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Provision of car parking space in the residential neighborhoods: A development control challenge in urban areas

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ABSTRACT

Although a substantial body of research concurs that most urban areas have a challenge in providing adequate car parking space, there is a scarcity in the literature on how conformity to planning standards that regulates the provision of car parking spaces may be analyzed. This study, therefore, examines the extent to which the planning standards that regulate compliance with the provision of car parking spaces in the residential areas are enforced in Kenya, a case study of Kisii Town. It is anchored in the theory of regulatory compliance with a sample size of 364 residential developments proportionately drawn from the seven neighborhoods. Data were collected using questionnaires and analyzed using means, standard deviation, paired sample t-test and Pearson's bivariate correlation. Research findings showed that although the recommended standard for car parking in Kenya is a ratio of one parking space for every two dwelling units, most developers disregarded the requirement. Hypothesis testing confirmed a significant difference between the recommended planning standards on the minimum number of parking spaces and the extent of conformity by developers, t (289) = 20.261, p=.000), thus, compliance declined by a mean of four. The study concludes that developers rarely comply with planning standard owing to insufficient development control. It is recommended that when approving building plans, it should be mandatory to make provision for adequate parking space followed by monitoring to ensure compliance. The study benefits the international readers by validating how conformity to the standards that regulate car parking space may be statistically analyzed.

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INTRODUCTION

Transportation has long been considered a key variable in urban economic development. In the recent past, the incidence of vehicle acquisition has been on the increase with cars parked for longer hours as the owners peruse different socio-economic interests. This draws attention that the parking of vehicles is a vital component within the urban transportation system which cannot be overlooked (Rooshihan *et al.,* 2019). Advances in urban mobility which are seen in the increased ownership of cars are hence perceived as an indicator of economic prosperity and urbanization (Liu *et al.,* 2012). Parking will, therefore, remain a fundamental constituent of the urban development on the account of the role that it plays in the containments of traffic and congestion

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(Asiyanbola and Akinpelu, 2012). Although parking is perceived as an indispensable part of the trip making in the urban areas, in most urbanized cities, increasing car ownership and inadequate supply of parking space have led to land use conflicts (Adams *et al.,* 2014). As such, the provision of adequate car parking spaces is currently emerging as a topical issue in the neighborhoods of urban areas. This circumstance has arisen due to the rapid increase in the demand for car ownership, which outstrips supply, a challenge whose root cause may be traced to the failed initiatives on land use planning (Ibrahim, 2017). There is, therefore, a need to create a balance between demand and supply so as to ensure that parking does not negatively impact on the urban land use structure (Wang, *et al.,* 2012). Parking, therefore, remains a major problem in urban areas since it provides a linkage between transportation and land use management (Msigwa, 2013).

The situation is not different in Kenya, where parking remains a major problem in key urban areas, a situation that has been compounded by an increase in the population. As a way forward, several proposals have been made. For instance, (Kinyanjui, 2019a; Karanja and Thiongo, 2019), in the City of Nairobi, the county government has in the past made an attempt to double the parking fee for private vehicles within the central business district (CBD). Further efforts have also been made to prevent public service vehicles (locally knows as 'matatus') from accessing the CBD, a strategy for addressing the perennial problem of parking and congestion (Kinyanjui, 2019b; Waweru, 2017). However, such initiatives have been successfully challenged in the law courts with the petitioners having their way. The problem of insufficient parking, congestion and huge traffic jams in the CBDs of key urban areas have been estimated to be costing the country a loss of approximately Kshs 50 billion (USD 500,000) (Ahmed, 2019). Nonetheless, most of the challenges related to parking in Kenya have been narrowed to commercial areas, mainly CBDs of major towns with a lack of consideration of residential neighborhoods that are equally grappling with similar challenges. Further, although Kenya has standards on the minimum number of car parking spaces in residential areas, there has not been any previous attempt to find out if the standard is conformed to by developers, thus a major gap in academia, professional practice and policy implementation. Kisii Town, the study area, is no exception where most residential areas are currently facing a major problem in the provision of adequate car parking spaces.

This study, therefore, examines the extent to which the planning standards that regulate compliance with the provision of car parking spaces in the residential areas are enforced in Kenya. It is undertaken in Kisii Town as a case study. To achieve the stated objective, the study is guided by a corresponding hypothesis that there is no statistically significant difference between the recommended planning standard on the minimum number of car parking spaces in Kisii Town and the extent of conformity by developers. The methodology and findings of this study are expected to benefit the international audience by empirically authenticating how conformity with the recommended planning standards that regulate car parking in residential areas could be statistically analyzed. It may further influence the formulation of transportation policies by providing insight to planning authorities on how to effectively ensure compliance with car parking standards. The central argument in this paper is that once urban planning authorities have developed standards that guide development, they should have a mechanism of monitoring their extent of conformity by developers, car parking standards is, therefore, not an exception. To broadly anchor the research problem, the paper begins with an in-depth literature review that links the current study with the growing body of knowledge in urban transport planning with a particular reference to the provision of parking in urban areas, and in so doing, systematically identifying the gaps in knowledge that the current study sought to fill.

Literature review

Problems related to parking in urban centers is an accrual of the consequences of several variables that include but not limited to the rapid economic transition, increased dependency on cars, high population densities, inadequate regulations on land use planning, ineffectual enforcement by planning authorities, and ambiguous policies on parking (Msigwa, 2013; El-Fadel and Sbayti, 2001). There is, therefore, a need to adopt more practical solutions that would culminate in a sustainable spatial planning framework (Süleyman, 2019). This without a doubt includes the provision of adequate car parking space.

Several studies have up to now been undertaken to account for the reasons why the provision of car parking spaces in urban areas continues to be a challenge.

As a starting point, Aljoufie (2016) assessed the parking traits among the motorists in Jeddah, South Arabia and established that Illegal parking was more evident over the weekends during the peak hour of 6 pm to 10 pm. Further, most drivers preferred parking in unauthorized locations which were closer to their destinations hence purposely disregarding the parking lots which were empty. In China, Yan-ling *et al.,* (2016) established a relationship between an increase in the number of vehicles and adequacy of parking space in Beijing city, an association that resulted in inadequate and disorganized parking, consequently negatively impacting on the residents' quality of urban life. Recommendations made comprised of raising the cost of vehicle usage, levying congestion fees, and increasing the number of parking lots in residential areas. A further case study in China by Chen *et al.,* (2016) through an analysis of different land uses and parking facilities found out that commercial areas exhibited high parking saturation. In contrast, some garages were inconveniently located leading to a low utilization rate of parking spaces. The study recommended an integrated public transport system that would alleviate the prevailing car parking challenges. In an attempt to explore other viable options in the provision of car parking spaces which was observed to be inadequate in the urban areas of India, Dawra and Kulshreshtha (2017) suggested adoption of a concept called, 'spatial zoning', a tactic for decentralizing the development of car parking spaces to other parts of the urban areas. In their view, this approach would minimize the pressure on the centrally designed parking spaces and in so doing significantly promoting a sustainable urban environment. This line of argument compares to that of Sharma *et al.,* (2017) and Amini and Oruji (2017) who both observed that an increased population was the reason behind car parking challenges that affected Kota City, India. The problem was deepened by the owners of commercial developments who used sections of the roads fronting their premises to display products, as a result encroaching on the few available parking spaces. Some of the recommendations made concerning an efficient provision of parking space included introduction of centralized parking (unlike Dawra and Kulshreshtha, 2017), outlawing on-street parking, use parking meters to improve monitoring, establishing an authority to coordinate traffic and parking activities in the town, and encouraging the use of non-motorized transport modes such as bicycles.

