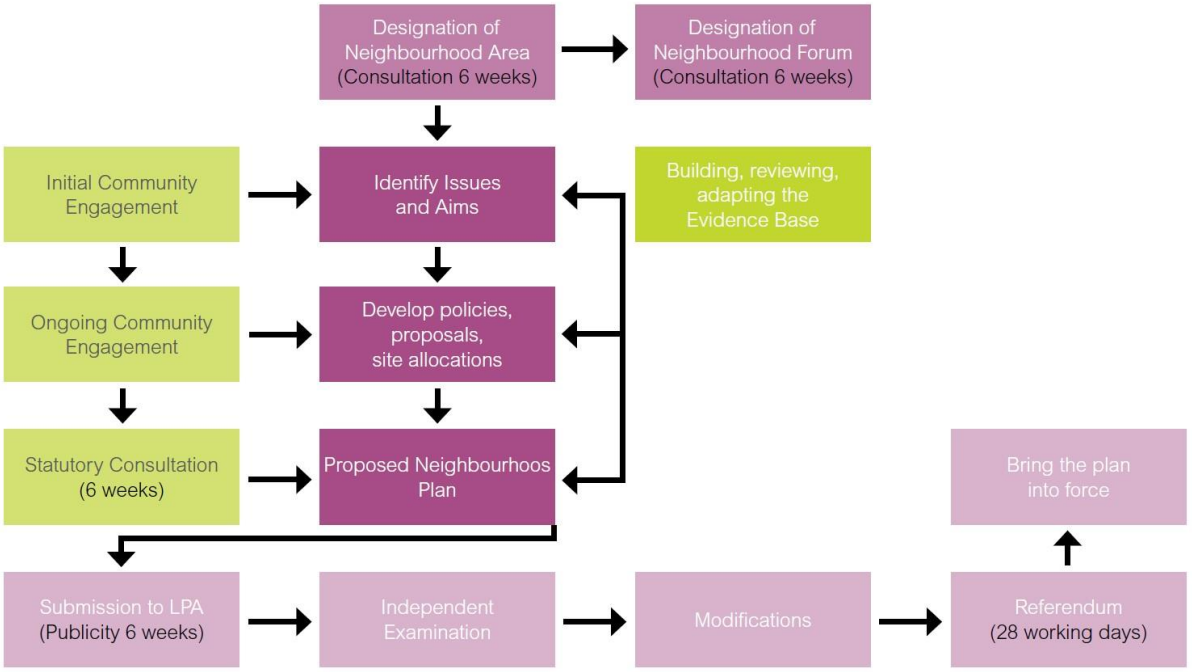

Figure 2. 3: Neighbourhood Planning Process *(Source: www.local.gov.uk)*

2.5.2. Neighbourhood Planning Process in Pakistan

In Pakistan, there are no specified set of rules for neighbourhood development at national level. However, neighbourhood planning standards are conceived by provincial government for design and planning neighbourhoods. In Punjab Province, *"The Punjab Private Housing schemes and Land-subdivision rules 2010"* is exercised for development, sanctioning, planning and designing of housing scheme. The processed involved various steps that are presented in the diagram below.

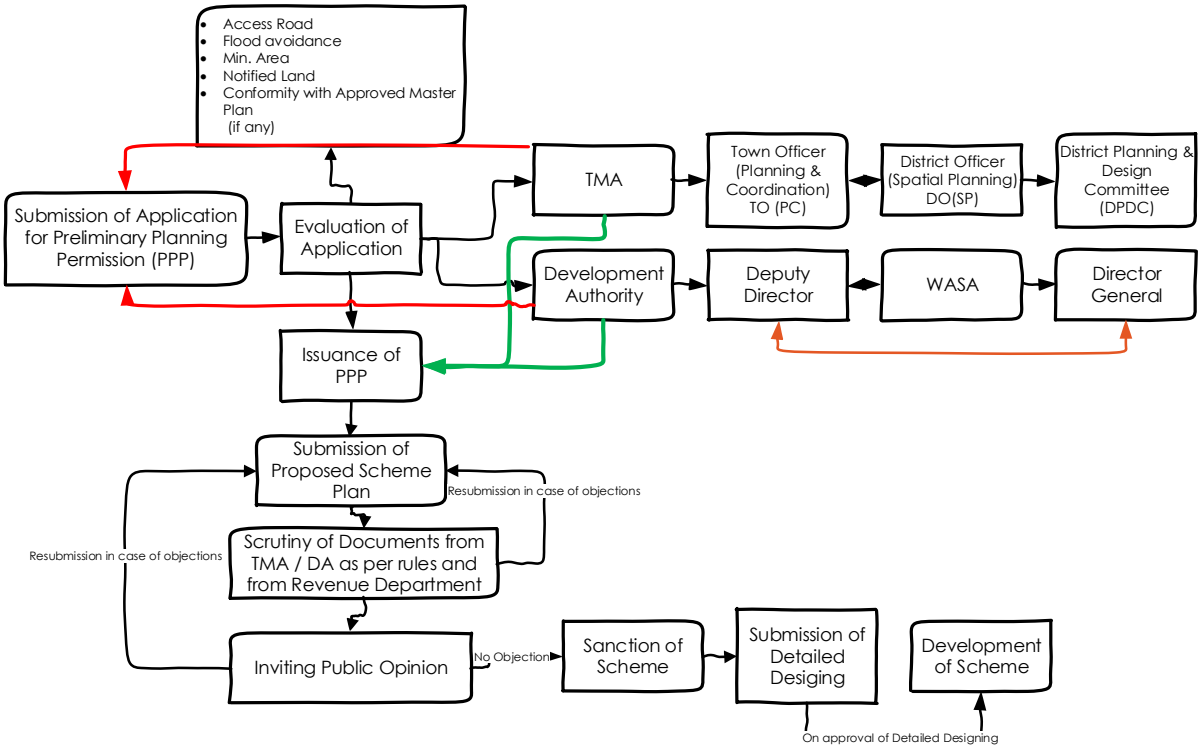

Figure 2. 4: Housing Scheme Planning Process in Punjab

2.6. Global Barriers for Developing Sustainable Neighbourhoods

The holistic concept of sustainable development with aims to integrate environmental, social and economic policies, to assure the growth our communities in fine feather, is accepted exquisitely among professionals. The ultimate goal of SD is to find a logical and enduring

balance between these three aspects. Still regrettably it is not an antecedence for many nations especially the developing nations and people other than providing a lip service. Nevertheless, owing to numerous benefits, there are certain barriers that defy the application of sustainable development. Thus, a scopious review of past literature has been done for identification of such barriers.

Many researchers, from different background and countries, have dig down and carried out extensive studies to rationalize various barriers that are impeding in development of sustainable neighbourhoods. Sakundarini et al., (2015) identified barriers in Green Manufacturing Practices (GMP) in Small Medium Enterprises (SMEs) in Malaysia. Significant barriers found in his work are 'Delayed execution of decisions pertaining to GMP due to high internal politics', 'Management resistance to change', 'Lack of technical expertise', 'Lack of involvement from external stakeholders', 'Lack of awareness of impact', 'Lack of effective measures', 'Lack of GMP technologies capabilities', 'Lack of guidance from regulatory authorities' & 'High initial capital cost for implementation'. Another study by (Ali, Jaineudin, Tawie, & Jugah, 2016) concludes 'Lack government will & support', 'cost vs benefit issue', 'lack of knowledge', 'lack of awareness' as barriers in green initiatives in construction industry.

Azad & Akbar, 2015 conducted a local study in Rawalpindi in Pakistan regarding obstructions in construction of Sustainable Buildings. The study selected 17 barriers and ranked it on Likert Scale based on responses on 97 respondents. The most crucial barriers in construction of Sustainable Building is 'Lack of credit resources to cover up front cost' while other significant barriers are 'Risk investment', 'Lack of training / education in sustainable design or construction', 'Lack of demand', 'Higher final Price', Lack of building codes and regulation', 'Lack of expertise', 'Lack of Public Awareness' and 'Lack of Strategy to promote green Building'.

A recent study of Zhang et al., 2018 predominantly explores the barriers in China regarding neighbourhood planning. According to the study ‘inadequate degree, experience and forum of public participation’, ‘weak sense of community’, ‘Unclear official definition and national policy’, ‘unclear accountable body of neighbourhood planning project’, ‘Lack of institutional support’, ‘inadequate human and financial resource support’, ‘lack of assistance of steering committee’, ‘Inadequate institutional mechanism for planning implementation and evaluation’, ‘planning procedures are not standardized, systematic and iterative’ are major barriers. In addition to that ‘archaic law & regulations’ and ‘highly bureau tic community residents’ committee’ is also found barrier in development of sustainable neighbourhood.

An extensive research by Shi, Yu, Zuo, & Lai (2016) explores relationship the barriers in developing Sustainable Neighbourhoods in China. The study identifies ‘Unsustainable urbanization mode’, ‘Uncertain revenue, High capital cost, and low predictable profit’, ‘Deterioration of environment’, ‘Lack of supporting policies’, ‘Lack of sustainable urban infrastructure’, ‘Lack of sense of happiness’, ‘Inter-relationship among various barriers’, ‘Unsustainable urban areas’, ‘Lack of national standards and assessment tools’, ‘Difficulties to coordinate various stakeholders and their interests’,‘ Lack of model projects’, ‘Poor project management capabilities’, ‘Lack of attention to developing sustainable culture’, ‘Lack of environmental governance mechanism’, ‘Difficult application of Sustainable Technologies’, ‘Difficulties for reuse and transformation of built-up areas’ as major barriers in China in sustainable development of neighbourhood.

Olawumi, Chan, Wong, & Chan, (2018) identified barriers in integration of Building Information Modelling (BIM) for sustainable practices in construction projects. According to study ‘Lack of initiatives and hesitance on future investment’, ‘High initial investment’, ‘Lack of supporting sustainability analysis tools’, ‘increased risks and liabilities’, ‘Lack of awareness and collaboration among project stakeholders’, ‘societal reluctance to change from traditional

values and culture' and 'low level of research in the industry and academia' are the main barriers.

