

Research Article

Progress and challenges of Guinea's national service of risk management in building climate-induced disasters' resilience in Guinea Savanna communities

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Abstract

The increased frequency and magnitude of climate-induced disasters are a huge setback for the world's economic growth and performance. Addressing such risks has long time motivated many governments to set up disaster-based management strategies, policies, and plans to strengthen their resilience. However, the implementation of such initiatives remains challenging in developing countries due to their specific internal development issues that require timely performance appraisals to offer suitable remedial actions. This motivated the present study to use the Risk Management Index (RMI), to measure Guinea's risk management performance and effectiveness, focusing on its institutional progress and challenges encountered in building climate-induced disasters' resilience in Guinea Savanna communities. Data were generated through semi-structured interviews with local authorities responsible for implementing prevention measures and emergency responses to disasters in Guinea Savanna, as well as inputs from academia with activities related to disaster risk management, combined with documentary research and field observations. Analyses of the RMI showed very limited progress in risk identification ($RMI_{RI} = 0.672 - 1.00$), while almost no significant progress was made in financial provision ($RMI_{FP} = 0.124 - 0.487$). On the contrary, policies of disaster management ($RMI_{DM} = 0.600 - 1.934$) and Risk Reduction ($RMI_{RR} = 0.791 - 1.606$) have shown incipient progress. While all public policies need to be improved, urgent actions are needed in financial provision and risk identification policies. Therefore, the study suggests that local authorities should be more committed to risk identification and risk financing approaches to address the priority needs for effective disaster risk management in Guinea Savanna communities.

Keywords: Climate change, Drought, Flood, Resilience, Savanna communities

INTRODUCTION

Worldwide, extreme weather events and slow onset ones are now part of life for millions of people world-

wide (Abbass *et al.*, 2022). Climate-induced disasters disrupt the normal functioning of states, economies, and global development efforts, and consequently undermine prospects of achieving sustainable develop-

ment goals (SDGs) (Clarke *et al.*, 2022). However, such phenomena are expected to increase in frequency and magnitude in the future due to incessant societal pressures on the natural environment with extremely adverse impacts on vulnerable societies (Sloggy *et al.*, 2021). However, vulnerable societies worldwide have been developing numerous adaptation measures in response to multiple hazards assorted with financial support to implement their adaptation plan, but challenges still exist (United Nations Framework Convention on Climate Change, 2020).

While significant progress is made in developed countries, many developing countries are still confronted by enormous financial and technological barriers to successfully implementing adaptation measures to strengthen community resilience. This is illustrated by WorldRiskReport 2021 (Aleksandrova *et al.*, 2021), which indicates that Africa remains the continent with the highest overall societal vulnerability. Over two-thirds of the most vulnerable countries are located in Africa (Aleksandrova *et al.*, 2021), where over 2,000 natural disasters have occurred and affected 460 million people, killing over 880,000 since 1970 (Global Facility for Disaster Reduction and Recovery, 2016). Poor people strongly dependent on declining natural resources are the most affected by disasters that cause pernicious hunger and malnutrition in developing countries such as Guinea (United Nations for Disaster Risk Reduction, 2020).

Guinea is no exception to disaster risk management (DRM) constraints and ranks 58th world's most disaster-risk countries, with a high lack of coping and adaptive capacities (Aleksandrova *et al.*, 2021). However, strategies to reduce disaster risks in the form of policies and plans have been underway for years, but efforts to build resilience are still unsuccessful due to increasing socio-economic development challenges (African Development Bank Group, 2018; Manyena, 2016). To date, traditional knowledge, beliefs, customs, prayers, incantations, and sacrifices, as well as some rare rehabilitation activities, remain the main means used to deal with disasters all over the history of occurring disasters in Guinea (Iloka, 2016). Therefore, Guinea seems almost powerless to face new climatic conditions noticeable by episodic drought or flood events across the country, notably in Guinea Savanna (Van Niekerk *et al.*, 2020) highly prone to disasters (Loua *et al.*, 2020).

