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Dorothy Tembo-Nhlema, Katharine Vincent and Rebecka Henriksson Malinga

September 2019

Centre for Climate Change Economics and Policy Working Paper No. 357
ISSN 2515-5709 (Online)

Grantham Research Institute on Climate Change and the Environment Working Paper No. 325
ISSN 2515-5717 (Online)

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**Creating useful and usable weather and climate information – insights from Participatory Scenario Planning in Malawi**

Dorothy Tembo-Nhlema[a], Katharine Vincent[a,b,c,] and Rebecka Henriksson Malinga[c]

[a] Kulima Integrated Development Solutions, Postnet Suite H79, Private Bag x9118, Pietermaritzburg, 3200, South Africa, dorothytembo@yahoo.com katharine@kulima.com

[b] School of Architecture and Planning, University of the Witwatersrand, Private Bag x3, WITS 2050, South Africa

[c] Centre for Water Resources Research, University of KwaZulu-Natal, Private Bag X01, Scottsville, 3209, South Africa, malingar@ukzn.ac.za

District level PSP workshop in Karonga, 18-19th November 2015 (Source: Richard Nyoni)

**Abstract**

For weather and climate information to be used at the grassroots level, it needs to be effectively interpreted and communicated so that it is both useful and usable. The gap between producers and users, however, has typically not been filled. This paper outlines experiences with Participatory Scenario Planning (PSP). PSP has been used in Malawi as one method to bring together producers and users to co-produce sectoral interpretations of (typically seasonal) weather information to make it both useful and usable to decision-makers, farmers and local level planners. Based on qualitative interviews with the Department of Climate Change and Meteorological Services, NGOs and farmers in Karonga and Mulanje districts, and focus group discussions with district and sub-district climate change-related administrative institutions, the paper elaborates the process and the extent to which farmers have deemed the information generated to be useful and usable. The findings show that, based on the early stages of its application, PSP can generate information that is deemed credible, legitimate and salient by its intended users. Its usability is reinforced through the demonstration effect which leads to even sceptical farmers adopting it after they have witnessed proof of its effectiveness from early adopters. PSP can thus be an effective method to bridge the divide between producers and users. Challenges of PSP in Malawi include the timely availability of seasonal forecasts and appropriate resourcing to facilitate the cascade of information from national to district to sub-district level. In Malawi the sustainability of PSP is threatened due to limited integration of PSP in planning framework and reliance on projects. For optimum effectiveness of PSP there needs to be a mechanism in place to ensure its regular occurrence and embeddedness in formal governance structures.

**Key words**: climate services, seasonal forecasts, co-production, knowledge brokering, agro-meteorology, Africa

**Acknowledgements**

This work was carried out under the Future Climate For Africa UMFULA project, with financial support from the UK Natural Environment Research Council (NERC), grant references: NE/M020010/1 (Kulima) and NE/M020134/1 (UKZN) and the UK Government's Department for International Development (DFID). We are grateful to the key informants, DCPC/ACPC/VCPC members and farmers from Mulanje and Karonga who participated in this research, and to Neha Mittal for producing the map (Figure 2).

## 1. Introduction

Adaptation to climate change requires information about potential future conditions in order to make decisions that reduce the adverse impacts. The importance of climate information to inform planning decisions is now well recognised (Jones et al., 2015). Climate information can be provided on different timescales, from short term, for example seasonal forecasts, to longer term climate projections. However, the nature and presentation of climate information means it is not always well understood by users in the agricultural sector; in particular regarding to the level of skill, uncertainty, and the terciles typical of probabilistic forecasts (Patt & Gwata, 2002; Hansen, Mason, Sun & Tall, 2011).

The climate services agenda has arisen to address this demand for information that can be used in planning (Hewitt, Mason, & Walland, 2012). Climate services refers to the generation, provision and contextualisation of information and knowledge derived from climate research for decision-making at all levels of society (Vaughan & Dessai, 2014). The development of climate services thus requires involvement of new partners and construction of new knowledge beyond just the provision of forecasts and projections. This is often achieved through a process of co-production between information producers and users (e.g. Vincent et al., 2018).

One technique of co-production of climate services that has been widely applied in an African context is Participatory Scenario Planning (PSP) (e.g. CARE, 2012; Bizikova, Pinter, & Tubiello, 2014; Ojoyi, Mutanga, Mwene Kahinda, Odindi, & Abdel-Rahman, 2017). PSP is an attempt to generate useful and usable weather and climate information through co-production of sectoral interpretations by producers and users. Although it can be used with all timescales of information, PSP has particularly been applied to probabilistic seasonal forecasts to enable appropriate decisions to adapt to forthcoming conditions, particularly among farmers (CARE, 2012, 2017; World Vision, 2013).

Malawi is highly vulnerable to weather and climate conditions (Davis-Reddy & Vincent, 2017). The country is exposed to various weather and hydrological hazards including droughts, severe storms, and floods. The economic base of the country, and the livelihoods of most of the population, are also dependent on natural resources (UNDP-UNEP-PEI, 2016). Tobacco, sugar and tea are the predominant exports and subsistence agriculture focuses on maize and sorghum. The effects of weather and hydrological hazards are becoming increasingly evident (Archer et al., 2017). Major droughts accompanied an El Nino event in 2015-16, with 6.5 million people affected in central and southern Malawi – a third of the population. Major floods occurred in 2014-15, when the country experienced more devastating floods in terms of geographical coverage, severity of damage and extent of loss such that an estimated 1,101,364 people were affected, 230,000 displaced, 106 killed and 172 missing (Malawi Government, 2015). Further flooding associated with the passage of tropical cyclone Idai in March 2019 resulted in 868,900 people affected and 86,980 displaced (Malawi Government, 2019a).

The introduction of PSP in Malawi followed successful experiences elsewhere in the continent, particularly Kenya and Ghana where it was implemented by CARE (CARE, 2012). PSP was first implemented at district level in Malawi in the 2014-15 season and has variously been adopted by many NGOs aiming to support adaptation to climate change. However, other than initiative-specific efforts, there has been no systematic evaluation of its effects, an absence of evidence which is recognized more widely in climate services (Vaughan & Dessai, 2014; Tall, Coulibaly, & Diop, 2018). Since several rounds of PSP have now taken place, time is ripe to use the example of Malawi to investigate the extent to which PSP has been able to generate useful and usable information for decision-making. Such an analysis also fits into broader

discussions around how to provide information for decision-making (e.g. Vincent et al, 2016), and how best to communicate information (Vaughan, Buja, Kruczkiewicz, & Goddard, 2016), as well as the call for more, particularly ex-post, qualitative assessments of climate services (Bruno Soares, Daly, & Dessai, 2018).

The paper is structured as follows. Section 2 provides a literature review of climate services, co-production and participatory scenario planning. Section 3 then gives an overview of the history of PSP in Malawi, outlining how it was introduced in 2013 and how it has variously been applied at district level in the subsequent seasons. Section 4 outlines the method of investigation, based on interviews with key informants in government and NGOs and farmers in two districts, together with interviews/focus group discussions with the relevant Civil Protection Committees that were involved in the process. Section 5 presents the results, illustrating perceptions of PSP among farmers at grassroots level, together with evidence on the salience, legitimacy and credibility of the information generated, and the extent to which it has been used according to both farmers and other actors in the process (Civil Protection Committees and government and NGO staff), also taking into account gender differences. It then unpacks some of the barriers to scaling up PSP throughout Malawi, and ensuring sustainability of the approach. Section 6 concludes by placing the results in the context of the agenda to evaluate climate services, and wider applicability of scenario planning approaches taking into account different timescales of climate information.

