

6th Transport Research Arena April 18-21, 2016



## A decision support system for the resilience of critical transport infrastructure to extreme weather events

Jan Kiel <sup>a,\*</sup>, Peter Petiet <sup>b</sup>, Albert Nieuwenhuis <sup>b</sup>, Ton Peters <sup>c</sup>, Kees van Ruiten <sup>c</sup>

<sup>a</sup>*Panteia BV, P.O. Box 7001, 2701 AA Zoetermeer, The Netherlands*

<sup>b</sup>*TNO, Oude Waalsdorperweg 63, 2597 AK Den Haag, The Netherlands*

<sup>c</sup>*Deltares, P.O. Box 177, 2600 MH, Delft, The Netherlands*

---

### Abstract

Resilience of critical transport infrastructure to extreme weather events, such as heavy rainfall, drought or icing, is one of the most demanding challenges for both government and society. Extreme weather is a phenomenon that causes threats to the well-functioning of the infrastructure. The impacts of various levels of extreme weather on the infrastructure varies throughout Europe. These impacts are witnessed through changes in seasons and extreme temperatures, humidity, extreme or prolonged precipitation or drought, extreme wind, and thunderstorms. The extreme weather events may result in disasters such as flooding, drought, ice formation or wild fires. These present a range of challenges to the operational resilience of critical transport infrastructure.

The economic and societal relevance of the dependency and resilience of critical transport infrastructure is obvious: infrastructure malfunctions and outages can have far reaching consequences and impacts on economy and society. The cost of developing and maintaining critical transport infrastructure is high if they are expected to have a realistic functional and economic life (i.e. 50+ years). Hence, future extreme weather events have to be taken into account when considering protection measures, mitigation measures and adaption measures to reflect actual and predicted instances of critical transport infrastructure failures.

The INTACT project, which is co-financed by the European Commission, addresses these challenges and brings together innovative and cutting edge knowledge and experience in Europe. It develops and demonstrates best practices in engineering, materials, construction, planning and designing protective measures as well as crisis response and recovery capabilities. All this will culminate in a decision support system that facilitates cross-disciplinary and cross-border data sharing and provides for

---

\* Corresponding author. Tel.: +31 79 32 22 436; fax: +31 79 32 22 381.  
E-mail address: [j.kiel@panteia.nl](mailto:j.kiel@panteia.nl)

a forum for evidence-based policy formulation. This paper provides some first results of the project and an outlook to the final result, the ‘INTACT Wiki’, a decision support system for the resilience of critical infrastructure to extreme weather events.

© 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of Road and Bridge Research Institute (IBDiM)

*Keywords:* Critical infrastructure; resilience; extreme weather; climate change

## 1. Introduction

Resilience of Critical Infrastructure (CI) to Extreme Weather Events (EWE), such as heavy rainfall, drought or icing, is one of the most demanding challenges for both government and society. Extreme Weather (EW) is a phenomenon that causes severe threats to the well-functioning of CI. The effects of various levels of EW on CI will vary throughout Europe. These effects are witnessed through changes in seasons and extreme temperatures (high and low), humidity (high and low), extreme or prolonged precipitation (for example rain, fog, snow, and ice) or prolonged lack thereof (drought), extreme wind or lack of wind, and thunderstorms. The increased frequency and intensity of EWEs can cause hazard events such as flooding, drought, ice formation and wild fires which present a range of complex challenges to the operational resilience of CI. The economic and societal relevance of the dependability and resilience of CI is obvious: infrastructure malfunctioning and outages can have far reaching consequences and impacts on economy and society. The cost of developing and maintaining CI is high if they are expected to have a realistic functional and economic life (50+ years). Hence, future EWE has to be taken into account when considering protection measures, mitigation measures and adaption measures to reflect actual and predicted instances of CI failures.

The INTACT project addresses these challenges and brings together innovative and cutting-edge knowledge and experience in Europe in order to develop and demonstrate best practices in engineering, materials, construction, planning and designing protective measures as well as crisis response and recovery capabilities. All this will culminate in the INTACT Reference Guide, the decision support system that facilitates cross-disciplinary and cross-border data sharing and provides for a forum for evidence-based policy formulation.

The objectives of the INTACT project are to:

- Assess regionally differentiated risk throughout Europe associated with extreme weather;
- Identify and classify, on a Europe-wide basis, CI and to assess the resilience of such CI to the impact of EWE;
- Raise awareness of decision-makers and CI operators about the challenges (current and future) EW conditions may pose to their CI; and,
- Indicate a set of potential measures and technologies to consider and implement, be it for planning, designing and protecting CI or for effectively preparing for crisis response and recovery.
- Develop a decision support system to share the knowledge and information with different stakeholders throughout Europe

In this paper we provide some first results of the project and an outlook to the final results, the ‘INTACT Wiki’, a decision support system for the resilience of critical transport infrastructure to extreme weather events.

### Nomenclature

CI	Critical Infrastructure
EWE	Extreme Weather Event
EWI	Extreme Weather Indicator

Download English Version:

<https://daneshyari.com/en/article/1106191>

Download Persian Version:

<https://daneshyari.com/article/1106191>

[Daneshyari.com](https://daneshyari.com)