MONITORING THE PERFORMANCE OF THE NATION'S ROAD NETWORK: WHERE DO WE GO NOW?

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ABSTRACT:

Reports on the NAASRA Roads Study (NRS) and the Bureau of Transport Economics Assessment of the Australian Road System acknowledge the difficulty in assembling data and drawing conclusions about changes in the road network, and in the traffic service on the network.

One major objective of the NRS was to provide a basis for assessing future changes in (and the rate of change of) the nature and condition of the Australian road system. This paper examines the various Quality of Service concepts used in the NRS and other measures for monitoring the performance of the road network at a macro level.

The paper also examines the emerging requirement to develop performance indicators for the monitoring of programs and organisation effectiveness.

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INTRODUCTION

The NAASRA Roads Study [NRS] 1984 and the Bureau of Transport Economics [BTE] "Assessment of the Australian Road System 1984" both acknowledged the difficulties in tracing past changes in the nation's road system.

The BTE report [BTE 1984, p9] says that "A difficulty confronting the researcher into road matters in Australia is the lack of a consistent, reliable data base so that even simple facts, like the length of road at any time, are difficult to establish with certainty".

After briefly establishing a conceptual framework for road performance monitoring the remainder of this paper looks at :

- recent attempts to measure past change of the Australian road network.
- the work undertaken by the BTE and NAASRA in describing the 1981 situation and providing a basis for future comparisons
- a practical approach to network monitoring by a state road authority [SRA]
- some thoughts on performance monitoring requirements for the nation's roads.

This paper focusses only on the physical characteristics and performance of the road network. It does not cover aspects such as changes in trip demand, vehicle stock and usage, road finance or expenditure and output. In particular the paper concentrates on the arterial road network.

PERFORMANCE MONITORING REQUIREMENTS

General

Before any detailed consideration is given to discussing particular performance measures it is essential that a suitable conceptual framework is developed.

The first step is to formulate strategy objectives. These are typically stated by governments as :

- first priority for funds is for preservation of road network assets
- a high priority for road safety
- priority for freight transport, which typically flows from the general economic strategy of reducing transport costs, especially for trade-exposed industries
- encouragement of tourism [and the economic benefits it provides]
- assistance of road-based public transport operations
- maintaining [and selectively improving] traffic service.

The next step is to consider the types of indicators to be used, for example whether they deal with :

- supply of road facilities
- customer demand, or
- performance [ie, the relationship of supply to demand]

The combination of the two above factors can conveniently be thought of as producing a two-dimensional table of road network strategies and basic types of measures. In this context it is useful to introduce the idea of subnetworks of selected routes which predominantly cater for freight, public transport or tourism. One difficulty with the freight network concept is apportioning the cost of road projects on such a sub-network to freight vehicles as distinct from passenger vehicles. [This is quite apart from the further distinction between vehicles carrying significant tonnages of freight and small delivery vehicles, builders, tradesmen, rubbish trucks, etc.]

The final step is the formulation and definition of specific indicators, including such aspects as rate of change, simplicity, accuracy, cost of measurement [or estimation] and their value for purposes other than performance monitoring.

Figure 1 gives an example of a possible conceptual framework for the development of performance indicators. It is illustrative only.

Program Budgeting

In a number of States the program budgeting approach to financial and economic management is being introduced. This approach to budgeting allocates resources to defined programs, each of which has specific government objectives. It provides a basis for monitoring performance against objectives and deciding on priorities for resource allocation.

Programs are often based on convenient geographical and functional groupings of roads, eg, metropolitan and country, arterial and local. Subprograms are typically expressed in terms of groups of activities performed on the road network, eg.

- operational and routine maintenance
- periodic maintenance
- rehabilitation
- improvements

These program and sub-program categories provide two further levels of disaggregation of performance measures.

One aspect of program budgeting which should be noted is that the indicators need to be simple, the values quoted as a single number [or a very small set of numbers], that they generally be available on an annual basis and that forecasts be made of the values for the forthcoming financial year. These severe requirements restrict program budgeting measures to a small sub-set of the performance measures which are desirable for the management of a road network.

