

1 CHAPTER 1: INTRODUCTION

1.1 Background

The idea for the research came from intrigue at Singaporean Housing and Developing Board (HDB) housing being generally lauded, while South African housing was often discussed in media as lacking. It seemed there was no evaluation basis as to what made one superior to the other, where it was lacking and how different organisations could learn from others internationally.

The basic human right to adequate housing is agreed upon by all member states of the United Nations (UN HABITAT, 2009). The details of what adequacy entails are vague and ill-defined according to existing literature, and it is therefore difficult to determine whether any shelter used for housing is adequate, how adequate it is, or where it lacks in adequacy.

Instead of focusing on the provision of housing by government entities, or the extent of support offered, this study aims to establish a model to evaluate the adequacy of any shelter used for housing. This means it should be applicable to evaluate any structure used as a shelter for housing—this includes, but is not limited to social housing, emergency housing, informal housing, private developments, temporary housing, student housing, employee housing, etc.

1.2 Outline of the document

Following on this introductory Chapter 1, the document will discuss, detail and critique the theoretical overview and literature background on the topic in Chapter 2. Chapter 3 considers grounded theory as approach including the methodology through the different stages of data collection, analysis, presentation and validation. Chapter 4 considers data collection in the different phases of the project and details the sampling and source documents. Chapter 5 analyses the data through open coding, axial coding and core categories as per the grounded theory approach. The data obtained from these codes are then formulated into the elements and model presented in Chapter 6 and validated through theoretical saturation and confirmation as per grounded theory as well as a case study example in Chapter 7. Chapter 8 is a discussion chapter that includes the answering of research questions and comparison of the results to existing theories in terms of universality, definitions and elements. The document

1.6 Research aim

To identify the universal elements comprising the concept of adequate housing, and develop a model that enables the evaluation and comparison of housing in different settings and contexts.

1.7 Research objectives

Developing a rating system to objectively and realistically evaluate housing provisions will allow comparisons of strengths and weaknesses and facilitate international learning from the experience of others. The aim is to start from the fundamental and international human right to adequate housing. This statement is normally not amplified by further explanation or specifications of what adequacy should entail (UN HABITAT, 2009). An adequacy valuation will not seek to replace rigid and often unchanging regulations and standards, but rather to supplement these. It will also take into consideration that there will be individual and collective differences between different countries and regions; the aim would be for the model itself to be universally applicable, in order to allow evaluation within individual contexts as well. The elements should not depend on a geographical, financial and/or developmental context, even though the evaluation of such elements might depend on such. The model should provide details on what would constitute adequate in the case of any elements discussed in order to provide a measurement of degree of adequacy. Such a system can then be used for any shelter for housing: including social; public and even temporary or refugee shelter for housing.

1.8 Research question

As per grounded theory approach discussed in the methodology in 3.1, the research question is expected to be a process question (Creswell et al., 2007) that can be used for theory building (Gligor et al., 2016). The result is often presented as a visual model to help illustrate the results (Creswell et al., 2007). In this case, to achieve the research aims and objectives, the results would need to be universal in nature; compiled into a model with a possible visual element, and it importantly needs to evaluate the adequacy that can be applied to any form of shelter used for housing. Can a universal model be established to evaluate the adequacy of shelter for housing?

attempts to focus on moving away from specialised aspects like layouts and set designs. As Marshall (1969) suggests one can achieve further universality through customisability, and universal application is the aim.

- The study acknowledges the limitation of differences in principles, cultures, and thought-processes in different regions, times and classes (Marshall, 1969). To this end, the model attempts to ensure universal applicability by leaving results open to allow for interpretation and comparison in different cultural, physical and social circumstances.
- This study is focussed on the basic human right to adequate housing, but acknowledges that it may be a concern for other species and could have application in ecological studies as well such as Baumans and Van Loo (2013) that determined simple factors like cost, space, hygiene etc. do not really take the welfare of animals into account, and that physical and physiological needs are both very important when determining the minimal needs for acceptable housing.

1.10.2 Methodology limitations

The following limitations pertain to the data collection. The methodology of Phase 1 of the study will be discussed in detail in 3.2.1, the following methodology limitations are anticipated:

- The study was limited to online communication only – not only because of the charges for international telephone calls, but also due to restrictions as this study was undertaken in the midst of the Covid pandemic in 2020.
- The study was predominantly limited to the English language. Although English is only the primary, de facto or de jure language in 55 countries, it is the most spoken second language (Papadopoulos, 2019). The EF English Proficiency Index (EPI) is only rated as low to very low for a select few countries (Breene, 2019). Where possible, website interpreting and text translation was used to comprehend aspects that were not in the English language. It was also attempted to have the salutations of communication in the local language, but the language of communication still remained in English.

The methodology and data collection technique of Phase 2 of the study is detailed in 3.2.2, the following limitations to data collection are expected:

- Time restrictions—The study's time-horizon is cross-sectional, and data was collected between June and August 2021. The date of latest available revision or amendments were used, although the initial document might have been published prior to that.

- English language—only documents available in the English language or with translated versions of the document were used in the study. Self- or automatic translations were not used, as the context might be changed with incorrectly translated words.
- Online availability—the methodology followed made use of the internet for data collection; therefore, documents or revisions not available online were by default excluded. Documents behind a paywall, login or geographical access block were also deemed to be unavailable.
- Type of document—only official government publications were used in the study to ensure that data sources can be considered as primary data.

1.11 Application and future studies

The results of this study are aimed to be for the use of evaluating and possibly comparing the adequacy of housing by the potential provider or potential user of such housing. The application can include:

- Adequacy of housing in specific provision systems such as state-provided or public housing systems
- Adequacy of shelter for housing in emergency situations
- Adequacy of shelter for housing in informal settlements
- Adequacy of housing in private developments
- Adequacy and comparison of specifics of design or layout
- Case studies and comparisons in different contexts such as different geographic, social or economic settings.

Aspects excluded from this study could provide scope for future studies on adequacy of:

- Provision system such as
 - Scope and set-up of housing committees and departments
 - Involvement of public sector or state in provision
- Critique on policies, legislation, legal processes, or other official documentation and governance processes and legislation.
- Manner of usage and related aspects such as:
 - Selection of beneficiaries,
 - Loan assistance,

2 CHAPTER 2: THEORETICAL OVERVIEW

2.1 Introduction

The right to adequate housing, and universal acknowledgement of the need for adequate housing is confirmed at the hand of existing literature and theories. The universality of housing concerns can be expanded upon by touching on applicability in different contexts. While ‘adequacy’ is the main focus, related concepts like housing standards and residential satisfaction should also be considered. Existing definitions of adequacy should be considered, and in summarising the elements that comprise such definitions – these should be investigated further.

2.2 Right to adequate housing

According to international human rights law, adequate housing is included in the adequate standard of life every person is entitled to; it is included as such in the 1948 Universal Declaration of Human Rights, as well as the 1966 International Covenant on Economic, Social and Cultural Rights (UN HABITAT, 2009). It is considered a basic human right (South African Human Rights Commission, 2018; UN HABITAT, 2009), that is interdependent on and indivisible of other human rights, such as access to health, education, and services including water and sanitation (South African Human Rights Commission, 2018). This is reiterated in Article 25 of the Universal Declaration of Human Rights (UDR) as well as Article 11 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) (South African Human Rights Commission, 2018).

All member states of the United Nations (UN) have ratified one or more treaties that mention adequate housing, and/or international declarations, plans of action or conference outcome documents that commit the protection of the right to adequate housing (UN HABITAT, 2009); therefore all member states of the UN agree that access to adequate housing is a basic human right.

Other international treaties that mention the right to adequate housing as part of human rights include (UN HABITAT, 2009):

- The 1951 Convention Relating to Status of Refugees (Art. 21)

These are all important factors to be considered further in determining adequacy.

It can be inferred that adequacy does have an element of perception of satisfaction. Satisfaction with a building depends on the user—for client satisfaction is mostly based on return on their investment; professional team satisfaction is in the realisation of their creativity; end user and community satisfaction is in meeting their needs and supporting their activities (Ibem et al., 2013). The physical characteristics with the greatest influence on user satisfaction relate to physical, spatial attributes, building location, aesthetic and cost (Ibem et al., 2013). Building satisfaction subjectively evaluates the difference between the needs and expectations of the user and how well these are met by the building (Ibem et al., 2013).

2.5 Existing theories

Adequacy changes depending on different contexts and circumstances, as well the needs of a collective and individuals (Tissington, 2011). This sentiment is echoed throughout other research: Housing should be more than something that can be owned or a place where household activities can actually and potentially take place (Suchar and Rotenberg, 1994); Adequacy is linked to standards where standards are used to clarify interactions and are used as an analytical tool (Haffner, 1999), but where minimum standards or requirements are determined by professionals and the environment (Ratcliff, 1952), adequacy is determined by communities and their interpretation (Suchar and Rotenberg, 1994). In contrast with the rigidity of standards, some degree of flexibility is needed to allow for the balance between psychological and physical factors and user needs for which standards and legislation do not provide (Aroni, 1975; Meir et al., 2009); a standard that is more flexible in application, it is more likely to be universally applicable (McLean, 2018); Assessment of the performance of a residential building as a dwelling unit should consider the satisfaction of users and how well the building meets the expectations of the user (Abass and Tucker, 2018; Ibem et al., 2013; Kim et al., 2005).

Examples of definitions of adequacy are:

- A place where someone can exist and express freely, with personal and collective meaning (Suchar and Rotenberg, 1994).
- The ability to support the least acceptable standard of living through all elements that make up the housing (McCray and Weber, 1991).

determined by using a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) was similar enough to be considered, and offer a more comprehensive set of indicators than other lists of elements. A summary of the results is shown in Table 1.

Table 1: Elements of Adequacy summary (Aroni, 1975; Barber, 2008; Behr, 2021; McClean, 2018; Onibokun, 1985; Russell, 2021; Smit, 2008; South African Cities Network, 2011; UN HABITAT, 2009; Whitehead and Scanlon, 2007; Wimalasena, 2022; Yang, 2008).

	Element	Theory												
		CESCR UN HABITAT - tenure security	UN HABITAT	Behr (World Bank Index)	CESCR Barber	McClean	Onibokun	Smit	South African Cities Network	Whitehead and Scanlon	Yang	Russell	South African White Paper	Aroni
1	Physical security / physical safety													
2	Tenure security													
3	Access to infrastructure /service provision													
3.1	Waste removal													
3.2	Drinking water supply													
3.3	Sanitation													
3.4	Energy for electricity including gas													
3.5	Stormwaster system													
3.6	Fire system													
4	Affordable													
5	Habitable													
5.1	Purpose of structure / type of housing													
5.2	Layout / internal / design details													
5.3	Floor area / size / spatial													
5.4	Crowding / household size													
5.5	Specific rooms (kitchen, bedrooms, bathrooms)													
5.6	Protection from the elements													
5.7	Structurally sound													
5.8	Construction quality													
5.9	Building materials													
5.10	Heating and cooling / thermal performance													
5.11	Ventilation													
5.12	Lighting													
5.13	Air quality													
5.14	Acoustic performance													
5.15	Pest control													
6	Accessible to all / availability													
7	Location													
7.1	Neighbourhood													
7.2	Access to childcare													
7.3	Access to social													
7.4	Access to education													
7.5	Access to health and hospitals													
7.6	Access to jobs and opportunities													
7.7	Access to amenities													
7.8	Access to parks, green and open spaces													
7.9	Access to public transport													
7.10	Access to religious places													
7.11	Access to exercise space													
7.12	Privacy and safety													
8	Socio-cultural and political considerations													
9	Other													
9.1	Longevity													
9.2	Durability													
9.3	Sustainability													
9.4	Age													
9.5	Building technologies													
9.6	Maintenance													
9.7	Energy-saving and renewable energy													

2.7 Existing theories critique

Existing theories do list elements that comprise adequacy, but are fairly silent on what would be considered adequate within these elements or even which aspects should be considered. To this end, the entire section of 0 detailing the adequacy of such elements have been compiled mainly from other sources of literature, as the existing theories seem to list but not describe. It is notable that as per Table 1, a large amount of detail in terms of specification is provided by the sources that do not use the term 'adequacy', but rather 'quality of housing'. Are these housing quality aspects then supposed to be considered over and above adequacy? Lastly, taking note of the existing theories, there is still no way to evaluate or compare adequacy in different circumstances, therefore being exactly that, theoretical, and not practically applicable.

