

# **THE SOCIAL IMPACT OF INTRODUCING A TOLLING SCHEME ON A PRE-EXISTING URBAN NETWORK: THE CASE OF SOUTH AFRICA**

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## **ABSTRACT**

The paper reviews the merits of the user-pays principle in the context of tolling of a pre-existing urban road network in a developing country. The province of Gauteng in South Africa is used as a case study, in which an open toll road system is proposed for implementation. The project itself, while at terminal stages of operational implementation, was marred by court battles and civil protests that cited, among other things, poor stakeholder consultation, inappropriate transport solution concept, and claims of severe economic and social impact. The paper shows that an indiscriminate implementation of the user-pays principle within the context of urban network tolling is indeed inappropriate. This is demonstrated through the use of more explicit, yet aggregate level, impact analysis of the proposed scheme on households as a function of household income, urban spatial structure, and available mobility choices. It is, for example, shown that only 10% highest income households are able to comfortably absorb the additional costs of transport due to tolls, and that the historical urban spatial structure renders the tolling less appropriate as a mobility management instrument. The paper recommends further research in respect of equitable user-pays principle in the transport sector, as well as the need to seek more comprehensive mobility and access solutions as opposed to purely road infrastructure oriented solutions.

## **1. INTRODUCTION**

As one of the youngest transitional democracies in the world, South Africa is undergoing intensive transformation characterised by such things as increased social inequalities, with a Gini coefficient of 0.7 (National Planning Commission, 2011). This consequently demands a conscious balance between addressing historical backlogs, including infrastructure, and investing in purely economic competitiveness oriented programmes. In the transport sector, backlogs are associated with historical gross under-investments in public transport, and historical apartheid-based spatial planning that, among other things, resulted in increased average travel times for commuters as a result of state-led separatist-type development. Investing in road infrastructure, also viewed against this backdrop, requires that a balance be struck between the need to invest in developing and maintaining world class infrastructure and the addressing of dilapidated, and sometimes, non-existent road networks in many urban and rural areas.

South Africa's extensive road network, spreading 606 978 km (SARF, 2010), requires relatively large amounts of financial resources to manage. The road network is managed separately by National government (3%), Provinces (30%) and Local government (67%). The entire national government managed network is paved, in contrast to only 26% of provincial and 22% of local government paved road networks. The national roads serve the purpose of

providing long distance mobility and facilitate countrywide regional connectivity, and 19% of this network is currently tolled, mainly along rural sections. Given the financial constraints to expand and maintain increasingly congested urban-based national road network, in 2005 the Minister of Transport announced phased proposals to toll the network, beginning with a 185km of existing national road network located in Gauteng Province, the economic heartland of the country. The entire 185km of the proposed tolled network runs in the urban areas of the cities of Johannesburg, Tshwane and Ekurhuleni, carrying the highest traffic flows of the entire national network. The announcement to toll the network was the first major decision in the history of the country to implement the policy of user-pays principle at a large scale on urban road networks. After the physical implementation of the tolling proposals on the 185km network in 2011, a large wave of public protests impeded the operational implementation of the tolls on grounds of poor public consultation, inappropriate solution concept, affordability, and double-taxation claims.

The paper provides a critical review of introducing the user-pays principle infrastructure financing approach in the context of tolling of a pre-existing urban road network in a developing country. It uses readily available transport planning data in South Africa to evaluate the merits of the approach. The province of Gauteng in South Africa is used as a case study, and the analysis is mainly limited to households and household members.

The paper is arranged as follows: Following the paper introduction, a synthesised background to the urban tolling proposals in South Africa is provided, followed by the identification of some of the critical shortcomings of the approaches used to assess and support the viability of the scheme. This is then followed by the actual assessment of the urban tolling proposal, leading towards paper conclusions and recommendations.

## **2. BACKGROUND**

The background provided in this section of the paper provides a contextual background to the proposed urban tolling scheme in South Africa in terms of geography, policy and the operational aspects of the scheme.

### **2.1 Geographical context**

The paper uses an urban tolling scheme, located in Gauteng Province of South Africa, as a case study. Gauteng province is one of the nine provinces of South Africa. The province serves essentially as the economic epicentre of the country, contributing over a third of the country's GDP. The overall character of the province is summarised in Table 1 where the indicators such as population, number of households, and labour force are provided and also compared with national figures. Worth noting within the context of this paper is that only a third of households have access to a car and that the area is relatively dense, with a fifth of the country's population, but occupying 1% of the country's space.