Guinea Savanna is identified as the most climate-vulnerable area in Guinea, characterised by frequent weather-related hazards such as drought, floods, bushfires and high temperatures that trigger huge obstacles to livelihoods' production and food security (United States Agency for International Development, 2018). This region records the lowest mean rainfall balance unevenly distributed (1200-1600mm) while it has the

highest mean annual temperature, which goes up to 37° C during the dry season (Kante *et al.*, 2019). These issues, combined with communities' huge pressures on forest resources, have altered soil quality and affected vegetation dynamics leading to flash flood events after rain and drought episodes, making it Guinea's most disaster-prone area (Guinea-United Nations Framework Convention on Climate Change, 2015).

Disaster risk management is a set of activities that include risk reduction and disaster management, which aims to protect productive assets and life and help enhance resilience (United Nations for Disaster Risk Reduction, 2020). Therefore, understanding the performance of disaster management systems is key to understanding their success or effectiveness, enhancing their benefits, and correcting their shortcomings (Bayrak, 2011; Novelo-casanova and Sua, 2015). However, much-existing research focused on climate change impacts description and mitigation measures (Makate *et al.*, 2019; Mwashia & Robinson, 2021; Nyang'au *et al.*, 2020), ignorant of the root causes of failure and maximising progress to cope with changes. This study seeks to fill this gap by highlighting what Guinea faces in the quest to build disaster resilience, with a focus on its institutional progress and challenges, crucial to the formulation of tailored policies.

Natural hazards in Guinea

Guinea is part of Africa's sub-Saharan countries, with about 12 million people. It covers an area of 245, 857 km² and borders Guinea-Bissau, Senegal, and Mali in the North; Côte d'Ivoire in the East; and Liberia and Sierra Leone in the South. Its 320 km of coastline in the southwest faces the Atlantic Ocean, where the capital Conakry is located. Guinea is subdivided into four (4) natural regions due to its distinct geographical and climatic conditions: (1) Lower Guinea, which borders the entire coastal strip of the country with lowlands and mangrove forests; (2) Middle Guinea known as Fouta Djallon, covers the wooded and mountainous areas; (3) Upper Guinea or Guinea Savanna, covers the largest watershed area of the country, made up of uplands and floodplains; and (4) Forest Guinea, a region of dense forests and mountains, as well as dense river network (Loua *et al.*, 2020).

Overall, Guinea faces a variety of natural shocks, including droughts, floods, landslides, earthquakes, tornadoes, and sea level rise, as well as disease outbreaks notably the Ebola (2014-2015) with 2,500 deaths, and recently COVID 19 virus (2020). The vulnerability of Guinea to these disasters is strongly related to its geographical location and socio-cultural and politico-economic conditions (African Development Bank Group, 2018; Manyena, 2016).

Drought episodes highly detrimental to rain-fed agricul-

ture occur in the northern part of Guinea, especially in the Savanna region, and the areas are covered by Gaoual and Koundara localities (Diallo *et al.* (2020). For instance, Guinea experienced its most severe drought in 2002, which considerably caused failures in cereal crop yields as livelihood sources for many Guineans. However, the future raise concerns as the mean annual temperature are projected to increase from 1.1° to 3.0°C by 2060, and 5.3°C by 2090. Precipitation will also drop from 36.4 % by 2050 to 40.4 % by 2100, as well as sea level from 0.4 to 0.7 meters by 2100 (United Nations Development Programme (UNDP) and United Nations Environmental Programme (2020). Flood disasters occur everywhere in Guinea but with greater effects in urban areas and on livelihoods in rural areas. Guinea is considered the water tower of West Africa due to its many and various watercourses, including 1,165 rivers that originate from Fouta Djallon Mountain and the Guinean Ridge, and 23 river basins including 14 internationals. Communities living along these rivers often experience severe floods during the peak of the rainy season notably from Jun to September. Moreover, human settlements on natural drainage areas or wetlands also cause flash floods with serious damage to people's livelihoods, settlements, and human life notably in Conakry, Kankan and Kouroussa. Several events related to floods in Guinea are aggravated by the lack of appropriate drainage systems and the non-application of urbanisation internal rules. For instance, from 6 to 7th September 2020, 26 out of 27 districts in Kankan prefecture were affected by heavy rain, which caused significant damage both to people and their properties. An assessment of damages conducted by the Red Cross members identified 49,536

affected households, including 23,248 men and 26,288 women. As damages, 657 houses were destroyed, 1,363 were displaced and 551 water sources were destroyed (International Federation of Red Cross and Red Crescent Societies, 2020).

