

# COMPARATIVE SPENDING REVIEW OF PROVINCIAL ROAD EXPENDITURE

## 1 Introduction

The main purpose of this performance and expenditure review (PER) was to understand how much is being spent on provincial roads, what drives this expenditure, and what is being delivered. The aim was to identify where spending might be inefficient, which could inform policy decisions and improve value for money. The PER aimed to analyse the unit cost per kilometre of provincial roads, taking into account the different costs structures across provinces due to topographical, climatic, soil and other differences.

PDG was appointed in November 2014 to conduct the PER, but the project was effectively suspended in June 2015 and finally terminated in January 2016 when it became clear that the lack of data made it impossible to complete the cost analysis and costing model. This report presents some of the findings of the project during that time, highlights the reasons for its suspension, and makes recommendations about taking it further in future. The full report is available at: [www.gtac.gov.za/programmes-and-services/public-expenditure-and-policy-analysis](http://www.gtac.gov.za/programmes-and-services/public-expenditure-and-policy-analysis).

## 2 Institutional context

In addition to road layer works and 'pavements', the term 'road' encompasses a range of road structures (e.g. bridges, culverts and sidewalks) and road furniture (e.g. signage, signals and traffic calming). Provincial roads, of which there are over 270 000km most of which are gravel-surfaced, are public roads for which the nine provinces have been proclaimed as the responsible road authority.

Table 1: South African road network, by type and authority

Authority	Paved	Gravel	Total
SANRAL	21,403	0	21,403
Provinces - 9	47,348	226,273	273,621
Metros - 8	51,682	14,461	66,143
Municipalities	37,691	219,223	256,914
<b>Total</b>	<b>158,124</b>	<b>459,957</b>	<b>618,081</b>
Un-Proclaimed (Estimate)		131,919	131,919
<b>Estimated Total</b>	<b>158,124</b>	<b>591,876</b>	<b>750,000</b>

**Un-Proclaimed Roads** = Public roads not formally gazetted by any Authority

The various role players in (national and) provincial roads are as follows:

- The *national Department of Transport* is responsible for developing policies, strategies, plans and guidelines to assist the roads authorities.
- The *Roads Coordinating Body* provides comment and input on these. Chaired by the national Department of Transport, it consists of representatives from the National Treasury, the Department of Cooperative Government and Traditional Affairs, the national Department of Public Works, the nine provincial road authorities, the eight metropolitan road authorities and

the Johannesburg Road Agency, the South African Local Government Association, and the South African National Roads Agency Ltd (SANRAL).

- The *Committee of Transport Officials* provides technical support to the Roads Coordinating Body, and consists of various technical sub-committees that make recommendations to the MinMEC (which consists of the national Minister of Transport and the nine provincial Members of the Executive Council (MECs) for transport).
- *SANRAL* collates provincial road data and, in some instances, acts as a consultant or contractor to the provinces.
- *Provincial roads authorities* gather and maintain data on the extent and condition of roads assets and on road usage; plan, prioritise and schedule projects; implement or outsource roads activities via consultants or directly to contractors; and monitor and report on these.
- *Consultants* generally prepare project designs, identify contractors to undertake work, manage the construction works, hand over the completed works to the roads authorities, and then close out the projects.
- *Contractors* carry out most of the roads activities on behalf of the provincial roads authorities.

Understanding road asset management is critical to analysing expenditure on provincial roads because there are real consequences for road quality and expenditure if assets are allowed to deteriorate. Roads asset management is ‘a strategic approach that identifies the optimal allocation of resources for the management, maintenance, operation, preservation and enhancement of road asset infrastructure in order to meet the needs of current and future customers’. Ensuring that road assets are managed effectively throughout their economic lives requires careful assessment of these assets and recording their maintenance needs.

Some of the key roads activities are reflected in the table below.

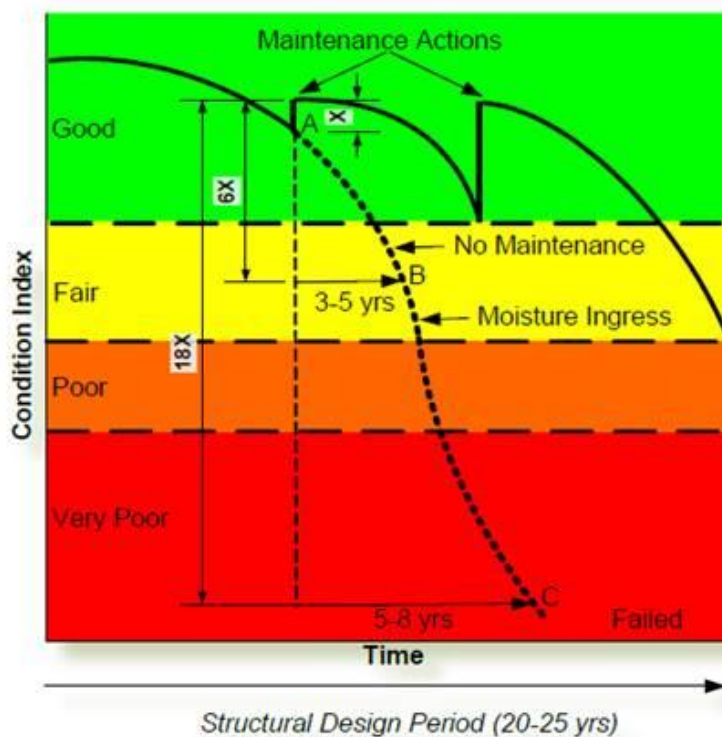
*Table 2: Definitions of roads activities as applied in TMH22 (COTO, 2013)*

