Adaptation and transformation

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Abstract

Transformation as an adaptive response to climate change opens a range of novel policy options. Used to describe responses that produce non-linear changes in systems or their host social and ecological environments, transformation also raises distinct ethical and procedural questions for decision-makers. Expanding adaptation to include transformation foregrounds questions of power and preference that have so far been underdeveloped in adaptation theory and practice. We build on David Harvey's notion of activity space to derive a framework and research agenda for climate change adaptation seen as a political decision-point and as an opportunity for transformation, incremental adjustment or resistance to change in development pathway. Decision-making is unpacked through the notion of the activity space into seven coevolving sites: the individual, technology, livelihoods, discourse, behaviour, the environment and institutions. The framework is tested against practitioner priorities to define an agenda that can make coherent advances in research and practice on climate change adaptation.

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1. Introduction

Transformation as an adaptive response to climate change risks opens a range of novel policy options and positions adaptation firmly as a component of development policy and practice. Within the range of adaptation options, transformation describes non-linear changes (Nelson et al. 2007; Wilson et al. 2013). These may appear as radical shifts, directional turns or step changes in normative and technical aspects of culture, development or risk management. Both adapting systems and surrounding environments can be subject to transformation, with non-linear change being either intentional or unexpected (O'Brien 2012).

Much of the adaptation literature applies transformation to describe actions that lie beyond the limits of incremental adaptation (Dow et al. 2013). Transformation is presented as opening adaptive possibilities for organisations or individuals, either forced by systems failure or chosen in anticipation of collapse and movement to a novel social-ecological systems state. One example of the former is distress migration triggered by drought, while planned resettlement as an adaptation to rising sea levels illustrate the latter. (IPCC 2012). We offer a view of transformation reflected in an alternative and growing understanding where fundamental change is directed at the surrounding social-ecological system. This interpretation ascribes transformation to adaptive actions that have the reach to shift existing systems (and their component structures, institutions and actor positions) onto alternative development pathways, even before the limits of existing adaptation choices are met. In this reading incremental adjustment and transformation express preferences about the rational for adaptation and its connection to development trajectories. This positioning of transformation pushes decision-makers and those assessing adaptive capacity and action to extend their concerns from the proximate causes of risk (e.g., dwelling quality, livelihood structure or demographic characteristics) to its structural or root causes (e.g., social, cultural and economic relationships, power hierarchies) (Wisner et al. 2004), and to justify choices made between incremental and transformative agendas of change.

Some policy actors have already articulated this ambition: The UK Department for International Development (DFID), encourages "maintaining or transforming living standards in the face of shocks or stresses" (DFID, 2011a: 6) in its resilience strategy. This view is now informing DFID's international humanitarian programming, for example in its Building Resilience and Adaptation to Climate Extremes and Disasters Programme which is expected to benefit up to 5 million people. At the national level, the Philippine Disaster Risk Reduction and Management Act (Republic Act 10121) of 2010 (Brower and Magno, 2011), in conjunction with the Climate Change Act (RA 9729) of 2009, seek to underlying causes of vulnerability such as land ownership, governance and poverty, and community level capacity building (Brower and Magno, 2011). These experiences are pushing the limits of practice with academic engagement lagging behind.

Within the academic community transformative adaptation has gained visibility through the Intergovernmental Panel on Climate Change (IPCC) which first discussed transformation in its Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) (IPCC 2012). The SREX report not only identified the links between climate change and extreme weather events, but considered what it meant for disaster risk management and climate change adaptation in the context of sustainable development. Transformation was presented as one of six interacting elements that make up the 'solution space' for managing risks and adapting to climate extremes. Other elements include reducing vulnerability; preparing, responding and recovering; transferring and sharing risks; reducing exposure; and increasing resilience to changing risks (IPCC 2012).

The subsequent IPCC Fifth Assessment Report (AR5) (2014) reflects the evolution of the concept of transformation. Where SREX presented transformation within a single narrative logic, AR5 offers three – each reflected in the underlying science: (1) transformation inducing fundamental change through the scaling up of adaptation, conceived as a limited, technical intervention with transformative potential; (2) transformation as actions or interventions opened when the limits of incremental adaptation have been reached; (3) transformation seeking to address underlying failures of development, including increasing greenhouse gas emissions by linking adaptation, mitigation, and

sustainable development. Of these narratives, the first and second were deployed most frequently in SREX and AR5. The third narrative was ~~also~~ presented in AR5, for example in the transformation of eThekwini Municipality, Durban, South Africa, through its placing of ecological values centrally in urban planning (Roberts 2010). It is this third form that has the greatest potential to open the political possibilities of adaptation.

