ACT

ACTION ON CLIMATE TODAY

LEARNING PAPER

Unpacking transformation: A framework and insights from adaptation mainstreaming

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Abbreviations and acronyms

ACT	Action on Climate Today
ADB	Asian Development Bank
BBS	Bangladesh Bureau of Statistics
CBS	Central Bureau of Statistics (Nepal)
CFU	Climate Finance Unit
FAO	Food and Agricultural Organization
FPC	Farmer Producer Company
GCF	Green Climate Fund
GLOF	Glacial Lake Outburst Flood
ICF	International Climate Fund
IPCC	Intergovernmental Panel on Climate Change
M&E	Monitoring and Evaluation
MoCC	Ministry of Climate Change (Pakistan)
NCCA	National Climate Change Authority (Afghanistan)
NCCIS	National Climate Change Impact Survey (Nepal)
NEPA	National Environmental Protection Agency (Afghanistan)
NOAA	National Oceanic and Atmospheric Administration
PoCRA	Project on Climate Resilient Agriculture (Maharashtra)
SOP	Standard Operating Procedures
ToC	Theory of Change
UK	United Kingdom
UNDP	United Nations Development Programme
US	United States
USAID	US Agency for International Development

Executive summary

The increasing scale and severity of the impacts of climate change pose a fundamental challenge to development and economic growth. The scale and urgency of action required to limit global warming and help systems rapidly adapt to the impacts of climate change have led to a growing discourse on the need for transformational changes within social, human, physical, financial and political systems. However, while there is consensus among academics and practitioners on the need to radically alter systems, there is little agreement on what constitutes transformation and how to support and measure it.

This paper contributes to improving understanding of how funders, practitioners and other stakeholders can support and facilitate transformation in adaptation to climate change. It uses the latest academic literature, as well as learning from practice, to put forward a conceptual framework for determining the likelihood of an adaptation initiative delivering transformation. This framework unpacks the term 'transformation' into three components:

1. **Enabling environment factors:** These are the factors that should be in place to be able to achieve meaningful, lasting and fundamental change. They include political will and the policy environment, evidence and information, and awareness and capacity.
2. **Transformational domains:** These constitute areas within which transformational change takes place. They include public policy and governance, innovation, and social and behaviour change.
3. **Characteristics:** These are indicators of transformation and therefore should be features of initiative aiming to support transformation. They include catalytic, scale, sustainable, inclusive, and systemic.

The paper then applies the framework to examples of adaptation interventions being delivered as part of the Action on Climate Today (ACT) programme. ACT, a Department for International Development-funded initiative, supports 11 national and sub-national governments in South Asia to mainstream climate change adaptation into plans, policies and interventions. The paper presents a number of case studies from ACT that explore how the intervention is attempting to support transformation, and the signs that transformation is likely. These case studies use a theory of change approach to present evidence to assess how likely an intervention is to deliver transformation. Cutting across these case studies is a set of key lessons from ACT on how to support transformation. These lessons are aimed at others in the process of designing and delivering similar technical assistance programmes:

- Characteristics of transformation should guide programme design as well as implementation.
- Prioritising transformation within one domain of activity may entail trade-offs and limit the ability to transform within another.
- Transformation should be firmly rooted in a shared understanding of what is being transformed, what results need to be achieved and who will stand to benefit.
- Adaptive management is essential for programmes designed to deliver transformation.
- Aiming for transformation may not always be feasible or desirable, and the rationale behind it is dependent on various factors, such as context, time, resources, scope and demand.
- Building an enabling environment is essential to trigger transformation, as the changes it aims for are radical and often disruptive.
- Theory-based monitoring and evaluation (M&E) offers a flexible approach to analysing the likelihood of an initiative to deliver transformation. This said, more robust M&E mechanisms, such as post-end line evaluations, will support the consolidation of more rigorous evidence on transformation.

The paper concludes by presenting a set of actions that will help pave the way for the community of practice working towards delivering transformation in the context of climate change adaptation:

- Mainstream discussions on transformation and move towards agreed understandings of enabling transformation;
- Create an enabling environment for transformation through a strong contextual analysis of the political economy and the institutional dynamics that underpin the systems targeted for change;
- Build a stronger evidence for programme components and features that deliver transformational change;

- Tailor M&E systems to the complex challenges of systemic change;
- Develop a set of multiple and contextual yet cohesive analytical frameworks for adding rigour to conceptualisations of transformation;
- Keep the concept of transformation front and centre at the stage of designing and conceptualising initiatives;
- Diffuse the concept of transformation among donors and programme managers by emphasising that it supports durable, comprehensive, catalytic, inclusive development at scale.

The scale of the impacts of climate change requires a fundamental shift in the level of resilience of people and systems in South Asia.

1. Introduction

Annual natural disaster statistics of the past 30 years show that the number of floods and windstorms in Asia is increasing rapidly, annual flood frequency has doubled (Dutta and Herath, 2004), and with 16 of the past 17 years having been the hottest on record, Arctic ice is melting faster than ever before, raising sea levels at an increasingly rapid rate (NOAA, 2018).

The Intergovernmental Panel on Climate Change (IPCC) has determined that limiting global warming to 1.5°C will require a scale of action that has no precedent in history, even while, based on current emissions scenarios, global warming may rise by more than 2°C. Warming of 2°C would mean that 37% of the world's population would be exposed to severe heatwaves at least once every five years, average global sea levels would rise by close to 0.5 m by 2100, crop yields would decrease, coral reefs would disappear, fisheries would decline, ecosystems would fail and there would be major losses in plant and animal species, with knock-on effects on human life and well-being. The world must, therefore, brace for the catastrophic impacts of climate change (Levin, 2018).

The scale of action needed to respond to this challenge has given rise to a growing discourse on the need for transformational changes to social, human, physical, financial and political systems to enable them to adapt to the impacts of a changing climate (O'Brien and Sygna, 2013). Within the growing body of literature discussing adaptation and its challenges, there is little consensus on what can be considered transformational, how transformational changes can be gauged or understood and how those delivering interventions to enable adaptation can ensure they are working towards changes that will transform risks and build resilience for the most vulnerable (ibid.). This gap is the starting point for this paper.

The paper addresses this by drawing on existing literature as well as emerging evidence from the Action on Climate Today (ACT) programme. Operational since 2014, ACT is a five-year initiative funded by the UK Department for International Development aimed at providing direct technical assistance to 10 national and sub-national governments in Afghanistan, Bangladesh, India, Nepal and Pakistan. ACT is designed to support mainstreaming adaptation in South Asia's policy environment and delivers solutions in climate-resilient agriculture; climate-resilient water management; accessing and managing adaptation finance; and organisational development for adaptation.

Over the past 4.5 years, ACT has been successful in shaping and mobilising close to a £1 billion in finance for adaptation from domestic, international and private sources. It has integrated climate change considerations within 18 major public policies and built the capacity of over 2,000 government officials on various aspects of adaptation mainstreaming. This paper uses an operational framework and a theory of change approach to test the likelihood that some interventions delivered as part of ACT will deliver transformational change in the context of adaptation within the sphere of policy formation and reform.

Following this introduction, Section 2 examines the state of the art in understanding transformation in the context of adaptation to climate change. This includes defining the concept, understanding the differences between incremental and transformational shifts, reviewing the growing salience of transformation in the domain of adaptation policy and determining its characteristics (i.e. the 'how') and its pathways/routes (i.e. the 'what') to build a framework for transformational change.

Section 4 applies the framework synthesised in Section 3 to five examples of adaptation interventions delivered under ACT, to exhibit the likelihood of these delivering transformational change, using a 'process tracing' approach. Section 5 then teases out replicable lessons, insights and learnings to inform other adaptation programmes working towards enabling transformational change within the policy realm. The conclusion provides potential future directions for adaptation initiatives and practitioners working towards enabling transformation in the adaptation domain.

2. Understanding transformation and adaptation

2.1. Understanding transformation for adaptation to climate change

The IPCC defines transformation in the context of climate change as 'the altering of [the] fundamental attributes of a system (including value systems; regulatory, legislative or bureaucratic regimes; financial institutions; and technological biological systems)' (IPCC, 2012: 564). We build on this to consider transformation for adaptation as *fundamental changes to the systems that shape well-being, enhancing people's ability not only to function but also to flourish despite the impacts of a changing climate*. This understanding rests on the premise that existing systems need to be radically changed or remodelled to address the short- and long-term challenges of climate change.

Given the scale and depth of expected climate impacts, governments and non-governmental organisations alike acknowledge there is a need to go beyond incremental and piecemeal adaptation activities.

