DOES THE CURRENT TRAFFIC IMPACT ASSESSMENT (TIA) PROCESS FOLLOWED IN SOUTH AFRICA ENCOURAGE UNSUSTAINABLE TRANSPORT PLANNING?

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ABSTRACT

Traffic Impact Assessments (TIAs) analyse the impact of new developments and land use zoning changes on traffic of the surrounding road network. These assessments play a key role in transportation planning and assist in predicting future transport needs. TIAs in South Africa are required to be prepared according to national TIA guidelines, or local variants thereof. This paper considered the implementation of South African TIA guidelines through a case study analysis of the TIAs of five gated suburban residential developments in Cape Town, South Africa. The level of detail of discussions of private vehicle transport, non-motorised transport (NMT), and public transport was investigated. This desktop TIA analysis of TIAs was augmented by a survey of transport engineers that evaluated the level to which sustainable transport planning is facilitated by South Africa's TIA process. The five TIAs focussed on private vehicle traffic impacts, with detailed capacity analyses, parking discussions, and road upgrade recommendations. NMT and public transport needs were largely overlooked. This supports findings of the literature review of international TIA guidelines, which found that South African guidelines require comparatively little focus on public transport modes. Furthermore, survey results indicated that transport practitioners felt that TIA requirements in South Africa place minimal emphasis on sustainable transport, despite practitioners acknowledging the importance of these modes. This paper provides input for future South African TIA guidelines by emphasising limitations of not incorporating sustainable transport planning and need to move away from vehicle-centric planning.

Keywords: Traffic Impact Assessment, TIA, Transport planning, Sustainable transport, South Africa.

1. INTRODUCTION

1.1 Background

A TIA evaluates the impact that a proposed development or change in land use zoning would have on the surrounding transport network. In South Africa, TIAs are required when an application is submitted for a change in land use zoning or for a development that will generate more than 50 vehicle trips during any peak hour (Committee of Transport Officials, 2012). TIAs play a critical role in urban and transport planning, predicting future transport needs and ensuring that the road network operates safely and efficiently.

All TIAs conducted in South Africa must follow national TIA guidelines (the Department of Transport guideline or the later Committee of Transport Officials (COTO) guideline), or

municipal variations based on either of these guidelines for the local area in question. The standardisation of TIA preparation provides the opportunity to encourage standard and widespread sustainable transport planning practices throughout South Africa.

Sustainable transport (for the purposes of this paper) refers to transport systems that have minimal environmental impact, promote public transport, and which minimise the negative impact of transport systems on future generations through the use of renewable fuels and reduced emissions (Rodrigue, 2024). Essentially, sustainable transport aims to meet present mobility needs without compromising the ability of future generations to meet their own needs.

1.2 Purpose of Study

The South African TIA guidelines; the *TMH16 Volume 1: South African Traffic Impact and Site Traffic Assessment Manual* (COTO, 2012), and the *TMH16 Volume 2 South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual* (COTO, 2012) primarily focus on private vehicle traffic and the impact of private vehicles on the surrounding road network. While these manuals do include sections about sustainable transport such as NMT and public transport, limited practical guidance is provided for assessing these transport modes. This allows transport planning in South Africa to also focus on private vehicles and neglect sustainable transport alternatives.

The idea that private vehicles are a necessity for the middle class to thrive is reinforced by transport policies that influence infrastructure and the provision of public transport (Vasconcellos, 1997). This would mean that design choices, development location, and parking requirements would also reinforce the view of private vehicles as a necessity, thereby promoting unsustainable transport. This research aims to evaluate the implementation of the South African TIA guidelines in practice and determine whether they are encouraging unsustainable transport planning.

2. METHODOLOGY

2.1 Introduction

Two research strategies are employed to evaluate the research question. Firstly, a case study of gated suburban housing developments, a predominant form of new residential area provision, is used to assess how effectively sustainable transport planning is considered during the TIA process. Secondly, a survey was distributed to determine the opinions of qualified traffic and transport engineers regarding the sustainability of the TIA process followed in South Africa.

2.2 Case Study Evaluation of the South African TIA Process

2.2.1 Research Strategy

Investigation of five TIAs of gated suburban developments in South Africa was conducted to evaluate how the TIA guidelines were implemented in the preparation of the TIAs and to highlight areas where the guidelines do not provide adequate guidance. Gated suburban residential developments were used to allow for comparison of the implementation of the TIA guidelines between five developments.

2.2.2 Data Collection

TIAs in South Africa are publicly available documents and are available for all interested and affected parties. An official at the City of Cape Town assisted with the identification of

five gated suburban residential developments within the municipal area that have been approved within the last ten years. The official provided a list of five developments that fit into the scope of the research along with contact information for the transport engineering consultants that compiled the TIAs. All the consultants agreed to allow their respective TIAs to be included in this research and the TIAs were submitted to be analysed.

2.3 Survey of Transport Engineers

2.3.1 Research Strategy

Quantitative analysis of the survey completed by transport engineers working in South Africa was carried out. The quantitative research strategy focussed on identifying trends and patterns in regard to how transport practitioners apply the TIA guidelines and their view on the sustainability of the South African TIA process.

