A TRAFFIC CONGESTION MANAGEMENT PLAN FOR GAUTENG?

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ABSTRACT

With traffic congestion acknowledged to be a major problem in our cities, much thought has been given to ways of managing it. It is neither desirable to focus on a sectoral approach to implementing congestion management measures; nor is it sustainable to implement a variety of Transport Demand Management (TDM); Transport Supply Management (TSM); and Land-Use Management (LUM) measures, on a piecemeal basis. To overcome the strictly sectoral application of such measures, Integrated Development Plans (IDPs) have the scope to integrate supply, demand and land-use management measures, as they have a strategic position within regional planning that coordinates and aligns many sectoral functions at local and district level. This paper highlights the need for the development of a Traffic Congestion Management Plan (TCMP) as a component of the South African planning system's delivering balanced packages of measures. It also considers a TCMP's likely structure, and examines the way in which to focus sectoral integration and alignment more directly in the management of traffic congestion in a sustainable manner.
Keywords: congestion management, transport, sustainable development.

1 INTRODUCTION

This paper highlights the need for the development of a Traffic Congestion Management Plan (TCMP) in Gauteng, as a component of the South African planning system. Many of the challenges surrounding the introduction of congestion management are caused by implementing TDM, TSM, and LUM measures inconsistently, and on a piecemeal or mutually exclusive sectoral basis. Policy debates of recent years have therefore called for greater integration in the form of integrated packages or strategies which would overcome a wide range of transport and spatial-planning externalities (Geerlings and Stead, 2003). It is essential that these measures are fully integrated, ensuring that their synergy encourages sustainability.

In addressing the sectoral application of measures, Integrated Development Plans (IDPs) are applied within the South African planning system as a strategic management tool with which to integrate TDM, TSM, and LUM measures, because the IDPs have the ability to coordinate and align many sectoral functions. Whilst the South African IDP provides a framework within which to develop potentially highly integrated strategies, it lacks a direct mechanism to manage traffic congestion, as part of the IDP process (Heyns & Schoeman, 2008a). The purpose of this paper is, therefore, to explain why we need congestion management; why policy integration is important; the way in which the planning process enables integration; which criteria need to prevail when we are considering a Traffic Congestion Management Plan; and what such a Plan may look like. This paper considers these issues within a wider international context.

2 WHAT IS IT THAT CONGESTION PREVENTS US FROM ACCOMPLISHING – WHY IS CONGESTION "BAD" FOR OUR CITIES?

Transport systems facilitate the rapid and predictable movement of people, vehicles and goods. Congestion, on the other hand, prevents traffic from moving freely, quickly and/or predictably. However, the benefits afforded us by transport activity stem not from mobility itself, but, rather from what that mobility allows us to accomplish. Travel is not undertaken for its own sake. Rather, in almost all cases, people travel to access activities, people and services; and goods travel to reach markets. Mobility, per se, is generally considered not to have an intrinsic value; rather, it is often viewed as a derived demand. What value (and benefits) mobility delivers, lies in the activities that mobility enables.

The question posed above, therefore has two answers. A first answer to the question is that congestion prevents us from moving freely and/or predictably; the second is that it reduces the time those affected have available to undertake activities – including "productive" activities. The complex issues of "time loss", economic impacts, loss of productivity, travel delay, and schedule delay, have an important bearing on our understanding of how it is that congestion negatively impacts society.

3 WHY IS POLICY INTEGRATION IMPORTANT?

Evidence from over 30 countries investigated by the Organisation for Economic Cooperation and Development (OECD, 2007) shows that congestion management cuts across a number of organisations and layers of vertical and horizontal governance. The concept of developing integrated policy strategies across vertical and horizontal layers of government as an overarching approach to transport, environmental and land-use planning, is not a new one. The benefits of policy integration lie in that it forces greater synergy between measures, where the sum of the total impacts is greater than the individual impacts of the measures (Barredo and Demicheli, 2003).

A lack of policy coordination and its uncoordinated implementation among transport land-use, environmental departments and authorities, which are essential in ensuring the implementation of packages of complementary policies rather than single measures, are a key obstacle to developing integrated strategies aimed at managing traffic congestion. Such an uncoordinated approach is a direct result of segmented policy-making (Hull, 2005). This is why cooperative governance is important across horizontal and vertical levels of government; ensuring legislative coordination and the alignment of plan implementation. Once this is achieved, the scale of urban transport problems may well be significantly reduced (May and Gardner, 1990).