Zaidi, Mirza, Hou, & Ashraf, (2018) identifies factors that resist the implementation of sustainable procurement in Pakistan. According to the study, government legislations, financial support, lack of green initiative, high prices and unavailability of green item /products are major barriers in sustainable procurement in Pakistan. (Esmaeilifar, Mohd Shafiei, Ghodrati, Samari, & Olfat, 2013) also identified barriers in development of green buildings according to the researcher 'lack if building codes and regulations', 'lack of incentives', 'higher investment cost', 'Lack of Public Awareness', 'lack of demand', 'Lack of strategy to promote green building', 'Lack of expertise', 'lack of professional knowledge and technology' and ' lack of government support' are the major ones.

According to (Seetharaman, Moorthy, Patwa, Saravanan, & Gupta, 2019) 'Transition from convention resources to renewable energy', 'insufficient information', 'inadequate awareness', uncertainties about financial feasibility', 'lack of experienced professional', 'High initial capital cost and intangible cost', ' lack of research and development capabilities', 'ineffective policies by government', ' administrative and bureaucratic complexities' and 'lack of standards and certification' are main barriers in deployment of renewable. (Williams & Dair, 2007) have identified barriers experienced by stakeholders in England. According to them 'lack of information, awareness and expertise to achieve sustainable measure', 'high cost', 'stakeholders not involved in development of sustainability measures', ' inadequate sustainability measure' are the major findings.

(Azeem, Naeem, Waheed, & Thaheem, 2017) examine barriers in promoting green building practices in Pakistan. The main barriers of the research are 'poor implementation of laws and regulations', ' lack of standards', 'lack professional knowledge and technical expertise',

‘unsustainable measures by statutory undertaker’, Higher capital and maintenance cost’ and ‘resistance to change’.

CHAPTER 3 - METHODOLOGY

"*Research methodology is a systematic way to solve a research problem*" (Kumar, 2011). Research methodology is a general but a clearly defined structure comprising of different steps that are carried out over a course of time to address a specific research question and to reach logical conclusions in the light of set objectives. The nature of study and the objectives which are the main driving force while establishing the research methodology.

In order to investigate the in-depth of the current research, a mix-method research is adopted. Mixed methods research is formally defined "*as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study*" (Johnson & Onwuegbuzie, 2004). To obtain necessary information and validate the purpose of research following data is obtained;

- Primary data be obtained through : semi structured interviews from professionals, field surveys and observation
- Secondary Data be obtained through: through published data, journal articles, reports, dissertations, news and existing policies etc.

3.1. Research Design

The main starter for any research work is the topic or research question to be answered. The selection of research question is governed by the interest of the researcher as well as the prevailing situation in the society.

Initially secondary data is collected. For this around 80 - 100 journal articles, reports and papers were downloaded. Initially *Content Analysis* was done and use of relevant key words is applied to narrow done the available data which is most relevant to proposed topic. To ensure its relevance and significance papers published in last two decades (2001-2018) are selected. A

gist of the research mythology is given in diagram below and description of various step in given in preceding headings.

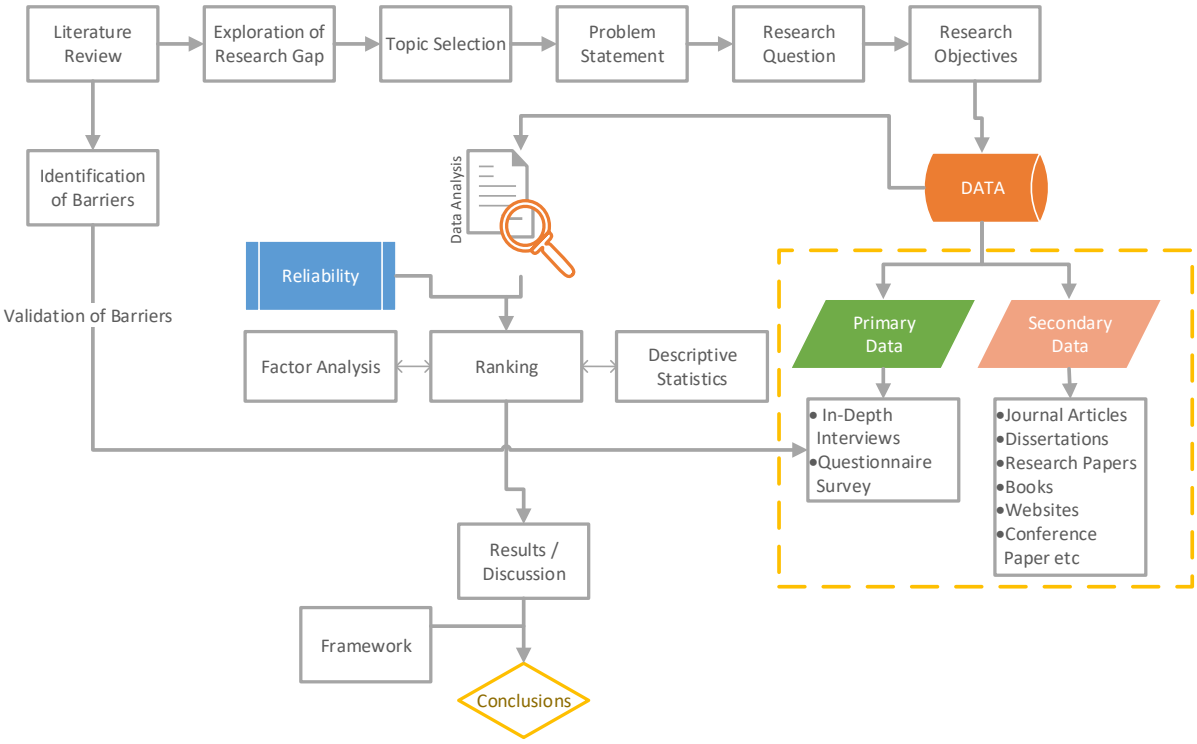

Figure 3. 1 : Research Methodology

Research Objectives	Research Method			Analytical Techniques		
	Literature Review	Questionnaire Survey	Semi-structured Interview	Ranking	SPSS	Factor Analysis
To identify key parameters / indicators for Sustainable Neighbourhood in developing countries	✓					
To identify the critical barriers toward development of Sustainable Neighbourhood	✓	✓	✓	✓	✓	✓
To develop framework for Sustainable Neighbourhood			✓			

Table 3. 1 : Research Methodology and Analysis Techniques to achieve the Research Objectives

3.2. Data Collection

The current study is mixed method research in nature, collection of data is essential to explore the unexplored thing. The current study opts detail literature review, questionnaire survey and in-depth interview as its core method of data collection.

3.2.1. Secondary data

Secondary data collection is much easier and less costly as compared to primary data therefore first secondary data will be collected. Secondary data related to Sustainable Neighbourhood Assessment Tools and identification of barriers in development of SN is obtained via various sources encompassing journal articles, published reports, technical manuals, dissertations, newspapers, information from relevant departments.

3.2.2. Primary Data

Primary data is quantitative in nature. Data related to the perception of key stakeholders, from various background, about barriers for development of sustainable neighbourhood in Pakistan is collected through questionnaire survey technique and in-depth interviews.

3.2.2.A. Questionnaire Design

To plead with the professional opinions questionnaire survey technique has been broadly used as a systematic technique of data collection. The questionnaire for this study was designed primarily to lead data collection from expert respondents. The questionnaire is divided into two parts. Section A will focus on the collection of personal information of respondents including type of organization, designation of respondent, academic qualifications and years of working experience. Sections B will consist barriers extracted from extensive literature. The experts will be asked to grade each question on a 5-point Likert Scale with 5 being the highest on the rating, where 1 = Not at all important, 2 = somewhat important, 3 = moderately important, 4 = Very important, 5 = extremely important. The five-point Likert scale was selected since it gives unambiguous results, which is easy to understand (Darko, Chan, Ameyaw, He, & Olanipekun, 2017). Preceding with questionnaire survey, a pilot / trial study was conducted to check the comprehensiveness and relevance of questionnaire (Azeem et al., 2017). The study involved three professor and four post-graduation researchers, who were well experienced in this field of research. On the basis of feedback received from the pilot study the final questionnaire is then concluded.

3.2.3. Sample size

From a strong theoretical base, if the parameters are clear and reliably drawn, then sample size for exploratory factor analysis (EFA) can be 100. However, some others suggest a general rule of having a minimum threshold of 5–10 responses per item is suggested to guarantee robust

results (Pallant, 2011; Zahoor, Chan, Memon, Gao, & Utama, 2017). The sample size applied to this research comprising 114 respondents working in various organizations from different fields; Town Planning, Architecture, Engineering, Environmentalist, Academia, and Developers. To identify potential experts that have appropriate knowledge snowball sampling technique was employed. To endorse the representativeness and reliability of the collected data, all the potential experts should have at least five years of work/research experience possess sufficient knowledge in neighbourhood planning / designing (Shi et al., 2016).

3.3. Required Data

For identification of barriers, in-depth literature has been done in order to identify various barriers that hinders in development of sustainable neighbourhoods. Following are the list of barriers that were identified based on literature:

CODE	Barriers	References														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B-01.	Unsustainable Urbanization mode	✓			✓											
B-02.	Unsustainable planning practices	✓								✓	✓					
B-03.	Lack of supporting policy	✓	✓	✓		✓	✓		✓		✓		✓	✓	✓	
B-04.	Lack of institution and mechanism for implementation and evaluation					✓								✓		
B-05.	High capital cost, uncertain revenue & low expected profits	✓	✓	✓				✓	✓		✓		✓		✓	✓
B-06.	Deteriorating environment	✓														
B-07.	Lack of sustainable urban infrastructure	✓						✓								
B-08.	Lack of sense of happiness	✓														
B-09.	Weak sense of community					✓										
B-10.	Unsustainable urban area	✓														
B-11.	Lack of national standards & assessment tools	✓	✓	✓		✓	✓		✓			✓		✓		✓
B-12.	Government Institution resistance to change							✓			✓			✓	✓	
B-13.	Difficulty in Coordination of the interests of Stakeholders	✓	✓			✓		✓					✓	✓		
B-14.	Lack of exemplary projects	✓	✓				✓		✓							
B-15.	Lack of expertise of professionals						✓	✓	✓		✓		✓			
B-16.	Inadequate efforts towards standardization							✓						✓		
B-17.	Poor project management capabilities	✓	✓													
B-18.	Lack of environmental governance mechanism	✓														
B-19.	Lack of attention to develop sustainable culture	✓	✓	✓			✓		✓				✓	✓		✓
B-20.	Low level of research in industry and academia													✓		
B-21.	Difficult Application of Sustainable Technologies	✓	✓	✓			✓		✓				✓			
B-22.	Difficulty in Transformation and Reuse of existing Built-up Areas	✓														
B-23.	Lack of Public Participation					✓						✓				✓

Notes: Digits in the 2nd row represent the references from the past studies, as: 1 = (Shi et al., 2016), 2 =(Sakundarini et al., 2015), 3 = (Ali et al., 2016). 4 = (Choguill, 2008), 5 = (Zhang et al., 2018), 6 = (Azad & Akbar, 2015), 7 = (Hammitt, 2010), 8 = (Esmaeilifar et al., 2013), 9 = (Shen, Jorge Ochoa, Shah, & Zhang, 2011), 10 = (Azeem et al., 2017), 11 = (Mazmanian & Kraft, 1999), 12 = (Seetharaman et al., 2019), 13 = (Olawumi et al., 2018), 14 = (Zaidi et al., 2018), 15 = (Williams & Dair, 2007)

3.4. Data Accumulation and Analysis

Data collected from survey was analysed using IBM-SPSS 23 and Microsoft Office. IBM-SPSS was used to execute various statistical analysis on collected data from questionnaire survey. The methodologies used in this research were Descriptive Statistics, Ranking Technique and Factor Analysis (FA)

3.4.1. Descriptive Statistics

Descriptive Statistics were used to describe the characteristics of participants and variables. Collected data was analysed using frequencies, percentages and means. Results of these analyses were presented graphically using tables, bar charts etc.

