Stockholm Environment Institute

Improving the co-production of climate services for agriculture: a case study from Nigeria

SEI Discussion Brief
January 2020

Ruth Butterfield

Philip Osono

Key messages

- **Climate services should expand the focus beyond the negative consequences of climate change to consider potential opportunities, which may include those that arise as the result of climate change itself, and those that occur as the result of the increased provision of services and information in response to the climate change threat.**
- **Climate services should consider the costs of short-term coping strategies for managing climate changes. These may help for a time, but they can require physically strenuous labour, demand significant financial investment, and take a negative toll on health.**
- **Collaboration – in this case, between farmers, agriculture extension officers, NGOs, researchers and government officials – can improve coordination between state, local and federal governments to address climate change in agriculture. Co-production processes should consider how improved coordination can influence the requirements for new climate services.**
- **Co-exploration of experiences and learning with climate-informed farmers and extension officers could inform governance practices at local, regional and national levels. Communication pathways (e.g., SMS messaging) already in use could help to distribute such information.**
- **Co-production processes that focus on water, the environment, and food and other agricultural production issues may help raise possible options to address both adaptation and mitigation. Further, discussing these issues can help prioritize the most urgent changes.**
- **Potential climate service users and their unique needs should be clearly identified. End-of-the-line users may differ from those users who engage directly with producers of climate information.**

Introduction

Despite a strong increase in climate change adaptation research over more than a decade, climate information is seldom used to its full potential in adaptation planning and decision-making. This gap between research and action (Klein and Juhola 2014; Palutikof et al. 2019) signals that there is a lack of actionable knowledge to support adaptation decision-making (Ernst et al. 2019). One of the ways forward is the use of more bottom-up and inclusive approaches that challenge providers to tailor information to users' specific institutional and decision contexts (Hewitt et al. 2017; Palutikof et al. 2019).

IMAGE (ABOVE): Okra

Tailored information meets the ambition to bridge the gap between providers and users of climate information. It has been shown to assist and improve climate change adaptation decision-making, and such climate information outputs have come to be widely known as *climate services* (Vaughan and Dessai 2014). Climate services may be in different formats such as models, assessments or participatory processes (Daniels et al. 2019) or "tools, products, websites" (Vaughan and Dessai 2014, p.588).

The Tandem framework has been developed in the SEI Climate Services Initiative (further described in Daniels et al. 2019; Daniels et al. n.d.) to inform processes for co-designing climate services.

This brief is part of a series designed to test and refine the Tandem framework using completed and ongoing projects related to climate services and adaptation decision-making. The brief draws on a two-year project that aimed to strengthen the capacities of farmers and government officials to understand and share appropriate climate information and best practices to inform agricultural decision-making in Edem Ani, Enugu State, Nigeria. The African Development Bank (AfDB)-funded project, "Bridging Climate Information Gaps to Strengthen Capacities for Climate Informed Decision-making (CDSF)" was implemented by the African Technology Policy Studies Network (ATPS) in partnership with five technical and research agencies, including the SEI Africa Centre.

Led by SEI, the Nigerian case study aimed to:

- Identify and analyse climate information needs, and provide support for climate information production, synthesis and use.
- Build capacities and knowledge of stakeholders to collect and utilize high-quality, demand-driven climate information for adaptation planning and decision making.
- Facilitate the mainstreaming of climate change issues in regional policy dialogue aimed at raising awareness on climate change issues to strengthen understanding, use and mastery of climate information.

In the wake of the project, the Tandem framework was applied in an effort to understand how the co-design of climate services could better support adaptation planning and decision-making in such contexts, and to understand how the framework itself might be improved. Thus, this retrospective analysis examines the elements of the Tandem framework that were (or could have been) applied; the value these elements added, both to the services and to the processes; and potential issues that could improve climate services and the framework itself.

The Tandem framework

The framework has been developed to guide **providers** and **intermediaries** (see Box 1) of climate information through seven iterative steps that are intended to produce relevant, actionable and sustainable climate services that meet the needs of the **users** of the climate information:

- **Step 1** consists of identifying and defining an adaptation challenge that would benefit from the use of a climate service.
- **Step 2** focuses on identifying and engaging with potential users of a climate service.
- **Step 3** involves co-defining the desired objectives of a climate service, and reviewing advantages and shortcomings of existing services.

