



## 2

# Co-production in the development of weather and climate services

### 2.1 Where does co-production come from?

While co-production is ideally suited to climate services, it has long been used in other fields as a mechanism for bringing together science and society to produce knowledge that is 'legitimate' and that is valid to all parties. Traditional models of knowledge production are often very 'top down' and linear in nature, whereby knowledge is produced by powerful actors – by scientists in academia, or technical experts, or bureaucrats for example – and is then transmitted to users of that knowledge. Co-production challenges this traditional model by recognising that collaboration between these typically-separate groups – often termed 'producers' and 'consumers' – can generate credible, salient and legitimate knowledge (Cash et al., 2003).

The idea of 'co-production' first arose in the 1970s in public services administration. Involving citizens through participation and empowerment was seen as a way of increasing the efficiency and effectiveness of various areas of public services, for example, education, health and public safety. Involving citizens in knowledge production, as opposed to having them just consume knowledge, is now common in developed countries, and is increasingly also practised in developing countries (Ostrom, 1996).

In developing countries, co-production arose in the 1980s when there were parallel critiques of the 'top down' model of development. The growth of participatory approaches (for example, Participatory Rural Appraisal) recognised that development is not always best designed by external experts applying technical knowledge from outside the context (Chambers, 1983). Instead, including the insights and perspectives of those people intended to benefit from the development can lead to more appropriate and effective interventions.



## 2.2 Co-production of weather and climate services

Learning from co-production highlights that the process of co-production is equally as important as the product that results (see sections 3.1.2 and 3.1.3 later). However, the nature of co-production means that it is impossible to be prescriptive and define exactly what it looks like. Instead the form that co-production takes depends on the aim, the context and the parties involved.

Co-production is rarely a linear process. While it is possible to outline some common building blocks that are undertaken in the co-production process, it is difficult to be definitive about what the co-production process should look like or, indeed, the order of these building blocks. Each co-production process is context-specific and may start at different points and follow different pathways. In addition, not all actors may be involved in each step (Visman et al., 2018).

It is important to note, however, that, while recommended, co-production is not a compulsory activity in the development of all weather and climate services. In some cases, co-production is inappropriate, for instance, due to timescales of the information being communicated, as in the development of aviation forecasts, for example. There are also different points at which co-production could be considered beneficial, depending on the service being developed. For instance, co-production could be employed during the product development, or during the communication phase, or both. Box 1 provides more information on the difference between co-production and climate services.

### BOX 1

#### The difference between co-production and climate services

The terms 'climate services' and 'co-production' are often confused. However, they actually refer to two fundamentally different processes. The term 'climate services' came to the fore after the formation of the Global Framework for Climate Services (GFCS) in 2009. The framework was developed at the Third World Climate Conference in response to a growing demand for climate information in decision-making and has since become a prominent mechanism for addressing the identified gap between the societal need for climate information and what the producers supply. The GFCS supports a range of activities from making fundamental observational and climate modelling data available to decision-makers, to stakeholder engagement and capacity development.

During the implementation of the GFCS, it became increasingly evident that employing a predominantly data-focused approach to communicating climate information for decision-making was not resulting in a step-change in climate information uptake or use. This developed into a recognition that the majority of decision- and policy-makers are not specialists in the field of climate science, and the manner in which information was made available to them was a hindrance to them engaging with the information – even when the information is perceived by the producers as being easily accessible (Barsugli et al., 2013; Steynor et al., 2016).

In order to better understand the needs of the climate service users, approaches to climate services have been strengthening interaction with users, particularly in terms of incorporating users' expertise into the development and/or communication of climate information products in a user-producer dialogue process. This dialogue process often results in what is commonly referred to as 'co-production'. While co-production has become a central process *within* climate services, climate services, as a term, encompasses a much wider range of activities and outputs.

## 2.2.1 Spectrum of co-production types

Co-production comes in different forms due to a number of factors: (i) the specific context; (ii) the people involved; (iii) the purpose of the work; (iv) the funding framework, and so on. A unique blend emerges within any one process or project.

One way to organise and distinguish these forms, without trying to define them too tightly, is to look at them in terms of a co-production spectrum. The intention here is not to say that one is better than the other, but to recognise that there is a range. The spectrum is made up of consultative co-production on the far left, and immersive co-production on the far right.



**FIGURE 1:** Spectrum of co-production approaches

Since co-production is still an evolving concept in this field we may see an evolution in the approach. What we have termed consultative co-production in this manual may seem unambitious in hindsight a few years from now, when more immersive processes have been conducted. However, these co-production approaches are all examples of moving towards a more collaborative mode that seeks to improve decision-making so that outputs are useful in making better informed decisions.



### Consultative co-production

On the consultative side of the spectrum, there is less flexibility in terms of the focus and process of co-production. The co-production focus and questions to be addressed may be fully or partially established before bringing together people with different knowledge and experiences. Outputs or products are, to varying extents, planned, designed and developed outside the co-production space, with people holding different knowledge and experiences coming together, at specific points of this process.



**IN PRACTICE:** The BRACED Gender 'Writeshop' case study is an example of a co-production process that leans towards the consultative side of the spectrum. The BRACED Knowledge Manager identified and conceptualised the output (four case studies) and the process and actors involved. Here, the bringing together of different experiences and knowledge happened, largely, through one very specific event, a carefully facilitated 'writeshop'. At the 'writeshop', the focus was on discussions being inclusive, equitable and constructive, to enable the different knowledge holders to share their knowledge and personal experiences, all of which then fed into the case studies.



**IN PRACTICE:** The Pathways to Resilience in Semi-arid Economies (PRISE) case study also focused on collaborative co-production in their design of research questions that would be most relevant to livestock value chain actors in Kenya. This brought out interesting issues about how migration and property rights are affecting resilience to climate impacts.



## Immersive co-production

On the immersive side of the spectrum, a broader range of actors are deeply involved, and people with different knowledge and experiences come together fluidly throughout the co-production process. There is greater flexibility, with the focus and the questions asked not being predefined, but emerging from bringing together people with different knowledge and experiences. The frequency and format of get-togethers are decided during the process as the co-production focus and needs emerge. Accordingly, the outcome, whether a manual, a policy brief or a learning objective, is not predefined, but is established through the co-production process. Here, the process and co-learning, which are often less tangible, can be equally as important as the outputs themselves, if not more so.



**IN PRACTICE:** The Forecast for Anticipatory Humanitarian Action (FATHUM) case study is an example of a project where the co-production process leans towards the middle-to-immersive side of the spectrum. Here, co-production has been incorporated as core to the working of the interdisciplinary project partners. At the design stage, the interdisciplinary partners co-produced the research questions and deliverables, which were then revisited by the team at different stages of the project. The kick-off meeting identified co-production rules for working in interdisciplinary teams. Effective and continuous communication within the project team has been central to the co-production process. Monthly FATHUM calls allowed everyone to be updated on progress, and to identify synergies both across the project and with non-FATHUM work. This strategy prompted co-production of research outputs that are relevant across different organisations.



**IN PRACTICE:** The co-production process in the FRACTAL case study displays immersive characteristics. FRACTAL was a transdisciplinary project aimed at advancing scientific knowledge about regional climate responses to human activities. It sought to work with decision-makers to integrate this scientific knowledge into climate-sensitive decisions at the city-regional scale. The FRACTAL project proposal's development was a co-production process. Processes and modalities for knowledge co-production are an integral part of the FRACTAL project design, from the team structure through to the engagements in each city. Learning Labs and Dialogues were central co-production methods, creating periodically convened spaces that brought together a broad range of stakeholders to constructively engage with complex burning issues. The Learning Labs and Dialogues were designed to be emergent, in that, beyond the broad thematic areas of climate and urban decision making, the specific themes of focus were completely open. When people from diverse disciplines and backgrounds got together in each city, they jointly identified city specific burning issues and key questions that became the focus of the co-production process. Outputs, whether policy briefs, input into ongoing policy process or learning outcomes, were further identified collectively by those engaged in the Learning Labs and Dialogues.

Importantly, it may not always be possible for an entire project to be classified as either immersive or consultative. Co-production may only be a sub-process of the overall project approach, for example, the BRACED Gender 'Writeshop' process formed part of a project that has no other co-production components. Or a project could hold a combination of both immersive and consultative co-production processes, with, for example, a project's consortia members working together through an immersive co-production process while engaging a wider group of stakeholders through a more consultative style of co-production. There are different motivations for doing co-production, and in some cases, processes with consultative characteristics will be more appropriate than processes with immersive characteristics and vice versa.

## BOX 2

### Types of Co-production

Bremer and Meisch (2017) conducted a review of 130 climate change research papers about co-production. They typified eight perspectives on co-production (see Figure 2); two perspectives on describing co-production, and six perspectives on enacting it. Each perspective comes with its own motivations and approaches for working with co-production, and nurtures its own configurations of collaboration. Co-production does not always neatly fit into only one of these perspectives. In fact, 'good' co-production should encompass multiple types (Bremer et al., 2019).



