

City Planning and Policy Frameworks and their Implications for School Transport in Nairobi, Kenya

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Abstract

City planning frameworks in African cities have largely failed to address school transport, resulting in unregulated, costly, and unsafe systems. This study examines Nairobi's policy and planning framework governing school transport, evaluating its effectiveness and proposing improvements. A mixed-methods longitudinal design analysed 18 policy instruments (1948–2025), eight legal frameworks, institutional interviews, household surveys (n=96), pupil surveys (n=80), school surveys (n=19), GIS analysis, and secondary data comparing 2010 and 2025. Only six (33.3%) policy instruments referenced school transport, and no legal instrument created affirmative government obligations. Institutional responsibility is fragmented across five agencies, with 92% of officials citing unclear leadership. Despite a 227% increase in schools, average walking distance remains 1.1 km. Walking accounts for 42% of trips, while students commute 1–3 hours daily. School transport consumes 41.5% of public-school education expenses. The proposed five-pillar framework integrates school neighbourhood units, safe routes, subsidised buses, non-motorised transport, and institutional reform to enhance accessibility, safety, affordability, and equity.

Keywords: School transport, urban planning, transport policy, Nairobi, accessibility, household expenditure

INTRODUCTION

City planning frameworks provide integrated policy, legal, and institutional mechanisms that guide urban development decisions over time (Rydin, 2011). School transport systems, as essential components of urban mobility, enable students to access education reliably, safely, and affordably through networks of infrastructure, vehicles, services, and institutions (Brooks, 2025). In developed countries, comprehensive policy frameworks increasingly treat school transport as a public good requiring systematic planning and dedicated resources, including statutory provision and regulated safety standards (Taylor, 2024; Brooks, 2025).

In Africa, planning frameworks have been characterised as “thin” due to weak enforcement capacity, fragmented institutional mandates, and reliance on outdated colonial-era standards (Berrisford, 2011). School transport systems are often fragmented, with no single authority

coordinating routes, safety standards, or fares (Behrens et al., 2015). Consequently, many children walk long distances or depend on unregulated public transport, exposing households to safety risks and financial burdens (Lucas & Nkurunziza, 2017; Porter et al., 2013).

Kenya's city planning framework comprises the Constitution (2010), Physical and Land Use Planning Act (2019), Urban Areas and Cities Act (2011), and sectoral policies including NIUPLAN (2014), yet no framework specifically addresses school transport (Republic of Kenya, 2019; Nairobi City County, 2014). Nairobi's school transport system operates largely through ad hoc arrangements, with 65 per cent of children walking, 18 per cent using matatus, and only 5 per cent using school buses (Post Buckley International, 1999; Mutua & Otieno, 2021). Following the rollout of Free Primary Education in 2003 and Free Day Secondary Education in 2008, student enrolment increased significantly, reaching 424,891 primary

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school learners in Nairobi by 2023 (KNBS, 2024). However, school transport provision has not developed correspondingly, resulting in long trips, high fares, and unsafe travel conditions (Ondego, 2000).

The study therefore examines how Nairobi's legal, policy, and city planning frameworks have directly and indirectly influenced the school transport system. The historical policy review covers 1948–2025, while the longitudinal assessment compares school transport conditions between 2010 and 2025, thereby distinguishing the historical policy analysis from the empirical comparison period.

Problem Statement

Ideally, all children should access schools safely, affordably, and reliably through coordinated land-use and school-transport planning that minimises travel distances and risks (UN, 1989; Wilson et al., 2010). Well-regulated school transport systems can reduce household expenditure while improving children's safety (McDonald & Aalborg, 2014). However, Nairobi presents a substantially different situation.

Despite school-age children constituting approximately 25–30 per cent of the city's population, the school transport system remains inadequately regulated, costly, and unsafe (Obiero, 1992; KNBS, 2024). More importantly, the systemic policy and planning failures underlying these challenges remain insufficiently examined. No comprehensive policy audit of Nairobi's planning instruments has assessed the extent to which they address school transport, while the statutory obligations of government across relevant legal frameworks have not been systematically analysed (Post Buckley International, 1999; Mutua & Otieno, 2021).

Institutional fragmentation among responsible agencies also remains inadequately documented, while the relationship between policy and planning gaps, school accessibility, operational efficiency, and household transport expenditure has not been sufficiently established. The study addresses these gaps by examining existing frameworks, evaluating their effectiveness, assessing the implications of identified gaps for household expenditure, and proposing an improved city planning framework for sustainable school transport in Nairobi. This integrated assessment provides the study's

principal scholarly contribution by linking policy and planning deficiencies directly to accessibility, operational efficiency, and household transport costs.

Research Objectives

- i. To analyse the key provisions of the existing legal, policy, and city planning framework governing school transport in Nairobi.
- ii. To evaluate the effectiveness of the legal, policy, and city planning framework in addressing school transport accessibility and operational efficiency.
- iii. To assess the implications of legal, policy, and city planning framework gaps on school transport costs and household expenditure.
- iv. To propose a city planning framework that can ensure an improved and sustainable school transport system.

Scope of the Study

Theoretically, the study examines how policy and planning frameworks influence school transport outcomes through interconnected urban subsystems, focusing on accessibility, operational efficiency, and household costs. It also incorporates elements of Generalized Cost Theory to analyse monetary, time, and safety implications.

Geographically, the study is limited to Nairobi City, Kenya. Nairobi was selected because of its rapid urbanisation, spatial inequalities in school distribution, and persistent school transport challenges. The findings are expected to offer lessons for other rapidly growing African cities facing similar conditions.

THEORY

Concept of City Planning Framework

What is a City?