The perpetual problem of parking in urban areas may as well be addressed through the adoption of technological innovations. For instance, Gupta *et al*., (2017) through a case study of the selected Indian cities came up with a smart parking management system that aided motorists to automatically search for free parking space within a shorter time. This involved the integration of, among others, ultrasonic sensor and cloud server that operated in real-time. A similar approach was beforehand advanced by Hilvert *et al*., (2012) to establish the variables that influence the choice of parking by divers. The model showed that the choice of parking location was a function of parking cost, search time, and walk time to the destination, facility type, and decision-maker characteristics. The model was consequently applied to a case study to evaluate various policy measures. Specifically, the effect of a change in the demand for on- and off-street parking was evaluated with respect to the parking pricing policy and the value of search time for various parking durations. Analysis of the survey results on the timing of parking decisions suggested that most drivers made their final parking decisions dynamically, in proximity to their destinations, and thus the results supported the proposed approach. The results further postulated that drivers considered the price of parking in two ways: (a) as the overall cost for the entire parking duration and (b) as the price paid per hour of parking. Other documented factors that may also preclude the provision of adequate parking space in urban areas, according to Sabir and Anjum (2017) include the absence of bylaws governing curbside parking, weak institutions, and inadequate public transport. This is in reference to a study conducted in Lahore, Pakistan, where a conclusion is made that the development of curbside parking should be the first step towards managing existing and future curbside parking resources. Akin to previous studies, a study by Amini and Shankar (2017) also delved into the challenges facing vehicle parking in the CBD of Sabzevar City, Iran. Despite the fact that previous efforts had been made by the government

to solve the challenge, not so much had been attained owing to the ever increase in the demand which had negatively affected residents' lifestyles especially during peak hours. As a way, forward, recommendations were made for the development of multi-level car parking spaces at the busiest parts of central business districts, preparing and integrated public transportation policy, discouraging long hour parking, and imposing high fees for a long hour parking.

A further literature review was conducted in reference to selected African countries to further understand the challenges that occasions in the provision of car parking spaces. A recent study by Abu and Mahto (2019) in Addis, Ketema sub-city established that the average parking occupancy of off-street and on-street parking was respectively 90% and 80%. This was bound to escalate owing to an increase in demand that is projected to outstrip supply in the near future. A relative study in Accra, Ghana by Yorgri *et al.,* (2016) established that scarcity in the number of on-street car parking spaces frequently resulted in the loss of lives and properties, a problem fast-tracked by the lack of a parking policy. Additionally, both private and commercial vehicles were parked on-street with few off-street parking provisions which were mostly privately owned. A recommendation was made for the adoption of comprehensive parking and management policy along with collaborating with private companies who could be encouraged to consider investing in the development of car parking spaces. A connected study by Adams *et al.,* (2014) that evaluated the changes in parking turnover and duration for the Adum Paid Parking Scheme in Kumasi, Ghana showed that the proportion of vehicles that parked for more than two hours had almost doubled, a situation that contributed to further congestion, effectually making most shoppers not to easily access any parking space. Among the recommendations made was that the parking fees should be revised since they were too low, as a result, encouraging long term parking.

An earlier study by Osoba (2012) that reviewed parking problems and traffic management strategies in the central business district in Lagos, Nigeria, also revealed that parking problems were triggered by inadequate parking space and illegal development of shops at the car park. Key recommendations included effective land-use planning and strict enforcement of bye-laws. Another study by Msigwa (2013) that examined the parking challenges in urban cities of Tanzania found out that available parking space was inadequate, resulting in double parking, increased traffic congestion and more dispersed destinations. This effectively contributed to economic, social and environmental problems. Moving forward, he recommended for continuous control of on-street parking and provision of adequate off-street parking facilities. Lastly, in Nairobi, Kenya, it is estimated by Harding (2011) that over 30% of traffic is caused by drivers looking for a parking space. Not only do disorganized parking systems result in congestion and increased carbon emissions, but also waste commuters' time, consequently leading to lost productivity and economic opportunities. According to Nyangweso (2015), inadequate parking coupled with a lack of development control is among the factors contributing to the poor state of traffic circulation in the Upper Hill area of Nairobi City County. He further reveals that even the implementation of policies that are intended to enhance traffic circulation was completely disregarded in the area. From the reviewed literature, it is clear that there is a general consensus among all discussants that most urban areas have been facing a daunting challenge in the provision of adequate car parking space, a situation triggered by the ever-increasing urban population. This has, in turn, elicited several reactions leading to recommendations that have unquestionably benefited the current study. However, until now, there is still a dearth of knowledge on two fundamental issues. First, there is a scarcity in the literature on how residential developments in urban areas conform to the recommended planning standards that are used in regulating the provision of car parking spaces by planning authorities. Second, a further scarcity in knowledge exists on how conformity to the same planning standards that are used to regulate car parking on one hand and the extent to which developers comply with them, on the other hand, maybe statistically analyzed. These emerging gaps in the literature of urban transport planning are worth filling given that development control is widely acknowledged as a potent tool for plan implementation. The study was conducted in Kisii Town between November and December 2019.

MATERIALS AND METHODS

Study area

Kisii Town is located in the south-western part of Kenya and currently serves as the designated administrative and commercial headquarter of the Kisii County (Fig. 1), one of the 47 devolved county governments that constitute the Republic of Kenya. The town spatially covers an area of 29km^2 out of which 9km^2 falls within the CBD as leasehold with the rest consisting of peri-urban settlements which are located in freehold areas. Land use planning and development control in the town is an exclusive jurisdiction of the County Government of Kisii (CGOK), the statutory planning authority. This is according to section 56 of the Physical Planning and Land Use Act of 2019 (the Republic of Kenya, 2019a) that grants the county government the powers of controlling the use and development of land with the objective of promoting sustainable spatial development. Without a doubt, this comprises ensuring compliance with planning standards that regulates parking in residential areas.

