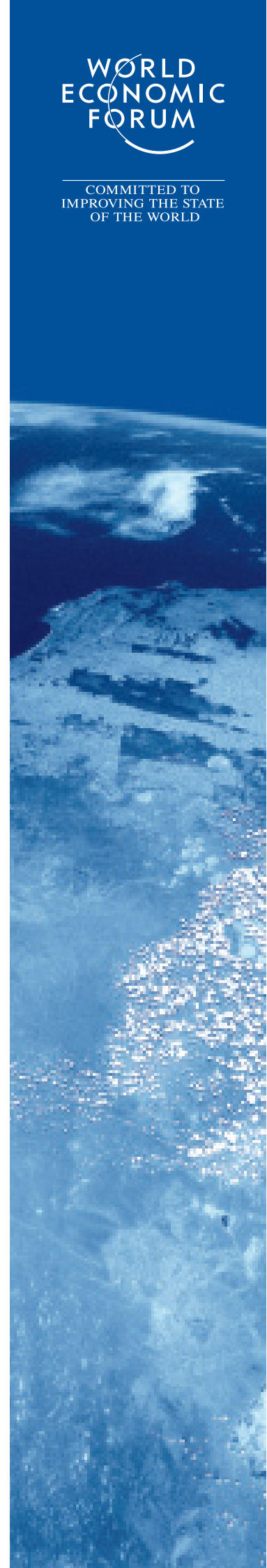


Engineering & Construction Disaster Resource Partnership

A New Private-Public Partnership Model
for Disaster Response



In collaboration with Arup



The views expressed in this publication do not necessarily reflect those of the World Economic Forum.

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Preface

This report summarizes an ongoing effort by the World Economic Forum to serve as a catalyst for greater private sector involvement in responding to natural disasters. Although it is generally recognized that the private sector has an important role to play in addressing the increasing socio-economic consequences of disasters, there has been relatively little effort to understand the potential for contributions by specific industries, or to develop models of engagement that recognize the need for local action and ownership while being replicable, scalable and justifiable in business terms.

This report elaborates a new framework for the engagement of the engineering & construction industry sector during relief, recovery and prevention efforts as a result of natural disasters. The framework, called the Engineering & Construction Disaster Resource Partnership (DRP), builds on the experience of the Forum's Disaster Resource Network (DRN) in India and Mexico, and the Logistics & Transport Industry's Logistics Emergency Teams (LETs). Both of these models have demonstrated the critical role that industry can play during natural disasters and the broader partnership potential with government, the humanitarian community and other key stakeholders.

Based on a mandate by the Engineering & Construction Governors community of business leaders in 2009, the World Economic Forum facilitated an initial series of workshops and interviews between September and December 2009 to analyse the contributions of selected Engineering & Construction Member companies in response to actual natural disasters. These were documented in an interim report, which formed the basis of consultation with key humanitarian actors in May and June 2010. A final series of meetings and workshops were held in the summer and early fall of 2010 to develop and refine the DRP proposal between humanitarian and private sector organizations to leverage core strengths and existing capacities of the engineering and construction industry around the rapid onset of natural disasters at both national and international levels.

We would like to thank the many UN agencies, international organizations, civil society organizations and governments, which provided input and feedback into the development of the DRP model, including ALNAP, Build Change, ICT4Peace Foundation, Mercy Corps, Oxfam, Save the Children, Shelter Centre, World Vision International, the UK Department for International Development (DFID) and the US Federal Emergency Management Agency (FEMA).

Special thanks go to the United Nations International Strategy for Disaster Reduction (UNISDR), the Office for Coordination of Humanitarian Affairs (OCHA), the United Nations Development Programme Bureau for Crisis Prevention and Response (UNDP/BCPR) and the International Federation of the Red Cross (IFRC), all of which provided multiple reviews and inputs into the DRP model and will be key partners of the DRP once it is operational.

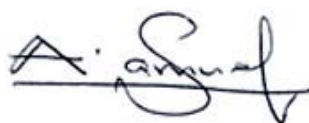
A final thanks to Frank Clary from Agility and Fred Moavenzadeh from the Massachusetts Institute of Technology for providing valuable contributions that were used to help develop the initial DRP framework.

We also thank the Forum Member and Partner companies that helped steer our work through sharing their specific interventions in past natural disasters: AMEC, Arup Group, CH2M Hill Companies, Consolidated Contractors Company, Fluor Corporation, Grupo Marhnos, Halcrow Group, Hindustan Construction Company and Steiner Construction. In particular, we recognize and thank Arup International Development, which worked as a knowledge partner in the overall development of the DRP model, in particular the team of Jo da Silva, Samantha Rex and Victoria Batchelor.

With the incidence of natural disasters on the rise as a result of climate change, and with the changing attitudes of the international humanitarian community, such as those outlined in the new disaster risk reduction partnership opportunities in the 2005 Hyogo Framework for Action, the time for coordinated private sector engagement is now. We hope that the concepts outlined in this report will provoke increased interest and engagement by all stakeholders.



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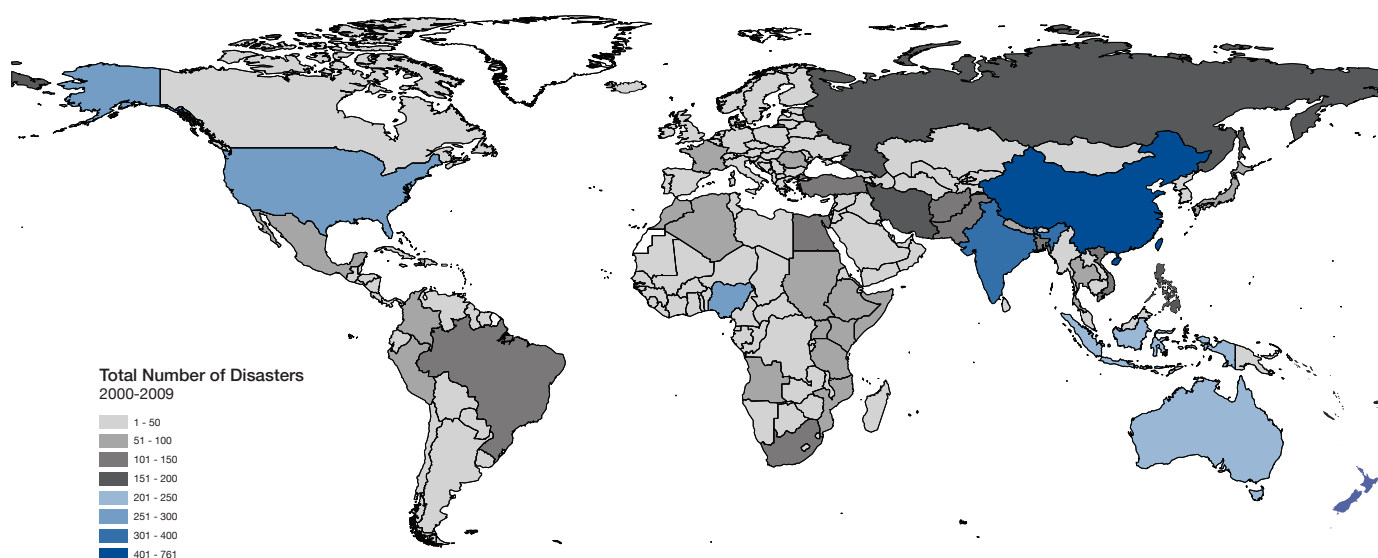
Tania Gutknecht
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Introduction: Natural Disasters – A Global Challenge

Natural disasters result in significant loss of life, damage to property, assets and environmental resources, and the disruption of supply chains and markets. In 2008, roughly 354 natural disasters killed more than 235,000 people and affected another 214 million.¹ Over the past decade, natural disasters have on average affected more than 250 million people a year.²

Approximately 75% of the world's population and half of the least developed countries are exposed to extreme events such as earthquakes, flooding and cyclones.³ The risk associated with exposure to natural hazards is exacerbated by the vulnerability of communities and businesses to the impacts of the event. For this reason, the majority of people affected by natural disasters live in developing countries: they account for 99% of deaths, 98% of people seriously affected and over 90% of economic losses.⁴

Figure 1: Total number of natural disasters per country 2000-2009⁵



Source: Arup International Development

The annual number of natural disasters has more than doubled since 1980. Statistics indicate that hydrometeorological events (such as flooding and cyclones) have increased dramatically, while those caused by geophysical events (such as earthquakes and volcanoes) have remained relatively stable. This suggests that the increase in weather-affected events is very likely the result of environmental degradation and climate change.

The Global Humanitarian Forum estimates that 40% of the total increase in natural disasters since 1980 can be attributed to climate change. Future projections indicate that by 2030 the annual number of weather-related disasters will be three times higher than during the last three decades.⁶ Evidence suggests that smaller disasters are increasing in frequency more quickly than larger ones, but the impact of frequent smaller events on a community may be just as severe.⁷

1 *Annual Disaster Statistical Review: The Numbers and Trends 2008*. June, 2009. Brussels: CRED.

2 *The Humanitarian Costs of Climate Change*. December, 2008. Medford: Feinstein International Center.

3 *Reducing the Risk of Disasters: Helping to Achieve Sustainable Poverty Reduction in a Vulnerable World*. March, 2006. London: DFID.

4 *Climate Change Human Impact Report: The Anatomy of A Silent Crisis*. 2009. Geneva: Global Humanitarian Forum.

5 *EM-DAT: The OFDA/CRED International Disaster Database*. Université Catholique de Louvain. Brussels, Belgium. www.emdat.be.

6 *Climate Change Human Impact Report: The Anatomy of A Silent Crisis*. 2009. Geneva: Global Humanitarian Forum.

7 *Global Humanitarian Report*. 2009. UK: Development Initiatives.

Figure 2: Number of disasters by type 1980-2008⁸

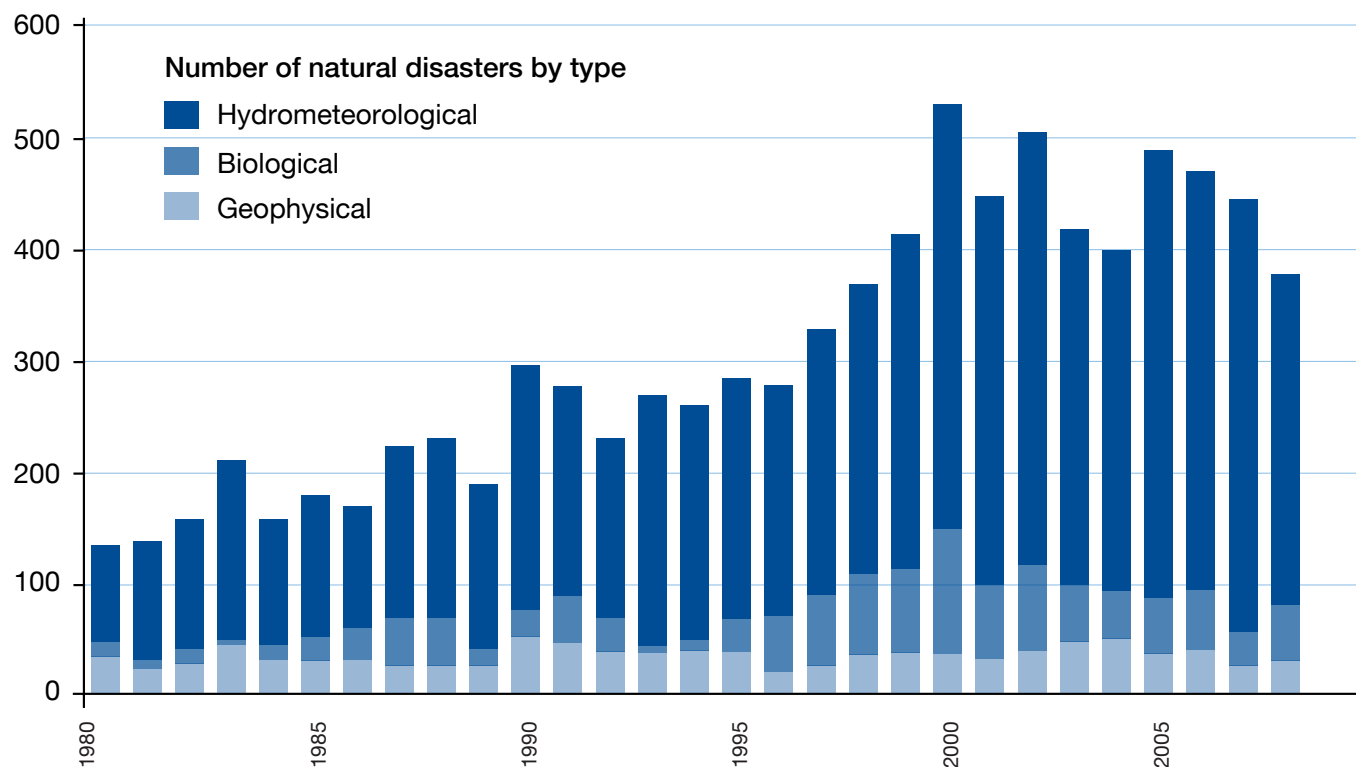
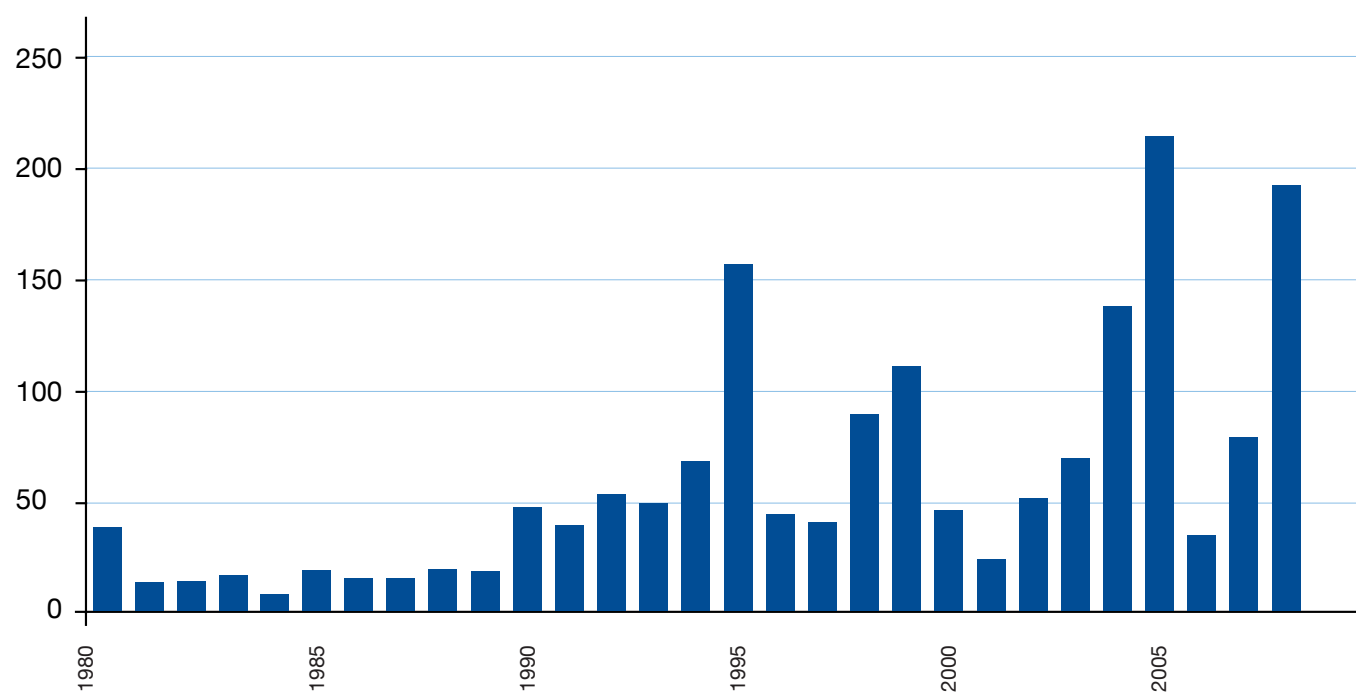


Figure 3: Damage caused by natural disasters in US\$ billion⁹



8 EM-DAT: The OFDA/CRED International Disaster Database. Université Catholique de Louvain. Brussels, Belgium. www.emdat.be.

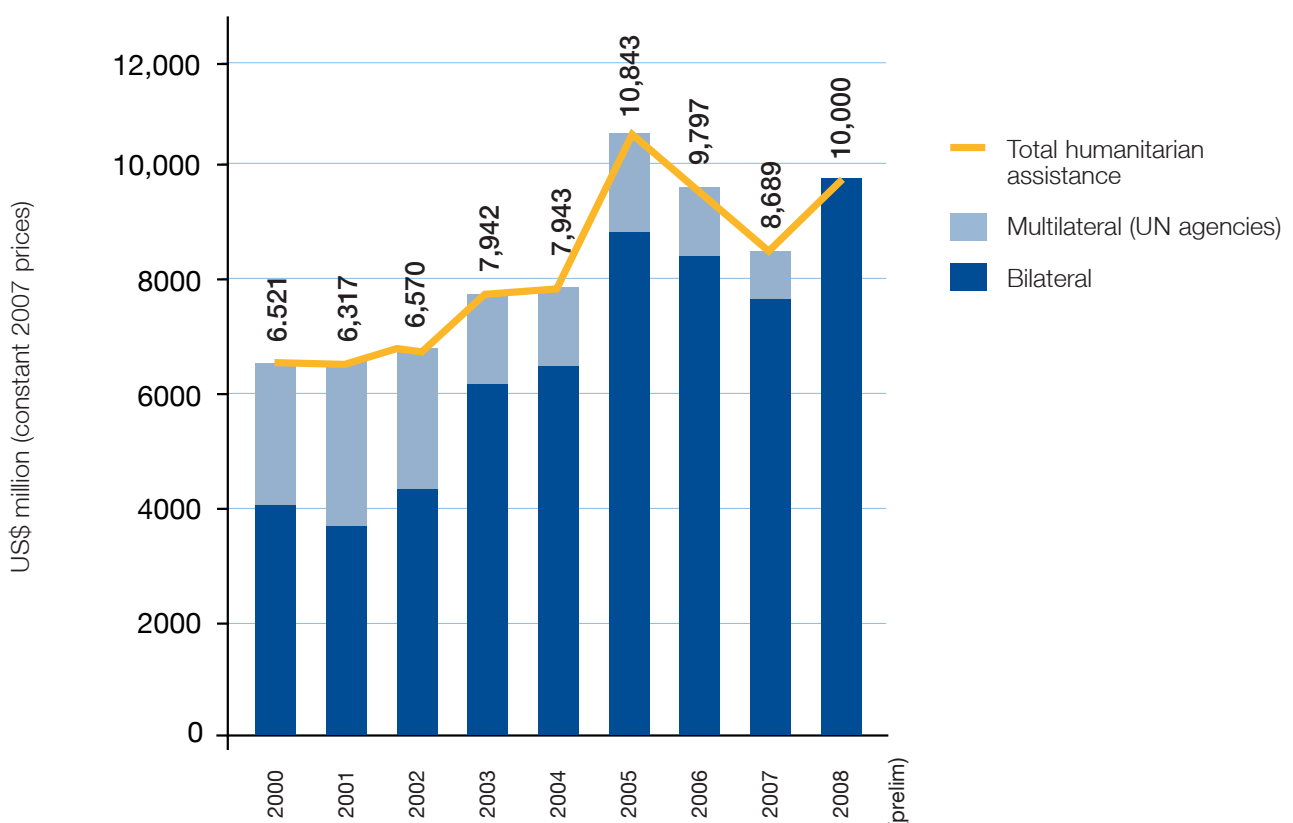
9 Ibid.

The socio-economic impact of disasters has escalated even more rapidly in recent decades than the increase in the number of disasters. Since the early 1970s, the number of people affected by natural disasters has steadily increased by an estimated 50,000 to 60,000 people per decade.¹⁰ During the four decades from the 1950s to the 1990s, the reported global cost of natural disasters increased 15-fold¹¹ and in 2005 the economic costs of disasters reached a record high, with direct financial losses of US\$ 230 billion or 0.5% of worldwide GDP.¹² These trends are expected to continue as a result of population increase and rapid urbanization.

Disasters in urban areas affect greater numbers of people and generate greater economic losses in terms of direct losses such as damaged property and infrastructure, and also indirect losses as a result of disruption to livelihoods and businesses discontinuity. By 2050, the world population is expected to increase by 2.5 billion, with the urban population expected to almost double.¹³ Most of the increase will be in developing regions where poverty intensifies vulnerability and adds to the pressure on limited resources and services.

The growing number of disasters and the increased number of people living in vulnerable areas have led to increased spending on humanitarian relief. The Global Humanitarian Assistance Data Access and Transparency Programme estimates that the international resources allocated to humanitarian assistance exceeded US\$ 15 billion in 2007 and US\$ 18 billion in 2008. In real terms, humanitarian spending in 2007 was more than 33% higher than in 2000 and almost 175% higher than 1990. It is becoming increasingly clear that the cost of humanitarian action is going to be prohibitive in the long term. Moreover, despite increased spending, figures from the last three years indicate that only around 70% of humanitarian needs are actually being met. Year after year, the majority of humanitarian assistance is spent in a small number of countries suffering from protracted conflicts or repeating cycles of natural disasters, or in emergencies with a high media profile.¹⁴

Figure 4: Official humanitarian assistance 2000-2008¹⁵



10 *The Humanitarian Costs of Climate Change*. December, 2008. Medford: Feinstein International Center.