3.4.2. Ranking Technique

Ranking technique was used to rank barriers based on mean item scores and standard deviation. The mean score ranking technique is very popular and has been broadly used to rank and identify the key factors among several other factor (Darko et al., 2017).

3.4.3. Factor Analysis

Factor analysis was performed on barriers, as it is used to reduce to large data set of variables into smaller set of factors or components (Pallant, 2011; Tabachnick & Fidell, 2012). Two other statistical tests were also performed to assess the factorability of the data i.e. Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were conducted in this research.

CHAPTER 4 - DATA COLLECTION AND ANALYSIS

This chapter describes the data collection, analysis and results obtained from literature review, questionnaire survey and in-depth interviews in detail. In the first phase, various neighbourhood sustainability assessment tools (NSATs) are analysed. In second phase, perception of key stakeholders about barriers impeding in development of SN is examined.

4.1. Analysis of key parameters of NSATs

As one of the research question was to "What are the tools to measure the neighbourhood sustainability?", for that reason 3 internationally recognized NSATs were selected that are developed by developed nations i.e. LEED-ND, BREEAM-Communities and CASBEE-UD and 2 NSATs from developed by developing countries i.e. GBI for Township and IGBC for Residential societies have been selected. Pakistan being a developing country so selection of NSATs from developing countries is essential to relate it in local context in an easy way. Though there are several research available that identified several other tools but their implication is mostly done at local level or to their regional context. In addition to that there some authorization / restriction for downloading so those tools are not considered for analysis.

Table 4.1 gives a picture of key parameters i.e. the origin, the institution that developed those tools, their rating system and certification, validity and number of certification.

SPECS \ NSATs	Developed Countries			Developing Countries	
	LEED-ND	**BREEAM COMMUNITIES**	**CASBEE-UD**	**GBI for Township**	**IGBC-Residential Societies**
Open Name	Leadership in Energy and Environmental Design – Neighborhood Development	Building Research Establishment Environmental Assessment Method (for) Communities	Comprehensive Assessment System for Built Environment Efficiency - Urban Development	Green Building Index for Township	Indian Green Building Council (for) Green Residential Societies
Country of Origin	USA	UK	Japan	Malaysia	India
Institution / Developer	United States Green Building Council	BRE Global Ltd.	Japan Sustainable Building Consortium (JSBC), Institude for Building Environment and Energy Conservation (IBEC)	Pertubuhan Akitek Malaysia (PAM), Association of Consulting Engineers Malaysia (ACEM)	Indian Green Building Council
Rating	• Certified: 40-49 points • Silver: 50-59 points • Gold: 60-79 points • Platinum: 80+ points	• Unclassified <30 • Pass ≥ 30 • Good ≥ 45 • Very Good ≥ 55 • Excellent ≥ 70 • Outstanding ≥ 85	• Class C (Poor) BEE ≥ 3 • Class B^{-} (Fairly poor) BEE = 1.5 – 3.0 • Class B^{+} (Good) BEE = 1.0 – 1.5 • Class A (Very Good) BEE = 0.5 – 1.0 • Class S (Excellent) BEE < 0.5	• Certified 50 – 65 Points • Silver 66 – 75 Points • Gold 76 – 85 Points • Platinum 86 – 100 Points	• Certified 30 – 39 Points • Silver 40 – 49 Points • Gold 50 – 64 Points • Platinum 65 & above
Themes	Smart Location & Linkage, Neighborhood Pattern & Design, Green Infrastructure & Buildings, Innovation & Design Process, Regional Priority Credit	Governance, Social and economic Wellbeing, Resource and Energy, Landuse and ecology, Transport and movement	Q_{UD} (Quality) : Environmental Quality of Building L_{UD} (Load) : Environmental load of building $\text{Built Environmental Efficiency (BEE)} = \frac{\text{Environmental Quality of Building}}{\text{Environmental Load of Building}}$	Climate, Energy & Water, Environmental & Ecology, Community Planning & Design, Transportation & Connectivity, Building & Resources, Business & Innovation	Facility Management, Sustainable Water Practices, Energy Conservation, Waste Management, Innovative Practices
Version Studied	LEED_v4 (2018)	SD 202 – issue 1.1 (2012)	(2014)	Version 2 (2017)	Pilot version (2015)
Number of certified Projects	216	47	-	8-10	-
Validity of Certification	5 years	-	5 years	5 years	3 years
Website	https://new.usgbc.org/leed	https://www.breeam.com/	http://www.ibec.or.jp/CASBEE/	https://new.greenbuildingindex.org/	https://igbc.in/igbc/

Table 4. 1 : Comparative Analysis of NSATs

4.2. Scored Distributions in NSATs

4.2.1. LEED-ND

LEED-ND majority of points are distributed in domain of Neighbourhood Pattern & Design and Green Infrastructure & Buildings. Smart Location and Linkages also have share of credits with many perquisites. LEED-ND is divided in 5 thematic areas with their credit points distribution are shown in Figure 4.1.

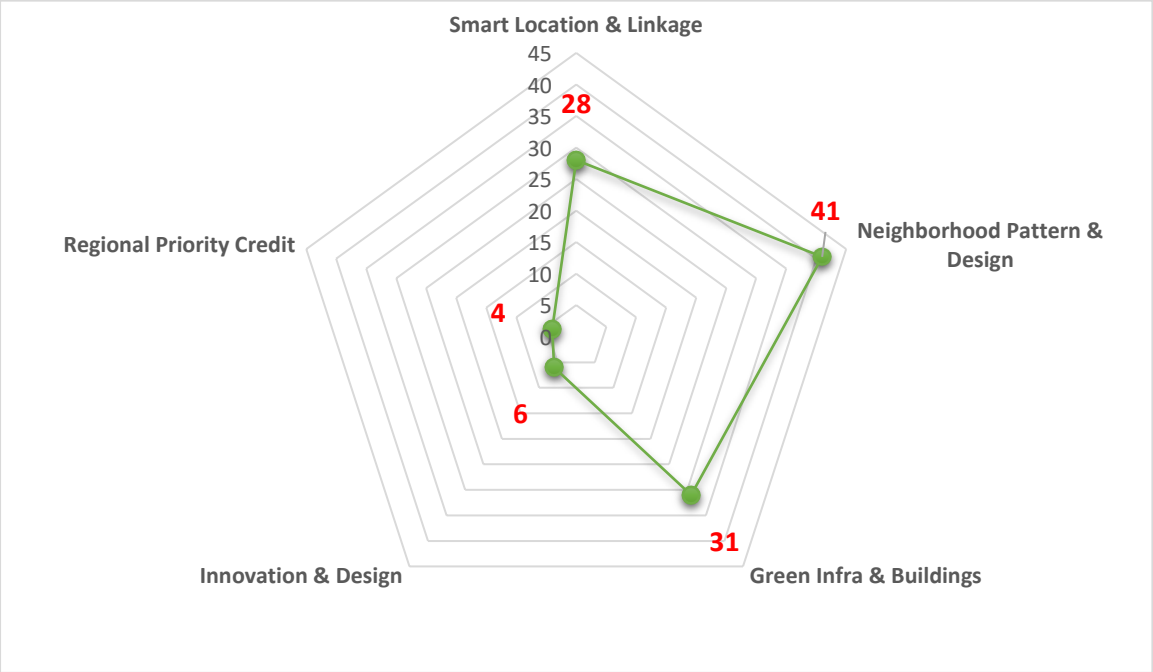

Figure 4. 1 : Credit Points Distribution in LEED-ND

4.2.2. BREEAM – Communities

BREEAM-Communities credit points are distributed in 5 domains with main focus on Social & Economic Wellbeing. The credit points distribution in BREEAM-Communities have been shown in Figure 4.2.

