INDEPENDENT MOBILITY OF CHILDREN IN THE MILITARY BARRACKS OF NIGERIA

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DEDICATION

This thesis is dedicated to the almighty God, the alpha and omega, to whom all glory, honour and adoration is returned for opportunity to contribute to knowledge and humanity, especially the children's well-being

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Sincerely

Oluwatomisin Daodu

ABSTRACT

Independent mobility in military barracks is crucial for a child's proper physical, social, and cognitive functioning. However, despite the contribution of mobility to health and overall quality of life, barracks create a high level of parental restrictions. The restrictions and the children's immobility are linked to an unfriendly environment, non-active travel behaviour, and the exclusion of children's experience. Hence, this study aims to build a conceptual framework of independent mobility that fits into the military barracks in Nigeria. Consequently, children's independent mobility indicators were identified in Sam Ethnan Air Force Barracks in Lagos and Nigerian Air Force Barracks in Kaduna. The barrack-environment characteristics were examined, and travel mode behaviour factors were assessed. The set of rules for a parental licence was also explored. Data collection and analysis followed an explanatory sequential mixed method strategy, which is grounded on post-positivism and social constructivism. Barracks' spatial data was acquired using Geographical Positioning System devices and Landsat imagery. Subsequently, the research used a semi-structured interview and paper-based participatory mapping. The participants of the study comprised 60 children aged 5 to 12 years of age, living in the barracks. The research answered seven research questions. The spatial analysis was carried out using ArcGIS 10.3 ESRI, descriptive analysis in SPSS 22 version, and thematic analysis in NVIVO 12 Plus software. Focus group discussions, face-to-face interviews with policymakers, and photographs were used in triangulation. The findings revealed that home, school, and play areas were meaningful destinations, within 100 m to 1900 m walkable buffer distances within 5-20 minutes for children in the two barracks investigated. The study is aligned with child-friendly environments and socio-ecological theoretical frameworks. Thus, seven characteristics emerged for the barrack environment theme, six factors for travel behaviour, and three sets of rules for parental licences upheld by parents and children. Thus, permission to engage in walking or cycling to school and to the play areas was the most frequently granted. More licences denote higher independent mobility for children. Therefore, the independent movement of barracks children is the degree of freedom from parental restriction to engage in short-distance active travel to school and leisure activities within a specific home range and travel time. The conceptual framework for the independent mobility of children is useful for the Nigerian Air Force policymakers and design professionals such as architects, landscape architects, and planners, to create a child-friendly barracks. It is relevant to address children's immobility and improve their health in barrack environments, including the para-military barracks, housing estates, and compact cities across Africa.

ABSTRAK

Kebebasan mobiliti di berek tentera adalah perkara penting bagi seseorang kanak-kanak untuk berfungsi dengan betul dari segi fizikal, sosial dan kognitif. Walau bagaimanapun, di sebalik sumbangan pergerakan terhadap kesihatan dan kualiti kehidupan secara keseluruhan, berek mewujudkan sekatan-sekatan keibubapaan yang tinggi. Sekatan dan ketiadaan pergerakan oleh kanak-kanak adalah berhubung rapat dengan situasi persekitaran yang tidak mesra, tingkah laku perjalanan yang tidak aktif dan pengecualian pengalaman kanak-kanak. Justeru itu, kajian ini bertujuan untuk membina kerangka konseptual kebebasan mobiliti yang sesuai diguna pakai di berek-berek tentera di Nigeria. Akhirnya, indikator kebebasan mobiliti kanak-kanak telah dikenal pasti di Berek Tentera Udara Sam Ethnan di Lagos dan Berek Tentera Udara Nigeria di Kaduna. Tingkah laku persekitaran berek telah diuji dan faktor tingkah laku mod perjalanan telah dinilai. Di samping itu senarai peraturan lesen keibubapan telah juga dikaji. Pengumpulan dan analisis data menggunakan strategi kaedah campuran berurutan yang dilandaskan dari pasca-positivisme dan konstruktivisme sosial. Data spatial berek telah diperolehi melalui penggunaan peranti Geographical Positioning System dan imejan Landsat. Selepas itu, penyelidikan telah menggunakan teknik temuduga semi-struktur dan pemetaan partisipatif dalam bentuk cetak. Responden kajian adalah 60 orang kanak-kanak berumur di antara 5 dan 12 tahun yang menetap di berek. Penyelidikan ini telah menjawab tujuh soalan kajian. Tiga jenis perisian telah digunakan untuk membuat analisis: ArcGIS 10.3 ESRI untuk analisis spatial; SPSS versi 22 untuk analisis deskriptif; dan perisisan NVIVO 12 Plus untuk analisis tematik. Perbincangan kelompok fokus, temubual bersemuka dengan penggubal dasar, dan gambar telah digunakan di dalam triangulasi. Hasil kajian mendapati kediaman, sekolah dan kawasan permainan di dalam lingkungan 100 m hingga 1900 m dan waktu penyangga berjalan kaki di antara 5 hingga 20 minit adalah merupakan destinasi bermakna bagi kanak-kanak di dua berek yang dikaji. Kajian ini dijajarkan dengan persekitaran yang mesra kanak-kanak dan kerangka teori sosio-ekologi. Justeru tujuh tingkah laku untuk tema persekitaran berek, enam faktor tingkah laku perjalanan dan tiga set peraturan untuk lesen keibubapaan yang perlu dituruti oleh ibubapa dan kanak-kanak telah diperolehi. Oleh yang demikian, kebenaran untuk berjalan kaki atau berbasikal ke sekolah atau pun ke kawasan permainan adalah merupakan permintaan yang mempunyai kekerapan tertinggi untuk diluluskan. Oleh itu dapatlah disimpulkan bahawa pergerakan bebas kanak-kanak berek adalah merupakan tahap kebebasan dari halangan keibubapaan untuk terlibat di dalam perjalanan aktif jarak dekat untuk ke sekolah dan aktiviti santai di dalam julat spesifik kediaman dan masa perjalanan. Kerangka konseptual untuk kebebasan mobiliti kanak-kanak adalah bermanfaat untuk penggubal dasar di Tentera Udara Nigeria dan juga pereka bentuk profesional seperti arkitek, arkitek lanskap dan perancang untuk mencipta berek yang mesra kanak-kanak. Ianya adalah relevan untuk menangani isu ketiadaan pergerakan di kalangan kanak-kanak dan memperbaiki kesihatan mereka di persekitaran berek, termasuklah berek separa-tentera, estet perumahan dan juga bandaraya yang padat di seluruh Afrika.

