

## FRAMEWORK FOR EVALUATING THE SUSTAINABILITY OF PUBLIC HOUSING PROGRAMMES IN DEVELOPING COUNTRIES

*Eziyi O. Ibem & Dominic E. Azuh*  
*Covenant University, Ota*

### Abstract

This paper presents a framework for the evaluation of sustainability of public housing programmes in developing countries. It is motivated by the gap between theory and application of the concept of sustainability to solving practical problems in the production and consumption of housing in developing countries. It argues that dearth of multi-dimensional evaluation framework for assessing the long term environmental, technological, economic, social and cultural consequences of public housing programmes is partly responsible for this development. The paper proposed an integrated analytical and evaluation framework based on the construct of sustainable development and housing as a social programme. The framework basically hypothesized a direct link between the outcomes and sustainability of public housing programmes; and suggests the adoption of housing and neighbourhood environment quality, housing affordability; quality of life, evidence of preservation of cultural heritage as well as technical feasibility as parameters for assessing key dimensions of sustainability of public housing schemes. Although, the effectiveness of the framework lies more on the use of subjective than objective parameters; it addresses the limitations of environmentally biased evaluation frameworks for sustainable housing. The paper suggests the adoption of this framework as an analytical, research and assessment tool in sustainable housing research.

**Keywords:** Sustainability; Evaluation; Public Housing Programmes; Developing Countries

### 1.0. Introduction

Across the globe, new social intervention programmes are implemented on yearly basis. Public housing provision accounts for a number of such programmes implemented with the aim of achieving the goal of sustainable development in many developing countries. This is because housing generally has profound influence on the socio-economic wellbeing of the human society and sustainability of the physical and cultural environment during its production and consumption. Moreover, public housing programmes are designed to provide decent and affordable housing to citizens who cannot afford housing provided

by the commercial private sector at prevailing market price (UN-HABITAT, 1996; Balchin et al., 2000; Grigsby and Bourassa; 2003), and thus are essential in addressing social and environmental challenges associated with poor housing and living conditions among targeted population (Ibem et al, 2011).

Public housing programmes can involve enormous human, material and financial resources, and constitute huge public investment. However, well intended housing programmes might result in adverse consequences if sustainability criteria are not put into consideration at the

design and implementation stages of such schemes. Savaya et al (2008) noted that planning for programme sustainability is a key factor in social programmes; evidence in literature however shows that this aspect of social programming is lacking in many developing countries (Abdellatif and Othman, 2006). This is attributed to a number of factors such as weak political institutions, social and economic structures, lack of effective accountability and governance mechanisms (Sarker and Azam, 2011) and inadequate monitoring and evaluation frameworks (Federal Republic of Nigeria, 1991; Akinmoladun and Oluwoye 2007; Ibem and Amole, 2010). As a result, a large proportion of urban population in less developed countries do not have access to decent housing at affordable cost in spite of the increasing number of public housing schemes implemented in these countries (Tipple, 1994; Sengupta and Sharma, 2008; Ibem et al, 2011 ).

The review of literature has revealed that despite the significant progress in research in public housing provision, the assessment of sustainability (long-term consequences) of housing schemes has not been considered as an important aspect of programme evaluation in many developing countries. For instance, previous studies (Kaitilla, 1993; Ukoha and Beamish, 1997; Djebarni and Al-Abed, 2000; Lux, 2005; Obeng-Odoom, 2009; Mohit et al., 2010) evaluated the user's satisfaction outcomes of public housing schemes in Guinea, Nigeria, Yemen, Czech Republic, Ghana, and Malaysia respectively without any attempt at assessing the sustainability of such programmes. This corroborates the observation by Savaya et al (2008) that programme evaluation has traditionally focused on the implementation, outcomes,

and impact of social programmes, and not much attention was paid to their sustainability.

This paper argues that this development is principally due to lack of appropriate framework for a comprehensive evaluation of the sustainability of public housing programmes in many developing and transition economies. Consequently, very little is known about the long-term consequences of public housing schemes in many developing countries. Therefore, any conscious effort aimed at providing better understanding on the sustainability of public housing programmes in these countries is a well come development, as this will assist in decision-making to support sustainable development initiatives in the housing sector. It is on this basis that this paper sought to develop a framework for evaluating the sustainability of public housing programmes in developing countries. It contends that public housing programmes are vital components of socio-economic and physical development of any nation, and as such adequate knowledge of their long term consequences is vital for good housing policy formulation and effective programme design and implementation strategies.

