



Summary Report: Innovative Qualitative Approaches for CIS Monitoring and Evaluation



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Learning Agenda for Climate Services in
Sub-Saharan Africa

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1. Introduction

Climate information services (CIS) for agriculture and development are useful only when farmers have the ability to make changes in their activities and practices based on the information received. This ability is mediated by a wide range of factors and considerations, such as access to appropriate seeds or needed agricultural equipment, or the authority to make decisions about the cultivation of a particular farm plot. Different users of a CIS will have different abilities to act on weather and climate information, and therefore effective CIS design begins with the empirical identification of potential CIS users and their climate information needs as shaped by these mediating factors. At the same time, user expectations of CIS, environmental conditions, and the social and economic factors that shape the utilization of weather and climate information can change during the implementation of a project. To effectively monitor and evaluate CIS therefore requires approaches to monitoring and evaluation (M&E) that identify and analyze these complex factors.

This report outlines lessons about CIS monitoring and evaluation drawn from two qualitative pilot assessments of CIS users and their needs in Senegal (Carr et al. 2018) and Rwanda (Onzere et al. 2018). These assessments were conducted by the Humanitarian Response and Development Lab (HURDL) as part of the Climate Information Services Research Initiative (CISRI) funded by the U.S. Agency for International Development.

The goal of these assessments was to test innovative evaluation methodologies on ongoing programs to develop general lessons that could contribute toward improving the design and evaluation of CIS interventions. Specifically, HURDL tested the utility of the Livelihoods as Intimate Government (LIG) approach (described below) as a means of identifying different users and the factors that shape their different weather and climate information needs, for the Multi-disciplinary Working Group (MWG) model in Senegal and the Climate Services for Agriculture Initiative (CSAI) in Rwanda.

A growing literature demonstrates that understanding who the potential users of these CIS are, and their needs for weather and climate information, allows for the design of monitoring and evaluation efforts that are aimed at likely impacts. Further, because the potential impacts of climate information are never evenly distributed across a population, better understanding users and their information needs, calibrates monitoring and evaluation to what a significant impact looks like in a particular place or population.

These pilot assessments identified the following lessons for effective CIS design, monitoring, and evaluation:

- 1) **Identity and social barriers influence CIS uptake.** The social barriers to CIS uptake and use in a given livelihoods zone take shape around roles and responsibilities associated with particular identity categories, including gender, seniority, and ethnicity. These social barriers rarely take shape around a single identity or issue.
- 2) **Factors shaping the use of CIS scale to the livelihoods zone.** Project design and M&E methodologies aimed at understanding the factors that shape the use of weather and climate information, and thus the underlying decision-making of different CIS users, produce evidence valid at the scale of the livelihoods zone. Popularized by the Famine Early Warning System Network (FEWS-NET), livelihoods zones are geographic regions characterized by shared socioeconomic and agroecological situations, and broadly similar livelihoods activities. However,

the factors shaping the uptake and use of weather and climate information are rarely applicable beyond the livelihoods zone in which they are identified.

- 3) **Potential impacts of CIS go beyond yields and incomes.** Indirect impacts on food security and improved capabilities for coping with adverse climate conditions could be important. The activities that climate information might influence are closely linked to local understandings of identity (particularly gender), roles, and responsibilities. Thus, CIS impact should be identified not only in terms of material outcomes, but also in terms of changes in the ways in which people conduct livelihoods activities, and who conducts those activities. Qualitative tools, such as that piloted in these assessments, allow for the identification of these broader changes and impacts.

2. Background and Overview of the Assessments

2.1. Senegal's Multidisciplinary Working Group (MWG) Model

Since its development and pilot delivery in 2011, Senegal's MWG model, a CIS which translates weather and climate information into actionable information for farmers at the national and local levels, has sought to address the impacts of climate change on rural agrarian livelihoods in Senegal. MWG advice has three main objectives: (i) help farmers to master their farming calendar, (ii) assist farmers in choosing dates for cropping operations, and (iii) secure people and property. The advice focuses on high winds, rain, thunderstorms and lightning by providing four broad types of weather and climate information: seasonal forecasts; 10-day forecasts; daily forecasts; and instant forecasts for extreme events. Seasonal forecasts focus on the dates of onset and cessation of rains, and expected the amount of rainfall. Forecasts of the amount of rainfall are generally characterized as rainy, normal, or deficit, and are updated monthly throughout the agricultural season (June, July, and August). The 10-day forecasts are intended to help identify dry spells and other shorter-term events that might affect agricultural production. Daily forecasts of rainfall probability are issued twice, each covering the subsequent 12-hour period. Early warnings are used to alert farmers to events such as thunderstorms, which can cause significant damage to cattle holdings.