- **Step 4** entails gaining an understanding of the institutional and decision contexts in which the climate service will be embedded.
- **Step 5** guides providers and users of the climate service in co-exploring data and information needs, including their sources, formats and modes of dissemination.
- **Step 6** consists of appraising adaptation measures, in which decision-support methods may be used to identify, evaluate, prioritize and sequence interventions.
- **Step 7** ensures that the climate service is used in practice by embedding it in existing institutions, and ensuring that mechanisms are in place for maintaining, evaluating and upgrading the service as appropriate.

BOX 1. KEY CONCEPTS

Climate service users (e.g. local planners and decision makers) employ climate information and knowledge for decision- making; they may or may not participate in developing the service itself.

Climate service providers are actors (e.g. climatologists, meteorologists, consultants) who supply climate information and knowledge.

Climate service intermediaries are actors (e.g., adaptation and learning specialists, project managers, consultants and researchers) who "translate" between providers and users.

Co-design processes involve end-users throughout the process of designing a climate service.
(Daniels et al. 2019; Steen et al. 2011; Vaughan and Dessai 2014)

Methodology

Conducted in 2018 and 2019, the project brought together a wide variety of stakeholders to address challenges and opportunities for agriculture and food security in the Edem Ani community in Enugu State in Nigeria. The project involved two aspects: The first included field visits, interviews and focus group discussions with local farmers, extension agents (from the State Agricultural Development Programme), and researchers from the University of Nigeria, Nsukka. The second consisted of a two-day policy workshop with key stakeholders from the agriculture, water, environment and land sectors at the local, community, and state governance levels. Participants included farmers, researchers, representatives of NGOs and the private sector, and officials from the Nsukka local government and the Enugu State government.

Events were designed to generate information to prepare a climate vulnerability assessment to inform, screen and implement adaptation options at the community level. To assess the current local situation, facilitators used various tools (resources mapping, capacity mapping, current vulnerability mapping, trend analysis, historical disturbance, and perception of climate changes) with participants from an Adaptation Toolkit (Ampomah and Devisscher 2013, Osano et al. 2018).

Our retrospective analysis relies on a standard template table with guidance questions for each of the Tandem steps, questions on expected outcomes, and identification of the case study approach. We examined project reports and workshop documents, including results of the community fieldwork and policy workshop (Osano et al., 2019, Osano et al., 2018), and compared these with the template questions.

Results

This project addressed rural challenges and opportunities (Tandem steps 1-4, and some of steps 5 and 6) for agriculture and food security, the main economic activity of the Edem Ani town community. For context, crop production in the town community constitutes the main farming activity on commercial and subsistence scales, with farmers growing crops such as cassava, cocoyam, okra and pepper. Livestock reared include sheep, goat, cattle, duck and poultry. The climate consists of two main seasons: the rainy and dry season. The vegetation is mostly dried savannah characterized by incomplete canopy cover, which adversely affects soil moisture.

Policy workshop participants answered specific questions about challenges of climate change for agriculture and food security in the Edem Ani community (Step 1). Participants identified numerous problems: drought, windstorms, flooding, high temperatures, acid rain, rivers and streams drying up, erosion, irregular rainfall

patterns, increases in pest and diseases, and increase in invasive weeds as critical challenges. Participants discussed the perceived level of vulnerability to drought and windstorms of various groups of people (men, women, elderly, youth, people living with disabilities, and subsistence farmers) and various economic and natural resources (forests, cash crops and water supply).

Workshop participants discussed climate changes that have occurred since the 1970s; these discussions made use of historic rainfall, temperature and solar radiation time series from a local meteorological station.

Participants said that direct and indirect effects of climate change are taking a toll on Enugu State. Concerns discussed included: challenges relate to the loss of trees and drying up of streams; high vulnerability of the area to pests and diseases, drought, erosion, windstorms, increased temperatures and flooding; and the perceived high impact of climate change on the local population with men (rather than women or youth principally because they cannot own or rent land), people living with disabilities, and the elderly being reported as most vulnerable.

Discussion also focused on other local changes from non-climate-related drivers. For example, population growth has led to increased demand for land and house building materials resulting in increased felling for trees for wood products and firewood. The traditional five-year crop rotation has suffered alongside the loss of shrubs, mushrooms and some crops.

