



## Assessment of Scour Risk in Hydraulic Infrastructures. A Bridge Case Study

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### Abstract

The scouring phenomenon can pose a serious threaten to bridge serviceability and users' safety, as well. In extreme circumstances, it can lead to the bridge's structural collapse. Despite efforts to reduce the scour's unfavorable effects in the vicinity of bridge foundations, this issue remains a significant challenge. Many uncertainties affect the design process of bridge foundations, namely the associated hydrological and hydraulic parameters. Past and recent flood records strengthen bridges' vulnerability by reducing scouring estimation uncertainties. Therefore, the present study applies a semi-quantitative methodology of scour risk assessment to a Portuguese bridge case study, accounting for those uncertainties. The risk-based methodology comprises three main steps towards the assignment of the bridge's scour risk rating. The methodology constitutes a potential key tool for risk management activities, assisting bridge's owners and managers in decision-making.

**Keywords:** bridge scour; decision-making; flood events; hydraulic infrastructures; risk rating; scour risk; three-step risk methodology.

### 1 Introduction

The social and economic impact of bridges is of the utmost importance to society. These infrastructures' safety is dependent on having stable foundations (piers and abutments), which are frequently unseen underwater and often

subjected to high velocity flows [1]. These flows can cause scour in the vicinity of bridge foundations, which are the cause of numerous bridge collapses worldwide, with damaging consequences [2-5]. In 2001, the collapse of the 19<sup>th</sup> century Hintze Ribeiro bridge, Portugal, caused the loss of 59 lives [6].