11 Benson, C, Clay, E. *Understanding the Economic and Financial Impacts of Natural Disasters*. 2004. Washington DC: World Bank.

12 *Natural Catastrophes and Man-made Disasters 2005*. January, 2006. Zurich: Swiss Re.

13 *World Urbanization Prospects: The 2007 Revision*. February, 2008. New York: UN DESA.

14 *Global Humanitarian Report*. 2009. UK: Development Initiatives.

15 *Ibid*.

The Private Sector: More than Just a Donor

A call for private sector engagement

The humanitarian community has traditionally looked on the private sector primarily as donors and, in fact, corporate donations for humanitarian relief have steadily increased over the past several decades.¹⁶ Yet, in recent years there has been a growing call for greater direct involvement by the private sector in disaster response, particularly at the national level. The emphasis has shifted from seeing the private sector's role as a donor to being more actively engaged in sharing expertise and capacity, both to reduce suffering and to help rebuild communities following a disaster, as well as to play a critical role in disaster risk reduction through prevention and preparedness.

In January 2005, recognition of the increasing number and economic cost of disasters resulted in the international community making a collective commitment to formulate an integrated approach to disasters through the Hyogo Framework for Action.¹⁷ The commitment encompasses response, preparedness and prevention. The Hyogo Framework recognizes the private sector as a key actor and calls for the "full commitment and involvement of all actors concerned, including governments, regional and international organizations, civil society, the private sector and scientific community."¹⁸ In particular, it promotes "the establishment of public-private partnerships to better engage the private sector in disaster risk reduction activities."

The Hyogo Framework: Priorities for Action

1. Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation
2. Identify, assess and monitor disaster risks and enhance early warning
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels
4. Reduce the underlying risk factors
5. Strengthen disaster preparedness for effective response at all levels

The UN Humanitarian Response Review in 2005 highlighted a number of gaps in the humanitarian system and the need to improve the predictability, timeliness and effectiveness of humanitarian response. Humanitarian agencies, donors and governments are beginning to recognize that "private firms possess the business management expertise and tools governments increasingly demand; and donors may also consider companies to be more responsive to their demands."¹⁹

Several high-profile failures and increasing competition between agencies have also led to increasing pressure from within the humanitarian community and from donors for more professionalization and increased accountability to both donors and beneficiaries. The need for greater professionalism is often highlighted as another reason for greater involvement of the private sector,²⁰ and it has also led to the development of several internationally recognized principles and codes of conduct such as the Sphere Standards.²¹

In April 2008, the World Economic Forum and the UN Office for the Coordination of Humanitarian Affairs (OCHA) launched the Guiding Principles for Public-Private Collaboration for Humanitarian Action, which are meant to serve as a guide to the private sector and the humanitarian community, with an emphasis on communicating key humanitarian principles as well as integrating elements of lessons learned from previous private sector engagement.

In 2009, the Forum's Global Agenda Council on Humanitarian Assistance highlighted the importance of localized disaster response and the increasing importance of national actors. The Global Agenda Council predicts the decline of the traditional model of humanitarian response that relies on an "international alliance of aid donors, UN agencies and international NGOs" – such as the response following the Indian Ocean Tsunami in 2004 – to a model where national governments take a more significant role with greater involvement of the local private sector. The Kashmir earthquake (2005) and the Sichuan earthquake (2008) are cited as precedents for the future of humanitarian response.

16 Binder, A, Witte, J. *Business Engagement in Humanitarian Relief: Key Trends and Policy Implications*. June, 2007. London: Humanitarian Policy Group.

17 *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. January, 2005, Geneva: UNISDR.

18 *Ibid*.

19 Binder, A, Witte, J. *Business Engagement in Humanitarian Relief: Key Trends and Policy Implications*. June, 2007. London: Humanitarian Policy Group.

20 Binder, A, Witte, J. *Business Engagement in Humanitarian Relief: Key Trends and Policy Implications*. June, 2007. London: Humanitarian Policy Group.

21 *Humanitarian Charter and Minimum Standards in Disaster Response*. 2004. Geneva: The Sphere Project.

Greater understanding in the private sector

The private sector is developing a greater awareness of its own vulnerability to natural disasters, particularly after the scale of devastation caused by Hurricane Katrina in 2005 (US\$ 125 billion) and the Sichuan Earthquake in 2008 (US\$ 85 billion).²² Companies with project sites located in coastal areas of developing countries, for instance, are beginning to realize that they are increasingly vulnerable to flooding resulting from storm surges or sea level rise.

This increased understanding is being matched by a growing realization of the private sector's role as a global citizen. As companies face increasing scrutiny over the social and environmental impact of their actions, consumers are becoming more selective in their purchasing choices, and employees want to work for a company that is seen to have a positive corporate image. From a local perspective, businesses depend on the communities in which they operate and to whom their goods and services are sold. They not only have a responsibility towards these communities, but both their market and resource base depend on them.

Research carried out by the Overseas Development Institute shows that companies increasingly “seek more direct ways of engaging in humanitarian relief operations”, which for some includes direct engagement.²³ Such immediate actions undertaken by companies in response to disasters are not isolated philanthropic gestures. They are based on an understanding of their extended responsibility as part of a global citizenship in an increasingly interconnected world. They usually build on a pre-existing relationship with a community, government or civil society organization, and they often continue long after the immediate humanitarian response.

The role of the engineering and construction industry

The role of engineers in disaster response is widely recognized when it comes to providing technical expertise in water and sanitation, shelter, logistics and communications and the rebuilding of roads and bridges. Engineering and construction (E&C) consultants are often employed by humanitarian agencies to enhance their capacity; hiring is often done through the agency's own networks, or through specialist recruitment services such as Registered Engineers in Disaster Relief (RedR)²⁴ and ReliefWeb²⁵.

Only a few national networks proactively promote the hiring of E&C companies in disaster response. Notable examples are the Disaster Resource Network, established in India in 2002 following the Gujarat earthquake, and Unidos por Ellos in Mexico. Yet the engineering and construction industry has the potential to play a very significant role in encompassing humanitarian response as well as prevention and preparedness.

In the immediate aftermath of a disaster, a construction company already operating in an area affected by a disaster is ideally positioned to contribute labour, materials and equipment that can save lives and reduce suffering. In addition to proximity, the company is likely to have the advantage of pre-established local networks and supply chains, relationships with local government, and a unique understanding of regulatory frameworks that may be lacking in the humanitarian agencies arriving on the scene. The distribution of food, water, medical supplies and shelter materials can be undertaken much more rapidly and efficiently by a large workforce that is immediately deployable and knows the local area. Assets such as earthmoving equipment can immediately be used for clearing debris. Company vehicles can be used for the distribution of humanitarian assistance. Generators can supply temporary power, and company offices and satellite communications can prove critical in assisting the coordination of the response.

The E&C industry can provide a wide range of technical expertise and services in both the emergency phase and in the recovery phase following a disaster. This includes damage assessment, hazard assessment, hydrological surveys, seismic expertise, design, planning and programme management. Most important, E&C companies have the management capability required to recognize the type of expertise that is needed. Specific skills can be tapped by transferring personnel from elsewhere within the company to boost local capacity, or through their national or international networks.

²² *Topics Geo, Annual Review: Natural Catastrophes 2005*. 2006. Munich: Munich Re.

²³ Binder, A, Witte, J. *Business Engagement in Humanitarian Relief: Key Trends and Policy Implications*. June, 2007. London: Humanitarian Policy Group.

²⁴ www.redr.org

²⁵ www.reliefweb.int

E&C companies are also well placed to provide strategic advice on the reconstruction of critical infrastructure that is essential to establishing supply chains, and to making health and education facilities operational. Early engagement in the relief and recovery phases also means a company's expertise is more likely to be consulted, which can contribute strategically to longer term reconstruction planning. For instance, E&C companies are well equipped to play a central role in land use planning and determining construction standards, both of which are critical to reducing the risk of future disasters.²⁴

24 *Building Resilience to Natural Disasters: A Framework for Private Sector Engagement*. January, 2008. Geneva: World Economic Forum.

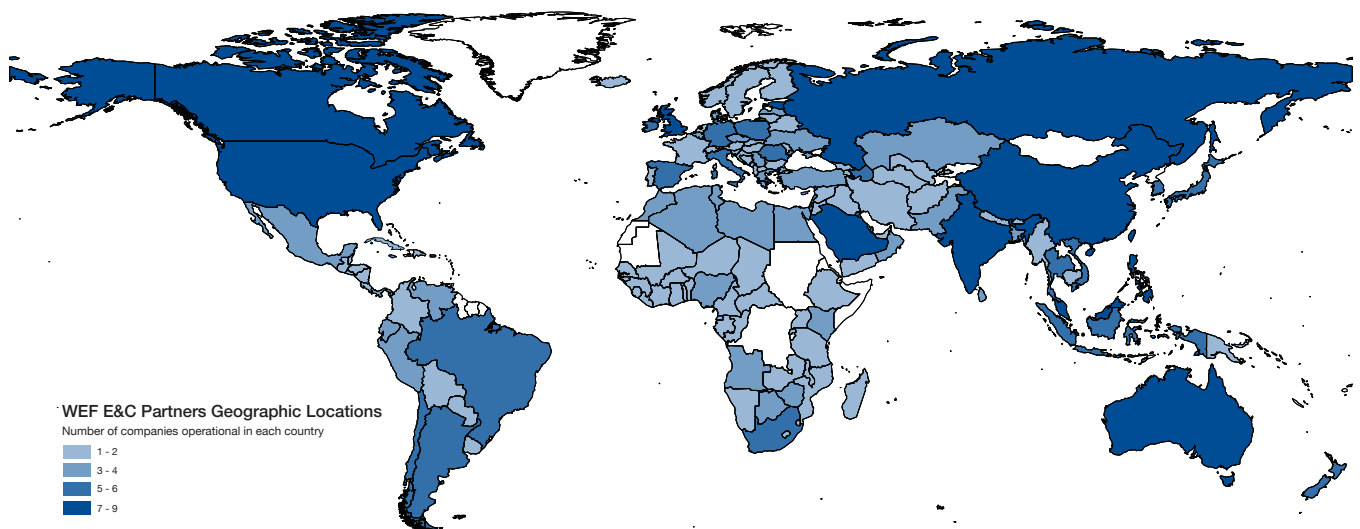
Precedent: Building on Success

The 99 Engineering & Construction Industry Partners of the World Economic Forum constitute a mix of national and multinational private sector companies (contractors, service providers and global consultancy firms) that collectively have a presence in almost every country in the world. Several Forum E&C Partners have already engaged in humanitarian responses following a natural disaster, including four contractors: Consolidated Contractors Company (CCC), Fluor Corporation, Grupo Marhnos and Hindustan Construction Company (HCC); and four global consultancies: AMEC, Arup Group, CH2M Hill Companies and Halcrow Group.

These companies have engaged in humanitarian response work either through their national networks or as independent organizations. Based on their experience, they have come to realize that the E&C sector has the potential to make a much more significant contribution to disaster response. This section presents an analysis of their motivation, disaster response activities, assets and skills deployed, modalities of delivery, timing of their contributions and entry points. Based on this analysis, the following section discusses how these experiences might be leveraged to serve as a catalyst for wider engagement of the E&C sector.

For more in-depth information regarding the involvement of Forum Members in natural disaster response, 19 case studies – spanning a 10-year period from 1999-2009 – are included in Appendix A.

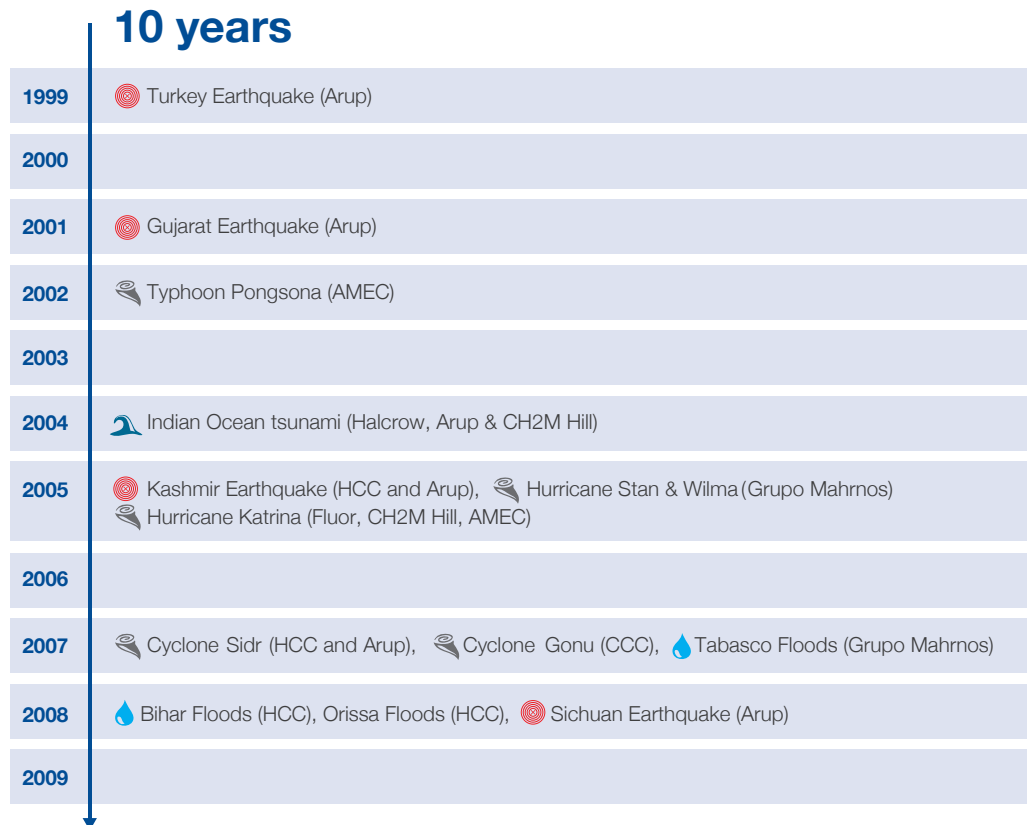
Figure 5: World Economic Forum E&C Partners' geographic coverage



Source: Arup International Development

Research and analysis for the report was undertaken by Arup International Development from September 2009 to September 2010, with valuable inputs from the eight companies who formed a working group and consultation with humanitarian agencies. Its purpose is to better understand to date the activities of Forum Members, spot potential opportunities for further engagement and to identify approaches which can be replicated more widely. Research was conducted through three group workshops, monthly group teleconferences and individual partner interviews.

Figure 6: Timeline of case studies



Source: Arup International Development

Figure 7: Location of case studies



Source: Arup International Development

Operations and motivations

All eight companies can be characterized as being decentralized when it comes to decision-making and in their operations. This approach gives them a strong national presence and identity even though they are regional, multinational or global entities. AMEC, Arup, CH2M Hill, Fluor and Halcrow are global firms, but their regional operations are actually composed of numerous country offices that are linked through global networks.

CCC has a specific regional focus in the Middle East and Africa; the company's country managers are responsible for local decision-making and refer to the company's upper management when required. Although HCC works mainly in India, the company has more than 50 site project offices; a significant amount of decision-making is decentralized and in the hands of the project manager at each location. Grupo Marhnos works in Mexico and in Guatemala and decentralizes decision-making to a network of offices managing more than 40 projects at any one time. However, in the case of Grupo Marhnos, decisions concerning disaster response are usually made by the head office.

National and country offices are usually motivated to respond to a disaster as a result of their proximity to the affected area often because their own staff has been affected or because they feel a moral obligation to assist nearby communities. For instance, CCC evacuated all their staff prior to Cyclone Gonu, but returned in the immediate aftermath to assist those affected. The motivation to engage internationally usually comes from individuals abroad who either have a specific link to the affected area, or a strong ethical motivation to engage in humanitarian response.

“The disaster [Cyclone Gonu] occurred near our project sites so we wanted to actively participate in the relief work.”

Niyati Sareen, General Manager, Corporate Social Responsibility, Hindustan Construction Company, India

“People working on a Halcrow project in Banda Aceh were personally affected by the tsunami – Halcrow wanted to support them.”

Anna Mann, Halcrow Foundation Trustee

“Arup is a multinational company, every time an earthquake occurs, someone, somewhere, in Arup will want to respond.”

Dinesh Patel, Director, Arup

All eight companies have a culture that recognizes the importance of their interaction with society. In several cases, the company was either still being led by its founding member or had adopted a strong ethos passed down by the company's original founder. An example of a corporate philosophy stemming from a company's original founder is Arup, which was created in 1946 by Ove Arup and is still guided by its founding principles of social purpose with a humanitarian attitude.²⁵ The exception to the rule is Halcrow, where the decision to make sustaining and improving the quality of people's lives a company-wide objective was a conscious change in corporate direction that took place a decade ago and did not come from the original founders. Arup, Halcrow and CH2M Hill are employee-owned, thus ensuring that the companies are free to pursue their aims without having to depend on shareholders.

In all of the case studies in Appendix A, the ability of the organization to respond to a disaster relied on a combination of top-down willingness and a desire by the leadership to make a contribution matched by bottom-up enthusiasm from the staff. The fundamental motivation for both CEOs and staff members was the humanitarian imperative “to alleviate human suffering among those least able to withstand the stress caused by disaster.”²⁶ This corroborates the findings of the Overseas Development Institute in 2007 that when “a considerable number of [humanitarian] initiatives are initiated by the CEO or a board member, they frequently attract senior management attention, which helps them maintain the necessary support inside the company.”²⁷

25 Arup, O. *The Key Speech*. 1970. http://www.arup.com/Publications/The_Key_Speech.aspx.

26 *Code of Conduct*. International Red Cross and Red Crescent Societies. <http://www.ifrc.org/publicat/conduct/code.asp>.

27 Binder, A, Witte, J. *Business Engagement in Humanitarian Relief: Key Trends and Policy Implications*. June, 2007. London: Humanitarian Policy Group.

“It is what the founders of CCC believe in.”

Tony Awad, Corporate Social Responsibility Officer, Consolidated Contractors Company (CCC), Greece

“Halcrow is full of like-minded individuals with a strong ethical and moral sense of duty. After the Indian Ocean Tsunami in 2004, they were all asking the company what we were going to do to help.”

Anna Mann, Halcrow Foundation Trustee

“Senior leadership at AMEC drives the decisions to participate in humanitarian efforts but our employees often greatly impact that decision.”

Roger Jinks, President, Earth and Environmental, AMEC

“CH2M Hill engages in humanitarian response because it is core to our values and corporate culture, important to our employee-owners and it is our responsibility as an industry leader.”

Gary Craft, Senior Vice President, Government Facilities & Infrastructure, CH2M Hill

Business case

Although the immediate and most significant motivation for all the companies involved is to alleviate suffering and provide safety for their own personnel and assets on project sites, both companies and individuals received business benefits by engaging in humanitarian response (Table 1). All the companies stated that although the motivation for their involvement in a humanitarian response was not connected to business development, business opportunities arose thanks to their involvement in the initial stages of the crisis.

“Arup is part of society. Business opportunities came later but they were not the motivation for getting involved.”

Hamdi Ataoglu, Director, Arup Turkey

In some cases, early engagement led directly to an opportunity to contribute to recovery and reconstruction, but more generally it provided an opportunity for companies to strengthen relationships with local government and other institutions. It also helped to develop new networks and contacts and provided potential access to new markets and geographic regions. Involvement in post-disaster response enhanced the image of the company both within the country where the disaster took place and internationally. It improved brand recognition and the company's reputation. This proved to be a positive benefit in retaining and attracting talented staff.

“Relationships developed through the Forum's Disaster Resource Network have resulted in day-to-day business relationships in the long term.”

Niyati Sareen, General Manager, Corporate Social Responsibility, Hindustan Construction Company, India

“Arup's work following the earthquake meant that Arup gained a reputation in seismic assessment, and this subsequently became part of normal business practice.”

Hamdi Ataoglu, Director, Arup Turkey

Individual staff members also developed skills and knowledge, which contributed to their personal and professional development and turned out to be a long term benefit to the company. Companies that develop mechanisms that allow their staff to engage in humanitarian responses usually manage to leverage significant amounts of voluntary time and

fundraising from their employees. At the same time, they generate goodwill in their workforce and they build a strong sense of community within the organization.

“Employee engagement provides opportunities for professional development, increases morale and strengthens loyalty, thus attracting, developing and retaining talent.”

