



SCYPEA: Co-produced Seasonal Forecasts for More Effective Management of Hydropower Supply in Kenya



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Aim of the project

The aim of the WISER **Strengthening Climate Information Partnerships – East Africa** (SCYPEA) project was to strengthen national and regional resilience to seasonal climate variability by enhancing partnerships between global, regional and national climate organisations to increase access to, and use of, the best available information on seasonal prospects for East Africa; and between providers and users of seasonal forecasts to aid translation of the best forecast information into improved, co-developed services for decision-making.



Dates

2016–2019



Countries

Kenya, Tanzania, Uganda and Ethiopia
(This case study focuses on Kenya)



Service Development Team meeting between the Kenya Electricity Generating Company, the Kenya Meteorological Department and the Met Office; one of several over 2016–2019 to build common ground and co-explore and co-develop a customised seasonal forecast service to assist hydropower management (Source: R. Graham, 2018)

Aim of co-production:

The three key aims of the co-production were as follows:

1. For the Kenya Meteorological Department (KMD) to develop a better understanding of:
 - how seasonal predictions could assist Kenya Electricity Generating Company (KenGen) in its operational decision-making for hydropower reservoir management;
 - how forecasts are currently used; and
 - how they might be improved to better inform decisions.
2. To assist KenGen in improving their understanding of the potential benefits and challenges of seasonal forecasting to be better equipped to fully appreciate and interpret the forecasts in decision-making.
3. To use the new knowledge acquired to develop new, prototype prediction services that supplement the publicly available national forecast with more detailed information specific to KenGen's requirements; to jointly trial and refine those prototypes and bring them to operational status.

Context:

KenGen already made good use of KMD's public national seasonal rainfall forecast product, which is designed to give generalised information. However, KenGen's key needs are for specific information relating to reservoir inflow. The relationship between rainfall, reservoir levels and capacity for hydropower is complex, and the potential for new, reliable, more detailed forecasts was not obvious. Sustained co-production activities were needed to build common ground, develop mutual understanding of potential options and co-explore solutions.

Who was involved and what were their roles?

The core participants formed a Service Development Team (SDT) which comprised:

- senior forecasters from KMD and, later, deputy directors of Forecasting and Business Support;
- energy planners/engineers from KenGen;
- a climate researcher from KMD's Institute for Meteorological Training and Research (IMTR);
- climate scientists from the IGAD Climate Prediction and Applications Centre (ICPAC); and
- a climate scientist from the Met Office, United Kingdom.

KenGen shared details of their responsibilities for predicting energy production, and the decision process this involves, focusing on hydropower, and their need for forecast information. KMD and IMTR shared detailed information on the national seasonal rainfall forecasts produced and suggested reservoir inflow and other products for trial to meet KenGen's needs. ICPAC used lessons learnt to help build a regional information hub for fostering co-production. All partners participated in trials and reviews of the developing service. Later, KMD deputy directors joined meetings to help steer the new services to operational status. The KMD director reviewed and signed off the issued forecast bulletin. The Met Office advised on forecasting methodology and facilitated all meetings, including meeting reports and actions agreed.

What was co-produced?



The agreed aim of the co-production was to co-develop and implement an additional, operational, seasonal forecast bulletin for the October–December (short rains) season, issued annually in August and conveying forecast information specific to the needs of KenGen's hydropower planning. The bulletin is issued by KMD as a supplement to the national forecast designed for public consumption. It includes explicit predictions of inflow into two reservoirs selected by KenGen, which are of primary importance in the hydropower network. Conventional rainfall prediction maps are also provided, with river basins overlaid to aid interpretation of implications for hydropower. The first co-produced bulletin was issued ahead of the October–December 2019 season.



Benefits of the co-production approach

- The resulting strengthened partnership between KenGen and KMD has resulted in new customised services, which add significant value to the public national service, and forms a firm basis for continued iterative service improvement.
- Co-production led to a clearer understanding of KenGen's use of the 'analogue year' approach to predict seasonal inflows. This is where the estimated inflow for the season is simply the inflow observed in a previous year when climate factors such as El Niño were similar. The analogue method is imprecise and untested and has now been supplemented with a new, fully evaluated method more firmly based in climate science.
- Knowledge sharing during co-production means KenGen now has increased understanding of, and confidence in, the forecast, and KMD better understands KenGen's decision-making processes and need for forecasts.
- The frequent engagement in co-production has led to increased contact and consultation between KenGen and KMD on weather and climate issues, including high-level reflection on how the service might be expanded.