Incremental adaptation and *transformational* adaptation are viewed as two distinct approaches (Lonsdale et al., 2015). Incremental shifts operate within existing power structures and maintain the *status quo*; transformational shifts address power imbalances and bring radical changes to the existing system (ibid.). Incremental shifts are much smaller and specific; transformation aims for broader changes (see Box 1 for further details on how systemic change is at the heart of transformation). The former focus on short-term change and are predominantly reactive; the latter are systemic, anticipatory and designed to initiate long-term change (Mustelin and Handmer, 2013).

Transformation can be autonomous (e.g. where ecosystems tip into dysfunction owing to pollution) or deliberate, based on the flexibility of the system to transform (O'Brien and Sygna, 2013). This paper is concerned mainly with the latter. Deliberate transformation has been described as an intentional process involving fundamental, systemic shifts in empowerment, values and beliefs, patterns of social behaviour, institutional structures, governance, technology or management regimes (Olsson et al., 2014).

2.2. The increasing need for transformation in the context of climate change

Opinions on what really constitutes transformation, how achieve it and its end results continue to be diverse and, in some cases, divided (O'Brien and Sygna, 2013). However, there is consensus that development interventions that do not factor in climate change do not just fail to take into account the additional risks it poses but also may jeopardise the economic and environmental systems in which they are implemented (Lonsdale et al., 2015). Such interventions are unsustainable and maladaptive, exacerbating rather than reducing vulnerability

Box 1: Systemic change at the heart of transformation

A system can be defined as 'an interconnected set of elements that is coherently organised in a way that achieves something' (Meadows, 2008). The many different elements and component parts in a system translate into a complex set of relationships. This relational interconnectivity means altering one component will have knock-on effects on others in the system, presenting the characteristics of complex and adaptive systems (Ramalingam and Jones, 2008; Patton, 2012).

Within the complexity-focused approaches that have come to characterise a large portion of the international donor community's programming, much is based on the premise that major social challenges, such as climate change adaptation, are systemic problems, framed by the institutions and political systems of intermediary agents, such as organisations, governments and agencies that govern behaviour and the way societies interact (North, 1990; Acemoglu and Robinson, 2012; Andrews, 2013; Booth, 2014). And the most effective approach to addressing such systemic problems is through complex interventions tailored to these dynamics.

(Brooks et al., 2011). On the other hand, measures to manage climate risk need to ensure they are not contrary to development and keep it 'on track' (Brooks et al., 2011). Transformational shifts are significant because adaptation needs to go beyond mainstreaming climate change into existing development paradigms and requires broader systemic shifts to effectively address vulnerability (Sovacool et al., 2018).

However, the need for transformational adaptation and the methods for achieving it need to be scrutinised thoroughly. Radical shifts can lead to considerable disruption and discontinuity within the systems and processes that are rendered in flux. This can have socio-economic, cultural and financial implications that may be difficult to anticipate and that affect certain groups more than others (Akram, 2012). Without adequate data, evidence, understanding of the system's complexities and relatively accurate estimation of the outcomes and preparedness to handle them, pathways for delivering transformation will fail to do so (Matyas et al., 2014).

This is why the concept is becoming increasingly visible within the criteria to access funding for dealing with the causes and impacts of climate change. The International Climate Fund lists 'extent to which an intervention is likely to have a transformational impact' as one of its key performance indicators (ICF, 2015). For the Green Climate Fund (GCF), 'paradigm shift' towards low-carbon and climate-resilient development is a guiding principle in countering climate change (Harmeling and Grießhaber, 2013). The Adaptation Fund prefers projects that can demonstrate the potential for transformation (Carter et al., 2018). However, detailed explanations of the characteristics, indicators, markers or features of transformational change are still emerging, scant or entirely missing (Feola, 2014).

To respond to this gap, the sections that follow develop a conceptual framework for understanding how transformational change may happen and a set of characteristics to help in recognising it.

The lives of vulnerable people, including women and children, is at the core of any transformation.

3. A conceptual framework for transformational change

This section sets out our conceptual framework for assessing progress towards achieving transformational change. Our framework consists of three main components:

1. Enabling environment: factors recognised as predicates for achieving transformation (3.1);
2. Transformational domains: the focal areas within which transformational change occurs (3.2);
3. Characteristics demonstrating the likelihood of an initiative delivering transformation (3.3).

3.1. Enabling environment: Factors that predicate transformational change

For lasting change to occur, certain conditions are necessary. These are commonly understood to be factors of an *enabling environment* that are foundational for sustainable and transformational change. The literature on supporting adaptation to climate change and similar transformation-oriented support is increasingly recognising these factors (Adger et al., 2009). This paper identifies three enabling environment factors that are important for understanding transformation for adaptation. While some of these may be pre-existing, creating an enabling environment may be the first necessary step towards creating transformational pathways (Gogoi et al., 2017).

1. **Political will** to address adaptation gaps and **policy mandates** to enable action are a prerequisite for initiating transformational pathways. These provide a broad enabling environment in which to build specific policy, innovation or behavioural domains targeting transformation (Gogoi et al., 2017).
2. Transformational change needs to be built on a strong **evidence and research** base to minimise risks and uncertainties (Carter et al., 2018).
3. An **understanding** of climate risks, vulnerabilities and adaptation along with the requisite **capacity** to execute it are imperative (Harmeling and Grießhaber, 2013). Transformation can take place only if a broader understanding of climate change and the urgency for action exist.

3.2. Transformational domains: Areas in which transformational change takes place

The second component of our conceptual framework comprises the areas to which an intervention would target its support to effect change. We call these areas *transformational domains*. These are the spheres within which initiatives can set out and adopt effective routes to deliver transformation. Such interventions need to be tailored to and implemented within one or more of these domains.

First, transformational changes can come about as a result of changing and improving public *policies and governance*. New acts of parliament (e.g. national or provincial climate change acts) or national strategies and climate change action plans can fundamentally alter a country's capacity to respond to climate-induced risks by providing political legitimacy, a mandate and increased funding for climate adaptation (Gogoi et al., 2017). New governance structures charged with executing these strategies and policies can provide an impetus for reducing climate risks and building resilience (Shakya et al., 2018). Such shifts can be top down, bottom up or a combination of both, depending on the organisational and authorising context (Andrews et al., 2010) and programmatic opportunities. Such interventions that support transformation need to be participatory and take into account the varied contexts and requirements of all actors involved (Harmeling and Grießhaber, 2013).

Second, transformational changes can result from *innovation*. Biggs et al. (2011: 3) argue that a 'wave of innovation' is needed for society to transform to meet the environmental challenges of the 21st century. Therefore, actions aimed at generating new knowledge and supporting the application of this towards a markedly different way of doing things to enhance the ability of a system to adapt can help support its transformation. While innovation can be interpreted differently in different contexts, there is an important distinction between actions that strengthen the *status quo* and those that champion processes of change (Pelling, 2010). Such innovation can be disruptive, at

least in part, to existing approaches to livelihoods, governance and business (Francis et al., 2003). In essence, innovation can entail the institution of new 'processes' as well as new 'technologies' that enable adaptation, which can include new decision-making tools, capacity-building techniques, methods to collect and use data, infrastructure solutions and policy instruments, among others.

Third, transformational change results from interventions to deliver *social and behavioural change* (O'Brien and Sygna, 2013). This is because transformation is about addressing the root causes of vulnerability, such as social and political factors that disempower vulnerable populations, increasing the risks they face. Therefore, it entails being aware of and challenging inherited ways of thinking, assumptions and biases, as well as recognising and negotiating oppressive power structures and developing alternatives to entrenched and institutionalised positions (Pelling, 2010). This could occur through enhancing skills and knowledge (e.g. access to and use of climate information), questioning pre-conceived ideas, changing ways of working, strengthening rights claims over resources, etc. Advocacy campaigns, judicial activism, mobilisation of public opinion in favour of new legislation and community mobilisation can all contribute to social and behavioural changes as a way of addressing these drivers of vulnerability (O'Brien and Sygna, 2013). Note that awareness and advocacy initiatives designed to build leadership and ensure large-scale behavioural transformation can occur only if an enabling environment exists. Wider, even if generic, awareness about climate adaptation will help foster a more in-depth understanding of what transformation in adaptation entails. (Section 5 reviews how the ACT programme, which was mandated to respond directly to the needs of governments, has fallen short in utilising this route to delivering transformation.)

Such interventions are not exclusive or discrete forms of action as they share synergies and trade-offs. For instance, changes in policies and institutions can enable or curtail innovation, while shifts in behaviour can result in changes in policies and governance frameworks. Also, processes to deliver transformational change for adaptation can take more than one of these routes. As Section 2.1 noted, complex programmes to support systemic transformation are most effective when they consist of an array of interventions that individually support

ACT interviews farmers in Layyah in Punjab, Pakistan on changing rainfall and temperature patterns.

component-level change while also addressing relationships between components, collectively supporting changes to the wider system.