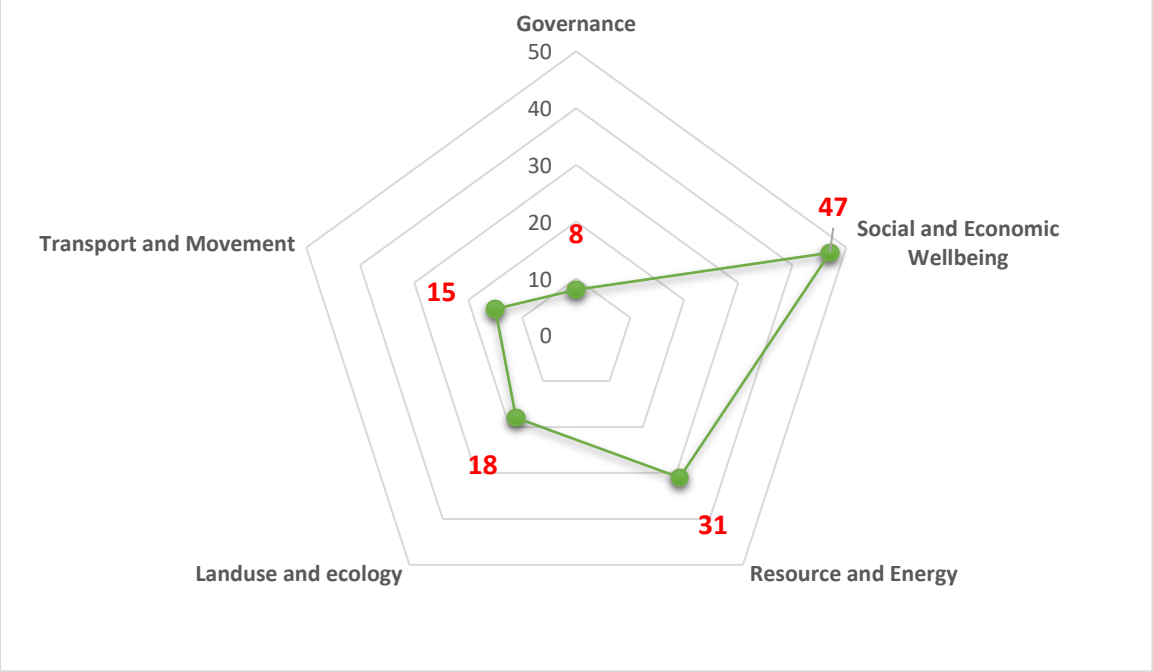

Figure 4. 2 : Credit Points Distribution in BREEAM-Communities

4.2.3. CASBEE-UD

There are two main themes in CASBEE-UD the first one is the Environmental Quality of Urban development inside the observed virtual boundary (Q_{UD}) and external Environmental load outside the observed boundary i.e. (L_{UD}). Q_{UD} is further broken down in 3 themes that is environment, Society and economy and all have same weighted scores of 3. The distribution is given in the Figure 4.3. in addition to that Environmental load outside the boundary (LUD) which basically measure CO2 emissions on a score of 5 and Final score is calculated by is calculated by following formula.

$$\text{Built Environmental Efficiency (BEE)} = \frac{\text{Environmental Quality of Building}}{\text{Environmental Load of Building}}$$

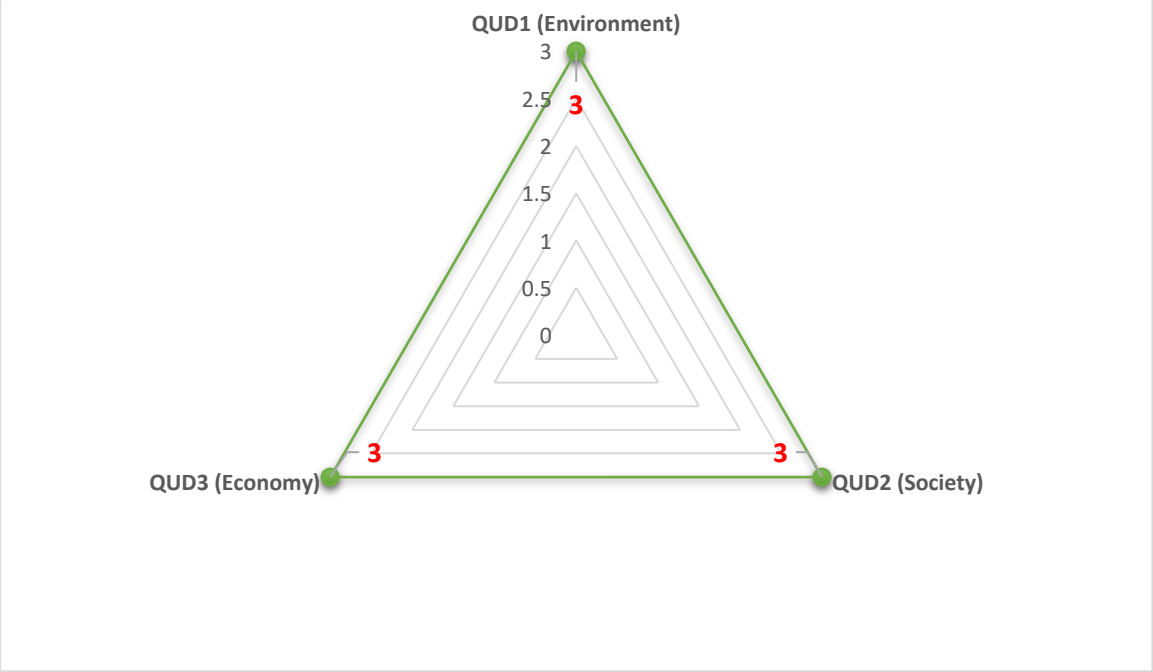

Figure 4. 3 : Credit Points Distribution in CASBEE-UD

4.2.4. GBI for Township

Green Building Index (GBI) for Township is broken down in 6 domain for measuring neighbourhood sustainability. Distribution of credit points are shown in Figure 4.4 below. The main categories in GBI are Climate, Energy & Water, Environmental & Ecology, Community Planning & Design, Transportation & Connectivity, Building & Resources and Business & Innovation.

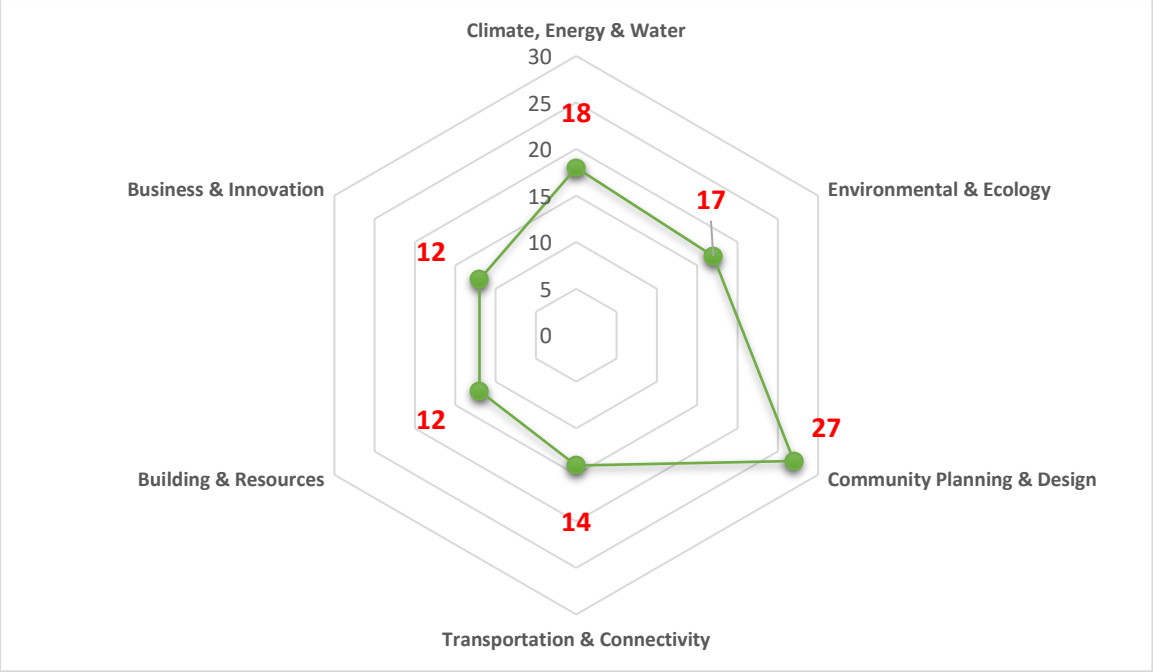

Figure 4. 4 : Credit Points Distribution in GBI for Township

4.2.5. IGBC for Residential Societies

IGBC measure neighbourhood sustainability under 31 criterion systematized into 5 themes. Like GBI, IGBC also possess 100 credit points with their distribution is shown in figure 4.5. Most of the Points is related to Management, Sustainable Water practices and Energy Conservation.

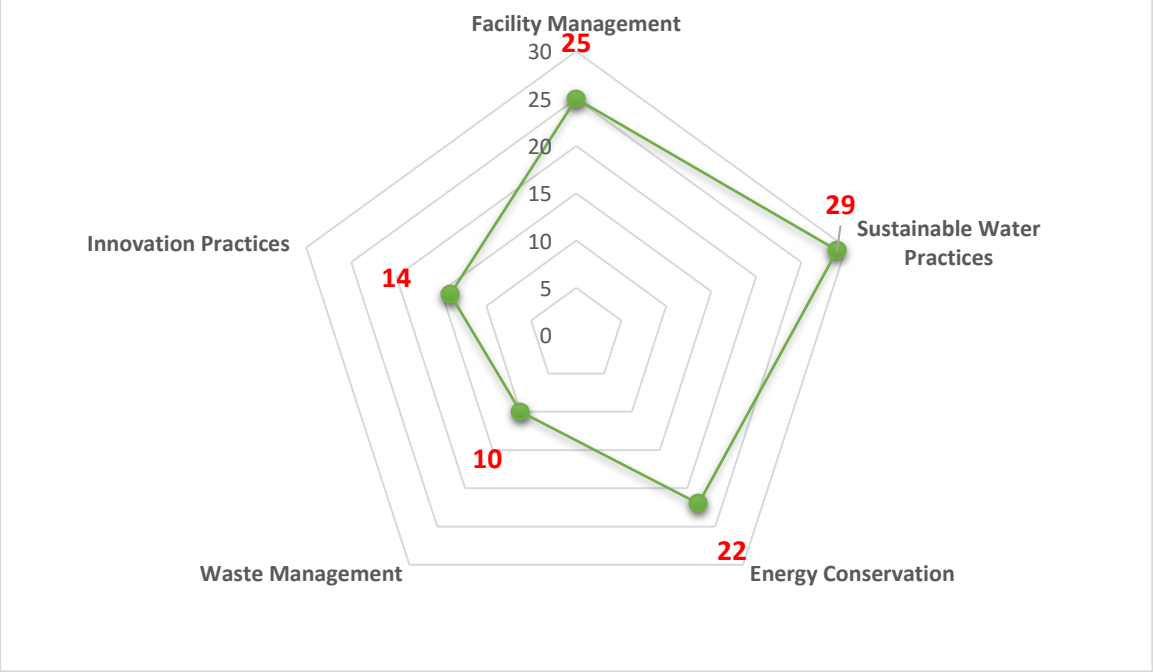

Figure 4. 5 : IGBC for Residential Societies

4.3. Comparison of NSATs

Based on in-depth literature review and analysing the score distribution of various NSATs, it is necessary to compare them on one scale / similarities as the assessment of these NSATs is very subject and purpose based. Various sustainability dimensions that are similar in NSATs are shown in the Table 4.6. “Site Selection & Location”, “Transportation”, “Ecology, Environment & Resources Efficiency”, “Social Well-being”, “Economics”, “Management / Governance” and “Engaging Certified Professional” were the main domains common in all NSATs.

