Table of Contents

Preface ................................................................................................................................................ xxi

Volume I

Section 1
Fundamental Concepts and Theories

This section serves as a foundation for this exhaustive reference tool by addressing underlying principles essential to the understanding of Civil and Environmental Engineering. Chapters found within these pages provide an excellent framework in which to position Civil and Environmental Engineering within the field of information science and technology. Insight regarding the critical incorporation of global measures into Civil and Environmental Engineering is addressed, while crucial stumbling blocks of this field are explored. With 15 chapters comprising this foundational section, the reader can learn and choose from a compendium of expert research on the elemental theories underscoring the Civil and Environmental Engineering discipline.

Chapter 1
Creating Product Innovation Strategies through Knowledge Management in Global Business......... 1
Kijpokin Kasemsap, Suan Sunandha Rajabhat University, Thailand

Chapter 2
Numerical Modeling of Historic Masonry Structures ................................................................. 27
Panagiotis G. Asteris, School of Pedagogical and Technological Education, Greece
Vasilis Sarhosis, Cardiff University, UK
Amin Mohebkhah, Malayer University, Iran
Vagelis Plevris, School of Pedagogical and Technological Education, Greece
L. Papaloizou, University of Cyprus, Cyprus
Petros Komodromos, University of Cyprus, Cyprus
José V. Lemos, Laboratorio Nacional de Engenharia Civil, Portugal

Chapter 3
Mathematical Models Used for Hydrological Floodplain Modeling ........................................ 69
Carmen Mafiei, Ovidius University of Constanta, Romania & Technological Educational Institute of Serres, Greece
Konstantinos Papatheodorou, Technological Educational Institute of Central Macedonia, Greece
Chapter 4
Seismic Vulnerability of Arches, Vaults and Domes in Historical Buildings ................................. 101
Tariq Mahdi, BHRC, Iran

Chapter 5
Building Information Modelling in Cameroon: Overcoming Existing Challenges ...................... 145
F. H. Abanda, Oxford Brookes University, UK
M. B. Manjia, University of Yaoundé, Cameroon
C. Pettang, University of Yaoundé, Cameroon
Joseph H. M. Tah, Oxford Brookes University, UK
G. E. Nkeng, National School of Public Works, Cameroon

Chapter 6
Simulation Based Construction Project Schedule Optimization: An Overview on the State-of-the-Art ..................................................................................................................................................... 173
Maximilian Bügler, Technische Universität München, Germany
André Borrmann, Technische Universität München, Germany

Chapter 7
Structural Identification and Numerical Models for Slender Historical Structures .................... 196
Dora Foti, Technical University of Bari, Italy
Mariella Diaferio, Technical University of Bari, Italy
Nicola Ivan Giannoccaro, University of Salento, Italy
Salvador Ivorra, University of Alicante, Spain

Chapter 8
Floods Monitoring ............................................................................................................................................. 223
Mary-Jeanne Adler, National Institute of Hydrology and Water Management, Romania

Chapter 9
Composition of Leachate ............................................................................................................................ 248
Shuokr Qarani Aziz, Salahaddin University – Erbil, Iraq
Amin Mojiri, Shanghai Jiao Tong University, China

Chapter 10
Optimization of Tuned Mass Dampers to Improve the Earthquake Resistance of High Buildings ........................................................................................................................................... 275
Rolf Steinbuch, Reutlingen University, Germany

Chapter 11
Seasonal Statistical Variability of Precipitations in Dobrogea and Danube Delta ......................... 311
Gabriel Minea, National Institute of Hydrology and Water Management, Romania
Georgeta Bandoc, University of Bucharest, Romania
Gianina Neculau, National Institute of Hydrology and Water Management, Romania
# Chapter 12

Identification of Dry Periods in the Dobrogea Region

Silvia Chelcea, National Institute of Hydrology and Water Management, Romania  
Monica Ionita, Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Germany  
Mary-Jeanne Adler, National Institute of Hydrology and Water Management, Romania

# Chapter 13

Ancient Materials and Singular Constructions: Numerical, Experimental, and Heritage Strategies to Preserve Masonry Structures in Seismic Areas

