ENVIRONMENTAL RESEARCH
LETTERS

**LETTER • OPEN ACCESS**

# The future-climate, current-policy framework: towards an approach linking climate science to sector policy development

To cite this article: Barbara E Evans *et al* 2020 *Environ. Res. Lett.* **15** 114037

Environmental Research Letters

CrossMark

OPEN ACCESS

RECEIVED
19 May 2020

REVISED
22 September 2020

ACCEPTED FOR PUBLICATION
6 October 2020

PUBLISHED
23 November 2020



LETTER

# The future-climate, current-policy framework: towards an approach linking climate science to sector policy development

**Barbara E Evans**[1,*], **David P Rowell**[2] **and Frederick H M Semazzi**[3]

[1] University of Leeds, United Kingdom
[2] UK Met Office, Hadley Centre for Climate Prediction and Research, United Kingdom
[3] North Carolina State University, United States of America

**E-mail:** b.e.evans@leeds.ac.uk

**Keywords:** climate change, policy, east Africa, planning, sanitation, agriculture, water

## Abstract

That global climate is being altered by human activities is well-established; for specific locations, however, the details of how and when many aspects of the changes will become manifest remains somewhat uncertain. For many policy makers there is a gap between recognising a long-term change and implementing short-term practical responses; therefore many countries are failing to implement changes needed for long-term adaptation. Traditional planning approaches are often closely aligned with near- term political cycles and perform poorly in terms of prioritising interventions that address multi-decadal climate impacts. We propose a novel approach that builds on adaptive planning and lessons from the business sector. The Future-Climate, Current-Policy (FCCP) Framework is based on plausible medium-term future climate scenarios, linked 'backwards' to identify short-term 'no regrets' actions. The approach was designed by a team of climate scientists and policy practitioners in East Africa and tested in national and regional fora. Initial trials of the FCCP Framework has proved it to be popular and effective as a way of linking climate science with policy. Its use shows promise as a way of initiating discussions that can enable long-term climate change information to feed effectively into the policy and planning process.

## 1. Introduction

That global climate is being altered by human activities is well-established; for specific regions, however, the details of how and when many aspects of the changes will become manifest remains somewhat uncertain. This change is also happening at a time when many countries are undergoing rapid economic and demographic change. In 2015, the world committed to an ambitious set of development targets, the United Nations Sustainable Development Goals (SDGs). The SDGs acknowledge that development is complex and multi-faceted, and in setting out a wide ranging and extensive framework they draw attention to the scale of the task. The SDGs also have a time horizon of 15 years (2015 to 2030), a period of time during which the impacts of climate change are expected to be significant. Many countries have tailored their national development programmes to address some or all of the pressing issues expressed in the SDGs, and in many cases a general recognition of the challenges associated with climate change is included. However, specific commitments designed to both mitigate and adapt to the effects of climate change are often absent, unclear, or are not backed by commensurate institutional capacity, resources and coordination (Antwi-Agyei *et al* 2018, England *et al* 2018). There has been a long history of international and national commitments to general principles, but what is often lacking is clear guidance that can be acted upon by policy makers and practitioners on the ground (see for example Dessai *et al* 2005).

It is undoubtedly difficult for national and local governments to adequately prepare for long-term change while facing significant short-term challenges. The gap between recognising a long-term change and implementing short-term practical responses appears to be hard to bridge (Climate and Development Knowledge Network 2012). Some studies suggest that this disconnect is at least partly a problem of time scales. Policy responses to climate change are needed that will be resilient and appropriate in the long term,

* Author to whom any correspondence should be addressed.

and that can respond well under a range of possible future scenarios, while policy is generally made in political and technical institutions that run on much shorter time horizons; five-year election cycles or even annual budgeting cycles. There is strong evidence that political imperatives have often led to deferral of urgent and difficult decisions, often for decades. There is also evidence that the nature of the uncertainty in climate science is poorly understood by policy makers. While many or most decision makers are aware that the climate is changing, non climate-specialists are often unaware of the extent to which the direction or scale of change is known or can be predicted with a reasonable degree of confidence. As a result, they are often challenged in identifying priority actions and critical changes. Finally, the pressing need to address short-term priority needs can 'crowd out' strategic changes designed to secure long-term resilience.

In this letter we propose one approach for bridging this gap and facilitating a policy discourse between those involved in climate science and those involved in policy making. In this short letter we demonstrate its use in the Greater Horn of Africa (GHA) region, as an example, and explore its potential to be further developed and tested. This new approach is being used in the mapping of climate services deliverables on long-term national development policy targets (e.g. NDPII 2015) in the GHA region and beyond.

## 2. Background (planning experiences)

Development is complicated. National and local governments face well-documented challenges to balance competing and urgent development needs, and this is exacerbated in rapidly growing economies with a low tax base, where public funding is scarce. Long-term changes in the climate present additional challenges. For resilience, policy must be developed that delivers good outcomes both in the short term and into the future, even though the nature of the changing climate means that there are a number of different possible future scenarios.