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LIST OF ABBREVIATIONS

NCOQ	-	Non-Commission Officer's Quarters
SNCOQ	-	Senior Non-Commission Officer Quarters
JMOQ	-	Junior Married Officers' Quarters
SMOQ	-	Senior Married Officer Quarters
SEAB	-	Sam Ethnan Air Force Barrack in Lagos
IMCI	-	Independent Mobility of Children' Indicators
BEC	-	Barrack Environment Characteristics
TMCB	-	Travel-Mode-Choice Behaviour
PAL	-	Parental Licence
SPSS	-	Statistical Package for Social Sciences
TAC	-	Tactical Air Command
SOC	-	Special Operations Command
MC	-	Mobility Command
ATC	-	Air Training Command
GTC	-	Ground Training Command
LC	-	Logistics Command
NAF	-	Nigerian Air Force
NAFB	-	Nigerian Air Force Barrack in Kaduna
HQ	-	Headquarters
Ds	-	Dimensions

LIST OF SYMBOLS

m	-	metres
%	-	per cent
km	-	kilometres
s	-	seconds
min	-	minutes

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CHAPTER 1

INTRODUCTION

1.1 Background of the Problem

The first chapter of this thesis presents sections consisting of the background of the study, the problem statement, the research gap, and the research aim and objectives. Next are seven research questions formulated in this study based on the four objectives. After that, there is a brief outline of the scope, the definition of special terms, and the significance of the study. An overview of the general background of the problem for this study was on children living in the barracks. Notably, previous studies have revealed that West Africa has close to half of its population as children under 14 years (Robson, 1996). Similarly, children constitute 56% of Nigeria's total population of over 180 million. It is reflected in the military barracks' demographic profile in Nigeria, which showed a population that comprises over 50% of children (Daodu, 2004). Meanwhile, the average fertility rate in developed nations ranges from 1.5 to 2 children while the highest rate is 5.4 children per woman in Nigeria (NPC, 2018).

Nevertheless, military service in Nigeria gave credence to dependants, referring to the family of military personnel, especially the children (HTACOS, 2018). A study by Gewitz and his colleagues stated that the enlistment of a person into the military invariably signifies the immediate family joins the service. To this extent, the family plays a crucial role in ensuring the success of military operations (Gewitz *et al*., 2011; Park 2011). Similarly, a study in the US military revealed that 51.4% of 3.5 million personnel were married and 42% had dependent children (Deputy Assistance Secretary of Defence, 2015). Similarly, the majority of military personnel in Nigeria were married with a high percentage of dependent children (NAF Directorate of Personnel Management, 2018). On this note, the HTACOS (2018) gave recognition to four children per personnel in active service. Thus, dependents living in barracks far outnumbered service personnel in the Nigerian Air Force and sister services including

the Nigerian Army, Navy, Police, and other para-military services. Therefore, it requires more attention by the NAF authority to care for their emotional, physical, social, and cognitive functioning for an improved quality of life through policy interventions.

The issue of the emotional and physical health and well-being of children has been a priority for national and military authorities in the US (Department of Defense, 2010). Similarly, the Federal Government of Nigeria and the military authority recognise service personnel's children but have been unable to consider the influences of their demographic characteristics on barrack environment and travel behaviour, especially age and gender, as they grow up. Their characteristics influence the family decision-making process, while the surrounding and policy environment play a role in shaping them. Consequently, children from middle-childhood, that is between the ages of 5 to 12 years, were considered a unit of analysis in this study. This is the period during which parents consider giving their children the liberty of independent mobility. It includes licences granted to children to walk and cycle freely from home to school and to play areas in their neighbourhood environment without adult supervision (Hillman *et al.,* 1990; Fyhri & Hjorthol, 2009). Notably, the population of elementary school children that made up a quarter of population size outnumber secondary school children residing in the barracks community. It was due to the provision of military secondary schools with boarding facilities, such as the Nigerian Military School in Zaria, Jos, Kano, Akwa-Ibom, and Enugu. Nigeria's education system and admissions policy consists of six years in elementary, three years in junior secondary, three years in senior secondary, and four years of higher learning in a tertiary institution. The structure was set out in Nigeria's Education Policy, Section 1, Sub-section 5 (NPE, 1997 in Odukoya, 2017). It gives the age of 5 or 6 for children's eligibility to attend primary school. It is compulsory for Nigerian children to attend primary school in a friendly environment, including those living in barracks as a matter of policy. If possible, achieve freedom of movement to school to develop their confidence and motor skill acquisition. Pre-adolescence is an important developmental period and an opportune time to identify and halt any potential decline in habitual physical activity (Bhosale, 2015). Hence, the friendliness of the environment and promoting active travel behaviour is germane to achieving the independent mobility of children in barracks.

Nonetheless, the background of many studies on the child-environment review has been rooted in the United Nations Conventions (UNICEF, 1989, 2004 & 2009) promoting the rights of children in society (Nordstrom, 2010). It emphasised the need for the welfare of children to be accorded priority and for them to have the opportunity to contribute and for their views to be relevant in decision making. In addition, the significance of and the need to create a conducive environment for children were advocated. The concept of a child-friendly environment underpins child-friendly cities and community's studies including current research on military barracks. This idea entails an understanding of the need to improve the health and well-being of children (Chatterjee, 2005; Horelli, 2007). Thus, a United Nations Child-friendly City International Secretariat was founded by UNICEF in Florence to support studies into child-friendly environments. The importance of the parent-child relationship in children's interaction with their environment is reflected in how free children feel in utilising their neighbourhood independently. However, for children in middle childhood to explore a community such as a barracks is a significant consideration in making it available. It explains the association between parent and children, including the relationship that children create in the community where they live as a crucial determinant of the child-friendly environment.