3.3. Characteristics of transformation: Indicators of transformational change

The third component in our framework is the most central to understanding and identifying indicators of transformational change. These are the *characteristics* that form observable changes that an intervention may support towards achieving the goal of transformation for adaptation. These characteristics demonstrate the likelihood of an initiative delivering transformational change; programmes that aim to do this must embody all of these characteristics.

First, transformational changes can result from initiatives that demonstrate *systemic* characteristics, delivering solutions that are comprehensive and that address change beyond just component challenges to cover also wider relational issues that pertain to the root causes of vulnerability. Piecemeal solutions that engage with parts of a system without understanding how these relate to the entire system will, in all likelihood, be unable to deliver a vision of deliberate, transformational change (Kates et al., 2012). Similarly, processes that are focused predominantly on quick technical fixes as opposed to understanding the root causes of vulnerability may end up delivering changes that are superficial, ephemeral, inequitable or ineffective (Lonsdale et al., 2015). Often, there will be a need to shift away from deeply entrenched systems of policy-making, planning and delivery to newer ways of conceptualising and achieving change. For instance, raising the height of dykes to prevent inundation in an urban area may reduce the risk in the short term for certain populations, but comprehensive shifts in urban planning such that settlements are directed away from areas that are exposed and are designed to minimise vulnerability are more transformational over time.

Second, transformational change can result from initiatives that *catalyse* broader change. Deliberate shifts within systems can be expanded to trigger indirect changes and cascading impacts within structures and systems that are beyond an initiative's direct mandate or reach. This could include the replication of particular adaptation-building measures in another geographic area (Villanueva et al., 2018), or a group of trainees passing on capacity-building on enhancing adaptation to a larger group of people – that is, without further investment by those running the intervention. It could also entail the use by multiple agencies of a model, tool or framework developed by one initiative, delivering benefits for vulnerability reduction in areas beyond the original remit (ibid.).

Third, transformational changes can result from initiatives that operate at *scale*. It is not possible to objectively define how to interpret scale across contexts, but this point pertains to the fact that pilot interventions, demonstration projects or small experiments that do not deliver substantial impacts, cover large proportions of the local population or get scaled up, for instance by being embedded in a national policy, cannot be seen to be harbingers of transformational change. This is not to say that initiatives that aim to deliver transformational changes cannot be phased and expand slowly, just that they must ultimately aim to make alterations that occur at the level of 'the system'. The issue of scale can also be looked at in terms of the outcomes achieved in relation to the size of resource inputs. The pathways for this can range from direct shifts within governance, economic or social systems, to strategic expansion of short-term, smaller, specific action on the ground to large-scale and more permanent processes of building resilience (Harmeling and Grießhaber, 2013).

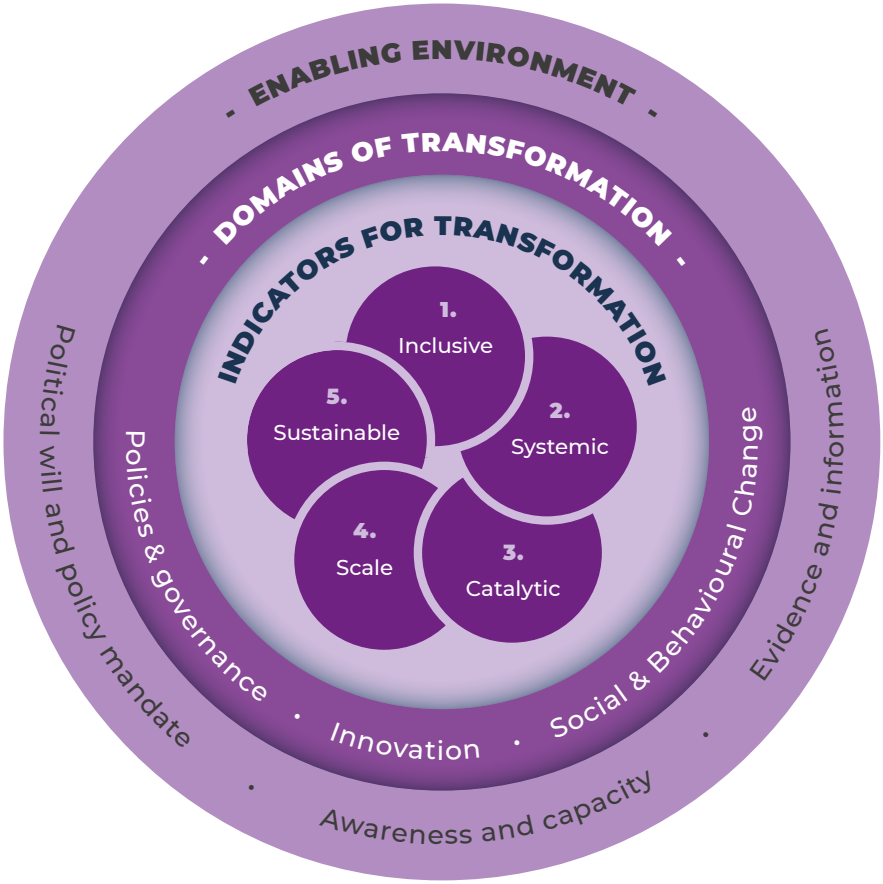
Fourth, transformational changes result from initiatives that are *inclusive* of vulnerable, poor and marginalised populations. This is because social marginalisation and political disempowerment (owing to caste, class, gender and ethnicity, among others) magnify the vulnerability of populations and the risks they face (Eriksen et al., 2015). Initiatives that aim to deliver transformational shifts in adaptation will not be successful if they do not target those most at risk and the systems that perpetuate this marginalisation. Also, adaptation initiatives that are not inclusive risk privileging the priorities of more powerful sections of society and exacerbating the vulnerabilities of marginalised people (Bahadur and Tanner, 2014). Even adaptation solutions that attempt to alter systems can sometimes overlook the priorities of the most vulnerable, because they often lack a voice and are inadvertently hidden from view. Deliberate, transformational change cannot be achieved without including those who are on the margins and most vulnerable to climate change impacts because of their marginalisation (exclusion from resources and access to power to protect them from harm) (Lonsdale et al., 2015). Inclusion can take various forms, ranging from ensuring programme design includes the voices of the

vulnerable to ensuring initiatives are delivering outcomes that benefit those who are socially and politically disempowered.

Fifth, a crucial characteristic of transformational change is its *sustainability*, with the gains for adaptation retained over time (Haukeland, 2013). Sustainability refers to the ability of an initiative to deliver benefits after direct implementation support ends (Mustelin and Handmer, 2013). Others have pushed this understanding further and claim that, along with the sustainability of outcomes delivered, the entire trajectory of influence, networks and action that the initiative has created needs to continue functioning (Anadon et al., 2016). 'Sustainability' can take many forms: it could include uptake of models and approaches into public policies and programmes; the establishment of permanent governance structures that will continue to deliver benefits; changing attitudes and behaviours; or a permanent improvement in the processes through public organisations that have a critical role in reducing risk and vulnerability.

We argue that transformational change for adaptation is most likely to result from initiatives that display these five characteristics: systemic, catalytic, inclusive, sustainable and operating at scale.

Figure 1: Conceptual framework for transformational adaptation



4. Case studies: Determining the likelihood of transformation

An ongoing challenge for programme evaluators lies in attributing observable changes to a particular programme's support. This is particularly true for complex or systems-focused interventions (Stame, 2004; Ramalingam and Jones, 2008; Scriven, 2008). Theory-based approaches to monitoring and evaluation (M&E) have gained prominence in recent years to offer a methodological solution to this challenge (Weiss, 1997; Forss et al., 2011; Mayne, 2012).

Theory-based approaches place a programme's theory about how change will occur (its 'theory of change', or ToC) at the centre of the design. The ToC seeks to explain how a set of inputs will lead to a corresponding set of outputs, which in turn should result in certain outcomes and impact. These *causal processes* are used to explicitly show how a programme intends to achieve its desired results. The ToC also articulates its assumptions about the conditions needed for such change to occur, and risks that may prevent the change from happening (Vogel, 2012; Taplin et al., 2013).