Gary Craft, Senior Vice-President, Government Facilities & Infrastructure, CH2M Hill

Table 1: Business benefits during various stages of disaster response

| Preparedness | Relief | Recovery | Reconstruction |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Strengthen local relationships | Strengthen local relationships | Strengthen local relationships | Strengthen local relationships |
| Reinforce brand, reputation, values | Reinforce brand, reputation, values | Reinforce brand, reputation, values | Reinforce brand, reputation, values |
| Staff development | Staff development | Staff development | Staff development |
| | | Business development | Business development |
| | | Direct business opportunities | Direct business opportunities |

Source: Arup International Development

Assets, expertise and networks

Construction companies located in disaster-affected areas have assets that can be invaluable to humanitarian and government relief organizations. These can be tangible assets, including stockpiled food, water and shelter materials (such as tarpaulins, timber, scaffolding, galvanized sheeting and sand bags), equipment for moving debris, vehicles to assist in distribution of food and water, and generators and fuel to provide power as well as transport to affected areas. They can also provide skilled personnel to coordinate activities in addition to satellite communication equipment and office space to enable coordination, space for community shelters and storage space for materials at their construction sites.

Construction companies can also offer a number of intangible assets that can be extremely useful to NGOs and humanitarian agencies. These can include networks with local government, construction companies, manufacturers and communities as well as access to existing supply chains for the procurement of additional materials, all of which are invaluable to humanitarian organizations frequently operating in an unfamiliar environment.

Figure 8: Key E&C assets



Source: Arup International Development

In the majority of the case studies, engineering and construction companies' skills and expertise, and the services they provided, constituted their most significant contribution to humanitarian response efforts. A number of recent efforts have focused on the potential contribution of individual consultants or professions (surveyors, engineers, architects) in post-disaster response.²⁸

This analysis considered the engineering and construction community's skills in relation to planning, design and implementation of disaster responses:

Planning

The E&C community can offer technical expertise in: mapping and understanding hazards and risks; assessing damage and loss; identifying and prioritizing reinstatement of critical infrastructure; site assessment; stakeholder engagement; communications; strategic planning; programme management; and risk management.

Design

The E&C community can offer multidisciplinary technical services in settlement and infrastructure planning as well as specific sectoral technical expertise in shelter, community facilities (schools, health centres, warehousing) and infrastructure design (water, drainage, sanitation, roads, power). The sector can also develop appropriate, sound and innovative technical solutions based on an understanding of local regulatory frameworks as well as international best practice.

²⁸ *The Built Environment Professions in Disaster Risk Reduction and Response: A Guide for Humanitarian Agencies*. 2009. UK: Max Lock Centre. http://www.rics.org/site/scripts/download_info.aspx?downloadID=829&fileID=991.

Implementation

The E&C community can offer services such as supply chain management and logistics, programme and cost monitoring, quality assurance, programme management, procurement and contract administration, risk and safety management, and site supervision.

Figure 9: Key E&C skills



Source: Arup International Development

These skills are not typically available within most humanitarian organizations or UN agencies, which may employ few technically qualified architects, engineers or construction managers. In recent disasters, the tendency has been to rely on advice from individual consultants rather than to form partnerships with the private sector. These skills are not prevalent with multilateral and bilateral donors who have significant influence in many post-disaster situations.

Specialist knowledge and skills available within the E&C community, including technical expertise such as flood risk assessment, seismic design, urban planning and quality of construction assurance, are particularly needed to reduce the risk of future disasters in heavily populated urban areas; areas where there is a high level of dependency on infrastructure and are subject to repeat or multiple natural hazards (floods, cyclones, earthquakes).

The symbols in Figures 8 and 9 map the assets deployed and skills provided by the eight Forum Member companies for each of the case studies. Figure 10 (see below) illustrates that companies already located in the vicinity of a disaster

were able to respond quickly in the immediate aftermath, made a significant contribution through deployment of their assets, and continued to contribute as a result of their local knowledge and networks. Where companies were not in the immediate vicinity, assistance was provided through provision of skills rather than assets. In some cases this was very specific technical expertise, but elsewhere it encompassed a wide range of skills related to planning, design and implementation.

Table 2: Summary of assets and skills provided in each response

| Company | Year | Assets | | | | | | | | | | Skills | | | | | | | | | | |
|--------------------------------|-----------|--------|--|--|--|--|--|--|--|--|--|--------|--|--|--|--|--|--|--|--|--|--|
| CONSULTANT | | | | | | | | | | | | | | | | | | | | | | |
| Turkey Earthquake | Arup | 1999 | | | | | | | | | | | | | | | | | | | | |
| Gujarat Earthquake, India | Arup | 2001 | | | | | | | | | | | | | | | | | | | | |
| Typhoon Pongsona, Guam | AMEC | 2002 | | | | | | | | | | | | | | | | | | | | |
| Indian Ocean, Tsunami | Arup | 2004 | | | | | | | | | | | | | | | | | | | | |
| Indian Ocean, Tsunami | CH2M Hill | 2004 | | | | | | | | | | | | | | | | | | | | |
| Indian Ocean, Tsunami | Halcrow | 2004 | | | | | | | | | | | | | | | | | | | | |
| Hurricane Katrina, USA | CH2M Hill | 2005 | | | | | | | | | | | | | | | | | | | | |
| Hurricane Katrina, USA | AMEC | 2005 | | | | | | | | | | | | | | | | | | | | |
| South Asia, Earthquake | Arup | 2005 | | | | | | | | | | | | | | | | | | | | |
| Cyclone Sidr, Bangladesh | Arup | 2007 | | | | | | | | | | | | | | | | | | | | |
| Sichuan Earthquake, China | Arup | 2008 | | | | | | | | | | | | | | | | | | | | |
| CONTRACTOR | | | | | | | | | | | | | | | | | | | | | | |
| South Asia, Earthquake | HCC | 2005 | | | | | | | | | | | | | | | | | | | | |
| Hurricane Katrina | Fluor | 2005 | | | | | | | | | | | | | | | | | | | | |
| Hurricane Stan & Wilma, Mexico | Marhnos | 2005 | | | | | | | | | | | | | | | | | | | | |
| Cyclone Sidr, Bangladesh | HCC | 2007 | | | | | | | | | | | | | | | | | | | | |
| Cyclone Gonu, Oman | CCC | 2007 | | | | | | | | | | | | | | | | | | | | |
| Tabasco floods, Mexico | Marhnos | 2007 | | | | | | | | | | | | | | | | | | | | |
| Bihar floods, India | HCC | 2008 | | | | | | | | | | | | | | | | | | | | |
| Orissa floods, India | HCC | 2008 | | | | | | | | | | | | | | | | | | | | |

Source: Arup International Development

Modalities of delivery

Building on the analysis above, four main modalities of delivery have been identified. Typically, E&C companies located in the vicinity of a disaster contributed initially as direct action, and later by providing local technical services. Those located elsewhere often assisted through secondment of key personnel, or provided global technical services through wider national or global initiatives, sometimes in partnership with other organizations.



Direct action. Companies operate in a location where there is a disaster and immediately engage in emergency relief, such as distribution of food, water and medical supplies.



Secondments. Staff members are seconded to NGOs or UN agencies to provide surge capacity or where the company is not operating in the disaster-affected area



Local technical services. Companies at a national level partner with local/national governments, academics or NGOs to provide technical assistance, such as clearing debris, repairing critical infrastructure, damage assessment and design, project management and construction expertise.



Global technical services. Multinational companies partner with each other or with the public sector to provide technical assistance or fundraising through global networks.

Figure 10: Modalities of delivery

Direct action

In several of the case studies, Forum Member companies had construction sites or local offices in areas directly affected by the natural disaster. In these cases, they were immediately able to engage in direct action to provide emergency assistance in the first few days and weeks after the disaster. Typical activities undertaken included the provision of medical assistance and distribution of food and water to affected communities. In some cases, companies undertook damage and needs assessments and distributed clothing and shelter materials.

Another activity undertaken in the relief phase is search and rescue, and the removal of dead bodies and livestock. These are important steps in saving lives and reducing the spread of disease in the aftermath of a disaster. Construction companies have the equipment and labour to engage in this type of activity.

HCC went so far as to enhance the health and safety training for site staff to include skills specific to post-disaster response. Halcrow in Banda Aceh provided affected staff members and their families with emergency cash payments in the aftermath of the 2004 Indian Ocean tsunami. While the benefit to individuals in affected communities (other than staff members) is not immediately obvious, emergency payments of this kind can be instrumental in restarting the local economy and encouraging early recovery after a disaster.

“I would like to thank HCC for the excellent support to the Bihar flood response through deployment of HCC’s corps of engineers, which is well-trained in relief and rescue missions. Their contribution has been enormous in setting up a response programme that aims to provide clean water and appropriate sanitation to over 120,000 flood-affected people at Supaul.”

Enamul Hoque, Public Health Adviser, Oxfam GB, India

Local technical services

Once immediate needs have been met, the focus of disaster response shifts to recovery. In the case studies analysed, companies that were engaged in the relief phase of humanitarian response often went on to provide local technical services to humanitarian organizations or local and national governments during the recovery phase. In the case studies from the US, pre-existing agreements with disaster-response organizations enabled local technical services to be provided in the relief phase.

Typical activities undertaken by both HCC and CCC included clearing of debris and repair of critical infrastructure such as roads and embankments, and technical design and project management services. In the Halcrow case study, local staff, working in partnership with local NGOs after the 2004 Indian Ocean tsunami, identified, designed and monitored the implementation of projects. Arup's national offices, following major earthquakes in both Turkey and China, provided a range of local technical services including training, design and project management. Grupo Marhnos provided funding and technical support through Unidos por Ellos for housing reconstruction following two natural disasters in Mexico.

Both CH2M Hill and Fluor had pre-existing agreements with the US Army Corps of Engineers (USACE) and US Federal Emergency Management Agency (FEMA), which enabled them to provide local technical services in the immediate aftermath of Hurricane Katrina. CH2M Hill deployed 130 quality assurance and control officers to monitor and manage debris removal, installed 24,000 housing units, and later undertook site assessments and installation of temporary public buildings. Fluor installed over 54,000 housing units and provided a range of technical support to FEMA – mobilizing over 4,500 personnel. CH2M Hill continued to provide local technical services to the Mississippi Development Authority under the Gulfport Restoration Programme.

Secondments

In many instances, companies were able to contribute to humanitarian responses even though they were not located in the disaster-affected area. They did this either through the secondment of staff with key skills or through the provision of global technical services. The key difference between these two modalities of delivery is in the number of people involved. Secondments almost exclusively involved single staff members, who as individuals were able to draw on wider expertise in their firms, although this was limited to their personal and professional networks. In contrast, the provision of global technical services engages a firm on a corporate basis, enabling access to teams of people and the full depth of the organization's resources and expertise.

The case studies reveal that typical activities undertaken by secondees include damage and needs assessments, logistics support, programme or project management, and provision of technical expertise in water, sanitation, shelter and construction. Secondments tend to occur in the relief and recovery stages. Shorter assignments in the relief phase are usually followed by longer assignments of up to one year in the recovery phase. For instance, HCC seconded a series of staff for 2-3 weeks to Oxfam in Bangladesh in the aftermath of Cyclone Sidr. After the 2005 earthquake in Pakistan, Arup seconded engineers to humanitarian agencies for 3-6 months to provide seismic and construction expertise during recovery and initial reconstruction of houses and schools.

Only one of the case studies – AMEC's response to Hurricane Katrina – involved the secondment of staff within country to provide surge capacity to a government disaster response authority. In this example, AMEC seconded staff on minimum 90-day assignments to serve as debris specialists for FEMA. More than 70% of the deployed AMEC staff received in-field promotions to project management positions supervising the work of other debris specialists.

Global technical services

Typically, global technical services are provided in response to a request by a national government or donors for private sector engagement. This is either in recognition of the need for global expertise during the recovery and reconstruction phases in order to “build back better”²⁹ and reduce long-term disaster risk, or to provide transparency and accountability at a global level.

The activities in this category include: damage assessments and analysis to inform reconstruction strategies; multi-hazard assessments, development frameworks and strategic reconstruction plans to reduce vulnerability; strategic advice and the development of implementation and funding plans for key projects such as reconstruction of critical infrastructure; technical assessments; and evaluation of reconstruction programmes.

Arup provided global technical services through the British Earthquake Consortium for Turkey (BECT) following the earthquake in north-west turkey in 1999. The consortium, a group of six British companies, worked together to develop a Reconstruction Implementation Plan for Yalova Province, an area which had been significantly damaged in the earthquake but had received little international funding.

CH2M Hill provided global technical services in the recovery and reconstruction phases after the Indian Ocean Tsunami. In September 2005, CH2M Hill was contracted by USAID to provide consulting, design, project management and construction services for infrastructure rehabilitation in Sri Lanka. AMEC provided global technical services to the US military in response to Typhoon Pongsona in Guam in 2002; a team of 10 engineers from AMEC undertook damage assessments and designed and managed the reconstruction of infrastructure for the Andersen Air Force Base in Guam.

²⁹ *Lessons Learned from Tsunami Recovery: Key Propositions for Building Back Better*. 2006. New York: Office of the UN Secretary-General's Special Envoy for Tsunami Recovery.

Table 3: Summary of the modalities of delivery in each response

| Company | Year | Direct Action | Local Tech Services | Secondment | Global Tech Services | |
|--------------------------------|-----------|---------------|--|---|---|--|
| CONSULTANT | | | | | | |
| Turkey Earthquake | Arup | 1999 | | Project management design | Damage assessment | Strategic planning, technical expertise |
| Gujarat Earthquake, India | Arup | 2001 | | | | Technical expertise, local knowledge |
| Typhoon Pongsona, Guam | AMEC | 2002 | | | | Damage assessment, project management, design & construction of infrastructure |
| Indian Ocean, Tsunami | Arup | 2004 | | | Project management, technical expertise | Evaluation, strategic planning |
| Indian Ocean, Tsunami | CH2M Hill | 2004 | | | | Design, construction & project management of infrastructure. Coastal zone management |
| Indian Ocean, Tsunami | Halcrow | 2004 | Cash payments, needs assessment, use of office | Identification, monitoring, implementation | | |
| Hurricane Katrina, USA | CH2M Hill | 2005 | | Debris removal and NFI distribution. Installation of pre-fabricated buildings. Port Restoration | | |
| Hurricane Katrina, USA | AMEC | 2005 | | Hazard mitigation | Debris removal supervision and management | |
| South Asia, Earthquake | Arup | 2005 | | | Technical expertise | |
| Cyclone Sidr, Bangladesh | Arup | 2007 | | | | Reconstruction programme review |
| Sichuan Earthquake, China | Arup | 2008 | | Design, technical expertise, training | | Assessment, strategic planning |
| CONTRACTOR | | | | | | |
| South Asia, Earthquake | HCC | 2005 | Distribution of food, water, clothing, shelter materials | Project management, design, site supervision | | |
| Hurricane Katrina, USA | Fluor | 2005 | | Installation of +54,000 housing units. Technical support to FEMA's disaster-response programme | | |
| Hurricane Stan & Wilma, Mexico | Marhnos | 2005 | | Fundraising, reconstruction management | | |
| Cyclone Sidr, Bangladesh | HCC | 2007 | | | Monitoring WATSAN programmes | |
| Cyclone Gonu, Oman | CCC | 2007 | Food, water, materials, removal of dead livestock | Restoration of access road, clearing mud | | |
| Tabasco floods, Mexico | Marhnos | 2007 | | Fundraising, reconstruction management | | |
| Bihar floods, India | HCC | 2008 | | | Monitoring WATSAN programmes | |
| Orissa floods, India | HCC | 2008 | Distribution of food, water, materials, assessment | Restoration of roads infrastructure | | |

Source: Arup International Development

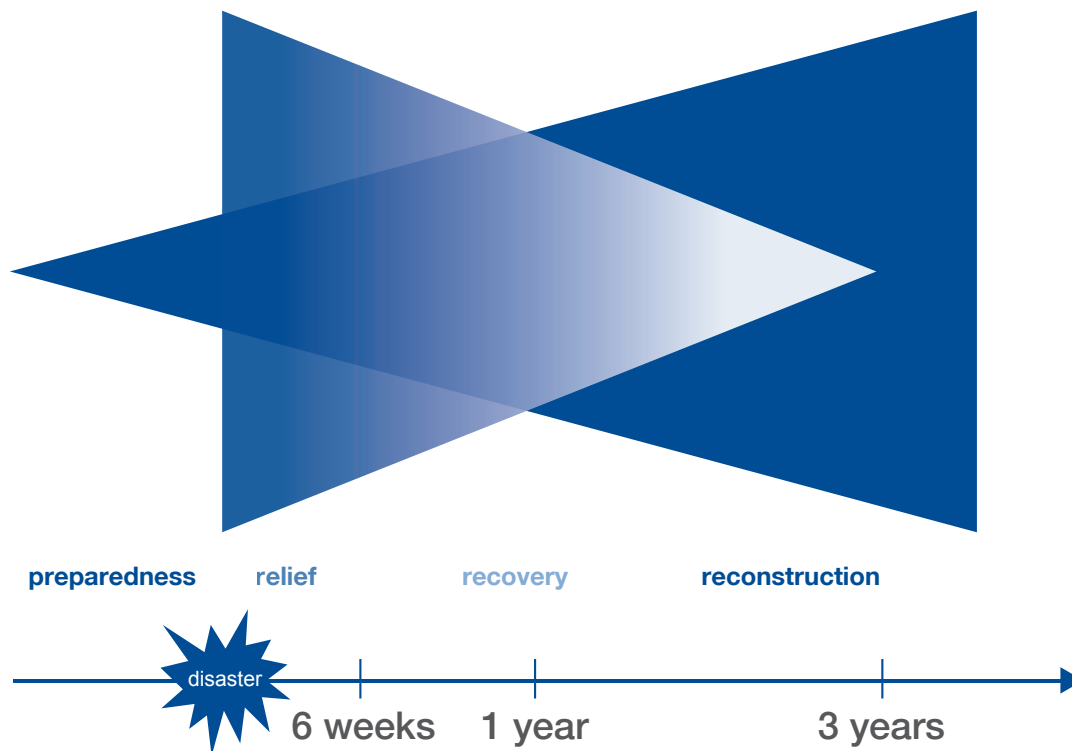
Phases of response and entry points

Humanitarian response can be understood as having three phases: relief, recovery and reconstruction. These phases are not rigidly defined but often merge into one another. Recovery and reconstruction start at the same time as the relief effort immediately following a disaster. The focus of the relief phase is alleviation of suffering and the prevention of further loss of life.

In contrast, the recovery phase focuses on the reconstruction of critical infrastructure and enabling people to resume their normal lives by returning to work or school. The final reconstruction phase includes the building of permanent housing and infrastructure, and the development of sustainable livelihoods.³⁰ The needs in the relief, recovery and reconstruction phases depend on local capacity to respond, the degree of preparedness before the disaster, and the extent to which the impacts of the disaster were prevented or reduced in advance.

³⁰ UNDP Policy on Early Recovery. February, 2008. New York: UNDP.

Figure 11: Phases of humanitarian response³¹



An analysis of the case studies shows that the Forum Member companies engaged at all stages of humanitarian responses with multiple entry points. This is summarized in Table 4. A pattern also emerged when disaggregated into the different modalities of engagement.

Relief

During the immediate relief phase the primary modality of delivery by the World Economic Forum Members already based in developing countries was direct action in close cooperation with local governments and with whom the Forum Members had pre-existing relationships. The Members spontaneously contributed, either as individual organizations (as in CCC following Cyclone Gonu in Oman) or through a national coordination mechanism such as the Disaster Resource Network (DRN) in India or Unidos por Ellos in Mexico.

These national networks were able to build on pre-existing relationships with both the government and the humanitarian sectors resulting in wider access to the E&C sector; investment by E&C companies in pre-disaster training; and improved understanding of their respective strengths and the potential for greater and more systematic involvement.

³¹ Diagram adapted from UNDP Policy on Early Recovery

Table 4: Stages of humanitarian response and partnerships/entry points

| Company | Year | Preparedness | Relief | Recovery | Reconstruction | |
|--------------------------------|-----------|--------------|---------------------------------------|--|---|---|
| CONSULTANT | | | | | | |
| Turkey Earthquake | Arup | 1999 | | University | Local contractors / Local government | Donors / Governments |
| Gujarat Earthquake, India | Arup | 2001 | | | Government / Disaster Management Authority | |
| Typhoon Pongsona, Guam | AMEC | 2002 | | | Government / Military (global technical services) | Government / Military (global technical services) |
| Indian Ocean, Tsunami | Arup | 2004 | | INGOs | Government, UN Agencies, INGOs | Donors / Governments |
| Indian Ocean, Tsunami | CH2M Hill | 2004 | | | | |
| Indian Ocean, Tsunami | Halcrow | 2004 | | Local communities / international NGOs | Communities / Local NGOs | |
| Kashmir Earthquake | Arup | 2005 | | INGOs | INGOs / Government | |
| Hurricane Katrina, USA | CH2M Hill | 2005 | | Government (local technical services) | Government (local technical services) | Government (local technical services) |
| Hurricane Katrina, USA | AMEC | 2005 | Government (local technical services) | | Government (secondment) | |
| Cyclone Sidr, Bangladesh | Arup | 2007 | | | INGOs | |
| Sichuan Earthquake, China | Arup | 2008 | | INGO | Academics / Local NGOs | Government |
| CONTRACTOR | | | | | | |
| Kashmir Earthquake | HCC | 2005 | RedR | Communities / Army / Government | National NGO | |
| Hurricane Katrina, USA | Fluor | 2005 | | | | |
| Hurricane Stan & Wilma, Mexico | Marhnos | 2005 | National companies / Government | | National companies / Government | National companies / Government |
| Cyclone Sidr, Bangladesh | HCC | 2007 | RedR | INGO | | |
| Cyclone Gonu, Oman | CCC | 2007 | | Local government | Local government | |
| Tabasco floods, Mexico | Marhnos | 2007 | National companies / Government | | National companies / Government | National companies / Government |
| Bihar floods, India | HCC | 2008 | RedR | INGO | | |
| Orissa floods, India | HCC | 2008 | RedR | Local government | Local government | |

■ Direct Action
■ Local technical services
■ Secondment
■ Global technical services

Source: Arup International Development

In contrast, Forum Members that were not located in the affected country usually provided assistance primarily through short-term secondments to international NGOs. This distinction is highlighted by the way HCC and Halcrow were able to deploy national staff following the Kashmir earthquake and Indian Ocean Tsunami, respectively. In comparison, Arup seconded international staff to international NGOs and UN agencies after the Indian Ocean Tsunami and HCC seconded staff to Oxfam in Bangladesh during the relief phase that followed Cyclone Sidr. While during the Orissa floods in India a year later, HCC engaged directly.

