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Pathways for Transformation: Disaster Risk Management to Enhance Resilience to Extreme Events

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Disaster risk from extreme events and development are intimately linked. Disaster risk management influences and is affected by local development strategies. Trade-offs made in policy and implementation determine winners and losers on the basis of unequal capacity, susceptibility and hazard exposure. Transformation has been introduced as a concept opening new policy space for fundamental shifts in development trajectories. Though policy neutral, when combined with normative frameworks such as the Sustainable development goals it can open up leverage points for determining development trajectories. There is limited empirical evidence on which to base understanding of transformative disaster risk management policy though some work has been done in sister domains such as climate change mitigation and adaptation. This study asks whether transformation pathways for disaster risk management can be observed, offering an initial qualitative analysis to inform policy development. It is based on five case studies drawn from diverse locations exposed to a range of extreme events, examined through a conceptual framework offering five indicators of transformation to aid analysis: intense interaction between actors; the intervention of external actors; system level change extending beyond efficiency to governance and goals; behavior beyond established coping strategies; and behavior extending beyond established institutions. Core

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characteristics of transformative pathways for disaster risk reduction are identified, including pathway competition, pathway experimentation, pathway scale effects and pathway lock-in. These characteristics are seen to determine the extent to which the disruption consequent on extreme events leads to either transformatory change or relative stasis. The study concludes that transformative disaster risk management, both intentional and incidental can be observed. It is seen that transformations occur primarily at local level. Where policy level change occurs this generally played out at local level too. The particular insight of the study is to suggest that most often the burden of transformation is carried at the local level through the behavior of individuals, populations and civil society. This observation raises an important question for further work: How can the burden of undertaking transformation be shared across scales?

Keywords: Transformation; Policy development; Transformative pathways; Disruption; Local level; Cross scale.

1. Introduction

"Sustainable development goals cannot be achieved without managing disaster risk. The overall focus of disaster risk management, therefore, has to shift from shielding social and economic development against what are seen as external events and shocks, to one of transforming development to manage risks, sustainably seize opportunities, strengthen resilience, thereby ensuring a sustainable development." (UNISDR 2014)

The shift in focus for risk management from externalizing risk to questioning the sustainability of underlying development places disaster risk management squarely at the heart of development processes. While this view has long been championed it has proven difficult to articulate. Current debates on transformation offer a new lens on this challenge. The present report offers an analytical framework and empirical assessment of the range of pathways through which disaster, disaster risk reduction and response have had a transformative impact on underlying development trajectories, processes and values across an international selection of case studies.

Within this lens disaster is conceptualized not as an aberration of, or archipelago to development, but as a moment or period in the unfolding of development history. Disaster is an event that reveals accumulated development failures and vulnerability expressed in damage and loss. (Hewitt 1983, Wisner *et al.* 2004) Individual development pathways are an expression of specific value sets, reproduced and legitimized by institutions, habituated behaviors and dominant discourses. Individual pathways entwine, sometimes smoothly, at other times producing friction, to produce collective pathways for development (Pelling and Dill 2010). Transformation draws analytical and policy attention to the potential for disaster events, risk reduction and response to provoke a change in pathway

trajectory (Pelling 2011). Transformation describes the depth and reach of development impact, and when combined with a normative framework that provides a specific value position it can indicate who might benefit or lose, or whether such changes in the direction of development pathway are more or less socially desirable. Normative frameworks include sustainable development, economic growth and equitable development with multiple interpretations possible of the same transformative pathway. The Sustainable Development Goals (UN 2015) represent a detailed agenda against which transformative pathways can also be judged to assess the potential or actual contribution of disaster risk management.

By highlighting potential transformation makes clear the responsibility for disaster risk management to realize its role as a component of unfolding development. To deny the potential of risk reduction to contribute to unfolding development, to relegate disaster risk reduction to a position of protecting existing development structures, practices, goals and values, is to miss the bigger picture that disaster risk and loss are a product of development decisions and their legacy. Risk management strategy may legitimately choose to support existing development pathways — but transformation demands a justification of this policy choice.

This report offers a basic analytical framework to move from abstract discussion of development pathways to specific actions and responsibilities on the ground. To do this we have elaborated an actor based framework. This view builds on the work of earlier, alternative frameworks that have emphasized component parts of our framework, including work that has focused on innovation and leadership (IPCC 2012), reflective decision-making (Matyas and Pelling 2014) and the interaction between development sectors as transformation emerges (Pelling *et al.* 2014). Our core concern is to identify the interaction of actors (individuals and organizations) with dominant development pathways and here an actor oriented frame that can open the relationship between policy actors, constraining institutions and the structures that drive development trajectories provides most analytical leverage. Examples are built around five case studies (see Box 1). These are presented in the results section in some detail, this detail necessary to situate these events in respective development pathways and to then draw out the ways in which responding to or preparing for future disaster has touched pathway trajectory — by accident or design. We then discuss common features observed from these cases to allow some general comments on transformation in disaster risk management.

