

HF/E in shaky places

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Abstract. This paper considers the actual and potential contribution of Human Factors / Ergonomics in regions impacted by extreme natural events. The data is from nine interviews with HF/E practitioners and related professionals in New Zealand and Chile, places that have recently experienced trauma from earthquakes, tsunami, inundation and related problems. The findings include suggestions of areas in which we should be more active in order to better prepare, respond and recover. Of concern to participants, is that the HF/E services offered by practitioners were too often perceived as irrelevant by the community; raising the question of what we as HF/E specialists are really here for. Can we survive and thrive when considered a luxury item?

Keywords. HF/E practice; natural disaster; emergency response; future of ergonomics

1. Introduction

‘After Feb I had no job, because no one gave a shit about the things I did professionally.’

In the last few years a number of practitioners and researchers have been giving thought to HF/E and sustainability. Posing questions such as what do we actually mean by this anyway? A lot of different things it appears (Thatcher, 2012). And do we really need to consider sustainability as in some way a new approach at all? (Zink and Fischer, 2013).

This paper looks at relevance - as a prerequisite perhaps of both resilience and sustainability as a professional service to communities.

1.1 The events

In February 2010 an 8.8 magnitude earthquake shook Concepcion, Chile for about three minutes at around 3am local time. The shake was felt by about 80% of the population of the country as it was centred in the central part of Chile - the most populated regions. The shake created a tsunami that hit different towns and cities on the coast, and the alert for this was sounded 15 minutes after the main earthquake was felt. Most of the 525 fatalities and missing 25 people lived in the coastal regions. It is reported that there was confusion amongst officials responsible for the Tsunami alert; they mistranslated a signal sent to them in English, and as a result told the public that there was not a risk of a tsunami, where in fact the signal said the reverse. 370,000 homes were damaged, leaving 9% of the population in the affected region without housing. Nationally, more than two million people in Chile were affected in some way, and the economic losses were estimated at US\$30 billion. 17% of the GDP of the country.

Almost all supply lines for basic needs failed after the shake. 93% of the population were without power - for several days in some locations. Telecommunications were especially hard hit and slow to recover. Water reticulation was widely damaged, not just through pipe fractures but also as a result of level changes that impaired falls and heaved tanks from the ground. Food and petrol supply was similarly hit.

The absence of these basics and the slow response from government to assist the area fuelled public disorder and looting, leading to some areas having curfews imposed. The military were finally sent in to restore order.

The shakes in the Christchurch region of New Zealand began with a 7.1 in September 2010, a more damaging 6.3 in February 2011 and further 6.3 in June 2011. There is a growing body of reports and other information available. Notably via the Earthquake Commission (more commonly referred to as EQC. <http://www.eqc.govt.nz/>).

1.2 The continuing impact

Earthquakes are rarely isolated events. They are clustered as the release of pressure between plates does not happen in one hit. People living in seismically active areas therefore become used to living with minor shakes. And we have many of them. On average in New Zealand there is a shake of at least magnitude 4 somewhere every day, but most of these are too deep, or remote from inhabited areas to be felt by anyone other than penguins. The official GeoNet site <http://www.geonet.org.nz/quakes/statistics> reports in excess of 25,000 magnitude 2 or greater seismic events in NZ in the year to March 2014.

However, from a prolonged more powerful and damaging series, the emotional impact has been discovered to be dramatic.

Four years on the full impact on infrastructure and buildings are also still being discovered both in NZ and Chile. Around Concepcion example, there have been recent fires linked to wiring damage from the shakes that was undetected, but has decayed and can spark fires amongst accumulated dust and debris.

In the Christchurch area heavy rains this year caused flooding that damaged large areas and took out the power to 5000 homes. The severity of the damage has been linked to changes in ground levels and natural falls from the shakes. The topography has shifted, rendering much of the surface water management system developed over 150 years at best unhelpful.

1.3 Previous work

Moore and Barnard (2012) posed a basic loop model for potential HF/E contributions related to natural disasters. It covers: what we can do before the event strikes; how we can best respond as it strikes; and then how can recover most quickly, learn from all these experiences, and redesign our systems using that knowledge.