## 2. Climate services, co-production and participatory scenario planning

The climate services agenda has arisen recognising that the increase in availability of climate information has not necessarily led to effective adaptation to climate change (Lemos, Kirchhoff, & Ramprasad, 2012). There is a key role for climate information, with WMO estimating over a decade ago that 100,000 deaths and US$1 billion per year could be the annual global cost of weather, climate and water-related disasters – numbers that are likely to have subsequently increased (WMO, 2007). Significant efforts and resources have been targeted at generating better information on a range of timescales, from short-term weather to seasonal forecasts to long-term climate projections. The emphasis of these efforts has been global – for example COPERNICUS in Europe (e.g. Buontempo, Hewitt, Doblas-Reyes, & Dessai, 2014) and the Regional Climate Outlook Fora for seasonal forecasts in Africa and Asia (Patt, Ogallo, & Hellmuth, 2007). There is still a challenge in bridging the so-called "valley of death" between climate information producers and users (Buontempo et al., 2014). Various studies have highlighted that the information produced does not necessarily meet users' needs, for example in terms of timeframe, spatial scale and applicability (e.g. Vincent et al., 2016; Singh et al., 2017; Vincent et al., 2017). Improved information alone is not adequate - it needs to be useful and usable to decision-makers (Dilling & Lemos, 2011; Lemos et al., 2012; Jones et al., 2015). This typically requires that information is targeted and tailored to the different needs of users (Sivakumar, 2006; Vaughan & Dessai, 2014).

Creating targeted and tailored information requires closer collaboration between producers and users (Hewitt, Stone & Tait, 2017). Climate services needs a problem context and to have data available (Goddard, 2016). Co-producing such information has the benefit of ensuring that there is both scientific credibility, legitimacy and salience to users (Buontempo et al., 2014), defined as the three key criteria for knowledge systems (Cash et al., 2003). However, producing new knowledge in this way requires new

ways of working and, crucially, involves partnership of producers and users. As recently as 2014 this was still a novel approach, with COPERNICUS having three aims expressly covering the creation of novel dialogue fora and non-hierarchical and multidisciplinary approaches to service development existence and design of such a producer-user partnership (Buontempo et al., 2014).

The mechanisms through which climate services can be co-produced require new partnerships. Scientists are not always the best at understanding user needs or communicating, which is required for such co-production partnership (Porter & Dessai, 2017). The capacity limitations of national meteorological and hydrological services in Africa mean that adding such a role can create unrealistic burdens on them (Ziervogel & Zermoglio, 2009). Similar to COPERNICUS, The Regional Climate Outlook Fora have also applied different approaches and had different levels of success with user engagement (Guido, Rountree, Greene, Gerlak, & Trotman, 2016; Daly & Dessai, 2018). Instead of expecting this from the climate information producers, there may be a role for boundary agents or knowledge brokers who can bridge the divide (Cvitanovic et al., 2015; Guido et al., 2016). Various parties can play the role of broker, but NGOs are increasingly playing this intermediary role between producers and users in the co-production of climate services (Harvey, Jones, Cochrane, & Singh, 2019).

There are several ways in which NGOs can play a role in co-production of climate services. These roles can occur at various parts in the climate service value chain, from data analysis to interpretation to communication and use (Jones, Harvey, & Wood, 2016). Since NGOs are typically embedded with, and trusted by, user communities (particularly at the grassroots level, Jones et al., 2016) they can provide a crucial link with producers, enhancing collaboration. This collaboration could facilitate dialogue linking traditional knowledge of local climates with scientifically-generated climate information. It can also mean playing a key role in communicating information, for example seasonal forecasts or early warning, through translating into local languages, and distributing such information to remote communities otherwise unconnected with digital media sources. There is increasing evidence of NGOs playing these roles in various contexts (Cochrane & Singh, 2017; Harvey & Singh, 2017). However, it is important to remember, as these new roles emerge, to ensure coordination and learning from experiences to maintain legitimacy (Tall et al., 2014).

One of the ways that climate information can be made more useful to users is to generate scenarios. Scenarios can link socioeconomic and climate trends to provide plausible, alternative futures and thus are useful for planning (Tschakert & Dietrich, 2010). PSP involves users to generate scenarios that are useful and usable for them (Kok, Biggs & Zurek, 2007). It has a long history in a variety of fields within the interface between research and practice, including ecosystem services (e.g. Malinga, Gordon, Lindborg & Jewitt, 2013; Otera-Rozas et al., 2015), environmental assessments (Whitfield & Reed, 2012), and natural resources conflict resolution (Evans et al., 2006). PSP for adaptation planning has been used in Ghana, Honduras, Tajikistan (Bizikova et al., 2014), Mexico, Argentina, Colombia (Brown, Martin-Ortega, Waylen, & Blackstock, 2016), the Arctic (Flynn et al., 2018), Tanzania (Ojoyi et al., 2017) and Australia (Rickards, Wiseman, Edwards, & Biggs, 2014). The success of PSP is contingent on the availability of qualitative and quantitative information (beyond participants' knowledge) and the process of participation is not always easy (Kunkel, Moss, & Parris, 2016). However, PSP has well documented benefits, in terms of increasing legitimacy, utility and building capacity and shared understanding within the process of development (Kok et al., 2007; Bizikova et al., 2014; Olabisi, Adebiyi, Traore, & Kakwera, 2016).

PSP has been embraced by NGOs as a method for building resilience and adapting to climate change (e.g. Addison & Ibrahim, 2013; CARE, 2012). CARE has used PSP as a mechanism for collective sharing and interpretation of probabilistic seasonal forecasts and integrating local and scientific knowledge (Guthiga & Newsham, 2011). As soon as the seasonal forecast is issued, workshops are convened bringing together meteorologists, community members, NGOs and local government departments with the aim of interpreting the information so that it is locally relevant and useful (CARE, 2012). The aim is to use the information to generate a shared understanding of the possible future risk factors, vulnerabilities and potential impacts enabling them to forward plan (World Vision, 2013). The dialogue during the workshop enables consideration of climatic probabilities, assessing likely hazards, risks, opportunities and impacts, and ultimately developing three probabilistic hazard scenarios. Discussion of the implications of the scenarios on different livelihoods and sectors leads to agreement on plans and contingencies to reduce risk. Early evidence shows that PSP can reduce adverse impacts of climate change. In Kenya, for example, the forecast for the March-May 2014 season predicted a dry spell of two to three weeks following the start of the rains. As a result, farmers shifted the planting date from the onset of rains to approximately six weeks later and used early maturing seeds, meaning that they were able to produce a crop (CARE, 2017). An ancillary benefit that has been observed is that growing willingness to use information stimulates further demand for the availability of climate information (CARE, 2017).