Traditional public sector planning, by contrast, tends to be incremental and conservative. It is often based upon annual budgetary cycles managed at the intersection of the political and the executive arms of government. In many countries in the GHA, the process is modelled on the Westminster system, wherein sector ministries and departments must compete for funding allocations from the Ministry of Finance. Budgeting is often driven from the bottom up—with local offices and departments preparing annual budgets that are then included in the national level request for funding. Despite recent decentralisation, evidence suggests that responsive local budgeting that engages effectively with local community needs and opinions remains elusive (see for example Tidemand 2009, Tsofa *et al* 2017). To a large extent, budget allocations and plans remain highly influenced by competing political interests at higher levels of government.

Furthermore, when resources are scarce, the total budget requested is rarely forthcoming and often delivered late in the financial year. This has two effects. The first is to encourage unrealistic requests for funding, in the hope that a 'reduced' allocation will still be sufficient to deliver the planned programme. The second effect is to reduce the efficacy of funding as a whole because where part of the budget is allocated and disbursed late funds may either remain unspent or are spent on high cost items outside of the original plan, to ensure utilisation before the end of the funding cycle. This tendency for budget allocations to be released late also has the effect of focusing spending at the start of the financial year on 'contracted' obligations such as salaries and utilities, because these must be paid even if the overall budget is never honoured. Many observers note that the net effect of this, and other structural constraints in government, is to encourage 'planning to budget' to the detriment of long-term strategic change. In urban water and sanitation, for example, constraints in planning and budgeting limit the ability of departments to invest in re-engineering water or sanitation systems to deliver resilient services, because this would require reliable multi-year financial planning and operational transformation that cannot be funded from sporadic unreliable annual allocations. Limitations in the planning and budgeting system thus constrain the potential to drive the sort of systemic changes needed to tackle climate change.

In response to the well documented limitations of conventional planning many commentators have proposed a more adaptive approach to planning, recognising that decisions made today may have unexpected consequences tomorrow, and that there are significant interdependencies between decisions made in a range of sectors. A range of adaptive planning tools and approaches have been developed many of which have been applied to the sphere of natural resources (see for example Alterman 1988, Kato and Ahern 2008, Poff *et al* 2016). Adaptive planning is well established and widely used particularly in the private and third sectors. While governments often play lip service there is little evidence of their adopting true adaptive planning in practice. A significant body of work provides useful frameworks that can be used or modified and there are well documented cases of these being applied to climate change. However, while adaptive planning is undoubtedly important and useful it has three potential flaws that have been found in some cases to limit its applicability in the early phases of climate-responsive policy planning.

The first is that it is complicated; adaptive planning frameworks by definition are complex and require a sophisticated understanding of path dependency and interdependency. Non-specialists may struggle to engage with the process in the early stages; where multiple stakeholders need to participate the twin paths of adaptive planning and negotiation may prove so complex that the result is paralysis and no action. Chaudhury *et al* (2012) note for example the challenge of engaging sufficient stakeholders in an effective way.

The second is that it remains difficult to link long-term future-facing climate data to practical policy decisions. Many sector planners are familiar with historic data (for example, engineers use historic rainfall and flooding data to design stormwater infrastructure) which has high specificity and accuracy. Nissan *et al* (2019) noted that 'multidecadal climate change projections, while essential for informing mitigation policy, do not target the appropriate timescale needed for the majority of adaptation decisions …'. This mismatch between the available forward-looking data and traditional planning approaches creates a mismatch and renders it challenging to plan for building resilience into the future.

The final problem lies with human nature. Planning processes that start from the present and work forward risk capture by stakeholders whose incentives (conscious or unconscious) is to reinforce their current behaviours. Climate change calls for a new way of working and requires a planning approach that can place adequate priority on to long-term goals.

In summary, the anticipated threat of climate change introduces a tension between the need to achieve long-term, large-scale change under conditions of uncertainty and the needs of short-term decision makers to meet budgetary planning cycles with a focus on current staffing and ongoing operational management. The tendency is thus for long-term planning to be subsumed under pressing everyday needs.

A proven, but under-utilized, approach to ensure near-term decisions are also advancing long-term interests is to explicitly 'work backwards' from the long-term goal to the near-term decision. The idea of 'working backwards', from impact towards action, has long been recognised as an important concept both in the development literature and in the climate change literature, where it is often referred to as 'back-casting' (see for example Vervoort 2013). In development literature and practice, the idea is embedded in the use of logical frameworks (often known as 'logframes'). The logframe process starts with a discussion to define the anticipated or desired impact of an intervention. Subsequently, those planning the intervention walk 'backwards' from the desired impact, first towards the project outcomes needed to achieve the intended impact, then to the corresponding outputs required to produce those outcomes. The final step is to identify the inputs needed to produce these outputs. Logframes, and the related 'theory of change' approach, thus enable a linking between immediate action and later effects. They are not, however, widely used outside of project and programme settings where their use is widely promoted by bilateral and multilateral agencies and international non-governmental organisations. Furthermore, logframes are often constrained as project planning tools, because the general themes of planned activities are known in advance, and the ultimate impact is defined by the funding agency.