2. Conceptual Framework

Transforming development through disaster risk management and climate change adaptation is emerging as an alternative to treating risk as external to development

— to be addressed by incremental changes that use risk management to protect existing development goals, practices and relations (Pelling 2011). This shift in thinking reflects the increasing recognition that the inexorably growing rate of disaster losses (EM-DAT 2014) has its root causes in failed development. Also that movement toward sustainable development, and meeting agreed Sustainable Development Goals, is unlikely without fundamental changes to development pathways. In short moving toward sustainable and just development requires a recalibration of the disaster risk management-development relationship.

The insufficiency of a "business as usual" approach to disaster risk management is not a new observation. Hewitt (1983) and Wisner *et al.* (2004) amongst others have long argued that development itself is a driver for and generative of disaster risk. Transformation for disaster risk management positions this observation alongside a number of parallel debates on transformation. Most notable are those from the climate mitigation community where a considerable expertise and literature exists in transforming society toward low consumption development (as described by working group III of the IPCC's Fourth and Fifth Assessment Reports) drawing on a systems theory framework expressed through socio-technological transitions literature. A second and closely aligned systems view come from the take up of social-ecological systems (SESs) thinking in natural resource management and climate change adaptation literature. The SES approach includes transformation (fundamental change) in its account of systems level shifts from one state to another. Importantly though SES frameworks have been predominantly deployed to understand resilience (stability seeking) and contain, rather than focus on, transformation. Recognizing that stability in unsustainable sectors is not desirable, recent work from climate change adaptation and disaster risk management has attempted to address this bias and has attracted attention through extensive peer review in the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) (2012). SREX offers transformation as one of seven solutions for adapting to climate change, defined there as:

> "The altering of fundamental attributes of a system (including value systems; regulatory, legislative, or bureaucratic regimes; financial institutions; and technological or biological systems)." (IPCC 2012, p. 564)

The idea of transformation moves work beyond a focus on coping within and adapting to dominant development contexts to mobilizing the potential for risk management to seek change in the structures of development that constrain vision, entitlements and capacity. Where development has systemically failed and produces unsustainable, insecure and unjust outcomes as well as disaster risk it opens

policy and public space to think of alternatives and use risk management as a point of leverage in moving toward sustainable, equitable and secure development. This option comes, however, at a cost. Transformation — disrupting the *status quo* — may be appealing to those concerned with re-directing development toward sustainable pathways; but stability, rather than disruption, is what development organizations are most comfortable with. This can be seen in all spheres, from science to politics and is often strongly held by the poor who have least resources to cope with change and instability as surroundings systems shift (Pelling and Dill 2010). Political and policy organizations and institutions are built intentionally to be durable and resistant to pressures for transformational change (Clemens and Cook 1999) including those responsible for disaster risk management and climate change adaptation (Pelling and Matyas 2011). Alongside this inertia development discourses define "how things are done round here" normalizing dominant values and creating individual as well as organizational and systemic resistance to disruption (Pelling 2011).

2.1. *Learning from past transformations*

Transformation remains a young area of work but already empirical cases are emerging to provide some theoretical and policy texture. A case from the Mulwene area in Maputo, Mozambique, shows a transformation in housing provision resulting from an unforeseen event chain (Nielson 2010). Following severe floods in 2000, the city prepared to establish new housing areas in Mulwene to cater for displaced residents. Plans were drawn up but a lack of capacity meant they were not implemented. However over the following years the local population appropriated the vision and regulatory framework for construction of a model residency area in the wake of the flooding. Through appropriating and developing the targeted land — to which they had no legal rights — the local community have used elements of the government plans and legislative frameworks to create a *de facto* legitimacy for their actions, and in doing so have transformed local governance and development. The ability for local populations to create systems of governance, decision-making and rule enforcement to transform local development pathways is one which Ostrom (1990) demonstrates in a number of case studies; in her view offering an escape from the tragedy of the commons which suggests a local level race to the bottom in management and exploitation of common pool resources.