Transformation describes depth of change, but not its origin, breadth or trajectory. Trajectory can be assessed against existing normative frameworks to determine distance from desired process and outcome goals (O'Neill and Handmer, 2012). Tschakert et al. (2013) develop just such a test using the benchmark of social justice to assess ~~the need for~~ transformative adaptation. Origin and breadth—the point of emergence and its reach across development sectors require a clear~~er~~ mapping of the social landscape in which adaptation intervenes and through which its influence can potentially spread in planned and unplanned movements. This requires also an understanding of the power relations that will direct, block or distort outcomes and may reduce predictability. Transformation raises the stakes in adaptation decision-making, bringing into focus many ethical and procedural questions: who—or what processes—determine the dominant mode for adaptation, and selects objects for change? What are the contexts within which adaptation pathways emerge and how do they move? These are significant questions. Without at least considering transformative choices, adaptation remains limited to protecting existing systems properties, even where these are associated with the structural causes of risk, which can build pressure for eventual, catastrophic systems collapse (Handmer and Dovers 1996). If sustainable development is desired transformative adaptation offers one tool to leverage adaption to address the root causes of current failures.

To help meet this challenge we draw from social theory to present an analytical framework that can articulate power in its many guises through the lens of adaptation. This framework is then tested against practitioner viewpoints to explore the questions that transformation raises for research and policy. In summary, the paper addresses three questions:

- What is the theoretical relationship between transformation, incremental adaptation, stability and resilience, and how might these processes interact?

- How and where might transformation emerge and spread through adaptation processes?

- In what ways does transformation provoke changes in the approaches to adaptation taken by researchers and practitioners?

2. Positioning transformation

Early work on transformative adaptation introduced the social contract as an analytical lens (Pelling 2011). The social contract asks for analysis to look at interactions across scales, both within and between individual activity spheres. The defining characteristic of social contract theory is recognition of the legitimising force of citizen consent to the authorities that limit their freedoms, and the role of social institutions in upholding ~~the~~a dominant rights settlement (Pelling 2011). Transformation is ~~seen~~indicated in ~~the~~an observed rebalancing of rights and responsibilities between actors; the citizenry and state in a classical formulation, but open to be applied to any hierarchical relationship~~s~~ held on a promise of security (e.g., in the family or workplace). The social contract for risk management and adaptation can constrain or legitimate state authority and protect citizen rights (O'Brien et al. 2009). It can reveal public assumptions about rights and responsibilities, as well as the dissonance between these and state capacities or legal responsibilities to protect life and property (Adger et al. 2013). In the aftermath of disasters, this can open political space for alternative narratives and organisation to emerge (Pelling and Dill 2010). By drawing attention to shifts in the balance of power, rights and responsibilities in institutions, discourse and behaviour, attention to interactions within and across the framework presented below, based on notion of activities spheres, helps to sharpen analysis of transformative adaptation.

Methodological innovations have also begun to provide insights on transformation processes. Park et al.'s (2012) Adaptive Action Cycle, considers transformational adaptation to involve purposeful decision-making that draws on change management and action-learning theories. The Adaptation Action Cycle includes two linked action-learning cycles, in recognition of the differential information needs and policy support requirements of incremental and transformational adaptation. The result is

a demarcation of points of entry for research on transformative processes, and their effects. Park et al. (2012) hypothesize that once the outcome of a transition process is perceived as being successful, decision-making returns to the realms of incremental adaptation, until further transformational adaptations are deemed necessary. In developing an Inequality and Transformation Analysis framework, Tschakert et al. (2013) argue for the need to examine the structural and relational dimensions of inequality that shape vulnerability. The relational view allows better purchase on understanding and assessing the transformation of constraining institutions and structures and the role played by actors in any processes, or their blockage, and is taken up below in our own framework approach.

Recognising the potential for transformation expands the policy options for adaptation, from (a) measures taken to preserve stability and resist the drivers of hazard and vulnerability, and (b) incremental adjustments that preserve systems integrity when conditions change, to include (c) measures that challenge the stability of current systems. In Table 1 we summarise and describe these adaptive responses as resistance, incremental adjustment and transformation. Béné et al. (2012) present a similar framework whereby they deconstruct resilience into three elements; persistence, incremental adjustment and transformation stressing that each mode of resilience will interact supporting, fostering as well as blocking development pathways. We share this perspective and concern.

