

Urbanization and the Challenges of Sustainable Transportation: A Developing Country Perspective

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ABSTRACT

A major requirement in the development of a sustainable urban transportation system is the reduction of automobile dependence. This paper focuses on the ownership and use of private vehicles in the city of Kaduna in North West Nigeria. Travel behavior data used in the study was obtained through a city-wide socio-demographic and household travel characteristics survey that made use of structured questionnaires and the analysis employed was mainly descriptive statistical analyses. Spatio-temporal data used in the analysis of urban growth was obtained from remote sensing sources. The results show a city experiencing rapid urbanization and population growth alongside high level of private motorized vehicle ownership and use. The paper concludes by highlighting the environmental, human health and social effects of rapid urbanization and increase in the use of motorized modes of transportation.

OBJECTIVES

The objectives of the research are as follows:

- To determine the rate and pattern of urban growth in Kaduna
- To determine motorized vehicle ownership and mode choice for commuting among household heads in Kaduna
- To examine the implications of urbanization and transportation mode choice in Kaduna

SAMPLING DESCRIPTION

- To determine the sample size for the household travel characteristics survey, a 95% confidence level and a (+-) 4 confidence interval were chosen. The city has a total population of 1, 139, 743 persons, a sample size of 615 households was arrived at using the sampling formula for infinite population (Cochran 1963).
- Samples were drawn using a combination of cluster sampling and systematic sampling based on the administrative districts of the city.
- The derived sample yielded travel behavior and socio-demographic characteristics for 3,690 individuals.

DATA

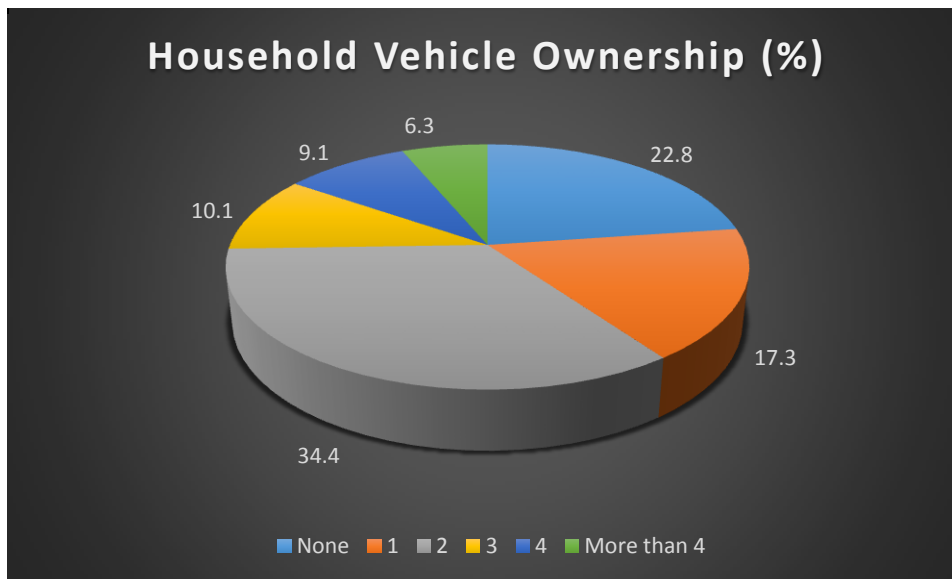
Data	Method of Collection and source
Data on vehicle ownership	Household travel characteristic survey
Data on commuting mode choice among household heads in Kaduna	Household travel characteristic survey
Data on population and population growth in Kaduna between 1990 and 2010	National Population Commission
Data on the physical extent of Kaduna for 1990, 2001 and 2010	Satellite imagery from Global Land Cover Facility www.landcover.org

