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The Natural Hazards Research Platform 2009-2019: A Retrospective

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1 THE BEGINNING – THE STABLE FUNDING INITIATIVE

Helen Anderson, in her MoRST CEO report of 2007, noted that the stable funding environment (SFE) initiatives that were introduced in 2006 were refined in the 2007/08 year. The major change was to the rules relating to negotiated investments that would enable FRST to fund platforms of research across research institutions. The change was envisioned to enhance collaboration and build national capability.

A further step in the SFE journey was a paper presented to Cabinet in early 2009 on the results of an evaluation of the stable funding initiative. McGuinness et al (2009) in writing a history of science funding in New Zealand observed FRST's structural changes following a change in government in the 2008 that were associated with several new initiatives. One of these was to simplify and streamline the investment process to achieve reduced transaction and compliance costs (FRST, 2009). One aspect of streamlining was the requirement the devolve R&D investment decisions to research organisations, simultaneously devolving greater trust and accountability to scientists and scientific institutions.

An aspect of SFE with the creation of 'platforms' for research funding was also seen to address the problem of research areas losing funding due to shifting priorities. Platforms were defined as areas of research interest that cover a specific topic of value. FRST implemented the first platform of the SFE in August of 2009 (NZ Govt, 2009), covering natural hazards research; the value of the platform was established at \$140 million

Invited

over a ten-year period (NZ Govt, 2009c), although much of this funding was the alignment of existing funding to GNS Science, NIWA, Opus Research, and Canterbury, Auckland and Massey universities.

Murray Bain as FRST CEO announced the Natural Hazards Research Platform ('Platform') as a pilot platform on 18 March 2009. Two aspects are of particular note. Firstly, Dr Bain noted the role of the Platform Manager was to be the public face and point of contact and that the Platform should bring science leaders together and speak on behalf of all scientists (this was to play out to a larger degree than anyone expected a little over a year later). Secondly, the Platform Manager should communicate and link the Platform Advisory Group, External Science Advisory Group, end users and science theme leaders. This latter expectation begins to point strongly to the 'science to practice' expectation of the government-funded science and what Beaven et al (2016) later identified as the role of the Platform as a boundary organisation.

Minister Wayne Mapp formally launched the Platform on 7 August 2009 and noted in his press release that the Platform:

[breaks new ground in how science research is funded. This new Platform means that essential scientific research will benefit from secure long-term funding and a cooperative approach. The new platform is hosted by GNS Science. The Platform will examine how natural hazards occur, their effects, and how we deal with them. It will involve scientists from a range of fields, including hydrology, seismology and climate. This initiative will provide further long-term certainty for our scientists. It will reduce the transaction costs involved in applying for research funding every two or three years. This approach avoids duplication and unnecessary contestability. Most importantly, it encourages collaboration. Bringing together our best researchers from different agencies will help maximise the impact from the Government's science investment].

2 STRATEGIC INTENT OF THE PLATFORM

To provide the evidence basis and sound advice on natural hazard risk management that enables individuals, communities, businesses and central and local government agencies deliver against social and economic obligations. Good risk management leading to community well-being and financial prosperity requires cost-effective utilisation of available options via enhanced decision support tools.

3 EVENTS, SCIENCE, POLICY AND INTERNATIONAL

In the decade of the Platform a wide range of events, science breakthroughs, policy changes and international collaborations have been undertaken (Table 1). The Canterbury Earthquake Sequence (CES) of 2010-2011 was a very significant opportunity for the Platform to demonstrate value during a national crisis, but those events were also a distraction to the development of improved boundary organisation roles as discussed by Beaven et al (2016). In coping with short term expectations of public, media, government, and insurers the tyranny of timely advice – seeking to assimilate diverse, complex data and opinion on short timelines – was challenging, all this in a broader frame of major expectations with little additional resourcing.

Other major events in the period included major weather events on almost annual frequency, volcanic activity in the central North Island, Port Hills and Nelson fires, and further earthquakes in Cook Strait and Kaikoura.

