Redundancy as requirement: lessons from the 1997–98 Peruvian El Niño disasters

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A nation's preventative measures and ability to respond are always tested when calamity strikes. The resiliency of mitigative works and quality of relief operations undoubtedly determine the effectiveness of disaster preparedness and efficiency of emergency management. What is sometimes neglected is the importance of having multiple means available to more adequately confront, absorb and react to the problem. Calvin Streeter addresses this important issue in his 1991 article. He discusses the concept and theory of 'redundancy', and also highlights the implications that an 'excess capacity' may have on warning and evacuation planning. In spite of his significant contribution to the literature, the field has not, to my knowledge, followed up with empirical investigations on this subject.

The following situation report is written with the intent of partially filling this gap in the discipline by utilising the Peruvian El Niño flooding and mud slides as a case study. This recent event in South America will be drawn upon to reiterate—in a heuristic manner—that redundancy is necessary for nations to successfully reduce calamitous events and their adverse consequences. Information was obtained when the author visited Peru in February 1998. Relevant findings were gathered from personal interviews, phone conversations and personal correspondence with scientists, program managers and others within the disaster prevention and relief community. Newspaper articles and electronic documents were also utilised in this investigation.

In attempting to make my argument, I will provide background information about the El Niño disasters in Peru; discuss why redundancy is critical in works of prevention, systems and forms of transportation, institutional and actor response, and emergency communications; and highlight the implications of this study for disaster management at the domestic level and for those actors involved in disaster prevention and relief around the world.

Background to the Peruvian El Niño Disasters

Commonly referred to as El Niño ('the Child' in Spanish) due to its typical appearance when the birth of Christ is observed, the Pacific Oscillation Phenomenon is an oceanic and atmospheric disturbance that results in the alternating appearance of warm and then cooler sea surface temperatures off the Western shores of Latin America. While the exact causes of this recurring climatic fluctuation remain to be deciphered, scientists have determined that El Niño's ocean currents and accompanying wind are affecting weather patterns around the world. This was especially true in 1997–98, as the ocean temperatures off the coast of Peru were higher than what has previously been recorded. In fact, the recent El Niño has been regarded as being very severe, a Mega Niño, or even the climatic event of the century.

Although the impact of the Pacific Oscillation Phenomenon is global, Peru is generally numbered among those countries which are most severely affected. Several types of disasters agents are common in this developing nation during stronger El Niño episodes. These include flooding and mud slides due to an excessive amount of rainfall, sea surges emanating from strong ocean currents and wind, and drought owing to the lack of precipitation. The first two of these agents were mainly prevalent in the North, the second along the coast, and the third exclusive to the South. While the effects of the sea surges and the consequences of drought have been minimal, the flooding and mud slides certainly left behind an incredible amount of devastation. Besides the fact that physical damages are in the millions of dollars and that Peru's goals for economic development are now suddenly set back, it has been estimated by a local research institution that 374 people have lost their lives, another 412 have been injured, and close to 600,000 have been affected in one way or another by the disasters.

While the Fujimori government and other actors from the international humanitarian community worked diligently to prepare for and respond to El Niño, weaknesses associated with prevention projects and challenges in relief operations became apparent. Many of the obstacles had to do with the lack of redundancy.

Redundancy in prevention

The 1997–98 Pacific Oscillation Phenomenon demonstrates the importance of an excess of preventative and mitigative works in Peru. This can be seen in those areas where such measures were undertaken as well as in those where they were not. On the positive side, the Fujimori administration undertook a massive preparation campaign in Northern Peru after the IDNDR Consultive Council confirmed in the Summer of 1997 that El Niño would affect the country six months later. Some of the numerous projects of prevention included dredging canals, cleaning and expanding drainage systems, building retention walls, reinforcing bridges and constructing dikes. This focus on prevention lies in stark contrast to the deficiency thereof in 1982–83. Consequently, the Fujimori administration was credited for being the first government in Peru to take hazards seriously and for mitigating a series of disasters that would have otherwise been even more destructive.

