

ROAD NETWORK ASSET MANAGEMENT AS A BUSINESS PROCESS

**Paper prepared for the REAAA Conference in Japan,
4 – 9 September 2000**

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Ms Mihai has 17 years experience as a professional engineer in areas of road and railway transport policy and planning, developing safety regulations, asset valuation, assessing investment needs, and in recent years, asset management. For the last 6 years Florentina has been working for Main Roads Western Australia. She held the position of Asset Management Planning and Policy Manager being responsible for maintaining, improving and managing the asset management planning process, and the development of intervention standards and asset management policy. Recently she has been appointed as Data Planning and Standards Manager. Her responsibilities include identifying and coordinating corporate road data and systems policies, standards and audit processes.

Neville Binning has a first degree in Civil Engineering [Curtin University - Western Australia], a Master of Business Administration (University of Western Australia) and a Graduate Certificate in Human Resource Development (University of Canberra). He has over 25 years of professional experience. This has primarily been with Main Roads Western Australia – the State Government Road Management Authority. He has thereby gained experience in all aspects of road infrastructure management. Neville has also worked with Local Government, Treasury and Transport Departments. Currently he is Manager Road Asset Planning of Main Roads Western Australia.

Mr Dowling has had more than 30 years experience as a professional engineer in road engineering and management, including senior responsibility for the planning, design, construction, maintenance and operation of extensive freeway, highway and main road networks. His current and recent consulting work covers a broad range of road issues including development of route planning strategies, public consultation, asset management, road user costs, transport and land use planning, contract documentation, asset capitalisation and traffic safety as well as environmental management, training and road construction. Mr Dowling regularly leads community workshops as part of the development of road planning strategies. Mr Dowling has maintained a strong involvement with road safety programs for more than 20 years.

1. CONTEXT

Asset management has been around for the last fifteen years, changing shape and emphasis to reflect and accommodate changes in the operating environment. In the 1980s the focus was more on the construction of new assets with the management of existing assets being a low priority, if thought of at all. Then, as the capital ceased to be readily available, the focus changed to maintenance and life extension. Further budget tightening and increasing demands had required agencies to be more accountable and provide cost justification before allocating money to maintenance. The emphasis has shifted to Information, asset registers, valuation, information collection and data systems. But information by itself is not sufficient. Agencies began to recognise the need to have systematic processes and procedures in place, which would enable business decisions based on the information available. In Australia, in recent years there is a new shift in asset management, towards outcomes. Agencies have started to focus on the purpose of asset information and management procedures, the emphasis is more on changes to service delivery outcomes and rethinking what is core business. Asset management becomes more holistic.

Nowadays the concept of asset management is widely used to describe a comprehensive and structured approach to the management of assets, over their whole life, for the efficient use and delivery of services.

Austrroads, in its capacity of providing strategic direction for the development, management and use of the Australian and New Zealand road systems, has identified asset management as a major issue in its strategic planning, and has produced comprehensive guidelines on road asset management. The Austrroads Road Asset Management Guidelines produced in 1994 were fundamental in the development of road asset management in Australia. They introduced the concept of Total Asset Management to the management of road networks. The 1994 Austrroads Guidelines identified the main elements of road network asset management: community benefits, road system performance, asset features, asset use, physical treatments, management of use and asset management strategy.

To further promote and progress the concept of a holistic, total asset management process, in 1999 Austrroads undertook three projects:

- The Development of a Framework for Integrated Asset Management
- Use of Community Input in Determining Level of Service and Intervention Standards
- Benchmarking Study of Approaches to Road Asset Management.

These projects, and particularly the Asset Management Planning (AMP) Framework provide a step by step, hands on, generic asset management planning process, and a plan for implementation, that will give asset managers the basis for producing sound investment decisions reflecting stakeholders requirements, at the optimum transportation cost.

This paper, in part one, provides a description of the generic AMP Framework, including the use of community consultation in developing Levels of Service. The second part highlights the results of the AMP benchmarking survey.