Domains	LEED-ND	BREEAM-Communities	CASBEE-UD	GBI for Township	IGBC for Residential Societies
Site Selection & Location	✓	✓	✗	✓	✗
Transportation	✓	✓	✓	✓	✗
Ecology / Resource & Environmental Efficiency	✓	✓	✓	✓	✓
Social Well-Being	✓	✓	✓	✓	✓
Management / Governance	✗	✓	✓	✗	✗
Economics	✗	✓	✓	✗	✓
Engaging Certified Professionals	✓	✗	✗	✓	✓

Figure 4. 6 : Comparison of NSATs

4.4. Analysing Barriers in Development Sustainable Neighbourhoods in Pakistan

2nd objective of the current research is to detect critical barriers impeding in development of Sustainable Neighbourhoods in Pakistan. To accomplish this objective, questionnaire survey technique along with in-depth interview were conducted with key stakeholder. Questionnaire were distributed to the practitioners and concerned stakeholders who are directly and indirectly associated with Development of Neighbourhood. A total of 120 questionnaire were distributed and 114 completed were received with response rate of 95% from the participants. Snowball sampling technique was employed to identify the potential interviewees with relevant knowledge and experience. All potential experts should possess at least 5 years of research / work experience in planning / development of sustainable neighbourhood and holds key positions in their respective organization to ascertain the reliability and representativeness of collected data. They were: 1) Professors from academia that conducted extensive studies on

sustainable neighbourhoods, 2) Government representatives that developed policies for neighbourhood development, and 3) Practicing professionals that directly dealing in planning / designing of neighbourhoods. First of all, potential interview experts were identified by reviewing leading firms, government websites and neighbourhood projects. A list of potential experts was compiled based. Then suggestions were sought by the expert to recommend other experts whom they think have sufficient knowledge and experience in neighbourhood development. To get in touch with the experts initial contact was made through e-mails and telephone calls. Out of twenty, only ten experts were agreed to take part in this research which were identified by snowball sampling technique.

4.4.1. Profile of interviewees

The profile of 10 interviewees that participated in this research are shown in the table below, the interviewees belong from various discipline i.e. developing company, academia, government institutions, etc. having rich experience in their field.

Interviewee	Organization	Organizational Role
A	University	Assistant Professor
B	University	ex-Dean / Professor
C	Government	Director General
D	Property Development Division of large trading company	Manager Infrastructure
E	Private Consultancy firm for Housing	Principal Consultant
F	Private Consultancy firm for Housing	Managing Director
G	A large real estate development company	Director General
H	Large Housing construction for veterans	Director
I	Large Housing construction for veterans	Chief Engineer
J	A large real estate development company	Principal Design Engineer

Table 4. 2 : Profile of Interviewees

4.4.2. Physiognomy of Respondents

The respondents of current study have different professional background are shown in Table 4.2. 46.5% (53) of the respondents were Town Planner, 26.3% (30) of were Engineers, 9.6%

(11) from Academia, 8.8% (10) were Architects, 3.5% (4) are Environmentalist and 5.3% (6) are Other from various backgrounds.

Respondents	No of Questionnaire Returned	Percentage	Cumulative Percentage
Architect	10	8.8	8.8
Environmentalist	4	3.5	12.3
Town Planner	53	46.5	58.8
Engineer	30	26.3	85.1
Academia	11	9.6	94.7
Other	6	5.3	100.0
Total	**114**	**100.0**	

Table 4. 3 : Characteristics of Respondents

The educational background and years of experiences of the above mentioned respondents are shown in Figure 4.1. According to that 45.6% are Graduate, 49.1% are Post-Graduate while the remaining 5.3% are Ph.D. Most of the respondents are at entry level career i.e. having 0-5 years of experience contributing to 57% of overall responses. 26.3% of respondent have 5-10 years, 4.4% respondents are have 10-15 years and 12.3% have experience more than 15 years.

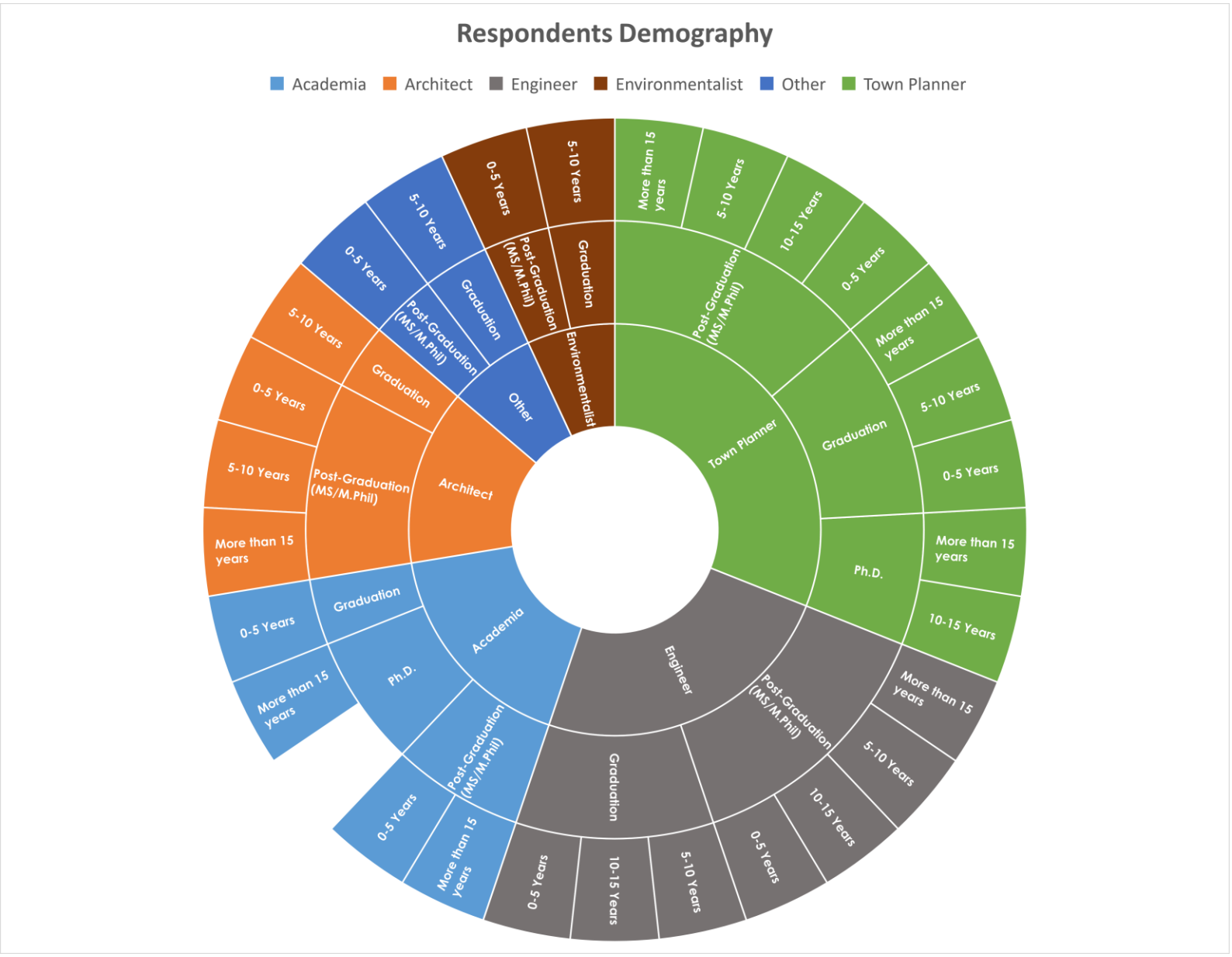

Figure 4. 7 : Respondents Demography

4.4.3. Statistical Analysis

Cronbach's alpha is most widely used to measure the reliability. Calculating alpha has become common practice when multiple-item measures of concept or construct are employed. Lee Cronbach in early 50s provide a measure of internal consistency of a test or scale. It is expressed as a number value varying between 0 and 1. Where 1 shows perfect internal consistency reliability and 0 is refers as the reliability of data is inadequate i.e. there no consistency in the

measurement. To measure the internal consistency and reliability of every factors Cronbach's coefficient alpha values were calculated for extracted factor and for the complete data set as well. A value ranging between 0.8 – 1.0 is *"acceptable"*, 0.7 – 0.8 is *"marginal"* and if the value of alpha is less than 0.7 then there are some serious issues with data and is quite "*questionable*" (Zahoor et al., 2017). The value above the threshold of 0.7 are acceptable. The value of coefficient of alpha "α" of the current study is 0.828. As value of test are greater than 0.7, which the data is reliable using five point Likert scale (Azeem et al., 2017; Darko et al., 2017).

Barriers were ranked based upon their mean item scores and standard deviation. The mean score ranking technique is very popular and had been broadly used in studies to rank and determine the key factors among several individual factors (Azeem et al., 2017). For a better interpretation of barrier and to condense them into small manageable number of components, Factor analysis was performed to reduce large set of barriers into smaller one being more manageable while keeping as much of original variance possible. Principle component analysis with varimax rotation, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Usually assumption are made that only factors are retained whose eigenvalue is ≥ 1 according to Kaiser's normalization criterion but beside that it is suggest to carefully observe the scree plot of Eigenvalues to validate the K1 criteria.

4.4.4. Survey Results

4.4.4.A. DESCRIPTIVE STATISTICS OF BARRIERS

The respondents were asked to rate the importance of 23 barriers that were dig out through intensive literature review. The results were shown in the Table 4.3 where M is stand for

"mean", SD stand for "Standard deviation" and N is "number of responses". Figure 4.7 shows the frequency percentage of the likert scale questions.