Nonetheless, the modest success in the North was somewhat diluted by the apparent failure to prepare in the South. Basing its preventative policies on its experience with the 1982-83 El Niño, the government did not expect flooding to be a problem outside of the Northern departments. However, several cities in Southern Peru were also adversely affected by the considerable amount of precipitation. For example, the city of Ica was inundated in the final days of January 1998. At least 15,000 houses (many of them constructed of adobe) were destroyed or partially damaged, and close to 120,000 people were victimised by a local river that overran its banks. What made the disaster particularly tragic is that it could have been averted or at least minimised. Several scientists in Peru have acknowledged that each El Niño is different, and that Southern portions of the country have received abnormal amounts of rainfall in previous episodes. Local political leaders also notified the central government of the impending threat. Unfortunately, this knowledge was either insufficiently disseminated or ignored, and recommended works of prevention were not undertaken. Thus, the disasters in Peru indicate that redundancy in prevention is important for two reasons. Large quantities of mitigative works help to minimise the destructive consequences of nature and may also reduce the effects of human miscalculation or error.

Redundancy in transportation

The disasters in Peru likewise reveal why redundancy in transportation is critical to

reduce the effects of disaster and ensure an effective response. One of the most visible evidences of El Niño's destructive power was in the area of the infrastructure. Flooding and mud slides washed away hundreds of miles of road and scores of bridges, especially in Northern Peru. The interruption of these vital lifelines of society left many cities isolated which had numerous adverse consequences. The first and most obvious effect was a disruption of economic activity. Tourism, mining, commerce and other industries which rely on transportation suffered heavy losses due to El Niño's devastation. The agricultural sector was particularly hard hit as produce frequently rotted on trucks as drivers waited for roads to be repaired. Thus, food which was not originally destroyed by the flooding or drought could not be distributed, thereby contributing further to the overall scarcity and subsequent higher prices. Second, and also because power and phone lines were down, communication was reduced, if not completely eliminated, among neighboring communities. A few newspapers even ran stories about political leaders in smaller pueblos that had no choice but to travail mountain passes and cross swollen rivers if they were to relay disaster needs to neighbouring municipals. The inaccessibility of diverse locations was certainly to blame for the slow response by the central government. Third, and most importantly, the damage sustained by the infrastructure meant that relief could not always be transported by ground to those areas which required it. Luckily, other means were used to send aid to the victims of El Niño. For example, the Navy delivered relief supplies to cities on the coast. In addition, planes and helicopters were utilised by the air force and civil defense to distribute necessary supplies to other hard-to-reach areas. It is evident, therefore, that an increase in the numbers of routes to and from cities is advisable, and that various forms of transportation are necessary if a society is to function normally and deliver aid after disaster.

Redundancy in institutional and actor response

The disasters in Peru indicate furthermore why differing levels of government and a plethora of humanitarian actors must be able to respond to disaster. Like many administrations in developing nations, the Fujimori government is very centralised. When flooding and mud slides began in December of 1997, the Presidential Ministry had little difficulty in overseeing the relief and reconstruction operations. As the El Niño phenomenon proceeded, calamities began to increase in number and soon appeared in diverse locations throughout the country. In spite of this onslaught, Fujimori refused to delegate disaster assistance to regional and local levels, and continued handing out aid in a very politicised fashion (for which he was harshly criticised). With time, however, the number of hazardous events overwhelmed the national government and Fujimori recognised his command and control system was in trouble. But, at this juncture, local politicians and bureaucrats were in no position to take over the post-disaster responsibilities. As was mentioned previously, department and municipal leaders were geographically isolated which hindered the delivery and sharing of emergency resources. Moreover, these officials were politically weakened and lacked resources anyway as Fujimori had previously consolidated power in order to more successfully wage Peru's war against terrorism. Therefore, when the national government finally recognised it would have to decentralise due to the disasters, it was too late. Regional and municipal institutions were either not in place or weakened at local levels. Governmental activities in the areas of relief and reconstruction were consequently regarded as being insufficient in several departments.