**FIGURE 2:** Applying the co-production prism to climate service research questions  
(Source: Bremer et al., 2019; adapted from Bremer and Meisch, 2017)

### 2.2.2 The building blocks of co-production

Keeping in mind that it is difficult to be prescriptive about the ideal co-production process, Figure 3 outlines a series of common co-production building blocks. These building blocks include: identification of key actors and building partnerships; building common ground; co-exploration of need; co-developing solutions; and evaluation, including continuous feedback and ongoing learning.

Each of these building blocks is introduced, in brief, in this section. For a more detailed overview of the practical implementation of these building blocks see section 2.4.



**FIGURE 3:** The building blocks of co-production (Source: *Building on models developed by AMMA-2050, Visman et al., 2017b and KCL engagement in two BRACED consortia projects in Visman et al., 2018 and WISER, 2017*)

A short description of the six building blocks follows:



### **Identify key actors and build partnerships**

At the outset of any co-production process, it is essential to ensure the inclusion of all the relevant actors. Excluding critical actors in the process can invalidate or undermine the co-production process. These actors include people from the three actor groups: producers, users and intermediaries (see section 2.2.3 for more detail on this). The selection of actors for co-producing a specific climate service is dependent on the areas of climate-related concern, sector(s) or region(s) of consideration. While some actors may have previous experience of working together, others may not. The range of actors may need to be extended and revised as the project focus matures and understanding about the ways to address this issue develops.

The process of identifying actors and building partnerships – as well as building common ground and co-exploring need – should be allocated ample time in project planning. Developing equitable, trust-based relationships should not be rushed and requires a series of interactions and repeated engagements in order to form an effective basis for co-production.



### **Build common ground**

Very early on in the process, it is necessary to develop a shared understanding, across actors, of the intention and desired outcomes of the co-production process. This includes identifying any competing priorities across the group. This building block is critical for managing expectations across all the actors and agreeing on foundational principles for the interaction going forward. An additional function of this building block is the capacity development of all actors to ensure an equal footing for discussion, across multiple disciplines, to take place throughout the co-production process.



### **Co-explore need**

The focus of this building block is on cementing the relationships and understanding between actors, which underpins the co-production process. It is about creating a space where a relationship of equals can form and thrive and where jointly defined issues can emerge as the focus of the co-production activities. This is also the building block in which the responsibilities and roles of each of the actors can be agreed upon and formalised, if necessary.



### **Co-develop solutions**

Through this building block, the actors can build on the identified issues to focus on a collaborative effort that will lead to the development of solutions. This will involve a series of knowledge exchanges and the contribution of a variety of expertise from across the actors. This building block results in an agreed-upon output (tangible or intangible) that aims to improve previous approaches and better enables the uptake and use of weather and climate information. Co-development should support ongoing feedback from those actors using the co-developed output in order to continually improve the delivery of weather and climate services.



## Co-deliver solutions

Once collaborative outputs have been agreed upon, this building block allows for the outputs to be effectively applied by the group or packaged and communicated to ensure that they are useful and usable by external user groups. The co-delivery process, again, requires agreement about how to communicate the output to ensure that it is accessible; that cultural considerations have been taken into account and that all contributors have been given appropriate acknowledgment. This process will also need to ensure that the actors who will be using the product are confident enough to appropriately use the co-produced service. Likewise, those ‘intermediaries’ responsible for onward communication, as well as feedback – such as media or extension services – should have the required capacities to both communicate and train other users, including an understanding about inappropriate uses of the climate service.



## Evaluate

Since co-production is often such an unpredictable process that ebbs and flows over time and involves so many actors, who would otherwise not work together, it is particularly important to schedule regular reflection and monitoring. Therefore, evaluation is a building block that is both stand-alone and also extends across all the building blocks in the co-production process. Each of the co-production building blocks should include an evaluative process in order to allow for ongoing feedback, learning from experiences to date and regular review of the process as it is unfolding, providing the space for course correction if required. Similarly, a review of the entire co-production process should be undertaken, usually towards the end of the process. This allows for the documenting of successes and failures as well as learning from the process that can inform future activities. This learning can also inform any further co-production activities within the same group of actors.

### 2.2.3 Actors in the co-production process

Recognising that there can be fluidity, for simplicity, we divide the predominant groupings of actors as follows:

- **Producers:** Those who produce weather and climate data and information. e.g. national meteorological services, university researchers, private sector forecasters, regional and global climate centres.
- **Intermediaries:** Those who support engagement between producers and users. e.g. sectoral experts, extension services, public engagement actors, economists, communicators, and donor-funded programme teams.
- **National, regional and local users:** Those who will take action based on the weather and climate information. e.g. government ministers, local government decision-makers, community-based organisations, sector-based service officers, farmers or pastoralists, urban planners and humanitarian agencies.

A more detailed description of the role of each of the actor groups, and the specific responsibilities within the co-production process, follows:

**Producers of climate information** include actors who hold or produce the raw scientific data (e.g. meteorological station data, remote sensing data, model outputs) and have the responsibility for converting this data into a form that is appropriate for the user of information.

**Intermediaries** have content knowledge and play the role of a knowledge broker, or connector, in co-production.

## PRODUCERS

Producers hold a prominent role in the co-production process. The manner in which the producer approaches, integrates into, and is responsive to, the co-production process is often central to the success or failure of the process.

- **Meteorological services** provide historical data, real-time information, future forecasts and projections and analysed products. In developing this information they learn what information is needed by different users and what format they need them in, so that users can make decisions that incorporate weather and climate considerations. A co-production process may create new – and additional – demands from meteorological services. Some meteorological services also play an intermediary role.
- **Research institutions** with climate science expertise provide complementary data in many forms, including future projections from climate models and derived products such as impact analyses and other user-focused products. Researchers can also play an intermediary role (see below).
- **Local forecasters** provide forecasts based on local observations and knowledge, for example, tracking of vegetation, animal behaviour, forage conditions, astronomical features, etc.
- **Global and regional climate centres** support the development of new science and new products. A co-production process enables their efforts to be demand responsive.

## INTERMEDIARIES

They provide the opportunity for innovation, initiating a co-production process, linking climate information to an identified purpose within a sector or informing adaptation and resilience decisions in funded programmes. They have an overview of the full spectrum of actors and the knowledge value chain within which climate services are delivered. Their functions are to: (i) enable linkages; (ii) ensure meaningful interaction between actors; (iii) support 'language translation' so that producers and users understand each other; (iv) create or facilitate systems for knowledge access, combining different forms of knowledge (e.g. scientific and local), communication, and feedback on the use and impacts.

- **Non Government Organisations (NGOs)** can provide a link between all stakeholders involved in climate information services. They can facilitate two-way communication around the co-generation of localised information that is contextually relevant. Moreover, they can feed back to the producers on changing user needs. NGOs facilitate and maintain links between actors with various roles at different levels. NGOs advocate for climate information services and the resources to support them (Jones et al, 2016). As well as overcoming the producer-user barriers through dialogue, NGOs can also be users of climate services to inform their own policies and programmes.
- **Media organisations** play a key role in packaging and communicating climate information to various users. They support the development of user-based and locally relevant climate services through: (i) raising awareness about users' context-specific and changing climate information needs; (ii) raising user awareness of climate change impacts; (iii) highlighting the value

of co-produced climate information services in informed decision-making; and (iv) highlighting societal problems to research institutes that climate information could help address. They are important intermediaries between climate science and policy decision-makers, and support monitoring and evaluation of climate services. They identify connections between information from different sectors and climate information.

- **Government ministries**, including national meteorological services as well as extension and other service providers in agriculture, livestock, disaster risk reduction, water and other climate-sensitive sectors, provide sector-specific knowledge which can help to understand climate impacts. They may also double as users.
- **Research institutions** involving, for example, sectoral scientists and economists engaged in climate-service-related initiatives, can provide evidence that supports the usefulness and value of climate services to specific groups of people affected by climate-related risks facilitating uptake and application of research.

## USERS

Users may also be intermediaries and, in some cases, producers. For example, national meteorological services are users of information from regional and global centres. One of the goals of using a co-production process is the creation of user-centred and user-led climate services that are more responsive to demand.