This paper is divided into six main parts. The next section is a review of literature on housing provision and the concept of sustainability. This is followed by the review of literature on existing sustainability assessment frameworks and development of proposed framework for the evaluation of the sustainability of public housing programmes respectively. Next is the methodological approach to testing the effectiveness of the framework. The paper ends with brief concluding remarks.

## **2.0 Housing Provision and the Concept of Sustainability**

Among the several endemic social problems in developing countries, including crime, health, education, housing, poverty

and poor physical infrastructure base, just to mention the few; housing provision is one of the very few social programmes that

result in the production of a commodity that has multi faceted influence on the socio-economic, cultural and environmental components of the society. In fact, housing is generally known to fulfil basic need for shelter and has a profound impact on the quality of life, health, safety, security, welfare as well as productivity of man. It also plays a crucial role in integrated physical and economic development, environmental sustainability, natural disaster mitigation and employment generation as well as wealth creation (Erguden, 2001; UN-HABITAT, 2006). The above implies that housing has significant influence on all aspect of human life at home, work or recreation.

Generally speaking, public housing provision is aimed at providing subsidised housing to ameliorate or improve poor housing conditions and thus contribute to enhancing peoples' standard of living and the general quality of physical environment (Liu, 2007). Chiu (2000) noted that public housing can also assist in achieving some macro political, economic and social objectives. Hence, Rossi et al (2004) identified housing as one of the social intervention programmes designed, planned, organised and implemented to ameliorate a social problem or improve on social condition. Social intervention programmes in this context refer to rational actions taken to address serious multifaceted challenges and problems in different fields of human endeavours (Sampson, 2007; Weiss 1995). It is therefore not surprising that a number of such programmes are introduced globally on a yearly basis.

Social programmes are usually born out of experience, professional lore, logical reasoning of how such programmes can address identified needs; and are also based on goals, objectives, outcomes and impacts (Weiss, 1997; Birckmayer and Weiss, 2000). Savaya et al (2008) noted that social programmes have underpinning

assumptions that identified need(s) will be met through such programmes. In the context of housing, public housing programmes are generally based on a set of assumptions and beliefs that the housing need of targeted population would be met and their socio-economic status and physical living conditions will improve. Based on the above, public housing programmes are conceived of in this paper as social programmes involving the use public resources in providing housing and related services to target population.

The multi faceted components and impact of housing suggests that the issue of sustainability is central to its production and consumption; and thus can contribute significantly to sustainable development. The early and standard definition of sustainable development by the World Commission of Environment and Development (the Brundtland Commission) in 1987 shows that sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). This widely accepted definition of sustainable development highlights three fundamental components of sustainable development: environmental protection, economic growth, and social equity. Drawing from this, Chiu (2002) submitted that sustainable development aims at delivering built environment that enhances quality of life, satisfaction, flexibility and has the potential to cater for user changes in the future as well as provides and supports desirable natural and social environments that maximize the efficient use of resources. This implies that the ultimate goal of sustainable development is to protect, improve and sustain the quality of life and environment in such a way that meeting the needs of present generation will not comprise or jeopardize the prospects of succeeding generations in meeting their own needs. In fact, Marcause (1998) opined that it is a

reminder to all generations to conduct every activity on the planet earth with the highest degree of caution and restraint by making it sustainable. From the above, it can be concluded that sustainable development is an all encompassing construct, covering a large part of people's way of life, livelihood and continuity on the surface of the planet earth.

Derived from the definition of sustainable development is the concept of sustainability. This term which literally means the 'ability to be maintained' has been used by several authors in different contexts to the extent that it has become a highly debated construct (Marcause, 1998). As Rotmans (2006) noted, sustainability is a contested concept because it is inherently complex, normative, subjective and ambiguous. Although, there is a consensus that sustainability has environmental roots (Chiu, 2000), it is evident from literature that the notion of environmental sustainability implies a concern for social equity between generations and has economic and cultural implications with respect to future generations (WCED, 1987). This implies that the concept of sustainability places more emphasis on long term than short term impacts of human production and consumption activities on the planet earth.

