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Managing Humanitarian Logistics

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ISSN 2198-7246 ISSN 2198-7254 (electronic)
Springer Proceedings in Business and Economics
ISBN 978-81-322-2415-0 ISBN 978-81-322-2416-7 (eBook)
DOI 10.1007/978-81-322-2416-7

Library of Congress Control Number: 2015949924

Springer New Delhi Heidelberg New York Dordrecht London

Printed on acid-free paper

Springer (India) Pvt. Ltd. is part of Springer Science+Business Media (www.springer.com)

To
Our Parents

Preface

The worldwide rise in natural and man-made disasters in the last two decades has questioned the very preparedness to cope with them. Although less frequent, such disasters occur with high impact and completely disrupt the daily lives of people resulting in huge loss of lives and capitals to the extent of wiping out the entire city. Countries the world over have been developing mechanisms to deal with such disasters, but recent disasters reveal that the existing preparedness is still far below normal. Particularly, in emerging economics like India, such preparedness is hardly given any preference. The key to cope up with such disasters is logistics, termed as Humanitarian Logistics, organized to make life-saving drugs, food products, and other necessary amenities available to the affected people.

This book is a compendium of selected best papers presented at ICHL 2013 (International Conference on Humanitarian Logistics), organized by IIM Raipur on the 2nd and 3rd of December 2013. ICHL 2013 is the first conference organized in India to address the key issue of Humanitarian Logistics. This book addresses global call for effective Humanitarian Logistics.

The holistic approach to the management of Humanitarian Logistics requires addressing four key areas, namely, designing and planning humanitarian response strategies, developing strategies for efficient Humanitarian Logistics, modeling Humanitarian Logistics, and preparedness for emergency humanitarian response. This book addresses these key areas for Humanitarian Logistics.

Part I discusses about the importance of design and planning in a disaster situation. With the ever-growing natural and man-made disasters reaching epic proportion, the need for nodal agencies with appropriately trained manpower, know-how, and machinery to reduce, avoid, and hedge the uncertainty is paramount. Thus, design and planning are the primary aspects of Humanitarian Logistics that deal with preparedness for emergency well in advance with various logistics designs and planning strategies. Sahay et al. (2014) discuss the inherent issues in managing Humanitarian Logistics from the perspective of design and implementation. Papers presented in this section also discuss about the barriers and critical success factors of an efficient humanitarian supply chain. The section

presents the importance of logistics in designing a humanitarian supply chain. If the logistics is poor, then all the three stages of dealing with a disaster, namely, preparedness, response, and recovery, will suffer. The planning aspects of logistics during natural disasters are covered in this section. Improving logistics response times is essential for improving response to a disaster situation, and this section discusses how logistics response capacity can be improved by combining it with the local commercial mobility through a truck sharing solution.

Part II discusses about developing strategies for improving humanitarian response. Research and preparedness for humanitarian response is not sufficient, unless backed up with proper humanitarian response strategies. A poorly designed humanitarian response will not work well even if all the other necessary ingredients of humanitarian response are in place. Formulation of strategies during the preparedness stage is therefore essential for effective and efficient response and recovery from a disaster. A number of papers presented in this section emphasize the use of technology for disaster response. Particularly the use of ICT and RFID has been presented in this section for developing effective humanitarian response strategies. Several strategies have been presented in this section and include the IT-based network relief model; supply chain configurations for identifying the best configuration and developing collective capacity as a strategy for improving disaster response and recovery are the major frameworks presented in this section.

Part III discusses about modeling of Humanitarian Logistics from various perspectives. Humanitarian Logistics modeling includes integrative, analytical, conceptual, inter- or multidisciplinary approaches and methods of dealing with the logistics, transport and supply chain management and emergency, crisis and disaster preparedness, and response and management. The models and approaches form the backbone for the decision support systems in logistics operations. These various perspectives presented include a comprehensive model for finding the optimal location of suppliers for designing humanitarian efforts that mitigates and reduces the risk of a disruption in the humanitarian aid; modeling of human elements, namely, donors and frontline staff, involved in delivering humanitarian aid for efficient relief operations; modeling of supplies for effective humanitarian response using p-median approach; modeling for multi-period demand allocation of relief items in a humanitarian supply chains; modeling of reverse supply chains for improved cost benefits, reclaiming value of used products and profits in secondary markets and indirect benefits such as gaining customer confidence and enhancing the green image of the organization, compliance of regulations, etc., that can be appropriated; and modeling of post-disaster Humanitarian Logistics structure. The section also presents a case study of an existing rural healthcare system deployed in a slum community in India for modeling of a sustainable and successful humanitarian effort.