Table 1

The advantages and disadvantages of resistance, incremental adjustment and transformation

	Advantages	**Disadvantages**
Resistance: increased and concentrated investment in existing development pathways infrastructure, institutions and practices (*examples include strengthening sea walls or maintaining insurance for all at risk to protect business-as-usual development*)	Allows for 'business-as-usual': established stakeholders and institutional regimes are already in place and are supported by capital throughput. Investments are externally visible examples of risk management that produce political advantage Enables re-organization without causing major systemic disruption.	This 'all-or-nothing' strategy can narrow down worldview, and technical capacity restricting management options and reducing flexibility over time so generating hidden vulnerability within systems structures

Incremental Adjustment: marginal changes in infrastructure, institutions and practices that foster flexibility and fulfil capacity while not directly threatening systems integrity (*examples include revising land-use planning legislation or improved application of building standards regulations*)	Diversity in development vision and path, human resource and supporting systems can be built gradually over time rendering transactions costs more politically palatable. Allows for system flexibility, diversity, supports redundancy and incrementally can open scope for experiments in decision-making enhancing broader governance objectives	Committed to functional persistence, it does not allow for challenges to the underlying values and assumptions that give rise to systemic vulnerability
Transformation: fundamental change to the functioning of systems (*examples include new social contracts and new relationships of power eg by gender, class, or ethnicity that surface alternative development priorities, preferences and pathways*)	Opens new areas of policy response by going beyond existing systemic forms. Allows deep-rooted causes of risk and vulnerability to be addressed as part of a reorientation of development pathway towards social justice and sustainable development.	Can cause significant and unexpected secondary costs as systems reach new equilibrium. It risks undermining the stability of economies, ecosystems, or societies The poorest may be most exposed to the transactions costs of transformation in the short term.

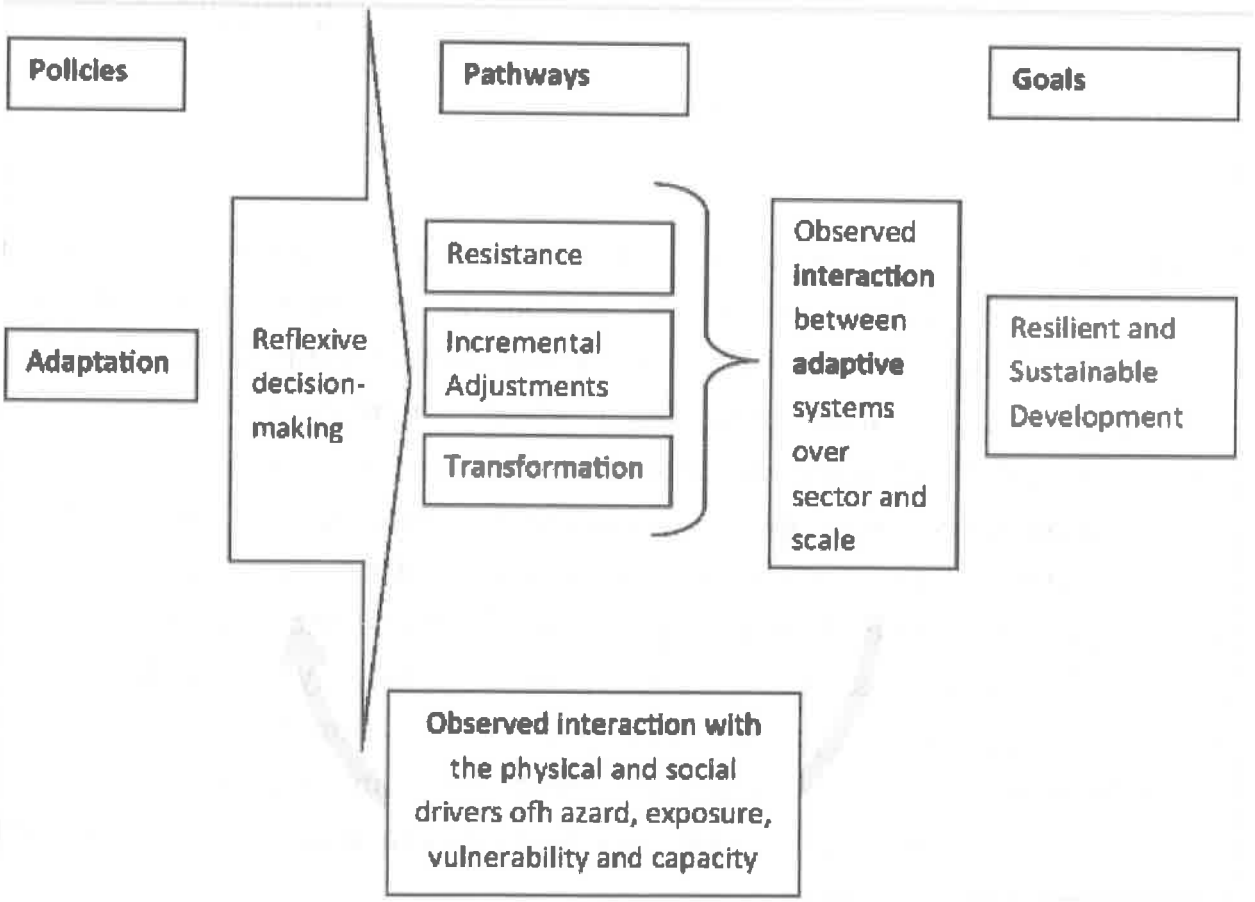
Source: Based on: Matyas and Pelling (2015)

