THE IMPACT OF URBAN SPRAWL ON THE INHABITANTS OF THE ETHEKWINI MUNICIPALITY AND THE PROVISION OF INFRASTRUCTURE

M P YUSUF and D ALLOPI*

Durban University of Technology, P O Box 1334, Durban, 4000
Tel: (031) 3732352/3732310*

ABSTRACT

The control of urban sprawl is one of the critical issues challenging planners in many countries. Most of South African cities are expanding predominantly through the spreading out of new housing areas beyond the existing urban periphery in a comparatively unplanned manner. The urban periphery thus consists of development which is isolated and separated from each other by major roads or open spaces (Dewar, 1984).

Urban sprawl is characterised by, an increase in the cost of providing for public infrastructure, more expensive development costs, reduction in transportation effectiveness and choice of mode, higher energy consumption, reduction in community interaction, greater stress, destruction of the environment and deterioration of the inner city. The concept of one family per plot has also contributed towards the sprawling nature of our cities.

Land use patterns and transportation are interdependent. Being reliant on the motor car for transport leads to higher demand for land for the construction of roads and parking than other forms of transportation and encourages low-density urban expansion. This increases land development costs. Transportation by cars has allowed and encouraged radical changes in the form of cities and the use of land. Land in the outer parts of cities is generally cheaper and this leads to developers purchasing these lands, including agricultural land, for the development of houses.

A questionnaire survey has been conducted within the study area in order to establish the impact of urban sprawl on the inhabitants. The information has been analysed, and policy guidelines and recommendations to manage urban sprawl and thereby densification of the study area has been suggested.

1. INTRODUCTION

Urban sprawl is a trepidation that communities, farmers, environmentalists, municipalities, planners and politicians have been debating about throughout South Africa for decades and probably in the foreseeable future. Urban sprawl is epitomized by spatially extensive settlements where building densities are low and consists of free standing houses on large parcels of land.

Characteristics of sprawl are low density residential development, homogenous single family development with scattered units, non residential uses of shopping centers, retail businesses located in a strip, freestanding industries, office buildings, land uses which are spatially separated, reliance on the car for transport, large scale consumption of

agricultural and environmentally sensitive land. Growth which is compact around numerous smaller nodes which are situated and separated from the main urban core is also classified as sprawl. Sprawl is a matter of degree and not an absolute form.

Sprawl development consists of three basic spatial forms:

- Density sprawl is the use of land for urban purposes along the boundaries of existing metropolitan areas. This type of sprawl is exacerbated by unplanned extensions of basic infrastructure such as water, sewer, electricity and roads.

- Ribbon sprawl is development that occurs along major transportation corridors outward from urban cores. Lands adjacent to corridors are developed, but those without direct access remain as rural uses. Over time these nearby rural lands maybe converted for urban development as land values increase and infrastructure is extended perpendicularly from the major roads and lines (http://chesapeake.towson.edu).

- Leapfrog development is characterized by an irregular and discontinuous pattern of urbanization, with fragmented developed lands that are broadly separated from each other and from the boundaries or urban edge of urbanized areas (http://chesapeake.towson.edu). It is very expensive to provide infrastructure such as water, sewerage and electricity in this form of development. Scattered or leapfrog development exhibits discontinuous development away from an older central core, with areas of development interspersed with vacant land.

2. OBJECTIVES

- This paper explores the impact of urban sprawl on the inhabitants in Ethekwini Municipality. Durban's spatial form began to change in the latter portion of the apartheid era, as rapid urbanization and relaxation in the enforcement of apartheid laws led to a massive growth of informal settlements on the periphery. A few informal settlements came into existence within the central urban areas as political instability led to lack of enforcement on the control of settlement. By 1994 dwellers in informal settlements formed about a third of Durban's population, but less than four percent were in central areas (Urban Strategy Department, 1995).

- This paper examines how land use factors influence travel behaviors.

3. METHODOLOGY

- Questionnaire survey (random sample) was undertaken in Hillcrest (low density sprawling development, high income earners, 25 kilometers to the city centre) , Cato Manor (medium density, low income earners, 7 kilometers to the city centre) and Phoenix (medium density, medium income earners, 30 kilometers to the city centre), to determine demographics, knowledge of urban sprawl, mode of travel to place of employment and education facility, travel cost and duration, satisfaction with average monthly expenditure on transport versus place of residence, current and preferred housing and opinion with regard to living in a high density housing.
- On site investigation for the assessment of the impacts of urban sprawl.

