

Positioning a traffic congestion management plan within South African planning

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Abstract

With traffic congestion acknowledged to be a major problem in our cities, much thought has been given to the introduction of measures capable of managing and/or alleviating its occurrence. It is, however, neither desirable to focus on a strictly sectoral approach to implementing such measures, nor is it sustainable to implement a variety of measures on a piecemeal basis. In addressing the strictly sectoral application of 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 co-ordinates and aligns many sectoral functions at local and district level. Whilst the South African IDP provides a framework to develop potentially highly integrated strategies it lacks a direct mechanism to manage traffic congestion as part of the IDP process. To this end this paper reports the results of a recent study highlighting the need to develop a Traffic Congestion Management Plan (TCMP) as a component of the South African IDP process 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

We can no longer deal with traffic congestion problems by implementing Transport Demand Management (TDM), Transport Supply Management (TSM), and Land-Use Management (LUM) measures on a piecemeal basis in order to address traffic congestion. These measures must be integrated to ensure that the synergy between them creates a sustainable outcome. Geerlings and Stead [1]



suggest the debates in recent years have focused on policy integration - developing integrated packages or strategies to overcome a wide range of transport and spatial planning externalities. Integrated Development Plans (IDPs) are used within the South African planning system as a strategic managerial tool with direct local application to co-ordinate, cut across and align many sectoral functions (such as transport, environment, social-wellbeing, housing and economy) within the local municipal landscape. Because of its cross cutting nature it has the scope to facilitate and integrate TDM, TSM and LUM measures to deal with traffic congestion and produce highly integrated strategies. As the existing IDP process does not have a mechanism to manage traffic congestion directly, this paper highlights the need for the development of a TCMP as a component of the South African IDP process, considers its likely structure and examines how it could be positioned within the South African planning system.

2 Previous research

The concept of developing integrated strategies as an overarching approach to transport and land-use integration is not a new one. Previous research has shown that over the last decade or so the approach to transport and land-use integration together with a means of evaluating resulting strategies has been developed and accepted into practice as May and Gardner [2] report. The studies cited by these authors have demonstrated that when an integrated approach, in which infrastructure provision, management of existing infrastructure and pricing the use of that infrastructure are co-ordinated, the scale of urban transport problems can be significantly reduced.

The lack of policy co-ordination and integration among transport land-use and environmental consideration which are essential to ensure the implementation of packages of complementary policies rather than single measures is a key obstacle when producing integrated strategies particularly those aimed at reducing traffic congestion. Such an unco-ordinated approach results in a segmented approach to policy-making as Hull [3] suggests and prevents the development and implementation of comprehensive, integrated strategies addressing all related aspects of urban travel. It is, therefore, not sustainable to implement a variety of measures on a piecemeal basis when tackling urban problems as Barredo and Demicheli [4] confirm – integration of the measures is a prerequisite in order to force greater synergy where the sum of the total impacts is greater than the individual impacts of the measures. This is why co-operative governance is important across horizontal and vertical levels of government to ensure legislative co-ordination and the alignment of plans.

This is where Integrated Development Planning (IDP) comes to the fore as a tool that integrates sectoral functions promoting vertical and horizontal integration and communication. Currently the South African IDP, described as a “super plan that gives an overall framework for development” (Education and Training Unit [5]), includes Environmental Management, Sectoral plans, Spatial Planning and Land-Use Management elements. Although there is an obvious interface between IDPs and sectoral plans which include a variety of measures

capable of managing traffic congestion, no specific provisions are made within the South African IDP process to tackle traffic congestion directly. On the other hand the basis of TCMPs is to integrate TSM, LUM and TDM measures into integrated strategies aimed at traffic congestion reduction at a local and regional level. It is therefore inferred that both IDPs and TCMPs have a local to regional planning focus aimed at the integration of a diverse set of similar functions. Against this background an international survey and case study was undertaken in South Africa to establish, amongst others, whether an interface and/or connection potential exists to connect a TCMP to the IDP process in supplying the IDP with a direct tool capable of managing traffic congestion more sustainably.

3 Empirical results

3.1 Key findings relevant to connecting the IDP to the TCMP

The IDP was considered by respondents as a multi-sectoral and multi-level activity incorporating local government and other agencies in a process that integrates various dimensions of development where space rather than sectors becomes significant, and the role of spatial planning comes to the fore. Across these dimensions and within this space it was considered that both the TCMP and IDP has the ability to weave together elements of TDM, TSM, LUM, land-use management systems, environmental management and spatial planning to produce integrated strategies. The similarity in scope or interface provides the basis to position a TCMP within the IDP as shown by Figure 1.