Both adaptive planning and logical frameworks have also informed and drawn from another planning strand, from the business literature. Businesses often use variations on an integrated planning cycle that links a long-term (i.e. ten years) planning forecast to a medium-term (i.e. three year) requirement for 'capability development' and short-term (i.e. one year) 'breakthrough' projects. Short-term projects can thus be placed in a 10-3-1 framework that calls for them to be both achievable but also aspirational and geared to address long-term change. This long-established approach has been used to 'legitimise' short-term innovation because it creates explicit links to as yet unrealised future changes (Earl *et al* 1995). This idea has been amplified, with an explicit recognition of the uncertainty in future scenarios by, for example, Sharpe *et al* (2016), who use 'three horizons' to frame a range of possible futures as the basis for planning. A combination of scenario development and 'back-casting' has proved successful in several development sectors, for example, for assessing the effect of implementing the Water Framework Directive in Europe (Kok *et al* 2011).

The question is can we use this combined experience from the development and business world to find a way to link changes needed in the distant future with concrete action today and to kick start more informed policy-focused discussions about policy priorities that would enable the participation of both climate scientists and policy specialists?

## 3. The Future-Climate, Current-Policy (FCCP) framework

Our approach has drawn on all these strands but we have aimed to simplify them sufficiently to engage key stakeholders in a rapid and comprehensible process. Our aim has been to develop an approach that is: sufficiently grounded and detailed to generate realistic draft plans; focused on the generation of a set of achievable but challenging short-term actions; and also geared to address long-term change. The resultant 'Future-Climate, Current-Policy (FCCP) Framework' enables a flexible debate that anchors proposed actions to an analysis of whether they are likely to result in outcomes that mitigate future climate change impacts. We use the example of East Africa to illustrate the implementation and testing of this approach.

Over five years the authors have engaged in the HyCRISTAL collaboration, which aims to generate new climate science for East Africa focused around the Lake Victoria Basin specifically on a 40-year time horizon (Marsham *et al* 2015). There is an explicit recognition of the need to create a link between the generation of new climate science and policy change on the ground. A series of meetings were held that brought together leading climate scientists and sectoral policy makers, in the fields of water management, urban infrastructure, agriculture and rural livelihoods, tea production, transport and fisheries in East Africa. Policy makers and development practitioners in the region understand the 'idea of climate change', but are often unable to relate it to immediate policy choices. This appears to be because the longer time horizons of climate change outstrip regular planning cycles.

For example, if we know that in forty years' time inland freshwater lake temperatures are likely to rise, we can understand that this is likely to have an effect on current fish stocks. Critical changes to the intensity and pattern of rainfall are a likely result, potentially affecting lake visibility, so that Nile Perch, for example, may no longer be a viable crop, that means that many people who currently make a living from Perch fisheries will no longer be able to do so. However we also know that the details of what will happen are not precisely known—and this, coupled with the long time frame, can make the problem seem overwhelming. There is no obvious answer to the question, what should we do about this pressing future problem today?

Two innovations attempt to bridge this gap between the science of medium-term (40 years) change and short-term planning. Firstly, Climate Risk Narratives (CRNs) are used to reduce the complex multi-dimensional nature of the climate model projection data to three plausible quasi-quantitative climate scenarios (Jack *et al* 2019, Burgin *et al* 2020). They are based on a synthesis of the most up to date climate information with a specific focus on communicating critical messages to audiences with different levels of climate science capacity (Burgin *et al* 2019a,b). More sophisticated and established scenario planning approaches, e.g. the 2 × 2 scenario method, are well adapted to later stages of the planning process, but are noted for their complexity (Ramirez and Wilkinson 2013). In contrast, the Climate Risk Narratives are less complex, using potential climate futures to support the early stages of policy planning.

In East Africa, Burgin *et al*'s (2020) three CRNs are used to frame the policy discussion. These broadly span the range of climate model outputs, highlighting the primary areas of risk and uncertainty, and ensuring internal physical consistency within each narrative. Individually, each CRN is posed deterministically, but collectively they give a sense of the prediction uncertainty, with headlines as follows:

CRN1—Much wetter seasons, large increase in extreme rainfall events, and hotter.

CRN2—Increase in extreme rainfall events, and hotter.

CRN3—Much hotter and drier with more erratic rainy seasons.

Secondly, we develop the FCCP Framework, that utilises these CRNs to support planning that is responsive to climate change. The overall approach of FCCP is based on the idea of articulating a desirable outcome on the medium-term (40 year) time horizon and working back from that point to identify short-term (1 to 5 year) actions. A forty-year vision is potentially extremely extensive, so to ensure that the results are practical and achievable the FCCP Framework focuses on the likely set of impacts of future climate change on specific sectors (for example fisheries, infrastructure, water etc) with a particular focus on the most vulnerable people who are likely to experience the most serious impacts. While these impacts may be both positive and negative, the focus tends to be on the negative impacts as these are the ones that primarily need to be the focus of both adaptation and mitigation. In a given sector the likely effects of climate change can be identified for all three CRNs on a 40 year time horizon. The resulting set of potential impacts can then be used to identify a parallel set of desirable outcomes in the same time horizon (also 40 years).—These outcomes can be thought of as the inverse of the negative impacts—for example, reductions or elimination of any anticipated negative impact. The result is a forty-year 'target' for the sector in question. This in turn forms the basis for a planning discussion working back from the forty year time horizon towards the development of 1 to 5 year action plans.

The detailed steps are given in Box 1 and a schematic of the approach in figure 1.

