

Investigating Institutional Readiness in Enabling Adaptation to Future Changes in the Climate: A Case Study of Institutions Working with Frafras Farming Communities within the Semi-Arid Ecosystem of Northern Ghana

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Abstract

Institutional readiness to enable communities' adaptation to future changes in the climate is a great challenge in developing countries like Ghana subject to limited resources. This study aimed to assess local institutions readiness to enable communities' adaptation under future changes in the climate in order to provide a basis for their capacity building. A case study of institutions working with Frafras farming communities within the semi-arid ecosystem of northern Ghana was used to investigate existing local institutions: (1) level of understanding of climate change and its impacts, (2) ability to manage knowledge and information (3) forward-thinking character and (4) participatory character. A total of 49 semi-structured interviews with key representatives of various organizations from different sectors in Bongo and Bolgatanga districts (e.g., agriculture, disaster management, banking, forestry and community development) were conducted. The analysis of existing local institutions capacity revealed that despite their high level of understanding of climate change and its impacts and their good participatory character, most of these institutions are limited in their ability to manage information, especially in terms of the usage of scenarios or other techniques. This situation hinders them to plan against long time horizon and thus, to avail resources for emergencies. Over a long-term, these limitations or inabilities would likely exacerbate, hindering these institutions to sustain their role in enabling communities' adaptation to climate change. Thus, to contend with potential climate uncertainty and risks to be associated with future changes in the climate, there is a need for institutional capacity building especially in terms of information or knowledge management essential in planning against long-term and ensuring an emergency response.

Keywords

Adaptation, Future climate change, local institution, Readiness

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1. Introduction

Climate change has been defined as the statistically significant variation in climate that persists for an extended

period, typically decades or longer [1]. This change includes shifts in the frequency and magnitude of sporadic weather events as well as the slow continuous rise in global mean surface temperature. As a matter of fact, climate change is predicted to have the main impact on agriculture, economy and livelihood of the populations of the under-developed world and mainly in Sub-Saharan West Africa (SSWA) [2].

Ghana, like other countries in West Africa, has been already experiencing considerable variations in temperature and rainfall patterns since the 1960s, a phenomenon associated with an increase in some extreme events' incidence especially droughts, floods and bushfires [3, 4, 5]. In addition, Owusu et al [6] reported that there has been a shift in the rainfall regime in Ghana towards a longer dry season and vanishing short dry spell. Meanwhile, the temperature has increased by 1°C across the country

representing an average increase of 0.21°C per decade [7]. As future is concerned, based on climate change scenarios, IPCC predicted that Ghana is likely to experience greater rainfall variability and higher temperatures in the future [8]. An increase in temperature averaging 0.25 °C is expected from 2010 to 2020 while rainfall is projected to decrease in most of the agro-ecological zones (including Guinea and Sudan Savannah zones). As a result, Ghana will be highly challenged by climate change and variability because of its reliance on rain-fed agriculture, the key for its economy (i.e. it contributes to about 44% of the country GDP and employs about 57% of the population). This impact will be felt mostly in semi-arid of Ghana (as part of grassland area) where most extremes are expected to occur as result of climate change [9]. Against this background, adaptation widely recognized as a vital component of any policy response to climate become a requirement to enable development in the country.

Local institutions are known as formal and informal organizations through which society structures share decision-making and take collective actions [10]. Based on their actions, they can be organized into state/public, private/market and civic/civil society [11]. These institutions have been highlighted as key actors which structure risks and peoples' sensitivity to climate hazards, facilitate individual and collective responses and shape the outcomes of such responses [11]. They are known as steward of communities' adaptation to environmental changes including climate change, for their contribution in enhancing these communities' capacity to respond to changes both in the past [11] and currently [12, 13]. However, the question which remains is whether these existing institutions measure up to the challenges associated with future changes in the climate? Are they ready to sustain their role under the coming changes?