At the national level, the MWG is composed of representatives of the Department of Agriculture (DA), the Institute of Agricultural Research of Senegal (ISRA), the Ecological Monitoring Center (CSE), the National Agricultural and Rural Council Agency (ANCAR), the National Agricultural Insurance Company of Senegal (CNAAS), and the National Agency of Civil Aviation and Meteorology (ANACIM). This group produces climate information, interprets it into actionable decisions, and communicates these products to users at the local level (Lo & Dieng 2015). At the local scale, MWGs consist of Senegal's decentralized technical services, farmers and local farmer organizations, local administrative authorities, NGOs, and the media. Local MWGs are responsible for collecting climate information from ANACIM, disseminating that information to farmers, monitoring harvests and potential agricultural shocks and stressors, and managing early warning systems that use the climate information produced by ANACIM (Lo & Dieng 2015).

To investigate the ways in which farmers might engage with the MWG, HURDL focused its pilot fieldwork on a single FEWSNET livelihoods zone, Zone SN10: Rainfed Groundnut and Cereals. As HURDL was trying to establish a baseline of livelihoods decision-making to inform our understanding of the potential uptake and use of the MWG in this zone, the team selected two villages that, at the time of the studies, had not yet participated in the program. The first of these was Ngetou Malick, a community located approximately 9km from Kaffrine, the regional capital, along a well-maintained dirt road. HURDL gathered data in Ngetou Malick in 2013 before local implementation of the MWG as part of an assessment of the potential users for climate information

in Senegal's Kaffrine region (Carr et al. 2015). Fieldwork included interviews with forty-four respondents (21 women and 23 men) and observational data about their activities. The second community was Panal, located in the Guinguineo commune. It is approximately 40km north and west of Ngetou Malick, and 45km to the northeast of Kaolack on the border of Livelihoods Zone SN08, Rainfed Groundnut and Millet. Like Ngetou Malick, Panal was not engaged in MWG. It was selected as a comparative site to MWG-engaged communities in Kaffrine by a counterpart quantitative assessment conducted by the World Agroforestry Centre (ICRAF), a CISRI partner. Fieldwork included interviews with 85 residents of Panal (37 women and 48 men) and observational data about their activities.

2.2. Rwanda's Climate Services for Agriculture Initiative (CSAI)

As part of Rwanda's efforts to help rural communities manage climate related risks and improve their adaptive capacities for changing precipitation and temperature patterns, CSAI disseminates climate information and provides advisory services to farmers in all 30 of Rwanda's districts. The program disseminates historical climate data, downscaled seasonal forecasts, and daily weather information to rural farming communities through radio broadcasts and cellphone SMS. In some districts, CSAI circulates information and associated advisories via the Participatory Integrated Climate Services for Agriculture (PICSA) program. PICSA works with agricultural extension staff, sector agronomists, farmer promoters, and farmers themselves to consider the practical implications of the seasonal and short-term forecasts for farmers' plans for the season. The goal is to assist farmers in choosing crops and livestock best suited to expected conditions. PICSA is expected to reach over a million farmers across Rwanda by 2019 (the end of the project).

In Rwanda, HURDL conducted pilot fieldwork in two FEWSNET livelihoods zones, Zone RL04: East Congo-Nile Highlands Subsistence Farming and Zone RL12: Eastern Semi-Arid Agro-Pastoral Zone. PICSA has been implemented in both study communities. In RL04 the study was carried out in Gapfura village. Gapfura is located in Hindiro sector, Ngororero district, Western Province. It is located near Ngororero town which is approximately 99 kilometers west of Kigali, the capital city. Fieldwork in Gapfura included interviews with 88 individuals (50 women and 38 men) and the collection of associated observational data. In RL12 the study was carried out in Kabeza village. Kabeza is located in Kabare sector, Kayonza district, Eastern Province of Rwanda, near Kayonza town, approximately 92 kilometers east of Kigali. Fieldwork in Kabeza included interviews with 87 individuals (44 women and 43 men) and the collection of associated observational data. The two livelihood zones were selected because, as they contain socioculturally similar populations, they provided an opportunity to compare patterns of decision-making across zones under similar sociocultural conditions and therefore understand the influence of other factors, such as agroecology, economy, and infrastructure, on decisions to use weather and climate information. Within these zones, the two communities in the study, Gapfura and Kabare, were selected because the cross-section of livelihood activities and socio-economic composition of the population were broadly representative of those seen across the larger livelihoods zone to which they belong, and because they are both communities where PICSA has been implemented.

