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Assessment of on-street parking in the commercial districts of Minna, Niger State, Nigeria

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Abstract: *The development of cities is significantly impacted by the state of their transportation system, with parking playing a vital component of the overall system. Nevertheless, the importance of creating sufficient parking facilities within urban areas is often neglected despite the continuous rise in car ownership which has led to a greater demand for parking spaces. On-street parking exacerbates several issues in Nigerian cities, including traffic congestion, security concerns, and environmental pollution. These problems are mainly attributed to commercial activities, socioeconomic factors, driver behaviour, and inadequate parking infrastructure. This paper examines as a case study the challenges of on-street parking in the Minna business districts, Nigeria. Physical observations and questionnaire data were collected from three selected commercial areas where on-street parking and traffic jams have previously been reported. The research findings highlight that the main causes of parking and traffic problems leading to delays and congestion are insufficient parking spaces, socioeconomic factors, indiscipline acts, and businesses operating near the roadside. To overcome these on-street parking problems, the study suggests prioritizing driver education, implementing effective design and construction of parking facilities, providing road furniture and lay-bys, and enforcing traffic laws through authorized agencies.*

Keywords: *On-Street Parking, Congestion, Commuters/ Road Users*

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I. INTRODUCTION

Transportation is crucial for the social and economic development of towns and cities. However, without proper organization, it can lead to traffic congestion and disruptions, and thus reduced economic activities. One significant aspect of the transportation system is parking, which plays a vital role in managing traffic and congestion (Nadimi et al., 2021). Common parking issues include parking on the side of the road, which, if not effectively controlled, can result in losses for drivers and the public. On-road parking in general, reduces the road capacity and hampers its overall performance (Sulistyono et al., 2018). In Nigeria, where most roads are narrow and lack designated pedestrian lanes, on-street parking exacerbates traffic congestion in major cities nationwide. Furthermore, inadequate management and regulation of parking can lead to severe traffic congestion and a reduction in road width, hindering the flow of traffic (Nadimi et al., 2021). Cities function as commercial and industrial centres, with buses, trucks, and cars moving goods and passengers in and out of cities daily. The way cities are organized increases the demand for motor-based travel. Poor road-traffic performance can occur when there is a mismatch between the high volume of transportation in commercial areas and the available parking spaces. This is due to the limited off-street parking options and instances of double parking along the roadways, which exacerbate traffic congestion (Sulistyono et al., 2018). Furthermore, some cities need more capacity, particularly financial capacity, to deal with population explosions caused by urban economic activities in urban centres. The situation worsens due to urban revitalization, suburban developments, and significantly increasing mobility trends, making parking more difficult. Parking should be given

additional attention as an essential aspect of transportation planning since parking challenges are no longer limited to city centres as they now extend to urban regions (Ajeng & Grim, 2018). Unrestricted on-street parking is a common occurrence in Minna's central business district, owing to the high volume of traffic generated by the presence of commercial and economic activity and the need for controlled off-street parking places. Consequently, the free flow of traffic has been disrupted, resulting in traffic congestion that affects the road's width and performance. The purpose of this study is to evaluate on-street parking in the town against this backdrop. Much of the literature on the effects of on-street parking has been assessed, with most of the studies focusing on urban roadways and residential areas, with relatively few studies focusing on business areas or districts. This study aims to investigate the consequences of on-street parking in Minna's commercial districts.

B. Parking-related Challenges for Cities

The importance of transportation in facilitating the movement of individuals, goods, and services from one place to another, resulting in enhanced socio-economic status and overall national progress, cannot be overstated. The challenges of most cities facing parking challenges are the increase in vehicle numbers without proper infrastructure, which resulted in problems of traffic congestion, traffic delays, parking issues, accidents, and urban land use severance (Dukiya, 2021). In most developing-country cities, road network planning lacks the provision of all essential infrastructure required for the safe and orderly movement of cars (Olorunfemi, 2021).