MATERIALS AND METHODS

Study area

Guinea Savanna (Fig. 1) is the most prone region to climate-induced hazards in Guinea. This is due to its sensitive geographic position, climatic conditions, and the magnitude of population pressure on natural resources (National Strategy for Disaster Risk Reduction, 2012). It is made up of seventeen livelihood zones (LZs) including (1) Kouroukan; (2) Bouré; (3) Lélé-Wéléwéléya; (4) Soudanese Plateau, (5) Kolokalan High Valley; (6) Fié Basin, (7) Middle Plateau, (8) Woulada Plateau, (9) Foutanian Piémont, (10) Wassolonké Plateau, (11) Dion-Niandan Inter-River, (12) Bassando, (13) Sankaran Plateau, (14) Fria High Hills and Plateau, (15) Solima High Plateau, (16) Pre-forest area, and (17) Natural Reserves and Parks (Institut de Recherche Agronomique de Guinée, 2001). These LZs are under the influence of episodic drought and flood events that challenge farming practices and food security (Koivogui *et al.*, 2018).

Data source

Data were collected through semi-structured interviews with regional disaster management authorities (RDMA), responsible and/or actors for implementing prevention, mitigation measures, and emergency responses in the field. RDMA included the coordinators

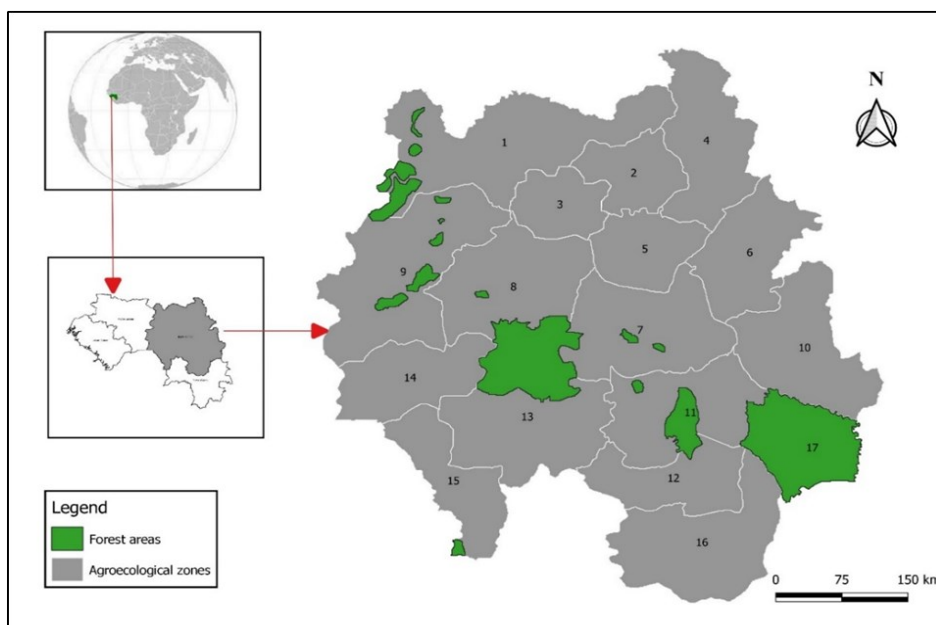


Fig. 1. Guinea Savanna showing the livelihood zones

of humanitarian actions (CHA), environmental bodies (EB), and academics from institutions with activities related to DRM, namely N'Zerekore and Gamal Abdel Naser Universities, respectively, in Forest and Lower Guinea. Correspondence letters with attached assessment forms were addressed to relevant targeted people absent during data collection. Respondents were requested to establish the levels of performance or achievement of 24 sub-indicators by assigning a score ranging from 0 to 5 (with 0 for *lack of actions* or information on that indicator, 1 for *low*, 2 for *incipient*, 3 for *significant*, 4 for *outstanding*, and 5 for *optimal*). Before this, all respondents were advised to provide scores that well reflect the achievement level for each sub-indicator, and proofs of achievements were solicited if available.