Meanwhile, independent mobility accounts for children having the freedom to move around and play outside their home environment. This is fundamentally important in a child-friendly environment (Hart, 1979). It is also an indicator of an urban environment that allows the independent mobility of children (Chawla, 2002). The index includes negotiated freedom within the home geographical range at a given time, regarding specific destinations, and with licence from parents without being supervised by an adult (Kyttä, 2004; Loebach & Gilliland, 2014). There are also essential rules for the parental licence required for children's physical, social, mental, spiritual, and cognitive development (Evans *et al.*, 2013). Based on this, various studies on the association between the built environment and the independent mobility of children revealed a significant increase in the degree of decline over four decades (Loebach and Gilliland, 2019). This reduction was found to be responsible for children been obsessed, feeling of loneliness and fear. It also results in children's incompetence, insufficient knowledge of the environment (Rissotto & Tonucci, 2002), the weak interaction, and fewer opportunities for recreation (Prezza *et al.*, 2005). Likewise, car

dependency is attributable to the decline in the independent mobility of children (Mackett, 2002; Lopes *et al.*, 2014). Studies have revealed that characteristics of the child-friendly built environment are essential in supporting travel-mode choice behaviour and, at the same time, these influence the independent mobility of children. The distance and features in children's outdoor play areas are also affected by various attributes of the built environment and social factors (Christian *et al.,* 2015; 2017).

1.2 Statement of the Problem

The statement of the problem for this research was mainly from the direct experience of the researcher, reviews of the literature, and quantification of the existing situation in the barracks. The experience of the researcher stems from his 23-year experience as an Air Force officer and an architect. His duty tour to the Nigerian Defence Academy in Kaduna between 2015 to 2017 formed the major part of his experience on the importance of a child's health and well-being at a very young age. The Nigerian military invites young boys and girls from age of 17 to 20 years for selection as an officer's cadet. However, it is concerning to note that 40-60% are dropped on the grounds of poor health, such as obesity and high blood pressure. It became an even greater concern as many drop out of training in the first 6 months' probation. This is attributed to the lack of physical activities starting from their primary education. It is also due to environmental unfriendliness and exposure to non-active travel-mode behaviours that result in children's immobility in barracks.

The review of the literature on the national perspective found the high rate of growth in Nigeria's population, especially in urban areas, to be a challenge. This, alongside the high rate of rural-urban drift in search of social and economic activities, has continued unabated (Kempe, 1986; Knox, 2009). Consequently, the structural failure in matching economic policies with population growth has affected the developmental facilities for well-being in Nigeria, including barracks (Ede, 2011). Consequently, the increase in urbanisation has led to a decrease in children's independent mobility (Lope, Cordovil, & Neto, 2014). Notably, urban areas promote the independent mobility of adolescents more than that of children in middle childhood (Muthuri *et al*., 2016). Meanwhile, many NAF barracks are situated in urban areas due

to the role of national air defence and security maintenance in airports. Thus, the barrack establishments have an impact on the metropolitan cities as well. The military barracks in urban areas are, in turn, affected by the high population density of the neighbourhood communities and rural-urban drift (Ozoemene, 2016). If barracks fail to address this by providing adequate infrastructure to support population growth, widespread poverty will limit children's potential for a secure family life.

Moreover, the dwindling economic situation coupled with the internal crisis in the country contributed to the drift in which young families migrate to cities for better prospects and more secure lives. The military involvement in the provision of specialised services for citizens both in and out of barracks became a matter of necessity. Besides, the military, in fulfilling its humanitarian intervention role, performs a social responsibility to neighbouring settlements, especially in crisis-prone areas. Some of the internally displaced persons (IDP) live temporarily inside the barracks for security reasons. In addition, many communities bordering the barracks are allowed access to benefit from the socio-economic facilities provided in the barracks. For example, the night market, referred to as the mammy market, is at a close range to soldiers in the barracks for their relaxation and to provide inexpensive items. It is open to civilian friends once the working day has ended. Likewise, religious worship centres, health care centres, and sporting facilities receive patronage from civilians. However, these have contributed in no little way to the high population density, overcrowding, and high volume of traffic experienced in Nigerian barracks. The neighbouring settlements and host communities rely on already overstressed facilities and services in barracks to survive. It is worthy of note that a relationship exists between urban neighbourhood planning and design, and crime (Morris 1957; Cozens & Love, 2009; Marzbali *et al.*, 2016) which affects children's independent mobility. An assessment of this relationship regarding the planning policy is essential in the military barracks that have turned them into a constant area of the transition zone. The features of social disorganisation, the heterogeneous way of life, the self-fulfilling prophesy, and the criminogenic environment appear in the barracks (Daodu, 2004). The negative environmental effect is more on children's independent mobility and well-being, and their quality of life in barrack communities in Nigeria.

Consequently, many barrack communities in Nigerian cities have merged with residential neighbourhood and business districts due to urban expansion. The physical development plan for the future expansion and upgrade of barracks to meet the projected personnel and their family population is no longer feasible. There is little or no space for middle-childhood play areas and no natural environment for the children's independent play. Meanwhile, the quest to solve the shortage of accommodation has compounded the poor planning of barracks'-built environment. The rate of population growth has resulted in a high occupancy ratio, overstressing infrastructural facilities, and environmental problems that persist in barracks across Nigeria in urban areas (Omonobi, 2016).

