



A CRITICAL REFLECTION ON
**LEARNING FROM THE
FCFA PROGRAMME**

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Acronyms

AMMA-2050	African Monsoon Multidisciplinary Analysis 2050	HyCRISTAL	Integrating Hydro-Climate Science Into Policy Decisions for Climate-Resilient Infrastructure And Livelihoods in East Africa
ACRC	African Climate Risks Conference	HyTPP	HyCRISTAL Transport Pilot Project
CCKE	Coordination, Capacity Development and Knowledge Exchange Unit	IDAPS	Integrated Database for African Policy Makers
CI4Tea	Climate Information for Resilient Tea Production	IMPALA	Improving Model Processes for African Climate
CLARE	Climate and Resilience Framework Programme	IPCC	Intergovernmental Panel on Climate Change
COMNACC	National Committee on Climate Change	ISRA	Senegalese Institute of Agriculture Research
COP	Conference of the Parties	LuWSI	Lusaka Water Security Initiative
CoP	Community of Practice	MEL	Monitoring Evaluation and Learning
CRN	Climate Risk Narratives	MetUM	Met Office Unified Model
CSAG	Climate Systems Analysis Group	NERC	Natural Environment Research Council
DESA	Department of Economic and Social Affairs	NGOs	Non-Governmental Organisations
DFID	Department for International Development	PI	Principal Investigator
ECR	Early Career Researcher	UCT	University of Cape Town
ESRC	Economic and Social Research Council	UK	United Kingdom
FCFA	Future Climate For Africa	UKRI	United Kingdom Research and Innovation
FONERWA	Rwanda Green Fund	WISER	Weather and Climate Information Services for Africa
FRACTAL	Future Resilience for African Cities and Lands		



Executive Summary



Executive summary

Sub-Saharan Africa is highly vulnerable to weather and climate variability as well as future climate change. Therefore, in parallel to reducing climate-related risks today, there is an urgent need to account for future climate risks in long-lived planning, policymaking and projects. Large-scale investments and programming have been implemented to address climate risks and vulnerabilities in the region. The Future Climate For Africa (FCFA) programme represents one such large-scale initiative, emphasising a transdisciplinary approach to knowledge production and mobilisation through strengthened research and policy/decision-making capacity. From 2015-2019 this programme brought together more than 200 researchers from over 20 countries to improve our understanding of climate variability and change across Africa; develop new tools and methods for integrating climate information into decision-making; and contribute to policies, plans and investments that are resilient to medium- to long-term climate change.

The goal of this publication is to take stock of the lessons emerging from implementing this cross-regional, use-oriented, and consortium-based research programme, in order to inform future investments into research on climate and development. We focus on three interrelated themes: project team members' collective learning, leadership and capacity development, and knowledge co-production and research uptake. Insights on these themes were gathered through interviews and surveys with approximately 31% of the project team members of FCFA's five research consortia, while ensuring a wide diversity in geographic location, gender, career stage, and roles within the consortia. A number of methodologies and analytical frameworks were used in analysing this data, including multiple case study analysis (Stake, 2013), contribution analysis (Mayne, 2012), and frameworks for analysing social learning (Collins & Ison, 2009), capacity strengthening (Brinkerhoff & Morgan, 2010) and knowledge brokering (Jones et al. 2016).

Collective learning in FCFA:


Facilitated learning processes play a critical role in strengthening capacity and collective action and improving understanding of the complexity and uncertainty of climate change. FCFA featured a wide range of learning processes at both consortium and programme scales. The learning processes that were deemed most impactful by participants were those that featured in-person engagement and 'expert facilitation'. The most significant positive benefits reported by participants were on higher levels of trust and cohesion among team members, and improving the consortia's collective understanding of the problems they were seeking to address. The survey also revealed that these learning processes offered significant cognitive and relational benefits, such as acquiring new transdisciplinary knowledge, and strengthening relationships with key stakeholders.

Leadership and capacity development:

Ensuring that research is contextualised, tailored to stakeholder needs, communicated effectively and appropriately targeted, requires a geographically balanced consortium with a strong presence of local (or Southern in the case of FCFA) leadership. This leadership may be located in either individuals, or still more frequently, distributed within teams. However, a number of systemic barriers that prevent Southern partners from assuming positions of leadership have been identified. These contribute to inequities between South-North and in some cases South-South collaborations in terms of the distribution of resources, responsibilities, and partnership benefits. Issues around leadership are tightly woven with issues of capacity. As many of the initiatives focused on building the capacity of individuals over institutions and given the unstable research environment in Africa (especially for early career researchers) this could mean that capacity efforts have a short institutional legacy. Addressing these issues is critical to developing collective leadership and research capacity in the South.



Facilitated learning processes play a critical role in strengthening capacity and collective action and improving understanding of the complexity and uncertainty of climate change.



Achieving greater research impact may require a shift in the way that research is currently practised.

Knowledge co-production and research uptake:

FCFA faced a significant challenge in attempting to improve uptake of long-term climate information amongst decision-makers where the demand for such information was limited. The issue is not necessarily access to climate information as a wealth of sources exist, but rather, tailoring information to decision-makers' needs and building their capacity to interpret and apply that information. A number of novel engagement approaches were used by FCFA consortia to create dialogue around long-term climate information, while building the capacity of the decision-makers and academics alike. Many of these approaches target broad groups of audiences and need to be assessed in relation to the success of an output/product in meeting the needs of a targeted user. While it may still be too early to fully assess the impacts of knowledge mobilisation and knowledge brokering approaches within FCFA, an expanded focus on assessing and comparing their outcomes and impacts is critically needed.

Recommendations:

Taken collectively, these three areas of review reveal some important insights and recommendations for improving the design, delivery and impact of climate and development research.

- **Building flexibility into programme design:** Programme design has a significant impact on the way that the research is conducted, the research themes and who conducts the research. However funding calls often require the entire research process to be predefined, with little opportunity for emergent research opportunities. Within the context of knowledge co-production (actively promoted within FCFA), it is difficult to deliver appropriate research that is co-produced and has a bottom-up approach within such models of programme design. Designing mechanisms to support emerging research and practice at the outset of programmes is critical. As from the successful examples in FCFA, this might include creating innovation or opportunity funds for emergent research, building on adaptive governance mechanisms; and promoting opportunities for emergent leadership roles.
- **Transforming research and knowledge mobilisation practice:** Achieving greater research impact may require a shift in the way that research is currently practised. While it is clear that in-person engagement is impactful, it also bears

the financial and emission-related implications of frequent in-person meetings of international teams. However, there are many benefits to the appropriate use of in-person engagements, especially within the lens of co-production. Shifting linear research and knowledge mobilisation practices towards the principles of co-production can be effective in establishing long-term engagement and can also guide future research initiatives. Alternative engagement and dissemination activities like online convening remain important, but these still face challenges related to a more linear model of delivery, and connectivity challenges in many African countries. Therefore it is important to support innovation in the field of designing and facilitating virtual engagements or communities of practice (CoPs).

- **Investing in Southern leadership and capacity:** This study highlights the need for programmes to entrust greater responsibility and accountability towards Southern partners, challenging traditional power dynamics and the typical definition of roles, such as Southern partners as network champions. Future programmes need to consider fostering a leadership model that is inclusive, equitable and focuses on distributed leadership, especially for South-South and South-North partnerships. Leadership and capacity are highly connected, in acknowledging this, there needs to be a shift towards ways in which leadership functions focus on the collective rather than the individual and how capacities have emerged to achieve broader outcomes. It is also important to acknowledge that researcher capacity and institutional capacity are inseparable. So in order to overcome some of the long-term capacity development barriers of Southern researchers, funders need to develop a better understanding of the administrative complexities of Southern institutions and determine if a more flexible system could be developed.
- **Evaluating impacts:** The real impacts of programmes seeking to build capacities and transform practice are often felt long after their conclusion, and it is important to ensure that Monitoring, Evaluation and Learning (MEL) practices track changes in the longer term to better understand these impacts. Also important within multidimensional programmes like FCFA is developing an understanding of how competing programme requirements (such as research excellence vs capacity development) might affect overall programme outcomes.



Introduction



This Learning Review is a part of the programmatic learning endeavour to take stock of the lessons emerging from FCFA's collective experience that might inform future investments into research on climate and development.

This report draws on a number of FCFA published literature. For a comprehensive list of documents analysed for this study, please see ANNEX 2 of the online version. Similarly, a copy of the research ethics approval can be found in ANNEX 3 of the online version.

The challenges of climate change adaptation are highly complex, often involving interconnected social and ecological problems that entangle competing social interests, norms, values and priorities. Incorporating a diversity of perspectives, world-views and knowledge systems is therefore essential in developing response options and pathways to resilience (Cash et al. 2003). Moreover, formulating effective adaptation strategies relies on knowledge about the long-term impacts of climate change. This adds an additional layer of complexity for decision-makers who must align short-term development priorities with long-term sustainability challenges. It also involves engaging with the inherent uncertainty of climate change. The uncertainty, complexity and contestation related to climate adaptation make it a particularly wicked problem for decision-makers (Termeer et al. 2013; Turnpenny et al. 2009). Wicked problems like this cannot be solved by scientific methods alone or through the mechanisms of top-down governance (Webber & Rittel, 1973). Consequently, the traditional “puzzle-solving approach” to problem-solving and scientific research is inadequate in the course of climate change (Rodela et al. 2012). Yet, actions for sustainable adaptation remain urgently needed.

In addressing the adaptation challenges, new forms of researching and policymaking are underway (or at the very least, calling for changes has been increasing) (Irwin et al. 2018; Parks, Rodriguez-Rincon, Parkinson & Manville, 2019). Particularly in the recent programming and international investment into research and action on climate adaptation, attention to large-scale collaborations is growing (Cundill et al. 2019a). These programmes recognise that involving stakeholders with diverse perspectives is crucial when dealing with climate and sustainability challenges. They also seek for greater impact by encouraging large-scale collaboration and use-orientated research practice (Jones et al. 2018). Therefore, multiscale and trans-disciplinary collaborations are the central features of this contemporary approach to researching complex adaptation challenges. The FCFA programme presents one of these large-scale initiatives emphasising a transdisciplinary approach to knowledge production and change-making.

However, the changing landscape of adaptation research and practice have posted challenges for programme planning and management. Not only do the programme design and decision-making tend to be experimental (Cundill et al. 2019b), but the solutions to adaptation challenges are highly context sensitive. Therefore, there is no one-size-fits-all programme that can be recommended for all research endeavours addressing climate adaptation challenges. The inherent uncertainties associated with climate change also add to the overall complexity when considering medium- and long-term planning. Consequently, programme development for adaptation research is always in a state of becoming. Especially in the current trend of investing in long-term and large-scale research collaboration, ongoing learning and reflexivity are the key to successful implementation and programme management. Learning from experience is also vital in informing the design and evaluation of future adaptation research programmes (Jones et al. 2018; Preston et al. 2015; Vinke-de Kruijf & Pahl-Wostl, 2016).

This Learning Review is a part of the programmatic learning endeavour to take stock of the lessons emerging from FCFA's collective experience that might inform future investments into research on climate and development. Specific objectives are (1) to examine how learning has guided the governance and research processes and outputs within FCFA, and (2) to reflect on FCFA members' experience of the successes, or lack thereof, throughout the programme. The authors herein recognise the need to elucidate our conceptualisation of learning for this report. Before doing so, we first provide a brief background of the FCFA programme. We then delve into the learning questions, study methods, and findings of the Learning Review. This report concludes with a number of recommendations for future programme design, research practice, and leadership, and capacity development for climate adaptation and resilience. Case studies for the contribution analysis, a list of documents analysed and the research ethics certificate can be found in Annex 1, Annex 2 and Annex 3 respectively.

1.1 About FCFA

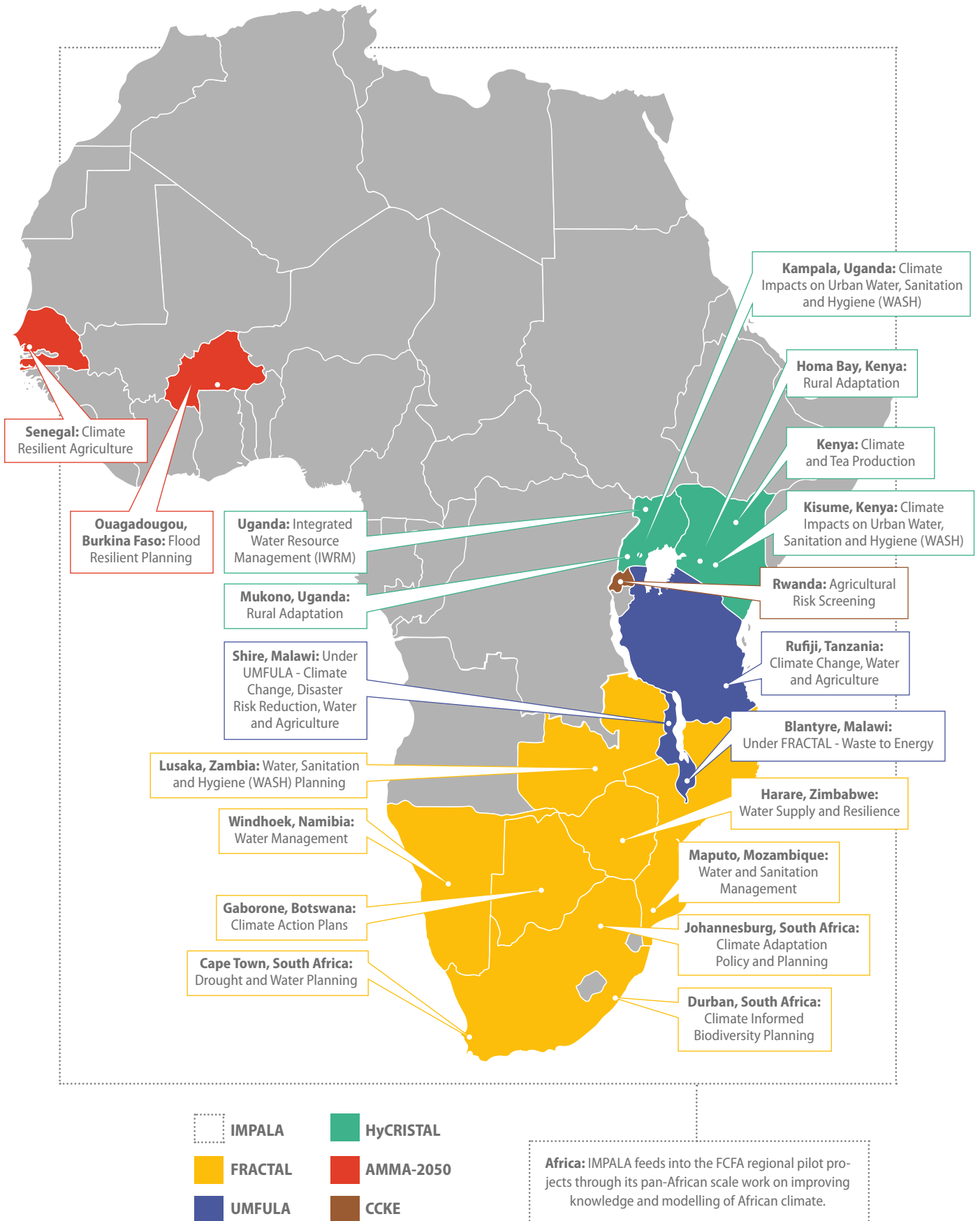
FCFA is a £20 million programme funded by the UK Department for International Development (DFID) and Natural Environment Research Council (NERC). It is generating fundamentally new climate science focused on Africa and piloting the use of improved medium- to long-term (5 – 40 year) climate change information in development projects. The goal of FCFA is to reduce disruption and damage from climate change and to safeguard economic development and poverty eradication efforts over the long-term. The programme is being implemented by five research consortia (see Figure 1): African Monsoon Multidisciplinary Analysis (AMMA-2050), Future Resilience for African Cities and Lands (FRACTAL), Integrating Hydro-Climate Science into Policy Decisions for Climate Resilient Infrastructure and Livelihoods in East Africa (HyCRISTAL), Improving Model Processes for African Climate (IMPALA), and Uncertainty Reduction in Models for Understanding Development Applications (UMFULA), with support from a cross-programme Coordination Capacity Development and Knowledge Exchange Unit (CCKE). The core research ran from 2015 – 2019. For more information, visit www.futureclimateafrica.org.

FCFA has now entered a (financially smaller) costed extension (March 2021), to maximise the impact and legacy of research undertaken to date and to implement key components of work that emerged during the FCFA programme. The focus remains to leverage the value of DFID's initial investment in FCFA to inform a wider African research agenda

whilst bringing new climate information to bear on strategic and operational developmental decisions in Africa.

FCFA is a unique applied research programme with many successes, challenges, evolving objectives and adaptive decisions regarding research, engagement and strategy. As FCFA nears the end of its research process, it is worth reflecting on what we have learnt through engaging with a research programme comprising multiple, international consortia, working on research-into-action projects. FCFA is a large-scale investment with a wide range of experiences to learn from, however, in FCFA this learning is often captured at the consortium level. This Learning Review provides the opportunity to synthesise learning across the FCFA programme. Similarly, programmatic learning can provide useful insights into the governance and research processes that can be used to influence the design of future donor programmes (e.g. the Climate and Resilience Framework Programme (CLARE)). At the researcher level, learning can help to improve the way that research is conducted on the ground, drawing from the successes of existing collaborative, interdisciplinary, and use-oriented research that adds to professional and personal growth. Given that this is still an emergent model of practice for many, learning from FCFA is a valuable addition to the researchers within the programme as well as those operating in the climate and development space.

FIGURE 1 FCFA pilot projects





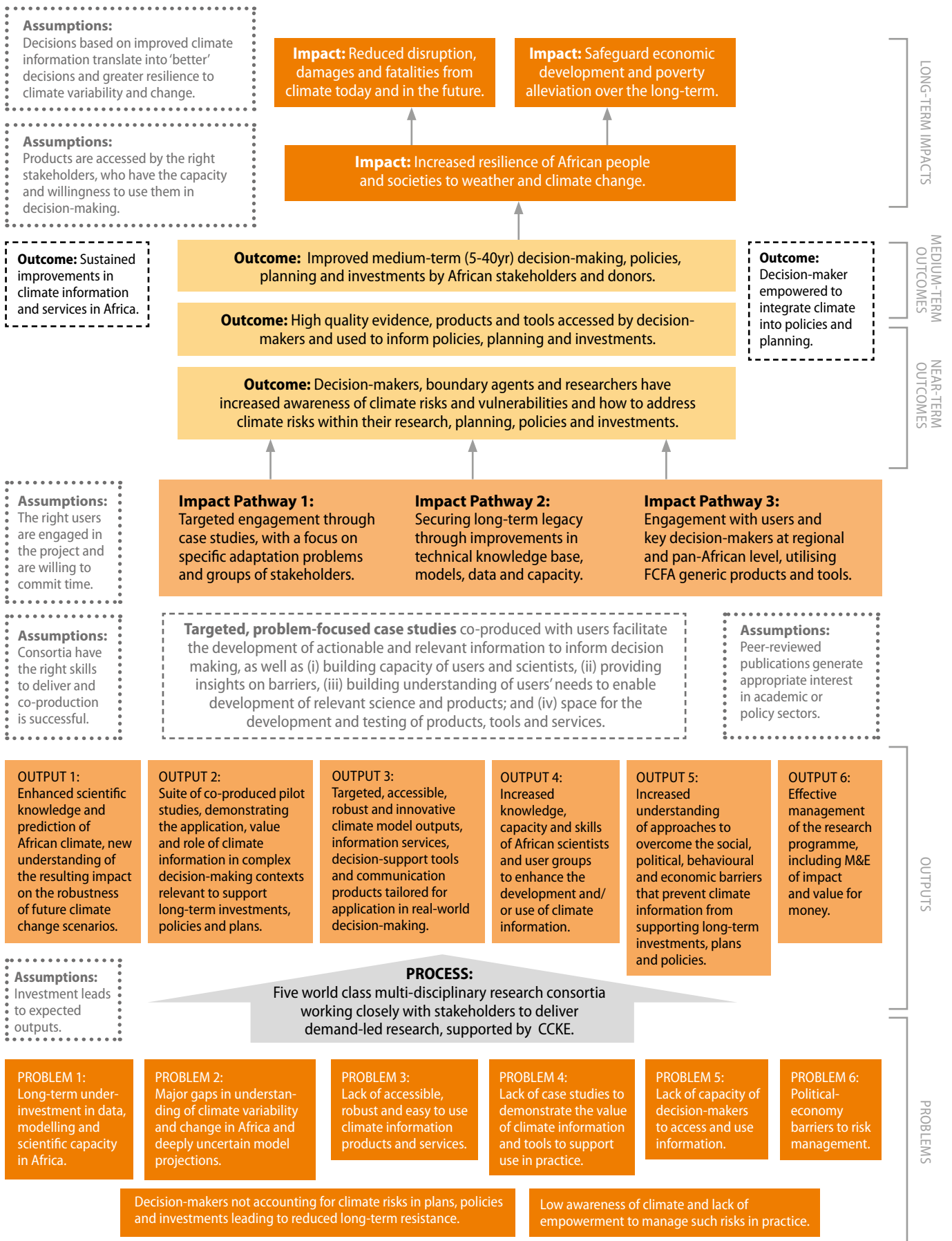
TOP: Bruce Hewitson introduces information distillation and communication at the FCFA Mid-Term Conference, South Africa, 2017.
- Photo by Gregor Rohrig

1.2 What do we mean by “learning”?

This Learning Review uses the term learning in two slightly different ways: the first use refers to learning from action through structured inquiry and analysis. This is essentially the purpose of the Learning Review and its learning questions. Reflecting on FCFA’s collective experience and taking stock of the programmatic lessons are the primary goals of this learning exercise. Drawing on FCFA’s goal to improve “medium-term (5 - 40ys) decision-making, policies, planning and investments by African stakeholders

and donors” (FCFA Theory of Change, see Figure 2), this Learning Review focuses on three aspects of the programmatic learning. They are: (1) collective learning among FCFA members (including researchers, practitioners, and knowledge brokers), (2) Southern leadership and capacity development, and (3) lessons on mobilising climate information for medium- and long-term impacts on resilience in Africa. Learning questions for each focus area will be discussed in the section below.

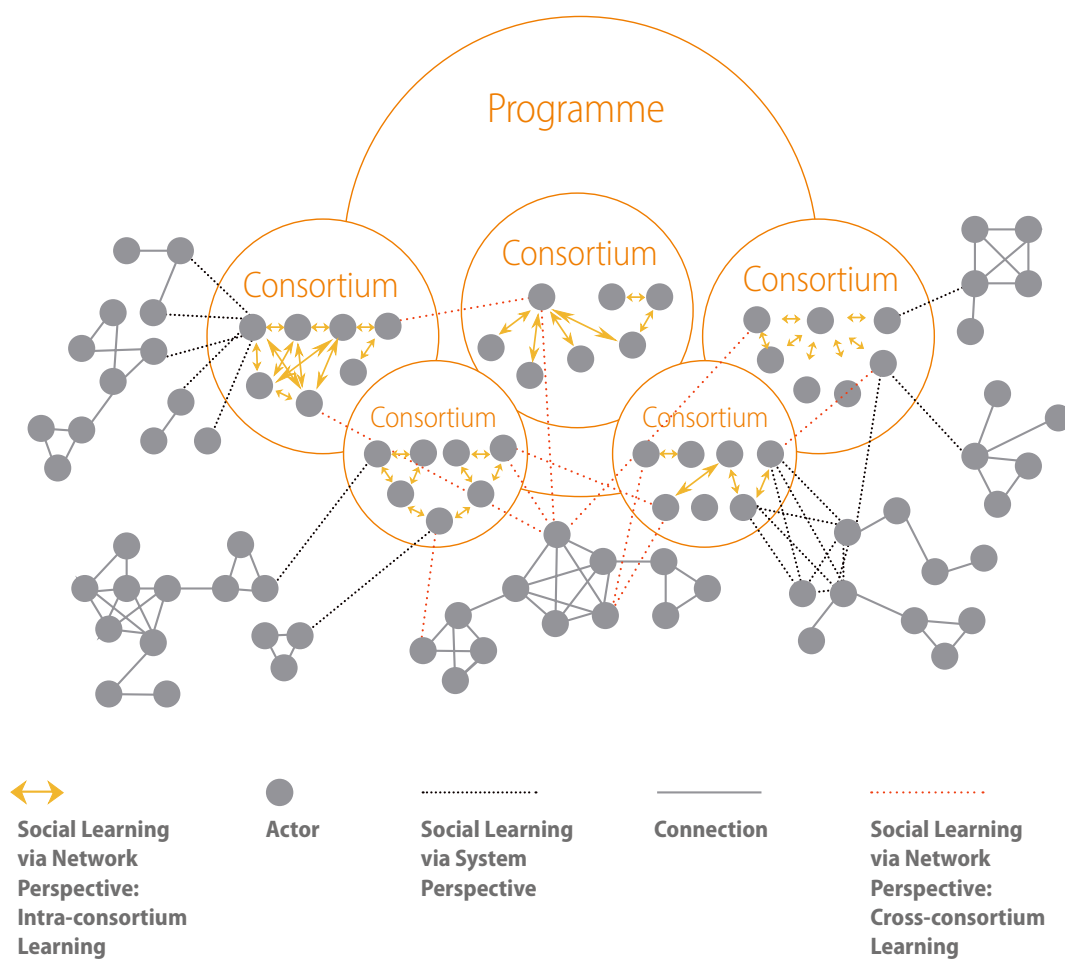
FIGURE 2 FCFA Theory of Change



The second use of the term ‘learning’ is related to the collective learning in action that took place in FCFA. We refer to this as collaborative learning, intra-consortia learning and cross-consortia learning at various points in this report. Our understanding of this form of learning draws on theories of social learning which have been used extensively in studies of ecology and natural resource management (e.g. Reed et al. 2010), and increasingly on climate change adaptation (e.g. Ensor & Harvey, 2015). These

studies describe social learning as emerging through practices that facilitate knowledge sharing, joint learning, and co creation of experiences between stakeholders around a shared purpose in ways that: 1. Take learning and change beyond the individual to communities, networks, or systems; and 2. Enable new shared learning to emerge, that leads to changes in practice. Figure 3 illustrates how we conceptualise collective learning in networks and systems within the FCFA programme.