Documentary analysis was undertaken to complement and triangulate the information obtained from respondents. The documentation included action plans, strategic documents, reports, sectorial policy documents, codes, conventions and treaties. The evaluation process covered the timeframe between 2017 to 2020, and it was especially focused on issues at the regional level, notably the Guinea Savanna, instead of the national level. The year 2021 was not included because of the lack of appropriate data due to administrative malfunctions during that year.

Risk Management Index

The risk management index (RMI) is a well-recognised composite indicator designed to measure risk management performance and or effectiveness. It enables both the depiction of DRM at the national and sub-national levels, as well as the urban levels (Novelo-casanova and Sua, 2015). The RMI comprises four main indicators or public policies, including (1) risk identification (RI), (2) risk reduction (RR), (3) disaster management (DM), and (4) financial provision (FP). Each public policy contains six sub-indicators (Fig. 2).

RI policy is about people's access to climate risks and disaster information, as well as the capacity of people to use this information, create, and manage risks; RR policy covers the prevention and mitigation measures, people access to more accurate and timely early warning systems capable to stimulate a quick response in the event of a disaster; DM policy covers the response and recovery process; and FP policy covers the possibility of access to pre and post-sufficient financial resources, and increased investments in vulnerability reduction (Global Facility for Disaster Reduction and Recovery, 2016).

Risk management benchmarking

Risk management benchmarking involves the institutional actions taken to reduce vulnerability and losses,

prepare for a crisis, and to recover efficiently from disasters (Cardona, 2008; Novelo-casanova and Sua, 2015). It includes twenty-four (24) sub-indicators that make up the RMI (Fig. 2).

Tables 1 to 5 show the qualifications of these sub-indicators with corresponding average scores ranging from 0 to 5 assigned by local disaster management authorities, with the participation of academics from relevant institutions.

Levels of performance range from 0 to 5, where:

- 0 = Non-existent
- 1 = Low
- 2 = Incipient
- 3 = Significant
- 4 = Outstanding
- 5 = Optimal.

Weighting of indicators

As in Novelo-casanova and Sua, (2015), the analytical hierarchical process (AHP) method (Saaty, 1987) was used to determine the weights of each public policy that compose the RMI. AHP is an expert statistical weighting tool for organising and analysing complex decisions using math and psychology. It was preferred since it is one of the most inclusive systems allowing one to make decisions with multiple criteria and believe in a mixture of quantitative and qualitative criteria (Taherdoost, 2017).

For each policy, assigning weights to sub-indicators needs first to compare them to one another, two at a time, and then estimate each sub-indicator's impact on local authorities' plans intending to successfully prevent, respond, and mitigate potential disaster risks in Guinea Savanna. Therefore, the assigned weights were tailored to the country's specific DRM needs and intervention priorities. These are accounted for in the AHP tool (Taherdoost, 2017; Zhang et al., 2020).

Data processing

To measure the performance of risk management at the regional level, the average values of the individual scores assigned by the local disaster management authorities (LDMA) were retained regarding the years covered by the study.

Each public policy ($RMI_{RI}, RMI_{RR}, RMI_{DM}, \text{and } RMI_{FP}$) is estimated via a weighted average method as shown below:

$$RMI_{RI} = \frac{\sum_{i=1}^6 w_i RI_i}{\sum_{i=1}^6 w_i} \tag{Eq. 1}$$

$$RMI_{RR} = \frac{\sum_{i=1}^6 w_i RR_i}{\sum_{i=1}^6 w_i} \tag{Eq. 2}$$

$$RMI_{DM} = \frac{\sum_{i=1}^6 w_i DM_i}{\sum_{i=1}^6 w_i} \tag{Eq. 3}$$

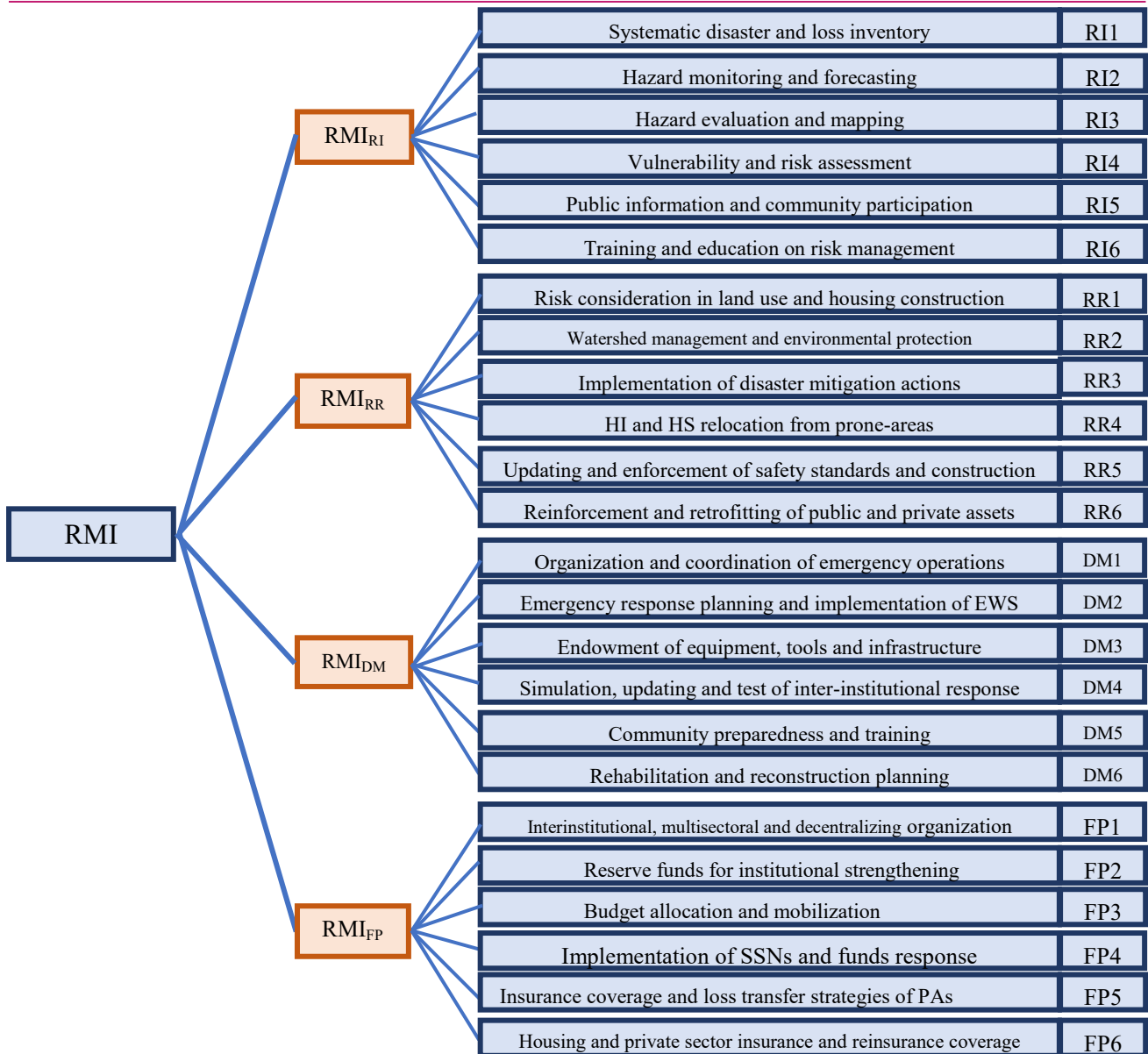


Fig.2. Component indicators and sub-indicators for RMI (Note: SSNs design social safety nets, PAs = Public assets, and HI and HS design, respectively, housing improvement and human settlement).Source: Adapted from Novelo-casanova and Sua (2015)

$$RMI_{FP} = \frac{\sum_{i=1}^6 w_i FP_i}{\sum_{i=1}^6 w_i} \quad \text{Eq. 4}$$

The overall RMI is the average of the four aforementioned composite indicators or public policies computed using Equation 5:

$$RMI = (RMI_{RI} + RMI_{RR} + RMI_{DM} + RMI_{FP})/4 \quad \text{Eq. 5}$$

RMI values are displayed by year (from 2017 to 2020) and by public policy for analysis and interpretation purposes.