According to the United Nations (2016), a city is a highly populated urban area characterised by diverse economic, administrative, and cultural activities. It features a diverse population, complex land-use patterns, and reliance on external resources. In the African context, cities are characterised by rapid urbanisation, colonial-era planning systems, high population growth, informal settlements, and inadequate service delivery that often excludes the urban poor (Pieterse, 2011).

The Constitution of Kenya (2010) and Urban Areas and Cities Act classify urban areas into markets, towns, municipalities, and cities. A city has a minimum population of 250,000 inhabitants, capacity to generate revenue, and strategic regional economic importance, with Nairobi designated as Kenya's capital city (Republic of Kenya, 2011).

Table 1 summarises this classification.

These definitions highlight that a city is not merely a physical space but a socio-economic system whose development and allocation of essential services, including education and transport, are influenced by planning. The original manuscript similarly links urban classification to the planning and allocation of essential services.

Concept of City Planning

Globally, city planning is the deliberate process of managing urban growth, determining land uses, planning infrastructure networks, and controlling development to meet public health, welfare, and efficiency objectives (Levy, 2017). In Africa, city planning has been criticised as a colonial import characterised by master plans that inadequately respond to rapid informal urbanisation (UN-Habitat, 2014).

In Kenya, city planning is regulated by the Physical and Land Use Planning Act (2019), which requires integrated spatial planning, public consultation, and cooperation between national and county governments. However, despite these established mechanisms, their implementation has remained weak (Nairobi City County, 2014).

City Planning Framework

A city planning framework refers to an integrated set of policies, legal instruments, institutional arrangements, standards, and implementation mechanisms guiding urban development decisions over time (Rydin, 2011). African

planning frameworks have been characterised as “thin” because of weak enforcement capacity, fragmented institutional mandates, and outdated colonial-era standards (Berrisford, 2011).

In Kenya, the framework comprises the Constitution (2010), Physical and Land Use Planning Act (2019), Urban Areas and Cities Act (2011), Nairobi City County Integrated Development Plan, and sectoral policies including NIUPLAN (2014). However, no framework specifically addresses school transport (Republic of Kenya, 2019; Nairobi City County, 2014).

Policy and Planning Framework Governing School Transport

Statutory entitlement models in the UK produce stronger equity outcomes than discretionary models in the US and Australia, where services vary by district wealth and distance thresholds may create inequalities (Brooks, 2025; Taylor, 2024; Black et al., 2013). Wilson et al. (2010) found statutory frameworks reduce household expenditure, although critics argue that distance thresholds can overlook route safety and school-quality disparities (Baslington, 2008; McDonald & Aalborg, 2014).

African evidence challenges the assumption that having a policy necessarily ensures effective implementation. Across five cities, dedicated public-school transport was largely absent, leaving children dependent on walking and informal transport (Behrens et al., 2015). South Africa similarly demonstrates that comprehensive policy can remain ineffective where budget and vehicle-safety constraints persist (UDM, 2025).

Regarding accessibility and operational efficiency, strong statutory frameworks can increase transport coverage and reduce household expenditure (Brooks, 2025; Wilson et al., 2010).

TABLE 1

Classification of urban areas by population

Category	Minimum population	Examples
City	250,000+	Nairobi, Mombasa, Kisumu, Nakuru, Eldoret
Municipality	50,000+	Thika, Kisii, Malindi, Kitale, Ngong, Machakos, Chuka
Town	10,000+	Gilgil, Molo, Emali, Karuri, Wajir
Market Centre	2,000+	Dadaab, Masalani, Awasi

Source: Urban Areas and Cities Act (Kenya, 2019)

Centralised contracting may also reduce per-student costs (Black et al., 2013). However, poor land-use and transport integration contributes to congestion and unreliable access (Hatfield et al., 2025; Opiyo & Obudho, 2025).

Policy gaps also have implications for household expenditure. Studies indicate that transport costs increase with distance, while conventional monetary measures may overlook broader generalised costs involving time, safety, and opportunity (Wilson et al., 2010; McDonald & Aalborg, 2014; Black et al., 2013). African evidence shows that school transport imposes substantial costs on poor households, while parents may lose productive hours accompanying children (Behrens et al., 2015; Porter et al., 2013; Lucas & Nkurunziza, 2017).

For improved school transport, Safe Routes to School approaches integrate engineering interventions, traffic calming, pedestrian infrastructure, education, and enforcement. Such measures can reduce pedestrian injuries, although evidence from low-income settings remains limited (DiMaggio & Li, 2013; McDonald & Aalborg, 2014). African frameworks must additionally recognise walking and informal transport as dominant travel modes rather than focusing primarily on motorised transport (Behrens et al., 2015; Zainol, 2026).

In Kenya, the School Neighbourhood Unit concept, based on a 0.5–0.7 km radius, remains inadequately implemented (Republic of Kenya, 2008), while the draft school transport strategy remains pending (Nairobi City County, 2024). This demonstrates the continuing gap between planning provisions and implementation.

Theoretical Framework

General Planning Process Theory conceptualises planning as a rational sequence of problem identification, solution generation, evaluation, and implementation (Wells, 1975). It helps explain why planning documents repeatedly identify school transport challenges without implementing solutions. However, its assumptions of rationality and political neutrality limit its ability to explain persistent institutional and political implementation failures (Sietchiping, 2004).

Generalized Cost Theory conceptualises travel

costs as comprising monetary, time, safety, and opportunity costs (Papacostas & Prevedouros, 1993). It explains household burdens arising from fares, poor infrastructure, and long commuting times but inadequately captures household coping strategies and differential impacts on low-income families (Mutua & Otieno, 2021).