As regards sustainability of social programmes, Chovav and Weinstein (1997) proposed five levels of programme sustainability to include full continuation of the programme, partial continuation, implementation of the programme in another locale, implementation of the programme in a modified form, and full cessation of the programme. On the other hand, Savaya et al (2008) again noted that there is a growing body of literature on programme sustainability, the factors and processes that foster sustainability. They identified survival, continuation, maintenance, institutionalization, incorporation and integration as the

different terms used in defining programme sustainability in contemporary literature. In relation to housing, Turcotte, and Ken (2010) argued that most literature on sustainable housing mainly focuses on environmental aspects. Hence, Chiu (2003:224) argued "not until the other sustainability aspects of housing are adequately researched and integrated, would it be possible to seek a sustainable development path for housing". The above goes to suggest that apart from environmental issues, other aspects of sustainable housing has not been properly researched.

Marcuse (1998) contended that the concept of sustainability should not be considered as a goal for housing or urban programme because many bad programmes are sustainable. However, the review of literature has revealed that sustainability has become a valuable issue in developing housing projects for obvious reasons. The first reason is that given the multi-faceted nature of housing as discussed above, the environmental, economic, social, and cultural dimensions of sustainability can find no less expression than in the production and consumption of housing (Turcotte and Ken, 2010). The second is the essential role of housing in enhancing global and local sustainability and environmental protection. As Mitlin and Satterthwaite noted, sustainable housing is:

*'.....a shelter which is healthy, safe, affordable and secure, within a neighbourhood with provision for piped water, sanitation, drainage, transport, health care, education and child development. Also a home.....protected from environmental hazards, including chemical pollution. Also important are [to meet] needs related to people's choice and control – including homes and neighbours which they value and where their social and cultural priorities are met.....achieving this implies a more equitable distribution of income between nations and, in most, within*

*nations.*' (Mitlin and Satterthwaite, 1996, p.31-32.)

The above submission provides insight to the fact that the outcomes of housing provision have direct link to sustainable development. It also identified key features of sustainable housing. Moreover, Choguill (2007) pointed out that for housing initiatives to be sustainable, they must be economically viable, socially acceptable, technically feasible and environmentally compatible. Also Winston (2007) highlighted some vital characteristics of sustainable housing to include: sustainable land use planning, resisting scattered settlements, housing development closer to employment and public transport, higher residential densities, sustainable construction and high standards of energy efficient dwellings. Others are housing availability, affordability and quality, access to green areas, and a high quality residential environment. The above views corroborate the European Union definition of sustainable housing as affordable, quality and energy efficient housing with positive psychological impacts (Klunder, 2004). Abdellatif and Othman (2006) also noted that sustainability housing is achieved when housing is delivered on time, cost effective in both short and long runs, has high quality, good indoor environment, durable, cheaper to

### **3.0 Sustainability Assessment Frameworks**

Studies have shown that public housing schemes as social programmes have been evaluated on the basis of their effectiveness in providing adequate, satisfactory and affordable housing that enhances the economic status of residents (Kaitilla, 1993; Lall, 2002; Hanson et al., 2004). It is also evident from the review of literature that top on the research agenda in the evaluation of public housing schemes has been whether public housing schemes are consistent with their intents and purposes, particularly, in improving the

maintain, and user friendly. In the African context, Odebiyi (2010) observed that housing quality and affordability were key areas of sustainable housing provision in the continent. This is probably because poor housing quality and high cost of housing are the two key challenges in housing provision in most African countries.

A number of inferences can be drawn from the foregoing review of literature. First is that public housing is a social programmes designed and implemented to meet social, economic, environmental needs of beneficiaries, and thus there is a strong relationship between housing and sustainable development. Second is that sustainability is the key parameter for assessing the long term impacts of public housing schemes on socio-economic development and environmental protection in a community. Finally, housing programmes are described as sustainable initiatives when they provide housing that meets the needs of present generation without compromising the chances of future generations to meet their needs. In the context of this paper, sustainability of public housing programmes is therefore viewed as the long-term economic viability, social acceptability, technical feasibility and environmental compatibility of such programmes that ensure their continuity.

quality of life and neighbourhood environment. Arising from this, a combination of subjective and objective parameters associated with end-users' personal experience, cultural values, attributes, perceptions, aspirations, goals and needs as well as generally defined and acceptable objective standards have been engaged in the evaluation of housing schemes across the globe (Amerigo and Aragones, 1990; Filfil, 1999).

Apart from the above cited research efforts which clearly focus on the short and

medium term outcomes of public housing schemes, very few attempts have been made at advancing our knowledge of the long term consequences of public housing programmes in developing countries.