Where the initiative for change was taken by the community presented with the inability of authorities to enact their own plans in Maputo, a case from India shows the ability of an individual leader to effect transformation. The city of Bhuj in Gujarat made headlines both because of its dramatic devastation in the earthquake

of 2001, and because of its wholesale espousal of the "build back better" principle. The BBC reported "Gujarat's astonishing rise from the rubble" (2011). The disruption was a powerful entry point for a dramatic transformation, with the whole city redesigned and reconstructed — reportedly due to the drive of government official Pradeep Sharma. More reflective assessments sound a note of caution: Tafti and Tomlinson (2013) found that whilst homeowners were well catered for; those in rented accommodation were poorly supported and the expectation that the market would provide suitable and affordable accommodation proved fallacious, this despite over 1800 consultative meetings. A wider study of post-earthquake housing in Gujarat (Sanderson *et al.*, 2012) similarly concluded that the evident transformation did not necessarily take account of the residents' needs: "Very often, reconstruction is seen as a building project delivering products, rather than an opportunity to engage in development".

Experience from the Indian Ocean tsunami shows how gradual and yet persistent pathways for transformation can be identified. Research from the Andaman and Nicobar Islands, India explored the role played by NGOs in opening (or widening) political space — specifically, space for the renegotiation of development priorities in favor of local communities — within local government. One of the most significant changes post-tsunami has been the establishment of an NGO sector where none existed previously. In Little Andaman, only three NGOs now remain out of the huge initial influx. One of these, an Indian NGO that works to promote and enable child rights, has undertaken a variety of initiatives including: establishing child development centers (CDCs), offering trainings and support meetings for parents, managing a child-run newspaper, and delivering health awareness programmes. The NGO is now accepted as a regular stakeholder in the local governance framework. Whilst this NGO's narrow focus on child rights may make this *appear* to be a small step for transformation more widely, it has nevertheless succeeded in widening the space for state-society negotiation around development priorities (Blackburn personal communication).

These and other case materials indicate that while transformation is an intuitively attractive goal when development is manifestly unsustainable and unjust, success at scale requires the support, and leadership of actors across scales from the local up. Perhaps the best documented case of failed transformation — with failure a result of top down leadership without buy in from national or local levels — is the reconstruction and development in Honduras after Hurricane Mitch in 1998. The impact of the storm on Central American countries and the need for massive reconstruction aid opened an opportunity for affected countries and donors to reflect on the root causes of risk production in dominant development

pathways — concentrated urbanization, deforestation, inequality. Transformation was called for in the resulting Stockholm Declaration, 1999, and included an agenda for using reconstruction to:

- Reduce social and ecological vulnerability
- Enhance transparency and good governance in recovery efforts;
- Consolidate democracy and the active participation of civil society
- Respect human rights and equality between women and men
- Reduce the external debt burden of the countries of the region (Christoplos *et al.* 2010)

An overarching aim was to avoid the risk of the large international response undermining the capacities and legitimacy of the states of the region. However, an assessment produced by the World Bank in 2004 (Telford *et al.* 2004) found that these transformative goals had not been met. They conclude that short time-scales, a lack of social cohesion, high levels of corruption and unfocused efforts by the many agencies involved all contribute to this. They report one G-15 donor stating:

> "Reconstruction more-or-less happened, but transformation has not. Security has deteriorated dramatically, poverty is increasing. The coffee crisis is more devastating than the drought. If we (donors) don't see fundamental transformation we shall leave."

The assessment of progress post-Mitch in Honduras runs counter to the above cases. Whilst transformation may be invoked, its effectiveness depends on persistent drivers over substantial timeframes to achieve transformative tipping points. Disasters as an entry point are a potential but not a sufficient driver for transformative change. The art of transformation is to embed disaster risk management within development so that responsibility for transformation is a co-responsibility of both communities from the onset.

2.2. *An actor framework*

To understand the scope for disasters and risk management to open transformative moments in dominant development pathways it is helpful to reflect on those in-built institutional characteristics that resist change. Specific mechanisms for resistance to political change include closing political spaces or more subtly managing "invited political spaces" (Gaventa 2005) thereby excluding particular views and actors from meaningful participation even when major disruptions occur. Gaventa (1980) described communities becoming resigned and passive in the face of recognized development deficits as a result of this persistent exclusion.

Social actors may force open the closed political spaces through actions such as campaigns. The trajectory of transformation resulting from disruption depends on the relative power of associated actors. Long (2001) demonstrated that it is not just obviously influential actors who can shape development trajectories, but that other, seemingly less powerful actors could exercise influence. Development interventions, for example, often have outcomes different to those anticipated, due to the unexpected agency of such actors (Mosse 2004). Outcomes then are determined by which actors, and whose agency, take control of the spaces which are opened for and by risk management and it is here that transformative potential is likely to be found.

