



A Risk Assessment Approach Based on Chain-Model during Bridge Construction

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Abstract

Due to the relatedness of the risk events in infrastructure, this paper attempts to give the correlation mechanism of the risk events, and abstracts the correlation structure into a risk chain-model. At the same time, based on the risk chain-model, the process and approach of the ecological, disaster and safety risk assessment during the bridge construction are proposed. Taking the railway bridge across the Nairobi national park as an example, this method is applied to the risk assessment study during the bridge construction, and the probability level, the loss expectation and the risk level of every risk category are given. The results show that this method is more systematic and comprehensive for the risk sensitive construction management, ecological environment and natural disasters. The evaluation method proposed in this paper has important practical application value for the risk evaluation of the infrastructure in ecologically sensitive areas.

Keywords: chain-model; risk assessment; ecology; disaster; safety.

1 Introduction

Due to the increasingly close relationship between engineering structure system, surrounding ecosystem and natural environmental system, the ecological, disaster and safety risk assessment during the entire construction process of key infrastructure has received close attention. Numerous in-depth studies have been conducted on independent engineering risk assessment and have accumulated rich results and experience in risk assessment methods and risk decision tools, such as analytical hierarchy process [1], fuzzy logic based global assessment [2], risk matrix method [3], and artificial neural network method [4]. Cao J.M. et al [5] proposed the segmentation method of the risk association network into independent risk chains using an Interpretative Structural Modeling (ISM) Method [6]; Zhang L. et al [7] addressed the

risk assessment problem with coupling phenomena, and identified the correlation relationship between risks by constructing a complete association matrix; Li C.B. et al [8] explained the risk elements transmission theory in engineering projects. Although these studies involve correlation between risk events, they have not proposed an evaluation method and the related process that consider risk correlations and are suitable for engineering applications.

Based on the risk event correlation mechanism, this article refines the correlation structure between risk events into a chain-model, and proposes the method and process for assessing the engineering chain risks. Taking the Nairobi National Park railway bridge as an example, the application process of the method is clarified and the main results of the assessment are given.