Adaptation readiness expresses the level of preparedness and organization of human systems to enable adaptation [14]. The assessment of the adaptation readiness can be carried out at various level of human organization (global, regional, and national), with all the adaptation stakeholders (e.g. communities, institutions, decision makers and policy makers), and in various key sectors (e.g. agriculture, fishery). One of the ways of assessing adaptation readiness is through the adaptive capacity [15]. Adaptive capacity is considered as the ability of a system to change its behaviour in response to existing or anticipated stress, thereby reflecting the potential of the system to adapt [15]. The concept of adaptive capacity has been differently defined. But the common factors or function of adaptive capacity while considering the characteristics of Africa Climate Change Resilience Alliance (ACCRA) Local Adaptive Capacity Framework, the World Resources Institute National Adaptive Capacity Framework and World Resources Institute World

Resources Report Framework are the participatory character, its capacity to manage knowledge and information and its forward-thinking character [16, 17, 18]. As a matter of fact, Ministry of Environment, Science, Technology and Innovation [19] highlighted the information or knowledge management among others key strategies as essential in ensuring adaptation to climate change in Ghana. In the other side, Boyd et al. [20] highlighted the relevance of longer-term policy vision, known as forward-thinking, for developing strategies under uncertain environmental futures. Forward-thinking also known as anticipatory governance help in managing events instead of waiting until an event (whether climate-related or socio-economic) results in crisis [20]. This system consists of using foresight (scenarios of other prediction methods) to reduce climate risks and to increase potential capacity to respond. Another element or component recognized as key for an effective strategy for climate change policy formulation and implementation is stakeholders' participation, especially community participation [21, 22].

More explicitly, Green and Hunton-Clarke [23] highlighted the key role of participation (informative, consultative, and decisional) in communities' contribution to policymaking. Finally, public awareness and perceptions, especially awareness and perceptions of the risk of climate change are also numbered among key factors for a successful adaptation for its influence on the initiation and development of programs as well as institutional capacity building [24].

Several studies have been carried out on adaptation readiness, nevertheless, most of them focused on global regional and national [25, 26, 27] assessment while adaptation is supposed to be done locally [1, 28]. In addition, few of these studies have genuinely looked at institutional readiness in terms of institutional preparedness and organization to enable adaptation under a future change in the climate. Thus, this study aims at investigating institutional readiness in enabling adaptation to future changes in the climate using the case study of institutions working with Frafras farming communities within the semi-arid ecosystem of Northern Ghana.

2. Methods

A total of 49 in-depth semi-structured interviews were conducted between June and August 2015 with 28 organizations working with farming communities in Bongo district (with a focus on 12 communities namely, Boko, Feo, Soe Awukabisi, Soe Sanabisi, Soe Tamolga, Amanga, Balungu, Lungu, Ve, Nyariga, Gowrie and Central Bongo). Interviews were conducted in Bongo and Bolgatanga districts.

Key informants were purposively sampled using Institutional Perception Mapping (IPM) approach based on their importance for considered communities. A broad

range of informants was selected from several sectors due to the cross-cutting nature of climate change adaptation. Organizations assessed were categorized by their types, either public organizations (are those within the existing government or governance structure whether elected or appointed, like MoFA) or civic organisations (are more about non-governmental organizations, hybrid organizations such as cooperatives, and other organizations such as World Vision, ACDEP). Of the 28 organizations assessed, nineteen (19) were civic while nine (09) were public. Most of the institutions focused on all domains of rural life (agriculture, community development, forestry, education, disaster management, banking, water resource management, and financial empowerment). Most of the informants held senior positions within the institutions (e.g., Director, Monitoring/Evaluation Officer, Project manager/leader) with most of them having at least 3 years working experience in the institutions. Table 1 presents the characteristics of key informants interviewed.