Fig.1: Parked Cars around Minna CBD (Author's Field Survey, 2022)

The construction of new roads is typically too expensive, so most municipal governments prefer to enlarge existing highways, necessitating the demolition of houses and properties. Numerous concluded studies have shown that widening roads and demolishing buildings is not always an effective solution for alleviating traffic congestion on highways. The construction of new roads, expansion of existing ones, and creation of parking lots often involve acquiring portions of valuable public space. Interestingly, the more space dedicated to transportation, the higher the demand for additional traffic space (Asiyanbola and Akinpelu, 2012). In Nigeria, as in other regions where cars are a prominent mode of transportation, urban traffic flow presents a significant challenge, and parking appears to be a neglected aspect of transportation development. According to Agbiboa (2022), urban circulation is one of the most visible challenges in Nigeria, as it is elsewhere when vehicles are one of the primary forms of transportation, and parking appears to be a neglected element in transportation development. However, for a city to function effectively, the transportation system must be efficient and dependable to support not only intercity movement of people and their activities but also intra-city movement within the city. These movements are from one point of origin to another (Ganiyu & Kawu, 2022). According to Asiyanbola and Akinpelu (2012), categories of space in urban centres include exchange space and movement space, which are related to motor parks, interchange points, and so on. This will cause on-street parking and consequently chaotic traffic, with a large amount of traffic circulating looking for a parking place, contributing to congestion and pollution (Okafor, 2020). On-street parking refers to all metered and unmetered parking along roadsides (Asiyanbola & Akinpelu, 2012). On-street parking exists because of the lack of off-street parking space, and it is referred to as "nearest to destination

routes," resulting in road reduction and traffic performance interruption (Sulistyono et al., 2018). In most cases, on-street parking places are not marked explicitly; instead, parking develops organically near points of interest (Sisiopiku, 2014). Where there are no sidewalks, haphazard on-street parking can make it difficult for pedestrians, who are forced to weave their way around the parking lot or walk on the right-hand edge of parked automobiles while moving traffic, providing a safety risk (Asiyanbola & Akinpelu, 2012). This type of street parking also poses a threat to bicycles and motorcyclists, which are frequently struck by automobile doors opening. Children too short to see out of car windows may dart out into traffic between parked automobiles (Christopher, 2006). According to some studies, on-street parking is one of the critical causes of disorganized traffic conditions in Nigerian cities (Asiyanbola & Akinpelu, 2012). They studied the issues of on-street parking in Nigerian cities' transportation routes and discovered that a lack of suitable off-street parking facilities was the primary cause of traffic congestion and accidents. Motorists, however, are stressed when hunting for a parking spot, which leads to illegal on-street parking. Due to roadside hawking and trading, road lane capacity is greatly diminished. This issue rendered the area inaccessible, slowing vehicles and increasing congestion and travel time. On-street parking is a serious issue in most emerging countries due to a widening disparity between available parking supply and demand, which has created numerous problems for on-street parking on key streets in central business district regions (Dave et al., 2020).

II. METHODOLOGY

This study combined both descriptive and analytical research methods. The methodology focused on obtaining both primary and secondary data to achieve the broad aim and specific objectives of the study. This section addressed aspects such as data types and sources, data collection instruments, sampling methods, and analysis techniques. To gather primary data, the study primarily relied on onsite observations and questionnaire survey. This approach allowed for the assessment of actual parking volume and the condition of existing parking facilities. As for secondary data, various sources were utilized. These included published transportation data and statistics from different years and locations, specifically selected for this study.

A. The Study Area

Minna is the capital and the administrative head of Niger state (consisting of Chanchaga Local Government Area and part of Bosso Local Government Area), located within the North central, geo-political zones of Nigeria. Minna covers about 0.10% of the total land mass of Niger state (which is 76,363 square km) and also represents 0.0082% of the country's total land mass. The city is situated within the eastern zone of the state confined by Shiroro L.G.A. (up north), Wushishi L.G.A. (westward), Katcha L.G.A. (southward) and Paiko L.G.A. (eastward) respectively. Minna had an estimated population of 201,429 in 2006 and is the 28th biggest city in Nigeria by size of the population (NPC, 2006). "Minna lies at latitude 9°37 North and longitude 6°33 East on a geological base of undifferentiated Basement Complex of mainly gneiss and magmatite" (Olawale, 2010).

