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From Chaos to Order: Designing for Multifunctional Efficiency in Intracity Bus Termini in Nairobi

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Abstract

Nairobi's intra-city bus termini have evolved from simple transit nodes into multifunctional urban spaces accommodating transport, commercial, and social activities. However, this growth has been largely unplanned, resulting in congestion, pedestrian-vehicular conflicts, underutilized off-peak spaces, and declining user comfort. With 47% of Kenyans relying on public transport each day, the spatial efficiency and comfort of these hubs are increasingly critical. Yet their uncoordinated evolution has overwhelmed existing infrastructure, producing congestion, spatial disorder, and user discomfort, particularly at legacy facilities such as Kencom Bus Stage and Railways Bus Station located in Nairobi's CBD, where dense pedestrian-vehicular convergence compromises accessibility. This study investigates the spatial and operational challenges of five key termini—Kencom Stage, Central Bus Station, Ngara Bus Terminus, Muthurwa Terminus, and Railways Bus Station. Using mixed-methods, comparative case-study design, the study concentrated on Ngara and Central Bus Station. A total of 150 field respondents (commuters, vendors, and PSV personnel) were surveyed, which was augmented by systematic observations, semi-structured interviews, and spatial audits. Quantitative data were processed in R 4.3 and Python 3.11 to generate descriptive statistics and χ^2 tests, while qualitative materials were thematically coded in NVivo 14. GIS-based mapping and AutoCAD overlays visualized functional conflicts and underused areas. Findings reveal a persistent design bias toward vehicular flow: peak-hour pedestrian density exceeded the comfort threshold of 1.8 persons m^{-2}, and 73% of passengers alongside 62% of vendors reported frequent conflicts, noise, overflow queues, and inadequate weather protection. At the same time, 30% of off-peak terminal floor area was unused, which underscored poor use of space. The research recommends interventions include multimodal integration that privileges human-scale movement, context-specific zoning of com-

plementary uses, modular and inclusive architectural solutions. The study concludes that reimagining Nairobi's bus termini as inclusive, human-centered, and economically vibrant mobility hubs can simultaneously improve transport efficiency, enhance commuter experiences, and support informal economic activities.

Keywords

Bus Termini, Efficiency, Multi-Functionality, Public Transportation, Urban Congestion

1. Introduction

Public transportation is the backbone of urban mobility in Nairobi, where only 13% of commuters rely on private vehicles, 47% depend on public transport, and the remaining 40% walk to their destinations [1]. These figures highlight the critical role of public transport in the city's daily operations and underscore the urgent need to address persistent congestion and inefficiencies in Nairobi's transport network. Central to this challenge are the bus termini, which function as key nodes within the public transportation system.

Over time, as shown in **Figure 1**, Nairobi's intracity bus termini have evolved from simple transit points into multifunctional urban spaces that accommodate not only transport activities but also vibrant commercial, social, and informal economic functions. However, this transformation has been largely unplanned, leading to congestion, pedestrian-vehicular conflicts, and declining user comfort, particularly in older facilities like Ngara and Central Bus Stations [2]. To counter rising demands for bus termini, the Nairobi Metropolitan Services have invested in retrofitting or redesigning existing termini. In the 2023/24 fiscal year, Nairobi Metropolitan Area Transport Authority (NaMATA) was allocated only 177 million in the BRT facilities, and 217.5 million in the 2024/25 fiscal year, which is just a fraction of the Sh5.6 billion contract it signed in 2020, and only 52 percent of the planned stations were in place as of 2023 [3].

Figure 1. Vendor stalls on Pedestrian Walkways in Thika Town main bus station [6].

Multifunctional efficiency refers to the ability of a bus terminus to balance four interrelated dimensions. The first is pedestrian flow, which focuses on people's safe and efficient movement in peak and off-peak periods, providing minimal congestion and free circulation flow. The second one is the commercial viability, which will focus on integrating formal and informal business into the terminus without disrupting the transport operations and harming the safety of passengers [4]. User comfort and accessibility are the third dimension, which entails providing necessary facilities like shelter, sanitation, sitting, and the universal access-based features to establish an inclusive and user-friendly environment [5]. Finally, vehicular throughput relates to the smooth and well-coordinated circulation of buses and public service vehicles (PSVs), achieved without compromising pedestrian safety or comfort. Together, these dimensions form a comprehensive framework for assessing and improving the functionality and overall performance of Nairobi's bus termini.