Table 1. Key informants stratified by sector and organization type

Types of organization/ institutions	Sectors							Subtotal
	Water	Forestry	Disaster	Agriculture	Banking	Cross-cutting	Subtotal	
Public	2	1	1	3	3	21	31	
Civic	0	0	1	5	0	12	18	
Subtotal	2	1	2	8	3	33	49	

2.1 Conceptual framework

Key factors of the Institutional Readiness for Adaptation (IRAF) Framework are related to institutional perception on climate change and its potential impacts, their capacity to manage information and knowledge, their forward-thinking character and participatory character (Fig.1). The capacity of an institution to manage knowledge and information depends on its access to climate information, its capacity to reformat that information for users, the capacity to use scenarios or other techniques to predict the future and its awareness and integration of the National adaptation guidelines (NAP) in their program. Besides, an institution forward thinking character is linked to its capacity to plan for a long-term horizon, to avail resources and capacity for rapid response, and its capacity to incorporate new information/lessons learnt. Finally, the participatory character of an institution is related to its capacity to incorporate periodically the communities with which it is working, to solicit beneficiaries' participation to their activities and to provide active roles to beneficiaries.

All the data packages collections are based on the theoretical and conceptual framework below (Fig 1.).



Figure 1. Conceptual framework: Institutional Readiness for Adaptation (IRAF) Framework. **Source:** Authors' construction

A total of 13 indicators have been selected for the assessment. The indicators are summarized in Table 2.

Descriptive statistics and content analysis were the main analytical techniques used in this study. The qualitative data were codified in the quantitative form using Access 2013 which was used for the data entry. SPSS software version 16.0 was used to perform descriptive statistics (frequencies analysis) of the data.

Table 2. Recapitulative factors, criteria and indicators of Institutional Readiness for Adaptation

Readiness factors	Criteria	Indicators
1. Institutional perception	Level of understanding of climate change and potential impacts	Perception of the climate change manifestation in the study area. Perception of the causes of climate change Perception of the climate change impacts on the farming communities.
2. Information and knowledge management capacity	a. Access to climate information b. Capacity to reformat climate information c. Ability to use scenario or other techniques d. Awareness and integration of the National adaptation guidelines (NAP)	Number and type of institution with access to climate information Number and type of institutions with the capacity to reformat information Number and type of institutions with the capacity to use scenario or other techniques Number and type of institutions aware and have integrated of the National adaptation guidelines (NAP) in their program
3. Forward-thinking character	a. Planning for a long-term horizon b. Availability of resources for rapid response c. Capacity to incorporate new information/lessons learnt	Number and type of institutions with the capacity to plan for a long-term horizon Number and type of institutions with available resources and capacity for rapid response Number and type of institutions with the capacity to incorporate new information/lessons learnt
4. Participatory character	a. Involvement of key stakeholders in the decision-making process b. Vertical coordination of adaptation actions c. Provision of an active role for beneficiaries	Number and type of institutions with the capacity to incorporate periodically communities Number and type of institutions that solicit community participation Number and type of institutions that provide an active role for beneficiaries

3. Results and Discussion

This article assesses local institutions readiness to enable communities' adaptation under future changes in the climate using the case study of local institutions working with Frafras' farming communities in Northern Ghana. This assessment has been in terms of local institutions perception of climate change and its impacts, their ability to manage information and knowledge, forward-thinking character and participatory character. This section presents and discusses these factors of readiness as well the leading institutions on this matter.

3.1 Relevant local institutions

Of the 28 local institutions assessed, most of them are involved in agriculture (47%), in cross-cutting issues (39%), in water (4%), in banking (4%), in disaster management and prevention (4%) and in forestry (2%). Out of the institutions assessed, nine (09) are public while nineteen (19) are civic, making a total of 28 local institutions.

3.2 Factors of institutional readiness

Institutional readiness is a function of institutional perception on climate changes and its impacts, its capability to manage knowledge and information, the capability to think forward and capability to allow beneficiary communities participation.

3.2.1 Institutional perception

All the local institutions' respondents interviewed are aware of the changes in the climate occurring in the study area through specific observations. The most evident observations perceived by these respondents include high temperatures (40%), a decrease in rainfall (25%), change in seasons' length (20%), and disturbance in the rain distribution (15%). These results are confirmed by Obeng et al. [29] who found an increase in temperature trend of about 1.9 °C and a decrease in rainfall of about 20.5 mm in Upper East Region using 1931-2003 data series. In addition, some local institution respondents linked drying up of rivers and trees, loss of soil fertility, and increased animals' diseases and death to climate change. Besides, respondents identified drought and storm as the major climate events or hazards occurring more frequently in Bongo district. Nevertheless, insect invasion and flood were also considered to be related to changes in the climate. In terms of frequency, storm and drought are the two-climate hazard/events occurring more frequently these recent years. As a result of these changes in the climate, farming activities in Bongo are affected with major impacts being the decrease in agricultural yield (100%) and a shift in the type of crops cultivated (33%). These observations are obvious because most of the livelihoods of the people are based on rain-fed agriculture. Above all, local institutions respondents depicted deforestation (84%), abandon of traditions (38%), bush burning (32%), greenhouse gases emissions (20%) as the

