AN EVALUATION OF THE PLANNED GAUTRAIN FEEDER AND DISTRIBUTION SYSTEM

D. J. King and B. Ssamula

CSIR Built Environment, P.O. BOX 395, Pretoria, 0001
Tel: 012 841 2985, Fax: 012 841 3037, E-mail: dking@csir.co.za

ABSTRACT

The Gautrain rapid rail link is seen as a flagship public transport project of national importance to act as a catalyst to promote public transport in a holistic fashion in South Africa. The success of the Gautrain will largely depend on the quality of the feeder and distribution services and on the integration with other existing transport services. This paper analyses the proposed feeder and distribution system, focussing on specific issues such as the placement of transport nodes and the associated infrastructure, the use of public transport modes on the chosen routes and corridors, the integrated ticketing system, the option of using non-motorised transport (walking or biking) to and from stations, and will also look at the effect that the system will have on private car usage and traffic congestion. The dedicated and auxiliary feeder and distribution services has a very important role to play in attracting users to the Gautrain and planning, design and implementation of these services are very important to ensure sufficient levels of ridership are achieved and maximum conversion is obtained from private transport.

1. INTRODUCTION

Due to the high economic growth in the country and especially in the Gauteng region pressure is placed on existing infrastructure, and economic growth has continually outpaced infrastructure investment and development to date. Coupled with a historical land development policy based on segregation and promotion of private car use and one can see that especially transport infrastructure struggles to cope with the combination of long distances travelled and high congestion.

1.1 Gautrain Background

In February 2000 the Gauteng Provincial Government announced the development of a rapid-rail system linking Johannesburg with Tshwane (Pretoria) and with the OR Tambo International Airport. After an extensive and iterative Public Participation Process, Environmental Impact Assessment study, and design phase, construction of the R25 billion (approx. $3.7 billion) Gautrain started September 2006. The first phase between the OR Tambo International Airport and Sandton is scheduled to be completed before the start of the Soccer World Cup tournament in 2010. The second phase of construction between Johannesburg and Tshwane will be completed by March 2011. Three anchor stations plus seven other stations will be linked by 80 kilometres of rail along the planned route (See Figure 1). The three anchor stations will be located at:

- OR Tambo International Airport;
- Tshwane (Pretoria train station); and
- Johannesburg (Park station)

The seven other stations will be located at Rosebank, Sandton, Marlboro, Midrand, Centurion, Hatfield, and Rhodesfield (Kempton Park).

The operation specifications for the Gautrain include maximum travelling speeds of between 160 to 180 kilometres per hour and it will reach Tshwane from Johannesburg in less than 40 minutes. The frequency between Johannesburg and Tshwane will initially be six trains per hour per direction and it will operate approximately 18 hours per day with a maximum peak hour seating capacity of 1 926 passengers per direction. The ancillary road-based public transport service will include dedicated, exclusive bus services to transport passengers to and from stations (www.gautrain.co.za).

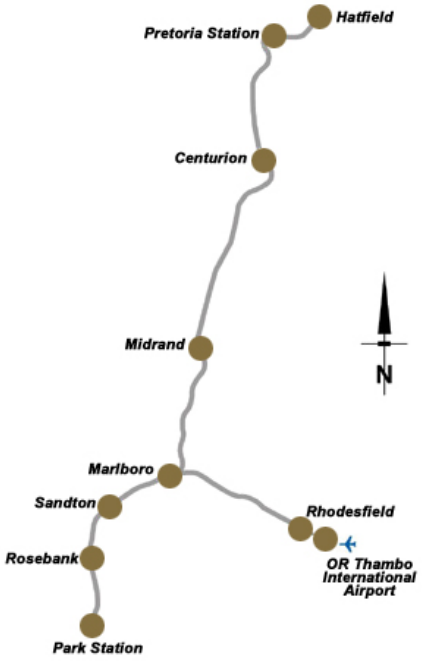

Figure 1 Gautrain route layout

1.2 Planned Feeder and Distribution Services

The dedicated Gautrain feeder and distribution service will be operated by the rail operator using similar branding and service levels and is planned to include thirty-six routes serving nine stations over a distance of 430km. The frequency of the services will average 12 minute intervals during morning and afternoon peak periods and 18 minutes on average during off-peak times. The fleet will consist of 125 buses of which 97 will be 35-seater vehicles, 21 will be 55-seater vehicles and seven articulated buses. Bus stops will be provided at least 500 metres apart on both sides of the route. Figure 2 and 3 below conceptualises the feeder and distribution system (www.gautrain.co.za).