Paloma Pineda, University of Seville, Spain

# Chapter 14

Determination of Pull Out Capacity of Small Ground Anchor Using Data Mining Techniques

Pijush Samui, VIT University, India

# Chapter 15

Structural Non-Linear Models and Simulation Techniques: An Efficient Combination for Safety Evaluation of RC Structures

Jorge M. Delgado, Polytechnic Institute of Viana do Castelo, Portugal  
Antonio Abel R. Henriques, Faculty of Engineering, University of Porto, Portugal  
Raimundo M. Delgado, Faculty of Engineering, University of Porto, Portugal

## Section 2
### Development and Technologies

This section provides in-depth coverage of conceptual architecture frameworks to provide the reader with a comprehensive understanding of the emerging developments and presents an extensive coverage of various tools and technologies available in the field of Civil and Environmental Engineering that practitioners and academicians alike can utilize to develop different techniques. Research fundamentals imperative to the understanding of developmental processes and the many tools facilitating the burgeoning field of Civil and Environmental Engineering are presented. From broad examinations to specific discussions on methodology, the research found within this section spans the discipline while offering detailed, specific discussions. It is through these rigorously researched chapters that the reader is provided with countless examples of the up-and-coming tools and technologies emerging from the field of Civil and Environmental Engineering. This section includes 17 contributions offering a broad treatment of development of some of the many technologies within the Civil and Environmental Engineering field.

# Chapter 16

Smart, Sustainable, and Safe Urban Transportation Systems: Recent Developments in the Asia-Pacific Region

Hoong-Chor Chin, National University of Singapore, Singapore  
Yueying Wang, National University of Singapore, Singapore

# Chapter 17

Current State of Highway Projects Planning and Scheduling

Sunil Sharma, National Institute of Technology Hamirpur, India  
V. K. Bansal, National Institute of Technology Hamirpur, India  
Raman Parti, National Institute of Technology Hamirpur, India
Chapter 18
Cyber Attacks on Critical Infrastructure: Review and Challenges .................................................. 448
   Ana Kovacevic, University of Belgrade, Serbia
   Dragana Nikolic, University of Belgrade, Serbia

Chapter 19
The Effect Degree Analysis of Human Activities on Regional Groundwater Level Based on
Variable Fuzzy Optimization Model .................................................................................................. 466
   Dong Liu, Northeast Agricultural University, China
   Wenting Liu, Northeast Agricultural University, China
   Tianqi Luo, Northeast Agricultural University, China

Chapter 20
Seismic Retrofitting for Masonry Historical Buildings: Design Philosophy and Hierarchy of
Interventions ........................................................................................................................................ 480
   Alberto Viskovic, University “G. D’Annunzio” of Chieti – Pescara, Italy

Chapter 21
Pareto Evolutionary Optimization of Joint Network Design and Pricing Strategies Related to
Emissions in Urban Networks .................................................................................................................... 504
   Loukas Dimitriou, National Technical University of Athens, Greece
   Antonios Kaltsounis, National Technical University of Athens, Greece
   Antony Stathopoulos, National Technical University of Athens, Greece

Chapter 22
A Distributed and Local-World Topology Evolution Model for Wireless Sensor Network ............ 535
   Changlun Zhang, Beijing University of Civil Engineering and Architecture, China
   Chao Li, Beijing University of Civil Engineering and Architecture, China
   Haibing Mu, Beijing Jiaotong University, China

Chapter 23
Cyberattacks on Critical Infrastructure and Potential Sustainable Development Impacts ............ 545
   Toufic Mezher, Masdar Institute of Science and Technology, UAE
   Sameh El Khatib, Masdar Institute of Science and Technology, UAE
   Thilanka Maduwanthi Sooriyaarachchi, Ceylon Electricity Board, Sri Lanka

Volume II

Chapter 24
A Computer-Aided Conceptual Cost Estimating System for Pre-Stressed Concrete Road
Bridges .................................................................................................................................................. 563
   Nikolaos Fragkakis, National Technical University of Athens, Greece
   Sergios Lambropoulos, National Technical University of Athens, Greece
   John-Paris Pantouvakis, National Technical University of Athens, Greece
Chapter 25
A Web Based Decision Support System (DSS) for Individuals’ Urban Travel Alternatives.............. 576
Ebru V. Ocalir-Akunal, Gazi University, Turkey