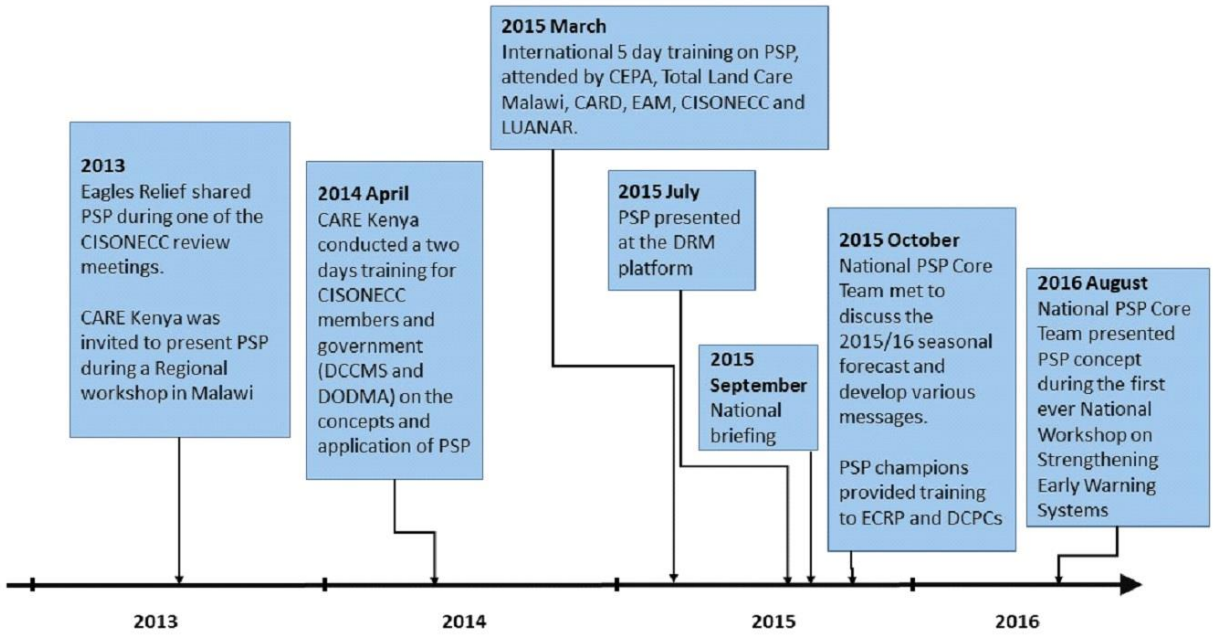
**3. History of PSP in Malawi**

The concept of PSP for climate services was first raised in Malawi by Civil Society Network on Climate Change-CISONECC in 2013 (Figure 1). During a regional workshop they organized, as part of their role as focal point for the Southern Voices on Climate Change in East and Southern Africa, CARE International-Kenya presented their positive experiences with PSP in Garissa County, Kenya. The Garissa example ultimately led to the method being replicated annually at county level throughout the entire country when the seasonal forecasts were released. CISONECC subsequently arranged for CARE to provide training for several Malawian NGOs and government departments and ministries, including Department of Climate Change and Meteorological Services (DCCMS), Department of Disaster Management Affairs (DODMA), and the Ministry of Agriculture, Irrigation and Water Development (MoAIWD) in April 2014.

Simultaneously, a major resilience initiative - the Enhancing Community Resilience Programme (ECRP), funded by DFID and implemented by two consortia of NGOs (known as ECRP and DISCOVER-Developing Innovative Solutions to Overcome Vulnerability through Enhanced Resilience, respectively) in eleven districts across Malawi, was already experimenting in improving accessibility of weather forecast information. This was done by translating the 5- and 10-day forecast information issued by the DCCMS, into the local language, Chichewa. Through a technology called ESOKO, the translated information was disseminated via text message to implementing partners, district officials and targeted community members (lead farmers who were charged with further spreading the message among their communities), together with extension advice developed by DCCMS and Christian Aid. Having these processes already in place, ECRP and DISCOVER became important partners in the implementation of PSP in Malawi. Eagles Relief was also using existing knowledge to adopt a process to interpret seasonal forecasts at district level, but not full PSP.

Preparation for application of PSP occurred throughout 2015. In March 2015 a regional training workshop on PSP organized by CARE was attended by six Malawi representatives from NGOs and academia. They

then proceeded to implement the work plan they devised during the training, which included presenting the concept at a meeting of the national Disaster Risk Management (DRM) platform in July 2015, followed by briefing key government and non-government stakeholders in September 2015. During this meeting, a National Core Team was constituted, comprising international NGOs (Red Cross, Catholic Development Commission-CADECOM, Oxfam, ActionAid, CARE, and Christian Aid), national NGOs (Centre for Environmental Policy and Advocacy-CEPA, Total Land Care, Churches Action in Relief and Development-CARD, Evangelical association of Malawi-EAM, Leadership in Environment and Development for Southern and Eastern Africa-LEAD SEA, National Association of Smallholder Farmers of Malawi, and Green Belt Initiative), multilateral institutions (UNDP and WHO), government departments (DODMA, Environmental Affairs Department, Ministry of Agriculture, Irrigation and Water Development, Ministry of Health, Ministry of Education, and DCCMS), as well as representatives from media.




Acronyms: PSP: Participatory Scenario Planning; CISONECC: Civil Society Network on Climate Change; DCCMS: Department of Climate Change and Meterological Services; DODMA: Department of Disaster Management Affairs; CEPA: Centre for Environmental Policy and Advocacy; CARD: Churches Aid in Relief and Development; EAM: Evangelical Association of Malawi; LUANAR: Lilongwe University of Agriculture & Natural Resources; DRM: Disaster Reduction Management; ECRP: Enhancing Community Resilience Programme; DCPC: District Civil Protection Committee.

Figure 1: Timeline of PSP evolution in Malawi until the first implementation in the 2015-16 season

## 4. Method

With increasing demand for, and development of, climate services, there is a need to critically assess different methods and contexts to inform more effective development and ultimately contribute to more effective adaptation to climate change. Since several rounds of PSP have now taken place in Malawi, time is ripe to use this case study to investigate the extent to which PSP has been able to generate useful and usable information for decision-making. The objectives are thus to:

- Investigate the rollout of PSP in Malawi
- Determine the extent to which PSP has generated useful and usable information for farmers
- Determine the barriers to the generation of useful and usable information through PSP.

PSP has taken place in at least 18 districts up to the 2018-19 season, but only five of these have had at least two repeated years of PSP. We sampled Karonga and Mulanje as they have both had multiple rounds of PSP and are in different parts of the country (north and south, respectively), meaning that the forecasts there are different (Figure 2). Among institutions involved in introducing and implementing PSP, we interviewed key informants from eight organisations nationwide: seven NGOs (Self Help Africa (SHA), EAM, CEPA, CARD, CISONECC, World Vision Malawi, and CADECOM, and one government department-DCCMS (Table 1).

In each of the two districts, we conducted focus group discussions with the District Civil Protection Committees (DCPC), Area Civil Protection Committees (ACPC), and Village Civil Protection Committees (VCPC) (Figure 3, Table 2) (although with the Karonga DCPC this ended up being an interview due to an emergency meeting calling away other members). CPCs are groups charged with disaster risk reduction as mandated by the Disaster Preparedness and Relief Act 1991 and, at each governance level (district, area, and village), comprise a chair, vice chair, secretary, treasurer and members (approximately 15 people in total). The implementing NGOs in each district, CARD and SHA, then identified farmers who had been part of the PSP process, and five farmers were randomly selected (2 females and 3 male) in Mulanje and Karonga and interviewed (Table 3).

All interviews and focus groups took place in 2018. Interview and focus group protocols contained key themes for exploration (around PSP implementation procedures, benefits, challenges and sustainability) but were semi-structured in scope (see annexes). Data was then transcribed and underwent content analysis.

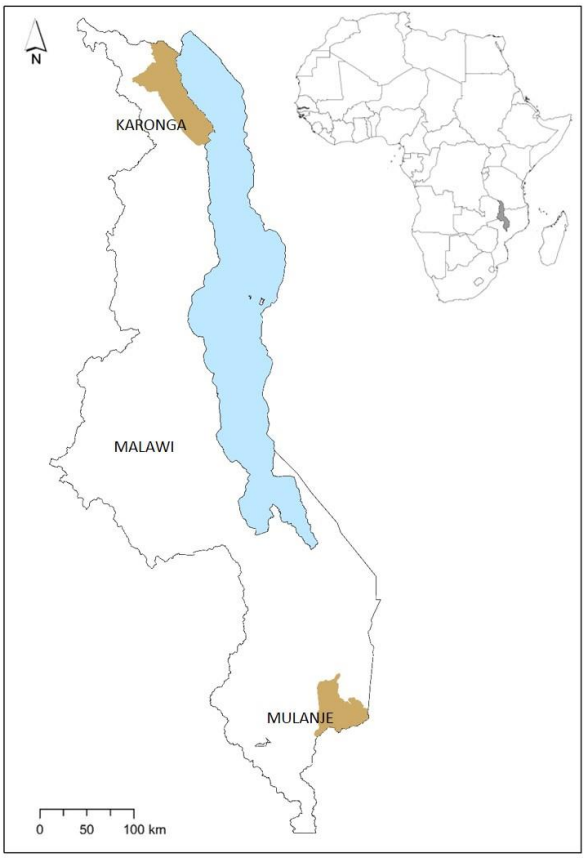



Figure 2: Location map of Mulanje and Karonga districts in Malawi

Table 1: Summary of government and NGO interviewees

| **Organisation** | **Sex** | **Role in PSP** | **Length of time involved with PSP** |
|---|---|---|---|
| Self Help Africa (SHA) | M | Implementer of PSP | 3 years |
| Evangelical Association of Malawi (EAM) | M | Implementer of PSP | 4 years |
| Centre for Environmental Policy and Advocacy (CEPA) | F | Supporting workshops with knowledge on PSP | 1 year |
| Churches Aid in Relief and Development (CARD) | M | Part of the National Core Team, PSP Champion and Implementer of PSP | 3 years |
| Civil Society Network on Climate Change (CISONECC) | M | Part of the National Core Team, PSP Champion | 4 years |
| World Vision Malawi | F | Implementer of PSP | 2 years |
| Catholic Development Commission of Malawi (CADECOM) | M | Implementer of PSP | 1 year |
| Department of Climate Change and Meteorological Services (DCCMS) | M | Seasonal forecast generation and interpretation | 4 years |