RESULTS

This study discusses, at the regional scale, the ability of Guinea's risk management system to prepare for and

respond successfully to climate-induced disasters in Guinea Savanna communities, focusing on its institutional progress and challenges from 2017 to 2020.

Institutional framework

Documentary analysis showed that Guinea had set up numerous institutions and issued many policies dedicated to DRM (Fig. 4). Guinea's national initiatives in disaster risk reduction (DRR) and management began before its independence in 1958 and it had been supported and continued to be supported by its development partners who actively contributed to building its capacities, particularly in terms of prevention, risk reduction, disaster management, and financial support. Among others, there are the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA),

the Global Environment Facility (GEF), the United Nations Industrial Development Organisation (UNIDO), the United Nations Development Programme (UNDP), the World Bank, the International Fund for Agricultural Development (IFAD), the International Federation of Red Cross and Red Crescent Societies (IFRC), and the World Meteorological Organization (WMO). Since the outbreak of Ebola in 2014, Guinea also ratified many treaties and conventions at the regional and international levels and has made international commitments to act in favour of DRR in the country.

Its organisational framework for DRM (Fig.3) included five (5) main levels starting from the central (Ministry) to the quarter (Community-based disaster risk reduction) level.

The arrows show a reciprocal relationship between the highest to the lowest level actors.

Risk management benchmarking

Table 1 shows the weights for the set of sub-indicators that compose each public policy obtained from the AHP method based on the judgement of local disaster management officials according to DRM goals in the study area. Tables 2 to 5 show the qualifications of the set of sub-indicators that make up the RMI as previously shown in Fig. 2, with corresponding average scores ranging from 0 to 5 assigned by local disaster management authorities, with the participation of academics.

Guinea’s risk management performance

Table 6 gives the weighted average of the main indicator or public policy between 2017 and 2020 covered by the study.

Risk Management Index (RMI)

Table 7 gives the average of the four composite indicators obtained using Equation 5. The results indicated that the RMI increased gradually between 2017 and 2020.

DISCUSSION

Results of the analysis of the RMI reveal Guinea’s limited capacity to cope with disasters and raise serious concerns about the future. Between 2017-2020, disaster management authorities implemented very limited actions for all public policies notably in activities related to financial provisions ($RMI_{FP} = 0.124 - 0.487$), and risk identification ($RMI_{RI} = 0.672 - 1.00$). To date, all public policies need to be improved calling into question Guinea’s ability to deal with future climate uncertainties. Findings that raise such concerns are discussed as follows:

Financial provision policy

The least progress in FP policy could be explained largely by a lack of political will and weak integration of