Secondments varied from two weeks to six months, but in some cases were extended through to the recovery phase. They were typically arranged through an organization such as RedR, which specializes in placing skilled personnel in humanitarian agencies, or as a result of pre-existing relationships between the company, or individuals within the company, and the humanitarian agency requiring assistance.

Recovery

In most cases early engagement in the relief phase by Forum Members in-country led to a subsequent provision of local technical services requested by NGOs and/or the local or national government. In the Halcrow case study, projects were conducted in partnership with affected communities and local NGOs, whereas HCC and CCC provided local technical services as a result of their relationship with local government.

After Hurricane Katrina AMEC, Fluor and CH2M Hill provided local technical services in the recovery phase, including the installation of temporary housing units (Fluor) or prefabricated public buildings (CH2M Hill), and the provision of technical support in debris removal (CH2M Hill and AMEC).

Arup provided international staff for longer-term secondments of 3-12 months to international NGOs and UN agencies during the recovery phases. Several staff members were seconded to Bosphorus University (Turkey 1999), which performed damage assessment on behalf of the government. Arup also seconded a planner to the Urban Development Authority in Sri Lanka. This was part of an AusAid funded initiative to develop a land zoning strategy for the location of resettlement sites and to develop a planning policy to reduce the risk of future disasters.

It is worth noting that only two case studies (AMEC's response to Hurricane Katrina and Arup's response to the Indian Ocean Tsunami) involved secondments to government agencies and none of these case studies included secondment or services to a government disaster response authority established after a disaster, such as ERRA in Pakistan or BRR in Aceh, Indonesia.

Just as important, there were no secondments to major multilateral and bilateral donors despite the fact that although the donors have only limited engineering and construction expertise, they have a major influence on strategic post-disaster planning. This is an area of opportunity in which a more systematic approach to E&C sector engagement might unlock.

Both CH2M Hill (in Sri Lanka) and AMEC (in Guam) provided global technical services in the reconstruction of infrastructure during the recovery phase and in both case studies this led on to longer-term reconstruction or prevention activities. Arup provided global technical services in the recovery phase after Cyclone Sidr through a pre-existing global relationship with Habitat for Humanity. In China, Arup responded to an early request from a municipal government for companies around the world to volunteer assistance in developing a planning framework for recovery and reconstruction.

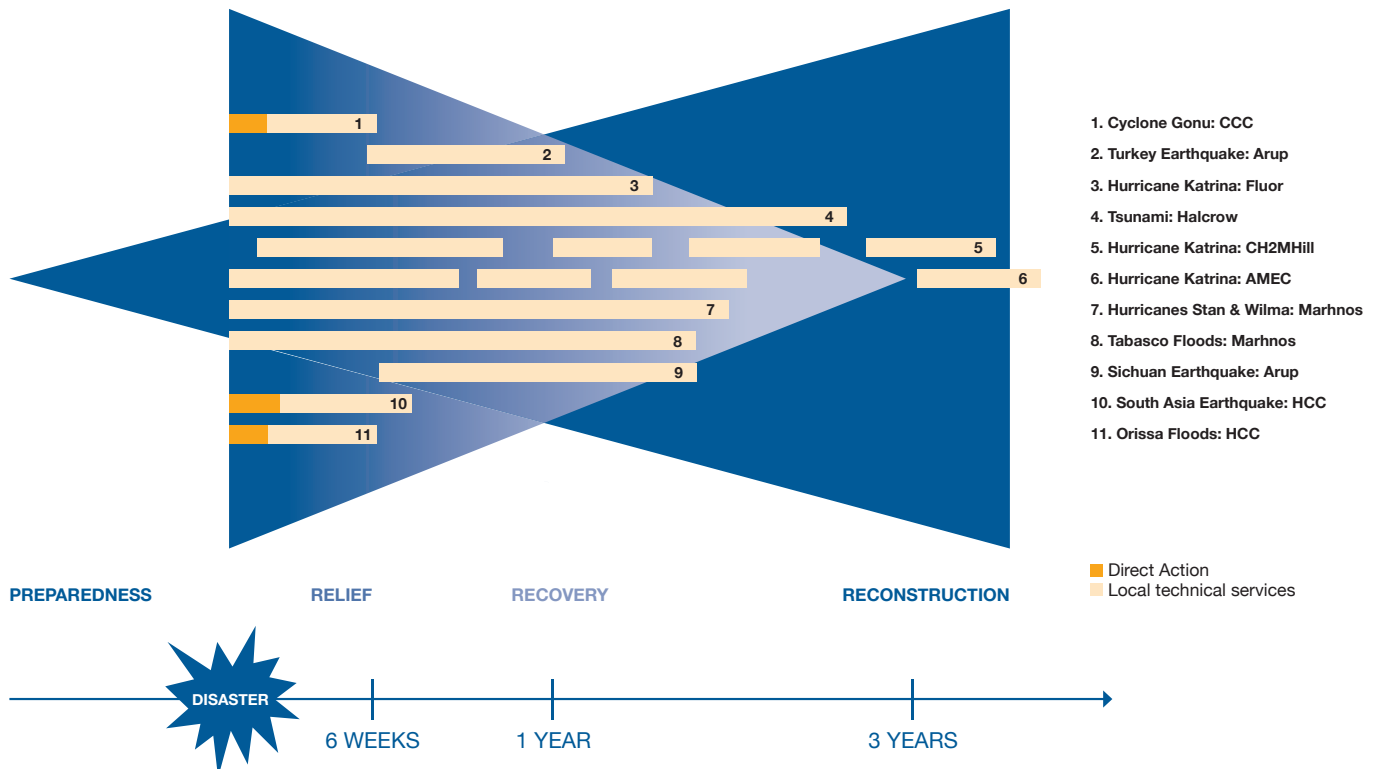
Reconstruction

In several cases, engagement of Forum Members in relief and recovery activities led to further activities in reconstruction or prevention of future disasters. The national offices of both Grupo Marhnos and Halcrow worked in partnership with local companies, NGOs and communities to provide a wide range of technical services locally to support the reconstruction of thousands of houses.

In the reconstruction after Hurricane Katrina, CH2M Hill is serving as a programme manager for the 10-year Port of Gulfport Restoration Programme. Their reconstruction of infrastructure in Sri Lanka after the Indian Ocean Tsunami for USAID also led to work in coastal zone management. Arup provided advice on housing reconstruction programmes, but this was as a global technical service for international NGOs.

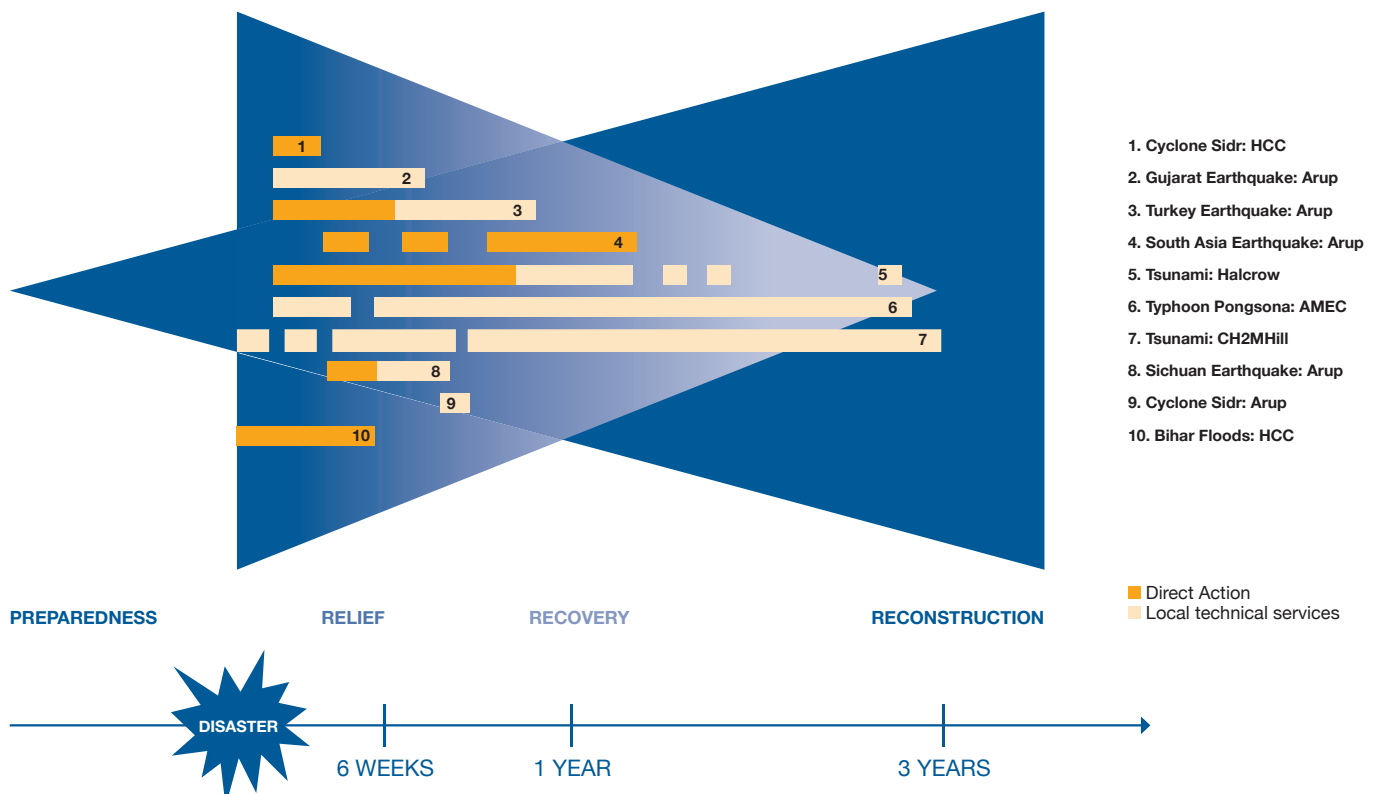
The British Earthquake Consortium for Turkey is a rare example of a global partnership between the public and private sector arising from a bilateral agreement between the United Kingdom and Turkish governments.

Figure 12: Companies physically present in disaster-affected areas tended to engage in direct action and provide local technical services



Source: Arup International Development

Figure 13: Companies not physically present in disaster-affected areas tended to engage in secondments or provide global technical assistance



Source: Arup International Development

Funding

Funding to cover the costs of the engagement by Forum Members in the case studies varied significantly. Beyond the immediate relief phase, access to funding was cited as a factor that severely limited the extent to which Forum Members could provide advice and assistance. Access to wider funding is therefore critical to scaling up involvement of the private sector.

The case studies demonstrated a willingness to absorb the costs of engaging in the immediate aftermath of an event, but companies soon came under pressure to account for their costs, even though they might be willing to continue helping on a not-for-profit basis for a certain amount of time.

The costs of direct action during the first hours and days following a disaster were usually borne by the company. With no time for funding mechanisms to be put in place, these activities were often absorbed at first by the local office. In some cases, expenses were covered under global corporate social responsibility budgets. As a result, the period of engagement of private companies in disaster relief is often very finite – a week or so – but can nevertheless be very significant.

Local technical services were provided on a semi-voluntary, cost recovery or for-profit basis, depending on the level of service provided. Forum Members were often willing to provide services as needed on the understanding that they would be subsequently reimbursed for their costs and/or expenses by local government or they had pre-existing framework agreements enabling them to mobilize rapidly.

HCC secured funding to build shelters in Kashmir through a local NGO, SEEDS India, because it was part of the global DRN network. HCC's experience illustrates the potential for a wider network of companies to unlock funds under the umbrella of a separate entity with a pre-declared humanitarian intent. Both Grupo Marhnos and Halcrow financed their activities by fundraising inside the company, combined with additional funding at a global level, while CH2M Hill, AMEC and Fluor provided local technical services in the aftermath of Hurricane Katrina on both an at-cost and for-profit basis.

Unless they are paid by a recipient organization, secondments rely heavily on the commitment of individual staff members and the support they receive from their company. Staff time is usually provided on a voluntary basis by the individual, or paid for as an in-kind corporate pro bono donation by the company. Depending on the length of assignment, stage of response, expertise of the individual, they can also be paid by the recipient organization (or third party). Travel costs and living expenses are funded either by their company, the humanitarian agency, a third party or a combination of all three.

For its two-week secondments during the aftermath of Cyclone Sidr and the Bihar floods, HCC covered all of the staff members' travel and living expenses and paid their normal salaries. The 33 months of Arup staff in post-tsunami secondments involved six different staff members with assignments varying from 6 weeks to 12 months. In some cases, costs and expenses were fully recovered. In others, staff took a voluntary leave of absence or went on partial salary with expenses covered by the humanitarian organization.

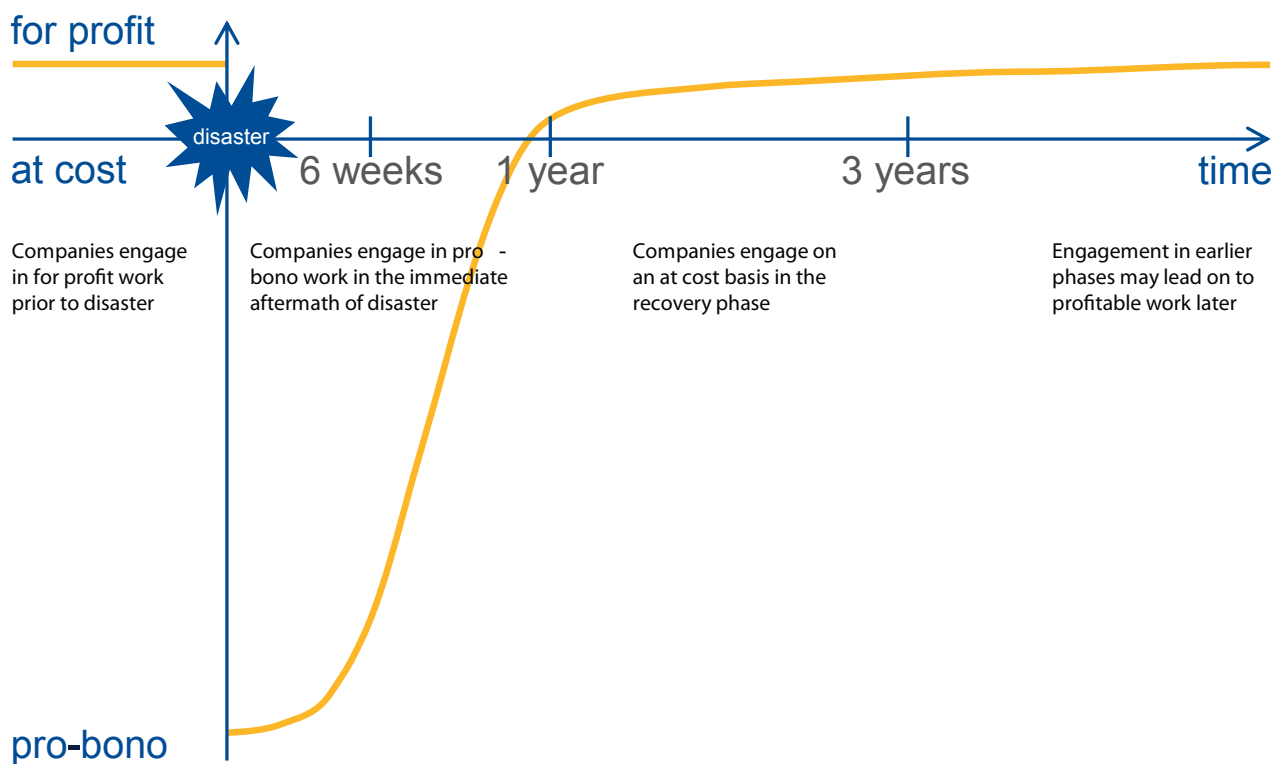
In several of the case studies global technical expertise was provided voluntarily for short-term work, with the companies covering travel expenses and a limited amount of staff time. Typical examples are missions by the Earthquake Engineering Field Investigation Team (EEFIT) to assess earthquake damage, and Arup's mission to assist Habitat for Humanity after Cyclone Sidr and the Sichuan Master Plan.

Longer term assistance is typically provided on a not-for-profit basis or funded through funding secured at a global level, such as Arup's involvement in the South Eastern University master plan and the British Earthquake Consortium for Turkey, or CH2M Hill's reconstruction of infrastructure for USAID in Sri Lanka.

A key challenge to wider engagement during relief and recovery is the inability of humanitarian agencies or governments to procure private sector expertise on anything other than a competitively tendered commercial basis. Fluor's willingness to offer assistance in rubble removal after the Haiti earthquake was not realized due to a lack of contracting capability. But companies are willing to work in partnership, recognizing the challenges in the early post-disaster stages of identifying clear scopes of work and the need for a rapid response.

The UK Department for International Development (DFID) engaged in a services agreement with Arup to provide key personnel to a UN agency post-tsunami in Sri Lanka, but this was later converted to a UN individual consultancy agreement for contractual reasons. Several humanitarian organizations have a desire for individuals from the private sector to join personnel rosters to provide surge capacity in disaster-response. However, there is an expectation that the private sector should fund the specialist training of their staff to meet the requirements of these rosters, despite the services they provide.

Figure 14: Work is undertaken by companies pro bono, at cost or for-profit at different stages of the response



Source: Arup International Development

Strength through Partnership: A New Model for Public-Private Partnership

The Engineering & Construction industry opportunity

The increased recognition of the scale and complexity of humanitarian response and the considerable interest in the role of the private sector in disaster prevention, response and reconstruction are matched by recognition of the value of expertise and capacity within the engineering and construction sector, particularly in urban situations.

Equally, there is a desire by an increasing number of private sector firms to engage proactively in humanitarian response as part of a wider corporate global citizenship agenda, which recognizes business' role in society (locally and globally) and contributes to developing corporate culture, brand reputation and employee loyalty beyond the short-term financial bottom line. This includes companies within the World Economic Forum's Engineering & Construction community. Many already engage in various ways in humanitarian assistance. Collectively, they have the potential to catalyse wider engagement of the private sector.

As illustrated in the case studies (Appendix A) and discussed in section three, the E&C community has specific assets and skills and can provide a wide range of services to humanitarian and government agencies during a disaster response. However, scaling up their activities in this area requires a more systematic approach that is proactive rather than reactive. The proposed public-private partnership model develops the ability to leverage the assets, services and engagement of the E&C community to provide a strategic humanitarian advantage after a disaster.

Particularly for the humanitarian community, including governments involved in managing humanitarian crises, the model has several benefits: it offers greater access to expertise and resources locally and around the world; increased ability to scale-up quickly; and better mechanisms for both accountability and value for money.

Through the identification of potential partners in government and humanitarian organizations, relationships can be developed before a disaster takes place, which will facilitate early and effective engagement of the E&C community in a post-disaster situation. The model also enables common mechanisms for engaging the private sector, such as pre-arranged forms of agreement.

The benefits of creating this global alliance for E&C Members include:

- Increased visibility and access to global funding networks
- International knowledge sharing and training
- The ability of a global network to build relationships and trust with governments and humanitarian agencies in a way which individual companies find challenging
- The ability to identify and prepare entry points for E&C Members into humanitarian response
- The ability to increase preparedness and raise awareness of disaster-response between organizations

The model provides an opportunity for a common language to be developed, raise awareness, share learning and engage in disaster prevention and preparedness that will further leverage the assets of the E&C community for humanitarian benefit. The partnership is also designed to create a longer term solution to address the need for the private sector to engage professionally – not just charitably – in the humanitarian field.

Vision, mission, objectives and guiding principles

Based on the opportunity and the needs of the humanitarian community, the Disaster Resource Partnership (DRP) has articulated its strategy as per the following charter.

Vision

The Disaster Resource Partnership (DRP) is an international alliance of Engineering & Construction Member companies to develop a cross-sector, professional, scalable and accountable humanitarian response to disasters that has the ability to meet growing demands to reduce suffering and save lives.

Mission

The DRP forms an ongoing collaboration with the humanitarian community at the global level and government and other key humanitarian organizations at the national level to leverage the core strengths and existing capacities of the E&C community before, during and after natural rapid-onset disasters.