Chiu (2000) observed that the assessment of the sustainability of housing was not an easy task. She noted that the indicators to use require consistent, reliable and regularly available data. This view was corroborated by Savaya et al (2008) who noted that precise assessments of programme sustainability are impossible to conduct on the basis of the existing literature, due to differences in the time studied and in the criteria of sustainability used. On the hand Dalal-Clyton and Sadler, (2004) were of the view that although increasing attention is being given to tools to assist in decision-making to support sustainable development initiatives, but most of the existing tools for the assessment of and making decisions on sustainability have a strong environmental focus. Turcotte, and Ken (2010) corroborated Sadler's view by noting that most literature on sustainable housing mainly focus on environmental aspects, which goes to suggest that an assessment tools incorporating social, economic, environmental, cultural dimensions of sustainability are desirable. It is clear from the foregoing that existing sustainability assessment frameworks are mainly preoccupied with environmental issues, and that one of the major obstacles to effective sustainability assessment is the choice of criteria to be used. This is probably due to the environmental origin of the concept sustainable development.

In the light of the above, Bennett and James (1999) and Turcotte, and Ken (2010) suggested that effective sustainability assessment framework should consider a wide range of criteria including social sustainability (healthy internal environment, safety, provision of social amenity, provision of recreation amenity and accessibility to jobs and amenities), economic sustainability

(cost efficiency over time, affordability, job creations and local economy), environmental sustainability (energy efficiency, water conservation, reduction of greenhouse gas emissions, waste management, material efficiency, pollution prevention, optimization and conservation of land, protection and enhancement of biodiversity, reduction of dependency on car) and cultural sustainability (designing housing that preserves, respects, and recognizes the unique historical and cultural characteristics of an area and its residents). Several other authors have indicated that sustainability of housing programmes can be assessed using indicators describing the impacts of building materials (Adedeji, 2005), architectural design, construction solutions and structural design (Onibokun, 1976; Fatoye and Odusanmi, 2009) and economic factors (McNulty and Holloway, 2000; Lall, 2002). Others are environmental impact (Chen et al., 2005) and socio-cultural impact (Djebarni and Al-Abed, 2000; Lux, 2005; Mohit et al., 2010).

A number of empirical studies on sustainability assessment of housing and urban projects have adopted integrated frameworks derived from the above listed criteria in developed countries. For instance, Blair et al., (2004) adopted a set of 37 equally weighted indicators representing economic, social and environmental components of sustainable housing. The indicators were grouped under key sub-components of housing affordability, sense of community; neighbourhood safety and satisfaction; transportation; environment-biodiversity; environment-energy; environment- resources consciousness; environment-wastewater/storm water control. Although, the environmental indicators were found to be more developed than the socio-economic indicators, the study was however significant in attempting to adopt criteria that addresses three key dimensions of sustainability: economic, social and environmental.

Davidson and Venning (2009) opined that the future of sustainability assessment lies in the adoption of a systems thinking approach. Systems thinking, according to Pullen, et al. (2010:52), suggest that the component parts of any system can be best understood in the context of relationships with other components and other systems, rather than in isolation. To this end, Daniell et al (2005) applied the Assessment of Urban Systems through Integrated Modelling and Exploration (AUSTIME) methodological framework to a particular housing development in Adelaide, South Australia. The study was able to combine carbon dioxide, water, waste, ecosystem health, economic and social subsystems into a multi-agent model, and in the process, simulate a variety of changes in occupant behaviour, infrastructure and location. Although, this framework is environmentally biased, it however made significant contribution in advancing our understanding of sustainability assessment by highlighting the relative importance and effects of various subsystems to the overall sustainability.

More recently, Pullen, et al. (2010) developed and tested an assessment framework for affordable and sustainable

housing in Australia. The study adopted ten 'characteristics' of affordable and sustainable housing grouped under broad characteristics that sought to reflect literature on affordability, economic sustainability, social sustainability and environmental sustainability. The key indicators used were energy efficiency, construction materials, construction methods, affordability, safety, quality of life, quality of place and health. Again, it was found that environmental sustainability indicators were reasonably well defined whereas those reflecting social sustainability needed further development.

The general inference that can be drawn from the above studies is that although the different frameworks so far developed and tested relied on the widely accepted Brundtland definition of sustainable development, they are deficient in the cultural dimension of sustainability as more emphasis are on the development of environmental criteria to the detriment of social, economic and cultural dimensions of programme sustainability. Therefore, an all inclusive framework capable of evaluating the four key dimensions of sustainability equally is needed. This is the gap this paper will attempt to fill.