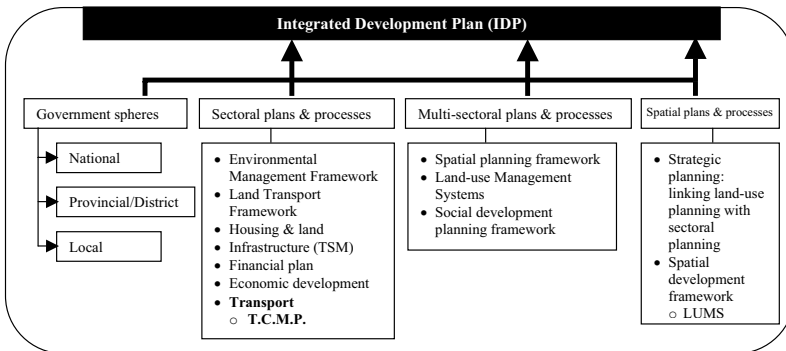


Figure 1: Positioning the TCMP within an IDP and South African planning.

By way of positioning the TCMP within the IDP, the IDP not only pulls together all sectors of government involved in development, but also has a direct tool to manage traffic congestion at a local level. As a result it is possible to formulate a single programme within the IDP that brings together/integrates various sectoral actions into a sustainable integrated spatial development process.

3.2 The need to enhance South African planning legislation to implement a TCMP

In further assessing how to position and enact the TCMP in South African planning and in particular the IDP it was necessary to identify how suitable current South African Planning legislation, plans and policies were. To this end the research results showed that the National Land Transport Transition Act (2000), the Municipal Systems Act (2000), the Land-Use Management Bill (2003), the Municipal Planning and Performance Management Regulations (2001), the National Environmental Management Act No. 107 (1998) and the Development Facilitation Act 67 (1995) are the underlying legislative components underpinning the IDP process in South Africa. In order to implement a TCMP and for it to contribute to the creation of fully integrated strategies, these legislative components and the 5 phases of the IDP process have to be amended or enhanced. To this end the following section sets out the recommended enhancements as well as the potential structure and components of a South African TCMP.

4 Recommendations

4.1 Enhancements required to connect the TCMP to South African planning legislation

To ensure that all plans prescribed by the National Land Transport Transition Act (2000) address the integration of transport and land-use planning within the context of the Development Facilitation Act (1995), Part 7 Section 19 paragraph 1 of the Act requires 7 specific plans and/or strategies in support of this aim and sets out clear priority issues to this end. As the Act does not specify that dealing with traffic congestion is a priority or require a plan that will manage traffic congestion within the context of integrated transport and spatial planning as contemplated under Part B of Schedule 4 of the Constitution, it is recommended that a TCMP be introduced as a provision of the Act to fill this gap. The recommendation is therefore that the Act be amended to include a requirement specifying that a TCMP, as an additional sectoral plan, is required under the provision of Section 27 of the Act and that Part 7 Section 20 of the Act should be amended to reflect a legal requirement to prepare the TCMP.

The Municipal Systems Act (2000) sets out the contents of IDPs, their core components and the processes or phases to be followed for planning, drafting, adopting and reviewing them at Municipal and District level. As Chapter 5 Part 1 Section (26) of the Act sets out the core components of IDPs and in particular the requirement that the municipality's development strategies must be aligned to any national or provincial sectoral plans and planning requirements, it is recommended that Chapter 5 Part 1 Section 26 of the Act be amended specifying that a TCMP must form part of a municipal IDP as an additional component.

Chapter 3 Section 17 (1) of the Land-use Management Bill (2003) requires the development of SDFs as part of an IDP as well as Section 26(e) of the

Municipal Systems Act and Section 24 of the National Environmental Management Act, 1998 (Act 107 of 1998). For the Bill to facilitate LUM through the TCMP it is recommended that Chapter 3 Section 17 (2) of the Bill is amended to enact the need for land-use management and spatial planning in South Africa to consider the principles and objectives of the TCMP in developing integrated strategies.

When positioning the TCMP within the IDP the performance management-system enacted by Chapter 3 of the Municipal Planning and Performance Management Regulations (2001) must reflect a requirement to measure the performance of the TCMP and so it is recommended that Chapter 3 is amended to reflect this requirement.

Chapter 5 Section 23 of the National Environmental Management Act (1998) promotes the application of appropriate environmental management tools in order to ensure the integrated environmental management of development activities. Because the Act provides for Integrated Environmental Management of plans at National, Provincial/District and Municipal levels it will also cover a TCMP once enacted as part of an IDP and so requires no specific amendments.