3. Methods

HURDL utilized the Livelihoods as Intimate Government (LIG) approach as the conceptual framework for its field methods and analysis (Carr 2013; Carr 2014). LIG views livelihoods as ways of living in particular places - not merely the activities pursued by individuals (Carr 2013). Decisions people make to engage in various livelihood strategies are part of efforts to organize their social and

material world to achieve various goals. Because it treats livelihoods as more than instrumental activities aimed at material ends, LIG incorporates a much wider range of stressors, including social stressors that emerge within particular places, into explanations of people's goals, decisions, and actions. This broader lens is critical for understanding why people do or do not use CIS. LIG therefore provides critical information for both CIS design and evaluation. At the design stage, LIG analysis allows projects to better tailor interventions for impact. In the context of monitoring and evaluation, LIG analysis allows for better explanations of impact by identifying conditions where CIS can achieve desired development goals and conditions under which these goals will not be achieved.

LIG does not make a priori assumptions about potential users, or their needs and capacities to use weather and climate information. Instead LIG begins from a broad understanding of the shocks and stressors different individuals navigate in their day-to-day lives, and the various activities and assets these individuals employ to negotiate those challenges. From this initial data, investigators stratify the population by shared vulnerabilities. This, in turn, allows investigators to identify situations where some members report a particular stressor or shock as a vulnerability, while others do not. Understanding how different people living in the same place come to understand and experience shocks and stressors differently serves as an entry point to livelihoods decision-making.

These different understandings of stresses emerge in livelihoods at the intersection of three domains of everyday life: discourses of livelihoods, mobilization of identity, and tools of coercion (see Figure 3.1). Discourses of livelihoods are the ways people talk about and understand how they should live in a particular place, especially as related to what activities they should undertake, to what ends those activities should be directed, and who should be undertaking them. For example, the Wolof farmers in the Senegal study argue that a man should feed his family with rain-fed grains, and success for this activity is defined as providing enough food to last the entire year. Discourses of livelihoods mobilize particular aspects of an individual's identity, elevating particular roles and responsibilities that shape how people see themselves, and how they understand appropriate ways of living in that place. These discourses mobilize identity by explicitly or implicitly identifying who should be conducting what activity, in what way, and with what resources. To return to the Wolof example, men are responsible for cultivating these grains and feeding their family, which both defines and draws upon existing understandings of men as providers and leaders of their families. Taken together, the discourses of livelihoods among Wolof farmers in this livelihoods zone, and the ways those discourses mobilize aspects of men's identities, create a powerful framing of men as providers and subsistence farmers that becomes a way of living in this part of Senegal that is very difficult to challenge or ignore. While the day-to-day conduct of different livelihood activities tends to reinforce both discourses of livelihoods and the roles and responsibilities of those with different identities, livelihood strategies produce inequitable outcomes for community and household members and can lead to frustration and discord. For example, the framing of livelihoods among Wolof farmers privileges men's production above women's, which leads to lower investment in women's farms, and therefore limited opportunities for women to accumulate their own assets or realize their own opportunities. Those who benefit less, or see fewer opportunities, are likely to challenge existing livelihood logics as they seek to improve their positions. Additionally, the physical, environmental and social contexts in which people are embedded are complex and change often, challenging the legitimacy of livelihood logics as the context exceeds their utility (for instance, as during a period of weather that causes farmers to doubt their previous agricultural practices). Because deviations from either expected livelihood activities or roles and responsibilities can present threats to the social order and material well-being of households and communities, such deviations are often managed

through the use of tools of coercion, which are locally-legitimate means of disciplining transgressions or rewarding those who conform to expected roles and responsibilities (Carr 2013; Carr 2014). Thus, a Wolof man who repeatedly fails to cultivate enough rain-fed grain for his family faces a loss of status, potential loss of access to decision-making (critical to his role as a man), and even expulsion from the family. The intersection of these three domains of livelihoods, which shapes individuals' everyday decisions about how to live in their community and household, shapes whether or not and how individuals take up new activities or information, such as those provided by a CIS (Carr 2013).

