

The Results of Sustainable Maintenance Policy for Infrastructure Networks in the Randstad: A climate change perspective

Weather conditions can have a strong influence on road and railway infrastructure. Road and railway users experience this influence throughout the year, although the intensity can differ between years and location. For example, in winter periods freeze-thaw cycles can cause damages of road asphalt and snow can lead to failures of railway switches. In summer periods high temperatures can overheat railway installations. Furthermore, in each season parts of the road and railway network can be blocked or flooded due to strong storm and heavy rain. The research project revealed that the risk of railway failure increases with temperatures above 20 °C and below 0°C, and with snowfall more than 10mm. For road infrastructure the risk of damages increases with more than 20 freeze-thaw cycles per winter. The research also showed that these thresholds will most likely change with the expected climate change. According to different climate scenarios the risk of failure and damages will decrease in winter due to milder temperature and will increase in summer due to higher temperature. Although public agencies can anticipate these developments by, for example, increasing the capacity of drainage systems, shows the assessment of the weather-related vulnerability of infrastructure and the decision to invest in adaptation measures great uncertainties. The research also found that besides the different weather conditions and the expected climate change, infrastructure age, condition, material, traffic load and traffic intensity influence the risk of failure and damages.

A main conclusion of the research is that road and railway agencies should consider the management of infrastructure as a learning process. This learning process is characterized by a continue infrastructure monitoring and a dynamic evaluation and decision support system. Such a system should be able to collect data about weather-related failures and damages and link them with other infrastructure characteristics in order to identify locations of the infrastructure network that are vulnerable to weather conditions and important for accessibility. On the basis of a continue risk assessment measure can be taken that:

- give more insights in weather impacts, for example through research about the influence of frost on asphalt,
- reduce weather impact in the short run, for example winter services,
- prevent weather impacts in the long run, for example through the development and use of changed asphalt.

Here, a more professional asset management at road and railway agencies is needed. Unfortunately, until now collected data about weather effects on infrastructure have been incomplete, inconsistent and not up-to-date. Furthermore, investment decisions are often not taken in an integral manner considering different risk factors (weather, traffic), the effects on infrastructure (condition, deterioration), and the service provision (accessibility, traffic flow) over the entire life-cycle of the infrastructure. This also means that climate robustness should become a criterion for the infrastructure design.