Technical Infrastructure – Resilience needs Durability of Physical Constructions

A. Gerdes, Scientific Director, KIT Innovation Hub Prevention in Construction
Infrastructure – diverse and essential

0 percent improving labour productivity over the last 20 years in Japan, Germany and the USA*

40 trillion € will be invested in infrastructure worldwide from 2013-2030*

Energy

Mobility

Technical Infrastructure

Water

Industrial Infrastructure

Information

4 times increase service life through prevention

3 times economic and ecological damage caused by repairs

80 percent of companies in the main construction sector have fewer than 20 employees
UN Sustainable Development Goals – Hardware „Infrastructure“
Sustaining the Functionality of the Technical Infrastructure – Challenges of the 21st Century

 Reasons for the bad current state

- Insufficient quality of construction materials
- Inadequate planning and execution
- Shift in usage
- Change of environmental impact

New and integrative approaches are essential for a sustainable infrastructure
Infrastructure – Environmental impacts determine the service life ...

Airports

Sewage Plants

Highway bridges
... and lead to damages at the construction!

Airport - ASR-Reaction  
Sewage plant – Sulphate attack  
Bridge - Corrosion
Physical properties of building materials determine durability!

Permeability

Nanostructure of CSH

Reactive Transport
Prevention in Construction

Strategy: Increasing the real service life to the planned service life
Conclusions

- The consequences of megatrends such as climate change will also place higher demands on cement-based materials in respect of performance and durability.
- The restoration-free service life of structures can be extended in a very efficient way by the application of preventive measures during the service life which also leads to a significant reduction of economical and ecological burdens.
- The establishment of Foresight Processes in the construction sector is crucial for the development of a sustainable infrastructure and the international success of construction companies.
- New offers for the academic education of young researcher and courses for experts working already in practice, representatives of the public administration and politicians must be developed.
- New formats must be developed to achieve an intensive communication between all stakeholders who are acting along the supply chain of building materials and/or the life cycle of a structures.