A number of different methods have emerged from this approach, generally using an intervention's ToC as a basis for evaluating its effectiveness (Weiss, 1997; Davidson, 2009; Mayne, 2012; White and Phillips, 2012). One method relevant to our purposes is Process Tracing, which aims to build evidence about how much an intervention's implementation aligns with its ToC (Bennett, 2010; Collier, 2011; Morris, 2005; Thusi and Lucas, 2013). By mapping a body of evidence against the various aspects of the causal processes in a ToC, along with other contextual or contributing factors (Befani and Mayne, 2014), we can then plausibly infer an intervention's likely impact (Weiss, 1997).

ACT's results framework was designed in a way that was theory-based and that would support a Process Tracing approach to assessing results. By mapping to its causal pathways – that the programme's technical assistance (inputs and outputs) would be *adopted* (intermediate outcomes) by its beneficiary stakeholders and subsequently *implemented* (outcomes) within the governance frameworks it sought to change – the results framework built a body of evidence through routine reporting against its structure.

This paper uses this body of evidence, mapped against the programme's causal pathways (output *adoption* and *implementation*), as a basis for *inferring* the likelihood of transformational change. We identify the five characteristics of transformational change in our conceptual framework (Section 3.3) with outcome-level changes that we have monitored in our results framework. By doing so, using a Process Tracing methodology with evidence of intervening steps along the causal pathways, coupled with other supporting contextual factors (see Section 3.1 on the enabling environment), we suggest an approach to inferring the likelihood of transformational change at the programme's impact level.

The following case studies drawn from ACT's work have been tested against the framework to demonstrate their likelihood of delivering transformation. Whether they actually do so can be determined through methods such as post end-line evaluations well beyond the programme life.

4.1. Enhancing the flood early warning system in the Mahanadi River Basin, Odisha, India

One of the major river basins in India, the Mahanadi Delta region is highly prone to flooding, given its large catchment area and the inadequate carrying capacity of its river channels. The Hirakud Dam was built over the river in 1953 to provide flood relief through storage of excess water in flood years. However, the dam was not designed for the changes in rainfall patterns, the increased intensity of rainfall and the concomitant increase in siltation. These have led to high-volume flood discharges, originally expected to occur only once every 1,000 years, once every 7 years since construction of the dam (ACT, 2018).

This has rendered the lives and livelihoods of over 10 million people highly vulnerable and the situation is expected to worsen as a result of climate change. To mitigate this, the state government had installed a flood forecasting system that could issue warnings only eight hours prior to heavy rainfall and flooding, which did not provide sufficient time for a full response (e.g. large-scale evacuation), leading to heavy loss of lives, livelihoods and land in past decades.

Odisha Chief Minister Naveen Patnaik launches the expanded flood early warning system developed by ACT which increases the warning time from 8 to 36–72 hours.

In this context, ACT provided technical assistance to the Department of Water Resources for the Government of Odisha to design and develop a new hydrology model that now takes climate change into full consideration. This includes a wider range of detailed geophysical information and builds in local weather forecasting to predict impending flooding with a much higher degree of accuracy. It has also led to an increased early warning time of 36–72 hours (from the previous 8 hours), allowing for greater response and preparation time. As opposed to providing flood response mechanisms based on the existing warning system, this initiative improved the system itself to allow more time for enhanced response.

This intervention demonstrates a number of characteristics of transformational change discussed in the section above. First, it is *systemic* and *sustainable*. By strengthening an existing, government-run early warning system, ACT's support was embedded into an existing system with local resourcing and capacity (albeit still requiring strengthening and support). Second, as ACT's intervention is at the level of the entire of Mahanadi River Basin, it is clearly delivering benefits at *scale*. The basin is home to 10 million people, of 46 million in the entire state of Odisha, thus the early warning system has impacts on the lives and livelihoods of a large proportion of the state's population.

Third, the intervention is *inclusive* of the poor and marginalised, as it directly affects the lives of vulnerable households that are primarily dependent on climate-sensitive livelihoods. Close to 40% of Odisha's population live below the poverty line and around 70% depend directly or indirectly on natural resources for livelihoods and sustenance (Praharaj, 2017). To determine whether the intervention was helping improve the lives of the vulnerable and assess its impact, in-depth conversations and group discussions were carried out with people residing in the flood-prone Tikhiri village, located on the banks of the Mahanadi. When people were asked what they would do if they received a warning 36 hours in advance, one farmer replied, 'We would harvest crops first. It would be impossible to save everything, but we would call our relatives and

try to cut and store as much as possible.' Another farmer added that he would send the children and women away to safer locations, and a labourer said he would secure stocks of food and water. Finally, the model and methodology that underlie the early warning system have been catalytic, leading to a revision of reservoir management protocols to ensure they are responding to a wider range of hydro met variables. The intervention has influenced the government's disaster management protocols, as preparedness activities and flood response mechanisms are being triggered using a new set of hydrological indicators developed as part of this system.

The intervention also utilises *innovation* as a route to delivering transformational change. At the heart is a new approach to predicting floods – a move from a reactive model based on the observed rainfall of the previous day, to a proactive model based on the projection of rainfall for the next three days. More specifically, ACT used the innovative *Soil and Water Assessment Tool*, a spatially distributed, physically based model that includes a wide range of detailed geophysical information, to build in local weather forecasting. This was the first time that a tool of this kind and this level of sophistication had been used in this context. In this way, innovations spanned both technology (new kinds of data were collected and analysed) as well as processes (this data was then used within a novel decision-making system for issuing early warnings).

Creating an enabling environment was crucial to ensure government buy-in and the institutional uptake of the new localised early warning system. ACT drew from Odisha's experience of managing disasters to build the intervention's narrative around disaster risk reduction and conducted a rigorous scoping exercise to lay out options for improved flood management for the government.

Therefore, ACT's work to enhance the early warning system for the Mahanadi River Basin to reduce flood risk was transformational because it worked to substantially enhance an existing risk reduction apparatus (e.g. by rapidly expanding the warning window) that is delivering benefit at scale and targeting the most vulnerable. This is in stark contrast to other, 'non-transformational', risk reduction interventions that might have worked either to incrementally improve the existing system (e.g. ensuring the eight-hour warning is delivered more effectively) or to reduce risk through more traditional community-level disaster preparedness activities.

4.2. Sediment management along the banks of Kosi River, Bihar, India

The state of Bihar in India accounts for almost half of India's average annual damage as a result of floods (Agarwal, 2012). Seasonal variations in river water volume, coupled with the region's low-lying flat terrain, lead to frequent and extensive flooding. The Kosi River, a tributary of the Himalayan Ganga River, is one of the major rivers passing through the state, and it wreaks devastating floods, with great loss of life and property. Known as the 'sorrow of Bihar', the river submerged more than half of the state and affected the lives and livelihoods of close to 3 million people in 2008 (ibid.). Moreover, the intensity and frequency of the flooding have increased over time as a result of land use changes, thanks to deforestation and rapid urbanisation, especially in the upper reaches of the river, and as a result of climatic shifts.

Recurrent flooding over the years has adversely affected the state's economy and undermined efforts to alleviate poverty and improve the living conditions of a predominantly rural and vulnerable population. According to the World Bank (2016), a disproportionate share of India's poor lives in Bihar, most of whom depend on the climate-sensitive agriculture sector. Dependence on climate-sensitive livelihoods, low human development, high population density and frequently occurring disasters continue to hinder growth and development. Climate change has already started exacerbating the situation and pushing the marginalised further into the poverty trap.

One of the reasons for flooding in the Kosi is its excessive silt load, which reduces its carrying capacity. This results from deforestation and biomass degradation upstream combined with extreme precipitation events that lead soil and silt to flow into the river (Joy, 2018). Bihar's government had recognised this problem but had attempted only piecemeal solutions, such as dredging the river from time to time. ACT worked with the government to address the challenge.

The key component of ACT's support was development of a silt management plan. In this, ACT sought to determine the quantity and quality of silt in the river and prepare an operational plan for using it commercially. To foster an enabling environment for the intervention, ACT garnered support from the state's deputy chief minister to endorse the silt management plan. ACT also undertook rigorous scientific analysis and consultations with a wide

The Bihar Sediment Management Framework will reduce the vulnerability of local people to flooding, and provide new livelihood opportunities.

group of stakeholders, which helped build evidence and research and enhance awareness and capacity. These in turn provided a pathway for a diverse set of actors to use the silt to reclaim low-lying land for productive purposes, enhance the productivity of agricultural land and enable commercial and livelihood opportunities (making ceramic products, such as paving blocks, bricks and tiles), while also providing options to develop infrastructure to mitigate the river's flooding (building dykes along the banks). In essence, ACT engaged with farmers, research organisations, government and the private sector in the consolidation of a self-sustaining supply chain for silt that delivers commercial benefits and results in reduced flooding of the Kosi River (with all its concomitant commercial and livelihood benefits) through the regular removal of silt from the river bed.