FIGURE 3 Conceptualisation of collective learning in networks and systems within FCFA



It is important to note that this Learning Review focuses on social learning from a network perspective, rather than individual or system. The differences are outlined in Table 1 below. Although the three perspectives are interrelated, differentiating them helps to narrow the study focus and approach (Rodela, 2011). By situating this Learning Review in the network category of social learning research, we focus on the learning processes and outcomes that strengthen CoPs. We are keen to examine how and to what extent the members' collective learning experience within and between consortia shaped their practices for transdisciplinary and more impactful research (e.g. relationship building, adaptive capacity, approaches to communicating

uncertainty). Future reviews of programme-based learning could consider taking on more of a systems perspective to examine how collective learning occurs by interacting with actors working in the wider social-ecological context where change is expected. Future reviews might ask, for example, how multi- or transdisciplinary teams affect the learning of key actors in the wider social-ecological system (decision-makers, resource managers, etc.). They might also study the extent to which collective learning has resulted in systemic transformations that improve sustainability and resilience. These questions were beyond the scope and timeline of this review.

TABLE 1 Overview of the differences in perspective within a social learning system (Adapted from Ensor & Harvey, 2015 and Rodela, 2011).

	Social Learning System		
	Individual Perspective	Network Perspective	System Perspective
Description	A transformative process that occurs by individuals' participation in learning activities, and results in their internal-reflection or changes in individual behaviours	A process of change in established governance, resource use, research practices, or ways of relating among members of a common network or community	An emergent process that results from engaging with or around social-ecological systems, and resulting in more systemic transformations that improve the sustainability of these systems
Locus of Learning	Learning in participatory activities	Learning in networked practice	Learning in the social-ecological context where change is expected
Study Focus	Different dimensions of individual learning (e.g. moral, cognitive, epistemic) that can contribute to collective learning in networks or systems	Multi-level actions and relationship development that can result in effective CoPs	Social-historical processes (e.g. programme formation, disciplinary norms, organisational culture) that can lead to ecosystem responses or societal change (e.g. policy, institutional directive, farming practices)
Example Evidence of Impact	Participants' attitudes toward a communal resource (canals) shifted; Participants focus on solutions that respect a plurality of interests and worldviews; Municipal participants allocated new budget for maintenance of shared resources	Change in participants' understanding of farmers as merely recipients of knowledge and technology, to active agents with the capacity to learn and collaborate; Improved governance and collective planning processes; New types of funding introduced for knowledge syntheses	Farmers rebuilding professional identities based on a new relationship to the resources they use; Change in research directions based on inputs from indigenous communities; Redesign of fencing to cross legal boundaries of property ownership
Example in FCFA	Post-event surveys; ECRs learning report	Cross-consortia and intra-consortia learning mechanisms; Building the adaptive and research capacity of consortia	Field visit; Baseline Review; Working with a wide range of stakeholders to realise a consortium's work packages



TOP: Stakeholder engagement at AMMA-2050 annual general meeting, Senegal, 2017.
- Photo by Nkulumo Zinyengere.

1.3 Learning questions and their relevance

As mentioned earlier, this Learning Review is composed of three interrelated lines of inquiry. This section presents the learning questions in detail. Rationale for each learning question and its relevance to the literature are also included. To avoid repetition, the overall methods for investigating these learning questions are discussed in Section 2 of this report. Findings of each learning question are then reported in Sections 3, 4 and 5 respectively.

Promoting collective learning in FCFA

Mutual learning among diverse stakeholders is a key feature of transdisciplinary collaborations in climate change adaptation research (Cundill et al. 2019b; Ensor & Harvey, 2015). The reasons include the scale and urgency of climate impacts, the complexity of adaptation challenges, and the inherent uncertainties of climate knowledge. Therefore, actors who share a commitment to tackling complex social and ecological problems are required to learn from and with each other while negotiating appropriate solutions. They also need to learn to engage in a collective learning process to enhance adaptive capacity (Hagemeier-Klose et al. 2014), to build socio-ecological resilience (Keys et al. 2014; Lemos, 2015), and to develop relations and foster social cohesion for knowledge co-production (Chaffin et al. 2016). As we mentioned in the section above, this form of learning from and with each other is conceptualised “social learning” in the natural resource management and climate adaptation literature. It emphasises the learning process that spans across networks and systems, rather than solely within individuals (Ensor & Harvey, 2015).

In FCFA, ongoing collective learning among the members is thought to be the key to creating effective CoPs that can eventually make research more impactful, targeted and relevant. It thus represents a significant investment of time and resources in the FCFA programme, as well as in a few of the consortia. Without some elements of learning from engagement, it may be difficult to provide outputs and products that are tailored to the “user” needs. As a result, reflecting on the design and experience of collective learning that took place in FCFA can help to take stock of the good practices that can be embedded in future programme design and delivery. To this end, we focus on collective learning promoted within FCFA from two perspectives: cross-consortia, as convened by the CCKE unit, and intra-consortia, through a wide range of activity sets and outputs. Specific questions are:

- How has the CCKE promoted collective learning amongst FCFA members? (How) has this altered the direction of research practices, outputs or outcomes?
- How has ongoing intra-consortia learning altered the direction, uptake or impact of consortia research agendas and outputs?

Given our intention to inform future programme design and investment, for this set of the learning questions, we paid attention to the collective learning that was deliberate and structured, instead of emergent (Cundill & Harvey, 2019). Examples of this kind of learning in FCFA include facilitated working group meetings, conference dialogues, and more, as we will discuss in the study findings. Detailed findings can be found in Section 3 of this report.

Southern leadership and capacity

The seventeenth Sustainable Development Goal is to strengthen global partnerships so that all individuals, communities and countries would have the opportunity to live in sustainable societies. Realising this vision needs international cooperation to ensure that “sufficient means of implementation exist” (United Nations DESA, 2019, p. 22). It also requires mutual learning and processes of change across institutions, disciplines, and geographical boundaries. One key aspect to move this area of work forward is to increase dialogue, knowledge exchange and collaborations between the Southern and Northern hemispheres (Blicharska et al. 2017). Against this backdrop, capacity building in developing countries has been identified as a key means of implementing the 2030 Agenda and other pathways for sustainable development (e.g. the Samoa Pathway). Sustainable Development Goal Target 17.9 is subject to capacity development through South-North, South-South and triangular collaborations.



In FCFA, developing adaptive and research capacity of African partners through intensive South-North and South-South research collaborations are at the core of the programme design.

In FCFA, developing adaptive and research capacity of African partners through intensive South-North and South-South research collaborations are at the core of the programme design. This is evident when looking at FCFA’s Theory of Change and the manifold activities revolving around strengthening scientific capacity and international collaboration in Africa. The capacity building emphasis within the log frame also focuses on supporting early career researchers (ECRs). This context thus presents a unique opportunity to reflect on and learn from FCFA’s experience of South-North and South-South partnerships in terms of capacity building. To this end, we approached this area of programmatic learning from a leadership perspective.

There is a well-supported link between leadership and capacity, particularly when capacity extends beyond the abilities of individuals, and into organisations and systems (Lichtenstein & Plowman, 2009). For this Learning Review, capacity is understood as a consortium’s ability to address its objectives, core values, and work packages. FCFA’s effort into capacity-building focuses on improving the working environment (e.g. norms, governance, formal arrangements, internal and external relationships, and partnerships) to maximise consortia’s possibility to deliver outputs based on the impact pathways and legacy strategies. Therefore, leadership represents a significant portion of the capacity-building efforts, aside from institutions and policies. Leadership development thus refers to preparing individuals

with the necessary skills, attitude and functional knowledge to operate within this complex system to maintain and/or advance the capacity of a consortium. For this Learning Review, we use the term ‘Southern leadership’ to refer to ECRs and senior researchers who are based in African institutions and who are in positions of power within the larger streams of work, for example, leading, conceptualising and delivering research within a thematic area.

Research has shown that Southern leadership is an integral part of ensuring that research collaborations have an impact on the ground (Blicharska et al. 2017). Amongst many enabling factors, Southern partners have a strong understanding of the context in which the research is trying to situate itself (Blicharska et al. 2017). A strong Southern presence in African research projects have shown to be highly beneficial towards design and implementation, yet we continue to find a strong bias towards Northern institutions in research initiatives, particularly those led by academic institutions. This trend is not limited to the field of climate research (see Blicharska et al. 2017; González-Alcaide et al. 2017), but raises important concerns for a field that is seeking to scale up the local use of evidence for climate action. It is therefore important to assess the barriers and enablers that affect Southern leadership, including capacity gaps that might prevent the emergence of leadership. Understanding the Southern leadership space can help to design projects and programmes that create equity, ownership and greater impact and legacy. Therefore, for this learning question, we set out to ask:

“What influence has Southern leadership had on the design and implementation of FCFA research and research uptake efforts?”

This learning question sought to investigate how consortia’s capacity and Southern leadership were developed and unfolded in practice. Specifically, we investigated this question from a range of entry-points, starting from an analysis of the design of FCFA (asking, for instance, “How was the concept of ‘Southern leadership’ framed in the FCFA business plan, and what informed this framing?”), through to the practices that unfolded in the consortia themselves. Interviewing FCFA members to understand their experiences also helped us gain an insider’s view of the South-North and South-South partnerships in large-scale development programmes like FCFA. Through interviews, a few critical, hitherto unexplored issues related to the



TOP: Learning exercise at HyCRISTAL annual general meeting, Kenya, 2016.
- Photo by Julio Araujo

development of Southern leadership began to emerge. In Section 4, we discuss findings such as: How have the roles/leadership of Southern partners influenced the types, opportunities and levels of impact that consortia have had? And, how have different forms of Southern leadership (assigned, assumed, emergent, etc.) shaped collaborations? This discussion generates important lessons about how the presence of key capabilities has either enabled or constrained leadership in the South.

Mobilising climate information

Despite the widely-documented exposure of lives, livelihoods and assets to rising climate risks in the Global South, the integration of information about those risks into planning and decision-making remains limited. Researchers have highlighted the challenges associated with encouraging use of medium to longer-term climate information in many developing countries (Jones et al. 2017). As a recent review by Singh et al. (2018) notes, despite the critical need to consider decadal and multi-decadal time scale information in planning, “there are very few clear examples of long-term climate information linking directly to on-the-ground decision-making” (2018: 394). Numerous recent studies have sought to better understand the barriers to this integration, highlighting factors related to the nature of the climate information (its salience, legitimacy, credibility and accessibility); the nature of the ties between producers and users of that information; as well as individual, organisational and systemic constraints that interfere with actors’ capacities to act appropriately on information (including technical, financial, social and psychological barriers to action) (Carr et al. 2019; Jones et al. 2017; Singh et

al. 2018; Vincent et al. 2017; Watkiss & Cimato, 2015). This is also an issue relevant to other researchers and programmes working on the continent.

There is no single universal strategy or solution to promoting the uptake of climate information amongst a range of users, especially considering different contexts. FCFA consortia have used several different approaches to promoting information uptake, which creates a valuable opportunity to compare and draw lessons from across these recent practices. The following learning question begins to engage with this opportunity by asking:

“What have we learned about how best to present or position medium- to long-term climate information for uptake by targeted users across scales?”

While the question examines the barriers and enablers of approaches used by FCFA consortia and the CCKE, it is important to note that the aim of this question is not to determine which approach is better than another. The attempt is to understand how these approaches can be used across the board and how we can be more effective in the future under different contexts, and with different audiences. This offers an opportunity to better understand how these have been beneficial, for whom, and in what contexts. Having a better understanding of what has or has not worked will help to improve the way in which researchers engage with the “user” community. Detailed findings can be found in Section 5 of this report. We now turn to the overall research design and method of this Learning Review.



Study design and methods

This section begins with a brief discussion of how the learning questions were decided in consultation with the FCFA Reference Group.¹ Data collection and analysis methods for each learning question are then explained.

In this study we developed an initial set of questions that are aligned with the underlying assumptions of the FCFA programme, linking to the FCFA Theory of Change. The six key assumptions are summarised below.

- Decisions based on improved climate information translate into 'better' decisions and greater resilience to climate variability and change;
- Knowledge products are accessed by the right stakeholders, who have the capacity and willingness to use them in decision-making;
- The right users are engaged in the project and are willing to commit time;
- Consortia have the right skills to deliver and co-production is successful;
- Peer-reviewed publications generate appropriate interest in academic or policy sectors; and
- Investment leads to expected outputs.

We further narrowed this set of questions to focus on options that can be sufficiently explored within the time and budget available for this learning process, and that are not likely to be addressed through other research and evaluation activities within FCFA. A shortlist of questions was established through an engagement process with the FCFA Reference Group. The basic criteria for selection were as follows:

- Relevance to FCFA work and context;
- Relevance to the broader literature as discussed in the Introduction;
- The team's ability to appropriately analyse a thematic area in a robust and ethical manner; and
- Ability to appropriately address the question within the timeline of the study.

The questions are intended to take stock of the

lessons, as opposed to evaluative orientation, with a view to better understanding both the successes and challenges encountered by FCFA over its lifespan. Through the selection process, three learning questions were formulated to be addressed by this study:

1. **On promoting collective learning in FCFA:**
How has the CCKE promoted collaborative learning amongst FCFA partners? (How) has this altered the direction of research practices, outputs or outcomes? (How) has ongoing intra-consortia learning altered the direction, uptake or impact of consortia research agendas and outputs?
2. **On Southern leadership and capacity:**
What influence has Southern leadership had on the design and implementation of effective FCFA research and research uptake efforts?
3. **On mobilising climate information:**
What have we learned about how best to present or position medium- to long-term climate information for uptake by targeted users across scales?

As ethical researchers, it is important to ensure that the process and outcome of the research does not negatively impact on any of the participants of the study. Given the potentially sensitive nature of the questions in this study, we recognised the importance of adhering to internal research ethics protocols to maintain the privacy and confidentiality of participants' identities and research data. To address all these points we applied for a Certificate of Ethical Acceptability for Research Involving Human Subjects from the McGill University Research Ethics Board (see ANNEX 1). This outlined the process in which this study approached all aspects of the research process, from participant recruitment, to data collection and storage.

¹ FCFA Reference Group: We invited a number of consortium partners to join us as members of a reference group (drawing from the FCFA MEL working group, FCFA project managers and the FCFA principal investigators) for this work to provide guidance on the framing of the learning questions, the existing resources, and the people or processes that should inform the specific areas of the review.

BOX 1

Challenges in obtaining research ethics approval for non-academic institutions

Obtaining formal research ethics board approvals from an accredited entity is a major challenge for non-academic institutions like non-governmental organisations (NGOs).

This is largely due to a lack of availability of such review processes for non-academic researchers. As a result, many proceed without such clearance, giving rise to the possibility that protocols around informed consent, confidentiality and data protection may not be adhered to, simply because the requisite training and awareness may not be present in

the research teams.

As funders of significant amounts of development research undertaken by non-academic institutions, DFID could make an important contribution by promoting the adoption of research ethics standards among non-academic institutions. DFID could also provide resources to guide the ethical conduct of research for recipients who might lack the support infrastructure enjoyed by universities in the North. For more details on these concerns see Neyfeh and Charron (2018).

2.1 Data collection



We aimed for even distribution amongst respondents per consortia, with a final range between 9% and 25%

Data for this study was collected through a combination of an online survey, one-on-one interviews, group interviews and extensive document analysis between May and October 2019. An additional data collection and validation step was carried out through the Learning Workshop at the African Climate Risks Conference (ACRC) on 9 October 2019.

Surveys

The online survey was designed and administered between June and July 2019. It was administered in both English and French, with French responses being translated into English for analysis. The online survey, which covered questions on facilitated learning at cross- and intra-consortium scales,

was sent out to all persons within FCFA contracted institutions² and CCKE (approximately 229 people), to gain as many perspectives as possible within the programme. The survey recipients span a wide range of geographical locations (Africa, North America, Europe and the United Kingdom), genders, roles within the FCFA consortia (e.g. researchers, project managers, practitioners; see Figure 4) and ages. We aimed for even distribution amongst respondents per consortia, with a final range between 9% and 25% per consortium. The survey return rate is 31%, with a total of 72 responses for analysis. A demographic breakdown of the survey respondents is outlined in Table 2 below.

TABLE 2 Demographic breakdown of survey respondents.

	CCKE	HyCRISTAL	UMFULA	IMPALA	FRACTAL	AMMA-2050
Researcher	1	7	12	7	9	17
Practitioner	0	1	1	0	0	0
Knowledge manager and/or broker	3	0	0	0	2	0
Project manager	3	1	2	0	2	1
Others	1	1	3	0	0	1
Total number of respondents*	8	10	18	7	13	19

*Note: The total number of respondents is greater than 72 because some respondents participated in more than one consortium's activities.

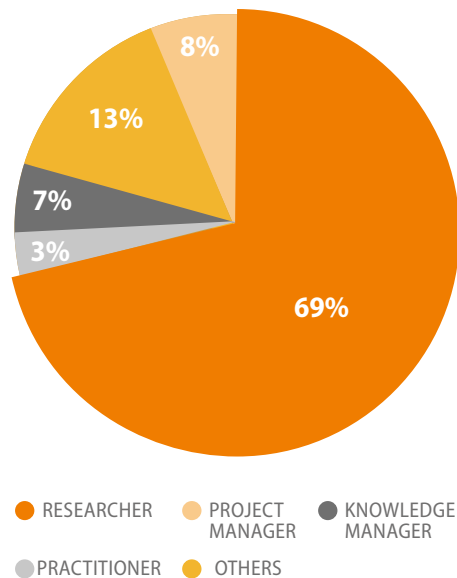
² Only FCFA consortium members were included in this sample and did not include the project stakeholders

³ A **researcher** was defined as: 'I lead or support research activities for a project within the project'. A **practitioner** was defined as: 'I implement field-based activities for a project within the project'. A **knowledge manager** or broker was defined as: 'I lead or support the knowledge management or brokering function within the project'. A **project manager** was defined as: 'I lead or support the overall management of the project'.

⁴ An ECR is defined as meeting both the following requirements:
Experience: At least completed a Bachelors, and currently enrolled in a Masters in a climate change related field, and at most a PhD with four years of relevant experience, or alternatively at most ten years of practical experience following a Master's qualification.
Institutional affiliation: Registered as a student or staff member of either a contracted FCFA research institution or FCFA-affiliated institution. An FCFA research institution refers to institutions that are directly contracted through DFID and NERC.

An FCFA-affiliated institution was defined as an institution in which at least one full time staff or student member is partnering with contracted FCFA research partners in the delivery of FCFA-related outputs, either as a sub-contractor or through other formalised mechanisms such as a Memorandum of Understanding.

FIGURE 4 Typology of FCFA learning survey respondents.³



Interviews

The one-on-one and group interviews conducted in this study, strategically sampled a mix of researchers with diversity in geographical location (specifically Global North and Global South), gender and leadership roles within FCFA. For each learning question we interviewed at least one person representing each of these criteria. We ensured that there was at least one interview with an ECR⁴ as well as a senior researcher/principal investigator. All the interviews were conducted by Julio Araujo, Zablone Owiti and Jean-Pierre Roux at the CCKE. Each interview within each learning question was guided by the same set of overarching questions, allowing for standardisation across responses. Individual interviews of

It is important to note that of the 72 respondents, ten responded to the survey as a member of **cross-consortia** activities, 36 responded to the survey as a member of **intra-consortia** activities, while 26 responded to the survey for both. Thus, in Section 3, findings related to cross-consortia learning reports the results of a total of 36 respondents (i.e. ten for only cross-consortia plus 26 for both). Findings related to intra-consortia learning reports the results of a total of 62 respondents (i.e. 36 for only intra-consortia plus 26 for both).

Survey responses were analysed using basic statistical analysis with some levels of comparison across the different consortium models and practices. Moreover, thematic analysis was used to analyse open-ended questions in the survey to identify the learning outcomes and contributing factors that led to an effective cross- and intra-consortia learning.

approximately 45-60 minutes and group interviews of approximately 90-120 minutes were conducted (remotely and in-person depending on availability) with representatives from each consortium. Participants were invited to share their experiences and views on various aspects of FCFA implementation, drawing on the barriers and enablers to delivering on a range of processes and activities relating to each learning question. As appropriate, we facilitated the discussion to traverse the timeline of FCFA and not just focus on the beginning or end. Table 3 sets out the data collection and analysis approaches that were used for each learning question and the range of respondents.

TABLE 3 Overview of data collection and analysis for each learning question.

LEARNING FOCUS		DATA TYPE	DATA COLLECTION DISTRIBUTION	METHODS FOR ANALYSIS
Promoting collective learning in FCFA	Cross-consortia level	Survey; Documents	36 responses (8 CCKE; 5 AMMA-2050; 9 FRACTAL; 7 UMFULA; 4 HyCRISTAL; 2 IMPALA; 1 involved in multiple consortia)	Contribution analysis (Mayne, 2012) Thematic analysis • Design factor framework (Collins & Ison, 2009) • Social learning outcome framework (Ensor & Harvey, 2015)
	Intra-consortia level	Survey; Documents	62 responses (3 CCKE; 16 AMMA-2050; 13 FRACTAL; 14 UMFULA; 10 HyCRISTAL; 3 IMPALA; 3 involved in multiple consortia)	
Southern leadership and capacity		Interviews; Documents	12 FCFA members: • 1 AMMA-2050; • 4 FRACTAL; • 4 UMFULA; • 3 HyCRISTAL.	Thematic analysis • Capacity framework (Brinkerhoff & Morgan, 2010)
Mobilising climate information		Interviews; Documents	13 FCFA members: • 2 AMMA-2050; • 3 FRACTAL; • 4 UMFULA; • 4 HyCRISTAL.	Multiple case-study analysis (Stake, 2013) Thematic analysis • Knowledge Brokering framework (Jones et al. 2016)

2.2 Data analysis

A number of methodologies and analytical frameworks were used in this study. A brief outline and the relevance towards this study are presented below:

Multiple case study analysis

While individual case studies can be very helpful in understanding the conditions that lead to particular outcomes in a specific setting (e.g. policy engagement on climate resilient infrastructure in a specific city), the context-specificity of these cases can make it difficult to reliably draw out generalisable findings. Multiple case study analysis allows us to look across a body of cases, studied in a similar manner, to identify themes, trends or emerging issues that extend beyond individual contexts and present themselves more consistently within the findings (Stake, 2013). For context-sensitive challenges like climate change and policy engagement, this can offer important insights for the design of future programme support. Programmes like FCFA are particularly well suited to multi-case analysis due to the presence of multiple consortia working in comparable configurations towards a common set of overarching goals.

Contribution analysis

One of the key challenges faced by transdisciplinary and collaborative research initiatives is understanding what difference (if any) these collaborations have had on the initiative's expected outcomes. Contribution analysis (Mayne, 2012) is an approach specifically designed for assessing these causal links in real-life programme settings. It can be used in conjunction with a programme's Theory of Change to generate evidence around the contribution of specific activities or initiatives to observable outcomes. In the context of this Learning Review, contribution analysis is important to understand the extent to which the observed learning happening at programme and consortium levels has contributed to observed outcomes.

Design factor framework

To study learning processes in FCFA, we also used Collins and Ison's (2009) design factor framework for social learning (see Table 4). In their framework, Collins and Ison propose five factors that serve as "a minimum set of activities necessary for a social learning system for climate change adaptation to function" (2009, p.366). Given our specific emphasis on deliberate and structured learning activities (as

opposed to broader learning from experience), we wanted to be able to identify which factors were particularly important to participants in making learning experiences meaningful. Clarifying these factors will encourage future initiatives to focus attention on the factors that are most likely to contribute towards effective learning experiences within collaborations.

TABLE 4 Analytical definition of the design factors drawing on Collins and Ison (2009).

DESIGN FACTOR	ANALYTICAL DEFINITION
Appreciating context	Awareness of specific historical context or problems in which FCFA is engaging
Building stakeholder relationships	Convening the appropriate range of stakeholders and ensuring they can take part, such as building common understanding through joint responsibility, agreeing on rules of working together, developing a sense of common purpose, and providing participants with the experience of being listened to through facilitated activities
Providing facilitation	Meeting the needs of the participants through facilitated learning activities; convening facilitated workshops or intervening conversations to create collective learning settings
Recognising epistemologies	Developing understandings of the meanings and practices of diverse disciplinary norms
Conducive institutions/policy	An enabling environment; engaging with senior personnel in the programme to develop an awareness of current and possible practices
Didactic knowledge transmission⁵	Knowledge learned directly from senior or other researchers

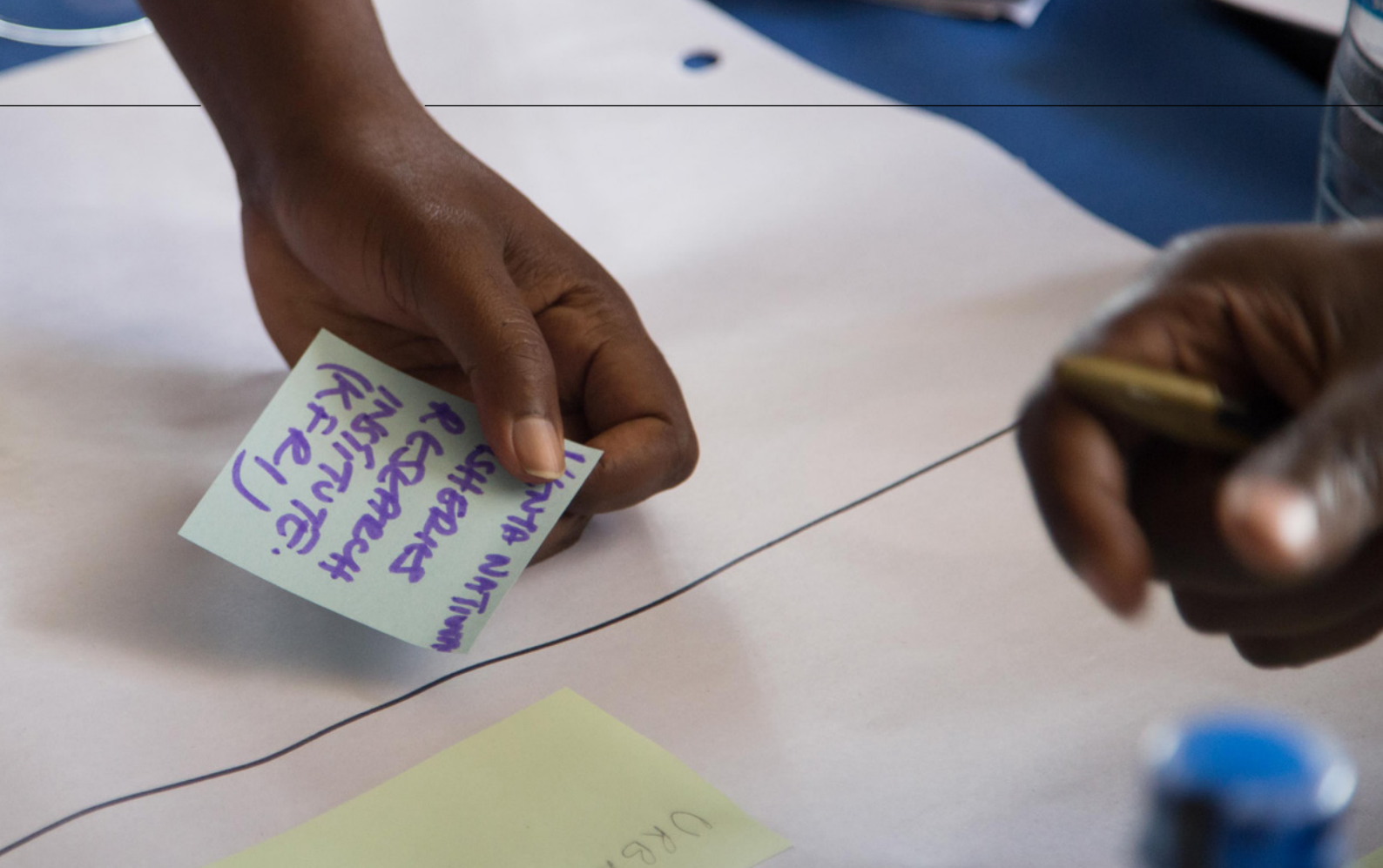
Capabilities model for capacity development

Leadership, and one's ability to affect change, is fundamentally linked to a consortium's capacity. Leadership thus exists not only in individuals but in the systems (organisational, governance, financial, etc.) within which they operate. Understanding the emergence of leadership within collaborative settings, therefore, demands attention to the presence and strengthening of the capacity of their working environments. To understand how leadership evolved in FCFA (rather than only looking at how it was assigned at the beginning of the programme), we used the "five capabilities model", developed by Brinkerhoff and Morgan (2010). This model was developed for the field of international development to understand the relationship of capacity and capacity development to achieving sustainable results. Brinkerhoff and Morgan (2010) define

capacity as the evolving combination of attributes, capabilities and relationships that enables an organisation or a network of organisations (a 'system') to exist, adapt, and perform. This study uses five core capabilities that contribute to system capacity performance, namely:

1. The capability to commit and engage. Actors can: mobilise resources (financial, human, organisational); create space and autonomy for independent action; motivate unwilling or unresponsive partners; plan, decide, and engage collectively to exercise their other capabilities.
2. The capability to carry out technical, service delivery, and logistical tasks. Actors can: produce acceptable levels of performance;

⁵This factor was not included in Collins and Ison (2009), but was inductively drawn from the data.