Surfacing the full range of adaptation options allows informed questions to be asked of the relationship between adaptation, underlying development priorities and the dominant values that finally determine pathway choice. This raises new questions about who or which structures drive these processes, and the phasing and preconditions for adaptation: Is transformation needed to open new options for incremental change? Can the institutional stability of resistance forge confidence to move towards transformation? Can early warning systems for transformation be envisaged? These questions open debate onto the largely overlooked issue of adaptive preferences, problematizing the observation that security from risk is bought by giving up rights and identity and opens a lens onto the social power that mediates in reflexive processes producing such trade-offs (Teschl and Comim 2005),

Seeing transformation as one pathway choice for adaptation is illustrated in Fig. 1 and positioned in relation to development policies, pathways and goals. Moving from the left, the invocation of transformation alongside established agendas of resistance and incremental adjustment widens adaptation options. The decision to adapt then becomes a critical space for analysis and policy work. Once selected (or forced), adaptation pathways will interact over time in planned and unplanned ways, with scope for adjustments as systems coevolve. Interaction may be especially powerful across scales, as illustrated by the case of mangroves along the coast of Quintana Roo, Mexico. Here~~R~~regional and national level incremental adjustments in legislation ~~have~~ strengthened protection for mangroves acting as coastal defence. However this has been undermined by a lack of transformative adaptation at the local level where persistent power asymmetries work though cultural, economic and land-use systems to legitimise mangrove clearance for tourist development even where legality is uncertain (Redclift et al., 2011).

Fig. 1

Transformation as a pathway to resilient and sustainable development



Over time incremental adjustments may move an original system towards transformation. Pelling (2011) describes this process of incremental transformation as 'transitional adaptation'—changes that individually do not exceed systems thresholds, but in aggregate and over time can transform systems. Yet incremental adjustments can also prove to be short-term palliatives to avoid deeper rooted change and as such delay transformation, potentially building hidden and latent risk into the system (Matyas and Pelling, 2015). For example, path dependence from previous administrations and incremental adjustments to patronage networks can lock a system into a less desirable regime (Schlüter and Herrfahrdt-Pähle 2011). The social characteristics that lead to choices for incremental adaptation can also block transformation: in an analysis of adaptive capacity amongst peanut farmers in Queensland, Australia, Marshall et al. (2012) found that while place and professional attachment were drivers for incremental adaptation, they were barriers for transformative adaptation that closed options for planned adaptation in the industry.

It is then reflexive decision-making based on the continuous observation and monitoring of adaptive outcomes that will determine the potential for transformative adaptation within a wider portfolio of adaptive action seen as a component of development (Nelson 2009). As new risks and social or economic uncertainties emerge in response to the non-linear impacts of climate change and development, the balance in preferences between resistance, incremental adjustment and transformative adaptation may shift, and the scales and sites experiencing specific modes of adaptation may also change. For example, as the frequency of extreme events such as heat waves shift from 1-in-20 year events to 1-in-2 year events, as is predicated for the end of the 21st Century in most regions under climate scenarios with sustained economic growth (A1B and A2) (IPCC, 2012), new family as well as public responsibilities for social care may be called for, alongside new strategies for risk management.