Part IV of this book discusses about the relief supply chains required for disaster management from various perspectives. A relief supply chain requires trained manpower, understanding of peculiarities of disasters in difficult terrain, logistics for relief operations, and reverse logistics of disposing human remains in a disaster. The studies presented in this section discuss about challenges in management of

human resources in a disaster, strategies for developing trained manpower, and simplistic methods of logistics for effective and efficient disaster response, dealing with disaster situations in a high altitude area and also dealing with the human bodies/remains after the disaster.

The collective discussions help understand managing Humanitarian Logistics from design, preparedness, response, and recovery perspective apart from usage of technology for managing the logistics involved. We hope that this book will help academicians and researchers in defining their research and practice, respectively, towards improvement of Humanitarian Logistics towards both natural and man-made disasters.

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Acknowledgments

First of all, we express our sincere thanks to the Honorable Governor of Chhattisgarh, Shri Shekhar Dutt, who spent valuable time with us in designing the theme and coverage of the ICHL 2013 and helping us connect with eminent personalities and stakeholders in the field of Humanitarian Logistics. We are thankful to him for identifying and connecting us with the key speakers from Atomic Energy, Indian Army, Air Force, and Naval and Coast Guard. Meeting with him gave us enthusiasm to pursue ICHL 2013 with full determination.

We express our sincere thanks to our Conference Cochair, Mr. N. M. Prusty, who helped us in connecting with key players in the field of Humanitarian Logistics, eminent personalities from National Disaster Management Authority (NDMA), New Delhi, and key NGOs and in helping us with sponsorships.

We express our sincere gratitude to the members of the Advisory Board who provided us with an international perspective to the conference. The members of the Advisory Board include Prof. Amrik Sohal, Monash University Australia; Prof. Anthony Roath, University of Bath, the UK; Prof. Aristides Matopoulos, Aston University, the UK; Prof. Ashish Chatterjee, Indian Institute of Management, Calcutta, India; Prof. Ben Wisner, University College London (the UK) and Oberlin College (USA) UK; Prof. Beverly A. Wagner, Strathclyde Business School, the UK; Prof. Christenson, David, National Advanced Fire & Resource Institute, the USA; Prof. David Moore, Cranfield University Defence Academy of the UK; Prof. Dong-Wook Song, Edinburgh Napier University, the UK; Prof. Ediz Ekinci, Embassy of the Republic of Turkey; Prof. Emmanuel M. Luna, the University of the Philippines; Prof. Felix T. S. Chan, Hong Kong Polytechnic University; Prof. Gyongyi Kovacs, Humanitarian Logistics and Supply Chain Research Institute, Finland; Prof. Ivan Russo, the University of Verona, Italy; Prof. Jaideep G. Motwani, Grand Valley State University, the USA; Prof. James R. Stock, the University of South Florida, USA; Prof. Janat Shah, Indian Institute of Management Udaipur, India; Prof. J.C. Gaillard, The University of Auckland, New Zealand; Prof. Jock Menzies, American Logistics Aid Network (ALAN), the USA; Prof. Juliana Hsuan, Copenhagen Business School, Denmark; Prof. K. N. Singh, Indian