TOP: Stakeholder mapping at HyCRISTAL annual general meeting, Kenya, 2016.
- Photo by Julio Araujo

- generate substantive outputs and outcomes (e.g. health or education services, employment opportunities, justice, and rule of law); sustain production over time; and add value for their clients, beneficiaries, citizens, etc.
3. The capability to relate and attract external partnerships. Actors can: establish and manage linkages, alliances, and/or partnerships with others to leverage resources and actions; build legitimacy in the eyes of key stakeholders; deal effectively with competition, politics, and power differentials.
 4. The capability to adapt and self-renew. Actors can: adapt and modify plans and operations based on monitoring of progress and outcomes; proactively anticipate change and new challenges; learn by doing; cope with changing contexts and develop resiliency.
 5. The capability to balance diversity and coherence. Actors can: develop shared short- and long-term strategies and visions; balance control, flexibility, and consistency; integrate and harmonise plans and actions in complex, multi-actor settings; and cope with cycles of stability and change.

Knowledge brokering framework

Knowledge brokering is about “mak[ing] research and practice more accessible to each other” (Ward, House, & Hamer 2009, p. 268). The term is often used alongside other terms including knowledge translation, intermediation, or knowledge exchange, all of which imply the facilitation of an exchange of information, knowledge and experience aimed at supporting more informed practice. Several scholars (e.g. Shaxson et al. 2012; Jones et al. 2016) have proposed a continuum of knowledge brokering approaches, and we have used this framework to study climate information mobilisation activities. Studying the activities in this way gives us a means of distinguishing between the types of strategies that consortia have used to promote the uptake of this information into practice, and then assessing the alignment of specific strategies with audiences and outcomes.

To examine the overall functions of these approaches, we applied a knowledge brokering framework developed for use in climate services by Jones et al. (2016) (see Table 5). This framework offers a broad categorisation of approaches used in mobilising information for use, from relatively linear information provision approaches (information intermediaries) to approaches aimed at influencing the wider system (innovation brokers).

TABLE 5 A range of knowledge brokering functions for climate information services (adapted from Jones et al. 2016).

CATEGORY	ROLE	KEY FUNCTIONS	DETAILS/EXAMPLES
Information intermediaries	Ensuring new information is accessible	Communicating early warning information to communities	Providing early warning to local beneficiaries through the networks and technologies available
		Establishing knowledge repositories	Hosting knowledge portals to ensure that climate information (in various formats) can be readily accessed
Knowledge translators	Making knowledge accessible and actionable	Translating knowledge	Translating seasonal forecasts into local languages or easy-to-interpret formats
		Advisory/extension services	Acting as technical experts on the interpretation and use of climate information for local beneficiaries
		Development of user guidance tools	Producing toolkits on how climate information can be used in national and local decision-making processes
Knowledge brokers	Enhancing understanding and use of knowledge in decision-making and fostering co-production	Encouraging learning and knowledge sharing	Supporting learning and feedback loops within the development and communication of climate information.
		Convening and facilitating collective interpretation and co-generation of knowledge	Facilitating workshops and meetings between producers and users of climate information
Innovation brokers	Influencing the wider context to enable innovation in climate services	Encouraging innovation in how climate information is produced and used	Documenting the value of non-specialist knowledge sets such as indigenous knowledge in the production of seasonal forecasts

2.3 Limitations of the study

This study was significantly limited by time, which constrained the depth into which each learning question could be explored. While this study assessed a good sample of FCFA members, it is important to note that the responses are representative; participants' demographic breakdown for each learning question is outlined in the Data Collection section above. Similarly, the responses were not even across each consortium within FCFA, nor was it even across hierarchy, therefore there will remain a level of bias throughout each learning question in this study. Methodologically, the study was primarily qualitative, relying on recall and self-assessment from those interviewed or surveyed.

The CCKE also acknowledged that it is impossible to maintain a neutral view towards this learning study that explores the consortia processes as well as that of the CCKE. As such, the FCFA Learning Review was conducted in partnership with McGill University Faculty of Education (Blane Harvey and Ying-Syuan (Elaine) Huang). All sections relating to the CCKE were specifically conducted by McGill University to reduce the potential for bias. Engagement with the FCFA Monitoring and Evaluation (MEL) working group provided guidance on scope and methodology of this study.



Promoting
collective
learning
in FCFA



Key Findings on Collective Learning for Transdisciplinary Collaborations:

1. 'Expert facilitation' identified as the most influential factor for effective learning.
2. Facilitated learning developed FCFA members' cognitive and relational capacity.
3. In-person convening (e.g. programme-wide conference and consortium-specific annual meetings) is essential in fostering transdisciplinary collaborations and building trust and capacity.
4. Future initiatives should give more attention to learning for/in collaborative programme governance.

This section is divided into two parts based on the focus of cross-consortia learning and intra-consortia learning. Specifically, the first part presents the contributions of the CCKE as a coordination and knowledge exchange unit. It sets out to examine how the CCKE has promoted collective learning across consortia. The second part focuses on collaborative learning within the consortia. It was aimed at understanding how and to what extent collective learning—especially that of deliberate and structured—has facilitated members within a consortium

to learn with and from each other to create an effective CoP for their consortia's work. The goal of this learning question is to understand good practices for fostering transdisciplinary collaboration through programme and consortia activities. This section is then followed by a discussion of insights on the options available for promoting collective learning, and the benefits of learning at multiple scales. Findings reported in this section emerged from the survey results and contribution analysis.

3.1 Cross-consortia learning and the role of the CCKE unit

This section presents the analysis of cross-consortia learning and its impact on FCFA activities. The discussion includes the types of cross-consortia learning activities and their effects perceived by the FCFA members. Results related to the key design factors that contributed to members' experience of cross-consortia learning are also reported.

Typology of cross-consortia learning and its perceived effects

The CCKE unit has used a number of cross-programme activities to promote collective learning at various periods of the programme. The activities included webinars, producing joint knowledge products (e.g. Synthesis Products, Africa's Climate Report), the Mid-Term Conference, working groups, and joint project funds (e.g. applied research fund, innovation fund).⁶ When survey respondents were invited to select two of these "programme-level collaborative learning activities that they found most impactful on theirs or their team's work to date", the Mid-Term

Conference stood out as a highly valued option. 20 out of 36 respondents (55.6%) selected Mid-Term Conference, followed by joint project funds (30.5%), producing cross-consortia knowledge products (25%), and working groups (25%). Box 2 presents a contribution analysis of the members' collective learning at the Mid-Term Conference. It is important to note that these quantitative results do not imply that future programme design should or should not consider the same types of activities to promote cross-consortia learning. Different approaches can deliver different learning outcomes across consortia. As a CCKE member observed and reflected:

"... the joint project funds may have delivered more substantial collective learning spread across fewer individuals (as evaluated through the new research outputs and deep engagement with specific non-academic partners through e.g. Climate Information for Resilient Tea Production (CI4T)), whereas the

⁶The 2019 African Climate Risks Conference (ACRC) was held after we collected the survey responses for this learning question. Future reviews can consider including ACRC as an approach to cross-consortia learning for the FCFA programme.

Mid-Term Conference provided a different type of learning more broadly dispersed. This may be supported with the data from our ECR survey, which showed that different activities supported different facets of capacity development. ECRs tended to use conferences as platforms for communication and networking, whilst consortium annual meetings supported more substantial research collaborations.”

Moreover, deeper reflection and cross-case analysis to distil the key factors that contributed to their success or failures are necessary. For example, while setting up cross-consortia working groups seems to be a common practice in multi-consortia models, this form of collaborative learning did not seem to reach its potential in FCFA. Many cross-consortia working groups did not last the FCFA programme lifespan. While further investigation is needed, some members suspect that the timing to set up the cross-consortia working groups could be an important factor that influenced its success.

Another highlight of the findings is that “joint webinars” were ranked the lowest among all the cross-consortia learning activities mentioned above, selected by only six out of 36 respondents (16.7%). For those who explained why joint webinars were less impactful, they noted that this learning approach was “too unidirectional” (F13, researcher), lacked interactions (A17, researcher), or did not take into account the “challenges with Southern participants having a suitably reliable internet connection to participate fully (U2, researcher)”. Although some considered joint webinars only as an information dissemination tool and less about promoting learning, we argue that knowledge exchange and progress update can serve to sustain members’ mutual engagement in large-scale programmes, which is an essential component to create a CoP for mutual learning. Thus, future design of joint webinars can consider accommodating participants’ desire for real-time exchange and small-group interactions. Appropriate platforms and facilitation mechanisms that would allow for virtual dialogue and exchange need to be further explored. As one project manager suggested, “the webinar organisers need to prepare questions that can be used to facilitate further buy-in and engagement”.



“Joint webinars” were ranked the lowest among all the cross-consortia learning activities mentioned.

BOX 2

FCFA’s Mid-Term Conference as a milestone for cross-consortium collaboration

The CCKE unit hosted a cross-consortia event, the FCFA Mid-Term Conference, in 2017 as a part of the programme strategy for enhancing FCFA’s impact. Many Learning Review participants identified this conference as the most significant programme-level learning experience. The conference led to several important cross-consortium collaborations, including a few programme-wide Synthesis Products and initiatives for joint funding proposals (e.g. 50% of the innovation fund opportunities were awarded after the Mid-Term Conference and 33% of the projects included cross-consortium collaborations, while three out of the four collaborative projects are between IMPALA and UMFULA). As the Project Manager of CCKE reflected: “the Mid-Term Conference was particularly effective because all consortia contributed to crafting the agenda and there was broad participation, from Principal Investigators through to early career researchers.” Importantly, the appropriateness and relevance of the cross-cutting themes “allowed for targeted thinking for new knowledge products . . . [therefore], the researchers were able to share their work and identify areas of overlap.”

Event planning: The success of the FCFA Mid-Term Conference was not random. One key attribute to its successful development was the CoP that was established during the quarterly Principal Investigator (PI) Coordination Calls. Participants of these calls represented each consortium, including the PIs, Co-Investigators and Coordinators. In this process, some ideas around cross-consortia activities, such as the Mid-Term Conference and Synthesis Products, were proposed by the participants in the PI Coordination Calls. Therefore, when the goal of organising the

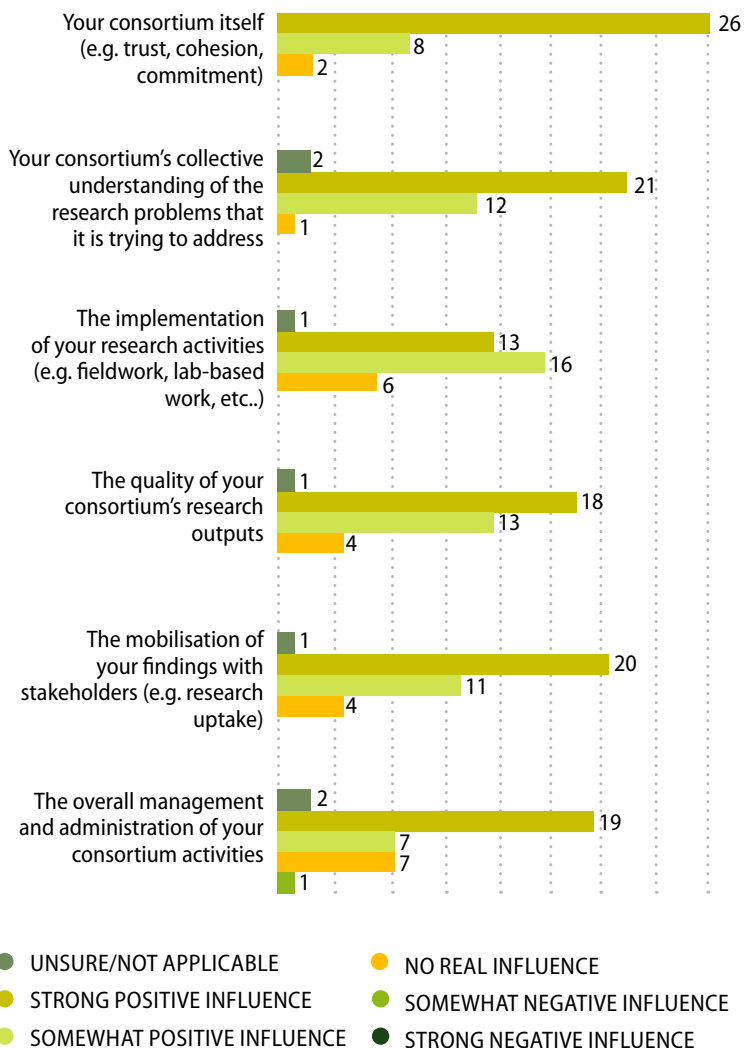
Mid-Term Conference was mooted by the CCKE, a sub-group took on the leadership role and formed a Scientific Steering Committee responsible for planning the conference.

Event structure: The Mid-Term Conference brought together 103 participants from across the FCFA programme over the course of four days. An experienced researcher, Dr Cath Senior (the PI of IMPALA) served as the conference chair. The cross-cutting themes of the Mid-Term Conference were critical in stimulating cross-consortia dialogue and learning. Participant interactions were facilitated in the event via collaborative sessions driven by the predefined thematic areas. These included sessions on decision-making under climate uncertainty, co-production, climate science, Urban WASH, information distillation, rural livelihoods and agriculture and climate narratives. Similarly, a session dedicated towards scoping the suite of FCFA Synthesis Products (drawing on the lessons, outputs and outcomes of the consortia within the scope of the thematic areas) was pivotal in fostering collaboration. There was an emphasis to learn from processes rather than outputs, including lessons from collaborative approaches to pilot case studies. The Mid-Term Conference was the first official time where the consortia presented on their work to the entire programme and was facilitated by the PIs during the plenary sessions as well as the various project leads during the thematic parallel sessions. A two-hour poster session on three of the days created the space for ECRs to actively engage with the broader programme and receive feedback as well as market themselves for future collaborations.

For full contribution analysis of this case, please see Annex 3, Case 1.

To understand the effects of cross-consortia learning on the direction of members’ research practices, outputs or outcomes, the survey question sets out to ask the respondents to assess to what extent cross-consortia activities have respectively influenced (a) the relationships within the consortia, (b) their consortium’s collective understanding of the research problems, (c) their implementation of research activities, (d) the quality of their consortium’s research output, (e) the mobilisation of their findings with stakeholders, and (g) the overall management and administration of their consortium activities. Figure 5 presents a summary of the survey results of each option.

FIGURE 5 Detailed results to the survey questions: “How would you assess the influence of programme-level collaborative learning activities on ...” (N=36)



One significant finding from the set of questions in Figure 5 is that almost all respondents (94.4%) found that cross-consortia learning had an influential impact on the relationships within the consortium; 72.2% selected “strong positive influence” and no respondent selected negative influence. This result is significant because establishing trust, fostering team cohesion, and strengthening members’ commitments are essential to lasting partnerships in the FCFA community.

Moreover, 91.7% of the respondents indicated that cross-consortia learning had positively influenced their consortium’s collective understanding of the research problems. At the same time, 86.1% found that cross-consortia learning contributed to mobilising their research findings for broader impact. These findings are important indicators that cross-consortia learning played a vital role in helping the members to understand how their consortia’s work fits into the broader social-ecological challenges that FCFA is dealing with. By situating their research within the programme framework, the members were able to better navigate their areas of contributions and envision an impact pathway for their research outputs.

91.7%
Percentage of respondents that indicated cross-consortia learning had positively influenced their consortium’s collective.

‘Creating common understanding’ as influential for cross-consortia learning

As mentioned earlier, the focus of this section is on understanding the design and facilitation of collective learning that took place in FCFA, to take stock of the good practices that can be embedded in future programme planning. To this end, participants invited to explain, via an open-ended question, why they thought the selected learning activities were meaningful. Collins and Ison’s (2009) design factor framework for social learning was used to analyse the common factors that were particularly important in making collective learning effective within the FCFA programme. An overview of the distribution of the responses under each design factor can be found in Table 6 below.

An interesting result from this analysis was “building stakeholder relationships” appearing in the responses from all consortia. One third of the respondents found that cross-consortia events contributed positively to trust-building and developing a common understanding between consortia. This result aligns with the findings on the perceived effect of cross-consortia learning, discussed above. For example, an IMPALA researcher found that cross-consortia activities helped to build trust, and everyone was actively engaged by offering constructive ideas to advance the FCFA work. Several researchers and practitioners also found that cross-consortia events helped to develop a “common understanding” and “common aim”, such that they found themselves to be “part of a greater collective.”

TABLE 6 An overview of the distribution of responses by design factor and consortium. (Total number of respondents is 36).

DESIGN FACTOR	TOTAL #	BREAKDOWN					
		CCKE (TOTAL: 8)	AMMA -2050 (6)	FRACTAL (9)	HYCRISTAL (5)	IMPALA (3)	UMFULA (7)
Provided facilitation	15	4	1	7	1	0	2
Building stakeholder relationships	14	4	3	2	1	1	2
Recognising epistemologies	7	0	2	3	0	0	2
Appreciating context	6	1	2	0	2	1	0
Conducive institutions/policy	5	2	0	2	0	0	1
Didactic knowledge transmission	2	0	0	0	0	0	2



TOP: FCFA Researchers at Africa's first Wikipedia edit-a-thon on climate change, South Africa, 2019.
- Photo by Mnoneleli Mlobeli

3.2 Intra-consortia learning processes and outcomes

This section focuses on the analysis of intra-consortia learning and its impact on consortium's research activities. It begins with a brief discussion about the perceived effects of different intra-consortia learning activities. An analysis of the learning outcomes is also presented.

A typology of intra-consortia learning and its perceived effects

The five consortia shared some similar strategies for promoting collective learning within their consortium. Examples of these learning activities included workshops, training events, stakeholder dialogues, knowledge exchange and learning alliances, annual meetings, and joint webinars. Like the results of the cross-consortia learning outcomes, there is a clear trend towards favouring learning through face-to-face engagement, as opposed to more remote activities like webinars. This finding is important for future consideration of learning design, as in-person engagement is likely to be an essential component in fostering collective learning processes for research impact. Figure 6 presents a summary of the perceived effectiveness of each collective learning activity at the consortium level.

In particular, "annual meetings" (see Box 3) stood out as the most influential collective learning experience, reported by approximately three quarters of the respondents (46 out of 62; 74.2%). One ECR noted that "the diversity of stakeholders" in the annual meetings, including key contacts and researchers from different disciplines, was particularly impactful on their research output and learning experience. As an UMFULA researcher also described,

"Through participation in our annual meetings, we have been able to learn new ideas from other fields including climate science and social groups on how to incorporate their information [climate] into our hydrological systems to provide required outputs suitable for the human system [social]. From there, we have been able to modify the way we generate hydrological information."

Annual meetings in FCFA

Annual meetings were a central component of consortium-level planning and interaction in FCFA, but their formats varied. As highlighted in a parallel study to this report, “where consortium annual meetings and FCFA programme events were appropriately designed, these events served as multi-purpose platforms, enabling multiple skills development opportunities and supportive factors to be combined, including formal training in a range of fundamental research skills and applied skills such as communication skills, experiential learning through presentations, platforms for communication and collaboration.” (Mackay et al. Forthcoming).

The general aim of the FCFA annual meetings was for the consortia to take stock of their progress to date and plan for the year ahead and was typically attended by all the core researchers and stakeholders within each consortium. The annual meetings provided the space for learning, interrogating work plans, deciding on and assigning new research and engagement activities, fostering intra-consortia collaboration and building an understanding of each workstream. Another significant element of the annual meetings was engagements with local partners. Most annual meetings were based in one of their respective pilot study countries each year, which allowed the consortia to engage with local partners where the meetings were based and promote relevant outputs with strategic groups and individuals. During some of the annual meetings, high level dignitaries like the Prime Minister of Uganda attended and endorsed the events. Many annual meetings were also used as a platform to conduct field visits which helped to better understand and appreciate the practical realities on how climate variability and change is exacerbating issues on the ground.

Most learning activities within the FCFA annual meetings were built around cognitive and relational learning. One of the major benefits of the transdisciplinary nature of FCFA and the collaborative activities within the annual meetings meant that there was an opportunity for capacity building amongst everyone who attended. Since the research needed to flow from the climate scientists to the impact scientists to the social scientists and vis-a-vis, a

significant portion of time was allocated towards discussing needs, connections between the disciplines and how this process could be streamlined. Similarly, some annual meetings included collaborative activities between consortia. For instance, FRACTAL and UMFULA collaborated during a one-day combined meeting as both of their annual meetings occurred in Cape Town over the same period. The cross-consortia learning session offered an opportunity to explore “burning issues” raised during both events. Discussion groups explored the potential for joint activities on climate science, in-country work, coordinated knowledge products, methodologies of co-production and the legacy of the FCFA programme.

The relational learning component of the annual meetings was key in building a cohesive network of researchers and internal stakeholders (those working directly within the consortia), and trust within and between the consortia and external partners/stakeholders. Each annual meeting hosted several collaborative activities to further understand the context in which they operate and learn from the experiences and issues raised by local partners/stakeholders. During a few of the annual meetings, time was allocated for the senior researchers to provide mentorship to the ECRs to help build capacity in networking, self-branding and scientific thought processes. Several “market places” were established for the ECRs to present their research to the consortium, receive constructive feedback and pitch for collaboration on current and future work. Within the consortium, open dialogue on information and issues, icebreakers, facilitation and time for co-exploration helped to enhance the relationships and build trust between members of each consortium.

The annual meetings were largely set up to be open and transparent and to allow for anyone within the consortium to attend sessions and meetings from another discipline. The benefit of such an approach is that many participants noted that they had learned new skills from other disciplines and had a greater understanding of the work being conducted within the consortium. This resulted in the non-climate scientists noting a better understanding of the climate system in their region of work and the associated intricacies and limitations, while the climate scientists noted a better understanding of the context in which their work is being used.



“This approach has produced learning that is not ‘expert’ to ‘user’ but much wider and deeper. . . . Trust and relationships are built both within the city and between city partners and external researchers. Relational capacity is developed alongside technical and knowledge capacity.”

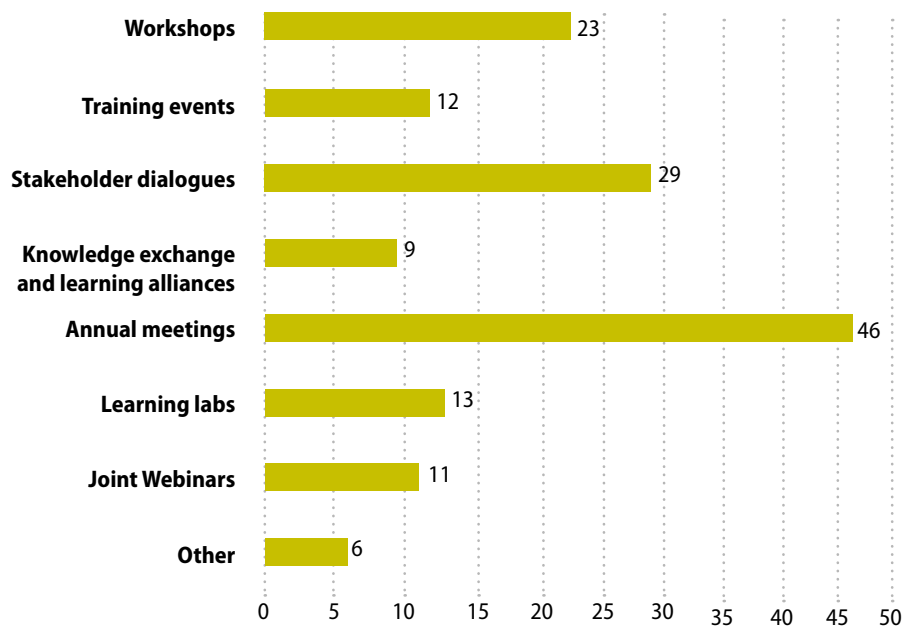
In terms of the specific learning process within the consortium, it is worth noting that the “Learning Labs” approach to embedding learning in transdisciplinary collaborations was unique to FRACTAL. Future programme design and planning can consider adapting this collective learning approach to facilitating transdisciplinary partnerships, as 12 out of 13 FRACTAL participants pointed to the City Learning Labs as influential in their collective learning experience. As one member described,

“This approach has produced learning that is not ‘expert’ to ‘user’ but much wider and deeper. . . . Trust and relationships are built both within the city and between city partners and external

researchers. Relational capacity is developed alongside technical and knowledge capacity.”