The CGOK encounters numerous challenges in the provision of parking facilities, especially in residential areas of Kisii Town. As is characteristic in most urban centers in developing countries, this challenge is amplified by the fact that the town lacks a plan to guide its spatial development. The physical development plan that was prepared in 1972 cannot exhaustively address the existing spatial problems such as those related to parking since it is obsolete. The plan, moreover covered only 4km2 of the town's area of 34km^2 implying that 88% remains unplanned. In addition, the plan was a rigid zoning scheme with proposed land uses that included industrial, commercial, recreational, public purposes, public utilities, transportation, and educational land use. A major flaw of the plan was that its planners had no vision on how the town would spatially expand in the near future on the account of increased population growth. The plan equally failed to provide for the planning standards that could be applied in each segregated zone to act as a tool for controlling

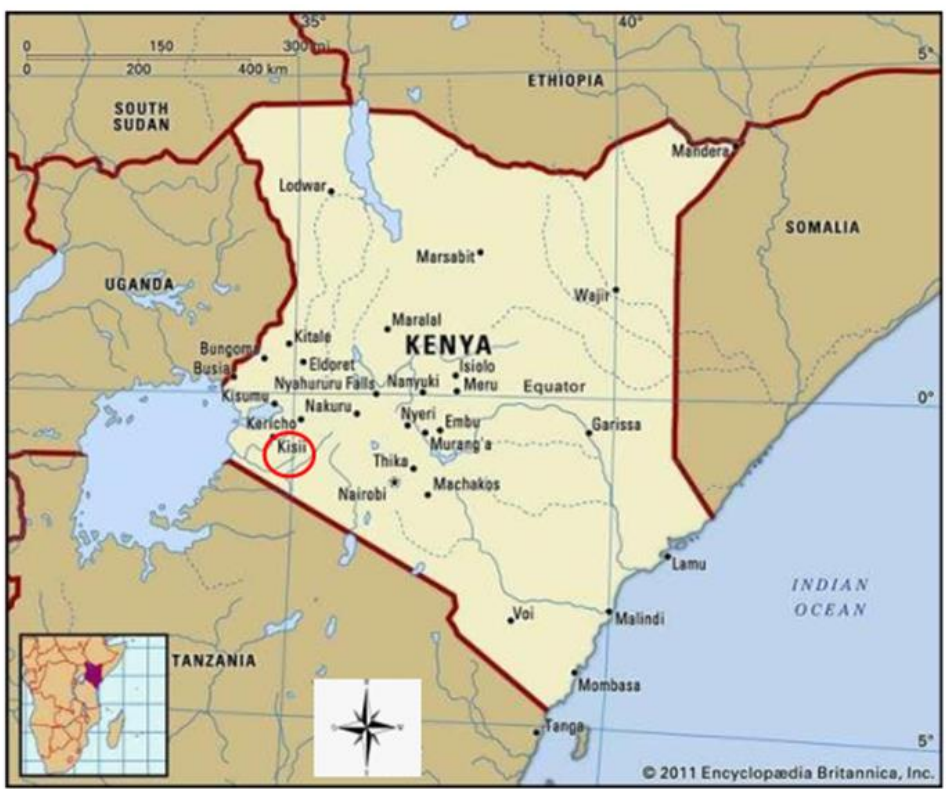

Fig. 1: Location of Kisii Town, the study area (Encyclopedia Britannica, 2011)

development. All these problems may suggest why compliance with planning standards such as those related to car parking space has to date remained a challenge. Regarding population dynamics, the town, according to the Central Bureau of Statistics (the Republic of Kenya, 2019b) had a population of 90700 which is projected to 135,260 in 2032 with an annual growth rate of 2.7%, higher than Kenya's average of 2.7%. Kisii Town has also the third-highest population density in Kenya (2,862 per km2). A combination of these variables in the absence of effective land-use planning is a pointer on why Kisii Town currently faces a major challenge in the provision of adequate parking in the residential areas.

Theoretical Context and Research Philosophy

This study was grounded in the Theory of Regulatory Compliance (TRC), which according to Fiene, (2016) is concerned with complying with stipulated rules and regulations. Applied to the current study, regulatory compliance is effected through legislation and policy guidelines by the CGOK to ensure that developers comply with planning standards, in this case, those that relate to parking space in the residential areas. For example, to ensure compliance with planning standards, section 56 of the Physical Planning and Land Use Act gives powers to the CGOK to forbid the use or development of land and buildings with the objective of promoting orderly spatial development. Further, section 57 (1) of the Act prohibits any person from initiating s development that has not been approved by the CGOK. To safeguard compliance through regulation, section 57 (2) pronounces that a person who initiates any development without first acquiring development permission perpetrate an offence, therefore, predisposed to be sentenced to a fine of not less than five hundred thousand shillings (50 US dollars) or to incarceration for a term of not less two months or to both. This unmistakably gives an indication that developers of residential dwelling units in Kisii Town are obligated by law to comply with the recommended land use planning standards which regulate the number of car parking spaces.

The current study was further anchored in the positivist research philosophy by relying on a deductive method of inquiry where the adopted research strategy involved data collection and hypothesis testing. This was accomplished by working on quantifiable and measurable observations where statistical analyses were used. The emphasis was on replication, meaning that the study could be peer-reviewed and other researchers are able to find similar results. According to Brent and Leedy (1990), replication is the ultimate test of knowledge since positivists uphold that different groups of observers looking at the same facts should obtain the same results.

Population, Sample and Sampling Design

The sampling frame delimits the section of the population from which the sample is selected. Its quality, completeness, and availability are therefore key considerations made when selecting a population for study using statistical inference. Because a researcher seldom has direct access to the entire population of interest, a sampling frame consequently used to represent all elements of the population of interest (Warnecke, 2014; Lewis-Beck, *et al.,* 2011). However, in the current study, there was no readily available sampling frame on the number of residential developments in Kisii Town. To address this challenge, a high resolution and pre-processed satellite image (0.16 meters spatial resolution) that covered the seven residential neighborhoods of Kisii Town was procured from the Regional Centre for Mapping of Resources for Development in Nairobi,

Table 1: Proportional sample size per neighborhood

Neighborhood	Spatially Segregated Buildings	Sample per Neighborhood
Jogoo	1,551	220
Mwembe	1,105	54
Nyamage	1,171	57
Nyanchwa	673	33
Nyamataro	808	40
Egesa	821	40
Daraja Mbili	1.301	64
Total	7,430	364

Kenya, and each development thereafter digitized using QGIS software version 3.10.2 to generate a spatial attribute table, followed by a detailed ground reconnaissance survey to ascertain that the digitized buildings were residential. In the end, 7430 buildings were positively mapped as residential (Table 1). This provided the required sampling frame that was used to investigate the extent to which residential building developments complied the planning standard for the provision of car parking spaces. After spatially determining the study population, the next phase involved determining the boundaries of each residential neighborhood to ensure that there was no overlap in data collection. This was attained through a participatory mapping approach that incorporated the sub location Assistant Chiefs and the representatives of the neighborhood associations. Spatial segregation of the mapped residential developments per neighborhood is presented in Table 1. Sample size determination was undertaken using Krejcie and Morgan (1970) sample size table which suggests that a sample size of 364 should be selected from a population ranging between 7,000 to 7,999. Based on this, each neighborhood was used as a stratum and the number of their buildings divided by 364 to obtain the corresponding proportional sample size (Table 1).