Category	Sub-category	Definition in TMH22
Routine maintenance	Cyclical	Routine cyclical activities carried out on daily basis (blading, drainage maintenance, road reserve and vegetation maintenance, maintenance of ancillary components)
	Condition-based	Condition- or event-driven activities carried out at short notice (drainage repair, waterway repair, crack sealing and patching, repair of cut-and-fill slopes, reinstatement of line markings, minor repair of structures, spot regravelling, reshaping unpaved roads)
Periodic maintenance	Periodic maintenance	Long-term cyclical activities, including surfacing rejuvenation and thin slurries
	Resurfacing	Regravelling, resealing pavement surface using chip and spray or thin overlay
Special maintenance	Special maintenance	Resurfacing preceded by extensive patching and repair, major damage repair
Rehabilitation	Rehabilitation	Repairs to pavement to restore condition and functionality
	Reconstruction	Reconstruction or replacement of asset
Betterment		Upgrades to elements of asset, such as alignment and drainage improvements, intersection improvements, accident black spot elimination, bridge strengthening
Expansion		Increase in number of lanes (including structures)
Upgrading		Change in road type
New roads		
Ancillary assets		Weighbridges or other major ancillary assets

There is, however, little consensus on the definitions of these activities among provinces, which may contribute to ostensible cost variations. Regravelling and resealing projects in particular may be classified as routine maintenance, periodic maintenance or rehabilitation, depending on the province. This complicates efforts to analyse and compare provincial spending.

As noted, delaying road maintenance has a significant impact on the cost of that maintenance, as shown in Figure 1. One estimate suggests that delaying maintenance by three to five years raises cost six times. Thus, for every 1 km of road that is allowed to deteriorate from a good to a fair condition before being maintained (level B in Figure 1), another 6 km cannot be maintained in a good condition (level A in the diagram). Higher costs are also borne by road users. The sixth *State of Logistics Survey* estimated that moving from a road in a good condition to one in a bad condition increases truck maintenance and repair costs by 121%. A similar logic applies to preventative maintenance. Timeously resealing a paved road delays the need for rehabilitation, which is far more expensive. The window for resealing only exists as long as the road is in fair condition. If repairs are not carried out during this window period, rehabilitation becomes necessary.

Figure 1: Impact of delayed road maintenance



### 3 Funding for provincial roads

Funding for the operations and maintenance of provincial roads is mainly provided through the equitable share of national revenue provided to provinces, as well as some vehicle licence fees. The provinces can also use the provincial roads maintenance grant for the preventative, routine and emergency maintenance of their road networks. This conditional grant was allocated R9.3 billion in 2014/15. Grant allocations to individual provinces are based on a formula that considers the extent of the provincial road network, road traffic, weather, and geo-climatic and topographic conditions.

## 4 Provincial road cost drivers

The unit cost per kilometre of road varies across provinces, and indeed across projects. Reasons for this variation include:

- *Differences in road type* (e.g. unpaved or paved, single or dual carriageway, freeway): Paved roads typically cost more than gravel roads.
- *Differences in road usage*: Roads designed to withstand greater usage are more expensive.
- *Rainfall and climatic conditions*: Roads in wetter zones cost more.
- *The social environment*: Urban roads cost more than rural roads.
- *Differences in road condition*: Roads in a poorer condition are more expensive to repair.
- *Differences in topography and underlying geology*: Weak underlying soils require the removal of the weak soil, extra structural layer works and/or slope stabilisation. In addition, materials suitable for the sub-base and base course must be quarried and crushed, existing materials must be strengthened, or suitable materials must be hauled in.

There also seems to be a business cycle effect, in that contractors tend to charge more in periods of rapid economic growth when work is plentiful. Some even look for ‘super-profits’ in order to accumulate reserves for the lean times. While the PER did not focus on this issue, it is understood that this can easily lead to differences in the order of 20% for the same work.

## 5 Reasons for terminating the PER

The preferred approach to the PER was to perform the analysis on a project-by-project basis. This required the following data per project:

- Total expenditure on the project;
- The nature of the activity (new road building, rehabilitation, routine maintenance, etc.);
- The length of road affected; and
- The characteristics of the road and its location (climatic zone, road class, the extent of drainage structures, topography, etc.).

While considerable efforts were made to identify and source datasets, it became clear that data disaggregated to project level was not readily available. An alternative approach, based on the average characteristics of a province, was considered. However, after reviewing this proposal, GTAC decided to terminate the existing project and attempt to source the required data per project. If data did become available, the project could be reinitiated later.