As an attempt to examine to what extent this collective learning experience might have contributed to programme outcomes and wider impact, contribution analysis was used to unpack the process, learning outcomes and impacts of FRACTAL’s City Learning Labs. The analysis showed that reflective practice stood out as one contributing factor to this case, resulting in normative influence on decision-makers e.g. Lusaka city representatives expressing a desire to continue a learning lab-type engagement after the project ends. The full analysis of this case can be found in Annex 3, Case 2.

FIGURE 6 Which consortium-level collaborative learning activities have had the most significant influence or impact on your/your team’s work to date [select two]? (N=62)



*Note: “Learning labs” is a unique approach to facilitating transdisciplinary collaborations in FRACTAL. Among the 13 respondents, 12 of the FRACTAL members selected it as effective in promoting collective learning within their consortium.



One key finding which emerged from this set of survey questions was that the participants reported intra-consortia learning was comparatively less beneficial in the overall management and administration of their consortium activities.

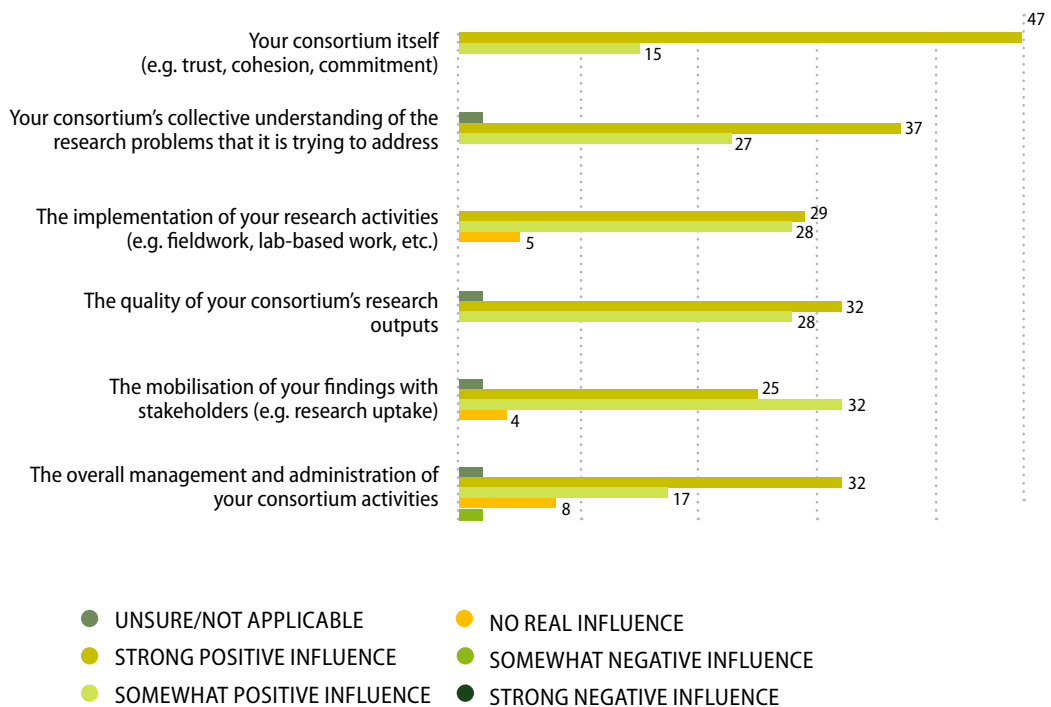
Like our investigation at the programmatic level, the survey also set out to examine the effects of intra-consortia learning on the direction of members' research practices, outputs or outcomes (see Figure 7 below). It was found that most of the participants (75.8%) also found intra-consortia learning strongly contributed to their positive relationships within the consortium. This finding confirmed the scholarly discussion about the benefits of social learning for climate adaptation research (Cundill, Currie-Alder & Leone, 2019; Ensor & Harvey, 2015). Importantly, it offered empirical evidence that collective learning can indeed contribute to trust-building and establishing commitments among members in large-scale transdisciplinary collaborative research and action on climate change.

One key finding which emerged from this set of survey questions was that the participants reported intra-consortia learning was comparatively less beneficial in the overall management and administration of their consortium activities. Only about 50% of the participants selected "strong positive influence", but 13% of them felt "no real influence"

on this aspect of their research practice, and two selected "somewhat negative influence". Among the respondents who selected "no real influence" or "somewhat negative influence" were five researchers, two project managers, two knowledge brokers, and one practitioner. Although the survey did not ask respondents to offer an explanation, we observed that among the seven project managers, two of them stated "somewhat positive influence", one felt "no real influence", and one selected "somewhat negative influence" on this question. This could potentially be the reason why the overall perceived effect of intra-consortia learning on management and administration is lower compared to other aspects.

Moreover, a few respondents reported that intra-consortia learning had no real influence on the implementation (8%) and mobilisation (6.5%) of their research activities and findings. These results warrant attention, as they might reveal some misalignment between members' intra-consortia learning experience and research activities. Implications for these findings are elaborated in Section 3.4.

FIGURE 7 Detailed results to the survey questions: "How would you assess the influence of consortia-level collaborative learning activities on . . .". (N=62)



‘Expert facilitation’ and ‘convening appropriate stakeholders’ are identified as the most effective factors for intra-consortia learning

Like the cross-consortia learning, we used Collins and Ison’s (2009) design factor framework for social learning to analyse the open-ended questions from the survey responses in which participants were asked “what factors they felt made the selected learning activities so effective”. This set of the analysis highlights that “provided facilitation” (23 out of 59 respondents; 39%) was the most appreciated factor that contributed towards the effective learning experiences of the participants. For example, half of the AMMA-2050 participants found that facilitated discussion had contributed to building trust and developing shared goals among team members. One UMFULA member also described that the collective learning was most effective when there was “effective facilitation with clear aims [and] engagement across career levels with less focus on hierarchy.” Similarly, one FRACTAL researcher attributed the importance of expert facilitation in supporting “the selection of topics and research to prioritise [as well as] the gaining of trust that quality validated products would materialise.”

appropriate range of stakeholders and ensuring they can take part; see analytical definition in Table 4 on page 22). In their responses, participants especially appreciated the diversity of stakeholders involved in the annual meetings and joint workshops, which contributed to creating a common understanding of the FCFA work. For example, one AMMA-2050 member highlighted that the “*stakeholder discussion on climate issues [les discussions avec les parties prenantes sur les questions de changement climatique]*” was particularly useful in helping them understand stakeholders’ concerns and the broader context of their research problems. An UMFULA researcher also emphasised that “stakeholder engagement makes the myriad of problems around the world more vivid than what [they] could learn through the literature which feels more abstract and theoretical.” In terms of building stakeholder relationships within consortium, some noted that learning about the research outcomes from other “countries and teams” (U11, researcher) shaped the direction of their consortium research and established trusting relationships between members. An overview of the distribution of the responses under each design factor can be found in Table 7 below.



“Stakeholder engagement makes the myriad of problems around the world more vivid than what [they] could learn through the literature which feels more abstract and theoretical.”

The second design factor that contributed to the effectiveness of collective learning was “building stakeholder relationships” (i.e. convening the

TABLE 7 An overview distribution of the responses on each design factor and consortium. (N=59).

DESIGN FACTOR	TOTAL #	BREAKDOWN				
		AMMA -2050 (18)	FRACTAL (13)	HYCRISTAL (11)	IMPALA (6)	UMFULA (15)
Provided facilitation	24	7	9	1	2	5
Building stakeholder relationships	21	6	4	4	1	6
Appreciating context	9	3	0	2	1	3
Conducive institutions/ policy	8	3	2	1	1	1
Recognising epistemologies	8	2	4	0	0	2
Didactic knowledge transmission	4	1	0	0	1	2

Facilitated learning developed members' cognitive and relational capacities

A key component of this learning question is to understand how (if any) ongoing intra-consortia learning has altered the direction, uptake or impact of consortium research agendas and outputs. To answer this question, we set up an open-ended question in the survey to invite participants to describe the kind of influence that consortia-level learning experience might have contributed to their research work. The qualitative responses were then thematically analysed. Three types of learning outcomes emerged from this analysis, which are cognitive (acquisition of new knowledge; restructuring of existing knowledge⁷), relational (improved understanding of mindsets of others; building of relationships; enhanced trust and cooperation), and normative (changes in norms; change in values; change in paradigms; convergence of group opinion). See Table 8 for the overall distribution of the responses under each learning outcome within the consortium.

Most AMMA-2050 members (12 out of 18) found that the collective learning space equipped them “with needed tools for future research” and enhanced their understanding of climate modelling. Members of UMFULA (six out of 15) shared similar learning outcomes, as one researcher shared that intra-consortia learning activities have provided “stronger exposure to fundamental climate science than in other projects”, while another country representative also shared that their “understanding of climate models and general outlook of climate related issues” has improved. Additionally, many (four out of ten) researchers shared that they have increased understanding of the needs of stakeholders and knowledge users through their participation in consortium activities. As one AMMA-2050 researcher described, the “guide for stakeholder identification” and “communication strategy” were particularly beneficial when reaching out to different types of “actors (decision-makers) [who are] not used to engage in technical training for using climate information in the medium and long term.”

The key finding is that most learning effects fall under the categories of cognitive (40.3%) and relational (35.5%) outcomes.

⁷ Definitions retrieved from Baird et al. (2014).

TABLE 8 An overview of the distribution of the responses for each learning effect and consortium. (N=62).

LEARNING OUTCOMES	TOTAL #	BREAKDOWN					
		CCKE (TOTAL: 3)	AMMA-2050 (18)	FRAC-TAL (13)	HYCRISTAL (11)	IMPALA (6)	UMFU-LA (15)
Cognitive	25	0	12	3	3	4	6
Relational	22	2	5	6	1	1	6
Normative	14	1	3	4	3	0	3



Face-to-face interaction is “crucial” when attempting to establish “real relationships” for “effective collaboration and co-learning”

It is interesting to note that many respondents also found that intra-consortia learning processes have contributed to the relational learning outcomes. This finding aligns with the results at the programmatic level, where building stakeholder relationships was considered an important design factor that contributed to the meaningful learning experience of the FCFA members. Many researchers (including ECRs) (16 out of 22) shared that consortium activities have provided them with opportunities to “bring decision-makers and information providers onto common ground” (F4, researcher). An IMPALA researcher also emphasised that face-to-face interaction is “crucial” when attempting to establish “real relationships” for “effective collaboration and

co-learning” (see a contribution case analysis of IMPALA in Box 4 as an example). Interestingly, many researchers also received opportunities to observe how other researchers approach their research and learn through modelling these approaches. Some ECRs also shared that consortium activities have allowed them to “share project results with key stakeholders” and “learn what others have done”. This finding is aligned with another ECR scientific capacity development study in which the Mobility Fund was particularly appreciated among ECRs, as it supported their travel and engagement activities with other senior researchers and the wider FCFA research community.

BOX 4

Developing a sustained partnership through CoPs

The collaborative learning process in IMPALA has led to a sustained partnership between the African and UK scientists. A new LaunchPad project was funded by DFID during August 2019, to extend this strong research network that seeks to establish a climate model evaluation hub over Africa. Importantly, core Africa-based researchers and six associated ECRs have remained active in leading the LaunchPad project through various research activities. Our analysis showed that the relationship outcome of IMPALA was achieved through forming a research CoP. This CoP was established from the very beginning of the IMPALA project in which the proposal was developed in consultation with the African scientists. In doing so, members of this CoP began to develop a shared understanding and vision for the IMPALA project (joint enterprise).

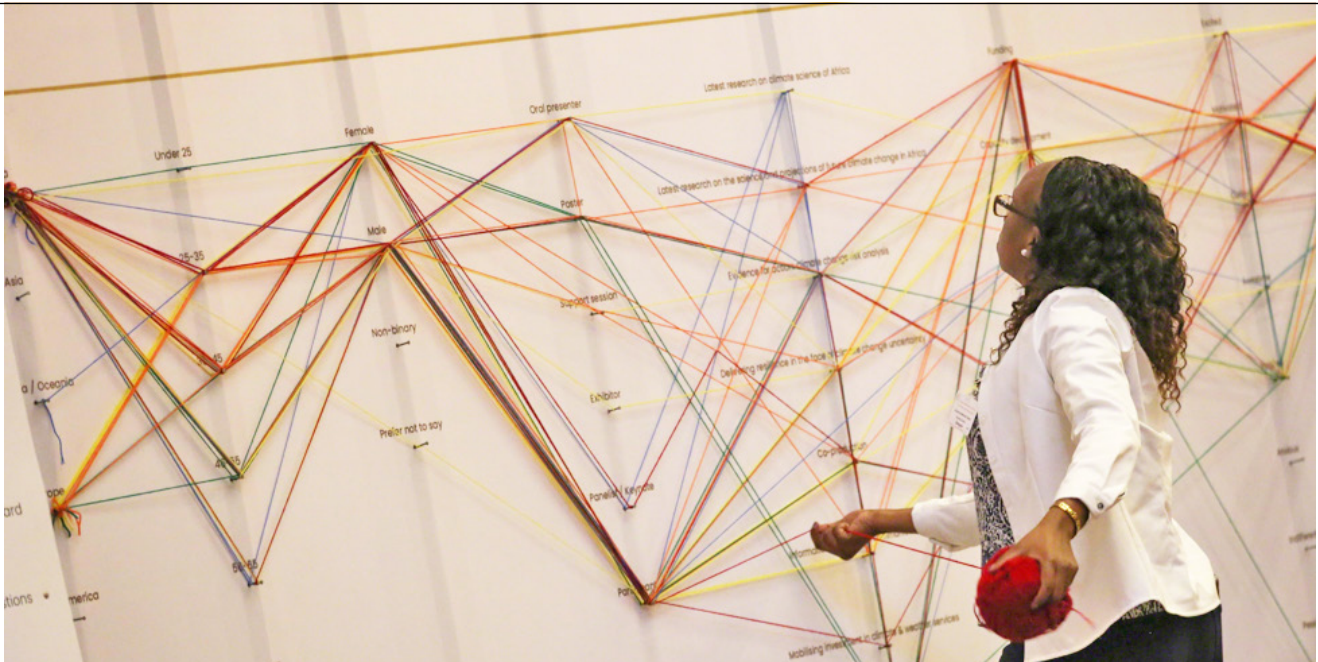
Moreover, the emphasis on collaborative learning through doing (practice and meaning making),

becoming (identity), and belonging (community), was a key contributing factor that led to the members wanting to sustain this partnership. It was done through “carrying everybody along (interview)” and ensuring that every member would have the support (e.g. travel fund) and capacity (e.g. scheduling, mini workshops on specific research skills) to attend and participate in every IMPALA meeting. As an IMPALA researcher described, the trusting relationship started to form “at the beginning” when we were writing the proposals for the IMPALA and for the LaunchPad and “they asked you . . . what do you think, what is your opinion.” This practice creates a sense of belonging for everyone in this research community because “everybody has their voices” and all their comments are “taken into account” throughout the project. It also developed members’ researcher identity (especially for ECRs), as they were positioned to engage in research discussion and activities. As another IMPALA researcher observed, the students came back from the last two IMPALA meetings full of “eagerness and enthusiasm” and were motivated by thinking that their research will make a useful contribution. For full contribution analysis of this case, please see Annex 3, Case 2.

3.3 Lessons across the two scales

Looking across the two scales of analysis (programme and consortium), we can draw out some general lessons from these findings:

- a. **Investment into collective learning is essential in programmes designed for multi-disciplinary/applied research.** Whether at the cross- or intra-consortia level, collective learning has significantly contributed towards improving the outputs and outcomes of FCFA. We also find that the widespread relational learning outcomes like trust-building within transdisciplinary teams and enhancing members’ commitment to the project/programme can contribute towards longer-term strengthening of research and leadership capacity. It is also worth noting that the organisational learning of CCKE has played an important role in shaping their strategies for engaging with consortia, which has contributed to building trusting relationships between consortia. Although a discussion of CCKE’s learning is beyond the scope of this study, there is a need to continue to explore the potential of a communication unit like CCKE in fostering knowledge exchange and facilitating collaborative learning across large-scale transdisciplinary research programmes.
- b. **The focus of learning processes has been the research rather than on the management or governance of the initiative.** We see a strong emphasis on the design and substance of the research itself in the learning activities that were highlighted by respondents. This is not surprising as it is likely the main preoccupation and challenge of team members. However, less reported outcomes of learning on administrative or management practices might also represent a missed opportunity for learning for/in collaborative programme governance. That is to say, the potential contribution of learning to improve the overall operation of the partnership at programme or consortium scales. This gap is also evidenced by the limited number of normative learning outcomes (e.g. new rules, practices in FCFA because of learning). Other similar research initiatives have successfully used social learning processes to this end (see Currie-Alder et al. 2019). It could be an area for consideration in future initiatives.



TOP: Delegate participating in the interactive survey board at ACRC, Ethiopia, 2019.
- Photo by Kiara Worth

c. In-person convening remains extremely impactful in fostering cross-programme collaborations and building trust and capacity.

Across both programme and consortium scales, face to face gatherings (conferences, annual meetings, stakeholder dialogues, etc.) were noted as being the most impactful. This reminds us of the continued need to plan and budget for these activities as they are key to building trust, coherence, and a shared vision of the research agenda. On the other hand, we also know of financial and climate-related implications of frequent convenings of international teams. Paired with the lower ranking of webinars as a space for collective learning, these findings should serve as a call to reflect on how we re-imagine our models of online convening to increase their perceived value.

d. Effective facilitation is a core competency for transdisciplinary research teams.

If facilitation is a critical factor for collective learning successes, there is a need for programmes and consortia to plan sufficiently for this role. Unfortunately, it is a role that has traditionally been an afterthought, or outsourced to consultants. A converse example can be found within FCFA, where the FRACTAL consortium included a partner with a strong facilitation focus. This was fundamentally linked to the design of their research programme, but is reported to have been a key factor for success. A further concern is whether there is enough clarity on, and availability of, researcher-practitioners with the skill-set needed to lead effective facilitation in this domain, particularly in Africa. With the growing recognition of the importance of this role, particularly in knowledge co-production processes, there

may be an opportunity for building “Southern” capacity in expert facilitation, which contributes towards overall programme legacy. For future programmes, call specification could highlight “Southern” capacity in facilitation—and its role in promoting collective learning beyond just the research—if funders deem it important.

e. Facilitated learning approaches build significant cognitive learning outcomes.

Cognitive outcomes, such as the acquisition of new knowledge and skills, are not typically noted as a primary benefit of facilitated social learning processes, but they were frequently highlighted by researchers in FCFA consortia. The opportunity for researchers to participate in learning processes alongside peers that are using different methods, models and data was viewed as highly beneficial. It is thus important to ensure that learning spaces are open to those who would benefit most from this form of learning, such as ECRs. This may not always be the case, for example if participation in annual meetings is dependent upon other factors such as seniority or the allocation of travel budgets. These findings on the cognitive benefits of participation in collective learning processes in FCFA, might also signal a need to rethink how capacity development activities are designed and conducted. For example, could this mean a shift away from more didactic (teacher/learner) styles of activity to more collaborative, and team-based approaches combining ECRs and senior scholars? There is an opportunity to shift the norms and practice at the system level and develop appropriate mechanisms for two-way capacity development.



It is thus important to ensure that learning spaces are open to those who would benefit most from this form of learning, such as ECRs.



Southern leadership & capacity



Key findings on Southern leadership and capacity:

1. The most-cited enablers of leadership and capacity are collaborative and distributed across a group rather than an individual “leader”, and they were observed in the FCFA practice.
2. Members recognised the essential roles of the Southern partners in crafting, managing and sustaining key relationships for wider FCFA impact. Further discussion and reflection on equitable collaborations between South-South and South-North institutions are needed.
3. There is a lack of career pathways for early-career researchers in the Southern research institutions. Attending to this issue is critical in developing collective leadership and research capacity in the South.
4. Future programmes should consider the systemic capacity barriers that might have prevented Southern partners from emerging in positions of leadership.
5. For transdisciplinary collaborations to contribute to social good, institutional biases and unconscious assumptions need to be constantly challenged. Disrupting long-lasting power dynamics is a critical step in creating international collaborations that are just and sustainable.

4.1 Collective capacities of consortia

As discussed in the methodology, the five capabilities model from Brinkerhoff and Morgan (2010) was used to structure our analysis of the barriers and enablers for Southern researchers in FCFA. A number of these barriers and enablers shape Southern partners' capability to engage with research, carry out tasks, attract support and adapt. Responses outlining the strengths of Southern partners within the consortia focus on their ability to engage at field level, leveraging partnerships that are key to research impact, and - to a lesser degree - working adaptively within the partnership to ensure

diversity, flexibility and collective action. There remains a significant perceived gap, however, where Southern partners highlighted that they do not have the capability to appropriately engage in technical tasks. Similarly, many respondents felt there was often little flexibility built in to the research design that can allow Southern partners to adapt over time and as capacity increases. While there are many factors that shape Southern leadership capacity, the key barriers and enablers that emerged from the interviews are listed in Table 9.

RIGHT: Researcher collaboration at FCFA Mid-Term Conference, South Africa, 2017.
- photo by Julio Araujo



TABLE 9 Collective capacities of consortia, and associated drivers/barriers to success.

	Capability to Commit and Engage	Capability to Carry Out Technical & Logistical Tasks	Capability to Relate and Attract External Partnerships	Capability to Adapt and Self-renew	Capability to Balance Diversity and Coherence
Most frequently-cited examples (50+%)	None	<ul style="list-style-type: none"> • Able to carry out logistical tasks smoothly. 	<ul style="list-style-type: none"> • Southern partners are crucial in establishing external partnerships. 	None	None
Frequently-cited examples (25-50%)	<ul style="list-style-type: none"> • Engage collectively. 	Perform and generate outputs and outcomes.	<ul style="list-style-type: none"> • Build legitimacy among key stakeholders. • Manage linkages and partnership with others to leverage actions. 	<ul style="list-style-type: none"> • Modify procedures to resolve administrative issues. • Adapt and cope with changing contexts. 	<ul style="list-style-type: none"> • Create space for diverse perspectives. • Harmonise plans and actions in multi-actor settings.
Enablers	<p>Intrapersonal Relations: sustain trusting relationships, mutual respect.</p> <p>Collective Learning: annual meetings, face-to-face engagement.</p> <p>Design: clearly defined roles and responsibility.</p>	<p>Personnel: dedicated project managers, members' continuous motivation.</p> <p>Management: robust financial management support, flexibility in supplying African partners funds up front, formal agreement.</p>	<p>Participatory: involving local researchers and communities.</p> <p>Design: identifying the right partners.</p> <p>Networks: effectively leveraging key actors in positions of authority.</p>	<p>Governance: coordination management with a decentralised decision-making body.</p> <p>Inclusion: balanced representatives for strategic decision-making. Regular face-to-face engagement.</p>	<p>Governance: collective decision-making.</p> <p>Personnel: dedicated project managers.</p> <p>Collective Learning: regular updates via newsletter, shared repertoire such as joint tools, concepts, etc., dedicated time for collective reflection.</p>
Barriers	<p>Time: allocated for sustaining engagement</p> <p>Management: poor institutional coordination and financial delay demotivated researchers.</p>	<p>Time: competing demands between FCFA activities and institutional responsibilities for Southern partners.</p> <p>Financial Oversight: pre-existing financial constraints, delay in funds allocation.</p> <p>Systemic constraints:</p> <ul style="list-style-type: none"> • pre-existing tensions between institutions. • lacking postdoc system in the South. • lack of funding for physical equipment (computers, lab equipment, etc). 	<p>Accessibility: information locked behind a paywall (e.g. non-open access journals).</p> <p>Systemic constraints: pre-existing tensions between institutions.</p>	None	<p>Systemic constraints: lacking post-doctoral programmes for Southern graduate students.</p> <p>Management: insufficient allocation of funding for research support (travel, research budget, human resources).</p>



This is an area where past research has highlighted that Southern partners are consistently engaged too late in the process, often because of the Northern-driven design of the programme call process

Key drivers to strong Southern capacity

- Appropriate partner selection in the project design is crucial to creating successful impact on the ground. This includes ensuring there is equitable participation in crafting the research plan and determining the distribution of roles for its implementation. This is an area where past research has highlighted that Southern partners are consistently engaged too late in the process, often because of the Northern-driven design of the programme call process (Jones et al. 2018).
- Having dedicated, motivated personnel is important to any successful programme. However, the interviewed respondents highlighted the importance of an approachable and dedicated project manager at the grant holding institutions. Many Southern partner issues that affect their engagement in the research (financial mechanisms and administration), were noted as manageable when dealing with a dedicated project manager.
- For any successful transdisciplinary collaboration, trusting and respectful relationships are required. Building social bonds characterised by psychological safety and trust can create the space for less established partners to build the confidence to pursue greater leadership within a project. This can be done through facilitated interaction that emphasises equity, top-down modelling of these ideals, and promotes openness about uncertainty, failure, and learning-by-doing (Cundill et al. 2019b; Freeth & Caniglia, 2019)
- An inclusive decision-making process that allows for all voices to be heard can help to better shape the research with Southern interests and capacity in mind. This helps to situate the research in appropriate contexts and align with the interests and skills of Southern partners which can set the scene for greater opportunities for leadership. Inclusivity in this regard can help to keep the researchers motivated and generate a greater interest in the research and dissemination.
- In longer research programmes and where appropriate structures are in place, the capacity of Southern partners will increase over time. Collective learning and regular engagement (in-person) is necessary to create the flexibility for emerging roles and new leadership positions. Similarly, this flexibility needs to be aligned with emerging leadership opportunities (over time) which can be achieved through ring-fencing funds for emergent research. *If facilitated correctly, this also creates the space for Southern partners to engage with the research discourse and contribute new perspectives, and lead to positive adaptive change.*
- Clear distribution of roles and governance is an important way to avoid tensions and disagreements amongst all partners involved. A good understanding of what is expected for each partner means that the research is conducted efficiently from the start. Similarly, clearly defined roles, especially between Southern institutions, reduces the risk of tension from institutions competing for the same work which could affect the social dynamic of the consortium as well as the willingness to engage with the research.

Key barriers to strong Southern capacity

- Sustained engagement in FCFA has been shown to be paramount for promoting research into use and completing research tasks. Insufficient time for engagement, especially in-person, can affect the FCFA (and affiliated) research institutions' ability and willingness to appropriately engage with and contribute to research activities. Another point is that some of the more senior Southern researchers are affected by administrative burdens which take away from their research and engagement time.
- Many African researchers, especially those in a more senior position within universities, are significantly affected by competing time demands and often need to take on additional consulting work to supplement low rates of pay in academia. Juggling roles of lecturing, supervising postgraduate students, administration and other assigned research tasks affect their ability to critically and appropriately engage in the research, especially in a position of leadership.
- Southern partners experience several financial barriers that affect their ability to appropriately engage in research, attend events and build capacity. *Organisational constraints within universities with few resources can cause delays in the research process and this is compounded*

by the timing of fund disbursement from donors or Northern institutions.