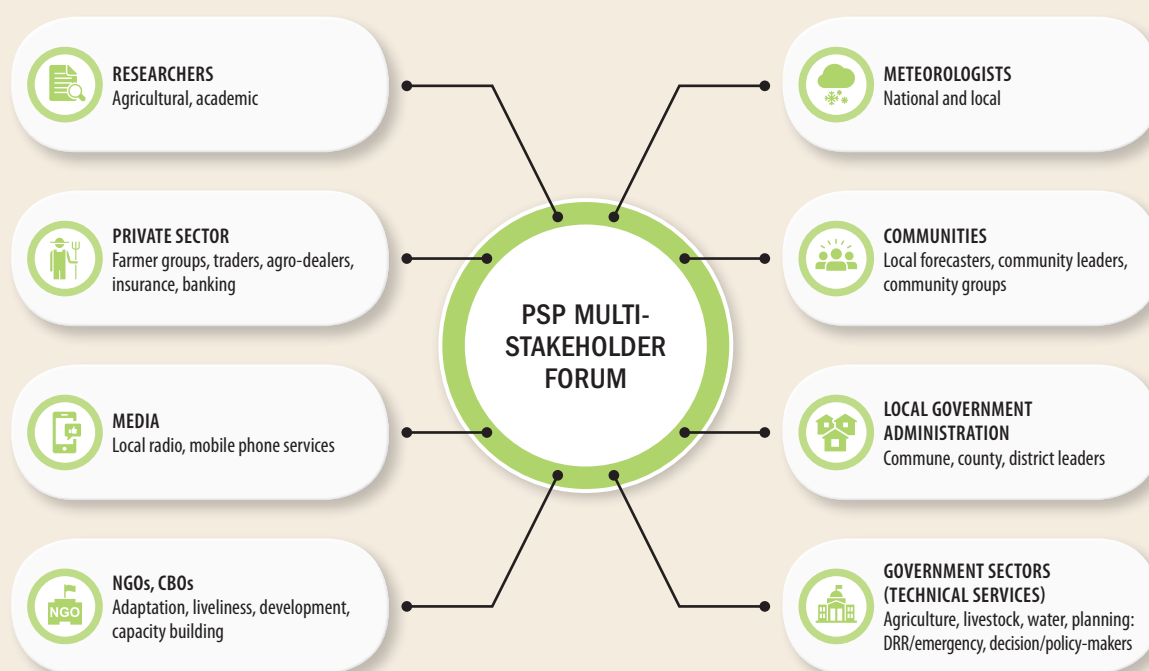
- **Government sectors**, such as disaster risk management, agriculture and food security, livestock, water, gender and health, play key roles in co-production. These technical services provide sector information and analysis and develop sector-specific advisories for integrating climate scenarios and information into sectoral adaptation, resilience planning and implementation. Government sector services are well positioned to inform producers on the information they need and to co-develop services that work. A good example is public health officials in Ethiopia working with producers to develop the ENACTS' Malaria Maproom.
- **Citizens**, particularly those whose lives and livelihoods are directly impacted by climate-related risks, can provide context to help frame the approach as well as feedback on the suitability of possible solutions.
- **Private sector actors**, such as farmer and pastoral groups, traders, agro-dealers, insurance and banking service providers, can inform and influence the types of information and the level of detail required in order to produce forecasts that are fit for purpose and which facilitate informed business and investment decisions.
- **Local leaders and livelihood groups**, such as local customary and religious leaders, women and youth representatives, natural resource managers, water user and farmer groups, are interested in forecasts and advisories that are relevant, suited to local contexts, timely and packaged in locally usable formats. They play key roles in developing trustworthy, contextualised and locally co-owned climate services that respect and blend with local and indigenous knowledge. As they are in touch with the people whose lives are impacted most by climate risks, local leaders and livelihood groups are important sources of information on the access, value, use, benefits and perceived impact of climate services.
- **Researchers** can both add value to climate services and use the services to inform their own research.

**Users** are defined as people, or organisations, that benefit from access to, and the use of, climate information.

## BOX 3

### An example of actors and their roles in the Participatory Scenario Planning approach

As a multi-stakeholder platform for co-producing user-centred climate services, the Participatory Scenario Planning (PSP) approach brings together meteorologists, local forecasters, researchers, community members (women, youth, men), local government sectors, private sector actors, local NGOs and media. The PSP workshops provide these actors with a common forum in which to discuss important issues affecting the local area in relation to, and going beyond, seasonal climate forecasts. These are stakeholders who would not normally meet, yet their collective knowledge and expertise is essential for informed and successful adaptation. The PSP process places all actors and their knowledge on the same level, presenting an open space for stakeholders to negotiate local priorities and contribute to adaptation, with the assistance of an external facilitator. Figure 4 illustrates the different key stakeholders typically involved in the PSP process.



**FIGURE 4:** An example of types of stakeholders who are usually involved in PSP. This list is not exhaustive and is subject to change based on context. (Source: ALP, 2017)

## 2.3 Overarching principles of good co-production

Co-production opens up important opportunities for bringing together knowledge from a range of actors to jointly develop climate services that are better able to support people and sectors affected by climate-related risks. The following section identifies a series of ten principles that should be considered when undertaking co-production. These are drawn from emerging learning and resources jointly developed among partners engaged in a range of climate services-related initiatives that outline shared principles for guiding co-production (EUCOMS/EUPORIAS, 2014; Adams et al., 2015; WISER, 2017; Visman et al., 2018; Vincent et al., 2018a; Steynor et al., 2016, Taylor et al., 2017).

Each principle is described followed by commonly experienced challenges related to putting the principle into practice with tips to overcome them. Each principle draws on emerging learning from the case studies to help show how these principles might come up in practice.



**FIGURE 5:** Ten principles for good co-production

### 2.3.1 Tailor to context and decision

Climate services are expressly developed to address identified user needs. Co-exploratory processes between producers and users, for example through workshops or surveys, can unpack the decision-making context to understand the decision that the climate service can address. Various participatory tools can be used to explore the priorities and contexts of the decision that the co-produced climate service is intended to inform. This might include ‘mess maps’ (also called cross-boundary causality maps) or problem trees that highlight the linkages between problems, causes and solutions. Power mapping analysis could be used to identify who makes decisions, whether at a small scale or national scale (which could be assisted through analysis of policy coherence, e.g. Curran et al., 2018). Understanding of the decision context will shape the problem that the co-production process will address and the type of outputs that will be relevant. This principle should be considered throughout the project life cycle but is critical in identifying key actors and building partnerships as well as building common ground stages.



**IN PRACTICE:** Around Lake Victoria in Kenya, the WISER Western project investigated user decision contexts which led to the production of a daily weather forecast for fishermen to inform decisions around when to fish. Prior to that, only a national weekly forecast was available for most counties around Lake Victoria.



**IN PRACTICE:** In the USAID energy sector planning project in Tanzania, the project team made use of the contextual knowledge of past climate impacts, and the relative magnitude of these impacts on the power system, to enrich the findings of the power sector’s climate risk assessment. This knowledge was also used to prioritise a core set of climate risks to be included in the power sector master plan, and incorporated into the sensitivity analysis.

### 2.3.2 Deliver timely and sustainable service

In the joint development of climate services, there may be conflicts in the time frames of interest to all the actors involved (e.g. the people at risk that an initiative is seeking to support, humanitarian and development agencies, meteorologists, researchers and funders). Climate services may be driven by meteorological practice rather than the priorities of the decision-makers for whom the information is developed. Climate information may lack the certainty, skill and spatial and temporal precision required to support longer term planning time frames (Nissan et al., 2019).

Managing expectations and aligning climate service delivery time frames between providers and users is important in the co-exploration, co-production and co-delivery of a solution so that the ultimate climate product arrives in a timely manner to inform its intended decision. The time and financial resources required to convene partners and build the trust and partnerships that are essential for the co-production process also needs to be taken into account and planned for. Timely delivery of climate products is particularly important with natural resource-based activities – for example, seasonal forecasts need to be delivered in time to inform crop planting seasons. The issuing of seasonal forecasts may, for example, be determined by key climate parameters (such as sea surface temperatures) rather than meeting the planning time frames of farmers needing to know which type of seed to buy and when to plant it. When time frames are adjusted to coincide with user needs there can be large scale benefits.



**IN PRACTICE:** In the WISER SC�PEA project the shifting of the seasonal forecast to earlier in the season saw communities that embrace these kinds of initiatives seeing a substantial improvement in crop yields (WISER, 2019)

Project-initiated services may prove successful over the course of the project, but might not continue when project funding ends. New or external intermediaries may, for example, facilitate co-production over the course of the project. Staff turnover among those partnering in climate services initiatives can be high, particularly among humanitarian and development organisations. Changes in political leadership may also result in institutional restructuring and reprioritisation that could reduce the interest in participating in co-production activities.



**IN PRACTICE:** Many of those partnering in Participatory Scenario Planning appreciated the collaborative approach, successfully advocating for county governments to budget resources to support its continuation within county climate outlook forums.

### 2.3.3 Build trust

Prior to working together, partners may not have a shared understanding of the process of co-production, including the different ways of working and the resources it requires. They may perceive co-production as a one-way transfer or 'dissemination' of knowledge to 'end' users, a one-off workshop or series of discrete engagement activities. A process-based approach to co-production recognises the importance of sustained collaboration for building trust and relationships between the various partnering institutions and groups (producers, intermediaries and users). Trust and relationships are built by, and in turn lead to, knowledge exchange between groups which is important to co-produce climate services. Building the trust and equitable relationships through knowledge exchange however takes time and resources, and each partner needs to be aware of the time required and the resources needed to achieve this.

Embracing a process-based approach from project inception enables partners to identify the most effective places and spaces for interaction and engagement across decision-making levels, sectors and disciplines to enable the co-production of relevant climate services. Whether consultative or immersive, a process-based approach enables a co-production initiative to identify where effort is placed and how the achievement of objectives is linked to other steps and actors.

Many of the case studies included within this guide, including UMFULA, FATHUM, the BRACED Gender 'Writesop', FONERWA and Zaman Lebidi have recognised the need to invest in building relationships and trust between partners. In many cases, co-production in these examples builds on previously-developed relationships.



## TIP

To promote sustainability, ensure investment in building capacities among actors across decision-making levels to enable ongoing engagement between producers and users of climate services post-project.



## TIP

Combinations of informal and formal engagement can assist in building partnerships, and may, especially at the outset, benefit from face-to-face interaction where there has been limited previous interaction.