METHODS

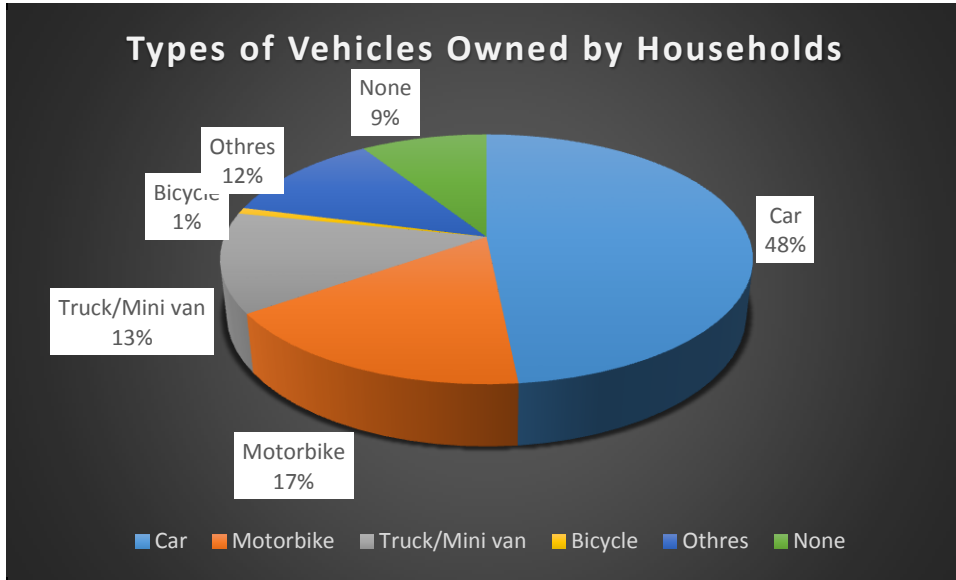
- Travel behavior analysis – Descriptive statistics
- Urban growth analysis – Land cover classification and analysis and computation of urban built-up area using GIS
- Population growth analysis – Descriptive statistics