**Box 1; The FCCP Framework**

1. Select one possible 40-year CRN
2. Identify the set of negative impacts of this CRN on a specific sector (for example all relating to agriculture, or water). Some positive impacts may also be identified at this step.
3. Identify a set of outcomes that would need to be achieved by 40 years from now, in order for these negative impacts to be mitigated or avoided through adaptation. This becomes the 40-year policy 'target' that can now form the basis for a discussion about priority policy changes.
4. To link this with the present the first step is to ask, if this is the outcome that we need to achieve in 40 years, what outcome do

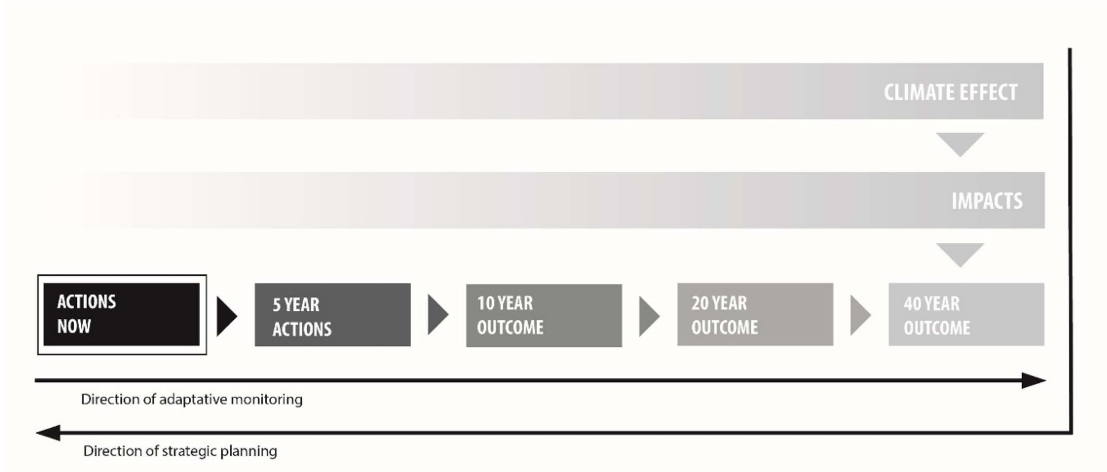


**Figure 1.** The FCCP Framework Approach to Planning and Monitoring. Climate effects under a given climate future, in a given sector, along with their impacts are identified first. The 40-year outcome is developed next—this is the desired effect of policy changes made in the short-term which would offset, reduce or eliminate any anticipated long-term negative climate-related impacts. 20- and 10-year outcomes are those that need to be achieved to secure the desired 40-year outcome. 5-year and immediate actions are those needed to achieve the required 10-year outcome.

we need to have achieved by 20 years from now?

5. The next step is to ask, if this is the outcome that we need to achieve in 20 years what do we need to have achieved 10 years from now?
6. Ten years is an easier target to visualise, and it is now possible to ask, if this is what we want to achieve in ten years what do we need to be doing five years from now.
7. And if we need to be doing certain things five years from now what do we need to be doing today?
8. A final step for this FCCP is then to ask who needs to be doing these things and what resources are needed?

The process can be repeated for a range of possible futures and a range of potential impacts. The combined results provide a long list of priority actions for today that provide protection in face of diverse future climate risks that are needed *irrespective of which climate futures occur* and some of which can be delivered with potential impact across multiple sectors. These outputs in turn can be used to map out actions that can be incorporated into national and local development plans as well as annual budget planning.

## 4. Testing the FCCP framework

The FCCP Framework was first tested at an interdisciplinary meeting in Kampala, Uganda in April 2018. A total of 50 people participated in the process, including climate scientists and sector specialists from Uganda, Kenya, Tanzania and Ethiopia. FCCP Frameworks were developed for a variety of sectors and for each of the three possible climate narratives. An example of one output from this process is shown below in figure 2. Note that the entries under 'Actions Now' are brief summaries of a rich and wide ranging discussion.

The participants were drawn from a wide range of sectors and the process resulted in very detailed and ambitious plans and stimulated a well-informed debate about future action. The immediate and five year action plans were characterised as being both realistic and ambitious and in most cases represented a challenge to embedded current practices (for example the need to reorient teaching curricula). There was a strong emphasis on the need for generating improved systems of data collection so that future investments can be more responsive. A common theme was the need to transform professional training so that it focuses on building capacity to solve problems rather than focusing on the transference of information. This was seen to be critical in recognition of the fact that the context in which most policy makers work will be dynamic and rapidly changing over the coming decades.