The study therefore adopts Systems Theory of Planning as its dominant theory. Bertalanffy (1968), McLoughlin (1969), and Chadwick (1971) conceptualise the city as an interconnected system where changes in one component affect others. The theory explains school transport as a systemic issue involving education, transport, household economy, land use, and planning institutions. It consequently provides a stronger basis for understanding why isolated interventions produce limited outcomes. The manuscript identifies this interconnected explanation as the principal reason for selecting Systems Theory.

The theoretical framework presented in **Figure 1** illustrates how Systems Theory of Planning provides the overarching perspective for understanding the interconnected relationships among city planning, institutional arrangements, school transport, accessibility, operational efficiency, and household costs.

Research Gap

Existing literature on school transport in African cities largely concentrates on modal choice, accessibility, costs, and safety without adequately examining how city planning and policy frameworks shape these outcomes. Institutional mechanisms connecting planning decisions with school accessibility remain insufficiently explored. The application of Systems Theory to school transport also remains limited, particularly in explaining how fragmented institutional mandates and policy gaps interact with household costs and accessibility. This study addresses these gaps by linking legal, policy, planning, institutional, accessibility, operational, and household-cost dimensions within an integrated assessment of Nairobi's school transport system.

Conceptual Framework

The conceptual framework follows this section and should demonstrate how legal, policy, and city planning frameworks influence school transport accessibility, operational efficiency, costs, and

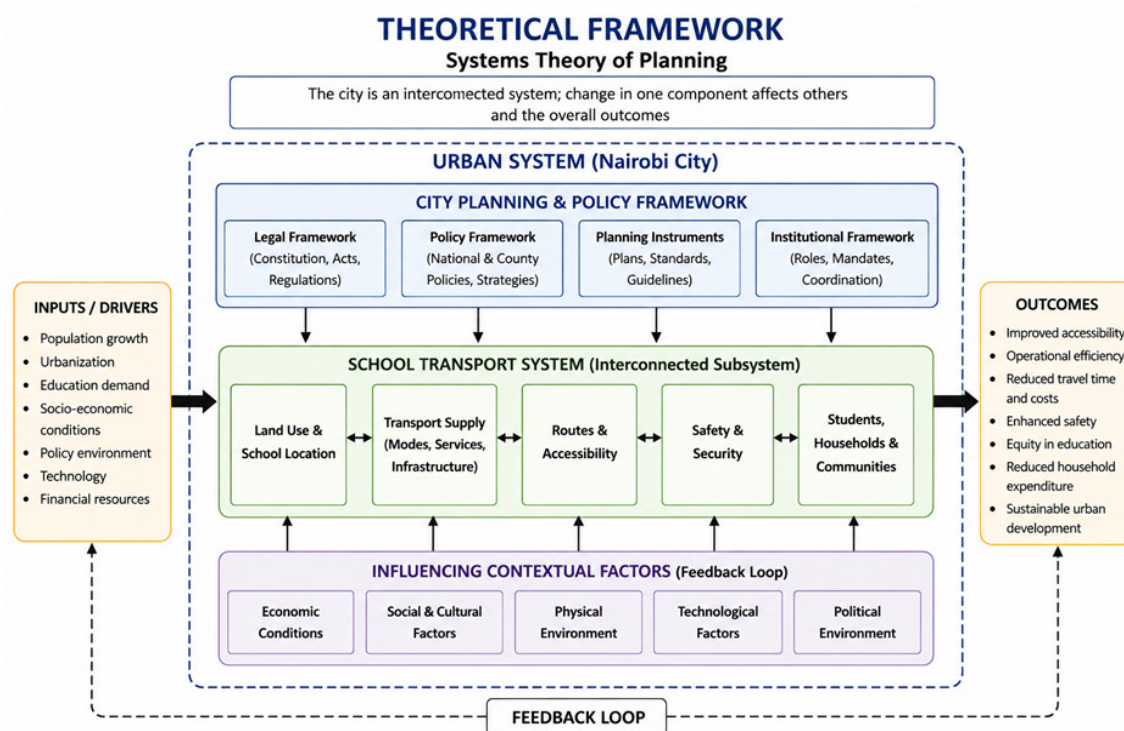


FIGURE 1

Theoretical framework for the school transport system

Source: Authors, adapted from Bertalanffy (1968), McLoughlin (1969), and Chadwick (1971)

household expenditure, interpreted through the interconnected relationships established by Systems Theory. The conceptual framework presented in **Figure 2** illustrates the relationship between the legal, policy, city planning, and institutional frameworks governing school transport and their influence on accessibility, operational efficiency, costs, household expenditure, and wider outcomes within Nairobi's school transport system.

The framework conceptualises school transport as an interconnected urban system in which legal, policy, city planning, and institutional frameworks influence school location and land use, transport supply and services, routes and accessibility, safety and security, and the experiences of students, households, and communities. These components collectively determine accessibility, operational efficiency, transport costs, household expenditure, and broader social outcomes. Contextual factors, including economic conditions, demographic trends, urbanisation, technology, social conditions, and environmental factors, further influence the functioning of the system. Consistent with Systems Theory, the feedback loop demonstrates that school transport outcomes can