2. COMMUNITY INPUT IN THE DEVELOPMENT OF LEVELS OF SERVICE AND THE CONCEPTUAL ASSET MANAGEMENT FRAMEWORK

The generic asset management process covers six main phases:

- Phase 1: Use of Community Consultation for Defining Organisational Objectives and Developing a Level of Service Framework
- Phase 2: Develop asset strategies and plans
- Phase 3: Identify asset requirements
- Phase 4: Develop an investment plan and a works program
- Phase 5: Implement asset management plans and actions
- Phase 6: Audit and review of the process.

The conceptual AMP framework is shown in Figure 1.

Phase 1: Use of Community Consultation for Defining Organisational Objectives and Developing a Level of Service Framework

This is a fundamental part of the AMP process because it prompts an agency to assess its role and purpose in regard to stakeholder requirements and government policies, to review what is core business and to focus on these core activities.

Community consultation is vital to successful asset management, and an essential element of the planning and policy development of the whole road system and delivery of any successful project.

This phase begins with the identification of potential stakeholders and the preparation of concepts prior to the actual consultation process, including a preliminary standards framework to be presented for group discussion.

To ensure that the program serves the needs of all people in the community, consideration should be given to:

- ❑ The size and distribution of the population
- ❑ The presence of organised interest groups
- ❑ Community issues that may be relevant
- ❑ Local community leaders
- ❑ The input and potential ongoing involvement of relevant Government Ministers, Local Government and Media.

Local Government and regional development authorities and State Government agencies are a good starting point for ascertaining the basic characteristics of the community and to identify the target groups.

Prior to the actual consultation process the agency would have to identify and prepare concepts for discussion. This may include the development of a Issues and Directions Paper documenting current issues associated with maintaining a road network and would initiate discussion on levels of service and intervention standards, or in other words, would determine what are the expectations of the community regarding the road service. Such a document should provide a general overview of the key issues associated with the ageing network, funding availability, safety, comfort and maintenance standards. The agency may take the view that uniformly high operating conditions across all roads in the network are too costly to achieve and would not represent an economic return on investment, therefore, a 'fit for purpose' approach is more appropriate.