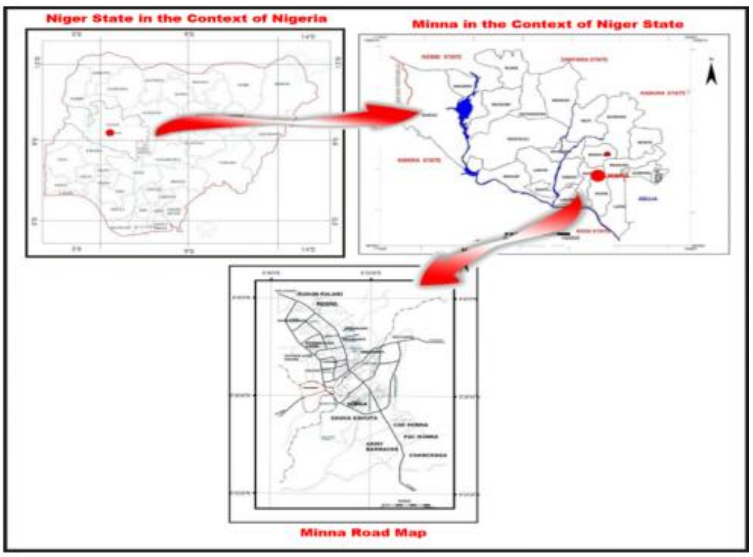

Fig. 2: Location of the Study Area ((Author 2021)

B. Method of Data Collection and Analysis

Information and data obtained from the field through onsite observation, questionnaire survey and documented materials were used in making inferences for the study. The Architectural Geographic Information System (ArcGIS) was used to digitise the sample areas. These coordinates were entered into a spreadsheet and imported to the ArcGIS environment on the digitized map of Minna, with each of the coordinates depicting the extent of the study area. For this study, 128 questionnaires were collected for each of the 3 study districts, making a total of 384 respondents, based on the required sample size for the total projected population of Minna in 2022, which was 478,576. The assessment of on-street parking was descriptively presented in the form of frequency tables. Photographs were also used to present findings pictorially. Also, physical features on the earth's surface were located and presented using maps. The study focused on the three (3) major commercial districts within Minna, namely Mobil (Minna CBD), Kure ultra-modern market and Tunga market. Government agencies that have been consulted in the course of this study were Ministry of Transport (Niger state) and Federal Roads Safety Corp (FRSC). The data collected covered both primary and secondary sources. Primary data was obtained from vehicle owners and drivers, while secondary data was obtained from the Federal Ministry of Transport (Niger state) and Federal Roads Safety Corp (FRSC). A structured questionnaire consisting of two sections was used for data collection. Section A covered the sociodemographic variables of the respondents to elicit the demographics of the respondents. Section B examined the parking behaviours from the perception of respondents. Before the survey, a pilot study was conducted on a small group of respondents to ensure the instrument's validity.

III. RESULTS AND DISCUSSION

During the field survey, it was observed that commercial vehicle users (tricycles popularly called Keke) are the main offenders in on-street parking. Though they stay parked for a short time, they often stop abruptly at intervals to drop off or pick up customers. These categories of motorists were not part of the questionnaire survey since they were constantly on the move. Still, it is worth noting that the uncontrolled and frequent stops increased the traffic congestion level and expose motorists to minor road crashes. This may be addressed if designated bus stops are introduced. It was observed from the questionnaire administration that most business owners and workers within the business district prefer to park their cars on-street close to the business. This is the case even at the Kure market, where designated parking lots are provided. Also, visitors, shoppers or customers have the same character of parking at the closest proximity to their destination, not minding if it is on-street or off-street. According to data analysis and physical observation, the primary impact of on-street parking is a time delay in traffic flow. On-street parking primarily has two effects on the capacity of the road. First, surrounding the traffic stream reduces the carriageway's width. Vehicles are compelled to squeeze into this narrower space, which slows down the stream as a whole. Also contributing to congestion on congested urban highways are frequent parking and unparking manoeuvres. These two effects of on-street parking ultimately contribute to reducing urban road capacity. In addition to operational degradation, on-street parking causes hazards and increases the risk to road users, which is consistently reported in many studies. Notably, the collision with other vehicles while darting out between two parked cars and the collision while backing into the stream from parking space are the riskiest and most observed accident prototypes. In fact, many transportation planners still consider the removal of on-street parking as the easiest and most economical method to enhance the capacity and safety of an urban street. While Fig. 3 indicate that the respondents can be categorized into different groups based on their affiliation and purpose for visiting the district. Firstly, it is noteworthy that the largest group among the respondents consists of visitors to the area. This implies that many individuals coming into the business district are shoppers or customers for various businesses. This trend suggests the district's appeal as a commercial hub and emphasizes the importance of accommodating the parking needs of these visitors. The data also reveals that many respondents are business owners within the district. These individuals may require parking for longer hours, as they would likely spend extensive time managing their businesses. This high number of business owners can affect parking availability within the district, as their vehicles would occupy parking spaces for extended periods. Furthermore, the paragraph highlights the presence of employees within the business district. Visitors to the business districts made up 131 of the total respondents. Most of which were shoppers or customers for various businesses. According to this analysis, most respondents are those under the visitor’s category.