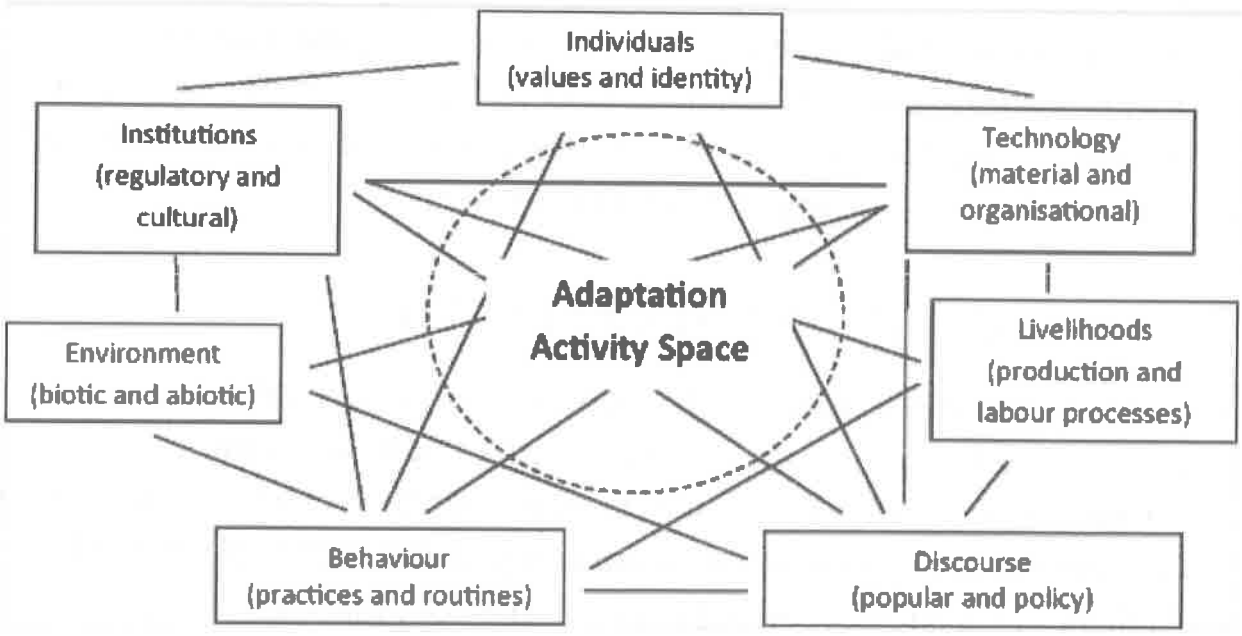
3. Deconstructing transformation

The discussion above indicates the increased significance that transformation brings to analysis and reform of adaptation and development decision-making, and the need therefore to look more closely at their conjunction. A clearer understanding of the origins and breadth of movement of transformation requires a framework that captures the diverse

components of coevolving social-ecological systems. Figure 2 represents one attempt to delineate such a framework, and in so doing helps to identify the spaces in which transformation (and other adaptive actions) can be observed and the relationships through which non-linear change may be transmitted or contained. This formulation of components draws from David Harvey's (2008) 'methodology of moments' originally proposed by Marx in his *Economic and Philosophical Manuscripts* (1844) to develop an analysis of the relations between components of a 'socio-natural totality' in determining development history (Loftus 2012). Harvey's original 'moments' included 1) relations of production; 2) social relations; 3) mental conceptions; 4) technology; 5) relations with nature; and 6) everyday life. Recognizing organizational form as a variant of technology, Harvey (2010) later revised the framework, adding a seventh component for institutional and administrative arrangements. He also rechristened the moments as 'activity spheres' to highlight their utility in guiding an understanding of meta-systems through an analysis of interactions, flows and blockages between system components. Power is found in the movement of information, entropy and influence between actors and spheres, it captures the ability of actors to influence structures and through this to maintain control of the adaptation and development choices of others. Activity spheres then become places where contestations between power can be revealed and the reach of power mapped through the influence of change in one activity sphere upon another.

Fig. 2

The adaptation activity space



Harvey's activity spheres have been reformulated in Fig. 2 to focus on the 'adaptation activity space~~,~~', which can be seen as a shift from a political-economy to a political-ecology epistemology. Political-ecology extends political-economy's interest in power relations to help explain observed asymmetries in the distribution of risk and opportunity to include nature and environmental processes as drivers, mediators and sites of power. The individual sphere captures the values and identity elements of Harvey's social relations and relations with nature. Other expressions of social relations can be mapped across activity spheres, for example social capital connects with the individual (values of trust and reciprocity), technology (organisational forms, e.g., community groups) and behavioural (routines that ~~enact~~reproduce trustful relations) activity spheres. Similarly, by devoting an activity sphere to the environment, social relations with nature can be drawn from all other activity spheres, while also acknowledging the importance of internal interactions and coevolution within the environmental, biotic and abiotic realm for adaptation to climate change. Relations of production, which speak most clearly to a structured capitalist and modern economy, is subsumed within the broader category of livelihoods to recognise that many of those most at risk from climate change impacts are also constrained by the informal and petty-capitalist nature of production and consumption.

Discourse orientates Harvey's mental conceptions to worldviews generated and reproduced beyond the individual, such as political and popular discourses. Behaviour aims to capture all aspects of everyday practice and routine, often unthinking acts that embody and reproduce the naturalism of other activity spheres, especially discourse and individual identity and values. Institutions include Harvey's focus on formal arrangements, but we broaden this to accept informal/cultural institutions and the interaction between these two as a key constraint on adaptation pathway. Technology is faithful to Harvey's (2010) vision, encompassing material and organisational expressions.

Activity spheres are conceived as co-evolving though history, all are interrelated and none essentially dominates. Each activity sphere itself is capable of transformation as a result of internal processes of change, as well as in response to changes in surrounding spheres. This approach prompts questions about the relative significance of individual activity spheres in specific cases of transformation, the phasing and direction of

interaction between activity spheres, and the extent to which transformative adaptation requires change in all components. Different interests may emphasise a preference for enacting transformation through specific activity spheres, e.g. hazard managers have more expertise in transforming within the technology sphere, while those working on social vulnerability may be more concerned with the livelihoods and institutions spheres.

