Preface

During the last decades the number of losses caused by natural and man-made disasters has increased. Evidently, humans are not always capable of avoiding extreme natural phenomena, technological accidents, or terrorist attacks. There is a need to prepare and plan in advance actions in response to these events in order to support sustainable livelihood by protecting lives, property and the environment. In turn, various disaster management bodies (FEMA, EMA, European Civil Protection, etc) involving authorities at a local, national and international level have been formed to mitigate, prepare for, respond to and recover from such disasters. There are also collaborative research institutes, scientific laboratories and other non-profit organizations studying natural phenomena yet most importantly, the response processes as to advance the disaster management discipline, its practice and application as a whole.

Disaster management is a dynamic and fluid area, which requires the involvement of expertise from different authorities and organizations. It mainly consists of expert individuals and teams from the civil protection, police, fire and rescue services, health and ambulance services, engineering sector, utility companies, local authorities, central government, relief bodies armed forces, monitoring, research and observatory centers. Bringing in expertise from different parties is essential and critical, as these will assist in managing emergency situations in a more informed and holistic approach. Apparently, this type of collaboration bring together the intellectual and physical resources so as to enable the conceptualization, production, utilization and application of disaster management strategies including critical infrastructures, relevant ICT resources, response plans, policies, risk management techniques, recovery and contingency plans.

ICT developments over the last four decades have facilitated organizations with numerous collaborative tools to support various levels of enquiries within the field of application. In particular, the use of advanced distributed technologies has evolved over the years such as to accommodate and advance collaborative endeavors between interested parties (including disaster management stakeholders) scattered across the world. Such utilization of distributed data and resources related to ICT developments – including but not limited to early warning systems and alerting technologies, data mining and advanced decision support systems, data visualization techniques, data and system integration frameworks, next generation collaborative technologies and Web 2.0, service oriented approaches, and grid technologies – should be further aligned for the purpose of augmenting the effectiveness and efficiency of disaster management and risk reduction approaches towards sustainable developments and livelihood.
THE PURPOSE OF THE BOOK

The primary goal of this book is to demonstrate how strategies and state-of-the-art ICT have and/or could be applied so as to serve as a vehicle to advance disaster management approaches, decisions and practices. The achievement of such a goal implies the contribution from various practitioners, scholars in the area and researchers from other disciplines who are willing to offer their expertise and skills in advancing disaster management discipline both as theory and practice.

It aims to provide both conceptual and practical guidance to disaster management stakeholders including ICT and senior managers from relevant organizations. It will help assist in identifying and developing effective and efficient approaches, mechanisms, and systems using emerging technologies to support their effective operation. Specifically, the book aims to build a network of excellence in effectively and efficiently managing advanced strategies and next generation distributed and collaborative ICT for disaster management stakeholders to advance their current practices and approaches. This is achieved by introducing both technical and non-technical details of strategies and ICT demonstrating their application and their potential utilization to the disaster management sector. It also prompts revisiting current approaches and further develops the area for best practice so as to cope with emerging and unforeseen threats.

The book has collected together the vast experience of many leaders demonstrating past and current methods, tools and practices employed for disaster management purposes. As such, the book claims to be a definitive state-of-the-art collection and to prompt the future direction for disaster managers to identify applicable theories and practices in order to mitigate, prepare for, respond to and recover from various foreseen and/or unforeseen disasters.

WHO SHOULD READ THE BOOK?

The content of the book reflects the interests of a broad audience as it offers state-of-the-art information and references for work undertaken in the challenging area of utilizing cutting edge distributed and collaborative ICT to advance disaster management as a discipline to cope with current and future unforeseen threats.

The projected audience ranges from those currently engaged to those interested in joining collaborative work in the field of disaster management utilizing applicable ICT. In particular, audiences currently working in or are interested in joining interdisciplinary, multidisciplinary and transdisciplinary collaborative disaster management related advancements are the primary focus in this book. Specifically, audiences who are: (1) researchers in the areas of disaster management, emerging technologies and collaborative ICT; (2) managers and practitioners in the local authorities, research institutes and scientific centers and the industry; (3) academics, instructors, researchers and students in colleges and universities.

The book can be used as a source for leading edge literature review in the area of emerging and applicable ICT and disaster management, documenting the latest developments in the academia, government and business sectors. It serves as a guide between relevant bodies from different countries providing lessons learnt and paradigms of good practices worldwide. It can also be used as a library reference. Most importantly, specialist training providers, colleges and universities (having relevant courses) could use it as a course supplement. Finally, the book serves as a source of reference material and as a source of
ideas for further research and development activities for academics and researchers in the field. Similarly, it serves as a valuable source for researchers willing to join in relevant collaborative works.

