



BAST: Areas and Activities of Focus

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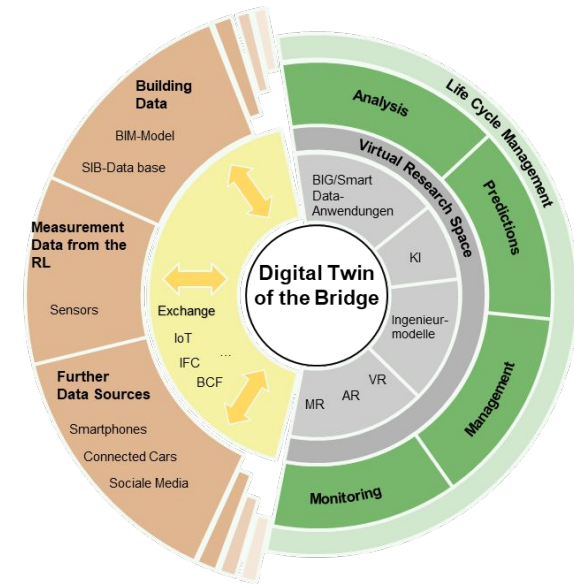
President of the Federal Highway and Transport Research Institute

9 Areas of Focus

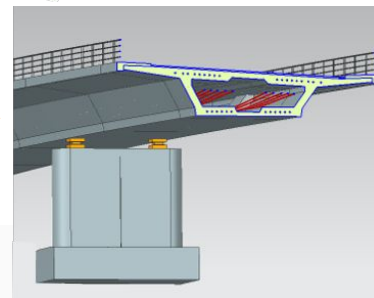
- TB 1 Infrastructure: Predictive Infrastructure Management
- TB 2 Construction: Sustainable Construction
- TB 3 Energy: Sustainable Energy Use
- TB 4 Environment: Environmentally Friendly Transport
- TB 5 Mobility: Active Mobility
- TB 6 Safety: Proactive Traffic Safety
- TB 7 Driving: Automated and Connected Driving
- TB 8 Digital: Digital Transport Sector
- TB 9 Skilled Labour: Securing Skilled Workers

TB 1 Predictive Infrastructure Management

- The built infrastructure (roadway, structures) in the federal highway network shows deficits due to increased traffic loads, the high age of structures, a backlog of maintenance measures, and constructional deficiencies. These already partially lead to impairments in functionality and availability of roads.
- Reliability of road infrastructure
- Improvement of resilience
- Ensuring availability
- Digital condition monitoring and evaluation
- Innovative methods for maintenance, reinforcement, deconstruction, replacement construction, minimized traffic interference, resource conservation, energy efficiency