ASSESSING PAST CHANGE OF THE NETWORK

BTE 1984 Report

In their 1984 report BTE restricted their description of past changes to:

- proportion of total road length sealed in each State, 1950 to 1980
- total unsealed rural arterial road length and length unsealed with greater than 300 vehicles per day [vpd] at 1972 and 1981
- length by seal width by Annual Average Daily Traffic [AADT] distribution for rural arterial roads, 1972 and 1981.
- travel times on rural arterial roads in three states
- "demand" for urban arterial road space [population multiplied by square root of area and adjusted by a car use factor] for 1971 and 1981
- peak travel times on urban arterial roads in Sydney and Melbourne going back to the early 1960s, but mainly for routes focussing on the Central Business District [CBD].

There was no mention of past changes on local roads.

NAASRA Roads Study

The NRS Report [NAASRA, 1984] contained no information on physical change to the road system prior to the nominal date of the road inventory [30 June 1981], though there was a limited coverage of the trend in total road travel between 1971 and 1981.

In summary it can be said that after the mammoth effort involved in the 1972 Australian Roads Survey information on the road and travel situation gradually became outdated and it was not until the NRS [conducted between 1982 and 1984] that the situation improved.

FIGURE 1 CONCEPTUAL FRAMEWORK FOR PERFORMANCE INDICATORS

TYPE OF MEASURE	[Typical units etc.]	ROAD NETWORK STRATEGY					
		Maintain Network	Road Safety	Freight [1]	Public[1] Transport	Tourism [1]	Improve Traffic Service
SUPPLY							
Network Characteristics							
Road Space	[lane-km]			*	*		
Road Stereotype	[km]		*	*	*	*	
Alignment	[2]		*			*	
Bridges	[3]		*	*			
Intersections	[4]		*	*	*		
Expenditure							
Maintenance	[$,$/km]	*					
Rehabilitation	[$,$/km]	*					
Improvements			*				*
Work Output							
Rehabilitation							
- reconstruction	[km]	*					
- resurfacing	[km]	*					
- bridges	[number]	*					
Road Stereotype changes							
- lanes added	[km]		*	*	*	*	*
- length duplicated	[km]		*	*	*	*	*
- length sealed	[km]					*	*
DEMAND							
Total travel	[veh-km]						
	[vehicles]		*				*
	[population]						
Car	[veh-km]					*	
Truck	[truck-km]	*		*			
Freight	[tonne-km]			*			
Peak,Off-peak	[veh-km]				*		
PERFORMANCE [DEMAND versus SUPPLY]							
Structural Condition							
Pavement	[strength]	*		*		*	
Surface	[cracking]	*	*				
Bridges	[load capacity]	*		*		*	
Operational Condition							
Pavement	[roughness]	*		*		*	*
Surface Profile	-	*	*	*		*	*
Road Stereotype	[lane-km]			*		*	*
Alignment	[no.curves]		*	*		*	*
Traffic Congestion							
General	[veh/lane/day]		*		*		*
Freight	[truck/lane/hr]			*			
Recreation	[veh/lane/day]					*	
Peak	[veh/lane/hr]		*		*		
Economic	[cost/km]	*		*			
Safety	[accidents]		*				

[1] selected routes
[2] number of curves by design speed range
[3] number of bridges by width and material
[4] number of intersections by type of traffic control

NAASRA ROADS STUDY INFORMATION

The two major objectives of the NRS relevant to this paper were:

[a] provide a clear picture in measurable terms of the nature and condition of the Australian road system

[b] provide a basis [along with earlier surveys and continuing surveys] for assessing changes in [and the rate of change of] the nature and condition of the Australian road system.

Many of the measures outlined below can be related to the conceptual framework given in Figure 1 [e.g. road stereotype is a road supply measure relating to safety and other strategy objectives]. However, not all of the measures follow directly from the conceptual framework which was developed following completion of the NRS.

Arterial Road Data

There is no doubt that the NRS provided a very detailed and well documented description of the 1981 arterial road network. For rural arterial roads it included :

- road stereotype [i.e. width and surface type] composition of the network
- quality of service
  - traffic service
  - horizontal and vertical alignment and grade
  - roughness of sealed roads
  - bridge strength
  - bridge width

The results for each State were separately reported for national highways, primary arterials and secondary arterials.

For urban arterial roads data reported included :

- road stereotype composition
- intersection characteristics
- land use and parking restrictions
- quality of service
  - road utilisation, a broad measure of the state of the travel demand/road supply equilibrium
  - average daily mid-block lane volumes for the various stereotypes
  - peak hour volume/capacity [v/c] ratios
  - average daily intersection lane volumes
  - peak period travel speeds

Some or all of the above were reported for each of the 18 largest cities in Australia.