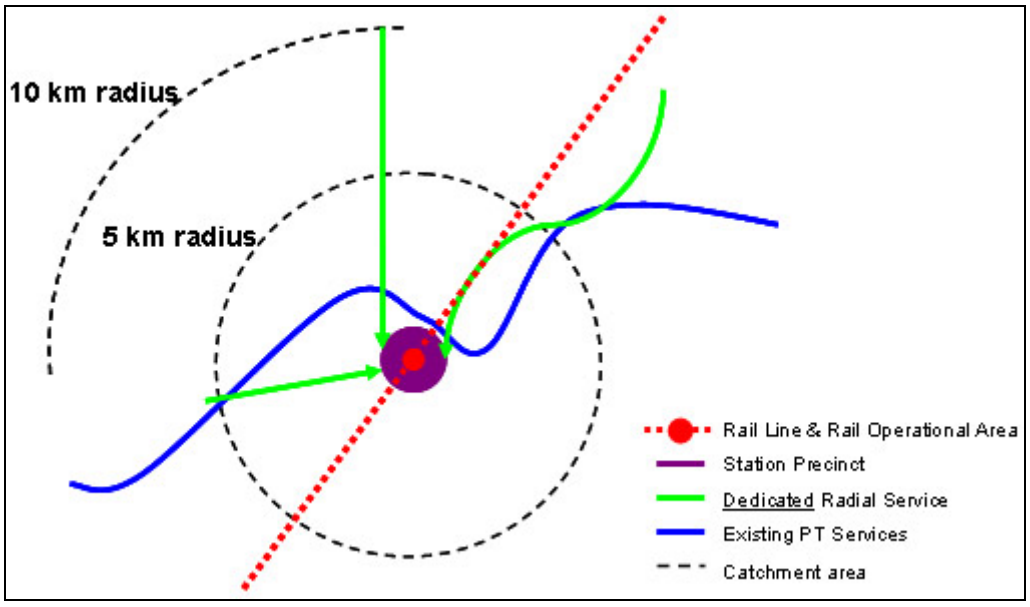

Figure 2 Dedicated radial feeder service on origin side of journey

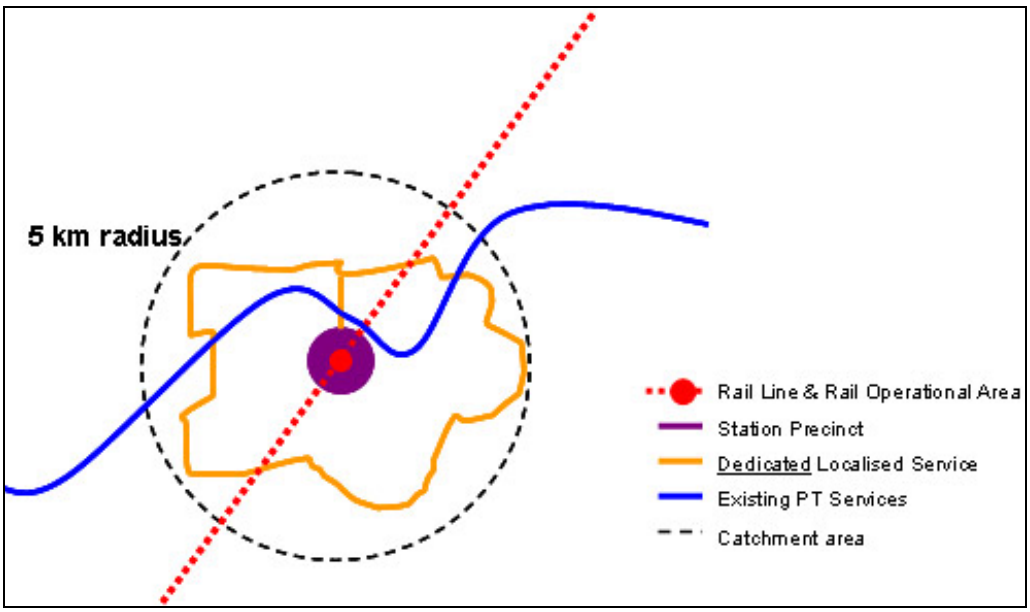

Figure 3 Dedicated circular distribution service on destination side of journey

1.3 Auxiliary transport services

All Gautrain commuter stations have been planned to ensure easy access by means of a variety of transport options. According to the Gautrain website transport options to stations include the following:

Walking **-** This is ultimately the preferred option and stations have all been located in existing or planned future high-density development nodes. Developments around stations are expected to focus increasingly on the Gautrain, and it is expected that the number of passengers that walk to and from stations will increase over time.

Bicycles **-** Provision will be made at stations for bicycle lockers to promote passengers to cycle to and from stations.

Park-and-Ride **-** Park-and-ride is an important component of the Gautrain system and adequate parking facilities will be available at each station precinct.

Kiss-and-ride **-** Kiss-and-ride refers to passengers that are dropped off or picked up at stations by private vehicles. Provision is made at each station for short term parking bays where passengers can be dropped off or picked up.