To ensure that there was no bias in the neighborhood sampling, random numbers that were generated using Microsoft Excel software was used. This gave credence that the samples that were drawn from each neighborhood were a correct representation of their population.

Data Collection and Analysis

A questionnaire administered to the developers (the owners of residential buildings) was used to collect data from each residential neighborhood. The instrument was organized into two parts. The first part contained background information such as awareness of building plan approval process and inspection requirement, obtaining of development permits, engagement of professionals in design, and size of land. The second part, on the other hand, had a checklist that was structured into three columns. While the first column was indicating the number of recommended car parking space per the sampled development, the second column, on the other hand, was used to record the observed number of car parking spaces. Conversely, the third column was used to indicate the extent of conformity (that is, conformity = number of appropriate car parking space versus the number of observed parking spaces). In this case, a negative variance would denote non-compliance. Collected data were analyzed using means, standard deviations, Pearson's bivariate correlation and paired sample t-test. Pearson's bivariate correlation was specifically used to determine the correlation between the Building Coverage Ratio (BCR) and Floor Area Ratio (FAR) on one part and the provision of car parking space on the other part. The research hypothesis was tested

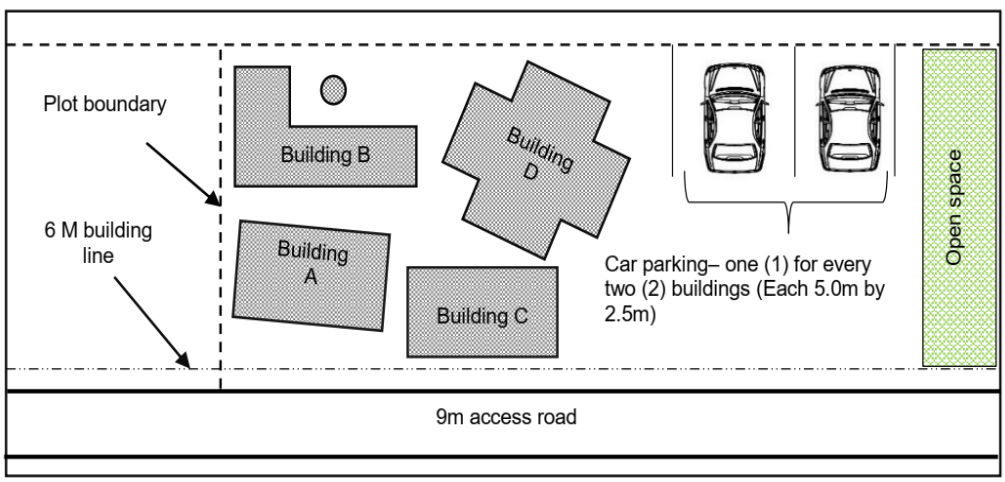

Fig. 2: An illustration of the ratio of residential buildings to car parking space ratio

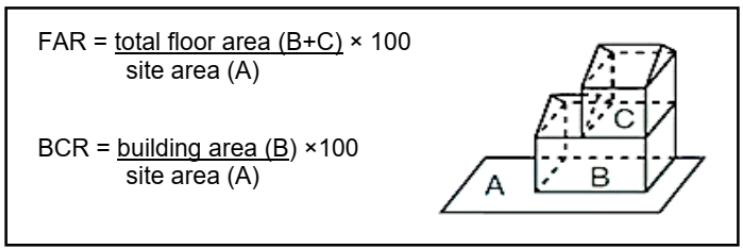

Fig 3. Illustration of FAR and BCR planning standards (UN-Habitat, 2013)

using a paired sample t-test to determine whether the mean difference between two sets of observations was zero. That is if the means of the recommended planning standards on car parking space and observed extent of compliance by developers are zero. In the event that sampled developers were tenants, contacts of their landlords were obtained from them and the landlords approached at a later date for data collection, thus a key contributor to a high response rate. Parking standards are intended to ensure that sufficient space is provided within the plot so as to accommodate all vehicles likely to be attracted to, or generated by the residents. The objective is to minimize accidents, loss of amenity as well as convenience, which are likely to be caused by on-street parking, in consequence promoting safety as a principle of development control. As illustrated, the Republic of Kenya (2007) through the Physical Planning Handbook recommends one car parking space to be provided for every two residential dwelling units (providing a ratio of 1:2) (Fig. 2). This is the planning standard that should be enforced by the CGOK in the study area. The current study in this regard determines the extent to which residential developments conform to this important planning standard.

As alluded to before, the study determined if there was a correlation between BCR and FAR on one hand, and the provision of car parking space, by using a case study of two residential neighborhoods of Mwembe and Nyamage. While FAR is the ratio of total floor area divided by land (site) area, where total floor area means the total of all the floor space in a building, BCR refers to the ratio of the building area divided by the land (site) area, where building area means the floor space of a building when looking down at it from the sky. The formula for computing BCR and FAR is demonstrated in Fig. 3.

For example, the FAR value of 2.0 would indicate that the total floor area of a building is two times the gross area of the plot on which it is constructed, as would be found in a multiple story building (UN-Habitat, 2013). The maximum permitted FAR for Mwembe and Nyamage was respectively 350% with a further corresponding BCR of 70%.

Tests for Statistical Assumption

In the current study, Kolmogorov-Smirnov Test was used to determine if the collected data were normally distributed. The collected data were further tested for other assumptions that included that the dependent variables should be continuous, observations should be independent of one another, and the dependent variables should not contain any outliers.