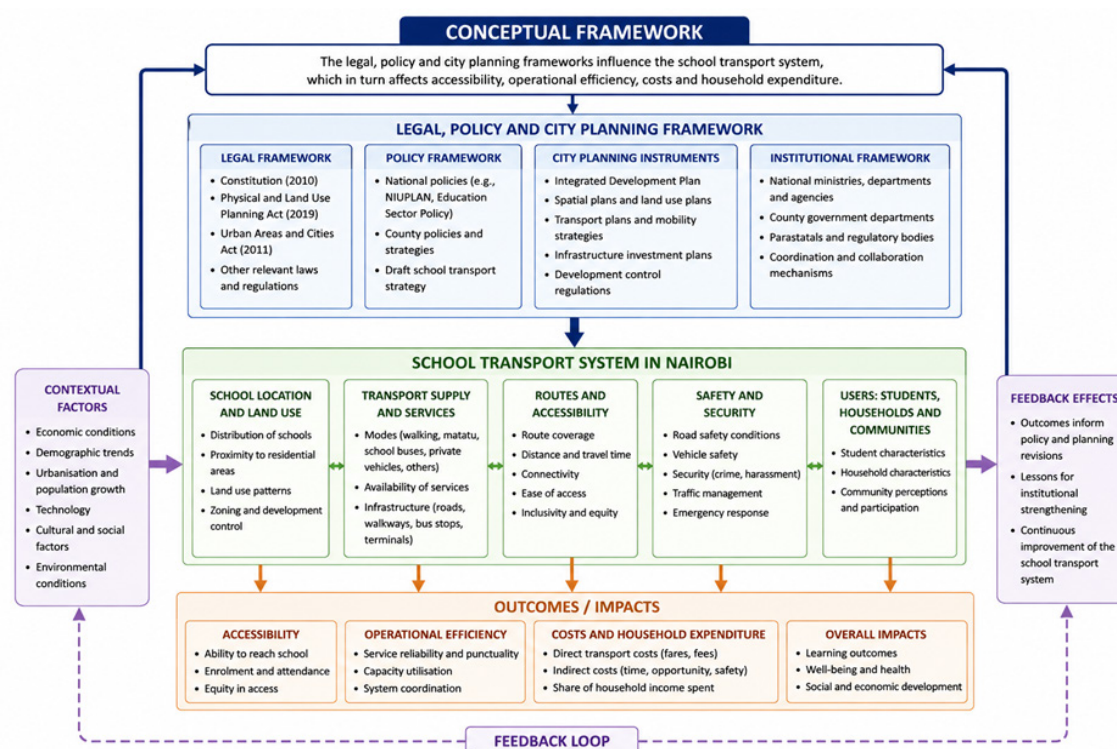
inform subsequent policy and planning revisions, institutional strengthening, and continuous system improvement.

RESEARCH METHODS

Research Design

This study adopted a mixed-methods longitudinal research design, combining qualitative and quantitative approaches to examine changes in Nairobi's school transport system between 2010 and 2025. The longitudinal framework enabled measurement of changes in school transport demand and supply over fifteen years while identifying persistent challenges resistant to policy intervention. The design was informed by critical realism, enabling examination of underlying mechanisms, including policy enforcement failures, institutional fragmentation, and socio-economic disparities.

The research comprised three temporal components: a historical policy review covering 1948–2025, longitudinal comparison of 2010 and 2025, and cross-sectional analysis of current conditions in 2025–2026.

**FIGURE 2**

Conceptual framework for the school transport system in Nairobi

Source: Authors (2026), adapted from the Systems Theory of Planning (Bertalanffy, 1968; McLoughlin, 1969; Chadwick, 1971).

Sampling Design and Techniques

The study employed multistage sampling. Three sub-counties were purposively selected based on school density using GIS analysis: Embakasi Central (12.94 schools/km²), Dagoretti South (3.74 schools/km²), and Lang'ata (0.13 schools/km²), representing high-, medium-, and low-density school accessibility.

The sampling units comprised households with schoolchildren, pupils, day primary schools, school transport operators, and transport infrastructure. Using Yamane's (1967) formula at a 90% confidence level, 96 households were surveyed, with a minimum of 12 from each of eight administrative divisions. The study also covered 19 primary schools and 80 pupils, the latter determined using Cochran's formula at a 90% confidence level and design effect of 1.2. Additionally, 12 institutional interviews, 5–7 expert interviews, and three stakeholder workshops were conducted.

Stratified random sampling selected households based on residential density and income, while pupils were selected through simple random sampling. Convenience sampling captured

transport operators and routes, while purposive sampling enabled re-surveying of the same 19 schools and operators studied in 2010.

Data Collection Methods

For the policy and planning framework, document analysis reviewed 18 policy instruments covering 1948–2025, while statutory gap analysis examined eight key laws. Semi-structured interviews with 12 officials from relevant government institutions assessed mandates and institutional coordination.

Spatial and demographic trends were assessed using GIS analysis of school distribution and secondary KNBS census data. School surveys examined enrolment, pupil-teacher ratios, and capacity across 19 schools.

School transport conditions and costs were assessed through modal split surveys involving 80 pupils, seven-day travel time and distance logs, household transport expenditure surveys, vehicle condition inspections, and route assessments covering pedestrian infrastructure within 500 metres of schools. NTSA accident data for 2020–2024 were analysed by age and road-user category,

while parent surveys captured time spent escorting children.

Framework development drew on international best-practice cases, three stakeholder validation workshops, expert interviews, GIS suitability analysis based on neighbourhood-unit concepts, and cost-benefit analysis.

Data Analysis Methods

Qualitative data were analysed using content and thematic analysis of policy documents and interview transcripts. Quantitative analysis employed descriptive statistics, including percentages, means, and standard deviations, and inferential statistics, including t-tests and chi-square tests, to compare 2010 and 2025 data. GIS analysis involved spatial mapping, buffer analysis, and density calculations. SPSS and ArcGIS were used for analysis, while mixed-methods integration was achieved through triangulation of documentary, survey, spatial, and interview evidence.

Validity, Reliability, and Piloting

Research instruments were piloted with 10 households and two schools to assess clarity and comprehensiveness. Validity was strengthened through expert review and triangulation, while reliability was enhanced through standardised protocols, consistent enumeration, and inter-coder verification of qualitative data.