4. IMPACTS OF URBAN SPRAWL

Access to public transportation

Access to public transportation is an essential right of the inhabitants of a city and in particular the low income earners. In the Ethekwini Municipality area and other South African cities, there are continuing community concerns over increasing public transportation costs to the commuters and improved levels of service and conditions of service. The public transportation service is not adequate and affordable in South African cities.

Rail service is available in certain suburbs but requires high threshold of support. In most South African cities, densities are simply too low to allow for an efficient service to exist. While some service lines are viable, others are not.

The concentric outward low density sprawl from one or more central points mean that public transportation systems and in particular railway cannot serve urban inhabitants on the urban edge efficiently. As the rail service moves further from the city centre, the distance to be travelled to the terminus by commuters residing in between rail lines increases significantly.

Owing to these factors, public transportation will continue to be inefficient and costly. The impact on the urban poor is massive. Travel costs are high because of the inefficiency and regular increases in travel costs. This is exacerbated because a large segment of commuters using rail transport have to initially walk to bus stops thereafter travel by bus/minibus to the train station. Owing to the levying of a minimum charge with each mode of transport, the cost of public transportation increases dramatically (Dewar, 1984).

Public transportation lacks the capacity to serve the poor effectively and has resulted in many low income earners purchasing a car which is one of the most expensive modes of transport and which they cannot afford adequately. The car has regrettably become the dominant and convenient form of transport and thus there is no choice being exercised amongst the different modes of transport. As the traffic volume increases rapidly, this now becomes a justification for the expansion and construction of new roads.

Air pollution

Vehicle emissions are the primary source of air pollution. The collective effect on energy consumption and air pollution of individual suburbanites and exurbanites commuting back and forth to their places of employment are considerable. Diesel trucks and cars emit a wide variety of gases, such as carbon monoxide, nitrous oxides, polyaromatic hydrocarbons (PAHs) and other products of incomplete combustion. The carbon dioxide, in emissions from vehicles, is a major greenhouse gas that has been linked to global warming. Traffic generated air pollution threatens human health, agricultural production and ecological systems. Respiratory functions in individuals are impaired by ozone. Ozone damages foliage and interferes with the physiological operation of plants. (http://chesapeake.towson.edu/landscape/urbansprawl.)

Owing to the expansion of the residential area in Merebank, south of Durban, has resulted in the oil refinery and Mondi factory being mainly surrounded by residential areas. The pollution emanating from such industries has a detrimental effect on the health of surrounding residents.

Many inhabitants of the city travel by car from areas such as Hillcrest, Tongaat and Amanzimtoti (distances greater than twenty five kilometers) to the central business district, thus adding to the air pollution.

Water and land pollution

Chemical gases and particles that are released into the air by motor vehicles eventually settle onto buildings, streets and land surfaces. Vehicles often leak oil, gas, brake fluid, windshield detergents, engine coolants and worn metal particles. Car tyres leave zinc and other pollutants as they wear. These pollutants from hardened areas such as, streets, paved areas, sidewalks and parking lots often flow directly to stormwater drains, thereafter into lakes and streams without any filtration.

Environmental sustainability

Urban sprawl leads to an ineffective use of land, through the consumption of extreme amounts of land that may be valuable relative to agriculture, minerals, wetlands and amenity. Owing to the nature of urban sprawl, development may encroach into land which is geologically unstable, susceptible to flooding, sea level rise, etc. (Gasson, 1998)

Sprawled cities consume considerable quantities of water required to irrigate extensive gardens (Davies and Day, 1998) and require greater quantities of construction materials for infrastructure and detached buildings. Sprawled cities require greater quantities of energy than compact cities. This is due to heavy car dependence and excessive trip lengths characteristic of sprawled cities.

Urban sprawl is rapidly spreading as people move into the countryside for a better lifestyle while commuting to nearby cities to work, shop, go to school and recreate. In the city, most land is committed to streets and parking lots, rather than livable, walkable places for people to enjoy. Our quality of life declines as more greenspace is covered with concrete.

Agricultural land is being lost around the Gateway shopping centre in Umhlanga. What was previously lush agricultural land is lost under the hardened areas and buildings. North of the Gateway shopping centre roads are being constructed into the sugarcane field in anticipation of further demand for residential and commercial sites. Low density commercial development with private frontage gardens has mushroomed in La Lucia Ridge Business Park.