2.3.2 Data Collection

Approval was obtained from the Research Ethics Committee: Social, Behaviour and Education Research at Stellenbosch University (Project ID:30527) before participant recruitment or data collections through survey begun. Data was collected through an anonymous online stated preference survey prepared using SunSurveys. SAICE, the South African Institute of Civil Engineers, distributed the survey via email to their members who are registered as qualified traffic and transport engineers.

3. ANALYSIS OF GATED SUBURBAN RESIDENTIAL DEVELOPMENT TIAS

3.1 Introduction

The aim of the analyses is to evaluate if the current TIA framework is applied consistently and to evaluate the extent to which the current framework promotes unsustainable transport planning practices in South Africa. Each of the TIAs included in the research was evaluated according to aspects such as trip generation, reductions to trip generation rates, vehicular access design, application of parking rates and any proposed reductions, traffic analysis, and proposed road network upgrades. The level of detail in the discussions of private vehicle transport, NMT, and public transport was also investigated.

3.2 Status Quo

The City of Cape Town was chosen as the study area for this research. The growth in population of the City of Cape Town results in the expansion of the residential areas and gated suburban developments on the outskirts of the cities. Furthermore, the City of Cape Town was chosen as the study area since the municipality makes information regarding erf numbers, erf zoning, public transport routes and parking requirements publicly available, and frequently updates aerial imagery.

3.3 Developments Evaluated

In order to ensure the data collected was relevant to the most recent TIA guidelines, only developments with TIAs conducted after 2013 were considered. The 10-year timeframe allowed for the inclusion of developments that have already been constructed, enabling comparison between what was proposed in the TIAs and what was ultimately implemented. Due to the size of the study area, not all development types could be included in the research, and it was decided to focus on one type of development: gated suburban residential developments. This is a predominant form of new housing developments in South Africa and regularly require TIAs. It was decided for the purpose of

this research that a gated suburban development would be defined as an erf or multiple erven that have been approved by the governing authority as a single project and has several dwelling units on the enclosed property.

The developments included in this research had various sizes, residential land uses, parking types and a range of incomes. As such, the developments themselves were not directly comparable. However, the focus of the study was not to compare the developments, but rather on how the TIA guidelines were implemented for each development's TIA. Therefore, the developments did not have to be comparable.

The TIAs of five gated suburban residential developments were utilised in this research. The developments, the developers and the authors of the TIAs will be kept anonymous. The aim of this research is to analyse the TIA methodology followed in South Africa and not to single out consultancies regarding their preparation of TIAs and use of the guidelines.

3.4 Private Vehicle Analyses in TIAs

3.4.1 Trip Generation

Vehicle traffic counts were performed during the weekday AM and PM peak hours at several intersections for all of the developments. All TIAs provided the land use applicable to the proposed development along with the source used for the trip generation rates and directional split utilised. The expected peak hour private vehicle trips likely to be generated by the proposed developments were calculated and thoroughly explained in all five of the TIAs.

3.4.2 Accesses

The location and geometry of the proposed vehicle accesses to the sites were clearly indicated on the developments' SDPs and were described in all five of the TIAs.

3.4.3 Parking

The number of parking bays required were calculated in four of the development's TIAs and additional details were provided regarding the reduction of the parking requirements in all of these cases. The one TIA that omitted parking completely provided no reasoning as to why this was done.

3.4.4 Traffic Analyses

Capacity analyses for multiple scenarios were performed at the studies' intersections and the results thereof were well described for all the developments. All TIAs also included recommended road network and intersection upgrades based on the results of the capacity analyses. Details regarding the proposed upgrades were included in all of the TIAs.

3.5 Sustainable Transport Analyses in TIAs

3.5.1 Accesses

None of the TIAs included descriptions of the pedestrian accesses to the developments. The number of pedestrian accesses, the locations of the pedestrian accesses or the pedestrian access controls were not provided in any of the TIAs. The only information available regarding the pedestrian accesses was provided on the SDPs with no accompanying details. Furthermore, pedestrian accesses were provided to three of the developments that have already been constructed as of January 2023. Indicating that there was a need identified but not deemed necessary to include in the TIAs. The TIAs

also did not include information regarding the crossing locations or proposed pedestrian crossings outside of the developments. No pedestrian or bicycle traffic counts were performed or included and no calculations regarding the expected number of NMT trips were done in any of the TIAs.

3.5.2 NMT Facilities

Descriptions of the existing NMT infrastructure in the site vicinity of the developments were discussed in two of the TIAs. Recommendations for additional NMT facilities were made in three TIAs. Details regarding the recommended NMT facilities, including the location, size and length of the facilities were often omitted from the TIAs. The SDPs for four of the developments did indicate the provision and location of NMT facilities inside the development boundaries, but these facilities were not detailed in the TIAs.

3.5.3 Public Transport

The existing public transport modes operating in the site vicinities, or the lack thereof, were mentioned in four of the TIAs. Only three of the TIAs included recommendations for additional public transport embayments or the use of the proposed refuse embayments by minibus taxis. Only one of the TIAs calculated the number of minibus taxis that would be required to service the development. The remaining TIAs did not include such calculations or information. Thus, indicating that the majority of TIAs do not consider the expected number of public transport trips that would be generated by the development and the number of minibus taxis or buses that would be required to accommodate the additional demand on the existing public transport system.