Objectives

The purpose of the DRP is to:

- Support existing national networks at the country level and catalyse new national networks
- Establish partnerships and framework agreements with humanitarian organizations, donors and governments which:
 - Facilitate the engagement of national networks locally
 - Facilitate the delivery of global E&C expertise at the global and local level (in countries where national networks exist and in countries where no national network exists)
- Capture and share best practice/institutional knowledge between national networks and with humanitarian organizations and academic institutions
- Provide a focal point and voice for the E&C sector in global humanitarian coordination

Principles

Several key principles have been identified in conjunction with the vision:

- The focus will be natural rapid-onset disasters, particularly extreme major events.
- Using disaster prevention as an entry point, Members will create partnerships that can be leveraged in the event of a disaster.
- The approach to recovery and reconstruction will seek to “build back better” so as to reduce vulnerability from natural hazards in the future.
- Mobilization of construction equipment will depend on the proximity of equipment to a disaster zone and the availability of existing capacity.
- Multiple modalities of delivery are accommodated through the framework.
- The partnership of networks will be mobilized through multiple entry points through pre-formed relationships with relevant post-disaster actors.

Evolution of the Disaster Resource Network to the Disaster Resource Partnership

The DRP builds on the original concept and intent of the Disaster Resource Network (DRN), launched by the E&C Governors in response to the Gujarat earthquake in 2001. The DRP was developed through case studies of past private sector interventions, numerous workshops and interviews with key humanitarian organization actors in disasters, and continual input and interventions by the working group executives of the E&C Members and Partners steering this work since 2009.

From this analysis, the key differentiating factors on which the DRP has been designed are:

- The DRP must have a clear and focused objective; with the DRN there was concern that scope creep distracted from the original intent and core strength of what the E&C companies could provide
- All services offered by the DRP need to be demand driven by the humanitarian actors with whom DRP is partner
- Ongoing operational costs of the DRP are kept low and that there are clear resource commitments and funding
- DRP needs to be linked to the Forum for a sufficient duration of time, especially during the start-up phase; this will help develop sustainable relationships with key humanitarian actors and governments and help keep coordination costs low
- Any national network always involves and is ideally led by a deeply committed principal/owner or country executive

Key Differentiating Factors: DRN vs. DRP

| | Disaster Resource Network (DRN) | Disaster Resource Partnership (DRP) |
|---|--|--|
| <i>Mission and Scope</i> | Broad objective to engage E&C industry in disasters in a purely probono and short term basis, resulting in responses include earthquakes to supermarket fires | Specific focus on natural disasters and only where response compliments existing E&C company core assets. |
| <i>Humanitarian Community Environment</i> | Bilateral partnerships established with certain key organizations. | Clear definition of role and scope with humanitarian community partners (entry, exit, probono, at cost, etc.), enabled by an increased understanding on the role of private sector in all phases of disaster response and a clearly articulated need (pull) from the humanitarian sector for private sector partnership. |
| <i>Organization Structure</i> | Capacity for the World Economic Forum E&C sector to run initiatives not established until Industry Partnership (2007), resulting in DRN established as external entity from the beginning. | There is global and national governance that includes representatives from both the private sector and the humanitarian community. DRP secretariat will be located in the Forum offices for initial 3 years. |
| <i>Budget</i> | Significant time/focus required to raise initial budget. | Remaining DRN foundation funds (190k usd) and IP revenue will allow all secretariat costs to be absorbed by the Forum in Year 1, and significant portions of costs in Years 2 and 3. |

The global partnership model

In addition to the DRN model, the organizational architecture of the DRP builds on the precedents of other partnerships, particularly the Logistics & Transport Industry's Logistics Emergency Teams (LETs) and Public Social Private Partnerships (PSPP).

Logistics & Transport Industry's Logistics Emergency Teams (LETs)

A partnership of Forum Partner companies – Agility, TNT and UPS – LETs enable the UN to draw on private sector capabilities to provide coordinated assistance in humanitarian crises.

Their key roles are:

- Development of joint LETs that mobilize to respond to sudden-onset natural disasters and leverage different resources and competencies of each of the participating companies
- Development of industry-wide “ground rules” for logistics and transportation companies’ work in disaster response, including responsible public relations, guidelines for in-kind donations, etc.
- Development and delivery of training courses to provide volunteer employees a common understanding of the humanitarian sector and the role of the LETs
- Information and experience-sharing regarding industry participation in disaster response

LETs operate on a simpler model than the DRP as the membership is limited, and they serve the humanitarian (or civic) sector rather than including these stakeholders in their governance.

Public-Social-Private Partnerships (PSPPs)

PSPPs have been particularly successful in the health sector, where they bring different types of institutions together in an alliance with a specific social purpose to create a more formalised intersectoral partnership.

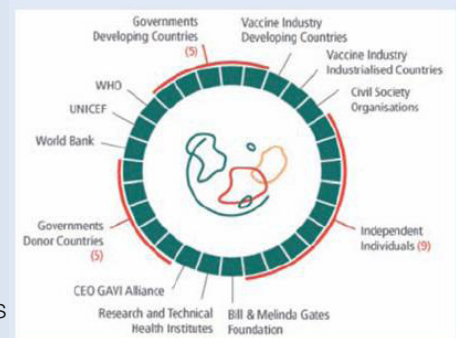
Box 1: Public-Social-Private Partnerships (PSPPs)

PSPPs provide an existing model for our global partnerships. Typically, they have the following features:

- They are used in social services
- They have a social agenda
- They have a long-term vision (financing, service, ongoing partnership)
- They comprise three partners instead of two: public and private sectors and civil society

Some PSPP examples include: Global Alliance for Vaccine Innovation (GAVI), The Global Fund and the Malaria Vaccine Initiative (MVI). Most of these models are from the health sector and frequently the role of the private sector is that of donor. The TB Alliance and EQUAL are examples of partnerships that involve the private sector as partners for their expertise and not just financial resources.

The Global Alliance for Vaccine Innovation (GAVI)



From the case study analysis of the response by E&C companies to natural disasters in the past, four modalities for delivery have been identified: direct action, secondment, local technical services, and global technical services. This provides a framework to guide E&C companies in responding to different scenarios depending on their proximity, assets and expertise.

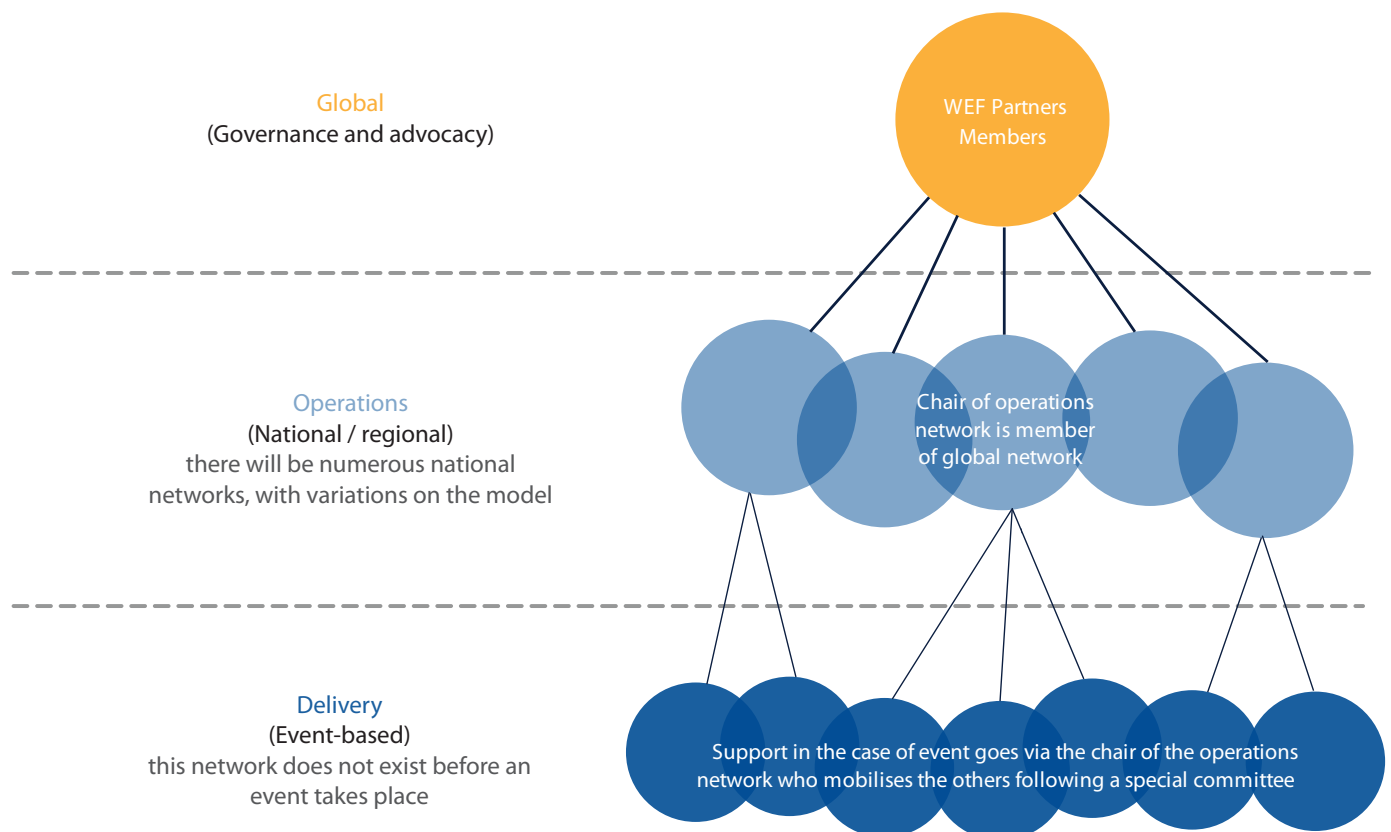
To best leverage the E&C response, the following organizational structure is proposed. It is intended to allow activities of individual organizations to be facilitated through engagement in national/regional networks connected through and supported by a global partnership of E&C community members.

Partnership structure

The organizational structure comprises three levels of relationships: delivery (event-specific), operational (regional/national) and global. At the delivery level, event-specific alliances form in order to respond to each event. As each disaster occurs in a different location and has different characteristics, the alliance at the delivery level will be different for every disaster depending on the need for E&C DRP Members' assets and expertise and their relative proximity to the disaster. The operations level can be national or regional depending on the susceptibility for natural disasters in a country/region and the number of E&C DRP Members active in the area. This level includes E&C DRP Members, national/local governments, disaster management authorities and humanitarian and development organizations.

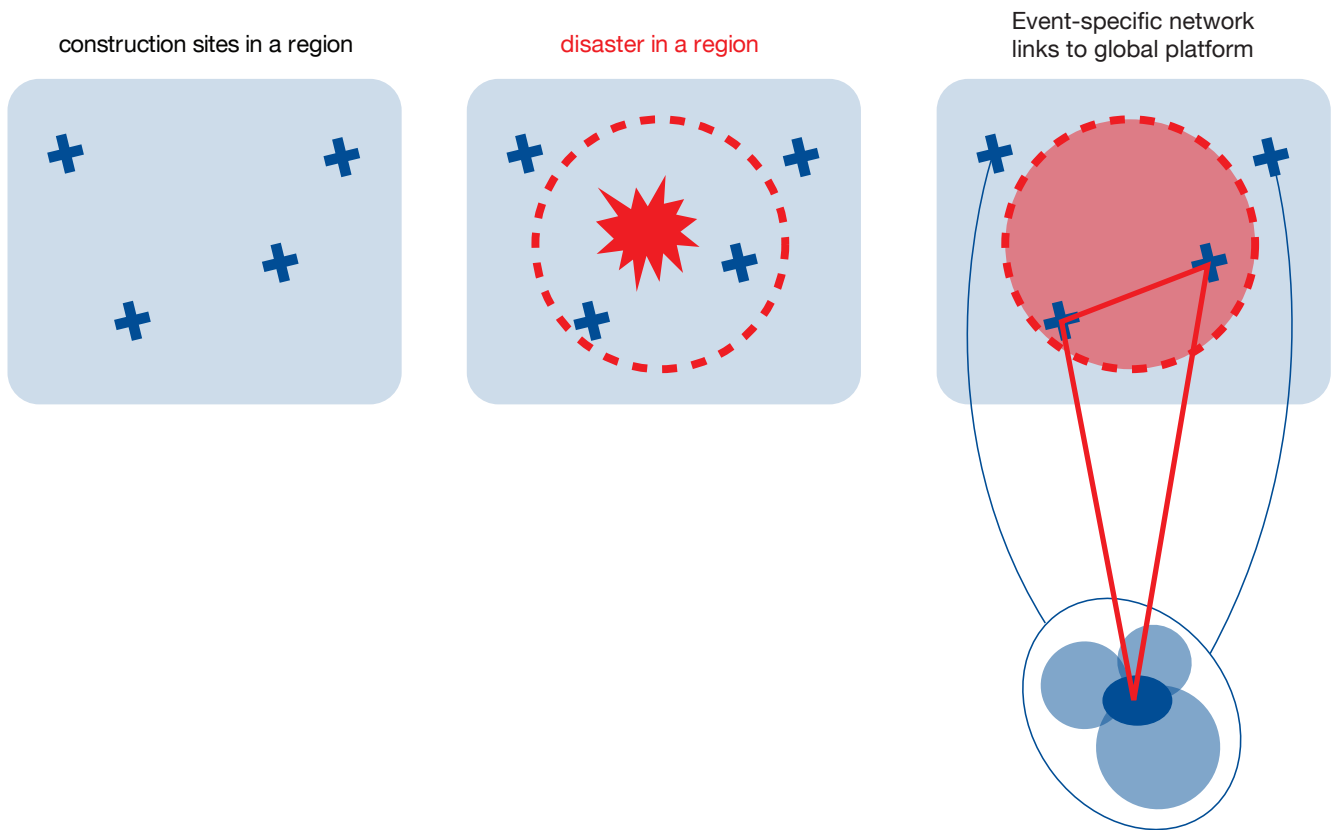
It is proposed that there will be several national/regional networks each with a variation on a standard network model. At the global level, a partnership is proposed between E&C DRP Members and global humanitarian organizations. Key actors within the DRP at the global level are the chairs of each of the regional/national operational networks that ensure coordination with the secretariat.

Figure 15: Levels of organizational structure



Source: Arup International Development

Figure 16: Network engagement following a disaster

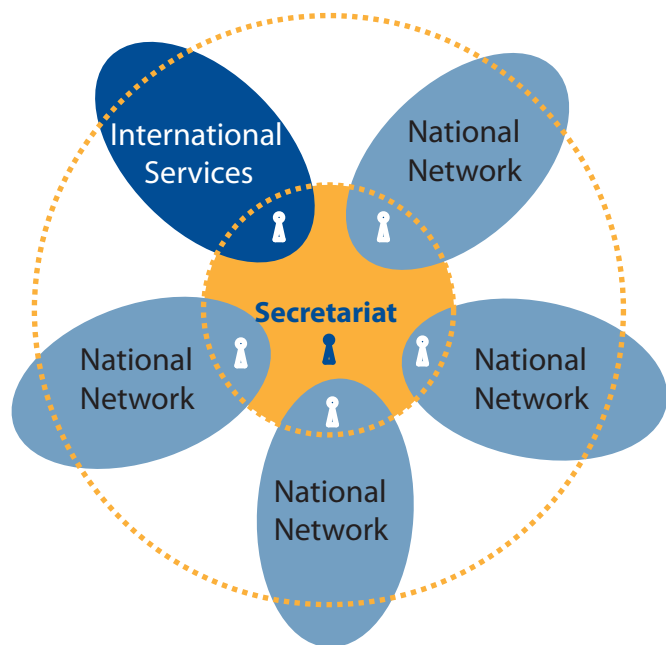


Source: Arup International Development

Scope of activities

There are two key components of the DRP: Networks – both national and international – and the secretariat. These networks provide services to organizations external to the DRP, while the secretariat manages the functions that sustain the DRP.

Figure 17: Relationship of key DRP components



Source: Arup International Development

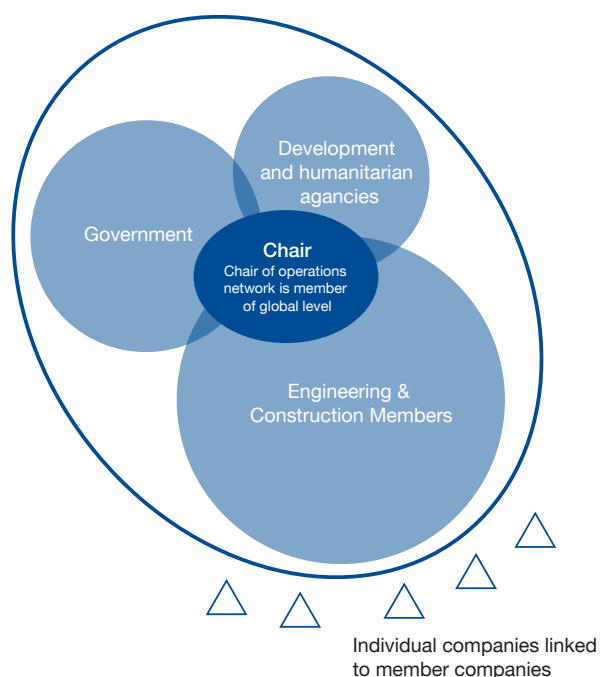
The networks are either driven by local or international geographies. The E&C community will support the DRP with assets and skills relevant to core E&C expertise and physical resources. Response can be provided locally to enhance and build local capacity, or globally (in particular, services) where local capacity does not exist. The DRP can also add value at the global level through advocacy and expertise to international policies and guidelines, which will serve the dual role of developing relationships and trust with the humanitarian community.

National networks

The national networks are the drivers of the DRP (there are two networks already active as part of the DRN: India and Mexico). In many locations, the response to a disaster will be dependent on local national actors who have existing relationships, systems and frameworks that enable them to respond. A key factor for the establishment and ongoing effectiveness of a national network will be the commitment and engagement of the principal or country executive from one or several of the E&C companies involved.

The principal, or an executive delegated by the principal, would serve as the National Network chair to provide overall coordination. The chair would also formally be part of the secretariat for coordination at the global level and with other National Networks. As seen from the examples (see Boxes 2 and 3), the detailed set-up and operations of the National Networks is intended to be flexible in order to respond to the local contexts.

Figure 18: National network model



Source: Arup International Development

Box 2: Disaster Resource Network, India

DRN India was established in November 2002 and is coordinated by Hindustan Construction Company (HCC). HCC CEO Ajit Gulabchand is the Chairman of the Indian DRN and sits on the Board of Directors of DRN Global. DRN India is associated with CFI (Construction Federation of India) and has undertaken many rescue and relief operations in the past seven years. DRN India has two areas of operation – providing training and increasing the capacity of the E&C community to respond to disaster situations, and creating an organizational structure and emergency management plan to respond to emergency situations.

DRN India has a partnership with Registered Engineers in Disaster Relief (RedR) India, an organization that provides disaster response training and facilitates the secondment of engineers to humanitarian organizations in post-disaster situations. As coordinator of DRN India, HCC has incorporated DRN activities at all levels of its company structure.

The HCC Group consists of several companies covering project management, infrastructure, horticulture and other activities. At group level there is one person whose full-time job is the management of the DRN. The DRN manager is supported by several people who spend 25% of their time on DRN activities. At each project site there are people who have DRN as part of their job description; they spend 15% of their time on DRN activities, including designing training, forming networks and building relationships at the district level.

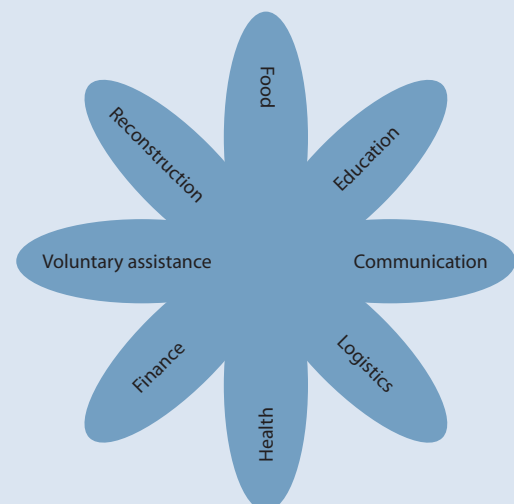
At an operational level the national networks are characterized by their ability to provide services in the form of direct action, assets and local technical expertise within a certain radius of a disaster. They can also use the network to import international expertise services from the partnership.

Box 3: Unidos por Ellos, Mexico

Unidos por Ellos was founded in 1998. It has since developed into a national network of approximately 50 companies, foundations and universities that provide post-disaster assistance (logistics, information management, medical assistance and damage assessments) in Mexico and abroad. Their response is considered in two phases – relief and subsequently reconstruction.

Unidos por Ellos is coordinated by Robert Delgado from Anahuac University and his team, overseeing eight committees – health, financial, logistics, communication, food, education, reconstruction and voluntary assistance – which form clusters to bring together and coordinate the response of member organizations.