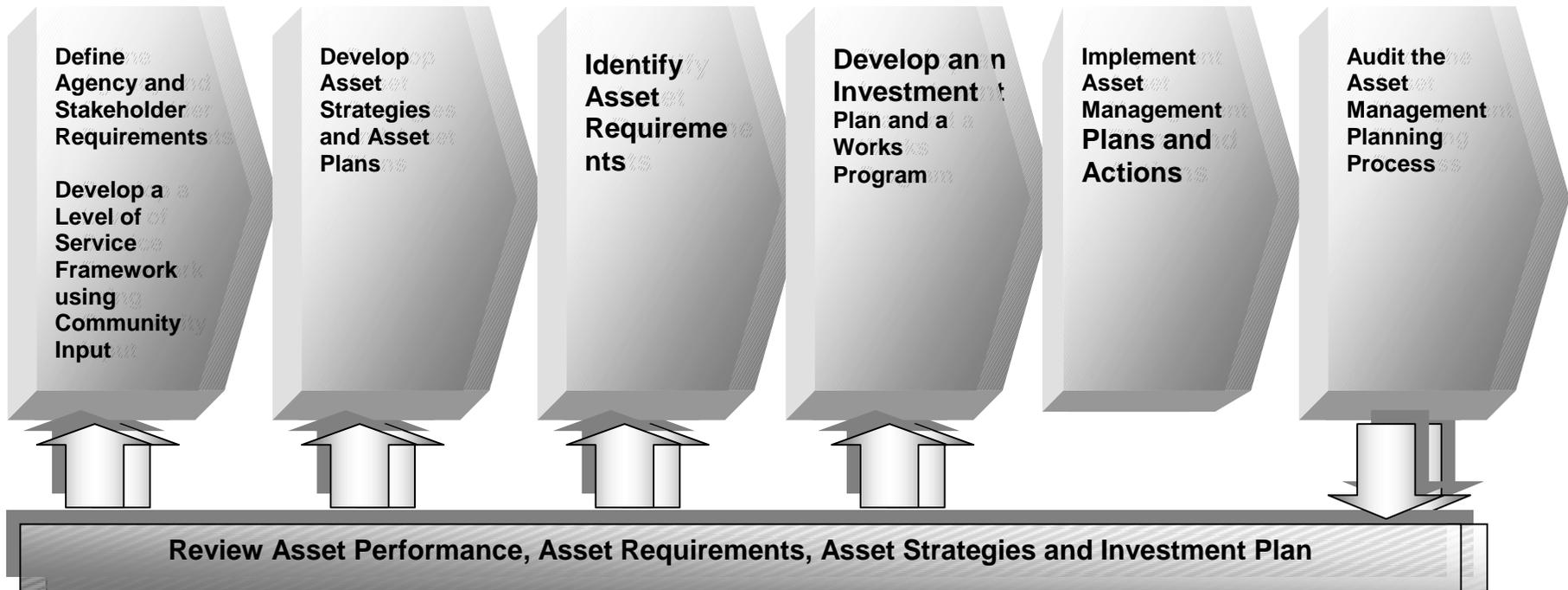


Figure 1: Asset Management Planning Process Flow Chart

An example of 'fit for purpose' Level of Service Standards is provided in Table 1. The Level of Service Standards define the type and quality of road that should be provided based on demand or usage parameters, eg. traffic volumes and freight tonnage.

Using Table 1, the required Service Level Class of any road related asset can be determined. For example, a road with an annual freight tonnage of 200K tonnes and an AADT* of 4 000 vehicles, has a specified Service Level of 'A'. The meaning of each service class is described in Table 2.

Table 1: Road Categories by Traffic Volumes and Quantity of Freight

AADT	Freight (tonnes-km/year)		
	<100 000	100 000 – 300 000	>300 000
< 300	C	C	C
300 - 500	C	C	B
500 - 600	C	B	B
600 – 2 000	B	B	B
2 000 – 3 000	B	B	A
3 000 – 4 000	B	A	A
4 000 – 8 000	A	A	A
> 8 000	M	M	M

Table 2: Level of Service Designation

Service Level Class	Description
M	High standard dual carriageway providing primary road links
A	Similarly high standard but on a single carriageway
B	Medium standard single carriageway
C	Basic standard single carriageway

Target road condition and configuration standards can be defined for each road class, based on community expectations regarding road safety, ride comfort, road amenity etc, and the community willingness to pay for the road service. The challenge here is to translate these expectations into engineering standards.

An example of target standards is presented in Table 3. The use of these road asset performance target standards provides tangible measurements to determine road asset configuration and condition requirements in terms of capital investment and upgrading and maintaining the existing road infrastructure.

* AADT – Average Annual Daily Traffic

When developing condition and configuration intervention levels, consideration should be given to road user requirements, whole of life cycle costing and engineering and safety standards already in use.

Community consultation can be undertaken using a range of techniques such as media release, displays, public meetings, surveys, workshops, public documents, information days etc.

Table 3: Road Asset Performance Standards

Service Level	Intervention Standards Configuration		Intervention Standards Condition	
	Seal Width (metres)	Bridge Strength (load Capacity)	Roughness (NRM counts/km)	Rut Depth (mm)
M	n x 3.7	T44	90	20
A	7.4	T44	100	20
B	6.2	T44	110	30
C	5.6	T44	140	30

Key Result Areas (KRAs) and Key Performance Indicators (KPIs) should reflect the outcomes of the community consultation process and Government policies, and should be integrated into the agency's objectives. KRAs are areas considered important to stakeholders; examples of KRAs may include economic, safety, environmental, social. A number of KPIs should be set to monitor the effectiveness of the AMP process.