Whilst the Development Facilitation Act 67 (1995) sets out key principles in the promotion of efficient and integrated land development, the principles do not extend far enough in acknowledging the need for integrated strategies as a prerequisite to the TCMP. To position the TCMP within the IDP the principles of the Act need to be enhanced for the IDP to fully implement land-use development guidelines and regulations in line with land development objectives and to fully support and align the TCMP objectives to those of the IDP.

4.2 Positioning the TCMP within an IDP

Having recommended a method whereby the TCMP can be connected and enacted within the South African planning system, this section explains how to position the TCMP within the 5 phases of the IDP planning process. To do the IDP integration process justice, identify traffic congestion problem areas and congested corridors and connect the IDP to the TCMP, Phase 1 (analysis) needs to be enhanced in order to consider and review local transport system demands and spatial development needs, and to assess the operational performance of the highway network and its interaction with spatial planning and the environment. That is why the Municipal Systems Act needs to be amended so that Phase 1 of the IDP planning process coincides with the strategic content analysis and assessment of the operational performance of the highway stages of the TCMP.

During Phase 2 (strategies) of the IDP process a multitude of stakeholders are brought together to determine a vision for long-term development objectives and development strategies, which must be aligned to a national or provincial sector plan and to planning requirements. Phase 2 of the existing IDP process is well suited to identify: (i) objectives to reduce traffic congestion (ii) preliminary and alternative measures or options for locally specific traffic congestion and priority issues (iii) criteria groups, indicators and targets and (iv) measures to be considered for traffic congestion reduction. It is recommended that these four planning activities be included as part of Phase 2 of the IDP. In this way overall



development strategies and projects identified as part of Phase 2 of the IDP will be consistent with, and support, the integrated strategies developed using the TCMP thereby increasing alignment and co-operation between different activities of the IDP process.

During Phase 3 (projects) of the IDP planning process, the municipality specifies project proposals for implementation based on the strategies and potential projects identified in Phase 2. One of its key outputs is designing draft project proposals. Phase 3 needs to be enhanced to ensure that the integrated strategies developed by the TCMP, transposed into draft project proposals, are integrated, aligned and assimilated into the IDP process. In this way the output of phase 3 will be the development of draft projects that incorporate the TCMP draft projects.

In Phase 4 (integration) of the IDP planning process, the municipality ensures that the draft project proposals identified in Phase 3 are in line with its objectives and the agreed development strategies. Critical to this stage is the harmonising of individual draft project proposals identified in Phase 3 with those contained in the sectoral plans of the sector agencies at National, Provincial and Municipal level in terms of contents, location and timing in order to arrive at consolidated and integrated programmes for the municipalities. This phase is crucial for the achievement of an Integrated Development Plan. And so it is recommended that the draft project proposals produced by the TCMP firstly be incorporated into Phase 4 of the IDP planning process, which is then integrated with the draft project proposals of various other sectoral programmes.

Phase 5 (approval) of the IDP planning process covers the adoption of the IDP by the municipal council and does not have to be amended in terms of positioning the TCMP within the IDP. If the IDP is enhanced in these proposed ways, the TCMP is positioned within an aggregate plan and has a real chance of bringing about meaningful change to managing traffic congestion levels.

4.3 An integrated TCMP support unit (ISU)

To ensure the attainment of the vision, goals, objectives and implementation of the TCMP together with inter-departmental co-operation and the alignment of objectives, it is recommended that an ISU as “a super department” is established within each local and metropolitan municipality to bring together expertise from within the municipality or externally (as appropriate) to deal with the complex consultation and strategic implementation processes.

4.4 The structure and components of a South African TCMP

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. The sub-sections that follow explain the structure and components of a Traffic Congestion Management Plan (as shown by Figure 2) as a 5 year plan in more detail as well as some considerations which need to be taken into account in its preparation.



4.4.1 Setting out 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 within the context of the proposed enhancements to the National Land Transport Transition Act 2000. 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 it must subsequently include the procedural components set out in sections 4.4.2 – 4.4.8.