In the international sphere there are many examples of peer-to-peer scientific collaboration in structural engineering, social science, earthquake hazard and risk, tsunami modelling, landslide studies, and volcano observatory functions. At a programme level the Platform coordinated the NZ-US science collaboration for natural hazards, and via the Platform NZ joined the Collaboratory for the Study of Earthquake Predictability (CSEP).

Invited – Some significant events, scientific advances and policy impacts associated with the NHRP

Table 1: Some significant events, scientific advances and policy impacts associated with the Natural Hazards Research Platform

	EVENTS	SCIENCE	POLICY DEVELOPMENT
2009	Major Weather Events		
2010	Darfield EQ (Sept 2010) Major Weather Events	* New Zealand National Seismic Hazard Model 2010 released	
2011	Christchurch EQ & aftershock sequence Port Hills rockfalls, liquefaction & flooding	* NZ Govt funds NHRP to develop Canterbury EQ recovery programme informed by stakeholder needs * NZ via NHRP joins international Collaboratory on Operational Earthquake Forecasting	* Researchers provide expert testimony to the Royal Commission on the Canterbury Earthquakes; includes seismicity, geotechnical and engineering * Christchurch City Council utilises research findings to identify Port Hills red zone * NHRP provides science advice to CERA * Tsunami blue lines are introduced in Island Bay based on research from tsunami and social scientists and in successive years expands across the Wellington region
2012	Mt Tongariro volcanic eruption Auckland tornado	* Researchers develop risk-based planning guidelines and contribute to a review of Resource Management Act 1991 * RiskScape expands its direct loss fragility modules to include infrastructure - road, electricity and water services * Resilient Organisations (research team) develops Benchmark Resilience Tool & Organisational Resilience framework * Christchurch EQ research contributes to the CERA Wellbeing Survey	* Researchers develop National Tsunami Hazard Model for all NZ coasts * Platform makes successful application for natural hazard to be one of the 10 National Science Challenges * Volcanic hazard maps updated for Tongariro, Ruapehu * Platform continues science advice role to CERA
2013	* Cook Strait-Lake Grassmere EQS * White Island volcanic unrest * Floods & storms	* Earthquake and social scientists participate in Seddon community Q&A to discuss the Cook Strait-Lake Grassmere earthquakes * NIWA & Scion develop the National Fire Weather System	* Civil defence Exercise Pahu based on Mt Taranaki volcanic eruption scenario * Platform continues to provide science advice to CERA
2014	* Dart River Landslide * Christchurch flooding due to subsidence associated Canterbury EQ sequence * Ex tropical cyclone Lusi floods	* High resolution record developed for Mt Taranaki volcanic eruptions * Canterbury EQ research contributes to understanding factors that build iwi resilience * Researchers participate in the Collaboratory for the Study of Earthquake Predictability (CSEP) to improve earthquake forecasts on the scale of days to years. NZ has contributed 16 models to the Collaboratory	* Christchurch City Council publishes reports on Port Hills hazards & risk; findings contribute to the review of the Christchurch District Plan * Researchers contribute to Mt Taranaki Regional Council Volcanic Response Plan * NZ Government allocates an additional \$13.5 million for psychosocial services in Canterbury based on the <i>CERA Wellbeing Survey</i>