4 TDM, TSM, AND LUM INTEGRATION IN SOUTH AFRICA

In considering how South African cities deal with the integration of TDM, TSM and LUM measures, Heyns and Schoeman (2008b) found (as part of a case study) deficiencies in the roll-out of the City of Cape Town's and the City of Johannesburg's policies in addressing traffic congestion. At a generic level, this study provided some insight into the way in which other metros, and perhaps local authorities across South Africa, deal with congestion management. Not all findings in that study are, however, applicable elsewhere in South Africa.

The study revealed that spatial and economic development and transport planning in Cape Town and Johannesburg are guided by a number of inextricably linked documents; most

notably, National Strategic Plans; their respective Provincial Spatial Development Frameworks; their Integrated Development Plans (IDPs); their Spatial Development Framework (SDFs) (which include Land-use Management Plans); their Growth and Development Strategies (GDSs); and a host of Sector Plans. Whilst at a policy level there are good indications of integrated decision-making and policy integration and intent, the roll-out or implementation of projects aimed at congestion management revealed less evidence of integrated action. Heyns and Schoeman (2008b) attributed this outcome to the following factors:

- different tiers of government have mutually exclusive funding objectives and constraints;
- unsynchronised planning cycles;
- no specific provisions within the South African IDP process to tackle traffic congestion head-on jointly across sectors; and
- the lack of a single Traffic Congestion Management Plan that joins up the many individual policy-drivers relevant to congestion management, forming different tiers of government, and different stakeholders, with a vested interest in transport and spatial planning.

The implication is that congestion-management measures are not rolled out in a joined-up manner. This gap in the process is where the TCMP fits in – forcing greater policy integration, aimed at traffic congestion management.

5 TRAFFIC CONGESTION MANAGEMENT ELSEWHERE

A study by the OECD (2007) draws conclusions on a variety of traffic congestion management plan frameworks, as well as on who will be responsible for implementation. The following countries were included in the study:

- Australia
- Canada
- Czech Republic
- France
- Germany
- Greece
- Japan
- The Netherlands
- New Zealand
- The Russian Federation
- Spain
- The United Kingdom
- The United States

5.1 Congestion-management frameworks

The OECD (2007) cites that in some of the countries studied, congestion analysis is undertaken within nationally consistent frameworks. There is a great variety of frameworks and approaches in use, and, in fact, it is rare to find a uniform conceptual framework across countries or regions for addressing congestion and appraising congestion-management policies, strategies and measures. Two typical themes/approaches emerged: (i) the **Traditional approach** and (ii) the **Economically Optimal congestion approach**.

- The **Traditional Approach** typically focuses on management of road systems in urban areas, in ways that maximise the ability of existing infrastructure to handle current and expected future traffic demand. The approach aims to minimise traffic delays.
- The **Economically Optimal Congestion Approach** defines economically “optimal” levels of congestion by balancing demand for road space with supply. In essence, the approach concedes that some level of congestion is quite acceptable.

Despite a lack of uniform frameworks, what is apparent from the diversity of national experiences, is that many countries, and, indeed, many urban regions, either explicitly or implicitly reference flow-based parameters when discussing their congestion policy goals (e.g. Greece, Japan, the Netherlands, the UK and USA). In other words, the majority of countries manage traffic congestion with the traditional approach – aiming to reduce delay; few countries manage traffic congestion by defining economically "optimal" levels of congestion.

Broadly, the traffic congestion management plans in the countries evaluated, set out a programme of actions, detailed below, informing their TCMP frameworks:

1. Effective horizontal and vertical policy integration;
2. Identification of existing and potential future congestion locations;
3. Identification of possible improvements;
4. Assessment of the priorities amongst possible projects, often with the assistance of benefit-cost analysis (BCA) and/or cost-effectiveness analysis;
5. Proposal of congestion-mitigation actions that, in the short term, may lead to improvements in traffic flows and capacity utilisation of the existing infrastructure; and
6. Appropriate identification, prioritisation and proposal of locations and corridors, where further improvements may be required in the longer term – including new infrastructure capacity or congestion management areas.