The potential impact of this book is to educate, sustain or even enable the formation of communities and teams (like research teams, charities, voluntary bodies, etc) as to support interdisciplinary and collaborative multidisciplinary research and practices towards an effective and efficient protection of human lives, property and the environment.

ORGANIZATION OF THE BOOK

Seventeen self-contained chapters, each authored by experts in the field, are included in this book. The book is organized into three sections according to the thematic topic of each chapter. Thus, it is quite possible that a paper in one section may also address issues covered in other sections. However, the following three sections reflect most of the topics sought in the initial call for chapters.

The first section, Section 1: Current Approaches in Disaster Management includes six chapters. This section introduces concepts and principles of disaster management and ICT, such as systemic approaches to managing disasters, rapid onset natural disasters and disaster informatics. These cover past and recent methods and techniques for ICT based decision-making in disaster management. In addition, some chapters present scenarios and approaches related to the role of education, training and media in disaster reduction. As such, they underpin future development and implementation of relevant approaches.

The second section, Section 2: Advanced Collaborative Technologies for Disaster Management includes six chapters. This section is concerned with the use of various collaborative Information and Communication Technologies (ICT), such as Early Warning Systems, Alerting Technologies, Web 2.0 innovations, Second Life® and simulation, which aim to advance disaster management processes and risk reduction.

The last section, Section 3: Next Generation Approaches and Distributed Frameworks for Disaster Management includes five chapters. This section goes beyond and builds upon current theory and practice, providing visionary and applicable directions on how next generation technologies – based on current state-of-the-art service oriented and grid computing frameworks – could be used in the future to the benefit threat detection, disaster management and risk reduction.

A brief introduction to each of the chapters follows.

In Chapter 1, A Systemic Approach to Managing Natural Disasters, J. Santos-Reyes, and A. N. Beard present a Systemic Disaster Management System, that is able to be used proactively, as well as reactively, as a means to manage disasters in a more effective manner.

In Chapter 2, ICT Approaches in Disaster Management: Public Awareness, Education and Training, Community Resilience in India, S. Kuppuswamy discusses the important role that ICT plays in the public awareness, education, training and preparedness for disasters. This takes place via the presentation of various ICT approaches and initiatives taken in the coastal districts of Tamilnadu.

In Chapter 3, Multimedia Educational Application for Risk Reduction, A. Iztúriz, Y. Barrientos, M. A. González, L. Rivas, M. V. de Bezada and S. Ruiz focus on the application of modern ICT in the learning process, in order to enhance a preventive culture in disaster risk reduction. In particular, they use cognitive learning theories and existing software to create a multimedia version of a boardgame promoting and sensitizing school community members to different urban and rural areas.
In Chapter 4, *Natural Hazards: Changing Media Environments and the Efficient Use of ICT for Disaster Communication*, H. Zemp considers media coverage of floods in Switzerland from 1910 to 2005, in order to examine how disaster reporting is relating to the public’s behavior about risk perception and prevention. Further to this, the chapter highlights the opportunities and limitations arising from the emergence of digital, internet-based information and communication technologies used in disaster communication.

In Chapter 5, *United Arab Emirates: Disaster Management with Regard to Rapid Onset Natural Disasters*, H. Al Ghasyah Dhanhani, A. Duncan and D. Chester, examine the structure and procedures for management of natural disasters in the United Arab Emirates. The chapter has a particular focus to issues of governance, accountability and communication within states that are part of a federal system, via the use of case studies. These in turn, highlight the need for clear delineation between regional and federal roles and for effective channels of information to relevant agencies.

In Chapter 6, *Disaster Informatics: Information Management as a Tool for Effective Disaster Risk Reduction*, J. Subedi focuses on information management during decision making for disaster management. In particular, the chapter presents an overview of disaster informatics, and a conceptual framework for information management for disaster risk reduction. Finally, a review on existing approaches of information dissemination through Internet and on the use of combined potential of Internet with tools, which are widely available at grassroots is offered.

In Chapter 7, *Efficient Deployment of ICT Tools in Disaster Management Process*, A. Sagun focuses on the efficient integration of various Information and Communication Technologies in disaster management processes that can help mitigate the impacts of disasters on people and the environment, by minimizing failures and maximizing collaboration.