**IN PRACTICE:** The UMFULA project team invested a lot of effort into building positive relationships with partners to create the trust necessary for effective co-production. The team had an advantage because several of the members were already well known to government partners. They had meetings early on in the project with various partners and stakeholders to determine the specific nature of their interest in the project and how they wanted to be kept in touch, both in terms of communication medium and frequency (e.g. some people wanted a team member to drop in to their office every six weeks, whilst others were happy with more infrequent email updates). Responding to comments from government staff that they rarely hear from projects in between occasional visits from international researchers, the project team produced a one page update on progress with activities every six months and sent personalised emails to key partners, highlighting their areas of interest.

### 2.3.4 Embrace diversity and respect differences

Co-developing a relevant climate service requires a collaborative process built upon the inclusion of different people, from across different sectors, disciplines and levels of decision-making, each with different needs and incentives, knowledge and value systems, practises, languages and terminologies. This typically requires a willingness on the part of both climate information producers and users to embrace new roles, skills and ways of working. It also requires the establishment of a shared understanding of the complementary areas of expertise that each partner brings to the co-production initiative. For example, staff from national meteorological services may have limited capacities for engaging with stakeholders or communicating risk information. Researchers may have limited knowledge of the context where climate services are to be developed.



#### TIP

The collective knowledge and networks of co-production actors can greatly enhance the accessibility of co-produced services. Create spaces from the project outset to recognise and value the different types of knowledge that each individual brings to the process.

Partnering institutions often come from different districts, countries or regions, bringing practical issues in terms of identifying cost-effective forms of interaction, addressing visa or security issues or other travel constraints. Enabling co-production requires investment in approaches and frameworks that can overcome both physical, as well as intellectual, institutional, social, economic, political and other types of boundaries.

It is essential to embrace diversity from the project outset. It is vital to ensure that the co-production process facilitates effective communication among all partners, respects differing value and knowledge systems, builds common ground through establishing a shared understanding of key concepts and shared goals. Multi-stakeholder engagement supports effective communication as well, bringing respective knowledge on the networks and formats that are accessible to and trusted by the intended range of users.



**IN PRACTICE:** The FRACTAL project ‘embedded’ researchers in decision-making environments. This created improved understanding and empathy, allowing insight into how decisions are made to develop effective climate services.



**IN PRACTICE:** In the AMMA-2050 and BRACED Zaman Lebidi projects, climate information providers participated in engagements with decision-makers, employing approaches to strengthen users’ understanding of key meteorological and climate concepts and developing their own appreciation of the specific decision-making processes the projects sought to address, through joint problem tree analysis and stakeholder mapping exercises.



**IN PRACTICE:** Employing frameworks that bring together expertise from across stakeholders, as supported within the World Bank Resilient Transport Strategic Assessment for Dar es Salaam, support the pooling of local and scientific knowledge of climate-related risks.

## BOX 4

### Engaging with national meteorological services

In some countries, national government systems can constrain the ability of national meteorological services to lead internationally-funded climate service initiatives or receive direct funding. In other countries, national contracting regulations and insufficient resource allocation at project outset may lead to difficulties in engaging national meteorological services as full project partners, as experienced in the BRACED Zaman Lebidi project.



**IN PRACTICE:** The Fund for Environment and Natural Resources for Rwanda (FONERWA) is the vehicle through which environment and climate change finance is channelled, programmed, disbursed and monitored. The FONERWA Climate Risk Screening Tool project had very limited financial resources. This meant that there was little to no direct funding available for incentivising Meteo Rwanda’s participation. Without either capacity-building activities or financial support for Meteo Rwanda’s time, their willingness to engage was limited.

National meteorological services staff may be overburdened with meeting existing commitments as well as engaging in a wide range of often poorly coordinated, externally-funded climate services initiatives. Beyond mandated duties for supporting aviation, national meteorological services may have more limited experience of supporting the climate information requirements of other sectors and levels of decision-making. In many countries, capacities to develop longer-term climate information are situated within research institutions. Systematic collaboration between national meteorological services and climate research institutions is often limited. Researchers frequently highlight the constraints of accessing the observational data held by national meteorological agencies.



**IN PRACTICE:** The Raising Risk Awareness (RRA) project dealt with this challenge by setting up Memorandums of Understanding with both meteorological services and researchers to clearly define roles and responsibilities and ensure access to observational data by creating good incentives for collaboration, in this case a joint academic paper.

### 2.3.5 Enhance inclusivity

Inclusion of a whole range of users, and their partnership in the process of producing a climate service, can help construct knowledge that is useful and useable. Similarly, including non-scientific knowledge can build legitimacy and increase access to information for non-expert users.

There is knowledge on stakeholder engagement, and how to do it, in the participatory development literature. This requires empathy and putting oneself in another's shoes, as well as creating a safe and open space in which dialogue can occur. Practically speaking, this may involve doing things differently. When a group of scientists come together, they may speak in technical jargon and present material in English using technology such as PowerPoint presentations. This may be intimidating and incomprehensible to a group of farmers. Similarly ensuring that women can participate may require that the timing and location of meetings takes into account the social norms that restrict women's mobility. The particular needs of people living with disabilities also need to be considered to improve the accessibility of any consultative and decision-making process.

As well as good practice in facilitating dialogues between different parties, particular care should be taken when identifying stakeholders as there is the risk of overlooking and excluding marginalised or less powerful groups. This requires particular empathy and open-mindedness. Evidence shows that scientists and climate information producers tend to gravitate towards people with similar educational backgrounds to them (Porter and Dessai, 2017). The danger here is that certain user groups end up not being represented and their views not heard, which could create solutions that reinforce inequality.



#### TIP

Inclusivity is the responsibility of everyone but, without explicit attention, there is a risk that it is overlooked. Nominating a champion who coordinates monitoring and learning, and conducting awareness raising and training at the start on how to be inclusive, can improve successful inclusion.



**IN PRACTICE:** UMFULA and FRACTAL involved policy-makers as the primary user groups, bringing together producers and users that have different thematic backgrounds and experience but are likely to have similar levels of education (in that most probably have an undergraduate degree). Those that involve local leaders and livelihood groups among the user groups, for example BRACED and Participatory Scenario Planning, have had to pay particular attention to ensuring inclusion given the different backgrounds, languages, and perceived 'knowledge' levels that require efforts to overcome. The BRACED Zaman Labidi example particularly highlights the difficulties of working in both French, English and a number of local languages. In Senegal, AMMA-2050 used a theatre forum to build empathy and space for listening to and inclusion of different sources of knowledge.

## BOX 5

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### Key questions to ask when promoting inclusivity

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The questions below can be applied in a wide range of contexts and settings and aim at improving inclusive meetings and activities so that the benefits of climate services can be distributed equitably (adapted from the BRACED Myanmar Alliance's Handbook, 2015 and from Gumucio & Schwager, 2019):

- Create spaces for many voices and narratives including physical access:
  - Where are meetings/activities being held? Can most people afford to travel to the venue?
  - Can people with reduced mobility, including wheelchair users, physically access the venue?
  - Does the timing of meetings prevent certain people for attending (e.g. colleagues who have child care duties might not be able to attend early or late meetings; partners based in different time zones might not be able to attend early/late video-conference meetings)
  - Are facilities provided for elderly people/pregnant women, e.g. toilets, seating?
- Opportunity to participate:
  - Are people aware that activities/meetings are taking place?
  - How can information channels be improved to reach diverse groups? (e.g. relying on radio or religious institutions to inform people in areas where there is no phone or internet coverage)
  - Is the language used appropriate to the context and to the level of education of users?
- Meaningful participation:
  - Is there space for non-scientists to speak up?
  - Are people's suggestions listened to? Are there mechanisms for ongoing dialogue and feedback?
  - How will language and use of words and materials be adapted to address the needs of people living with disabilities such as blind, deaf or mute people?
- Sharing relevant information:
  - Are information and communications technologies or media devices appropriate to the context and living conditions of users?
  - Are information and services relevant to the specific needs and interests of different gender groups?

### 2.3.6 Keep flexible

Flexibility is important in the co-production process because it is not possible to fully map out the process and outcomes at the start. Flexibility needs to be applied throughout the co-production process. As a result of continuous knowledge exchange, monitoring and learning, there may be a need to refine products and processes, extend activities and engage actors and areas of expertise not identified at the project outset.

Flexibility is also required on the part of all institutions and individuals participating in the co-production. For climate information producers, taking into account the different timelines and priorities of users may be new, and require acceptance of factors outside of their control that may affect timelines (Vincent et al., 2018b). Funding time frames for climate services initiatives are often short and fund management may lack sufficient agility to support the reallocation of resources required to ensure project objectives can be achieved. Realities such as turnover of staff may also cause progress to stall, and may necessitate repetition of parts of the process.



#### TIP

Project managers can extend activities to take into account the additional time required to reach consensus in the co-production processes where multiple actors are coming together.



**IN PRACTICE:** As demonstrated in the BRACED Zaman Lebidi case study, inflexible programming can constrain households from receiving the required inputs or information at the right time.