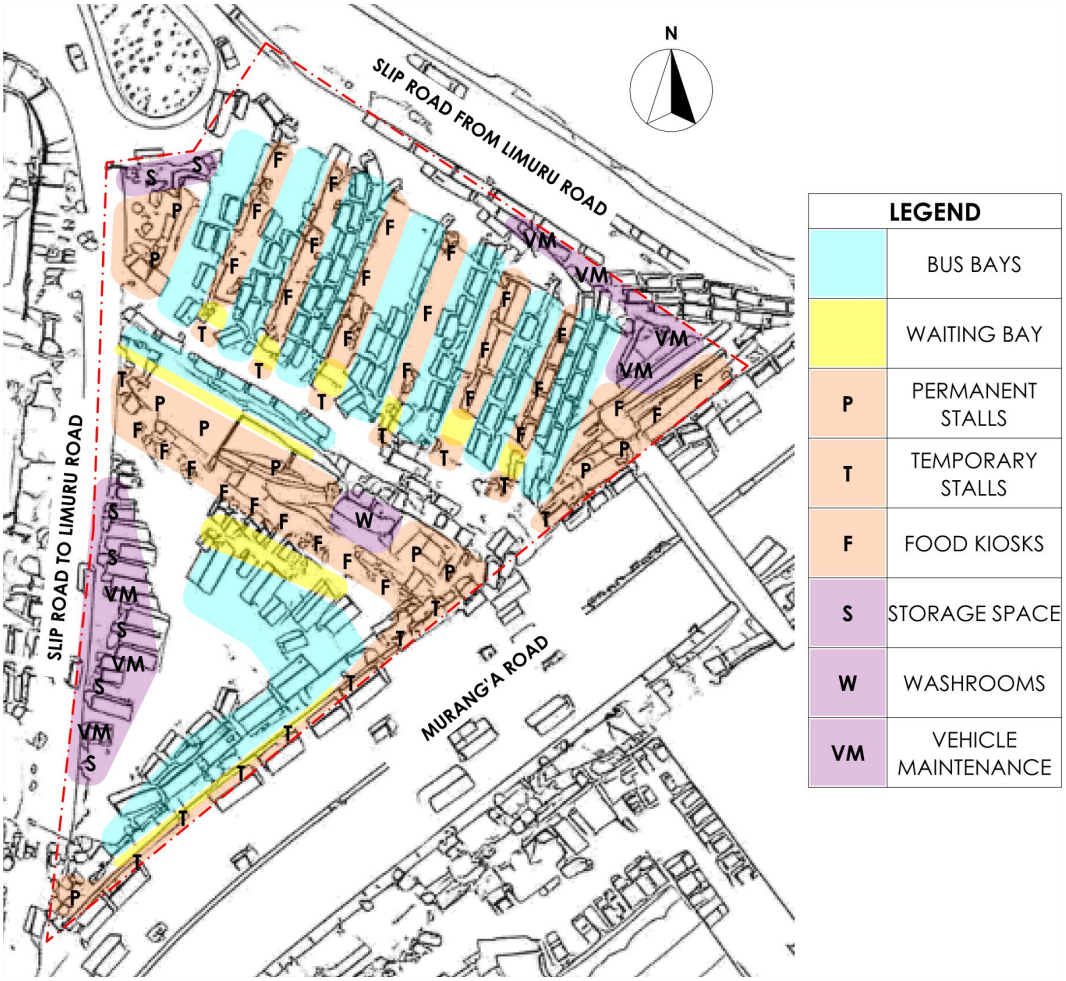
Despite policy ambitions for modernized and inclusive transport hubs, Nairobi's bus termini remain congested, under-serviced, and poorly integrated. Pedestrians, vendors, and PSV operators compete for limited space, while infrastructure fails to meet rising mobility demands [7]. For instance, street vending, hawking, and makeshift food kiosks have proliferated—often without corresponding infrastructure upgrades or planning interventions [8]. The absence of context-specific design guidelines and participatory planning processes further widens the gap between policy objectives and ground-level realities.

2. Spatial Challenges facing Bus Termini in Nairobi

The bus termini within the city of Nairobi were initially envisaged as a single-stream transnational terminus, built principally to streamline the flow of passengers and buses. These spaces, however, have gradually turned into multi-purpose urban nodes that can organically fulfill informal commercial functions, social lives, and a gathering place [9]. This change has come with little active spatial planning or infrastructural adaptation and has created several urgent urban-design and operational challenges.

2.1. Historical Evolution of Bus Termini in Nairobi

Nairobi's transport infrastructure was initially designed during the colonial era, primarily to serve low-density urban populations and a limited fleet of buses [10]. Post-independence urbanization led to massive population growth and a dramatic increase in travel demand. Today, Nairobi's bus network is dominated by matatus (privately owned minibuses), which account for over 60% of public transport trips [11]. As the city expanded, bus termini evolved organically, accommodating: High-frequency for short-distance routes within the city, long-distance, intercity routes connecting Nairobi to other regions, and Informal commercial activities, such as street vending, to serve commuters. This unplanned growth, illustrated in **Map 1**, has resulted in bus termini that are spatially inadequate, congested, and



Map 1. Spatial analysis of Ngara bus park (Source: Author, Field Survey, 2024).

poorly integrated with surrounding urban land uses [12].

2.2. Key Spatial Challenges facing Bus termini in Nairobi

The physical planning of most bus terminals remains colored by Poor Spatial Zoning and Intrusion with the transport-oriented concept of the initial planning, where commercial activities are usually on the margins. It causes traders to fail to get the desired foot traffic and shift towards more pedestrian foot traffic car routes to find [9]. It has caused a lot of spatial conflicts—pedestrians have to move through small, blocked aisles, whereas vehicles have to share the space with traders and commuters, leading to unsafe and congested spaces [13]. **Figure 2** illustrates how these dynamics disrupt pedestrian circulation and compromise commuter safety.

Inadequate Infrastructure and Informal Adaptation further define bus termini in Nairobi with Infrastructure that has not evolved to adapt the use of termini from mixed-use to an upgrade. Simple things like covered waiting rooms, rest areas, toilets, and waste disposal systems are either poorly developed or nonexistent. Vendors usually set up temporary shacks on available materials such as timber,

iron sheets, tyres, and polythene; they proved to be functional, but due to the materials used, they were structurally weak and appeared inconvenient. Such informal infrastructures, which include eateries that serve commuters and PSV operators, generate waste that leads to the accumulation of waste and environmental degradation since there is no supply of clean water, drainage and waste collection systems.

Dilapidated Urban and Demographically Inactive Commercial Zones are a key indicator of terminus with the earlier zoning formula, under which commercial activities were placed in the periphery of bus terminals, is more or less defunct. Traders move into the central functional areas, leaving the less critical regions dormant, underused, and unused. As it is no longer open to the public, inaccessible, and with no foot traffic, such vacant areas often develop into places of vandalism and criminal activity, contributing to urban rot and crime.