In Chapter 8, *Current State and Solutions for Future Challenges in Early Warning Systems and Alerting Technologies*, U. Meissen and A. Voisard discuss disaster prevention and mitigation via the use of Early Warning Systems and Alerting Technologies, by presenting general approaches, representative systems, interoperability aspects and the most critical issues regarding efficient alerting.

In Chapter 9, *MedISys: Medical Information System*, J. P. Linge, R. Steinberger, F. Fuart, S. Bucci, J. Belyaeva, M. Gemo, D. Al-Khudhairy, R. Yangarber and E. van der Goot present both the technology and the user perspective of the Medical Information System (MedISys), that is a fully automatic 24/7 public health surveillance system. The MedISys monitors human and animal infectious diseases and chemical, biological, radiological and nuclear (CBRN) threats using open-source media.

In Chapter 10, *Social media (Web 2.0) and Crisis Information: Case Study Gaza 2008-09*, M. Dandoulaki and M. Halkia discuss how social media technologies interact with formal and informal crises communication and information management via the use of a case study and they point out directions for the future development of collaborative intelligence systems for crisis management.

In Chapter 11, *Utilizing Web 2.0 for Decision Support in Disaster Mitigation*, K. Rajan, R. Chen, H. R. Rao and J. Lee describe Web 2.0 innovations through the use of Activity Theory. They examine both the benefits and drawbacks of each technology, highlighting that the principles of Web 2.0, and in particular social collaboration, are well suited to help effectively manage the effects of disasters.

In Chapter 12, *Incident and Disaster Management Training: Collaborative Learning Opportunities Using Virtual World Scenarios*, A. M. Hewitt, S. S. Spencer, D. Mirliss and A. R. Twal present a review of ICT appropriate learning theories and a synopsis of the educational benefits and practices via the use of a case study. This is offered as part of a Master of Healthcare Administration (MHA) course for health
care managers, demonstrating the application of a virtual world training scenario hosted in Second Life® and using a Play2Train simulation.

In Chapter 13, Mathematical Models Generators of Decision Support Systems for Help in Case of Catastrophes: An Experience from Venezuela, J. G. Hernández R., and M. J. García G. present a series of mathematical models created to support the development of advanced Decision Support Systems, that are able to minimize the impacts of pre-catastrophe, impact and post-catastrophe stages of disasters.

In Chapter 14, Integrating Scenario-Based Reasoning Into a Multi-Criteria Decision Support System for Emergency Management, T. Comes, M. Hiette, N. Wijngaards, and F. Schultmann discuss the multi-criteria decision analysis and scenario-based reasoning as decision making techniques for disaster management. The chapter proposes a theoretical framework as a mechanism of scenario integration, able to facilitate the assessment of consequences within a scenario, and to propose new scenarios during emergency management.

In Chapter 15, POP-C++ and Alpine3D: Petition for a New HPC Approach, P. Kuonen, M. Bavay, and M. Lehning appreciate the method of numerical modeling, which offers the possibility of simulating complex scenarios for understanding the causes of a disastrous situation. The dramatic increase in the complexity of the processes challenges the traditional HPC approach and thus, the chapter presents the POP-C++ as a method for providing a better understanding of the processes, which lead to natural hazards.

In Chapter 16, Sensor and Computing Infrastructure for Environmental Risks: The SCIER System, O. Sekkas, D. V. Manatakis, E. S. Manolakos, and S. Hadjieffthymiades present the SCIER platform, with particular reference to its key software components architecture, as an integrated system of networked sensors and distributed computing facilities. The SCIER platform aims to detect and monitor a hazard and also, to predict its evolution and assist the authorities in crisis management for hazards occurring at Wildlife Urban Interface areas.

In Chapter 17, A Personalized Forest Fire Evacuation Data Grid Push Service: The FFED-GPS Approach, E. Asimakopoulou, N. Bessis, R. Varaganti, and P. Norrington present the concepts, architecture and implementation of a Personalized Forest Fire Evacuation Data Grid Push Service (FFED-GPS), as a method able to effectively and efficiently produce personalized forest fire evacuation plans. The innovative feature of the FFED-GPS is to automatically inform potential victims about the most relevant evacuation routes in the most-timely fashion so they can escape a forest fire safely. The service is based on integrated data from heterogeneous and distributed sources that change over time very quickly.

We wish you to find this book an inspirational read.

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