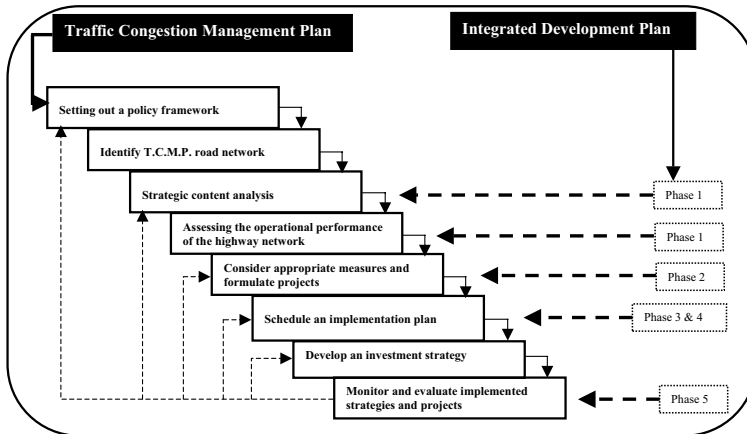


Figure 2: Components of a TCMP and its alignment to IDP phases.

4.4.2 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 can be identified, and connections made between proposed projects including their specific impacts on the network and spatial form.

4.4.3 Strategic content analysis

The next step in preparing a TCMP is to review the plans, programmes, strategies, guidelines and policies (sectoral interventions) relevant to the TCMP - a strategic content analysis. This stage of the TCMP should coincide with phase 1 of the IDP process as shown by Figure 2. The purpose of the strategic content analysis is primarily to review the text and structural components of each sectoral intervention, identify the priority issues, problems and concerns raised in each intervention and to form a strategic view of the integration and alignment potential between the interventions and the TCMP and the level of alignment that exists between the interventions.

4.4.4 Assessing the operational performance of the TCMP Road Network

Next, it is necessary to establish where on the TCMP Road Network traffic congestion is at its ideal "Level of Service" and to assess the traffic congestion

generating ability of new or regenerated development (requiring a TA or TIA). 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 in order to assess the operational performance of the TCMP Road Network, it is possible to consider measures that will mitigate existing or potential congestion and identify areas of specific need in congestion management.

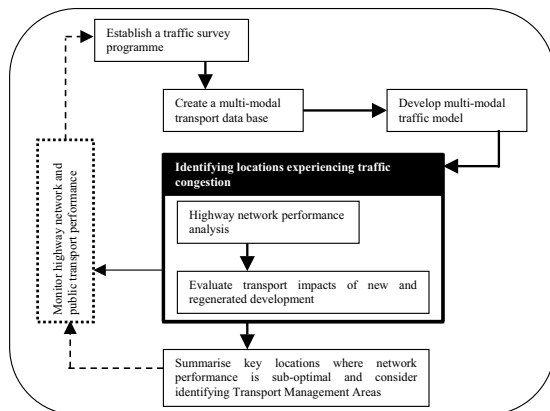


Figure 3: Assessing the operational performance of the TCMP Road Network.

4.4.4.1 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 is established to collect up-to-date and locally relevant traffic and transport data.

4.4.4.2 A multi-modal transport database and highway model Once traffic and transport data have been collected, it is essential to develop a multi-modal transport data base and a local multi-modal highway model to guide the decision-making process to identify system performance and those locations experiencing traffic congestion and to allow demand forecasting, capacity and delay analysis as well as option testing.

4.4.4.3 Identifying locations experiencing traffic congestion To improve core highway performance and to identify where recurrent traffic congestion occurs, an appreciation of the current level of congestion experienced is required. To this end it is recommended that traffic congestion is quantified by:

(i) Measuring highway performance and evaluating the operational efficiency of junctions, road segments and corridors in terms of capacity analysis, vehicular delay analysis and queuing analysis.

Capacity analysis measures the ability of a road segment or junction to accommodate traffic effectively and determines the quality of traffic flow,

referred to as Level of Service (LOS). Levels of Service (LOS) describes the different operating conditions which can occur on a road segment or at a junction at different times in terms of speed, safety, drivers' comfort, delay and vehicle operating cost. LOS A represents the best conditions, LOS F represents the worst.

In measuring the LOS of road segments or corridors, congestion is expressed as a Volume to Capacity Ratio (v/c). The v/c ratio is an indicator of a road's traffic volume versus its capacity, on a numerical scale, where a v/c ratio equal to 1.0 or greater indicates that the demand volume is exceeding the available capacity of the road segment from which forced flow conditions will inevitably result. At the opposite end of the scale a zero ratio indicates that there is no demand (and hence no congestion). The observed v/c ratios at various locations are then coupled to a specific Highway Capacity Manual defined LOS. It is however recommended that the Highway Capacity Manual LOS relating to v/c ratios of road segments be reformulated to recognise and reflect local conditions for motorised vehicles in South Africa.

When measuring the LOS at junctions, their capacity is calculated by standard capacity analysis techniques and the LOS expressed in terms of junction delay. So the calculated LOS (A through to F) for each junction represents an average delay for all vehicles travelling through the intersection during a peak travel period of the day. It is also recommended that the Highway Capacity Manual LOS relating to delay at junctions be reformulated to recognise and reflect local conditions for motorised vehicles in South Africa.