No TIAs considered the public transport trips that would be generated to and from the developments from non-residents. The main focus of the TIAs was the expected private vehicle trips generated by residents of the proposed developments. However, in reality, those are not the only people travelling to and from the sites. Many individuals work privately inside of the developments and would require public transport to travel to and from work. No detailed information regarding existing public transport operating in the vicinity of the developments, including the location of the existing public transport routes, the location of the nearest ranks or public transport interchanges, the location of bus stops or public transport embayments, was provided in any of the TIAs.

3.5.4 Safety

Three of the TIAs included information regarding proposed traffic calming outside of the developments in the form of intersection upgrades or speedbumps while one of the SDPs indicated additional traffic calming measures inside the development boundaries.

4. SURVEY OF TRANSPORT PRACTITIONERS

4.1 Introduction

An anonymous survey was distributed to qualified traffic and transport engineers to gauge the opinions of these professionals regarding the sustainability of the current TIA process followed in South Africa. The background to the intentions of the research was presented in a neutral manner to avoid influencing the responses. Specifically, the aim of assessing whether practitioners are implementing sustainable transport solutions in their TIAs was not disclosed, as this could lead to the participants placing higher emphasis on this than is actually the case.

Insights were evaluated regarding the promotion of NMT and public transport for gated suburban residential developments and the level of detail applied in these sections of a

TIA. Opinions regarding parking requirements and the frequency with which reductions are proposed to parking rates in TIAs were investigated, as reduced parking provision is often associated with efforts to discourage private vehicle use and promote more sustainable transport modes. Finally, the opinions of the professionals regarding the future of sustainable transport in South Africa were ascertained.

4.2 Participants

The anonymous online survey was open for seven days and was completed by 50 participants, comprising of 17 candidate engineers or technologists, 26 professional engineers, and 7 professional engineering technologists. Given the relatively small size of the traffic and transport engineering field in South Africa, the aim of the survey was to provide a general idea of how practitioners implement the South African TIA guidelines.

The majority (70%) of the participants indicated that the preparation of TIAs is the bulk of their work. The participants in this research thus have a thorough understanding of the current TIA process followed in South Africa.

4.3 NMT

The majority of participants (42%) indicated that they only include one paragraph detailing NMT aspects when conducting TIAs, as shown in Figure 1. TIAs often only include a short description of the existing and proposed NMT facilities. This trend illustrates that the participants are following the South African TIA guidelines since an extensive assessment of NMT facilities are not required.

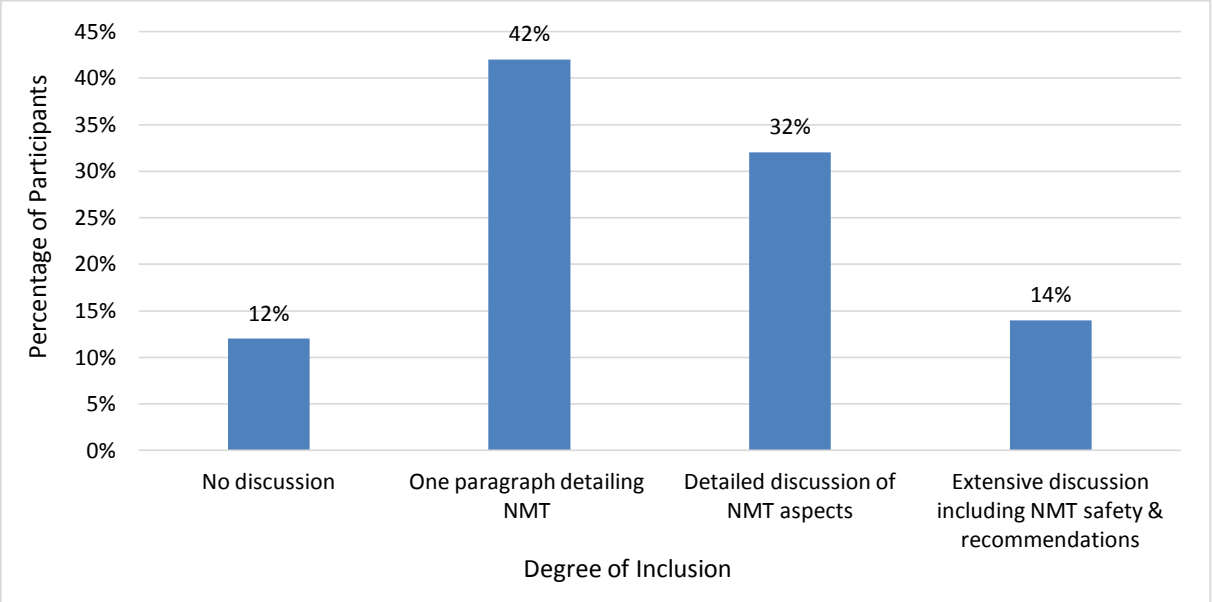

Figure 1: Degree of inclusion of NMT aspects in TIAs

The frequency of participants including additional NMT facilities that are not already included on the proposed gated suburban developments SDPs are shown in Figure 2. Half of the survey participants (50%) indicated that they “frequently” or “very frequently” proposed additional NMT facilities in TIAs that are not included on the SDPs of the developments. SDPs often do not include NMT facilities and participants include proposed facilities within the one paragraph detailing NMT aspects. By recommending additional facilities participants are aware of the current lack of infrastructure and the increased need that residents have for such facilities.