Chapter 26
FDTD Simulation of the GPR Signal for Preventing the Risk of Accidents Due to Pavement Damages................................................................. 597
Fabio Tosti, Roma Tre University, Italy
Andrea Umiliaco, Roma Tre University, Italy

Chapter 27
A Review of Soft Computing Methods Application in Rock Mechanic Engineering .................. 606
Nurcihan Ceryan, Balıkesir University, Turkey

Chapter 28
A Neural Network Model for Predicting Cost of Pre-Fabricated Housing .................................. 674
Mladen Vukomanović, University of Zagreb, Croatia
Mirsad Kararić, Libra Projekt, Ltd., Croatia
Mladen Radujković, University of Zagreb, Croatia

Chapter 29
Electrochemical Technologies for Industrial Effluent Treatment ............................................. 683
Rohit Misra, Durban University of Technology, South Africa
Neti Nageswara Rao, CSIR-National Environmental Engineering Research Institute, India

Chapter 30
Reliability Analysis of Slope Using MPMR, GRNN and GPR .................................................. 712
Dhivy Subburaman, VIT University, India
Jagan J., VIT University, India
Yıldırım Dalkiliç, Erzincan University, Turkey
Pijush Samui, VIT University, India

Chapter 31
An Efficient Adaptive Strategy for Melody Search Algorithm..................................................... 727
Seyem Mohammad Ashrafi, Islamic Azad University Roudehen Branch, Iran
Noushin Emami Kourabbaslou, Payame Noor University, Iran

Chapter 32
Smart Technologies for Sustainable Mobility............................................................................... 764
Ozge Yalciner Ercoskun, Gazi University, Turkey

Section 3
Utilization and Applications

This section discusses a variety of applications and opportunities available that can be considered by practitioners in developing viable and effective Civil and Environmental Engineering programs and processes. This section includes 15 chapters that review topics from case studies to best practices and ongoing research. Further chapters
discuss Civil and Environmental Engineering in a variety of settings. Contributions included in this section provide excellent coverage of today’s IT community and how research into Civil and Environmental Engineering is impacting the social fabric of our present-day global village.

Chapter 33
Application of an Online Interactive Simulation Tool to Teach Engineering Concepts Using 3D Spatial Structures ................................................................. 788

Brett D. Jones, Virginia Tech, USA
Mehdi Setareh, Virginia Tech, USA
Nicholas F. Polys, Virginia Tech, USA
Felipe Bacim, Virginia Tech, USA

Chapter 34
Laser Scanning for the Evaluation of Historic Structures ........................................ 807

Belen Riveiro, University of Vigo, Spain
Borja Conde-Carnero, University of Vigo, Spain
Pedro Arias-Sánchez, University of Vigo, Spain

Chapter 35
Passive Control Techniques and Their Applications in Historic Structures ............. 836

Angeliki Papalou, Technological Educational Institute of Western Greece, Greece

Chapter 36
A Sensitivity Analysis of Critical Genetic Algorithm Parameters: Highway Alignment Optimization Case Study ................................................................. 863

Eungcheol Kim, Incheon National University, South Korea
Manoj K. Jha, Morgan State University, USA
Min-Wook Kang, University of South Alabama, USA

Chapter 37
DHS Minority Serving Institution (MSI) Programs: Research Linked to DHS Centers of Excellence (COE) ................................................................. 881

Kevin A. Peters, Morgan State University, USA
Nira C. Taru, Morgan State University, USA

Chapter 38
Seismic Performance of a Mixed Masonry-Reinforced Concrete Building ............. 902

Vincenzo Gattulli, University of L’Aquila, Italy
Francesco Potenza, University of L’Aquila, Italy
Filippo Valvona, University of L’Aquila, Italy

Chapter 39
An Adaptive Elastic Net Method for Edge Linking of Images ................................ 921