Ethical Considerations

Informed consent was obtained from participants, including parental consent for pupils. Confidentiality and anonymity were maintained, and findings were reported in aggregate. Institutional approval was obtained from the University of Nairobi and relevant government authorities.

Justification for Selection of Nairobi

Nairobi was selected because of its large school-age population, severe transport challenges, spatial inequalities in school distribution, and concentration of relevant government institutions. Rapid urbanisation and metropolitan expansion have increased commuting distances, while variations in school density provide an appropriate context for examining the effects of planning frameworks. The findings may therefore provide lessons for other rapidly growing African cities.

RESULTS

Overview

This section presents findings according to the four research objectives: the legal, policy and planning framework governing school transport; its effectiveness in addressing accessibility and operational efficiency; implications for school transport costs and household expenditure; and the proposed city planning framework. Findings derive from analysis of 18 policy instruments, eight laws, institutional interviews (n=12), household surveys (n=96), school surveys (n=19), pupil surveys (n=80), GIS spatial analysis, NTSA accident data and field observations.

Legal, Policy and Planning Framework Governing School Transport

Historical Legal and Policy Scan

A systematic analysis of legal, policy and city planning instruments enacted between 1948 and 2025 found that only six of the 18 policy instruments reviewed (33.3 per cent) explicitly referenced school transport. **Table 2** summarises the principal instruments and their treatment of school transport.

The historical review showed repeated recognition of school transport challenges without corresponding implementation. The 1973 plan identified school trips as 28 per cent of travel, while the 1979 project recommended staggered school hours and bus services. NIUPLAN (2014) subsequently recommended land use-transport integration and a school bus system. The 2024 School Transport Strategy and 2025 Draft Traffic (School Transport) Rules remained at draft or review stages.

Statutory Gap Analysis

Analysis of eight legal provisions found no affirmative obligation requiring government to provide, fund, regulate or subsidise school transport. The main statutory gaps are presented in **Table 3**.

The Constitution provides for the right to education and free and compulsory basic education but does not expressly provide for school transport. Similarly, the Basic Education Act, Traffic Act, NTSA Act and Physical and Land Use Planning Act contain no specific government obligation to

TABLE 2

Summary of reviewed policy instruments and school transport references

Year	Instrument/Document	School Transport Reference	Key Finding/Status
1948	Nairobi Master Plan	No	No provision for school transport
1973	Nairobi Metropolitan Growth Strategy	No	School trips were 28% of travel but excluded from recommendations
1979	Nairobi Urban Transport Project	Yes	School buses and staggered hours recommended but not implemented
2002	Physical Planning Handbook	No	School siting addressed without transport services
2006	Nairobi NMT Policy	Yes	Recognised walking by schoolchildren; partially implemented
2010	Constitution of Kenya	No	Right to education provided without transport
2011	Urban Areas and Cities Act	No	School transport not specified
2013	Basic Education Act	No	No school transport obligation
2014	NIUPLAN	Yes	School bus system and land use-transport integration recommended; not implemented
2019	Physical and Land Use Planning Act	No	School siting standards without transport linkage
2024	Nairobi City County School Transport Strategy	Yes	Draft awaiting approval
2025	Physical and Land Use Planning Handbook	Yes	Provides school catchment radii; not implemented
2025	Draft Traffic (School Transport) Rules	Yes	Safety and operating standards under stakeholder review

Source: Author's policy document analysis, 2026**TABLE 3**

Statutory gap analysis of school transport obligations in Kenyan Law

Legal Instrument	Relevant Provision	School Transport Obligation
Constitution (2010), Art. 43(1)(f)	Right to education	No
Constitution (2010), Art. 53(1)(b)	Free and compulsory basic education	No
Basic Education Act (2013)	Definition of school	No
Children Act (2022)	Child welfare	No
Urban Areas and Cities Act (2011)	County functions	No
Traffic Act (Cap. 403)	PSV regulation	No
NTSA Act (2012; amended 2020)	Road safety regulation	No
Physical and Land Use Planning Act (2019)	Development control	No

Source: Author's statutory gap analysis, 2026

provide school transport.

Institutional Coordination

Institutional interviews further established that school transport responsibilities are distributed among the Ministry of Education, Nairobi City County, NTSA, KURA and NaMATA, without a single institution having an explicit overall mandate. Of the 12 officials interviewed, 92 per cent cited lack of clear institutional leadership, 75 per cent had never attended an inter-agency meeting on school transport, 83 per cent reported having no school transport budget line, and all respondents acknowledged school transport as a growing problem.

Effectiveness in Addressing Accessibility and Operational Efficiency

Spatial Accessibility

GIS analysis showed that the number of primary

schools increased by 227 per cent, from 242 in 1997 to 589 in 2025. Theoretical minimum walking distance declined to 0.48 km, although actual average walking distance remained 1.1 km.

Table 4 shows changes in school travel distances between 2010 and 2025.

School density also varied substantially, ranging from 12.19 schools/km² in Kibra to 0.08 schools/km² in Lang'ata.

Modal Split

The distribution of transport modes changed substantially between 2010 and 2025. **Figure 3** presents the modal split recorded in the 2025 pupil survey.