- A number of power dynamics are at play when engaging in collaborative research. Pre-existing tensions between partners, both North-South and South-South, can affect the way that teams are constituted, who is in a position of leadership, how the research is conducted and the receptivity of that research. It is important to be aware of pre-existing tensions as well as have the appropriate processes in place to deal with emerging ones.
- Systemic barriers for postdoctoral researchers/graduate students remain an important issue amongst African universities. Many research institutions and universities in Africa (apart from South Africa) do not provide fully funded postdoctoral programmes which affects an ECR's ability to take on larger portions of the research and build experiential capacity.
- In typical Northern-driven research programmes there is often a mismatch between personnel and resources. Most of the resources/research within a programme are often located within Northern institutions, with a monopoly on leadership positions and possibilities. Limitations on financial allocations to Southern partners exist in many research

grants, for example UK Economic and Social Research Council (ESRC) grants are as low as 30% for Southern partners. The procurement limitations can have a direct impact on inclusivity and equity, and therefore provide significantly more (and greater) opportunities for Northern institutions. In the short-term, this limits the number of Southern institutions (and researchers) that can be contracted into a programme, as well as their contribution to various (especially for bigger roles) elements of the work. While in the long-term (over the time of the programme) this can prevent Southern partners from building experiential capacity through engaging in less research that is of a lower technical level. However, FCFA was unique due to an exemption resulting from the co-design between DFID and NERC, which led to no limitation being set. Without comparing the results from FCFA with other programmes that had greater restrictions on Southern partners, it is difficult to determine the extent to which this has influenced their involvement in leadership positions. While the novel exemption was successful in producing a Southern led consortium (FRACTAL), most top-tier leadership positions in the programme were held by UK institutions.



In typical Northern-driven research programmes there is often a mismatch between personnel and resources.

4.2 Leadership challenges faced by Southern partners

Seeing Southern partners as more than an entry point

While some participants (three out of 12) found that Southern partners were gradually taking on more leadership roles in project activities, others (four out of 12) felt that more work was still needed to develop research capacity in the South. Often, Southern partners were involved only in data collection and stakeholder engagement activities because of their existing networks and ability to leverage local actions. All the respondents acknowledged the importance of Southern partners in the research process and implementation. Southern partners are key in “driving the agenda”, “contextualising the research problem” and influencing the “type of opportunities and level of engagement” that

a consortium had. As one respondent observed: “Without Southern partners, the successes recorded in the FRACTAL project could be dropped to almost 20%”.

One third of respondents (four out of 12) expressed that Southern researchers contributed (commented on and discussed) towards the research agenda but did not express this from a significant leadership position, especially relative to the Northern researchers.

Given the importance of facilitation as noted in the previous section, and the natural connection that



It is possible that future programming needs to account for the issues around financial mechanisms and allocate a small part of the budget towards capacity building amongst Southern institutions as a preventative measure as well as to build capacities for leading future proposals and projects.

Southern partners have with Southern stakeholders, it would seem obvious for this to be taken over as a key leadership role for Southern partners. However, building capacity for facilitation can be a timely process and would need to be inclusive of ECRs who can later emerge as strong facilitators between the academic community and the stakeholders. A sharing of facilitation roles between the senior Southern researchers and ECRs would be beneficial, and should include a component of mentorship, allowing the ECRs to step up over time. Similarly,

the career pathways for ECRs often do not pertain directly to “boundary agent” type functions. If the funders are serious about increasing “capacity and skills of African scientists” (Output 4 in the Theory of Change), more attention needs to be given to creating pathways for Southern ECRs, setting up infrastructures and related technical training for local scientists, and offering fellowships or funds for lecturing release for Southern partners to take on more research activities related to the projects.

Financial mechanisms need to be adaptive and understood before research starts

Many of the participants (five out of 12) described financial mechanisms (particularly the reporting process, payments in arrears and payment cycles) as a significant barrier for Southern partners to engage in research, especially during the first year of the programme. Significant delays with regards to getting their work off the ground were associated with a lack of available funds for research and activities. In some cases, Southern researchers noted paying for research activities out of pocket and the time-consuming process for claiming those funds back. It is apparent that the quarterly financial cycle as part of the donor funding mechanism can create delays in the research, demotivate key researchers and put a strain on institutions that do not have the financial capital to front money for various activities. In some cases, this was mitigated by the UK based institutions providing upfront finances for Southern institutions and then waiting for the quarterly cycle to claim back the funds. While this is indeed a good strategy for mitigating the issue, it shifts the financial risk towards the UK based institutions.

Another noteworthy issue raised by a few participants (two out of 12) is the disconnect between Southern and Northern financial administration as well as between Southern administration and the funders. Many African universities are not well equipped to deal with complex funding mechanisms (in terms of payments in arrears and cumbersome financial reporting) resulting from limited capacity

and this often requires the local PI to assist in administrative tasks. In some cases, this additional administration takes away from research time and adds to delays. Similarly, poor Southern administration caused further delays as the financial reporting was not correct for the needs of the donors. It was noted that the delays in financial reporting, especially during the first year, were only corrected after the researchers took over the reporting role. It is important that both Northern and Southern administrations are aligned and have open communication with regard to financial reporting and the processes for claiming and receiving funds. Ensuring that both administrations are aligned is often overlooked at the start of the programme and only acted on after an issue arises. While many financial issues can be solved in a timely manner, it is important that the correct mechanisms are put in place as a pre-emptive measure to ensure that Southern partners are able to engage in and conduct their research in a timely manner. Currently some donors provide a small portion of funds for final proposal development and further scoping, however, this was not available for compliance with due diligence amongst Southern partners. It is possible that future programming needs to account for the issues around financial mechanisms and allocate a small part of the budget towards capacity building amongst Southern institutions as a preventative measure as well as to build capacities for leading future proposals and projects.

Flexibility needs to be built in at the start

⁸ This includes books, journal articles, guides, briefs, think pieces, working papers and conference proceedings.

⁹ The number of journal articles counted for this value was calculated from the NERC output reporting mechanism (researchfish). Only first authors from African institutions were counted towards this value; in total there were 33 out of 230 journal papers in this regard.

¹⁰ The Innovation Fund supports small research grants to enable ECRs to conduct research in partnership with contracted FCFA research institutions (established centers of excellence) and African FCFA-affiliated institutions (emerging centers of excellence).

¹¹ The FCFA Mobility Fund supports ECRs affiliated to FCFA to undertake travel to further their personal research and contribute towards the outputs and outcomes of their FCFA research consortium.

While there are a few Southern researchers in leadership positions, project and programme design may be a limiting factor for emerging leadership. Detailed project plans that are typically required by the donors prioritise known workstreams and do not have much room in the budget for larger, more emergent research activities. While having a well thought out work plan is beneficial, it is also important to question who is benefitting the most. Some leadership and capacity are built over a long period of time while the roles and responsibility of the researchers are defined at the beginning of the project. This misalignment means that it is particularly difficult for Southern researchers to assume new roles and research, especially with the more technical skills being favoured by Northern institutions. The issue around flexibility is well summarised by one of the UK based researchers.

“In hindsight, we could give a much stronger, funded role to some key partners that we have identified during the project. Give them more leadership and ownership. But that just simply wasn’t possible back in 2015.”

Half of the respondents noted that the members in their consortium had developed new skills and capacity and were in a good position to do more technical work, while fewer noted that they had shifted into new leadership positions within FCFA where they would be leading on a pilot or workstream. While the opportunities for leadership positions may be lacking, it does not detract from the fact that many Southern researchers had the opportunity to lead

on smaller research outputs like academic papers, briefs and reports. *While the opportunity is available for Southern participation in research outputs, their involvement within leadership remains low with only 28% of all academic outputs⁸ with first authors from Southern institutions. Similarly, the number of academic journal articles with first authors from Southern institutions is only 14%⁹.* However, there are a few cases in FCFA where funds were ringfenced to allow for new research to be taken on by partners over time and as the research needs emerged. FRACTAL instituted what they called the “gap filling fund” which was set up at the beginning of the project and allowed many of their Southern partners to take on new and targeted research based on their interests. Similarly, after the first year of continuous stakeholder engagement to better understand their needs, UMFULA refined its research workstreams, decided on specific case studies and took on additional Masters and PhD students from Southern institutions to strengthen the team and expand the research agenda. While the consortia were successful in promoting new Southern research within their projects, the CCKE allocated a significant portion of funds (just over £370 000) towards supporting new research and capacity development across FCFA through the innovation¹⁰ and mobility¹¹ funds. Both funds actively encouraged Southern leadership, in which 74% of grants were awarded to African researchers. All the aforementioned approaches allowed Southern partners to identify, design and research an emerging need, while being supported by researchers from the North.

Individual vs institutional capacity development

FCFA, like many other research programmes, has prioritised building the capacity of individuals over institutions. While capacity development at any level is a positive outcome of the programme, the unstable research environment on the continent could mean that capacity efforts have a short institutional legacy. As mentioned previously, there is little opportunity for post-doctoral researchers and strong emerging researchers (Masters and PhD students) to remain in a university for extended periods of time due to unreliable funding. *This raises the question of whether capacity development as a legacy activity*

is only improving institutional capacity temporarily. A further concern is whether the focus on individual capacities is leading to institutional capacity at some Southern institutions being centred around only one or two people, and could then struggle when those individuals move on. Efforts to build individual capacity need to be accompanied by investments in more robust systems that allow that capacity to be mobilised (Hewitson, 2015; Cobban et al. 2016). This in itself can be complicated given that many donors feel research programmes should not be a vehicle for capacity development. However, it is important to

acknowledge the significance of relational learning (as outlined in Section 3 on Collective Learning) in building capacity. ECRs within FCFA have had significantly greater sustained access to world leading researchers (as mentors and collaborators), exposure to other disciplines and opportunities to experience and learn from different contexts. As a result, there have been significant increases in capacity noted by the majority of ECRs in FCFA. The collaborative context/environment in which the ECRs were constantly exposed to, has helped to build their capacity while delivering world class research as well as provide a strong case for value for money. Considering other research programmes that do

not focus on capacity development, perhaps there are ways for donors to consider streamlining and aligning capacity support and research programmes to take full advantage of these benefits.

Whether this system and institutional capacity is supported through programmes like FCFA or WISER, or through other forms of investment or support, we see this approach to capacity development as a key component of a robust climate research system in the South. [Given the success of ring-fencing funds in FCFA and the opportunity for building capacity and promoting Southern leadership, it is important to consider such approaches in future programming.](#)

4.3 Key messages and implications

- a. **Address systemic barriers to leadership and capacity development:** There are a significant number of systemic capacity barriers that prevent Southern partners from emerging into positions of leadership. These barriers sit at both the level of individual organisations, as well as being embedded in the wider rules and norms of project development and commissioning (see Jones et al. 2018). These range from financial mechanisms, to project flexibility, as well as the way pre-call engagement activities are carried out by funders like DFID, UKRI and other research councils. Effective capacity baseline mapping of partners (both Northern and Southern) and proactive management at the inception stage of the project could help to anticipate and develop strategies for addressing many of these barriers. It is important that donors take advantage of the successful approaches from FCFA, especially with regards to ringfencing funds for emerging leadership and ECR capacity development. Similarly, donors need to provide appropriate support or the opportunity for supporting alignment and capacity development of better financial reporting and appropriate mechanisms to ensure Southern partners are not affected by contracting and payment issues.
- b. **The most cited enablers of leadership and capacity are within the collective rather than the individual:** While there remains a common perception of leadership as individual and “heroic” (Andrews, 2016), evidence from our interviews suggest a far more collaborative and distributed model of leadership and capacity in FCFA. Drivers are often tied to harmonious and well-managed partnerships, as opposed to individual excellence. This reinforces the need to support collective learning and collaboration. It also aligns with what theories of sustainability leadership propose as key features of effective leadership for sustainability challenges like climate change (e.g. Ferdig, 2007).
- a. **Existing and emerging power dynamics shape African leadership opportunities:** If we are serious about enhancing Southern leadership and leadership capacity we must begin by addressing some of the power dynamics that shape these collaborations. These are linked to long-standing biases around institutional prestige, number and profile (or impact factor) of publications, disciplinary orientation (e.g. natural vs. social sciences), intersectionality (e.g. gender, ethnicity, class, age, ability), and more. Understanding and actively addressing these biases that might be limiting the opportunities of particular groups of collaborators is an important step towards more equitable collaborations.



If we are serious about enhancing Southern leadership and leadership capacity we must begin by addressing some of the power dynamics that shape these collaborations.



Project and programme design need to be flexible to identify and accommodate (or encourage) emerging leadership amongst Southern partners.

- b. Look for and support emergent leadership:** Two important principles underpin this theme of analysis: First, leadership is not static, or solely 'assigned' (like the formal leadership role of the PI). It can emerge over time and be assumed by new actors during the life of a programme. Second, system rigidity, barriers and power dynamics often stand in the way of this emergence. As such, project and programme design need to be flexible to identify and accommodate (or encourage) emerging leadership amongst Southern partners, taking advantage of built capacity. Examples include opportunities for ECRs to lead on opportunity grants, scaling up direct financing to Southern partners if this was not feasible at the outset of the programme due to fiduciary concerns. Rigid programme structures, or reporting requirements that prohibit deviation from projected spends work against these forms of flexibility and should be examined critically to see if they are truly required.
- c. Southern partners are critical to relational and peer-support functions; but are more than an entry point.** The contributions of Southern partners in crafting, managing and sustaining key relationships was clearly emphasised in this study, and future programmes should ensure that this role is given an adequate profile and enough resourcing. However, if we are serious about increasing the "capacity and skills of African scientists" (FCFA Output 4), we must examine the distribution of roles, including leadership roles and pathways for emergent leadership. Critical analysis of who has played formal leadership roles, the distribution of authorship on publications, and how finances are shared within partnership must be a part of this reflection.
- d. Current models for financial management are not always appropriate.** If the same funding model will continue (i.e. funds disbursed directly to all partners from the funders as opposed to funds going to the lead institution who then disburses to the others), funders need to recognise the inherent issues and perhaps provide training (or funds for training) at the beginning of the project on aligning financial administrations and better understanding financial reporting. The current portion of funds used for proposal development could be extended or partitioned to allow for this capacity development. Donors should consider financial mechanisms that are sensitive to lack of cash reserves in Southern academic institutions for project-based work, and consider mechanisms to frontload grants. Here, intermediary grant management institutions can play a key role as they can take some contracting risk whilst working to mitigate other risks with African institutions. It is also important for the funders and the consortia to have open communication channels for financial reporting, while reflecting on the mechanisms and updating if necessary.
- e. Contracting parameters should have a "Southern" focus.** The co-design of FCFA between DFID and NERC created an opportunity for increased Southern participation and leadership as no financial limitations were set between UK and non-UK institutions. However, apart from FRACTAL, which is predominantly Southern led, most top-tier leadership positions were held by UK institutions. While this approach was effective in creating a strong Southern led consortium, it may not have been as effective in promoting Southern leadership within the UK led consortium. Additionally, a more direct approach could be to set the financial split to favour the region being targeted and thus allow more funds to flow to non-UK/Southern institutions.



5

Mobilising
climate
information



Key Findings on mobilising climate information:

1. Intermediary and translation approaches to knowledge brokering were widespread in FCFA. Future programmes can focus on developing more approaches for engaging non-expert audiences, building capacity and shifting behaviours.
2. Consortia developed a range of approaches for stakeholder engagement and communicating uncertainties. However, there is limited data on the effectiveness of specific approaches to knowledge brokering within FCFA documentations.
3. Expanded focus on assessing and comparing the outcomes and impacts of mobilisation approaches is critically needed.

This section reports findings related to the learning question: What have we learned about how best to present or position medium- to long-term climate information for uptake by targeted users across scales? We begin by exploring the approaches used across FCFA to communicate medium- to long-term uncertainties and climate information. We then examine the strategies used to engage a wide range of stakeholders for knowledge uptake. The findings presented in this section draw on an analysis of interview data and a review of FCFA documents (see the full list of the reviewed documents in ANNEX 2).

It is important to note that the approaches discussed in this section are not an exhaustive list of all the knowledge mobilisation and brokering approaches that have been used in FCFA. Given our specific focus on learning what approaches are effective in presenting or positioning medium- to long-term climate information for uptake, we focus here only on those that were designed specifically for communicating mid- to long-term climate knowledge and that made this objective explicit in their project documents. As a result, some engagement and

brokering activities that were used over the course of FCFA may not be reflected. However, the range of approaches reviewed here provides an extensive and representative sample of the forms of engagement and knowledge mobilisation work undertaken through the programme.

We also wish to note the importance of the interplay between user engagement and knowledge mobilisation. Past research has underscored the interdependent relationship between the engagement process and the generation of appropriate knowledge products in effective knowledge mobilisation (Harvey & Cook, 2018). Some knowledge brokering approaches examined below attend to both elements within a single process. In other cases, these are attended to sequentially, with user engagement processes and the production of knowledge products built upon one another. While our analysis looks at knowledge brokering approaches and engagement processes in turn, it is important to emphasise that in many of the most effective cases, these have been planned together and exist under a common strategy or approach.

5.1 Knowledge brokering approaches used in FCFA

We first sought to map the range of knowledge mobilisation and brokering approaches that were being used across FCFA and then look more closely at how those varied according to context. Figure 8 illustrates the distribution of these approaches based on a widely-used typology known as the knowledge brokering spectrum. While we see a distribution of approaches across this spectrum, we find a predominance of cases using intermediary and

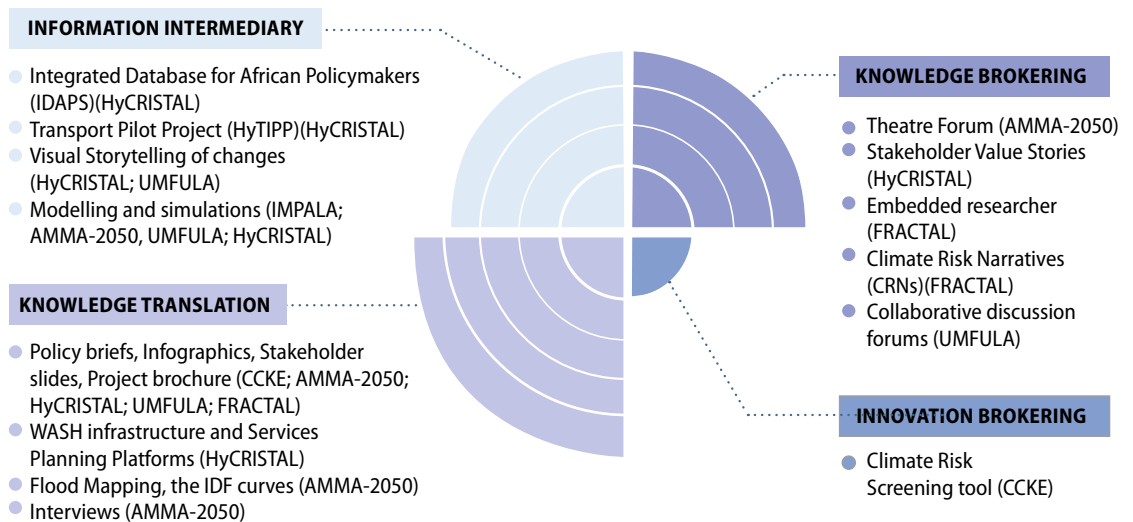
translation approaches, which emphasise ensuring that information and knowledge are available and are in accessible language or formats. This is perhaps unsurprising, given that such approaches (such as policy briefs and brochures) have long been used by projects to translate and communicate information for targeted audiences. Evidence does tell us, however, that such approaches tend to be less effective for engaging with non-expert audiences,

for building capacity, or for shifting behaviour (Bielak et al. 2008; Turnhout et al. 2013). They may nonetheless be helpful for raising the awareness among actors already active in the climate information and services field (such as other researchers). Also worth considering in these intermediary and translation approaches is the way in which the underlying information was identified or developed before being shared and also how they can be the direct outcome of interactive approaches. We address this point in Section 5.2 below. We also find examples of more interactive or two-way brokering approaches being used by most consortia. These include the co-development of stories and narratives that speak to climate risk and uncertainty and mid-

long-term development trajectories, and to illustrate the range of possible perspectives that exist related to climate risk. These approaches have tended to be used as conversation starters to engage targeted stakeholders in more sustained knowledge mobilisation processes. As one FRACTAL researcher noted in speaking about the power of these interactive brokering processes for knowledge mobilisation,

“Fundamentally it’s the process that has produced the uptake of the information, but I just want to emphasise, it’s not just information, it’s the understanding. It’s the relational capacity amongst the participant groups, it’s the exchanges across the cities.”

FIGURE 8 Approaches used to present climate information for uptake.



Distribution of approaches

Having established the overall distribution of the approaches to mobilising knowledge, we are then able to look at the alignment between the type of approaches used and the contexts and audiences that were targeted. As is evident in Table 10, the approaches used by FCFA consortia spanned a wide range of user types and scales (from local to national). While some approaches appeared to target a diverse set of users, the majority target a clearly defined audience and scale. This is in line with the growing awareness for context-informed knowledge sharing. In reviewing the range of approaches used in FCFA and the audiences that each sought to engage, no clear trends emerge. Each of the approaches that features multiple products also has a wide distribution of user types. This could suggest a lack of clear consensus (or perhaps analysis) on the approaches to knowledge mobilisation that are most effective with particular stakeholder groups - or it may highlight that is not as simple as one approach being more appropriate for one group. It may instead be a

question of aligning approaches with specific aims, intended outcomes, or stage of collaboration.

Unfortunately, as we will discuss below, our document analysis revealed very limited data reporting on the effectiveness of specific approaches. This leaves us with limited data available for understanding whether there are clear “best matches” between approaches and particular audiences, aims, or stages of engagement, or whether there are approaches that have particularly wide-ranging utility. These are important questions for the future of research-to-action linkages on climate information services in Africa and robust testing of approaches could yield important insights. Some preliminary analysis has been undertaken by FCFA consortia to compare the advantages and challenges of some user engagement strategies (see Harold et al. 2019 for a comparison of infographics and narratives). Future investigation could seek to include a wider range of approaches and contexts.

TABLE 10 Approaches and examples of uptake by targeted users. The table is colour coded according to the spectrum presented in Figure 8.

Approaches	Knowledge Product	Type of Product	Targeted Users	Examples of Uptake
Informational functions (Information intermediary)	Integrated Database for African Policymakers (IDAPS) (HyCRISTAL)	Online database of climate modelling, agronomy and hydrology	Policy-makers at the national, district, and sub-district levels	The modules of IDAPS have been tested in Uganda to support livelihoods and policy decisions
	Transport Pilot Project (HyTPP) (HyCRISTAL)	Reports on current- and future-climate analysis	World Bank and their consultants	The reports were shared by the World Bank at a workshop in October 2018
	Visual storytelling of changes (HyCRISTAL; UMFULA)	Videos	Local communities Local government International donors	Too early to assess (was released in late 2019).
	Modelling and simulations (IMPALA; AMMA-2050, UMFULA; HyCRISTAL)	Large-scale synthesised data with simulations and modelling	Research institutions	A high spatiotemporal resolution meteorological dataset is expected to be published in the UK CEDA and used in collaboration with other universities
Informational-Relational functions (Knowledge translation)	Policy briefs, Infographics, Stakeholder slides, Project brochures (CCKE; AMMA-2050; HyCRISTAL; UMFULA; FRACTAL)	Written briefs; infographics; summary slides; brochures; etc.	A wide range of stakeholders (e.g. farmers, researchers, NGOs, policy-makers)	The briefs are used in various policy documents.
	WASH infrastructure and Services Planning Platforms (HyCRISTAL)	A web-based data sharing platform	Policy-makers and practitioners	
	Flood Mapping, IDF curves (AMMA-2050)	Maps of inundated areas with land use scenarios	City planners, infrastructure companies	Decision-makers have requested IDF curves for particular infrastructure projects
Relational functions (Knowledge brokering)	Theatre Forum (AMMA-2050)	Theatre play	Diverse project partners (e.g. scientists, government officials, and farmers)	Promoted discussion on adaptation options with national and regional decision-makers, including from the National Assembly, COMNACC and COMRECC, farmers groups, AMMA-2050 partnering institutions including ISRA
	Stakeholder Value Stories (HyCRISTAL)		Policy-makers	
	Embedded researcher (FRACTAL)		City decision-makers	Developed networks with decision-makers
	Climate Risk Narratives (CRNs) (FRACTAL)	Textual descriptions of plausible climate futures	City decision-makers	Contributed to the city-specific strategy and action plan in Windhoek
Systems functions (Innovation brokering)	Collaborative discussion forums (UMFULA)	Multi-stakeholder discussion on climate impacts, decision trade-offs and robust options	Policy and decision-makers at the national and river basin levels	Too early to assess (ongoing)
	Climate Risk Screening tool (CCKE)	Screening tool	FONERWA staff, expert reviewers and project developers	

5.2 Strategies for user engagement

Regardless of the knowledge brokering approach adopted by consortia, there is a need to identify and engage potential users of the climate information being mobilised, whether to understand their needs, build trust, or simply to prioritise who should be engaged. Through a series of interviews, we sought to understand which strategies have proven effective in engaging potential users of climate information and knowledge. We structured our analysis

(Table 11) around the four stages of climate services co-production described by Vincent et al. (2018): Identify actors and build partnerships; Co-explore need; Co-develop and co-deliver solutions; and Evaluation. Although not all the approaches adopted by consortia can be described as co-production, we find close alignment between the strategies highlighted by interview respondents and those set out for co-production.

TABLE 11 Strategies used by consortia to engage knowledge users.

<p>How to identify appropriate entry points for engaging with potential knowledge users?</p>	<ul style="list-style-type: none"> • Stakeholder meetings, early scoping visits, and in-person visits • Well-connected personnel and prior contacts • Enhancing receptivity, such as embedding researchers or using project brochures to communicate goals and potential outcomes
<p>How to build trust and connection with the targeted user groups?</p>	<ul style="list-style-type: none"> • Prolonged engagement through events and regular communication • Joint production of knowledge products • Relational coordinator (assigned and emergent) and personal rapport • Trustworthiness (e.g. credibility of partnering institutions, reputation of the project team, commitment to partners' needs)
<p>How to communicate uncertainties with knowledge users? (also see Box 5)</p>	<ul style="list-style-type: none"> • Transparency • Participation for co-production • Knowledge sharing through workshops or training sessions • Communicate through scenarios, instead of uncertainty • Use visual aids paired with in-person support for interpreting
<p>How to monitor/evaluate the results of engagement?</p>	<ul style="list-style-type: none"> • Establish baselines • Survey partners • Monitor requests from partners coming through ongoing correspondence • Look for evidence of use noted in other data collection activities • Specific case studies aimed at studying information



We find close alignment between the strategies highlighted by interview respondents and those set out for co-production.