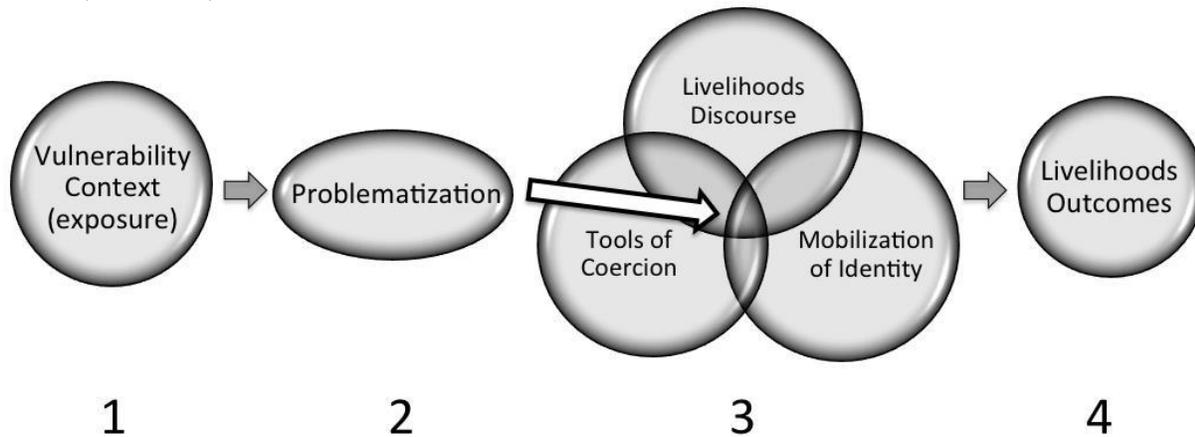


Figure 3.1: Conceptual diagram of the LIG approach (drawn from Carr 2014). The diagram outlines that 1) in identifying current stressors to well-being and livelihoods (the vulnerability context); 2) and examining why particular stressors become defined by one group of people as problematic but not another, the logic and legitimacy of livelihood strategies are called into question (problematization); 3) this creates a point of entry into understanding how livelihoods decision making emerges at the intersection of the mobilization of identity, livelihoods discourses and tools of coercion 4) and forms the basis for interpreting livelihoods strategies and outcomes (Carr 2014).

To avoid introducing bias from outside the context, LIG does not start from assumptions about either the potential users of a CIS, or the needs of those potential users. Instead, LIG first identifies structures of resource access and use, climate and non-climate related livelihood stressors as explained and prioritized by users, and the context of livelihood decision-making. After this, explanations for the use (or lack there of) of CIS are then developed taking into consideration where CIS use fits in the broad structure of livelihoods and livelihoods decision making. By providing an understanding of the broader structure of livelihoods into which weather and climate information must fit to impact behavior and outcomes, LIG acts as a powerful tool to empirically identify users and capture a broader range of their needs for both project design and project monitoring and evaluation.

4. Findings: Uptake and Impact of CIS

The two pilots sought to identify different potential users of CIS and their needs for weather and climate information within each livelihoods zone. This included the identification of projected pathways of uptake and impact expected if the particular CIS is implemented in a manner that meets different user needs. These pathways help improve CIS monitoring and evaluation by identifying who is likely to experience impacts and the likely character of those impacts.

4.1. Senegal

In Senegal, the pilot work found that the residents of the livelihoods zone could be divided into three groups, those with Surplus Production Livelihoods, those with Stable Subsistence Livelihoods, and those with Low Resource Livelihoods. From this division of the population, HURDL was able to identify a range of likely impact pathways with specific definitions. For example:

- A principle barrier to CIS use is a lack of trust in the information, and a lack of training in the use of the information. Trust is something that will be earned over time after implementation, but findings from other CISRI projects suggest that trust might also be hastened by an inclusive feedback/engagement mechanism for end users from the very beginning of the development of the CIS (Lambert et al. 2019). It is possible that training at least those residents who have both a need for climate information and the capacity to make decisions based on that information can increase the potential uptake of the CIS. Monitoring and evaluation of CIS should account for any such training and identify any new pathways of potential impact for that project that might emerge from the education of users on new forms of information, or the empowerment of new users to engage the CIS.
- The stratification of the population by assemblages of vulnerability shows these groups have very different responses to climate information. Moving from the most secure to the least secure residents of the zone, the likely impact of the MWG shifts from yield and income increases among the most secure to a highly defensive strategy formed around the avoidance of loss among those with the least secure, lowest resource-access livelihoods. Understanding how different people will use information helps ensure that monitoring and evaluation are focused on measuring the most likely responses.
- Shifts in variety selection in response to recommendations from the MWG will likely be concentrated among the wealthiest and most secure, as they have access to the assets that allow for the purchase and planting of new and different varieties. For the poorest and most vulnerable, information on variety selection will only support decision-making in the longest and wettest of seasons, when these farmers still have options with regard to their desired cycle length (where shorter cycles might be more reliable in uncertain precipitation, but yield less overall). Understanding the different ways in which various members of a population are able to use climate information will define likely pathways of impact to be monitored, and serve to properly calibrate expectations of impact across the population.
- For wealthier residents of the zone, particularly in the northern and western parts of the zone, MWG impacts will likely support the purchase of additional draft animals such that these purchases further diversify animal traction at the household level, making their secure livelihoods even more secure.
- As households become more secure, women's opportunities to engage in new activities, including activities from which they were previously excluded, will increase. In such households, women are unlikely to threaten the status of the man at the head of the household, who will himself be more secure in both his material situation and his identity. Women who take up weather and climate information, either in their existing activities or in new activities, are less likely to attract attention and discipline as women living in resource- and income-challenged households. In more challenged households, playing one's role is seen as a path to safety, and therefore changes in women's activities will be viewed as a threat to the safety and stability of the household and therefore constrained.