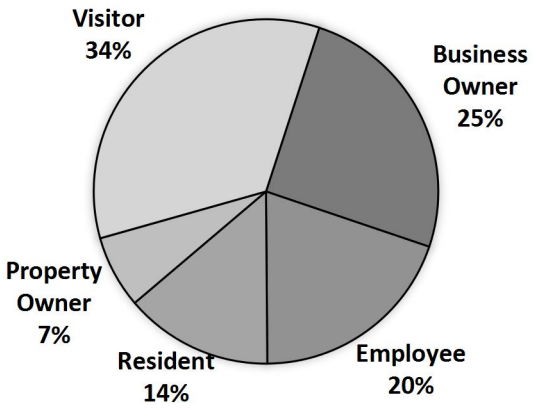

Fig. 3: Parking purpose within the area

Fig.4 illustrates the primary motivations for respondents to visit the business district. Work and shopping are the principal reasons, which is expected given the nature of the district. Surprisingly, although shoppers make up the majority of the population in the area, their numbers were fewer than anticipated. This could be attributed to their tendency to rush through their shopping and quickly leave the district. Consequently, a more significant proportion of participants in the questionnaire administration were workers rather than shoppers. Additionally, it is worth noting that 53 respondents were residents of the area, forming an interesting subgroup. Other motivations for visiting the business district included dining (37 respondents), entertainment (14 respondents), government services (2 respondents), and civil events (6 respondents).

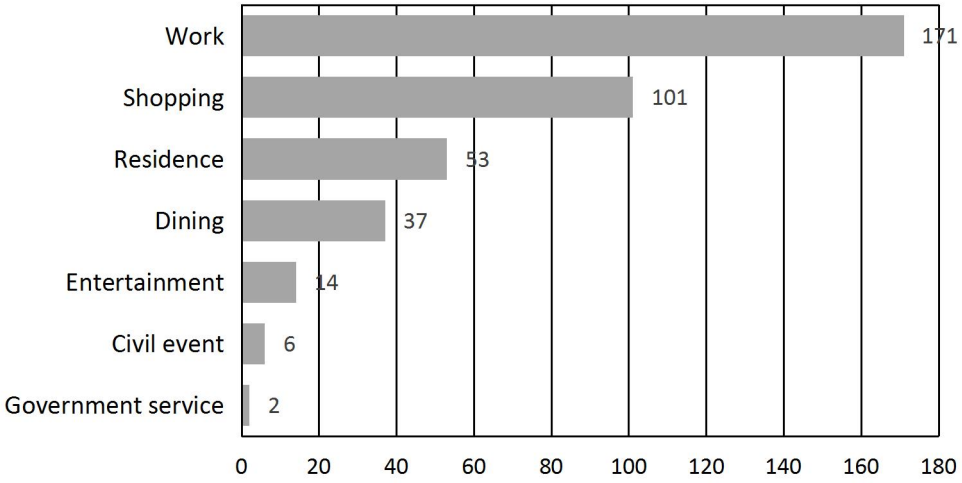

Fig. 4: Purpose of Trip of the Respondents

Again, it was observed that majority of the respondents in the study area were very familiar with the 3 districts as they visit any of the districts up to 2 or 3 times weekly as shown in Fig. 5 and 6. It can be observed that a total of 177 respondents park on-street on a daily basis. 61 park weekly while 22 park monthly. 124 respondents do not have a specific parking frequency pattern hence they were termed as parking occasionally.