**Table 1: Selected illustrative statistics for Gauteng province**

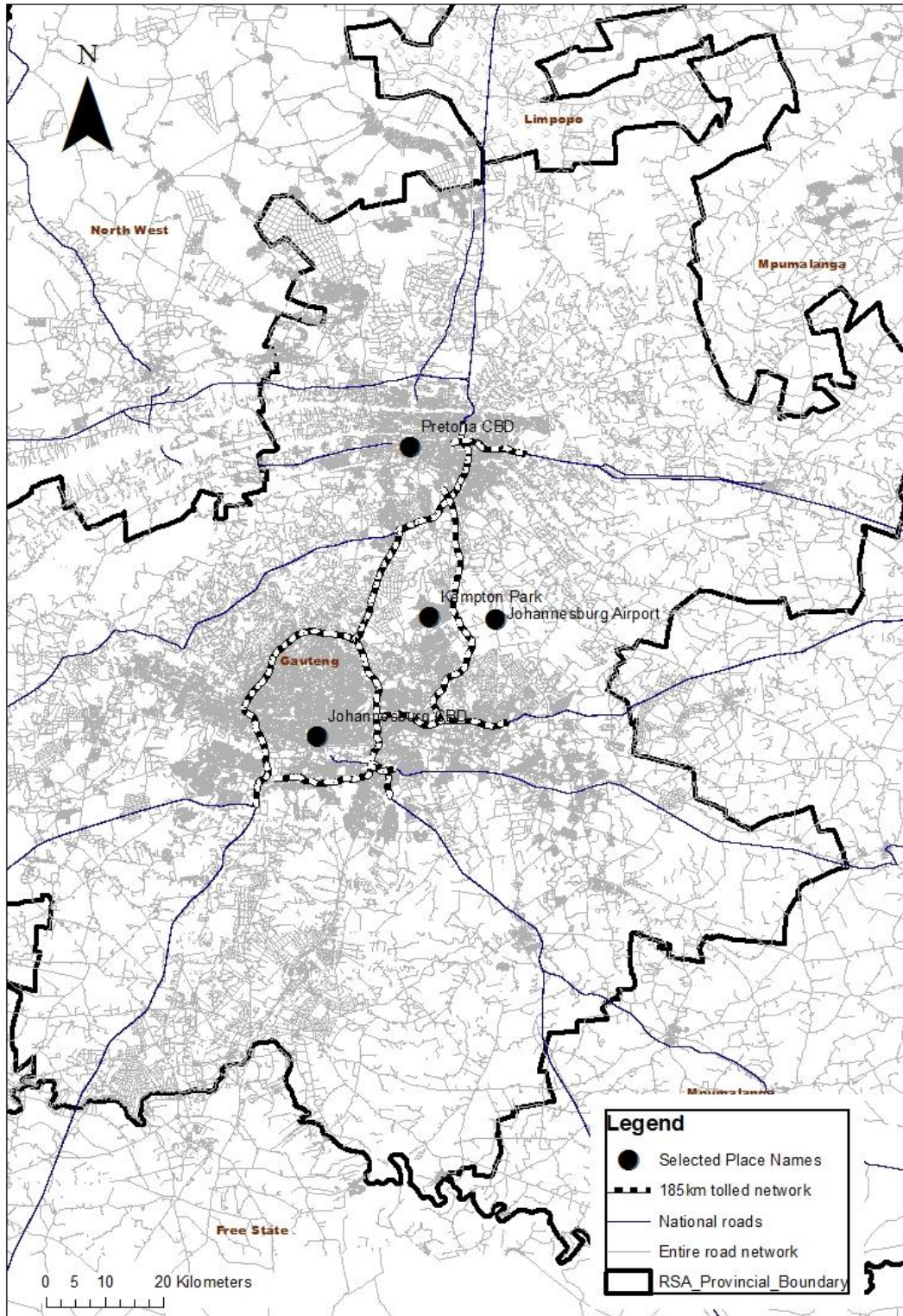
Parameter	Value	Relative to the rest of the country
Population (2011)	11,328,203	22% of country total
Households (2011)	2,712,000	19% of country total
Labour force (2011)	3,965,000	30% of country total
Area (2011)	16 548 km <sup>2</sup>	1% of country total
Registered number of all types of motorised vehicles (business and private) (2012)	3,661,881	39% of country total
Contribution to South Africa's GDP (2010)	R811 Billion (€1≈R10)	34% of country total
% of households with cars (2003)	33%	The figure is 26% for the whole country