2.8 Summary

The universal need for and right to adequate housing is supported by existing literature. Definitions of adequacy in existing literature are investigated, and the details of such definitions are expanded upon further. Adequacy is tied to related concepts including standards and residential satisfaction through literature as well, and are expected to form part of the full scope of adequacy. The existing literature is found to be theoretical in nature with limited application in evaluation of adequacy.

3 CHAPTER 3: METHODOLOGY

3.1 Introduction

This study is qualitative in nature, and rooted in grounded theory. Grounded theory originated in the field of sociology, but has been used in a broad range of other applications including business, management and action plans (Douglas, 2003). It is an approach that does not start with a theory, but instead starts with an area of study from which theoretical concepts emerge (Douglas, 2003). The research is therefore not hypothesis-driven, but the model for housing adequacy will be derived from the data. It is an applicable strategy where existing theories are limited or insufficient (Creswell et al., 2007) where existing housing adequacy theories are discussed in 2.7. This approach also has the benefit that existing theories do not need to be discarded, but can be used as knowledge to build upon (Sarker et al., 2000).

The methodology of the project is visually represented as per Figure 1, and this will be used as a guideline for the structure of this chapter, and further throughout the document.

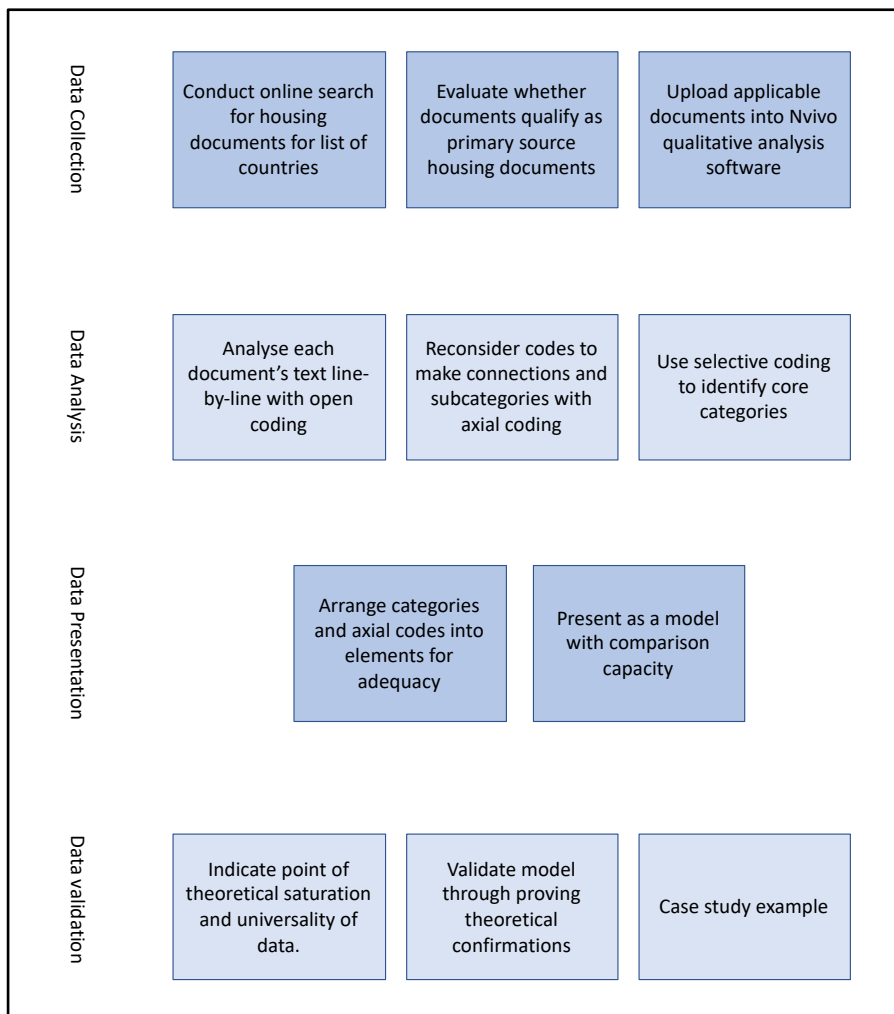


Figure 1: Visual representation of methodology for Phase 2

3.2 Data collection

This study has two phases of data collection, with some differences in methodologies. Both are discussed and reported on, but because phase 2 was the approach that was used in the analysis and results of this study, it will be the main focus of the document.

Grounded theory is often found in instances where the research question aims to discover a process, and entails the analysis of many individuals or entities (Creswell et al., 2007) the study is expected to start with the gathering of data (Heath and Cowley, 2004), thereby immersing in a large amount of data (Sarker et al., 2000) until a point of theoretical saturation is reached (Sarker et al., 2000). The sampling strategy aimed to generate a large amount of data, and non-probability sampling was used to ensure a maximum sample size. Limitations

in data collection methodology for both phase 1 and phase 2 are noted in the methodology limitations section in 1.10.2. Data collection and sample results are explained in full in Chapter 4.

3.2.1 Phase 1

A list was compiled containing all 195 UN member states, plus four non-members (Vatican City, Palestine, Kosovo, and Taiwan) housing authorities (United Nations, 2022). The names of these countries were then entered into an online search, combined with terms that relate to:

- “housing”—including “housing”, “residential” and a translation of the word “housing” into the local language for the particular country
- “authority”—including “authority”, “department”, “regulation”, “body” and “national”.

Thereby, a database was constructed of all the specified authorities in charge of housing in that specified country. The internet was scoured for an official website or online presence for these authorities for each country, and this was used to collect official contact information or contact methods for each authority. The authorities in the various countries were contacted during the time period June 2020 to August 2020. In some of the 199 countries, multiple authorities are involved in housing often based on geographical area delineation such as: individual authorities for Australian states and territories; individual authorities for Canadian provinces; and separate authorities for Belgian regions and languages. Sometimes the authorities referred the request for information to other branches or authorities. A total of 210 organisations in 199 countries were attempted to be approached, and asked if they would participate in providing information on what would be considered “adequate” housing in their area/region.

The letters of consent obtained from housing authorities of countries that were interested in participating were included in the Ethical Clearance application, together with a question-list of eight main questions that would be put to respondents following ethical approval:

1. What determines whether housing is adequate?
2. What is considered adequate safety and security regarding housing?
3. What is considered adequate service provision?
 - (You may choose to delineate your response according to subsections)
 - Drinking water provision

- Sanitation provision
 - Energy provision
 - Heating, ventilation or air conditioning provision
 - Refuse removal
4. What is considered adequate affordability for shelter/housing?
 5. What constitutes an adequate physical structure?
 - (You may choose to delineate your response according to subsections)
 - Size
 - Structural adequacy
 - Thermal properties
 - Acoustic properties
 - Weatherproofing properties (including wind and water)
 - Maintenance
 6. What would be adequate accessibility regarding shelter/housing?
 - (You may choose to delineate your response according to subsections)
 - Access to transport
 - Access to non-motorised mobility (including walkability and cycling)
 - Access to amenities
 7. What would determine whether the location of the shelter/housing is adequate?
 - (You may choose to delineate your response according to subsections)
 - Proximity to CBD (urban areas) or nearest city (rural)
 - Proximity to healthcare
 - Proximity to education
 8. What is considered adequately meeting cultural requirements regarding housing?

3.2.2 Phase 2

A list was compiled of all 195 UN member states, plus four non-members (Vatican City, Palestine, Kosovo, and Taiwan) (United Nations, 2022). A systematic internet search was made of the following combination of terms:

- The name of the country
- “housing”
- Iterations of: “standards” / “regulations” / “minimum” / “code” / “policy” / “adequacy” / “requirements”

3.3 Data analysis

With a grounded theory approach, the study commences with an area of study, rather than a theory (Douglas, 2003). As with most qualitative studies, there is a role of interpretation assigned to the researcher (Heath and Cowley, 2004), and while the process shares a lot of elements with reflexive thematic analysis (Braun and Clarke, 2021), to dissuade a mix of methodologies the data continually be discussed at the hand of grounded theory (Sousa, 2014). Grounded theory can be a combination of positivism – where purely data and facts are considered; and interpretivism – where differences in context is also taken into account (Alharahsheh, 2020). As with all qualitative studies there is a role of interpretation (Heath and Cowley, 2004), but it remains important that the emphasis of the data analysis should be on the source data in order to minimise the researcher’s own opinions (Douglas, 2003). Relevant theoretical concepts can then emerge from the data in the data analysis process. By following the grounded theory coding steps, the emergent theory is detailed and dense in nature (Heath and Cowley, 2004). To this end qualitative analysis software was used to assist in the form of the computer programme/app NVivo. This specifically allowed for coding of a large body of information into different themes, and managing and correlating such coding to discuss similarities and differences.

3.3.1 Open coding

The source data is approached in a line-by-line basis (Sarker et al., 2000) and systematically sorted into codes (Heath and Cowley, 2004) aligned with the theme of study. A single line of data might be assigned to any and all codes that seem applicable. Prior understandings of the topic and existing literature can be acknowledged, but the aim is not to test existing theories, so coding should remain open in nature (Heath and Cowley, 2004).

3.3.2 Axial coding

Once all data has been through the open-coding process, axial coding commences. Axial coding is the process of reworking through all the data, but this time with a code-by-code basis making connections and reassembling data (Sarker et al., 2000). The axial coding phase is aimed at reducing and clustering the data (Heath and Cowley, 2004).

3.3.3 Selective coding

Selective coding is the process of considering the axial codes, and categorising to enable identification of core categories (Creswell et al., 2007; Douglas, 2003; Heath and Cowley, 2004; Sarker et al., 2000). Categories are linked through context, condition, strategy and consequence (Sarker et al., 2000).

3.4 Data presentation

For data generated in grounded theory to be presented for theory building, it should be presented in a manner that is (Gligor et al., 2016):

- Is clear and logical
- Has utility and relevance
- Enables describing, explaining, predicting and possibly controlling the phenomenon.

To this end, the housing codes and core phenomenon of this study should be presented in a way that is useful in clarifying what housing adequacy entails, that can be universally relevant, and that can be used to explain and predict the adequacy of housing to the point where it can possibly assist in implementing change towards addressing inadequacies.

The data presentation stage should answer the grounded theory 'what', 'how', 'why', 'who', 'when' and 'where' as indicated by Gligor et al. (2016) and Dubin (1978). The phenomenon description should entail 'what' aspects determine adequacy of housing, and 'how' they relate to one another as well as 'how' they answer the research question. The 'why' is an explanation of underlying dynamics that lead to adequacy or inadequacy. The 'who', 'when' and 'where' are limitations to the applicability, and the study should describe how it deals with differences in social and temporo-spatial settings in order to achieve universality.

3.5 Data validation

Data validation in qualitative research should preferably be intrinsic, and based on the research context itself rather than additional criteria (Sousa, 2014). This aligns with grounded theory where ideas should be verified by the data: The comparative analysis subsumes and assumes the verification process (Glaser and Strauss, 1967; Heath and Cowley, 2004). Validation is done at each stage using constant comparison until theoretical saturation is achieved (Sarker et al., 2000). The theory-building approach taken is seen as exploratory instead of

4 CHAPTER 4: DATA COLLECTION

4.1 Introduction

Data collection took place between June and August 2020 for Phase 1, and during June to August 2021 for Phase 2. As per the grounded theory approach of the study, the aim was to gather as much data as possible in order to fully immerse in data. To this end non-probability sampling was used, and all countries were attempted to be included – in instances where countries wished to be represented by region, this was also complied with. Data collection methods and strategies are described in detail in 3.2, and sample details and results are further discussed for each phase separately.

4.2 Phase 1

A total of 210 organisations in 199 countries were attempted to be approached, and asked if they would participate in providing information on what would be considered “adequate” housing in their area/region. In countries with multiple organisations, the country might therefore be represented in multiple categories of responses.