Based on our conceptual framework, this intervention has a number of characteristics that point to transformational change. First, it empirically understood the excessive silt load to be the underlying cause of flooding in the basin. Therefore, rather than only piecemeal infrastructural solutions (e.g. raising the height of dykes or dams), offering short-term relief, the approach sought to provide a more *systemic* solution, by addressing the cause (the silt load) as well as enhancing mitigation efforts (infrastructure) while also addressing some of the relational components of the systemic nature of vulnerability (turning livelihood vulnerabilities into livelihood opportunities).

Second, by identifying productive and commercially viable uses for silt, ACT incentivised a diversity of actors across scientific and policy institutions and the private sector to participate in a silt management system that would operate *sustainably* and without external support.

Third, the intervention's *inclusion* forms around its focus on the poor and marginalised, as they are the most affected by flooding in the basin. This not only because they occupy the most exposed and low-lying tracts of land and depend on agriculture for their livelihoods, but also because they lack financial safety nets that permit them to absorb the shocks. Therefore, any reduction in flood risk is likely to reduce their vulnerability. Furthermore, many of the opportunities identified for silt use are likely to improve the livelihoods of the poor. To ensure they actually do so, they were pinpointed and developed in consultation with the communities involved.

Fourth, the impact of this intervention is likely to be at a large *scale*, touching more than 10 million lives affected by waterlogging and flooding. This number grows substantially if we include the beneficiaries of initiatives aimed at silt use.

Fifth, this initiative is starting to *catalyse* a shift in how public policy and governments consider the problem of flooding. Traditionally, standard operating procedures (SOP) for flood management entailed 'quick fixes', such as evacuation procedures and protective infrastructure. As a direct result of this intervention, Bihar's SOP now includes solutions supported by ACT that embed a systemic approach to address this endemic problem. Furthermore, private sector actors in Bihar were not previously engaged in discussions on flood management; by developing a viable value chain for silt management and use, ACT has helped catalyse interest among this potentially influential group of actors.

This intervention utilises the route of 'innovation' to tackle the issue of flooding by converting the liability of sedimentation into a business opportunity. By presenting a new model in the region that builds an entire supply chain around silt based on in-depth scientific assessments and discussions with key market players, ACT provided a long-term solution to excessive siltation. The use of silt in the infrastructure and agriculture sectors will turn sediment collection and management into a lucrative option, thereby plugging the existing resource gap for handling excessive silt and minimising the damage caused by it.

Therefore, this initiative is transformational as it has shifted the mindset of the government and key stakeholders towards seeing silt as a commercial opportunity and developing a self-sustaining supply chain for excessive silt in the river bed. Other, 'non-transformational' approaches, might be focused on providing technical and financial support to dredge silt repeatedly.

4.3. Strengthening farmer producer companies to enhance climate-resilient agriculture, Maharashtra, India

It is estimated that climate change is responsible for annual economic losses in India's agriculture sector of up to 9%, with associated loss in farmers' income of 15–18%. From affecting water availability, soil quality and storage facilities to causing pest infestation, climate change is set to have a major impact on agricultural systems (Pound et al., 2018). The problem is particularly acute in the state of Maharashtra, where the sector now faces key issues of land fragmentation, with impacts on the returns and bargaining powers of small farmers and landholders (ibid.). These factors, combined with the impacts of climate change, such as water scarcity, are having a significant, negative effect on the lives and livelihoods of farmers.

To create a robust evidence base, ACT conducted a multi-criteria analysis with over 300 key actors in Maharashtra, including producers and producer organisations, traders, processors, distributors and retailers, universities and research institutes, extension service providers and financial institutions, to identify crops able to withstand the impacts of climate change. It was found that sorghum, pearl millet, pigeon pea, chickpea and soybean were the most appropriate climate-resilient crops for the region, as they require less water and energy for cultivation, deliver better economic returns and can tolerate a higher variation in temperature, rainfall and extreme events. ACT linked its work with the World's Bank's Project on Climate Resilient Agriculture (PoCRA) to amplify its impact. Furthermore, ACT engaged with the state's legislative assembly, increasing awareness on climate change and fostering the necessary enabling environment for this work.

To expand the cultivation of these crops, ACT, together with the Government of India, is working with Farmer Producer Companies (FPCs) to assist farmers in transitioning to more climate-resilient crops. FPCs are similar to farmer collectives, as they allow farmers to organise to secure loans, start agricultural businesses, strengthen links to markets and increase their bargaining power with wholesalers. Maharashtra is home to more than 1,500 FPCs (Maharashtra Government, 2018) that account for more than two thirds of all FPCs in India. These are the cornerstone of Maharashtra's agricultural economy and wield enormous influence over all facets of agricultural production.

With ACT's support, the Government of Maharashtra and a range of other key stakeholders are training FPCs on securing finance for climate-resilient agriculture practices (including the use of climate-resilient crops), providing advice and inputs during the production process and helping the FPCs bring these resilient crops (or products made from them) to market. The agriculture sector in Maharashtra is adapting to climate change by ensuring FPCs prioritise the production of climate-resilient crops in their business plans and financing

guidelines. ACT also devised a tool to gauge the weaknesses of FPCs, including their ability to support climate-resilient agriculture practices, so the government and other development partners can provide targeted support to strengthen these organisations that are pivotal to the lives and livelihoods of farmers across Maharashtra. This, in turn, will ensure that farmers receive the support they need to grow these crops but also that their livelihoods are adaptive, better able to withstand the impact of a changing climate.

This intervention demonstrates a number of the characteristics of transformational change outlined in our conceptual framework. First, ACT's work has delivered significant *catalytic* effects, particularly through PoCRA. PoCRA has included the crops identified by ACT in the list of climate-resilient crops that it will be supporting across the state and has accepted the FPC rating tool developed by ACT. Also, PoCRA is using the tools and approaches ACT developed to enhance the capacity of 21 FPCs to strengthen the capacity of over 620 FPCs within its purview.

Second, by choosing to strengthen FPCs – which exist independent of the programme and will continue to function long after ACT concludes – ACT has ensured that it is not establishing parallel agencies. Instead, it has sought to alter the business processes and focus of these companies so that they emphasize the cultivation of climate resilient crops.

Third, while ACT's direct outreach was to a small subset of FPCs, PoCRA is taking ACT's influence – tools, approaches and analysis – to *scale*, reaching approximately 50% of all FPCs in Maharashtra.

Fourth, as FPCs are essentially farmer cooperatives that support the bargaining power of marginalised farming communities, ACT's support to FPCs has ensured vulnerable people are *included* and central to its support.

Finally, this intervention also demonstrates that ACT is attempting to tackle vulnerabilities in the agriculture sector in Maharashtra *systemically*. Instead of focusing on the one-time distribution of climate-resilient seeds or new agricultural technology, it identified influential organisations in the sector and set out to increase the knowledge of members, amend business processes, provide training support and link them with larger

ACT works with Farmer Producer Companies (FPCs) in Maharashtra to transition to more climate-resilient crops.

initiatives, such as PoCRA. In this way, ACT's support to FPCs is both systemic and catalytic, enabling both vulnerable farmers and the agriculture sector as a whole to transition into climate-resilient agricultural practices and less vulnerable livelihoods.

This intervention also employs 'institutional shifts' as a route to delivering transformational change. ACT's work with FPCs aims to alter their internal business processes (e.g. by strengthening their systems to enhance access to finance for cultivating climate-resilient crops), build their knowledge base (e.g. on what climate-resilient crops are suited to their contexts) and strengthen their capacity to expand cultivation of climate-resilient crops (e.g. by providing insights into cultivation techniques and marketing approaches for these crops). As such, the programme is making systemic enhances in how this crucial institution functions.

Therefore, this initiative is transformational as it has helped identify and strengthen specific entry-points to enhance a comprehensive value chain of climate-resilient crops at scale by establishing channels of finance for these crops through leveraging the power of a larger, state-wide development programme. Other, 'non-transformational', approaches might involve small-scale distribution of seeds in climate-resilient crops to selected villages and farmers.