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We also express our sincere gratitude to our key speakers who spared their valuable time from their busy schedule to garner this conference and share their invaluable views in the conference. It is because of their presence that ICHL 2013 took altogether a different dimension. Prominent speakers include Shri Shekhar Dutt, Honorable Governor of Chhattisgarh; Shri J. K. Sinha, Honorable Member, NDMA; Dr. Anil Kakodkar, DAT Homi Bhabha Chair Professor and Former Chairman, Atomic Energy Commission, Government of India; Mr. B. Bhattacherjee, Member, NDMA; Shri Sudhir Vasudeva, Chairman, ONGC; Prog. Gyongyi Kovacs, Director, Humanitarian Logistics and Supply Chain Research Institute, Finland; Mr. N. M. Prusty, Founding Chairperson, Sphere India, and Conference Cochair; Prof. N. V. C. Menon, Former Member, NDMA, and Conference Cochair; Mr. Ali Illiassou, H.E. Ambassador, Embassy of Niger; Shri Anil Kumar Sinha, Vice Chairman, Bihar State Disaster Management Authority; Lt. General Anil Chait, CISC, Headquarters-IDS; Air Marshal Jasvinder Chauhan, AVSM, VSM, Central Air Command; Vice Admiral Anurag G. Thapliyal, Director General, Indian Coast Guard; Dr. P. K. Mishra, Director General, Gujarat Institute of Disaster Management; Mr. P. P. Shrivastav, Former Member, North East Council, Government of India; Mr. Pierangelo Gandini, In Charge, Consular Affairs, Embassy of Columbia; Mr. B. Bhattacherjee, Member, NDMA; Mr. Bhaskar Barua, Former Secretary, Ministry of Agriculture; Prof. Prem Vrat, Former Director, IIT Roorkee and VC, ITM University; Prof. Devanath Tirupati, Director In Charge, IIM Bangalore; Prof. G. Raghuram, IIM Ahmedabad; Prof. Gautam Sinha, Director, IIM Kashipur; Prof. Prafulla Agnihotri, Director, IIM Trichy; Prof. Ravi Shankar, IIT Delhi; Prof. Janki Andharia, TIIS Mumbai; Dr. Santosh Kumar, Director SAARC Disaster Management Center; Mr. Kuldip Nar, Managing Director, Aidmatrix; Prof. Bernhard Blessing, FH Vorarlberg, Austria; Mr. Ashutosh Bajpai, Director of India Operations, DHL Express; Mr. Aslam Perwaiz, Head, Disaster Risk Management Systems, Asian Disaster Preparedness Center, Bangkok; Mr. Derek Glass, Programme Director, ADRA; Dr. Ram Boojh, Programme Specialist, Natural Sciences, UNESCO; Dr. Richard Oloruntoba, the University of Newcastle, Australia; and Ms. Margarita Tileva, UNICEF.

We are thankful to our sponsors, Oil and Natural Gas Commission, National Disaster Management Authority, UNICEF, and Aidmatrix, for supporting the conference in different capacities. We are also thankful to the Directorate of Culture and Archeology, Government of Chhattisgarh, for sponsoring the cultural program during the eve of the conference. We are also thankful to our print media partner, Business Standard, for providing adequate coverage to our event.

We are thankful to the organizing committee including Group Captain Vivek Dubey, CAO IIM Raipur; Shri B.R. Khairnar, AFA, IIM Raipur; Dr. C. K. Swain, Librarian, IIM Raipur; and Mr. Hemant Debata, FA & CAO, IIM Raipur, for helping us with administrative efforts in organizing this conference. We are also thankful to Mr. Ghanshyam Sohoni, Mr. Pratik Bakshi, Mr. Shakib Ahmed, Ms. Sparsh Lunkad, and Mr. Tanmoy Kundu in helping us with organizing this conference. We are also thankful to Mr. Shubham Singh, Ms. Namrata Sharma, Ms. Thalla Monika, Mr. Sourav Mandal, and Ms. Vikita Pawar who helped us in designing and disseminating information about ICHL 2013.

We are thankful to the faculty colleagues, particularly Prof. Vinita Sahay and Prof. Sanjeev Prashar, for their whole-hearted cooperation and support for ICHL 2013. We are also thankful to the students of IIM Raipur for their support in anchoring and taking care of conduction of the conference. As we may miss out names of valuable partners in the conference, we thank one and all who supported in whatever form for ICHL 2013, the outcome of which is presented in the form of this edited book.

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Editors' Profiles

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Sumeet Gupta is currently affiliated with IIM Raipur as associate professor and chairman (research). He received his Ph.D. (information systems) as well as MBA from the National University of Singapore. He has worked as a research fellow with the Logistics Institute – Asia Pacific, Singapore. He has worked on several high-profile national and international consultancy assignments such as with SAP A.G., DFS Gallerias, ASEAN secretariat and EDB Singapore. He has published several papers in top-tier international journals (such as Journal of Management Information Systems, Decision Support Systems, *European Journal of Operations Research*, Omega) and conferences (such as ICIS, ECIS, POMS). He is also a reviewer of top-tier international journals in the field of information systems.

N. Vinod Chandra Menon is a former member of NDMA, GOI. He is an alumnus of Kerala University and Jawaharlal Nehru University, New Delhi. He joined the UNICEF India Country Office, New Delhi, in August 2002 in charge of Emergency Preparedness and Response till August 2005, when he was nominated by the Prime Minister of India as one of the founder members of the National Disaster Management Authority (NDMA), Government of India, with the status of a Union Minister of State in the Government of India. He worked as a member of NDMA till 27 September 2010. For his contributions in the field of disaster management in India, Prof. Menon was awarded the Skoch Challenger Award 2010 for Disaster Management. He has been a consultant to UNICEF, UNDP, World Bank and ADPC on various aspects of disaster management before joining the Government of India.