An example of the power of the approach can be seen under the 40-year outcomes in figure 2 where one of the outcomes is listed as 'Drainage is sized for new peak flood events'. To achieve this outcome—where drains would be appropriately sized for appropriate design events—a number of outcomes are mapped out for earlier periods including investment in soft infrastructure to attenuate peak flood events, implementation of active management of drainage including training and funding for excellence in operations and maintenance, and modifications to building codes. The objective at forty years is achieved

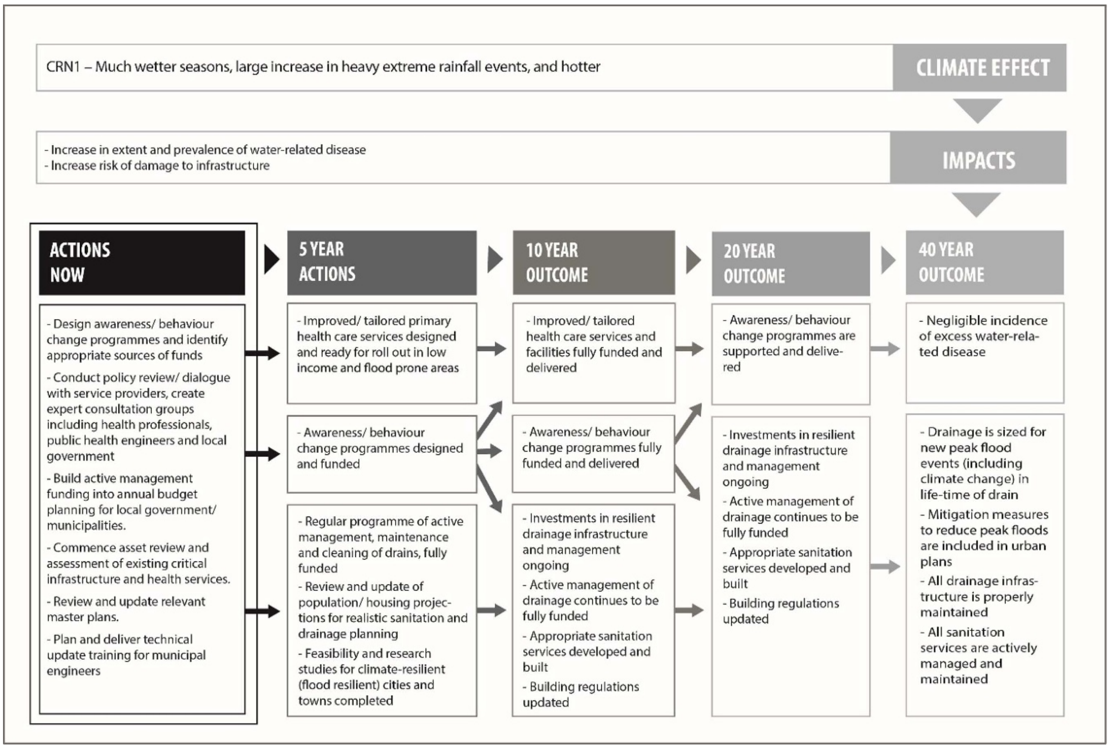


**Figure 2.** FCCP Framework for health services and sanitation infrastructure in a hotter, wetter climate. The framework is completed from right to left. The forty-year outcome is the target that needs to be achieved to offset anticipated negative climate effects and impacts. To achieve this the twenty- and ten-year policy outcomes have been identified. To achieve the ten-year outcome, five year and immediate actions have then been identified.

through a combination of interventions that can all be tracked back to immediate five-year actions around budget allocations, awareness raising and training. The implication is that in forty years, drainage professionals will need to be thinking about drainage in a way that is transformed when compared to today.

While the Uganda workshop proved the value of the FCCP Framework in the abstract, it was far from a genuine policy making meeting—limited conclusions could be drawn about the usefulness of the approach when it is implemented in a planning arena where stakeholders do not have a central stake in the resource implications of the derived plans.

To address this shortcoming and engage more active stakeholders, the FCCP Framework was subsequently used to advance user engagement at the August 2018 Greater Horn of Africa Climate Outlook Forum (GHACOF). This long-standing tri-annual activity, coordinated by the IGAD (Intergovernmental Authority on Drought and Development) Climate Prediction and Applications Centre (ICPAC), has until recently focussed exclusively on seasonal prediction, but now aspires to include climate change information. These regular interdisciplinary fora bring together scientists working in weather and climate and sectoral specialists (from agriculture, food security, livestock, water, energy, health, conflict warning, media) to prepare a consensus climate outlook, discuss likely impacts, and prepare strategies for resilience. In August 2018, a capacity building event—'Climate Change Perspectives'—was held with representatives of national meteorological and hydrological services from the ten regional IGAD member countries. The event comprised three interrelated components: CRN development training, FCCP Framework development training, and deliberations on future applications of the CRNs and FCCPs. The full report for the event is available from the authors. Participants were divided into three breakout groups: Northern (Eritrea, Ethiopia, Djibouti, South Sudan and Sudan), Equatorial (Kenya, Somalia and Uganda) and Southern (Burundi, Rwanda and Tanzania), with an example of one output shown in table 1. A similar capacity building event was also held with GHACOF stakeholders in November 2018. In this case participants were divided based on user sectors (agriculture, water and energy) instead of geographic regions.

Feedback was elicited from participants at all three meetings. We used online follow up by email and a simple survey questionnaire. Participants were asked to reflect on their experience of using the FCCP and to comment on its usefulness as a preliminary planning tool. We also gathered feedback from the facilitators at all three meetings. In this case, we carried out unstructured interviews to garner their reflections. A total of over sixty participants provided their feedback.