4.2. Rwanda

In Rwanda, the pilot work found that the residents of RL04 and RL12 could be stratified into groups that were likely to have different levels of CIS uptake and use.

- In RL04, these groups were Stable Income Livelihoods (SIL), Adequate Resource Livelihoods who were more dependent on agriculture (ARL-ag dependent), Adequate Resource Livelihoods who were more diversified in their livelihoods than those in ARL-ag dependent (ARL-diversified) and Limited Resource Livelihoods (LRL).
- Residents in RL12 were also stratified into four groups: Stable Income Livelihoods (SIL); Adequate Resource Livelihoods (ARL); Adequate Resource Livelihoods – no livestock (ARL- no livestock), and; Low Resource Livelihoods (LRL).

From this stratification of the two populations, HURDL was able to identify a range of likely impact pathways with specific characteristics. For example:

- In Rwanda, roles and responsibilities around farming activities are not as clearly gendered as in other contexts where LIG has been implemented (e.g. Carr, 2013; Carr, Fleming, & Kalala, 2016; Carr & Onzere, 2018; Carr & Owusu-Daaku, 2016). However, there were still some gendered roles and responsibilities associated with livelihoods. For example, women in zone RL12 could not engage in market-focused agricultural production without the permission of their husbands, and may encounter barriers to the use of information about certain crops whose principle value is for market sale. This will be particularly true for resource poor households, where the participation of women in market-oriented agriculture may threaten men's roles as a provider.
- Those with LRL in both zones are often performing labor on the farms of others at critical junctures during the growing season, such as at planting time. As a result, they are not able to respond to forecasts or other forms of agricultural advisory until later in the season. This presents a challenge, as farming with limited days of rainfall can, for example, force farmers into planting fast-maturing, but lower-yielding varieties regardless of what information a CIS might provide about the overall duration and amount of precipitation in a season. As this is true even in a context like Rwanda, where seed and other inputs are available for these households, it is therefore likely to be a limitation on potential CIS impact in many settings.
- In Rwanda, as farmers diversify their livelihoods away from agriculture, climate information becomes less important to them. This is true even when they have access to resources necessary to take advantage of this information on their farms. Instead, the benefits of CIS appear to accrue more to the middle of the income/asset distribution than in Senegal. However, the likelihood of yield and income increases from the use of CIS varied by the security of individual livelihoods and the zone in which the person lived. For instance, in RL04 we do not expect the most secure to increase yields through CIS use because their livelihoods were diversified beyond agriculture into activities that limited the labor and time they could devote to farming. As a result, agriculture is becoming an activity of equal, if not secondary, importance. While weather and climate information might improve their agricultural outcomes, to take up that information in a vigorous manner would require those in RL04 with SIL to back away from their non-farm activities, an unlikely outcome given their current success. Instead, it was those with adequate resources who were most likely to increase yields principally by adopting new varieties of the crops they were growing or changing their practices. Those with adequate resources but more diversified livelihoods might concentrate their efforts on a few crops more intensively.

- Within both livelihoods zones, as individuals and households become less secure, they are likely to adopt CIS as a defensive strategy that protects against loss in agricultural productivity, rather than maximizes income. For example, a farmer with LRL faces existential risks each year, as these households lack assets that might be sold in the context of a failed or inadequate harvest to offset outcomes such as starvation. In this situation, farmers are unlikely to take on greater risk by experimenting with new techniques or strategies, but might use climate information to better inform their existing strategies. This may be particularly applicable in unfavorable seasons, when the bifurcation between the information needs of resource poor households and wealthier households becomes particularly apparent.

5. Cross-pilot lessons: Monitoring and Evaluating CIS

The pilot projects in both Senegal and Rwanda, while engaging different contexts and different CIS, provide a range of broad lessons for the monitoring and evaluation of CIS. These include the importance of proper population stratification to capture the diverse users of CIS and their needs, the generalizability of such stratifications and their findings, and the identification and interpretation of impact.

5.1. Population Stratification

In both Senegal and Rwanda, the potential users of CIS and their identified needs were diverse. To identify who was using the CIS, what aspects of the CIS they were using, and the reasons why they were or were not using particular types of information required stratifying the populations of all three livelihoods zones in a manner that created groups of people whose livelihoods and engagement with CIS were broadly similar. HURDL's work with the LIG approach in both Senegal and Rwanda suggests that one productive means of such stratification is through the specific sets of vulnerabilities that members of the population report. Once groups of people reporting shared sets of vulnerabilities were identified, it was important to look within them for intra-group differences created by the roles and responsibilities associated with gender and other identities. This stratification process allowed for a detailed, rigorous analysis of livelihoods decision-making that enabled the identification of pathways of uptake and use (Senegal) or the explanation of patterns of observed use (Rwanda).