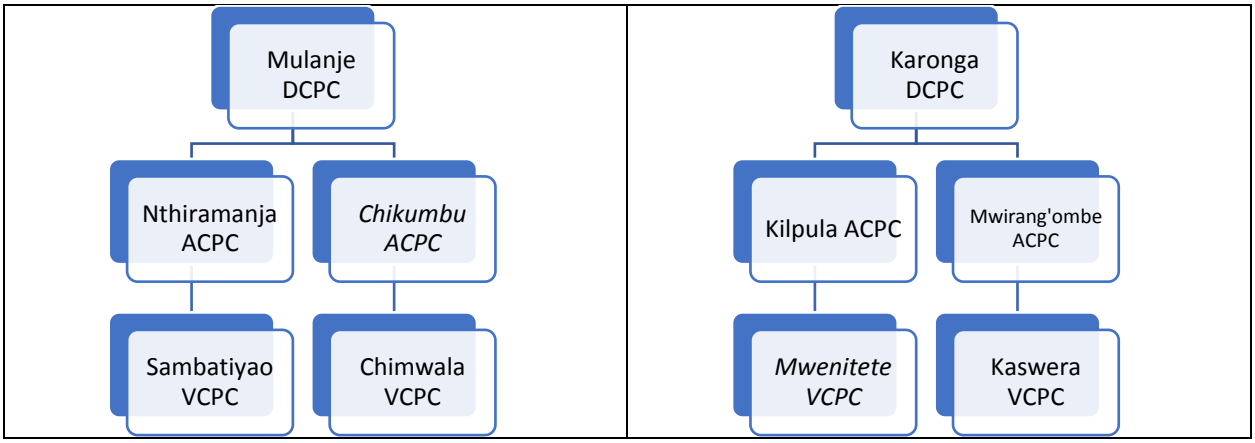



Figure 3: Civil Protection Committees at the District (DCPC), Area (ACPC) and Village level (VCPC) in Mulanje and Karonga districts that were part of the research (* *note Chikumbu ACPC and Mwenitete VCPC were unavailable to be interviewed during fieldwork but are still shown here to complete the hierarchy of governance*)

Table 2: Summary of Civil Protection Committee focus group participants/interviewees

| **Level** | **District** | **Institution** | **Participants (sex-disaggregated)** | **Role in PSP** | **Length of time involved in PSP** |
|---|---|---|---|---|---|
| District | Karonga | Karonga DCPC (member) | 1 man | Seasonal forecast generation and interpretation | 3 years |
| District | Mulanje | Mulanje DCPC (member) | 6 men, 1 woman | Supporting PSP in the communities | 3 years |
| Area | Karonga | Kilipula ACPC (Vice chair and members) | 4 men | Participants in the PSP workshop | 2 years |
| Area | Mulanje | Nthiramanja ACPC (Secretary and members) | 1 man, 1 woman | Participants and knowledgeable locals in the PSP workshop | 2 years |
| Village | Karonga | Kaswera VCPC (Chair, vice secretary and members) | 7 men, 1 woman | Participants and knowledgeable locals in the PSP workshop | 2 years |
| Village | Mulanje | Sambatiyao VCPC (Vice chair, secretary, treasurer and members- | 4 men, 3 women | Participants and knowledgeable locals in the PSP workshop | 2 years |
| Village | Mulanje | Chimwala VCPC (members) | 8 men, 2 women | Participants and knowledgeable locals in the PSP workshop | 2 years |

Table 3: Summary of Farmer interviewees

| District | Identifier | Relevant VCPC | Sex | Length of time involved in PSP |
|---|---|---|---|---|
| Karonga | Farmer 1 | Kaswera | Woman | 2 years |
| Karonga | Farmer 2 | Kaswera | Man | 2 years |
| Mulanje | Farmer 3 | Sambatiyao | Man | 2 years |
| Mulanje | Farmer 4 | Chimwala | Woman | 2 years |
| Mulanje | Farmer 5 | Chimwala | Man | 1 year |

## 5. Results and discussion

### 5.1 Application of PSP in Malawi

*5.1.1 National level PSP*

PSP was first formally implemented as a multi-stakeholder process in Malawi in the 2015-16 season after a needs assessment revealed limited understanding of climate information and PSP was thought to be the most appropriate intervention (CEPA representative). In October 2015 the National Core Team was presented with the seasonal forecast by DCCMS, and then divided into sector-related groups to provide interpretation and develop messages. Figure 4 provides an example of the 2015-16 PSP outcome for the below normal rainfall scenario for national level (where a large part of the country shows 35% likelihood of above normal rainfall, 40% likelihood of normal rainfall, and 25% likelihood of below normal rainfall). The compiled messages were validated by DODMA and Ministry of Agriculture, Irrigation and Water Development and then disseminated through various channels. The messages were developed for the national seasonal forecast, and the messages highlighted the seasonal outlook, possible hazards, risks, opportunities and advisory messages as shown in Figure 4. ECRP also supported a radio recorded program where DODMA and Christian Aid presented the PSP output. Many NGOs, particularly those involved in ECRP and DISCOVER, expressed interest in being trained along with their corresponding DCPC. District level training and scenario planning workshops, attended by the National Core Team, DCCMS and DODMA, took place in Karonga, Nsanje, Mulanje, Balaka and Salima during October-November 2015. Interest continued to grow and in 2016 training of trainers took place for additional NGOs, including World Vision Malawi, Red Cross, ActionAid and Trocaire, with others such as CADECOM, Save the Children and EU resilience programme called BETTER (Better Extension Training Transforming Economic Returns) adopting the practice in subsequent years (Table 4). Here we have undertaken research with two of the districts that have participated in PSP in multiple years and are geographically distinct (and thus have different seasonal forecasts).

| BELOW NORMAL RAINFALL IN AGRICULTURE SECTOR (Erratic Rains) | | | |
|---|---|---|---|
| **IMPACT** | **ADVISORIES FOR AGROPASTROLISTS** | **OPPORTUNITIES** | **LEAD DEPT** |
| Crop Failure | Preserve Harvest from previous Year | High demand for commodities e.g. Maize | Min. Agric |
| | Increase Area under Irrigation | Increased demand for Short duration Crop varieties | Min. Agric |
| | Grow Draught torrelant crops | | Min. Agric |
| | Plant early maturing Varieties | | Min. Agric |
| | Crop Diversification | | Min. Agric |
| | Adopt Conservation Agriculture Technologies | | Min. Agric |
| | | | |
| Fodder scarcity | Preserving Animal Feed e.g. Hay | | Min. Agric |

Figure 4: Snippet of the PSP-derived messages for the 2015-16 national forecast

Table 4: Rollout of PSP in Malawi by district and season (with relevant lead partner, project name and month of workshop)

| **District/Year** | ***2014-15**** | **2015-16** | **2016-17** | **2017-18** | **2018-19** |
|---|---|---|---|---|---|
| **Districts** | **NGOs that played a lead role (with project name and month of workshop)** | | | | |
| Balaka | | United Purpose (November) | | DFID - Breaking the Cycle INGO Consortium | |
| Chikwawa | *EAM and Eagles Relief* | EAM and Eagles Relief | EAM and Eagles Relief | DFID - Breaking the Cycle INGO Consortium | CADECOM (UBALE)(October) |
| Chiradzulu | | | | | BETTER (October) |
| Chitipa | | | | | BETTER (October) |
| Dedza | | United Purpose (November) | | DFID - Breaking the Cycle INGO Consortium | |
| Karonga | | SHA (DISCOVER) (November) | SHA (March) | DFID - Breaking the Cycle INGO Consortium | BETTER (November) |
| Kasungu | | | CADECOM, MALEZA and Heifer International | | |

| District/Year | *2014-15** | 2015-16 | 2016-17 | 2017-18 | 2018-19 |
|---|---|---|---|---|---|
| | | | (ECRP) (December) | | |
| Machinga | | Emmanuel International (December) | Emmanuel International (October) | DFID - Breaking the Cycle INGO Consortium | |
| Mangochi | | | | DFID - Breaking the Cycle INGO Consortium | |
| Mulanje | | CARD (ECRP) (October) | CARD (ECRP) (November) | DFID - Breaking the Cycle INGO Consortium | |
| Mwanza | | | ADRA (ECRP) (January) | | |
| Mzimba | | | | | BETTER (October) |
| Nkhatabay | | | | | BETTER (October) |
| Nkhotakota | | | | | BETTER (October) |
| Nsanje | *Action Aid International (ECRP) (December)* | Action Aid International and GOAL Malawi (ECRP and DISCOVER) | | DFID - Breaking the Cycle INGO Consortium | |
| Phalombe | | | | DFID - Breaking the Cycle INGO Consortium | |
| Salima | | COOPI (DISCOVER) | | DFID - Breaking the Cycle INGO Consortium | |
| Thyolo | | CARD (ECRP) (October) | CARD (ECRP) (November) | | |