Grupo Marhnos participates in the reconstruction committee of Unidos por Ellos, working with national governments, state governments and municipal authorities to reconstruct houses for affected communities. The reconstruction committee assesses the needs of the affected population, establishes selection criteria, selects families eligible for assistance, identifies land for relocation sites, appoints a project leader from within Unidos por Ellos, and oversees the construction of new houses.



Through coordination with government and key local humanitarian actors, typical services expected from a national network could include the following:

| Pre-disaster | Post-disaster (72 hours – 2 weeks) | Relief (2-12 weeks) | Recovery (12 weeks – 3 years) |
|---|--|---|---|
| Developing and undertaking training provided by partner organizations Developing disaster response/ contingency plans Community-based disaster risk reduction Programmes around project sites (mapping hazards and critical infrastructure, developing response plans) | Temporary repairs to critical infrastructure Providing emergency shelter Acting as engineering first responder Strategic technical assistance (e.g. advice on rubble clearance) | Temporary repairs to critical infrastructure Providing emergency shelter Secondments (staff) Needs assessment (leads to implementing programmes) | Building permanent housing (through company fundraising/CSR programmes) Implementing recovery programmes |
| Ongoing <ul style="list-style-type: none"> • Building relationships • Strategic technical expertise to inform decision-making • Attending fora/coordination mechanisms • Acting as an “honest partner” • Project management | | | |
| What it does not do <ul style="list-style-type: none"> • Develop or advocate for appropriate building codes/standards (should be global level) • Distribute food, water, medical supplies and non-food items | | | |

International services

The international services network of the DRP is made up of E&C companies that are interested and willing to provide resources on a global support basis. This support would be provided typically to countries where a national network does not exist; it could also be in response to a call for help from a national network. The interventions move geographically according to project needs and are usually service based.

The international services network will operate by forming long-term relationships and developing pre-designed processes with the humanitarian community at the global level.

Key UN humanitarian organizations and cluster leads have already confirmed the need for services from such a network and their willingness to develop global partnerships in the following areas:

- Emergency response shelter services, in partnership with the shelter cluster-lead International Federation of the Red Cross
- Emergency response early recovery services with the early recovery cluster-lead UNDP Bureau for Crisis Prevention and Recovery

- Prevention/risk reduction activities with the UN International Strategy for Disaster Reduction and on a local level (where international companies have a local interest to engage) with national disaster risk reduction platforms
- Emergency shelter technical advisory support, in partnership with the UN High Commission for Refugees

Many of these services related to emergency relief will require special training of engineers with specific experience levels who would then be expected to respond to calls for action with clearly specified duration and cost conditions (e.g. pro bono, at cost).

Governance architecture

The governance of the DRP is led by two internal bodies: the secretariat, which has responsibility over day-to-day operations of the partnership, and consists of one full-time senior project manager and part-time, virtual representatives from the chairs of the national networks and international services network; and the board, which is responsible for steering the organization, and is represented by the World Economic Forum's E&C community and Humanitarian community.

The Board's governance function must first establish the purpose of the DRP set out in the vision and objectives. It must also have the capacity to manage the changes required by the DRP as the external or internal environments change and as the DRP learns from experience. This includes the management of strategic risks. The DRP has a responsibility to be clear about what constitutes ethical behaviour. As the private sector and humanitarian community operate by different norms of conduct, a common code must be agreed upon.³² To fulfil the governance function, the role needs to be representative of the key stakeholders involved in the DRP.

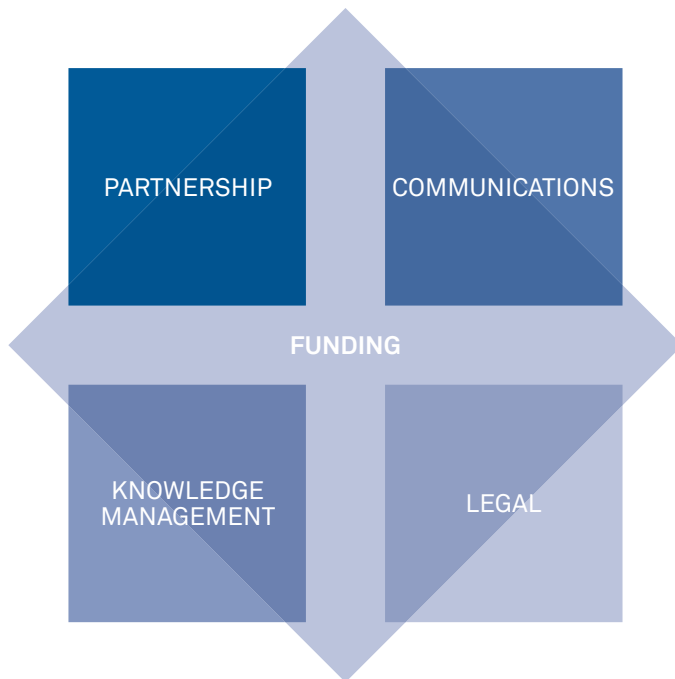
DRP secretariat

The DRP secretariat provides overall coordination and global support to the national and international services networks. The secretariat:

- Supports existing national networks and catalyses new ones
- Establishes partnerships and framework agreements with humanitarian organizations, donors and governments
- Provides a voice for the DRP in existing humanitarian coordination mechanisms/fora
- Captures and shares best practice/institutional knowledge between national networks and the private sector, humanitarian organizations and academic institutions
- Provides quality assurance and ethical standards through mutual review/collaboration
- Defines and coordinates needs with capacities
- Develops and implements a communication strategy
- Provides a mechanism to address liability/insurance issues
- Coordinates resource needs to keep the DRP secretariat operational
- Coordinates common training requirements to tailor to DRP trainees and needs of DRP companies

32 *Principles for private sector engagement already exist and should form the base of any agreement.*

Figure 19: DRP secretariat functions



The secretariat has five main functions: partnerships, communications, knowledge management, legal and funding.

Partnerships

Creating and maintaining partnerships with external organizations is one of the most important functions of the DRP and the secretariat; they enable the DRP to share knowledge and scale up capacity. Partnerships are between different types of organizations: clients (humanitarian actors, governments and donors), resources (other members of the E&C community), and professional associations, including the Royal Institution of Chartered Surveyors (RICS), RedR and the Institution of Civil Engineers. The next priority will be to engage CEOs from within the E&C community and expand the member base. Regular partnering activities need to take place with the humanitarian community and bilateral donors.

Communications

There are four key areas of focus for communications:

- Supporting advocacy and marketing to the Humanitarian community, governments and donors
- Sharing knowledge with the networks, E&C community and wider Forum audience
- Raising public awareness
- Promoting and maintaining a common language between stakeholders

The term of the private sector, humanitarian sector, and operational representative Board seat is envisaged to be initially one year with staggered terms so that not all Board members are replaced at the same time.

Knowledge management

Input from working group and national network representatives identified the importance of the knowledge management function in both attracting and keeping members in the network. This will include elements of sharing best practice, training, providing a database and contacts directory. The DRP must have a platform for network members, which provides access to case studies and an E&C resource database.

Legal

The DRP secretariat provides a mechanism to address liability and insurance. To operate efficiently, several legal provisions will need to be considered, including insurances at both the employee and company level. The secretariat can provide some guidance in this area. The potential for value-add by the secretariat, however, will be in consideration of Memorandum of Understandings and pre-arranged contracts and national-level agreements. This will be critical for speed of response in a disaster (and resources) and also to manage the different commercial and legal environments.

Funding

Funding will cover the cost of providing the secretariat's functions. The DRP secretariat manages the day-to-day budget and the annual budgeting process, and is responsible for informing the Board of any resource needs.

Source: Arup International Development

Figure 20: Representative community board membership

DPR board

The role of the DPR board is to set the vision and objectives, manage change at a strategic level, maintain agreed ethical standards and monitor overall performance against the DPR's objectives.

The composition of the board is proposed as:

- One representative (ideally CEO level) from the Forum E&C Industry Partners community
- Two senior-level representative from the World Economic Forum
- Two representatives from the Humanitarian community (possibly selected from the initial cluster focus areas)
- Two operational representatives drawn from the chairs of the national networks and international services network.

The term of the private sector, humanitarian sector, and operational representative board seat is envisaged to be initially one year with staggered terms so that not all board members are replaced at the same time.

Role of the World Economic Forum

In the role of incubator, the World Economic Forum will house the DPR secretariat for an initial period of three years. During this period, a full-time project manager position will be created to manage the scaling up and day-to-day operations of the secretariat. The Forum, through the project manager, will foster relationships with the humanitarian community and support the development of Memorandum of Understanding with relevant and interested humanitarian agencies. The Forum will also be responsible for bringing in more companies with the aim of starting new National Networks, growing existing national networks and developing the international services network capabilities.

As start-up capital for the secretariat, the Forum will apply funds available through the DRN. While the incubation period is intended to be limited to the initial three years, a key objective for the Forum, and a significant scope of their work, will be to ensure that the DPR is viable as an independent entity beyond that period.

Next steps

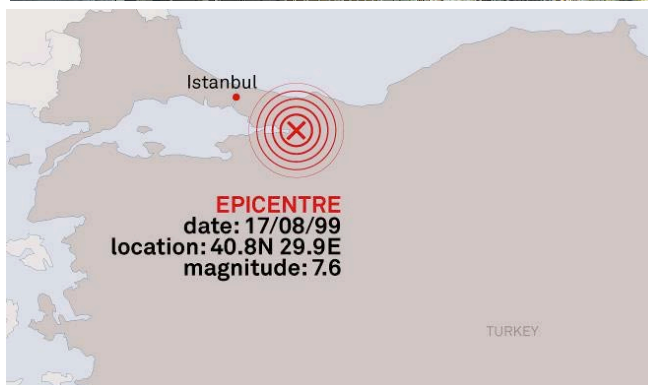
This report has been complemented with the development of a preliminary operating model and budget for the DPR. These materials will serve as a basis for the development of operating partnerships between E&C companies, governments and the humanitarian community to begin the DPR pilot implementation.



Source: Arup International Development

Appendix A – Case Studies

1999: Arup's response to the Turkey earthquake



Local and global technical services through both Arup's local office and their global network.

At 3.00 on the 17 August 1999 a 7.4-magnitude earthquake struck the north-west of Turkey. Although only lasting for 45 seconds, damage spread over seven provinces and affected several cities in this densely populated area. Three months later, on 12 November, a second 7.2-magnitude earthquake occurred 112 km east of the first. Although causing less damage than the first earthquake, two towns were completely levelled and nearly 1,000 people were killed. In total, the two earthquakes killed over 19,000 people and displaced 500,000; over 210,000 houses were damaged or destroyed and direct overall losses were estimated at US\$ 20 billion.

Arup had an office in Istanbul at the time of the earthquake and Arup offices around the world were quick to respond to the disaster.

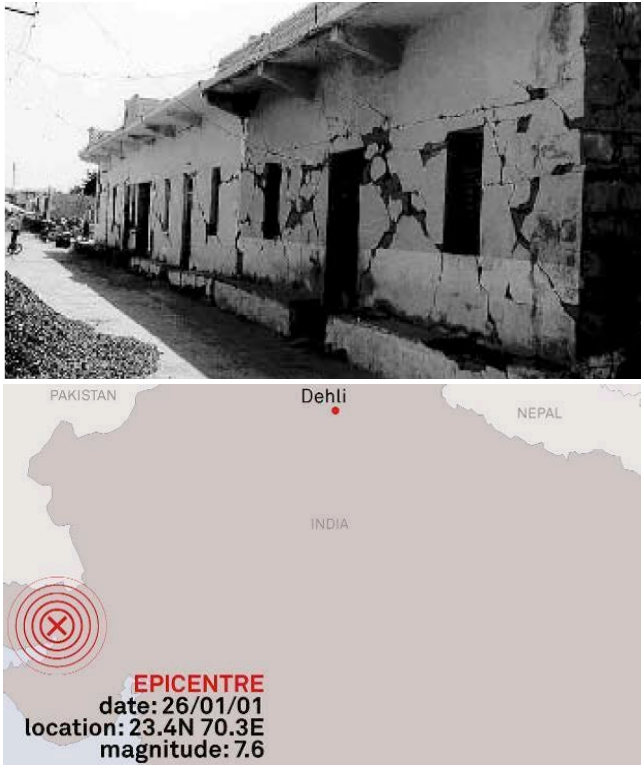
Relief: In the immediate aftermath of the disaster staff fundraising around the world raised over US \$8,000, which was donated to a Turkish education charity. Arup also provided temporary housing for staff that lost their homes.

Recovery: Arup's Istanbul office seconded engineers to Bosphorus University for several weeks on a pro bono basis to complete visual damage assessment of affected buildings. Arup also partnered with the Yapi Merkezi Group (a local contractor) and a Turkish education NGO to reconstruct schools and accommodations; Arup provided local technical services on a pro bono basis while the contractor donated materials, equipment and manpower.

Reconstruction: In the first month after the disaster the British government offered the Turkish government global technical services to help rebuild devastated areas. On 15 February 2000, the two governments signed a bilateral agreement establishing the British Earthquake Consortium for Turkey (BECT). This was a consortium of six British companies with interests in Turkey. Their aim was to produce a reconstruction implementation plan for Yalova Province, an area which had been significantly damaged in the earthquake but had received little international assistance. Funding for the work came from the individual companies and from the British Department of the Environment, Transport and the Regions.

Over six months, multidisciplinary teams from Arup's London, Istanbul, Leeds, Hong Kong and Sydney offices, worked together with other members of the BECT consortium to develop a reconstruction framework and identify key projects to catalyse reconstruction of the province. The final report was presented to the Turkish government on 16 August 2000 and the projects were confirmed in an intergovernmental Memorandum of Understanding signed on 9 September 2000. Unfortunately, the Turkish economy faltered in late February 2001 and few of these projects were realized as planned.

2001: Arup's response to the Gujarat earthquake, India



Global technical assistance provided on a pro bono basis.

At 8.45 on 26 January 2001 a 7.7-magnitude earthquake hit Indian state of Gujarat, affecting 24 districts, of which Kutch, Surendranagar and Radhanpur were the worst affected. The epicentre was located 220 km west of Ahmanabad (India), 290 km south-east of Hyderabad (Pakistan) and just north of Bhachau, a town of 60,000 people. This was the strongest earthquake in this part of India for almost 200 years. In cities such as Bhuj, almost 90% of all buildings were destroyed. Fatalities exceeded 17,000 while 500,000 people were displaced. More than 145,000 houses were damaged or destroyed and direct overall losses were estimated at US\$ 4.5 billion.

Although Arup did not have an office in India at the time of the earthquake several staff members were from Gujarat and they were highly motivated to provide assistance.

Reconstruction: Arup is a corporate member of the Earthquake Engineering Field Investigation Team (EEFIT), a partnership between universities and industry, which seeks to improve the seismic resistance of buildings in earthquake prone countries. After major earthquakes, EEFIT conducts a field investigation and reports to the local and international community on the performance of buildings and infrastructure. Two weeks after the earthquake an EEFIT mission went to Gujarat; one of Arup's Gujarati engineers was part of this mission. EEFIT found that although Gujarati building codes were generally adequate for seismic conditions, buildings were often not built in accordance with the codes.

Arup's engineer realized the need to develop a guide for repair and reconstruction work in seismic areas that was easily accessible to local builders, homeowners, consultants, local authorities and relief agencies. He also understood that this was needed very quickly to take advantage of the window of opportunity after a disaster where people are willing to change the way they build. With two other Arup engineers from the Shree Kutch Leva Patel Community (SKLPC), he formed the Gujarat Relief Engineering Advice Team (GREAT). Over the next three months, the team worked on a pro bono basis at evenings and weekends to develop the *Repair and Strengthening Guide for Earthquake Damaged in Low-rise Domestic Buildings in Gujarat, India*. This was published in June 2001 and forwarded to the Gujarat State Disaster Management Agency (GSDMA) and other organizations in India.

The GSDMA invited the GREAT team to train their engineers and field staff (over 700 people) for three weeks in late 2001. Arup provided US \$7,200 of funding for printing the publication and distributing it in the field. The publication was well received by GSDMA and many communities incorporated the recommendations into their repair and reconstruction. The publication was made freely available on Arup's website and has been used in several subsequent earthquakes around the world, more recently in the South Asia earthquake in 2005.

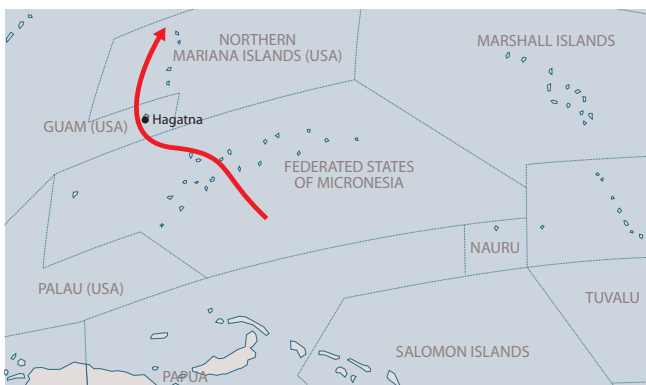
2002: AMEC's response to Typhoon Pongsona, Guam



Global technical services provided to facilitate rapid recovery at Anderson Air Base.

Typhoon Pongsona passed through Guam and the Northern Marianas Islands on 2 December 2002. Its strong winds left the entire island of Guam without power and destroyed about 1,300 houses, leaving 3,467 people homeless. There were no fatalities directly related to Pongsona, but damage on the island totalled over US\$ 730 million.

Prior to Typhoon Pongsona, AMEC had no presence in Guam. However, as a US territory, AMEC was able to offer immediate assistance since it has offices throughout the US.

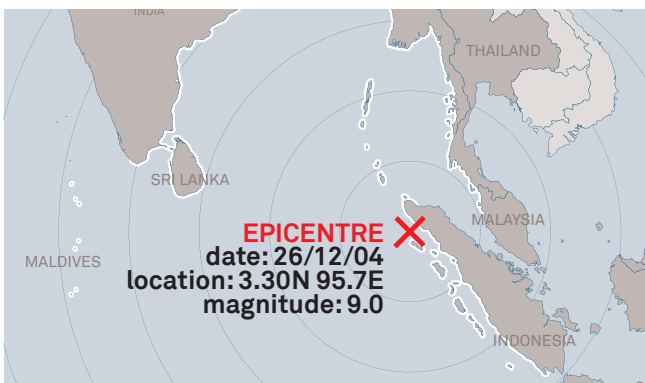


Recovery and Reconstruction: Following an initial damage assessment by the US military in the immediate aftermath of Typhoon Pongsona to ascertain the scope of work, AMEC was contracted through the military's Environmental Remediation and Construction Contract (ENRAC) to provide global technical services for the Andersen Air Force Base on the US territory of Guam.

AMEC deployed a team of 10 engineers, working 12-14 hours a day, to survey 30 buildings in less than 10 days. AMEC personnel were responsible for the design and construction of 13 km of electrical distribution lines from sub-stations to the Andersen Air Force Base, and the design and installation of 30 new generators with enclosure buildings and new storage tanks on base, along with all associated site and roadway improvements.

To address the unique considerations of Guam's remote location and limited construction resources, AMEC tailored their management strategies to respond rapidly and efficiently. The company's financial resources, previous experience and contacts allowed the AMEC team to purchase and supply generators, automatic transfer switches and ConVault aboveground storage tanks directly from the manufacturer, which proved to be cost effective with a minimum lead in time. All other equipment and materials were supplied by subcontractors. The initial contract focused repairing damage to the base caused by the typhoon, but it led to three-year programme of work with a total budget of US\$ 74.2 million.

2004: CH2M Hill's response to the Indian Ocean Tsunami



Secondments and global technical services to support humanitarian and development organizations in relief, reconstruction and prevention.

A 9.3-magnitude earthquake 160 km off the western coast of northern Sumatra caused the single worst tsunami in world history. A UN estimate put the human loss at 229,866 people – 186,983 dead and 42,883 missing. While most that perished were native to impacted countries, approximately 9,000 were foreign tourists. Indonesia, Sri Lanka and Thailand were the hardest hit countries. More than 1.5 million people were displaced, including more than 500,000 in Indonesia, 520,000 in Sri Lanka and 650,000 in India.

CH2M Hill had offices in Thailand, India, Malaysia and Singapore at the time of the tsunami with about 325 staff working on a range of projects; CH2M Hill's Asia Pacific Vice-President was on holiday in Thailand at the time of the tsunami. CH2M Hill employees responded immediately to the disaster through global fundraising and mobilized staff from around the world, including setting up a regional response office in Singapore to support project staff on assignment. The firm established country-specific teams for Indonesia and Sri Lanka to focus strategy and resource deployment efforts.