Road based public transport services **-** Provision will be made at Gautrain stations for public transport stops and lay-bys for buses and minibus taxis to enable passengers to use these existing public transport services.

Metrorail commuter service **-** The Gautrain rail network and stations have been planned to allow passengers to use existing Metrorail commuter rail services as a feeder service to the Gautrain. The existing commuter rail services in Johannesburg and Tshwane serve large areas within the metropolitan municipalities and such passengers can access the Gautrain at the Johannesburg Park Station, Pretoria, and Hatfield

Other services **-** Ancillary transportation services such as meter taxis and tour coaches (specifically at Pretoria and Johannesburg Park) to the Gautrain stations will be promoted to expand the range of passengers served by the Gautrain.

Planned bus-rapid transit - Johannesburg and Tshwane are planning to implement bus-rapid transit routes that will combine with the Gautrain stations and feeder and distribution service. (www.gautrain.co.za)

2. PROBLEM STATEMENT

The Gautrain is seen as a flagship public transport project of national importance to act as a catalyst to promote public transport in a holistic fashion in South Africa. The analysis will not focus on the Gautrain per se, but rather on the feeder and distribution services that will run in conjunction with the rapid rail link. The success of the Gautrain will largely depend on the quality of the feeder and distribution services and on the integration with other existing transport services. Although the main aim of the feeder and distribution services will be to transport passengers to and from the Gautrain stations, other positive external effects will flow out of this. One major benefit is that public transport service delivery will improve, with more reliable, more efficient, more regular services being offered to passengers. Another benefit is that a shift to public transport usage could decrease road congestion and lead to a decrease in private car usage.

The paper analyses the proposed feeder and distribution system, focussing on issues such as the placement of transport nodes and the associated infrastructure, the use of public transport modes on the chosen routes and corridors, the integrated ticketing system, the option of using non-motorised transport (walking or biking) to and from stations, and will also look at the effect that the system will have on private car usage and traffic congestion. A selective analysis of the current plans will be done and a conclusion drawn if these plans are sufficient in dealing with the 'Gautrain hinterland' and if it will be viable to implement the proposed feeder and distribution services. Alternative or further recommendations will be made to improve these plans, where applicable.

3. EVALUATION

3.1 Target market

A survey conducted on potential users of the Gautrain (Synovate Gautrain survey 2006) showed that only 48% of current private car users between Tshwane and Johannesburg would be likely or extremely likely to use the Gautrain as their main mode of transport between the cities. Of the current taxi-commuters between the two cities, 81% said they would be likely or extremely likely to use the service. It thus seems that a shift between public transport modes is more likely with more taxi users willing to use the Gautrain than private car users, percentage wise.

The top three reasons that will prevent commuters from using the Gautrain were listed as:

- Safety and security on the train,
- Transport to and from stations,
- Ticket cost and affordability.

The survey found that only 50% of car drivers believed the Gautrain will offer a safer trip than a car journey, while 70% of taxi users thought the Gautrain will be safer than a taxi journey. One reason for the low trust in safety of the Gautrain by car users might be the way current public transport is perceived as unsafe to travel on. Security also plays a big role when choosing alternative transport and the current crime situation in South Africa deters rather than promotes passengers from using public transport. To reach the intended target market of private car users the perception of public transport as unsafe will have to be changed. The Gautrain and its feeder and distribution services will need to be

intensively promoted as a safe and secure travel option.

Compared to the current cost of travelling, 55% of car drivers thought the Gautrain would be cheaper than using a car while 47% of taxi users believed the Gautrain would be cheaper than using a taxi. According to the Gautrain website the fare will be lower than the cost of travelling by car, but car users tend to add the cost of travelling from home to the station and from the station to work and this total travel cost might seem higher to them than the perceived cost of travelling by car. To attract private car users it should be proven unequivocally that it is much cheaper to travel via the Gautrain system than to travel by car. The Gautrain fare will be more expensive than current public transport fares, but will offer a higher quality service to commuters.

In the same survey 55% of car drivers said they believe that the Gautrain will not reduce traffic problems on Gauteng roads. The Gautrain by itself does not have the capacity to reduce congestion on the Tshwane – Johannesburg corridor, but with the support of the feeder and distribution service it might act as a catalyst to change the negative image of public transport and thereby facilitate a switch from private to public transport.

Figure 4 and 5 gives a summation on how potential Gautrain users think they will travel to and from the stations (Synovate Gautrain survey 2006).