Phase 2: Develop Asset Strategies and Plans

This phase consists of developing Road Use Strategies and Guidelines, Infrastructure Strategies and Road Asset Plans.

The purpose of Road Use Strategies is to identify ways for optimising the efficiency and utilisation of the existing network as part of an integrated transportation system.

Road Use Strategies should address the range of issues impacting road transportation such as road safety, traffic management, travel demand, freight efficiency, cycling and pedestrian needs, inter-modal integration, noise and air quality, transport equity and heritage conservation.

Road Use Strategies will consider regulation, enforcement, education, route designation, the use of Intelligent Transport Systems, as well as infrastructure solutions such as traffic calming devices, pedestrians and cycling initiatives, as ways to manage road use.

Road Infrastructure Strategies have the role of identifying means for maintaining, improving and expanding the road network to meet the present and future road transport needs of the community and to assist in the promotion of economic growth of the Nation. Infrastructure Strategies cover issues such as road preservation, overtaking requirements, bypasses, road alignments, road and bridge widening and bridge strengthening.

The agency's corporate objectives, KRAs and KPIs, the level of service framework, as well as relevant government policies and initiatives, trends in state demographics, freight development, together with the agency's strategies on road use and infrastructure are consolidated in a Road Asset Plan.

According to the size of the organisation, the Asset Plan may be a set of plans, eg network plan, regional plan and link plan. At the lowest level of magnitude, the link plan is a source of information on the condition of assets on a homogeneous section of the network, including road statistics, current and future road usage, road deficiencies, and a list of needs based road works, and associated funding needs.

Phase 3: Identify Asset Requirements

This phase establishes gaps in asset performance by comparing current and future configuration and condition with desired configuration and condition, and identifies projects to fill these gaps.

The Level of Service Framework provides the first level of assessing network deficiencies, and helps identifying preservation projects and improvements projects. Road network planning studies and freight policies reflecting current and future economic developments are some of the factors that would help the identification of network expansion projects.

This phase may consist of a top-down approach and network modelling, complemented by a bottom-up assessment of funding needs.

The output of this phase is a list of needs based, budget unconstrained projects.

Phase 4: Develop an Investment Plan and a Works Program

It is expected that owing to resource constraints, only a portion of the total needs program will receive funding. To ensure an equitable allocation of resources and to achieve the organisation's objectives, projects should be ranked in order of 'importance'. This may be via a value for money ranking, incorporating, for example:

- ❑ Economic benefits including optimisation to minimise Life Cycle Cost (LCC), Road User Costs and other agency costs, and
- ❑ An adjustment for factors such as economic, environmental, safety and social, eg. a Multi-Criteria Analysis.

LCC is the total costs to be expended on an asset over its entire life span. LCC analysis considers all costs, in present day value, throughout the life of the assets. It includes initial construction costs, annual maintenance costs, any costs towards enabling the asset to reach its expected life or service potential, the timing and cost of future investments and compares options with different economic lives.

The development of an Investment Plan and a Work Program is an iterative process and should take into account:

- ❑ Existing commitments, eg projects that have been signed or are under construction
- ❑ Indicative funding levels and business resources
- ❑ Project cash flow requirements
- ❑ Delivery strategy, eg projects may be combined to facilitate delivery by Design and Construct contract or to provide economy of scale
- ❑ Inter-modal funding considerations
- ❑ Regional development issues
- ❑ Community and Government feedback.

The agreed investment plan should represent the optimal match between available funding, road investment and business resources.

Phase 5: Implement Asset Management Plans and Actions

This phase involves delivery all of the projects and tasks identified in the Works Program.

Phase 6: Audit and Review of the Process

Audits should be performed to ensure that the asset management cycle has been carried out as documented and the works program satisfies organisational and stakeholder requirements. The audit of the AMP process can be integrated into the agency's quality assurance systems.