If disaster risk management can open new policy space for government, civil society and other public actors, how and where might transformation then come about? Where fundamental, systemic change is approached, it would be useful to know something of the precursors, early warning signals and determinants of change.

This study adopts Long's (2001) actor oriented perspective, focusing on values, intentions, choices, negotiations, conflicts and collaborations between actors (whether groups or individuals) rather than on the mechanic functioning of a "system". Taking an actor perspective and holding in mind a range of scales — from local urban and rural through subnational to national and international — several basic analytical building blocks to help better understand processes of social change can be identified. These include: social **structures** constraining a broad array of individual and corporate **actors** who may have shared or conflicting interests. The **interactions** between these actors are shaped by **institutions** (rules, law, culture) and occur at meeting points which have been described as interfaces (Long 2001, 2002). Such institutions may be more or less formal in nature, and resultant interfaces inclusive or exclusive, collaborative or conflictual. These encounters are stimulated by a range of **drivers**, both external and internal, including disruptions such as environmental, economic and social shocks, deliberate initiatives of groups and individuals and emerging trends, social shifts and innovations. The interactions between the various actors in response to these drivers will lead to a range of **outcomes:** from resistance (coping with the *status quo*) through incremental change to transformation (Pelling 2011). These elements are represented in Figure 1 below, emphasizing our interest in dynamic, unfolding, processes of development, rather than a single historical moment.

Figure 1 indicates that transformative outcomes are indicated by changes associated with a disrupted system, intense interaction between actors, potentially the successful intervention of external actors and of evidence of change going beyond
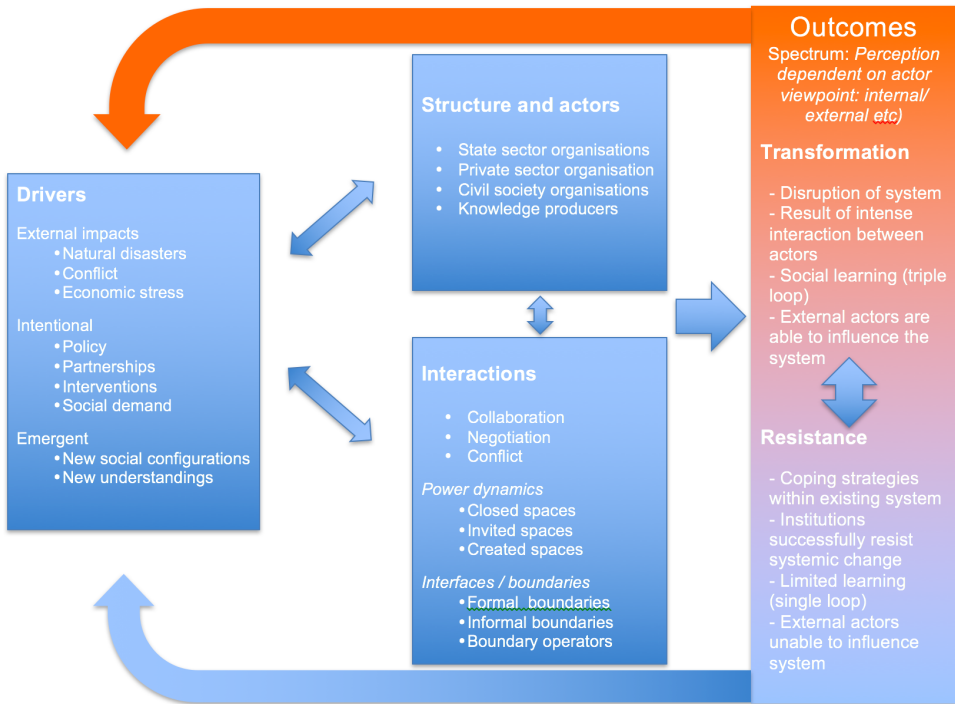
Figure 1. Transformation and Resistance Pathways from an Actor Oriented Viewpoint

efficiency and targets to goals and governance regimes. Resistance is indicated by a continuation of existing coping strategies, successful continuity within dominant institutions (laws and cultural norms), learning limited to efficiency gains and limited influence of actors external to the system of interest.