4.4. Upgrading organisational capacity to collect and analyse climate statistics, Nepal

A landlocked country with diverse physiographical features, Nepal is home to a substantial part of the highly sensitive and vital Himalayan ecosystem. Increasing temperatures can cause glacial melt and result in glacial lake outburst floods (USAID, 2012). Extreme events, such as floods and landslides, are frequent in the country, and predicted to increase as a result of variability and increases in the intensity of rainfall in the future. Nepal is already experiencing increased frequency of droughts in historically dry areas and during winter months. With 25% of its population living below the national poverty line (ADB, 2018), and dependence of around 66% of the population on agriculture as a source of livelihood (FAO, 2019), Nepal is exceptionally vulnerable to climate change. Moreover, temperature projections predict increases of 1.8–5.8°C in Nepal by 2090, with warming expected to occur more rapidly during

ACT supported the Nepal Central Bureau of Statistics (CBS) to undertake the first ever National Climate Change Impact Survey.

the winter season (USAID, 2012). Therefore, it is essential that Nepal develops appropriate policy and organisational responses to battle climate change impacts. However, effective responses require accurate data.

This is why ACT supported Nepal's Central Bureau of Statistics (CBS) to undertake the National Climate Change Impact Survey (NCCIS). ACT helped expose CBS staff to climate change issues, introduced them to the opportunities and challenges of collecting climate change-related statistics and supported them to develop survey instruments, analyse data and then collate findings. ACT ensured the process was participatory and inclusive, so CBS could take ownership and institutionalise learnings. ACT also linked CBS with the Bangladesh Bureau of Statistics (BBS), which has experience in handling climate data, and sent a team to Bangladesh to build their capacity. By generating large-scale evidence, ensuring political buy-in and building capacity, ACT helped foster an enabling environment for transformational adaptation.

With over 200 questions spread across 12 modules, the survey collected granular data on the exposure, sensitivity and adaptive capacity of 5,060 households in 26 of Nepal's 75 districts. It was based on household and individual experiences of short- and longer-term weather variations, impacts and adaptation approaches. Results present a wide range of perceived climate-induced disasters in the country, but drought dominates, cited by 86.1% of households. This is followed by disease/insects (43.4%), hailstorms (32.5%) and flooding (28.1%). A wide range of on-farm adaptation measures have been implemented in recent years. The most popular are inorganic fertilisers (60.46%), mixed cropping (55.47%) and improved seed varieties (53.50%) (CBS, 2017).

This intervention demonstrates a number of characteristics of transformational change discussed in the conceptual framework. First, ACT sought to ensure *sustainability* by working with CBS – the government agency charged with designing and undertaking surveys – rather than undertaking a one-off survey independently, simply to build evidence.

Second, ACT used a *systemic* and holistic approach to upgrade Nepal's capacity to collect and analyse climate statistics. Resource constraints mean CBS is unlikely to be able to undertake a survey of this nature (focused entirely on climate change) regularly. Instead, ACT worked with CBS to form an internal technical committee on climate change responsible for integrating modules on climate change within other ongoing surveys in Nepal. This permanent group has already included modules in the national Commercial Tea Plantation Survey and integrated indicators in the upcoming Environmental Statistics Survey. In this way, ACT has ensured CBS will collect data and statistics on climate change on an ongoing basis as part of its new 'business as usual'.

Third, the initiative's potential *catalytic* effects can be seen in the influence the data generated has on government plans and policies. For example, the CBS director general stated that the survey aimed at addressing the data gap as well as providing information on climate change and making it available for different users. The data obtained from the survey is expected to be useful for different initiatives in the national development plan and programmes. Similarly, a member of Nepal's National Planning Commission noted that climate-related data and information played a key role in the preparation and implementation of plans, policies, programmes and projects in the country. Furthermore, this analytical report would also provide a comprehensive picture of the climatic situation of the country and presents an important instrument for policy integration and assist in informed decision-making (Tsitsiragos, 2016).

Fourth, the intervention's *scale* can be seen through the fact that its nationally representative sample (5,060 households, by some estimates the largest perception-based survey on climate change ever undertaken in Nepal) has generated evidence that represents the entire population in Nepal, including its most vulnerable. This representation enables policy decisions for the entire country – the largest possible scale for policy support that could be hoped for in Nepal.

Finally, this intervention reflects *inclusive* characteristics because the underlying framework is aimed at gauging vulnerability. More specifically, the NCCIS focused on capturing vulnerability observed at the household level based on the existing socio-economic situation. This was done through identifying the potential impacts of climate change and adaptive capacity at the household level to respond to these impacts (CBS, 2017).

It is clear this intervention aligns with the 'institutional' route to transformation as described in Section 3. ACT decided to build the

institutional capacity of CBS to collect and analyse climate statistics sustainably; CBS has started to mainstream modules on climate change across different surveys in varied policy domains; and, more broadly, senior government functionaries have underlined the usefulness of the data emanating from the survey in the development of plans, policies and programmes aimed at dealing with the impacts of climate change in Nepal.

4.5. Strengthening the institutional architecture for accessing and managing international climate finance, Afghanistan and Pakistan

A study by the Asian Development Bank (ADB) (Ahmed and Suphachalasai, 2014) states that South Asia could lose an equivalent of 1.8% of its annual gross domestic product by 2050 as a result of climate change impacts, and this will progressively increase to 8.8% by 2100. A study by the World Bank suggests developing countries will need about $100 billion of new investments per year over the next 40 years to build resilience to the impacts of climate change (Tsitsiragos, 2016). In response, ACT has been working in Afghanistan and Pakistan to strengthen their institutional architecture for accessing and managing international climate finance.

The 2012 Global Adaptation Index ranks Afghanistan among the countries most vulnerable to the effects of climate change (UNDP, 2016a). The country is also in the top 10 most fragile in the world, in the top 20 for suffering disaster deaths and in the top 30 for the number of people affected by natural disasters. Looking ahead, the situation looks increasingly unstable, as climate projections estimate an increase in the annual mean temperature by 1.5°C between 2030 and 2052 if global warming continues at its current pace (IPCC, 2018). Climate models estimate the worst case scenario towards the end of the century, where average estimated increases in temperature will be between 2°C and 6.2°C (Savage et al., 2009).

Pakistan is listed as the seventh most vulnerable country to the impacts of climate change (Kreft et al., 2016). Temperatures across Pakistan are expected to rise by 3°C to 5°C, with greater inter-annual variability in rainfall by the end of the century (Chaudhry, 2017). These future projections point to multiple and interconnected impacts for the country, starting from increased incidence of glacial lake outbursts in the northern mountain ranges, extreme floods along the Indus River and its tributaries and cyclones in the coastal areas. Agriculture – which employs 45% of the total workforce and contributes about 60% to exports – is expected to be heavily affected, as is the water sector (ibid.). In short, climate change poses enormous threats to social and economic development and food security for the country.

In order to ensure these countries have the financial resources to adapt, ACT supported the establishment of climate finance units (CFUs) within the Ministry of Climate Change (MoCC) in Pakistan and the National Environmental Protection Agency (NEPA) in Afghanistan. Conscious of the need to foster an enabling environment to facilitate this process, ACT held regular discussions with MoCC in Pakistan and NEPA in Afghanistan and reached an agreement on the need for organisational structures focused specifically on channelling funds for adaptation.

The ACT-supported CFUs facilitate development of project proposals for international funds such as the GCF, the Global Environmental Facility and the Adaptation Fund, by convening relevant stakeholders and implementing agencies and providing technical advice for developing fundable projects and their successful submission to funding agencies. Technical support is complemented by organisational capacity building, whereby the CFU delivers trainings to provincial planning and development departments to equip them with technical knowledge and skills for preparing bankable projects for climate change adaptation.

The CFU in Pakistan was established in 2014 and, with ACT's support, has been successful in securing over $156 million of climate-related finance leveraged from international and domestic sources, which include mega projects such as the GCF-funded glacial lake outburst flood (GLOF) project. Additionally, around 100 government officers from across the country, from various departments, have been trained in developing proposals to access global climate funds. In Afghanistan, the CFU, established in 2017, has submitted one successful proposal to the GCF (for readiness funding), is supporting various ministries in the formulation of 10 others and has trained close to 500 government officials in the processes and protocols of securing international climate finance. Both CFUs follow the same organisational design, whereby a mix of external consultants supported by ACT and government staff work together and are located within government.

ACT's support to these CFUs shows early signs of transformational change. First, the approach is *sustainable* because the CFUs are located within ministries and are partially staffed by government personnel. In Pakistan, while ACT was supporting establishment of the CFU, it was developing the organisational design of the National Climate Change Authority (NCCA) – a soon-to-be-launched, constitutionally mandated, nodal climate policy agency for the country. This parallel support helped embed the CFU within the NCCA's mandate, thereby ensuring the NCCA would take over its functions, to continue well beyond ACT. In Afghanistan, the CFU is staffed by two technical consultants funded by ACT who are slowly building the capacity of three officials appointed by the ministry to the CFU to take over functioning of the CFU once ACT concludes.