Table 2: Contact status results for phase 1 sampling

Contact status		No. of countries (No. of authorities where different from no. of countries)	% of total countries (% of organisations)
No contact initiated	No information on authority	13	6,2 %
	No website or online presence	4	1,9 %
	No English translation	2	1,0 %
	Website error	12	5,7 %
	No contact information or contact form	23 (25 authorities)	11,0 % (11,2 %)
Contact initiated	Undeliverable	17	8,1 %
	No response	115 (123 authorities)	55,0 % (54,9 %)
	Acknowledged, no correspondence	10 (12 authorities)	4,78 % (5,36 %)
	Some correspondence	9 (12 authorities)	4,31 % (5,36 %)

4.3 Phase 2

Phase 2 entailed the usage of official published documents available online in English as source documents. The methodology is discussed further in 3.2.2. The exclusion of certain documents deemed irrelevant are described further in the limitation section of 1.10.2. This resulted in acceptable documents from 42 countries:

- Australia (Australia, 2010)
- Azerbaijan (Azerbaijan, 2009)
- Bahrain (Kingdom of Bahrain, 2010)
- Bangladesh (Bangladesh, 2016)
- Belarus (Belarus, 2012)
- Bhutan (Bhutan, 2020)
- Canada (Alberta - Canada, 2012)
- Croatia (Croatia, 2001)
- Czechia (Czech, 2016)
- Ethiopia (Ethiopia, 2016)
- Finland (Finland, 2005)
- Ghana (Ghana, 2015)
- Guyana (Guyana, 1998)
- Iceland (Iceland, 1998)
- Iraq (Iraq, 2010)
- Ireland (Ireland, 2019)
- Jamaica (Jamaica, 1973)
- Kazakhstan (Kazakhstan, 1997)
- Kuwait (Kuwait, 1993)
- Lesotho (Kingdom of Lesotho, 2018)
- Malaysia (Malaysia, 2021)
- Maldives (Maldives, 2008)
- Malta (Malta, 1949)
- Marshall Islands (Republic of the Marshall Islands, 2016)
- Moldova (Moldova, 2021)
- Nepal (Nepal, 2018)



Figure 8: Word cloud of most common terms in coded content in source documents (own compilation)

As data was coded in a line-by-line basis, the list of open codes, together with how many files or individual sample documents contained code with this specific content, as well as the total number of text references coded to each code is shown in Table 3.

Table 3: List of open codes

Name	Files	References
Accessibility—access	21	57
Accessibility—location	20	64
Adequacy	14	28
Affordability	20	208
Amenities	18	91
Cultural requirements and community	27	126
Emergency	13	34
Family and women	23	73
Housing need	32	171
Informal housing	7	19
Maintenance	23	59

Name	Files	References
Occupants	14	42
Other	19	59
Physical properties	16	180
Building materials and structure	28	162
Maintenance	12	21
Other	20	63
Protection from elements	18	59
Size and layout	30	117
Type of building	31	80
Resettlement	10	32
Rural vs urban	13	39
Security	4	6
Physical safety	18	27
Tenure security	14	28
Service provision infrastructure	20	155
Electricity	16	44
Fire or smoke	8	11
Gas supply	3	4
Heating or cooling	12	27
Pest control	4	5
Sanitation	21	50
Storm water	2	4
Waste	11	14
Water	21	53
Sustainability	16	131
Technology and innovation	10	97

5.3 Axial coding

Subsequent to the open coding phase, axial coding commenced – each open code was revisited and data was reorganised and recoded. Firstly, the need for housing across the sample was analysed and discussed.

Table 4: Aspects and categories of adequacy as defined by different countries

Axial code	United Nations	Taiwan - Republic of China	New Zealand	Czech	Ethiopia	Finland	Guyana	Kazakhstan	Lesotho	Malaysia	Maldives	Moldova	Poland	South Africa	St Lucia	Trinidad and Tobago	Uganda	Zambia	Zimbabwe
1	Access to housing / availability																		
2	Location / Access to amenities																		
3	Physically accessibility – including limited capacity																		
4	Affordable																		
5	Tenure security / structure permanence																		
6	Protection from crime																		
7	Physically safe - including structural																		
8	Quality building materials																		
9	Protection from damp, cold, precipitation and wind																		
10	Protection from fire																		
11	Protection from pests																		
12	Acceptable internal layout																		
13	Proficient size																		
14	Intended for residential use / habitation																		
15	Lighting																		
16	Ventilation																		
17	Indoor temperature																		
18	Energy - including gas and electricity																		
19	Sanitation																		
20	Surface drainage																		
21	Water supply																		
22	Waste removal																		
23	Environmental considerations																		
24	Social / family considerations																		
25	Lifecycle Maintenance																		
26	Future considerations /technology and innovation																		
27	Cultural / community considerations																		

The data was then reworked into these axial codes with the following results:

5.3.3 Elements of adequacy

1. Access to housing/availability

All should universally have access to housing (Bangladesh, 2016; Ghana, 2015) as also believed by countries where it is seen as a human right (Zambia, 2020), basic human right (Moldova, 2021; St Lucia, 2008), and fundamental human right (Taiwan, 2017).

Some countries specifically state that this right is applicable to citizens of the country (Bhutan, 2020; Croatia, 2001; Nepal, 2018; Russia, 2021; Tajikistan, 1997; Ukraine, 1983), while others at least broaden it to include other lawful residents in addition to citizens (Republic of South

20. *Surface drainage / storm water*

Sufficient drainage should be provided (Republic of South Africa, 2009; Republic of the Marshall Islands, 2016) to remove storm, surface and ground water (New Zealand, 2013; Republic of South Africa, 2009).

- This includes provision of gutters, downpipes and drains (Ireland, 2019; New Zealand, 2013). Gutters should be:
 - Sufficiently sized to deal with usual rainfall (New Zealand, 2021)
 - Intact, unbroken and properly fixed (New Zealand, 2021)
 - Unobstructed and unblocked (New Zealand, 2021)
- Surface drainage system to:
 - Be easily maintained with no hidden path such as open and lined (Republic of South Africa, 2009; Samoa, 2006)
 - Have removable silt traps to minimise debris accumulation (Samoa, 2006)
 - Overflow to a major drainage system (Samoa, 2006)
 - Be far from sanitation system (Samoa, 2006).

21. *Water supply*

The house is required to ensure supply of water (Alberta - Canada, 2012; Croatia, 2001; Iraq, 2010; Kazakhstan, 1997; Kingdom of Lesotho, 2018; Malaysia, 2021; Maldives, 2008; Nepal, 2018; New Zealand, 2013; Poland, 2016; Republic of South Africa, 2009; St Lucia, 2008; The Republic of Uganda, 2016; United States of America, 1994; Vietnam, 2014; Zimbabwe, 1972) including pipes, valves and fittings (Kingdom of Bahrain, 2010) to provide:

- Adequate volume—uninterrupted or continuous supply (Alberta - Canada, 2012; Ghana, 2015; Iraq, 2010; Ireland, 2019; New Zealand, 2013)
- Adequate water pressure—use of pumps if required (Alberta - Canada, 2012; Kingdom of Bahrain, 2010; Republic of South Africa, 2009)
- Adequate temperature—hot and cold water (Alberta - Canada, 2012; Ireland, 2019; New Zealand, 2013; Republic of South Africa, 2009)
 - Hot water should be maintained between 46 °C and 60 °C
- Adequate quality—drinking/potable water (Alberta - Canada, 2012; Bangladesh, 2016; Ghana, 2015; Malaysia, 2021; Maldives, 2008; New Zealand, 2013; Republic of South Africa, 2009; Republic of the Marshall Islands, 2016)

- Water-saving (Iraq, 2010; Republic of South Africa, 2009).

Personal washing facilities should also be included (Alberta - Canada, 2012; Finland, 2005; Republic of the Marshall Islands, 2016; Zimbabwe, 1972).

22. *Waste removal*

Handling of solid (Ethiopia, 2016; Iraq, 2010) and liquid waste (Iraq, 2010) should include:

- Waste management (Ethiopia, 2016; Iraq, 2010; The Republic of Uganda, 2016)
 - Adequate waste collection (Malaysia, 2021; Vietnam, 2014)
 - Adequate storage (Alberta - Canada, 2012; Ireland, 2019)
 - Sustainable and environmentally friendly (Iraq, 2010)
- Waste final disposal (Alberta - Canada, 2012; Ethiopia, 2016; Kazakhstan, 1997; Kingdom of Lesotho, 2018; Samoa, 2006)
 - Engineered and designed landfill (Ghana, 2015)
 - Proper final disposal location (Samoa, 2006)
 - Proper chemical and hazardous substance disposal (Samoa, 2006).

23. *Environmental considerations*

Environmental and natural circumstances should be taken into account (Finland, 2005).

Sustainable housing through environmental considerations (Iraq, 2010; Maldives, 2008; Samoa, 2006; The Republic of Uganda, 2016; Vietnam, 2014; Zambia, 2020) include:

- Energy efficiency (Bangladesh, 2016; Bhutan, 2020; Iraq, 2010; Kazakhstan, 1997; Maldives, 2008; Poland, 2016; Republic of South Africa, 2009; The Republic of Uganda, 2016; Vietnam, 2014). Energy products comprise such a large expenditure (12% of household expenses) that improvements in energy parameters should be considered.
 - Energy-saving construction materials (Bangladesh, 2016; Republic of South Africa, 2009; The Republic of Uganda, 2016)
- Passive design for enhanced environmental performance including lower energy requirements (Republic of South Africa, 2009; The Republic of Uganda, 2016)

- Alternative energy from renewable sources for lighting, heating, cooling and cooking (Bangladesh, 2016; Kingdom of Lesotho, 2018; The Republic of Uganda, 2016) such as:
 - Installation of solar panels (Bangladesh, 2016)
- Water saving technologies—like:
 - Low flow rate sanitary fittings and dual flush cisterns (Republic of South Africa, 2009)
 - Methods of rain water conservation or reuse where possible (Bangladesh, 2016; Ghana, 2015)
 - Secondary water or greywater harvesting—reuse of household wastewater (Ghana, 2015; Republic of South Africa, 2009; The Republic of Uganda, 2016)
 - Fittings or by design—i.e. no dead legs or short dead legs in the pipework (Republic of South Africa, 2009)
- Environmental preservation and area conservation (Bangladesh, 2016; Bhutan, 2020; Ethiopia, 2016; Ghana, 2015; The Republic of Uganda, 2016; Vietnam, 2014), including avoidance of critical areas, local ecosystems, flood zones, wetlands, etc. (Bangladesh, 2016; Bhutan, 2020; Ghana, 2015)
- Environmentally friendly products (Bangladesh, 2016; Bhutan, 2020; Ethiopia, 2016; Iraq, 2010; Kingdom of Lesotho, 2018; Republic of South Africa, 2009; The Republic of Uganda, 2016) such as:
 - Those that cause no environmental harm (Ethiopia, 2016)
 - Green certified products (Poland, 2016)
 - Ones upcycled from waste materials (Bangladesh, 2016)
 - Local natural products (Ghana, 2015; Iraq, 2010; Kingdom of Lesotho, 2018; The Republic of Uganda, 2016; Zambia, 2020).

24. *Social / family considerations*

Socially sustainable communities can be achieved by being supportive of wider social needs (Australia, 2010; Maldives, 2008; Samoa, 2006):

- Social development (Bangladesh, 2016; St Lucia, 2008)
- Cultural (Bangladesh, 2016; St Lucia, 2008; The Republic of Uganda, 2016)
- Economic prosperity and opportunities (Ghana, 2015)

- Gender (Ghana, 2015; Zambia, 2020)
- Youth and aged (Ghana, 2015)
- Unemployed (Ghana, 2015)
- Historic or heritage preservation (Iraq, 2010; St Lucia, 2008).

25. *Lifecycle maintenance*

The lifecycle of a house includes maintenance (Ghana, 2015), repairs, enhancement etc. during and after use for a period of time (Bangladesh, 2016). Poor condition is a safety risk. The minimum service life on housing construction should be 25 years (Kingdom of Bahrain, 2010). Reconstruction and repairs to existing buildings play a big role in providing sufficient housing stock as required (Bangladesh, 2016; Iraq, 2010; Maldives, 2008; The Republic of Uganda, 2016).

Housing should be:

- Fully completed/finished buildings (Belarus, 2012; Croatia, 2001)
- Free of defects (Belarus, 2012):
 - Properly maintained and kept (Alberta - Canada, 2012; Bangladesh, 2016; Ghana, 2015; Ireland, 2019; Kazakhstan, 1997; Kingdom of Lesotho, 2018; Malaysia, 2021; Nepal, 2018; New Zealand, 2013; New Zealand, 2021; The Republic of Uganda, 2016; Vietnam, 2014)
 - Repaired or items replaced where necessary (Alberta - Canada, 2012; Bangladesh, 2016; Guyana, 1998; Ireland, 2019; Kuwait, 1993; Malaysia, 2021; Nepal, 2018; New Zealand, 2013; New Zealand, 2021; The Republic of Uganda, 2016; Vietnam, 2014)
 - Rehabilitated, renovated or reorganised where required (Bangladesh, 2016; Belarus, 2012; Iraq, 2010; The Republic of Uganda, 2016; Vietnam, 2014)
- Reconstructed or redeveloped where applicable (Bangladesh, 2016; Guyana, 1998; Kuwait, 1993; The Republic of Uganda, 2016)
- Enhanced or renovated, if possible (Bangladesh, 2016; Kuwait, 1993).