	Statements	Extremely Important	Very Important	Moderately Important	Somewhat Important	Not at all Important	M	SD	N
B-01	Unsustainable Urbanization Mode	**43** *37.72%*	**42** *36.84%*	**19** *16.67%*	**8** *7.02%*	**2** *1.75%*	4.02	0.995	114
B-02	Unsustainable Planning Practices	**50** *43.86%*	**46** *40.35%*	**13** *11.40%*	**4** *3.51%*	**1** *0.88%*	4.23	0.852	114
B-03	Lack of Supporting Policy	**53** *46.49%*	**45** *39.47%*	**11** *9.65%*	**5** *4.39%*	**0** *0.00%*	4.28	0.815	114
B-04	Lack of Institution and Mechanism for Implementation and Evaluation	**55** *48.25%*	**50** *43.86%*	**7** *6.14%*	**2** *1.75%*	**0** *0.00%*	4.39	0.685	114
B-05	High Capital cost, Uncertain Revenue & Low Expected Profits	**25** *21.93%*	**48** *42.11%*	**29** *25.44%*	**11** *9.65%*	**1** *0.88%*	3.75	0.939	114
B-06	Deteriorating Environment	**44** *38.60%*	**35** *30.70%*	**26** *22.81%*	**7** *6.14%*	**2** *1.75%*	3.98	1.013	114
B-07	Lack of Sustainable Urban Infrastructure	**36** *31.58%*	**50** *43.86%*	**20** *17.54%*	**6** *5.26%*	**2** *1.75%*	3.98	0.931	114
B-08	Lack of Sense of Happiness	**29** *25.44%*	**30** *26.32%*	**37** *32.46%*	**14** *12.28%*	**4** *3.51%*	3.58	1.104	114
B-09	Weak Sense of Community	**23** *20.18%*	**43** *37.72%*	**36** *31.58%*	**10** *8.77%*	**2** *1.75%*	3.66	0.958	114
B-10	Unsustainable Urban Area	**27** *23.68%*	**48** *42.11%*	**25** *21.93%*	**11** *9.65%*	**3** *2.63%*	3.75	1.012	114
B-11	Lack of National Standards & Assessment Tools	**49** *42.98%*	**31** *27.19%*	**23** *20.18%*	**10** *8.77%*	**1** *0.88%*	4.03	1.034	114
B-12	Government Institution Resistance to Change	**41** *35.96%*	**43** *37.72%*	**22** *19.30%*	**7** *6.14%*	**1** *0.88%*	4.02	0.941	114
B-13	Difficulty in Coordination of the interests of Stakeholders	**42** *36.84%*	**43** *37.72%*	**22** *19.30%*	**6** *5.26%*	**1** *0.88%*	4.04	0.925	114
B-14	Lack of Exemplary Projects	**29** *25.44%*	**42** *36.84%*	**25** *21.93%*	**15** *13.16%*	**3** *2.63%*	3.69	1.074	114
B-15	Lack of expertise of professionals	**40** *35.09%*	**41** *35.96%*	**22** *19.30%*	**10** *8.77%*	**1** *0.88%*	3.96	0.99	114
B-16	Inadequate Efforts towards Standardization	**32** *28.07%*	**45** *39.47%*	**31** *27.19%*	**5** *4.39%*	**1** *0.88%*	3.89	0.896	114
B-17	Poor Project Management Capabilities	**28** *24.56%*	**38** *33.33%*	**35** *30.70%*	**11** *9.65%*	**2** *1.75%*	3.69	1.006	114
B-18	Lack of Environmental Governance Mechanism	**28** *24.56%*	**58** *50.88%*	**20** *17.54%*	**6** *5.26%*	**2** *1.75%*	3.91	0.888	114
B-19	Lack of attention to Develop Sustainable Culture	**39** *34.21%*	**43** *37.72%*	**24** *21.05%*	**7** *6.14%*	**1** *0.88%*	3.98	0.941	114
B-20	Low Level of Research in Industry and Academia	**30** *26.32%*	**49** *42.98%*	**22** *19.30%*	**11** *9.65%*	**2** *1.75%*	3.82	0.989	114
B-21	Difficult Application of Sustainable Technologies	**28** *24.56%*	**44** *38.60%*	**30** *26.32%*	**10** *8.77%*	**2** *1.75%*	3.75	0.983	114
B-22	Difficulty in Transformation and Reuse of existing Built-up Areas	**33** 28.95%	**52** 45.61%	**24** 21.05%	**4** 3.51%	**1** 0.88%	3.98	0.852	114
B-23	Lack of Public Participation	**43** *37.72%*	**48** *42.11%*	**16** *14.04%*	**5** *4.39%*	**2** *1.75%*	4.10	0.921	114

Table 4. 4 : Frequency Analysis and Descriptive Statistics for Likert Scale Questions

4.4.4.B. RANKING OF BARRIERS

Ranking based on the perception of respondents are shown in Table 4.3 and Figure 4.7 respectively.

Barrier Code	Mean Value	Std. Deviation	Ranking
B-04	4.39	0.685	1
B-03	4.28	0.815	2
B-02	4.23	0.852	3
B-23	4.10	0.921	4
B-13	4.04	0.925	5
B-11	4.03	1.034	6
B-01	4.02	0.995	7
B-12	4.02	0.941	8
B-06	3.98	1.013	9
B-19	3.98	0.941	10
B-07	3.98	0.931	11
B-22	3.98	0.852	12
B-15	3.96	0.99	13
B-18	3.91	0.888	14
B-16	3.89	0.896	15
B-20	3.82	0.989	16
B-21	3.75	0.983	17
B-10	3.75	1.012	18
B-05	3.75	0.939	19
B-14	3.69	1.074	20
B-17	3.69	1.006	21
B-09	3.66	0.958	22
B-08	3.58	1.104	23

Table 4. 5 : Barriers' Ranking based on Mean Values and Standard Deviation

Ranking of identified barriers was as per the perception of respondents. It's been based on their mean value (M) and Standard Deviation (SD). The results from empirical analysis revealed that five top mist important barriers in development of sustainable neighbourhoods in Pakistan are; Lack of institution and Mechanism for implementation (M = 4.39; SD = 0.685), Lack of supporting Policy (M = 4.28; SD = 0.815), Unsustainable Planning Practices (M = 4.23; SD = 0.852), Lack of Public Participation (M = 4.10; SD = 0.921) and Difficulty in Coordination of the interests of Stakeholders (M = 4.04; SD = 0.925). While some of the barriers share the same mean score so there are arranged as per the SD value. B-11, B-01 and B-12 are rank 6^{th}, 7^{th} and 8^{th} respectively. While B-06, B-19, B-07 and B-22 are ranked similarly have same M value.

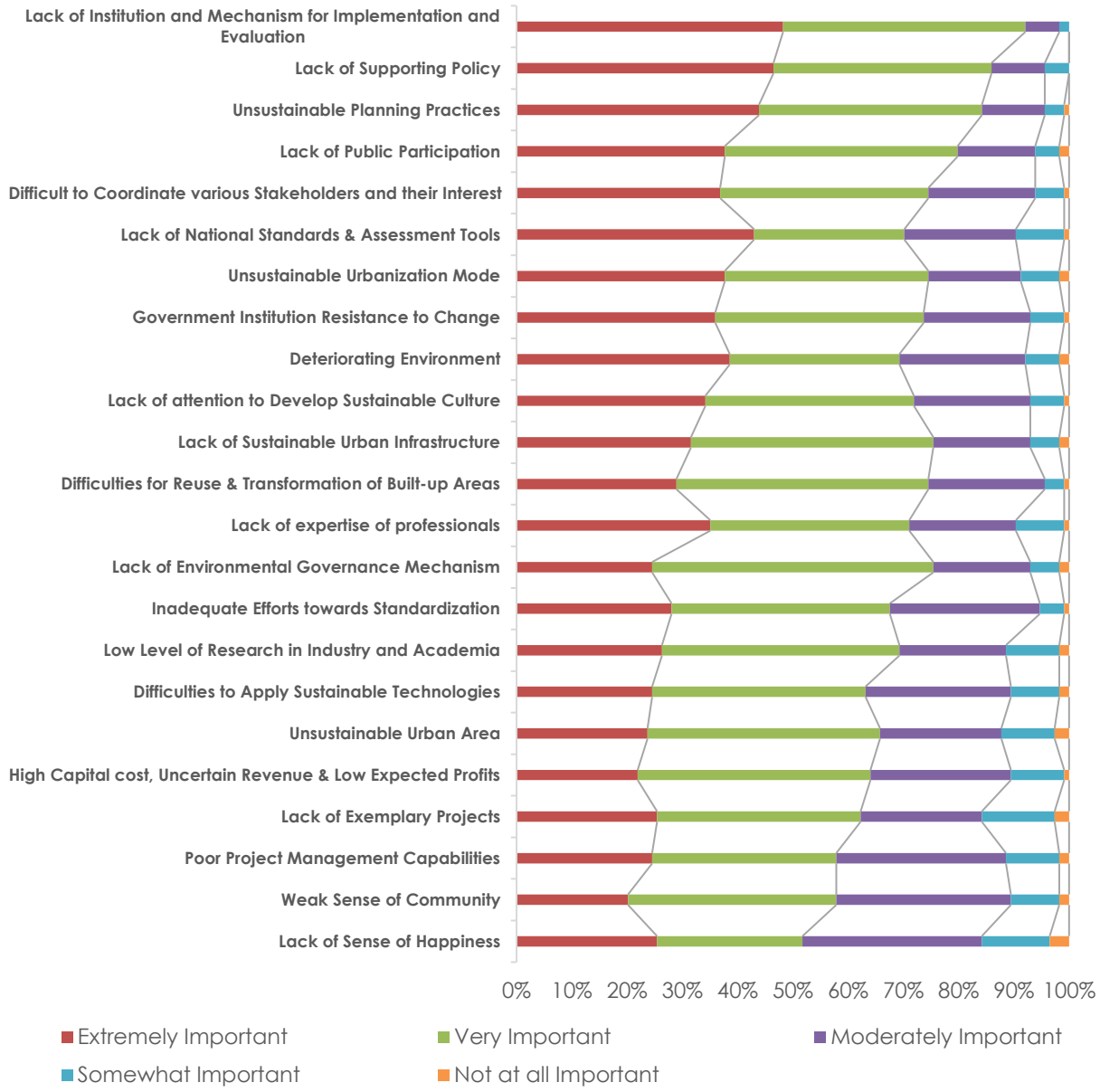

Figure 4. 8 : Barriers' Ranking based on mean values and share of responses to each Barrier

4.4.5. Factor Analysis

Results of Factor Analysis was based on the assumptions that a factor is substantial for the study, it has mean value greater than 2.00. All the 23 barriers were included in factor analysis as the M value of all is greater than 2.00 (Azeem et al., 2017).