Potential users of climate services and other collaborators were identified (Step 2). This process revealed two distinct groups of users: farmers and extension workers as current users of climate information; and government, NGOs and other development agencies as actors who can implement adaptation projects at community level and could therefore make use of climate information.

In general climate information is used in the community for deciding planting dates for crops; timing of fertilizer and herbicide application; location of poultry houses (determined by temperature and wind direction); and loan appraisals and disbursements. The interviews with farmers are of significant value here in understanding what is currently available, how knowledge is disseminated and how the farmers make use of this information (see Box 1).

Identified sources of climate information and existing climate services in the community consist of forecasts delivered by radio (in the local language), on television, from newspapers, and through extension agents (Step 3). Farmers report that information is also available at the Monthly Technology Review Meeting (organized by the National Research-Extension-Farmer-Input Linkage System).

Building understanding of institutional and decision contexts (Step 4) was a specific ambition of the CSDF project. Questions addressed in the workshop focused on adaptation planning opportunities for strengthening horizontal and vertical policy coherence across sectors (for example, between land use management, water planning, and agricultural interventions), and improvement of institutional coordination across scales (local, regions, state and national). For example local governments enforce state policies, such as laws banning bush burning, and extension agents who work through state-funded programmes (e.g., the Agricultural Development Programme) work directly with local farmers. Thus, we observe that co-production of climate services – and the Tandem Framework – could be improved by incorporating questions aimed at improving coordination between various levels of government on matters concerning climate change in agriculture. Such question would help actors understand the

institutional context, and to develop recommendations to improve climate adaptation and policy coherence. These conversations may not arise in conversations solely between front-line users and producers of climate services.

Participants made clear that they need more localized climate and soil information to make decisions on planting times, prepare for the start of the rain season, and understand the variability in the climate (Step 5). In an interview, one farmer suggested that local churches could help deliver needed information. However, a strong call for a different mode of delivery of climate information did not emerge because current radio and television delivery were deemed popular and effective.

A question posed in the workshop raised the matter of the *opportunities* of climate change (Step 6) – in contrast to the challenges widely addressed (Step 1). The discussion went on to address opportunities presented both from the actual changing climate and those from better climate information and research as a result of greater attention to the issue. For example, reflections raised the prospect of increased ease of drying of agricultural products due to increase hours of sunshine and dry winds, and better opportunities for water harvesting because of increased runoff from flooding, afforestation, and agroforestry. These could be framed as adaptation options (Step 6). At the same time participants discussed indirect opportunities that may lead to improved local use of land, and greater understanding of the landscape. Participants suggested that the focus on generating and providing climate change-related information has the potential to lead to better research, improved use of climate and meteorological knowledge, improved use of geospatial (LandInfo) technology, increased development and use of drought-resistant seeds, greater use of organic manure, and more widespread adoption of hydroponics. The question – framed as "What are the opportunities from climate change?" – could provide a way to help raise possible adaptation options, particularly if facilitators prefer not to use the term adaptation or the term is not well understood.

Participants identified general physical coping strategies in the state already in place – including the use of land management actions, such as manual irrigation, building of ridges instead of mounds, and the use of sandbags to prevent flood water from reaching farms but acknowledge that these are physically strenuous, require financial investment, and can lead to negative health effects. Participants identified urgent issues for appraisal of adaptation options to be addressed as shortages of water for agriculture, soil erosion, flooding and rising temperature.

Local government provides information on agricultural technologies and state and federal government policies on agriculture to farmers in villages. Local government also stores and distributes farm inputs (e.g. fertilizer). Coordination of these tasks often relies on SMS messages sent on behalf of the state and federal government. Beyond these interactions the local governance practices have no provision to harness the experience of climate change or practices of rural inhabitants in planning or operations.

Further exploration with climate-informed farmers and extension officers could allow sharing of information about experiences with and learning from climate services (Step 7). Such information could feed back into local, regional, state and national governance practices, and such information could be distributed via current communication pathways (e.g. SMS messaging) already in widespread use.

Participants compiled a long list of "*Ongoing and planned practical interventions/ solutions*" to agriculture and land issues (cross-cutting components and Step 4) such as the 2018 Enugu State government's initiative to curb flooding and improved agricultural practices, whilst acknowledging that most rural farmers do not have

BOX 2: HOW ARE FARMERS AND EXTENSION OFFICERS USING CLIMATE KNOWLEDGE?