It should include remaining safe (Alberta - Canada, 2012; Guyana, 1998; Iceland, 1998) in terms of:

- Elements, components, finishes and fittings (Alberta - Canada, 2012; Ireland, 2019; Kazakhstan, 1997; New Zealand, 2013; New Zealand, 2021)
- Structure (Alberta - Canada, 2012; Ireland, 2019; Malaysia, 2021)
- Technical requirements (Belarus, 2012; New Zealand, 2021)
- Health and sanitation (Belarus, 2012; Malaysia, 2021; Maldives, 2008; New Zealand, 2013; New Zealand, 2021; Vietnam, 2014)
- Historic preservation (Iraq, 2010; Vietnam, 2014).

26. *Future considerations / technology and innovation*

Information technology should be used efficiently (Bangladesh, 2016) with better methods of construction (Ethiopia, 2016) and building technologies that can:

- Improve housing quality (Ethiopia, 2016; Iraq, 2010; The Republic of Uganda, 2016)
 - Better structural designs (Kuwait, 1993; Republic of South Africa, 2009; The Republic of Uganda, 2016)
 - Better technical practices and safety (Kuwait, 1993; Poland, 2016; Republic of South Africa, 2009)
 - High quality building materials (Ethiopia, 2016; Iraq, 2010; Republic of South Africa, 2009; The Republic of Uganda, 2016)
- Reduce costs (Bangladesh, 2016; Kingdom of Lesotho, 2018; Republic of South Africa, 2009; The Republic of Uganda, 2016; Zambia, 2020)
 - Non-sewered sanitation (Iraq, 2010)
- Reduce environmental impacts (Bangladesh, 2016; Iraq, 2010; Kingdom of Lesotho, 2018; The Republic of Uganda, 2016; Zambia, 2020)
 - Building materials that can be proven to be efficient and sustainable (Iraq, 2010; The Republic of Uganda, 2016)
 - Improve energy efficiency (Iraq, 2010; Poland, 2016; Republic of South Africa, 2009; The Republic of Uganda, 2016)
 - Water-saving technologies (Iraq, 2010; Republic of South Africa, 2009; The Republic of Uganda, 2016)
 - Better waste disposal (Iraq, 2010)
 - Renewable energy sources (Kingdom of Lesotho, 2018)
- Provide better administration (Bangladesh, 2016)

- Housing planning to provide social cohesion and reduce risk of disasters (Bangladesh, 2016)
- Electronic databases for physical, legal, technological and financial housing aspects (Bangladesh, 2016; Iraq, 2010; The Republic of Uganda, 2016; Zambia, 2020)
- Online information distribution to end-users (Bangladesh, 2016)
- Solve local problems or use local resources (Ethiopia, 2016; Iraq, 2010; The Republic of Uganda, 2016; Zambia, 2020)
 - Certification for unconventional building methods or materials (Republic of South Africa, 2009)
- Reduce gap between supply and demand of housing (Iraq, 2010; The Republic of Uganda, 2016).

27. *Cultural / community considerations*

Housing satisfaction greatly determines not only the individual's development and quality of life, but also that of the entire social community and context (Poland, 2016; St Lucia, 2008).

Housing should:

- Be acceptable for a person's cultural identity and norms (Australia, 2010; Iraq, 2010; Nepal, 2018; Republic of South Africa, 2009; Samoa, 2006; St Lucia, 2008; The Republic of Uganda, 2016; Vietnam, 2014)
- Conserve archaeological or architectural aspects of historic or cultural significance (Bangladesh, 2016; Iraq, 2010; Vietnam, 2014)
- Be in line with religious values (Bangladesh, 2016; Iraq, 2010; Nepal, 2018)
- Support local solutions, technologies, businesses and materials (Bangladesh, 2016; Maldives, 2008; Poland, 2016; St Lucia, 2008; The Republic of Uganda, 2016; Zambia, 2020)
- Incorporate the local community (Bangladesh, 2016; Ethiopia, 2016; Ghana, 2015; Iraq, 2010; Maldives, 2008; Poland, 2016; Republic of South Africa, 2009; Samoa, 2006; St Lucia, 2008; Zambia, 2020)
- Be equitably available to all with no discrimination (Australia, 2010; Bangladesh, 2016; Finland, 2005; Ghana, 2015; Nepal, 2018; St Lucia, 2008; Zambia, 2020).

5.4 Selective coding / Core categories

For selective coding, the axial codes were reorganised and categorised to the following core categories through aligning them by condition, context, strategy and/or consequence:

1. *Accessibility*

All should universally have access to housing (Bangladesh, 2016; Ghana, 2015) as also believed by countries where it is seen as a human right (Zambia, 2020), basic human right (Moldova, 2021; St Lucia, 2008), and fundamental human right (Taiwan, 2017). Accessibility is not only access to housing, but also physical access, accessibility in terms of location to amenities and access through affordability, and access continuity through tenure security.

2. *Protection from the elements*

Houses should be for people to be resilient to vulnerabilities or the elements in different forms (Bhutan, 2020; Iraq, 2010; Republic of South Africa, 2009; The Republic of Uganda, 2016), and the condition should be maintained as hygienic (Alberta - Canada, 2012; Belarus, 2012), water-, wind- and weatherproof (Alberta - Canada, 2012; New Zealand, 2013). The elements detailed include crime, physical danger, damp, fire, and pests as well as mentioning the quality of building materials.

3. *Internal habitability*

The building should be internally habitable – this includes that the building is intended for habitation, of proficient size, with acceptable internal layout and room composition, and adequacy of lighting, ventilation and internal temperature.

4. *Service provision*

Service provision includes access to, continuity of, and details of acceptable provision of energy, sanitation, surface drainage or stormwater, water supply and physical waste removal.

5. *Sustainability*

The aim is to have sustainable communities and human settlements (Australia, 2010; Bangladesh, 2016; Iraq, 2010; St Lucia, 2008) including education of end-users, NGO's, and participating organisations (Bangladesh, 2016; Ethiopia, 2016; Ghana, 2015; The Republic of

Uganda, 2016). This includes environmental, social and cultural sustainability as well as lifecycle maintenance, future considerations and technology.

5.5 Summary

The data was analysed through open coding initially. Subsequent axial coding started with establishing universality in the need for adequate housing, then focussed on the definitions of “housing” and “adequacy” which formed the basis for the 27 axial codes – some with further sub-sections of axial coding – of housing adequacy. These 27 codes can also be seen as the elements of adequacy, and were reorganised into five core categories during the selective coding process.

6 CHAPTER 6: DATA PRESENTATION

6.1 Introduction

As per grounded theory, the emerging patterns from the data should be presented (Glaser and Strauss, 1967) in a clear and preferable visual manner (Creswell et al., 2007). The theory should be detailed and dense in nature, rather than concise (Heath and Cowley, 2004). This chapter presents the data in a model format, including the model's capacity for evaluation.

6.2 Model presentation

Based on the axial and selective codes, a visual representation of the model for housing adequacy is presented in Figure 9. Results are compartmentalised in different levels, with Level 1 being housing adequacy, Level 2 being the core categories, and Level 3 and 4 being referred to as elements and sub-elements of housing adequacy.

The aim of the model is to provide an overview and representation of the adequacy of housing; therefore, adequacy cannot be given as a single absolute value, but rather a comparison between different categories, elements and sub-elements in a layered system. The percentage per element enables the reader/interpreter of results to determine their own weighting as they look at a completed evaluation. For example, Physical accessibility (Element 3) could be of higher importance for the physically impaired than for a non-impaired reader, while Physical safety (Element 7) might be of higher importance to a reader in an area with a high crime rate rather than a low crime one.

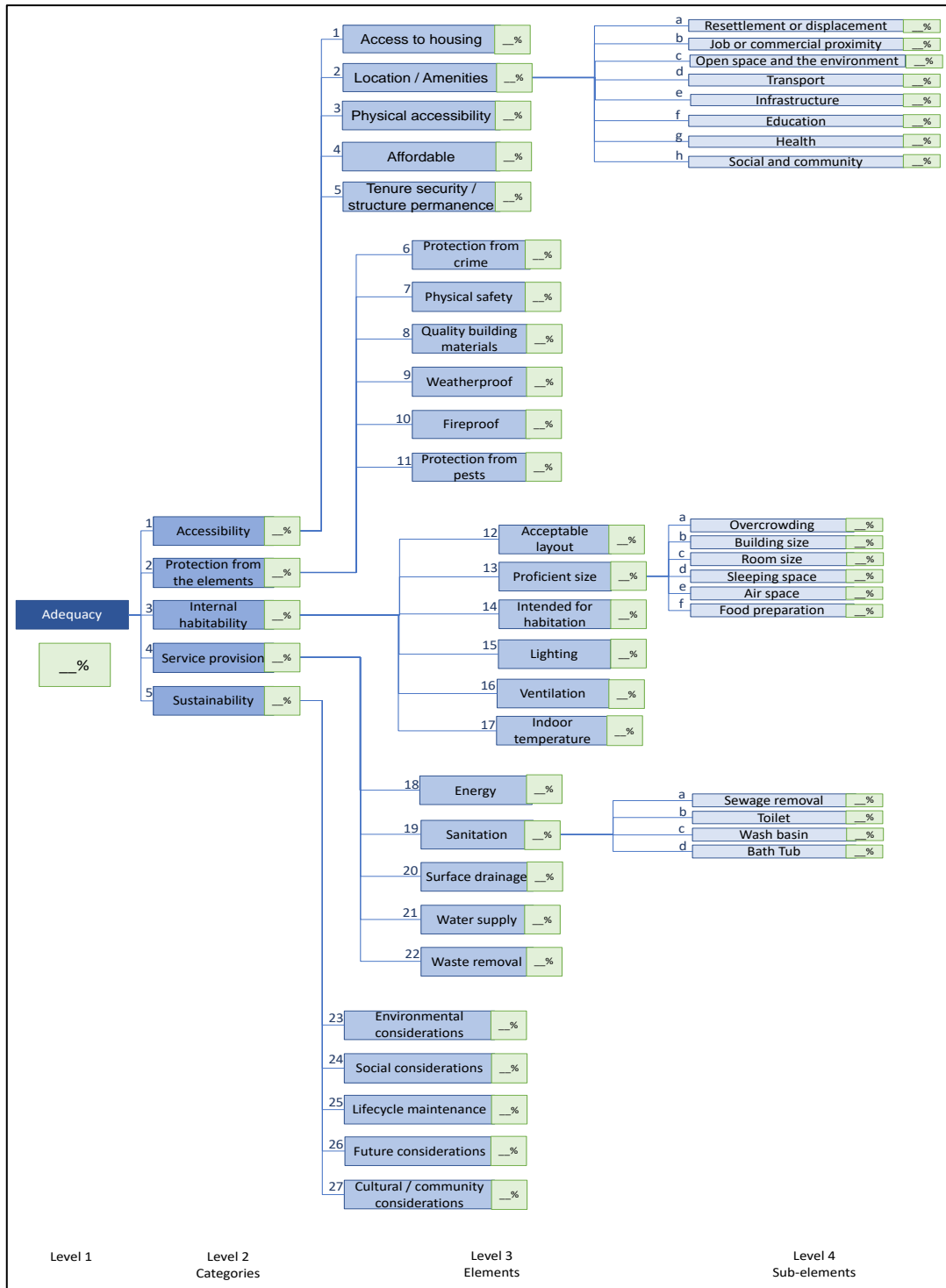


Figure 9: Summary of housing adequacy model

6.3 Evaluation capacity

The model evaluates adequacy by determining a percentage value for each category, sub-category and element. These values are then displayed in the model to allow evaluation by the interpreter or reader.