Consortia have used a wide range of strategies to engage knowledge users, but we see clear trends in using in-person engagements (via trusted intermediaries) for identifying entry points and engaging with potential users, and use of long-term multi-prolonged engagements in building trust with key stakeholders. These are not unusual practices but they underscore the fact that effective engagement strategies start early and remain intensive through the duration of programme activities - regardless of the knowledge mobilisation approach adopted.

This was not the case with all activities, however, as one AMMA-2050 researcher recounted the

challenges of effectively sequencing research plans and the development of appropriate knowledge brokering approaches and products:

“The first kick-off meeting we talked about what the key metrics of high impact on climate change were in different sectors and that was good to get us on ... everybody on the same wavelength and then the climate scientists went off and produced those and got a long and technical way, bringing in new bias corrected data sets and training early career scientists, so that process was good in terms of ... or definitely good in terms of building the skills of early career scientists. But

then we, you know, produced big ... documents that hang off our website, they were ... you know even within the consortium, people found some of them a bit tricky, you know, not presented ... the way that they were presented made sense to a scientist but not necessarily to a policymaker.”

The final stage of Vincent et al.’s (2018) co-production process cycle is to evaluate the effectiveness of the practice. As mentioned above, here we found limited evidence of results from the evaluation of evidence mobilisation activities, though some consortia reported having conducted some preliminary investigations. More specifically, respondents for three of the four consortia suggested that it was premature to assess whether there had been uptake of the information being shared. Where respondents did highlight approaches to monitoring uptake they cited some common approaches:

- Surveying partners (n=3)
- Monitoring requests from partners coming through ongoing correspondence (n=2)
- Looking for evidence of use noted in other data collection activities (n=2)
- Specific case studies aimed at studying information uptake (n=1)

While these are effective monitoring approaches, we note that only one of the approaches highlighted involves a structured analysis of context-specific progress or outcomes. Claims that it is premature to evaluate impact have merit, particularly in longer-term behavioural change processes. *However, there is a risk that, if left until the closing stages of the programme, consortia may not have the time or human and financial resources to undertake effective evaluations (see Harvey et al. 2019).* Here, developing “progress markers” (Earl, Carden & Smutylo, 2019) to indicate that interim steps are being made towards the longer-term behavioural changes can be helpful. These can include shifts in attitudes, knowledge, and behaviour, for example.

The incremental nature of these types of change is just one of several factors that can make evaluating knowledge brokering and mobilisation a challenge. Others include difficulties in causal attribution (e.g. Did our intervention generate this result? Did the stakeholder’s intention to act actually translate into action?) and questions around the sustainability of the influence (e.g. Will participants continue to adopt these recommendations or practices after our engagement with them has ended?).

Also important to consider in evaluating the effectiveness of practice is the value of robust baselines related to existing knowledge, skills, attitudes and resources among targeted stakeholders. An FCFA study was conducted to describe a synthesis of baseline information drawn largely from i) scoping studies commissioned as a precursor to FCFA research activities, and ii) pilot studies undertaken by FCFA research consortia with the purpose to explore the climate science needs of decision-makers in Africa to inform the design and implementation of FCFA research activities. The aim was to consolidate the project-level baselines to discern the “without programme” status of climate science and use across selected pilot sites in Africa. This forms a basis for evaluation of programme impacts and therefore lays a foundation for a journey of learning, adapting, improving and delivering impact of the FCFA programme.

BOX5

Communicating uncertainty with diverse audiences

Given the inherent uncertainty of medium- to longer-term climate projections, strategies for communicating these uncertainties were central to many of the knowledge brokering approaches used in FCFA. Based on interview responses we summarise some of the strategies that were highlighted:

- Engage users from the beginning so that they are directly engaged in discussions around the uncertainty of predictions (UMFULA, FRACTAL);
- Provide illustrative examples of potential outcomes (UMFULA);
- Use interactive approaches like forum theatre to provoke dialogue around uncertainties (AMMA-2050);
- Use narratives and storylines to provide different contextualised ‘futures’ in non-technical language (HyCRISTAL, FRACTAL).

It is also worth noting, however, that some respondents downplayed concerns about how uncertainty might affect the adoption of climate information, noting that the stakeholders being engaged understood the inherent uncertainty of such projections; and that in several communities there are already aspects of social and economic development which involve their own measure of uncertainty.



TOP: Lake Burera,
Rwanda, 2016.
- Photo by Julio Araujo

5.3 Key messages and implications

Looking across the analysis for this theme we find some evidence to advance our understanding of how best to mobilise medium-term climate information, but also some important questions that could be explored by other initiatives.

a. Linking mobilisation approaches to users and their needs:

While our review of literature on mobilisation strategies confirms the importance of tailoring approaches, our review of the specific knowledge brokering approaches used for certain stakeholder types did not reveal clear trends in FCFA. This may suggest that there is no straightforward alignment between knowledge brokering approach and user group, particularly if this brokering is embedded in an ongoing user engagement strategy. However, the lack of evaluative data on these strategies makes it challenging to draw firm conclusions on how to best align mobilisation approaches with specific user groups. This is already being taken on through some FCFA extension activities.

b. The principles of co-production are more widely relevant to mobilising medium- and longer-term climate information:

We find a good alignment between the strategies and approaches to knowledge co-production (set out in Vincent et al. 2018; Carter et al. 2019 and elsewhere) and those cited as effective for mobilising climate information using approaches across the knowledge brokering spectrum. The value of long-term engagement, trust-building, and in-person engagement appear to be important even in the development of more straightforward knowledge resources, such as infographics or briefing notes (see Lusaka's City Learning Labs as an example in Box 6). This underscores the need to consider both process and product in the

development of any resources for knowledge mobilisation. Emphasising the value of these principles of co-production offers a good starting point for future initiatives, particularly at the planning and design stages, to ensure that the sequencing of activities does not preclude meaningful stakeholder engagement. This will be the focus of some work in the FCFA extension phase.

c. Expanded focus on assessing and comparing the outcomes and impacts of mobilisation approaches is now needed:

Initiatives like FCFA present a unique opportunity to compare many approaches to knowledge mobilisation, implemented over a similar period and with comparable programmatic constraints (budget, scale, etc.). Unfortunately, these opportunities are all too often missed due to:

- d.
- Limited baseline development at the outset of initiatives; and
 - The rapid winding down of activities at the end of the project cycle leading to a lack of resources to undertake the review.

FCFA's extension activities, as well as future programming frameworks like CLARE could offer avenues through which this can be avoided. A call for more robust evaluation of these approaches should not be viewed as an accountability exercise but rather an opportunity to understand how particular approaches to knowledge mobilisation contribute to evidence used and behaviour change, for specific stakeholder groups and decision settings and at different points across the co-production process. This expanded focus should also include more attention to developing methods for monitoring and documenting these impacts.

BOX 6

Policy briefs as boundary objects in FRACTAL's City Learning Labs in Lusaka

The city learning processes in Lusaka have led to the “fundamental changes in key decision pathways (around water, flooding, land use and infrastructure development) to increase the [city’s] resilience” (Koelle, 2019, p. 25). One important factor that contributed to this policy impact is the process of co-developing policy briefs with the decision-makers. In Lusaka, policy briefs acted as the key boundary objects that resided between the social worlds (or CoPs) of the decision-makers and scientists. Coined by Star and Griesemer (1989), boundary objects are objects or ideas that emerged through collaboration and dialogue which were both adaptable to local needs yet “robust enough to maintain a common identity” (p. 393). Boundary objects can be abstract (e.g. ideas, classification systems, or concepts) or concrete (e.g. images, maps, or tools) (Steger et al. 2018). They tend to be temporal, subject to reflection and local tailoring, and based in action (Star, 2010).

In fact, the development of policy briefs was not a pre-planned output of Lusaka’s City Learning Labs. The idea came from the participants during the 2017 Media Training where they saw the need for media statements addressing burning issues in Lusaka related to climate change. Therefore, co-developing policy briefs became a mutual priority or “the golden thread towards which the team was working” (interview). It acted as a boundary object that brought the decision-makers and scientists together for more in-depth dialogue. As a member described, the idea of co-producing policy briefs “became the red [or unifying] thread” that guided the rest of “the research activities [and] all the engagement activity for most of the learning lab process in Lusaka”. In the fourth and fifth

Learning Labs, the decision-makers and the project teams even sat and wrote the policy briefs together “over a number of days (and evenings)” (Mwalukanga et al. 2018, p. 1). As a result, these policy briefs are now a shared product between all members involved. A shared ownership of such products is essential for medium- to long-term knowledge uptake, as it allows all members to use these policy briefs as a new form of boundary objects to initiate diverse dialogues and engage future collaborations with other decision-makers, researchers and practitioners.

Although the long-term impact of Lusaka’s City Learning Labs on knowledge uptake requires more time to unfold, some anecdotal evidence has been observed to show its effectiveness in leveraging high-level buy-in from the decision-makers to increase the resilience of the city around water, flooding, land use and infrastructure development issues in Lusaka. For example, the city representatives have expressed a desire to “continue a learning lab-type engagement” (Annual Review 2019, p. 9) after the project ends. This outcome deserves more attention and further investigation, as it signals a newly established norm of policy learning in the decision-making space. It also indicates a potential benefit of the co-productive practice in establishing long-term engagement and trusting relationships between partners. This specific case also presents an interesting opportunity for researchers and practitioners alike to reflect on the currently common approach to producing knowledge products and translating complex climate information for the “users”. In Annex 3, Case 2, we further discuss other factors that contributed to the collective learning process in Lusaka’s City Learning Labs.



Overarching
conclusions &
recommendations

This study, although only measuring a sample of FCFA work and collaborators, provides some interesting insight into the successes and failures of FCFA approaches to collective learning, Southern leadership and mobilising climate information. It also highlights the priorities/recommendations that are needed for future programming to learn from the progress and shortfalls of FCFA under the aforementioned thematic areas.

6.1 Recommendations for future programme design

Designing mechanisms to support emerging research and practice is critical. Our findings suggest that flexible funding mechanisms, such as the Small Opportunities Grant, allowed the consortium to be more exploratory and reactive to emerging research needs. FRACTAL's experience also demonstrated that outputs that were not planned during the project design phase (i.e. co-producing policy briefs and extensive partnerships with Lusaka Water Security Initiative (LuWSI) turned out to be impactful on the programme outcomes. While identifying a strong research course is good for delivering regular outputs, it is typically difficult to significantly alter the course of research to make it more applicable towards the "users"/actors/stakeholders. This form of flexibility can also allow for emergent leadership over the course of the programme. Therefore, future programme design can consider ways to balance the pre-defined and emerging outputs that would allow for wider, and sometimes unexpected, impact.

Investment into learning and capacity development needs to expand the focus from cognitive towards more positive effects on the networks and systems. Evidence on the benefits of facilitated learning in consortium's collective work and trust-building (i.e. cognitive and relational outcomes) are highlighted in the Collective Learning section. However, our analysis revealed a limited number of normative learning outcomes (e.g. new rules, practices in FCFA as a result of learning) at both programme and consortium scales, suggesting a possible disconnect between collective learning with the overall management of their consortium activities. Similar results were also observed in Table 9, in which little is reported on the consortium's collective capacities to adapt and self-renew. These findings signal a potential need to rethink how capacity development activities are designed and conducted. The lack of reported outcomes

of learning on administrative or management practices also represents a missed opportunity for learning for/in collaborative programme governance. Research has persistently shown that fostering collaborative management and nurturing norms of collaborative practices are essential elements in creating conditions that facilitate collaboration and enhance members' commitment to achieving trans-disciplinary goals and outcomes (Cundill et al. 2019; Stokols, 2006). Thus, future investments into climate research can examine collective learning processes in other similar research initiatives (see Currie-Alder et al. 2019) that have successfully used social learning processes to develop the consortium's adaptive capacity and foster collaborative norms and practices.

Monitoring, Evaluation and Learning (MEL) need to explicitly track changes beyond the lifespan of programmes. As mentioned in the Mobilising Climate Information section, our analysis identified a gap in assessing the effectiveness of specific approaches to knowledge brokering. At the same time, while the programme required the uptake activities to focus on medium- and long-term uses of climate information, questions regarding how to track and evaluate them after the programme ends have arisen. Similar concerns can be raised about the longer-term impacts of capacity building support. Moving forward, future study and design of MEL can seek to develop new tools and strategies (e.g. synthesis of impact case studies, cross-programme learning reviews) for tracking the longitudinal effects and impacts of mobilisation approaches on evidence used and behaviour change, for specific stakeholder groups and decision settings. It is important that funders re-evaluate the effectiveness of existing MEL strategies in effectively monitoring impact after the programme ends and ensure that the correct systems and networks are in place during



Future investments into climate research can examine collective learning processes in other similar research initiatives.

the project lifecycle to support sustainable engagement between the external researchers (outside of a particular country) and in-country partners with local stakeholders and policy processes. A portion of funds (for new programmes) and additional funds (for existing programmes) could be used to monitor the impact and draw final cases of learning, which can be used to better inform/influence future programming.

Addressing the challenge of working towards competing programme requirements. There is a need to pay attention to competing programme demands as set out in call documents. Consortia

in FCFA and other similar initiatives have sought to achieve world-leading research, uptake of that research into policy and practice, as well as capacity development simultaneously. This can prove a near-impossible challenge that involves trade-offs. For instance, placing leadership responsibilities on new researchers may provide important capacity development, but it would be unfair to then expect these researchers to generate world-leading results. Designing a MEL framework without considering this dilemma of some consortium can pose extreme challenges for the research teams.

6.2 Recommendations for research practice

Consider design factors when creating virtual spaces as well as in-person convening for trans-disciplinary collaborations. Our findings showed that in-person engagement is extremely impactful in fostering transdisciplinary collaborations and building trust and strong commitments among members. This result confirms the discussion in the literature focusing on large-scale transdisciplinary research (Cundill et al. 2019). However, it is worth noting that FCFA members have not found online convening (e.g. joint webinars) to be as beneficial due to limited internet access or its less interactive format in the cases under study. There is therefore a need to reflect on ways of improving the current models of online convening to increase their perceived value. Considering the financial and climate-related implications of frequent in-person meetings of international teams, we thus suggest periodic meetings or face-to-face engagements to bring members to build relationships and identify opportunities for collaboration. Online convening can include both formal and informal exchange with a focus on strengthening and sustaining CoPs

(e.g. see DeLorme et al. 2016 and Hossain & Wigand, 2004). Strategic co-creation of boundary objects (or even “boundary chains” in Kirchoff et al. 2015) can be considered for both in-person engagement (e.g. Synthesis Products) and virtual spaces (e.g. knowledge sharing tools such as newsletters). Perhaps funds can be pre-planned and allocated to support innovation in creating and facilitating virtual CoPs.

Shifting the linear research and knowledge mobilisation practices towards the principles of co-production. Our case analysis demonstrated that the principles of co-production are more widely relevant to mobilising medium- and longer-term climate information. The process can also be effective in establishing long-term engagement and trust-building. Although this approach can be time consuming and financially costly, the principles of co-production as described by Carter et al. (2019) (from immersive to consultative) can offer a good starting point for future initiatives to ensure that stakeholder needs are considered from the outset.



The principles of co-production are more widely relevant to mobilising medium- and longer-term climate information.

6.3 Recommendations for Southern leadership and capacity development

Moving towards a collective and distributed leadership model. International teams and trans-disciplinary collaborations bring together partners with different competencies, perspectives, and

expectations. Diversity related to professions, expertise, hierarchy, gender, age, and culture is thus a common characteristic of such collaborative settings. Pre-existing power dynamics are thus

inherently embedded in various forms of interaction with diverse groups of members. These dynamics thus shape the working culture and practices within the teams (Currie-Alder et al. 2019). Openness and patience were required for the benefits of diversity to be realised. Indeed, evidence in our interviews also suggest that the most-cited enablers to building consortium's collective capacity are collaborative and distributed leadership. This finding points to an opportunity for future programmes to consider fostering such a leadership model, especially for the South-South and South-North partnerships. Challenging and shifting the pre-defined roles, such as Southern partners as network champions, is often a necessary step for emergent leadership and capacities to evolve. Literature on sustainability leadership also highlights that effective leadership is collective (Lichtenstein et al. 2006; Vignola et al. 2017). Importantly, for serious effort of capacity building, we need to shift our attention from how individuals "lead" the team to perform. More focus needs to be placed on the ways in which leadership functions have been performed by every member in the team, and how the collective capacities have emerged to achieve broader outcomes and influence of the issues that the team is dealing with. For example, mentorship from the North as opposed to Southern partners playing a more supporting role

(experiential learning) could help build Southern capacity and form stronger relationships and social capital amongst partners. Understanding the power dynamics between partners and creating an inclusive and equitable space is important for emerging Southern leadership as well as consortiums' collective capacity building.

Institutional capacity and research capacity are inseparable; overlooking the institutional barriers can hinder the long-term capacity development of Southern researchers. As revealed by a few participants, the configuration of some Southern institutions may not be compatible with the current funding mechanisms that are largely designed by the Northern institutions. This misalignment had hindered the work of some consortium, especially within the first year. Thus, funders need to develop a better understanding of the administrative complexities of the Southern institutions and determine if a more flexible system could be developed. This system may consider stepping away from the current standardised approach and moving towards a more tailored approach that is adaptive to the specific issues and context in each country/institution. Funders can also consider linking research programmes with capacity development initiatives for Southern administration



Challenging and shifting the pre-defined roles, such as Southern partners as network champions, is often a necessary step for emergent leadership and capacities to evolve.

6.4 Recommendations for further research

A number of important questions were considered for this study but were not assessed due to available time, availability of data and information, and scope of this study. We recommend that these questions be addressed should there be any further study of FCFA by others as these are highly important areas of interest to both the research and donor communities.

- (How) has the interdisciplinary nature of FCFA consortia influenced the practice and outcomes of consortium research?
- Have decisions based on improved climate information translated into 'better' adaptation and greater resilience to climate variability and change?
- Learning on the low cost and cost benefit of developing a high resolution convective permitting model like CP4-A.

While this Learning Review looks at FCFA in isolation, there is still much to learn from other programmes while comparing and contrasting the issues raised in this study. There remains a wide range of insights that can be shared through a larger synthesis of cross-programme research and engagement activities and consortium/programme management. Ongoing work with McGill University is pursuing some of these areas of analysis, but a more comprehensive learning agenda for future research frameworks would also offer important opportunities and insights.



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Knowledge to Action



 FUTURE
CLIMATE
FOR
AFRICA

FUTURE CLIMATE FOR AFRICA (FCFA) AIMS TO GENERATE A FUNDAMENTALLY NEW CLIMATE SCIENCE FOCUSED ON AFRICA AND TO ENSURE THAT THE SCIENCE HAS AN IMPACT ON DEVELOPMENT ACROSS THE CONTINENT.

Annex 1

Contribution analyses



TOP: Jean-Pierre Roux presents the welcome address at the FCFA Mid-Term Conference, South Africa, 2017.
- Photo by Gregor Rohrig

CASE 1

Mid-Term Conference as a milestone for cross-programme learning

Main author: Ying-Syuan (Elaine) Huang

Contributing authors (and roles in this impact case)

Julio Araujo - Julio was a Research Officer of the CCKE involved in conceptualising the thematic areas of the conference.

Jean-Pierre (JP) Roux - JP was the Project Manager of SSN and the Unit Lead of the CCKE involved in the planning of the conference.

Emerging outcomes and uptake

- Built consensus on programme legacy: Broad-based critical review of the programme Impact and Legacy Strategy (prepared with consortia focal points prior to conference, reviewed by all at the conference) socialised shared vision of programmatic impact.
- Agreed on synthesis knowledge products: Exploration and prioritisation of topics of interest across consortia and with donor support.
- ECRs' involvement and active participation at the conference.
- Cross-consortium collaboration through joint fund (e.g. 50% of the innovation fund opportunities were awarded after the conference and 33% of the projects included cross-consortium collaborations).

Impact, significance and beyond

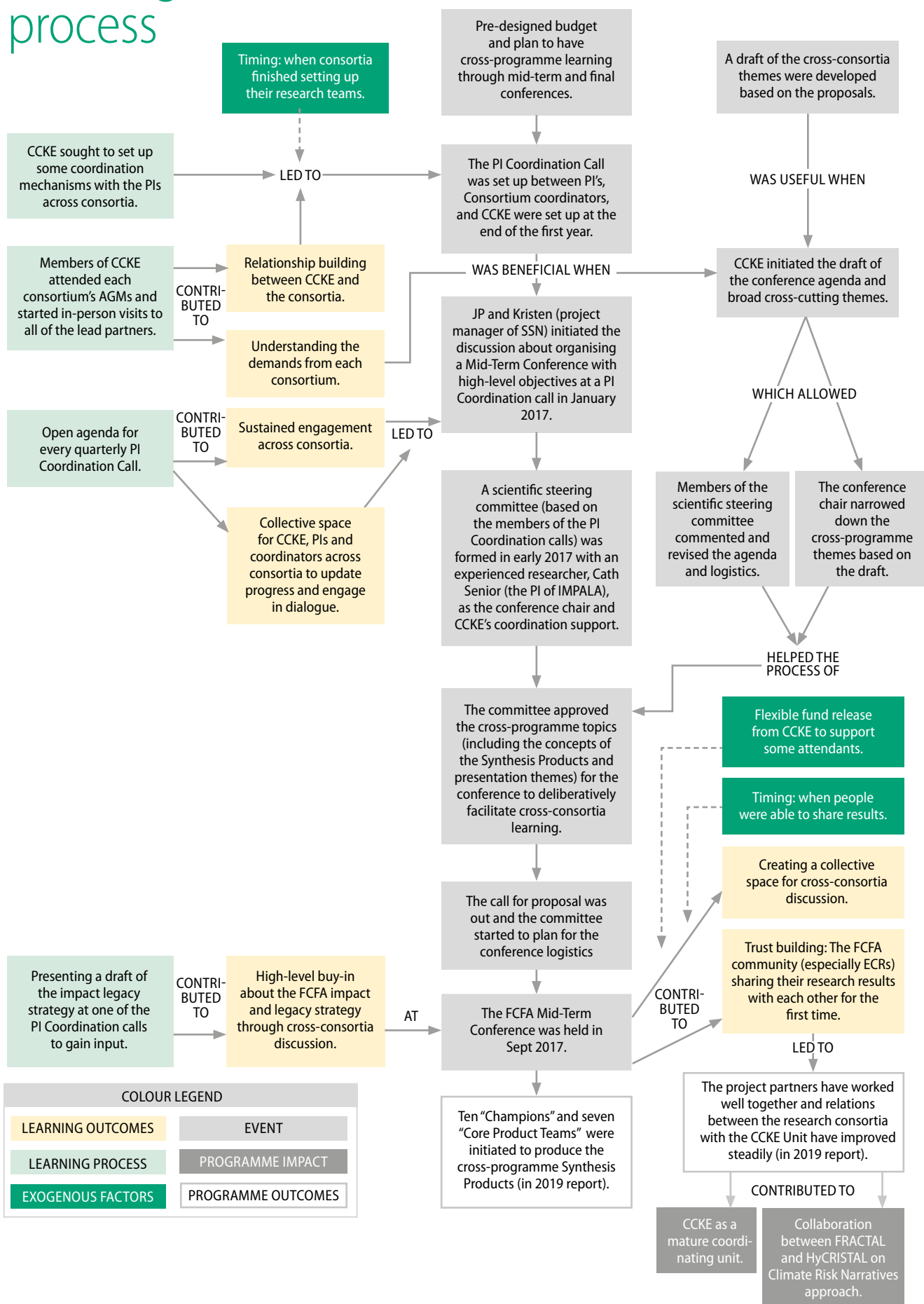
- Cross-consortia collaboration between FRAGMENTAL and HyCRISTAL on Climate Risk Narratives approach was initiated.
- Consortia's engagement in programme-wide knowledge synthesis processes towards the end of the programme.
- CCKE becoming a mature coordinating unit in establishing trusting and co-productive working relationships with the research consortia in the second half of FCFA (2019's Annual Progress Review).

Background

The FCFA Mid-Term Conference was held from 4–7 September 2017, in Cape Town, South Africa. It was an internal FCFA event, with the majority of the 103 participants being researchers from the five FCFA consortia. The primary goal of the conference was for the FCFA community to share and engage critically on research conducted in the first two years of the programme. It was also aimed at reflecting on progress and co-developing a roadmap with the FCFA members for the second half of the programme and the FCFA legacy.

Learning process

Timeline





TOP: Reflecting on programmatic impact pathways at FCFA Mid-Term Conference, South Africa, 2017. - Photo by Gregor Rohrig

Main story

According to the survey results of this Learning Review, the FCFA Mid-Term Conference was identified as the most significant programme-level activity by many members. Some found that the conference provided a great opportunity for the FCFA research consortium to learn from each other. The element of face-to-face interaction at the conference also contributed to establishing interpersonal trust, or “deep trust” as Nilsson and Mattes (2015) described, between CCKE and other members. In terms of concrete outcomes for impact, the conference led to several important cross-consortium collaborations, including several programme-wide Synthesis Products (such as IMPALA’s guidance documents on appropriate CP4-Africa data usage) and initiatives for joint funding proposals (e.g. 50% of the innovation fund opportunities were awarded after the Mid-Term Conference and 33% of the projects included cross-consortium collaborations).

The success of the FCFA Mid-Term Conference was not by chance. One key attribute to its successful development was the CoP that was developed over time through the quarterly PI Coordination Calls. Participants of these calls were representatives of each consortium, including the PIs, Co-Investigators and Coordinators. These quarterly calls were convened by the CCKE unit with an open agenda inviting participants to share the progress of their consortium’s work and exchange ideas about the programme. Participants negotiated their professional needs and interests to assemble goals of these calls, resulting in some shared concerns that connect members to continue the dialogue and

learning across consortia (joint enterprise). The regular interaction and sustained participation created mutual engagement among the members. They engaged in sharing progress, discussed ways of improving consortia or programmatic practices, learned from each other, and grew as a community. Through their interactions over time, the members of the quarterly PI Coordination Calls accumulated a shared language and understanding of each consortium’s work (shared repertoire) (Wenger, 1998). In this process, some ideas around cross-consortia activities, such as the Mid-Term Conference and Synthesis Products, were made aware by the participants in the PI Coordination Calls. Therefore, when the mission of organising the Mid-Term Conference was brought up by the CCKE, a sub-group of them took on the leadership role and formed a Scientific Steering Committee with the responsibility to plan the conference. An experienced researcher, Dr Cath Senior (the PI of IMPALA) served as the conference chair. The cross-cutting themes of the conference became key in stimulating cross-consortia dialogue and learning. As the CCKE lead reflected: “the Mid-Term Conference was particularly effective because all consortia contributed to crafting the agenda and there was broad participation from Principal Investigators through to early career researchers.” Importantly, the appropriateness and relevance of the cross-cutting themes “allowed for targeted thinking for new knowledge products . . . [therefore], the researchers were able to share their work and identify areas of overlap.”