To make matters worse, civil society was not completely capable of taking up the slack made evident by the government. According to one respondent, the social fabric in Peru is very weak and the inability of the private sector to respond to disaster is a direct result of the government's fear that any type of association involves terrorist activity. While this observation invites further investigation, there is little doubt that the poverty, illiteracy and fatalistic culture in this developing country discourage private disaster prevention and relief activities. Fortunately external aid for relief and reconstruction was contributed from both governmental and non-governmental sources which made up for internal shortages. Thus, the lesson to be gleaned from this section, is that all levels of government, and both internal and external actors must be able to respond to calamity in developing nations. This is especially the case when disasters are large, numerous or geographically dispersed.

Redundancy in communication

A final lesson from the catastrophes in Peru concerns the importance of possessing alternative means of relaying information in emergency situations. Without a doubt, modern technology is used extensively to communicate when disaster strikes, and the Peruvian El Niño was no exception. All of the emergency managers and NGO relief coordinators that were interviewed stated that two-way radios, cell phones, pagers, computer e-mail, and fax machines were crucial to their disaster response operations. The strengths of these types of equipment include ease of use, speed of transmission and portability. But there are some drawbacks to these types of equipment that must be recognised. For instance, my field research indicates that two-way radios may be limited due to range of reception and time of operation, cell phones and pagers are inoperable at times due to location, and computers and fax machines become useless when power and phone lines are down. It appears, therefore, that the weakness of one form of communication can only be overcome by acquiring other instruments to convey information. Consequently, redundancy in communication is also important when disaster strikes.

Implications of this study

The central lesson to be drawn from this investigation of the recent Peruvian El Niño is that quantity counts. Creating an 'excess capacity' undoubtedly increases the probability of successful prevention strategies while also facilitating the effectiveness of humanitarian operations. Numerous works of prevention mitigate the destructive power of nature and minimise the consequences of human error. Alternative routes and forms of transportation reduce the effects of catastrophes and ensure emergency access to victims in remote disaster sites. Enabling each level of government to respond to hazards, and having other domestic and international actors as partners facilitates timely and adequate relief operations. Finally, increasing the means of communication guarantees the continuous transmittal of crucial information about a disaster situation.

Do these conclusions imply that redundancy in disaster prevention and response is without drawbacks? Certainly not. Streeter points out that practitioners must come to understand how much is too much, or at what point the costs of redundancy overrun its benefits. Nonetheless, if the findings of this paper are accurate, then the importance of providing emergency managers with increased resources cannot be overstated. Monies, materials, and energies devoted to the disaster-reduction cause are investments well spent. Furthermore, this research provides additional reasons why industrialised countries and NGOs at the international level should maintain or increase the amount of development and disaster assistance they provide to nations of the Third World. Most of the poorer nations are not, as of yet, in a position to go it alone in their attempt to combat disaster.

In conclusion, we live, as Streeter notes, in a world of surprises and uncertainty. Works of prevention sometimes fail, disaster sites are not always be accessible, a single entity is never capable of responding alone, and communication systems are not consistently foolproof. If disasters are to be minimised therefore, redundancy, in its many forms, will be required.

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Disaster Events Calendar

15–17 October 1999
Melbourne, Victoria, Australia

1999 AFAC Annual Conference

Contact:
AFAC 1999 Melbourne Conference
Co-Ordinator
Roz Long
CFA, PO Box 701, Mt Waverley, Vic, 3149
Tel: (61 3) 9262 8334; Fax: (61 3) 9264 6200
E-mail: r.long@cfa.vic.gov.au
WWW: http://www.ausfire.com

27–29 October 1999
London

Dealing With Natural Disasters : Achievements and New Challenges in Science, Technology and Engineering

It is timely to review the significant progress that has been made in the STE aspects of disaster reduction, to point the way forward to new development and to set out the new challenges for practitioners in this field. Subjects that will be discussed at the meeting include drought, flood, seismic and volcanic disaster mititation.
Contact:
Mrs Tina Brown, The Royal Society,
6 Carlton House Tce, London SW1Y 5AG
Tel: +44 (0) 171 451 2591/2585
Fax: +44 (0) 171 451 2692
WWW: www.royalsoc.ac.uk