#### **4.0. Proposed Framework for Evaluating the Sustainability of Public Housing Programmes**

Generally speaking, knowledge on housing and sustainable development transcends the boundaries of many disciplines, as both affect all aspect of human life. As a result, a framework for evaluating the sustainability of public housing programmes should be multidisciplinary and yet address specific issues related to the long term social, economic, environmental technological and cultural consequences of such programmes. From the review of literature, housing is identified as a social programme consisting of objectives, outcomes and impacts. It was also found from the globally accepted definition of sustainable

development put forward by the Brundtland Report of 1987 that sustainability has social, economic, environmental and cultural dimensions, which influence the provision and consumption of housing vice versa. The analytical and research framework proposed in this paper therefore conceives of the evaluation of sustainability of public housing programmes as a multi-faceted cyclic process involving the assessment of the long term consequences of public housing schemes on the community. This is with specific reference to the economic viability, socio-cultural acceptability, technical feasibility and environmental compatibility of public housing programmes.

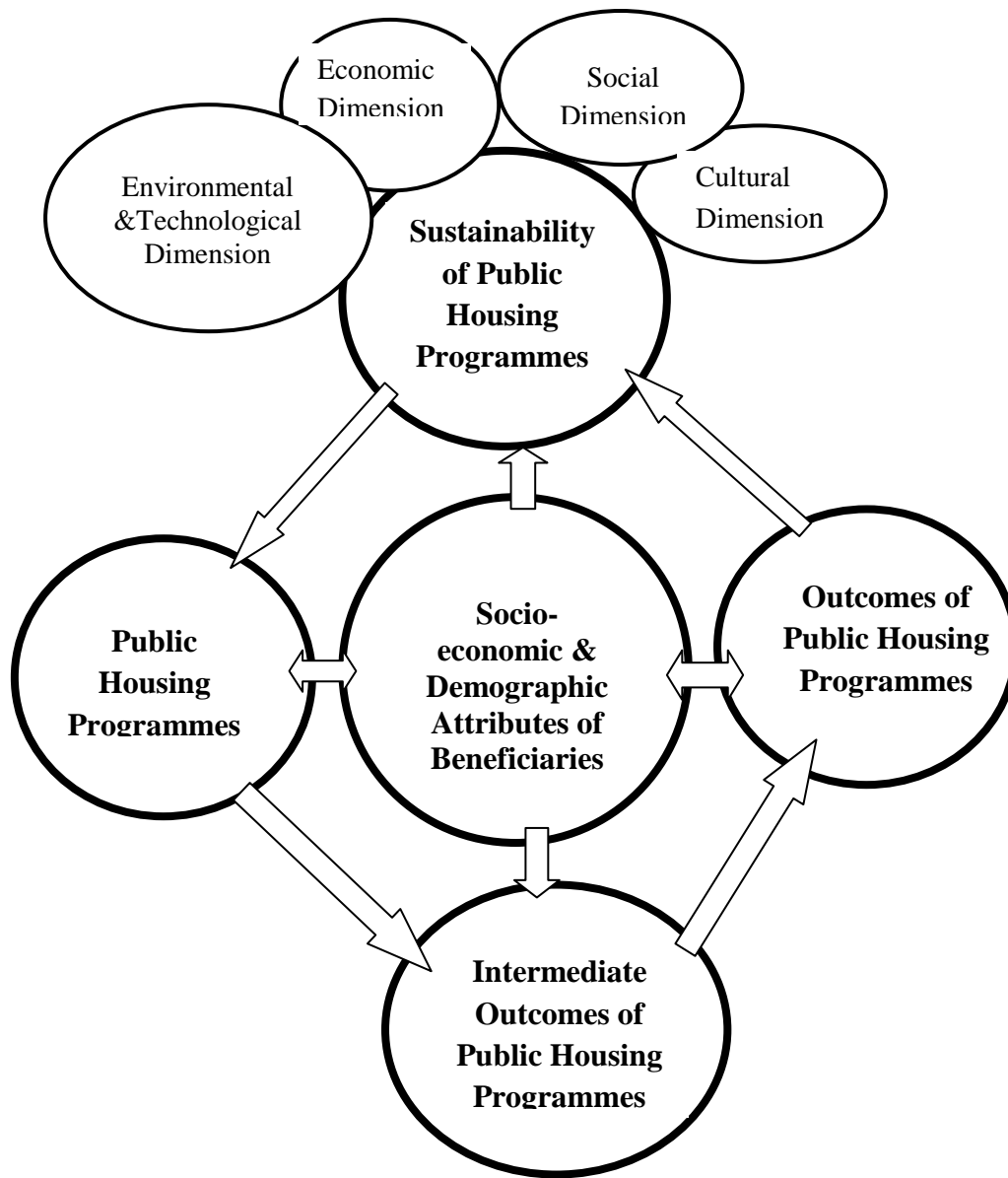
Figure 1 shows the graphic illustration of the proposed framework. It is evident from this illustration (Figure 1) that there are five key components of the framework, namely, public housing programmes, intermediate and final outcomes of the programmes, socio-economic and demographic attributes of beneficiaries as well as the sustainability of public housing programmes. The sustainability assessment component of the framework as to be expected consists of the environmental & technological, economic, social and cultural dimensions. Further examination of the framework (Figure1) will reveal that it suggests that public housing programmes comprising housing policies, programme goal and objectives, institutional framework and delivery strategies as well as intervening (economic, political, technological) factors are designed based on the socio-economic and demographic attributes (age, sex, marital status, education, income, employment sector, household size), housing needs and preferences of target population or beneficiaries. The framework also shows that housing programmes as social programmes have goals and intermediate outcomes (tangible products) such as dwelling units, housing services, neighbourhood facilities and housing management services. Beyond these intermediate outcomes are the final outcomes of the programmes. The final outcomes are also referred to as the impacts of public housing programmes and comprise housing and neighbourhood environment quality, housing affordability, housing satisfaction and quality of life of beneficiaries. The environmental & technological, economic, social and cultural dimensions of the sustainability of public