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Repaul Kanji is a computer science engineer at heart with the aim of finding scientific and logical solutions for disaster mitigation and management while pursuing postgraduation in the same field at IIT Roorkee. He is interested in diverse fields like algorithms and corporate social responsibility, the latter being the M. Tech research topic. Sports, music and travelling are the primary hobbies, and accolades in the first two encourage to keep on exploring more and more.

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Part I
Humanitarian Logistics Design and Planning

With the ever-growing natural and manmade disasters reaching epic proportion, the need for nodal agencies with appropriately trained manpower, know-how and machinery to reduce, avoid and hedge the uncertainty is paramount. Knowing what to do before, during and after the disaster is an essential part of preparedness and disaster relief operations. During necessary chaos, when every second is crucial in saving life and material property, capacity building, although costly, is the only differentiating factor in ensuring the safety and security before, during and after the disaster. Furthermore, the role that the stakeholders play in improvising, learning, unlearning and relearning from the disaster experience would lead to a better response in the humanitarian circumstances. What needs to be explored is how the stakeholder's behaviour impacts the operational and executional capability? The first paper presents the theme of this section and discusses the design, development and implementation of humanitarian logistics. This section also covers a discussion on the identification of critical success factors in a humanitarian supply chain. The major issue whether in preparedness stage or while responding to a natural disaster lies with logistics. If the logistics is poor then all the three stages of dealing with a disaster, namely, preparedness, response and recovery, will suffer. The planning aspects of logistics during natural disasters are covered in this section. Improving logistics response times is essential for improving response to a disaster situation. One of the papers discusses how logistics response capacity can be improved by combining it with the local commercial mobility through a truck-sharing solution. A discussion on the barriers to humanitarian supply chains with a view to overcome them has also been presented in this section.

Chapter 1
Humanitarian Logistics and Disaster Management: The Role of Different Stakeholders

B.S. Sahay, N. Vinod Chandra Menon, and Sumeet Gupta

1.1 Introduction

The increasing frequency and devastating impact caused by natural and man-made disasters in the last two decades, as witnessed in the loss of lives, disruption of livelihoods, and damage and destruction of property, infrastructure, and assets, has exposed the multi-hazard preparedness and response capacity of governments, business sector enterprises, international humanitarian assistance agencies, civil society organizations, and local communities. The Orissa supercyclone in India in 1999, the Gujarat earthquake in India in 2001, the Bam earthquake in Iran in 2003, Hurricane Ivan in 2004, the Indian Ocean tsunami in 2004, Hurricane Katrina in 2005, the Muzaffarabad earthquake in Pakistan in 2005, Cyclone Sidr in Bangladesh in 2007, Cyclone Nargis in Myanmar in 2008, the Sichuan earthquake in China in 2008, the Haiti earthquake in 2010, the Pakistan floods in 2010, and the triple disaster triggered by the earthquake, followed by a tsunami and ultimately the Fukushima nuclear emergency in Japan in 2011, the Pakistan floods in 2011, the Uttarakhand floods in 2013, Cyclone Phailin in Odisha and Andhra Pradesh in India in 2013, and the Typhoon Haiyan in the Philippines in 2013 were a few of the most devastating disasters in the recent past.

This article is based on the background paper prepared for the International Conference on Humanitarian Logistics 2013, organized by IIM Raipur on 2–3 December 2013 at Raipur, India. A brief report was also published earlier in the Summary of Proceedings of ICHL2013, published by IIM Raipur.

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B.S. Sahay et al. (eds.), *Managing Humanitarian Logistics*, Springer Proceedings in Business and Economics, DOI 10.1007/978-81-322-2416-7_1

India itself faced the threat of three cyclones in the year 2013, namely, Phailin, Helen, and Lehar, which shows the unprecedented increase in the frequency of natural disasters. The devastation caused by the increasing number of disasters in India, like the Odisha supercyclone of 1999, the Bhuj earthquake of 2001, the Indian Ocean tsunami in 2004, the Kashmir earthquake in 2005, the Kosi floods in 2008, the floods in Andhra Pradesh and Karnataka in 2009, the Leh cloudburst in 2010, the Sikkim earthquake in 2011, the floods and landslides in Uttarakhand in 2013, Cyclone Phailin in Odisha and Andhra Pradesh in 2013, and the recent floods in Jammu and Kashmir, has repeatedly alerted us to the critical imperative for strengthening the humanitarian logistics and supply chain management of relief supplies in India.