Ethical Considerations

In this study, the researcher obtained informed consent from all the targeted respondents. To guarantee this, all respondents were enlightened on the procedures followed in conducting the research and their purpose. As a strategy for attaining a high response rate, an option to answer any question concerning the procedures was further made. The instruction that the respondents were free to withdraw consent, and to stop participation in the research at any time without partiality was likewise made. The study also acknowledged that safeguarding of respondents' rights to confidentiality and anonymity were significant tenets in the success of the entire research framework. In this regard, no intrusion was made in people's homes without their consent. To assure this, personal information that was sensitive was not divulged. Anonymity and confidentiality further protected the respondents since there was no way of knowing the identity of the

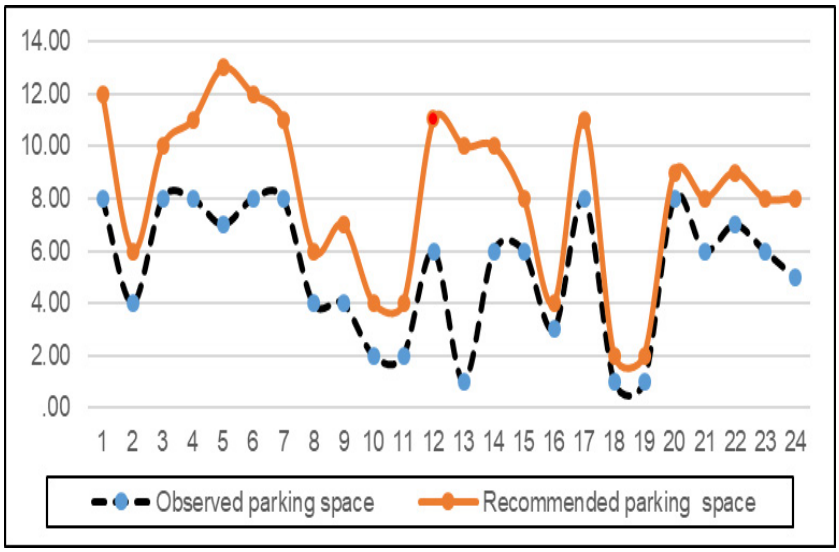

Fig. 4: Variations on the provision of car parking in Nyanchwa

respondent from the information they gave, as the questionnaires had no names. In order to guarantee this, the researcher explained to all respondents about the research, and specifically that the study was for academic purposes only. Importantly, ethical issues were considered from the perspective of the host community. The researcher equally adhered to a code of ethics and took responsibility for all decisions regarding procedural and ethical issues related to the study. This ensured that the study findings were valid and reliable. Before the commencement of data collection, research a permit was obtained from the National Commission for Science, Technology and Innovation.

RESULTS AND DISCUSSIONS

The objective of this study is to examine the extent to which the planning standards that regulate compliance with the provision of car parking spaces in the residential areas are enforced in Kenya. It is being undertaken in Kisii Town as a case study with a hypothesis that there is no statistically significant difference between the recommended planning standard on the minimum number of car parking spaces in Kisii Town and the extent of conformity by developers. This section, therefore, presents the results and discussions of the research findings. It is structured into subsections that include a test for statistical assumptions and response rate; compliance assessment of car parking planning; determinants of noncompliance with car parking standards, hypothesis testing, conclusions and recommendations.

Tests of Statistical Assumptions and Results of Response Rate

A p-value of 0.316 was reported by the results Kolmogorov-Smirnov Test for normality. Since it was greater than 0.05, a conclusion was made that the sample was drawn from a normally distributed population, as a result giving credence for data analysis, reporting and conclusion. Collected data were also continuous and independent of one another. Likewise, there was no outlier in the data as corroborated by a box plot. Concerning the response rate, out of the 364 residential developments that were targeted for data collection, 290 questionnaires were successfully collected consequently representing a response rate of 80%. This was above the 60% threshold that is recommended by Fincham (2008), further providing credibility for data analysis, reporting and drawing of conclusions.

Assessment of Compliance with Car Parking Planning Standards in Kisii Town

Planning standards integrates the applicable legal and policy framework with an objective

of safeguarding and allocating land to various competing uses with the intention of promoting a sustainable spatial urban development (Arimah and Adeagbo, 2000). The standards similarly promote the principles of development control such as esthetics, conservation, convenience, safety, and compatibility. This subsection, therefore, presents the research findings that depict the extent to with the minimum planning standard on car parking space is complied with by residential developments in Kisii Town.

Nyanchwa

While investigating the extent to which developers complied with recommended planning standards in Nyanchwa, the study sought to establish whether they observed the standard of one (1) car parking for every two (2) domestic buildings. This is according to the Physical Planning Handbook of Kenya (the Republic of Kenya, 2007). Preliminary findings depicted graphically demonstrate that this important planning standard is widely flouted in the neighborhood (Fig. 4).

The above findings were corroborated by descriptive statistics indicating that the ideal minimum number of parking per development (M =7.958, SD = 2.0532) was not complied with by the sampled

Table 2: Paired samples for parking standards in Nyanchwa

	Paired Differences					t	df	Sig. (2-tailed)
	M	SD	SEM	95% Confidence Interval of the Difference				
				Lower	Upper			
Recommended planning standard *versus* observed compliance	4.0417	2.236	.4563	3.0977	4.9857	8.856	23	.000

Fig. 5: Residential apartments with no parking in Nyanchwa

developers (M = 3.917, SD = 2.518) in Nyanchwa, an indication of inadequate development control. The significance of these variations confirmed that compliance with the minimum car parking standard by was low (M = 4.417, SD = 2.236) and statistically significant, t (23) = 8.856, p = .000. Research findings specifically showed that compliance on average declined by a mean of 4.042 with a corresponding standard deviation of 2.236 (Table 2).

With a 5% error rate, it can, therefore, be assumed that differences in compliance with the planning standard on car parking space in Nyanchwa will be between 3.0977 and 4.9857. As a consequence of noncompliance with the planning standard, it was observed that some residents parked their vehicles on the road reserves or in undesignated open spaces (Fig. 5).

As shown in Fig. 5, all the three blocks of residential apartments, each with 10 units lacked car parking, as such, residents use the adjacent undeveloped plot owned by a different person. Should the plot be developed, they will have no choice other than parking on the road reserve. Particular attention is also drawn to the block on the right-hand side. Although it is under construction, the developer has not provided for parking spaces, suggesting laxity by the CGOK to enforce compliance. The problem is intensified by the fact that all these blocks have also disregarded the recommended BCR of 65%.

Jogoo, Egesa, Nyamataro, and Daraja Mbili

Analysis of the extent of compliance in Jogoo, Egesa, Nyamataro and Daraja Mbili was concurrently undertaken for the reason that they are spatially situated in Mwamosioma, the largest sub location in Kisii Town. As alluded to before, the recommended planning standard as per the Physical Planning Handbook, 2007, is one (1) car park for every two (2) dwelling units. As a starting point, descriptive paired sample statistics on the extent of compliance with recommended planning standard in each of the neighborhoods within Mwamosioma sub-location was undertaken as shown in Table 3.