Noise pollution

As traffic increase, so does the noise level, adding to the stress of modern city life. The increasing noise and congestion causes people to move to the country for peace and serenity, which adds to the number of long distance commuters who create traffic congestion.

Many residents move further from the suburbs of Durban to escape the noise. However, as time goes by these areas also become noisy as the city expands.

Increase in property rates and taxes

Much land is used for the creation of transportation corridors and thus a loss in taxable area. Hence property rates are increased to compensate for the loss. The construction costs of major roads and interchanges are phenomenal.

A major portion of property rates and taxes are used for upgrading and widening roads, new roads, maintenance of roads and associated infrastructure, and additional traffic law enforcement officials (Jackson, 1985).

Owing to crime, grime and lack of easy access to parking in the central business district, many medium size businesses have relocated to suburbs within a radius of 4 km of the central business district in Durban. This has resulted in property values escalating in the surrounding residential properties, as demand for properties increases, and thereby an increase in municipal rates.

5. KEY FINDINGS OF QUESTIONNAIRE SURVEY

During August 2008, a survey was conducted of 522 respondents in Hillcrest, Cato Manor and Phoenix townships/suburbs of the Ethekwini Municipality. The questionnaire was designed to obtain information pertaining to the socio- demographic profile, the movement of members of households to schools, tertiary institutions and place of employment, the amount of time spent waiting for public transport and duration of the trip/s. Other questions included were on the type of housing the respondents are presently living in, the problem associated with the housing and what type of housing they will prefer to live in. Only the key findings are shown below.

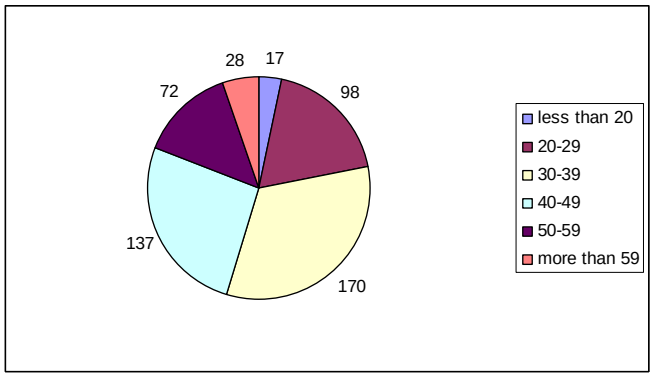

Figure 1 - Age of respondents

Most respondents (170) were in the age group between 30 to 39 and between the ages of 40 to 49 (137).

Table 1 – Urban sprawl knowledge versus suburb (%)

Heard/Knowledge of Sprawl	Suburb		
	Hillcrest	Phoenix	Cato Manor
No	32.9	99.1	91.6
Yes	67.1	0.9	8.4
Total	100	100	100

From the table above knowledge and awareness concerning urban sprawl is limited to 1% in Phoenix and 8 % in Cato Manor. Sixty seven percent (67 %) of respondents in Hillcrest, which is a high income earning suburb, know what urban sprawl is.

Table 2 – Current housing versus preferred housing per suburb (%)

Suburb			Preferred			
			freestanding	duplex semi detached	duplex in estate	flat
Hillcrest	Current housing	freestanding	88.6	66.7	46.7	40
		duplex semi detached	6.8	33.3	6.7	0
		duplex in estate	0	0	40	0
		flat	4.6	0	6.7	60
	Total		100	100	100	100
Phoenix	Current housing	freestanding	40.3	4.2	0	20
		duplex semi detached	41.8	95.8	0	20
		duplex in estate	.5	0	0	0
		flat	17.3	0	0	60
	Total		100	100	0	100
Cato Manor	Current housing	freestanding	80.6	100	50	76.7
		duplex semi detached	2.2	0	0	1.6
		duplex in estate	0	0	0	3.9
		flat	17.2	0	50	17.7
	Total		100	100	100	100

Sixty percent (60 %) of flat dwellers in Hillcrest will prefer to continue living in a flat. This is a good movement towards compacting the city especially in a suburb where knowledge concerning urban sprawl is the highest (67 % of respondents). Despite the fact that 99 % of respondents living in Phoenix do not have any knowledge with regard to urban sprawl; 60 % of flat dwellers living in Phoenix will prefer to continue living in flats.