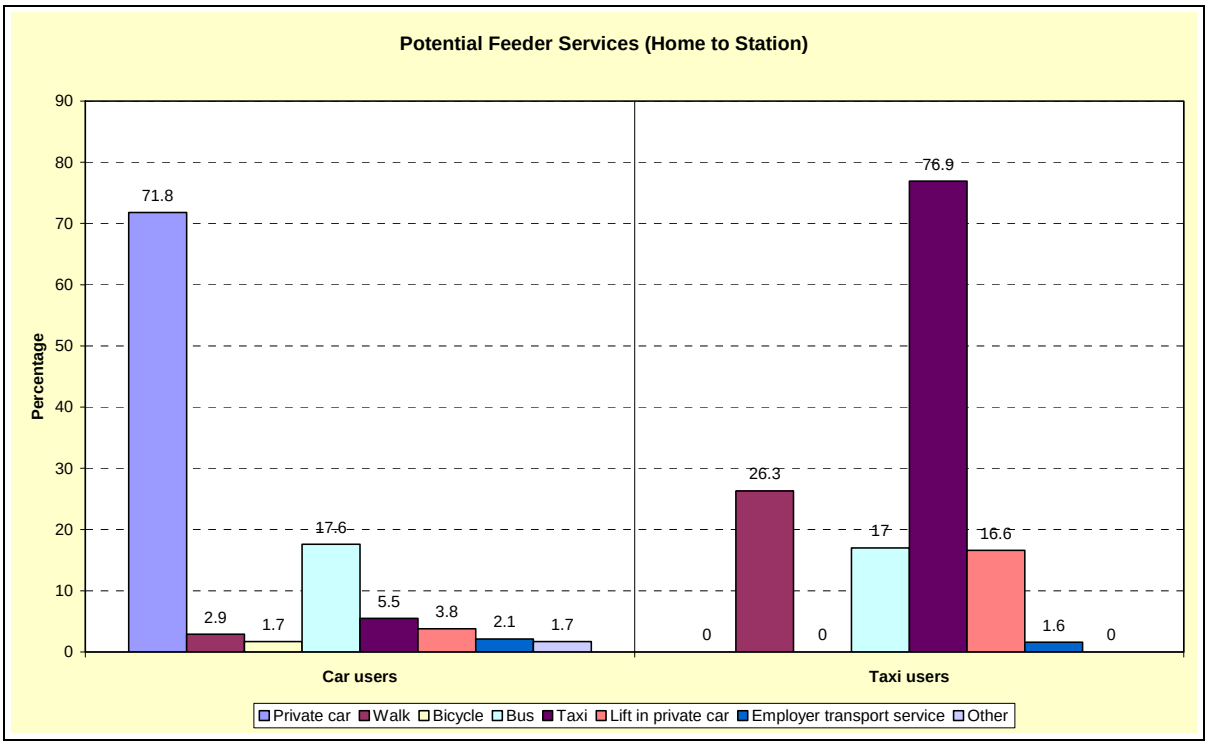

Figure 4 User preference on travelling from home to the station

Feeder services (Figure 4)

- As can be expected 72% of car and 77% of taxi users state that they would use cars and taxis respectively to travel to the station.
- 17% of both car and taxi users also said that they would be willing to use a bus to travel to the station.
- 26% of taxi passengers said they would walk as part of their journey to the station.
- In total 23% of car users and 94% of taxi users said they would be willing to use public transport as part of their feeder journey.