Figure 3 elucidates the conflict between human needs and vehicular Prioritization that face bus termini with the current termini design tending to focus on vehicle movement rather than pedestrian comfort and safety. Roadways used by vehicles are usually long and straight with no obstructions that stimulate high-speed driving and increase the chances of accidents within the limits of the termini. At the same time, waiting zones and pedestrian areas in general are usually undefined, unprotected, and open to the weather conditions. Commuters end up staying in the severe sun or rain, with a lack of accommodation and temporary seats on higher grounds or even under umbrellas of the vendors. These problems

Figure 2. Straight vehicular pathways at central bus station [14].

Figure 3. Unsightly but functional makeshift structures by traders at Ngara Bus Station [15].

demonstrate the lack of effectiveness of the existing spatial planning approaches to deal with the multifunctional and dynamic character of the bus termini of Nairobi [3]. Unless a concerted and participatory urban planning strategy considers factors of infrastructure, safety, commercial viability, and human scale demands, the quality of user experience, aesthetics, and functional operations within these crucial public spaces will deteriorate.

2.3. Lessons from Other Cities

As Nairobi continues to face rapid urbanization and growing pressure on its public transport infrastructure, lessons from other cities offer valuable insights into strategies that can improve the design, functionality, and governance of intracity bus termini. Comparative analysis of international case studies demonstrates how integrated planning, community participation, and institutional reforms can address congestion, enhance safety, and balance competing spatial demands.

In Dar es Salaam, Tanzania, the development of a Bus Rapid Transit (BRT) system introduced purpose-built termini that effectively separate vehicle and pedestrian flows. This design has significantly improved operational efficiency, reduced congestion, and enhanced commuter safety, demonstrating how strategic infrastructure investments can transform disorganized transport systems into structured, efficient, and user-friendly environments [16]. In addition to the above, there are other examples of international precedents that can give more insight into how multifunctional transport hubs are designed and operated. The Kuyasa Transport Interchange, located in Cape Town, South Africa, has used a modular design approach based on the inclusive planning principles. Having superimposed different layers of spatial programming and amenities with a high emphasis on the needs of the community, Kuyasa illustrates how the multifunctional transport infrastructure can incorporate mobility and other wider social and economic roles [17].

In the same manner, the Pool Meadow Bus Station in Coventry, the United Kingdom, is a perfect example of how the transportation infrastructure is intergrated into the urban character. The terminus has been designed to focus on the comfort of pedestrians, natural movement patterns, and the legibility of the city, as well as being efficient in its operations. The balance develops a transport hub that is functional and friendly to the overall urban experience [14]. These foreign case studies highlight the significance of spatial planning, community participation, and institutional reforms that can address congestion, enhance safety, and balance competing spatial demands. The challenges identified directly relate to gaps in existing policy frameworks of CIDP (2014-2023), which call for inclusive, modernized transport hubs but lack concrete strategies for informal trading integration and flexible design. Likewise, NaMATA Strategic Framework [12] advocates for multimodal, human-centered transport solutions, yet most termini still prioritize vehicular flow over pedestrian safety and commercial integration. By linking empirical findings to these frameworks, this study provides policy-rele-

vant recommendations to bridge the gap between vision and implementation.

3. Methodology

This research utilized a mixed-methods design combining spatial audits, direct observation, user surveys, and key-informant interviews of qualitative and quantitative methods to compose a complex image of the impacts of spatial structure on the effectiveness, safety, and inclusiveness of such urban transport nodes [2]. The study focused on five key intra-city bus termini in Nairobi—Kencom Stage, Central Bus Station, Ngara Bus Terminus, Muthurwa Terminus, and Railways Bus Station—purposively selected to represent a range of locations, infrastructure conditions, and levels of informal activity. Ngara and Central were examined in greater depth as primary case studies, while Kencom, Muthurwa, and Railways served as comparative benchmarks to determine whether challenges were site-specific or systemic across the city. Site selection was based on passenger volumes, diversity of operations, commercial activity, strategic location, and infrastructure age. This ensured that the study addressed multiple operational contexts within Nairobi's transport network.

A purposive sampling approach was used to select 150 respondents across the five sites, with 30 per terminus. Participants were stratified into commuters (60%), vendors (25%), and PSV personnel (15%), capturing diverse perspectives on pedestrian flow, commercial viability, user comfort, and vehicular throughput [5]. Ngara and Central provided detailed data for mapping congestion and redesign proposals, while the other three termini supplied comparative data for validation. This approach created a comprehensive and representative understanding of Nairobi's bus termini and aligned with the goals of the CIDP (2014-2023) and NaMATA Strategic Framework [12] for inclusive and efficient public transport planning.

Systematic walk-through audits were conducted during morning peak (06:30-09:30 h) and off-peak (13:00-15:00 hrs) periods on three non-consecutive weekdays. Audit variables included functional zoning, circulation hierarchies, amenity provision, and informal encroachment. Field teams produced annotated base maps (1500) and geo-referenced photo records. The number of people on foot and in cars and the lengths of queues and temporary vendors were measured using observational checklists taken every 15 minutes. A structured questionnaire (n = 150; 30 per terminus) found answers to the perception of safety, comfort, congestion, and what they wanted to improve. Respondents were stratified into commuters (60%), traders (25%), and PSV personnel (15%)—items employed five-point Likert scales and categorical choices. The response rate was 86%, facilitated by on-site administration in Kiswahili and English. Ten semi-structured interviews were conducted with planners, transport engineers, and trading-association leaders. Interviews probed policy constraints, design intentions, and operational challenges. Sessions (30 - 45 min) were audio-recorded, transcribed verbatim, and anonymized.