housing programmes are as presented on Table 1.

The framework (Figure 1) suggests direct relationship between the sustainability and final outcomes of public housing programmes. This implies that evaluation of sustainability of housing programmes as proposed in the framework can be based on the final outcomes of such programmes. It also suggests a direct relationship between socio-economic and demographic attributes of beneficiaries, the intermediate and final outcomes as well as sustainability of housing programmes. This is based on the notion that public housing programmes are designed based on the attributes of target population, and that the intermediate and final outcomes as well as sustainability of housing programmes can be evaluated based on the perception of beneficiaries of such programmes.

On the other hand, the framework suggests indirect relationship between the intermediate outcomes and sustainability of housing programmes. This is also based on the assumption that the intermediate outcomes do not have direct influence of sustainability of such programmes. The actual assessment of the sustainability of public housing programmes based on the parameters on Table 1 entails the use of Housing and Neighbourhood Environment Quality Index (HEQI) in the evaluation of environmental dimension, Housing Affordability Index (HAI) for the economic dimension, Quality of Life Index (QoLI) for the social dimension and Evidence of Preservation of Cultural Heritage (EPCH) and Evidence of Technical Feasibility (ETF) for the cultural and technological dimensions of sustainability respectively.





**Figure 1: Framework for evaluating the Sustainability of Public Housing Programmes**

**Table 1: Parameters for Sustainability Assessment of Public Housing Programmes**

<b>Environmental &amp; Technological Dimensions</b>	
1	Quality of Housing Environment
2	Quality of Neighbourhood Environment
3	Housing Density/Building Type
4	Architectural solution to energy consumption issues( e.g. ventilation, lighting, building morphology)
5	Type of building/ construction materials

- 6 Construction techniques
- 7 Landscaping Elements
- 8 Locational appropriateness to reduce dependency on car
- 9 Storm water discharge system
- 10 Waste management system
- 11 Main sources of power and water supply
- 12 Open Spaces and Green areas
- 13 Compactness of housing development for optimization and conservation of land
- 14 Noise Level

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**Economic Dimension**

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- 1 Housing affordability
- 2 Job creation in the form of home based enterprise
- 3 Tenure options
- 4 Suitability of housing acquisition process
- 5 Cost of living within the neighbourhood
- 6 Adaptability of housing units for future needs