Power to shape the content and interactions of spheres opens and closes space for transformation, incremental adjustment and resistance. Earlier work connected Giddens's (1984) Structuration Theory account of power, where power is reproduced through the interaction between agents, framing structures and enabling systems, to a social-ecological model of resilience and demonstrated how a disjuncture between individual values and behaviour on the one side and formalised institutions and organisations on the other can open space for alternative, potentially transformative adaptations to emerge or be driven (Pelling and Manuel-Naverrete, 2011). However, dominant social systems are adept at minimising this space, even following catastrophic disaster events that make clear inequality in the social contract.

With Fig. 2 as a guide, we explore each component of the adaptation activity space from the perspective of transformation. This is a first step to examining the interactions and interstices between activity spheres and projecting a research agenda that comes from this framework.

> Individuals as an action space for transformation describes fundamental changes to the acts or processes by which individuals acquire knowledge, including perception, intuition, reasoning and emotional intelligence. Understandings of individual transformation draw from work on the relationships between the self and society and the balance of influence that society and social processes have on the (re)production of the self, including identity and values. Bottrell (2009) argues that transformational change for the individual may require rejection of prescribed identities. Democratic theory has a long standing interest in self-transformation (e.g., Warren 1992: 8), positing that individuals exposed to democratic institutions and practices can become more "public spirited, tolerant, knowledgeable and self-reflective". In contrast, liberal theory argues that individuals are pre-politically constituted and narrowly self-interested. Moving

beyond this impasse, educational theorists distinguish between learning that better equips individuals to succeed in a given context and that which problematizes that context, turning it instead into an object of change. Building from Freire's (1970) work on liberation pedagogy, transformative learning (Mezirow 2000; Cranton 1994) describes change in an individual's frame of reference brought about by critical reflection on previously held assumptions, with consequences for the ways that an individual views and acts within and upon the exterior world of social relations and structures (Pelling 2011). Research on the development of mental complexity in adults shows that while the mind as a socialised product may be influenced by cultural fashion and ideological beliefs, the potential exists to develop self-authoring and self-transforming minds (Kegan 1994; Kegan and Lahey 2009). The literature on spirituality, theology and personal development views self-transformation as an inner process or journey, and also contributes to understandings of individual transformation (e.g., Krishnamurti 1996; Schlitz et al. 2007). Importantly, across the literature on transformative learning and political and spiritual consciousness, an emphasis is placed on the added value of individuals learning communally and through practice, rather than alone and abstractly.

Technology is an action space for adaptation that includes material interventions—engineered structures, new seed varieties, watershed-management tools, early warning systems—but also innovation in organization structure and function. Such adaptations can offer the advantage of being publicly visible, and as such likely to be a preferred entry point for state policies on adaptation. They can also potentially provide livelihood/economic stimulus. Organizational innovation can include the greater inclusion of women or other marginal interests in decision-making systems from the household and community to formal government structures (Pelling 2011). Science itself can also be restructured by technology and organisational change by bringing in new voices, sharing methodologies and practices, and changing proximity and influence with other activity spheres. Social media is perhaps the best example of technological transformation, although the implications for adaptation are at an early stage of exploration (Foresight 2012).

Institutions serve to regulate and facilitate social behaviour, they reproduce power asymmetries and police its reproduction. Institutions may be formalized through legislation, professional guidelines and administrative forms, or they can remain informal and experienced as cultural norms. The distribution of power within existing institutions and lock-in to unsustainable development pathways suggest that prospects for realizing transformation may be limited, unless systemic barriers are confronted (Glavovic 2008). Working with shadow networks and informal institutions can provide a space for formulating and enacting alternatives, and the development of such alternatives can catalyse the reformation of canonical institutions (Pelling et al. 2007). While rigid institutions can constrain adaptation, weak formal institutions that lack strategic leadership may lead to poor systems learning and generate high transactions costs for uncoordinated attempts at adaptation that undermine development gains. The experimentation that underlies adaptation, especially types of transformative adaptation that can threaten existing institutional forms, may depend upon the existence of a strong informal institutional context.

Livelihoods as an action space represents the skill sets and entitlements that shape individual and household asset profiles, as well as associated production and labour processes that describe the modes of economic reproduction available to those at risk. Acknowledging both assets and entitlements approaches (Chambers and Conway 1991) and production and labour processes (Harvey 2010), research within this sphere combines traditions of analysis rooted in international development and labour markets with research on economic inclusion that is attuned to informal and formal economies and data poor/data rich economic planning contexts. A key interaction for adaptation is between livelihood sustainability and ecosystem stability, as ecosystems can be degraded by the introduction of new technology or the erosion of traditional institutions, for example in water management regimes (Mustafa 2005). Such trade-offs are often presented within a narrative of development modernisation, and considered as a necessary local cost for wider economic benefit. The increasing use of climate change as a justification for large-scale environmental and livelihood interventions, for example around new dam construction, suggests that adaptation may also be deployed to

defend economic policy. Distinguishing between incremental and transformative pathways may be an effective first step in holding such climate and development narratives to account.