4.4.5.A. DATA SUITABILITY FOR CONDUCTING FACTOR ANALYSIS

Data suitability to conduct factor analysis was done using two sets of assumptions: (1) the significance value (*p*) of Bartlett test of Sphericity to be smaller than 0.05, and (2) the measure of sampling adequacy calculated using Kaiser-Meyer-Olkin (KMO) value be greater than 0.5 (Pallant, 2011; Zahoor et al., 2017). The KMO value of 0.9 or above is considered *spectacular*, 0.8 – 0.9 is *meritorious*, 0.7 - 0.8 or above is *middling*, 0.6 – 0.7 is *mediocre*, a value between 0.5 -0.6 is *miserable* (though acceptable), and below 0.5 is not *acceptable* at all and there is a need to collect more data or deliberation needs to be done that which variable needs to be included in the analysis (Zahoor et al., 2017). Another criterion to perform FA was that data correlation matrix must have numerous coefficient of 0.3 and above. These checks established the likelihood of the data matrix to have substantial correlation among some of its observed variables.

The results of Bartlett and KMO's test for 23 items measurement scale are given in Table

Tests for data appropriateness for conducting factor analysis		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.708
Bartlett's Test of Sphericity	Approx. Chi-Square	705.855
	df*	253
	Sig.	.000

*df stands for degree of freedom

Table 4. 6 : KMO and Bartlett's Test for 23 barriers

The value of 0.000 (less than 0.05) for Bartlett test of sphericity, and the existence of numerous coefficients of 0.3 and above in the correlation matrix state that correlation exited among the barriers. In the same way, KMO values of 0.708 indicated the existence of *meritorious* level of sampling adequacy. In addition, calibration sub-sample (N-114) was almost 5 times the 23 observed variables and also above the safe threshold of 100 (Pallant, 2011; Zahoor et al., 2017). So, it can said with confidence the data is found suitable for conducting FA.

4.4.5.B. IDENTIFICATION OF FACTORS

FA is very convenient method to find underlying factors by reducing and regrouping the number of variable through factor rotation. Principle component analysis (PCA), a default data reduction method in SPSS used to analyse the calibration of sub-sample, with aim to extract factors.

The Kaiser's Normalization criterion of Eigenvalues more than 1 along with Catell's scree test (the point where the curve bends and gets horizontal) was used for factors extraction (Pallant, 2011; Zahoor et al., 2017).

Principle component analysis (PCA), a default factor analysis method in SPSS software, was adopted for initial factors extraction. The results from this process suggests the retention of 8 barriers, having Eigenvalues greater than 1, as show in Table 4.6. However, some of the barriers attain factor loading and communality value lower than 03 and 0.4. Similarly. Few cross-loadings were also observed with a difference of less than 0.2. In next step, scree plot was carefully observed (Figure 4.8), which advocated in retention of 4 factors.

Factor number	Scree Plot	Eigen values > 1
1	*Accept*	4.965
2	*Accept*	2.152
3	*Accept*	1.739
4	*Accept*	1.393
5		1.303
6	Omitted as scree plot curve gets	1.219
7	parallel to axis after factor no. 4	1.164
8		1.016

Table 4. 7 : Comparison of Scree plot and Eigenvalues

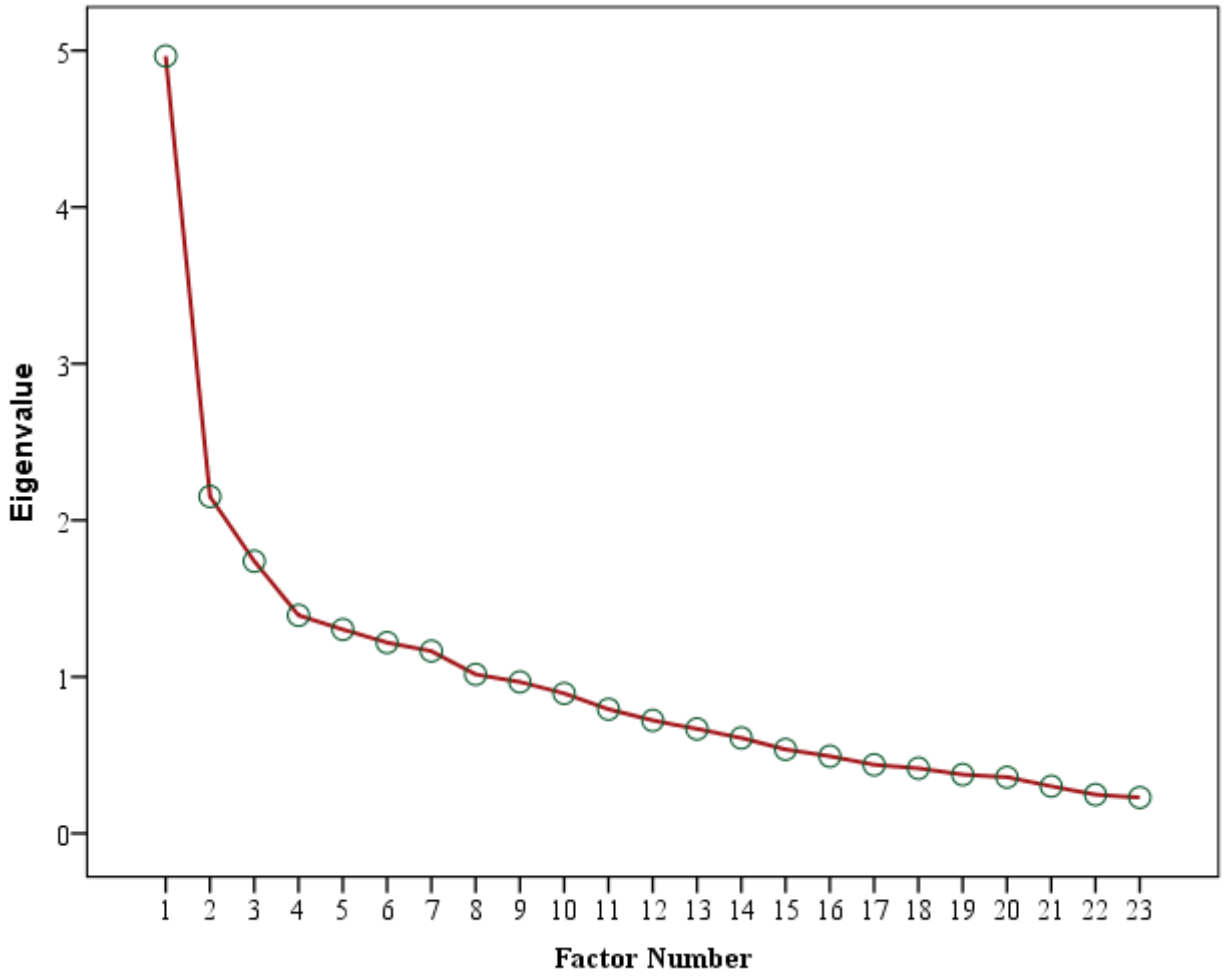

Figure 4. 9 : Scree plot

Thus, the extraction process was repeated with fixed numbers of factors (i.e. four) instead of Kaiser Normalization of Eigenvalues greater than 1. After analysing the factor loadings, communalities and cross-loadings 4 variables (out of 23) were removed. The results of FA comprising 19-items rotated component matrix with 4 factors (attained after 5 iterations) are tabulated in Table 4.7. The four-factor solution explained a total variance of 50%. Factor 1, 2, 3 and 4 explained 23.072%, 10.865%, 8.975% and 7.063% of variance respectively. Eigenvalues of all the four factors were more than minimum required value of 1. All factor loadings were higher than 0.4. The inter reliability "α" value of individual factors 1, 2, 3 & 4 are 0.717, 0.685, 0.626 and 0.657 respectively and cumulative Cronbach's coefficient alpha "α" of 19 items is 0.808.

Code	Statement	Factor loading			
		Factor - 1	Factor - 2	Factor - 3	Factor - 4
B2	Unsustainable Planning Practices	0.771	-	-	-
B10	Unsustainable Urban Area	0.683	-	-	-
B1	Unsustainable Urbanization Mode	0.669	-	-	-
B4	Lack of Institution and Mechanism for Implementation and Evaluation	0.612	-	-	-
B11	Lack of National Standards & Assessment Tools	0.558	-	-	-
B6	Deteriorating Environment	-	0.689	-	-
B8	Lack of Sense of Happiness	-	0.688	-	-
B9	Weak Sense of Community	-	0.603	-	-
B14	Lack of Exemplary Projects	-	0.534	-	-
B7	Lack of Sustainable Urban Infrastructure	-	0.532	-	-
B22	Difficulty in Transformation and Reuse of existing Built-up Areas	-	-	0.732	-
B18	Lack of Environmental Governance Mechanism	-	-	0.705	-
B17	Poor Project Management Capabilities	-	-	0.549	-
B23	Lack of Public Participation	-	-	0.514	-
B20	Low Level of Research in Industry and Academia	-	-	-	0.761
B13	Difficulty in Coordination of the interests of Stakeholders	-	-	-	0.661
B16	Inadequate Efforts towards Standardization	-	-	-	0.596
B19	Lack of attention to Develop Sustainable Culture	-	-	-	0.488
B21	Difficult Application of Sustainable Technologies	-	-	-	0.468

Note: Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 5 iterations.

Table 4. 8 : Factor Matrix for Barriers

CHAPTER 5 - FINDINGS AND DISCUSSIONS

In realm of sustainable urban planning the sustainability of human settlement holds a pivotal role. It can be found that the cities are sustainable if they have the requirements of the present-day without showing the capacity of future generations to get their own requirement (Elshimy, Ragheb, & Ragheb, 2016). To meet the desired state of sustainability at city level practitioners / planners need to focus on inhabitant by developing sustainable neighbourhoods (Arshad & Routray, 2018). In order to effectuate this research identified crucial barriers in development of sustainable neighbourhood and views form professionals were drawn. Ranking was done to provide valuable information to the decision makers. It will not also help them to recognize the key areas / domain but also assist them in propagation of policy / initiatives. The preceding paragraphs will discuss the findings of the study extracted from previous section.

