**Environmental Science and Engineering** 

Long Quoc Nguyen Luyen Khac Bui Xuan-Nam Bui Hai Thanh Tran *Editors* 

Advances in Geospatial Technology in Mining and Earth Sciences

Selected Papers of the 2nd International Conference on Geo-spatial Technologies and Earth Resources 2022



## **Environmental Science and Engineering**

## **Series Editors**

Ulrich Förstner, Buchholz, Germany

Wim H. Rulkens, Department of Environmental Technology, Wageningen, The Netherlands

The ultimate goal of this series is to contribute to the protection of our environment, which calls for both profound research and the ongoing development of solutions and measurements by experts in the field. Accordingly, the series promotes not only a deeper understanding of environmental processes and the evaluation of management strategies, but also design and technology aimed at improving environmental quality. Books focusing on the former are published in the subseries Environmental Science, those focusing on the latter in the subseries Environmental Engineering.

Long Quoc Nguyen · Luyen Khac Bui · Xuan-Nam Bui · Hai Thanh Tran Editors

## Advances in Geospatial Technology in Mining and Earth Sciences

Selected Papers of the 2nd International Conference on Geo-spatial Technologies and Earth Resources 2022



*Editors* Long Quoc Nguyen Department of Mine Surveying Hanoi University of Mining and Geology Hanoi, Vietnam

Xuan-Nam Bui Department of Surface Mining Hanoi University of Mining and Geology Hanoi, Vietnam Luyen Khac Bui Department of Geodesy Hanoi University of Mining and Geology Hanoi, Vietnam

Hai Thanh Tran Department of Geology Hanoi University of Mining and Geology Hanoi, Vietnam

ISSN 1863-5520 ISSN 1863-5539 (electronic) Environmental Science and Engineering ISBN 978-3-031-20462-3 ISBN 978-3-031-20463-0 (eBook) https://doi.org/10.1007/978-3-031-20463-0

 ${\ensuremath{\mathbb O}}$  The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2023

This work is subject to copyright. All rights are solely and exclusively licensed 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

This book comprises a series of selected high-quality peer-reviewed papers delivered at the 2nd International Conference on Geospatial Technologies and Earth Resources (GTER 2022). The event will be held during October 14–15, 2022, at Hanoi University of Mining and Geology (HUMG), Hanoi, Vietnam, which is co-organized by HUMG and the International Society for Mine Surveying (ISM) to celebrate the 55th anniversary of the Department of Mine Surveying (HUMG). The conference is financially supported by the Vietnam Mining Science and Technology Association (VMSTA), the Vietnam Association of Geodesy, Cartography and Remote Sensing (VGCR), Vietnam National Coal-Mineral Industries Holding Corporation Limited (VINACOMIN), and Dong Bac Corporation (NECO).

The conference is believed to be an excellent opportunity during the COVID pandemic for the authors and participants to discuss advanced technologies and scientific directions in the fields of geospatial technologies and earth resources. Additionally, via this conference, a chance to exchange new ideas, innovative thinking, and application experiences both virtual and in-person will be provided, by which research or business relations and partner finding for future collaborations would have been established.

Totally, 205 manuscripts have been submitted to the organizing committee. Subsequently, after screening by the selection committee and reviewing by at least two blind reviewers, 34 research and review papers have been selected to be presented at the conference. The selected papers will be delivered over four planned sessions covering different topics of geospatial technologies, earth sciences, water resources, and environmental systems. These 34 papers were also selected for publication in this book with Digital Object Identifier (DOI) references. We believe that this book will provide the readers with an overview of recent advances in the fields of geospatial technologies and earth resources.

We would like to thank all members of the organizing and selection committees, all blind peer reviewers, all chairpersons, and invited speakers for their invaluable contributions. We are also thankful to (i) Mr. Phuong Kim Minh—President of Dong Bac Corporation, (ii) Assoc. Prof. Tran Xuan Truong—President of the HUMG University Council, Assoc. Prof. Trieu Hung Truong—Vice-Rector of HUMG for their administrative work and financial supports. Special thanks are also to Doris Bleier and Viradasarani Natarajan at Springer Nature for supporting book production procedures. Finally, all authors are thankful for their manuscript submissions regardless of whether or not their manuscripts were selected.

Hanoi, Vietnam June 2022 Long Quoc Nguyen Luyen Khac Bui Xuan-Nam Bui Hai Thanh Tran