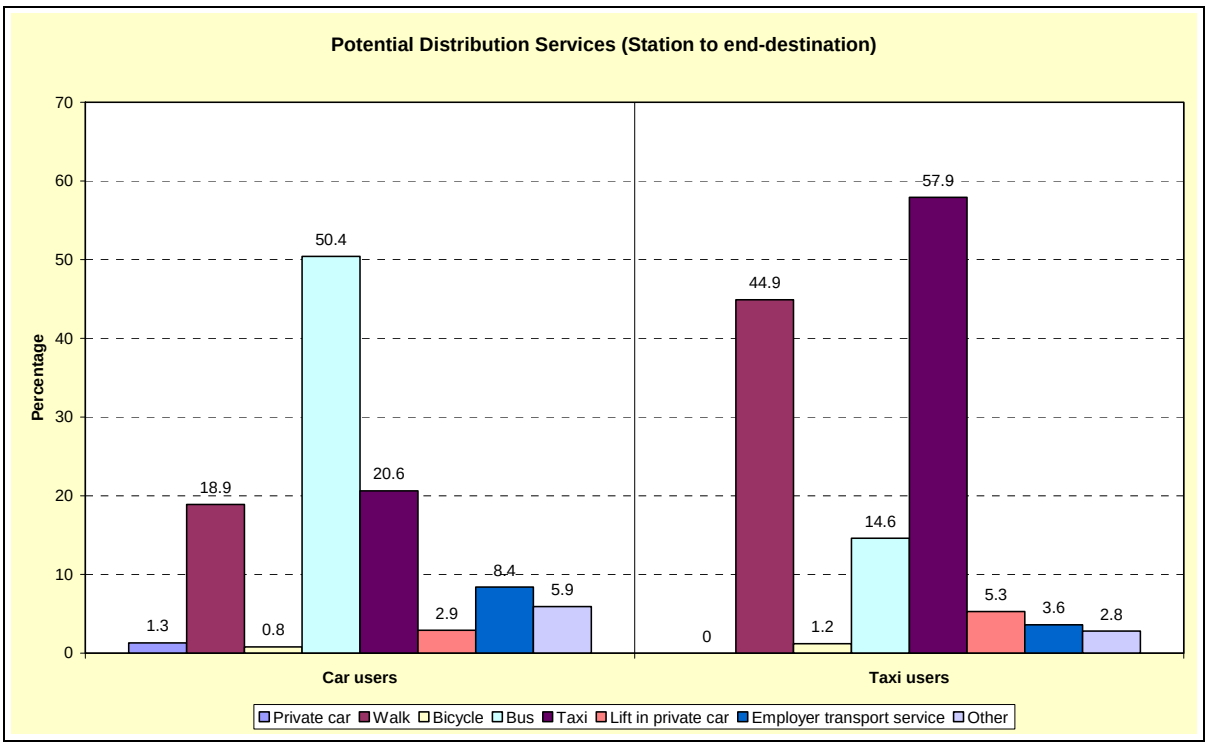

Figure 5 User preference on travelling from station to end-destination

Distribution services (Figure 5)

- Only 19% of car users and 45% of taxi users said they would be willing to walk to their end-destination.
- More than 50% of car users stated they would use bus transport to get to their end-destination compared with only 15% of taxi users.
- 58% of taxi users said they would rather use taxis to travel from the station to their destination.
- In total 71% of car users and 80% of taxi users said they would be willing to use public transport from the station to their end-destination.

Most prevalent is the fact that car users will rely on own transport to the station, but will rely heavily on public (especially bus) transport from the stations. Therefore investment in the park & ride facilities at origin stations and in the public transportation distribution services at destination stations are of utmost importance. Providing these services at an acceptable level will ensure that car users will be more willing to use the Gautrain.

Public transport users are probably more used to walking as a mode seeing that public transport seldom offers a door-to-door service as is the case with private transport. The willingness of taxi passengers to walk to and from stations places a burden on government and the concessionaire to provide a safe environment around the station precinct to promote walking. Seeing that it is expected for passengers to use walking as the preferred mode as densities around stations increase it is necessary to promote ease of access by foot.

The fact that current taxi passengers state they will continue to use taxi as a preferred mode of transport to and from stations could be because the minibus taxi has shown that it is the most flexible public transport mode in South Africa. The sensitivity of this mode to customer demand and preference will see that it adapts the fastest to serve Gautrain passengers.

3.2 Dedicated feeder and distribution services

As stated previously the Gautrain will not attract enough riders if feeder and distribution services are not provided to support the journey to and from the stations. A dedicated feeder and distribution system as described in section 1.2 is planned to support the Gautrain and will be operated by the Gautrain rail operator. O'Flaherty (2003) distinguishes four desired characteristics of a public transport system. He states that the main competition for public transport is the private car and to increase public transport usage it must have operational characteristics that give it an advantage over the car. These characteristics are:

Convenience - This includes anything from service frequency, service reliability, door-to-door travel time, comfort, interchange facilities that are well designed and offer ease of access and use to pedestrians, and stops / waiting areas that are protected from adverse weather conditions.

Image - The image of public transport should be upgraded by providing comfortable vehicles, trip quality, well designed vehicles, stations and stops that are clean and damage free, and positive attitude and helpfulness of staff.

Information - The provision of information is of vital importance if the system is to be perceived as being user friendly. Availability of service frequencies, times and fares by route and real-time information at stops and stations is of importance.

Security - Travellers should feel safe when using public transport. Facilities should be well lit and monitored at all times to induce the feeling of being safe and reduce the risk of personal attack.

The Gautrain dedicated feeder and distribution services document addresses almost all of these issues and the needs of passengers seems to be taken into account and well covered. There is however some issues that flow out of a comparison with the above characteristics and the Gautrain feeder and distribution services document and specifications and these will be discussed below.

Service performance monitoring

Although the feeder and distribution service will be provided by the rail operator and as stated with similar quality as the train service, the bus-operation will be sub-contracted to another transport company which in turn will use different transport operating companies to supply the service. A number of performance targets have been set by the Gauteng Provincial Government (GPG) that is ultimately the responsibility of the rail operator, which of course would want the service to be successful because it would directly influence the number of passengers using the Gautrain. Care should be taken by the rail operator to ensure that all bus transport companies involved buy into the service delivery standards and are able to provide the required levels of service.