## 2.2 Road tolling in South Africa

The South African national transport policy provides for the use of direct user charging for the use of transport infrastructure such as ports, railways, and roads (Department of Transport, 1996). For roads, the policy provides for the use of indirect road user charges such as fuel levy, as well as direct user charges in the form of tolling in cases where it is viable or appropriate. Tolling of roads is further provided for in legislation, namely the South African National Roads Agency and National Roads Act (Act 7 of 1998). Currently only sections of the national roads, representing 3% of the total road network, can be tolled. Of the 3,120km of tolled road network, 1,832km is financed by the state and toll revenue, and 1,288km financed and managed through 30 year concession contracts (SANRAL, 2012).

## 2.3 The proposed urban tolling scheme

The proposed urban tolling scheme (first phase), referred to as the Gauteng Freeway Improvement Project (GFIP) comprised upgrading of the existing 185km of freeway road network in the form of lane additions, pavement rehabilitation, interchange upgrades, and incorporation of road safety related features such as lighting. The actual tolling mechanism is in the form of an automated open road tolling, comprising some 42 tolling points placed 5 to 14km apart. The toll tariff recognises three classes of vehicles, namely light, medium and heavy vehicles, and also provides for vehicle subclasses. The proposed tolled network, depicted in Figure 1, is the first major urban tolling scheme in South Africa. The project was financed through public sector capital market borrowings with initial costs of R19.5 Billion (Department of Transport, 2012). The tolls are planned for implementation on a ring road surrounding the City of Johannesburg, as well as freeways connecting major urban centres in Gauteng Province.



**Figure 1: Geographical depiction of the location of the proposed tolled network**

The history of the project can be summarised as follows:

- **Initiation:** The open toll project was given a go ahead by parliament in 2007 with the understanding that the cost of the systems would be

recovered from the users. This followed years of debates within government circles in Gauteng Province on how to implement user-based road charges.

- **Initial stages:** Following preliminary system planning, the state produced a report for use in public consultation forums in September 2006. The Minister of Transport announced the project in October 2007, as a project that will “help ease traffic congestion in Gauteng's freeways”.
- **Construction:** The construction officially started in June 2008.
- **Accelerated implementation:** The implementation of the GFIP was accelerated by the need to provide sufficient transport infrastructure for the 2010 FIFA World Cup in South Africa. However, most of the construction was completed in 2011.
- **Tariff announcements:** From the planning stages of the project, the tariff for light passenger vehicles was generally announced as 50 cents/km. In February 2011 the tariffs were officially announced, which included discounts for users with system approved transponders for automated toll collection (e-tags), reduced off-peak tariffs, and discounts for valid public transport operators. A light passenger vehicle with an e-tag would pay 49.5 cents per kilometre, and the one without it would pay 66 cents per kilometre. Following an initial public outcry, the state decided to postpone the implementation of the system pending the results of a government appointed task team to review the tariff structure. In August 2011 reduced tariffs were announced which included exemption of public transport operators, and a tariff of 40 cents per kilometre for compliant light passenger vehicles. Following an even more intense public outcry, and calls for civil disobedience, the tariffs were reviewed once more resulting in 30 cents per kilometre for compliant light passenger vehicles, with planned implementation date of 30 April 2012. Furthermore, for light passenger vehicles with e-tags, the monthly cost was capped at R550 per vehicle.
- **Organised protest:** On 28 April 2012 organised business won an urgent court interdict to delay the implementation of the tolling system pending a thorough review. This action followed a protest march organised by the largest trade union federation, namely Congress of South African Trade Unions (COSATU), on 17 April 2012, against the implementation of the system on grounds that the system would impose extra financial burden on motorists, especially those who “have no choice but to use their cars” for commuting purposes, and result in “economic apartheid” in that roads will only be used by the few wealthier people.
- **On-going legal battle:** Following the awarding of an urgent interdict in April 2012, the state retaliated with a constitutional court appeal against the interdict. This paper was written in the middle of this court battle.