"Iduke", an extension officer, responded to the question of current climate information use directly – "*I heard over the radio about drought three years ago. In the farming season in Nsukka I instructed farmers from Ibagwahqu and Opanda to lay their farms along hilly zones and they should use agrochemicals only in the hilly zones … to avoid resistance*." Responding to a question on the current gap in information "Okoro", a farmer, noted that there is a lack of information to support "*decision(s) on time/ month to plant/ harvest crops. Melon is planted between March and April because if it is planted in May/June it will be affected negatively by intensive rainfall of June/July*".

Farmers and extension officers collectively said that their objectives are to get better local forecasts, particularly on the start of the rains and intensity of rainfall. However, gaps exist in the climate information available at local levels. Several farmers cited the non-availability of meteorological equipment in all agriculture zones of the state and the lack of a soil map as problematic .
"*We need updated/ annual outlook/ forecast of rain because the rainfall pattern is changing, and it is no longer certain that rains start every March/ April*", Okoro said.

the resources to do meaningful autonomous adaptation. The issues listed could be used as a source of specific questions in future application of the framework. Raising these issues has the potential to provide a wider understanding of rural dwellers' ambitions in the context of state ambitions and understanding of their local challenges and opportunities.

Discussion

Analysis of the Nigeria case points to the importance of clearly identifying the potential beneficiaries of climate services – both in practice and in terms of the conceptual framework (steps 1 and 2). Such distinctions are important to make clear the differences between direct users and the broader potential beneficiaries of the climate information or service. For example, in this case, the people who will make direct use of any climate service or information are the farmers and local community; this group includes those who are most vulnerable to the climate challenge, and who are most affected by related decisions. By contrast, those users who may be able to make decisions and implement measures to address or influence provision of information and services are another group. These people are more likely to be extension officers, and representatives of NGOs, state and local government, the private sector, and academia.

Questions about users' desired objectives in terms of addressing the adaptation challenge, and wider development goals (Step 3) aim to facilitate co-defining of a focused aim and expectations for the climate service(s). These questions are very pertinent to this case. As this case study demonstrates, indigenous coping strategies are physically strenuous, with potential related negative health effects. Some coping strategies also require significant financial investment. As a result, one assumed objective of co-exploration and co-production processes would be to make adaptation options more viable by reducing costs, effort and negative health impacts. Specifically addressing this question in the workshops would have been beneficial, and such topics deserve discussion in any discussion of adaptation prospects.

The project took a deliberately broad approach to questioning participants, who addressed challenges and corresponding opportunities of climate change not just for agriculture, land sectors and food security, but also for water and environment sectors. The answers reveal a good understanding of both opportunities available, and of desirable future climate services. For example, participants noted that provision of early warning information for impending flooding (e.g., a Nigerian Meteorological Agency warning) should be specific to localities and given in local languages. Solutions that surfaced also included opportunities for climate change mitigation (e.g., reducing deforestation by reducing the use of firewood, and encouraging the use of renewable energy sources such as solar). This approach, of discussing wide-ranging problems and opportunities, could help to improve co-production of climate services; with this in mind, the Tandem framework could include a specific question on synergies between adaptation solutions and mitigation.

The project created multiple opportunities for farmers, local, state and national government officials to share information. The process revealed a sophisticated understanding of climate information, its current usage, and its potential future benefits for the community and state. This sharing of knowledge in the project activities reflects an essential part of the co-production process. Such sharing is integrated into the steps and questions posed in the Tandem framework to aid understanding of the context and restrictions encountered by users. This is the starting point of developing co-produced climate services knowledge for decision-makers, and validates the built-in feedback processes inherent in the Tandem framework.

Key lessons

The Nigeria project sheds light on ways to refine the co-production of climate services to better serve farmers in developing countries, and to refine the Tandem framework to incorporate a fuller picture of the issues that demand attention to address climate change adaptation options in such multi-stakeholder engagement processes.
Key questions that can contribute to broader understanding emerged from these engagements and workshops. Questions include:

- What opportunities arise in such circumstances? Opportunities may surface due to actual changes in climate, and through new initiatives that are designed to address such changes by expanding the availability of climate and environmental knowledge. How do opportunities differ among sectors such as food and agriculture, water and environment? These questions, could be used to help spur possible adaptation options – even if the term adaptation itself is not used in discussions.