The AMP process should continue beyond the implementation of the Works Program. A number of feedback loops should be used to give the AMP its cyclic and continual nature. These reviews should be done after the implementation of the Works Program, with the purpose of cross checking if the implementation of the Works Program has satisfied agency's objectives. The road network performance after the implementation of the Works Program is assessed against the road network performance expected to be delivered by the approved Investment Plan and Program of Works. The outcomes of the review may determine changes to Asset Strategies, Levels of Service or to prioritisation methodology.

The implementation of the Works Program may affect stakeholder perceptions and thus their requirements and expectations. This feedback process highlights the necessity to gauge stakeholder requirements on an on-going basis.

3. RESULTS OF THE AMP BENCHMARKING SURVEY

The objective of this benchmarking study was to compare and contrast the approach taken to strategic planning and decision making in the management of road related assets by road agencies in Australia, New Zealand and overseas.

The study was conducted in three stages: survey, follow up interviews and data analysis and reporting. The survey questionnaire was sent to 24 road agencies, and 12 responses were returned.

The survey questionnaire covered the following main elements of asset management:

- Agency Objectives and Stakeholder requirements
- Asset Planning Strategies
- Asset Requirements
- Information Systems
- Formulation of Investment Program
- Review of the AMP process
- Audits.

The benchmarking study identified a number of areas for improvement in the AMP process, including:

- A general inability to determine how well the agency is achieving its purpose of fulfilling stakeholder requirements through the management of its assets. Specifically, KRAs need to be based on stakeholder requirements, and KPIs should reflect the agency performance in the KRAs.

- ❑ Benefits and costs of projects need to be quantified and a transparent prioritisation methodologies needs to be developed, reflecting stakeholder requirements and incorporating both capital and maintenance works.
- ❑ Standard costing frameworks need to be developed.
- ❑ In general, there is considerable potential to improve integration of systems.
- ❑ A Level of Service Framework reflecting stakeholder requirements needs to be formally developed and periodically reviewed to ensure that these requirements are satisfied.
- ❑ Audits, including benchmarking, should be performed more regularly.

The benchmarking study also identified a number of areas of outstanding practice, including:

- ❑ The use by some agencies of a road hierarchy, similarly to the 'fit for purpose' level of service classes in Table 2, for asset management planning purposes.
- ❑ Generally a high degree of community consultation among the major road agencies on Australia.
- ❑ Key Result Areas in the response to the Benchmarking survey from one road agency included a 'higher priority for maintenance' and 'making better use of the existing arterial road network'. Key Result Areas of this nature appear to be at the very heart of the asset management objective of managing assets with a balance between maximum community benefits and minimum life cycle costs.
- ❑ The use by at least one respondent, and the emerging use by other respondents of credible models to predict deterioration of pavement condition.
- ❑ The emerging use in Australia and New Zealand of rational evaluation of proposals for maintenance interventions including rehabilitation, in addition to the traditional use of rational evaluation for proposals for capital investment in road networks.

4. CONCLUSIONS

The three recently completed Austroads Projects described in this paper offer a suite of tools to assist a road agency in developing or improving its approach to road network asset management.

The Austroads Asset Management Planning (AMP) Framework is a generic suite of steps from the initial setting of objectives to the eventual audit, review and evaluation of the whole process including implementation. This generic framework is intended to help ensure that an agency's decisions in relation to road network asset management satisfy corporate and stakeholder needs.

Community input is essential to the achievement of optimum community benefits, having regard to budgetary constraints, asset deterioration and genuine stakeholder needs.

The 1999 Austroads benchmarking study was designed to examine asset management planning practices of respondents against the AMP Framework and the community consultation procedures and guidelines. A number of outstanding asset management strengths and areas for potential improvement identified in this study have been listed.

References

Burns, P. 1999. *The Way We Were*, Strategic Asset Management, Issue 26, December 31 1999.