Results pointed out that in Jogoo, the mean of observed parking (M = 2.60, SD = 2.18) was lower than that of the recommended parking standard (M = 7.45, SD =4.33). The same was observed in Nyamataro where the observed mean (M = 1.42,

Table 3: Paired statistics - parking, Mwamosioma sub-location

Neighbourhood	Paired Samples	M	N	SD	SEM
Jogoo	Recommended planning standard	7.45	70	4.33	.52
	Observed compliance	2.60	70	2.18	.26
Nyamataro	Recommended planning standard	2.37	35	1.95	.33
	Observed compliance	1.42	35	.814	.13
Egesa	Recommended planning standard	7.90	31	2.07	.37
	Observed compliance	2.96	31	2.52	.45
Daraja Mbili	Recommended planning standard	7.86	60	2.43	.31
	Observed compliance	2.76	60	2.11	.27

Table 4: Paired sample test - parking, Mwamosioma sub-location

		Paired Differences			t	df	Sig. (2-tailed)
		M	SD	SEM			
Jogoo	Recommended planning standard *versus* observed compliance	4.85	4.02	.48	10.08	69	.00
Nyamataro	Recommended planning standard *versus* observed compliance	.942	1.79	.30	3.10	34	.00
Egesa	Recommended planning standard *versus* observed compliance	4.93	3.19	.57	8.60	30	.00
Daraja Mbili	Recommended planning standard *versus* observed compliance	5.10	3.13	.40	12.60	59	.00

SD = .814) was lower than the standard mean (M = 2.37, SD = 1.95). Additionally, in Egesa, the observed mean (M = 2.96, SD = 2.52) was lower than the recommended standard (M = 7.90, SD = 2.07). Lastly, in Daraja Mbili, the observed mean (M = 2.76, SD = 2.11) was less than the recommended standard (M = 7.86, SD = 2.43). Information derived from these sets of descriptive paired statistics divulged a preliminary detection of noncompliance by the developers who were sampled. The study, from the foregoing, examined whether there was a statistically significant difference between the means of recommended parking standards and the observed extent of compliance by developers. This was attained using a paired sample t-test (Table 4).

Results indicated that in Jogoo, compliance was low (M = 4.85, SD = 4.02) among all sampled developments, and statistically significant, t (69) = 10.08, p = .00. In the same way, in Nyamataro, compliance was comparatively low (M = .942, SD = 1.79) and statistically significant, t (34) = 3.10, p = .00. A similar deviation was observed in Egesa and Daraja Mbili where compliance was low (M = 4.93, SD = 3.19) and statistically significant, t (30) = 8.608.60, p =.00; and (M = 5.10, SD = 3.13) and significant, t (59) = 12.60, p =.00 respectively. These findings equally confirm the prevailing status of inadequate development control by the CGOK.

Table 5: Paired sample test on car parking, Mwembe and Nyamage

		Paired Differences			t	df	Sig. (2-tailed)
		M	SD	SEM			
Mwembe	Recommended planning standard *versus* observed compliance	2.50	2.95	0.47	5.36	39.00	0.00
Nyamage	Recommended planning standard *versus* observed compliance	3.65	2.51	0.46	7.97	29.00	0.00

Table 6: Correlation matrix for BCR, FAR and parking, Mwembe and Nyamage

Mwembe				
		Parking	BCR	FAR
Parking	Pearson Correlation	1	.175	.362*
	Sig. (2-tailed)		.279	.022
	N	40	40	40
BCR	Pearson Correlation	.175	1	.658**
	Sig. (2-tailed)	.279		.000
	N	40	40	40
FAR	Pearson Correlation	.362*	.658**	1
	Sig. (2-tailed)	.022	.000	
	N	40	40	40
Nyamage				
		Parking	BCR	FAR
Parking	Pearson Correlation	1	.175	.362*
	Sig. (2-tailed)		.279	.022
	N	40	40	40
BCR	Pearson Correlation	1	.261	.474**
	Sig. (2-tailed)		.163	.008
	N	30	30	30
FAR	Pearson Correlation	.261	1	.405*
	Sig. (2-tailed)	.163		.026
	N	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

Mwembe and Nyamage

Data analysis for these two neighborhoods were analyzed together since they are both zoned by the CGOK as low density. Research findings on descriptive statistics showed that the mean for observed compliance in Mwembe (M = 1.95, SD = 3.46) was lower than the recommended mean (M = 4.45, SD = 3.46). In Nyamage, the observed mean compliance (M = 0.05, SD = 0.00) was equally lower than the desired mean compliance (M = 3.70, SD = 2.51). These findings also reveal that compliance with parking standards was highly disregarded by developers owing to inadequate development control by the CGOK. In an attempt to explore, whether these descriptive observations were statistically significant, a paired sample t-test was undertaken (Table 5).

Paired samples t-test for Mwembe showed an average reduction in compliance with the recommended number of car parking (M = 2.50, SD = 2.95) which was high and statistically significant, t (39) = 5.36, p = 0.00. The same was the case of Nyamage residential neighborhood where the average reduction was observed (M = 3.65, SD = 2.51) and was statistically significant, t (29) = 7.97, p = 0.00. The study further sought to test if there was any relationship between observed Building Coverage Ratio (BCR) and Floor Area Ratio (FAR) on one hand, and the provision of car parking space, on the other hand. FAR refers to the total building square footage (building area) divided by the site size in square footage (site area) while BCR denotes the ratio of the building area divided by the land (site) area. Enforcing FAR and BCR is broadly intended to contribute towards the following urban sustainability benefits:

a) Regulating density or intensity of land use

Fig. 6: Implication of high BCR on car parking space

Table 7: Determinants of noncompliance with car parking planning standard in Kisii Town

Key Determinant	N	Minimum	Maximum	M	Std. Deviation
Extent of developers engagement of professionals in design	290	1.0	5.0	3.014	.8021
The extent of enforcing the requirement on engaging professionals in design by the CGOK	290	1.0	5.0	3.221	1.0152
The extent of developers awareness of building inspection requirement by the CGOK during building construction	290	1.0	5.0	2.948	.8282
The extent of enforcing building inspection requirement during construction by the CGOK	290	1.0	5.0	3.314	1.0693

Table 8: Determinants of noncompliance with car parking planning standard in Kisii Town

Residential Neighborhood	Obtained Permission	Did not Obtain Permission
Nyanchwa	70.8%	29.2%
Jogoo	64.3%	35.7%
Egesa	61.3%	38.7%
Nyamataro	54.3%	45.7%
Daraja Mbili	78.3%	21.7%
Mwembe	87.5%	12.5%
Nyamage	73.3%	26.7%
Total	70.3%	29.7%

development. In this context, the higher the FAR value, the higher the floor area within the same plot, resulting in increased pressure on land and attendant infrastructural needs.

b) Establishing increased provision of essential services such as on plot parking.
c) Maintaining the skyline line of an urban area, hence enhancing urban aesthetics.
d) Providing planners with options to design additional habitable and open spaces, thus enhancing the quality of buildings along with increased monetary returns to the developer by maintaining the ratio of open space to built-up space.
e) Increasing mandatory open spaces around the domestic building which enables sufficient natural lighting and ventilation by reducing the amount of built-up environment, and so positively impacting on urban microclimate.