30–31 October 1999
Cairo, Egypt

Fourth Annual Conference on Crises and Disasters Management

Sponsor: Crisis Research Unit, Ain Shams University.
Contact:
Prof. Mohammed Rashad El-hamalawy,
Crisis Research Unit, Ain Shams University,
Abbasia, Cairo, Egypt
Tel: (02) 2619509 Fax: (02) 4025905/2609167

1–3 November 1999
Canberra, Australia

Australian Disaster Conference 1999: 'Disaster Prevention for the 21st Century'

Planning is currently underway for this conference, which will serve as one of the final summary conferences of the International Decade for Natural Disaster Reduction.
Contact:
Conference Logistics
PO Box 505, Curtin, ACT 2605
Tel: 02 6281 6624 Fax: 02 6285 1336
E-mail: conference@conlog.com.au

1-4 November 1999
Sydney, Australia

Third Canada/Australia/US Fire Safety Summit

Contact:
Maria Greenlee
International Association of Wildland Fire,
East 8109 Bratt Road, Fairfield, Washington
99012; (509) 523-4003 Fax: (509) 523-5001
E-mail: greenlee@cet.com

2–5 November 1999
Sydney, New South Wales, Australia

International Association of Wildland Fire (IAWF) 1999 Wildland Fire Safety Summit: 'What Have We Learnt From Major Wildfire Disasters?'

Contact:
IAWF
East 8109 Bratt Road, Fairfield, WA 99012
Tel (509) 523-4003 Fax: (509) 523-5001
E-mail: greenlee@cet.com
WWW: http://www.wildfiremagazine/safetysummit.shtml

10-12 November 1999
Hobart, Tasmania

Fire Australia 1999, incorporating the Seventh Asia-Pacific fire trade fair. Buildings, boats and bushfires

Contact:
Amy Maney, Conference Secretariat
Fire Protection Association Australia
PO Box 1049, Box Hill, Victoria, 3128
Tel: +61 3 9890 1544; Fax: +61 3 9890 1577
E-mail: amyh@fpaa.com.au

13-19 November 1999
Jindabyne, New South Wales, Australia

ANCOLD Conference on Dams: 'Dams: Environmental, Community and Business Challenges'.

Contact:
Jack Grimstad, The Convener ANCOLD 99,
SMHEA, PO Box 332, Cooma, NSW 2630
E-mail: jgrimstad@snowyhydro.com.au

30 January–4 February, 2000

Twelfth World Conference on Earthquake Engineering

Sponsor:
New Zealand Earthquake Commission and others, Auckland, New Zealand 2000.
Contact:
12WCEE Organizing Committee
Michael Brice
Adminstrative Secretary
New Zealand National Society for Earthquake Engineering
P.O. Box 312, Waikanae, New Zealand
Tel/Fax: 64-4-293-3059;
E-mail: 12wcee@cmsl.co.nz
WWW: http://www.cmsl.co.nz/12wcee
Also see: http://www.eeri.org/Meetings/12WCEE.html

25 February–2 March 2000
Arlington, Virginia

National Emergency Management Association (NEMA) Mid-Year Conference

Contact:
National Emergency Management Assoc.
P.O. Box 11910, Lexington, KY 40578-1910
Fax: (606) 244-8239
E-mail: thembree@csg.com
WWW: http://www.nemaweb.org

21-25 May 2000
Tokushima, Japan

Eighth International Conference of the Natural Hazards Society

Contact:
Natural Hazards Society
PO Box 49511, 80 Glen Shields Avenue
Concord, Ontario, Canada L4K 4P6
WWW: http://www.es.mq.edu.au/NHRC/NHS

28-31 August 2000
Reykjavik, Iceland

4th International Conference of Local Authorities Confronting Disasters and Emergencies

Contact:
The Union of Local Authorities in Israel,
3 Heftman Street
PO Box 20040, Tel Aviv 61200, Israel
Tel: +972-3-695-5024 Fax: +972-3-691-6821
E-mail: ulais@netvision.net.il
WWW: http://www.ladpc.gov.il