

# Climate change impacts on bridges

Division of Structural Engineering LTH

Amina Arnautovic

TVBK-5277

**Bridges are fundamental elements of our infrastructure. These elements cross valleys, rivers, lakes and oceans making it possible for you to get from point A to B. The climate is changing which jeopardises the safety and performance of bridge structures. Numerous potential climate change impacts significant for bridges have been identified in recent studies.**

Climate change is a fact. The evidence for climate change is overwhelming. It has been observed and the projected climate of the future indicate further change. The projected increase of precipitation and higher temperature are two climate parameters that induce a large number of severe climate change impacts relevant for infrastructure. To account for the climate change, it is necessary to be aware of the risks and to have a way of assessing them. Bridges are a part of the infrastructure that have a substantially long service life. This makes these structures especially important to consider when regarding the impacts of climate change.

In this thesis a recently developed risk-based prioritisation method was reviewed. The method qualitatively assesses the impacts of climate change on bridges. It could be a useful tool for risk assessment considering climate change impacts for bridges as well as for other infrastructures. The method was proved to be applicable.

The review of the method was conducted to examine the practical feasibility of the method on real case studies. Up until now, the method had only been tested on hypothetical bridge examples. Furthermore, the review was made to identify the methods strengths, weaknesses and possible improvement.

The method aims to address the following two questions. Firstly, for a single bridge which is the most critical climate change impact? Secondly, for a group of bridge which bridge is the most critical one considering the potential climate change impacts? The bridge selection assessed with the method comprised out of seven roadway bridge located in different counties in Sweden.

The proposed method turned out to be practically feasible on real case studies, it addresses the aforementioned questions, supplying the decision maker with a qualitative assessment of the bridge selection. The obtained results from the assessment can assist the decision maker to assign the restricted resources with consideration to climate change. The risk-based prioritisation method has potential though needs to be developed and examined further.

The method requires access to extensive data, both climate data and bridge data. It is also important to note that several assumptions and simplification were adapted to enable the assessment process.

Data of the climate is essential when assessing the increase of a potential climate change impact with the method. The requirement for the climate data is that it must consist of data representing the past and the future. The historical climate data is based on observations from weather stations. Whilst, the future climate data is created by modelling different climate scenarios, it all amounts to data referred to as scenario data.

The scenario data used in the assessment is analysed with two different attitudes, optimistic and pessimistic. Think of it as what the future climate would look like if Greta Thunberg was in charge of the climate change mitigation representing the optimistic approach. While the pessimistic approach would be if Donald Trump ruled the world.