Determining the relationship between BCR, FAR and provision for car parking space was accomplished using Pearson's bivariate correlation (Table 6). This line of inquiry was considered important because noncompliance with the recommended BCR and FAR reduces the space that could be availed for parking as previously demonstrated in Fig. 5.

Results showed that in Mwembe, a positive correlation ensued between the provision of car parking space and FAR, and was statistically significant ($r = .362$, $n = 40$, $p = .022$), implying that as FAR increases, more demand for parking space is created attributable to the increased number of floors. The relationship between parking and BCR was, however, not significant ($r = .175$, $n = 40$, $p = .279$). In Nyamage, a positive significant relationship existed between parking and FAR ($r = .362$, $n = 30$, $p = .022$), and also BCR and FAR ($r = .474$, $n = 40$, $p = .022$), but not between parking and BCR ($r = .175$, $n = 40$, $p = .279$). In both (Nyamage and Mwembe), the lack of significance suggested that BCR did not influence an increase in car parking space. Noncompliance with BCR may suggest why most residential plots in these neighborhoods are congested, as illustrated in Fig. 6 leading to inadequate car parking space.

Determinants of Noncompliance with Car Parking Planning Standard

Having established through statistical analyses

Table 9: Test of Research Hypothesis

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
The recommended number of parking space *versus* - Observed number of parking space	4.00690	3.36786	.19777	3.61765	4.39614	20.261	289	.000

that most residential developments in Kisii Town do not comply with the recommended planning standard that regulates the provision of car parking space, the study sought to determine the underlying variables that contributed to this noncompliance. A five-point Likert scale (1 = very low, 2 = low, 3 = moderate, 4 = high, 5 = very high) was used to derive appropriate descriptive statistics which rated responses obtained from the developers (Table 7).

Descriptive results show that while the means for the extent of developers' engagement of professionals in design; enforcing the requirement on engaging professionals in design by the CGOK; and enforcing building inspection requirement during construction by the CGOK were respectively moderate (M=3.014, SD = .8021; M=3,.221, SD=1.0152, and M=3.314, SD=1.0693), that of the extent of the developers' awareness of building inspection requirement by the CGOK during building construction was, on the contrary, rated as low (M=2.948, SD=.8282). Based on these findings, it may be argued that inadequate engagement of registered professionals in building development design, an inspection of residential buildings under construction and inspection of the same during construction through planned surveillance audits could be a pointer on why most residential developments do not comply with the minimum number of car parking space. This evidently contributes to unsustainable urban development. Table 8 indicates that most of the developers who did not obtain development permission were from Nyamataro (46%) followed by Egesa (39%) and Jogoo (35.7%), an indication that particular attention on enforcement of development control should be paid to these neighborhoods.

Test of Research Hypothesis

The study had a research hypothesis that there was no statistically significant difference between the recommended planning standards on the minimum number of car parking spaces in Kisii Town and the extent of conformity by developers. The hypothesis was tested by paired sample t-test as follows:

The results of hypothesis testing in Table 9 showed a deviation from the extent of compliance with the recommended planning standard for the minimum car parking space by a mean of 4.00690 in the sample of 290 residential developments. The observed nonconformity was also highly significant, t (289) = 20.261, p=.000). The null hypothesis was consequently rejected and an assumption made with a 95% confidence level that the observed reduction on conformity can also be found in the general population. With a 5% error rate, it can be assumed that the difference in the extent of compliance with the recommended minimum planning standard in the study area is between 3.61765 and 4.39614.

CONCLUSION AND RECOMMENDATIONS

This study, through the adoption of a positivist research philosophy approach has demonstrated through quantification that most residential developments do not comply with the planning standards that are used in regulating car parking spaces in Kisii Town. This problem continues notwithstanding the existing policy and legislative framework that grants the CGOK the powers of undertaking development control. The prevailing state of affairs has hastened land-use problems such as on-street parking leading traffic congestion and predisposition to accidents; conflicts between motorized and non-motorized transport modes;

and reduced accessibility to dwelling units. These problems in the absence of effective development control have been accelerated by other intervening variables such as unregulated BCR, FAR and land subdivisions which eventually contributes to the uneconomical size of residential land. Moving forward, a more radical approach would be for the CGOK to execute its statutory powers by demolishing the noncomplying residential developments as provided for under the Physical and Land Use Planning Act of 2019. This option is, however, bound to fail as it would be unpopular with both the political class and the residents. The option is also likely to derail the Government of Kenya's recent pronunciation on developing 500,000 urban residential buildings for the low-income Kenyans by 2030. It is therefore recommended that unlike the current practice in the approval of development permission where the requirement on car parking space is frequently overlooked, the provision of adequate car parking space in residential areas should be made as one of the mandatory conditions for all submitted applications for development permission. This should be subsequently followed by adequate monitoring through development control to ensure that each building is developed as approved. While this is done, the CGOK should also enforce compliance with the planning standards that regulate BCR and FAR for the reason that both standards are correlated with the provision of car parking space. Further, developers of comprehensive land subdivision schemes that are likely to attract residential apartments should be required to compulsorily set aside adequate land that would support the establishment of communal car parking space for the projected number of households. It was found out that all sampled residential apartments had no designated car parking space for the Persons Living with Disabilities (PLWDS). This could have occasioned on the account that the Persons with Disabilities Act (the Republic of Kenya, 2003), the Physical Planning Handbook (the Republic of Kenya, 2007) and the Building Code (the Republic of Kenya, 1968) are both silent on the minimum number of car parking space that should be provided for the PLWDS in the residential areas. In view of this limitation, it is recommended that at least 25% of the parking space that is provided for residential apartments should be reserved for the PLWDS. However, since the provision of car parking space for the PLWDS is linked with access to buildings, it is similarly recommended that as the case of public buildings, while reviewing the Building Code, it should be made mandatory for the developers of residential apartments to be providing ramps. This is intended to promote the development control objectives of accessibility and safety. In the long-term, it is recommended that the current planning standard on the provision of car parking space in the residential areas (one car park space for every two dwelling units) should be revised upwards to a ratio of one car parking space per dwelling unit. This is informed by the recent increase in the ownership of cars by the residents of Kisii Town. Finally, the CGOK should as a matter of urgency prepare a comprehensive Physical and Land Use Plan that covers the entire town to provide a basis for undertaking development control. Lack of this document has made the town to develop without any spatial guide, in consequence, making developers be always ahead of the planning authority.

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CONFLICT OF INTREST

The author declares that there are no conflicts of interest regarding the publication of this manuscript. In addition, the ethical issues; including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy has been completely observed by the author.