Local Roads Data

The NRS contained a less detailed and accurate description of the 1981 local road network because it was necessary to estimate the figures from a sample of some 5000 road sections drawn from 114 of the nation's 846 local government areas.

For local roads the published data comprised :

- length by road stereotype by traffic volume range
- roughness of sealed rural local roads
- bridge load capacity, width, material type and function of crossing.

It should be noted that the classification of physical road statistics for rural and urban areas was based on the classification of the collector district [in which the sample road section was located] at the 1976 census. Further details are given in NAASRA [1984b].

Quality of Service

Criteria Adopted

Two benchmark criteria were adopted for many of the quality of service measures shown above for the purpose of assessing the extent of the network giving levels of service described as poor, only fair or good.

Figure 2 gives the main criteria used by the NRS for rural arterials whilst figure 3 shows those for urban arterials. The values selected were suitably simple and appropriate for analysis and reporting to a national audience.

For the purposes of the NRS, the quality criteria were applied uniformly across Australia. They were fixed by collective judgement having regard to engineering requirements, economic reality and experience. The use of two criteria enabled a more robust and reliable assessment to be made of change between 1981 and 1991, and between funding levels at 1991.

Quality of traffic service

This was the most significant item for reporting. In practice it depends on a number of factors such as traffic composition, traffic distribution, alignment, terrain, access control and other factors. The principal factors, traffic volume and road stereotype, were used in combination to give an overall assessment of traffic service for both rural and urban arterial roads.

As a broad measure of the relationship between the level of urban travel demand and the supply of road space to serve this demand, a measure termed road utilisation [with units of vehicles per day per lane] was derived from estimated travel [vehicle kilometres per day] and road space [lane kilometres].

The average daily traffic volume per mid-block lane was derived from the inventory as an indication of the quality of mid-block peak traffic flow. This measure was conceptually similar to the ratio between the peak hour volume and hourly road capacity, termed peak volume/capacity [v/c] ratio, derived from traffic assignments.

As intersections are the major restriction on traffic flow in urban arterial road networks, it was important to have a measure of peak intersection traffic service. This measure was the average daily traffic volume per intersection approach lane.

Figure 2 Main Quality of Service Criteria - Rural Arterial Roads

Quality of Service Measures	Units	Quality of Service		
		Poor	Fair	Good
Traffic Services on selected road stereotypes [1]	Vehicles per day			
* Unsealed		Over 100	61 to 100	Up to 60
* Single lane seal		Over 300	151 to 300	Up to 150
* Narrow two lane		Over 4000	1001 to 4000	Up to 1000
* Wide two lane		Over 6000	4001 to 6000	Up to 4000
Design speed of curves [2]	Kilometres per hour	Under 70	70 to 89	Over 89
Road roughness	Counts per kilometre	Over 139	100 to 139	Under 100
Bridge strength	%T44 [4]	Under 50	50 to 74	Over 74
Traffic on various bridge widths	Vehicles per day			
* Up to 4.9 m		Over 100	61 to 100	Up to 60
* 5.0 to 5.9 m		Over 300	151 to 300	Up to 150
* 6.0 to 6.9 m		Over 4000	1001 to 4000	Up to 1000
* 7.0 to 7.9 m		Over 6000	4001 to 6000	Up to 4000

[1] For a complete list of traffic service criteria see NAASRA [1984a]
[2] Derived from road geometry where design details are not available
[3] The unit output from the NAASRA Roughness Meter
[4] T44 - the current bridge strength design standard

Figure 3 Traffic Service Criteria - Urban Arterial Roads

Traffic Service Measures	Criteria for Assessment of Peak Travel Service		
	Poor	Fair	Good
Daily Mid-block Lane Volume [vehicles per day per lane]			
* Two lane arterial roads	over 8500	6501 to 8500	up to 6500
* Other arterial roads	over 10000	8001 to 10000	up to 8000
* Freeways	over 14000	11001 to 14000	up to 11000
Peak Volume/Capacity Ratio	over 0.9	0.7 to 0.9	up to 0.7
Daily Intersection Lane Volume [vehicles per day per lane]	over 5000	4001 to 5000	up to 4000

Estimated travel speeds were derived from both traffic assignments [for 1981 and 1991] and from field surveys carried out in selected cities [for 1981].

A further analysis of traffic movements was undertaken, in the five largest cities by considering screenlines in defined major road corridors. Various traffic parameters were then derived for major routes crossing these screenlines, including peak hour v/c ratios.