- How viable and sustainable are current coping strategies for managing climate changes? Are short-term coping strategies detrimental? Can discussion lead the way to options that offer more potential to generate long-term solutions?

- How can a cross section of users, researchers, NGOs and government officials improve coordination between the state and the local and federal governments to address climate change in agriculture? Would improved coordination influence the requirements for new climate services?

- What are the ongoing and planned practical interventions or solutions to agriculture and land issues to urgent changes in the climate and environment? Climate service providers can use co-production processes to help appraise viable adaptation options from the list.

- Can potential users of a climate services identify opportunities that address mitigation as well as adaptation challenges?

- Who are the users of potential climate services? Are the users different from those who have the opportunity to engage with producers of climate services?

By incorporating such questions and concepts into processes that involve a wide range of stakeholders, climate services have an opportunity to tailor and enhance climate services for local users in the agricultural sector. Such questions underlie efforts to expand the usefulness of climate information, and they hold potential to enhance the likelihood that the information will be used in making key, related decisions.

ACKNOWLEDGEMENT

This brief draws on work carried out in the project "Bridging Climate Information Gaps to Strengthen Capacities for Climate Informed Decision-making" supported by the African Development Bank. This brief is also a deliverable of the SEI Initiative on Climate supported by the Swedish International Development Cooperation Agency (Sida). We are grateful to Philip Osano for providing the projects documents, Richard Taylor who acted as reviewer of this brief, and Karen Brandon for providing editorial support.

Published by
Stockholm Environment Institute
Linnégatan 87D, Box 24218
104 51 Stockholm, Sweden
Tel: +46 8 30 80 44

Author contact
ruth.butterfield@sei.org

Media contact
karen.brandon@sei.org

Visit us: sei.org
Twitter: @SEIresearch
@SEIclimate

References

Ampomah, G. and Devisscher, T. (2013) Adaptation Toolkit. Guidebook for researchers and Adaptation Practitioners Working with Local Communities, March, 2013. ENDA - Energie Environnement Développement, Dakar, Senegal. Stockholm Environment Institute (SEI), Oxford, UK.

Daniels, E., Bharwani, S., Butterfield, R. (2019). The Tandem framework: a holistic approach to co-designing climate services. SEI Discussion Brief. Stockholm Environment Institute.

Ernst, K. M., Swartling, Å. G., André, K., Preston, B. L. and Klein, R. J. T. (2019). Identifying climate service production constraints to adaptation decision-making in Sweden. *Environmental Science & Policy,* 93. 83–91. DOI: 10.1016/j.envsci.2018.11.023

Hewitt, C. D., Stone, R. C. and Tait, A. B. (2017). Improving the use of climate information in decision-making. *Nature Climate Change*, 7. 614–16. DOI: 10.1038/nclimate3378

Klein, R. J. T. and Juhola, S. (2014). A framework for Nordic actor-oriented climate adaptation research. *Environmental Science & Policy*, 40. 101–15. DOI: 10.1016/j.envsci.2014.01.011

Osano, P. , Ochieng, R., Ozor, N., Madukwe, M., and Nwobodo, C. (2018) A Report of the workshop on Adaptation Planning for Agriculture in Enugu State, Nigeria. 3-4 May 2018. University of Nigeria, Nsukka Campus. Report prepared for the project: Bridging Climate Information Gaps to Strengthen Capacities for Climate Informed Decision-Making (CDSF). Project Component 2: Capacity enhancement and climate information dissemination.

Osano, P., Ochieng, R., Madukwe, M., and Nwobodo, C. and Ozor, N. (2019) Climate Services, Adaptation and Policy Coherence in a Federal Jurisdiction: The Case of Nigeria. Draft Report.

Palutikof, J. P., Street, R. B. and Gardiner, E. P. (2019). Decision support platforms for climate change adaptation: an overview and introduction. *Climatic Change*, 153(4). 459–76. DOI: 10.1007/s10584-019-02445-2

Steen, M., Manschot, M. and Koning, N. D. (2011). Benefits of Co-design in Service Design Projects. *International Journal of Design*, 5(2). 53–60.

Vaughan, C. and Dessai, S. (2014). Climate services for society: origins, institutional arrangements, and design elements for an evaluation framework. Wiley Interdisciplinary Reviews: *Climate Change*, 5(5). 587–603. DOI: 10.1002/wcc.290