6.3.1 Evaluation formulae

The percentage value for each sub-element, element and category is determined by a set of binary questions, to leave as little as possible open to interpretation. This enables the user of the model to simply answer yes or no to various questions from which the percentage is then calculated. The equation for the percentage value of each category is determined by:

$$CP = \frac{\sum EP}{n_x}$$

Where:

CP = Category percentage

EP = Element percentage

n_x = The number of elements in the category

The equation for the percentage value of each element is determined by:

$$EP_a = \frac{\sum SP}{n_y}$$

Where:

EP_a = Element percentage where sub – elements are involved

SP = Sub – element percentage

n_y = The number of sub – elements in the element

Or:

$$EP_b = \frac{\sum MO}{MA} \times 100$$

Where:

EP_b = Element percentage with no sub – elements

MO = Marks obtained

MA = Marks available

The equation for the percentage value of each sub-element is determined by:

$$SE = \frac{\sum MO}{MA} \times 100$$

Where:

SE = Sub – element percentage

MO = Marks obtained

MA = Marks available

6.3.2 Evaluation criteria

The evaluation criteria determine the Marks Obtained for each category, element and sub-element, to be used in calculation of the formulae as presented in 6.3.1. The evaluation is done by awarding one mark for each statement that the housing adheres to. The statements are provided as follows for each category: Category 1 – Affordability is in Table 7; Category 2 – Protection from the elements in Table 8; Category 3 – Internal habitability in Table 9; Category 4 – Service provision in Table 10, and Category 5 – Sustainability in Table 11. For each criteria statement that is true, one mark is obtained. It is then tallied and calculated for each sub-element first (if applicable), element subsequently, and category last. The only exception is for element 5 – tenure security – where full marks available is awarded for security of tenure, but one mark is subtracted for each of the restrictions listed that are true. To minimise subjectivity in evaluation, the questions are kept in binary nature – either adheres for one mark per statement, or does not adhere for no marks for that statement.

Table 7: Evaluation criteria category 1 – Accessibility

1. Accessibility		n = 5
1. Access to housing (housing should be available):		MA = 9
a.	Regardless of citizenship	
b.	Regardless of gender or sexual orientation	
c.	Regardless of disability, health and pregnancy	
d.	Regardless of household composition and family size	
e.	Regardless of age	
f.	Regardless of income level	
g.	In different forms and types	
h.	For the homeless	
i.	In exceptional circumstances, including disaster and displacement instances.	
2. A location that allows access to amenities:		n = 8
a.	Resettlement or displacement handled acceptably	MA = 5
	i. With proper consultation	
	ii. Alternative housing provision on-site	
	iii. Alternative transport and service options provided	
	iv. Compensation or financial assistance offered	
	v. With appropriate legal court decision backup	
b.	Proximity to jobs and commercial areas	MA = 3
	i. Close to commercial areas	
	ii. Housing and work opportunities mixed in one location	
	iii. Centrally located and linked to limit horizontal expansion	
c.	Access to open space and the environment	MA = 4
	i. Access to green spaces	
	ii. Access to parks and public places	
	iii. Community linkages	
	iv. Open spaces maintained and conserved	
d.	Access to transport	MA = 4
	i. Access to roads	
	ii. Access to public transport	
	iii. Parking spaces and driveways	
	iv. Pedestrian footpaths	
e.	Access to infrastructure	MA = 7
	i. Public lighting infrastructure	
	ii. Solid waste management	
	iii. Water infrastructure	
	iv. Sanitation infrastructure	
	v. Electricity infrastructure	
	vi. Telecommunications infrastructure	
	vii. Drainage infrastructure	
f.	Access to education	MA = 4
	i. Nurseries and childcare	
	ii. Primary school	
	iii. Secondary school	
	iv. Tertiary and further education	
g.	Access to health	MA = 3
	i. Healthcare	
	ii. Hospitals	
	iii. Acceptable healthy location free from noxious industries, landfills and offensive trades	
h.	Access to social, community and religious spaces	MA = 5
	i. Playground	
	ii. Religious building	
	iii. Recreation facilities	
	iv. Social facilities	
	v. Sport facilities.	

3. Physical accessibility to the building:		MA = 5
	a. Vertical lifts	
	b. Horizontal movement with wide enough spaces with low slopes	
	c. Handrails	
	d. Parking bays for the disabled	
	e. Guide dog friendly.	
4. Affordability:		MA = 5
	a. Financing options available	
	b. Monthly housing cost of less than 40%	
	c. 30%	
	d. 25%	
	e. 20% of household income.	
5. Security of tenure and permanence of structure:		MA = 6
	a. Security of tenure with no restrictions	
	b. No evictions with legal recourse	
	c. No arbitrary evictions without legal recourse	
	d. No evictions even if housing deemed 'unfit for habitation'	
	e. No evictions according to tenancy agreement	
	f. No evictions in instances of public interest or national defence.	

Table 8: Evaluation criteria category 2 - Protection from the elements

2. Protection from the elements		n = 6
6. Protection from crime:		MA = 2
	a. Crime prevention or suppression	
	b. Windows and doors capable of locking.	
7. A physically safe building:		MA = 3
	a. Safety regulations and standards enforced	
	b. Safety at heights	
	c. Safe structural integrity for soil type and weather.	
8. Quality building materials:		MA = 8
	a. Materials and workmanship adhere to standards and/or codes of practice	
	b. Weatherproof building materials	
	c. Durable materials	
	d. Cost-saving materials	
	e. Locally available and/or produced materials	
	f. Environmentally friendly materials	
	g. Materials with heat reflection, thermal storage and/or heat conduction	
	h. No dated, damaged or proven adverse materials.	
9. Weatherproof building:		MA = 7
	a. Weatherproof roof	
	b. Weatherproof external walls	
	c. Weatherproof internal walls in areas of high moisture, like bathrooms	
	d. Weatherproof floors and subfloors	
	e. Weatherproof windows and external doors	
	f. Weatherproof joints between vertical and horizontal elements	
	g. Proper insulation.	
10. Fireproof building:		MA = 4
	a. Fire-resistant external envelope	
	b. Smoke detectors	
	c. Fire extinguishers	
	d. Emergency evacuation and egress.	
11. Protection from pests:		MA = 5
	a. Free from crawling insects and termites	
	b. Free from flying insects, mosquitos and flies	
	c. Free from bacteria	
	d. Free from vermin, including rat infestations	
	e. Free from noise and vibration.	

Table 9: Evaluation criteria category 3 - Internal habitability

3. Internal habitability		n = 5
12. Acceptable internal layout:		MA = 5
a.	Living room	
b.	Sleeping space/bedroom	
c.	Kitchen/cooking area	
d.	Bathroom and sanitary facilities	
e.	Utility spaces such as storage, corridors and cupboards.	
13. Proficient size:		n = 6
a.	Free from overcrowding	MA = 4
	i. One room per four (4) children from one to 10 years of age	
	ii. One room per two (2) people of the same sex aged 10 to 17 years	
	iii. One room per couple aged 18 years and over	
	iv. One room per unattached individual aged 18 years and over	
b.	Building of proficient size	MA = 5
	i. Minimum net floor area of 20 m ²	
	ii. 35 m ²	
	iii. 40 m ²	
	iv. An additional 10 m ² on top of minimum size for each occupant	
	v. An additional 9 m ² on top of the minimum size for each additional storey	
c.	Sleeping space of proficient space	MA = 6
	i. Minimum net floor area of 1.5 m ²	
	ii. 3 m ²	
	iii. 3.6 m ²	
	iv. 6 m ²	
	v. 7.5 m ²	
	vi. An additional 4m ² for every adult sharing	
d.	Other habitable room of proficient size	MA = 5
	i. Minimum floor space of 6.5 m ²	
	ii. 7 m ²	
	iii. 7.5 m ²	
	iv. 9.5 m ²	
	v. 11 m ²	
e.	Air space and volume of proficient size	MA = 6
	i. Minimum internal height of 2 100mm	
	ii. 2 300mm	
	iii. 2 400mm	
	iv. No space lower than 1 500mm	
	v. Minimum 5.6m ³ air space	
	vi. Minimum 8.5m ³ air space	
f.	Food preparation space of proficient size	MA = 3
	i. One food preparation space for every eight people	
	ii. Minimum width of 1.5 m	
	iii. Minimum area of 4 m ²	

14. Building intended for habitation:		MA = 2
	a. Building on the list of buildings intended for residential occupation: Apartment, flat, barracks, boarding house, domestic auxiliary room, hostel, hall of residence, dormitory room, boarding house, hotel, house (for a single family—detached, semi-detached or terraced), multi-unit building, outhouse or outbuilding, room, shelter, tent	
	b. Space expressly intended for residential purposes and sleeping.	
15. Adequate lighting:		MA = 3
	a. Natural lighting in all habitable rooms	
	b. Artificial light wherever natural lighting is insufficient—including halls, stairways and landings	
	c. Minimum 30 lux at floor or stair level.	
16. Adequate ventilation:		MA = 7
	a. Fume removal to external air for all heat producing appliances	
	b. Carbon monoxide alarm	
	c. Windows of minimum 5% (1/20 th) of room area	
	d. Windows of minimum 10% (1/10 th) of room area	
	e. Minimum one openable window per room that can be fixed and remain open	
	f. Draught closers for any unintended gap greater than 3 mm	
	g. Artificial or mechanical ventilation for all bathrooms.	
17. Acceptable internal temperature:		MA = 3
	a. Internal temperature kept at 22 °C	
	b. Internal temperature kept at 18 °C and 26 °C	
	c. Internal temperature kept at 16 °C and 28 °C.	

Table 10: Evaluation criteria category 4 - Service provision

4. Service provision		n = 6
18. Energy provision:		MA = 7
a.	Domestic energy supply	
b.	Uninterrupted energy supply	
c.	An electrical box for protection and isolation	
d.	Energy distribution with pipework and cables	
e.	Proper outlets and fixtures	
f.	Domestic gas supply	
g.	Lightning protection.	
19. Sanitation:		n = 4
a.	Sewage removal	MA = 4
	i. Through waste disposal	
	ii. Pump out sewage holding tanks	
	iii. Septic tanks	
	iv. Acceptable non-sewered sanitation	
b.	Access to a toilet	MA = 5
	i. One toilet for every six occupants	
	ii. Eight occupants	
	iii. 10 occupants	
	iv. 12 occupants	
	v. Flushable toilet	
c.	Access to wash basins	MA = 5
	i. One wash basin for every six occupants	
	ii. Eight occupants	
	iii. 10 occupants	
	iv. 12 occupants	
	v. Kitchen washing unit	
d.	Access to washing facilities	MA = 7
	i. Access to a tub	
	ii. Access to a shower	
	iii. One washing facility for every six occupants	
	iv. Eight occupants	
	v. 10 occupants	
	vi. 12 occupants	
	vii. Cold and hot water.	
20. Surface drainage:		MA = 3
a.	Gutters, downpipes and drains	
b.	Drainage systems sufficiently sized for usual rain	
c.	Easily and well maintained.	
21. Water supply:		MA = 4
a.	Adequate volume—uninterrupted and continuous	
b.	Adequate temperature—both cold and hot	
c.	Adequate pressure	
d.	Adequate quality—drinkable/potable.	
22. Waste removal:		MA = 3
a.	Waste collected and removed	
b.	Waste properly stored	
c.	Acceptable final disposal location and method.	

Table 11: Evaluation criteria category 5 - Sustainability

5. Sustainability		n = 5
23. Take the environment into account:		MA = 8
	a. Energy-efficient fittings and fixtures	
	b. Passive design elements to lower energy requirements	
	c. Alternative or renewable energy sources	
	d. Water saving technologies	
	e. Water reuse technologies	
	f. Environmental preservation and conservation	
	g. Environmentally friendly products	
	h. Natural local products.	
24. Consider the location's social dynamics:		MA = 3
	a. Social development—assist with housing or commercial opportunities in the area	
	b. Equality opportunities—assist with helping marginalised people on the premises	
	c. Contribute to historic or heritage preservation.	
25. Maintained over the building's lifecycle:		MA = 7
	a. Fully completed and finished building	
	b. Free of defects	
	c. Renovated or enhanced building	
	d. Safe in terms of elements, components, finishes and fittings	
	e. Safe in terms of structure	
	f. Safe in terms of health and sanitation	
	g. Safe in terms of technical requirements.	
26. Future considerations, innovations and technology:		MA = 5
	a. Technologies to improve housing quality	
	b. Technologies to reduce costs	
	c. Technologies to reduce environmental impacts	
	d. Technologies to provide better administration	
	e. Aims to solve local problems and use local resources.	
27. Cultural and community considerations:		MA = 6
	a. Acceptable to cultural identity and norms of occupant	
	b. Conservation of archaeological or architectural aspects of historic or cultural sites	
	c. Aligned with religious values of occupant	
	d. Support local solutions, technologies, businesses and materials	
	e. Incorporate local community	
	f. Equitably available to all with no discrimination.	