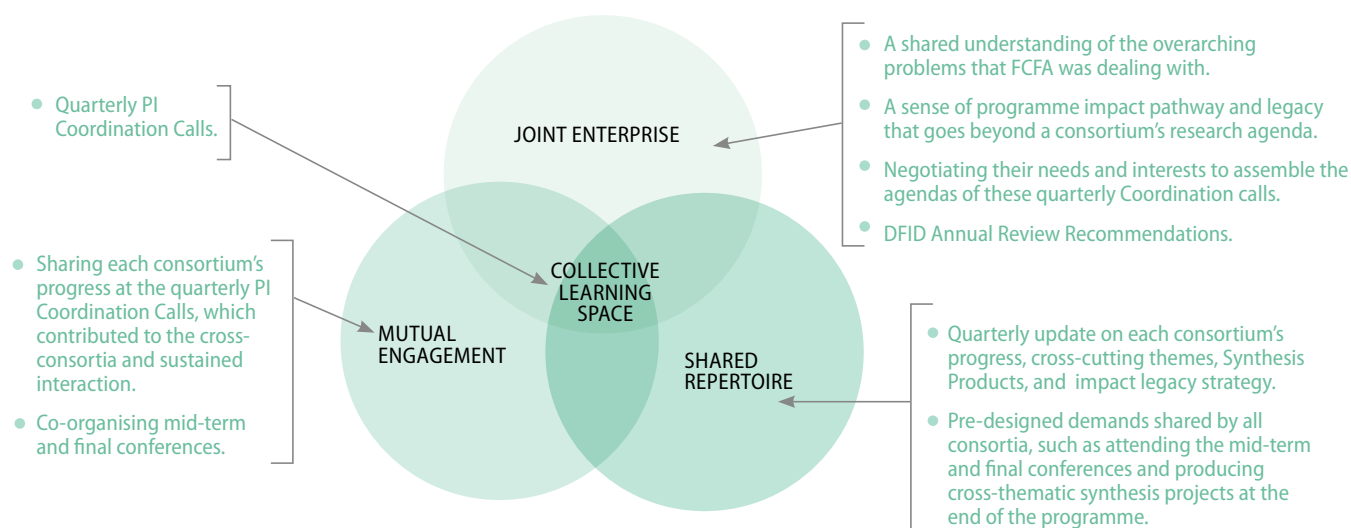
Another important element that contributed to the success of the FCFA Mid-Term Conference was the facilitating role of the CCKE unit. That is, in the 2016 Annual Review, the CCKE was recommended to begin shifting its focus from intermediating between the DFID offices and consortia, towards a more facilitating role in fostering cross-programme activities and collaboration (see pages. 19-20). To this end, several cross-programme working groups were set up based on the cross-cutting themes identified through an analysis of consortia's proposals. Members of CCKE also began to develop bilateral relationships with the FCFA partners through in-person visits and attending all the consortia's annual general meetings. Attending these meetings "in real time was highly beneficial" because it allowed CCKE to "negotiate" opportunities for collaboration "with the consortia on site" (Research Officer reflection). CCKE was also able to gain a close understanding of the demands from each consortium and offer responsive support when needed (e.g. supporting HyCRISTAL's development of Climate Risk Narratives), resulting in consortia's growing trust with CCKE. Through this mutual learning process, the supporting role of CCKE was also established and accepted by the members. It was also reinforced by the ways in which the CCKE unit coordinated and supported the quarterly PI Coordination Calls.

The bilateral relationship and CCKE's collaborative approach to facilitating cross-consortia exchange and collective learning were critical when there was a need to refocus all consortia's activities towards an impact and legacy strategy at the Mid-Term Conference. Specifically, learning from the past experience of engaging with consortia, CCKE first

presented the draft of the impact and legacy strategy at a PI Coordination Call which was held before the Mid-Term Conference. As a result, pathways to cross-programme impact were jointly finalised with the key actors at the PI Coordination Call before it was shared with the FCFA members at the Mid-Term Conference. A high-level buy-in of the FCFA impact and legacy strategy at the Mid-Term Conference can thus be considered as evidence of CCKE becoming a mature coordinating unit in enhancing cross-consortia learning and collaboration (2019's Annual Progress Review).

It is important to note that the success of this contribution story could not occur without the careful design of the programme (Cundill et al. 2019). DFID, in particular, played a key role, right from the start of the programme, through the kick-off workshop in 2015 and the two rounds of annual review in 2016 and 2017, to embed cross-consortia learning into consortia work. Therefore, the buy-in from consortia to start collaborating on Synthesis Products and programmatic learning was due to the sustained interest and critical feedback from the DFID Senior Responsible Owners. The DFID annual reviews in 2016 and 2017 were key mechanisms through which DFID obtained commitment from consortia towards programmatic coordination, collaboration and learning. Moreover, the timing of the Mid-Term Conference allowed members to feel more at ease with sharing methodologies and in-progress results with each other, in contrast to the cross-consortia working groups set up during the early phase. These design features are critical attributes that helped to facilitate cross-consortia learning at the conference, leading to ongoing collaboration between consortia.

Key contributing factors involved in this case (drawing on the 'community of practice' framework by Wenger, 1998)



Supporting evidence

CLAIMS	EVIDENCE
Understanding the demands from each consortium was beneficial when CCKE initiated the draft of the conference agenda and broad cross-cutting themes.	We attended AGMs, we attended many, we attend all the individual consortium AGMs. We did the regular six-monthly kind of road trip or the road show and visit to all the lead partners, often in the UK where it was just myself and one of my team members where we sat down with each of them face to face. We presented some of our work, we had a bit of a strategic conversation. We just built bilateral relationships with each of them and we just had to do that very slowly. . . . So that eventually when we got to doing the Mid-Term Conference, we had an amazing amount of buy in and amazing amount of good will because it had taken us two years to figure out how to work together. (Interview)
Mid-Term Conference contributed to creating a collective space for cross-consortia discussion.	Because of the Mid-Term Conference, ten “Champions” and seven “Core Product Teams” were initiated to produce the cross-programme Synthesis Products (2018’s Annual Progress Review, p. 29-30).
Mid-Term Conference contributed to trust building: The FCFA community (especially ECRs) sharing their research results with each other for the first time.	Survey results showed that most of the respondents (78%) found programme-level learning contributed very positively to trust-building and enhancing commitment among the FCFA members.
Lasting engagement between consortia in cross-programme collaborations.	In 2019’s Annual Progress Review, it was stated: “Over the past year the project partners have worked well together and relations between the research consortia with the CCKE Unit have improved steadily throughout the year, especially following the FCFA Mid-Term Conference in September 2017” (p. 28).

BOTTOM: Plenary discussion at the FCFA Mid-Term Conference, South Africa, 2017. - Photo by Gregor Rohrig





TOP: Model evaluation discussions at the first LaunchPad workshop, South Africa, 2020
- Photo by Beth Mackay

CASE 2

Developing a sustained partnership through a CoP

Main author: Ying-Syuan (Elaine) Huang

Contributing authors (and roles in this impact case)

Rachel James, a postdoctoral researcher during the course of the IMPALA project, and currently the co-investigator of the LaunchPad project.

Babatunde J Abiodun, researcher of the IMPALA and LaunchPad projects.

Pokam M. Wilfried, researcher of the IMPALA and LaunchPad projects.

Thompson Annor, ECR of the IMPALA project and a researcher of the LaunchPad project

Emerging outcomes and uptake

- The Africa Model Evaluation Hub (LaunchPad project) was funded in early 2019 for the first phase of the work to continue the UK-African partnership.
- Four core Africa-based researchers and six associated ECRs have remained active in the new LaunchPad project.

Significance

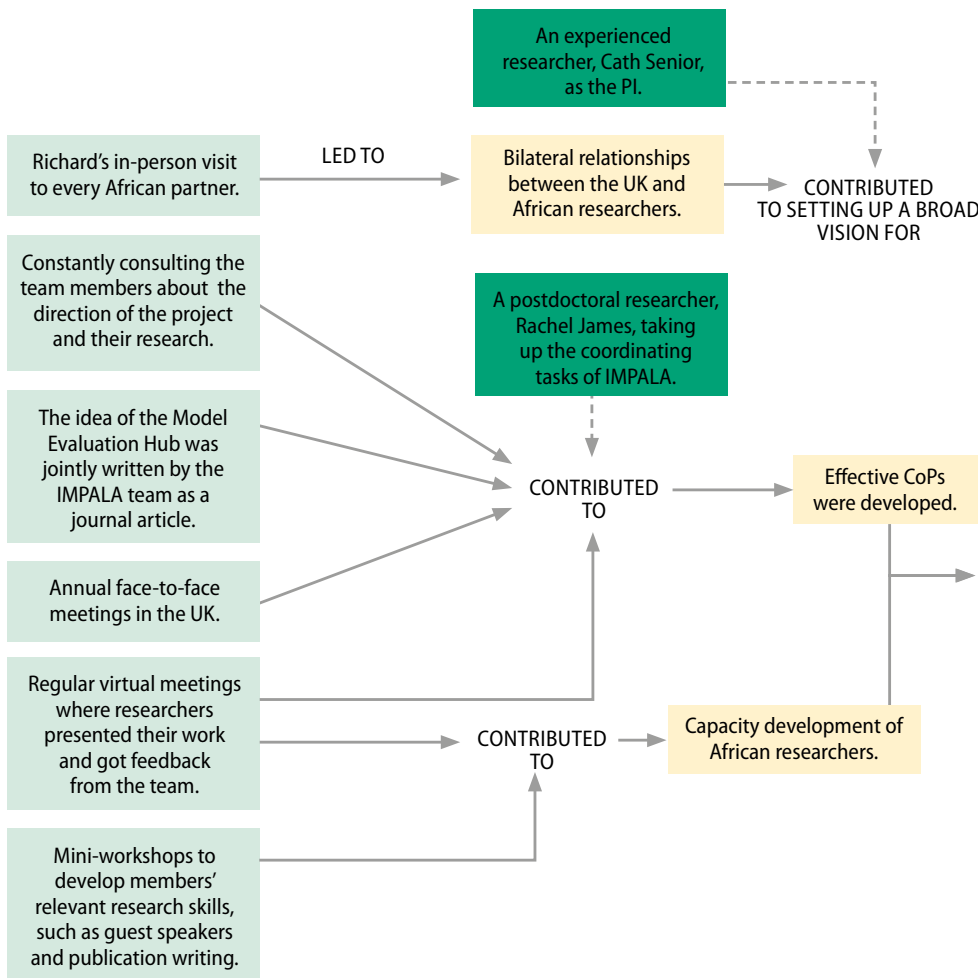
- Longer-term planning for developing African scientists and ECRs' research capacity.
- Sustain partnership of North-South and South-South research collaboration on climate modelling.

Background

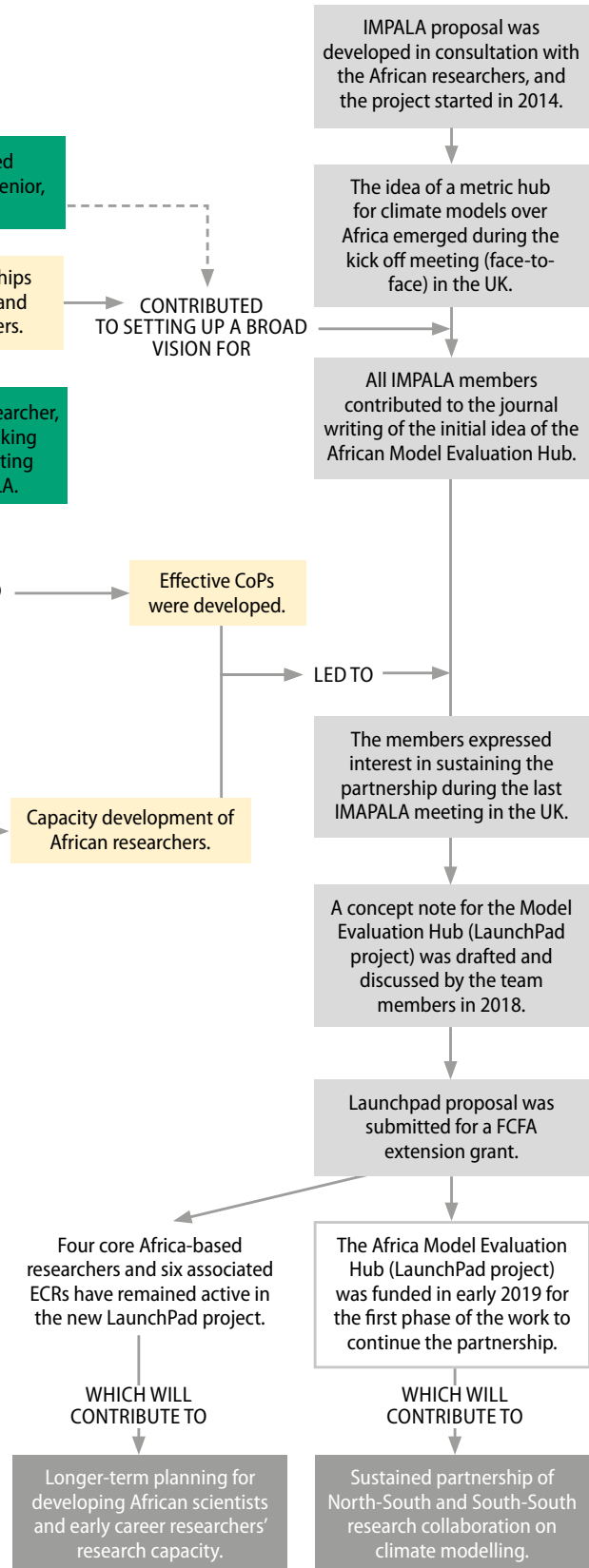
A better understanding of how the models perform is fundamental in determining how to improve them and to develop ways to assess their adequacy for future projection (James et al. 2018). Moreover, engaging local experts in the process is key to ensure that the models and associated metrics are relevant regionally. To this end, IMPALA has been proactively engaging the African researchers to create a metric hub that would allow modelling data and evaluation tools to be shared openly. Over the past five years, the IMPALA project has successfully built a strong African-UK network of researchers working on this goal. This South-South and South-North partnership that was formed through IMPALA also led to a continuation of a new research collaboration—the LaunchPad project—that has been funded by DFID in 2019. In this case analysis, we sought to understand how the members learn to work with each other and develop a trusting relationship.

Retrospective story of change: From IMPALA to the LaunchPad project

Learning process



Timeline



COLOUR LEGEND	
LEARNING OUTCOMES	EVENT
LEARNING PROCESS	PROGRAMME IMPACT
EXOGENOUS FACTORS	PROGRAMME OUTCOMES

Story of change

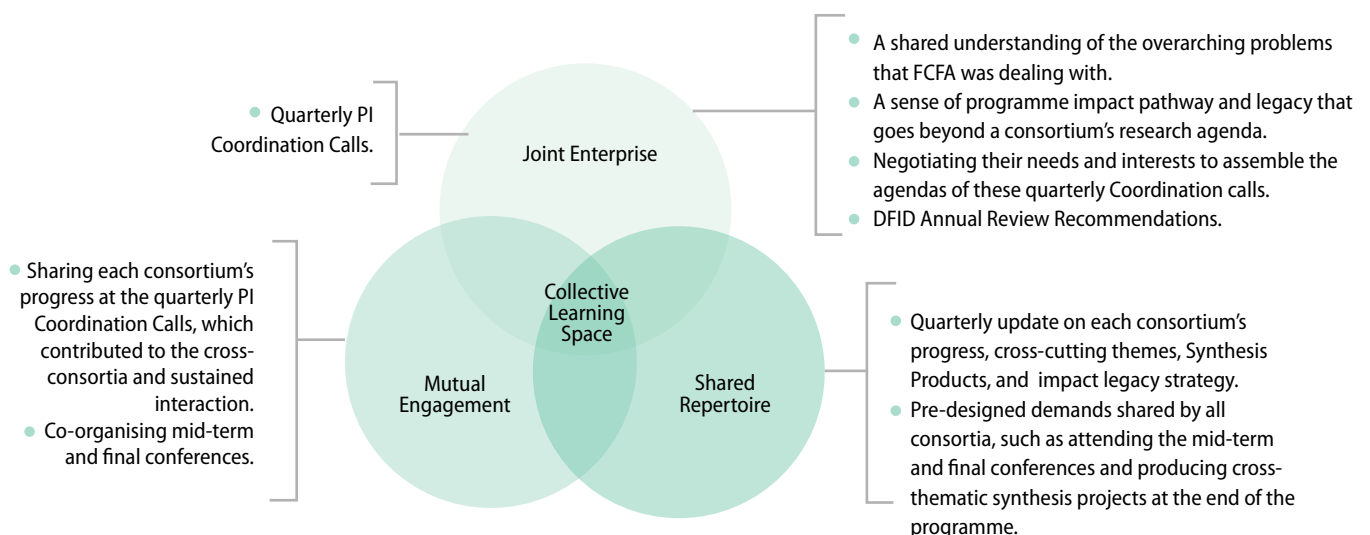
“We learn tremendously. We learn from one another during the project. So that’s really built that trust. And that was why it was a bit sad to see IMPALA project ends. But thank God, we have some opportunity with the climate model evolution hub to sustain that kind of relationship (interview).”

The collaborative learning process in IMPALA has led to a sustained partnership between the African and UK scientists. A new LaunchPad project has recently been funded by DFID to extend this strong research network that seeks to establish a climate model evaluation hub over Africa. Importantly, core Africa-based researchers and six associated ECRs have remained active in leading the LaunchPad project through various research activities.

Our analysis showed that the relationship outcome of IMPALA was achieved through forming a research CoP. This CoP was established from the beginning of the IMPALA project in which the proposal was developed in consultation with the African scientists. In doing so, members of this CoP began to develop a shared understanding and vision for the IMPALA project. The senior researchers in IMPALA also “paint the picture of the long goal of this area of the work”, such that every member understands how their part of the work can contribute to the IMPALA project (interview). Therefore, while each member was focusing on their area of research, a shared vision remained for improving the performance of climate models in Africa (joint enterprise).

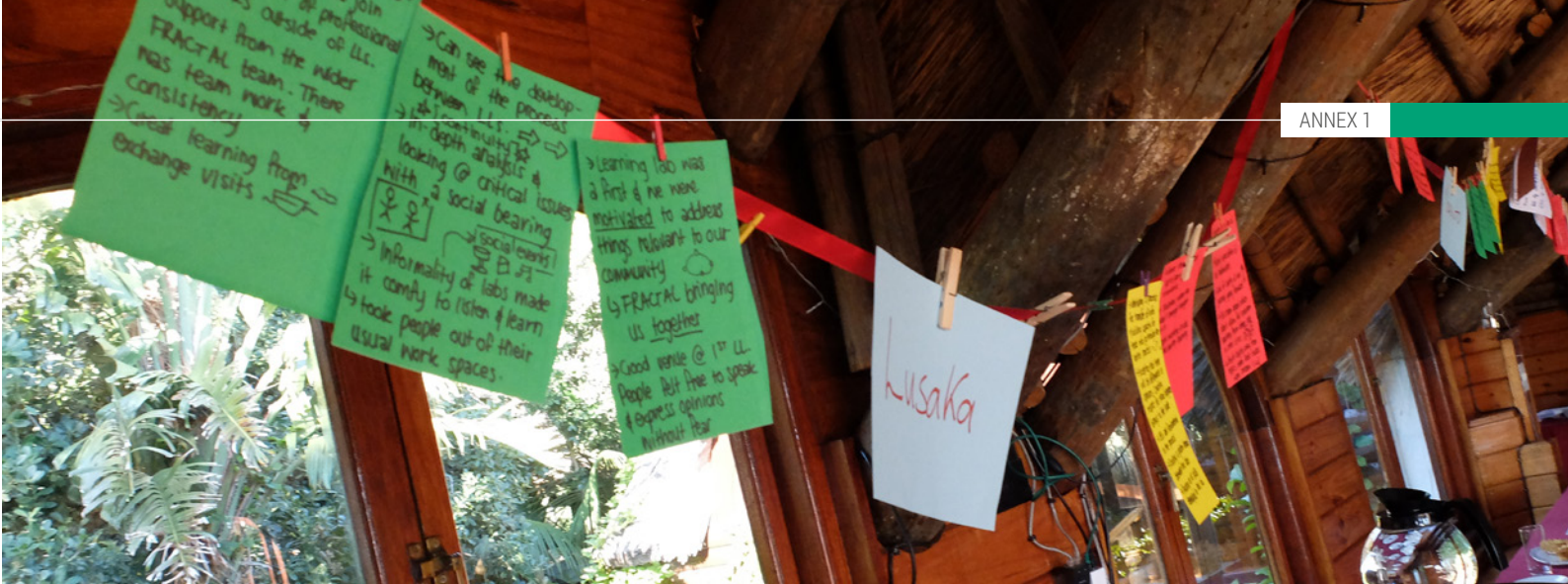
The emphasis of collaborative learning through doing (practice and meaning making), becoming (identity), and belonging (community), was also a key contributing factor that led to the members wanting to sustain this partnership. It was done through “carrying everybody along” (interview) and ensuring that each member would have the support (e.g. travel fund) and capacity (e.g. scheduling, mini workshops on specific research skills) to attend and participate in every IMPALA meeting. For example, a mutual engagement for the members is to present their research progress and receive feedback from each other at all IMPALA meetings. In these meetings, the organisers paid particular attention to ensure everyone was included in the discussions. Therefore, when reflecting on how the trusting relationship with the UK researchers began to form, Wilfried described that it started “at the beginning” when we were writing the proposals for the IMPALA and for the LaunchPad and “they asked you . . . what do you think, what is your opinion.” This practice creates a sense of belonging for everyone in this research community because “everybody has their voices” and all their comments are “taken into account” throughout the project. It also developed members’ researcher identity (especially for ECRs), as they were positioned to engage in research discussion and activities. As Babatunde Abiodun observed, the students came back from the last two IMPALA meetings full of “eagerness and enthusiasm” and were motivated by the useful contributions to their research.

Key contributing factors involved in this impact case



Supporting evidence

CLAIMS	EVIDENCE
An experienced researcher, Cath Senior, as the PI contributed to setting up a broad vision for the IMPALA members to jointly write the initial idea of the African Model Evaluation Hub.	... it was through those discussions, actually Cath Senior who was a PI on the IMPALA project, came up with this idea, uh, for metrics hubs and we called it as metrics hub. ... And then once we'd done quite a bit of work with the fullest team, we were constantly, you know, asking this question, how should we evaluate model? What kind of processes should we look at which winds, which, um, uh, um, how should I describe the other processes? (interview)
Bilateral relationships between the UK and African researchers contributed to setting up a broad vision for the IMPALA members to jointly write the initial idea of the African Model Evaluation Hub.	... before [the first] meeting, what started a little bit, especially from my side, was the visit of Richard Washington to Cape Town. ... He sat in the office. And he gave me more explanation of what the project was about. ... we had a meeting on how things are, and all the bottleneck, like administrative bottlenecks and everything he helped in fixing them. So, from that I could see well. This project may be different from the normal one that we've seen. (interview)
Effective CoPs were developed.	I think this also contribute to strengthen the collaboration because on that way it's really like you are all in the same room working together. ... everybody's presenting, you are discussing the result of everybody. Everybody's giving their opinion. So, it gives you the impression that you are involved in the same. This is also one thing which strengthen our capacity in terms of doing science. (interview)
Effective CoPs were developed, which led the members to express interest in sustaining the partnership during the last IMPALA meeting in the UK.	<p>It starts by the fact that at the beginning, uh, they asked you, they're asking you, okay, we are going to do we want to develop this. what do you think, uh, what is your opinion? Why do you think, should we bring in that kind of thing? So, it's a way of starting to say, okay, everybody has their voices here, so you can say something and it's important to everybody. ... So, it's not like we are going to design or we are just going to tell you what you are going to do and you just do it, and reading the results. So, it was the case for the IMPALA, it was the case also for the LaunchPad. (interview)</p> <p>They show interest in what people do. They showed interest in what scientists do, what we are doing. When people give some results, they don't just turn them down. But rather they want to look at, yes, how can we improve this result? How can we dig into other level? So, the, the sort of carrying everybody along. ... And we learn tremendously. We learn from one another during the project. So that's really built that trust. And that was why it was a bit sad to see IMPALA project ends. But thank God, we have some opportunity with the climate model evolution hub to sustain that kind of relationship. (interview)</p>
Capacity development of African researchers, which led the members to express interest in sustaining the partnership during the last IMPALA meeting in the UK.	Especially for the young researchers. It helps them. It helps them to focus. ... you could see their eagerness and the enthusiasm in them because the response they got was quite very interesting. Build that in there more to think that they are doing things that are useful. (interview)
Longer-term planning for developing African scientists and ECRs' research capacity.	Four core Africa-based researchers and six associated ECRs have remained active in the evaluation of the MetUM: they presented their progress in evaluating the latest version of the Met Office Unified Model (MetUM proto-GA8/GC4) at the IMPALA model evaluation workshop in Oxford (September 2018), and at the IMPALA science meeting (January 2019). (Annual Review, 2019, p. 15)
Sustained partnership of North-South and South-South research collaboration on climate modelling	Previous IMPALA-based collaboration on "Evaluating Climate Models with an African Lens" has led to advanced planning for establishment of an African Climate Model Evaluation Hub, and has secured continued DFID funding for its first phase of work partnering Oxford University, University of Yaoundé I, University of Nairobi, University of Cape Town, and Kwame Nkrumah University of Science and Technology. (Annual Review, 2019, p. 14)



TOP: Reflections from the Lusaka pilot project at the FRACTAL annual general meeting, South Africa, 2019. - Photo by Beth Mackay.

