

Re-Gen: Risk Assessment of Ageing Infrastructure

Eugene O'Brien

The objective of the Re-Gen project is to provide Road Owners/Managers with best practice tools and methodologies for risk assessment of critical infrastructure elements, such as bridges, retaining structures and steep embankments. Risk is being assessed considering not only the probability of failure of an element/network but also based upon the consequences of that failure. The prioritisation of these structures for repair should be planned based upon this risk. The project is developing a set of risk management and decision tools which will provide Owners/Managers with the facility to optimise budgets/resources from the perspectives of minimisation of cost. To achieve this, the following areas are being investigated:

1. Prediction of Deterioration Considering Climate change
2. Traffic Effect Forecasting
3. Risk profiling

The Intergovernmental Panel on Climate Change low, medium and high scenarios for CO₂, temperature and precipitation will be considered with respect to the temporal resistance of road infrastructure, such as material degradation and slope stability. This is being accomplished by employing methods which predict the expected impact of climate change on degradation, and utilising recently gathered field data that reflect the influence of changing climate on the relevant damage mechanism.

Traffic tends to increase with economic growth. Furthermore, heavier and longer freight vehicles are coming to the market. To examine the effect of traffic growth on characteristic load effects, long run simulations are performed where the traffic volumes and weights are increased year-on-year. The results can then be compared with the Eurocode load model and an α -factor calculated. For larger or strategically located bridges, a Reliability Analysis may be required to obtain a more accurate measure of its true safety. A framework is also being developed through which traffic growth can be allowed for in a FORM/SORM Reliability Analysis.

The effect of the climate change and traffic growth will be combined to provide a methodology to estimate the probability of failure of the infrastructure at the considered limit state. In order to estimate the level of risk, a detailed treatment of the consequences of failure is being performed. The safety, operation, financial, commercial and reputational risks are being considered.

Finally, the project prescribes a set of risk management and decision tools which may be employed by infrastructure owners/managers in optimising the lifecycle performance of infrastructure elements. These optimization tools will predict the optimal frequency and extent of maintenance cycles and preventive measures on each of the critical nodes of the network.