Quality of alignment

Quality of alignment for rural artertials was reported using two benchmark values of design speed as the criteria. These values were not varied for terrain, road category, or any other variable. Measures of horizontal curvature were selected to represent alignment overall.

Due to problems encountered in assessing the speed value of curves on unsealed roads the reporting of curves was restricted to those on sealed roads.

Quality of roughness of sealed roads

Roughness was a user measure of rideability for sealed rural roads. Roughness was also used as a surrogate measure of pavement condition for use in the NAASRA road planning model NIMPAC. For this purpose it is acceptable but at the macro level only, not for individual pavement sections or for small segments of the road network.

Quality of bridge strength

The rural arterial bridge strength was reported in relation to current and historic design standards. Bridges constructed with a design strength greater than 75% of the current NAASRA design standard [T44] were described as having good strength, those between 50% and 75% described as fair, and those with under 50% described as poor. The analysis and reporting of bridge strength could have been more comprehensive.

Measurement of bridge strength is an expensive and time consuming process and the quality of the data varied greatly by State. In some cases bridge age was used to estimate bridge design strength.

Quality of bridge width

The width of bridges on rural arterials was related to traffic volume in NIMPAC by a modification to the bridge inventory data [to incorporate the traffic from the road inventory data]. Subsequent tabulation of traffic volume versus bridge width enabled an assessment of the adequacy of bridge width to be made.

Road Condition

Methods of measuring the structural condition of roads were given substantial consideration when study methods were being developed for the NRS. These considerations are documented in NAASRA [1984c].

There is no single method currently available which is applicable to all three categories of road studied in the NRS and there is no satisfactory method of measuring the condition of unsealed roads, some of which are rural arterials but most of which are local roads. However, a method used by the Brisbane City Council has been used successfully for both urban arterial and urban local roads. This suggests that another method might be suitable for sealed rural arterial and rural local roads.

The major findings arising from the NRS examination of road condition survey methods were :

- measurement of roadway condition is required to monitor the physical condition of roads for management purposes and to strengthen methods of projecting condition into the future under various management strategies.
- despite the many problems of measurement there are relatively rapid, simple and effective methods of assessing the condition of sealed urban and rural roads in use at present.
- given the necessary time and resources it would be possible to test these methods over wider areas, amending them as necessary, to produce uniform methods for particular road classes throughout Australia.

- the time required may be several years, not only for development of methods but for the interpretation of results.

- the results of time series roadway condition assessments cannot be interpreted in a realistic way without information on the work done to the network, and some development of management information systems is required before data of adequate quality can be produced reasily.

- the possibility of sampling to reduce the size of the task should not be overlooked, but sample sizes are likely to be large i.e. a substantial proportion of networks.

SRA PERFORMANCE MONITORING PROPOSALS

Practical Issues

Major constraints on implementing desirable measurement and data collation exercises are the limited staff resources available and the necessity to gather information from numerous sources both within and outside the organisation.

The Road Construction Authority [RCA] has recently conducted, or is currently conducting :

- peak hour travel time,
- road roughness, and
- road condition surveys

Travel Time Surveys

The 1983 survey of peak hour travel times was undertaken on half the primary arterials in the Melbourne [NRS] urban area [about 400 route-km]. The remaining primary arterials were covered in late 1984.

Consideration is currently being given to undertaking some off-peak and/or truck travel time surveys on a small selection of routes, but only a limited start to such a monitoring program is likely in 1985, given the desirability of also repeating peak hour surveys on [most of] those routes surveyed in 1983.

Road Roughness Surveys

In late 1981 and early 1982 the RCA undertook NAASRA roughness meter surveys on 16,285 route-km of sealed rural arterial roads for the purposes of the NRS. Roughness measurements were recently repeated over these same set of roads and on average some 1000 carriageway-kilometres were measured each week.

In addition, in the NRS, roughness meter readings were undertaken on the sample of sealed rural local roads for which other inventory characteristics were collected. These were distributed across 16 Victorian rural municipalities and significant travelling was required going from one sample section to the next.

Road condition surveys

The Road Condition Survey is an annual assessment of the condition of all sealed surface rural roads under the direct control of the Road Construction Authority [approximately 8000 km]. These are almost entirely arterial roads.

Information concerning the existence and distribution of surface defects of the road carriageway, together with the occurrence of rehabilitation treatments, is collected by the Regional Divisions concerned during October and November each year and the results documented and processed by computer.

The Road Condition Survey provides a systematic statement of the structural condition of the rural network, recorded at the same time each year, and available, along with a wide range of other essential information, for use in various aspects of road management.