6.4 Summary

By using the evaluation criteria for each category, element and sub-element of housing adequacy, a score of 'Marks Obtained' can be computed. This value is then used in the formulae discussed to calculate a percentage for each sub-element (where applicable) and element. The sub-element percentages (where applicable) are used to calculate the element percentage, and the element percentages are used as variables in the formula to calculate category percentages. Category percentages are left to interpretation and comparison by the user.

7 CHAPTER 7: DATA VALIDATION

7.1 Introduction

This chapter considers the validation of the data and the model presented in Chapter 6. This is firstly done according to the grounded theory approach of achieving theoretical saturation, and confirmations of the data by the data. Validity is also illustrated by providing an example.

7.2 Theoretical saturation

While theoretical saturation and data saturation is not the same, it should be noted that non-probability sampling was used to attempt to get close to data saturation. Theoretical saturation as per grounded theory, was achieved by continuous axial coding. Most of the 27 elements reached theoretical saturation at the point of determining the criteria for each element. Three elements – Location/Amenities; Proficient size; and Sanitation – only achieved theoretical saturation at the point of determining criteria for sub-elements.

7.3 Theoretical confirmations

As per the grounded theory approach as discussed in 3.5, data is validated through the data itself as well. To ensure validation by theoretical confirmation, information should be present in documents across the sample spectrum to be included in the model. A visual representation of theoretical confirmations is shown for each category respectively in Figure 10, Figure 11, Figure 12, Figure 13, and Figure 14. Each category lists the evaluation criteria as per 6.3.2, and all countries in the sample are listed at the x-axis. A green block represents the document from this country verifying the information in the criteria for this category, element and/or sub-element.

From the visual representations it can be seen that the data is validated by other data, and that multiple sample documents determined the criteria derived during axial coding and analysis.

7.4 Illustrative case study

An illustrative case study is provided by completing the evaluation criteria as discussed in 6.3.2 for a specific property. To this end, some assumptions had to be made on the example case study property and interested parties, as the adequacy would entail an intersection between these two.

7.4.1 Assumptions about the property

For this case study a specific two-bedroom house in Lynnwood, Pretoria, South Africa is used for which all the variables are known and/or can be obtained. For the purposes of the case study, it is assumed that the house is currently for sale, for a middle-class market-related value. The property has recently been checked for structural integrity and termites. The single storey house has been built in 1986, with walls of clay brick, and a tiled roof. The windows are single glazing in steel frames with steel security bars in front of the windows, and no insect screens. It is a freestanding house on a small stand. The building is $120m^2$, with two bedrooms of $9m^2$ and $12m^2$ respectively, two bathrooms of $4m^2$ and $5m^2$ respectively, a living room of $30m^2$ and a kitchen of $8m^2$.

7.4.2 Assumptions about the interested party

It is assumed that the interested party is a family of four – two adults and two children under the age of 10. It is assumed that they do have access to financing and that repayment on a bond of the market related value would equate to approximately 28% of their household income.

7.4.3 Case study evaluation discussions

7.4.3.1 Category 1 – Accessibility

Because the house is being sold at a market related value, it will not be available for all regardless of income type, homelessness, or in exceptional circumstances. There are also no alternative housing forms or types as it is the only house available. This results in an access to housing percentage of 56%, as this house is not available to all.

In terms of access to amenities and location, there is no resettlement and displacement involved resulting in full marks for this category. The house is situated in a residential area with no mixed-use development or work opportunities on site impacting the proximity of jobs and commercial opportunities. The Lynnwood area of Pretoria does not offer community linkages, and the open spaces, though available, are not seen as well maintained and conserved due to uncut grass and littering in the few open areas impacting access to open space and the environment. While there is access to roads, driveways and parking, there is no public transport – the closest bus stop is more than 1km away and the buses are irregular. There are sections of footpath, but because it is not consistently present it impacts access to transport. Municipality provides all infrastructure for public lighting, solid waste removal, water supply, sanitation, electricity, telecommunications and stormwater drainage. Childcare and nurseries are within walking distance, primary and secondary schools are within a 5-minute radius, and the University of Pretoria is located within a 15-minute radius. Healthcare is within walking distance and hospitals within 5-minute radius. On the assumption that the closest religious building is the applicable denomination, it is within a 5-minute radius, as is a shopping mall with gym and sport facilities. There is no public playground in the area.

The building is single storey, so vertical lifts are not applicable. There are a few changes in level with steps, and these do not have handrails. There is limited parking available, none designated for disabled parking. The property is guide dog friendly, with broad doors with wide spaces and low slopes bar one- or two-level changes in the garden.

Affordability is assigned based on the assumptions for the interested party. Tenure is generally secure, although eviction would be possible based on home loan conditions – it should be with legal recourse. The details of the evaluation of category 1 in the case study is shown in Table 12.

Table 12: Case study evaluation criteria category 1 – Accessibility

1. Accessibility			67%
1. Access to housing (housing should be available):		5	56%
a.	Regardless of citizenship	1	
b.	Regardless of gender or sexual orientation	1	
c.	Regardless of disability, health and pregnancy	1	
d.	Regardless of household composition and family size	1	
e.	Regardless of age	1	
f.	Regardless of income level		
g.	In different forms and types		
h.	For the homeless		
i.	In exceptional circumstances, including disaster and displacement instances.		
2. A location that allows access to amenities:		5	78%
a.	Resettlement or displacement handled acceptably	5	100%
	i. With proper consultation		
	ii. Alternative housing provision on-site		
	iii. Alternative transport and service options provided		
	iv. Compensation or financial assistance offered		
	v. With appropriate legal court decision backup		
b.	Proximity to jobs and commercial areas	2	67%
	i. Close to commercial areas	1	
	ii. Housing and work opportunities mixed in one location		
	iii. Centrally located and linked to limit horizontal expansion	1	
c.	Access to open space and the environment	2	50%
	i. Access to green spaces	1	
	ii. Access to parks and public places	1	
	iii. Community linkages		
	iv. Open spaces maintained and conserved		
d.	Access to transport	2	50%
	i. Access to roads	1	
	ii. Access to public transport		
	iii. Parking spaces and driveways	1	
	iv. Pedestrian footpaths		
e.	Access to infrastructure	7	100%
	i. Public lighting infrastructure	1	
	ii. Solid waste management	1	
	iii. Water infrastructure	1	
	iv. Sanitation infrastructure	1	
	v. Electricity infrastructure	1	
	vi. Telecommunications infrastructure	1	
	vii. Drainage infrastructure	1	
f.	Access to education	4	100%
	i. Nurseries and childcare	1	
	ii. Primary school	1	
	iii. Secondary school	1	
	iv. Tertiary and further education	1	
g.	Access to health	3	100%
	i. Healthcare	1	
	ii. Hospitals	1	
	iii. Acceptable healthy location free from noxious industries, landfills and offensive trades	1	
h.	Access to social, community and religious spaces	3	60%
	i. Playground	1	
	ii. Religious building	1	
	iii. Recreation facilities	1	
	iv. Social facilities		
	v. Sport facilities.	1	
3. Physical accessibility to the building:		3	60%
a.	Vertical lifts	1	
b.	Horizontal movement with wide enough spaces with low slopes	1	
c.	Handrails		
d.	Parking bays for the disabled		
e.	Guide dog friendly.	1	
4. Affordability:		3	60%
a.	Financing options available	1	
b.	Monthly housing cost of less than 40%	1	
c.	30%	1	
d.	25%		
e.	20% of household income.		
5. Security of tenure and permanence of structure:		5	83%
a.	Security of tenure with no restrictions		
b.	No evictions with legal recourse		
c.	No arbitrary evictions without legal recourse	1	
d.	No evictions even if housing deemed 'unfit for habitation'		
e.	No evictions according to tenancy agreement		
f.	No evictions in instances of public interest or national defence.		

7.4.3.2 Category 2 – Protection from the elements

As can be seen in Table 13, all criteria for protection from crime, a physically safe building, and weatherproof building are satisfied. Quality building materials are mostly satisfied, apart from the environmentally friendly option – as the building is fairly old, there was no specific environmental consideration in material choice. While the external envelope of the building is fireproof, there are no smoke detectors or fire extinguishers, and due to steel bars in front of all openable windows, there is no emergency egress available. As there are no screens for doors or windows, the building is not free from flying insects, although it is assumed to be free of other pests on inspection.

Table 13: Case study evaluation criteria category 2 – Protection from the elements

2. Protection from the elements			82%
6. Protection from crime:		2	100%
	a. Crime prevention or suppression	1	
	b. Windows and doors capable of locking.	1	
7. A physically safe building:		3	100%
	a. Safety regulations and standards enforced	1	
	b. Safety at heights	1	
	c. Safe structural integrity for soil type and weather.	1	
8. Quality building materials:		7	88%
	a. Materials and workmanship adhere to standards and/or codes of practice	1	
	b. Weatherproof building materials	1	
	c. Durable materials	1	
	d. Cost-saving materials	1	
	e. Locally available and/or produced materials	1	
	f. Environmentally friendly materials		
	g. Materials with heat reflection, thermal storage and/or heat conduction	1	
	h. No dated, damaged or proven adverse materials.	1	
9. Weatherproof building:		7	100%
	a. Weatherproof roof	1	
	b. Weatherproof external walls	1	
	c. Weatherproof internal walls in areas of high moisture, like bathrooms	1	
	d. Weatherproof floors and subfloors	1	
	e. Weatherproof windows and external doors	1	
	f. Weatherproof joints between vertical and horizontal elements	1	
	g. Proper insulation.	1	
10. Fireproof building:		1	25%
	a. Fire-resistant external envelope	1	
	b. Smoke detectors		
	c. Fire extinguishers		
	d. Emergency evacuation and egress.		
11. Protection from pests:		4	80%
	a. Free from crawling insects and termites	1	
	b. Free from flying insects, mosquitos and flies		
	c. Free from bacteria	1	
	d. Free from vermin, including rat infestations	1	
	e. Free from noise and vibration.	1	

7.4.3.3 Category 3 – Internal habitability

The building satisfied all criteria for acceptable internal layout, proficient size, building intended for habitation and adequate lighting. There is however, no fume removal for heat producing appliances or carbon monoxide alarm. The building also does not have a central heating or air-conditioning system, resulting in a fairly large range of temperature fluctuations. It is assumed that the passive design and building materials will keep it within the range of 16°C to 28°C. Table 14 can be consulted for the full evaluation of category 3 in the case study example.

Table 14: Case study evaluation criteria category 3 - Internal habitability

3. Internal habitability		98%
12. Acceptable internal layout:	5	100%
a. Living room	1	
b. Sleeping space/bedroom	1	
c. Kitchen/cooking area	1	
d. Bathroom and sanitary facilities	1	
e. Utility spaces such as storage, corridors and cupboards.	1	
13. Proficient size:	4	97%
a. Free from overcrowding	4	100%
i. One room per four (4) children from one to 10 years of age	1	
ii. One room per two (2) people of the same sex aged 10 to 17 years	1	
iii. One room per couple aged 18 years and over	1	
iv. One room per unattached individual aged 18 years and over	1	
b. Building of proficient size	5	100%
i. Minimum net floor area of 20 m ²	1	
ii. 35 m ²	1	
iii. 40 m ²	1	
iv. An additional 10 m ² on top of minimum size for each occupant	1	
v. An additional 9 m ² on top of the minimum size for each additional storey	1	
c. Sleeping space of proficient space	5	83%
i. Minimum net floor area of 1.5 m ²	1	
ii. 3 m ²	1	
iii. 3.6 m ²	1	
iv. 6 m ²	1	
v. 7.5 m ²	1	
vi. An additional 4m ² for every adult sharing	1	
d. Other habitable room of proficient size	5	100%
i. Minimum floor space of 6.5 m ²	1	
ii. 7 m ²	1	
iii. 7.5 m ²	1	
iv. 9.5 m ²	1	
v. 11 m ²	1	
e. Air space and volume of proficient size	6	100%
i. Minimum internal height of 2 100mm	1	
ii. 2 300mm	1	
iii. 2 400mm	1	
iv. No space lower than 1 500mm	1	
v. Minimum 5.6m ³ air space	1	
vi. Minimum 8.5m ³ air space	1	
f. Food preparation space of proficient size	3	100%
i. One food preparation space for every eight people	1	
ii. Minimum width of 1.5 m	1	
iii. Minimum area of 4 m ²	1	
14. Building intended for habitation:	2	100%
a. Building on the list of buildings intended for residential occupation: Apartment, flat, barracks, boarding house, domestic auxiliary room, hostel, hall of residence, dormitory room, boarding house, hotel, house (for a single family—detached, semi-detached or terraced), multi-unit building, outhouse or outbuilding, room, shelter, tent	1	
b. Space expressly intended for residential purposes and sleeping.	1	
15. Adequate lighting:	3	100%
a. Natural lighting in all habitable rooms	1	
b. Artificial light wherever natural lighting is insufficient—including halls, stairways and landings	1	
c. Minimum 30 lux at floor or stair level.	1	
16. Adequate ventilation:	4	57%
a. Fume removal to external air for all heat producing appliances		
b. Carbon monoxide alarm		
c. Windows of minimum 5% (1/20 th) of room area	1	
d. Windows of minimum 10% (1/10 th) of room area	1	
e. Minimum one openable window per room that can be fixed and remain open	1	
f. Draught closers for any unintended gap greater than 3 mm		
g. Artificial or mechanical ventilation for all bathrooms.	1	
17. Acceptable internal temperature:	1	33%
a. Internal temperature kept at 22 °C		
b. Internal temperature kept at 18 °C and 26 °C		
c. Internal temperature kept at 16 °C and 28 °C.	1	

7.4.3.4 Category 4 – Service provision

The housing satisfies all criteria for surface drainage, water supply and waste removal through the municipal infrastructure and services offered as shown in Table 15. The sanitation services equate to one sanitation fitting per two occupants, which satisfies all possible options. While energy is provided to the household, it is not uninterrupted in nature, and there is no lightning protection offered.

