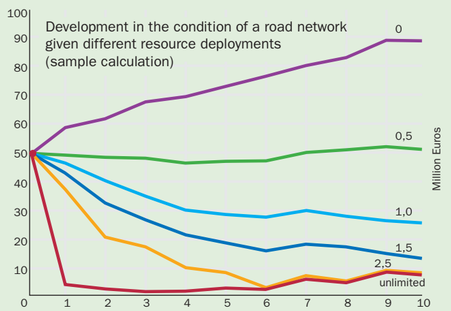
Pavement Management System (PMS)

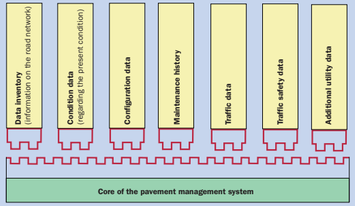
The relationship of all maintenance-relevant data for comprehensive maintenance planning can only be accomplished using computers. The Pavement Management System (PMS) for the German federal highways has been designed in a modular way. This modular structure permits individual modules to be developed and replaced without limiting the optimisation processes of the PMS. The ability to estimate and visually represent the effectiveness of the strategies and measures selected with the help of the PMS over a period of many years and for the entire network depending on the budget provided is a decisive development and facilitates the long-term assurance of adequate quality of the federal highways.

The results of the PMS decisively enhance the justification for the options and necessary resources for maintenance using a well-founded basis of argumentation. The PMS simplifies and improves the maintenance planning for the federal states.

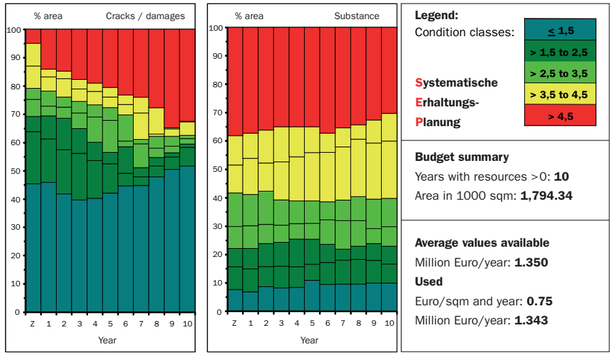
Module 1	Formation of homogeneous sections
Module 2	Selection of sections needing maintenance
Module 3	Analyses of deficiencies and damage
Module 4	Forecasts of changes in condition
Module 5	Technically feasible maintenance measures
Module 6	Assessment an prioritisation of measure variants
Module 7	Optimisation of measure variants within budgetary constraints
Module 8	Short-term and medium-term maintenance program