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2015	* Ex tropical cyclone Pam floods and storms	* Report to the Parliamentary Commissioner for the Environment on sea level rise * Alpine Fault research refines the recurrence interval of M8 earthquakes to approximately 300 years. * Advances in numerical weather modelling increases resolution to 100m horizontal resolution * Canterbury EQ Recovery programme ends - major improvements in knowledge of building and infrastructure performance, seismic hazard and risk, geotechnical engineering and economic considerations.	* The National Civil Defence & Emergency Plan 2015 describes mandated roles for NZ organisations & govt departments during hazard events * Technical input to update to the NZSEE Seismic Assessment Guidelines * NIWA becomes a core partner in the <i>Unified Model Consortium</i> directly linking NZ weather prediction & climate simulation research with global partners * NZ signatory to the Sendai Framework on Disaster Risk Reduction 2015-2030 - Platform support to the NZ delegation negotiating the Agreement * UNISDR Global Assessment of Risk Report - highlighted both the DEVORA programme and the mitigation of volcanic risk at Ruapehu as 'global best practice'
2016	* Kaikoura EQ (Nov 2016) * Severe weather impacts	* Extensive research programme begins on understanding the Kaikoura EQ and its impacts * RiskScape includes impacts from volcanic hazards - ballistics, ashfall, lava, pyroclastic surge * Risk researchers & Bay of Plenty RC develop an award winning 'model framework of public engagement about risk' * The complexity of the Kaikoura EQ receives extensive international attention	* Civil Defence Exercise Tangaroa tests nationwide tsunami readiness * Engineering researchers collaborate with industry to develop the first NZ bridge utilising low damage, quake-resilient technology * Risk modelling influenced an amendment to the Building Act to address issues of public safety from unreinforced masonry following the Kaikoura EQ * Societal resilience researchers contribute to Red Cross Hazard App * Tsunami blue lines are adopted in Oregon, USA and widely across Indonesia
2017	* Port Hills Fire * Edgecumbe floods * Severe weather associated with ex tropical cyclones Cook and Debbie	* Kaikoura EQ short-term recovery research programme begins. Includes geological, geotechnical, engineering, and economic projects * RiskScape post-event flood surveys in Edgecumbe * Research advances bring us closer to a National Volcanic Hazard Model * RiskScape + MERIT modelling tools are bolted together to explore optimal resilience investment in Wellington lifelines * The complexity of the Kaikoura EQ receives extensive international attention * In the period following the Kaikoura EQ researchers introduce slow slip events into EQ forecasts for the first time, globally	* NCTIR utilises hazards & risk research to inform SH1 and Main Trunk Railway repairs and re-instatement * Kaikoura EQ Landslide Inventory completed and recognised by overseas peers as one of the best available globally * Resource Management Act (RMA) reforms passed into law including, in Section 6: '<i>Matters of national importance: the management of significant risks from natural hazards.</i>' * Researchers contribute to update of the Australasian wind loading code AS/NZS1170.2:2011 * After the Kaikoura and with increased risks from aftershocks/triggered events, Government used emergency powers to fast-track earthquake strengthening work in Wellington, Lower Hutt and Blenheim
2018	* Severe weather related to ex tropical cyclones Gita and Fehi	* Kaikoura EQ research published in a special edition of the <i>Bulletin of the Seismological Society of America</i> * New research findings decrease the Mt Taranaki volcanic eruption probability over the next 50 years * RiskScape post-event survey following the Indonesian earthquake/tsunami	* GEONET 2.0 and 24/7 geohazards monitoring initiated in New Zealand * Landslide findings from the Kaikoura EQ used to inform Indonesian response teams * NZ volcanology teams provide advice to Vanuatu * Ongoing collaboration with & advice to USGS during Kilauea eruption, Hawaii
2019	* Nelson fires	* Upgrade of RiskScape software to Version 2.0 underway * Coastal hazards researchers release a free storm surge & coastal hazards tool for end-users * NZ volcanologists plan for IAVCEI 2021 in Rotorua	* Heritage EQUIP is funded by government to provide additional support to building owners for earthquake strengthening * Tsunami vertical evacuation guidelines for NZ are being considered

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Domestically, policy for disaster risk management and disaster recovery were advanced through CERA, the Canterbury Wellbeing Survey, Select Committee on earthquake prone building, risk provisions of the RMA reform, ‘red-zoning’ decisions for liquefaction and rockfall in Christchurch, NZ’s participation in the Sendai Framework for DRR, researcher involvement with extensive guidance from MBIE on improved earthquake engineering, and most recently with the National Recovery Office of MCDEM following the Kaikōura earthquake.

4 SUCCESSES

Chief among the successes of the Platform has probably been the ability to provide timely advice during response and recovery from the CES. Although stressful and the advice may have been better had there been a longer lead time (such that the collaborative processes of the Platform were bedded-in prior to the earthquakes), there is no doubt that the Platform’s performance was widely supported by the public, media and all parts of government.