Table 15: Case study evaluation criteria category 4 - Service provision

4. Service Provision			94%
18. Energy provision:		5	71%
a.	Domestic energy supply	1	
b.	Uninterrupted energy supply		
c.	An electrical box for protection and isolation	1	
d.	Energy distribution with pipework and cables	1	
e.	Proper outlets and fixtures	1	
f.	Domestic gas supply	1	
g.	Lightning protection.		
19. Sanitation:			100%
a.	Sewage removal	4	100%
	i. Through waste disposal	4	
	ii. Pump out sewage holding tanks		
	iii. Septic tanks		
	iv. Acceptable non-sewered sanitation		
b.	Access to a toilet	5	100%
	i. One toilet for every six occupants	1	
	ii. Eight occupants	1	
	iii. 10 occupants	1	
	iv. 12 occupants	1	
	v. Flushable toilet	1	
c.	Access to wash basins	5	100%
	i. One wash basin for every six occupants	1	
	ii. Eight occupants	1	
	iii. 10 occupants	1	
	iv. 12 occupants	1	
	v. Kitchen washing unit	1	
d.	Access to washing facilities	7	100%
	i. Access to a tub	1	
	ii. Access to a shower	1	
	iii. One washing facility for every six occupants	1	
	iv. Eight occupants	1	
	v. 10 occupants	1	
	vi. 12 occupants	1	
	vii. Cold and hot water.	1	
20. Surface drainage:		3	100%
a.	Gutters, downpipes and drains	1	
b.	Drainage systems sufficiently sized for usual rain	1	
c.	Easily and well maintained.	1	
21. Water supply:		4	100%
a.	Adequate volume—uninterrupted and continuous	1	
b.	Adequate temperature—both cold and hot	1	
c.	Adequate pressure	1	
d.	Adequate quality—drinkable/potable.	1	
22. Waste removal:		3	100%
a.	Waste collected and removed	1	
b.	Waste properly stored	1	
c.	Acceptable final disposal location and method.	1	

7.4.3.5 Category 5 – Sustainability

The building does not offer any social development on the premises, and as it is an old building it does not incorporate any innovations or technologies. While the building is old and has not been renovated or enhanced, it is still safe and free of defects. The house has energy-efficient fittings and fixtures and has incorporated passive design elements such as north-facing windows, strategically planted trees for shading, there are no further specific environmental considerations. The house is assumed to be culturally acceptable to the interested party, but does not offer any additional cultural or community considerations. Table 16 shows the case study evaluation of category 5 in detail.

Table 16: Case study evaluation criteria category 5 - Sustainability

5. Sustainability			29%
23. Take the environment into account:		2	25%
a. Energy-efficient fittings and fixtures		1	
b. Passive design elements to lower energy requirements		1	
c. Alternative or renewable energy sources			
d. Water saving technologies			
e. Water reuse technologies			
f. Environmental preservation and conservation			
g. Environmentally friendly products			
h. Natural local products.			
24. Consider the location's social dynamics:			0%
a. Social development—assist with housing or commercial opportunities in the area			
b. Equality opportunities—assist with helping marginalised people on the premises			
c. Contribute to historic or heritage preservation.			
25. Maintained over the building's lifecycle:		6	86%
a. Fully completed and finished building		1	
b. Free of defects		1	
c. Renovated or enhanced building			
d. Safe in terms of elements, components, finishes and fittings		1	
e. Safe in terms of structure		1	
f. Safe in terms of health and sanitation		1	
g. Safe in terms of technical requirements.		1	
26. Future considerations, innovations and technology:			0%
a. Technologies to improve housing quality			
b. Technologies to reduce costs			
c. Technologies to reduce environmental impacts			
d. Technologies to provide better administration			
e. Aims to solve local problems and use local resources.			
27. Cultural and community considerations:		2	33%
a. Acceptable to cultural identity and norms of occupant		1	
b. Conservation of archaeological or architectural aspects of historic or cultural site			
c. Aligned with religious values of occupant		1	
d. Support local solutions, technologies, businesses and materials			
e. Incorporate local community			
f. Equitably available to all with no discrimination.			

7.4.4 Visual representation of case study results

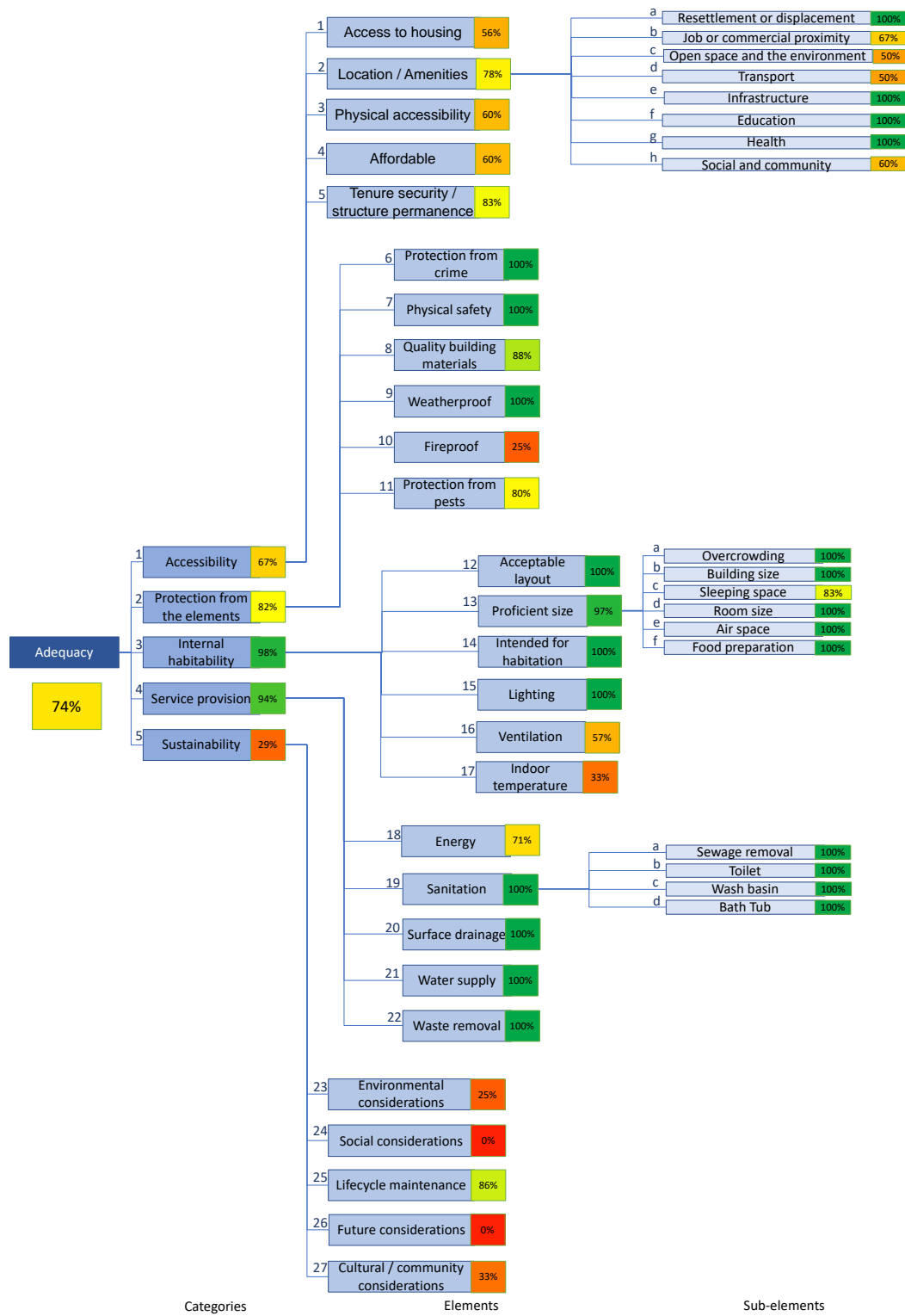


Figure 15: Case study visual representation

7.4.5 Case study discussion

The visual representation of the results in Figure 15 enables quick interpretation of the results. In this case study a middle-class house was used as an example, and it can be seen that the adequacy model is not limited to evaluation of low-income housing. It should be noted that the measure still remains adequacy, and opulence cannot result in a value exceeding 100%. The interested party could use the results to compare the adequacy of this property with the adequacy of another property. It can also be used to locate points of improvement for this specific housing, for example installation of an alternative energy system to supplement the current supply would improve the scores on elements 18, 23 and 26. Another example would be that if the interested party has limited mobility, a higher score for physical accessibility and access to amenities would be required than would be required for another party. A last example of interpretation by the user would be that if the interested party is satisfied with the affordability score, it might not be of great importance to them that the housing should be accessible to all, therefore a lower score can be interpreted as irrelevant to their needs in this regard. If, however, the user is the property developer or provider (such as public or social housing provision) – these scores would be of higher importance.

7.5 Summary

This chapter validated the data by confirming where theoretical saturation was achieved in the axial coding process, and displaying how the data is confirmed through the data itself, as per grounded theory. An example case study was then completed to illustrate the practical application of the model.

8 CHAPTER 8: DISCUSSION

8.1 Introduction

This chapter discusses if and how the research in the document answers the research sub-questions and examines how this contributes to answering the research question.

8.2 Research sub-questions

8.2.1 Can the model be considered universally applicable?

To evaluate universal representativeness, the distribution should reflect the population in terms of factors like geographic region, per capita GDP and WESP classification as discussed in section 4.3.

As is clear in Figure 16, the model does have a similar geographic representation apart from South American representation in the sample, which could possibly be because of a language barrier as discussed in 1.10.2, although it should be noted that the language barrier was expected from other continents such as Asia, Europe and Africa as well. The model can be deemed to be applicable universally in terms of geography.

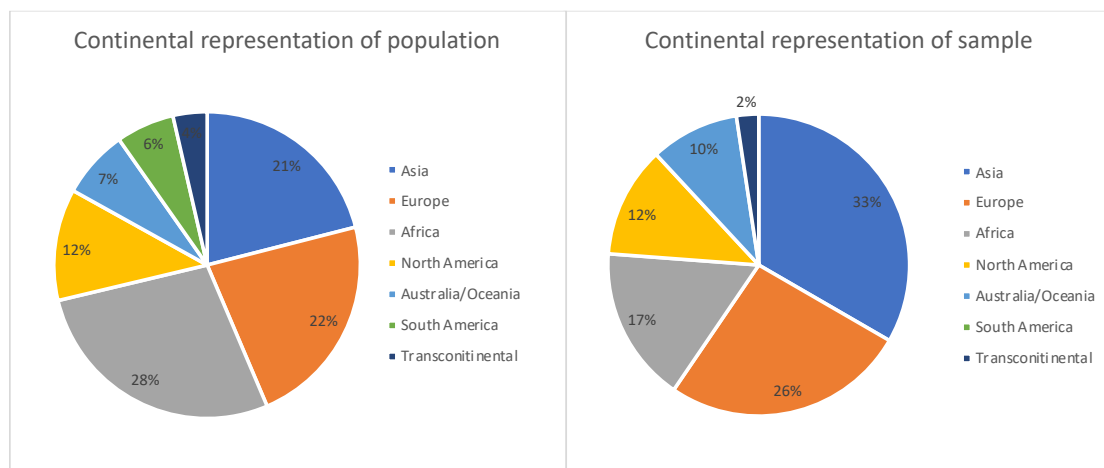


Figure 16: Continental representation population and sample (World Population Review, 2023)

The WESP classification of the sample is similar to and therefore representative of the population as shown in Figure 17. The model can be deemed to be applicable universally in terms of social status.