**IN PRACTICE:** In the UMFULA project, for example, flexibility was necessary to understand user needs for climate information in the agriculture sector. The initial co-exploration process identified interest in the increased occurrence of extreme events, but did not define the critical threshold for such events. The scientific team initially expected that users would be able to define their information needs but when this did not happen, they had to return to the drawing board to consider other methods of facilitating discussion to co-define what metrics are important (Vincent et al., submitted).

### 2.3.7 Support conscious facilitation

Conscious facilitation is a mindful process that provides a safe space to encourage and integrate multiple perspectives and knowledges. This requires a facilitator to create a space that diffuses power dynamics and hierarchies, and that allows different knowledges and experiences to be equally heard. Dominating voices can link to aspects such as rank and gender, as well as other power dynamics (e.g. funders), an assumed superiority of objective science and to perceptions of capacity of developed vs developing country actors. The facilitation process should ensure that everyone has a voice, and feels heard.

Knowledge that falls outside the so-called 'developed' world views still tends to be ignored or marginalised. Recognising that there are many world views, and a multitude of ways to see and make sense of the world, can allow for a variety of knowledges and experiences to be valued and heard.

If co-production is towards the consultative side of the spectrum, conscious facilitation may only be important at actual engagements, such as the planning and delivery of project stakeholder workshops. If co-production is more immersive, intending to work deeply and broadly with a variety of actors co-producing throughout, then conscious facilitation can be practiced throughout, from project conception and within project management processes, in addition to actual workshops and meetings. This can require ensuring that there is a thread between the events, and that participants at each event feel empowered to direct and steer the process of that and future events.

Facilitation and process design are skills in themselves, skills which a researcher or government or NGO practitioner may have limited or no background and training in. If such skills have not been brought in with the design of the project, the project team may need to contract external expertise at strategic points or, ideally, build these skills within the team by enabling team members to attend training courses.



**IN PRACTICE:** In the FRACTAL project the Red Cross Red Crescent Climate Centre is a core partner whose contribution and role is around facilitation and process.



**IN PRACTICE:** In the BRACED Gender 'Writeshop' case study a key focus was to allow every participant to contribute his or her own knowledge on the topic, enabling sharing of both 'expert knowledge' around gender equality and resilience, and of the 'lived experiences' of practitioners. The facilitator played a central role in ensuring inclusive and equitable discussions, with every participant invited to provide their view and opinion and given enough time to do so. Conscious framing of the discussions and process enabled participants to review each others' writing in a way that was honest and rigorous, yet respectful. The facilitator's consistent, efficient and inclusive facilitation was crucial to ensure the 'writeshop' was an inclusive, positive experience and supported honest and constructive discussions between participants.



## TIP

Make it known facilitation is a skill in itself, one which many people specifically train for and not something that team members are necessarily supposed to know how to do. This may motivate team members to think more deeply about the facilitation process, and to be more honest about how they feel about their ability to facilitate and what they feel comfortable facilitating.

### 2.3.8 Communicate in accessible ways

Co-production should work towards all actors being able to exchange information and learn from each other. This requires good communications both within project teams and with wider stakeholders involved in the co-production process. Multi-stakeholder cross-disciplinary engagement enables contribution from a wide range of expertise, which enhances the interpretation of climate information and products. The packaging and presentation format of what is communicated to specific audiences needs to be carefully considered. There is also a large selection of communication channels that can be used to reach a range of users. Co-production encourages collective decision-making on what information is shared and co-designing the delivery and communication channels that will have the best impact.

Existing climate information products may use language, terminology, formats and forms of visualisation that are not readily understandable by non-technical experts. Climate information may be provided through a limited number of channels, accessible to only a small number of decision-makers. Limited resources and requirements to pay for communication via mass media, including TV, radio, and mobile phone-based technologies, may prevent access among the wider public.



**IN PRACTICE:** In WISER, the BBC Weather Wise project is working with local radio stations to generate more climate and weather stories, paying for better equipment to incentivise the time investment in attending training courses.

Where budget is available the provision of animations, videos and infographics can help to overcome communication challenges.



**IN PRACTICE:** In FCFA, cognitive and psychological expertise was engaged to ensure that the forms of visualisation employed across FRACTAL and AMMA-2050 promoted emerging understanding about the most effective approaches for communicating climatic uncertainties.

Working between partners in different countries often involves working across different languages. To increase the uptake of the climate services it is often necessary to translate key products into a range of languages, often beyond the national or official language in which climate services are initially generated if working at the community level.



## TIP

This principle is important across the whole life cycle of the project but is especially critical in the early phases to ensure that a joint understanding of terminology is co-developed and to budget for translation requirements. Accessible communication is also vital in co-developing and co-delivering solutions to ensure that they are provided through channels that reach and are trusted by intended users, and in formats and language that are relevant and understandable to the intended user.



**IN PRACTICE:** The Raising Risk Awareness project benefited from the translation of infographics into Swahili (Kenya) and Amharic (Ethiopia) to make the process of extreme event attribution easier to understand.

The wide range of partners engaged in co-producing climate services come from different disciplines and sectors, each with their own terminologies. Failure to jointly develop a shared glossary of key terms, for example 'skill' and 'confidence' when used in relation to forecasts, can lead to miscommunication of climate information and result in undermining trust. There may be difficulties in identifying how to communicate complex scientific terms and concepts, such as the probabilistic nature of climate information, in local languages. There may be a lack of officially recognised, standard terminology guides in the range of languages spoken by those people for whom climate services are intended (Visman et al., 2017).



**IN PRACTICE:** In Burkina Faso, the BRACED Zaman Lebidi project co-produced a Lexicon of Words and Weather Terms in three local languages by bringing together the expertise of meteorologists, social scientists, the national risk management agency, farmers, journalists, community leaders and linguists.



**IN PRACTICE:** During the development of the Multi-Hazard Early Warning System (MHEWS) for Coastal Tanzania a range of stakeholders, including fishermen, seaweed farmers and coastal traders, were involved in the identification of the most important hazards, as well as the development of easily understood pictorial symbols to represent these hazards in the forecast. For instance, a flood warning (*mafuriko* in Swahili) is represented by a partially submerged house.

### 2.3.9 Ensure value-add for all involved

To fully engage and contribute to a process, the actors involved need to see the value of what is being shared, learnt or produced. What is considered valuable will vary between practitioners and researchers, between different academic disciplines, between different applications and between different people directly impacted by climate risk. The value is shaped by how an actor is impacted by an issue, their scope of work, as well as their personal views of what is important or valuable.

Those who initiated and secured funding for a co-production process would see value in the proposed project activities in themselves (e.g. workshops and other engagement processes), and in the project outputs (e.g. reports and briefs). Their time will likely be paid for through the project, and in shaping the project they would have ensured that the project outputs speak to aspects that are considered valuable in their field (e.g. academic articles for researchers or an implementation tool for NGO actors).

For those not part of the project team, whose time spent in the process is not covered by project funding and/or who were not part of developing the project proposal or project idea, the value of engagement and time and efforts spent needs to be demonstrated. Some may be sufficiently motivated by the opportunity to learn about aspects relevant to their life, livelihood or work, and to network. For others, making committed long term or substantial contributions will likely also be shaped by the extent to which this adds concrete value to their security, income or areas of work. For instance, a person living in an informal settlement may only be interested in taking part in a focus group if the climate service initiative is seeking to address the flood risks they face. A city official and his or her superiors may only see the value of participation and contribution if the process, workshop or meeting focuses directly on the person's Key Performance Areas (KPA's), and/or contributes directly to a plan or strategy or project with which their unit or directorate are tasked.



**IN PRACTICE:** In the Raising Risk Awareness case study the co-production focused on developing pilot studies on extreme event attribution in Kenya and Ethiopia. Drought events were co-identified as the focus of these case studies, based on the relevance of drought events in both countries at that time. Attribution for drought can be complex, especially in places like East Africa where the seasonal variability is large. To better showcase attribution it may have helped the project to start with a heat wave case study where extreme event attribution is most easily discernible. However, a drought focus was more valuable to local project partners and actors involved and was therefore chosen for the pilots.



## TIP

While a technical staff member may see the value of participating in a project or process, through, for example participation in its design, his or her manager may also need to be engaged in order for them to endorse their staff member's engagement in the process.



## TIP

Co-developing a Monitoring Evaluation and Learning framework at the project outset, ensuring consideration of impact requirements of all partners, and revisiting this over the course of the project can be one way to ensure partners' respective needs are being addressed.

If such value has not been co-identified during project or process development, then it is important for the project team to create the space and to have the flexibility to allow actors involved to identify at the outset how the process can add direct value to them and/or their work, and to adapt it accordingly. While this may require the project team to make some compromises on their priorities, ensuring that all benefit from the co-production process will create a greater likelihood of deep and continued engagement of actors and sustainability. Creating a space that enables everyone to openly share their expectations helps keep them transparent and feasible, and avoids cases of expectations not being met and the subsequent erosion of trust.