No surveys are currently conducted on asphaltic concrete rural roads or on urban arterial roads, nor has a suitable methodology been developed [although some other road authorities do conduct such surveys].

Road Inventory-based Measures

Many of the measures developed in the NRS depend on road inventory-based information, eg. traffic volumes per lane, trucks per day, accidents per vehicle kilometre, kilometres of divided road, percentage of total road length sealed etc. To analyse and report these on an annual basis requires significant efforts to keep the entire inventory "up-to-date", because in many instances the quantities being measured are only changing by a few percent per annum [eg. proportion of total road length that is sealed].

Work Output and Expenditure Measures

Practical measures here include the proportion of the network sealed, widened, rehabilitated, realigned and duplicated each year. In Victoria most of this information comes from those responsible for RCA sealing and resurfacing operations. In some instances municipalities need to be contacted to obtain the cost and quantities of works done on unclassified arterial roads using their own funds.

Public Opinion Surveys

Public opinion surveys have only rarely been used to gauge customer's opinions on the performance of the road network. Particular examples include the Commonwealth Bureau of Roads [CBRds, 1975] and some motoring organisations. SRAs have tended to rely on more traditional means of obtaining such information, ie, letters, phone calls and personal contact from individual members of the public, elected representatives and spokespersons for lobby groups. There is an inherent danger that such feedback comes from an unrepresentative sample of the organisation's customers.

Use of public opinion surveys have the advantage of providing information on change in community attitudes and perceived changes in network performance. Both of these aspects may change quite independently of physically measured changes in network performance.

Though appropriate methods of assessing road network performance by public opinions surveys have yet to be developed in Australia such surveys are likely to become increasingly used in the future.

PERFORMANCE MONITORING REQUIREMENTS FOR THE NATION'S ROADS

Returning to a national perspective [and particularly the interests of the Federal Government and the knowledge it needs when considering road funding decisions] it is clear that the trend in recent years has been away from the large scale one-off surveys and more towards continuous monitoring with periodic reporting.

Reporting Requirements and Intervals

One approach which is suggested is for different types and levels of data to be reported at appropriate intervals. A possible list of items for various reporting intervals is :

Annually :	. Length of sealed road, dual carriageways and freeways
	. Condition of sealed rural primary arterial road pavements
	. Expenditure and work output data
Tri-annually	. Roughness of sealed rural arterial roads
	. Travel time surveys over most primary arterial roads in the larger capital cities
	. Length and travel by road stereotype and other inventory based methods
	. Public opinion surveys
Every 5 years	. Analysis of ABS population census data, eg. journey to work and accessibility measures
	. Major report on the nation's arterial road network [even if no future projection undertaken]
Every decade	. Update of road alignment data over entire arterial network [using instrumented vehicle]
	. Substantial sample survey of local roads.

The above approach provides a practical program of network monitoring which is likely to be achievable within the resources available in SRAs. It should adequately provide for the road information requirements of SRAs, governments and the community whilst not being too costly [relative to physical road expenditure].

Inventory Data for Ongoing Monitoring

The ongoing monitoring of road network characteristics and performance is of considerable importance in charting the progress, or lack of progress, in road network development.

A number of standard road inventory data items have been defined as part of the NAASRA Data Bank System [NDBS], a nationally co-ordinated system for the storage of data in a standard format. In general SRAs convert to the standard format the inventory data normally held and updated by them in various different formats. The NDBS system was the method used by the NRS.

An essential element of the data updating is the precise location [to 0.01 km distance] of the changes and it is here that the NDBS "permanent reference point" system, defining road links, nodes and carriageways is vital in providing a basis for monitoring changes to the network [and particular sections of it] over time. The lack of such a location recording system was one reason why more extensive comparisons could not be made between the 1972 and 1981 road inventories.

Another essential part of the on-going inventory monitoring is to maintain a minimum, or "core", of current inventory data items. Figure 4 shows the standard [NDBS] data items indicating those which were collected for the NRS, and those which could be part of the core of inventory data to be kept current by all SRAs and LGAs.

CONCLUSIONS

To satisfy the need to monitor the on-going performance of the road network and the more specific requirement to provide program budgeting indicators for expenditures on roadworks it is essential to be able to provide reliable and up-to-date information over a period of time.