**Table 1.** Example summary FCCP Framework results from GHACOF Capacity Building Events.

| **Group: Northern Region** | | | | |
|---|---|---|---|---|
| **Scenario:** CRN 3 Much hotter and drier with more erratic rainy season | | | | |
| **Sector:** Agriculture | | | | |
| **40 year Impact:** Decline in Production | | | | |
| **1 year actions** | **5 year actions** | **10 year outcome** | **20 year outcome** | **40 year outcome** |
| • Initiate research on water and soil management and technology innovation<br>• Improve and target education in schools<br>• Allocate funds to mobilization and sensitisation of farmers<br>• Launch/strengthen research programmes on drought resistant crops<br>• Develop database of global best practices<br>• Prepare sorghum vulnerability maps<br>• Develop policy on land use investment export/import<br>• Design policies that promote climate smart agriculture | • Deliver sensitization programmes to communities (farmers) on the impending impact<br>• Promote moisture conservation practices among farmers (outreach and demonstration projects)<br>• Explore cloud seeding technologies to enhance rainfall<br>• Plan for water harvesting, dams and irrigation schemes are and include these in five- and ten-year investment plans of government<br>• Allocate funds for weather forecasting systems strengthening<br>• Establish technology innovation funds and projects | • Advocacy is well advanced by farmers unions and NGOs to push for modified agricultural extension policies in government<br>• Crop insurance index is implemented<br>• Capacity for improved soil management and ground water management is built<br>• Systems of information dissemination to farmers are in place<br>• Research on new water sources and water management is ongoing | • New drought resistant crops/sorghum are regularly grown<br>• Improved soil management is implemented<br>• Increasing use of solar power<br>• Increased role for NGOs, farmers unions government institutions and private sector | • Change in location of crop production<br>• New drought resistant crops/sorghum are widely used<br>• Change in times of planting/harvesting<br>• Increased sorghum production<br>• Increased water availability for crops<br>• Strong institutions with extension workers<br>• Soil management is significantly improved<br>• Solar power is widely used<br>• Increased role for NGOs, farmers unions government institutions and private sector |

(Continued)

**Table 1.** (Continued).

| | | | | |
|---|---|---|---|---|
| | | | | **Group: Equatorial Region** |
| | | | | **Scenario:** CRN 3 Much hotter and drier with more erratic rainy season |
| | | | | **Sector:** Agriculture |
| **1 year actions** | **5 year actions** | **10 year outcome** | **20 year outcome** | **40 year outcome** |
| • Initiate sensitization of communities (farmers) on the impending impact<br>• Identify vulnerable livestock breeds<br>• Create a legal framework to allocate needed funds<br>• Allocate funds<br>• Initiate discussion on new curriculum development | • Deliver sensitization of communities (farmers) on the impending impact<br>• Survey water resources available, plan and design water resources investments (feasibility)<br>• Start research on new livestock breeds and pastures<br>• Start related research on livestock vaccines<br>• Allocate funds<br>• Roll out new curricula in universities | • Awareness creation programmes and farmer education have been rolled out<br>• Research on new livestock breeds/-pastures is advanced<br>• Design complete and construction commenced on new water storage facilities<br>• Research on appropriate livestock vaccines is complete | • Awareness on new livestock and pasturing is widespread<br>• Research on new livestock breeds/pastures is well advanced and results disseminated/linked to funding schemes and policy<br>• Construction of water storage infrastructure is ongoing | • New breeds of livestock/alternative livestock are basis of livestock farming<br>• Water storage infrastructure is established and storage rates significantly improved<br>• New varieties of pasture are widely grown. |

The backward future-to-present planning process proved challenging for some. A few groups preferred to move directly from agreeing on the 40-year outcome to discussing actions needed now, and complete the action and outcome gaps for 5, 10 and 20 years ahead subsequently. However, when reviewing the outputs from the process, it was apparent that this approach does indeed risk locking in existing short-term planning choices (see 'background' above). When facilitators reiterated the motivation for working back in time at *every* step the groups were able to challenge some of their preconceptions about priority actions.

The feedback on the FCCP Framework approach at both of these GHACOF events can be summarized as follows.

- The FCCP Framework is a powerful approach to setting out the challenge of implementing climate information as an easy-to-conceptualize time sequence of adaptation and mitigation actions.
- The FCCP Framework minimizes, or altogether removes, the long-standing challenge of reconciling immediate adaptation actions with long-term developmental targets and visions.

Participants also expressed a strong desire to adopt the FCCP Framework approach to help inspire and formulate the following interrelated activities:

- Synthesis of climate projection information with user needs, in partnership with national and international programs and organizations.
- Enhanced engagement and uptake of climate information in government and private sectors at national, district, county, sub-county, parish and village levels.
- Facilitation of improved funding for climate services and technological resources and infrastructure. These limit the development of climate resilience in East Africa, with a self-sustaining cycle between poor support for climate research and services and the inability of climate service providers to meet stakeholder needs (Semazzi 2011). The FCCP Framework could include specific actions to advocate for greater support.
- Delivery of customized solutions to stakeholders that involve a more diverse spectrum of sectors, including entertainment (music, arts, theatre and cinema), media (newspapers, TV and radio); education (schools, technical colleges and universities); civil society (religion, cultural institutions, tribal and clan activities), and military services.