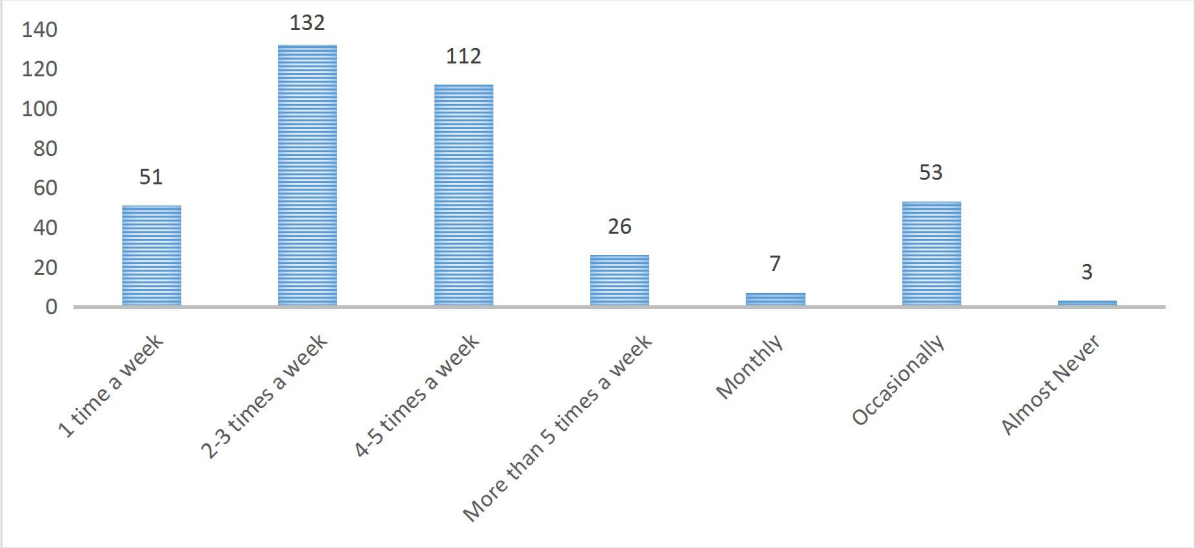

Fig. 5: Frequency of Parking

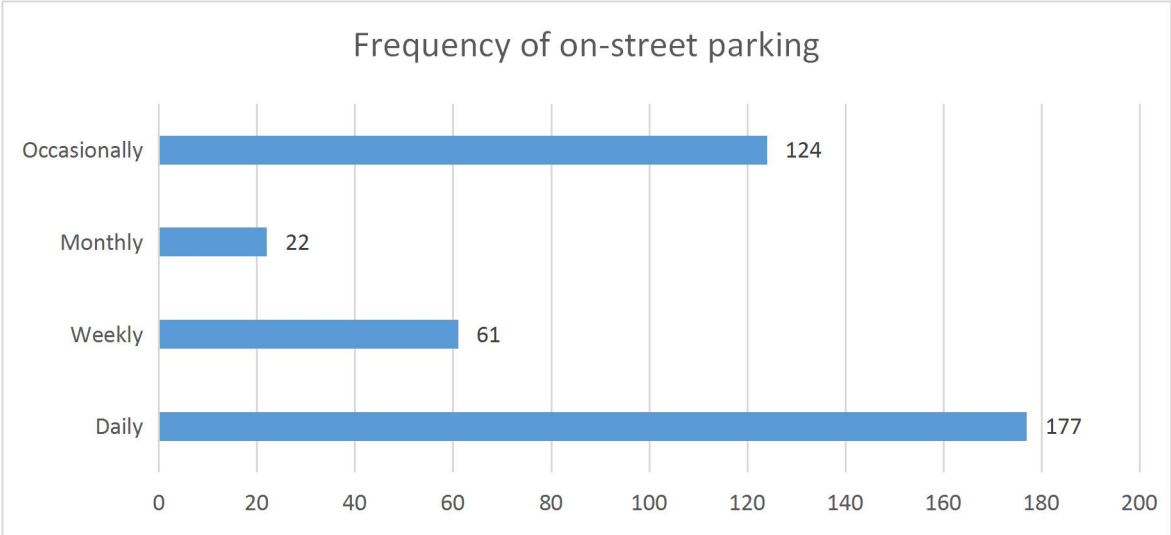

Fig. 6: Frequency of parking on-street

From the analysis presented in Fig.7, it is clear that most of the on-street parking takes place between 5pm and 8pm. These periods are also the peak for commercial activities within the districts. 184 respondents park between 5pm and 8pm, 74 respondents park between 2pm and 5pm, 64 respondents between 8pm and 11pm, 32 respondents between the morning peak hours of 7am and 11am, 19 respondents between 11am and 2pm and 12 respondents who park overnight all of which are residents.