Some impact studies were subsequently conducted by the state, firstly a social impact analysis and secondly an economic impact analysis. The social impact analysis emphasised the benefits that tolling would have on reducing

road traffic congestion, and in turn result in improved quality of family life where families would have increased contact time (Department of Transport, 2012). The study also indicated that for the tolling scheme to be successful, a reliable and safe public transport system needs to be provided, supplemented by change in societal behaviour in respect of shifting from private to public transport (Department of Transport 2012). The economic impact analysis revealed that the project was based on “sound economic logic” in that on the basis of Cost: Benefit ratios, Internal Rate of Return and Net Present Value, the upgrading of the Gauteng road network in the manner conducted, and at a 50 cents/km tariff for light passenger vehicles, was warranted (Department of Transport, 2012). In one of the calculations, it was estimated that for every Rand of initial capital expenditure as well as on-going maintenance over the life of the infrastructure, society would benefit by R8.40. The main cost savings were reduced road accidents, reduced fuel costs, and reduced travel times. An affordability assessment component of the study revealed that the cost to the total economy of Gauteng province was 0.34% of Gauteng’s GDP, and that at a household level the toll revenue would be 0.43% of “gross disposable income”. On the basis of the impact on the price of consumer goods, the study showed that costs of living increased by between 0.13 and 0.15% and therefore the scheme is not inflationary. Other project benefits included the contribution that the actual construction and maintenance would have on employment creation and overall economic growth.

Public engagement was relatively low key. For example, only 82 representations were received for the toll declaration process in 2007 (Department of Transport, 2012). Public comments received questioned the necessity of tolling, impact on the economy, impact on secondary roads due to traffic diversions, and general sentiments that tolling of existing urban roads is unacceptable.

### **3. SHORTCOMINGS OF THE PREVIOUS IMPACT ANALYSES**

The impact analyses carried out showed the gross net benefits of the urban tolling scheme. However, there are a number of shortcomings of the impact analyses that supported the tolling of existing urban roads. Some of the critical ones are that:

- The assessments did not explicitly take into account the historical socio-political context of the urban region.
- The analyses were undertaken at a highly aggregate level.
- Alternative mobility solutions were not considered.
- In the cost benefit assessments, some of the costs are already paid for by society, for example road traffic safety.
- The costs of secondary road impact were not explicitly quantified and taken into account in the cost: benefit analyses.
- The quantification of the impact of road traffic accidents that may be caused by diverting traffic were not assessed, given that the secondary

road network was built with less stringent geometric and overall quality standards than the primary network.

The paper attempts to examine the implication of addressing some of the above shortcomings, limited to readily available data and information.

#### **4. IMPACT ASSESSMENT METHODOLOGY**

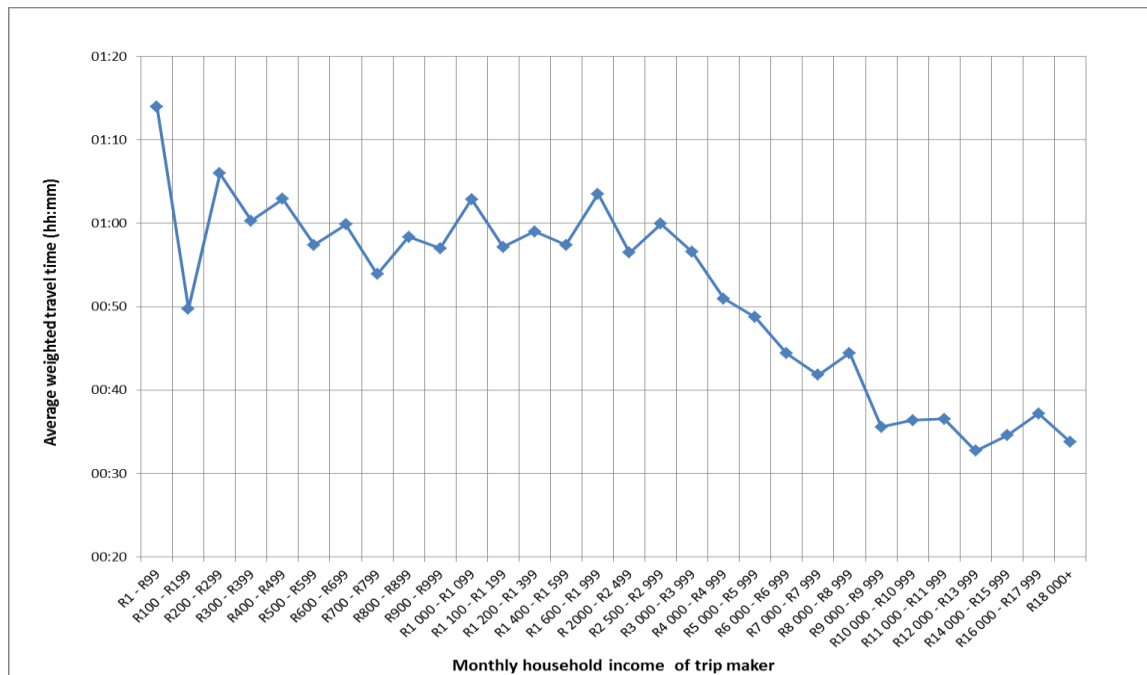
This section of the paper carries out an impact assessment of the proposed tolling scheme at two levels: (i) socio-economic, and (ii) spatial mobility.