**IN PRACTICE:** The Rwanda Climate Services for Agriculture programme has led to Meteo Rwanda producing some highly advanced, tailored climate services for the agriculture sector, such as the new 'flexible forecast' format developed in line with the **Participatory Integrated Climate Services (PICSA)**. The co-production process has led to Meteo Rwanda learning how to better work with stakeholders, including farmers. This, in turn, has played a role in creating and improving the climate services value chain (and demand for services) in the country. There has also been value demonstrated for other partners. IRI's capacity to tailor maprooms to specific country/project needs has been built as a result of the co-production process. The value of new climate services to other actors has led to the PICSA approach being introduced in the Joint Action Development Forums (JADF) of local district governments and existing community programmes through faith-based organisations such as the Catholic Church – a clear indication of PICSA's impact and reach.

### 2.3.10 Improve transparency of forecast accuracy and certainty

Ensuring foundational knowledge of the scientific skill and probabilistic nature<sup>1</sup> of meteorological and climate information is essential for enabling partners to actively participate as equal partners in co-producing climate services (EUCOMS/ EUPORIAS, 2014; Beier, 2017; Visman, 2014; Kniveton et al., 2016; Visman et al., 2018). Working from a shared understanding of the possibilities and limitations of existing meteorological and climate science capacities, climate information producers and users can together identify the climate information that can support specific decision-making processes.

<sup>1</sup> Forecasts are inherently uncertain due to the chaotic nature of the climate, inaccuracies in forecasting models and unknown future atmospheric concentrations of greenhouse gases and aerosols (Kniveton, 2014).

Engagement with climate services and national meteorological services may be new for some partners, requiring the building of foundational understanding of key meteorological terms and concepts. Equally where non-technical partners may not be aware of the current limitations of climate science and national observations networks, there may be a risk of raising currently unrealistic expectations. For example, farmers may want to know about the distribution of rain over the season, rather than total seasonal rainfall. Yet there may be limitations in national meteorological services' existing capacities to downscale forecasts to the time frames and geographic scales that farmers require. Similarly, there are significant risks in using climate change projections to inform longer-term planning without appreciating the levels of confidence in the information provided (Nissan et al., 2019).

Some meteorological services have been reluctant to communicate the probabilistic nature of climate information, considering that the difficulties of using uncertain information and misunderstandings over the skill of the forecasts may prevent people from using it. This has led to a number of national meteorological services not including numerical probabilities and instead describing these in terms of likelihood (for example, describing heavy rainfall as being 'highly' or 'moderately' likely) that are not clear to non-technical users. However, failure to communicate the accuracy and probabilistic nature of the information has also created mistrust of climate services, where people did not experience what was communicated as definite, or deterministic, information. For example, county government bodies and farmer groups in Kenya have, on occasions, threatened legal action against the Kenya Meteorological Department where they felt that the forecasts were not accurate and confidence levels were not sufficiently clear (Visman, 2014).



**IN PRACTICE:** Some projects, such as Zaman Lebidi, have supported non-technical partners, including local radio stations, to both appreciate the probabilistic nature of climate information and communicate this to targeted user groups.

Moreover, unwillingness to include probabilities within forecasts prevents the mainstreaming of climate services within decision-making processes. Enabling decision-makers to make climate-informed decisions requires clear communication of the level of forecast skill, or confidence in the climate information, as well as the joint establishment of agreed thresholds for acting on these. Climate information providers and users need to work together to identify how often decision-makers are willing to 'act in vain', when action taken on an agreed forecast probability threshold turns out not to have been required, as well as low/no regrets options, where action taken is cost-effective, regardless of outcome. See Box 6 for more information on Forecast-based Financing (FbF).

## BOX 6

### Transparently communicating forecast uncertainty

Because we cannot predict the future with total certainty, all forecasts have some ‘uncertainty’ about what might happen in the future. A key principle of Forecast-based Financing and subsequent action is that we need to understand the uncertainty of a specific forecast to know what action should be taken. Imagine that there is rain forecasted for a football match tomorrow. Should we cancel the match? If there is a 10% chance of rain, the match will go forward. If there is a 95% chance of rain, the match will be cancelled.

Deterministic weather forecasts state that a single event will happen. For example, a deterministic forecast is: ‘there will be flood water levels tomorrow’. However, it is unclear if we should evacuate based on this forecast of flooding and how uncertain this forecast is.

To understand the uncertainty in forecasts, scientists look at historical forecasts to see what happened in the past when flood levels were forecasted. They can count the instances of each of the following outcomes:

	Yes disaster	No disaster
Yes forecast-based action	Worthy action	Act in vain
No forecast-based action	Fail to act	Correct rejection

Based on the historical instances of acting in vain, scientists can estimate the False Alarm Ratio. In this case, if flooding happened only 50% of the time that flooding was forecast, then the False Alarm Ratio is 50%. This gives us an understanding of the uncertainty of the forecast, and we can decide if it is worthwhile to evacuate on a 50% chance of flooding.

Probabilistic weather forecasts already include an estimate of uncertainty. For example, a probabilistic forecast is: ‘there is a 50% chance of flood levels tomorrow’. If these probabilities are reliable, then out of every 100 times you receive such a forecast, it should flood 50 of those times, and 50 of those times it will not flood.

Forecast-based Financing projects aim to verify the reliability of probabilistic forecasts, because sometimes the probabilities produced by the models can be skewed. Some models, for example, will issue forecasts saying 50% chance of flooding, but every time that forecast is issued, a flood happens. In those cases, an adjusted probability should be closer to 100%, and we would want to take stronger action based on that forecast.

Humanitarians are collaborating with weather forecasters and researchers to calculate this uncertainty and reliability information as part of FbF projects. It is critical information for forecasters to provide on an operational basis, so that users have a clear understanding of what kind of action they should take when they receive a forecast.



**IN PRACTICE:** FATHUM researchers have **calculated** the probability of flooding in different rivers in Africa when there is a seasonal forecast of above-normal rainfall. Using historical forecasts and information about historical floods from a flood model, they were able to calculate the probability of acting in vain. In many regions, such as in Togo, the probability of acting in vain turned out to be more than 50%. Therefore, humanitarians have decided to use these seasonal forecasts only for awareness raising, but not for delivering goods to at-risk populations.

It is vital to acknowledge that co-production of relevant climate services is a 'long-game'. Even where a climate service is tailored to support a specific climate-sensitive decision, the probabilistic nature of climate information necessarily means that the most likely outcome may not always occur. However, if the forecast is of sufficient skill, and co-production has enabled climate information providers and decision-makers to identify appropriate thresholds for action together, over the long-term it will be more cost effective to act rather than not act.



**IN PRACTICE:** A number of projects have developed training tailored to strengthen the integration of climate information within local government decision-making and radio programming. The Red Cross Red Crescent Climate Centre and other institutions have developed a range of **tools** designed to strengthen understanding of the probabilistic nature of climate information and how probabilistic risk information can be employed within specific decision-making processes, including how forecasts can be downscaled (for example, **participatory downscaling**) and the similarities and differences between levels of confidence in local and scientific sources of knowledge about the weather and climate (for example, **knowledge timelines**).

## 2.4 Implementing the building blocks and principles of co-production

If we now take the overarching principles from section 2.3 and apply them to the building blocks of co-production from section 2.2.2, it results in a number of practical considerations that could guide the in-practice implementation of each building block of co-production.

This section outlines a selection of things to consider when implementing each co-production building block. This list is not exhaustive, but is presented to provide ideas on what a co-production process might incorporate. It is also important to note that many of these considerations are interchangeable across co-production building blocks and should not be considered at only one point in the process.

For example, the WISER Support to ICPAC project facilitated a group of 60 participants from multiple disciplines and sectors in the Greater Horn of Africa region to collectively develop a set of elements and principles for user-centred co-produced climate services. The result demonstrated the important interconnections between co-production and climate services and created a locally owned version comparable with the building blocks and principles in this manual.



### TIP

From project outset ensure non-technical partners are confident in key climate concepts and terminology, as well as how to appropriately use probabilistic risk information within specific decision-making processes. Equally important is to ensure that national meteorological services are committed and able to clearly communicate the levels of accuracy and confidence within the climate information that they develop.



Training of Sector Agronomists, Social Economic Development Officers, and Farmer Promoters on the use of the Participatory Integrated Climate Services for Agriculture (PICSA) approach, Muhanga District, Rwanda. (Source: G. Nsengiyumva/CIA, 2016)



## IDENTIFY KEY ACTORS AND BUILD PARTNERSHIPS

- Identify and involve relevant actors
- Develop/create new networks or strengthen existing partnerships
- Gain political buy-in
- Enable open interaction amongst actors
- Recognise all partners' roles, strengths and limitations
- Recognise gender and cultural differences
- Prioritise listening
- Develop a clear plan, which is also flexible
- Develop any required contractual documentation
- Secure adequate resources for ALL partners
- Factor in sufficient time and resources to support the steps of co-production

### 2.4.1 Identify key actors and build partnerships

Ownership and sustainability of a climate service will be dependent on ensuring the **inclusion of all relevant actors**. Particularly important is enabling opportunities for those directly impacted by a climate-related risk to inform the prioritisation, shaping and development of the climate service. Without effective engagement, climate services may not be relevant to, or may even heighten inequalities for, marginalised groups.

To ensure the climate service can be continued in the long term, initiatives need to be informed by the decision-making context. The frameworks, **partnerships and networks** required to support the co-production process may need to be strengthened or extended in some way, and **political buy-in** secured across relevant decision-making levels.