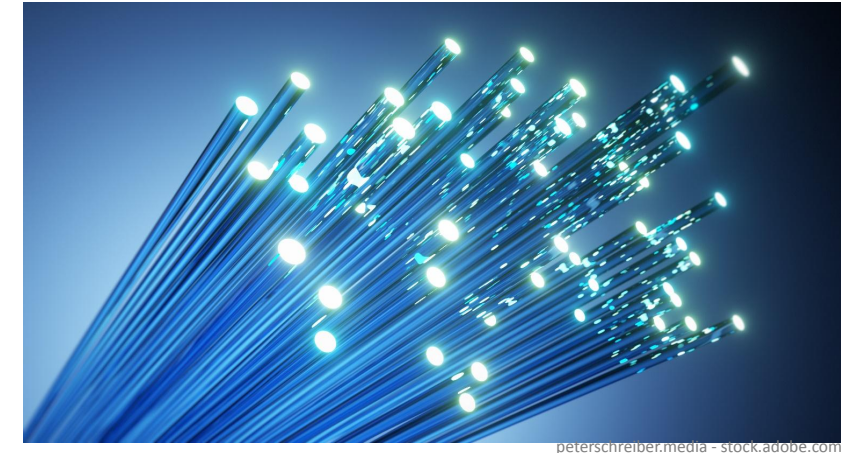
Living Lab



Digital Twin

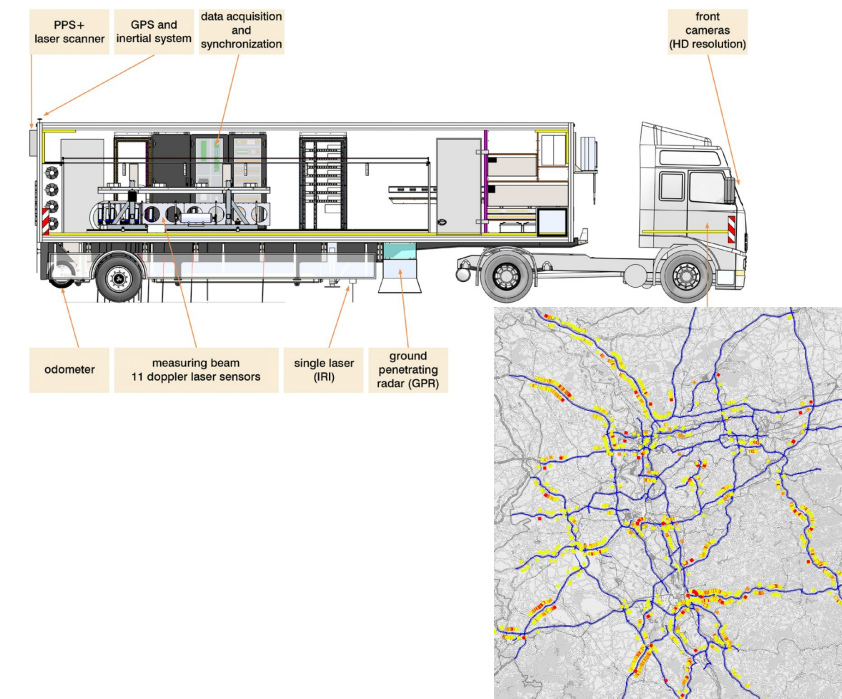
Fiber optic sensors (FOS) for pavements

- A fascinating technique for measuring vehicle movements, internal stresses and temperatures in roads.
- *Find out more in the presentation on BEPROACT*



Structural assessment on network level

- ▶ Using Traffic Speed Deflectometer and Ground Penetrating Radar technology
- ▶ *Find out more in the presentation on the BAST TSD MESAS*

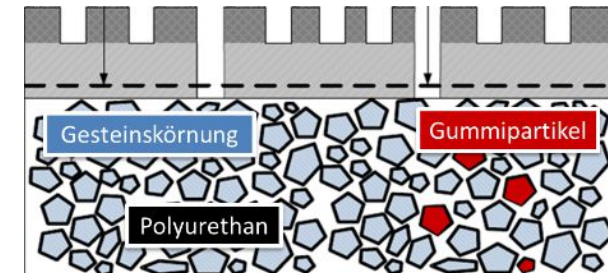
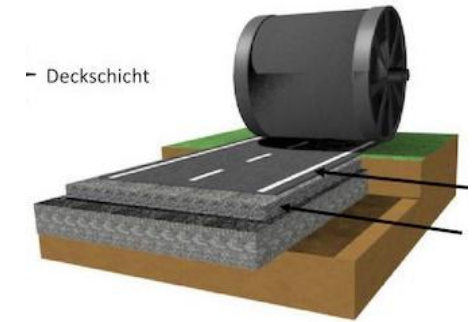


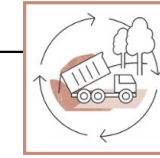


Construction

TB 2 Sustainable Construction

- The creation and operation of the built environment are among the world's largest consumers of energy and raw materials and are thus significantly dependent on these resources. The ecological footprint and resource consumption must be reduced.
- New manufacturing processes with lower energy demand
- New materials with low CO2 footprint
- Performance and sustainability-oriented building
- Recycling and circular economy
- Promotion of innovations in road construction
- Serial and automated construction





Construction

Alternative Binders for Road Construction

- motivation:
 - avoiding the use of fossil-based raw materials
 - conservation of resources through (partial) substitution
 - reducing greenhouse gas emissions
- research activities:
 - in-house research
 - 3 projects funded under the innovation programm (total budget ~3 Mio. €)

raw materials
(bio mass)



processing
(biorefinery, pulp and paper mill)

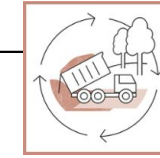


main products
(biodiesel, biogas, pulp/paper)



