HEAVY VEHICLE IMPACTS COST ESTIMATION AND FUND ALLOCATION

Developing a strongly-justified approach to allow the road network to be maintained to an appropriate standard under increasing and unexpected heavy vehicle loads

Background

The Western Australian road network carries a large amount of heavy vehicle (HV) traffic from industries such as mining and agriculture, which are important for the State's productivity. However, the pattern of this use is not always consistent, and significant and unexpected loading of the state's arterial road network can occur, impacting on the performance of the road infrastructure.

Main Roads Western Australia (MRWA) sought to answer this challenge by asking ARRB to develop a strongly-justified approach that would allow the road network to be maintained to agreed standards in spite of unexpected or increasing HV loads.

To do this, ARRB developed a process based on modelling the environment, traffic volumes and loading, and functional and structural condition and, therefore, future performance of the road network in 100-metre-long segments. This was used to determine the marginal cost of maintaining the road network due to heavy traffic. The study also examined potential benefits to heavy vehicle operators resulting from a well-managed and funded network.

Approach

Development of modelling process and WA-specific parameters to simulate Heavy Vehicle loading of the entire WA arterial road network over 50 years

Analysis with HV loading varying by -40%, 100% and +40%, to establish a relationship between Cumulative Equivalent Standard Axle Loads and Road Preservation and Renewal Costs

Slope of relationship = Marginal cost of road wear (in cents/esa.km)

Level of Service (LOS) refers to the standard the road is maintained to, as determined by subjective customer experience, or measurable technical parameters

Presentation of the Marginal Cost of Road Wear Results in a Highly-Visual, Interactive Tool

Further analysis to estimate the benefits to heavy vehicle road users of maintaining roads to assigned service levels

Framework for managing heavy vehicle loads on the network, allowing funds to be directed in such a way as to generate the greatest benefit to MRWA, industry and the community

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Outcomes

This study successfully adapted and applied an established national methodology for the determination of the marginal cost of road wear (in cents per esa.km) using available road condition, pavement strength, inventory, traffic, unit cost and environmental data representing a substantial proportion of Main Roads' network.

An investigation of productivity benefits, representing the net cost to heavy vehicle operators based on the estimated road user cost savings delivered by a fully funded asset preservation and renewal program and the marginal cost of road wear, has produced an understanding of available benefits. For the case studies examined, the factors which supported net benefits included lower road agency costs resulting from fit-for-purpose treatments and lower treatment unit rates, lower intervention levels consistent with a higher level of service, and corresponding lower road user costs where funding is unconstrained. The rationale is that the revenue generated by application of a user charge based on marginal costs should be used to directly support the fulfilment of service levels.

Conclusion

Accounting for road wear costs through a comprehensive analysis provides an evidence driven basis for determining funding needs and HV related road wear in response to local conditions and road use. It is founded on an economic savings driven approach which seeks to minimise total transport costs and provides MRWA with a strong and transparent basis for subsequent road management policies, funding decisions and user charging.

Confirmed approach and results for determination of HV related road wear costs based on rational, quantitative analysis for use by asset managers and HV access managers

This approach is consistent with national methodologies and similar approaches developed for QDTMR

FUTURE CONSIDERATIONS

The outcome from this work informs and is informed by the IDM 2 Project

Further research on the impact of the current vs minimum total transport cost based LOS is warranted and updating of results upon completion of IDM2.