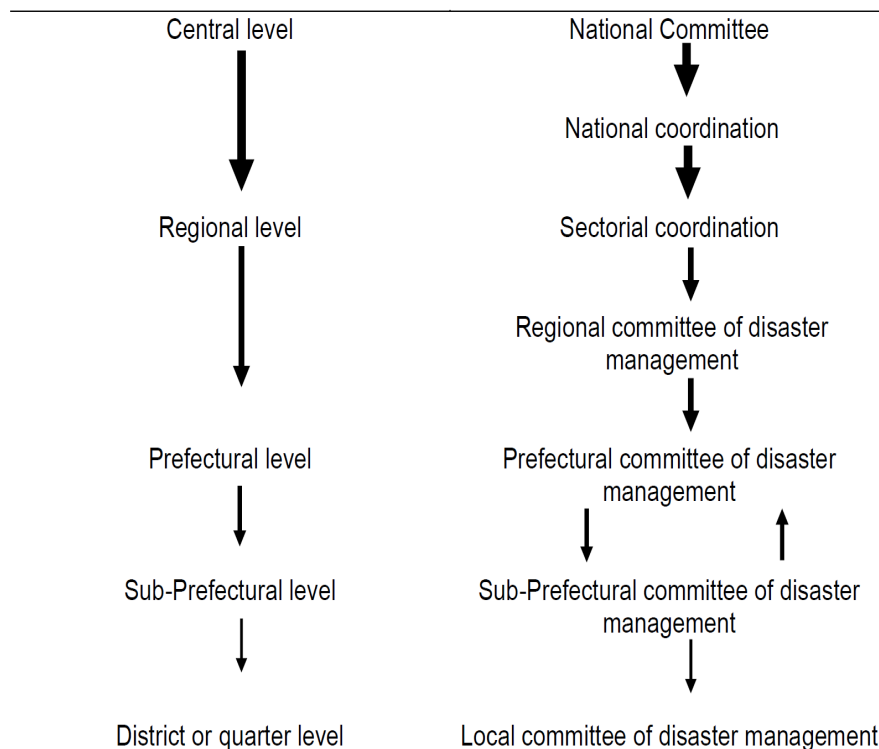


Fig. 3. Organisational framework for DRM in Guinea, Source: National strategy for Disaster risk reduction (NSDRR) (2012)

Ministries involved in DRM and their French abbreviations

Minister of Mine and Geology (MMG)
 Ministry of Higher Education, Scientific Research and Innovation (MERSI)
 Ministry of Agriculture, Livestock and Fishery (MAEP)
 Ministry of Environment and Sustainable Development (MEDD)
 Ministry of Habitat (MH)
 Ministry of Health and Public Sanitation (MSHP)
 Ministry of Hydraulics and Energy (MHE)
 Ministry of Livestock (ME)
 Ministry of Security and Civil Protection
 Ministry of Territorial Administration and Decentralisation (MATD)
 Ministry of Water and Forests (MEF)
 Centre of Studies and Research in Environmental Sciences (CÉRE)
 Scientific Research Centre of Conakry Rogbanè (CERESCOR)

Capacity timeline from 1954 to 2018

1954	General Direction for Civil Protection (DGPC)
1990	National Guinean Committee for the International Decade on Prevention of Natural Hazard (CNGDIPCN)
1997	National Committee on Disaster Management (CNGC)
2001	National Service for Humanitarian Actions (SENAH)
2005	National Office of Disaster Management and Environmental Emergencies (CNGCUE)
2007	National Adaptation Program of Action (NAPA)
2013	National Plate-form for Disaster Risk Reduction (PNRRC)
2014	National Office for the Coordination of the riposte against Ebola Virus Disease (CNLE)
2015	National Agency for Humanitarian Affairs (ANAH)

Policy frameworks that integrate DRM

2013-2017	Guinea Poverty Reduction Strategy Paper (PRSP)
2016-2020	National Economic and Social Development Plan (PNDES)
2012-2015	National Quinquennial Plan for Social and Economic Development (PQNDES)
1989	National Environment Enchantment Plan (NEPP)
1992	National Land Use and Land Policy Code (PNUT)
1996	Natural and Man-made Disasters Management Act (AGCNH)
1998	Urbanisation Code (CU)
2007	National Climate Change Adaptation Plan (PANA)
2011	National Environment Policy (PNE)
2011	Mining Code (CM)
2012	National Strategy for Disaster Risk Reduction (SNRRC)
2015	National Policy for Civil Protection and Disaster Management (PNPCGC)
2016	National Agency for Health Security (ANSS)
2018	National Contingency Plan (PNC)

Fig. 4. Institutional framework and evolution of DRM institutions in Guinea (Source: Author's work based on bibliographic surveys)

Table 1. Weights of sub-indicators of each public policy

Sub-indicator	Public policy			
	RI	RR	DM	FP
W_1	0.061	0.247	0.116	0.062
W_2	0.179	0.303	0.139	0.194
W_3	0.088	0.137	0.334	0.363
W_4	0.12	0.108	0.042	0.223
W_5	0.261	0.104	0.303	0.079
W_6	0.291	0.101	0.066	0.079

Source: AHP analysis from experts' judgement

Table 2. Qualification of risk identification sub-indicators (RI)