Competition from the minibus-taxi industry

Although the main target of the Gautrain is to move private vehicle users to public transport, it is expected that a large number of passengers will switch from their current public transport mode (mainly taxi) to the Gautrain (Synovate Gautrain study 2006). These users might also switch to the new dedicated feeder and distribution service, but the presumption is that taxi operators will realise there is a change in customer travel patterns and will adapt to serve these new routes as well, which will mean less people using the dedicated services. Another foreseen problem could be that the new dedicated service decreases the customer base of the current taxi operators. This could lead to new cases of

taxi violence and intimidation as has happened before in Gauteng and the Western Cape between taxi operators and bus companies. To limit the chances of any of the above two scenarios happening taxi operators and local government should be engaged at an early stage to come up with a working solution that will suite all parties involved.

Responsibilities of local government
The dedicated feeder and distribution routes will run outside of the station precinct on already established roads mostly owned and maintained by the local municipalities of Johannesburg and Tshwane. The feeder and distribution services document states that priority measures will have to be provided on congested arterials like High Occupancy Vehicle (HOV) lanes and that "changes to local roads may be required and access roads to certain station be provided." It will be presumptuous to expect the local municipality to provide and be responsible for all the necessary infrastructure (lay-byes, shelters, bus-stops, and priority measures) for the dedicated service and this issue is somewhat skirted in the document. It will be important to reach an agreement with the local municipalities as soon as possible as this issue will impact significantly on the level of service that will be provided by the dedicated service.

Impact on private road users
The provision of priority measures such as HOV lanes for the dedicated service will have an impact on the current road infrastructure. The dedicated lanes will decrease road space available for other road users, especially private car users and will lead to greater congestion during peak hour travel. This might lead to discontent from private car users and could lead to them not obeying priority traffic regulations. The increased congestion will also affect local road users that do not travel between Johannesburg and Tshwane and will place an unfair time and cost burden on them.

Feeder and distribution routes
Preliminary routes for the dedicated service have been developed and it is accepted that these routes will change due to changes in land-use and travelling patterns during the construction of the Gautrain, but doubt exists around the preliminary design of the Tshwane area feeder and distribution routes and more specifically for the east of Tshwane. In the original feeder and distribution services document passengers living in the east would have had access to the Centurion station via decentralised park-and-ride facilities served by a dedicated bus service, but the new planned route only covers the immediate Centurion area. The Hatfield station dedicated bus service covers a route that ends in the Menlyn Park area as can be seen in Figure 6 below.

It is clear form the feeder and distribution services document that passengers living in the east (1km buffered centre-points represents main neighbourhoods) would have to use private transport to the Hatfield or Centurion station and continue onwards on the Gautrain. The question that is begging is why if the main target market of the Gautrain is more affluent people that make use of private cars to travel to Johannesburg is there no dedicated service covering the east of Tshwane where most of these potential passengers reside?

A simple example will be a person living in Faerie Glen that works in Sandton. A normal morning peak trip by car would probably take 1h30min to 2 hours travelling on the N1. For this person to use the Gautrain it would take, assuming they use the Hatfield station, at least 30 minutes to get to Hatfield, 10 minutes waiting time for a train and another 35 minutes on the train plus maybe 10 minutes to walk if the workplace is near Sandton station. This gives 1h25min, which is just below the normal car travel time. Measured against the convenience of the car this small difference in time saving and the perceived

cost saving will probably mean this person will still choose private car transport to commute. If this person chooses to travel to Menlyn and use a park-and-ride facility and then the feeder bus service the extra mode change will add even more time to the commuter trip.

