Road Asset Management Investment

Towards reliable investment decisions for road asset maintenance and rehabilitation

Innovation in the decision support process

Australia's civil infrastructure assets of roads, bridges, railways, buildings and other structures are worth billions of dollars. Road assets alone are valued at around A$140 billion. As the condition of assets deteriorates over time, close to A$6 billion is spent on asset maintenance annually (i.e. A$16 million per day).

To effectively manage road infrastructures, road agencies require sound information based on knowledge and data describing the assets to support their investment decisions.

This *Construction Innovation* Research Project has developed innovative ideas on the quality of the decision support process for road agencies, namely:

- Road agencies need to optimise expenditure for asset data collection by determining the minimum amount of data required to predict maintenance and rehabilitation costs without jeopardising reliability.
- Road agencies need to accurately predict the deterioration rates of infrastructure to reflect local conditions so that realistic budget estimates can be calculated.
- The prediction of budgets for maintenance and rehabilitation must be reasonably reliable.

Effective decisions for road asset investment

Methods developed by the research team for effective decision making for road asset investment include:

- optimising data collection
- calibrating pavement performance models
- assessing risk (probability) of errors in budget estimates.

Optimising data collection

What? A method for determining sampling plans for road data collection that gives best value for money.

Why? Road asset management requires accurate monitoring of changes in asset condition. Monitoring road asset condition is high cost, especially monitoring pavement strength condition.

How? This method uses a probability-based, best-fit distribution technique to identify linear sampling intervals along the road that do not compromise the statistical relevance of the road data.

Outcome: A case study assessed the stochastic properties of road pavement strength data over extensive lengths of road network. The results found that road authorities could reduce strength test sampling rates by 75 to 80 per cent compared to current practice without losing any statistical relevance for network applications.

CRC Construction Innovation
BUILDING OUR FUTURE

CRC AUSTRALIA

Calibrating pavement performance models

What? A method for calibrating performance prediction models that replicates the statistical properties of actual performance observations.

Why? Road engineers or analysts need to calibrate deterioration prediction models for local conditions so that predicted budgets can be as accurate as possible.

How? The method uses the reliability concept and a best-fit distribution technique to tune model outputs so that the predicted variability demonstrated by modelled deterioration closely replicates actual variability of measured deterioration.

Outcome: Two road networks of 1688 km and 1033 km were used as case studies. The method yields calibrated models that closely replicate the actual variability observed in road network condition.

Assessing risk (probability) of errors in budget estimates

What? A method for assessing the risk (probability) that predicted cost estimates for future life-cycle maintenance may be met or exceeded.

Why? Risks of errors in budget/cost estimates exist due to the variability in road asset conditions, future traffic demand, climatic conditions, cost of treatment works etc.

How? By simulating relatively small sample populations of critical analysis inputs, this method produces a statistical population of predicted life-cycle cost outcomes. This more practical method substantially reduces input data preparation and analysis complexity.

Outcome: The use of this method allows road authorities to produce budget estimates for a project life cycle cost with a high degree of accuracy.

Neil Robertson
Manager Road Asset Management Branch
Queensland Department of Main Roads

"This research opens the door to improved analysis processes and greater cost-effectiveness in asset data collection. The work potentially lowers costs and certainly improves cost effectiveness in preparing road data sampling plans. The method for calibrating pavement performance models is unique in replicating the actual variability of measured performance data, and the results are very encouraging. Risks associated with future maintenance investment decisions can be evaluated using the risk assessment methodology."

Partners

The *Investment Decision Framework for Civil Infrastructure Asset Management Project* (2001-010-C) is supported by the following Australian industry, government and research partners.

John Holland

ARUP

Queensland Government
Department of **Main Roads**

Queensland Government
Department of **Public Works**

RMIT UNIVERSITY

QUT

For more information contact:

Professor Arun Kumar (Project Leader)
Professor of Infrastructure Management
RMIT University Melbourne Australia 3001
Phone: +61 3 99251515
Fax: + 61 3 99251313
Email: a.kumar@construction-innovation.info

Dr Noppadol (Anthony) Piyatrapoomi
Research Fellow, RMIT University
Phone: +61 3 99251521
Fax: + 61 3 99251313
Email: a.piyatrapoomi@construction-innovation.info

CRC for *Construction Innovation*
9th Floor, L Block, QUT Gardens Point,
2 George Street, Brisbane, Qld, 4000
Tel: + 61 7 3864 1393 **Fax**: +61 7 3864 9151
Email: **enquiries@construction-innovation.info**
Web: **www.construction-innovation.info**

January 2005