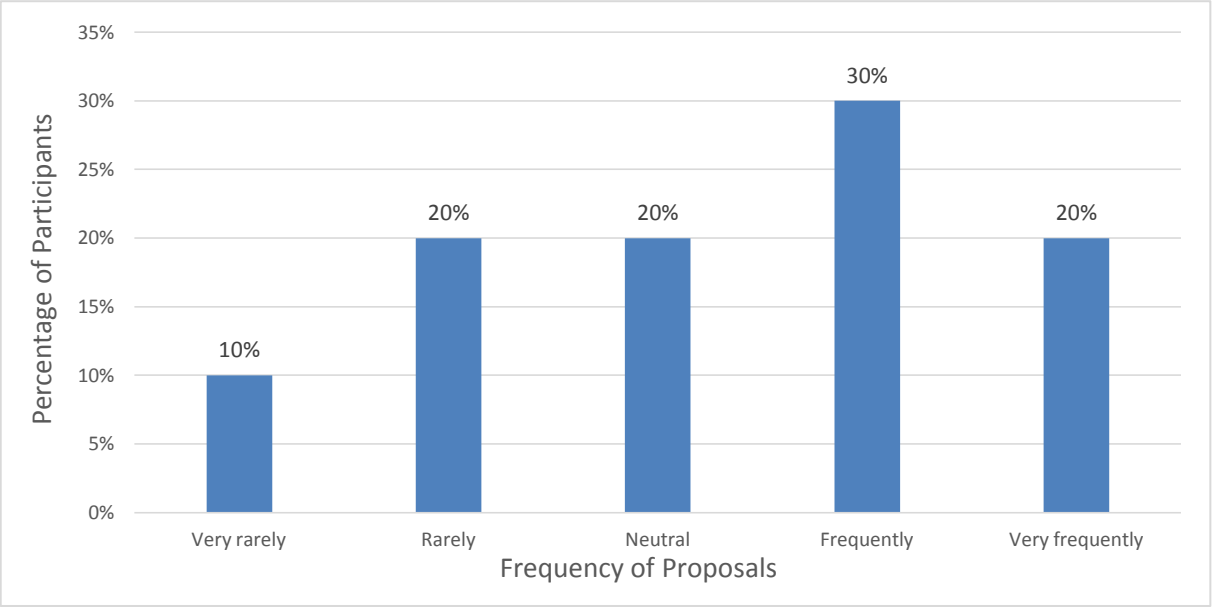

Figure 2: Frequency of proposing NMT facilities in TIAs that are not included on the SDP

Overall, participants indicated that the inclusion of NMT facilities are “important” or “very important” when conducting TIAs (80% of participants). It is interesting to note that while participants acknowledge the importance of NMT discussion in a TIA, most participants typically only include one paragraph detailing NMT aspects which reflects that the TIA guidelines may not require adequate inclusion of discussions of NMT facilities.

4.4 Public Transport

It was most common for participants to only include basic information regarding public transport facilities when conducting TIAs, as reported by 48% of the participants and shown in Figure 3. According to the *TMH16 Volume 2* (Committee of Transport Officials, 2012), TIAs should include at least a description of the existing and proposed public transport facilities. Fewer than half of the respondents indicated that they include more detailed information, with 8% of respondents reporting to describe routes, stops, minibus taxi operating licenses and recommended public transport facilities. Thus, illustrating that the participants are following the South African TIA guidelines since an extensive assessment of public transport facilities are not required.

According to Figure 4, only 42% of the participants indicated that they “frequently” or “very frequently” propose public transport facilities in TIAs that are not already included on the SDPs of developments. However, most of the participants (34%) captured a “neutral” response.

Similarly to the responses on NMT facility discussions, transport practitioners acknowledge the importance of public transport discussion in TIAs (76% of participants), even though most only reported basic information on public transport systems and facilities. This may indicate that the TIA guidelines do not encourage adequate inclusion of public transport in TIAs.

Only a small number of participants (24%) indicated that they “frequently” or “very frequently” alter trip generation rates to account for a greater share of public transport trips. This suggests an acceptance of the existing trip generation rates. The South African TIA guidelines do provide reductions that can be applied to trip generation rates for developments located near public transport nodes. The limited alteration of the trip

generation rates shows a missed opportunity to improve the modal split in favour of sustainable transport alternatives.