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**Social Dimension**

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- 1 Access to social infrastructure
- 2 Social networks capable of generating social capital
- 3 Provision of recreational/ sporting facilities
- 4 Security and safety issues
- 5 Housing near to the places of work and worship
- 6 Level of social mix in housing environment
- 7 Quality of internal spaces of housing units
- 8 Privacy in dwelling units
- 9 Contribution of public housing to the aesthetics of urban landscape and morphology

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**Cultural Dimension**

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- 1 Architectural design of housing in relation to cultural values of residents
  - 2 Suitability of housing to occupants' natural way of life
  - 3 Reflection of the unique historical and cultural characteristics of an area and its residents in the design and development of housing.
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A number of key issues regarding the merits and limitations the framework are worthy of note. First is that the socio-economic and demographic attributes of beneficiaries of public housing scheme are central to the effectiveness of the framework. This is because greater percentage of data on the outcomes and sustainability of public housing programmes are derived from beneficiaries of such programmes. In addition, the views of

programme designers and executors are also included in the assessment with feedback mechanism, thus making the framework to be highly dependent on the views of both providers and end users of public housing. This is advantageous in ensuring realistic sustainability assessment. However, the result can be highly subjective; and thus constitutes a key limitation of the framework.

Second is that unlike most existing frameworks that focus on the intermediate and final outcomes of public housing based on housing quality and satisfaction parameters, the proposed framework is an integrated analytical and assessment tool incorporating housing and environment quality, housing satisfaction and affordability, quality of life, cultural heritage and technical feasibility parameters . This means that the framework is an extension of existing frameworks, and thus can be used in the assessment of both medium and long term outcomes of public housing schemes. Therefore, it is considered to be more

versatile than traditional framework for evaluation research in sustainable housing.

Finally, with the inclusion of environmental and technological, social, economic and cultural dimensions of sustainability in the framework, it attempts to address the limitations of environmentally focused framework that is very common in sustainable housing research. This implies that different data gathering instruments can be used in the collection of both quantitative and qualitative data from the different stakeholders, which is essential for proper evaluation of the sustainability of public housing programmes in different contexts.

### 5.0 Methodological approach to Evaluating the Effectiveness of the Framework

From the review of literature and the framework presented in Section 4.0 above, a number of these are developed, which together form sequential methodological steps that can be adopted in testing the effectiveness and validity of this framework. Figure 2 shows the methodological

approach to testing the effectiveness of the framework. Examination of this Figure will reveal a five step process ranging from preliminary investigations to data collection and analysis.