** Note that Action Aid International, EAM and Eagles Relief attempted an abbreviated version of PSP in selected districts by interpreting seasonal forecasts. However, they did not follow the complete multi-stakeholder PSP process and thus 2015-16 was the first time that PSP was comprehensively implemented*

*5.1.2 District and sub-district level PSP*

The process of readying a district for PSP requires several stages. The first is to train the DCPC to support the delivery of PSP workshops at ACPC and VCPC (sub-district climate change-related-administration comprises areas which, in turn, comprise villages). In Karonga DCPC members were invited to a two-day training workshop organized by the DISCOVER project in November 2015 for the January to March rainfall period; and Mulanje DCPC members were trained in October 2015. After the training, an action plan was developed to train ACPCs and VCPCs. DCPC members were trained on understanding and interpreting seasonal weather forecast and developing various scenarios and messages. The training materials also included concepts on climate change and adaptation as well as the PSP concept and application.

At district level, the actual PSP workshops take place as soon as the seasonal forecast is available. They are attended by various parties who have knowledge about, or whose activities are affected by, weather conditions. They include DCCMS, DODMA and the implementing NGO(s), along with local government departments including disaster management, agriculture, health, forest, water and energy and, DCPC, ACPC, VCPC and community members.

The role of the community structures and community members is to assist in translating the seasonal forecasts during the workshops and be able to contextualize the forecast information and potential impacts through sharing the past experiences and local indicators related to weather and climate. The DCPC in Karonga and Mulanje highlighted their role in a PSP workshop is "*to share the history of the area in terms of hotspots and possible hazards and participate in developing scenarios*".

In practice this occurs through discussions on the skill of the previous season's forecast and discussion on the robustness of the PSP advisories, and then arriving at consensus on the potential hazards, risks, opportunities and impacts for each of the terciles within the forecast. The outcome of the workshops is advisories based on the tercile probabilities of the forecast that enable effective community-level adaptation decision-making (see Figure 4 for an example), and a communication plan for further disseminating the information through relevant communities, for example by word of mouth, radio and phones. Participants leave with knowledge of the forecast, skills in interpreting early warning information, and awareness of their own capacities and vulnerabilities and ways of taking adaptive decisions in line with the forecast. The process is then progressively taken to areas and villages through the ACPCs and VCPCs that have attended the district-level workshops, where the overall advisory is further contextualized and communicated with community members through word of mouth (villages tend to be small). Figure 5 provides a schematic representation of the PSP process and actors involved at various stages. Table 5 provides an example of participants and their roles in one district PSP level workshop, held in Karonga district on 18-19th November 2015 under the auspices of DISCOVER.

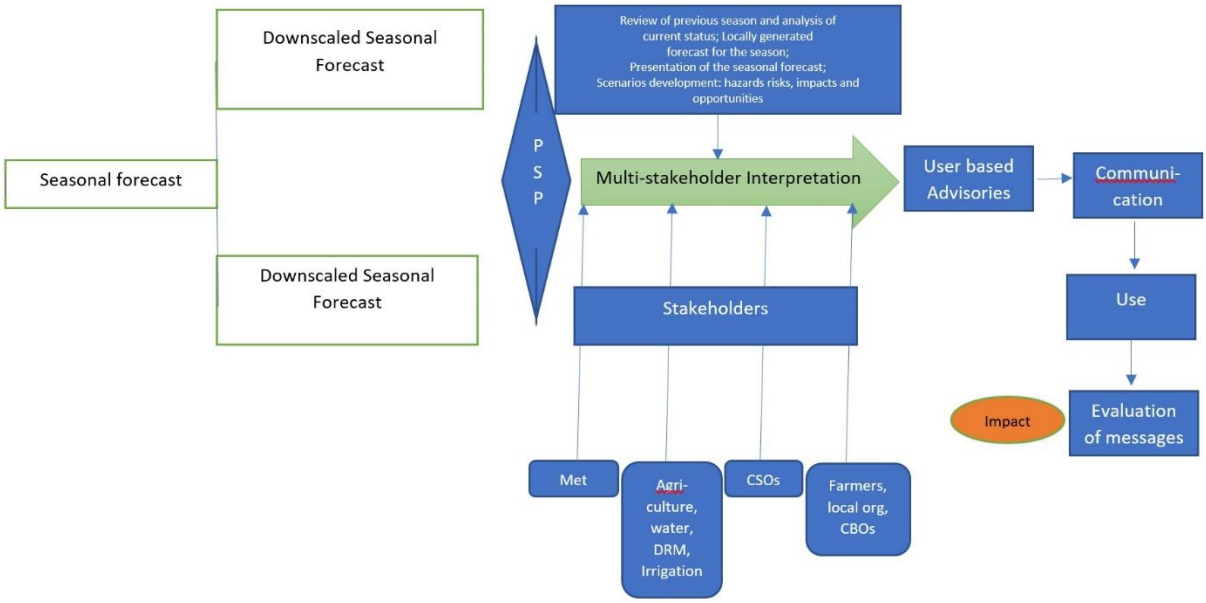



Figure 5: Schematic representation of the PSP process and actors involved

Table 5: Participants and their roles at the Karonga district PSP, 18-19th November 2015

| Participating agency | Role |
|---|---|
| DISCOVER Project (NGO) | Organized the district and community trainings and provided funds for PSP in the district; presented rainfall distribution report |
| CISONECC (NGO) | Made a presentation on the introduction of PSP in Malawi |
| Department for Climate Change and Meteorological Services | Presented on the basic terminology in weather forecasting and interpretation; presented the 2015-16 seasonal forecast |
| Assistant Disaster Risk Management Officer (ADRMO), District Executive Committee | Made a presentation on the Karonga disaster hot spots and hazard areas and possible solutions for the 2015-16 season |
| District Environment Officer | Participation in generation of agricultural advisories based on the forecast and translation of the Karonga 2015-16 seasonal forecast; and discussions on the Karonga disaster hotspots and hazard areas and possible solutions |
| District Agricultural Development Officer | |
| District Culture Officer | |
| District Forestry Officer | |
| Police | |
| Business community representative | |
| ACPC representative | |

**5.2 Utility and usability of PSP by farmers**

*5.2.1 How have farmers used PSP information in previous seasons?*

Farmers showed good understanding of the PSP messages and many also changed their activities in response to the advice that was generated. Farmer 3 (male) from Sambatiyao, Mulanje explained: *"From the forecast, we were informed that the season for 2015/16 especially southern region will have limited rainfall compared to central and northern region. Considering that this was October, I quickly changed the decision to plant maize on a bigger plot but to spread the risk by growing hybrid maize, sweet potatoes, cassava and vegetables."* In the north of the country, which could experience flooding, the forecast in that season was for wet conditions. Farmer 1 (female) from Kaswera, Karonga explained: *"During the workshop, technical experts from DCCMS explained that the season has the potential of heavy rains, and messages were developed on avoiding flood risk areas, growing of crops that require more water such as rice and maize".*