The worst of the population density-related problems is the high rate of personnel intake into the military without a proportionate increase in housing facilities. Land-use planning, residential zoning, and housing allocation to personnel according to status became a severe issue of concern from one administration to the other. These challenges in barrack space utilisation and residential planning affect personnel administration and the quality of everyday life, especially that of their children (Daodu, 2004). Moreover, the lack of physical planning development control and the non-availability of a barracks environment renewal policy on land use and population densities affect environmental quality. Consequently, there is inadequate provision and maintenance of infrastructure, such as road network and play areas for children. It has characterised military and police barracks in Nigeria, which have had a negative impact on the child-friendliness of the built environment of barracks (Adeniyi, 2004). Despite the proximity of residential housing to schools and other play areas for children, there is a high level of mobility restrictions. Meanwhile, effective interventions to promote the independent mobility of children in barracks is limited. Researchers have not explored the uniqueness of the built environment of barracks in terms of land-use mix, compact development, its geographies, and its regimental culture. This is probably due to the sensitivity and misconception attached to barracks by the general public. A few available studies have focused on adults in the barracks and retired personnel (e.g., Herman & Yarwood, 2014; Morrison & Lawell, 2016; Alfano *et al.*, 2016) but there has been little or no mention of the independent mobility of children living in barracks. This has affected the provision of play spaces for

children's independent outdoor learning and quality of life in the built environment of barracks.

It has been found in past studies that the lack of playgrounds with natural features including greenery (Jim, Yo, & Byrne, 2015; Snäll *et al.,* 2015; Meerow & Newell, 2019) hinders children's independence and affordances of play. Likewise, interaction with nature has been found to occur in places where natural elements, such as trees, grass, plants, and animals are available (Chawla, 2015; Laaksoharjua, 2017). Notably, children's opportunities for interaction with nature nurtures their independent outdoor play. This happens near the home environments, such as parks, gardens, and schools or neighbourhood playgrounds. Otherwise, children are unable to harness the outdoor space for their physical (Oliver *et al.,* 2015), social (Sidharthan *et al.,* 2011), cognitive (Shaw *et al.,* 2015), and emotional development (Fyhri *et al.,* 2011; Christian *et al.,* 2017). Similarly, children living in barrack environments require integration of natural, better-quality landscape and meaningful children's places, but these have suffered a setback. Many studies have also supported the necessity of such neighbourhood environments that contribute to children's physical and emotional experiences (e.g., Hart, 1979; Oliver *et al.,* 2015; Tam *et al.,* 2018). Moreover, the study by Hong, (2018) showed that children benefit from being in a friendly physical environment. Most importantly, the cognitive and behavioural functioning of children is associated with their living in a physical environment that shapes them (Duncan, Spence, & Mummery, 2005).

Furthermore, several kinds of research conducted on the independent mobility of children have focused more on the built environment dimensions than on the characteristics of the child-friendly environment (Stack & Aschaner, 2018). There has not been enough research that has addressed the independent mobility of children, the child-friendliness, and the peculiar situation of children living in barracks. Instead, children that live and grow-up in a Nigerian barracks community are tagged *barracks boys and girls* and perceived as deviant children. They are seen as synonymous with stubborn and atypical children in society. The influence of the environment and travel behaviour on their independent mobility development is a factor this research sought to explore. It includes how the regimentation and excessive control of the unfriendly

living environment and disorderly behaviour due to the lack of freedom affects them. Meanwhile, they are actors in their built environment whose experiences of neglect in planning policies must be explored. The quality of children's relationships with their environment determines, to a large extent, their learning skills at every stage of their development. Based on this, there is a need to consider the rapid and complex developmental stages of barracks children as opined by Borenstein and Willey (2009). It includes the behaviour, psychology, cognition, and geographies of children's development and childhood. This study allows room for children's participation, and their right to speak up, participate in, and contribute to decision making in creating an inclusive environment that shapes them (UNICEF, 1989).

Regarding travel-mode-choice behaviour, the resultant effect of modernisation, technological advancement, and the availability of cheap oil for transport is the origin of the problems in urban areas. Indeed, it has contributed to the predominant motorised mode of travel in metropolitan cities worldwide (Tranter & Sharpe 2012), including Nigeria. It has filtered through to the military barracks, especially in urban areas where the combined residential and work environment affects car use in a dual-earner household as previously found by Maat & Timmermans (2009). Private car use is most prominent in the barracks along with public buses and tricycles, popularly called "*keke*", which later became famous as a travel mode prevalent in barracks. Consequently, walking distance roads become equally covered by motorised transport in barracks resulting in congestion and a high volume of traffic which deprives children of walking and cycling experiences. This study is, however, specific to travel-mode-choice behaviour that contributes to children's development through independent mobility in barracks.

Meanwhile, the number of children that engage in physical activity is not improving in developing countries or globally due to predominant motorised travel. For example, in Africa, the number of overweight or obese children increased from 5.4 million in 1990 to 10.3 million in 2016 (Oyeyemi *et al.*, 2014, 2016). For children, the WHO recommends 60 min of moderate to vigorous physical activity daily to prevent diseases in line with age (Oliver *et al.*, 2015; Marzi & Reimeers, 2019). However, the motorised travel mode is still prevalent in barracks communities across

Nigeria. Active travel to school and leisure activities by walking or cycling in a child-friendly environment are valuable in children's daily lives (Schoeppe *et al.*, 2013; Loebach & Gillilland, 2019). It means that the environment shapes children and also determines travel-mode-choice behaviour. Nonetheless, these activities have not been factored into barracks planning by the planners and policymakers to achieve child-friendly barrack communities in Nigeria. Examples of this are safety concerns due to the lack of defined cycle routes, pavement networks, and adequate landscape elements along routes in the barracks which was previously discovered in a study by Hwang *et al.* (2017). Children's road connections to schools in barracks lack sufficient greenery and beautiful landscape elements that attract walking and cycling in home-school and leisure activity trips (see Figure 1.1).