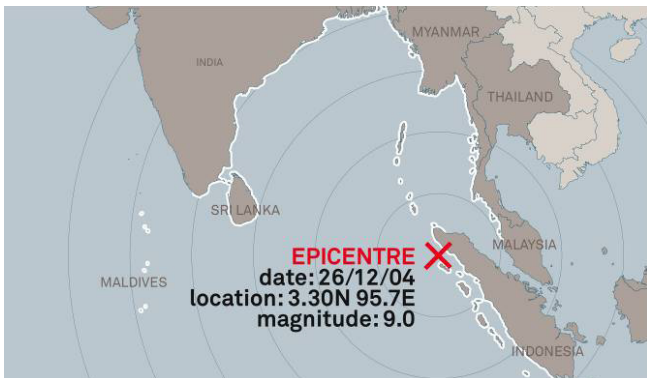
Relief: CH2M Hill launched a large-scale response to the tsunami relief effort with their employees by providing support to various relief agencies, including the International Red Cross, UNICEF, World Vision, AmeriCares, Mercy Corps and Save the Children. An internal fundraising appeal raised over US\$ 80,000 to support the relief efforts. Overall, the firm's in-kind and financial contributions were valued at US\$ 637,000. In addition, CH2M Hill partnered with GE to set up a water treatment plant in Banda Aceh, Indonesia, with the capacity to treat approximately 1.5 million litres of water per day; sufficient to provide safe drinking water to a large proportion of the population. CH2M Hill professionals from the firm's Operations & Maintenance Business Group worked with the Indonesian government to train local operators to take ownership of the longer term operation of the treatment plant. A similar water treatment system was also set up in Potuvil, Sri Lanka.

Recovery and reconstruction: In September 2005, CH2M Hill was contracted to provide global technical services for USAID in Sri Lanka as part of their tsunami reconstruction programme. Initially, five CH2M Hill personnel were deployed with an additional nine long-term and 11 short-term personnel sent out over 39 months. Through local partners CH2M Hill hired 70 full-time local staff for consulting, design and construction management services; during the peak of the construction efforts over 1,500 local staff were employed. Infrastructure rehabilitation was covered in four core areas: roads/bridges; nine vocational training schools; three fishery harbours, which covered 22,000 fishermen; and a water supply and treatment plant for a population of 40,000 people. In total, 14 major projects were completed along Sri Lanka's eastern and southern coastlines. Detailed activities included: damage assessment, planning, design and engineering, cost estimating and schedule control, environmental investigation/design, competitive contract/procurement tendering and management, educational training of teachers, and commodity procurement and debris removal. Soft components of community participation and government capacity strengthening were supported by a subcontractor, Chemonics.

In the Maldives, CH2M Hill was also awarded a contract by USAID to provide two sea water reverse osmosis water treatment and supply facilities on two remote islands, Naifaru and Hinnavaru, over a 24-month period. Several educational health-related tasks were undertaken to enhance the health and water habits of the local population.

Prevention: CH2M Hill provided coastal zone management for USAID for a variety of coastal developments and harbour plans based on tsunami areas. The work was conducted within a participatory consultation approach to gain community endorsement and consent along with long-term capacity building.

2004: Arup's response to the Indian Ocean Tsunami



Secondments in the relief and recovery phases followed by global technical expertise in reconstruction.

At 7.58 on 26 December 2004 a 9.0-magnitude earthquake struck the western coast of the island of Sumatra in Indonesia. The earthquake generated a tsunami up to 10 metres high and spread across the Indian Ocean, eventually affecting thousands of kilometres of coastline in 13 countries. In addition to the huge loss of life, communities lost their livelihoods and infrastructure and community services were destroyed. More than 275,000 people died in the tsunami and more than 2 million were displaced; 400,000 houses were destroyed and losses were estimated at US\$ 10 billion.

The countries worst affected were Indonesia, Thailand, Sri Lanka, India and the Maldives. Although Arup had several offices within the region at the time of the tsunami, their office in Bangkok was their only physical presence in these countries. However, the scale of the disaster captured global attention and Arup offices around the world were quick to respond.

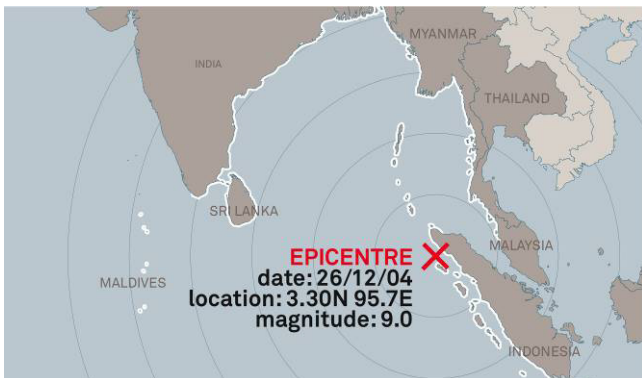
Relief: In the immediate aftermath of the tsunami, Arup raised over US \$370,000 through corporate donation and staff fundraising matched by the firm. Two staff members undertook secondments in the relief phase, one to assist Medecins sans Frontieres with logistics and another to provide water and sanitation engineering to IDP camps through GOAL.

Recovery: Throughout 2005, 33 months of in-kind contribution were supplied by Arup staff. Secondments to several different humanitarian agencies were undertaken on both a pro bono and not-for-profit basis for several partner organizations, including UNHCR, GOAL, Habitat for Humanity and Mercy Corps.

Reconstruction: An urban designer from Arup's Sydney office undertook a three month pro bono secondment to assist in the development of an Urban Design Framework (UDF) for the tsunami-affected communities of Hambantota and Siribopura as part of the Tsunami Reconstruction Planning Support Project (TRPSP) in Sri Lanka. The UDF established a vision for the design and development of the communities and was used as a guide for development, based upon local needs and aspirations, as well as a tool in the development assessment of both local and international projects.

Following Arup's engagement in the relief and recovery phases on a pro bono or not-for-profit basis, several paid commissions followed in the reconstruction phase. Arup provided global technical services to the British Council/Sri Lanka University Grants Committee in the form of strategic advice and technical expertise for the South Eastern University of Sri Lanka project. Several missions to Aceh, Indonesia, were also completed to technically review reconstruction programmes by Muslim Aid, Canadian Red Cross, Care International UK and the Disasters Emergency Committee.

2004: Halcrow's response to the Indian Ocean Tsunami



Direct action followed by local technical services provided through Halcrow's local offices.

At 07.58 on 26 December 2004 a 9.0-magnitude earthquake occurred off the western coast of the island of Sumatra in Indonesia. The earthquake generated a tsunami up to 10 metres high and spread across the Indian Ocean, eventually affecting thousands of kilometres of coastline in 13 countries. In addition to the huge loss of life, communities lost their livelihoods and infrastructure and community services were destroyed. More than 275,000 people died in the tsunami and more than 2 million were displaced; 400,000 houses were destroyed and losses were estimated at US\$ 10 billion.

The countries worst affected were Indonesia, Thailand, Sri Lanka, India and the Maldives. Halcrow had offices in Colombo, Sri Lanka, and Banda Aceh, Indonesia, in addition to their global network. Thus, they were able to react directly in the affected areas while undertaking fundraising and providing technical assistance globally.

Relief: Halcrow held an internal fundraising appeal, matching funds raised by staff, and raising over US \$149,000 in total. They simultaneously established the Halcrow Foundation, providing a mechanism through which funds could be spent directly on the ground, ensuring every penny was spent helping people and utilizing Halcrow's local knowledge and expertise in both countries.

One of the cities worst affected by the tsunami was Banda Aceh in Indonesia. Halcrow's local office was able to engage in direct action to identify and assist families that needed help and donated their office space to Oxfam. Employees of the Northern Sumatra Irrigated Agriculture Project in Indonesia, which was led by Halcrow, received emergency cash payments within weeks of the tsunami and school uniforms and equipment were provided for over 100 children living in IDP camps.

Recovery and reconstruction: Teams from Halcrow's local offices worked in partnership with affected communities and local organizations to provide local technical services in identifying, implementing and monitoring projects. In Aceh, a fishing trawler was provided for the Lampuloh community and financial support (£8,000) was provided for the repair and reconstruction of 15 homes belonging to Halcrow project staff members.

In Sri Lanka, 29 houses were built for families who lost their homes in Galle, a fishing boat was provided for a group of fishermen and a pre-school was built for Thalaiyady Village in Jaffna. The materials and labour for all of these projects were funded from the money raised in the relief phase, channelled through the Halcrow Foundation or from other funding sources identified at a global level. Local staff volunteered their personal time and Halcrow supported them in working hours where necessary.

2005: CH2M Hill's response to Hurricane Katrina, USA



Local technical services during recovery and reconstruction provided through a direct contract with government body.

Hurricane Katrina formed over the Bahamas and hit south-east Louisiana as a Category 3 storm on the morning of 29 August 2005, causing severe destruction along the US Gulf Coast from central Florida to Texas. At least 1,836 people are thought to have died and approximately 1 million displaced from their homes.

At the time of the disaster, CH2M Hill had 19,000 staff in the US, including 3,000 engineers and 100 architects; more than 50 engineers and architects were located throughout Alabama, Louisiana, and Mississippi. The Alabama office was collocated with FEMA offices for Alabama. Within days, CH2M Hill was supporting recovery efforts through the FEMA Individual Assistance-Technical Assistance Contract and several contracts with the US Army Corps of Engineers.

Recovery: Nearly 130 quality assurance and quality control inspectors were deployed to Louisiana within 48 hours of CH2M Hill receiving the contract for the US Army Corps of Engineers (USACE) debris removal programme in Louisiana to provide local technical services. CH2M Hill worked with local subcontractors as well as local, state, and federal offices and agencies to remove debris, such as collecting and recycling damaged “white goods” (e.g. washers, dryers, refrigerator units and freezers) and removing potentially dangerous vegetation. Quality assurance inspectors also worked in south-eastern Louisiana providing supervision of the blue roof programme, which provided temporary blue tarps for damaged roofs.

In the six months after the disaster, CH2M Hill deployed 26 staff (six within the first 48 hours) to support the FEMA-directed USACE Critical Public Facility Mission, a US\$ 13 million project funded through FEMA's Public Assistance – Technical Assistance Contract. CH2M Hill installed 395 pre-fabricated public buildings in 35 locations in southern Mississippi for use as local government offices, fire stations, schools, police stations and judicial offices; performed 30,000 private site assessments; constructed 13 community sites for 1,300 temporary housing units; and installed a combination of more than 24,000 trailers, park models and manufactured temporary housing on private sites in affected areas. CH2M HILL staff also completed pre-inspections, ongoing inspections and post-installation inspections and maintenance operations.

In addition, CH2M HILL worked with the US Air Force and Defence Logistics Agency to support Gulf Coast military bases with recovery and rebuilding. The company also worked with the Mississippi Emergency Management Agency, National Aeronautics and Space Administration (NASA) Stennis Space Centre, state and local departments of health, the City of New Orleans Public Works and the Sewer and Water Board, and various state and local government agencies throughout Alabama, Louisiana and Mississippi.

Reconstruction: In 2008, the Mississippi Development Authority (MDA) contracted CH2M HILL to provide local technical services and serve as programme manager for the US\$ 600 million Port of Gulfport Restoration Program (PGRP). CH2M HILL worked with the MDA to provide a review of existing master development plans for the port, create a 10-year work plan, identify alternatives to maximize long-term economic impact for the local community and the state, and develop a programmatic approach to implement the ongoing restoration programme. The restoration of the port is crucial to the economy and long-term recovery of the State of Mississippi as well as to the US Gulf Coast region.

2005: Fluor's response to Hurricane Katrina, USA



Local technical services funded through an existing cost plus fee contract with government agency.

Hurricane Katrina formed over the Bahamas and hit south-east Louisiana as a Category 3 storm on the morning of 29 August 2005, causing severe destruction along the US Gulf Coast from central Florida to Texas. At least 1,836 people are thought to have died and approximately 1 million displaced from their homes.

At the time of the disaster, Fluor had more than 13,000 employees in the US working on hundreds of projects. Fluor had been a contractor for the Federal Emergency Management Agency (FEMA) since 1997 and had a dedicated disaster response procedure prearranged. This enabled Fluor's FEMA operations centre in Greenville, South Carolina, to respond before Katrina even made landfall. Within one day of the disaster Fluor had 20 employees involved in the response. Within 30 days there were 480 Fluor employees and 568 sub-personnel involved. Within 61-90 days there were 1,410 Fluor employees and 2,190 sub-personnel responding to this disaster.

Recovery: Under a FEMA Individual Assistance contract, Fluor provided local technical services and installed over 54,000 temporary units to house approximately 160,000 displaced people in Louisiana. In addition to the temporary housing, they undertook site assessments, maintenance, group site design and construction, technical support, facility management, and staffing support to FEMA field offices and headquarters. The project staff consisted of 4,500 personnel and the installation workforce was 93% local or new hires. Fluor worked with local subcontractors and local government agencies as well as FEMA to obtain cooperation and permit compliance for temporary housing work. The equipment used in this effort included trucks to move temporary housing units and other construction equipment for grading of group sites and installation of housing units. The activities on this disaster relief effort were financed under a pre-existing cost plus fee contract with FEMA, which enabled Fluor to respond quickly in the event a disaster occurred anywhere in the US or its territories.

In response to the Katrina disaster, Fluor's management made a corporate commitment to the relief efforts, leveraging capabilities from all of their business groups and subsidiary companies to provide equipment, staffing and additional resources to support FEMA's growing needs. Through this commitment, senior management mobilized from across the company to provide expertise to not only oversee the project execution, but also to develop and refine the plans and procedures needed to perform work for FEMA.

One of the largest challenges Fluor faced was quality and safety as they performed work across 116,550 sq. km in challenging conditions and were tasked with the management of 16 temporary housing unit subcontractors. To support this, Fluor's project management team operated six independent "district offices" and provided safety leadership and driver safety courses to more than 700 supervisors.

Under Fluor's Public Assistance contract with FEMA, the company continued to provide local technical services and maintained a staff of 400 people for three months to provide continuity to FEMA's recovery operations. It then maintained over 300 staff in the field for eight months and over 200 staff in the field for the following five months. Fluor provided staff, including architects, engineers, construction inspectors and insurance specialists to assist with the implementation of FEMA's public assistance programme, which provides federal disaster assistance in the form of grants. Staff assisted with the preparation of grant applications, provided technical assistance for inspection of damaged facilities, and prepared cost estimates to repair damaged facilities.

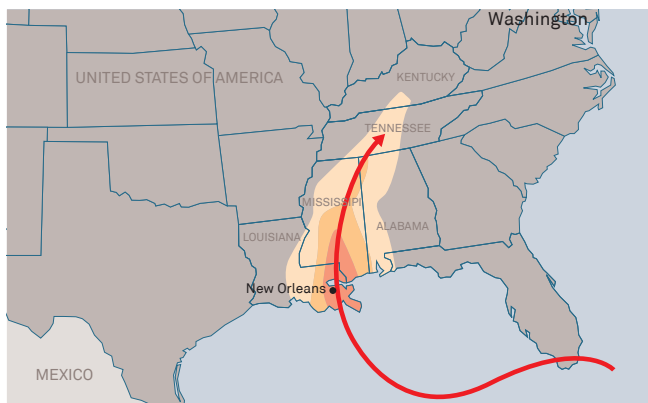
2005: AMEC's response to Hurricane Katrina, USA



Staff seconded to FEMA to support recovery efforts, provision of local technical services and implementation of direct action assistance.

Hurricane Katrina formed over the Bahamas and hit south-east Louisiana as a Category 3 storm on the morning of 29 August 2005, causing severe destruction along the US Gulf Coast from central Florida to Texas. At least 1,836 people are thought to have died and approximately 1 million displaced from their homes.

AMEC had no presence in the impacted area prior to the incident but had a strong presence in the US.



Recovery: AMEC provided support services to FEMA through the Nationwide Infrastructure Support Technical Assistance Consultants (NISTAC) contract, funded by the US Department of Homeland Security. AMEC staff were seconded to Louisiana to serve as FEMA debris specialists to support the recovery efforts. Staff were deployed for minimum 90-day assignments and mandatory 72-hour plus weeks. Services included monitoring debris haulers contracted by local governments, estimating load quantities and documenting compliance with FEMA payment regulations, and coordinating with local governments and haulers to address irregularities.

More than 70% of AMEC deployed staff received in-field promotions to project management positions, supervising the work of other debris specialists. This included a role as the area manager in support of the Hurricane Katrina response in Louisiana. The work also included: demolition planning; debris pick-up and disposal operations; disposal site selection and preparation; environmental, health and safety audits; contract review and documentation to support grant applications; and supervision of a staff of 45 debris specialists and debris monitors.

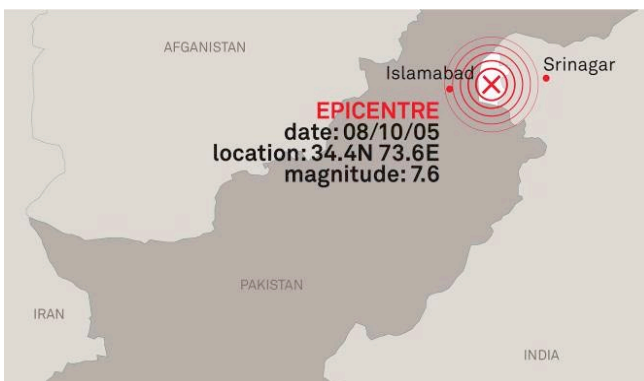
Prevention: Since Hurricane Katrina, AMEC has been working with FEMA and multiple communities along the US Gulf Coast to provide local technical services in hazard mitigation. These projects have included:

- Preparation of FEMA's new Expanded Mitigation Strategies Planning Grant Pilot
- Preparation of Hazard Mitigation Grant Program (HMGP)
- Preparation of Flood Mitigation Assistance (FMA)
- Partnered Mitigation Project (PMP) to combine Public Assistance (PA) funding with HMGP funding

Numerous submitted grant applications have now been approved by FEMA and AMEC is moving forward with the communities to implement them. The following projects are the result of these AMEC-prepared, FEMA-approved grant applications:

- Update to existing Hazard Mitigation Plans with revised mitigation goals and action items to better reflect communities following the catastrophic event.
- Update to existing building and zoning codes to direct development following the event
- Project management of HMGP grants for the wind retrofit of multiple critical facilities and installation of generators; rebuild, reconstruction and acquisition projects for affected housing; and local drainage projects

2005: Arup's response to the South Asia earthquake



Technical assistance provided through secondments throughout the humanitarian response.

At 8.52 on 8 October 2005 a 7.6-magnitude earthquake occurred 100 km north of Islamabad, devastating parts of north Pakistan and India. The earthquake lasted only for 50 seconds, but entire towns and villages collapsed and even 25 km from the epicentre more than 50% of buildings were badly damaged. Estimates show that 88,000 people died in the earthquake and 3 million people were displaced; over 400,000 houses were damaged or destroyed and direct overall losses were estimated at US\$ 5.2 billion.

Arup did not have a regional presence at the time of the Kashmir earthquake but they reacted quickly to provide technical assistance through secondments of key personnel. The culture of knowledge sharing within Arup enabled these personnel to access Arup's global expertise in related specialist fields while working in-country.

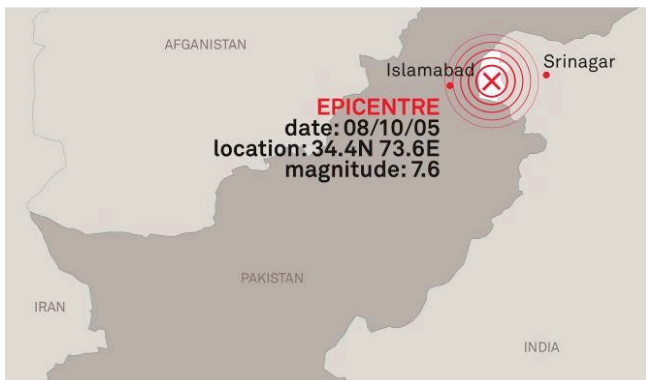
Relief: In the immediate aftermath of the disaster a project manager undertook a pro bono secondment to Habitat for Humanity International (HFHI) for two weeks to lead a team of technical experts to evaluate the shelter requirements of earthquake survivors and assess HFHI's most appropriate contribution. The scope included assessment of what to provide, logistics, appropriate design and technology for the area, and a programme for the activity. This resulted in a collaborative report for the funding presented to the HFHI's international board. The staff member took leave of absence to undertake this project. Arup funded international flights and HFHI covered in country expenses.

Recovery: From December to March 2006 a seismic engineer undertook a three-month secondment with GOAL to implement a mobile training programme in earthquake-resistant construction. Arup covered the engineer's salary while GOAL covered the in country expenses. The training was delivered directly to the affected communities: each week around 50 experienced craftsmen took part in a four-day training programme and a further day's training was provided to the general public. Arup's engineer also provided training to other national and international NGOs and the government's National Rural Support Programme. The training programme was completed within a very small budget, however, the impact of this work was significant as transfer of knowledge to the local population enabled them to build back better and reduce their vulnerability to future earthquakes.

Reconstruction: One engineer undertook a secondment to Medair for one year from June 2006 to June 2007 to provide technical assistance to their school reconstruction programme. This was a voluntary placement for which Medair covered living expenses and Arup assisted with part-funding for flights. His role was to oversee the technical aspects of the project including site selection, reviewing drawings and specifications, implementing a quality assurance system, site supervision, design of additional items and liaison with government authorities. Through contacts established as part of this secondment, Arup's engineer went on to complete two periods of consultancy work for the International Organization for Migration and UN-Habitat, assisting in the owner-driven rural housing reconstruction programme.