Walking accounted for 42.0 per cent of school trips, followed by public transport at 32.9 per cent, private cars at 10.4 per cent, school-owned buses at 10.0 per cent, private operators at 3.1 per cent and

TABLE 4

School travel distance trends, 2010 and 2025

Indicator	2010	2025	Change
Theoretical minimum walking distance	0.87 km	0.48 km	-0.39 km
Average travel distance	3.2 km	1.8 km	-1.4 km
Average walking distance	1.8 km	1.1 km	-0.7 km
Average motorised distance	6.5 km	4.2 km	-2.3 km

Source: Field survey (2010; 2025)

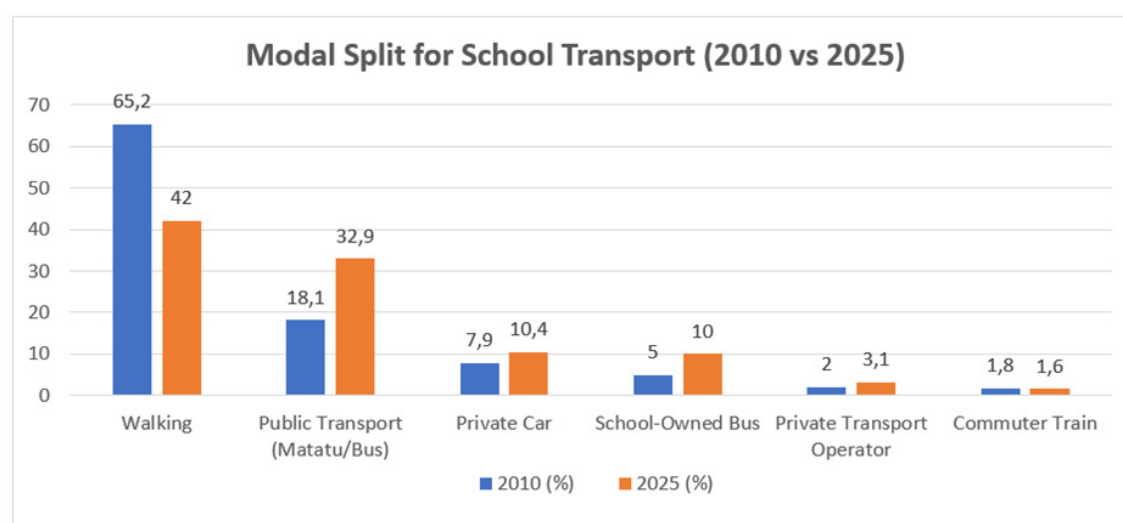


FIGURE 3

Modal split of school transport modes in Nairobi

Source: Field survey, 2026

commuter trains at 1.6 per cent. In 2010, walking accounted for 65.2 per cent and public transport for 18.1 per cent. Students reported spending between one and three hours commuting daily.

The survey also identified a substantial difference between preferred and actual modes. While 44 per cent of pupils preferred school-owned buses, only 10 per cent used them. Conversely, 20 per cent preferred walking compared with 42 per cent who actually walked, while 10 per cent preferred public transport compared with 32.9 per cent who used it.

Implications for School Transport Costs and Household Expenditure

Monetary Costs

Household surveys showed that monthly school transport expenditure per child ranged from KSh1,500 to KSh5,000. Among public-school households, transport accounted for 41.5 per cent of total education expenditure. Forty-three per cent of households reported reducing expenditure on food and healthcare, while 28 per cent reported transferring children to lower-cost schools closer to home.

Table 5 presents changes in average monthly transport expenditure by mode.

The weighted average increased nominally from KSh3,200 in 2010 to KSh5,100 in 2025, representing a 59 per cent increase. The study’s inflation-adjusted estimates recorded a 33 per cent decline in real costs.

Time Costs

Travel also imposed substantial time costs. Twenty-three per cent of students woke between 04:00 and

05:00, 43 per cent between 05:00 and 06:00, and 45 per cent returned home between 17:00 and 19:00. Parents escorting children reported losing approximately three to four productive hours daily. Twenty-seven per cent picked up their children from school, often leaving work one to two hours before the normal end of the working day.

Transport Costs

Public transport return fares increased from a weighted average of KSh70 in 2010 to KSh100 in 2025, a nominal increase of 43 per cent. Private school transport operators charged approximately KSh3,500–7,000 monthly, while school bus charges ranged from KSh4,500–15,000 depending on distance and school type.

Vehicle acquisition costs were also high. A 14-seater van cost approximately KSh5.2–5.7 million, a 33-seater minibus KSh6–8 million, and a 51-seater bus KSh8.5–10 million in 2025.

Safety

NTSA data recorded 22,505 road fatalities and 106,531 total casualties nationally between 2020 and 2024. **Figure 4** presents the annual casualty trend over the five-year period.

Annual fatalities ranged from 3,975 in 2020 to 4,748 in 2024, while total casualties increased from 16,970 to 24,245. Children under 18 accounted for 1,009 deaths in 2023–2024, while pedestrians accounted for 65 per cent of fatalities in the study area.

Proposed City Planning Framework for an Improved and Sustainable School Transport System

TABLE 5
School travel distance trends, 2010 and 2025

Mode	2010	2025	Nominal Change
Public transport	KSh2,500	KSh4,200	+68%
Private car	KSh6,000	KSh9,500	+58%
School-owned bus	KSh5,000	KSh7,800	+56%
Private operator	KSh3,500	KSh5,500	+57%
Weighted average	KSh3,200	KSh5,100	+59%