Figure 1.1 A typical school and leisure activity route in barrack environment

Moreover, traffic congestion and inadequate parking spaces are made worse by travel-mode-choice behaviour. Studies have revealed that personal characteristics usually drive this behaviour (Schoeppe *et al.*, 2013; Mitra, 2013), in addition to, among others, the distance between home and school, safety due to traffic, and stranger danger in cities are significant factors. This pedestrian-unfriendly barracks planning and the lack of travel policies support the pervasiveness of the motorized car culture including Nigerian barracks communities. It increases parental concern for children's safety, as does the lack of walking and crossing facilities (Malone & Rudner, 2011). Active travel-mode choice to school and play areas formed the bases for the independent

mobility of children in the military barracks which also became threatened over time. There is no policy backing active travel behaviour policy to revert immobility in barracks. It, therefore, increases the adverse effects, such as traffic congestion and parking along the roads, which affects walking and cycling by children (Garrard, 2008). This research seeks to integrate children's and parent's experiences on active travel and on the utilisation of outdoor space in barracks to conceptualise independent mobility for the improved well-being of children. Therefore, it is important for children to negotiate parental licence for independent mobility. Consequently, a set of rules for parental licence to afford children opportunities to explore their environment is significant in this research.

Additionally, findings from developed countries cannot be used to make generalisations for developing countries to achieve the independent mobility of children. Environmental perception varies from culture to culture (Valentine, 1997; Panter *et al.*, 2010). Thus, it is necessary to understand how children perceive their environment to create better environments for them. Notably, the environmental perception of children is weak (Cubukcu, Kahraman & Yavas, 2018). Thus, verbal methods often fail to attract the attention and interest of children because they do not like answering lengthy questions. In sum, the statement of the problem analyses the review of literature, current situation, highlighting the destabilising condition, which represents the methodological research gap in knowledge and the possible consequences if environmental and non-active travel issues remain unsolved. However, many parents continue to believe that the independent mobility of children is a result of poor environment and travel behaviour in the barracks whereas parental restrictions on children's independent mobility leads to the refusal to grant them parental licence. Likewise, children's participation is also lacking. Until the policymakers, planners, parents, and children collaborate, independent mobility will continue to decline in the barracks. Therefore, this research seeks to build a conceptual framework of children's independent mobility for policy formulation.

1.3 Research Gap

Studies on children and the environment that employ inter-disciplinary approaches and various parameters to investigate and suggest solutions to address their immobility have mostly been in developed countries (e.g. Gaster, 1991, Hillman & Adams, 1992; Van Acker *et al.,* 2010). In addition, studies on children's environment and behaviour experiences theoretical and methodological limitations for policy formulations (Marzi & Reimers, 2019). Thus, the research gap requires a review of previous studies and trends involving a multi-methods and interdisciplinary collaboration approach. This thesis made use of books, theses, and 500 journal articles searched for on the electronic databases of UTM e-library, Google Scholar, Science Direct, and Scopus. Notably, the study of children and nature dates back to the 18th century, as introduced by the Romantic literature movement, but all relevant documents were searched for the period 1935-2019. Search terms included five interdisciplinary field journals in the built environment, transportation, social sciences and humanities, health and place, and military architecture (see Appendix B p. 321). The child-friendly built environment and the active travel-mode-choice behaviour that influences the independent mobility of children was the focus.

Following the trends of studies on independent mobility since 1935, the 1980s showed that many studies have looked into how children can achieve control of their environment in terms of object manipulation and environmental exploration. Thus, children's independent mobility emerged as an essential environmental policy in those contexts (Wohlwill and Heft, 1987; Moore 1986) with access to a diversity of resources. Studies in developed regions, such as the UK and Western Europe, revealed that spatial and parental mobility restrictions and violation of rights apply mostly to children (Park & Kwan, 2017). This was similar to the challenges in developing countries. In addition, child labour compounded the restriction and injustices (O'Brien *et al.,* 2000; Carroll *et al.,* 2019). To this extent, mobility restriction was found to have affected the home-school journey and movement to play areas. However, none of these studies to the researcher's best knowledge has focused on children in the military barracks of Nigeria to investigate impact of restrictions on their independent mobility. There continues to be a growing concern that children are losing connection with the

natural environment because they have limited opportunities to move around or play independently outside their home. Thus, to reverse this trend, the barracks community residential area must provide playscapes for children to achieve independent mobility such that they can organise their play freely, and not just the small specific area set aside for children's use. They must be entitled to freedom from traffic, danger to their person from other people, and undue influence of an adult on their play activities as noticed in the study by McCarthy *et al.* (2015). However, studies have not often measured performances of children's independent mobility concerning the friendliness of the environment and travel behaviour, especially in barracks. Hence, this study will identify measurable indicators specific to children's independent mobility in barracks. It will be useful for natural resources planning in the challenging context of barracks owing to the nature of activities and the need for ecological protection without undermining security.

On this note, the trend in the study of concept of child-friendly environments in developed countries entrenched in the environmental child-friendliness of city is useful. It provides a general guide for planning and design policy in assessing child-friendly environments in cities. Thus, children's opportunities for friendship were found to be grounded in environmental child-friendliness from an environmental-behaviour perspective (Chatterjee, 2006). However, the idea framed in the study by Horelli's (2007) community-based theoretical framework is useful upon moderation. She factorised the ten normative dimensions into three. These include security and safety in the physical and social sense, basic services, and urban environmental quality. This research attempts to modify the ten dimensions directly relevant to assess the child-friendliness of built environment of barracks (for further details, see Chapter 2).

Moreover, many studies on the built environment have also used various parameters to see their impact on transport and mode choice behaviour in developed regions like Europe. However, they have rarely looked at their effects on children's independent mobility, especially in developing countries like Nigeria and barracks in particular. Although Nigeria is a signatory to the UN treaties on children's right to enjoy their environment, much of the impact has not been felt. Safety regulations put in place in barracks are not compatible with the provision of well-designed play spaces

that encourage both independence and collaboration. The process to do this varies according to the societal context, age, competency, and other factors. For instance, procedures are being introduced at various tiers of government and school levels to provide increased opportunities for children in developed countries. However, it requires a link with decision making on the everyday lives of children. Thus, the micro-level has been the focus of many studies regarding children's independent mobility and play ranges (e.g., Carver *et al.*, 2014; Kyttä *et al.*, 2015). The collaborative efforts of built environment professionals, policymakers, parents, and children are required to improve children's independent mobility.