The organizing framework has at its heart *drivers* — disruptive processes which may be initiated deliberately or may be unanticipated. The dynamic interactions of *actors* impacted by these drivers determine the depth of change (from transformation to resistance) and the direction of that change (regressive or progressive) from a specific actor perspective. Thus, whilst Figure 1 represents a process, we also want to understand normative aspects of outcomes. Who does transformation benefit? Does it contribute to sustainable development?

3. Methodology

The study is built on five original case studies commissioned to examine episodes of potential transformation associated with disaster events. Cases were chosen purposively through a search of recent high visibility projects and drawing on the expert knowledge of the writing team. The study aimed to illustrate the universality

Figure 2. Case Study Locations

Table 1. The Study Sample

Study Site	Focusing Event	Development Context	Disaster-Cycle Phase	Actor Viewpoints
Christchurch, New Zealand	Canterbury Earthquake Sequence of 2010/11	High-income, urban	Reconstruction	Disaster risk managers
Sundarbans, India	Recurrent, every-day and catastrophic riverine and storm surge floods including super- cyclone Aila, 2009	Low-income, natural resource dependent villages	Whole cycle	Exposed households and regional development planners.
Sindh, Pakistan	Widespread flooding in 2010/11	Low-income, natural resource dependent villages	Relief	Development planners
Niger and the Sahel region	Recurrent drought and food insecurity crises (2005/08/10/12)	Very-low-income, natural resource dependent region	Early warning and response	Humanitarian agency
New York Metropolitan Area	Storm surge floods including Irene, 2011 and Sandy, 2012	High-income, megacity region	Reconstruction and recovery	Transport planners

of disaster risk management as a contributing factor in development trajectory and its scope for transformation. Consequently we selected as diverse a set of cases as possible (see Figure 2 and Table 1). These include examples of everyday, chronic and catastrophic events; of geophysical and hydrometeorological hazards and of vulnerable human systems ranging from low- income resource dependent villages to a global megacity. It was particularly challenging to find experts able to comment on the transformative potential or outcomes arising from risk reduction activities, but these are included alongside response and reconstruction. Finally, we sought to recognize the influence of viewpoint and provide accounts from the perspective of citizens at risk, development planners, a humanitarian NGO and disaster risk managers. The case studies are highly context dependent but the analysis is able to draw out some common threads that can help in structuring the emerging policy debate around transformation.

4. Case Study Summaries

The aim in considering the five cases is to flag where moments of potential or actual transformation arise, and how. Our conceptual framework (Figure 1) indicates transformative outcomes through:

- Changes associated with a disrupted system,
- Intense interaction between actors,
- The successful intervention of external actors
- Change going beyond efficiency and targets to goals and governance regimes.

Transformation has not been observed when evidence finds:

- Continuity in established coping strategies,
- Continuity in dominant institutions (laws and cultural norms),
- Learning limited to efficiency gains
- Limited influence of actors external to the system of interest.

The viewpoint of actors and system scale are also important themes, the case study teams were asked to identify potential or observed feedbacks between systems across scales from local (e.g., household or organizational) to local, national or international economic, governance or policy-making systems. This recognizes that only rarely do complete meta-systems transform, more likely is the observation of local transformation with incremental impact on the overarching SES. This has strategic implications for policy when overarching systems constrain local efforts at social and ecological sustainability and security. Brief summaries of the studies are provided below. The full case studies are available in Pelling and Gibson (2015).

4.1. *New Zealand: Individual and structural transformation*

The magnitude 7.1 earthquake of 4th September 2010 which devastated Christchurch and surrounding districts led to substantial response at local and national government level and significant changes in both risk management and wider public policy. It catalyzed national debate; bringing strong voices from Māori, women's, student and regional groups as well as new business and political interests into the mainstream. Establishing a centralized recovery governance institution may have strengthened coordination but at the same time reduced engagement and empowerment of citizens and other stakeholders, whereas the Māori model of collective authority, agency and action within this bi-cultural country modeled a transformative approach to governance. These contrasting cultural approaches stimulated transformation at the level of individuals brought into positions of influence, enriching city and national policy debates on disaster risk management and more broadly — especially from gendered and Māori perspectives.

4.2. *India Sundarbans: The local burden of spontaneous transformation*

The Sundarbans, a unique mangrove forest ecosystem, extends along the Indian and Bangladeshi coastline. The impact of the Aila super cyclone of 2009 compounds other development failures in the region. In the wake of frequent, extensive risk and episodic catastrophic events pathways of transformation unfolded in parallel at household and at regional level. Households were seen to transform through crisis migration when *in situ* adaptive capacity met its limits, facilitated by information flows from previous migrants describing livelihood options in the cities. In aggregate household level transformations contribute to regional transformation through depopulation providing tacit support for an emerging conservation narrative, promoted by organizations such as International Union for Nature Conservation (IUCN) and the World Wide Fund for Nature (WWF) based on reducing population and its pressure on a globally significant ecological resource.

