Sustainability of transport structures – some aspects of the nonlinear reliability assessment

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Abstract. Efficient techniques for both nonlinear numerical analysis of concrete structures and advanced stochastic simulation methods have been combined in order to offer an advanced tool for assessment of realistic behaviour, failure and safety assessment of transport structures. The utilized approach is based on randomization of the non-linear finite element analysis of the structural models. Degradation aspects such as carbonation of concrete can be accounted in order predict durability of the investigated structure and its sustainability. Results can serve as a rational basis for the performance and sustainability assessment based on advanced nonlinear computer analysis of the structures of transport infrastructure such as bridges or tunnels. In the stochastic simulation the input material parameters obtained from material tests including their randomness and uncertainty are represented as random variables or fields. Appropriate identification of material parameters is crucial for the virtual failure modelling of structures and structural elements. Inverse analysis using artificial neural networks and virtual stochastic simulations approach is applied to determine the fracture mechanical parameters of the structural material and its numerical model. Structural response, reliability and sustainability have been investigated on different types of transport structures made from various materials using the above mentioned methodology and tools.