REFERENCES

Abu, T.; Mahto, S., (2019). Evaluation of parking problems for transportation system in Addis Ababa: A case study. Int. J. Res. Appl. Sci. Eng. Technol., 7 (9):729-745 **(17 pages).**

Adams, C.A.; Opoku – Boahen, R.; Zambang, M.A.B., (2014). Parking management in metropolitan cities in West Africa case study of the Kumasi paid parking scheme, Ghana. Int. J. Eng. Sci., 3 (6): 01-08 **(8 pages).**

Ahmed, F., (2019). Kenya loses Ksh 50M daily on traffic jams. Citizen, **(1 page).**

Aljoufie, M., (2016). Analysis of Illegal parking behavior in Jeddah. Curr. Urban Stud., 4(4): 393-408 (**15 pages)**.

Amini, E.; Oruji, S., (2017). Assess and challenges of vehicle parking scenario in the central core of Mysore City. IJEAT, 6 (6): 89-94 **(6 pages).**

Amini, E.; Shankar. B., (2017). Challenges of vehicle parking in central business district of Sabzevar City, Iran. IJET, 9 (3): 1657-1660 **(4 pages).**

Arimah, B. C.; Adeagbo, D., (2000). Compliance with urban development and planning regulations in Ibadan, Nigeria. Habitat int., 24(3): 279–294 **(16 pages).**

Asiyanbola, R.A.; Akinpelu A.A., (2012). The Challenges of on-street parking in Nigerian cities transportation routes. IJDS, 1(2): 476–489 (**14 pages**).

Brent, E.; Leedy, P. D., (1990). Practical research: Planning and design. Teach. Sociol., 18(2): 248-249 **(2 pages**).

Chen, Q.; Wang, Y.; Pan, S., (2016). Characteristics of parking in Central Shanghai, China, J. Urban Plan

Dev, 142(3): 05015012 **(10 pages).**

Dawra, M.; Kulshreshtha, S., (2017). A case study: Growing parking issues and effective parking management strategies. Int. J Innov. Res. Sci. Eng. Technol., 6 (2): 1792-1798 (**7 pages**).

El-Fadel, M.; Sbayti, H., (2001). Parking facilities in urban areas: Air and noise impacts. J. Urban Plan Dev., 127(1): 16–33 (**18 pages)**.

Encyclopedia Britannica, (2011). Kenya **(1 page)**.

Fiene, R., (2016). Theory of regulatory compliance. SSRN Electr. J. **(9 pages**).

Fincham, J. E., (2008). Response rates and responsiveness for surveys, standards, and the journal. Am J Pharm Educ., 72 (2): 43**.**

Gupta, A.; Kulkarni, S.; Jathar, V.; Sharma, V.; Jain, N., (2017). Smart car parking management system using IoT. Am. J. Sci. Eng. Technol., 2(4): 112-119 **(8 pages)**.

Harding, C., (2011). Lack of parking space has negative economic impact on Nairobi. Africa Business Insight **(1 page).**

Hilvert, O.; Toledo, T.; Bekhor, S., (2012). Framework and model for parking decisions. Transport Res. Rec., 2319(1): 30–38 **(9 pages).**

Ibrahim, H. E.D., (2017). Car parking problem in urban areas, causes and solutions. SSRN Electr.

J., 1-13 **(13 pages).**

Karanja, F.; Thiongo, J., (2019). Court suspends sh400 new parking fees hike by Nairobi County. Standard **(1 page).**

Kinyanjui, M., (2019a). Finance bill passed: Motorists to pay double fees for parking in CBD. Star**. (1 page).**

Kinyanjui, M., (2019b). Matatus impounded as cartels blamed for congesting CBD. Star. (1 page).

Krejcie, R.V.; Morgan, D.W., (1970). Determining sample size for research activities. Educ. Psychol. Meas., 30: 607-610 **(4 pages).**

Lewis-Beck, M. S.; Bryman, A.; Futing, L, T., (2004). The SAGE encyclopedia of social science research methods (Vols. 1-0). Thousand Oaks, CA: Sage Publications, Inc., 1-4. **(4 pages).**

Liu, Y.; Wang, W.; Ding, C.; Guo, H.; Guo, W., Yao, L.; Xiong, H.; Tan, H., (2012). Metropolis parking problems and management planning solutions for traffic operation effectiveness. Math Probl. Eng., 1–6 **(6 pages).**

Msigwa, R.E., (2013). Parking challenges facing urban cities in Tanzania: Evidence from Dar es Salaam City. JEDS, 4 (15): 94-102 **(9 pages).**

Nyangweso, J.E.O., (2015). Management of traffic circulation in Nairobi City, A case study of Upper Hill Area. Unpublished Master's thesis, University of Nairobi **(120 pages).**

Osoba, S. B., (2012). Appraisal of parking problems and traffic management measures in central business district in Lagos, Nigeria. J. Sustain. Dev, 5 (8): 105-115 **(11 pages).**

Rooshihan, M.; Rusuli, M.C.; Suhaila, A.K.; Hakim, M.; Ashlyzan, R.; Nazdrol, W.M., (2019). Rainbow smart parking system design: Problems into solutions for integrated parking management. Res. World Econ., 10(2): 66-69 **(4 pages).**

Sabir, S.; Anjum, A.G., (2017). Problems and prospects of curbside parking in Lahore: Policy Implications for Effective Management. Mehran University. Res. J. Eng. Technol., 36 (4): 867-880 **(14 pages).**

Sharma, K.M.; Prjapati, P.; Jain, M., (2017). Problem of parking and their possible solutions with special reference to Kota City. CPUH-Research J., 2(1): 18-24 **(7 pages).**

Süleyman, A., (2019). The Importance of urban transportation, managements and strategies for sustainable city. A paper presented at the International Conference on Contemporary Affairs in Architecture and Urbanism, 9-10 May 2019, 1-11 **(11 pages).**

The Republic of Kenya, (1968). The Building Code. Nairobi: Government Printer **(138 pages).**

The Republic of Kenya, (2003). Persons with Disabilities Act. Nairobi: Government Printer **(28 pages).**

The Republic of Kenya, (2007). Physical planning handbook **(112 pages).**

The Republic of Kenya, (2019a). Physical and Land Use Planning Act. Nairobi: Government Printer **(67 pages)**.

The Republic of Kenya, (2019b). Kenya population and housing census volume I: Population by county and sub-county **(49 pages).**

UN-Habitat, (2013). State of the world's cities 2012/2013: Prosperity of cities. Nairobi: UN-Habitat **(152 pages).**

Wang, X. Y.; Liu, C. X.; Xu, D., (2012). Analysis on parking problem for residential area. Appl. Mech. Mater., 193-194:1075–1078 **(4 pages).**

Warnecke, R. B., (2014). Sampling frames: Overview. Wiley StatsRef: Statistics Reference Online (**6 pages**).

Waweru, T. (2017). Matatus to be barred from accessing Nairobi CBD in Gazette Notice. Standard (1 **page**).

Yan-ling, W.; Xin, W.; Ming-chun, Z., (2016). Current situation and analysis of parking problem in Beijing. Procedia Eng., 137:777–785 **(9 pages).**

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