(ii) Measuring highway performance in terms of the spatial distribution of land. When measuring highway performance in terms of the spatial distribution of land the jobs/housing balance is a useful indicator. Achieving a balance between jobs and housing within a community can help the transportation system by reducing the length of trips and traffic congestion.

(iii) Measuring Public Transport performance. By evaluating the performance of each bus route in terms of: (a) aggregate peak hour travel time (b) bus headway and (c) bus on-time performance or reliability, it is possible to identify locations along the route which suffer from traffic congestion. It follows that underperforming routes or segments indicate the need to intervene and mitigate the cause of the problem.

4.4.4.4 Assessing the level of traffic congestion created by new and regenerated development It is recommended that new developments and those being redeveloped and requiring a TA or TIA must be subject to the TCMP traffic congestion assessment as described in the previous sections to measure the traffic congestion impact of the development proposal. In this way the assessment will identify where the LOS of existing intersections and road segments will deteriorate to levels E and F as a result of the proposed development, subsequently triggering the need to develop an integrated strategy to mitigate the adverse impacts of the proposed development and increase the LOS to an acceptable level.

4.4.5 Considering measures to manage traffic congestion

To ensure that underperforming road segments, junctions or other locations where traffic congestion has been identified or may potentially occur is dealt with, it is necessary to identify appropriate mitigation measures. This part of the TCMP therefore plays a key role in connecting the 2nd, 3rd and 4th phase of the IDP to the TCMP process. The ISU will be responsible for developing integrated strategies in response to priority issues identified through strategic content analysis, the assessment of the operational performance of the highway network and the assessment of traffic congestion created by new and re-developed land. This approach requires a 3 step integrated and co-ordinated approach: Step 1 – select appropriate measures from a wide pool of TDM, TSM and LUM measures. Step 2 – apply the Dynamic Adaptive Decision Framework postulated by Heyns and Schoeman [6] to select measures contributing to sustainable development and congestion reduction at a specific local area. Step 3 – carry out a control check to ensure all integrated strategies are aligned and integrated with other sectoral plan objectives and identified projects. Once the measures have been identified they are transposed into an integrated strategy, which in turn is transposed into projects.

4.4.6 Scheduling a project co-ordination and implementation plan

The ISU will be responsible for the prioritisation, co-ordination and implementation of the TCMP projects in line with the proposed amendments to the National Land Transport Transition Act (2000). Although the ISU will co-ordinate the implementation of the TCMP projects, it will be the various sectoral departments of the local or metropolitan authority that will be tasked with their implementation requiring effective horizontal and vertical communication between the sectoral departments.

4.4.7 Develop an investment strategy

The funding of TCMP projects will be the responsibility of the ISU, which means it will require a proportion of the local or metropolitan authority's budget to ensure timely implementation of the projects. However in view of existing financial constraints it is the view of the authors that the ISU will have to consider alternative funding mechanisms to attain the full potential of the TCMP. It is therefore recommended that additional funding is secured by: (i) including a balanced amount of TDM measures in the TCMP projects as they 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 to provide financial incentives to its delivery partners (i.e. local councils) to develop and deploy smarter, innovative, local or regional transport strategies aimed at traffic congestion reduction. Clearly much can be gained through a partnership approach encouraging self-sustainability or even a level of financial autonomy.

4.4.8 Monitoring and improvement evaluation of projects

Once the TCMP projects have been implemented the ISU must take active steps, at least biannually, to ensure that implemented projects enhance system



performance as the proposed amendments to the National Land Transport Transition Act 2000 specify. Monitoring and evaluation of projects form part of the *ex-post* assessment, providing an opportunity to reconsider the project objectives, the extent to which they have been achieved and the extent to which they have contributed to reducing traffic congestion.

5 Conclusion

This paper has shown that we can no longer deal with traffic congestion problems by implementing TDM, TSM and LUM measures on a piecemeal basis. These measures must be integrated to ensure that the synergy between them creates a sustainable outcome. The focus must be on policy integration - developing integrated packages or strategies to overcome a wide range of transport and spatial planning externalities. This is where Integrated Development Plans (IDPs) come to fore in the South African planning system. Whilst the South African IDP provides a framework to develop highly integrated strategies it does not prescribe a mechanism to address traffic congestion as part of the IDP process. In response to this need this paper has set out the likely components and/or structure of a TCMP as a component of the South African IDP process in order to focus sectoral integration and encourage sectoral alignment in managing traffic congestion more directly and in a sustainable manner.

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