4.3. *Sindh floods, Pakistan: Extending citizenship rights through disaster response*

In the Lower Sindh region of Pakistan the aftermath of large scale flooding in 2010 and 2011 led to an unusual government response in distribution of financial aid using Watan and Pakistan ATM cards enabling direct cash transfer to citizens. Though not a legislative right they were regarded as such by citizens, triggering an apparent transformation in citizen engagement in disaster and development policy,

fostering increased senses of citizenship through more directed rights claims and public engagement. The external environment was also influential as the World Bank had become supportive of such transfers through experience of similar interventions in Brazil, Mexico and India. This period reshaped political space for citizen-state interaction in the post-disaster period. In particular this study reveals a transformation in discourse and in the institutions of citizenship, and its impact on development pathways.

4.4. *Niger: A moment of critical reflection transforming development and humanitarian practice*

Failures in the strategic response of INGOs and other actors to slow onset drought in Africa over the last decade have raised a desire to transform the delivery of development and humanitarian aid. This case study focused on an agenda for transformative change within international humanitarian nongovernmental organization Save the Children, and its work in Niger. The intersection of incremental changes in Niger and wider discursive debate in the international aid system led to a moment of critical reflexivity within this INGO, focused on the future of responses to slow-onset shocks. The organization was able to use this moment to consolidate and realign internal, incremental change toward a transformational agenda that had as a key element bridging the relief development gap within the organization. Internal incremental change made Save the Children better able to support transformational change in the delivery of food security with its partners in sub-Saharan Africa.

4.5. *New York: Public transit systems and pathways to transformative flood control strategies*

The impacts of tropical storms Irene and Sandy in 2011 and 2012 are the latest in a sequence of extreme weather events which have triggered debate about the resilience of New York City's development trajectory. The urban public transport system is in many ways the infrastructural backbone of the region's economy. The Metropolitan Transportation Authority (MTA) operates the transit system for New York City and the surrounding region. In the wake of the storms the need for heightened resiliency and redevelopment was clear. However, despite high level support for building city resilience the complex administrative structure of the MTA along with internal skepticism about climate change impacts created inertia and *ad hoc* responses, slowing adaptation and transformation. Market forces also shaped the agenda. Better transit access and new flood protection structures provide added value to high amenity value waterfront locations; promoting disaster

risk reduction and economic growth. This strategy has social impacts: will redeveloped neighborhoods still have places for less economically advantaged residents or will the resiliency-driven construction spur a process of gentrification and larger social-political transformations? Diverse political, institutional, economic and social drivers lead to unclear transformatory pathways.

5. Findings and Discussion: In what circumstances can disaster risk management open space to address accumulated development failures or gaps?

This section discusses the key findings from the report case studies. Results are summarized in Table 2 which draws out six key characteristics of transformation introduced by our conceptual framework. Each case study presents a distinct historical context and development trajectory but common lines of influence can be seen that can help derive some core principles for the interaction of disasters and risk management with development.

Pathway competition: The Christchurch event provides a clear example of two development models coevolving. Liberal and Māori response and reconstruction efforts have involved individual and structural transformations. Both approaches have their roots in pre-earthquake society and both have gained ground in the response and reconstruction period. However, the discourses around each trajectory and their methods of operation are distinctive (centralization and the introduction of public–private partnerships compared to collective and communitarian action), potentially conflictual. Both also challenge some of the institutional foundations of New Zealand's Anglophone and welfare state oriented social democracy. These two pathways seem to be pulling in contrasting directions, toward more market oriented and collectivist development strands. Legislation, organizational structures and social development interventions institutionalize these pathways producing an increasingly multifaceted development trajectory post-earthquake.