RESULTS

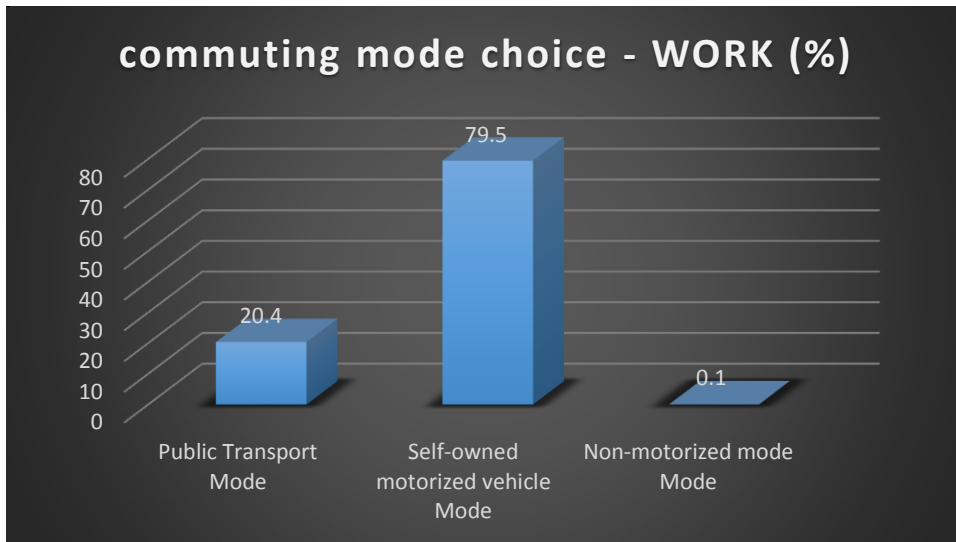
HOUSEHOLD VEHICLE OWNERSHIP



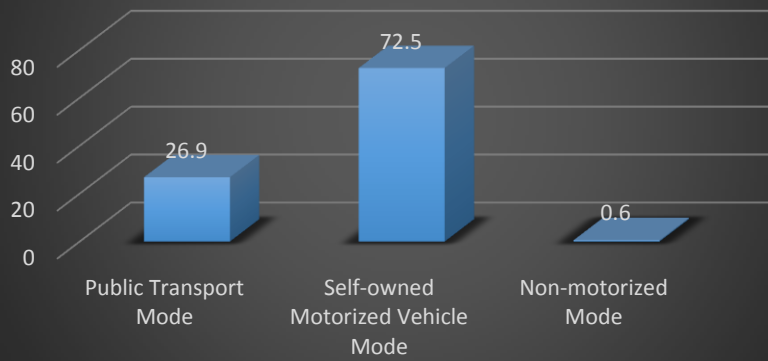
TYPES OF VEHICLES OWNED BY HOUSEHOLDS



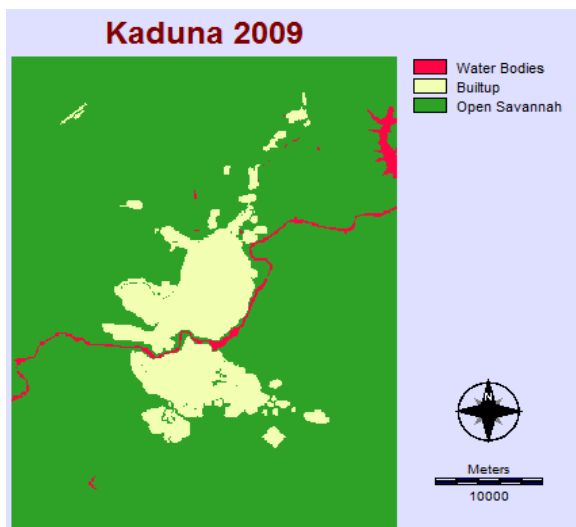
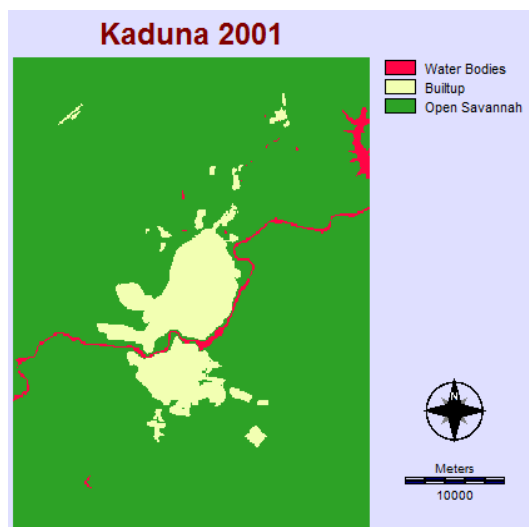
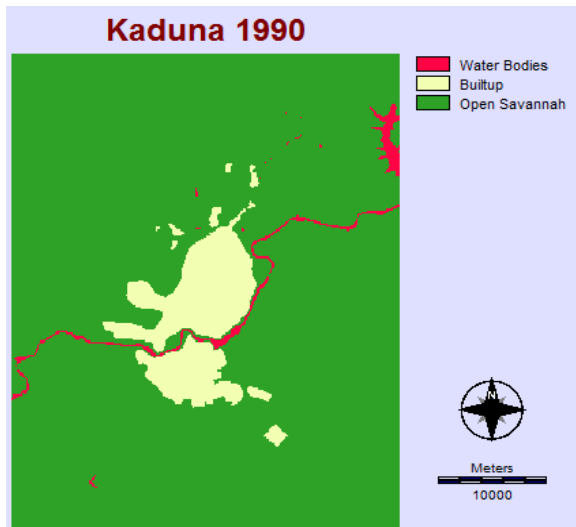
COMMUTING MODE CHOICE



commuting mode choice - non-work (%)



SPATIAL PATTERN OF URBAN GROWTH



URBANIZATION AND POPULATION GROWTH TRENDS

Population Growth and Urbanization in Kaduna 1990-2010

Year	Population	City Spatial Extent (km ²)	Rate of Pop. Increase (%)	Rate of urban expansion (%)
1990	739,575	541.39	-	-
2001	937,547	708.60	26.77	30.87
2010	1,139,743	961.22	21.57	33.76

Conclusion from the table above

- Rate of population increase lower than rate of land consumption, which implies urban sprawl
- Urbanization being driven largely by population increase

IMPLICATIONS FOR SUSTAINABILITY

- Traffic congestion
- Environmental degradation
- Health problems
- Social exclusion

NEXT STEPS

- Examine and model the relationship between socio-democratic characteristics and travel behavior in Kaduna