##### **4.1. Socio-economic assessment**

The province of Gauteng undertook a household travel survey in 2002. It is currently the only comprehensive household travel survey in the province from which detailed impact assessment can be made. Using the survey data, and based on the daily trips before 9:00am, the inter-city trips undertaken between the three main cities, affected by the tolling scheme, namely Johannesburg, Tshwane and Ekurhuleni, were estimated.

Figure 2 shows the relationship between average one-way journey travel times and the household incomes for the above trips, from which it is evident that travellers from high income households are more likely to travel for shorter periods than travellers from lower income households. In fact, whereas a traveller from high income household takes an average of 32 minutes, it could take a traveller from a low income household as much as 75 minutes. The travel pattern illustrated in Figure 2 is characteristic of apartheid planning legacy in which lower income households, particularly Black Africans, are located further away from economic opportunities. The travel pattern illustrated in Figure 2 implies that lower income households are more likely to travel longer distances than higher income households, and consequently pay relatively more for tolls. This certainly could be viewed as a penalty to lower income households for a spatial planning legacy created by the state.

Although most of the lower income households do not have access to a car, the ones that do would be disproportionately affected. In fact, Burger et al (2004) argue that although affluent Black Africans have urbanised more recently than their White counterparts, they have asset accumulation deficit, and this in turn remains a major hindrance towards middle class consumption patterns by Black people.



**Figure 2: The relationship between commute travel time and household income**

A further impact analysis is presented in Table 1 based on data collected by Statistics South Africa in the household income and expenditure survey (StatsSA, 2008). In this table, the households are divided into income deciles, from low income (decile 1) to highest income (decile 10). For each income decile average monthly income is indicated as well as the probability of a household income decile owning a car. The disposable income is the difference between the average income and all the monthly household expenditures such as food, clothing, education, health, and transport. On average, lower income households already have an expenditure deficit. In fact, the deficit occurs up to income decile 4, implying that 40% lowest income households already spend more than they earn. Assuming one car per household, two trips (forward and return), and an average one way distance of 30km, the toll expenditure as a percentage of disposable income for 66 cents/km tariff and a capped R550/ month tariff are provided for each income decile. With a 66 cents/km tariff income, decile 9 spends almost half of net disposable income on tolls, and with the tariff cap of R550/month the same income decile spends a third of income on tolls. The only income decile that is only marginally affected is income decile 10, representing the 10<sup>th</sup> highest income earning households, spending an average of 6% and 4% respectively for 66 cents/km and R550/month tariffs.