5.2 Who is responsible for implementation?

From an institutional point of view, urban-congestion response strategies are primarily the responsibility of municipal governments and/or regional governments, when these cover larger urban areas. The OECD (2007) draws the following conclusions as to who is responsible for congestion management implementation:

- National transport administrations have in many cases no overall responsibility or direct involvement in dealing with traffic congestion management in urban areas;
- In many countries, provincial and local authorities are fully responsible for congestion planning, decision-making and funding responsibility for major roads;
- Local governments often have full responsibility over local roads; however, not over public transport; and
- In some countries, Metropolitan Planning Organisations, or their equivalent, have been established, so as to coordinate overall planning and land use; some also have transport planning and operational responsibilities.

6 CRITERIA TO BE CONSIDERED IN DEVELOPING A SUCCESSFUL CONGESTION-MANAGEMENT PLAN

Eliasson (2010), Hau (1992) and Schwaab & Thielmann (2002) recommend a number of criteria that must be achieved if one is successfully to implement congestion-management measures:

- **From the road user's point of view**, requirements are user-friendliness (simplicity), transparency, anonymity (protection from invasion of privacy), pre- and post-payment options for charging; the system must also deliver benefits.
- **From the road authority's point of view**, the system goals must be explicit and relevant (secure buy-in); have the legal conditions clear from early on; set out institutional requirements; determine funding, financing and revenue allocation; it must

pass the revenue-cost test; make provision for occasional visitors; be reliable; be secure and enforced; be flexible, so as to allow variable pricing; and finally, it must enhance economic efficiency.
- **From the public / society's point of view**, it requires fairness, and the availability of alternatives; tolerance of a culture of non-compliance; gradual introduction (a transitional phase or adjustment period), perhaps in the form of a pilot study; provision for mixed traffic; it must pass the benefit-cost test; and finally, it must incorporate revenue recycling (the disposition of the revenues collected from the toll).

On balance, a great deal of thought has to go into developing a publicly acceptable congestion management plan – key to the success is to provide public transport; revenue recycling; value for money; and fairness (Heyns & Schoeman, 2005 & 2007). This is where the Traffic congestion Management Plan can help in striking a balance between positives and negatives; having a clear, integrated plan of action; having a clear, meaningful message; and delivering mechanisms that ensure public support.

7 A TRAFFIC CONGESTION MANAGEMENT PLAN FOR GAUTENG?

Congestion management is envisaged as a systematic process, with the principal goal of alleviating existing, or preventing future, traffic congestion; thereby enhancing the mobility of persons and goods, whilst encouraging sustainable development. Tackling congestion requires a proactive plan that considers the implications of congestion; its spatial and socio-economic impact; and its effect on the region's travel patterns. In Gauteng, a congestion management plan would require institutional role players and private sector stakeholders to join forces; securing buy-in among the entire spectrum of public, political, spatial, transport, and business interests.

As suggested earlier in this paper, the IDP process lacks a direct mechanism for addressing traffic congestion in an integrated and coordinated way. IDPs are implemented at local government and metropolitan district level in South Africa; it has been shown above that, owing to the synergy in focus, it is possible to situate a TCMP within an IDP. On the other hand, it may be equally effective to introduce a TCMP at provincial level in Gauteng, within a provincial transport authority, or other competent and empowered government entity.

The sub-sections below set out a possible framework for a traffic congestion management plan for Gauteng; given experience from around the world. The framework draws from both the traditional approach, and the economically optimal congestion approach. In this way, the approaches of delay-reduction and achieving "optimal" congestion levels, rather than "reducing" or "preventing future" congestion at all cost, is embedded in the Gauteng TCMP.

7.1 A policy framework

In prescribing a policy framework within which a TCMP will operate, it is necessary to set out its vision, goals and objectives. The policy framework must consider national, provincial and local spheres of government, in terms of approved spatial, local economic, environmental, and development frameworks. To achieve the goals and objectives of the TCMP, this should include the components set out below in Figure 1. Figure 1 also shows the way in which the TCMP could be aligned with the IDP process.

