

Springer Tracts in Civil Engineering

Series Editors

Giovanni Solari, Wind Engineering and Structural Dynamics Research Group,
University of Genoa, Genova, Italy

Sheng-Hong Chen, School of Water Resources and Hydropower Engineering,
Wuhan University, Wuhan, China

Marco di Prisco, Politecnico di Milano, Milano, Italy

Ioannis Vayas, Institute of Steel Structures, National Technical University of
Athens, Athens, Greece

Springer Tracts in Civil Engineering (STCE) publishes the latest developments in Civil Engineering—quickly, informally and in top quality. The series scope includes monographs, professional books, graduate textbooks and edited volumes, as well as outstanding PhD theses. Its goal is to cover all the main branches of civil engineering, both theoretical and applied, including:

- Construction and Structural Mechanics
- Building Materials
- Concrete, Steel and Timber Structures
- Geotechnical Engineering
- Earthquake Engineering
- Coastal Engineering; Ocean and Offshore Engineering
- Hydraulics, Hydrology and Water Resources Engineering
- Environmental Engineering and Sustainability
- Structural Health and Monitoring
- Surveying and Geographical Information Systems
- Heating, Ventilation and Air Conditioning (HVAC)
- Transportation and Traffic
- Risk Analysis
- Safety and Security

Indexed by Scopus

To submit a proposal or request further information, please contact: Pierpaolo Riva at Pierpaolo.Riva@springer.com, or Li Shen at Li.Shen@springer.com

More information about this series at <http://www.springer.com/series/15088>

Milan Gocić · Giuseppe Tito Aronica ·
Georgios E. Stavroulakis · Slaviša Trajković
Editors

Natural Risk Management and Engineering

NatRisk Project

 Springer

Editors

Milan Gocić
University of Niš
Niš, Serbia

Giuseppe Tito Aronica
Department of Engineering
University of Messina
Messina, Italy

Georgios E. Stavroulakis
Department of Production Engineering
and Management
Technical University of Crete
Chania, Greece

Slaviša Trajković
University of Niš
Niš, Serbia

ISSN 2366-259X ISSN 2366-2603 (electronic)
Springer Tracts in Civil Engineering
ISBN 978-3-030-39390-8 ISBN 978-3-030-39391-5 (eBook)
<https://doi.org/10.1007/978-3-030-39391-5>

© Springer Nature Switzerland AG 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

Management of natural disasters became the greatest global challenge and an indispensable requirement for sustainable development and is set as a goal both in Europe 2020 and the Agenda 2030 for Sustainable Development United Nations. While some natural disasters cannot be foreseen and/or prevented, much can be done to diminish and alleviate their human and economic consequences, using guiding principles, priority actions and prevention tools defined in Yokohama Strategy for a Safer World, Hyogo Framework for Action and Sendai 2015–2030. Disaster risk prevention and management considerations are included in a number of key EU policies.

The project **Development of master curricula for natural disasters risk management in Western Balkan countries** (NatRisk) is an Erasmus+ CBHE KA2 action in the field of higher education, co-funded by the Erasmus+ Programme of the European Union.

The project goal is the development and implementation of the advanced and modern master curricula in line with Bologna requirements and national accreditation standards that enable the education of specialists in the field of natural disasters risk management. The new master study profiles that include comprehensive aspects of natural disasters risk management will be the result of analysed shortcomings of the current system for natural disasters risk management in Western Balkan partner countries. Different aspects of natural disasters risk management request an interdisciplinary approach and cooperation between experts from various scientific fields.

This book of chapters is part of the project and consists of different contributions related to natural disasters risk management under various aspects from engineering to socio-economic.

In detail, chapters deal with risk assessment tools and quality methods, the different approaches for civil–military collaboration in natural disasters risk management, leadership models, theories or philosophies and their usefulness for managing successfully crisis deriving from natural disasters. Further, the main aspects of natural disasters and risk management in Bosnia and Herzegovina, in

Kosovo, in the River Ibar and in the South Morava river basins were discussed and presented.

All the contributions come from scientists, experts and academics which were deeply involved in all the project activities and in the educational processes outlined in NatRisk project goals.

Niš, Serbia
Messina, Italy
Chania, Greece
Niš, Serbia

Milan Gocić
Giuseppe Tito Aronica
Georgios E. Stavroulakis
Slaviša Trajković

Contents

| | | |
|----------|--|------------|
| 1 | Risk Assessment Tools and Quality Methods | 1 |
| | Gabriella Farkas, András Horváth and Georgina Nóra Tóth | |
| 2 | Model of Effective Civil-Military Collaboration in Natural Disaster Risk Management | 23 |
| | Dejan Vasovic, Goran Janackovic and Stevan Musicki | |
| 3 | Natural Disasters Risk Management in Bosnia and Herzegovina | 41 |
| | Emina Hadžić, Naida Ademović, Hata Milišić and Suvada Jusić | |
| 4 | International Trends in Managing Natural Hazards and the Role of Leadership | 63 |
| | Maria Bakatsaki and Leonidas Zampetakis | |
| 5 | Natural Disasters in Industrial Areas | 89 |
| | Jelena Đokić, Nebojša Arsić and Gordana Milentijević | |
| 6 | Contemporary Approaches to Natural Disaster Risk Management in Geotechnics | 115 |
| | Elefterija Zlatanović, Zoran Bonić and Nebojša Davidović | |
| 7 | Flood Risk Management Modelling in the River Ibar Catchment Area | 143 |
| | Srđan Jović and Jelena Đokić | |
| 8 | Neuro-fuzzy Techniques and Natural Risk Management. Applications of ANFIS Models in Floods and Comparison with Other Models | 169 |
| | Georgios K. Tairidis, Nikola Stojanovic, Dusan Stamenkovic and Georgios E. Stavroulakis | |
| 9 | Collapse Prediction and Safety of Masonry Arches | 191 |
| | Georgios E. Stavroulakis, Ioannis Menemenis, Maria E. Stavroulaki and Georgios A. Drosopoulos | |

**10 A Discrete Inspired Bat Algorithm for Firetruck Dispatch
in Emergency Situations 203**
Dimitra Trachanatzi, Manousos Rigakis, Magdalene Marinaki
and Yannis Marinakis

**11 Spatio-Temporal Distribution of Hydrological
and Meteorological Droughts in the South Morava Basin 225**
Slaviša Trajković, Milan Gocić, Danilo Misic and Mladen Milanovic