In 2012 the concept of National Science Challenges (NSC) was announced. This development was not explicitly acknowledged as having grown from the success of the Platform and indeed national science challenge programmes were launched in many countries at that time. However, Sir Peter Gluckman, then the PM’s chief science advisor, has noted the success of the Platform model as providing confidence in developing the NSC process (P. Gluckman, pers comm, 2012). In December 2012 the Platform led a proposal that natural hazards should be acknowledged as one of the 10 major challenges facing New Zealand. In May 2013 natural hazards was indeed announced as a NSC as ‘Resilience to Nature’s Challenges’.

A further success and legacy of the Platform has been a major improvement in cross-disciplinary engagement between the research community working on natural hazards and disaster risk management. The ‘value-add’ of moving from hazard understanding to risk by incorporating the physical, cultural, social, financial and environmental assets of New Zealand and their fragility to natural hazard and weather perils has developed very significantly in the past decade. Recent advances in social and economic impact modelling, supported in part by the Platform, is opening opportunities for even greater uptake and utility of research in practice.

5 CHALLENGES

It is interesting to reflect that over the decade of the Platform, which was developed to simplify and streamline research funding there is, in fact, more complexity than ever. The advent of the NSC, with Tertiary Education Commission funding to the QuakeCore Centre of Research Excellence, and even more MBIE contest processes, the natural hazards ecosystem is very difficult to navigate for the research user community.

Some ‘out of scope topics’ for the Platform either remain under-researched or not incorporated into systems assessment, notably:

- Research relating to man-made (technological or social) hazards including major transport accidents, infrastructure failures, terrorism and biological accidents was out of scope;
- Bio-security research was out of scope;
- Climate variability and change research was out of scope;
- Resilient Infrastructure and Communities was outside the Platform scope;

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- Research where the benefits are specific to a discrete sector, rather than having widespread national benefits was out of scope;
- Hazards-related research and translation of hazards research outputs to meet local needs or immediate operational requirements was out of scope.

Until the transfer of MCDEM into DPMC in 2014 the Platform was explicitly written into Director's guidelines as providing scientific advice to government on natural hazard issues and was expected to respond in a timely and effective manner. Supplementary budget to the Platform was made available for these activities following the CES. Since 2014 that responsibility has reverted to MBIE as the responsible responding agency. Thus, during the Kaikōura earthquake response in 2016 and 2017 the Platform no longer had discretionary funding to respond to national needs and it took many months before MBIE released so-called 'short term funding'. With the end of the NHRP contract there will not be a process in place for a single entity to take leadership of the science response in national disaster events. The contract to the Resilience Science Challenge precludes this adaptive capacity and it seems likely that advice to government may come from a diverse and potentially divisive set of actors, reverting to an environment that was perceived as a difficulty during the 1995/96 eruptions of Mt. Ruapehu and what the SFE initiatives of 2006-2009 and the advent of the Platform aimed at overcoming.

During the CES the Platform was asked to be an integral part of the National Controllers team in the Emergency Operations Centre in Christchurch. Following this experience, the MCDEM Director proposed that the 'science team' should be identified and acknowledged as an integral part of the response framework reporting directly to the event controller. Eight years on there has been no formalisation of this plan leaving the science community outside of response planning, meaning that as time passes many of the 'lessons' and processes originating from the CES will need to be re-learned in the turmoil of the next major event.

6 THE FUTURE

In this retrospective we have highlighted some of the ambitions, objectives and activities of the NHRP over the decade. The goals of the Resilience Science Challenge are in several ways are continuation of the Platform goals seeking wider participation across the natural hazards disaster risk management sector but, as noted above, the flexibility to re-prioritise the research programme is difficult and the science system is, in many ways, even more complex than a decade ago. Efforts to integrate across the science system and to seek coherence across the often siloed and fragmented user community is of utmost importance to delivering effective, useable and used science for the benefit of New Zealand.

7 REFERENCES

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