Secondary documents were widely reviewed to place the research results into

the context of the more general urban planning and policy-making fields. The development strategies are presented in the Nairobi County Integrated Development Plan (CIDP) 2014-2023, outlining the future development strategy regarding infrastructure. Others were Nairobi Metropolitan Area Transport Authority (NaMATA) policy briefs and spatial planning guidelines, which focus on incorporating multimodal transport and the importance of the human-centered, efficient, and inclusive mobility hubs [12].

Data was analyzed using a three-strand workflow.

1) Qualitative strand where Interview transcripts and field notes were thematically coded in NVivo 14 using an inductive, open-coding scheme.

2) Quantitatively by importing survey responses into R 4.3 (tidyverse and janitor packages) and Python 3.11 (pandas, scipy). Descriptive statistics (frequencies, cross-tabulations) profiled user perceptions, while χ^2 tests ($\alpha = 0.05$) probed relationships between respondent groups and perceived design deficiencies. Results were visualised with ggplot2 and matplotlib for rapid pattern recognition.

3) Spatial strand by digitised field sketches and GPS points in ArcGIS Pro and QGIS. Layer overlays and heat-density maps highlighted zoning conflict "hot spots", dead zones, and intensity of use across different times of day. Schematic layouts and sectional diagrams were finalised in AutoCAD for publication quality.

4. Results

4.1. Spatial Layout and Utilization Patterns

The spatial audits revealed distinct patterns across Nairobi's major bus termini. Central Bus Station was relatively structured, with marked bays and angular parking slots; however, 30 percent of its space remained dormant during off-peak hours, fostering insecurity and litter accumulation. The linkage between pedestrian numbers and comfort is key to ensuring functional bus termini. This is shown in **Figure 4.**

The bar chart above shows the peak pedestrian density at each terminus compared to the comfort threshold of 1.8 persons/m^2. The red dashed line marks the threshold, clearly indicating where each site exceeds or meets it.

During peak periods, informal stalls frequently spilled into waiting areas,

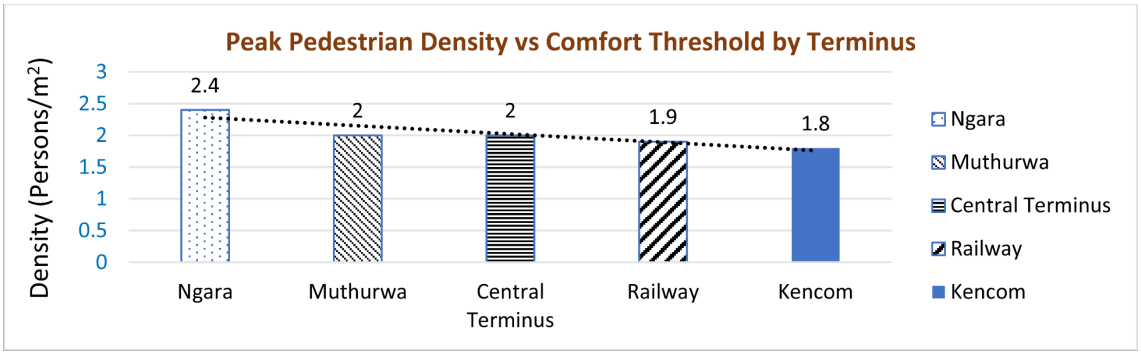


Figure 4. Peak pedestrian density vs comfort threshold by terminus (Source: Author, Field Survey, 2024).

further contributing to congestion. Ngara Bus Terminus displayed a highly organic and unplanned layout, with vendors interspersed along pedestrian pathways. Here, peak pedestrian density reached 2.4 persons per square meter—well above the 1.8 persons per square meter comfort threshold—resulting in severe bottlenecks and heightened safety risks.

At Muthurwa Terminus, the proximity of a large market created constant conflict between pedestrians and vehicles. Vendors occupied nearly 40 percent of circulation areas, often leading to disputes with PSV operators over access and space. Railways Bus Station, one of the older facilities, exhibited unclear circulation hierarchies and extensive dormant zones that were either used for informal activities or left abandoned, conditions that encouraged insecurity. Finally, Kencom Stage emerged as a highly formalized hub within the CBD, yet it faced severe pedestrian congestion during peak hours, compounded by limited space for expansion and the absence of universal access features. Pedestrian flow data revealed severe congestion, with peak-hour densities at every site exceeding industry comfort standards and causing circulation bottlenecks [1].

4.2. Divergent User Perceptions among User Groups

Chi-squared tests shown in **Table 1** examined whether perceptions differed significantly among commuters, vendors, and PSV personnel across the five termini.

Table 1. User perceptions among groups.

Dimension	Variable Tested	Significant Difference ($p < 0.05$)	Groups Driving Difference	Termini Most Affected
Pedestrian Flow	Congestion and safety perceptions	**Yes**	Commuters vs. PSV Personnel	Ngara, Muthurwa, Central
Commercial Viability	Vendor displacement & trading space	**Yes**	Vendors vs. Commuters	Muthurwa, Ngara, Railways
User Comfort & Accessibility	Shelter, sanitation, accessibility	**Yes**	Commuters vs. Vendors	Ngara, Central, Kencom
Vehicular Throughput	Smoothness of vehicle operations	No	No major differences	All sites equally

Up to 71% of commuters as shown in **Figure 5** indicated that there was congestion and safety hazards, especially in Ngara and Muthurwa, but the PSV agents perceived the conditions as manageable, exposing a conflict in design priorities. With respect to commercial viability, vendors highlighted inadequate trading space and frequent displacement during enforcement crackdowns, especially in Ngara and Muthurwa, underscoring the economic insecurity created by poor spatial zoning. User comfort also presented contrasting concerns: commuters prioritized shelter and seating, while vendors placed greater emphasis on sanitation and waste management [1]. For vehicular, throughput, the perceptions of the movement of vehicles were relatively consistent regardless of the location, imply-

ing systematic challenges in traffic management, as opposed to the problems that are unique to the particular terminals.