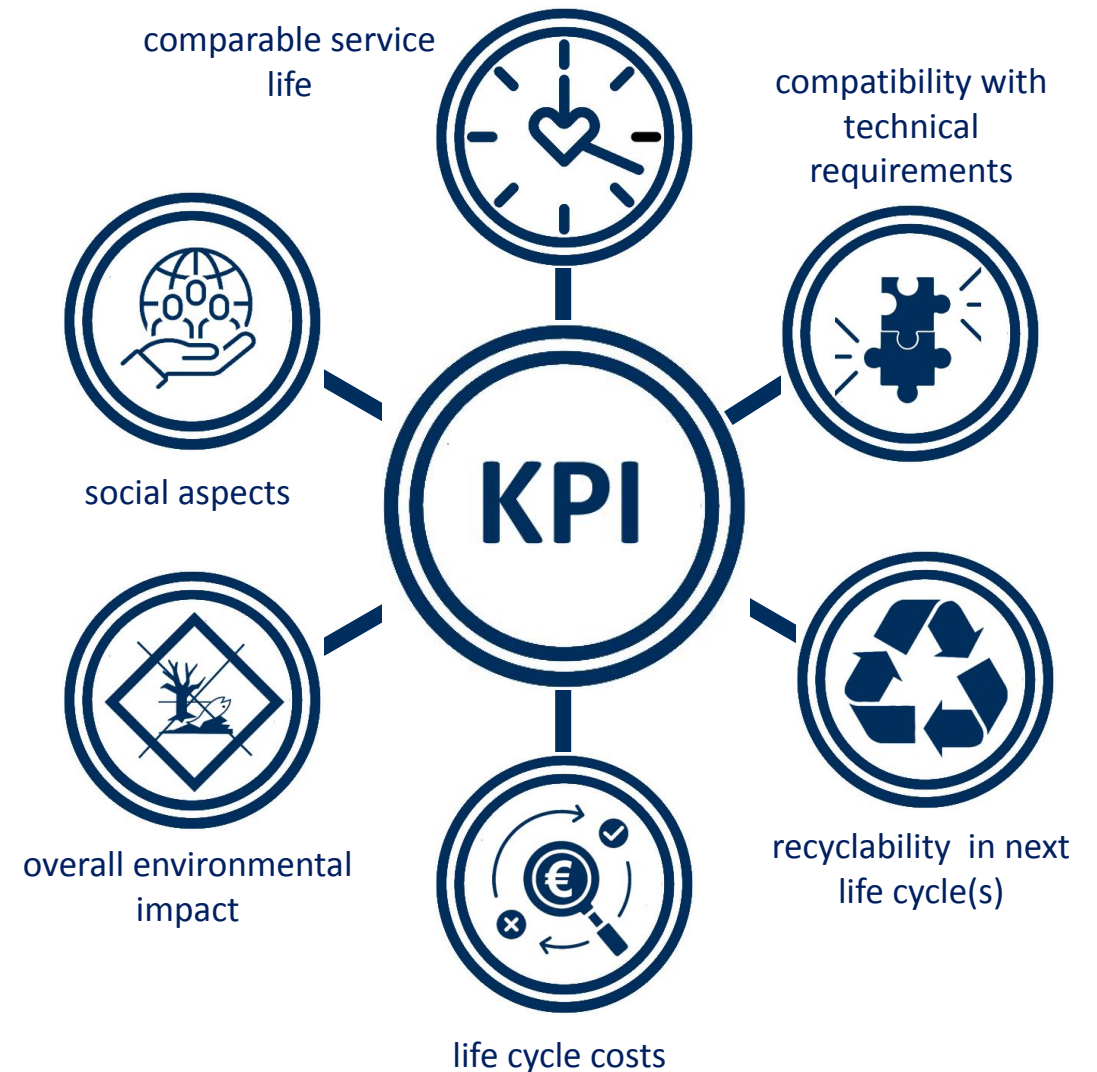
by-products for the use as alternative binder
(lignin, biochar, bio-oil ...)





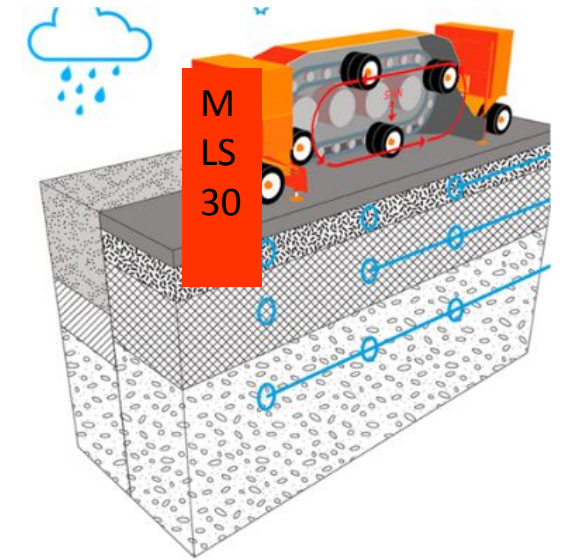
Alternative Binders for Road Construction