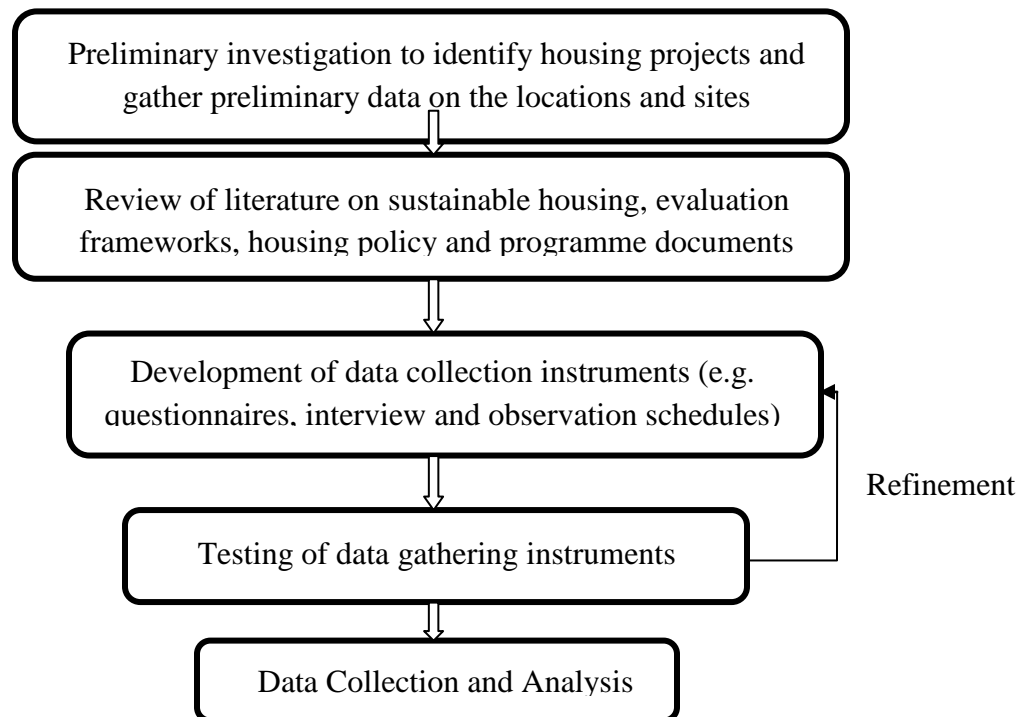


Figure 2: Methodological Approach to Test the Effectiveness of the Framework

The detail steps (Figure 2) show that the research activity begins with preliminary investigation to identify housing projects to be used as case studies and gather preliminary data on the locations and sites. Findings of preliminary investigation are documented with photographic materials and sketches. This is followed by the review of literature on sustainable housing, existing evaluation frameworks and policy and programme documents to identify housing policy thrust and programme objectives. The second step indicated above entails literature search and visitations to public housing agencies and other stakeholders for archival records and documentary evidence. Next is the development of data collection instruments. The key instruments required include questionnaires, observation and interview schedules. These instruments are tested and refined where necessary. Finally, data collection and analysis are carried out. The principal activities involved in the data collection stage are one-on-one interview with key executives of public housing agencies. As key stakeholders in public housing provision and charged with the responsibility of formulating housing policies, providing and managing public housing, the executives who are purposively selected, constitute valuable resources base for information on the provision of sustainable housing. They are also expected to receive feedback on findings of sustainability assessment research and put such findings into use in planning and executing future housing schemes. The interviews are conducted based on prepared interview guide in the case of semi-structured interview, and can be recorded manually or electronically.

In addition to the oral interview with housing agencies executives, household or housing unit survey is also carried out using the questionnaire and observation schedule. The household/housing unit survey is aimed at obtaining data on the socio-economic and demographic characteristics of residents as

well as their perceptions of the intermediate and final outcomes (housing and environment quality, housing satisfaction and affordability, quality of life) of public housing schemes. Data on the physical characteristics of housing units and surrounding environment as well as evidence of preservation of cultural heritage of the area and residents are made through physical observation and recorded using the observation schedule and photographic materials as may be required.

Analysis of the data obtained above involves analyzing and triangulating the quantitative and qualitative types of data. The quantitative data obtained from the questionnaire survey is analysed using relevant descriptive and inferential statistical tools, while the qualitative data obtained from the preliminary investigation and observation, review of policy and programme documents, and interview of executives of public housing agencies are subjected to content analysis. In evaluating the sustainability of housing programmes of Housing and Neighbourhood Environment Quality Index (HEQI), Housing Affordability Index (HAI), Quality of Life Index (QoLI) are used in evaluating the environmental, economic, and social dimensions of sustainability respectively. Taking the highest index as 100; the closer the index is to 100 in each case, the greater the sustainability of specific public housing scheme evaluated vice versa. On the other hand, Evidence of Preservation of Cultural Heritage (EPCH) and Evidence of Technical Feasibility (ETF) are used in evaluating the cultural and technological dimensions of sustainability. Also, the more evidence of preservation of cultural values as well as the use of simple technology in the construction and maintenance of housing units are found in housing schemes, the more culturally and technical sustainable such public housing schemes are vice versa. Based on the findings, research recommendations can be made on how to make the framework more

effective as a research and analytical tool. Policy and practice suggestions on the

sustainability of future public housing programmes can also be made.

## 6.0 Conclusions

The aim of this paper is to develop a framework for evaluating the sustainability of public housing programmes in developing countries. The paper proposed a new direction of housing sustainability research that goes beyond the traditional enquires on environmental and social-economic issues. It presents an integrated framework for assessing the environmental, technological, social, economic and cultural dimensions of housing programme sustainability. The proposed framework draws heavily on housing as social programmes and the construct of sustainable development. It suggests a direct relationship between the final outcomes (impacts) of public housing and sustainability of housing programmes and argues that the assessment of sustainability of public housing programmes

involves evaluation of the long term economic viability, socio-cultural acceptability, technical feasibility and environmental compatibility of such programmes. The proposed evaluation framework is effective in using diversified data collection instruments and techniques in obtaining data from a wide range of stakeholders including public housing providers and managers as well as housing occupants. It is noted that although this framework depends more on subjective than objective parameters, it attempts to address the pitfalls of environmentally biased evaluation frameworks. Hence, it is recommended to researchers, policy makers, programme designers and executors as well as professionals as an analytical, research and assessment tool.

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