4.3. Divergent Stakeholder Priorities within the Bus Termini

The χ^2 analysis showed conflicting priorities among stakeholders at Nairobi's transport termini. Commuters in Ngara and Muthurwa as shown in Figure 6 prioritized safe and comfortable walking spaces, PSV personnel emphasized bus throughput, and vendors sought stable trading areas—often clashing with commuter needs. Conflict intensity was highest at Ngara and Muthurwa, moderate at Central, and structurally constrained at Kencom and Railways. Overall, these tensions highlight a gap between CIDP objectives and actual on-the-ground outcomes.

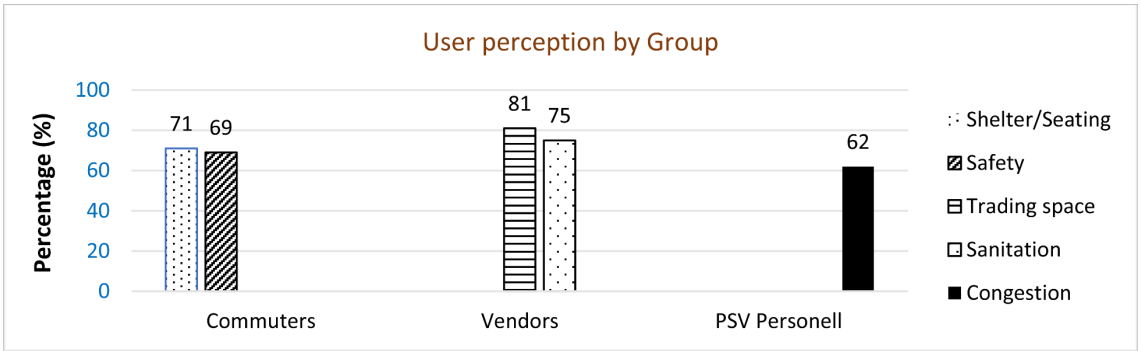


Figure 5. User perceptions by group (Source: Author, Field Survey, 2024).

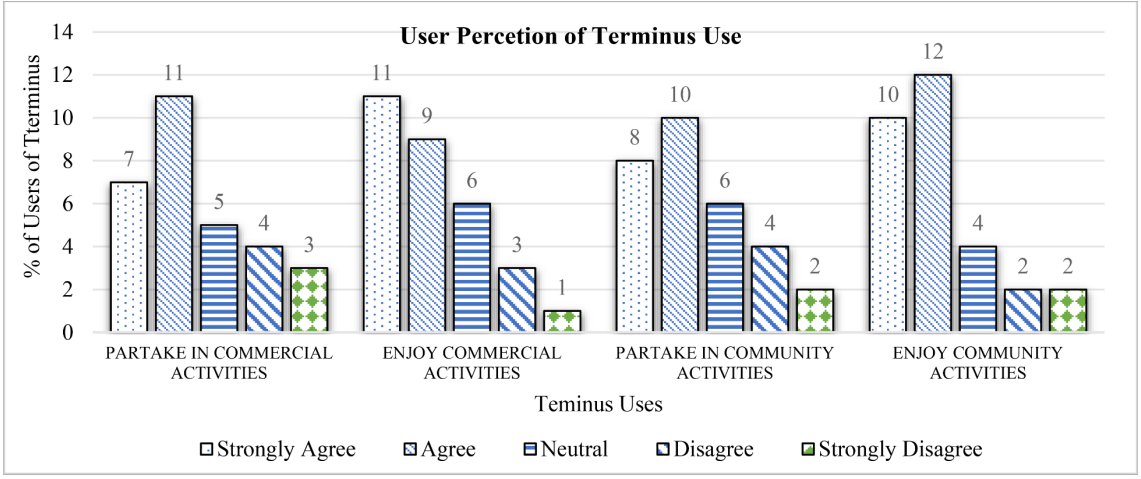


Figure 6. User perception feedback (Source: Author, Field Survey, 2024).

A thematic analysis of interview transcripts revealed five recurring concerns There is lack of weather protection and seating in waiting areas and absence of universal-access features such as ramps or tactile paving. The further exists a high speed of traffic and safety risks within mixed-use zones. There is inadequate waste management and sanitation for food vendors and insufficient lighting and security during off-peak hours. The five scenarios highlight the necessity of a planning

strategy for spatial design that utilizes both vehicle efficiency and the multi-functionality concept with regard to humans.

4.4. Linking Results to Policy Gaps

Table 2 indicate how findings align with and expand on identified gaps in Nairobi's transport policies:

1) Lack of weather protection and seating in waiting areas-Absence of guidelines for commuter comfort and user-centered design in transport and public space policies. Existing frameworks often prioritize vehicular flow over pedestrian welfare, leaving no mandates for shaded, sheltered, or resting zones in public transit or mixed-use corridors.

2) Absence of universal-access features such as ramps or tactile paving—Weak implementation of accessibility and inclusivity standards in urban design regulations. Although universal design principles may appear in national building codes, enforcement at the street and public transport level is minimal, excluding persons with disabilities and the elderly from safe mobility.