Second, the CFUs are starting to deliver results at *scale*. In Pakistan, the CFU was instrumental in securing $37.5 million from the GCF to build the resilience of 696,342 individuals directly and 29.2 million indirectly in northern Pakistan to the risk of GLOFs. In Afghanistan, multiple proposals supported by the CFU will affect large swathes of the country's population. For example, the Kabul Ground Water Recharge Adaptation proposal, led by the Ministry of Energy and Water, aims to enhance the adaptive capacities of more than 4 million Afghans suffering from water scarcity.

Third, *inclusion* is notable in that the CFUs' mandates are to secure financing for adaptation interventions aimed at enhancing the resilience of vulnerable populations. For instance, the average household income within the 37 project communities targeted by the GCF project to tackle GLOFs in Pakistan is estimated at $1,126 per year, compared with a national average of $$3,796 per year. Moreover, 38.8% of all people in the 12 districts covered by the project are living in poverty, compared with a national poverty index of 27.8% (UNDP, 2016b).

Fourth, ACT could have approached its support to accessing climate finance by sending in experienced international consultants who could have focused sharply on preparing proposals. This may have been more successful in the short term, but ACT's support to *systemic* change by addressing capacity gaps more holistically through entities within government provides for a more comprehensive and sustainable solution.

Finally, this intervention has also had a *catalytic* impact, as the model for the CFU developed in Pakistan was replicated in Afghanistan. The Government of Nepal has also expressed an interest in studying this institution further.

This intervention employs 'institutional shifts' as a route to delivering transformational change. ACT's work to build and operationalise CFUs aimed to strengthen the institutional architecture within Pakistan and Afghanistan for accessing international climate finance. Through embedding this function within government, the programme is aiming to ensure institutional capacity to secure the funds needed to build resilience at scale is enhanced sustainably.

The impacts of climate change are already being felt by farmers across South Asia .

Case study	A conventional approach	ACT's transformational approach
Improving the flood warning system for the Mahanadi River Basin in Odisha	Improve the operation and effectiveness of the existing eight-hour warning system or traditional community-level disaster preparedness activities.	Introduce and socialise the idea of moving away from reactive models to provide warnings, to using proactive projection-based models including the innovative Soil and Water Assessment Tool model. This increases the warning time to 36–72 hours – enough time for comprehensive disaster preparedness at scale.
Addressing the sedimentation and flooding problem along the banks of River Kosi, Bihar	Provide technical or financial support to dredging silt repeatedly, following the traditional approach to managing the problem.	Shift the mindset of the government and stakeholders towards seeing silt as a commercial opportunity, and develop incentives and provide support to build a self-sustaining supply chain for excessive silt in the riverbed.
Enhancing resilience of agriculture to climate change in Maharashtra	Carry out small-scale pilot programmes on climate-resilient crops with selected villages and farmers, such as distributing seeds.	Identify and strengthen specific entry-points to strengthen the entire value chain of climate-resilient crops. For example, focus on bridging the gap between farmers and financial lenders in accessing credit for such crops, but do this by leveraging the resources and mandate of a larger, long-term, state-wide development programme.
Enhancing information on the impacts of climate change and improving resilience at the household level in Nepal	Deploy external experts to conduct a one-off Climate Change Impact Survey and present the findings to the government for its use.	Support CBS, the nodal government institution charged with undertaking surveys to carry out the survey, and in the process build its capacity to conduct similar surveys on a regular basis. In parallel, strengthen institutional commitment to studying climate change, and establish a Climate Change Technical Committee within CBS to sustain the mandate.
Supporting access to and management of international climate finance in Pakistan and Afghanistan	Provide fly in-fly out international consultancy support to prepare and submit individual and *ad hoc* proposals for international climate finance.	Establish and strengthen permanent CFUs within ministries (staffed with government personnel) to act as nodal agencies to access and manage international climate finance. Build CFU capabilities to go beyond developing proposals, to managing disbursement and advising line ministries on climate change opportunities.

5. Lessons learnt

This section reflects on key lessons that have emerged during ACT's attempts to deliver initiatives that demonstrate the likelihood of supporting transformational change, often at the expense of more immediate but shorter-term successes.

Characteristics of transformation should guide programme design: The characteristics outlined in Section 3.3 can be used as 'guiding pillars' for interventions that aim to support transformation, especially in their formative stages. For example, by keeping these characteristics in perspective from the very beginning, ACT's decision to engage in sediment management in Bihar (Section 4.2) was to ensure that its intervention delivered outcomes at scale, benefited marginalised communities and was as inclusive as possible. It approached the issue of flooding systemically, worked with government systems for sustainability and catalysed other actors to engage.

At various points during ACT's implementation, its managers have faced choices that could have resulted in achieving short-term goals *without* working towards transforming the system. In some situations, enabling short-term incremental shifts was an appropriate approach to achieving larger goals, such as relationship-building with governments or establishing entry-points with departments or organisations. However, ACT prioritised transformational approaches while designing and implementing several interventions by keeping these characteristics in perspective.

ACT's log frame merely commits the programme to submit a number of proposals and mobilise a particular amount of international climate finance, leaving the method/modality to the programme team. Therefore, as discussed in the above sections, ACT could have utilised external consultants to provide purely technical solutions to immediate problems (e.g. to write proposals for climate finance on behalf of Pakistan and Afghanistan). Instead, it sought systemic transformation by delivering a set of activities that would change the national institutional architecture in these countries to be able to sustainably access and manage international climate finance over time.

Action to deliver transformation change entails trade-offs: Selecting a particular domain to transform may come at the cost of another. ACT interventions demonstrating the likelihood of transformation have largely taken the 'institutional and policy reform' route; none of the examples discussed in Section 4 used 'empowerment' as a pathway for transformation. This is because, by its very nature, ACT is a 'demand-led' initiative that is expected to work very closely with government on improving its systems, institutions and policy instruments to better account for climate change. For instance, in India, ACT functions under a bilateral agreement with the Government of the UK and is charged specifically with providing 'technical' services on adaptation mainstreaming. In all of ACT's locations, identifying issues has been a consultative process and, prior to the inception of workstreams, the programme signed memoranda of understanding or prepared terms of reference with relevant ministries or departments to formalise roles, responsibilities and outcomes.

Essentially, one of the reasons ACT has secured access to government and been able to effect transformational change through institutional and policy reforms is that it has stayed away from programmes of empowerment and advocacy. Therefore, while in some circumstances it may be possible to adopt multiple routes for transformation, in most contexts those leading change processes will need to mindfully navigate trade-offs to determine the most judicious pathway for achieving transformational change given the scope and ambit of the initiative.

Keep the context firmly in perspective by asking transformation 'of what', 'for what' and 'for whom': Any discussion on resilience needs to take place in the context of questions such as resilience 'of what', 'for what' and 'for whom' (Bousquet, 2016; Cutter, 2016). This pertains to the fact that, while building resilience, it is vital to identify the entity that is being made resilient (e.g. a school building), the reason for building the resilience of this entity (e.g. to enhance its ability to withstand earthquakes) and those who will benefit from the resilience-building action (e.g. populations using the school). This is to ensure not only that action to build resilience is targeted but also that any trade-offs are negotiated with care. The same parameters apply for actions that aim to deliver transformational change. There needs to be consensus on what is being transformed for delivering which kind of outcomes and who stands to benefit from this.

The examples discussed in Section 4 demonstrate how ACT sought to be mindful of these aspects. For example, after an intensely consultative process in Maharashtra, ACT determined that it wanted to support the agriculture sector to ensure food security and farmer well-being did not suffer despite climate impacts (mainly water scarcity). It did this primarily by proposing a new and alternative set of crops. However, it arrived at this after reviewing a long list of crops against a large number of parameters, ranging from potential economic value to climate resilience benefits. This multi-criteria analysis permitted the team to determine any trade-offs and arrive at the best possible set of options.

Adaptive management is key to enabling transformation: Incremental shifts can be linear and short in term and engage a limited number of stakeholders. Changes that demonstrate the likelihood of transformation need to be systemic and inclusive and engage with a wide set of factors. As such, initiatives aiming to deliver transformation will inherently confront more complexity (see Section 2.1) – that is, unforeseen circumstances that will need to be managed with a high degree of flexibility.

This is why regular learning and adaptive management is essential for delivering transformational change. Taking an example discussed in Section 4.4, in Nepal, ACT supported CBS in conducting the NCCIS with the intention of enabling CBS to undertake the survey independently and regularly. However, while ACT was successful in ensuring CBS acquired the necessary technical capacity to achieve this objective, it became clear CBS would not have the financial resources required to carry out a survey of this kind annually. ACT used this learning and worked around this problem by supporting CBS to instead embed modules on climate change within other ongoing surveys for which it was already resourced. This approach permits CBS to continue to collect rich data on climate impacts without the need for a big investment in an exclusive survey on climate change.