Unfortunately, many barracks in Nigeria, despite being compact in development, lacked shared facilities in their built environment and housing concept. This concept failed to consider shared facility planning for children's independent mobility and play that facilitates social interaction. Instead, it focused on personnel and military regimental open spaces such as the parade ground, mammy market, and other socio-economic facilities. To this extent, most barracks are not environmentally friendly, as physical developments are not adequately coordinated to achieve the goal of a child-friendly environment. Built environment professionals rarely carry out research or analyse the built environment of barracks comprehensively. Similarly, they rarely involved stakeholders, especially children, at the conceptual planning stage. Hence, diversity and patterns of land use mix neglect children living in the barracks communities of Nigeria. Consequently, existing research has only a limited capacity to inform effective policies and interventions, especially to advance a research agenda that will fill the current gap in the literature. This research avoided the pitfall of past studies and the status quo on the unfriendliness of a military barracks environment. It reviewed the indicators, methodologies, and findings in related areas. Therefore, this research measured children's independent mobility indicators and introduced a set of rules for parental licence negotiated by parents and children living in barracks. It is a social construct that intervenes in the friendliness of the barracks environment and travel behaviour in conceptualizing children's independent mobility in barracks. It included all the avenues to make children's experiences count and for them to be integrated into the conceptual framework. Finally, it assessed the influences of child-friendly barracks environments and travel behaviours for the conceptualization of children's independent mobility in the barracks

1.4 Research Aim and Objectives

This study aimed to build a conceptual framework for the independent mobility of children that fits into the military barracks in Nigeria. The taxonomies of four research objectives were set sequentially to identify, examine, explore, and assess, which are ranked in the following order:

To identify the independent mobility of children's indicators in the military barracks of Nigeria;

To examine the characteristics of child-friendly barrack environments that hinder or support independent mobility in Sam Ethnan Air Force Barracks;

To assess the travel-mode-choice behaviour pattern that influences the independent mobility concept in Sam Ethnan Air Force Barrack; and

To explore the set of rules for parental licence that influences the independent mobility of children in the residential environment of Sam Ethnan Air Force Barracks in Nigeria.

1.5 Research Questions

The study sought to answer a total of seven research questions according to the four research objectives. The research questions were formulated based on the assumption that the characteristics of the barracks environment, travel-mode behaviour, and set of rules for parental licence may significantly influence the independent mobility of children in barracks in Nigeria. Four question for Research Objective 1 and one question each for Research Objective 2, 3 and 4 are as follows:

(1) What are the measurable indicators of children's independent mobility in military barracks?

(2) What are the effects of land-use change on the independent mobility of children in barracks?

(3) How do children perceive or understand independent mobility indicators in barracks?

(4) How do children living in barracks understand their activity space via experiential knowledge of road connectivity, travel routes and time in barracks?

(5) How do parents, children, and policy makers living in barracks view their environment and independent mobility?

(6) How do parents, children, and policy makers describe their travel-mode-choice behaviour pattern and independent mobility in barracks?

(7) What is the set of rules for parental licence that influences the independent mobility of children in the barracks?

1.6 Scope of the Study

The scope of this child environment-behaviour study covers independent mobility indicators, the characteristics of the barracks environment, and travel-mode-choice behaviour experiences in barracks. Besides, the focus was on children's everyday lives and their opportunities for independent mobility in the outdoor residential environment in relation to the three basic settings. It means the possibility of promoting walking and cycling during home-journeys to school and leisure activities independently without adult supervision in the natural outdoor environment. This study identified indicators of independent mobility specific to children living in a barracks environment. The research took a cursory look at how friendly the barracks environment is and its effects on independent mobility. It examined the effects of land use on the physical planning development process of military barracks. Moreover, the travel-mode-choice behaviour of children and their parents that influences independent mobility was covered. Consequently, the set of rules for parental licence as a social construct played an intervening role in the association between the barrack environment and travel-mode-choice behaviour that supports the independent mobility of children. Finally, it aimed to develop a conceptual policy framework integrating a child-friendly barrack environment and active travel behaviour for the improved independent mobility of children in the military barracks of Nigeria.

1.7 Definition of Terms

1. Airman: An airman is an enlisted person in the Nigerian Air Force not holding a commission from the rank of Aircraftman to Air Warrant Officer.

2. Officer: An officer is a person holding a presidential commission in the Nigerian Air Force from the rank of Pilot Officer to Marshall of the Air Force.

3. Family: The Terms and Condition of Service (TACOS) in the Armed Forces of Nigeria define a family as the married wife under the marital act or Islamic law or native and custom, and children under 18 years old subject to a maximum of (4) four. However, for recording purposes, all wives and children registered by personnel are recognised.

4. Active Service Personnel: A person serving in or with a force which is on active service.

5. Type of houses by the structure in the barracks: These include

(a) Single-family bungalow: This refers to a single unit building on one floor, and it exists on a demarcated plot of land.

(b) Duplex (detached and semi-detached): A duplex is a unit building with the public and semi-private area on the ground floor, while the private area is on the first floor with bathrooms.

(c) Semi-detached buildings (4 or 6 flats): This is a four- or six-unit storey building known as a block of four or six units. Each existing side is arranged with two or three flats on top of another two or three flats.

(d) Storied apartment building: This is a group of the housing units in a multi-storeyed building. The apartment is 36 units of 1- or 30 units of two-bedroom flats for the two categories of airmen; it offers more facilities and better security.

6. Military Barracks: Facility directly owned by and operated for the military or one of its branches that shelters military equipment and personnel.

7. Mammy Market: A regimental night market for military personnel

8. Land-Use Mix: Evenness between proportions of residential, commercial, office, and institutional land use from physical environment characteristics promoting independent mobility and active transporting of children to meaningful places (Broberg *et al.*, 2013).