3) Traffic speed and safety risks within mixed-use zones—Lack of context-sensitive traffic management policies and clear spatial hierarchy. Current transport policies emphasize vehicular efficiency without integrating pedestrian safety measures such as speed calming, designated crossings, or shared-street design standards.

4) Inadequate waste management and sanitation for food vendors—Missing or fragmented informal economy and street-vending policies that recognize and regulate temporary or semi-permanent vending spaces. The absence of integrated sanitation and waste infrastructure provisions perpetuates environmental and health risks.

5) Insufficient lighting and security during off-peak hours—Inadequate urban safety and night-time economy policies addressing lighting, surveillance, and public space activation. Public design standards often overlook temporal dimensions of safety, especially in transit corridors that operate beyond daylight hours.

Table 2. Linking results to Policy Gaps

Policy Document	Gap Identified in Findings	Policy Goal
CIDP 2014-2023	Insufficient investment; only partial upgrades at termini	Modernize and expand public transport infrastructure
NaMATA Strategic Framework	Lack of inclusive pedestrian design and commercial integration	Human-centered, multimodal integration of transport hubs
Nairobi City Transport Plans	Persistent pedestrian-vehicular conflicts at all sites	Reduce congestion and improve safety

5. Discussions, Conclusions and Recommendations

5.1. Discussions

The findings of this study reveal that Nairobi's intra-city bus termini have grown

far beyond their original role as simple transport nodes, evolving into multifunctional urban spaces that accommodate transport operations, informal trading, and social activities. However, this transformation has occurred with limited spatial planning and infrastructure upgrades, creating challenges in accomplishing demands of diverse user groups who rely on these facilities daily [18].

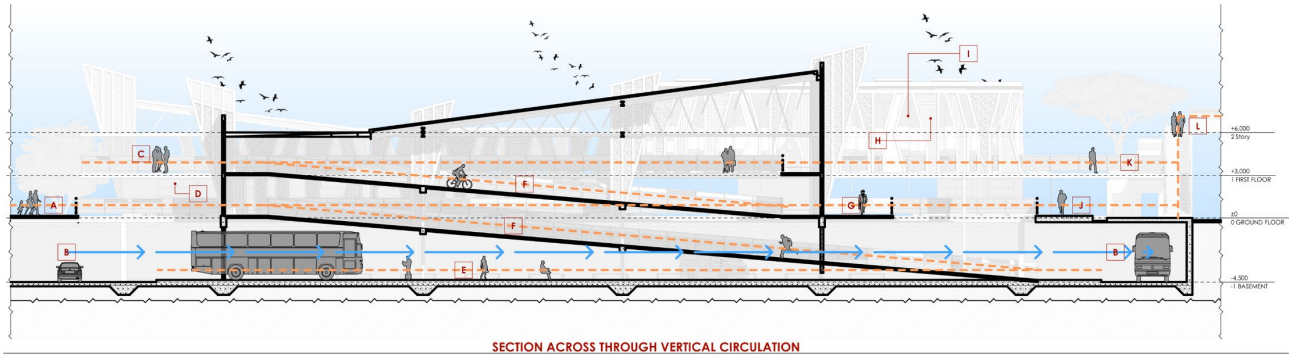
Spatial audits showed a bias design toward vehicular circulation at the expense of pedestrians, vendors, and commuters. As a result, traders encroach on circulation corridors due to a lack of designated commercial zones, passengers endure harsh weather with minimal shelter, and large terminal spaces remain underutilized during off-peak hours, creating both safety concerns and operational inefficiencies. Despite these challenges, survey results demonstrated user enthusiasm for the multifunctional potential of these spaces if formal and informal activities were better integrated through coherent design strategies. These findings align with previous studies by Otieno [19] and Kamunyori [20], who warned that unplanned informal growth often clashes with rigid, transport-centric layouts. Successful precedents such as Tanzania's Dar es Salaam development of a Bus Rapid Transit (BRT), South Africa's Kuyasa Transport Interchange, and England's Pool Meadow Bus Station further illustrate that integrated zoning, modular planning, and placemaking can harmonize transport functions with commercial and social needs [21].

5.2. Recommendation

To solve the spatial and operational challenges, the study recommend a multilayered intervention strategy cited by Nairobi County Integrated Development Plan [10] and the NaMATA Strategic Framework [12] as follows. Multimodal Integration shown in **Figure 7** should account for intergrated multimodal systems, pedestrians, hand-pulled carts, motorcycle taxis, etc. Differentiated pavement materials and levels (differentiated lanes), speed-calming geometry, strategically fortified bollards, universal-access ramps, tactile paving, and shade at waiting points will also prevent conflict and improve safety to all uses [22].