Junyan Yi, Zhejiang University of Technology, China
Gang Yang, Renmin University of China, China
Xiaoxuan Ma, Beijing University of Civil Engineering and Architecture, China
Xiaoyun Shen, Beijing University of Civil Engineering and Architecture, China
Chapter 40
Semantic Representation of Accurate Surveys for the Cultural Heritage: BIM Applied to the Existing Domain ................................................................. 931
Simone Garagnani, University of Bologna, Italy

Chapter 41
Seismic Vulnerability of Ancient Colonnade: Two Story Colonnade of the Forum in Pompeii ....... 950
Vasilis Sarhosis, Cardiff University, UK
Gian Piero Lignola, University of Naples “Federico II”, Italy
Panagiotis G. Asteris, School of Pedagogical and Technological Education, Greece

Chapter 42
Agrigento Cathedral: Experimental Campaign and Study of Damage Evolution Addressed to the Assessment of the Collapse Risk ................................................................. 975
Liborio Cavaleri, University of Palermo, Italy
Maria Giovanna Saccone, University of Palermo, Italy
Maurizio Costa, Sicilian Regional Department of Civil Protection, Italy
Calogero Foti, Sicilian Regional Department of Civil Protection, Italy
Giuseppe Basile, Sicilian Regional Department of Civil Protection, Italy

Chapter 43
Seismic Assessment via EC8 of Modern Heritage Structures: Knowledge of the Structure and Analysis Methodologies ................................................................. 1002
Gerardo M. Verderame, University of Naples Federico II, Italy
Flavia De Luca, University of Bristol, UK
Gaetano Manfredi, University of Naples Federico II, Italy

Chapter 44
Application of Artificial Neural Network and Genetic Programming in Civil Engineering .......... 1022
Pijush Samui, VIT University, India
Dhruvan Choubisa, VIT University, India
Akash Sharda, VIT University, India

Chapter 45
On the Assessment of the Seismic Vulnerability of Ancient Churches: The Case of “San Francesco ad Alto” in Ancona (Italy) ....................................................... 1037
Pardo Antonio Mezzapelle, Polytechnic University of Marche, Italy
Stefano Lenci, Polytechnic University of Marche, Italy

Chapter 46
Simulation-Based Scheduling of Waterway Projects Using a Parallel Genetic Algorithm .......... 1071
Ning Yang, Parsons Corporation, USA
Shiaaulir Wang, Clarksville, USA
Paul Schonfeld, University of Maryland, USA
Chapter 47
Causes of Delay in Budget Hotel Construction Projects: A Case of India

Milind T. Phadtare, National Institute of Construction Management and Research, India

Section 4
Organizational and Social Implications

This section includes a wide range of research pertaining to the social and behavioral impact, some of which related to the corporate and managerial utilization of information sharing technologies and applications of Civil and Environmental Engineering around the world. With 11 chapters, the discussions presented in this section offer research into the integration of global Civil and Environmental Engineering as well as implementation of ethical and workflow considerations for all organizations. Equally as crucial, chapters within this section discuss how leaders can utilize Civil and Environmental Engineering applications to get the best outcomes from their governors and their citizens.

Chapter 48
The Interdisciplinary, Project-Based Infrastructure Degradation Curriculum at Worcester Polytechnic Institute

Aaron Sakulich, Worcester Polytechnic Institute, USA
Tahar El-Korchi, Worcester Polytechnic Institute, USA
Richard D. Sisson Jr., Worcester Polytechnic Institute, USA

Chapter 49
Volume III

Chapter 49
Religious Ethics, General Ethics, and Engineering Ethics: A Reflection

P. R. Bhat, Indian Institute of Technology Bombay, India

Chapter 50
Teaching of Sustainability: Higher Education (HE) Case Studies

Sue Haile, Newcastle University, UK
Jarka Glassey, Newcastle University, UK

Chapter 51
Analysis of Pedestrian Road Crossing Behaviour in Urban Areas

Eleonora Papadimitriou, National Technical University of Athens, Greece
George Yannis, National Technical University of Athens, Greece
John Golia, National Technical University of Athens, Greece

Chapter 52
The Roles of Knowledge Management and Organizational Innovation in Global Business