PMS Modules



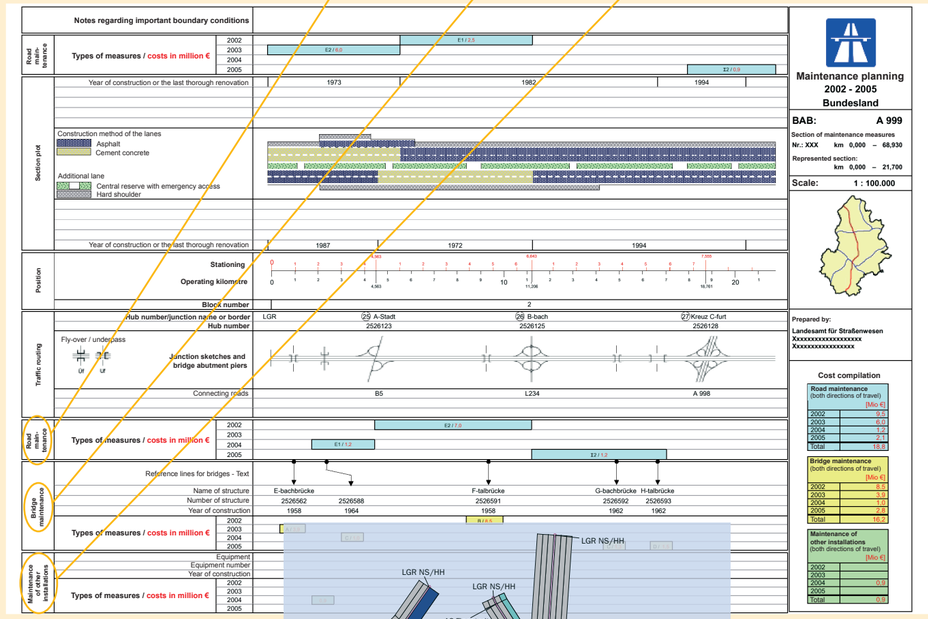


PMS input data

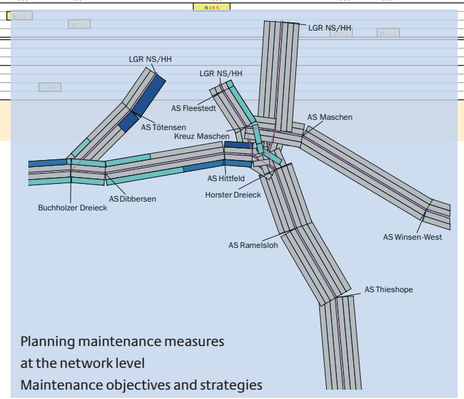


Co-ordinated maintenance management

The combination of maintenance of roadways, bridges and other installations of the road



The co-ordinated maintenance plan does not only take the fixed roadways into consideration such as, for example, the road surface but also the structures such as bridges and tunnels as well as other installations such as baffle-boards, signing and ancillaries.
Carefully planned measures executed in succession optimise the use of resources and minimise traffic disruptions.



Planning maintenance measures
at the network level
Maintenance objectives and strategies

Federal Ministry
of Transport, Building
and Urban Affairs

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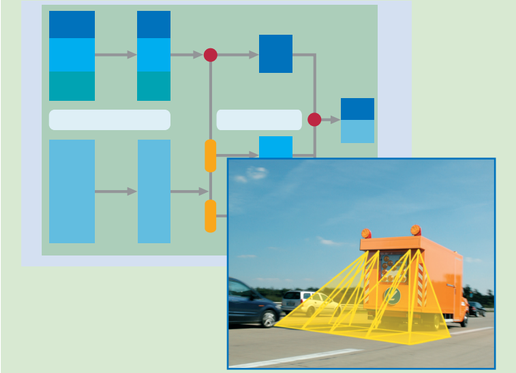
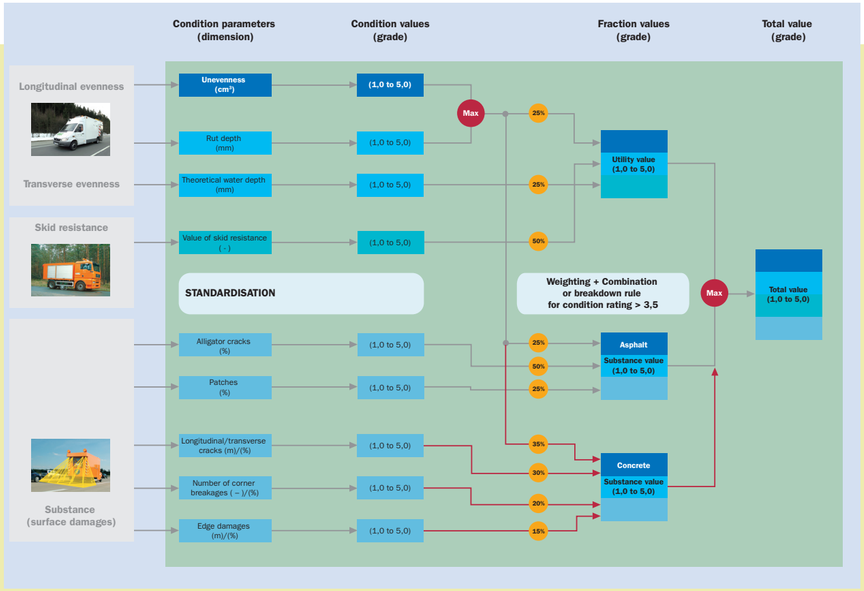
Maintenance management of the federal trunk roads



Maintenance Management

The German federal trunk road network covers over 12,000 km of federal motorways and 41,000 km of federal highways.
As a result of the enhanced European domestic market and its central location in Europe, this network must be in a position to sustain constantly growing traffic densities.
As it is, the very low occurrences of breakdowns lead to substantial traffic disruptions and the consequent negative impacts for the road users, the national economy and the environment.
The maintenance of the federal trunk roads is, thus, an urgent task, both for the present and the future to achieve a long-term guarantee of the mobility of the economy and the society.