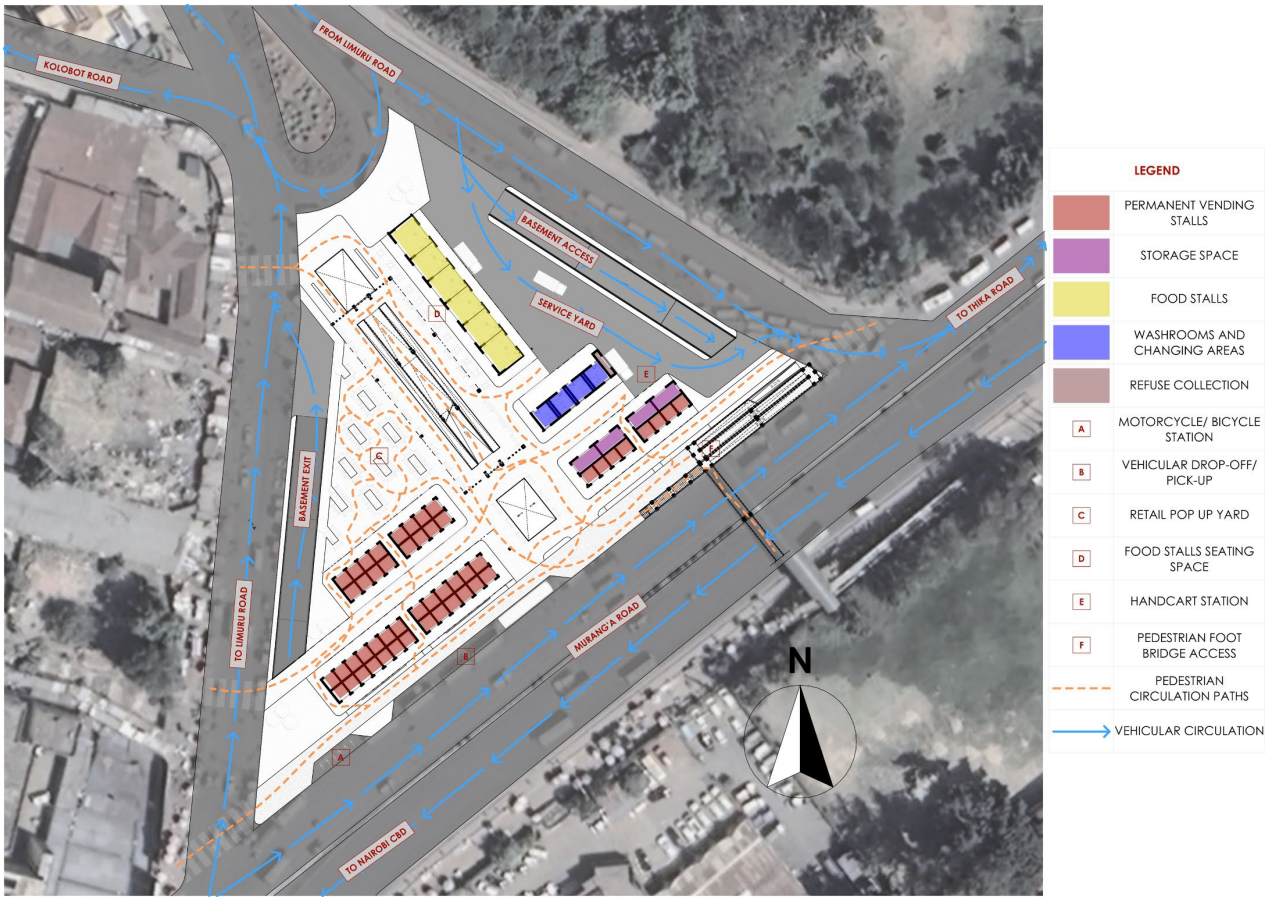
Multimodal Transit access with separated accesses for all modes. Appropriate Zoning should no longer relegate traders to isolated fringes but instead create a network of interlocking activity clusters—commercial, social, transit—that remain porously connected yet distinct. By distributing functions proportionately around the hub, planners can eliminate dead zones and encourage constant, orderly movement [22]. **Map 2** and **Figure 8** indicate a Multimodal Transit access with separated accesses for all modes across the horizontal and vertical scales.

1) Modularity and Multifunctionality as shown in figures 9 and 10, is a flexible system of dealing with the tidal nature of market stalls, food kiosks, and seat usage. Standardized, replaceable, and single-size stall units that were neat, stackable, and portable would wipe out the presence of unsightly haphazard sheds and enable quick rearrangement of spaces on a peak-hour basis [22].



LEGEND			
	PEDESTRIAN CIRCULATION PATHS	F	PEDESTRIAN ACCESS RAMPS
	VEHICULAR CIRCULATION	G	PEDESTRIAN WALKWAY
A	MAIN PEDESTRIAN ACCESS FROM LIMURU ROAD	H	MULTIFUNCTIONAL FACADE ALONG PEDESTRIAN WALKWAYS
B	BASEMENT VEHICULAR CIRCULATION	I	ANCHOR TENANT STALL ON UPPER LEVEL ENCOURAGING DISTRIBUTION OF FOOT TRAFFIC VERTICALLY
C	MULTIFUNCTIONAL COURT WITH SEATING AREAS FOR PERFORMANCES AND RETAIL POP UPS	J	MAIN PEDESTRIAN ACCESS FROM MURANGA ROAD
D	FOOD STALLS	K	PEDESTRIAN FOOT BRIDGE ACCESS ON UPPER LEVEL REDUCING CONGESTION
E	BUS WAITING BAY	L	PEDESTRIAN FOOT BRIDGE ACCESS

Figure 7. Multimodal integration (Source: Author, Field Survey, 2024).



Map 2. SEQ Map*ARABIC 1: Multimodal Transit access with separated accesses for all modes (Source: Author, Field Survey, 2024).

Figure 8. Multimodal integration (Source: Author, Field Survey, 2024).

Figure 9. Modularity and Separation of circulation along the vertical plane with standardized, replaceable, and single-size stall units (Source: Author, Field Survey, 2024).