- research needs
 - selection of suitable base materials and material combinations
 - achievable degree of substitution
 - scaling up from binder to asphalt and pavement performance
 - recyclability
 - ...
- assessment based on key performance indicators (KPI)



Recycling of used concrete in road construction

- Objective: Replacement of natural aggregate in the base course with recycled aggregate
- Key issues
 - Determination of practical mix designs
 - Exclusion of certain fractions where appropriate
 - Optimisation in terms of resistance to concrete-damaging reactive aggregates
 - CO₂ sequestration through recarbonation of the recycled aggregate
- Construction of a **test section on duraBAST in April 2026.**

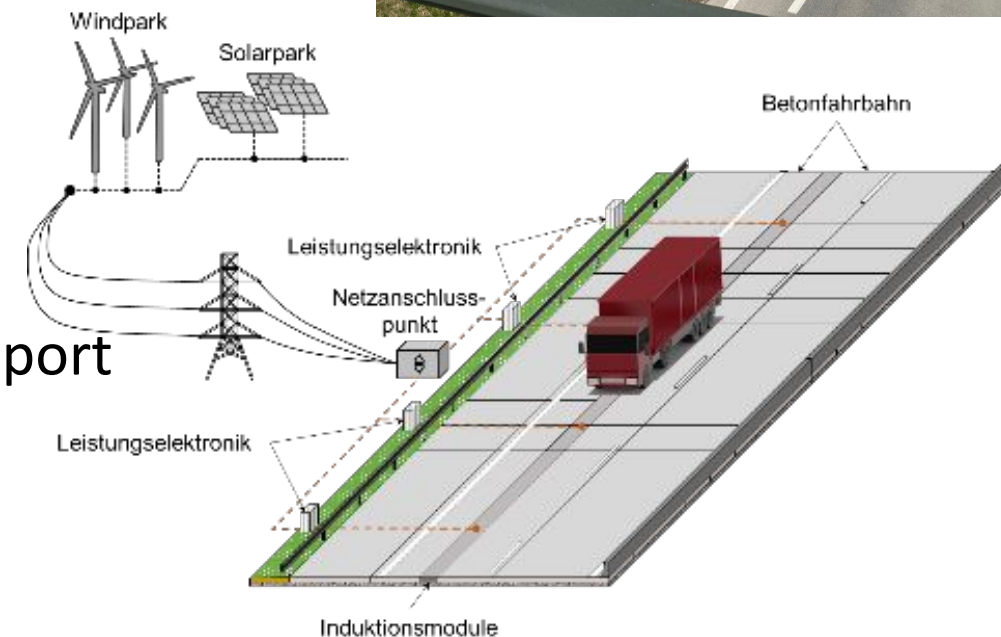


TB 3 Sustainable Energy Use

- A capable road infrastructure primarily ensures reliable transport of people and goods. In this context, the road traffic infrastructure must contribute to enabling energy-efficient and energy-sufficient (and thus sustainable) transport of people and goods. The generation of renewable energy in the road environment and its provision through road infrastructure can make a significant contribution to this.



- Energy generation in the road environment
- Coupling of energy and traffic sectors
- Charging technologies in passenger and freight transport
- Energy-efficient construction and operation



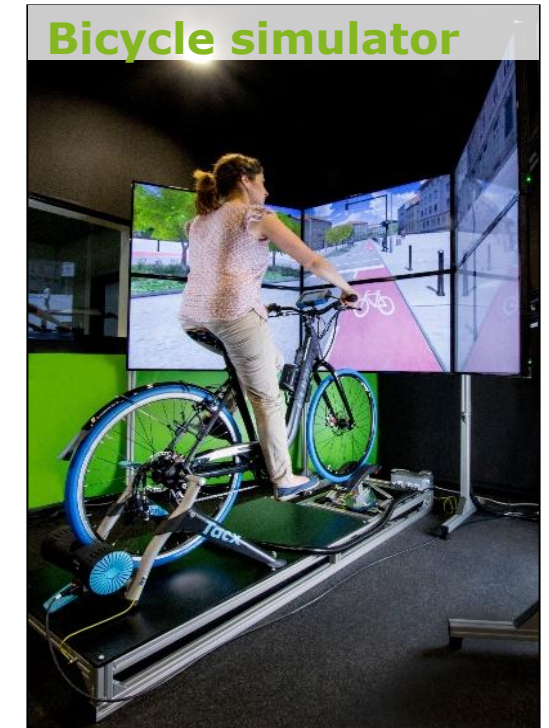
TB 4 Environmentally Friendly Traffic

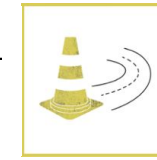
- Forward-looking investigations and innovative approaches to reduce emissions and immissions of noise, air pollutants, and light help to make traffic and traffic infrastructure sustainable and safe, as well as to make roadside residential areas more liveable. Innovative management techniques can contribute to increasing biodiversity in the vicinity of traffic routes.
- Traffic and environmental protection
- Biodiversity in the roadside space and reconnecting spaces
- Innovative technology in greenspace management
- Natural design and management of retention basins



