

Enabling Sustainable Road Infrastructure: The Strategic Role of the Traffic Speed Deflectometer

Achieving zero-waste and zero-carbon goals in road infrastructure requires strategies that extend beyond construction to include the entire life cycle, based on a holistic understanding of road pavements and their condition. Conventional condition assessment methods generally focus on surface properties, neglecting the structural state of the road. This often results in misguided or suboptimal maintenance decisions, leading to avoidable material use, emissions, traffic disruptions and cost.

The Traffic Speed Deflectometer (TSD) is a continuously operating, non-destructive measurement system that enables the assessment of the structural bearing capacity of pavements at network level. While the measurement process itself is minimally invasive, the true ecological value of the TSD lies in its ability to enable timely, targeted, and proportionate maintenance interventions.

To evaluate the potential of TSD measurement data for a sustainable road asset management, extensive surveys were conducted in Brandenburg and North Rhine-Westphalia. The collected data were used to identify structurally homogeneous sections and to assess key indices such as the SCI300 and the bearing capacity number Tz, enabling a comprehensive understanding of the pavement's condition.

Accurate knowledge of the structural condition ensures the selection of appropriate maintenance measures at the right time and location. This prevents premature or excessive interventions, reduces material consumption and construction waste and extends the service life of the infrastructure.

Since TSD measurements are carried out at traffic speed, no traffic management is required. Together with fewer maintenance interventions, this leads to less congestion and fewer traffic-induced emissions throughout the road's lifecycle.

In summary, the TSD enables a shift from reactive to performance-based strategic asset management. This study illustrates how structural diagnostics can address the root causes of emissions and resource inefficiencies, thereby laying the foundation for climate-resilient and resource-efficient road infrastructure systems.

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