Table 3 – Current housing versus problems (%)

Problem	Current Housing			
	Freestanding	Duplex semi detached	Duplex in estate	Flat
none	84	79.1	90.9	43.9
social	4.8	2.6	0	4.9
density high	2.6	.9	9.1	1.2
lack of land	3.8	11.3	0	36.6
lack of maintenance	3.5	2.6	0	6.1
other	1.3	3.5	0	7.3
Total	100	100	100	100

Those living in medium density housing, that is, 79 % of respondents living in duplex semi detached and 91 % of respondents living in duplex in estate experience no difficulties living in that type of housing development. Forty four percent (44%) of respondents living in flats experience no problems. The major concern raised by flat dwellers is the lack of land for expansion.

Table 4 – Preferred housing versus consideration to living in a medium or high density housing development close to work and facilities (%)

Preferred Housing	Medium/high	
	No	Yes
Freestanding	62.2	37.8
Duplex semi detached	48.3	51.7
Duplex in estate	50	50
Flat	2.9	97.1

The table above shows that a total of 97 % of those who will prefer to live in a flat would prefer to live in a medium to high density development in a trade off to be close to work and facilities which are a few of the benefits of living in medium to high density housing areas. Thirty eight percent (38 %) of respondents who would prefer to live in a freestanding house would consider living in medium or high density housing development close to work and facilities.

Table 5 – Reasons for moving to current residence per suburb (%)

Number	Hillcrest	Phoenix	Cato Manor
1	16.5	58.8	34.3
2	5.9	7.4	10.5
3	18.8	6.2	22.6
4	3.5	7.4	17.3
5	15.3	7.4	17.3
6	14.1	0	0
7	2.4	1.2	14.5
8	20	8.2	0.4
9	3.5	3.5	0.4

Key	Reason for moving into residence in suburb
1	Always lived here
2	Educational Facilities
3	Employment, business
4	No suitable housing available close to employment
5	Large land
6	Close to undeveloped land (Aesthetics-rural setting)
7	Close to the city
8	Security
9	Other (Specify)

Employment and business, security, large land and being close to undeveloped land are the most important reasons which have attracted respondents to live in Hillcrest. The benefits of living close to undeveloped land and rural setting is compromised as the sprawling area of Hillcrest attracts more low density development.

In a medium to high density area such as Cato Manor 23 % of respondents have moved into Cato Manor which is situated about 5 km from the city for employment/business opportunities.

Table 6 – Distance from home to school (%)

Distance km	Suburb		
	Hillcrest	Phoenix	Cato Manor
Not applicable	45.6	39.4	14.1
less than 2 km	7.4	29.2	48.2
2-4	5.9	18.1	22.3
5-10	30.9	11.1	12.7
11-20	7.4	1.3	0.9
21-30	0	0.9	0
more than 30	2.9	0	1.8
Total	100	100	100

Forty eight percent (48 %) of respondents in Cato Manor and 29 % of respondents in Phoenix attend school within 2 kilometres of their home. In the low density suburb of Hillcrest 31 % of children have to travel between 5 to 10 kilometres to school.

Table 7 - Mode of transport to attend school per suburb (%)

Mode	Hillcrest	Phoenix	Cato Manor
Car	87.8	30	17.1
Taxi	4.9	3.6	25.4
Walking	4.9	63.6	52.3
Other	2.4	2.9	5.2

Eighty eight percent (88%) of learners in Hillcrest travel to school by car. In the medium to high density area of Cato Manor car accounts for only 17 % usage by learners to attend school. In Phoenix and Cato Manor walking is the prevalent mode to attend school.

Table 8 – Distance from home to tertiary institution (% per suburb)

Distance km	Suburb		
	Hillcrest	Phoenix	Cato Manor
less than 5	5.9	0	58.1
5-10	0	14.0	36.5
11-20	0	25.6	1.4
21-30	35.3	48.8	1.4
31-40	47.1	11.6	0
41-50	5.9	0	2.7
more than 50	5.9	0	0

In Cato Manor, 58 % of students attend tertiary institutions less than 5 Km from home thus realizing the benefits of living in a medium to high density housing suburb close to the city.