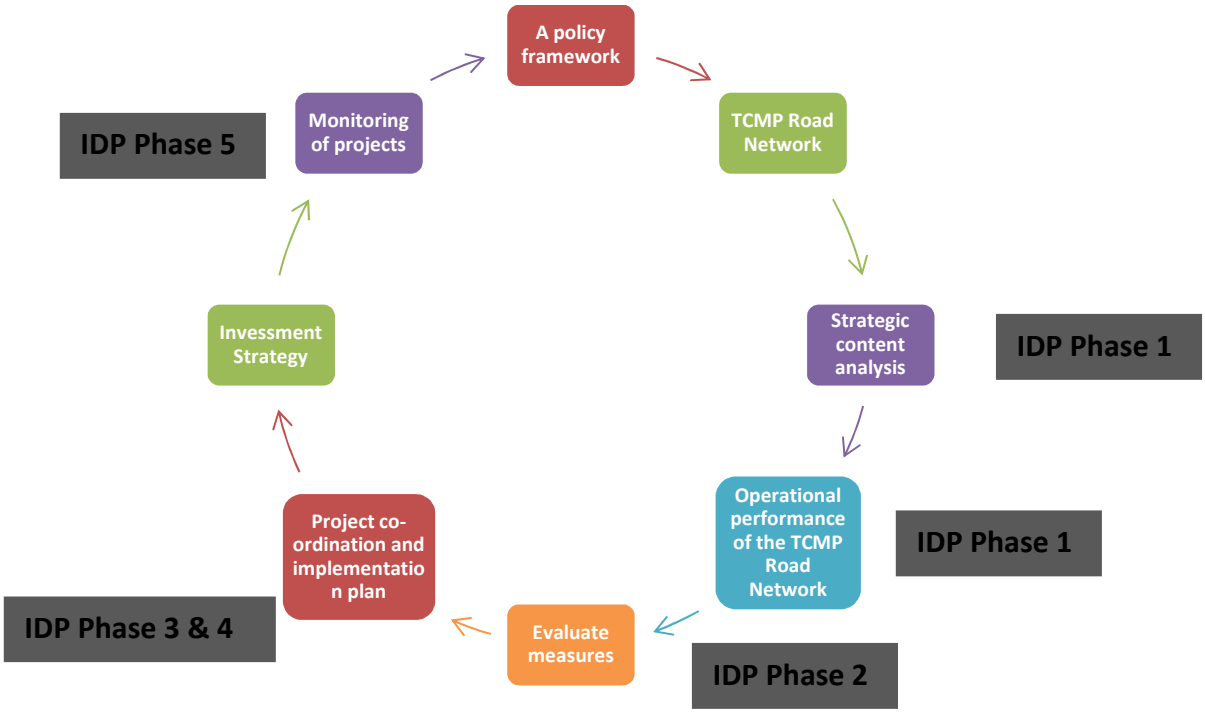


Figure 1: Components of a TCMP

7.2 Identifying the TCMP road network

At the outset of the development of a TCMP, the municipal or metropolitan authority must define a designated road network, at a level at which transport impacts may be identified; and connections made between proposed projects, including their specific impact on the network and spatial form.

7.3 Strategic content analysis – a baseline analysis

The next component of a TCMP is a comprehensive review of the plans, programmes, strategies, guidelines and policies (sectoral interventions) relevant to the TCMP - a strategic-content analysis. This stage of the TCMP could coincide with phase 1 of the IDP process, as shown in Figure 1. The purpose of the strategic-content analysis is primarily to review the objectives, strategies, programmes, projects and implications of planning directives. Through this process, it is possible to uncover priority issues, problems and concerns, to form a holistic view of the integration and alignment potential between the various role players in local governance. More importantly, it will help frame the type of options to be considered in addressing traffic congestion; and the way in which an integrated package of measures is to be developed.

7.4 Assessing the operational performance of the TCMP road network

Next, it is necessary to establish the “Level of Service” (LOS) of the TCMP Road Network, better to understand where traffic congestion occurs on the network. Figure 2 below illustrates the flow conditions associated with each LOS on a freeway. This stage of the TCMP should roughly coincide with phase 1 of the IDP process in identifying priority issues. By including the elements illustrated by Figure 3 in the TCMP (sub sections 7.4.1 – 7.4.4), the operational performance of the TCMP Road Network may be assessed, in order to consider measures that will mitigate existing congestion, and to identify areas where congestion management is specifically needed.