How was co-production done?

Identify key actors

Ahead of project start, KMD identified KenGen as one of a number of potential partners already using climate information in their operations. Climate service development is known to be challenging, and prior selection of 'climate-sensitised' partners helped in making quick progress. Next, a SDT was established from personnel in KenGen and the other partners, with KMD as the SDT leader. The key output of the SDT was defined as implementation of a new co-produced climate service for KenGen, and participation in the SDT was built into formal project contracts.

Build partnerships and co-explore needs

The following introductory 'scene setting' activities were conducted:

- The Paying for Predictions game, developed by the Red Cross Climate Centre (RCCC), introduces, in a simplified way, the challenges of making decisions under uncertainty and the benefit of forecasts.
- The experiences of the water and energy sectors of other East African countries in the use of forecasts were shared to aid learning.
- Envisioning exercises courtesy of the Walker Institute: To help focus on the desired main impact of the climate service, KenGen, KMD and other SCIPCA users were asked to imagine a best-case national newspaper headline after the launch of the planned service, then to construct a roadmap of activities needed to achieve the impact. The headline was: 'Cushioning Kenyans against power rationing despite weather fluctuations – thanks to close collaboration between the Kenya Meteorological Department and KenGen.'

KenGen's specific needs were then further explored, refined, prioritised and tabulated through a mixture of chaired discussions and questionnaires designed to establish the key operational decisions made, thereby illuminating the type of forecast information that could best inform those decisions.

Co-develop solutions

To respond to the tabulated needs identified and develop potential forecast solutions, KMD, IMTR and ICPAC undertook a one-month science 'retreat' at the Met Office. Solutions were later shared with KenGen, and the products to be included in a prototype bulletin were agreed. For example, it was decided that, in addition to predictions of reservoir inflow, predictions of season onset timing were also required, but that suggested predictions of rain-day frequency were not needed. The prototype, trialled and refined in 2017 and 2018,

became a focus for capacity building of KenGen staff, providing the opportunity to increase understanding of the methods used, as well as helping to reduce jargon and improve the content, design and understandability.

Co-deliver solutions

To assist operational delivery, KMD senior management joined later SDT meetings. The delivery of the first operational bulletin in September 2019 was led by the KMD focal point, using guidance from a Standard Operating Procedure (SOP) document, jointly prepared by the Met Office and KMD, that describes the production procedure. The process is owned by KMD, with the final version of the bulletin signed off by the KMD director. A SOP document guiding KenGen's use of the forecast information was also updated to refer to the new service.

Evaluate

Improvement of the bulletin, based on user evaluation and feedback, will be a continuous process and has started following the October–December 2019 bulletin. In feedback to the KMD director, the CEO of KenGen wrote: *'The supplement guided KenGen on making the hydropower projections effectively based on the forecasted weather of above normal that translated to above normal inflows into Masinga and Turkwel, as contained in the supplement. The supplement forecast, therefore, was accurate, and our request is to extend the supplement forecast to March–May season...'*

Lessons to learn from:

- **Co-production takes time:** It takes time to unravel the decision-making context and to co-develop solutions. For example, operational practices were documented but not in close detail – so it took time to appreciate KenGen's use of the analogue approach. Planning to

have adequate time for substantive engagement and mutual reflection is important.

- **Continuity of personnel:** Continuity of personnel throughout the co-production process allows continuous building of mutual understanding and trust and maintains momentum in service development. In the project, a key SDT member moved roles and was not available in the build-up to service implementation. This slowed implementation until a new member was appointed. It was necessary to divert resources from further service improvement to meet the implementation deadline.
- **Willingness to share data:** KenGen were ready to share the historical series of inflows into reservoirs, and co-production helped to confirm the importance and benefits of data sharing in developing the forecast method. The historical inflow data were requested ahead of the science 'retreat' so they could be 'blended' with climate prediction parameters to generate new inflow predictions. The data were also needed to evaluate the success of the predictions over past years.
- **Early prototype development:** It was found that development of a prototype bulletin, which served as a tangible benchmark for discussion and improvement, helped to focus the service development, set realistic targets for progress and – through enhanced discussion of the bulletin products – deepened mutual understanding of KMD and KenGen perspectives.
- **Nominated team with mandated task:** The use of a formal SDT within the project, tasked with service development, helped to identify evolving needs, such as the need to co-opt senior management to the team ahead of operationalisation. In particular, deputy directors of Forecasting and Business Support were needed to advise the SDT on protocols for implementation and procedures for making changes to the KMD's suite of operational products.

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