Table 9 – Distance from home to work versus place of residence (%)

Distance km	Suburb		
	Hillcrest	Phoenix	Cato Manor
Less than 5	21.7	7.1	47.0
5-10	27.5	28.4	35.9
11-20	15.9	17.3	6.0
21-30	17.4	30.2	6.0
31-40	7.2	14.2	0.5
41-50	8.7	1.8	1.4
more than 50	1.4	.9	3.2

In Cato Manor 83 %, Hillcrest 49 % and Phoenix 36 % of respondent's place of employment is within 10 km from home.

Table 10 – Travelling time to work versus place of residence

Time min	Suburb		
	Hillcrest	Phoenix	Cato Manor
Less than 10	27.1	6.2	8.8
10-20	27.1	21.7	61.8
21-30	17.1	18.6	10.1
31-40	11.4	11.5	8.8
41-50	10.0	4.0	3.2
51-60	7.1	23.0	2.3
61-75	0	13.7	2.8
more than 75	0	1.3	2.3

In Cato Manor 71 %, Hillcrest 54 % and Phoenix 28 % of respondents travelling time from home to their place of employment is within 20 minutes. Although most respondents in Hillcrest use cars as opposed to public transportation being the main mode of transport; respondents in Cato Manor have shorter commuting time

Table 11 – Waiting time for bus/taxi/train versus place of residence (%)

Time min	Suburb		
	Hillcrest	Phoenix	Cato Manor
<5	16.7	16.9	89.2
5-10	50	62.9	5.4
11-15	0	18.0	2.3
16-20	33.3	1.1	1.4
>20	0	1.1	1.8

Eighty nine percent (89 %) of respondents wait for less than 5 minutes for public transportation displaying the benefit of a well located suburb close to the city's core.

6. RECOMMENDATIONS

Urban sprawl cannot be totally reversed in the Ethekwini Municipality area but a few measures to achieve compaction are outlined below.

- Densification on existing brownfield land in urban areas to promote higher residential densities. Infill development where large tracts of vacant land

(greenfield land) within urban areas are developed. Ninety seven percent (97 %) of flat dwellers as shown in table 4 would consider living in a medium or high density housing development close to work and facilities. Prospects exist in certain areas of Cato Manor where there are undeveloped land available to construct high density flats.

- To define and maintain an urban edge which restricts outward expansion of urban areas. It is essential to maintain an urban edge in order to encourage densification. Table 10 shows that 62 % of respondents in Cato Manor commute time from home to work is between 10 to 20 minutes, thus benefiting from living close to the city.
- Provisions should be made to construct more than one dwelling without subdividing the property. The minimum size of properties should be decreased.
- Discourage underutilization of land by levying higher municipal rates.
- Review of building regulations, which restrict building height, coverage, and off street parking requirement.

7. CONCLUSION

From the questionnaire survey undertaken it has been found that 97 % of flat dwellers would prefer to live in medium to high density housing developments in a trade off to be close to work and facilities. Respondents living in Cato Manor, which is a medium to high density housing suburb located close to the city, benefit from having shorter commuting time to their place of employment.

Higher densities are necessary in order to capitalize on economic opportunities. Compaction encourages economic diversification and there is an increased threshold of support for varied forms of social and commercial services. The unit cost of services to the consumer tends to be lower. Inhabitants of a city must be able to undertake most of their trips for basic needs on foot. Compaction maximizes the use of existing infrastructure and enables viable and efficient public transportation system, thus discouraging car dependence. Compact cities make more efficient use of resources such as land, energy and finance, and can significantly reduce the current rate of environmental destruction.

8. REFERENCES

Barnes, KB, Sprawl Development: Its Patterns, Consequences and Measurement, (http://chesapeake.towson.edu/landscape/urbansprawl.) [Accessed 5 December 2007]

Davies, B and Day, J (1998), Vanishing Waters, University Cape Town Press, Cape Town.

Dewar, D, 1984. Urban Poverty and City Development, Architecture SA June1984, p 48-51).

Forms of Sprawl, (http://chesapeake.towson.edu). [Accessed 10 January 2004]

Gasson, B, (1995). Evaluating the Environmental Performance of Cities: The case
Of the Cape Metropolitan Area,

Jackson, K (1985), Crabgrass Frontier: the suburbanisation of the United States, Oxford University Press, Oxford.

Urban Strategy Department, (1995). Settlement areas and population estimates, Durban Metropolitan Area, City of Durban.