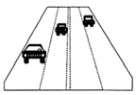
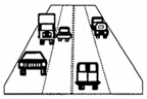
Level of Service	Flow Conditions	Technical Descriptors			
		Operating Speed	Delay	V/C Ratio	Service Rating
A 	Highest quality of service. Free traffic flow, with low volumes and densities. Little or no restriction on manoeuvrability or speed.	>100kph	None	0.00 – 0.60	Good
B 	Stable traffic flow, speed becoming slightly restricted. Low restriction on manoeuvrability.	80kph	None	>0.60 – 0.70	Good
C 	Stable traffic flow, but less freedom to select speed, change lanes, or pass. Density increasing.	70 kph	Minimal	>0.70 – 0.80	Adequate
D 	Approaching unstable flow. Speeds tolerable, but subject to sudden and considerable variation. Less manoeuvrability and driver comfort.	66kph	Minimal	>0.80 – 0.90	Adequate
E 	Unstable traffic flow with rapidly fluctuating speeds and flow rates. Short headways, low manoeuvrability, and low driver comfort.	57 kph	Significant	>0.90 – 1.00	Poor
F 	Forced traffic flow. Speed and flow may drop to zero with high densities.	< 30 kph	Considerable	>1.00	Poor

Figure 2: Levels of Service and flow conditions associated with a freeway

7.4.1 *A traffic-survey programme* – In order to assess where traffic congestion occurs and where transport problems exist; and to identify traffic trends, it is recommended that an annual traffic-survey programme be established to collect up-to-date and locally relevant traffic and transport data.

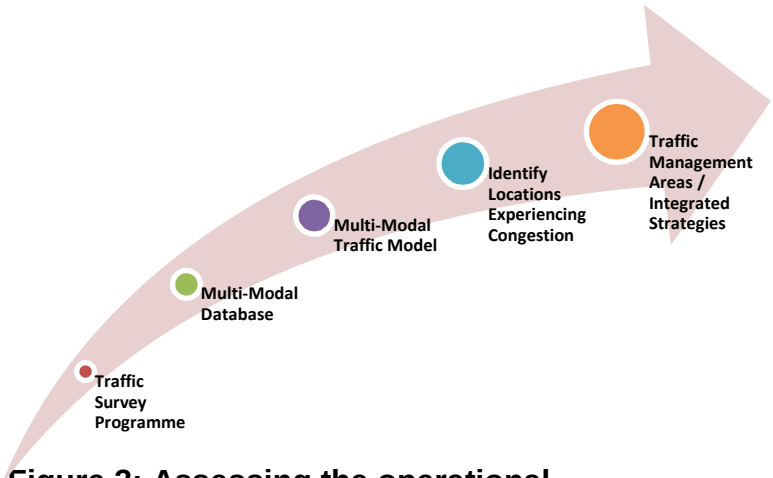


Figure 3: Assessing the operational performance of the TCMP road network

7.4.2 *A multimodal transport database and highway model* – Once traffic and transport data have been collected, it is essential to develop a multimodal transport data base, and a local multimodal model, which will guide the decision-making process in identifying system performance and those locations experiencing traffic congestion.

7.4.3 *Identify locations experiencing traffic congestion* – To improve LOS, and to identify where recurrent traffic congestion occurs, an appreciation of the current level of congestion experienced is required. It is recommended that traffic congestion be quantified in terms of:

(i) Capacity analysis measuring level of service;
(ii) The jobs/housing balance; and
(iii) Measuring road-based public transport performance.

7.4.4 *Assessing the level of traffic congestion created by new and/or regenerated development* – It is important that new developments that require a Traffic Impact Assessment be subject to the TCMP traffic congestion assessment, as described in the previous sections, in order to measure the traffic congestion impact of the development proposal.

7.5 Evaluating measures to manage traffic congestion

To ensure that underperforming road segments, intersections, or other locations where traffic congestion occurs or may potentially occur, are dealt with, it is necessary to identify appropriate mitigation measures. This process requires a 3-step integrated and coordinated approach:

Step 1 – select appropriate measures from a pool of TDM, TSM and LUM measures.

Step 2 – apply an Option Evaluation Framework (Heyns and Schoeman, 2007), selecting appropriate measures contributing to sustainable development and congestion-management. Key elements of the Option Evaluation Framework are clear sustainability objectives, and measurement criteria which will allow multimodal and strategic trade-offs to be made.

Step 3 – conduct a control check, thereby ensuring that all integrated strategies are aligned and integrated with other sectoral plan objectives and identified projects. Once these measures have been identified, they are transposed into an integrated strategy, which in turn is converted into projects for implementation. This part of the TCMP could be connected to the 2nd, 3rd and 4th phases of the IDP process.