Kijpokin Kasemsap, Suan Sunandha Rajabhat University, Thailand

Chapter 53
Information Seeking Behaviour in Changing ICT Environment: A Study of Alagappa Chettiar College of Engineering and Technology, Tamilnadu

G. Stephen, Alagappa University, India
M. Murugan, Alagappa University, India
Chapter 54
The Roles of E-Learning, Organizational Learning, and Knowledge Management in the Learning Organizations ................................................................. 1198
Kijpokin Kasemsap, Suan Sunandha Rajabhat University, Thailand

Chapter 55
The Project Management Process of Planning and Budgeting in Public Construction Projects ...... 1229
Jesper Kränker Larsen, Aalborg University, Denmark
Lene Faber Ussing, Aalborg University, Denmark
Thomas Ditlev Brunoe, Aalborg University, Denmark
Søren Munch Lindhard, Aalborg University, Denmark

Chapter 56
Greek Construction Project Managers’ Cognitive Abilities, Personality and Knowledge.............. 1243
Georgios N. Aretoulis, Aristotle University of Thessaloniki, Greece
Christoforos H. Triantafyllidis, Aristotle University of Thessaloniki, Greece

Chapter 57
Project Managers’ Profile Influence on Design and Implementation of Cost Monitoring and
Control Systems for Construction Projects ............................................................................. 1258
Georgios N. Aretoulis, Aristotle University of Thessaloniki, Greece
Glykeria P. Kalfakakou, Aristotle University of Thessaloniki, Greece
Aikaterini A. Seridou, Democritus University of Thrace, Greece

Chapter 58
Ethics Is Not Enough: From Professionalism to the Political Philosophy of Engineering ........... 1284
Carl Mitcham, Colorado School of Mines, USA

Section 5
Critical Issues and Challenges

This section contains 9 chapters, giving a wide variety of perspectives on Civil and Environmental Engineering and its implications. Within the chapters, the reader is presented with an in-depth analysis of the most current and relevant issues within this growing field of study. Crucial questions are addressed and alternatives offered along with theoretical approaches discussed.

Chapter 59
Integrating Sustainable Engineering Principles in Material Science Engineering Education........ 1318
Bandita Mainali, La Trobe University, Australia
Joe Petrolito, La Trobe University, Australia
John Russell, La Trobe University, Australia
Daniela Ionescu, La Trobe University, Australia
Haider Al Abadi, La Trobe University, Australia

Chapter 60
Reliability-Based Criteria for the Decision of the Compensation of Corroded Flexural Reinforcement ......................................................................................... 1336
Ashraf Ragab Mohamed, Alexandria University, Egypt
Chapter 61
A Multi-Level Approach for the Numerical Modelling of Complex Monumental Buildings:
Seismic Assessment of the “Maniace Castle” of Syracuse
Siro Casolo, Politecnico di Milano, Italy
Andrea Fiore, Politecnico di Bari, Italy
Francesco Porco, Politecnico di Bari, Italy
Domenico Raffaele, Politecnico di Bari, Italy
Carlo Alberto Sanjust, Politecnico di Milano, Italy
Giuseppina Uva, Politecnico di Bari, Italy

Chapter 62
Lifecycle Assessment of Structures and Probabilistic Performance Approaches
Alfred Strauss, University of Natural Resources and Life Sciences Vienna, Austria
Roman Wendner, University of Natural Resources and Life Sciences Vienna, Austria

Chapter 63
Comparing the MLC and JavaNNS Approaches in Classifying Multi-Temporal LANDSAT Satellite Imagery over an Ephemeral River Area
Eufemia Tarantino, Politecnico di Bari, Italy
Antonio Novelli, Politecnico di Bari, Italy
Mariella Aquilino, Politecnico di Bari, Italy
Benedetto Figorito, ARPA Puglia, Italy
Umberto Fratino, Politecnico di Bari, Italy

Chapter 64
A Qualitative Systems Thinking Approach in Understanding the Implementation of Innovation on Construction Projects
Arun Bajracharya, The British University in Dubai, UAE