CASE 3

Reflective practice in participatory co-production process: A case of Lusaka's City Learning Labs

Main author: Ying-Syuan (Elaine) Huang

Contributing authors (and roles in this impact case)

Alice McClure, Project Coordinator for the FRACTAL project from the Climate Systems Analysis Group (CSAG) at the University of Cape Town (UCT)

Chris Jack was the Co-PI of the FRACTAL project and head of the climate information research cluster and deputy director of CSAG

Emerging outcomes and uptake

- Four policy briefs were co-developed with decision-makers and presented at a high-level policy breakfast. Information in these briefs has been used in training and workshops following the FRACTAL process and informs some decisions for those who were involved in the Learning Labs.
- Cities and Regions Talanoa Dialogue events were held. The Talanoa dialogues (a process to help countries implement and enhance their Nationally Determined Contributions) contributed to the IPCC Talanoa dialogues platform (ICLEI and city learning cluster) and fed into the climate negotiations at COP.
- The Climate Risk Narratives and policy briefs have acted as boundary objects for ongoing stakeholder engagement.
- Through the Embedded Researcher approach, five ECRs built capacity as boundary agents between research and policy on an ongoing basis.

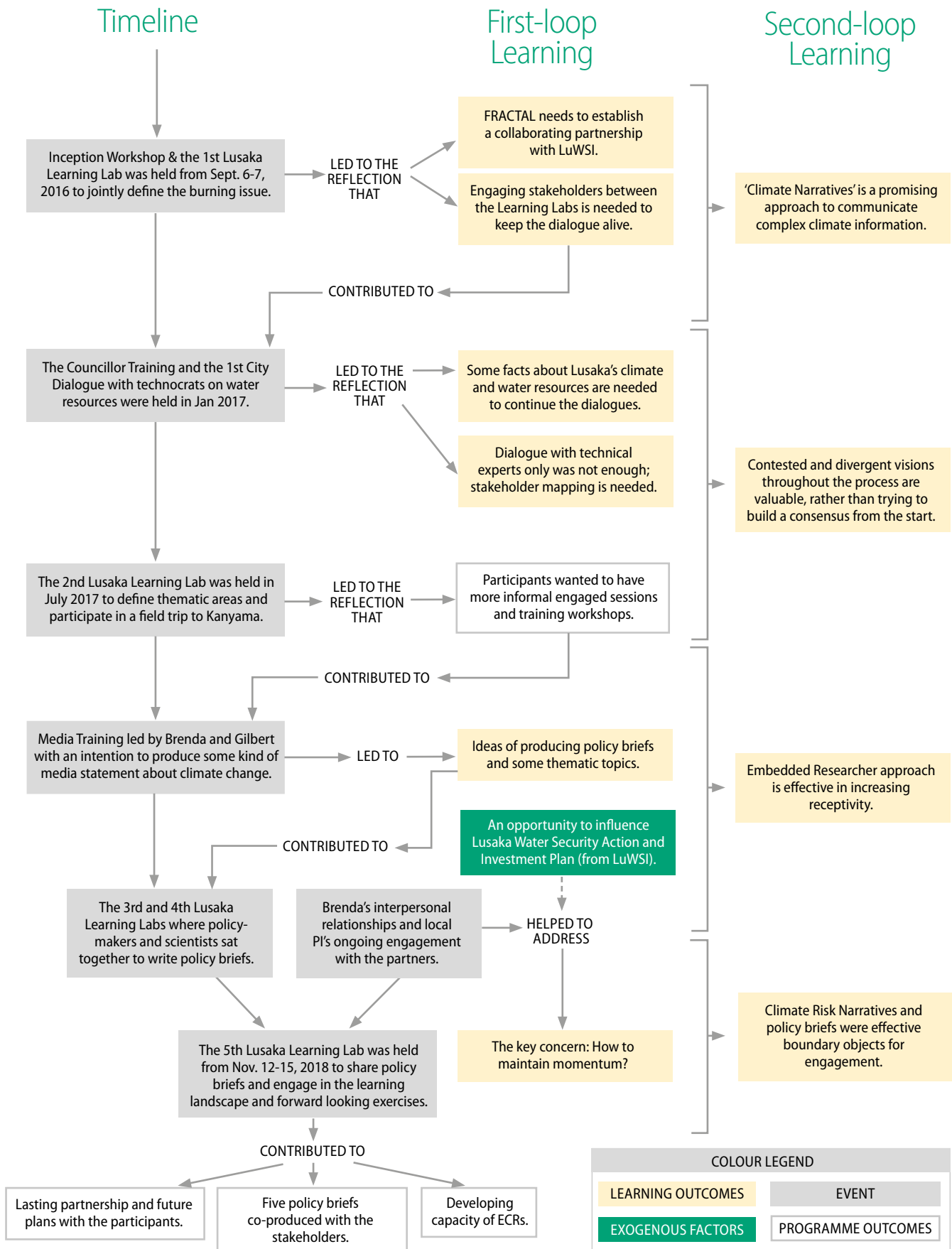
Significance

- Fundamental changes in key decision pathways (around water, flooding, land use and infrastructure development) to increase the resilience of city-regions.
- Lusaka city representatives expressed a desire to continue a learning lab-type engagement after the project ends.
- FRACTAL's city learning experience has been used by LuWSI in the design of the Lusaka Water Action and Investment Plan.

Background

One important goal of FRACTAL was to enhance understanding of how to integrate scientific climate change knowledge into decision-making at the city regional scale in Southern Africa. The approach of City Learning Labs was developed to achieve this objective through an iterative, co-production process with participating stakeholders and partners. Participants in these City Learning Labs were involved in these engagements to understand various perspectives, discuss possible solutions, and co-create knowledge products that could alter key decision pathways for increasing the resilience of city-regions. This approach to consortia-learning was highly appreciated within FRACTAL members, and almost all of them found it positively influenced their research practice.

Retrospective story of change: Lusaka's City Learning Labs



Main story



City representatives have expressed a desire to “continue a learning lab-type engagement” after the project ends.

Lusaka is one of the three cities (the others being Maputo and Windhoek) in FRACTAL that used the approach of the City Learning Labs to understand how urban energy and water systems would function in a changing climate. The city learning processes in Lusaka have led to the “fundamental changes in key decision pathways (around water, flooding, land use and infrastructure development) to increase the [city’s] resilience” (Koelle, 2019, p. 25). For example, [the Lusaka Water Action and Investment Plan drew on the Learning Lab’s approach to co-production in the policy development and planning process \(interview\)](#). Lusaka’s city learning process has also effectively leveraged high-level buy-in to increase the resilience of the city. This is a new norm of co-exploration and policy learning and has been cultivated in Lusaka’s decision-making space, as the city representatives have expressed a desire to “continue a learning lab-type engagement” after the project ends (Annual Review, 2019, p. 9). These impacts demonstrate an emergent “agora” approach to co-production (Harvey et al. 2019) in Lusaka’s city learning process. That is, instead of being output-oriented and bounded in scope and time, the processes and outcomes of Lusaka’s City Learning Labs have the potential to transform norms of practice in addressing sustainability challenges.

The focus of “participatory co-exploration” was set up from the beginning of the project design, and was thus embedded in every aspect of the FRACTAL practice (FRACTAL proposal, 2014, p. 6-8). In the City Learning Labs, participants were involved in activities to understand various perspectives, discuss possible solutions, and co-create knowledge products that could alter key decision pathways for increasing the resilience of city-regions. [In particular, the emphasis was placed on engaging a range of societal “co-researchers” in an iterative learning process to actively co-explore possible solutions to the climate challenges that the participants jointly decided to address.](#) The practice involved paying particular “attention to the political economy of knowledge production and use” (FRACTAL proposal, 2014, p. 6-8) when co-producing new knowledge, to disrupt norms and redistribute expertise in the decision-making space. The goals were to facilitate transformative learning with stakeholders and to

build the capacity of the city-regions for better informed decision-making (FRACTAL proposal, 2014, p. 6-8).

However, a careful design of the programme (e.g. the core principle of mutual learning and co-production for the City Learning Labs) does not necessarily mean that it would lead to transformative outcomes such as those observed in the case of Lusaka. Through our analysis, it was found that reflective practice stood out as a key contributing factor to the success of this case. Ongoing reflection was practised not only within the project team, but also with the Learning Lab participants. Specifically, allocating time for reflection was planned at the end of every Learning Lab for the participants to reflect on the process. The participants were also invited to decide what they would like to happen for the next lab and which direction to pursue. This feedback was carefully documented and taken seriously by the project team when planning the following formal and informal engagement.

Within the project team, a reflection meeting was also held after every learning lab to discuss “what happened, what worked, [and] what didn’t work” (interview). For example, the discussion in the first city dialogue held in January 2017 was found “shallow and broad” and “not pushing things forward” (Mwalukanga et al. 2017a, p. 8). The team soon learned that the presentations (or the lightning talks) at these events play a critical role in situating the discussion in the context of climate change instead of talking about sustainability issues in a general sense. Importantly, the project team became aware that “what is missing and needed in Lusaka institutional/research circles, is what the intended output of the Dialogue was” (Mwalukanga et al. 2017a, p. 8). Therefore, “some basic, but informative climate facts in Lusaka were necessary first, before in-depth and focused discussions were possible” (Mwalukanga et al. 2017a, p. 8). The project team took stock of these reflections to design the following Learning Labs and engagement events.

Reflective practice not only contributed to the team’s problem-solving and adaptive capacity (single loop learning), but also engaged the members



Having a joint long-term vision may not always be helpful when the challenges are present and immediate actions are required.

in challenging the underlying assumptions and pre-defined goals which led to new insights and strategies throughout the process (second loop learning as described by Argyris (1976). For example, when planning the second Learning Lab, the team went in with the idea that they needed to bring people's thinking and visions together. Therefore, a back-casting visioning exercise was carried out during the second Learning Lab to engage participants in collectively envisioning a mid- and long-term future for Lusaka. The goal of this participatory process was to engage participants in agreeing on a joint vision and identify steps to achieve it. However, having a joint long-term vision may not always be helpful when the challenges are present and immediate actions are required. During the exercise the discussion rarely "got beyond the next five years" (interview). This realisation was that having "contested and divergent views throughout the process" can sometimes be more valuable "than trying to build consensus" on the goal as the start.

Effective use of boundary objects was also found to be a key factor contributing to the success of Lusaka's City Learning Labs. That is, Climate Risk Narratives (CRNs) and policy briefs were used as the boundary objects for stakeholder engagement in Lusaka (Mwalukanga et al. 2018). Coined by Star and Griesemer (1989), boundary objects are a form of arrangement that allow different groups to work together without consensus but a wish to cooperate. Boundary objects can be abstract (e.g. ideas, classification systems, or concepts) or concrete (e.g. images, maps, or tools) (Steger et al. 2018). They tend to be temporal, subject to reflection and local tailoring, and based in action (Star, 2010). In Lusaka's City Learning Labs, CRNs and policy briefs acted as the key boundary objects that resided between the social worlds (or CoPs) of the decision-makers and scientists. They were adaptable to local needs yet "robust enough to maintain a common identity" (Star, 2010, p. 393). Therefore, the decision-makers and scientists were able to tack back-and-forth between different forms of CRNs and policy briefs, making them more relevant to their members for further engagement.

In fact, the development of policy briefs was not a

pre-planned output of Lusaka's City Learning Labs. The idea came from the participants during the 2017 Media Training where they saw the need for media statements addressing the burning issues in Lusaka related to climate change. **Therefore, co-developing policy briefs became a mutual priority or "the golden thread towards which the team was working" (interview).** It acted as a boundary object that brought the decision-makers and scientists together for more in-depth dialogue. As a member described, the idea of co-producing policy briefs "became the red [or unifying] thread" that guided the rest of "the research search activities [and] all the engagement activity for most of the Learning Lab process in Lusaka". In the fourth and fifth Learning Labs, the decision-makers and the project teams even sat and wrote the policy briefs together "over a number of days (and evenings)" (Mwalukanga et al. 2018, p. 1). As a result, these policy briefs are now a shared product between all members involved. A shared ownership of such a product is essential for medium- to long-term knowledge uptake, as it allowed all members to use these policy briefs as a new form of boundary objects to initiate diverse dialogues and engage future collaborations with other decision-makers, researchers and practitioners.

As a FRACTAL member described, the co-production approach to City Learning Labs allowed for a mutual learning process that is "not 'expert' to 'user' but much wider and deeper". This case thus presents an interesting opportunity for researchers and practitioners alike to reflect on the currently common approach to producing knowledge products and translating complex climate information for the "users". It also illustrates a potential benefit of the co-production in establishing long-term engagement and a trusting relationship between partners.

Key contributing factors involved in this impact case

- Reflective practice that led to a double loop learning process
- Effective use of boundary objects for stakeholder engagement
- Flexible outputs in the project design that allowed for true co-production processes to occur

Supporting evidence

CLAIMS	EVIDENCE
<p>The inception workshop and the 1st Lusaka Learning Lab led to the reflection that “engaging stakeholders between the learning labs is needed to keep the dialogue alive”.</p>	<p>Several action points emerged from the city learning process (in addition to the requests from the participants) . . .</p> <ul style="list-style-type: none"> • Reflection on the transdisciplinary knowledge co-production process . . . will be shared through the learning channels (slack, the report and the bi-weekly digest). • Learning Lab process guidelines: many lessons were learned during these first Lusaka Learning Labs. These lessons (and general guidelines for developing and managing the process) will be collated into a document. • Video: the inception workshop and Learning Labs were recorded on video. These recordings will be processed and shared with the team. • Blog: a blog has been developed and shared on the CSAG website. (Mwalukanga et al. 2016)
<p>The learning that “Climate Narratives is a promising approach to communicating complex climate information”.</p>	<p>Narratives are proving to be a promising approach for communicating complex climate information in Lusaka and issues around contradictory data/information (Roux et al. 2017, p. 12)</p>
<p>The 2017 Councillor Training and the 1st City Dialogue with technocrats led to the reflection that “some facts about Lusaka climate and water resources are needed to continue the dialogues”.</p>	<p>The dialogue established that what is missing and needed in Lusaka institutional/research circles, is what the intended output of the Dialogue was. I.e. some basic, but informative facts about Lusaka climate and water resources (in the past and in the future), and pointers to sources that unpacked and extended those basic facts. (Mwalukanga et al. 2017a, p. 8).</p>
<p>The 2017 Councillor Training and the 1st City Dialogue with technocrats led to the reflection that “dialogue with only technical experts was not enough. Stakeholder mapping is needed”.</p>	<p>After the training of LCC management and councillors, it was realised that there are several players in the climate change adaptation and response arena of Lusaka and therefore it is critical to understand who these players are. Stakeholder mapping will be conducted in the water and energy sector. (Mwalukanga et al. 2017b, p.15)</p>
<p>The learning that “contested and divergent visions throughout the process is valuable, rather than trying to build a consensus from the start”.</p>	<p>. . . in terms of what we needed to do, we kind of never got beyond the next five years [. . .] anyway. so, I don’t think it really works. I think that for me was realising that coding contested and divergent views throughout the process is really valuable rather than trying to build a consensus. (interview)</p>

CLAIMS	EVIDENCE
<p>The 2nd Lusaka Learning Lab led to the reflection that “participants wanted to have more informal engagement sessions and training workshops”.</p>	<p>Participants were also requested to state what they liked about the workshop.</p> <ul style="list-style-type: none"> • Presentations, projections on Lusaka’s future rainfall and temperature • Presentation on Lusaka, water security for the next generation • The visioning and stepping stones activity • The free and open communication • The informal engagements (Mwalukanga et al. 2017b, p. 16)
<p>Media Training held in 2017 led to “the ideas of producing policy briefs and some thematic topics”.</p>	<p>This idea of policy briefs that became the red thread into which all the other information kind of fed and that guided the reader, the research search activities, all the rest, all the engagement activity for most of the, of the Learning Lab process in Lusaka, they became sort of the outcome that was not defined at the beginning or the output that was not defined at the beginning of the lab. (interview)</p>
<p>The learning that “Embedded Researcher approach is effective in increasing receptivity”.</p>	<p>FRACTAL’s Embedded Researchers in Durban, Maputo, Lusaka and Windhoek city governments played a central role in understanding local policy landscapes and shaping FRACAL activities, developing their capacity as boundary agents straddling the research-policy divide (see pilot studies, Output 2 and Impact Case Studies). (Annual Review, 2019, p. 15)</p>
<p>The learning that “Climate Risk Narratives and policy briefs were effective boundary objects for engagement”.</p>	<p>Using the policy briefs (and climate narratives) as “boundary tools”, this city learning process in Lusaka represents an example of co-production according to the ambitious objectives that were set out in the FRACAL project, and body of literature on the topic, which is summarised in the working paper that was developed in March 2017. This process was not defined at the outset of the FRACAL project in Lusaka but rather emerged because of the city learning process. The policy briefs are a useful outcome for decision-making but equally as important was the process of scientists and decision-makers sitting together over a number of days (and evenings) to form relationships, bring different types together and understand each other’s perspectives better. (Mwalukanga et al. 2018. p. 1)</p>



Annex 2

List of FCFA
documents analysed

For learning questions on promoting collective learning

Focus	Title of the Document	Type of Document	Publication Year and Authors
CCKE	FCFA Mid-Term Conference 4th-7th September 2017, Cape Town	News	Rael, L. (2017)
CCKE	FCFA Mid-Term Conference Themes	Attachment	Rael, L. (2017)
CCKE	Mid-Term Conference Report	Report	Roux, J.P. et al. (2017)
FCFA	2016 FCFA Annual Review	Annual Progress Review	(2016)
FCFA	2017 FCFA Annual Review	Annual Progress Review	(2017)
FCFA	2018 FCFA Annual Review	Annual Progress Review	(2018)
FCFA	2019 FCFA Annual Review	Annual Progress Review	(2019)
AMMA-2050	AMMA-2050 Pathways to Impact	Consortium proposal	(2014)
AMMA-2050	AMMA-2050 Case for Support	Consortium proposal	(2014)
FRACTAL	FRACTAL Pathways to Impact	Consortium proposal	(2014)
FRACTAL	FRACTAL Case for Support	Consortium proposal	(2014)
FRACTAL	Baseline assessment for Lusaka	Baseline report	The Pegasys team (n.d.)
FRACTAL	FRACTAL annual report and annexes	Annual report	(2019)
FRACTAL	2017 DFID reporting: FRACTAL Impact studies	Impact case study (ICS)	(2017)
FRACTAL	2018 DFID reporting: FRACTAL Impact studies	ICS	(2018)
FRACTAL	City Learning Dialogue for decision-making on city level: unpacking the City Learning Lab approach.	Working paper	Arrighi, J. et al. (2016)
FRACTAL	Receptivity and judgement: Expanding ways of knowing the climate to strengthen the resilience of cities.	Working Paper	Scott, D. & Taylor, A. (2019)
FRACTAL	City Learning Labs for dialogue and decision making.	Webinar recording and presentation slides	(Oct-14-2019)
FRACTAL	Report on the inception workshop and learning lab held on 6th and 7th September 2016 at Chaminuka Lodge.	Report	Mwalukanga, B., Siame, G., & McClure, A. (2016)

Focus	Title of the Document	Type of Document	Publication Year and Authors
FRACTAL	Lusaka Training for City Councillors	Report	Mwalukanga, B. et al. (2017)
FRACTAL	Lusaka City Dialogue 1	Report	Mwalukanga, B. et al. (2017)
FRACTAL	Second Lusaka Learning Lab - June 2017	Report	(2017)
FRACTAL	Third Lusaka Learning Lab- November 2017	Report	Mwalukanga, B. & Audrey Daka, A. (2017)
FRACTAL	Fourth Lusaka Learning Lab - March 2018	Report	(2018)
FRACTAL	Climate risk narratives and climate information for Lusaka: Lusaka climate training Session 7.	Presentation slides	Jones, R. (2018)
FRACTAL	Lusaka City Governance Dialogue and Talanoa Dialogue.	Report	(2018)
FRACTAL	Fifth Lusaka Learning Lab	Report	(2018)
FRACTAL	Exploring perspectives that underpin decisions for southern African urban development Insights from Lusaka, Zambia.	Working paper	Mwalukanga, B. et al. (2019)
HyCRISTAL	HyCRISTAL Pathways to Impact	Consortium proposal	(2014)
HyCRISTAL	HyCRISTAL Case for Support.pdf	Consortium proposal	(2014)
HyCRISTAL	WP7	Revised proposal	(2014)
UMFULA	UMFULA Pathways to Impact	Consortium proposal	(2014)
UMFULA	UMFULA Case for Support	Consortium proposal	(2014)
IMPALA	IMPALA Case for Support 2	Consortium proposal	(2014)
IMPALA	Evaluating Climate Models with an African Lens.	Journal article	James (2018)
IMPALA	How can climate models be improved over Africa? Investigating global models with local knowledge.	Webinar recording	(May-20-2018)
FCFA	Baseline Synthesis Report: Understanding barriers to climate science generation and uptake in sub-Saharan Africa for medium-to long-term decisions.	Baseline Synthesis report	(2018)

For learning questions on mobilising climate information

Focus	Title of the Document	Type of Document	Publication Year and Authors
FCFA	Policy Brief Malawi	Policy Brief	2015, Vincent, K. et al. (2015)
FCFA	Africa's Climate: Helping decision-makers make sense of climate information	CDKN scoping review	Creese A. et al. (2016)
FCFA	Baseline Synthesis Report: Understanding barriers to climate science generation and uptake in sub-Saharan Africa for medium- to long-term decisions	Baseline Synthesis report	(2018)
FCFA	2016 FCFA Annual Review	Annual Progress Review	(2016)
FCFA	2017 FCFA Annual Review	Annual Progress Review	(2017)
FCFA	2018 FCFA Annual Review	Annual Progress Review	(2018)
FCFA	2019 FCFA Annual Review	Annual Progress Review	(2019)
FCFA	Tools and Products	Summary	
FCFA	Media outreach	Summary	
CCKE	The political economy of long-lived decisions	Framework Report	2015, PEGASYS
CCKE	Impact Case Study – CCKE support to FONERWA	Impact case study (ICS)	Araujo, J. (2017)
FRACTAL	Co-exploratory climate risk workshops: Experiences from urban Africa	Journal article	Steynor, A. et al. (2016)
FRACTAL	2018 DFID reporting: FRACTAL Impact studies	ICS	(2018)
FRACTAL	2019 DFID reporting: FRACTAL Impact studies	ICS	(2019)
FRACTAL	FRACTAL research methods for decision processes	Working paper	Taylor, R. et al. (2017)
FRACTAL	Baseline assessment for Lusaka	Baseline report	The Pegasys team (n.d.)
FRACTAL	Africa's climate: helping decision-makers make sense of climate information	Country Factsheet	(2016)
FRACTAL	Receptivity and judgement: Expanding ways of knowing the climate to strengthen the resilience of cities	Working Paper	Scott., D. & Taylor, A. (2019)
FRACTAL	The Story of Water in Windhoek: A Narrative: Approach to Interpreting a Transdisciplinary Process	Journal article	Scott et al. (2018)
FRACTAL	FRACTAL annual report and annexes	Annual report	(2019)
HyCRISTAL	Pilots CI4Tea (Kenya)	Pilot application	
HyCRISTAL	CI4Tea	ICS	Mittal, N. et al. (2018)
HyCRISTAL	Python	ICS	Kisembe J. et al. (2019)

Focus	Title of the Document	Type of Document	Publication Year and Authors
HyCRISTAL	Urban WASH	ICS	Way, C. & Evans, B. (2019)
HyCRISTAL	Rural Impact Case Study	ICS	Cornforth R. (2018)
HyCRISTAL	British Geological Survey	ICS	(2019)
HyCRISTAL	Pilots HyTPP	Pilot application	
HyCRISTAL	HyTpp	ICS	Leeds (2019)
HyCRISTAL	Output 2 Pilots_rural	Pilot application	
HyCRISTAL	HyCRISTAL annual report and annexes	Annual report	(2019)
AMMA-2050	Report from the Future Climate for Africa Pilot Country Case Study Project	FCFA pilot country case study report	CSAG, START, SEI, and University of Ghana (2018)
AMMA-2050	Climate metrics	ICS	Bamba. A. et al. (2018)
AMMA-2050	Ouaga	ICS	Taylor C. et al. (n.d.)
AMMA-2050	Developing decision-relevant climate information and supporting its appropriate application: Learning from the Zaman Lebedi BRACED consortium in Burkina Faso and collaboration with AMMA-2050	Learning Paper	(2017)
AMMA-2050	TR3-Summary baseline.pdf	Technical Report	Visman, E. et al. (2016)
AMMA-2050	Preliminary Findings of the Key Informant Interview Scorecards Towards Establish A Baseline For AMMA-2050	Technical Report	Visman, E. et al. (2015)
AMMA-2050	AMMA-2050 annual report and annexes	Annual report	(2019)
UMFULA	Climate information needs in Southern Africa: a review	Review paper	Lötter et al.(2018)
UMFULA	Metrics	ICS	Archer, E. et al. (2018)
UMFULA	Country climate briefs	ICS	Rouhaud, E. et al. (2018)
UMFULA	Actual and Potential Weather and Climate Information Needs for Development Planning in Malawi: Results of a Future Climate for Africa Pilot Case Study	Technical Report	Vincent, K. et al. (2014)
UMFULA	Case study FCFA-Revised	Learning Review	
UMFULA	UMFULA annual report and annexes	Annual Report	(2019)
	Perceptions.docx	Pilot application	
	Pilots Water	Pilot application	
	Pilots Urban	Pilot application	

ANNEX 3

Research ethics approval



Research Ethics Board Office
James Administration Bldg.
845 Sherbrooke Street West. Rm 325
Montreal, QC H3A 0G4

Tel: (514) 398-6831

Website: <https://www.mcgill.ca/research/research/compliance/human>

Research Ethics Board 2 Certificate of Ethical Acceptability of Research Involving Humans

REB File # 50-0619

Project Title: Future Climate for Africa (FCFA) Learning Agenda

McGill Principal Investigator: Professor Blane Harvey

Department: Integrated Studies in Education

Approval Period: June 27, 2019 – June 26, 2020

The REB 2 reviewed and approved this project by delegated review in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Participants and the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans.

Georgia Kalavritinos
Ethics Review Administrator

-
- * Approval is granted only for the research and purposes described.
 - * Modifications to the approved research must be reviewed and approved by the REB before they can be implemented.
 - * A Request for Renewal form must be submitted before the above expiry date. Research cannot be conducted without a current ethics approval. Submit 2-3 weeks ahead of the expiry date.
 - * When a project has been completed or terminated, a Study Closure form must be submitted.
 - * Unanticipated issues that may increase the risk level to participants or that may have other ethical implications must be promptly reported to the REB. Serious adverse events experienced by a participant in conjunction with the research must be reported to the REB without delay.
 - * The REB must be promptly notified of any new information that may affect the welfare or consent of participants.
 - * The REB must be notified of any suspension or cancellation imposed by a funding agency or regulatory body that is related to this study.
 - * The REB must be notified of any findings that may have ethical implications or may affect the decision of the REB.

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