Pathway experimentation. Planned, technological and administrative reforms can allow for controlled opening of potentially transformative social and political space. The New York and Sindh cases both led with technological innovation. Both provide scope for a controlled experimentation with social change processes without commitment. In New York, planned revision of public transit may include significant redesign and revision of transport management structure. In Sindh, cash transfers extended citizenship rights, claims and stakes. Both the Christchurch and the Niger case consider the management of the pace of change. Time compression

Table 2. Pathways for Transformation

Indicators of Transformation	Christchurch	New York	Sundarbans	Sindh	Niger
Disruption	**Yes**, to physical infrastructure, local economy, population and development narrative	**Yes**, to infrastructure performance and physical assets and business continuity	**Yes**, to life and livelihoods	**Yes**, to life, livelihoods and infrastructure	**Yes**, to lives, livelihoods and organizational reputation
Intense actor interaction	**Yes**, at local and national levels.	**Yes**, between administrative interests	**No**, strategy is isolated by sector and scale	**Yes**, at the technical level	**Yes**, within the humanitarian and donor communities
External intervention	**Yes**, increased central state and corporate private sector in reconstruction and Maori led initiatives	**Yes**, from science in planning for future risk	**No**, firmly set within state and national risk management and development planning	**Yes**, with expert interventions	**No**, led by internal reflection.
Triple loop learning	**Yes**, insertion and enactment of Maori values in response and reconstruction	**No**, focus on efficiency not major redesign or revised social role for transport.	**Yes**, amongst household livelihood and identity	**No**, mode of delivery and extension of citizenship.	**Yes**, new organization goals and processes to reduce risk.
New forms of coping	**Yes**, emergent social forms	**Yes**, new technology and user management investigated to enhance future risk management	**Yes**, amongst households and for individuals who meet adaptation limits	**Yes**, based on new entitlements claims	**Yes**, new organizational forms and processes under development.
Failure of institutions	**Yes**, new legislation in place	**No**, institutions robust and flexible	**Yes**, at the household level but reinforcing state level	**No**, institutions robust and flexible	**Yes**, at the organizational and policy community level.

in response to the Canterbury earthquake sequence constrained involvement of the community and local government actors in response. In contrast, and perhaps because changes have unfolded in a pre-disaster space, the Niger case has explicitly identified the need for critical reflection and consideration of a range of alternatives, allowing time for diverse actors to engage with the change process.

Pathway scale effects. Perhaps the clearest experience across the case studies is the tendency for the local level to carry the weight and costs of transformation. In the Sundarbans scale effects were not planned. Households self-transformed using migration as a survival and development strategy faced with region wide flood risk. The resulting population movements supported regional strategies for depopulation. Scale effects can also be reversed. In Niger, purposeful local but incremental action by Save the Children changed operating procedures and goals with a view to transform the delivery of drought and food crisis management. In New York, discussion of risk management combined with gentrification of water front neighborhoods shows just how tightly coupled development trajectories for risk management can be to urban planning.

Pathway lock-in. Institutional structures are designed to be resistant to organizational transformation. Transformation is most likely when multiple local and external actors are aligned, in critique of established systems elements.

Distinctive, disruptive drivers resulting from disasters of differing scales characterize all cases: In the Sundarbans, the failure to open a transformational policy space to support transforming households has constrained space for institutional transformation. This increases the likelihood that self-transformation at household level may have negative outcomes for those electing to pursue it. Environmental factors such as WWF and IUCN may see out-migration in the Sunderbans as an attractive demographic transformation in line with their preference for depopulation and conservation in the region.

By contrast the Canterbury earthquakes have proved a driver for transformation at organizational level, potentially shifting development trajectories, but for whom, and in what ways? The shift toward centralized and de-bureaucratized decision-making represents an institutional transformation. A further institutional transformation has resulted from awareness of the response strategies of the Māori, leading to the involvement of local tribe Te Rnjnanga o NgIi Tahu as a partner, a new departure in disaster risk management. It is not clear at this stage whether these institutional transformations have led to significant adjustment of core developmental pathways.

Hurricanes Sandy and Irene in New York created dramatic disruption, but the institutional structures under consideration appear more resistant to organizational

transformation than was the case in Canterbury. The complex array of interlocking institutions displayed "institutional interlock" limiting the effect of the disruptive events, on their behavior. The study questions, for example, whether climate change information has been taken account of in the management of the transport system by the MTA. The then Mayor stridently stated that ". . . as New Yorkers, we cannot and will not abandon our waterfront. It is one of our greatest assets. We must protect it, not retreat from it." representing an institutional schema defining the direction of development. As in the Canterbury case the impact of these incipient transformations may be negative to the local populations, who in both cases may have reduced voice or agency. The underlying question, as Harvey (2012) poses, is about who gets to shape and define the city.

Agency amongst local actors is displayed in Pakistan, where external institutional pressures from the World Bank have played a part in triggering innovative cash payments via Watan cards, which have in turn influenced discourse at the local level, increasing individuals' awareness of rights. This signals a potential shift in the social contract which may redirect the development pathway.