**IN PRACTICE:** The Ethiopia ENACTS case study worked with the Climate and Health Working Group (CHWG) to bring together a diverse community of operational and academic stakeholders in Ethiopia. In particular, the Ethiopian Public Health and Nutrition Institute (later the Ethiopian Public Health Institute) took a lead role in developing new products and services that responded to requests from the Ministry of Health. Malaria experts from the USAID office and many young researchers from universities across Ethiopia were invited to participate in the workshops. In this way the CHWG laid the foundation for a broad network of stakeholders to work at the interface of climate and health.

The selection of actors for the co-production process can also significantly affect the sustainability of the approach developed. For example, where intermediary roles are undertaken by externally-funded actors, such as international NGOs, it will be important that the co-production approach builds the capacities within national actors across decision-making levels to enable ongoing engagement between producers and users of climate services after the project ends.



**IN PRACTICE:** The CARE project selected a local task force to plan the Participatory Scenario Planning workshop. The task force involved sub-national government officers from the meteorological agency, planners, agriculture, disaster risk management and other relevant sectors, as well as some NGO and civil society participants particularly where they were leading adaptation and resilience programmes. This allowed for political buy-in to be gained across the relevant decision-makers.



**IN PRACTICE:** Established networks, partnerships and political buy-in was essential for the implementation of the Multi-Hazard Early Warning System project in coastal Tanzania. The Tanzania Meteorological Agency's (TMA) work to implement the Global Framework for Climate Services (GFCS) required it to collaborate with key stakeholders, including government ministries and other stakeholders, to raise awareness of weather and climate information services. In addition shorter project partnerships with the World Meteorological Organisation (WMO) and the UK's national meteorological service enabled TMA to draw on experience and learning and stimulated an interest in a co-production approach to ensure MHEWS delivered accessible and relevant information to prioritised users.

At the outset of a co-production activity, partners may not recognise respective areas of expertise or initially value the knowledge that particular actors bring. In building partnerships, it is important to **build mutual recognition and respect** of complementary areas of expertise within the co-production process, recognising the strength and expertise that each partner brings to the process. Some scientists may not, for example, recognise the value of local or indigenous forms of knowledge about the weather and climate. Some actors may seek to take on the roles of others, underestimating the expertise involved. Actors may fail to officially recognise the contribution of everyone within co-produced outputs. Those facilitating interaction among the actors will need to foster skills in **learning to listen** in order to appreciate the knowledge of all partnering actors and include the voices of marginalised groups.



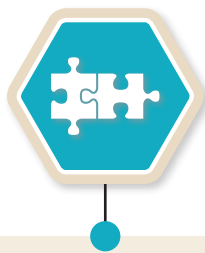
**IN PRACTICE:** The World Bank-funded Resilient Transport Strategic Adaptation for Dar es Salaam project brought together a wide range of organisations including investors, operators, city planners, disaster risk managers and engineers. The diverse engagement enabled the pooling of historical climate data and stakeholders' local knowledge of historical flood extent and duration, and specific impacts on transportation services, identification of critical transportation links, as well as broader economic and social impacts when roads become impassable. This provided a valuable basis for underpinning the direction of the modelling approach to map areas at risk of flooding.

Building trust and **equitable partnerships** among co-production actors takes **time and resources**. Combinations of informal and formal engagement can assist in building partnerships, and may, especially at the outset, benefit from face-to-face interaction where there has been limited previous interaction. **Developing formal agreements** between multiple partners is demanding. Partners often work in different regions and languages, and each needing to meet specific national and institutional contractual requirements. Each partner needs to be aware of the capacities and resources required to enable them to engage in co-production, and the implications for this in terms of recruiting and/or capacity building.



**IN PRACTICE:** In the FONERWA risk screening tool case study, the partnerships were formalised in a Memorandum of Understanding that outlined responsibilities of the project team and the partner that was required to formalise the partnership.

The range of expertise included at the outset may not have identified all the required discipline-specific areas of expertise, for example, in economics or behaviour change, that becomes apparent as the project evolves. It is important that projects retain flexibility, both in available finance and adaptive management, to be able to engage additional actors.



## BUILD COMMON GROUND

- Make clear impact or benefit requirements from all the actors
- Reach a shared vision and common purpose
- Develop agreed principles and ways of working together
- Strengthen climate information providers 'understanding of the decision-making context and decision-makers' understanding of key climate concepts

## 2.4.2 Build common ground

The actors in a co-production process may assume that they have shared aims, but without making these explicit, competing priorities may result in a discontent as some actors are perceived to prioritise benefits for their own organisation or group over those that support the wider group. Actors may also bring different ways of working, priorities, value systems and incentive structures. For instance, academic career paths have only recently, and in some countries, recognised the importance of demonstrating the social and economic benefits of investment in research. Partnering researchers may be reluctant to prioritise decision-makers' needs over more cutting-edge research questions. For their part, decision-makers and more operationally-focused actors may see scientific approaches as prioritising academic papers over tangible benefits for those whose lives and livelihoods are directly impacted by climate risks. **Recognising their differing agendas and incentives**, actors need to **jointly develop an impact plan** that benefits the whole group (Visman et al., 2018).

Similarly, there is also increasing recognition of the need for projects to jointly **agree the foundational principles and ways of working** at the outset to guide their collaborative work. Section 2.3 outlines ten principles drawn from evolving learning on approaches to effective co-production of climate services. These guiding principles will need to be contextualised for each climate service initiative, with partners jointly reflecting, from project outset, on how the principles can support and be operationalised within their ways of working.



**IN PRACTICE:** In the FRACTAL project, the Learning Labs and Dialogues were used as a means for stakeholders within cities to gather, get to know each other and share and develop knowledge. A lot of focus was given to developing a shared understanding across actors, and to collectively explore the intention and desired outcomes of the process.

Engagement with climate services may be new for some actors, requiring the **building of foundational understanding** of key meteorological terms and concepts. For their part, some meteorologists and climate scientists may not be accustomed to engaging with decision-makers or identifying their climate information requirements and, therefore, require capacity building in this regard.



Plateau Game (Source: F. Affholder, 2018)

### 2.4.3 Co-explore need

This building block is focused on **advanced relationship building** which forms the basis for identifying jointly defined issues. Importantly, it is not the primary intention of the co-exploration building block to extract new knowledge or outputs from any of the actors (Taylor et al., 2017). Rather, it is the intention of this building block to **develop essential trust and relationships** between multiple actors and form a **mutual understanding** of all actors needs and priorities. The co-exploration process also allows for the development of a shared understanding of the context in which each of the actors works, which may influence their framing of the issues in the development of a climate service.



**IN PRACTICE:** In AMMA-2050, a theatre forum was used to promote dialogue between actors on an equal basis, as well as encourage actors to reflect on their own behaviour.

During co-exploration it is important to create a space that allows for the free flow of ideas, learning and understandings, in particular, maintaining an environment that is not influenced by biases from one or more actors. This creation of an **unbiased environment** will allow for issues to emerge organically so that issues can be jointly identified and prioritised for further action in the development of a climate service. This **organic emergence** process also helps to facilitate the identification of issues of mutual concern for the group, that take into account pressing societal problems or inequities.



**IN PRACTICE:** In the REACH case study, local residents affected described the specific contexts in which they use climate information and also the limitations of what climate information is currently available. Rising insecurity, especially livestock raids, were connected to periods of acute water stress. They identified the need for reliable climate information for local law enforcement agencies to be able to put additional security measures in place during periods of higher risk.

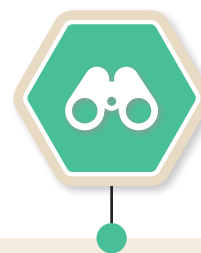
The co-exploration building block allows the group to **build and define a common purpose** which provides the framework around which **roles and responsibilities** of any future actions could be structured.



**IN PRACTICE:** In the PRISE case study, co-production of research questions led to the set up of targeted joint working groups. These groups elaborated specific inputs to the Narok County Integrated Development Plan that were based on emerging PRISE research findings in Kenya.

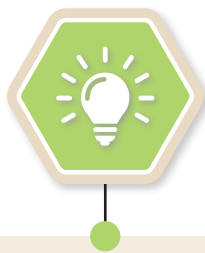
There is the possibility that there will be no collaborative future action required by the group of actors. It is possible that either no jointly-defined issues emerge or that a collaborative effort to solve the defined issues is not an appropriate way forward.

Similar to partnership building and building common ground, the co-exploration process should not be rushed. The co-exploration process requires sustained and regular interaction to form long-lasting and equitable relationships among all the actors, as well as to maximise any subsequent co-production processes.



#### CO-EXPLORE NEED

- Create a space for ongoing interaction and relationship building
- Create a relationship of equals amongst partners
- Maintain an unbiased and open agenda
- Allow for learning and understanding to take place in all directions (among actors)
- Allow for burning issues to emerge through the process
- Jointly identify issues to work on, to address a concern prioritised by the people whom an initiative seeks to support
- Clearly map out co-production roles and responsibilities



## CO-DEVELOP SOLUTIONS

- Support ongoing learning and research that takes into account local culture and knowledge
- Enable knowledge exchange amongst all partners
- Gain consensus agreement of the group
- Integrate learning from previous experiences (successes and failures)
- Develop plans for succession and sustainability

### 2.4.4 Co-develop solutions

The aim of this building block is to jointly develop an output that can better address a specific climate service need. The improved co-produced service may include changes in both the process through which the service is developed as well as the output produced. For example, the service may, for the first time, enable climate products to be provided in **languages and in formats** that are understandable to previously marginalised groups. Or the process for co-developing the solution may democratise service provision, enabling those who use the climate service to provide feedback, report on use, identify remaining or emerging challenges and inform future improvements.