It is important to note, however, that the stratification of vulnerability groupings, although often associated to some degree with access to assets, does not necessarily reflect hierarchical increases in vulnerabilities that have a simple connection to CIS use. In RL04 for instance, the capacity of those with Stable Income Livelihoods (SIL) to respond to advisories provided by PICSA was limited by the availability of labor. This stands in contrast to those in this zone with LRL, who did not take up weather and climate information because they lacked the resources necessary to act on advisories. In RL12, those with Adequate Resource Livelihoods (ARL) and those with Adequate Resource Livelihoods with no livestock (ARL- no livestock) had similar livelihoods outcomes, but different portfolios of livelihoods activities and consequently different vulnerability profiles.

5.2. Scaling Findings

The findings from the two studies strongly suggest that qualitative data on the decision-making behind CIS uptake and use is valid at the scale of the livelihoods zone. In Senegal, the research across environmental and economic settings within a single livelihoods zone demonstrated that HURDL's qualitative approach produced a stratification of the population and explanation for observed decisions and outcomes that was consistent and valid across the entire zone. The Senegal

study also shows that underlying structures of livelihood decision making are very durable and seem to have remained relatively stable over a period of four years. This, however, is true at least in part because the zone did not experience any major shocks that might have disrupted local livelihoods. In stable contexts, patterns of livelihood decision-making therefore form an appropriate baseline from which to understand the impact of CIS interventions on households and communities, as such a baseline allows for the identification and evaluation of behavioral change associated with an intervention even before the impacts of that behavioral change become apparent.

In Rwanda, work across two zones showed that even among populations who are ethnically and politically quite similar, differences in the economic and environmental context of the two zones produced different structures of decision-making that preclude the scaling of most findings across livelihoods zones. For example, in both RL04 and RL12 the vulnerability stratification identified households that had stable livelihoods and adequate resources to engage in agriculture. In RL12 those with SIL are focused on agriculture, leaving them exposed to environmental shocks. In years of average precipitation and temperature, CIS impacts will likely be captured in some form of yield increase. However, in RL04, on the other hand, those with SIL are more focused on non-farm sources of income. Because of the time constraints created by their nonfarm activities, they already have challenges in providing enough labor to meet their households' agricultural needs. Therefore, many members of this group will not increase the size of their fields, as this would entail more work. Instead, they are most likely to shift crops and varieties to those with greater market value, assuming conditions are favorable. Therefore, those with SIL in RL04 may not show clear signs of yield increase, even in the context of salient, reliable, trusted information. Instead, these farmers might shift to higher value crops with the same yields, but which result in greater income. The Rwanda study therefore demonstrates that the livelihoods decision-making that climate information might inform is variable across livelihoods zones, and therefore requires unique behavioral baselines to capture behavior change and explain observed material impacts of a CIS.

5.3. Identifying and Interpreting Impact

HURDL's work in Senegal and Rwanda found that the LIG approach, which established behavioral baselines for the pilot livelihoods zones, allowed for the identification of likely pathways of change in the context of legitimate, credible, and salient climate information, and created a starting point against which to measure and describe those changes. The deep understanding of how livelihoods decisions are made in the present facilitated the explanation of observed patterns of CIS uptake, including zone-specific social, economic, and environmental factors. However, these understandings also yielded some broad cross-contextual factors that must be accounted for in any effort to identify and interpret CIS impact. These factors can be broken into two categories: those which produce different pathways of impact across livelihoods zones, and those which create different pathways of impact within a livelihoods zone.

Cross-livelihood zone factors that shape pathways of impact:

- 1) Agroecology of the population in question: this shapes the production and livelihood challenges faced by potential users, and therefore the information that will be of use.
- 2) Ethnicity of the population in question: this will greatly shape the social barriers to and opportunities for uptake and use of climate information.
- 3) Market access and infrastructure of the area in question: this will shape both the motivations for growing crops (high access and infrastructure can facilitate cash cropping) and the ability to

access assets, such as inputs, that are needed to leverage climate information into changes in agricultural outcomes

Intra-livelihood zone factors shaping pathways of impact

- 1) Those aspects of identity which shape the ability of different people to make decisions about different activities.
- 2) Access to the assets needed to make use of weather and climate information. For example, those with plows can respond quickly to advice to prepare their fields, while those without plows cannot prepare their fields in a timely manner, even when they believe that advice to do so is credible and legitimate.
- 3) The character of the vulnerabilities experienced by different individuals. For example, those facing existential risks will adopt different strategies to achieve safety and subsistence than those who are largely secure in their material well-being.

The intra-livelihoods zone factors are the most highly contextual, and often the hardest to identify without significant effort to engage potential users. However, they are also often the factors that best explain the rates of climate information uptake and use. Further efforts to evaluate the impact of CIS on agricultural livelihoods should work to further elaborate these intra-zone factors.