The federal trunk road network of the Federal Republic of Germany has grown historically and, thus, has very different construction standards with respect to the alignment, cross section, frost resistance and bearing capacity of the pavement.
A substantial proportion of the federal motorways in the old federal states were constructed as far back as the sixties and the seventies that must now be extensively renewed. In the new federal states, renewal measures must be partially combined with cost-intensive reconstruction and upgrading measures in order to attain the standard of roads in the old federal states.
This calls for a substantial investment of resources and makes systematic and specific maintenance management necessary.



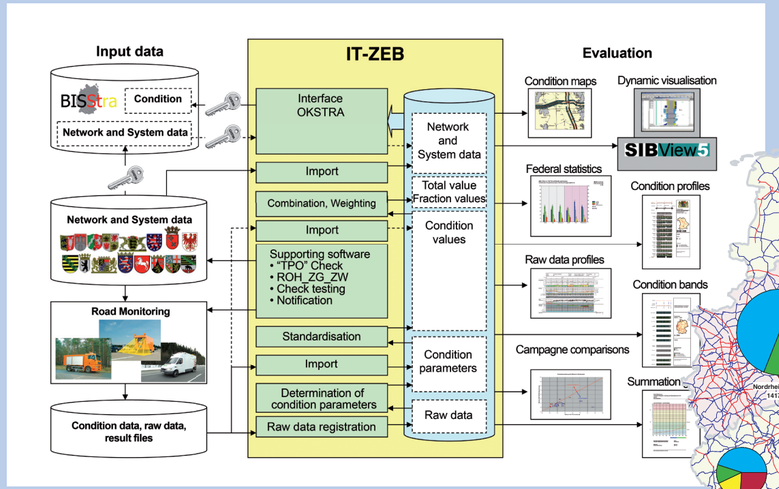
Measurements regularly carried out record the quality of the highway network on the basis of elementary criteria (transverse and longitudinal evenness, skid resistance, substance (surface damages)). A standard procedure guarantees uniform evaluation and grading across the Federal Republic. In this manner, utility values and substance values of individual route sections and entire highways can be calculated and can be used as the basis for maintenance planning.

Road monitoring and assessment (ZEB)

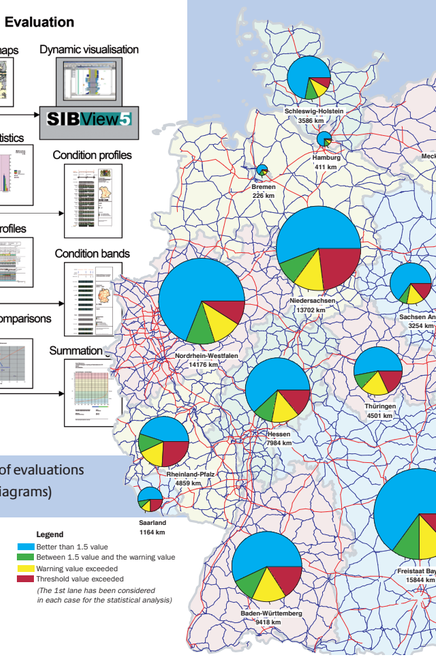
Road monitoring and assessment (ZEB) yields current, objective, and uniform data recorded across the Federal Republic that is used for short-term and medium-term maintenance planning of individual road sections and sub-networks. They are also used to obtain long-term financial requirements.
The data pertaining to the condition of the roads that are recorded at regular intervals are a pre-requisite for the use of a pavement management system (PMS).

The assessment of individual road sections is illustrated clearly in the network map. Blue indicates a very good road condition (grade 1 – 1.5), red indicates a very poor condition (grade 4.5 – 5) urgently requiring maintenance or repair.

IT-ZEB (BASt system Data pertaining to the condition of roads)



Data flow schematics



Visualisation of evaluations (Schematic diagrams)

The Federal Highway Research Institute has the "BASt system condition data" (IT-ZEB) for central preservation and management of the comprehensive information and data resulting from regular ZEB yearly measurements. The results from the IT-ZEB are checked and accepted at the end of each measurement year. They are then available permanently to the administrations of the federation and the federal states in order to be able to execute an objective maintenance schedule and amongst others, to track the behaviour of the roads over a period of many years for any necessary repairs. The condition parameters and grades can be reproduced by the IT-ZEB system from the raw data available at any point of time or they can be re-calculated on the basis of modified criteria.

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