The nature of the seasonal forecast, and thus the messaging associated with the interpreted advisory, changed the next season. Farmer 4 (female) from Chimwala, Mulanje stated that *"we were informed that the 2016-17 season had a higher probability of wet season especially the first three months of the season. We developed and followed messages on growing crops that require more water like maize, cassava and bananas. Furthermore, we were encouraged to reduce mulching on our fields unless its slope areas to avoid standing water and saturating the soils. We were also informed to be alert to the weather messages through radios to assist us enhance our decisions."* Farmer 5 (male), also from Chimwala, Mulanje

concurred, explaining "*2016/17, the forecast was interpreted in October 2016, and because of the season outlook, that the season will have heavy rainfall, I and my fellow villagers grew crops that require more water such as Maize. We were also informed that we should avoid places which could flood, growing crops in river banks and living in swampy areas and shaky houses.*"

The use of PSP information by farmers was confirmed by the DCPC/ACPC/VCPC representatives and key informants involved in the process. The DCPC/ACPC/VCPC groups highlighted that farmers used the information to select appropriate crops and practices in light of the forecast, which was reiterated by the representatives from DCCMS, Self Help Africa and CISONECC. Notably, the representative from CARD highlighted the role of "*information on planting times or signs that indicated when to plant, and farming methods to protect plants from extreme weather or pests*". However, the availability of relevant resources affects the extent to which farmers can use the information. The representative from EAM said that farmers "*developed plans which were implemented with their own resources*", reiterated by the representative from CEPA who highlighted that some actions, for example particular seed varieties, were based on affordability.

*5.2.2 To what extent is the information credible, salient and legitimate?*

There was higher credibility of the messages amongst the PSP workshop participants who had been directly involved in the scenario generation process compared to those that just heard the finalized advisory. Farmer 2 (male) in Kaswera, Karonga indicated that he faced challenges when sharing PSP outputs because some members of the community expressed dissatisfaction on the messages and forecasting because they believe that God only can predict the season. The representative from Chimwala VCPC also highlighted that when he shared outputs from the 2015-16 and 2016-17 processes, there were some community members that never showed interest in the messages and needed to be convinced. NGO representatives also acknowledged some problems with trust in the information but said that the integration of local knowledge into the PSP discussion was important as it validated local weather and climate indicators, and improved legitimacy. Only one of the farmers interviewed said that he did not believe in local indicators, with the majority trusting them. Having trusted messengers also aids credibility by increasing legitimacy: one farmer (5, male) who was the Group Village Headman in Chimwala indicated that he did not face any challenges in disseminating the PSP output because of his leadership position and he felt that people's trust in him extended to trust in the message he was sending.

Credibility in the forecast grows when the seasonal conditions unfold as forecast. However, given the probabilistic nature of seasonal forecasts, and the limits to skill, this is not always the case. Farmer 2 (male) from Karonga stated that he went against the advice for the 2015-16 condition, deciding to grow drought-resistant crops even though the forecast showed above normal rainfall. He said that heavy rains did come in the second half of the season, but that "*Some farmers within my area had to plant maize two times because of dry spells. Farmers now have a habit of planting drought resistant crops such as cassava, banana, sweet potatoes, and hybrid maize because the weather has really changed, and local maize is not an option*". However, one village in Karonga was subject to flash floods in 2018 and those farmers that had not accessed the forecast or participated in the workshop were the ones who were most adversely affected. The representative from CARD highlighted that the planning for three possible scenarios marked a difference in farmer approaches, which was reiterated by the representative from CEPA who highlighted that "there can be a lack of planning culture among farmers in Malawi". Demonstrated utility of information goes a long way to build credibility and PSP was able to continue in Karonga in 2017-18 under a different programme called BETTER (since DISCOVER had finished).

Growing credibility through demonstrated utility was also reported by farmers in Chimwala in Mulanje district. Farmer 4 (female) indicated that she and her community members could appreciate the value of the PSP messages more in the second year (2016-17) of PSP compared to the first year (2015-16), because the farmers were still not sure if the messages should be trusted. However, when the first season did have lower than average rainfall, and participating farmers were still able to harvest good yields despite the poor conditions. Farmer 3 (male) from Sambatiyao, Mulanje said that, when he heard that the 2015-16 season would be dry, he "*quickly changed the decision to plant maize on a bigger plot but to spread the risk by growing hybrid maize, sweet potatoes, cassava and vegetables. The season was indeed as forecasted with irregular rains, but I managed to harvest tangible yields from the crops I grew except maize.*" Similarly, credibility increased when initial PSP messages coincided with local indicators of forthcoming weather conditions. In Karonga a local indicator of a dry season is *Nkhokoko* flies flying upwards. These were observed around September 2016 season and, since the PSP workshop for 2016-17 had highlighted dry conditions in the Northern region, and local indicators proved that the district will exerience dry spells. Confidence then increased, with farmers largely trusting and implementing the advisories developed during the workshops. This was reiterated by the Mulanje DCPC who stated that, although it is difficult to quantify achievements from PSP since data has not been gathered on yields, it was his perception that farmers who participated in the PSP and implemented the messages harvested better yields compared to other farmers in the area especially in the dry 2015-16 farming season.

The utility of information is also linked to the salience of the presentation – that is how well it meets farmers' needs. Previously, weather forecasts or warnings were disseminated without advisories or messages as such it was difficult for farmers to interpret the meaning and decide on their actions. The messages were delivered in English and expressed in technical jargon, irrespective of the variety of knowledge, understanding and needs of the receivers. Instead, the PSP process has led to increased appreciation of the value of the information, with many farmers also stating that the knowledge they gained on interpreting seasonal forecasts was also very valuable to enable them to make informed choices. Farmer 5 (male) in Chimwala in Mulanje indicated that he has "*begun to appreciate making informed decision in line with the seasonal forecast. I no longer practice agriculture the traditional way, because each season is unique*." This is a significant change in understanding, as traditionally the annual calendar and farming practices have been very static. Farmers now embrace crop diversification because of the messages that they get from PSP workshops to ensure that they still harvest even during bad rainfall years. Community members have appreciated that seasons will always be different as such it is important to depend upon the seasonal forecasts for decision-making.

The salience of information is also related to the timing with which it is received. Interviews with key informants showed that most PSP workshops at area and village level were undertaken between October and December of the season, once the seasonal forecast has been released in September or October. The release of the seasonal forecast is contingent upon the annual SADC Regional Climate Outlook Forum, after which the consensus message is localized for Malawi. The message then goes through a government approval process, which can lead to delays. PSP workshops are undertaken immediately after the seasonal forecasts are made available – however if this is November or December it is too late for optimal decision-making since the rainy season starts in October. Farmer 5 (male) from Chimwala, Mulanje said that the first year of PSP was initially not that useful as the workshop was very late, taking place midway through the season, but that "*it helped me to prioritize winter cropping where I grew vegetables, hybrid maize and vegetables to supplement the season.*" The CISONECC representative also indicated that the delays in releasing the seasonal forecast has a big bearing in decision-making considering that farmers start making decisions around August, especially with land clearing, which crops to plant and where. One of the advocacy agenda for CISONECC is to engage decision makers to change approving protocols because

some of the stages are unnecessary and causes delays. The DCCMS representative was equally concerned with the delays, however it is difficult to by-pass some stages in the approval of the seasonal forecast.

The experiences of PSP to date, and the growing appreciation of the need for dynamic approaches to farming, have stimulated an increase in demand for climate information from the grassroots level, as well as among district level government and NGOs. This suggests that the information is deemed to be legitimate. Farmers interviewed reported that they pay greater attention to the standard daily, 5-day and 10-day forecasts that are issued by DCCMS and transmitted via local radio and print media. This is partly because they have greater understanding of weather forecasts from the PSP process. This is particularly important for the seasonal forecasts, where the probabilistic nature is very different to understand from the deterministic nature of short-term forecasts. Farmer 1, female from Kaswera, Karonga explained "*I have learnt that the forecast are probabilities*". In combination with their more dynamic approach to farming, greater ability to comprehend climate information means they are able to use emerging short-term forecasts as the season unfolds to modify their plans and take precautionary measures. DCCMS has been able to improve production and dissemination of short-term weather bulletins, such that the bulletins are released consistently, use both local and formal language as well are accompanied by advisories. Farmers are also to take advantage of changing conditions, rather than fear them. For instance, farmer 3 (male) from Sambatiyao, Mulanje indicated that with forecast interpreted information one could take dry spells as an opportunity for business where he or she can grow more drought-resistant crops that could be sold to starving families during dry season. A representative of the Karonga DCPC reported "*We have seen an increased interest and numbers of farmers and CPCs approaching us for an interpretation of a weather information they have heard or read to ensure that any action taken is information based*". Representatives of the Kaswera VCPC indicated that through the two sessions of PSP members of the community have begun to appreciate that climate change is real, and decisions should be informed by weather and climate information such as seasonal forecasts. PSP workshops here ended with closing of DISCOVER and ECRP project.