Moving away from external disruptions, can institutional structures transform themselves intentionally? In the Nigerien case, the prevalence of slow onset disasters has triggered an intentionally transformative response. The key question is whether the transformative outcome matches intention, and who the transformation benefits. The study anticipates the possibility of a transformative change breaking down the humanitarian/development barrier militating against effective developmental response but it is yet to be seen whether this historically intractable barrier can be removed.

The Sunderban case study documents not only the impact of Aila, but the increasingly unsustainable lifestyle resulting from the impacts of climate change. Similarly, in Niger livelihoods are fragile, though the precise impact of climate change is less clear (UNEP 2006; Black *et al.* 2013). In both cases, a key determinant of transformative outcomes in response to vulnerability and disaster is the responsiveness of institutions. The phenomena of institutional lock-in was identified in the New York case, and the authors of the Nigerien case study note that the need to manage the pace of anticipated organizational change must be adapted to take account of the variable responsiveness of institutions. Deeper anticipated transformation in that case — merging humanitarian and development workstreams and funding — is yet to emerge.

Returning to the Sunderbans, interlocking institutional goals appear to leave the most vulnerable groups with their only option as out-migration from the area. A more transformative outcome is seen in the Sindh, which benefits from the conjunction of a responsive government with specific local ties, the existence of

models of direct financial support from other countries, support of the World Bank and the active engagement of communities.

From across the case studies two overarching themes emerge, and reinforce observation made elsewhere in the wider literature: (1) transformation is resisted by established institutional frameworks, (2) transformation is dependent on the relative influence of multiple factors.

6. Conclusions

The core question put to this study — can we observe decision-making processes that lead disaster risk management strategies to impact upon underlying development trajectories can be answered firmly in the positive.

The study has shown that the interaction between disasters, disaster risk management and underlying development trajectories can be both incidental and purposeful. Our conceptual framework proposed that extreme events acted as drivers through disruption to the continuity of existing strategies and institutions. It also suggested that outcomes might range from transformation to resistance depending on the extent to which actor interactions combined with external interventions led to system level change. The framework also suggested that the persistence of institutions combined with lack of actor interaction and influence might restrict or prevent transformatory change. In the cases under consideration extreme events *did* lead to transformations. It was notable that the majority of observed transformations were *local* — found at the level of households or in organizational decision-making. Even when policy led transformation was also observed to be targeted at affecting strategic change this was worked through in local policy for land-use management, local governance and economic development.

The study has drawn out the importance of policy as a driver of transformative change but more significantly the case studies presented show the potential for individuals and population level behavior and of organized civil society, opening space through disruption of existing norms as a result of extreme events, as agents of transformation. This is a fundamental observation and opens questions on the scaled distribution of the burden of undertaking transformation.

A better awareness of cross-scale interactions as well as cross-sector communication as key determinants of transformative potential and in the distribution of possibilities and trajectories speaks directly to the two likely future scenarios for disaster risk. First where risk becomes more extensive: here as we see from the Sundarbans, Niger and Sindh while extensive risk impacts on widely distributed population's adaptation will be at the household level and it is here that adaptation

limits will be reached and forced transformations undertaken. It is important that policy actors and institutions are able to anticipate this and prepare to support forced transformation. Such preparations, such as Save the Children and the Pakistan Government have found are not easy and not always predictable in their outcomes. The ways in which risk managers have been able to develop anticipatory policy and hedge to contain the unexpected impacts of policy in the transformation solution space are new priorities. Second, as urbanization and population growth continue and assets become more concentrated so the risk of major catastrophe increases in scale and geography. The likely policy response here is for investment in large-scale engineering or social protection schemes. Macro-management also offers scope for transformation — from land-use and market behavior to the decision-making process itself. Managing risk at scale has been left out of discussions on the procedural justice which have concentrated on local and NGO led activities. This is a missed opportunity and one that will become increasingly evident and risk management scales up to meet likely future challenges.

In providing a first systematic analysis of transformative potential in disaster risk management, the study arguably opens more questions than it can resolve. Next steps at shaping a policy agenda for transformative risk management include:

- What kind of disruption is required to open transformative action?
- How do existing structures and dominant actors behave when faced with potential transformation?
- How best to anticipate and steer transformative pathways to avoid collateral costs, especially to the poor and vulnerable?

This new policy agenda can build on the substantive findings of this study which finds that transformative disaster risk management is:

- instrumental and spontaneous,
- delivered by individuals and in aggregation at the level of population
- led by national and international actors, across the public sector and civil society, and
- felt most strongly at the local level.

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