Source: Author’s statutory gap analysis, 2026

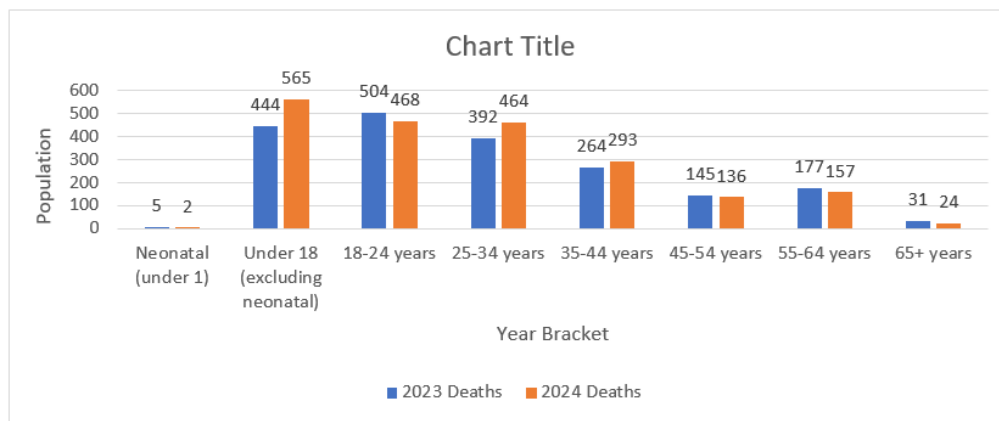


FIGURE 4
Annual road traffic casualties in Kenya, 2020–2024
Source: NTSA, 2026

Based on findings from the preceding objectives, the study developed a five-pillar city planning framework for school transport.

The first pillar covers school siting and land-use planning, based on neighbourhood units of approximately 5,000 residents and primary-school catchment radii of 0.5–0.7 km. The second comprises a Safe Routes to School Programme, covering pedestrian walkways, crossings, 30 km/h school zones, lighting, signage and crossing guards within 500 metres of schools.

The third pillar provides for integrated public transport for schools, including a subsidised school bus service and regulation of private school transport operators. The fourth addresses non-motorised transport, particularly pedestrian and cycling infrastructure and supervised walking programmes.

The fifth pillar addresses institutional coordination, centred on a dedicated School Transport Coordination Unit bringing together Nairobi City County, the Ministry of Education, NTSA, KURA, NaMATA and other stakeholders. The framework also identifies dedicated financing and defined walking-distance thresholds as components of the proposed system.

The framework targets, within five years, an average walking distance of no more than 0.7 km, a 50 per cent reduction in child pedestrian fatalities, subsidised bus access for more than 50,000 students, reduction of household transport

expenditure from 41.5 per cent to 25 per cent or less of education expenditure, and average daily school travel time of no more than 30 minutes.

DISCUSSION

Policy and Planning Framework

The finding that only six (33.3%) of the 18 policy instruments reviewed reference school transport, while none of the eight legal instruments creates affirmative government obligations, confirms Berrisford's (2011) characterisation of African planning frameworks as "thin" and extends it by documenting limited attention to school transport across 77 years of planning and policy instruments. Institutional fragmentation across five agencies, with no clear overall mandate and 92% of officials citing unclear leadership, similarly aligns with Behrens et al's (2015) analysis of fragmented responsibility and weak accountability in African urban transport planning.

The 1973 plan's identification of school trips as 28% of travel, yet their exclusion from recommendations, challenges General Planning Process Theory (Wells, 1975), demonstrating that identification of a planning problem does not necessarily guarantee implementation. Political economy factors, including competing sectoral priorities and weak advocacy, may help explain why rational planning recommendations remain unimplemented (Sietchiping, 2004). This finding supports Systems Theory, which views urban transport, education, land use and institutions as interconnected subsystems rather than

independent planning sectors (Bertalanffy, 1968; Chadwick, 1971; McLoughlin, 1969).

Effectiveness in Addressing Accessibility and Operational Efficiency

Despite a 227% increase in the number of schools, the actual average walking distance of 1.1 km remains more than double the theoretical minimum of 0.48 km. This finding is consistent with McDonald and Aalborg (2014), who established that geographical proximity alone does not necessarily reduce school travel distances where school choice and quality influence household decisions. The substantial spatial disparity in school density, ranging from 12.19 schools/km² in Kibra to 0.08 schools/km² in Lang'ata, also supports Sietchiping's (2004) analysis of historical planning patterns and continuing spatial inequalities.

The modal shift from walking, which declined from 65.2% in 2010 to 42.0% in 2025, alongside increased dependence on public transport, demonstrates changing school travel behaviour. More importantly, the preference-availability gap shows that actual travel modes do not necessarily represent student preferences: 44% preferred school buses, yet only 10% accessed them. This challenges a straightforward application of Central Place Theory (Christaller, 1933), because geographical proximity alone cannot explain school travel patterns. School choice, transport availability, historical development and spatial distribution also influence travel decisions, consistent with Mitra and Buliung's (2012) findings on cross-boundary school attendance.

The findings further suggest that improving physical accessibility requires coordinated interventions rather than infrastructure provision alone. This is consistent with Rahman et al. (2020), who identify pedestrian infrastructure, accessibility, land-use mix and traffic safety as interconnected determinants of active transport.

Implications for Costs and Household Expenditure

School transport accounting for 41.5% of education expenditure among public-school households demonstrates a substantial household financial burden. This exceeds the 2–4% reported in dedicated school transport systems by Wilson et al. (2010), suggesting that where organised provision is limited, considerable responsibility

is transferred to households. The finding is also consistent with Kenyan evidence showing households spending KSh1,500–5,000 per child monthly on school transport (Mutua & Otieno, 2021).

Household coping strategies further demonstrate that the burden extends beyond transport expenditure. Forty-three per cent of households reduced spending on food and healthcare, while 28% transferred children to closer, lower-cost schools. These findings mirror Porter et al.'s (2013) observations concerning the effects of transport constraints on low-income households.

Although real transport costs declined by 33% despite nominal increases, substantial non-monetary costs remain. Students commute for 1–3 hours daily, while parents lose approximately 3–4 productive hours through escorting and collecting children, consistent with findings reported by Opiyo and Obudho (2025). The recorded 1,009 child fatalities in 2023–2024 further demonstrates the safety dimension of school travel.