6. Addressing the CISRI Learning Agendas

The LIG assessments conducted in Senegal and Rwanda also speak to questions outlined in two CISRI learning agendas intended to identify, prioritize, and address knowledge gaps in the field of climate information services. One of these addressed the identification of CIS users and their needs (Carr et al. 2017), a critical theme for CIS design, implementation, and monitoring and evaluation. The second learning agenda speaks to the monitoring and evaluation of climate services (Vaughan et al. 2017).

6.1. Users and Needs: Over what spatial region or social groupings can a particular CIS be scaled?

As noted above, the pilot work in Senegal suggests that the broad structure of livelihoods decision-making is coherent at the scale of the livelihoods zone, even in zones where economic and environmental conditions vary. This suggests that to meet the requirement that CIS be tailored to specific users and needs, both users and needs can be identified at the scale of the livelihoods zone. The Rwandan assessments emphasize that there can be critical differences in the potential groupings of users and needs across livelihood zones, which further suggests that the livelihoods zone is the maximum extent to which any given identification of users and needs should be scaled. This is the case even where, at first glance, vulnerability stratifications seem similar. For instance, within both RL04 and RL12 there are those whose access to livelihoods resources is adequate to ensure subsistence, but too limited to allow for reliable surpluses. However, in RL12 this group of people owns livestock, while in RL04 this group is notable for its diversification of livelihood activities within the household. The information needs among those for whom animal husbandry is a major part of their livelihoods are likely to be very different than those that do not have livestock at all.

For monitoring and evaluation, this lesson is critical for the establishment of appropriate baselines (both material and behavioral) against which to measure impact. **The impacts of a CIS are likely to be consistent within a livelihoods zone, and exhibit significant differences across livelihoods zones.**

6.2. Users and Needs: What are the broad lessons we might learn about the social constraints to the use of climate information?

The LIG analyses in Senegal and Rwanda demonstrate that **it is necessary to identify social constraints to the use of climate information to properly target and calibrate monitoring and evaluation efforts**. For example, we know from the pilot work in SN10 that an evaluation of the entire population will produce an average rate of uptake/use that obscures important differences in impact across the population. Women in this zone are not likely to take up substantial rainfed staple grain production in the near future, not because they lack good weather and climate information, but because such cultivation is generally seen to be the work of men. The barrier to women's production is not information, but existing livelihoods and identities, and therefore evaluating women's use of climate information aimed at this production is unlikely to identify an impact. On the other hand, men *are* responsible for such cultivation. However, not all men have the assets that would allow them to respond to this information in a timely manner. Those without these assets are also unlikely to take up this information in a significant way because their principle barrier to increased production is access to assets, not information. Therefore, at least initially, monitoring and evaluation should be looking for impacts among those men with the assets to respond to advisories, as this is the group for whom information could be a critical barrier to increased production.

These findings point to a wider process by which those seeking to better calibrate CIS monitoring and evaluation can approach the sources and impacts of social constraints in their M&E design.

These processes are:

- 1) Stratifying the community into vulnerability groups to identify who is vulnerable to which shocks and stressors.
- 2) Identify the principle aspects of identity that shape roles and responsibilities in the area in question.
- 3) Identify the decisions that are associated with the roles and responsibilities of different people in the population.

6.3. Users and Needs: What are the most effective means of learning about users and needs in a given place?

While the LIG assessments conducted under the pilots in Senegal and Rwanda were qualitative, and therefore did not compare the information gleaned through different methods (for a comparison of methods, and an effort to synthesize the findings of different M&E approaches, see Carr et al. 2019), they serve to highlight understandings of CIS users and needs provided by such information. Ethnographic information focused on livelihoods decision-making explains observed patterns of behavior, and comes with a high degree of internal validity as data from one source (for example, an interview) can be triangulated with data from many other interviews, observations of daily life gathered by field teams, data on markets and prices for crops and animals, and weather and climate data for the place in question. Further, evidence from the pilot assessments suggests that LIG provides understandings of underlying decision-making structures with external validity at the scale of the livelihoods zone (but not necessarily across livelihoods zones). The external validity of the LIG assessments findings in both Rwanda and Senegal is limited with regard to observed material outcomes. Contextual factors such as market conditions, access to labor markets, or agricultural policy may change rapidly and alter incentives to participate in particular agricultural practices, even when the underlying livelihoods decision-making structures remain the same. This suggests that the careful integration of qualitative data with broader representative descriptive data, such as that

gathered through systematic surveys, is important in linking livelihoods decision-making to externally-valid observations of material outcomes.