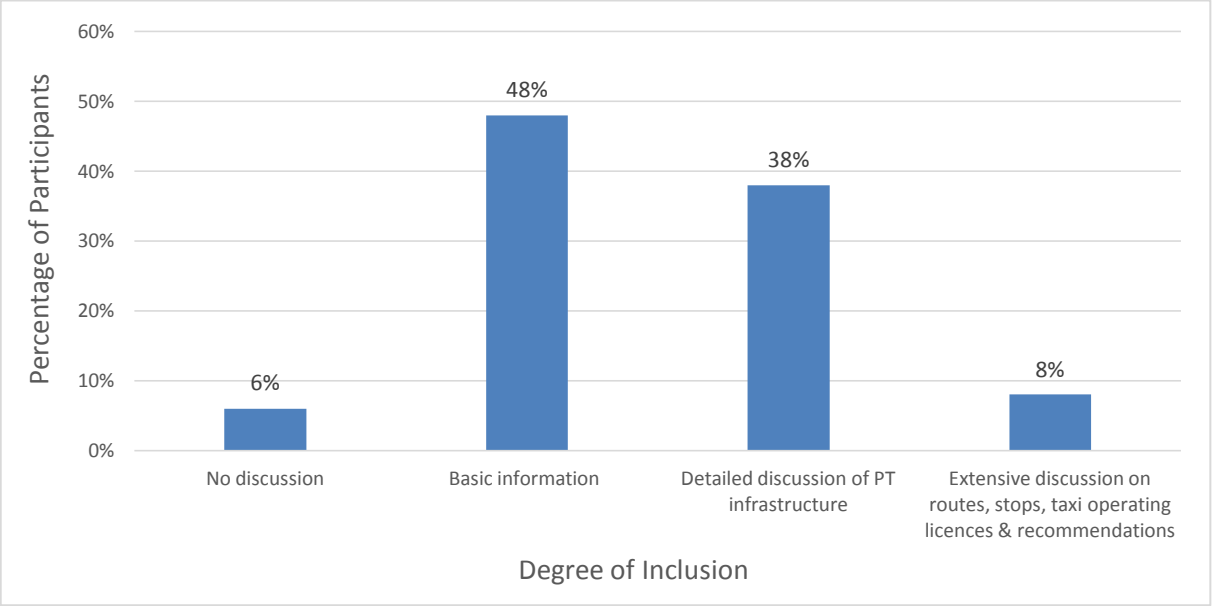

Figure 3: Degree of inclusion of public transport in TIAs

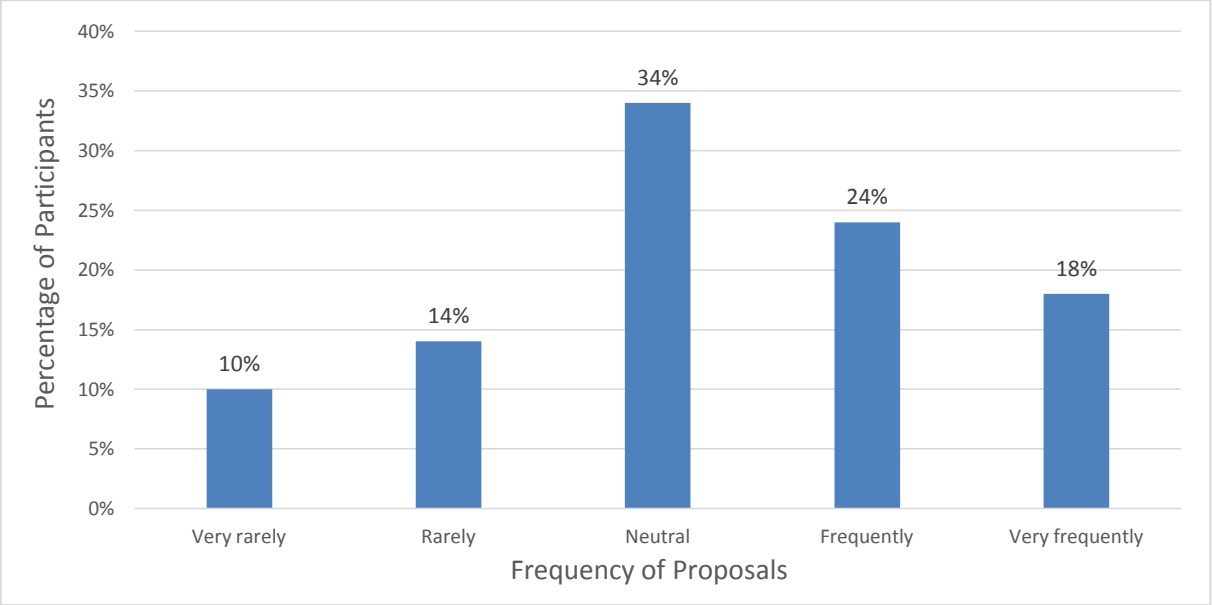

Figure 4: Frequency of proposing public transport facilities in TIAs that are not included on the SDP

4.5 Parking

Half of the participants (50%) perceive the parking requirements that are provided by municipalities in South Africa and utilised in TIAs to be sufficient for gated suburban residential developments, as shown in Figure 5. Thus, indicating that transport practitioners believe that the parking requirements will result in an adequate number of parking bays on-site to accommodate a proposed development. 10% of participants consider parking requirements to be excessive, while 12% consider the parking requirements "insufficient".