## 6 Recommendations for taking the work further

A cost analysis of provincial roads can be approached in a number of ways. A decision in this regard can be informed by a review of the general approaches to assessing the costs of large-scale networked infrastructure.

Road networks (or bulk or waste-water systems, for that matter) are complex systems, and projects to expand or renew them are typically part of a larger programme and not a single facility. Most projects involve a mix of new works and the renewal of existing works. Road networks are also affected by external factors, such as the intensity of use, geographic conditions and settlement patterns. It may be possible to disaggregate project information into individual components for comparison purposes, but the more the disaggregation, the less useful the comparative cost becomes. For example, one can compare the cost of a square metre of base course between two



projects, but this says little about the performance and cost of the whole system, which is ultimately what matters. This suggests that one has to assess the cost and performance of a system as a whole, rather than an individual component or a project to improve a part of the system. Ideally, costs should be assessed in relation to the performance of the network as a whole.

Assessments based on projects or components of a system fall roughly along a spectrum. At one end is a high-level analysis of expenditure per province, which assesses the average characteristics of the provincial road network and possibly the different road categories (e.g. gravel or paved). Essentially this is an output-based assessment, in which the extent and condition of the road network are the key parameters. This approach would require good data on the extent of the existing network (e.g. the kilometres of road in each category and possibly the square kilometres of road), as well as the extent of works carried out. Average characteristics for the province as a whole (the moisture index, topology, urban/rural mix, etc.) would be used in assessing the cost drivers.

In the middle of the spectrum is a project-by-project analysis of expenditure, based on the characteristics of an individual project. This would require data on project characteristics, such as: the activity undertaken (with standardised definitions); route start and end; route length; road width, capacity, class and type (paved, gravel or graded); climatic zone; topography and underlying geology; location (urban or rural); start and end dates; expenditure incurred per year; and the level of construction work in the industry at the time. However, as with all analyses of variations in unit costs, a wide range of factors drive these costs, only some of which would be captured in the data. Provinces would raise exceptional circumstances that affected their projects.

At the other end of the spectrum would be a detailed analysis of component costs, considering the costs of specific activities, possibly down to the level of items in bills of quantity. In addition to the information required in the previous approach, such a detailed analysis would require a breakdown of expenditure as outlined in Table 3. This approach would be onerous in terms of data collection and is probably not feasible for every roads project.

*Table 3: Expenditure breakdown for detailed analysis of cost*

Category	Cost items
Overheads	General requirements and provisions
	Contractors establishment on site and general obligations
	Housing offices and laboratory for engineers' site personnel
	Accommodation of traffic
	Testing materials and workmanship
	Quality control
	Occupational health and safety
Bulk earthworks	Overhaul
	Clearing and grubbing
	Borrow materials
	Mass earthworks
Structural layer works	Selection, stockpiling and breaking down the material from borrow pits, cuttings and existing pavement layers, and placing and compacting of the gravel layers
	Pavement layers of gravel material
	Stabilisation
	Crushed stone base
Surfacing	Prime coat
	Asphalt base and surfacing

	Double seals
	Bituminous single seal with slurry
	Surfacing of bridge decks
	Concrete pavement
Finishing and furniture	Guard rails
	Fencing
	Road signs
	Road marking
	Landscaping and planting plants
	Finishing the road and road reserve, and treating old roads
Storm water management and structures	Drains
	Prefabricated culverts
	Concrete kerbing; concrete channelling, chutes and down pipes; concrete lining for open drains
	Asphalt and concrete berms
	Pitching stone work and protection against erosion
	Gabions
	Structures – pedestrian foot bridge
	Foundations for structures
	Falsework, formwork and concrete finish
	Steel reinforcement for structures
	Concrete for structures
	No-fines concrete and drainage structures
	Reinforced earth
	Prefabricated concrete bus shelters
Standalone structures	
Other	Day works
	Other (day works, extras, special materials, stoppage claims, etc.)

It may be feasible to combine approaches, conducting a high-level analysis along with a detailed analysis of a sample of projects. The criteria for selecting the approach relate mainly to the time and budget required for data collection. At the very least, the following are recommended:

- The set of roads activities reported to the National Treasury (in the basic accounting system (BAS) and the national infrastructure reporting model (NIRM)) and to the national Department of Transport should be aligned, and clear, specific definitions should be set. For a future PER to be successful, all provinces would need to use the same definition of ‘preventative maintenance’, for example.
- The following additional fields should be included in the NIRM: route start and end, road length acted on, average road width for the segment, and road class (as per the *Road Infrastructure Strategic Framework for South Africa*).

Consideration could be given to including the other items recommended under the ‘mid-spectrum’ analysis option outlined above. However, this would mean considerable extra data entry by provinces, and it is unclear how often this data would actually be analysed and used. The reporting burden on subnational government entities is typically very high, and it may not be desirable to request additional reporting unless the data is analysed and feedback provided to the provinces.