HURDL's experience with learning about users and needs suggests two major lessons for the monitoring and evaluation of CIS:

- 1) **If aimed at decision-making, even a limited sample of ethnographic data can facilitate the rigorous identification of pathways of impact at the level of the livelihoods zone.** To produce rigorous identifications of material impact within a livelihoods zone, however, the pathways of impact derived from ethnographic data should be synthesized with larger systematically sampled data on outcomes. Livelihoods decision-making, even when of a consistent structure, can produce different outcomes depending on the local market and agroecological conditions.
- 2) **There are two key ways in which ethnographic data can be synthesized with larger systematic datasets: attribution and explanation of observed impacts.** The ethnographic data on pathways of impact can serve as means of attributing observed changes to the CIS or not by examining the alignment of those changes with expected pathways of change. Ethnographic data can also explain the processes by which the CIS facilitated or otherwise spurred the attributed changes.

6.4. Monitoring and Evaluation: How do we identify and measure diverse material and social impacts?

By laying out the decision-making of different actors in a livelihoods zone, the pilot studies demonstrate a methodology that can be employed to identify a broader and more heterogeneous set of users and their needs, and thus measure a wider range of impact pathways for CIS within a given user population than possible through the observation of material outcomes alone. The findings from Senegal and Rwanda show that the uptake, use, and impact of even the most accurate, best-communicated CIS is likely to be heterogeneous, both across and within livelihoods zones. However, monitoring and evaluation efforts can calibrate their efforts by carefully identifying what changes they are seeking to observe. For example, when comparing broad patterns of impact across livelihoods zones, evaluation efforts should calibrate their analysis through a consideration of the ways in which zone-specific economic, agro-ecological, and social processes and pressures create structures that create and restrict opportunities to use particular forms of climate information. When examining the diverse patterns of impact within a livelihoods zone, evaluation efforts should focus on the vulnerabilities individuals report, the identities associated with different roles and responsibilities, and the varying access to assets in that zone. Specific needs for weather and climate information will emerge around these three major sets of data.

The pilot efforts in Senegal and Rwanda also demonstrate that the impact of a CIS might not be visible in substantial material changes, either in practices or outcomes like yields. Instead, pathways of impact might come in the form of new people participating in new activities from which they were previously excluded. Such changes in activity are signals of more significant changes in the overall socio-ecological context, as it suggests that some portion of the connection between livelihoods activities, identities, and tools of coercion has changed. On the surface, such changes might seem minor, but they can be indicative of deep shifts which can result in fundamental changes in the ways people choose to live in that place. The underlying drivers of change and the pathways by which change is occurring for different members of a population brings to the fore impacts that have previously been difficult to document.

7. References

- Carr, E.R. et al., 2017. *Identifying Climate Information Services Users and Their Needs in Sub-Saharan Africa: A Learning Agenda*, Washington, DC.
- Carr, E.R., 2013. Livelihoods as Intimate Government: Reframing the logic of livelihoods for development. *Third World Quarterly*, 34(1), pp.77–108.
- Carr, E.R. et al., 2018. *Senegal's Multidisciplinary Working Group CIS Model: A Qualitative Assessment of CIS Users and their Needs*, Washington, D.C., United States Agency for International Development.
- Carr, E.R. et al., 2019. *Synthesis Report: Improving the monitoring and evaluation of CIS to facilitate learning and improve outcomes*, Washington, D.C., United States Agency for International Development.
- Carr, E.R., Fleming, G. & Kalala, T., 2015. *Assessing Climate Service Needs in Kaffrine, Senegal: Livelihoods, Identity, and Vulnerability to Climate Variability and Change*, Washington, DC: USAID.
- Carr, E.R., Fleming, G. & Kalala, T., 2016. Understanding women's needs for weather and climate information in agrarian settings: The case of Ngetou Maleck, Senegal. *Weather, Climate, and Society*, 8(3), pp.247–264.
- Carr, E.R. & Onzere, S.N., 2018. Really effective (for 15% of the men): Lessons in understanding and addressing user needs in climate services from Mali. *Climate Risk Management*, 22, pp.82–95.
- Carr, E.R. & Owusu-Daaku, K.N., 2016. The shifting epistemologies of vulnerability in climate services for development: the case of Mali's agrometeorological advisory programme. *Area*, 48(1), pp.7–17.
- Lambert, K., Allen, M., Lewis, A., Blumenstock, A., 2019. *Participatory Climate Information Services Systems Development: Methodology Guide*. Learning Agenda on Climate Services in Sub-Saharan Africa: Climate Information Services Research Initiative, Washington, DC, United States Agency for International Development.
- Lo, M. & Dieng, M., 2015. *Impact assessment of communicating seasonal climate forecasts in Kaffrine, Diourbel, Louga, Thies and Fatick (Niakhar) regions in Senegal*, Wageningen, the Netherlands.
- Onzere, S.N. et al., 2018. *Rwanda's Climate Services for Agriculture Initiative and the Participatory Integrated Climate Services for Agriculture: A Qualitative Assessment of CIS Users and their Needs*, Washington, D.C., United States Agency for International Development.