1.8 Significance of the Study

This research provides foundational knowledge on the indicators of the independent mobility of children as a measure to promote a child- and transit-friendly environment in barracks in Nigeria. It touches on parents' and children's perceptions of the built environment of barracks, outdoor play spaces, and travel-mode-choice behaviours. The independent mobility of children in barracks has been affected by rapid urbanisation, high population density, unfriendly built environment, non-active travel behaviour, and parental restrictions. The works and services directorate that has the responsibility of planning physical development in the NAF required a dynamic and adaptive research approach. Dogmatic environment planning approaches and renewal programs without due consideration for child-friendliness of the environment and active travel behaviour are not healthy for the future of the barracks. The present research will contribute to the existing theoretical knowledge and the practice towards developing a policy framework on children and their relationship with the environment in barracks. The outcome will also be relevant and applicable to para-military barracks, housing estates, campuses, and cities in Nigeria. On the other hand, the originality of the research is in the area of promoting child-friendly and best travel-mode-choice behaviour in the barracks community. Therefore, developing an independent mobility policy framework for children's independent play experience in the built environment in barracks is necessary to improve their health and quality of life

1.9 Thesis Structure

The thesis comprises six stages which are divided into seven chapters, and a list of references and appendices (see Figure 1.2 p. 22). Chapter 1 contains the introduction to the research background and the statement of the problem; the research gap, aim, objectives, and scope; the definition of terms; and the significance of the study. Next is the literature review chapter, which is sub-divided into two parts (Chapters 2 and 3). Chapter 2 deals with the review of the literature from books, theses, and journal articles. It was designed to address the thesis question and explore how a child-friendly built environment and best travel-mode-choice behaviour supports the independent mobility of children. The second part, which is Chapter 3, concentrates on the study areas. Chapter 4 discusses the research methodology procedures and research design used in the sequential identification of independent mobility indicators in barracks. It also contains the method of data collection and analysis of the characteristics of the built environment of barracks, travel-behaviour factors, and parental licence that influence the independent mobility of children. Chapter 5 presents the analysis and results according to the research objectives and questions and Chapter 6 dwells on outcome of findings and discussion. Finally, the conclusion and implications of the study are in Chapter 7, which consists of the barracks and travel-behaviour conceptual policy framework of independent mobility of children that fits the barracks. The contribution of the research that developed from the child-friendliness and socio-ecological frameworks, as well as the practical implications, are highlighted in this chapter.

1.9.1 Chapter 1- Introduction

In Chapter 1, the initial concept of various research ideas stemming from the identification of the focus areas specific to children and the environment was discussed. The areas were meaningful places where children relate in the barracks, their spatial experiential knowledge, and their active travel behaviour. The ideas were brought out to connect a conceptual framework for policy formulation on the independent mobility of children in barracks in Nigeria. The chapter was structured

into seven sections consisting of the background of the study in Section 1.1. Next was Section 1.2 on the statement of the problem. Section 1.3 identified the research gap. After that, Section 1.4 stated the aim and objectives of the study. Research questions were given in Section 1.5. Section 1.6 gave an overview of the scope of the study. This was followed by the definition of special terms in Section 1.7. Afterwards, Section 1.8 dwelled on the significance of the study. Section 1.9 dealt with the structure of the thesis, and Section 1.10 summarised the whole chapter.

1.9.2 Chapter 2 – Literature Review

This chapter contains a literature review on the ideas and trends of the independent mobility of children, child-friendly environments, travel-mode-choice behaviour, and policies. The chapter is divided into nine sections, starting from Section 2.1, which introduces the chapter. Section 2.2 explores the idea of the independent mobility of children. Next, Section 2.3 reviews child-friendly built environment settings, while Section 2.4 gives a brief appraisal of the characteristics of a child-friendly built environment. After that, Section 2.5 discusses children's travel-mode-choice behaviour, and Section 2.6 consists of how parental licence intervenes in the independent mobility of children. Section 2.7 covers the connection with planning and travel policy. The theoretical and conceptual frameworks underpinning this study are explained and illustrated in Section 2.8. Lastly, Section 2.9 summarises the chapter.

1.9.3 Chapter 3 – Literature Review on the Study Areas

This chapter focuses on the review of the study areas. Section 3.1 introduces the chapter. In Section 3.2, the military geographies, culture and built environment of barracks are explained. Section 3.3 gives a background of the military barracks. Next there is a brief look at the barracks children as actors in their built environment in Section 3.4. Section 3.5 briefly mentions the history of the mammy market and its influence on the built environment of barracks. The study areas are the Sam Ethnan Air Force Barracks (SEAB) in Lagos, and the Nigerian Air Force Barracks (NAFB) in

Kaduna, and these are explored in Sections 3.6 and 3.7. They are compared in terms of measurable children's independent mobility indicators. Finally, Section 3.8 summarises the chapter.

1.9.4 Chapter 4 – Research Methodology and Design

Chapter 4 discusses the research methodology and design as well as the procedure. It is in eight sections. Section 4.1 offers an introduction to the chapter. Next is Section 4.2, which gives an overview of the research design and methods. Section 4.3 consists of sources of data and the preliminary survey. Section 4.4 explores the method of data collection and ethical strategies. This is followed by Section 4.5, which explains the data analysis for the independent mobility of children in five sub-sections. Section 4.6 explores the validity and reliability of the research. Finally, Section 4.7 summarises the chapter.

1.9.5 Chapter 5 – Analysis and Results

Chapter 5 contains a discussion of the significant findings. It is divided into six sections starting with an introduction in Section 5.1. Section 5.2 considers the spatial data analysis for the objective measurement of children's independent mobility indicators using the spatial map of the barracks and the land-use land cover (LULC) changes that occurred between 2006 to 2018. The findings on the perceptions of 5 to 12 year-old children living in the barracks are discussed. Thereafter, the objective measurement and perception are compared; this comprises four sub-sections. Next is Section 5.3, which discusses the thematic and content analysis, and Section 5.4 summarises the chapter.