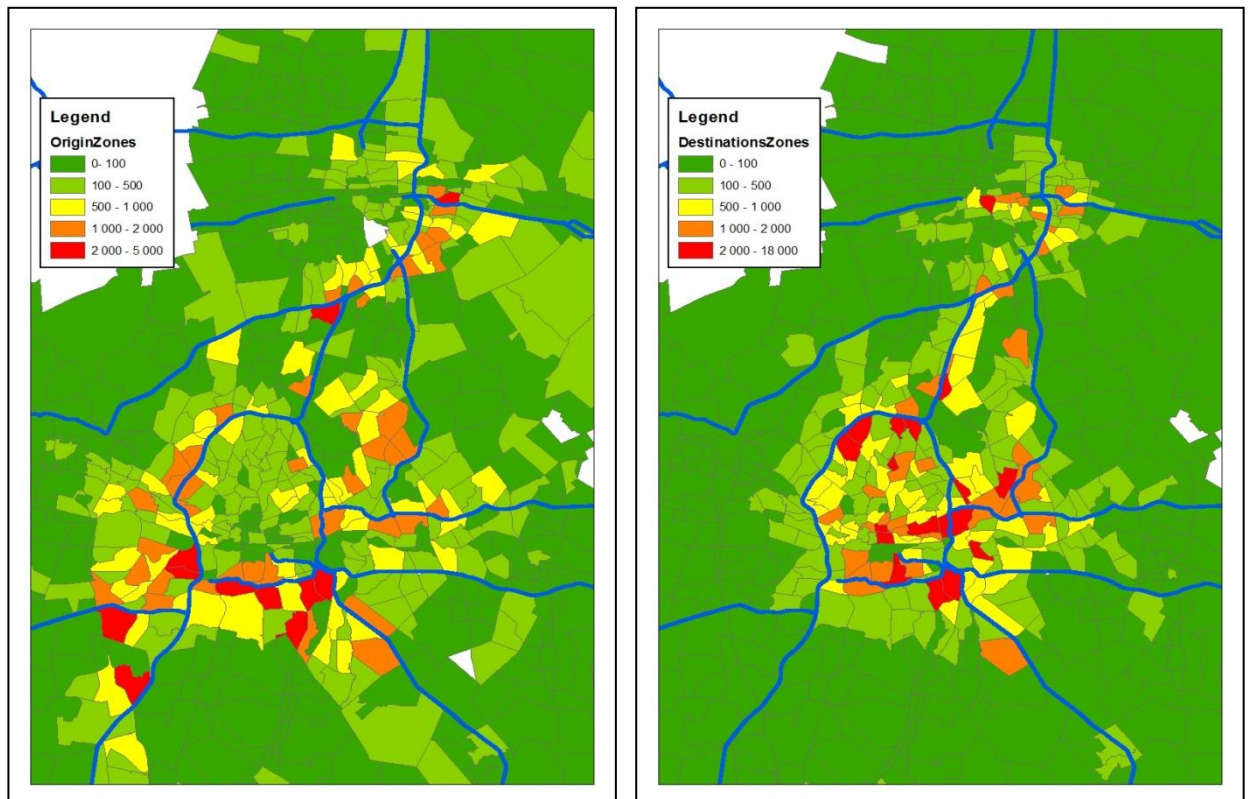
**Table 1: Toll impact analysis in terms of household income deciles**

Income deciles	Average monthly Income (Rand) [R10≈€1]	Household car ownership probability	Disposable income (Rand)	Toll expenditure as percentage of disposable income (66 cents/km)	Toll expenditure as percentage of disposable income (R550/month cap)
Decile 1	506	1.2%	-589	-134%	-93%
Decile 2	1 124	1.9%	-366	-216%	-150%
Decile 3	1 559	2.0%	-291	-273%	-189%
Decile 4	2 067	2.5%	-243	-325%	-226%
Decile 5	2 694	3.0%	13	6132%	4258%
Decile 6	3 579	6.0%	179	442%	307%
Decile 7	5 109	8.3%	660	120%	83%
Decile 8	8 149	19.1%	1 203	66%	46%
Decile 9	15 101	52.2%	1 730	46%	32%
Decile 10	47 562	82.0%	13 066	6%	4%

#### 4.2. Spatial mobility

On the basis of the 2002 household travel surveys, the province of Gauteng has developed an aggregate strategic network based transport model. The model was primarily developed for assessing road network proposals in the province, in response to travel demand changes for the period 2000 to 2025. This transport model was used in this paper to assess the morning peak hour travel patterns of travellers making use of the proposed tolled road network using the link-user equilibrium assignment routine in Emme/3 software. The results are presented in Figure 3 in which the year 2010 volumes of car-based trip origins and destinations of tolled network users are shown. It is observed from this travel pattern that:

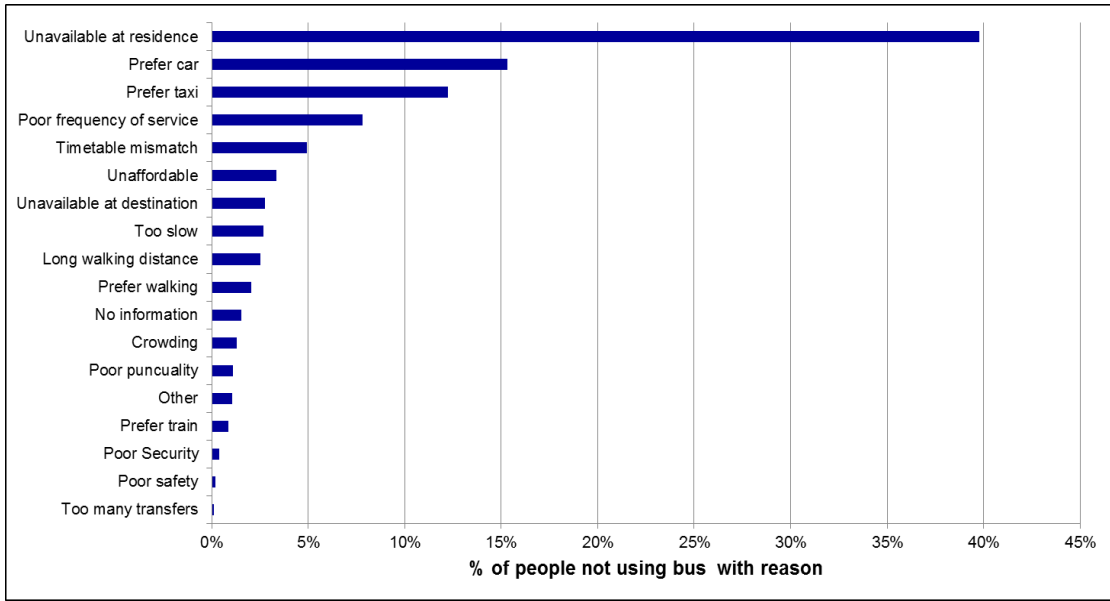
- Trip destinations are more spatially concentrated than trip origins. Nonetheless, the scattered nature of trip destinations (mainly non-residential land uses) is also evident.
- There is a many-to-many relationship between the trip origins and destinations, implying that a large proportion of people travel from many places to many other places.
- The tolled network is used by both travellers in the vicinity of the network and further away from the network. However, people who live closer to more attractive destinations (for example within the Johannesburg ring road) do not use the tolled network as much as those further away from these attractive areas.



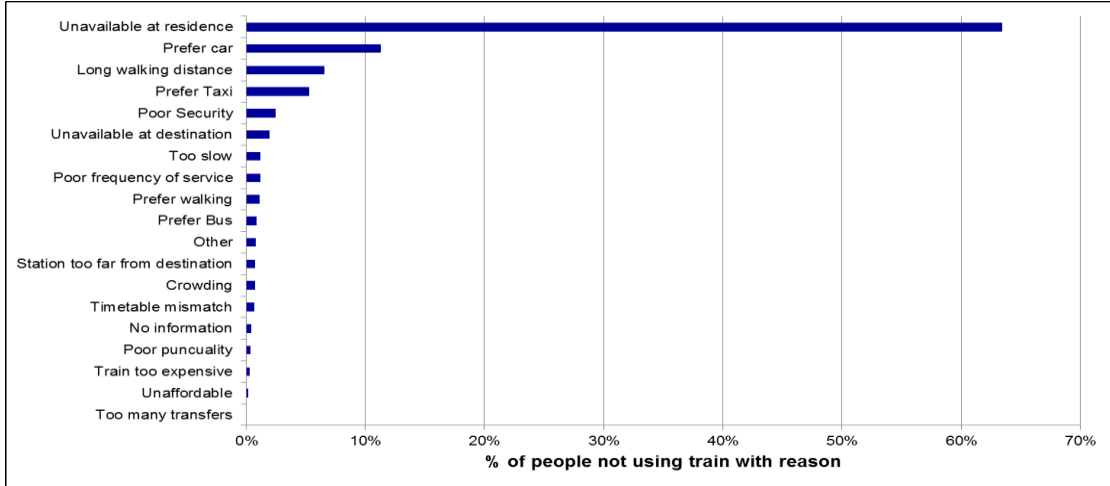
**Figure 3: Trip origins (left) and destination zones (right) for car-based trips making use of the tolled network**

The above travel patterns illustrate the absence of distinct origin-destination mobility corridors. This implies that it may be initially expensive to provide public transport network that adequately services this travel pattern.