The fact that the NGO sector has appreciated the importance of making climate-resilient decisions using climate information is evidenced in the increasing demand for training in PSP from the National Core Team from NGOs running projects that were not in existence in 2014. These include Better Extension Training Transforming Economic Returns (BETTER), a five year EU-funded project that aims to build capacity of smallholder farmers to increase production in the face of climate change in all the traditional areas in Karonga; and United in Building and Advancing Life Expectancies (UBALE) in Chikwawa, a USAID-funded projects that aims to support value chains among smallholder farmers, and proceeded with PSP in the district following the implementation by EAM and Eagles Relief.

### *5.2.3 Are there gender differences in perceptions of utility and usability?*

One issue that has previously arisen with regards to accessibility of climate information is gender differences in information type and communication preferences. Patriarchal structures in Malawi mean that, like many southern African countries, girls education has typically been deprioritized relative to that of boys, which means that levels of education of many women is significantly less than that of men (e.g. Henriksson Malinga, Vincent, Archer, & Schütte, submitted). Together with gender roles that find women largely in the reproductive sphere with limited spatial mobility, this can limit women's access to information, both in terms of them being able to receive information (for example if they don't have access to radios) and then also to understand it (for example seasonal forecasts are often transmitted in English and literacy levels may affect their ability to comprehend print media).

Additionally, preferred communication channels are gendered. A recent gender assessment for the Green Climate Fund M-CLIMES project found that men prefer to receive information over the radio with women preferring to get word in person, for example from extension officers, corroborating an earlier study in South Africa (Archer, 2003; UNDP, n.d.). Recognizing this, attempts were made to ensure inclusion of women in the PSP workshops in Karonga and Mulanje and ensure they had access to the final advisories, for example through theatre, using platforms such as Village Savings and Loans group meetings (in which women are the primary members), and through places where women are likely to be found because of their gender roles (e.g. boreholes where they collect water). Karonga DCPC also indicated that messages targeting women for the 2015/2016 season were developed, such as women should fetch adequate water and firewood because Karonga will receive above normal rainfall which may affect their mobility. The messages encouraged more women to participate in the 2016/17 PSP workshops. In the cases here, it was not so much gender differences as age differences that were noticeable in the uptake of the information, with younger farmers tending to be more open to changing their behaviour (as particularly noted by the representative from Self Help Africa).

#### *5.2.4 Summarising the benefits of PSP*

The success of PSP as a method to disseminate climate information to users in Malawi has been seen by several factors outlined in the previous sections. The acceleration of requests for training and implementation shows that PSP still has potential to reach even more districts, areas and villages. Table 6 summarizes the benefits of the PSP process, based on the information gained through the interviews and focus group discussions in the study.

Table 6: summary of benefits of the PSP process

| Summary of benefits of the PSP process |
|---|
| • Provides useful information through interpretation and advisories (as opposed to a raw seasonal forecast without understanding of its implications) |
| • PSP provides an opportunity to interpret forecasts while the usual use of seasonal forecast presents challenges to use the forecast because it is interpreted differently from one individual to another |
| • Bridges the divide between science and society – providing an opportunity for communities to understand scientific information and technical experts to understand local knowledge and weather information needs and uses |
| • Inclusive and accessible – the participatory nature of the workshops puts everyone on the same level, regardless of literacy and scientific background and increases legitimacy |
| • Enables women, who otherwise struggle to access climate information, to make use of seasonal forecast in their decision-making |
| • Through a PSP workshop, harmonized messages reach more users within a short time through multiple communication media |

### 5.3 Barriers to the generation of usable information through PSP

Despite the seeming success of PSP in Malawi to date in generating credible, legitimate and salient information for farmers for selected districts since its introduction in 2015-16, there are several challenges

that have impeded it being scaled out throughout the country. This suggests that the scaling up and sustainability of PSP has been challenged by various institutional and policy barriers. These barriers are technical and financial, and reinforced by the lack of a policy framework. The result is that PSP initiatives are "projectized" which raises concerns over sustainability (Harvey et al., 2019). This study has also revealed that it is difficult to trace previous information on PSP from NGOs because projects that funded PSP phased out.

*5.3.1 Technical constraints*

The technical challenges begin at the supply side of the climate services value chain, with DCCMS. The role of DCCMS is essential in producing the seasonal forecast and supporting its communication interpretation through PSP. DCCMS produces a national seasonal forecast based on the regional consensus forecast produced at the Southern African Climate Outlook Forum, which typically takes place in August/September. A DCCMS staff member explained that this then go through a political approval process within Malawi and can contribute additional delays. Thus, the release of the national seasonal forecast can be late and since PSP requires this information, any delays filter through to affect the timing of the PSP workshops, according to the CISONECC representative.

Technical constraints in terms of DCCMS staff availability provide a bottleneck in the process. It is essential that a DCCMS representative attends every PSP workshop to interpret the seasonal forecast and limited availability causes delays in the organisation of workshops, and even results in competition among the PSP coordinators to secure DCCMS expertise. The CISONECC representative further indicated that "*ideally there should be a district meteorological officer equipped with the skills to interpret the seasonal forecast during PSP without relying on headquarters which has limited human resources*", but this is not the case.

*5.3.2 Financial constraints*

Limited technical capacity is exacerbated by financial constraints. In ideal circumstances, DCCMS would downscale the national seasonal forecast to district level for each of the 28 districts, and then use this as the major input to the PSP process. However, financial constraints prevent them from doing this. Instead in recent years they have only been able to downscale for a couple of districts where project funding has been made available, for example through the World Bank-funded Shire River Basin Management Programme and the Green Climate Fund-funded Scaling Up of Modernized Climate Information and Early Warning Systems in Malawi (M-CLIMES) project implemented by UNDP. The DCCMS representative reiterated that, without external financial support, the efforts to downscale seasonal forecasts would be affected. For instance, in 2017/18 downscaled forecasts were only made available for the three districts that were funded by projects.

Low financial resources to the department which already challenges them to effectively disseminate the weather and climate related information to the public, has also resulted in poor adoption of PSP as one way of effectively communication the information. The DCCMS representative highlighted that, despite communication of weather and climate information being within the department's mandate, the limited operational budget means that the department has no resources to cover their own travel costs to participate in workshops organized by others. Low or absent operational budgets also impede the other public institutions, for example the District governments, and the Area and Village CPCs. For the workshops to take place at different levels there need to be resources to facilitate travel to workshops, as well as the provision of stationery (flipcharts etc.) to generate and record the scenarios through the

facilitated process and record the action plan for dissemination. The EAM representative also expressed concerns over delayed implementation of action plan at District level due to government bureaucratic systems.

*5.3.3 Policy and institutional barriers*

A new Meteorological Policy was approved in Malawi in 2019 but, unfortunately, the policy does not provide direction on PSP (Malawi Government, 2019b). The CISONECC representative explained that *"Initially we had advocated for inclusion of PSP to contribute towards an enhanced climate forecasting service that supports resilience-building in the draft National Meteorological Policy, which was adopted and included as one of the strategies under policy priority 3: Meteorological engineering, communication and information technology (IT) development, however it was dropped along the way and the approved policy no longer recognizes it"*. The lack of policy direction and limited resources on the part of DCCMS to lead the process means that PSP development to date has proceeded on a projectized-basis. This is a contrast to Kenya where the Kenya Meteorological Department has taken over the coordination and led and is now implementing at county level across the country (CARE, 2017).