**IN PRACTICE:** The Raising Risk Awareness project engaged with key decision-makers and the media about extreme event attribution analyses which informed the types of outputs that would be most useful to the key actors (including the media). This resulted in a range of communications products, including videos, animations, infographics and an image library.

Co-development of improved climate services requires **exchange of knowledge among all actors**. By enabling the bringing together of the respective expertise of actors, the group can together co-develop solutions that are better able to meet a specific climate service need.



**IN PRACTICE:** The co-development of the FONERWA climate risk screening tool took place in partnership with the International Center for Tropical Agriculture (CIAT), and built on previous work that they had undertaken. Both parties had mutual interest in strengthening FONERWA's capacity and developing climate-smart practices within Rwanda. Although no formal partnership was established, this mutual interest led to an informal agreement between the project team and CIAT on the co-development of the product through desk-based analysis combined with local knowledge and data of what is happening on the ground.

To enable uptake and use, the solution needs to be **relevant to the knowledge, culture and value systems** of the users that the service seeks to support. This, in turn, requires that the solution is informed by an understanding of these systems or that the co-production initiative commissions research to develop this understanding. Research to support the co-development and piloting of solutions needs to be undertaken in culturally-relevant ways that ensures feedback and joint validation with the people that the co-produced service seeks to support. All actors in the co-production process need to be afforded opportunities to inform the co-developed solution.



**IN PRACTICE:** In the Climate Risk Narratives project, engagements were undertaken with organisations and institutions in the city that have varying levels of influence over city development (including *inter alia* government, private sector and civil society). Through these engagements, city researchers collected information on climate risk perceptions, reactions to the draft climate risk narratives, as well as information on how these narratives might be updated to better capture the ideas of a broader range of stakeholders. In this way the climate risk narratives were validated with local knowledge.

Co-production has a particularly important role in promoting actors' willingness to **learn from both success and failure**. Actors may be understandably reticent to share instances of failure due to fears that this will affect organisational credibility and future funding. Emphasising ongoing, open and transparent learning, where all actors' knowledge is equally valued and there is commitment to continuous improvement of climate services recognises that it is only through learning from what has not worked that actors will, together, craft successful solutions.

A wide range of climate services initiatives have been undertaken, or are ongoing, and there are important efforts underway to ensure that the context-specific and transferable learning from across these can usefully inform complementary co-production initiatives. There is an urgent need to identify and integrate learning about how the **sustainability of climate service** initiatives can best be supported (as outlined in section 3.2).



Researchers Suzgo Kaunda (University of Malawi), Lapologang Mogale (University of Botswana) and Chipo Plaxedes Mubaya (Chinhoyi University of Technology) discuss the way forward for co-producing climate narratives at a workshop in Cape Town. (Source: A. McClure, 2018)



## CO-DELIVER SOLUTIONS

- Ensure co-branding and ownership of the product by the group
- Consider/incorporate local cultures and languages
- Build capacity amongst the recipient group
- Ensure accessibility of product, as well as ongoing feedback
- Co-develop a plan for communicating the climate service and solutions that ensure maximum impact

## 2.4.5 Co-deliver solutions

To promote wider ownership and sustainability of the co-produced output, it is vital to respect the contribution of the wide range actors involved in co-production. **Joint development of branding** can encourage buy-in and provide non-technical partners a readily identifiable contribution, as well as facilitate the tracking of the use and resulting changes supported through the initiative. Enabling ongoing feedback from users of the service will both promote ownership and enable continuous improvement of the service, informed by, and responding to, user specific needs.

Standard definitions of key terms will ensure that the co-produced climate service is accessible and understood. It may require that they are provided in a **range of languages** beyond those currently used by the national meteorological services, necessitating standardised translations of these key terms. Co-delivery also needs to consider whether co-produced services are provided in ways that recognise the different learning styles and **value systems** of social groups, individuals and institutions. Some people may, for example, prefer sharing learning through existing social and religious networks or through scenarios or plays, while others may prefer more formal training. The methods, spaces and places for co-delivery of climate services can build on and link with existing preferences, while ensuring that these do not perpetuate lack of access for those frequently marginalised.

The collective knowledge and networks of co-production actors can greatly enhance the accessibility of co-produced services. For example, partners with expertise in social and mass media, who have direct experience of working with the intended user groups, can ensure that co-produced services are provided through trusted channels and networks and reach intended users. Partners with expertise in language, communication and psychology can support the delivery of services in formats and languages most relevant and understandable to the intended user groups.



**IN PRACTICE:** In BRACED Zaman Lebidi, forecasts were broadcast in local languages, which were then relayed by local radios to rural people, listeners' groups, municipal councillors, village councils for development and early warning committees.

Ensuring understanding among users of the co-produced climate services is vital if they are to be appropriately used. Ensuring sufficient confidence in appropriately employing the climate service within specific processes is particularly important. For those intermediaries who are supporting onward communication,

it is vital to ensure that they have the capacities and confidence to communicate these climate terms and concepts, as well as to support others to appropriately use climate services. Where required, such **capacity building** needs to ensure confidence in communicating and using probabilistic risk information in understandable ways. Clear communication of the levels of accuracy and confidence of the climate services is foundational to building trust in the co-produced services.



**IN PRACTICE:** The ENACTS experience highlights that stand-alone training events are insufficient to build capacity in user groups to proactively use climate information. Workshops need to be reinforced with appropriate online training materials, followed through with technical support and engagement with peers who are also interested and motivated to use climate information. In Tanzania, the ENACTS' approach has evolved slowly with a series of in-country workshops and hands-on training. In Building Climate Services for Agriculture in Rwanda, farmer promoters (volunteer community members) were trained to be farmer-to-farmer extension agents. The farmer promoters then built capacity among farmers to use and understand weather and climate information.



**IN PRACTICE:** In the USAID Tanzania energy project, capacity development was undertaken through intensive working sessions to communicate findings on climate risk and build capacity for assessing and developing adaptation options to address the climate risks.



Community members in Rwanda discuss the seasonal forecast during a presentation on the Rwanda Climate Services for Agriculture Project. (Source: A. Nyandwi/MINAGRI Rwanda, 2017)



## EVALUATE

- Regularly review and co-evaluate the product and the process
- Continue to monitor and reassess the solution after completion
- Ensure ongoing learning and continuous feedback loops
- Document successes or failures in the process

### 2.4.6 Evaluate

The purpose of evaluation is not only to ensure that the intended end goal or product is delivered, but also that the various interests and preferences of the different parties are met in the process. Given the wide variety of backgrounds and expectations, this can allow for early detection of problems and provide opportunities to 'course correct' (Wall et al., 2017). Evaluation should therefore be planned from the very inception of the project.

Tracking the impact of climate services can be hard. But if co-production is recognised as a process, it becomes easier to track changes across each building block in the process. This will help identify how these changes may be contributing to reducing the risks and enhancing the opportunities of those people whose lives and livelihoods are most directly impacted by weather and climate (Kniveton et al., 2016).



**IN PRACTICE:** In Rwanda, the Climate Services for Agriculture programme was able to build on experiences and evaluations of the application of PICSA in other contexts. Among the learnings were the fact that a typical one-time, survey-based needs assessment is not enough to adequately capture user (farmer) needs. However, an iterative co-production process that captures and aggregates users' needs and evolving demand as they gain experience has proven to be beneficial. Similarly, learning from experience highlighted the importance of feedback processes to bring out users' voices in improved climate services.

Enabling ongoing monitoring and review also enables actors to learn about what is working and what is not. Where fully integrated within the process, learning can inform **continuous improvements** to climate services. **Sharing this learning** with those engaged in complementary initiatives is vital to building shared understanding about where co-production of climate services may be most effective and how this is best enabled. The relatively young nature of co-produced climate services means that there are very few post-project evaluations of sustainability and value. However, many of the co-production examples included here have included a strong element of reflection and multi-directional learning which has influenced the evolution of their process.



**IN PRACTICE:** In the BRACED Zaman Lebidi project a series of learning events were organised related to: the development and communication of climate information, gender, integrating climate information within local government decision-making and co-production related to resilience building. Learning on each topic was synthesised in a series of policy briefs which were discussed at the project's quarterly Steering and Technical Committee meetings, as well as being shared with BRACED partners and more widely.

**Budgeting appropriate time and money for reflection**, multi-directional learning and monitoring, evaluation and learning (MEL) increases the likelihood of success and sustainability. **Documenting successes and failures** along the way also helps to build an evidence base for co-produced climate services which is currently lacking. However, there is a need to also define what criteria will be used for measuring success as they might differ, reflecting the different interests (Wall et al., 2017).



A meeting with community members as part of the Rwanda Climate Services for Agriculture Project. (Source: A. Nyandwi/MINAGRI Rwanda, 2017)