Both the BTE and NAASRA Roads Study reports commented on the difficulty of making historical comparisons using road inventory information. The development in the late 1970s of the NAASRA Data Bank System of standard data definitions, coding and location referencing has overcome many of the technical difficulties of data consistency and transmittal.

Figure 4 Inventory Data Requirements-NRS and Ongoing Monitoring

Standard NAASRA Data Bank System Data Items								
Item No	Data Item	Rural Art	Urb Art	Local (1)	Item No	Data Item	Rural Art	Urb Art	Local
1	State	**	**	**	41	Buses per Weekday			
2	Route	**	**		42	Trams per Weekday			
3	Carriageway	**	**		43	Access Control	*	**	
4	Permanent Reference Point 1	**	**		44	General Comment		*	
5	Permanent Reference Point 2	**	**		45	Obstruction	*	*	
6	Distance from PRP 1	**	**		46	Description of Obstruction		*	
7	Division	**	*		47	Pedestrian Crossing		*	
8	Local Government Authority	**	*	**	48	Railway Level Crossing	*	**	
9	A.B.S. Area				48#	At-Grade Intersection		*	
10	General Terrain	**			49#	Intersection Approach Data		**	
					90#	At-Grade Intersection (Arterial/Arterial)		**	
					50	Interchange Description		*	
11	Land Use		*		51	Bridge - Identification		**	**
12	Road Number	**	*		52	Bridge - Function	*	**	
13	Functional Class	**	**	**	53	Bridge - Length	**	**	
14	State Legal Class	**	**		54	Bridge - Width	**	**	
15	Commonwealth Legal Class	**	**		55	Bridge - Number of Spans			
16	Area Class	**	**	**(2)	56	Bridge - Horizontal Clearance	*	*	
17	Horizontal Alignment Data	*M			57	Bridge - Vertical Clearance	*	*	
18	Legal Speed Limit	*	*		58	Bridge - Description	*	*	*
19	Vertical Alignment Data	*M			59	Bridge - Average Height	*		
20	Shoulder Type and Width	*M			60	Bridge - Load Carrying Capacity	**		*
21	Formation Type and Width	*			61	Bridge - Signposted Load Limit			
22	Pavement Type and Width	**			62	Bridge - Footway			
23	Surface Type and Width	**	**	**	63	Bridge - Flooding Closure History			
24	Median/Outer Separator Width	*M	**		64	Bridge - Detour Distance			
25	Safety Barrier in Median		*		65	Culvet - Total Waterway Area	*		
26	Kerbs	*	*	**	66	Ferry - Description	*		
27	Slow Vehicle Lane	*M			67	Ferry AADT			
28	Pavement Data	**			68	Ferry Capacity			
29	Surface Data	**			69	Ferry - Replacement Structure Length			
30	NAASRA Roughness Meter	**			70	Ford, Floodway, Causeway	*		
31	Minor Drainage Adequacy	*		*(3)	71	Closure - Description			
32	Adjacent Material	*			72	Closure - History	R		
33	Operational Class	*	**		73	Closure - Detour Distance			
34	Standing Allowed		**						
35	Off-Centre Operations		**						
36	Priority Lane		**						
37	Right of Way Width	*	*						
38	AADT	**	**	*					
39	Traffic Growth	*M	*						
40	Traffic Composition	**	*						

\# Non-standard items defined for urban arterial roads only
* Collected for NRS
** Collected for NRS and required for Ongoing Network Monitoring
(1) Data relates to a sample of road sections in a sample of LGAs, not filed in NDB format
(2) Note area class different from standard NDB definitions
(3) On sealed road sections in rural area class only
R Not collected but required
M Required in modified form

The NAASRA Roads Study, as part of it's requirements to provide a clear picture of the nature and condition of the Australian road system and a basis for future monitoring, developed various Quality of Service concepts and criteria, many of which are useful for on-going performance monitoring. However, considerable development work is necessary for some measures such as the quality of alignment and roadway condition.

Any successful monitoring process requires a clear conceptual framework and in this paper a start has been made to relate possible types of measures to government strategies for road networks. The ideas of supply, demand and performance [demand versus supply] measures and sub-networks for specific strategies [eg. road network for freight] have been mentioned.

However it must be remembered that any monitoring activity requires resources and there are very real limits on what can be achieved with the limited staff and other resources available within SRAs and other organisations. Examples of current and envisaged activities of one SRA are given in the paper.

Finally, an approach involving different types and levels of data reported at appropriate intervals has been suggested as providing a practical program of network monitoring which is likely to be achievable by SRAs at a reasonable cost.

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