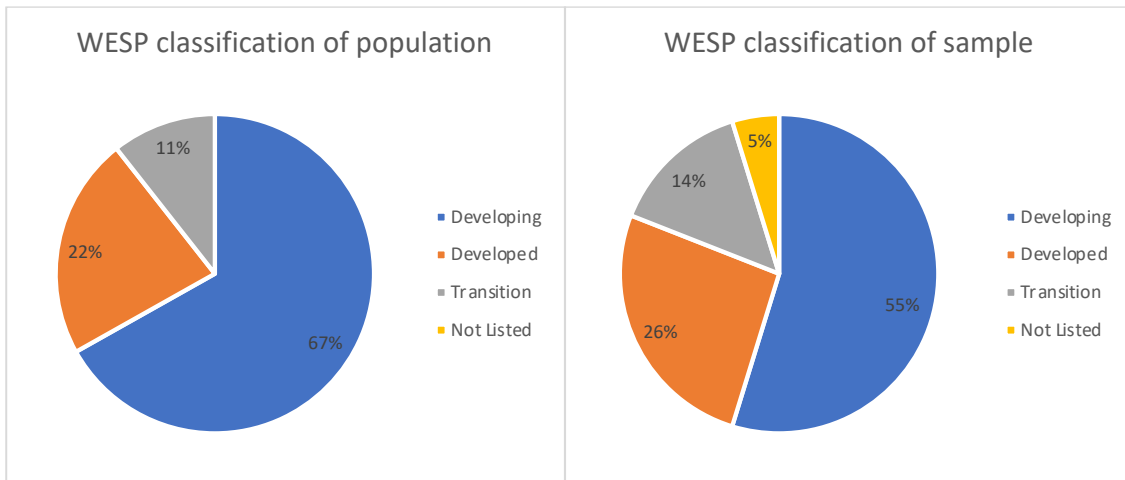


Figure 17: WESP classification of population vs sample (World Economic Situation and Prospects, 2014)

The model can be expected to be universally applicable in terms of economic status, as the sample is representative of the population in terms of per capita GNI classification as shown in Figure 18.

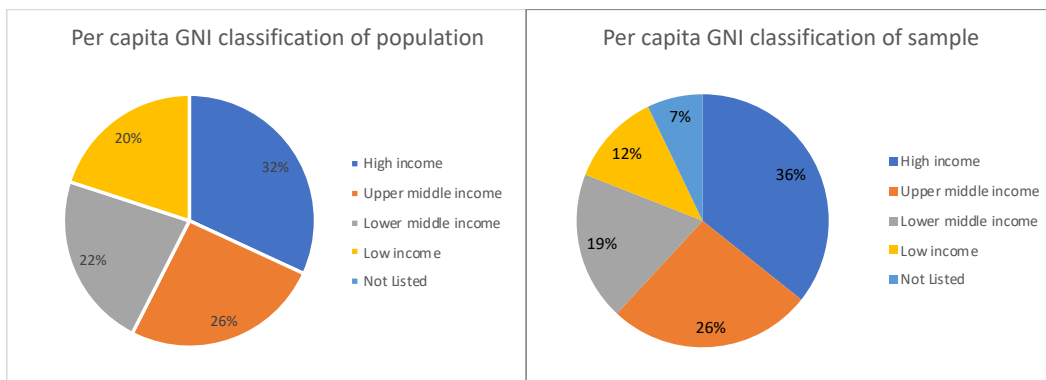


Figure 18: Per capita GNI classification population and sample (World Economic Situation and Prospects, 2014)

8.2.2 Are there minimum elements to adequacy of housing?

Yes, the 27 elements of adequacy have been determined and listed as per 5.3, visually presented in the model in 6.2, with the criteria of adequacy for each of the elements discussed in 6.3.2.

8.2.3 Can these adequacy elements be categorized and compiled into a model?

By using selective coding after axial coding, these elements were categorised into the five categories discussed in 5.4:

- Accessibility
- Protection from the elements
- Internal habitability
- Service provision
- Sustainability

8.2.4 Can the housing adequacy elements be evaluated?

Yes, the criteria used for each element to determine the level of adequacy that enables evaluation and facilitates comparison of adequacy are discussed in 6.3.2.

8.2.5 Does the model of housing adequacy build upon existing theories?

Yes, the details of existing theories as per 2.5, specifically the details of Table 4 can be found within the categories, elements, and criteria of the proposed model as shown in Table 7, Table 8, Table 9, Table 10, and Table 11. A condensed version of the model specifically indicating the intersection with existing theories is shown in Table 17 (Aroni, 1975; Barber, 2008; Behr, 2021; McClean, 2018; Onibokun, 1985; Russell, 2021; Smit, 2008; South African Cities Network, 2011; UN HABITAT, 2009; Whitehead and Scanlon, 2007; Wimalasena, 2022; Yang, 2008).

Table 17: Intersection between model and existing literature

	CECSR UN HABITAT - tenure security	UN HABITAT	CECSR Barber	Behr (World Bank Index)	McClean	Onibulkon	Smit	South African Cities Network	Whitehead and Scanlon	Yang	Russell	South African White Paper	Aroni	Wimalasena
1. Accessibility														
1. Access to housing (housing should be available):	x	x	x		x		x				x			x
2. A location that allows access to amenities:		x	x		x		x	x	x	x	x	x	x	x
b. Proximity to jobs and commercial areas		x			x			x				x		x
c. Access to open space and the environment														
i. Access to green spaces														x
ii. Access to parks and public places														x
d. Access to transport														
ii. Access to public transport														x
e. Access to infrastructure		x	x	x		x	x					x	x	x
ii. Solid waste management		x	x		x		x					x	x	x
iii. Water infrastructure		x	x		x		x					x	x	x
iv. Sanitation infrastructure		x	x				x					x	x	x
v. Electricity infrastructure		x			x		x					x	x	x
vii. Drainage infrastructure														x
f. Access to education		x			x			x						x
i. Nurseries and childcare					x					x				x
g. Access to health		x			x			x		x				x
i. Healthcare		x			x			x		x				x
ii. Hospitals		x			x			x		x				x
h. Access to social, community and religious spaces		x			x			x		x				x
ii. Religious building														x
iii. Recreation facilities														x
iv. Social facilities		x			x			x						x
v. Sport facilities.														x
4. Affordability:		x	x	x	x		x		x		x			x
5. Security of tenure and permanence of structure:	x	x	x	x	x		x				x	x		x
2. Protection from the elements														
6. Protection from crime:		x	x		x		x					x	x	x
a. Crime prevention or suppression		x	x		x		x							x
b. Windows and doors capable of locking.		x	x		x									x
7. A physically safe building:		x		x		x				x				x
a. Safety regulations and standards enforced											x			x
c. Safe structural integrity for soil type and weather.		x		x		x				x				x
8. Quality building materials:					x									x
10. Fireproof building:														x
11. Protection from pests:														x
e. Free from noise and vibration.														x
3. Internal habitability														
12. Acceptable internal layout:		x	x		x	x	x	x		x				x
b. Sleeping space/bedroom						x				x				x
c. Kitchen/cooking area														x
d. Bathroom and sanitary facilities														x
13. Proficient size:		x		x	x		x			x				x
a. Free from overcrowding														x
14. Building intended for habitation:								x	x					x
15. Adequate lighting:														x
16. Adequate ventilation:														x
b. Carbon monoxide alarm														x
17. Acceptable internal temperature:		x	x	x										x
4. Service Provision														
18. Energy provision:		x	x		x		x					x	x	x
a. Domestic energy supply		x			x		x					x	x	x
f. Domestic gas supply		x			x		x					x	x	x
19. Sanitation:		x			x		x					x		x
20. Surface drainage:														x
21. Water supply:		x			x	x	x					x		x
22. Waste removal:		x										x		x
5. Sustainability														
23. Take the environment into account:								x						x
24. Consider the location's social dynamics:		x	x		x				x		x			x
25. Maintained over the building's lifecycle:									x	x			x	x
26. Future considerations, innovations and technology:									x				x	x
27. Cultural and community considerations:		x	x		x				x		x			x

8.3 Research Question

The research question is posed in 1.8 as: Can a universal model be established to evaluate the adequacy of shelter for housing? As summarised in 8.2.1, the model can be considered

universally applicable for different geographical, and socio-economic settings. The model has determined 27 elements of adequacy as discussed in 8.2.2 that can be categorised into five categories as per 8.2.3, with a visual representation of the model as shown in 6.2. The model is capable of evaluating adequacy as summarised in 8.2.4 and detailed in 6.3. Therefore, it can be considered that a universal model to evaluate the adequacy of shelter for housing has been established.

8.4 Summary

This short chapter referred back through the document and discussed where and how the research sub-questions have been answered. It then also discusses how, in answering the sub-questions, the research question has been achieved. It is concluded that a universal model has been established to evaluate housing adequacy.

9 CHAPTER 9: CONCLUSION

9.1 Introduction

The findings of the research, potential contribution and possibility of future research concludes herewith the document. These elements are initially anticipated in 1.11, and finalised in this chapter.

9.2 Research findings

While Phase 1 of the data collection as per 4.2 did not lead to data for analysis, it did lead to very useful information on the accessibility of housing authorities across the world. Phase 2 of data collection as mentioned in 4.3, did lead to valuable data analysed as per grounded theory in Chapter 5, presented and discussed in Chapter 6, and validated in Chapter 7. The research question and sub-questions are also answered in 8.2 and 8.3.

Based on the analysis of the 42 housing documents from a variety of different backgrounds, it was determined that there are enough commonalities to establish a model that is universal in nature. The analysis indicated that there are 27 elements that comprise adequate housing, that can be grouped into five categories as per 5.3.3 and 5.4. The study also determined evaluation criteria for each of these elements in 6.3, and calculates a percentage adequacy per element and category that can be visually represented as shown in 6.2. This would allow not only for determination of adequacy at a universal level, but also comparison between case studies, geographical areas and/or better comprehension of the importance of these elements to different cultures or contexts.

9.3 Potential contribution

The model can be used to evaluate the adequacy of a specific shelter, and it also provides a platform to compare the adequacy of housing, while the results are open to be interpreted by a housing user, provider or authority. The application can include:

- Adequacy of housing in specific provision systems such as state-provided or public housing systems
- Adequacy of shelter for housing in emergency situations
- Adequacy of shelter for housing in informal settlements
- Adequacy of housing in private developments

- Adequacy and comparison of specifics of design or layout
- Case studies and comparisons in different contexts such as different geographic, social or economic settings.

9.4 Further research

The detail of accessibility of housing authorities as per phase 1 of the data collection could potentially contribute to better understanding if and how access to housing and the accessibility of housing authorities correlate.

The model leaves a lot of scope to conduct case studies and comparisons through its contribution, and further research through case studies is possible. Such research could also include determining the subjectivity of the assessment.

The model is open to interpretation based on geographic, cultural, organisational and personal preferences. This will mean that the relative importance of elements and sub-elements is expected to differ, and further research could be conducted in this regard.

During the research, a lot of information was found regarding the following aspects that was not necessarily applicable to the study for adequacy of housing, but could however provide scope for future research:

- Informal vs formal housing
- Emergency or disaster situations
- Relocation and resettlement.

Limitations excluded from this study could provide scope for future studies on adequacy of:

- Provision system such as
 - Scope and set-up of housing committees and departments
 - Involvement of public sector or state in provision
- Critique on policies, legislation, legal processes, or other official documentation and governance processes and legislation.
- Manner of usage such as:
 - Selection of beneficiaries,

- Loan assistance,
- Rental management schemes etc
- Rent control
- House-price appreciation
- Cost of maintenance
- Housing subsidies
- Statistics and feedback on historical progress or provision.
- Construction standards and specifications that are not focussed on housing or residential buildings.
- Design processes
- Housing of non-human species

9.5 Summary

This document followed the structure delineated in 1.2, and concluded in this chapter with a short summary of the research findings, contribution of the data and the possibility of future research. It is concluded that a universal model for evaluating the adequacy of shelter for housing has been established.

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