Chapter 65
Effect of Epicenter Data Inconsistency in Determining Bandwidth and Its Subsequent Use in Hazard Analysis for Chennai Using Kernel Smoothing Approach
C. K. Ramanna, Indian Institute of Technology Madras, India
G. R. Dodagoudar, Indian Institute of Technology Madras, India

Chapter 66
Smart Government: Opportunities and Challenges in Smart Cities Development
Carlos E. Jiménez, IEEE Computer Society E-Government STC
Francisco Falcone, IEEE Computer Society E-Government STC
Agusti Solanas, IEEE Computer Society E-Government STC
Héctor Puyosa, IEEE Computer Society E-Government STC
Saleem Zoughbi, IEEE Computer Society E-Government STC
Federico González, IEEE Computer Society E-Government STC
Chapter 67
Fuzzy Based Project Time-Cost Optimization Using Simulated Annealing Search Technique...... 1473
  Khan Md. Ariful Haque, Rajshahi University of Engineering and Technology, Bangladesh
  M. Ahsan Akhtar Hasin, Bangladesh University of Engineering and Technology, Bangladesh

Section 6
Emerging Trends

This section highlights research potential within the field of Civil and Environmental Engineering while exploring uncharted areas of study for the advancement of the discipline. Introducing this section are chapters that set the stage for future research directions and topical suggestions for continued debate, centering on the new venues and forums for discussion. A pair of chapters on space-time makes up the middle of the section of the final 9 chapters, and the book concludes with a look ahead into the future of the Civil and Environmental Engineering field. In all, this text will serve as a vital resource to practitioners and academics interested in the best practices and applications of the burgeoning field of Civil and Environmental Engineering.

Chapter 68
Alternative, Environmentally Acceptable Materials in Road Construction .......................... 1488
  Sanja Dimter, University of Osijek, Croatia
  Tatjana Rukavina, University of Zagreb, Croatia
  Ivana Barišić, University of Osijek, Croatia

Chapter 69
Improving the Energy Efficiency of Telephone Exchanges (Switching Centers) .................. 1517
  Keith Dickerson, Climate Associates, UK
  David Faulkner, Climate Associates, UK
  Paul Kingston, K8T Computational Modelling and Consultancy Services, UK

Chapter 70
Allocation Criteria for Increasing Electronic Toll Collection Gates on Freeways Determined Using Simulation Analysis ................................................................. 1541
  Pin-Yi Tseng, Central Police University, Taiwan
  Chiung-Wen Chang, Institute of Transportation, Taiwan
  Chi-Hung Wu, National Taiwan Ocean University, Taiwan
  Wan-Hui Chen, Tamkang University, Taiwan
  Sheng-Hsiung Chang, Tamkang University, Taiwan

Chapter 71
Significance of Structural Dynamics in Engineering Education in the New Millennium ......... 1554
  David P. Thambiratnam, Queensland University of Technology, Australia

Chapter 72
New Transportation Systems for Smart Cities ................................................................. 1569
  Christos G. Cassandras, Boston University, USA
Chapter 73
Towards Smarter Cities and Roads: A Survey of Clustering Algorithms in VANETs

Irina Tal, Dublin City University, Ireland
Gabriel-Miro Muntean, Dublin City University, Ireland

Chapter 74
Nonlinear Vibration Control of 3D Irregular Structures Subjected to Seismic Loads

Dookie Kim, Kunsan National University, South Korea
Md Kamrul Hassan, Kunsan National University, South Korea
Seongkyu Chang, Kunsan National University, South Korea
Yasser Bigdeli, Kunsan National University, South Korea

Chapter 75
Simulation of Pedestrians and Motorised Traffic: Existing Research and Future Challenges

Eleonora Papadimitriou, National Technical University of Athens, Greece
J.M. Auberlet, French Institute of Science and Technology for Transport, Spatial Planning, Development and Networks (IFSTTAR), France
George Yannis, National Technical University of Athens, Greece
S. Lassarre, French Institute of Science and Technology for Transport, Spatial Planning, Development and Networks (IFSTTAR), France

Chapter 76

Stacie L. Fain, Embry-Riddle Aeronautical University (ERAU), USA

Index