These findings strengthen the application of Generalized Cost Theory (Papacostas & Prevedouros, 1993), which conceptualises travel costs as including monetary, time, safety and opportunity costs. However, the results extend this perspective by showing that household coping strategies, including reduced expenditure on essential needs and school transfers, also form part of the wider welfare consequences of transport costs. This is particularly important for low-income households, whose experiences may not be adequately captured by direct monetary expenditure alone (Mutua & Otieno, 2021).

Framework and Theoretical Synthesis

The proposed five-pillar framework responds to the systemic weaknesses identified in the findings through integrated school siting and land-use planning, Safe Routes to School, subsidised public-school buses, non-motorised transport and institutional coordination. The Safe Routes component is supported by evidence that combined engineering, education, enforcement and other interventions can improve school travel safety (Houser, 2020; Khalaj et al., 2021). DiMaggio and Li (2013), for example, reported a 44% reduction in school-aged pedestrian injury rates in intervention areas.

The School Neighbourhood Unit concept corresponds with the spatial accessibility principles of Central Place Theory (Christaller, 1933), while the subsidised bus proposal addresses affordability and availability constraints. Institutional coordination responds directly to fragmented responsibilities identified across the five agencies.

Overall, the study extends Systems Theory (Bertalanffy, 1968; McLoughlin, 1969; Chadwick, 1971) by demonstrating how education, transport, household economy, land use and planning institutions interact within Nairobi's school transport system. It also challenges the linear assumptions of General Planning Process Theory (Wells, 1975), showing that technically rational recommendations do not automatically translate into implementation. Generalized Cost Theory is similarly extended by incorporating household coping strategies alongside monetary, time, safety and opportunity costs. The findings therefore demonstrate that sustainable school transport requires coordinated interventions across interconnected urban subsystems rather than isolated sectoral responses.

CONCLUSION

The study met its four objectives through analysis of 18 policy instruments covering 1948–2025 and eight legal frameworks. Findings revealed that only six (33.3%) of the policy instruments referenced school transport, while none created affirmative government obligations to provide, regulate, fund, or subsidise school transport. This statutory gap leaves much of the responsibility for school transport with households.

The study further established that, despite a 227% increase in primary schools, the actual average walking distance of 1.1 km remains more than double the theoretical minimum of 0.48 km. Walking declined from 65.2% in 2010 to 42.0% in 2025, while public transport increased to 32.9%. Students spend between one and three hours commuting daily, and although 44% prefer school buses, only 10% have access to them.

School transport also imposes substantial monetary, time, and safety costs. It accounts for 41.5% of education expenditure among public-school households, while 43% of households reduce expenditure on food and healthcare

and 28% transfer children to closer, lower-cost schools. Parents also lose approximately three to four productive hours daily through school drop-offs and pickups.

The study therefore concludes that Nairobi's school transport challenges are interconnected legal, institutional, spatial, economic, and transport problems requiring integrated responses. The proposed five-pillar framework combines school siting and neighbourhood units, Safe Routes to School, subsidised public-school buses, non-motorised transport, and institutional reform. The study contributes to Systems Theory of Planning by demonstrating the interaction between education, transport, household economy, land use, and planning institutions. It also extends Generalized Cost Theory by recognising household coping strategies, time costs, and safety costs alongside direct monetary expenditure. The framework provides lessons that may be applicable to other rapidly urbanising African cities.

RECOMMENDATIONS

Based on the study findings, the following recommendations are proposed to improve the accessibility, affordability, safety, operational efficiency, and sustainability of Nairobi's school transport system.

Legal and Policy Framework

National governments should enact dedicated school transport legislation creating direct legal obligations to provide, regulate, and subsidise school transport for children. The legislation should establish walking-distance limits beyond which children receive free or subsidised transport, mandatory vehicle safety standards, driver qualifications, route registration, and family complaint mechanisms.

Accessibility and Planning

The School Neighbourhood Unit concept should be mandatory for all new residential developments and school siting, with one primary school per 5,000 persons and a 0.5–0.7 km catchment radius. Catchment-based admission policies should prioritise local children and limit unnecessary cross-boundary travel. Governments should conduct GIS-based school-desert mapping, build new public schools in underserved areas, and improve existing public schools to address quality

disparities that contribute to cross-boundary attendance.

City-wide Safe Routes to School programmes should be implemented on roads within 500 metres of schools, including pedestrian walkways, zebra crossings, speed zones, speed bumps, appropriate footbridges, lighting, signage, and trained crossing guards at high-risk locations.

Costs, Transport Services and Financing

A dedicated School Transport Fund with ring-fenced revenue sources should be established to provide predictable financing for school transport services, subsidies, and safety infrastructure. Child fare subsidies should be introduced during designated school travel hours to reduce household transport expenditure.

Publicly owned or supported subsidised school bus services should be introduced, prioritising low-income communities and areas with poor school accessibility. Private school transport operators should be subject to mandatory registration, licensing, vehicle inspection, driver compliance monitoring, and appropriate fare regulation.

Institutional Reform

A dedicated School Transport Coordination Unit should be established as the single accountable coordinating authority, bringing together education, transport, road safety and planning agencies, operators, and parent representatives. A School Transport Management Information System should support operator registration, vehicle inspection tracking, driver compliance monitoring, accident recording, and subsidy management.

Areas for Further Research

Further research should quantify the contribution of school travel to peak-hour congestion through comprehensive origin-destination surveys. The feasibility and viability of subsidised school bus services should be examined through cost-benefit and operational modelling. Research should also examine the effects of travel time on academic performance, fatigue, and child well-being.

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