According to UNISDR (2013), "between 2002 and 2011, there were 4,130 disasters recorded, resulting from natural hazards around the world where 1,117,527 people perished and a minimum of US$ 1,195 billion was recorded in losses. In the year 2011 alone, 302 disasters claimed 29,782 lives; affected 206 million people and inflicted damages worth a minimum of estimated US$ 366 billion." UNISDR (2013) further observed that the proportion of world population living in flood-prone river basins has increased by 114 %, while those living on cyclone-exposed coastlines have grown by 192 % over the past 30 years. Over half of the world's large cities, with populations ranging from 2 to 15 million, are currently located in areas highly vulnerable to seismic activity.

Rapid urbanization further increases exposure to disaster risk (UNISDR 2013). Shyam (2013) observed that "the losses from natural disasters to mankind are undoubtedly massive—on average, globally every year over 100,000 people were killed and some 246 million people affected by natural disasters during the period 2002–2011 and the estimated average economic loss was US$ 131 billion per year."

Apart from the loss of lives, livelihoods, and damage and destruction of property, infrastructure, and assets caused by the natural disasters, in the immediate post-disaster phase, the affected countries face the challenges posed by bottlenecks in humanitarian logistics: the identification of sources for the supply of relief materials; the choice of the optimal way in which these relief materials can reach the disaster-affected communities; the transportation, warehousing, and distribution of relief supplies to the disaster-affected households; etc.

In other words, logistics is a major challenge in dealing with disasters, and therefore, there is a need for a comprehensive management of humanitarian logistics in disasters. Several research studies (Nilsson et al. 2010; Granot 1999; Trim 2004; Akhtar et al. 2010) have advocated the need for a well-coordinated effort in dealing with disasters, and therefore, it is imperative that the roles of various stakeholders in a disaster are defined properly and their responsibilities chalked out in advance. This paper looks into the roles that various stakeholders can play in the effective management of a disaster and develops a humanitarian action matrix that summarizes the roles of various stakeholders in humanitarian logistics for improving the effectiveness of disaster management.

1.2 Disaster Statistics and Response Mechanisms

The world has been a witness to various types of disasters since time immemorial. Table 1.1 presents a list of major disasters all over the world. These are representative worst disasters and such disasters have been increasingly common during the recent years.

From the statistics, we can note a few interesting things. First, earthquakes and cyclones have caused severe damages. They arrive for a short period but bestow huge damage. Second, epidemic used to be the cause of major deaths during early years, but its toll on humanity has subsided in recent years. Epidemics used to reign for a long period and sometimes even hundreds of years. Third, hurricanes cause major disasters usually in North America, whereas earthquakes are more common in Asian countries. We can also note that epidemics are more common in European countries and famine/drought are more common in South Africa.

According to UNEP-SBCI (2007) in the reconstruction of damaged houses immediately after the Indian Ocean tsunami which devastated Banda Aceh in Indonesia, the masonry needs for the construction of 120,000 houses in Aceh province were projected to be more than 1 million tons of cement and 3.6 million cubic meters of sand, while the timber requirements for the housing construction were estimated to be between 300,000 and 400,000 m^3. The logistics of sourcing the sand, cement, and timber and getting them across to the house reconstruction sites in Banda Aceh posed very serious challenges, similar to those faced in moving building materials from the mainland to Andaman and Nicobar islands in India for the construction of intermediate shelters and permanent housing reconstruction after the Indian Ocean tsunami.

According to UNISDR (2013), direct disaster losses are at least 50 % higher than internationally reported figures: Total direct losses in 40 low- and middle-income countries amount to USD 305 billion over the last 30 years; of these, more than 30 % were not internationally reported. The Global Assessment Report 2013 observed that disasters directly affect business performance and undermine longer-term competitiveness and sustainability: When business leaves, it may never return. Prior to the 1995 Kobe earthquake in Japan, the port of Kobe was the world's sixth busiest port. Despite a massive investment in reconstruction and efforts to improve competitiveness, by 2010, it had fallen to the 47th place.

Following the 2011 earthquake and tsunami, automobile and electrical component production in Japan declined by 48 and 8 %, respectively. But automobile production also fell by 20 % in Thailand, 18 % in the Philippines, and 6 % in Indonesia. Electrical component production fell by 18 % in the Philippines and 8 % in Malaysia (Ye and Abe 2012).

The Renesas Electronics Corporation, the world's largest custom manufacturer of microchips for the automobile industry, and which serves Japanese automobile manufacturers, suffered estimated losses of USD 615 million. Toyota lost USD 1.2 billion in product revenue owing to parts shortages that caused 150,000 fewer Toyota automobiles to be manufactured in the United States, production stoppages