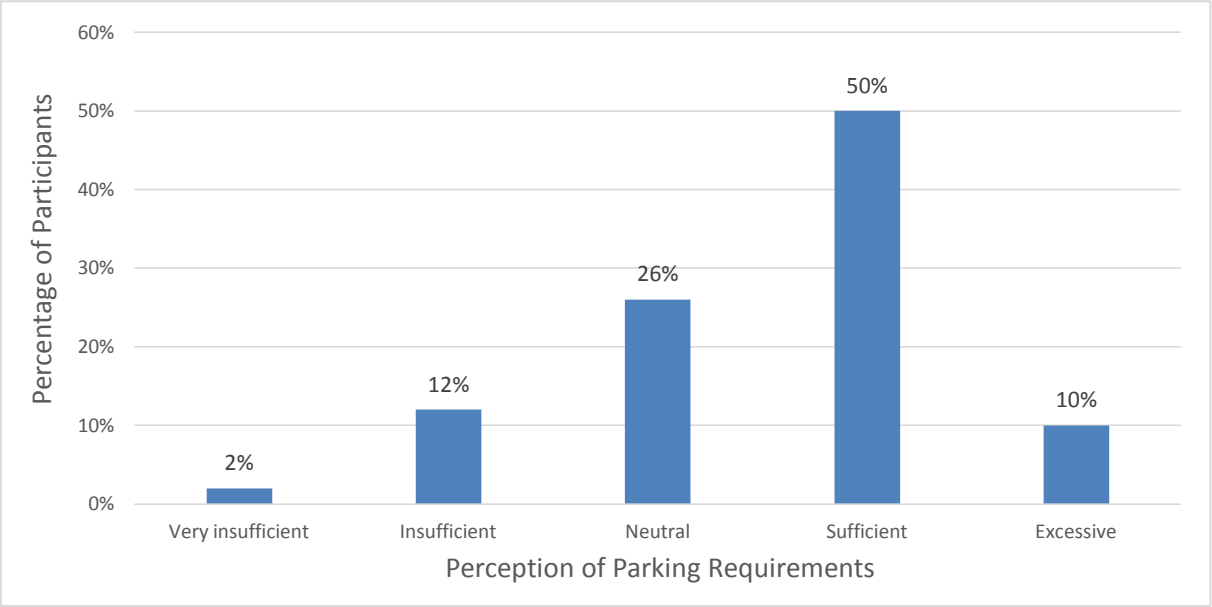

Figure 5: Perception of parking requirements

The frequency of participants motivating for the use of reduced parking requirements are shown in Figure 6. 32% of the participants indicated that they would "sometimes" motivate reduced parking requirements for gated suburban residential developments in their TIAs. However, only 20% of participants indicated that they "frequently" or "very frequently" motivate for reduced parking requirements in their TIAs. The use of reduced parking requirements in TIAs could be attributed to a multitude of factors, such as cost-saving measures or efforts to promote alternative sustainable transport modes. 48% of participants indicated that they "very rarely" or "rarely" motivate for reduced parking requirements. This is contradictory to the TIAs evaluated where the four TIAs that included parking all utilised reduced parking rates. This could be attributed to participants having varied interpretations of what is classified as reductions to parking rates. Participants may only be focused on major deviations, such as significant departures from municipal standards, when in reality minor reductions, such as small percentage adjustments or motivating for shared parking between land uses, are frequently implemented in practice.

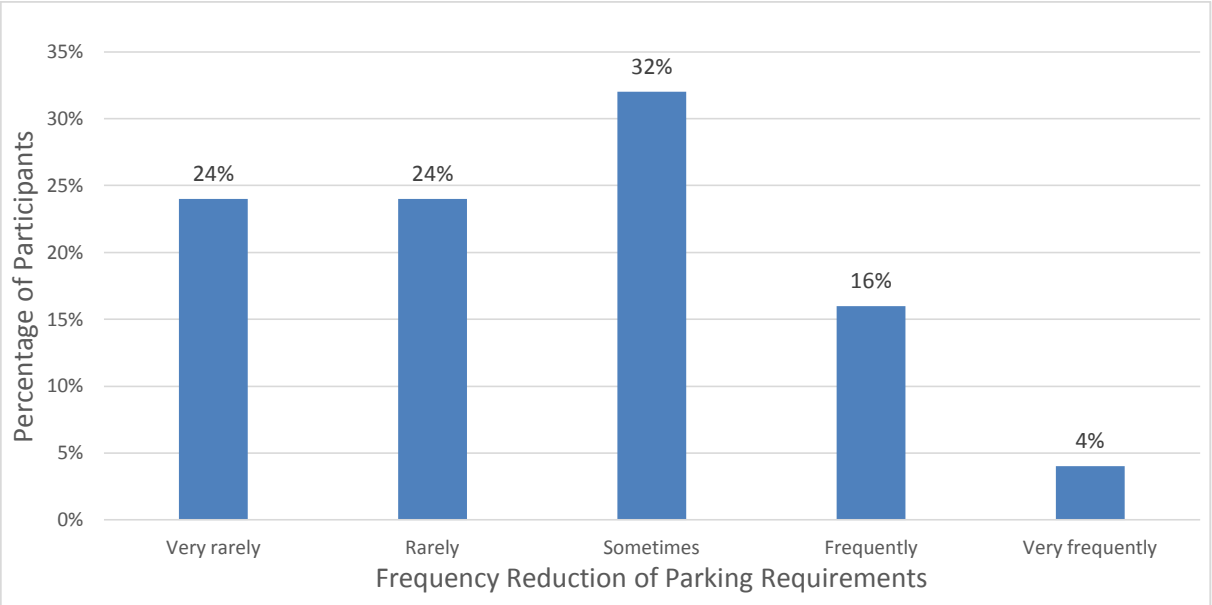

Figure 6: Frequency of motivating for reduced parking requirements

Participants were asked if excessive parking promotes the use of private vehicles, with responses shown in Figure 7. Half of the respondents (50%) indicated that it is “likely” or “definitely” that excess parking spurs private transport use, while 26% thought that this was not the case.