Environment captures ecological, physical and chemical systems and recognizes that these are integrated through coevolution with social and technological systems. Particular interventions, for example significant increases in the scale of physical interventions for coastal defences, damming or water management, can transform local biological and physical processes, impacting the resilience of social-ecological systems, just as non-linear changes in climate systems and weather extremes can influence such systems. The recognition that the impacts of global temperature increases of 2 °C or more, as well as sea level rise, changes in precipitation patterns and other variables will influence the frequency, magnitude and timing of extreme events has made expedient an increasing focus on large-scale adaptations with transformative impacts on receiving social and physical environments (Kates et al. 2012; Park et al. 2012; Marshall et al. 2012). The movement to large-scale physical adaptation interventions in response to impacts that are expected in the absence of large-scale, near-term efforts to reduce greenhouse gas emissions are increasingly discussed; particularly in cases where extreme events already represent significant challenges to households, sectors, communities, nations, and regions. Such large-scale interventions also raise some concerns: First, because they implicitly accept climate change as a largely 'inevitable' process that cannot be contested through social and political action, and second because they often support an understanding—and possibly an illusion—that transformational adaptations can be carried out in an orderly manner in the face of non-linear impacts, thresholds and tipping points.

Behaviour as an action space for transformation recognizes that adaptive capacity is reproduced through everyday activity. Routine behaviour and mundane or everyday acts embody power, instantiating and reproducing values and allowing institutional systems to persist (Shove 2010; Loftus 2012). While there has been an emphasis on behavioural change as an adaptation to climate change, individual action tends to be legitimated through social institutions and the wider social political system, including its development discourse.

Transformative adaptation is likely to be observed less through fundamental changes in behaviour, and more through changes in the social contexts in which they emerge. Alternative practices, for example in land-management or neighbourliness, are key elements of adaptation strategies that in isolation (and in conception) are incremental. However, they might also be interpreted as part of transformative adaptation if conceptualized as practical expressions of deeper changes in relationships towards nature and/or society. Opportunities for transformative adaptation to provoke wider change in discourse, individual values and institutions or technology may arise from interventions made at scale.

Discourse expands beyond individual cognition and specific practices or procedures to include conceptual models as action spaces that place boundaries on the material interventions that are considered legitimate and possible in adaptation. As part of reflexive processes, transformative adaptation questions the content, boundaries and trajectory of established development paradigms and attendant adaptation strategies. Here, transformation involves a consideration of a larger set of ideas, including broader issues of global sustainability, including the stabilization of greenhouse gas emissions (Calvin et al. 2009; Thomson et al. 2011; O'Brien 2012). A focus on changes not only in energy systems, but also in the larger socio-political systems that support technological choices, practices and behaviours make clear the responsibility that adaptation has for contributing to systemic changes to support the transition of multiple systems towards sustainability, including energy systems, transport systems, and governance systems (see Geels 2002; Loorbach 2007). Discussions of stabilization pathways seldom include attention to disaster risk management or climate change adaptation, emphasizing instead big science, technical interventions, behavioural changes, and international or national governance issues. Such changes are generally considered to occur over long time periods due to lock-in and path dependency, leaving a considerable gap in terms of increasing risk and vulnerability. Yet growing attention to 'loss and damage' (Huq et al. 2013) points to the risks and costs of failing to reduce greenhouse gas emissions as part of a comprehensive approach to sustainable development and disaster risk management. A transformative discourse on adaptation not only responds to the

impacts of climate change, but also challenges ~~the~~ underlying drivers.

4. Transformation in practice

Transformation in theory involves changes across multiple activity spheres, but how does this play out in practice? To help answer this question our framework was reviewed by Humanitarian and Development non-governmental organisation Save the Children.

A first consideration for practice is methodological. Understandings of the construction and interactions between activity spheres have deep-rooted implications for the mechanics of programs and policies. The ways in which sites of adaptation—including transformation—are formulated and described influences the targeting and evaluation of interventions, and how lessons are learned and transmitted. In already difficult environments, facing surveillance challenges, data scarcity and capacity limitations, the non-linearity of transformation, varied speeds of change, and possible ambiguity of pathways puts additional strain on often fragile operational systems. Moreover, monitoring, evaluation, accountability and learning for transformational change is not necessarily something that fits the logic of 'logframes' or 'organograms'. Accordingly, affecting transformational change may in turn require transformations in organizational methodology, major investments in capacity, and the development of new skills and ways of working. Reflecting on the challenges that vulnerability and resilience monitoring and evaluation schema have posed to the development and humanitarian communities, the added dynamisms and complexities of transformation must be carefully considered.