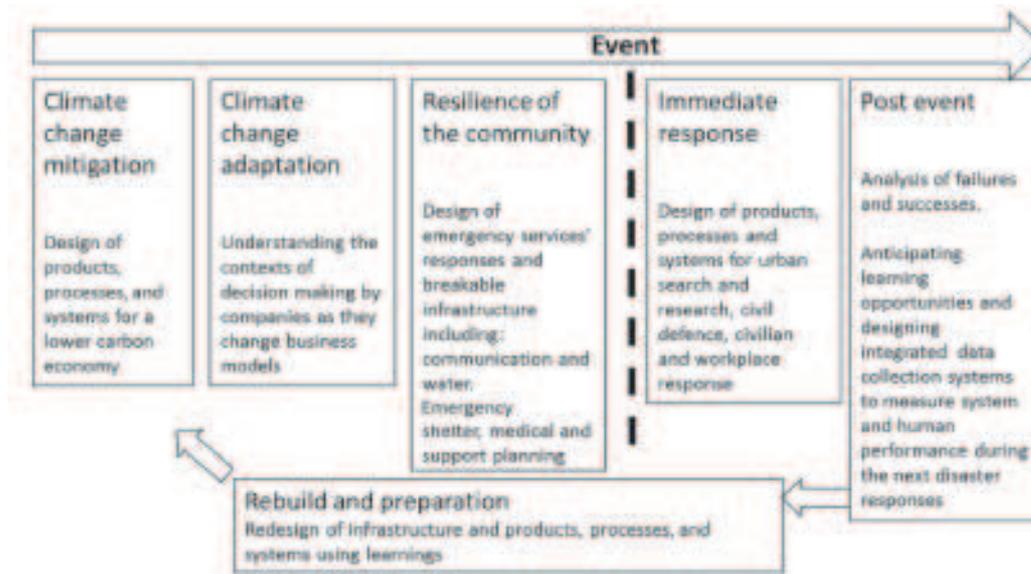


Figure 1. Potential HF/E roles relating to extreme natural events (Moore & Barnard 2012).

The original concept shown above includes mitigation which relates to climate change. For seismic activity we clearly have little or no ability to mitigate risk, but we can still more accurately assess the scale and nature of the risk, and then accept and adapt to that. In Christchurch certainly the risk was not widely understood, and preparedness was therefore inevitably low.

2. Method

The participants were invited to contribute on the basis of their practical experience of living and practising HF/E, and closely related business, in the affected parts of these countries. The data was collected in late 2013 and early 2014.

Nine semi structured interviews were conducted in Chile and New Zealand using as the basis for the discussion the simple before-during-after loop model produced by Moore and Barnard. This is not a complex piece of work. The aim was simply to record lessons learned, as told by those in our professional circle who have lived through unusual times. These times however could become less unusual if predicted increases in extreme natural events linked to climate change prove accurate.

3. Main findings

3.1 State of preparedness

'We weren't prepared because we didn't believe it would really happen' (NZ).

Within New Zealand Christchurch was reported to be a relatively perceived as a low risk area. When the September 2010 shake struck some people in Christchurch reported being most concerned about friends and relatives in Wellington, '...we assumed ours was just the edge of the (expected) really big one up there'. Jamming of telecommunications by the anxious population exacerbated problems.

3.2 Built environment.

Issues were raised at both detailed and macro scales. In Chile the experiences called into question the wisdom of building urban cores that held beyond 500,000 people. Is it

possible to be well enough prepared on such a large scale? Do resilient communities have size limits? In New Zealand comparative studies on two communities suggest that one with 1000 community groups prior to the shake coped much better than one with

Although many homes were damaged in Chile, less than 20 people died in properly engineered buildings. This supported efforts in recent years to strengthen the systems around design and inspection.

In New Zealand comments emerged regarding the dangers of awarding special powers to those rebuilding post-disaster while the sense of urgency encourages and facilitates shortcuts. Lack of participative approaches has been observed post event. '...the process followed to design them - the people involved in the consultations, who and about what'. Building in a hurry, the care and collaboration in a process can disappear.

'Architects seem to be going backwards. They don't need specialists because clients are happy for them to do everything real fast and just 'get it up'. ...'they think they know it all, and in this climate can just go ahead... (they) don't realise that they are setting up all these problems''

Relevance of research being done in the recovery phase was questioned. Participants noted a lack of practical solutions-focussed work being done in New Zealand. '...actually I think people really don't know what they should be doing'. This person said that hands-on stuff was mostly not in the Public Domain; instead they felt private companies are developing new systems to help them capitalise on the boom.

3.3 Communications - disseminating lessons learned and information needed day to day

Alarms / warnings. Clearly the tsunami system in Chile failed dramatically. An HF/E task in waiting if ever there was one.

In New Zealand the day to day communication in Christchurch was applauded, but the failure to get changes across the country was commented on. We are 'needing to be getting these messages out to the wider community' at risk. You had to be in the place to understand it all. Even just an hour up the road 'they missed it, and now don't quite get it'.