major four sources of changing in the climate. The result concurs with the general perceived cause of climate change in Ghana which is deforestation [30].

3.2.2 Knowledge and Information Management

While acknowledging their access to climate information (79%), most of the institutions' respondents reported their limited capacity to reformat this information to make it useful to those in need for decision making, especially farming communities with which they are working (only 30% out of the 79%). Climate information is mainly provided by the Meteorological agency, Radio, the Agricultural unit (MoFA), IGNITIA, Esoko and sometimes by traditional doctors, representing other local institutions working in the study area. This reality observed brings out the importance of linkages between local institutions for an effective adaptation [11].

Besides, most of the institutions' respondents (85%) highlighted their limited capability to use scenarios or other techniques in their planning processes. Thus, most of these institutions are exposed to uncertainty and risk associated with changes in the climate. The limited ability to use scenarios or other techniques may be due to the fact that most of the institutions enabling adaptation in the study area are not directly agricultural or climate related. Some of these institutions work in one of the domains of rural life (i.e. agriculture, community development, forestry, education, disaster management, banking, water resource management, and financial empowerment), thus, indirectly contributes to farm households' adaptation to climate change. Finally, as a result of the indirect link between their mandate and climate change adaptation focus, most of the institutions are not aware and consult neither the National Adaptation Program (NAP) guidelines nor agricultural guidelines (METASIP), therefore, do not integrate these documents in their directives.

Going into details, all the types of institutions do not have the same capacity of managing knowledge and information. As a matter of fact, all the types of institutions have high access to climate information while the ability to reformat climate information, the ability to use scenarios or other techniques and the integration of national adaptation guidelines remained low. Nevertheless, the civic institutions show a high ability to reformat climate information and integrate national adaptation guidelines compared to the public institutions. At the other side, public institutions depict a higher ability to use climate scenarios. The details on the knowledge and information management by institution types are shown in the Fig. 2.

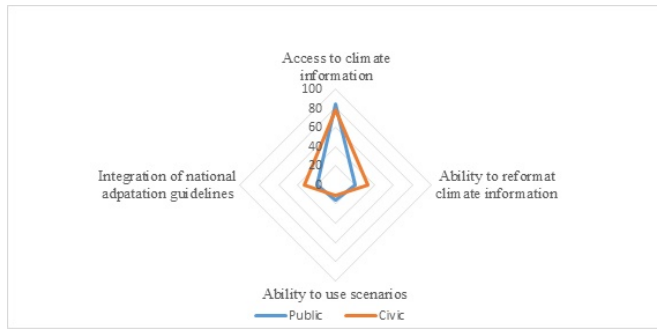


Figure 2. Knowledge and information management by local institutions type

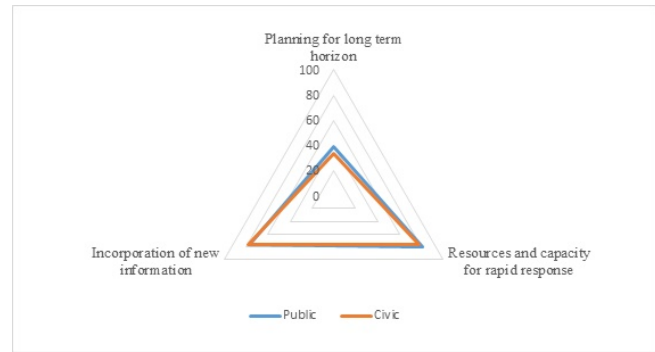


Figure 3. Forward-thinking character by local institution types

3.2.3 Institutional forward-thinking character

For local institutions' respondents, the incorporation of new information/lessons learnt is done along the way. Lessons learnt are introduced in most of the cases on a pilot basis or in unit plan and after in the general plan of the institution. Taking into account the lessons learnt along the way may contribute to the adequate and priority-based allocation of fund or resources. Besides, respondents highlighted that few institutions can plan against long-term climate change impacts (only 15%). This highlights the relationship between the foresight and planning. The inability of institutions to predict future changes using scenarios or other techniques stick them to plan only for the short-term horizon.