At the GHACOF, participants were primarily meteorologists and climate scientists, with many seeing the FCCP Framework as their first opportunity to analyse specific links between climate and sectoral policy. However, in the absence of sector specialists in, say, agriculture or water, they acknowledged that much of their policy discussion was poorly informed. Nonetheless, these scientists demonstrated high engagement, with enthusiasm to communicate their science to a 'real audience' of users. As above, they were also inspired to take the FCCP Framework approach into a much broader interdisciplinary environment, recognising this as a critical next step. In contrast, the Uganda meeting involved a much broader mix of experts, allowing participants to perhaps better sharpen the quality of their policy recommendations, but unfortunately they lacked the considerable time required to fully develop these.

In both cases, feedback was positive that the approach provides a clear and systematic way of (i) identifying the relevant stakeholders for more in-depth planning, (ii) identifying initial key messages for policy makers, (iii) linking actions from seasonal to multi-decadal timescales, and regional to village governance scales, that provides a means to effectively engage the full breadth of diverse stakeholders, and (iv) widening appreciation of the role of climate change information in diverse policy planning and development decisions. The next step will be to take these early results and discussions into more detailed dialogue and policy formulation with sector specialists. It is clear that this type of high-level engagement would have to be supported by more detailed and in depth planning processes, likely using more established and sophisticated tools (for examples see Presont *et al*, 2011). However, what came through from the experiences in East Africa is that the FCCP Framework enables the conversation to start—without the need for collecting extensive detailed information or to understand a more complex planning process.

## 5. Discussion and conclusion

Initial trials of the FCCP Framework has shown it to be both popular and effective as a way of linking climate science and the policy debate. Its use shows promise as a way of initiating discussions that can enable long-term climate change information to feed effectively into the policy and planning process in complex contexts (Wilkinson *et al* 2013). Another potential use may be to check the validity and likely effects of adaptation choices already being made, with several participants noting the need to ensure change has a real effect rather than enforcing current practices. The FCCP Framework approach acts as a 'reality check' and enables entrenched views and practices to be challenged. Participants also appreciated the straightforwardness of the approach.

One appeal of the FCCP Framework arises from the fact that it is designed explicitly to make use of information about the future climate in a form that is already available. Several participants at the Uganda meeting observed that 'uncertainty' is often used as an excuse for inaction, essentially camouflaging the fact that while we do not know the exact details of the changes in the climate, we do know that the climate *will change* (see Chadwick *et al* 2016). The use of contrasting plausible futures—climate risk narratives or CRNs—as the basis for FCCPs was useful in identifying 'no regrets' interventions that would be effective whatever direction of change occurs in the future. When combined with the 'walking back' approach this has the potential to generate a powerful list of short-term interventions that can have a bigger impact on future resilience than would be the case when planning works forwards from short- to long-term. This seems important given the challenges that conventional planning has had in generating visionary plans for the future.

The availability of clear and concise climate narratives undoubtedly facilitates this, as well as providing an extremely useful and effective way of communicating climate change uncertainty in East Africa. However, considerable time and expertise was required to carefully define the three CRNs (Burgin *et al* 2020). In the absence of this, an alternative more parsimonious approach might be to simply identify three specific climate models: one that has the joint most extreme wetting and least warming relative to all available models (with these variables being combined in either a quantitative or qualitative manner), another that has the most extreme joint drying and warming, and a third that sits closest to the multi-model mean. These could then be used to generate CRNs, that could then form the basis of FCCP Framework planning.

The FCCP Framework was originally developed as a workshop approach to initiate discussion between climate scientists and impact scientists in the HyCRISTAL project. However, feedback suggests it has greater scope and it does seem that this type of long-term to short-term planning framework has promise. In particular the response of climate scientists and National Met Service staff was extremely encouraging; the FCCP Framework appears to help make the link between their work and impact on current policy. This new approach will help in the *mapping of* climate services deliverables on long-term national development policy targets (e.g. NDPII 2015) in the GHA region and other countries.

Naturally the frameworks are not sufficient to support detailed sectoral planning, but there is potential to use them to provide an 'anchoring' for more dynamic adaptive pathway planning exercises. The complex reality of planning within challenging political environments, and with multiple dynamic processes working together, means that no single 'act of planning' can be sufficient, what is needed ultimately is an interlocked dynamic planning processes. As Wiebe et al, observe in their 2018 review 'scenario development, quantitative modelling, and scenario-guided design of policies and programs, play a key role in exploring options to address socioeconomic and environmental challenges across many sectors'. The FCCP Framework shows promise as a useful starting point for such detailed sectoral planning, and critically may unlock some of the policy paralysis that is often brought on when sector policy makers are confronted with climate change information. The real challenge, as many have found before, is to find the institutional 'home' that can act as a long-term host for such innovative, responsive long-term planning.

## Acknowledgments

The work was funded by the Natural Environment Research Council/Foreign, Commonwealth and Development Office (FCDO)-formerly the Department for International Development (DFID) (NE/M02038X/1) via the Future Climate for Africa (FCFA) funded project, Integrating Hydro-Climate Science into Policy Decisions for Climate-Resilient Infrastructure and Livelihoods in East Africa (HyCRISTAL). The authors acknowledge the contribution of Government and Civil Society partners in the Lake Victoria Basin region who actively participated in the development and testing of the framework. Graphics were developed by Anna Sevillano-Evans.