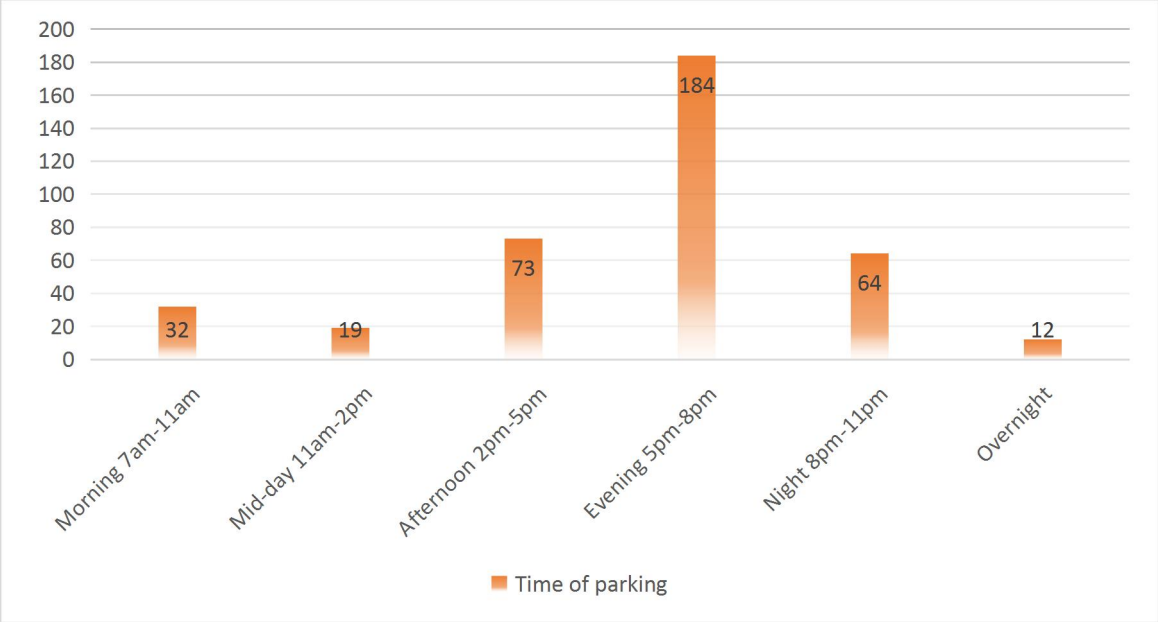

Fig. 7: Time of Parking

IV. CONCLUSION

This study established that parking is a vital component of the transportation system. When parking is unregulated, especially on-street parking, it affects the general performance of the road by causing congestion and other traffic-related problems. This makes parking an integral aspect of engineering a city transportation network, especially in a commercial area with high economic activity. On-street parking has traditionally become a practice by majority of the drivers. The practice all over the world, especially in developed countries, is to designate particular spaces for parking to serve busy public and commercial areas. This study has taken into cognizance the parking inventory and parking behaviour in three of the commercial districts of Minna town. Since parking seems to be getting worse, especially in densely populated areas like markets, shopping malls, public spaces, etc., it is important to note that both public and private organizations may come up with ways to solve the issue while making money by modernizing first-world countries' methods of on-street parking. The local authority in charge of traffic management should launch a campaign to raise public awareness about the detrimental consequences of on-street parking in commercial districts and implement a market-oriented approach to parking in the area. Additionally, the appropriate authorities ought to implement a parking market-oriented pilot program. This will make determining the policy's advantages and disadvantages easier before it is fully implemented. In order to reduce the frequent stops made by commercial drivers/ riders, which account for the majority of offenders for on-street parking, it is required to designate areas for building bus stops or lay-bys. These bus stops ought to be constructed with the central place theory in mind (distance, range and catchment).

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