At present, there lie significant barriers in the development of sustainable neighbourhood. The questionnaire survey highlighted "*Lack of institution & Mechanism for implementation and evaluation*" as the most crucial barrier in development of SN. According to Interviewee C & E, inefficient legal framework and policies for implementation of uniform land subdivision / housing scheme regulations. There is need to apprise general public through awareness and other social campaigns so that sustainable housing could be promoted and encouraged in Pakistan so as to minimize motorized traffic and maximize walk ability in sustainable neighbourhoods. Internationally residential precincts & neighbourhoods have all public amenities at walking distance of about 400 meter radius. Efforts should be made in this perspective.

'*Lack of supporting Policy*' been ranked as the 2nd most significant barrier by the respondents and experts. Interviewee C agreed that national policy lack in support of sustainability. Policy at national to local level need to be addressed as it is been addressed in developed countries.

Without addressing issue at lowest level effects get no change out of larger scale. National Housing Policy 2001 also highlighted that rationalization of existing framework and policy at local level needs to be coherent with long term strategic policies. There is dire need of professionals and experts who can ensure and suggest a better way to address the sustainability at neighbourhood level. Having a sound Sustainable policies will not only aid local authorities / companies and residents to recognize their responsibilities for SD but also motivate them to make a participation to the community.

'*Unsustainable Planning Practices*' has also been identified as one of most highlighted barrier in survey as well as in interviewees and ranked 3rd as per results extracted form survey. Idealistic / unrealistic goals in neighbourhood planning have been identified critical for the whys and wherefores that attributed to limited success in development of SNs. Arshad & Routray (2018) also mentioned that absence of sustainable policy at neighbourhood level may led urban development uncontrolled, unguided & unsustainable and eventually reap the harvest of socio-economic disparity causing social unrest and environmental injustice in the neighbourhoods. According to Sharifi (2015), urban planner and policy makers should open their eyes that physical planning and technological solutions in sustainable neighbourhood development has limited effects in eradication of social problems. Interviewee B say that ill planning practices at present encourage urbanization and illegal housing schemes are being developed due to lack of enforcement of rules plus the concept of sustainability is not present in rules. Interviewee C says the planners in Development Authorities or in Local Government while approving the housing scheme, check only land-use allocation percentages as mentioned in rules and regulations.

No two ways about it in promoting sustainability, public participation and expert-oriented approaches in participatory planning and decision making have been supported in several studies. The results from questionnaire survey ranked '*Lack of Public Participation*' at 4th

place. Usually decisions or drafted policy does not comprehensively reflect the local situations and address local important factors. Thus it turned out to be a barrier obstructing in local sustainable development (Zhang et al., 2018). Beside this, interviewee A, D & J and lot of respondents have mentioned the same problem that people are end-users of these commodities are they are not involved in planning phase to know their requirements / demands. They also highlighted that lack of awareness in common people about benefits of developing sustainable neighbourhoods & dangers of living in unsustainable neighbourhood. People need to be educated and most importantly a well aware next generation be produced, campaigns or school level training might help moving towards sustainability, since, children these days are more influential than the current generation were kids. Their better training would definitely ensure better future. Participation of public / residents will not only create strong "sense of community (SoC)" but also enhance equity, social democracy and other dimensions of sustainability in planning / development of sustainable neighbourhood.

The fifth ranked barrier is '*Difficulty in Coordination of the interests of Stakeholders'*. Previous researches also highlight this barrier as most critical so is the respondents. There is gap between in coordination among various stakeholders. Moreover, development of neighbourhoods in country is not properly administered. Development authorities / Local government have not envisage sustainable guideline in development of SN. It is also observed that mostly the neighbourhood developed are by developers or landlords who are not much well educated. They have vested interests in maximizing the profits out their saleable land without giving due respect to nature and sustainable practice.

5.1. Factor analysis

Factor analysis enabled 19 barriers out of 30 to be place under 4 Factors shown in Table 4.8. On the basis of the intrinsic relationship among the factors, following points are made according to underlining phenomenon linking the factors.

5.1.1. Factor – 1: Regulatory & Policy Barriers

- Unsustainable Planning Practices
- Unsustainable Urban Area
- Unsustainable Urbanization Mode
- Lack of Institution and Mechanism for Implementation and Evaluation
- Lack of National Standards & Assessment Tools

5.1.2. Factor – 2: Lack of Social Capital and Sustainable Infrastructure

- Deteriorating Environment
- Lack of Sense of Happiness
- Weak Sense of Community
- Lack of Exemplary Projects
- Lack of Sustainable Urban Infrastructure

5.1.3. Factor – 3: Inexperienced Professionals and Lack of Public Participation

- Difficulty in Transformation and Reuse of existing Built-up Areas
- Lack of Environmental Governance Mechanism
- Poor Project Management Capabilities
- Lack of Public Participation

5.1.4. Factor – 4: Weak Industry / Professional – Academia Linkage

- Low Level of Research in Industry and Academia
- Difficulty in Coordination of the interests of Stakeholders
- Inadequate Efforts towards Standardization
- Lack of attention to Develop Sustainable Culture
- Difficult Application of Sustainable Technologies

5.2. Framework for Development of Sustainable Neighbourhood

A framework for development of sustainable neighbourhood has been developed, after analysing the results from the collected data, conducting interviews and perceptions of respondents; and relating it with the literature review. The unexplored dimensions of barriers, drawn from factor analysis, were linked with themes of SN and issues that need to be addressed and required tasks to achieve sustainability at neighbourhood level has been given the framework below.

			Required Task			
ISSUE	**SN Dimension**	**Barriers**	**Institutional Support**	**Monitoring & Evaluation**	**Development & Construction**	**Public Awareness**
• **Rapid Urbanization** • **Environmental Degradation** • **Exhaustion of Natural Resources** • **Detoriating Housing Condition in city core areas** • **Re-use of existing Areas**	• **Housing** • **GI** • **Connectivity** • **Compact Development** • **Walkability** • **In-fill Development** • **Mixed Land-use** • **Urban-Design**	1. **Regulatory & Policy Barriers** 2. **Lack of Sense of Community** 3. **Inexperienced Professionals and Lack of Public Participation** 4. **Weak Industry / Professional – Academia Linkage**	• Public forums should be made to aware the public about benefits of SN • Updating existing Planning Laws • Execute exemplary Projects • Training and capacity building of Staff	• Compulsory courses for the supervision of Development per Sustainable practices	• Technological enhancement in construction industry among the developers • Encourage developers for certification of NS	• Educating public first about realization of SN and the concept of sustainability

Table 5. 1 : Framework for Development of Sustainable Neighbourhood

CHAPTER 6 - CONCLUSION & RECOMMENDATION

6.1. Conclusion

The current study revolves around the objectives of identifying the characteristics / indicators of SN and the barriers that are impeding in development of SN in Pakistan followed by suggesting a suitable framework for guidance and implementation in developing sustainable neighbourhood.

In the realm of modern era, developing sustainable neighbourhood is imperative in context of Pakistan as cities like Lahore and Karachi are expanding and exhausting the natural resources at a pace that natural cycle cannot replenish the effects of rapid urbanization. Pakistan is far behind in the race of achieving sustainability at neighbourhood level. So there is a dire need to build the basic unit of city i.e. neighbourhood in a sustainable manner so that it's effect can visible as whole at city level. It will not benefits the residents socially and economically but also make their living spaces liveable (in terms of environmental sustainability as well as technologically). Countries have developed many NSATs for measuring sustainability at neighbourhood level but such tool does not exist in case of Pakistan. However, the is draft version of measuring sustainability at individual building level developed by Pakistan Green Building Council in 2013 as explained by Azeem et al., (2017). But this is drafted on voluntary basis by practitioners from various background. There is a need to develop such kind of NSATs at national level that is readily available as guideline for future development as well as to the exiting built up areas. In Pakistan, less than 10 buildings are recognized as sustainable and certified but there is no documentation or recognized sustainable neighbourhood in context of Pakistan.

Perception of professionals and various stakeholders, in development of SN, helped in investigating in the major barriers in local context extracted through intensive literature review, questionnaire survey and interviews in the current study. The acquired data was analysed using various statistical techniques like ranking technique and factor analysis. For better understanding, these techniques are used, on barriers that are logical and need to keep an eye open in mitigating those unexplored barriers that are hindering in development of SN.

23 barriers were examined in the current study and factor analysis reduced them to 19 under four factors i.e. 1) Regulatory & Policy Barriers, 2) Lack of Social Capital and Sustainable Urban Infrastructure, 3) Inexperienced Professionals and Lack of Public Participation and 4) Weak Industry / Professional – Academia Linkage. Results from survey highlighted insufficiency of institutions and weak mechanism for rules implementation and evaluation, secondly Lack of supporting Policy resulting in unsustainable planning practices. Moreover, lack of public participation and their coordination among various stakeholder are also highlighted in the result. Beside that a lot of respondents have suggested that people should be educated and make them realize / aware regarding the very concept of sustainability. Also their participation should be ensured in planning process as it's done in developed countries.

Finding of this study would contribute in understanding the barrier that need attention of our policy makers and professionals. So that addressing them in proper manner would result in desired scenarios and help achieving sustainability overall. The results are extracted from survey and perception of various stakeholders.

6.2. Recommendation

It is recommended that Planners, Engineers, Architects, Developers, Environmentalist and other stakeholders should sit together and formulate NSAT as per local condition and update dilapidated planning guidelines like NRM as per current planning practises. Moreover,

Planning Authorities should amend their rules and include sustainability related clauses in them and enforce them. Building SN in Pakistan will definitely act as a guide for future development.

6.3. Limitation and Future Avenue of Research

There are some lagging and limitation in current study that requires attention form future researches. Though the sample size is fulfilling the minimum requirement for carrying various statistical analysis and factor analysis but future research need to employ a greater sample to have large dataset to get explicit results and observe whether the outcome from large dataset differs from the results of current study. Moreover, other cut-off criteria i.e. *Horn's Parallel Analysis* for retaining the number of factors be used. Factor analysis have two phase 1) measurement model and 2) Structure Model. The current study is limited to measurement model where unexplored barriers were identified. Future research should go beyond measurement modelling to structure modelling. Structure Equation Modelling (SEM) could be used to identify the exact influence and interrelation of various barriers in development of SN.

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