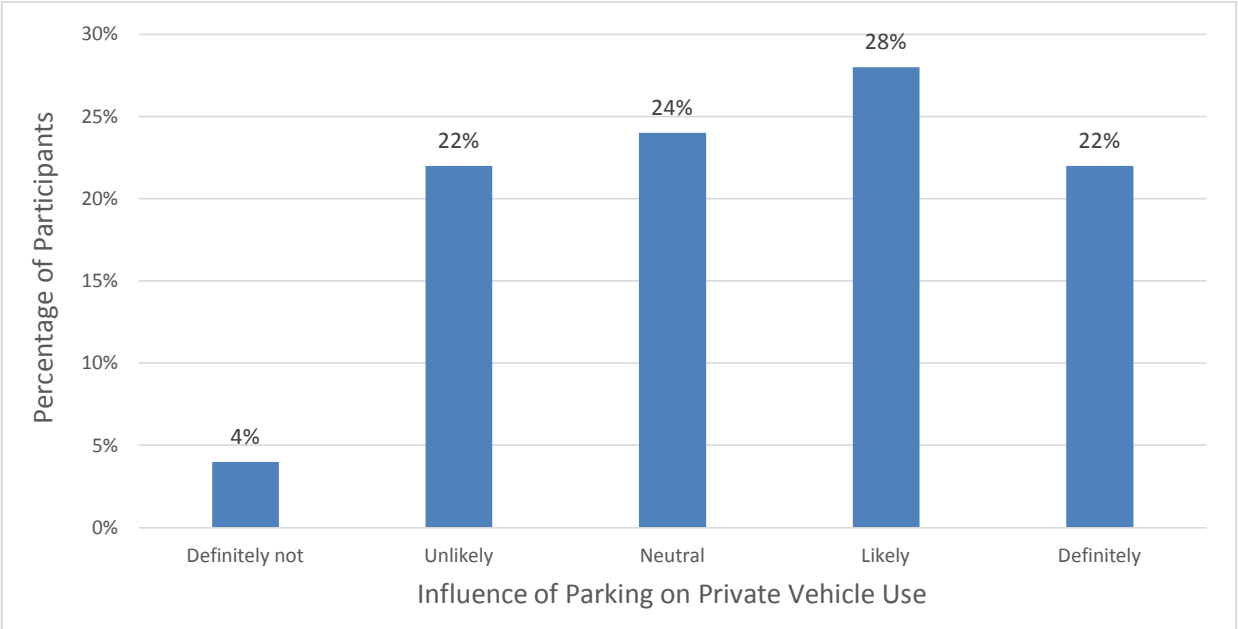

Figure 7: View of excessive parking requirements promoting the use of private vehicles

Participants were asked to evaluate the influence of parking requirements on sustainability, which was defined in the survey as transport with minimal environmental impact. Nearly half of the participants (48%) believe that parking requirements have an impact on sustainability, while only a small group (20%) did not. Even though transport practitioners do recognise the impact that parking has on sustainability, no efforts are made to reduce the parking rates utilised in TIAs.

4.6 Sustainability in South Africa

The view that participants have on the sustainability of the current TIA process utilised in South Africa are shown in Figure 8. Participants are divided in regard to the sustainability of the current TIA process, with few having a strong opinion that the current TIA process is either “very unsustainable” or “very sustainable”. The divided responses may reflect a limited focus on sustainability in TIAs or a lack of general knowledge regarding sustainable transport.

Finally, participants were asked if they feel that it would be feasible to focus on sustainable transport in a South African context, with the results indicated in Figure 9. Most participants indicated that they believe focusing on sustainable transport in South Africa is at least “somewhat feasible” or “very feasible” (48% of participants) or they were “neutral” about the subject (28% of participants). From this, it can be identified that transport practitioners consider incorporating sustainable transport practices in South Africa as feasible.