ACT, responding to the complexities of its implementation environment, actively inculcates adaptive management practices through annual context assessment exercises; the provision of a limited amount of flexible finance to support actions to deal with unforeseen circumstances; decentralised decision-making; and flexibility in its M&E systems. An upcoming ACT paper on the programme's approach to adaptive management examines this issue in greater detail.

Aiming for transformational change may not always be feasible or desirable: While Section 4 uses case studies from ACT to demonstrate the likelihood of supporting transformational change, not everything ACT has done shows the same potentiality. Transformational adaptation is generally driven by large-scale and acute vulnerability in a specific region, or amplified climate impacts (Kates et al., 2012). For example, in Bihar and Odisha, millions of people are vulnerable to natural disasters and rank low on human development, and thus required transformational interventions at scale.

There have also been instances of ACT undertaking interventions that were short in term and focused on bringing forth incremental shifts rather than transformation. Several factors, such as context, time, resources, scope and demand from government, help determine whether an intervention should or can be designed to support incremental shifts or transformational change. For instance, ACT helped review Assam's Energy Policy, then conducted a study on a community-based renewable energy generation plant for the Government of Assam. This intervention did not demonstrate many of the characteristics described in our conceptual framework, but as a request for this had emanated from the highest level of the state government, the programme decided to undertake it in the interest of establishing a positive working relationship and creating the space to undertake other interventions that would potentially support transformational change.

Similarly, ACT started work in Bangladesh only in the final 18 months of the programme, and was given a small budget and a specific remit and asked to work within areas that were pre-defined. Given these constraints, it was difficult to apply the transformational characteristics outlined in our conceptual framework and identify interventions that would support transformational change. Therefore, ACT decided to undertake a small number of varied interventions aimed at conclusively but incrementally shifting the needle on the state of adaptation mainstreaming in the country. ACT contributed to revision of the National Agricultural Policy to enhance the degree to which this spoke to climate impacts. This alone will not result in transformation of the agriculture sector nationally but provides a mandate and entry-point for the government and other stakeholders to design

and deploy interventions that may. While these interventions may not directly result in the radical shifts to the quality and quantity of adaptation spending, they may combine with other ongoing and current interventions in this domain to feasibly support transformational change in the future.

Building an enabling environment: It is possible to undertake interventions that demonstrate the likelihood of delivering transformational change only if the right enabling environment exists. This entails factors such as a policy mandate, political will, evidence and information, resources and capacity to aid shifts and facilitate change processes. While these factors are essential for many kinds of change processes, they differ for processes of transformation. This is because transformational initiatives set out to address *systemic* causes of vulnerability and exclusion, bringing radical shifts that may be disruptive (Pelling, 2010). As developed in Section 2.1, systems are noted for their interconnected nature among a wide set of elements that organise around specific objectives, which makes change all the more challenging and resisted.

This was evident in Bihar, where ACT reached out to the state's deputy chief minister, who also serves as its environment minister, to endorse a silt management plan (see Section 4.2). The backing of this champion permitted this initiative to achieve its objectives. Similarly, high-quality analyses conducted by a range of technical experts, including those from the prestigious Indian Institute of Technology, on the silt load in the Kosi River and its quality, availability and impact on flooding provided the credibility, justification and knowledge necessary to finalise the approach to sustainably managing the silt to reduce flooding. This underlines the importance of 'evidence and information' as another key element of the enabling environment. In Maharashtra, rigorous technical analysis on the most suitable climate-resilient crops, undertaken by ACT, and political backing from key senior civil servants helped the programme alter the functioning of the FPCs and demonstrate the likelihood of transforming the agriculture sector in the state. Therefore, it is vital to ensure that a robust base for transformational change processes is laid by identifying and creating an enabling environment that brings together political mandate, evidence and information and awareness and capacity.

Theory-based M&E offers a flexible approach to analysing change: ACT's M&E system utilised a theory-based approach to monitoring its progress. Being designed around the programme's ToC – specifically its causal pathways, on how it sought to influence government entities to alter policies and organisations; and its causal mechanisms, where key change points were noted in the adoption and implementation of ACT's outputs – provided important points for the programme to use to infer the likelihood of its support for transformational change.

However, the analysis reflected in this paper is not the result of a specific evaluation of ACT's possible contributions to transformation; rather, it draws on the evidence gathered during the programme's implementation and uses a Process Tracing methodology, combined with its conceptual framework, to infer the likelihood of contributing to transformational impact. Thus, more rigorous evaluative work, such as post end-line evaluations, is needed, not only to better understand ACT's actual transformational contributions but also more widely in developing viable and usable evaluation methods of transformational change. Moreover, while we suggest the theory-based approach to ACT's monitoring system has been useful to assess ACT's transformational contributions (ex-post), the system itself was not explicitly designed (ex-ante) to monitor transformational changes. As a result, a point that programmes may derive from ACT's experience is to more explicitly incorporate transformational components (such as the characteristics in our conceptual framework) into a monitoring framework in order to more explicitly and deliberately monitor progress in these areas.

Systemic change is crucial for transformation: This paper began by ranking climate change as one of the most significant challenges of our time. This is in large part because adapting to its impacts requires complex systemic changes to every aspect of society. It outlined how transformation corresponds to fundamental changes to a system, while a system consists of interconnected elements that react and relate to each other, adapting and changing to changes in other elements. This is a challenging approach for any programme to take on, particularly because it often comes at the cost of other more expedient results.

Examples were given of ACT specifically veering away from providing climate-resilient seeds directly in Maharashtra, and instead working with FPCs, enabling more organisational capacity change that would have more sustainable and systemic results (Section 4.3). Or supporting the considerably

more onerous process of establishing CFUs in Afghanistan and Pakistan rather than simply utilising consultants to develop financing proposals for short-term albeit unsustainable and indeed unsystemic change (Section 4.5). In each case, ACT's choice to target the systemic nature of the challenges it found in each context determined how it would approach its solution. The centrality of a systems perspective placed the interconnectivity of multiple components and their relationships at the centre of a decision-making process. Changing the nature of those relationships has been at the heart of much of what ACT has undertaken and its approach to choosing what to support. Without an explicit understanding of how systems shape a context and particular problem, the fundamental features of transformational change cannot take root.

6. Conclusion

Based on a review of global knowledge on transformation and analysis of ACT's interventions within the framework developed, the following lessons emerge, which will pave the way forward for the community of practice working towards delivering transformation in the context of climate change adaptation:

1. Given the scale of the climate problem and the need for transformational change, it is imperative that the discussions on supporting transformational change become more mainstream and move towards agreed understandings of transformation and how it is best supported.
2. An enabling environment is foundational to successfully supporting systemic transformation and needs to be approached through a strong contextual analysis of the political economy and institutional dynamics that underpin the systems targeted for change.
3. A stronger evidence base needs to emerge as more attention is given to supporting transformational change, how it works in certain contexts, what the most effective levers of change are and where and why transformation does not work in other environments and contexts.
4. M&E systems tailored to the complex challenges of systemic change are needed in order to support adaptive programmes to better support transformation. Theory-based approaches offer an entry point, but strong programme capacity is also needed to implement more sophisticated monitoring systems. Post-end line evaluations should also be considered to measure 'actual' as opposed to 'inferred' transformation.
5. Transformation must not become the new policy buzzword, used without adequate reflection as to its value for the endeavour in question. A degree of rigour is needed in its use through the development of multiple yet cohesive analytical frameworks that serve the needs of adaptation programming at different scales and in different sectors, geographies and political contexts. This paper has illustrated one possible approach to achieving this end.
6. It is most helpful to keep the concept front and centre at the stage of designing and conceptualising initiatives as it can help deliver qualitative shifts in programme strategy. There are ways of undertaking initiatives that demonstrate the likelihood of delivering transformation and there are ways that do not (as discussed in Section 5). As with many foundational, strategic decisions, it is easiest to make these at the inception of processes.
7. Like many other new concepts, programme managers may have to be savvy entrepreneurs when convincing senior managers and donors of the value of investing in initiatives that deliver transformational change. It is important to remember that, at its core, transformation is about doing development well. It is about ensuring that investments are durable, that problems are tackled comprehensively and that investments deliver amplified impacts on as many lives as they possibly can and leave no one behind.

Keeping these seven areas for action in perspective will ensure the true potential of the idea of transformation in the context of climate and development is realised and that marginalised people living in vulnerable contexts across the world not only function but flourish despite the impacts of a changing climate.

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