Prevention: Further to their work in Pakistan, Arup has funded state of the art non-linear dynamic time history analysis of Dhajji Dewari, the traditional form of house construction in Pakistan using timber, stone and mud. This work has involved collaboration with external experts in Switzerland, US, Pakistan, India and UN-Habitat, and will be used to inform reconstruction and retrofitting work. The analysis carried out to date forms an ideal platform to carry out further research by collaborating with universities and funding agencies.

2005: HCC's response to the South Asia earthquake



Direct action in the immediate aftermath followed by local technical services to a local NGO.

At 8:52 on 8 October 2005 a 7.6-magnitude earthquake occurred 100 km north of Islamabad, devastating parts of north Pakistan and India. The earthquake lasted for only 50 seconds, but entire towns and villages collapsed and even 25 km from the epicentre more than 50% of buildings were badly damaged. Estimates show that 88,000 people died in the earthquake and 3 million people were displaced; over 400,000 houses were damaged or destroyed and direct overall losses were estimated at US\$ 5.2 billion.

HCC had two construction sites in the area affected by the earthquake as part of their Uri-II Hydroelectric project. They had five teams of staff working at these two sites who could respond quickly to provide immediate and longer term assistance to affected areas.

Relief: In the first few days after the earthquake staff from HCC's construction sites undertook direct action to provide medical assistance and food and water to affected communities near their sites. Teams from HCC's construction sites undertook needs assessment in the surrounding villages and distributed tents, shelter materials, blankets, clothing, generators and lanterns. Materials were purchased by HCC through their established supply chains and distributed locally by HCC staff (working in partnership with the Indian army in remote areas). The teams assisted 21 villages in the first two weeks after the disaster, a remarkable achievement in the face of damaged infrastructure and adverse weather conditions.

HCC employees throughout India voluntarily contributed part of their salaries, raising over US\$ 15,000 to be spent in the project area. In total, HCC donated materials, staff time and use of equipment equivalent to US\$ 76,000 in the relief phase.

Recovery: SEEDS India (a national NGO) requested local technical services and funding assistance from DRN India to construct 410 transitional shelters in the Poonch district in 12 weeks before the onset of winter. A partnership agreement was established and HCC provided design, project management and site supervision assistance through a project manager and two site engineers. The engineers developed a design for the transitional shelters, which were seismically resistant, suitable for the local weather conditions and local construction capabilities. They also provided site supervision during construction and project management assistance.

US\$ 230,000 funding for this project was secured through the DRN global network from Sticing Benevolent (COFRA Group), an international funding agency.

2005: Grupo Marhnos's response to Hurricanes Stan and Wilma



Fundraising, coordination and local technical assistance to Unidos por Ellos.

Hurricane Stan made landfall in Mexico on 4 October 2005 as a Category 1 hurricane. Although it decreased to a tropical storm after moving inland, torrential rainfall caused severe flooding in the states of Veracruz, Chiapas, Oaxaca, Tabasco, Puebla, Hidalgo, and Guerrero. Fifteen people were killed, 370,000 were displaced and over 1.5 million people were affected.

Hurricane Wilma, a Category 4 hurricane made landfall on the island of Cozumel, near the Yucatan Peninsula on 22 October 2005. Wilma caused severe flooding across Quintana Roo and Yucatan states, seven people lost their lives, more than 300,000 were displaced and more than 1 million were affected.

Grupo Marhnos is part of the organization Unidos por Ellos, the Mexican chapter of the Disaster Resource Network established by the World Economic Forum.

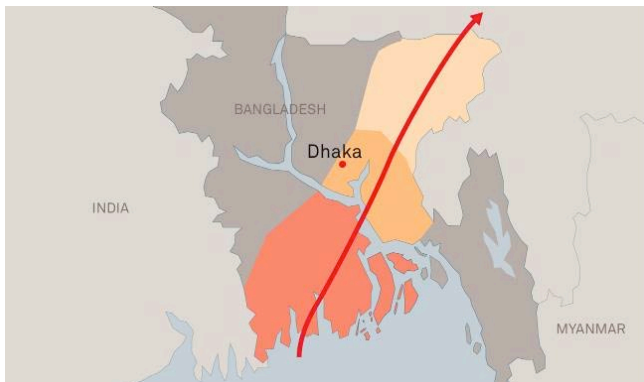
Relief: In the immediate aftermath of the disaster, Grupo Marhnos donated US\$ 25,000 to Unidos por Ellos. In total Unidos por Ellos raised over US\$ 7.7 million. Approximately 90% of funds were used for housing with the remaining 10% allocated to community facilities, such as sports grounds. All funds raised were spent on the implementation of reconstruction projects and with the companies of Unidos por Ellos donating their time on a pro bono basis.

Reconstruction: Grupo Marhnos also participates in the Reconstruction Committee of Unidos por Ellos, which works with national governments, state governments and municipal authorities to reconstruct houses (either in situ or in relocation settlements) for affected communities. The Reconstruction Committee assesses the needs of the affected population, establishes selection criteria and selects families eligible for assistance, identifies land for relocation sites (the government usually provide the land), appoints a project leader from within Unidos por Ellos (depending on the expertise required) and oversees the construction of new houses.

After hurricanes Stan and Wilma Unidos por Ellos reconstructed 2,163 houses in two years. The project was managed by Proviva A.C. a national NGO and the local government donated the land. Architectural/engineering design was provided by ARA Fundation, one of the main housing designers in Mexico, or by Proviva A.C. In general Unidos por Ellos and the local government (National Commission of Housing) bought the materials. However, some material suppliers/manufacturers from within Unidos por Ellos either donated materials or provided them at significantly discounted rates. Local companies were contracted for **the construction** to benefit the local economy and ensure that there is no conflict of interest between local contractors and members of Unidos por Ellos. Construction companies, which are part of the Reconstruction Committee of Unidos por Ellos, monitor the progress of the project.

Each house costs approximately US\$ 9,000. Of this, the household pays 4%, the government (through the national commission of housing) provides 61%, and Unidos por Ellos donates approximately 35%. This formalizes the partnership between Unidos por Ellos, the local government and households, and ensures that houses are occupied and maintained in the long term.

2007: Arup's response to Cyclone Sidr, Bangladesh



Global technical services provided to an international NGO on a pro-bono basis.

In the evening of 15 November 2007, Cyclone Sidr struck south-west Bangladesh as a Category 4 super cyclone with wind speeds of up to 250 km per hour. The cyclone moved north-east across Bangladesh, affecting 30 out of Bangladesh's 64 districts. Estimates put the number of people affected at 4.7 million, with 2.6 million in need of emergency food, shelter and livelihood assistance. More than 3,700 people lost their lives as a result of the cyclone and economic losses were estimated at US\$ 3.7 billion.

Although Arup had offices within the region, it did not have an office in Bangladesh to respond to this disaster. However, the company provided global technical services to Habitat for Humanity International through a workshop for Arup staff from around the world.

Recovery: Arup provided global technical services to Habitat for Humanity through a technical review of their transitional housing programme for 3,000 shelters in the Patuakhali District in south-western Bangladesh. A global multidisciplinary Arup team was sent to Bangladesh from 1-9 March 2008, which included project managers, structural, civil and electrical engineers, construction planners, engineering geologists and architects from around the world, providing Habitat for Humanity with access to a wide range of technical expertise. Staff used their annual leave to undertake the project while travel and expenses (US\$ 50,000) were covered by Arup. The work was undertaken through the goodwill of the two organizations and neither an MoU nor contract was put in place.

Arup's team undertook several activities including fundraising for Habitat for Humanity, construction of a prototype core house, technical review of a prototype house, a reconstruction programme and construction methodology. The team summarized these activities in a report incorporating simple, practical recommendations for the improvement of the design and implementation of HFH's programme. The team also reviewed the transitional housing programme in terms of design (including architectural/structural design and vulnerability to natural hazards), the construction and delivery programme, health and safety considerations, and risk management. Key issues highlighted in the report included the need to establish performance criteria (in this case resistance to cyclones) at the outset of design and the need to design for user adaptation and extension of the transitional shelter.

Arup's report was submitted to HFH Bangladesh and HFH International. Key recommendations were implemented locally and it was circulated to other HFH offices around the world, contributing to ongoing capacity building within HFH staff. Arup have subsequently built a relationship with HFH and has gone on to work with them in several humanitarian and development projects around the world.

2007: HCC's response to Cyclone Sidr, Bangladesh



Secondment of an engineer with specific technical skills and knowledge of the local language.

In the evening of 15 November 2007 Cyclone Sidr struck south-west Bangladesh as a Category 4 super cyclone with wind speeds of up to 250 km per hour. The cyclone moved north-east across Bangladesh, affecting 30 out of Bangladesh's 64 districts. Estimates put the number of people affected at 4.7 million, with 2.6 million in need of emergency food, shelter and livelihood assistance. More than 3,700 people lost their lives as a result of the cyclone and economic losses were estimated at US\$ 3.7 billion.

The Hindustan Construction Company has construction sites throughout India but they were not operational in Bangladesh at the time of the disaster. The company, however, was able to respond quickly through its national network of emergency response trained engineers.

Preparedness: HCC have a partnership agreement with RedR India, an NGO specializing in the training and deployment of engineers in post-disaster situations. RedR has conducted both First Responder and Engineering in Emergencies training for HCC so that its engineers are equipped to respond to a disaster. About 9,651 HCC staff have completed First Responder training and 63 engineers have undergone the seven-day Engineering in Emergencies training.

Relief: In the immediate aftermath of cyclone, RedR India requested HCC provide assistance to Oxfam India for its public health programmes in disaster-affected regions of Bangladesh. Subsequently, one Bengali-speaking public health engineer was seconded to Oxfam India to assist in public health programmes for 30,000 affected people in three districts. HCC's engineer assisted Oxfam's public health engineer in monitoring public health programmes in the districts of Bagerhat and Phirozpur. Activities undertaken by Oxfam India included clearing access roads of debris and trees, clearing canals used for transportation, using tidal irrigation to clear polluted water, cleaning, testing and refilling ponds, providing hygiene and water purification education, repairing pumps and filters, constructing temporary latrines and encouraging local manufacturers to meet demand.

The engineer's secondment lasted for two weeks in December, during which time 16 villages in several districts were covered. HCC Head Office Corporate Social Responsibility department covered the engineer's salary and expenses (US\$ 4,300) and additional funding from British Telecom Hilti Group was secured through the DRN global network.

2007: CCC's response to Cyclone Gonu, Oman



Direct action followed by local technical services provided to local government.

On the 6 June 2007, Cyclone Gonu, the most intense storm ever recorded in the Arabian Sea, passed through the Gulf of Oman. Although the eye of the cyclone never made landfall, the coastal area of Oman was hit by high winds (over 100 km/hour) and heavy rain (more than 200 mm); several inland dams burst flooding large parts of the coastal areas. Fifty people died in the cyclone and direct overall losses were estimated at US\$ 3.9 billion.

Consolidated Contractors Company in Oman had several construction sites within the affected areas. Although the company evacuated the majority of its staff prior to the impact of the cyclone, emergency teams remained in place and were able to engage in direct action in the immediate aftermath.

Preparedness: Consolidated Contractors Company (CCC) evacuated employees from their at-risk sites to urban areas prior to the impact of the cyclone; only emergency teams remained to secure the site and help the relief efforts.

Relief: Once the cyclone hit the area the CCC Wadi Dayqah Dam project site and nearby villages were severely damaged and almost completely isolated from the rest of Oman. In the immediate aftermath of the cyclone, Muscat Municipality requested assistance from CCC; subsequently, CCC Oman's vice-president instructed the immediate deployment of resources and staff.

CCC staff immediately undertook direct action to support affected communities. Using water from its project boreholes, CCC water tankers distributed drinking water to nearby villages as well as supplying bottled water and food. Hundreds of animals died in the cyclone and CCC removed all dead livestock and disposed of them away from local communities to minimize the spread of diseases. CCC used their loaders and materials from its crushing plant to clear and repair the main road from Muscat to the Al Qurayat region. This allowed the rest of the CCC workforce to return from their evacuation locations and allowed government relief assistance to reach communities in remote areas.

Once the full CCC workforce had returned, they were mobilized to clear houses and streets of mud in nearby villages under supervision of CCC's project managers, project construction managers and engineers. Teams focused their efforts on Haill El Ghaf, the worst affected village, and moved from one house to the next for more than three weeks until all houses were cleared and local people could return home. All CCC project staff were devoted to the relief effort until services were back to normal. CCC Oman financed all activities in the initial stages but later received some payment for the local technical services they had supplied to the Muscat Municipality.

2007: Grupo Marhnos's response to Tabasco floods, Mexico



Fundraising, coordination and local technical assistance to Unidos por Ellos.

Heavy rainfall over the Gulf Coast of Mexico lasting for a week starting on 27 October 2007 led to many rivers to burst their banks, leading to devastating floods in the states of Tabasco and Chiapas. About 70% of Tabasco was submerged in flood waters and in Chiapas 10-15% of the population was affected. Tabasco's capital city, Villahermosa (population: 600,000) was among the hardest hit. The government declared a state of emergency in the two states and requested international assistance. Nineteen people were killed in the flooding, more than 30,000 were displaced and direct overall losses were estimated at US\$ 7.5 billion.

Grupo Marhnos is part of the organization Unidos por Ellos, the Mexican chapter of the Disaster Resource Network established by the World Economic Forum.

Relief: In the immediate aftermath of the disaster Grupo Marhnos donated US\$ 25,000 to Unidos por Ellos. In total, Unidos por Ellos raised over US\$ 7.7 million. Approximately 90% of funds were used for housing with the remaining 10% allocated to community facilities, such as sports grounds. All funds raised are spent on the implementation of reconstruction projects and with the companies of Unidos por Ellos donating their time on a pro bono basis.

Reconstruction: Grupo Marhnos participates in the Reconstruction Committee of Unidos por Ellos, which works with national governments, state governments and municipal authorities to reconstruct houses (either in situ or in relocation settlements) for affected communities. The Reconstruction Committee assesses the needs of the affected population, establishes selection criteria and selects families eligible for assistance, identifies land for relocation sites (the government usually provide the land), appoints a project leader from within Unidos por Ellos (depending on the expertise required), and oversees the construction of new houses.

After the Tabasco floods Unidos por Ellos reconstructed 2,442 houses in two years. The project was managed by Proviva A.C., a national NGO, and the local government donated the land. Architectural/engineering design was provided by ARA Foundation, one of the main housing designers in Mexico, or by Proviva A.C. Unidos por Ellos and the local government (National Commission of Housing) bought the materials. However, some material suppliers/manufacturers from within Unidos por Ellos either donated materials or provided them at significantly discounted rates. Local companies were contracted for the construction to benefit the local economy and ensure that there was no conflict of interest between local contractors and members of Unidos por Ellos. Construction companies that are part of the Reconstruction Committee of Unidos por Ellos monitor the progress of the project.

Each house costs approximately US \$9,000. Of this, households pay 4%, the government (through the national commission of housing) provides 61% and Unidos por Ellos donates approximately 35%. This formalizes the partnership between Unidos por Ellos, local government and households, and ensures that houses are occupied and maintained in the long term.

2008: Arup's response to the Sichuan earthquake, China



Secondments in the relief phase followed by global technical services and fundraising.

At 14.28pm on 12 May 2008 an 8.0-magnitude earthquake struck Sichuan Province, China, about 90 km north-west of Chengdu. Although no major city was affected, the earthquake claimed thousands of lives through collapsed buildings and landslides in mountainous areas. Over 70,000 people died in the earthquake but more than 15 million were displaced. 5.3 million buildings were destroyed and direct overall losses were estimated at US\$ 8.5 billion.

Arup has worked in China for more than 30 years, establishing its first office there in 1995. At the time of the earthquake Arup had 1,500 staff in seven offices throughout China. Although none were directly affected, staff throughout China were highly motivated to respond.

Relief and recovery: Arup staff around the world responded immediately to the disaster. Staff fundraising amounted to over US\$ 30,000 with the firm matching the amount raised through individual donations. A project manager from Arup's Beijing office undertook a secondment to provide logistical support to Medecins sans Frontieres. Several staff members joined Engineers without Borders Hong Kong, which sent its first survey mission to Sichuan in June 2008. Staff from Arup's Hong Kong and Shanghai offices worked as part of the "Hands on Chengdu" project to provide local technical services on transitional shelter.

Reconstruction: Immediately after the disaster the Chengdu Planning and Management Bureau and the Dujiangyan Municipal Government requested global technical services on a pro bono basis in the Dujiangyan Post-quake City Reconstruction Conceptual Planning Project. Within three days, 47 organizations expressed an interest in taking part, from which Arup was selected as one of the top 10. Within an intensive one-month timeframe, following a field assessment, the team came up with a planning framework focusing on hazard resilient planning, sustainable development and socio-economic reconstruction. They also proposed several key development strategies covering integrated land use planning, economic recovery, sustainable development and social economic recovery as part of the overall reconstruction master plan.

Several engineers from Arup's Hong Kong office provided local technical services on a voluntary basis to Sowers Action, a charity with strong links to the Hong Kong Institution of Engineers (HKIE), which specializes in rebuilding lives in the disaster stricken areas. Activities undertaken by Arup staff included field trips to assess the extent of damage, assistance in funding applications, review of design drawings, preparation of training materials on appropriate concrete construction, and training of local personnel in construction management. The collaboration between Arup engineers and Sowers Action led to the government of Hong Kong providing US\$ 1.9 million funding for the reconstruction of two schools to be completed by mid-2010. Arup Hong Kong donated US\$ 19,000 to cover expenses for their staff involved in field trips, providing training and attending seminars but this was exceeded several times by the hours donated by their staff on a voluntary basis.

2008: HCC's response to the Bihar floods, India



Secondment of pre-trained engineers with specialist technical skills.

On the 18 August 2008 heavy monsoon rains caused a breach of 2 kilometres in length along the embankment of the Kosi River. The breach inundated over 1,800 villages in 16 districts in North Bihar affecting over 4 million people. After the breach the river shifted its course nearly 100 km eastward; 125 people died in the floods, more than 300,000 houses were destroyed and direct overall losses were estimated at US\$ 3.7 billion.

The Hindustan Construction Company has construction sites throughout India but they were not operational in Bihar at the time of the flooding. The firm, however, was able to respond quickly through its national network of emergency response trained engineers.

Preparedness: The Hindustan Construction Company (HCC) has a partnership agreement with RedR India, an NGO specializing in the training and deployment of engineers in post-disaster situations. RedR has conducted both First Responder and Engineering in Emergencies training for HCC so that its engineers are equipped to respond to a disaster. Many of HCC's staff completed First Responder training and 50 engineers underwent the seven-day Engineering in Emergencies training.

Relief: In the immediate aftermath of the floods, RedR India requested HCC to provide Engineering in Emergencies-trained engineers to assist in the relief work. RedR organized the secondment of 10 HCC engineers from several construction sites to Oxfam India. The HCC Head Office Corporate Social Responsibility Department covered both their salaries and expenses (US\$ 29,500). The engineers were seconded in three teams; each team went for two weeks. Their task was the provision of WATSAN facilities for 1.2 million displaced people living in camps. Activities undertaken included: design and construction of water storage tanks, boreholes with hand pumps and sanitation facilities, hygiene and sanitation awareness training, and disposal of dead bodies.

Chandrashekhar Shetty, a member of the seconded team, was surprised at the reaction of the Bhavani Nagar flood affected population. "We were the first people to reach the village. Not even media visited the village that was categorized as severely hit area, and they were happy to see a relief team reaching them."

2008: HCC's response to the Orissa floods, India



Direct action and the provision of local technical services to local government.

On 21 August 2008 three days of heavy rain caused flooding in the Mahanadi River and its tributaries. More than 3 million people were affected across the Indian state of Orissa.

The Hindustan Construction Company has construction sites throughout India. Its Paradip Road Project was severely affected by the flooding in Orissa. As a result of prior training from RedR India, the company was able to quickly and efficiently deploy its staff to assist the affected areas.

Preparedness: The Hindustan Construction Company (HCC) has a partnership agreement with RedR India, an NGO specializing in the training and deployment of engineers in post-disaster situations. RedR has conducted both First Responder and Engineering in Emergencies training for HCC so that its engineers are equipped to respond to a disaster. Many of HCC's staff have completed First Responder training and 50 engineers have undergone the seven-day Engineering in Emergencies training.

Relief: In the immediate aftermath of the disaster, HCC deployed 350 officers and labourers to undertake direct action under the supervision of two engineers who had undergone Engineering in Emergencies training. They completed search and rescue and needs assessment across 42 villages in Orissa and then distributed food, water and medical supplies to affected communities. They also distributed plastic sheeting and bamboo, assisted with the design of transitional shelters, provided a crane for loading/unloading boats, and provided equipment and manpower to prevent the breaching of embankments in flooded areas.

HCC's Paradip Road Project site paid the volunteers their full salary for the time they donated and also covered the cost of the procurement and distribution of relief materials. In total, HCC donated 420,000 man hours plus materials – equivalent to US\$ 77,600.

Recovery: HCC provided local technical services to the District Magistrates of Kendrapara and Jaipur to repair embankments, roads and culverts in flood affected areas.

Addendum A

The World Economic Forum thanks and recognizes the following organizations who contributed to the development of the Disaster Resource Partnership:

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