5.3. Conclusion

Nairobi's intra-city bus termini have the potential to become integrated, efficient, and inclusive urban transport hubs if future designs embrace multimodal connectivity, human-centered planning, and economic inclusivity. Aligning redesign efforts with the CIDP and NaMATA Strategic Framework will ensure that these interventions not only improve transport efficiency but also deliver social, economic, and environmental benefits for the city's growing population. Likewise, shift the design priorities and focus on a balance between vehicular efficiency and human scale, between formal Zoning and informal flexibility, between pragmatic

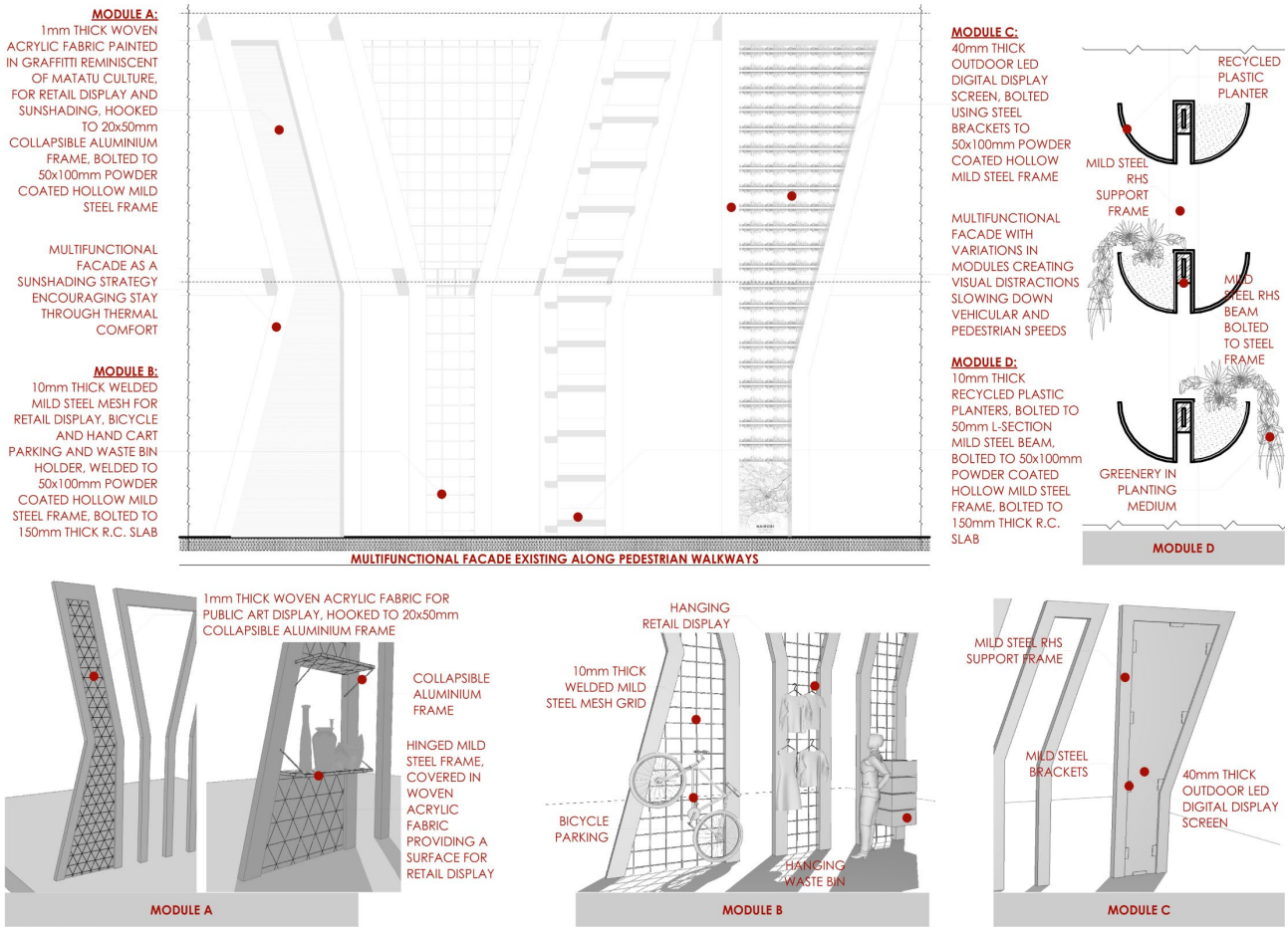


Figure 10. Multifunctional facade (Source: Author, Field Survey, 2024).

infrastructural design and the needs of the people, and the bus termini of Nairobi can become an excellent model of smart, sustainable, and safe city nodes. Its integrated and inclusive approach is projected to enhance the commuter experience, strengthen informal livelihoods, enhance urban aesthetics, and restore operational resilience.

6. Limitations

The study faced spatial and temporal limitations, as data collection was restricted to weekdays, potentially excluding weekend travel patterns. Perceptual limitations also existed, where self-reported responses may have introduced personal or response bias. Additionally, the exclusion of peri-urban termini limited the generalisability of the findings to the well-defined core areas of the metropolis. Nonetheless, the application of methodological triangulation and selection of diverse study sites helped to mitigate these constraints.

To address the spatial and temporal limitations arising from weekday-only data collection, future research should incorporate weekend and peak-off-peak observations to capture the full spectrum of travel behaviors and commuter patterns. Expanding the study to include peri-urban termini would enhance spatial repre-

sentativeness and improve the generalisability of findings beyond the metropolitan core. To minimize response and perception bias, mixed-method approaches such as direct observation, GPS tracking, and focus group triangulation can be applied to validate self-reported data. Furthermore, the use of longitudinal surveys or automated data collection tools (e.g., smart card or mobile tracking) can improve temporal accuracy. The current study's methodological triangulation and site diversity already mitigate some of these limitations by providing multiple perspectives and cross-validating results, but future extensions should deepen this integration across time and space to strengthen reliability and applicability.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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