The pivotal role of NGOs in introducing PSP in Malawi has already been outlined. Although DCCMS and other relevant government department and ministries have always been kept abreast of the process, the implementation of the process is still entirely reliant on NGOs and funded through climate resilience and adaptation-related projects that they are implementing. This is not uncommon and in other African countries NGOs have also been instrumental in the introduction and implementation of PSP, for example in Kenya and Ghana (CARE, 2017), and other climate services in Burkina Faso and Ethiopia (Jones et al., 2016; Cochrane & Singh, 2017; Harvey & Singh, 2017; Harvey et al., 2019). However, this raises issues of continuity and sustainability given funding and governance arrangements.

PSP was introduced to Malawi by a committed core team of (largely) NGO representatives and, since 2015, perceived utility has led to other NGOs motivating to include the approach in their own programmes and projects. However, there are issues of continuity. The ECRP, for example, was one of the initial programmes that spearheaded adoption of PSP, but this programme came to an end in 2017, meaning that PSP stopped in Mulanje and Karonga and other 9 districts where ECRP was present. However, with a year gap, PSP was able to continue in Karonga as Self-Help Africa was able to motivate for its inclusion in another project which it is now implementing, namely BETTER. However, this is entirely reliant on the ability to secure additional funding alongside the commitment of, and knowledge within, the organisation.

In addition to availability of operational finances, another continuity issue that stems from the projectized nature of PSP relates to the need for repeated training of personnel. Since so many parties are involved in PSP, for the process to successfully be implemented there needs to be training of implementing partners (typically NGOs), District officials in multiple sectors, and then ACPC and VCPC members. The representatives from SHA and DCCMS both highlighted challenges with literacy levels among ACPC levels and the high level of staff turnover (widespread in government in Malawi, e.g. Pardoe, Vincent, & Conway, 2018). Since there is no national PSP programme the progress is largely contingent upon the enthusiasm and goodwill of the National Core Team (and the organizations with which they are associated – for example CARE Malawi has provided a lot of support for training of NGOs). There are limited resource materials for training in PSP and the current champions have been using the CARE handouts that they received from the CARE training when the ideal would be to develop a national manual. The projectized

nature also means that there have been few attempts to systematically evaluate efforts and learn from experiences to inform subsequent rollout.

## 6. Conclusion

Through interviews and focus groups with PSP implementers at national, district and sub-district level, and farmers who are targeted with the interpreted advisories, this study has contributed to emerging literature evaluating climate services. The study provides evidence that there is scope for PSP to overcome the typical "valley of death" between producers and users, by generating useful and usable information. Farmers who have used PSP-issued advisories have been able to maintain production even when weather conditions have been suboptimal, and evidence of this has converted others to the experience. However, the longevity of PSP in Malawi is not adequate to determine if and how credibility is affected by forecasts that turn out to have low levels of skill. In these circumstances there is a risk that PSP will not be as effective in adapting to conditions.

Although PSP seems to generate useful and usable information, to date there have been significant challenges relating to the timing of the release of seasonal forecasts and the capacity to undertake the resource-intensive PSP process. The issuing of seasonal forecasts is a politicised process, relying on the release of the Southern African Regional Climate Outlook Forum forecast, following by an internal political process of approval of the national contextualisation. Delays can therefore ensue, which has knock-on effects for the PSP process which take place at district level, and then at sub-district level. Resource availability also plays a role. DCCMS has limited capacity to provide downscaled versions of the seasonal forecasts and to timeously participate in the PSP workshops across the country. Limited technical staffing at district level creates reliance on the national office. Despite the aim of PSP being to interpret climate information and generate advisories, informants at all levels of the process also highlighted that there were sometimes issues with technical weather language, which required capacity building among district and sub-district staff.

For PSP to be successful in generating useful and usable information, timely release of the seasonal forecasts, adequate human resources within DCCMS, and financial resources for the chain of PSP workshops that needs to take place at district and sub-district level. In Malawi, NGOs have taken up this cause. The utility is shown by the fact that NGOs are now motivating for its inclusion in the design and development of new programmes. However, the projectized nature has implications for sustainability. The recently-released National Meteorology Policy in Malawi unfortunately does not include provision for PSP. There are other planning frameworks in Malawi, for example the recently-instituted National Planning Commission responsible for medium- and long-term planning; as well as the decentralisation framework that provides for district level planning, and there would be scope for institutionalisation here. Similarly, there is scope to better integrate with hydrometeorological early warning systems and the annual contingency planning cycle that allows planning for circumstances of food insecurity. In Kenya the institutionalisation of PSP with the Kenya Meteorological Department and county governments counteracts these issues by leading to sustainability.

PSP is one of a suite of participatory methods that can be used to create targeted advisories from climate information aimed at farmers at the grassroots level. Others include climate field schools, agrometeorological advisories, and the Participatory Integrated Climate Service for Agriculture (PICSA)

curriculum (Hansen, Mason, Sun & Tall, 2011; Hansen, 2015; Mwanga, Kisanda & Dinh, 2017). All of these approaches have been variously applied in Malawi, typically through projects such as the Global Framework for Climate Services, and also have stories of success in creating useful and usable information. Like PSP, they are all are contingent on the timely availability of the seasonal forecast information from national meteorological and hydrological services, and are also resource-intensive processes that require the bringing together of various forms of expertise in face to face fora. Determining which of these participatory approaches is best suited to different circumstances, and whether there is scope to reduce the resource-intensive nature whilst not compromising on the legitimacy and credibility of information produced, is an avenue for further investigation.

More broadly, there are other applications of the PSP method to different timescales of climate information. Since the process of bringing together producers and users to co-produce interpreted advisories generates useful and usable information, it can be applied to other timeframes of climate information beyond just seasonal forecasts. Scenario planning has been applied in impact model assessments and approaches to decision-making under uncertainty, for example robust decision-making. Ensuring participatory scenario development builds legitimacy and can also be cost-effective in resource-constrained environments.

However, whilst this study addresses a gap in critical evaluation of PSP, it must be viewed within in limitations. As PSP continues, there is need for further evaluation in several dimensions. First, there is need for more spatially-extensive analysis, recognising the wide variety of different actors (in terms of NGO partners) that are involved in different districts, since this study only sampled two of the 18 districts that have undergone PSP to date. Second, there is also more room for a comprehensive overall evaluation. This could involve a larger sample size, with more attention paid to the extent to which design of the process takes place with a gender lens, considering different needs of men and women for information, as well as different preferences in communication. Third, as PSP continues and the evidence base expands, there is also need for rigorous analysis of the extent in-depth longitudinal evaluation, in particular as discussion is still underway on appropriate metrics for co-produced climate services, which should consider both producers and users and process and outcome (Wall et al, 2017).

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**Annexes**

**Themes for questions (varying for audience: DCPC, VCPC, ACPC/key informants/farmers)**

**Implementation of PSP**

- When (season) and how was PSP first rolled out in the community?
- Who was involved in the PSP process and what were their roles?
- What materials/input are required for a successful PSP?
- What is the output of PSP process?
- How are the outputs communicated? What difficulties are there with communication?
- How were messages used, and by whom?
- Did different community members believe in the information/message generated? (who believed, and who didn't and why)
- Did the season end up being different to the forecast discussed in the PSP?
- How did members of the community link PSP to local knowledge? (if they did continue with the rest of the question on number 8)
- Has integration of local knowledge into the PSP process improved credibility of the seasonal forecast?
- Has PSP been repeated in the Community? If yes, for which seasons? (if no, ignore the following questions)

**Benefits/value of PSP**

- What are the benefits of PSP?
- Were attempts made to ensure that different types of farmers, including women, received messages as well? (mention what was done)
- To what extent was the seasonal forecast used previously?
- What makes PSP different from the usual use of seasonal forecasts?
- What has the community learned over time of PSP process? (e.g. are different things farmed, are they farmed in different ways etc?)

**Challenges Associated with PSP**

- What challenges have been encountered in the generation and use of PSP?

**Sustainability of PSP**

- Is PSP on-going in the community? If not, why not?
- What are the strategies that are in place to sustain the PSP process?

**Additional Information**