The next consideration is the object of attention. Who or what is the subject of change, who or what is the object of change, and how does power factor into these differences? When the term is invoked is it in reference to the transformation of an individual, community, state, system, or even zeitgeist? For a practitioner, there are strong moral and ethical imperatives associated with the answers to these questions. Take, for instance, the current emphasis within the DRM and CCA fields of engaging in risk management in a manner that works with and supports existing socio-economic and political structures. One may question whether engaging with a government ministry or a network of non-governmental organizations heavily invested in support of dominant social

relations is conducive to transformation towards a more socially just and sustainable future. The challenge with working towards transformational change through these institutions is firstly that the pace of change can be slow and thus more inclined towards incremental acts, even if with a transformational intent. More significantly, development interventions can often reinforce power dynamics, thus potentially contradicting other transformational agendas related to gender, minority rights, etc. On the other hand, if these structures are the object of transformation, ethical questions arise over the right of the practitioner to challenge them, the so-called intervention paradox (Easterly 2006). Here again, scale and power dynamics come into play, as provoking system change through engagement with political leaders and technocrats has different implications than working towards transformation of individuals, vulnerable peoples, marginalized households, or subaltern communities.

Beyond contemplating transformational change in others, practitioners and their organizations may be required to engage in critical reflexivity and navigate internal processes of change, whether individual, organizational or technological. Can incremental changes within an organization enable it to better affect transformational change ~~in~~beyond the system, or does transformation of the object (be it an individual, institution or behaviour) simultaneously require transformation of the subject (discourse)? This shift from considerations of external change to internal change raises some practical challenges. For example, it is important to consider that the goal of transformational change may fundamentally challenge the standard operating procedures of an organization, potentially leading to unanticipated or even dangerous ends. In resilience discourse, for instance, there is considerable attention devoted to transforming the development-aid nexus and bridging or even collapsing the humanitarian/development divide (DFID 2011b; USAID 2012). This conversation, however, rarely acknowledges the strain that such a move could put on already fragile mechanisms (e.g., human rights and social or child protection).

A third consideration is time. In both DRM and CCA, risks are stratified over and through time. With participatory methodologies there is a tendency for communities to prioritize immediate risks (such as road traffic accidents) and discount the importance of future risks (such as sea level rise in 2100) or irregular risks (a one in 200-year flood). Here the question arises of 'who defines the object of risk?' Beyond the power

dynamics discussed above, there are tensions between taking a bottom-up versus top-down approach and contemporary priorities versus concerns of intergenerational equity. In this context, engagement with individual transformation might be a useful lens through which to sensitize communities to risks with higher uncertainty, sensitize practitioners to more immediate community concerns that fall outside their more cataclysmic purview, and ultimately co-construct a more dialectical approach to DRM/CCA and development.

A final consideration is the diversity of actors and interests engaged practically in these issues. Even within one non-governmental organization, policy, programming and advocacy divisions will be concerned with varied aspects of transformation. A DRM technical advisor focused on community risk reduction may be more inclined to think of transformation in terms of livelihoods or the individual, while a climate change policy advocate engaged in greenhouse gas emission targets may be more sympathetic to the transformation of institutions or technologies. Here, allusions to different transformational activity spheres are not necessarily contradictory, and 'talking past' one another could ~~actually be~~, wittingly or unwittingly, be complementary activities that represent different priorities at different scales. In this way, transformation acts as a boundary object (Brand and Jax 2007), with all the positive and negative connotations this term entails. Recognizing the challenges that unresolved understandings could have in practice, further research is needed to explore how contradictory understandings can best be brokered to advance complementary activities.

5. Conclusion

Moving towards ecologically sustainable and socially just development in a time of great environmental and social change challenges dominant values and goals, as well as current practices of development. Transformation as both an analytical category and an assemblage of practical methods brings CCA into this wider debate. Transformation, when seen alongside incremental adjustment and resistance reveals the hidden social preferences that are reproduced through adaptation choices and can embed or challenge dominant relations of power. Transformation only describes options for fundamental change as part of adaptation choices~~,~~. ŧThere is still some way to go to provide a satisfactory framework

to bring together the range of social theory that can illuminate adaptation as a social process and bring it fully into the grasp of critical social analysis.

The framework proposed here sharpens, and problematizes, the ways in which transformation can be deployed in research and policy. We re-emphasise existing cautions on the importance of viewpoint and scale for categorising adaptation pathways. Beyond this, tensions are highlighted between the macro-economic growth paradigm of modernising development discourses and assumptions that these will bring enhanced adaptive capacity. Everyday behaviour is opened as a site for research to better understand the embodiment and reproduction of values, institutions and techniques of development and adaptation. Beyond all the approach proposed here calls for work to examine interactions between activity spheres—the places of flows through which politics and power act, including that derived from knowledge and science. There is considerable intellectual engagement with the concept of transformation across the social sciences, and only a part of this has yet been applied to CCA. As discussed in this paper, transformation demands this be added to the conceptual landscape of adaptation to climate change, an analysis and policy innovation that can help to provide a fuller account of adaptation as a constituent part of ongoing and contested development trajectories.

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