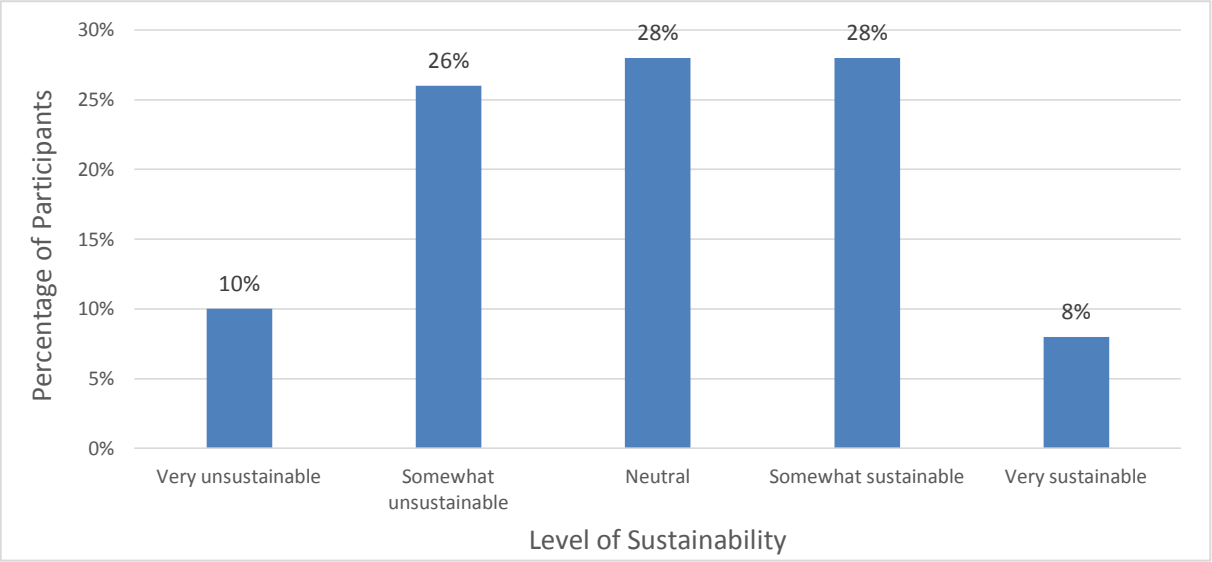

Figure 8: View of the sustainability of the current TIA process

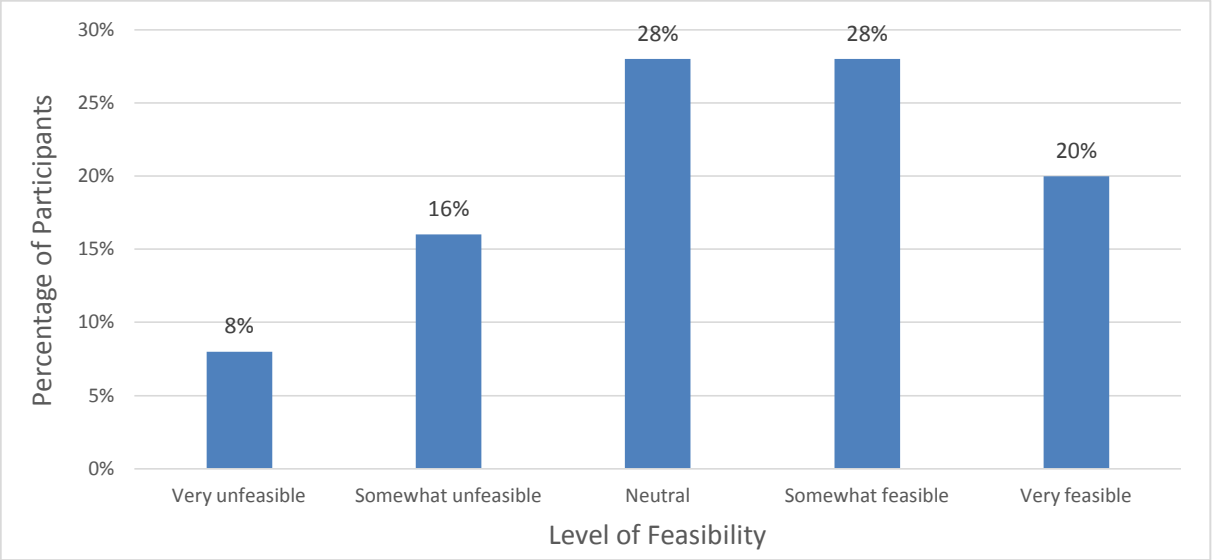

Figure 9: View of the feasibility of focusing on sustainable transport in South Africa

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The implementation of the South African TIA guidelines highlights a significant focus on private vehicle traffic, with limited attention on alternative sustainable transport modes. The case study of the five gated suburban residential developments' TIAs indicated that the TIAs extensively detailed the vehicular impacts of the developments, while NMT and public transport needs were not addressed to the same level of detail. This trend aligns with the findings of the survey of the traffic and transport engineers. The transport practitioners indicated that the current TIA guidelines place minimal emphasis on sustainable transport, despite practitioners acknowledging the importance of these modes.

The findings of the research suggest that TIAs in South Africa tend to encourage unsustainable transport planning practices, since private vehicle traffic and infrastructure is prioritised over sustainable transport. This may be due to the guidelines primarily focusing on private vehicle impacts with less emphasis on evaluating or incorporating sustainable transport options. The lack of detailed assessments of NMT and public transport facilities

in TIAs reflects a significant gap in the South African TIA process regarding sustainability. Alternative strategies, such as incorporating reduced parking rates and adjusting trip generation rates to account for public transport mode shares, are also often sidelined. This could be due to practitioners not including these strategies or officials not permitting the use thereof.

To ensure that sustainable transport planning occurs in South Africa the current TIA guidelines must be updated to place a greater emphasis on sustainable transport. Furthermore, this research indicates support from traffic and transport engineers, highlighting the feasibility of implementing sustainable transport strategies in South Africa.

5.2 Recommendations for Future Research

Future research into the TIA process in South Africa should focus on incorporating detailed NMT and public transport assessments more effectively into the existing framework. Methods for quantifying pedestrian and bicycle traffic should be explored alongside methods for evaluating NMT and public transport infrastructure. Additionally, investigating the impact of parking on modal split could assist in development designs that result in optimal use of sustainable transport modes.

6. REFERENCES

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