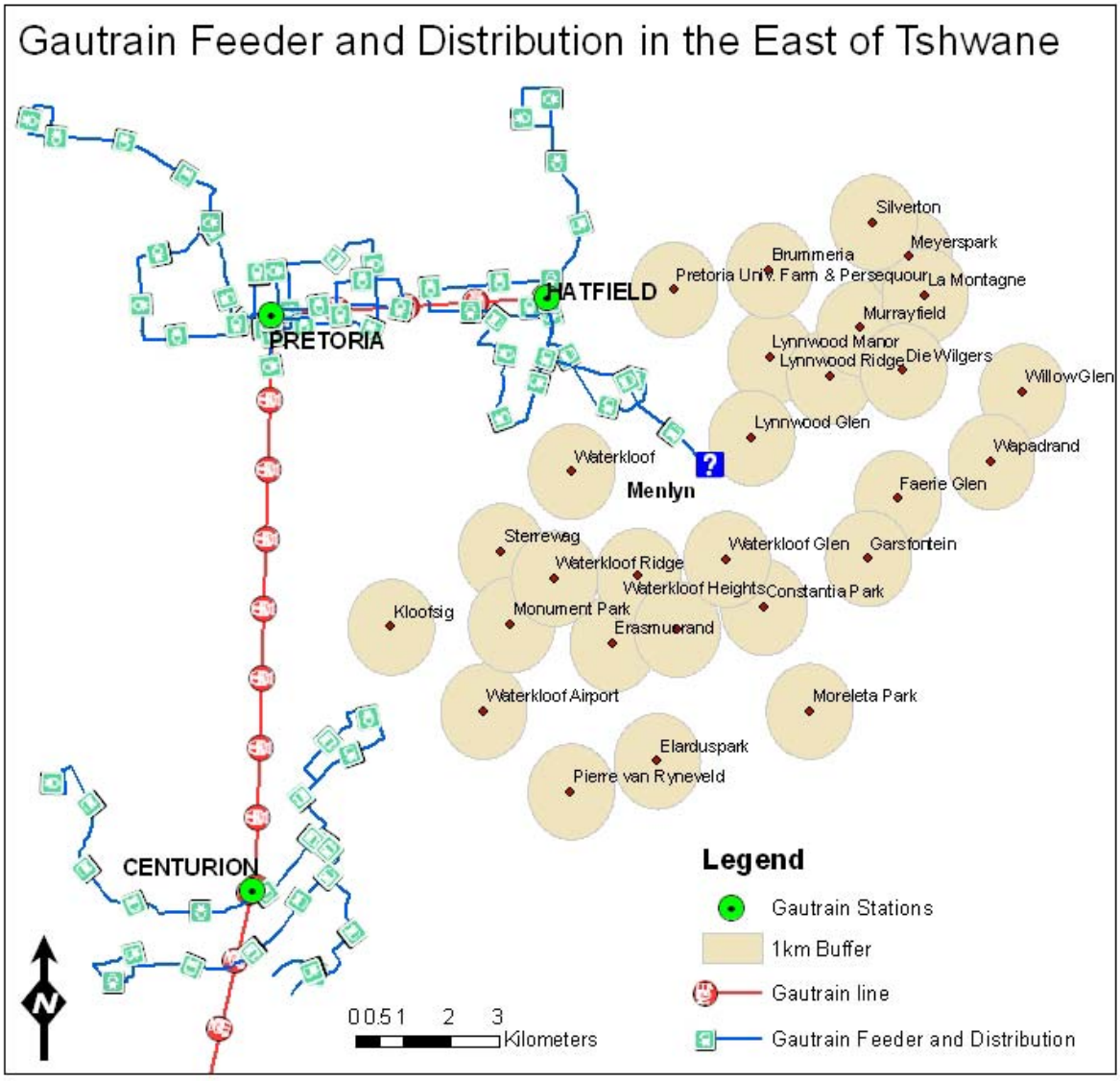

Figure 6 Exclusion of Tshwane East in dedicated feeder and distribution service

To capture the east of Tshwane as a market consideration should be given to a more extensive dedicated feeder and distribution service that will cover more of the high-income areas and make it easier for the stubborn or selective public transport users to choose the Gautrain instead of private transport.

Another question that can be asked is why Menlyn (blue question mark on Figure 6), which serves as the financial hub of the east of Tshwane, was considered, but not chosen as one of the Gautrain stations. This decision surely makes economical sense in that a major part of the potential user-base of the Gautrain lives in the areas surrounding Menlyn. As O'Flaherty (2003) states: "Since there is a suppressed demand for car travel in most large cities (which means that empty road space is filled as soon as it is created) this explains why it is that the introduction of a new light rail system (or in this case the Gautrain) often appears to have little impact on road congestion – and why there is an need for concurrent car-deterrence measures…"

In this case the provision of an extensive and adequate dedicated feeder and distribution system that fulfils the characteristics as described in the beginning of this section will bring the Gautrain this much closer to success. The projected demand for the feeder and distribution service at each station has intentionally not been discussed as the available results in the Gautrain feeder and distribution services document are very preliminary and coarse and needs further refining.

3.3 Auxiliary transport services

A few issues with the auxiliary transport services will subsequently be highlighted.

Integrated ticketing

Commuters will only need one ticket to pay for a Gautrain trip, a Gautrain feeder bus and also car parking and will probably use an electronic smart card for this. This system it is said can later be extended to include other public transport modes such as commuter rail services and the proposed BRT systems (www.gautrain.co.za). The smart card offers a public transport user convenience and eases access to a public transport system and could be one of the best ways to ensure easy integration of the different public transport modes and to increase ridership. The only real issue will be the acceptance of this card with minibus taxi users (which could make up a significant proportion of the Gautrain user base as stated earlier). It is presumed that it will be fairly difficult to implement a smartcard system in the taxi industry due to the fairly unique operating system of taxis and therefore the card would have to be purchased separately by travellers using taxis as part of their journey.