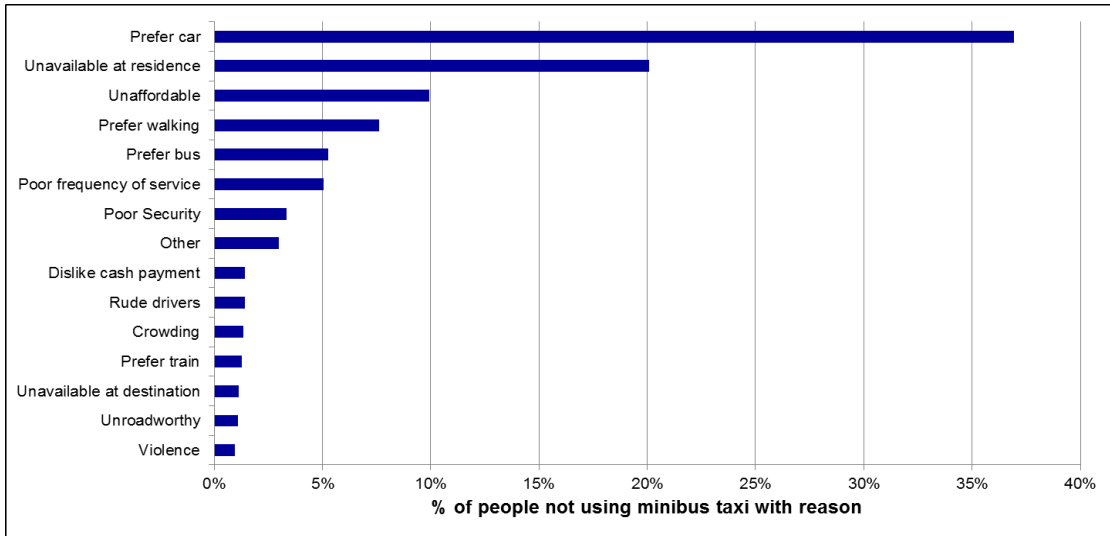
The national household travel survey carried out in 2003 made an assessment of the reasons why household members do not use specific modes of public transport. Figures 4 to 6 summarise the main reasons disclosed by household members for not using buses, trains and minibus taxis respectively, being the primary modes of public transport in South Africa. The main reason common among all the three modes is the unavailability of the services at place of residence. This is followed by preference for a car as opposed to public transport. Figures 4 to 6, in fact, show that availability, relative to other service quality attributes, is the main reason for not using public transport. This may crudely imply that if public transport was available, most of the household members would use it.



**Figure 4: Reasons why commuters do not use bus**



**Figure 5: Main reason for not using trains**



**Figure 6: Main reasons for not using minibus taxis**

The many-to-many travel pattern, together with the perceived general unavailability of public transport services, implies that network tolling leaves many travellers with no option but to pay tolls. Under these circumstances, tolls will not be perceived as a mobility management instrument, but rather a pure income generation tool, especially where an old pre-existing network is tolled.

## **5. CONCLUSIONS**

The paper reviewed the social impact of tolling an existing urban freeway network in the context of a developing country, namely South Africa. The particular context of the paper is the evaluation of the indiscriminate implementation of the user-pays principle. The tolling scheme evaluated is proposed in the province of Gauteng, which is essentially the economic capital of the country.

It was shown that while macro-level tolling impact assessments provide some guidance, it is important to carry out a more elaborate social impact assessment of tolling a pre-existing urban road network. This is particularly the case where social inequalities and historical infrastructure and services backlogs characterise an urban area. In particular, while macro-level assessments estimated that the tolling scheme will not have a significant impact, an assessment based on net disposable income revealed that only travellers from the 10% highest income earning households are not severely affected by the scheme. Undertaking an assessment of the availability of alternative modes of travel is also essential if tolls are to be used as a mobility management instrument.

## **6. RECOMMENDATIONS**

While in South Africa the implementation of an urban tolling scheme on a pre-existing network continues to be a court battle, there is an on-going need for more equitable infrastructure financing mechanisms. The user-pays principle is a proven economically efficient mechanism for infrastructure financing. However, it is recommended that further research be undertaken in respect of “equitable user-pays principle” in the transport sector. While the user-pays principle is in itself an economically equitable concept, it is important to ensure that infrastructure proposals are indeed affordable by the user before being implemented. Also important is the need to seek more comprehensive mobility and access solutions as opposed to only road infrastructure based solutions.

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