7.6 Develop a project coordination and implementation plan

The Transport Authority or other competent and empowered government entity will be responsible for the prioritisation, coordination and implementation of the TCMP projects. Although the responsible authority will coordinate the implementation of the projects, it will be the various sectoral departments of the local or metropolitan authority that will have to play a more prominent role in their implementation, requiring effective horizontal and vertical coordination. With a mixed bag of measures in the package, it will require an array of authorities/departments to orchestrate sequential implementation, through a well-thought-out road map or implementation plan.

7.7 Develop an investment strategy

The funding of TCMP projects will be the responsibility of the transport authority, or other competent and empowered government entity. Given budget limitations, it will be necessary to consider alternative funding mechanisms, such as: (i) including a balanced number of TDM measures in the package of projects, because these have a “capital-generating” characteristic; (ii) pursuing public private partnerships (PPPs); and (iii) considering the creation of a Transport Innovation Fund, similar to that introduced in the UK, which is used as a mechanism with which to provide financial incentives to its delivery partners (i.e. local councils).

7.8 Monitoring of projects

Once the TCMP projects have been implemented, the transport authority, or other competent and empowered government entity, must take active steps, at least annually, to ensure that implemented projects do indeed enhance system performance. Monitoring and evaluation of projects form part of the *ex-post* assessment, providing an opportunity for reconsidering the project objectives; the extent to which they have been achieved; and the extent to which they have contributed to managing traffic congestion.

8 RECOMMENDATIONS AND POSSIBLE WAYS FORWARD IN GAUTENG

Possibly the way forward will be to implement action or projects that build up sequentially to the implementation of a TCMP, in the following manner:

- Establish a transport authority to deliver the TCMP, or provide suitable powers to another competent and empowered government entity;
- Improve public transport, with much greater emphasis on customer focus;
- Provide strategic road infrastructure links;
- Start with a TDM pilot study (possibly on the Gauteng Freeway Improvement Project road network);
- Introduce revenue recycling (the process of ring fencing; and plough the revenue raised from the transport system back into the transport system);
- Introduce High-Occupancy Vehicle (HOV) lanes on the GFIP road network; and, finally
- Introduce a traffic congestion management plan (TCMP).

The actions outlined above suggest an incremental approach to dealing with traffic congestion. Congestion management is not simply about TDM; it cuts across a number of complex transport planning, economics, land use, and traffic engineering issues, which require a multidisciplinary approach to effective implementation; neither is it an off-the-shelf add-on to the transport system. TDM is part of the wider transport system; it relies on other components in the system for its effective working. The wider transport system must operate as a well-oiled machine before “hard” TDM measures, such as e-tolling, congestion charging, and road pricing, are considered. International evidence suggests that “hard” TDM measures are usually the final tool in the tool kit being reached for by the policy-maker; as this is an extremely controversial and blunt economic tool with which to change road-user behaviour (Heyns & Schoeman, 2007).

9 CONCLUSION AND RECOMMENDATIONS

This paper calls for more effective traffic congestion management in Gauteng, describing why policy integration is important; why policy implementation must be much more coordinated than it is today; which criteria must be met when we are considering a Traffic congestion Management Plan; and what such a Plan may look like.

This paper explained why policy-makers should no longer deal with traffic congestion problems by implementing TDM, TSM and LUM measures on a piecemeal basis. Selected measures must form integrated packages or strategies, which will ensure that their synergy creates a sustainable outcome. Whilst the South African IDP provides a framework on which to develop highly integrated strategies, it does not have a mechanism with which to address traffic congestion holistically across sectors. In response to this challenge, this paper has postulated the likely components of a TCMP framework for Gauteng, as a possible component of the South African IDP process, which would help focus sectoral integration and maintain alignment.

As policy-makers, we must adopt a transport-planning-systems approach to addressing traffic congestion, which goes beyond the introduction of a few TDM measures. Our approach to decision-making should reflect striking a balance between the many conflicting and/or supporting challenges, disciplines and stakeholders, thereby securing public buy-in. We need a coordinated policy approach and plan in Gauteng with which to address traffic congestion; perhaps a traffic congestion management plan for Gauteng will go a long way towards achieving this end.

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