Walking or cycling as a mode

It could be said that historically urban planners and designers in South Africa did not pay too much attention to walking or cycling as a mode of transport and it can be commended that the government believes walking will become one of the major feeder and distribution modes for the Gautrain in future, but the viability of such a notion seems far-off when looking at land-use patterns and travel preferences of transport users at present. In a culture where the only people that walk are those that cannot afford motorised transport and the only ones that cycle are children on their way to school, the mere provision of better pedestrian and cycling facilities would probably not be enough to convince someone to start walking to his or her destination. This has far reaching consequences in that it desires a shift in the thought of a public that is used to travelling in the comfort and luxury of a private car to a conscious decision to move towards non-motorised transport modes that are perceived as uncomfortable, dangerous and under the status-quo.

Park-and-ride facilities

O'Flaherty (2003) identifies the following features of a successful park-and-ride scheme:

- The park and ride scheme should be serviced by a public transport system that offers reliable and frequent services in both the inward and outward directions;
- The onward public transport mode must provide a reliable fast service from the interchange into the central area;
- The parking fee at the interchange plus the two-way public transport fare should be less than the perceived cost of travelling to the central area by car and parking there;
- Ample parking space should be provided at the interchange to ensure parking is easily obtainable at all times;
- The park-and-ride interchange must be properly located;
- The car park must be well designed and supervised to ensure ease of access and promote safety and security in the car park area.

The notion of decentralised park-and-ride facilities that act as intermediate stops where commuters can take the dedicated feeder and distribution system to a Gautrain station seems like a good idea in that it limits the distance travelled by private car, but private car users would most probably rather drive directly to the Gautrain station to avoid adding another mode change that increases travel time and cost to their journey. This option will have to be promoted heavily and as stated above should cost much less that the perceived cost of travelling by car.

Bus Rapid Transit systems
The newly proposed BRT systems for Tshwane and Johannesburg will most certainly complement the Gautrain and will ensure a more integrated public transport service covering a bigger area of the Gauteng province. The Johannesburg BRT system will interchange with the Gautrain at Park station, Rosebank and Sandton and the Tshwane BRT system will stop at the Hatfield and Pretoria stations (www.engineeringnews.co.za). Both systems aim to be operational before the 2010 Soccer World Cup and will therefore be in use before the final Gautrain construction stage is finished. The BRT systems and the Gautrain could be Gauteng's first step into a truly integrated public transport system that serves all and not just a select few.

4. CONCLUSION

There is thus reason to believe that the Gautrain will have some effect on relieving congestion on the corridor between Johannesburg and Tshwane, it will improve the image of- and promote public transport in South Africa, and it will certainly promote economic development and urban restructuring in the Gauteng area. It is the extent of these effects that is being questioned. The targeted private vehicle user is notoriously stubborn and needs much incentive (or disincentive) to actually make the modal shift to public transport. Safety, security, cost, reliability, and a fast, efficient and extensive feeder and distribution service are the main user concerns that need to be focused on in order to achieve maximum ridership on the Gautrain.

There is also evidence to suggest that the Gautrain could prove to be more popular among a completely different class of user, namely the taxi commuter, than previously thought. More extensive research needs to be done to determine the merit of this claim.

The dedicated and auxiliary feeder and distribution services has a very important role to play in attracting users to the Gautrain and planning, design and implementation of these services are just as important to ensure sufficient levels of ridership are achieved and maximum conversion is obtained from private transport.

5. REFERENCES

[1] Gautrain website (www.gautrain.co.za). Last accessed on 5 March 2008.

[2] Gautrain Position Paper - Feeder and distribution services to stations. May 2003. Downloaded from Gautrain website on 7 January 2008. Link: http://www.gautrain.co.za/index.php?pid=445&ct=1&fid=3&click=4

[3] Gautrain feeder and distribution services document. June 2001. Downloaded from Gautrain website on 7 January 2008.Link: http://www.gautrain.co.za/index.php?pid=445&ct=1&fid=3&click=4

[4] O'Flaherty. C.A. (ed). Transport Planning and Traffic Engineering. 2003. Elsevier Butterworth-Heinemann. Oxford. UK

[5] Synovate Gautrain survey. 2006. Gautrain will do B-Y, but what about A and Z? Downloaded from www.synovate.com/southafrica/news.html on 25 January 2008.

[6] Synovate Gautrain survey. 2006. Safety on the Gautrain. Downloaded from www.synovate.com/southafrica/news.html on 25 January 2008.

[7] Synovate Gautrain survey. 2006. Will the Gautrain Serve its purpose? Downloaded from www.synovate.com/southafrica/news.html on 25 January 2008.

[8] Tyrer. L. Joburg pursues bus rapid transit system in bid to ease gridlock by 2010. November 2007. www.engineeringnews.co.za. Accessed on 5 February 2008. Link: http://www.engineeringnews.co.za/article.php?a_id=119725

[9] Venter. I. Tshwane says work on R1,9bn bus scheme to start next year. August 2007. www.engineeringnews.co.za. Accessed on 5 February 2008. Link: http://www.engineeringnews.co.za/article.php?a_id=114600