1.9.6 Chapter 6 -Findings and Discussion

Chapter 6 consists of eight sections that cover the findings and discussion. Section 6.1 gives the introduction to the chapter. Section 6.2, which deals with the indicators of children's independent mobility, is structured into four sub-sections. Section 6.3 discusses the characteristics of the built environment of barracks that influence the independent mobility of children; it consists of five sub-sections. Section 6.4 discusses the travel-mode-choice behaviour that affects the independent mobility of children in six sub-sections. After that, the set of rules for parental licence that intervene in the characteristics of the barrack environment and travel-behaviour factors for a conceptual framework of children's independent mobility in barracks is given in Section 6.5, while Section 6.6 involves the assessment of the association between the barrack environment, active travel behaviour, and the set of rules for parental licence that influences the independent mobility of children. Section 6.7 presents the triangulation procedure in the research. Finally, Section 6.8 summarises the chapter.

1.9.7 Chapter 7 – Conclusion and Implications

The last chapter of this thesis presents the conclusion and implications. It is in five sections. Section 7.1 consists of a brief introduction to the chapter. This is followed by Section 7.2, which highlights the theoretical and practical implications of the research. Section 7.3 states the strengths and limitations of the study. Lastly, Section 7.5 gives recommendations for future research.

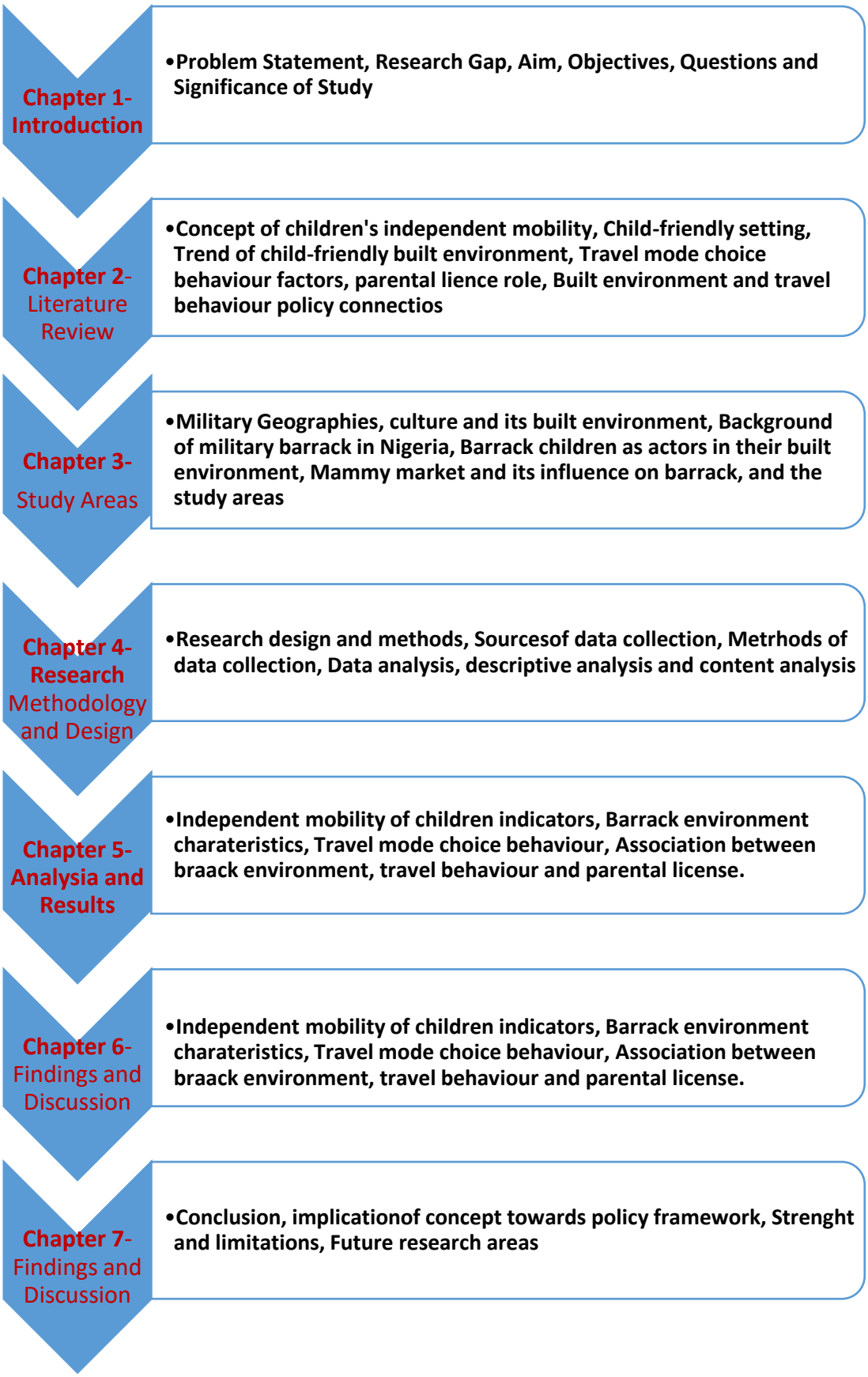

Figure 1.2 Flow chart of outline of chapters for the thesis structure

1.10 Summary

In sum, this introductory chapter explains the background of the study. Next is the statement of the problem that started with urbanisation and its effects on the ever-increasing population, especially the population of children. Unfriendly barrack environment planning affects children's independent mobility and is exacerbated by parental restrictions and non-active travel behaviour. Previous studies have not integrated children's experience from interdisciplinary studies into a built environment and independent mobility policy framework. The methodological research gap created emanated from the review of the literature in five main fields from developed and developing countries, the status quo, and the researcher's personal experience. The study aimed to develop an integrated child-friendly environment and active travel behaviour for a policy of improved independent mobility framework in the barracks. Seven research question were formulated to answer four objectives. Special terms relating to the military barracks, the personnel, and their rank stratification were defined. The study is significant as it gives foundational knowledge on the independent mobility of children's indicators, the built environment of barracks, travel behaviour, and the need for parental licence. Thus, the thesis is structured into seven chapters, and the next chapter is the literature review.

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