TB 5 Active Mobility

- Demographic change, increasing urbanization, and digitalization shape future mobility in Germany. Even today, cities in Germany are reaching their limits in coping with motorized individual traffic.
 - Societal change and behavior in traffic
 - Shifting traffic to active mobility forms
 - Safety of pedestrians, cyclists, and physically weaker road users
 - Creating space for active mobility forms
 - Researching traffic interactions





Safety

TB 6 Proactive Traffic Safety

- Ensuring safe participation in traffic for everyone is a central goal of traffic policy. The successes achieved so far in traffic safety work must be maintained under changed conditions and new potentials must be exploited, arising from technological and societal developments as well as societal acceptance of measures.



- Design and equipment of safe roads
- Safety monitoring and early detection of hazards
- Improvement of vehicle safety
- Measures to influence behavior
- Use of digital methods to increase safety



TB 7 Automated and Connected Driving

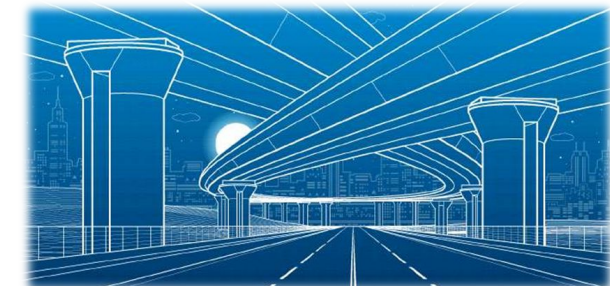
- The introduction of connected, cooperative, and automated mobility offers great potential for the sustainable securing of passenger and freight transport. The goal must always be to ensure safety in road traffic.
- Vehicle automation
- Connected mobility
- Systematic investigation of accidents with automated and autonomous vehicles
- Teleoperated driving
- Sustainability of new vehicle (drive) concepts

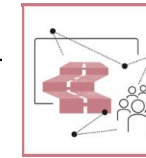


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TB 8 Digital Transport Sector

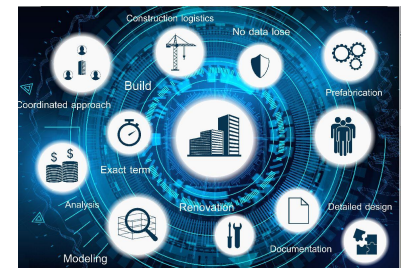
- The digitalization and automation in traffic are essential for sustainable development of mobility. New (digital) methods of planning, building, operating, and maintaining the traffic infrastructure are being introduced. However, in many areas, paradigm shifts are necessary, which can only be realized with the help of continuous networking of relevant information.
- Data exchange, Mobility Data Space (MDS)
- Data acquisition, evaluation, and networking
 - using KI and ML
- Digital twin infrastructure/traffic as well as BIM





TB 9 Securing Skilled Workers

- Innovative solutions for sustainable transformation of the entire transport and mobility sector are urgently needed. For these future tasks, there is an increasing shortage of specialists! Especially in the disciplines of construction, environmental, and traffic engineering, as well as geodesy, there is a massive shortage of specialists: According to the current VDI Monitor, about 45,000 positions in the field of civil engineering were vacant in 2021 [2].
- Coordinated junior programs together with universities – currently including an academy program
- (Re)qualifying career changers and returnees as well as international students and graduates



Literature

- [1]Hendrik Ammoser, Mirko Hoppe: *Glossar Verkehrswesen und Verkehrswissenschaften : Definitionen und Erläuterungen zu Begriffen des Transport- und Nachrichtenwesens*. In: Die Professoren des Instituts für Wirtschaft und Verkehr (Hrsg.): *Diskussionsbeiträge aus dem Institut für Wirtschaft und Verkehr*. Nr. 2, 2006, ISSN 1433- 626X, S. 41 ff.
- [2]VDI Ingenieurmonitor 2022/I
- [3]Verkehr in Zahlen 2022/2023, 51. Jahrgang, Herausgeber: Bundesministerium für Digitales und Verkehr

Many thanks for your attention!

I look forward to the
discussion.