## Data availability statement

No new data were created or analysed in this study.

## ORCID iD

Barbara E Evans https://orcid.org/0000-0001-9815-3141

## References

Alterman R 1988 *Adapt. Plan. Cogn. Sci.* **12** 393–421

Antwi-Agyei P, Dougill A J, Agyekum T P and Stringer L C 2018 Alignment between nationally determined contributions and the sustainable development goals for West Africa *Climate Policy* **18** 1296–312

Burgin L *et al* 2019a FCFA HyCRISTAL climate narrative rural infographic and brief (https://doi.org.10.5281/zenodo.3257288)

Burgin L *et al* 2019b FCFA HyCRISTAL climate narrative urban infographic and brief (https://doi.org.10.5281/zenodo.3257301)

Burgin L, Rowell D P and Marsham J H 2020 Possible futures for East Africa under a changing climate: technical appendix for HyCRISTAL's climate risk narratives (https://doi.org.10.5281/zenodo.3620757)

Chadwick R, Good P, Martin G and Rowell D P 2016 Large rainfall changes consistently projected over substantial areas of tropical land *Nat. Clim. Chang.* **6** 177–82

Chaudhury A S, Helfgott A, Thornton T F and Sova C 2016 Participatory adaptation planning and costing. Applications in agricultural adaptation in western Kenya *Mitigation Adapt. Strategies Glob. Change* **21** 301–22

Climate and Development Knowledge Network 2012 Managing climate extremes and disasters in Africa: lessons from the SREX report. CDKN available online at https://www.cdkn.org/srex

Dessai S *et al* 2005 Challenges and outcomes at the ninth session of the conference of the Parties to the United Nations framework convention on climate change *Int. Environ. Agreements 5* **105–124** 2005

Earl M J, Sampler J L and Short J E 1995 Strategies for business process reengineering: evidence from field studies *JMIS; Abingdon* **12** 31

England M I *et al* 2018 Climate change adaptation and cross-sectoral policy coherence in southern Africa *Reg Environ Change* **18** 2059–71

Jack C, Jones R, Burgin L and Daron J 2019 Climate risk narratives: an iterative reflective co-production process for producing and integrating climate knowledge *Clim. Risk Manage.* **29** 100239

Kato S and Ahern J 2008 'Learning by doing': adaptive planning as a strategy to address uncertainty in planning *J. Environ. Plan. Manage.* **51** 543–59

Kok K, Ven Vliet M, Bärund I, Dubel A and Sendzimir J 2011 Combining participative backcasting and exploratory scenario development: experiences from the SCENES project *Technol. Forecast. Soc. Change* **78** 835–51

Marsham J, Rowell D, Evans B, Cornforth R, Semazzi F, Wilby R, Efitre J, Lwiza K and Ogutu-Ohwayo R 2015 First HyCRISTAL workshop — integrating hydroclimate science into policy decisions for climate-resilientinfrastructure and livelihoods in East Africa *GEWEX Newsl.* **27** 23–24

NDPII 2015 Uganda National Development Plan (https://npa.ug/wp-content/uploads/NDPII-Final.pdf)

Nissan H, Goddard L, de Perez E C, Furlow J, Baethgen W, Thomson M C and Mason S J 2019 On the use and misuse of climate change projections in international development *Wiley Interdiscip. Rev. Clim. Change* **10** 3

Poff N *et al* 2016 Sustainable water management under future uncertainty with eco-engineering decision scaling *Nat. Clim. Chang.* **6** 25–34

Preston B L, Yuen E J and Westaway R M 2011 Putting vulnerability to climate change on the map: a review of approaches, benefits, and risks *Sustain. Sci.* **6** 177–202

Ramirez R and Wilkinson A 2013 Rethinking the 2 × 2 scenario method: grid or frames? *Technol. Forecast. Soc. Change* **86** 254–64

Semazzi F H M 2011 Framework for climate services in developing countries *J. Climate* **47** 145–50

Sharpe B, Hodgson A, Leicester G, Lyon A and Fazey I 2016 Three horizons: a pathways practice for transformation *Ecol. Soc.* **21** 47

Tidemand P 2009 Local level service delivery, decentralisation and governance: a comparative study of Uganda, Kenya and Tanzania *Commonwealth J. Local Governance* **3** 144–50

Tsofa B *et al* 2017 How does decentralisation affect health sector planning and financial management? a case study of early effects of devolution in Kilifi County, Kenya *Int. J. Equity Health* **16** 151

Vervoort J 2013 *Shared Action on Food and Environments in East Africa* CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), and Environmental Change Institute, Oxford University Centre for the Environment (https://cgspace.cgiar.org/handle/10568/27955)

Wiebe K, Zurek M, Lord S, Brzezina N, Gabrielyan G, Libertini J, Lock A, Thapa-Parajuli R, Vervoort J and Westhoek H 2018 Scenario development and foresight analysis: exploring options to inform choices *Annu. Rev. Environ. Resour.* **43** 545–70

Wilkinson A, Kupers R and Mangalagiu D 2013 How plausibility-based scenario practices are grappling with complexity to appreciate and address 21st century challenges *Technol. Forecast. Soc. Change* **80** 699–710