3.4 HF/E practice. in the aftermath

Participants spoke of 'an element of irrelevance to (selling) process improvement when people don't have a building or business anymore'. Some companies stopped using the services of two Christchurch participants 'because they didn't want to be seen as just carrying on with business as usual when (the city) was in disaster mode'. Companies doing ok, offered premises to other firms that had lost their buildings completely.

3.5 Emergency planning - personal and organisational

Evacuation drills are no longer a company joke. 'Emergency management plans have become much more real. It's not just lip service anymore. And the good companies are desperate to maintain it. Psychological welfare is key for us'

3.6 Behaviour at crucial times; measuring and understanding it

'People react in very different ways'. Some cope far better than others in the heat of it, but participants wondered whether the long term health impacts were being studied. A number had experience of seeing front-line workers suffer badly once the pressure came off and the adrenaline subsided months later.

Systems to actually learn about how we behave as they hit have to be constantly running. Surveillance camera footage is an underutilised resource it was suggested.

3.7 Training for key roles

Police, army, company evacuation officers and specialists all need higher levels of readiness, and the training has to draw on hard-learned lessons from the last few years. The details are crucial. ‘Always carry keys and cards on you" even just going to the loo or the office kitchen. People got caught out and ended up having to walk big distances home when locked out of a damaged building with possessions in it’.

The individuals need to think through personal plans, to ensure everything really will work after a major shake. Many staff now keep mountain bikes at work as these are proven to be the fastest way to get back to family, or to other parts of the city to fill emergency roles in the immediate aftermath.

3.8 Resilience of supply chains

In Chile the basics were not available for long periods. The backup systems that could maintain continuity were missing. People can build up supplies of some things, but not others. Along with water and food beer was also suggested in Christchurch. ‘our emergency kit includes plenty of booze; after-shocks are a lot easier to cope with if you're half pissed". The requirement that hand pumped mechanical systems for fuel be made mandatory was raised

3.9 Legal systems

Anticipation of the special powers needed to cope was raised in both countries.

3.10 Sustaining levels of preparedness.

In other areas also at risk, or after a few years of having no serious shakes, the commitment from government and pretty much everyone else wanes. Keeping that momentum will be key task.

Are the lessons learned here having any impact on behaviour in other parts of NZ? ‘Probably not, unless the people have been long periods without power and water with maybe flooding to deal with at the same time; the scale of adjustments you have to make are probably too much to take on unless you have been in it...’

3.11 Personal empathy for mental health issues within the community and organisations

‘People react in very different ways to tough times. This generation have seen it first-hand. so there is more empathy e.g. post-traumatic stress disorder is real, it’s not an old wives tale’.

3.12 Changing values reflected in ODAM

Christchurch participants observed that for workforces they deal with ‘the house is no longer 'your greatest asset'. Instead 'what you can do' and 'what you have right now' are the things most valued. Less people are 'living for the day the mortgage is paid off', and a more flexible approach is needed – people are becoming less rigid in viewing careers and options.

A silver lining has been the increased awareness in the importance of community and work life-balance. ‘Work is an absolute second - it’s always about the people here now’.

‘The organisations have changed. They have to be communities that support people now’.

And benefits are showing for those who do this well

‘The resilience of organisations has been aided by greater commitment (from staff, but only) enjoyed by those companies that do actually look after people’

3.13 *Future career changes as a result of the shakes*

The personal changes were generally greater than the professional ones. However in a number of cases the experiences were cited as a catalyst. One participant said that it has 'accelerated her into more of an organisational level of HF/E. Culture; and the interrelationships of (factors that build) resilience'. She explained, 'the bottom line of what's really important – the welfare of people – hasn't changed, but (now I have) a much broader perspective'. About how that welfare come about or is threatened.

4. Conclusions

A persistent observation, or complaint, from some practising and teaching HF/E in poorer parts of the world (Scott, 2009) is that the discipline as practised in advanced industrial settings has increasingly little relevance to those working outside these areas, for example in the land-based sectors of the Southern Hemisphere.

As one participant put it in this study, 'No one needs refinements if the basics aren't there'

There are plenty of sub-populations in wealthier countries for whom the basics aren't there - disaster or no disaster. Do we personally want to be seen professionally as luxury items?

This paper touches on many potential ways that HF/E practitioners can help make sure the basics are there. If we are sustain relevance as a discipline globally, our feeling is that we must not lose sight of that role as the basis of our service, and recognise that refining of systems comes second.

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