This situation explains the low allocation of resources and limited capacity for rapid response to an opportunity or a change in a situation (with only 34% having adequate resources for rapid response). In brief, these institutions have limited ability to plan for a long-term horizon, to incorporate lessons learnt along the way and adequately allocate resources for rapid response makes them less flexible and innovative. Looking at the complexity associated with climate changes and upcoming uncertainties, where flexible and innovative measures will be needed, these institutions may not be able to stand their role which is to enable communities to respond to future changes in the climate [31, 20]. Besides, all the types of institutions (whether public or civic) are ranging on the same level as regards to the forward-thinking character (Fig. 3).

3.2.4 Institutional participatory character

Farm households' involvement in local institutions activities goes from their periodic incorporation in institutions activities to them holding an active role within the institutions. Out of the 49 institutions' key informants interviewed, up to 60% acknowledged that beneficiary farm households' solicitation goes beyond their periodic incorporation (70% institution respondents) and their participation. These farm households are involved as a labour force, project extension workers (information dissemination/on-farm demonstration), and volunteer in emergency response, technical agents (irrigation canal maintenance /protection of forests) but also as project implementation agents. For most of the institutions, households are involved in institutions life through the occupation of those active roles. These active roles are carried individually or in a group with the most common being project implementation.

This stage of involvement can hinder communities' participation in the entire institutions' life cycle (including the early stage key decision making). The functional participation to which these farm households are subjected represents a hindrance to their contribution in terms of indigenous expertise. Besides, all the types of institutions (whether public or civic) are ranging on the same level as regards to the participatory character except in terms of the provision of active roles. Nevertheless, civic institutions show better ability to provide active roles to beneficiary communities (Fig. 4). This may be due to the fact that participation of beneficiaries has become today a requirement for those institutions to access funds from donors.

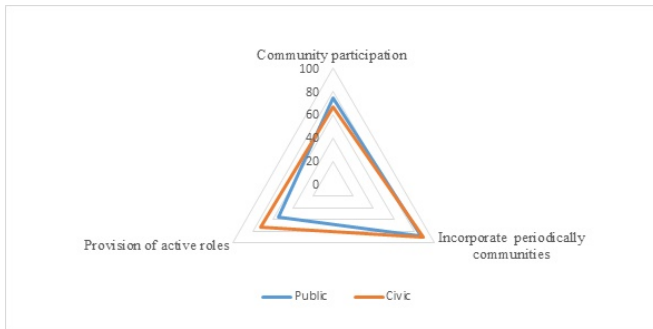


Figure 4. Participatory character by local institution types

4. Conclusion and recommendations

This study analyzed local institutions readiness in terms of their capacity to enable adaptation based on a cross-sectional survey data collected during the period of June to August 2015 in Bongo and Bolgatanga districts. The assessment of existing institutions perception on climate change, their capability to manage information or knowledge, their capability to think forward and their participatory character. The factors responsible for constraining adaptation readiness among the existing local institutions were limited capacity to manage knowledge and information (particularly the ability to reformat climate, to use scenarios or other techniques and the integration of national adaptation guidelines) and capability to think forward (particularly planning for long-term horizon). Thus, to enable local institutions to contend with potential climate uncertainty and risks associated with future changes and sustain their role in enhancing communities' adaptation in the future there is the need for institutional capacity building especially in terms of information or knowledge management essential in planning against long-term and ensuring an emergency response. In addition, the government should enforce the integration of the national adaptation guidelines and the adequate participation of communities' in local institutions lives.

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