Sub-indicator	Year			
	2017	2018	2019	2020
RI_1	0	0	0	1
RI_2	0	1	1	1
RI_3	0	1	1	1
RI_4	1	1	1	1
RI_5	1	1	1	1
RI_6	1	1	1	1

Source: Average scores from local disaster management authorities (LDMA)

Table 3. Qualification of risk reduction sub-indicators (RR)

Sub-indicator	Year			
	2017	2018	2019	2020
RR_1	1	1	1	1
RR_2	1	2	2	3
RR_3	1	1	1	1
RR_4	0	0	1	1
RR_5	1	1	1	1
RR_6	0	1	1	1

Table 4. Qualification of disaster management sub-indicators (DM)

Sub-indicator	Year			
	2017	2018	2019	2020
DM_1	1	2	2	2
DM_2	1	2	2	3
DM_3	0	0	0	1
DM_4	1	1	1	1
DM_5	1	1	2	3
DM_6	0	0	0	0

Source: Average scores from local disaster management authorities (LDMA)

DRR in national development plans. Although political commitments to DRR keep growing on paperwork, risk financing, in contrast, remains a major barrier to DRR in Guinea. Financial provision and governance did not show notable progress as they remained stable from 2017 to 2019 ($RMIFP = 0.124$) while slightly improved in 2020 ($RMIFP = 0.487$). According to the prefectural co-ordinators in charge of humanitarian affairs, there was no special budget for DRR activities. They often had limited financial means from international NGOs such as Red Cross Organisation. Perennial dependence on international aid seems extremely high in Guinea's DRM and crises often have to reach an alarming point before local authorities take reactive actions. Guinea needs a coherent policy and financing response to increase resilience to climate-induced shocks and stresses. According to Green Climate Fund (2018), Guinea

has mobilized few climate financing resources from multilateral donors since actors lack the proper skills to develop concrete proposals that meet the standards of funds' withdrawal, not to mention its existing high level of indebtedness. However, reducing disasters and building resilience to future shocks need adequate funding (Kudlák *et al.*, 2020).

Risk identification policy

The absence of performance in activities related to RI policy could find its explanation in the lack of technological tools and equipment required in DRM. As a result, almost no signs of progress were made in activities related to hazard monitoring and forecasting, hazard evaluation and mapping, as well as vulnerability and risk assessment. Activities related to RI have only been improved in 2020 ($RMIRI = 1.00$) while they were very

Table 5. Qualification of financial provision sub-indicators (FP)

Sub-indicator	Year			
	2017	2018	2019	2020
FP_1	2	2	2	2
FP_2	0	0	0	0
FP_3	0	0	0	1
FP_4	0	0	0	0
FP_5	0	0	0	0
FP_5	0	0	0	0

Source: Average scores from local disaster management authorities (LDMA)

Table 6. Annual weighted average of sub-indicators

Public policy	Year			
	2017	2018	2019	2020
RMI_{RI}	0.672	0.939	0.939	1
RMI_{RR}	0.791	1.195	1.303	1.606
RMI_{DM}	0.600	0.855	1.158	1.934
RMI_{FP}	0.124	0.124	0.124	0.487

Source: Author's computation using Equations 1 to 4 according to public policies

Table 7. Risk Management Index (RMI)

Public policy	Year				\bar{X}
	2017	2018	2019	2020	
RMI_{RI}	0.672	0.939	0.939	1	0.89
RMI_{RR}	0.791	1.195	1.303	1.606	1.22
RMI_{DM}	0.600	0.855	1.158	1.934	1.14
RMI_{FP}	0.124	0.124	0.124	0.487	0.21
RMI	0.547	0.778	0.881	1.257	0.87

Source: Author's computation; Note: \bar{X} = mean

low in 2017 (RMI_{RI} = 0.672) and stable between 2018 and 2019 (RMI_{RI} = 0.939). Documentary analysis shows that Guinea's first disaster-based mapping activities started in 2020 with the support of the UNDP and the World Environment Fund (WEF) (Diallo et al., 2020). The study suggests that RI is a basic risk management mechanism to reduce the impact of disasters and consequently supplementary efforts are still needed to urgently improve it.

Risk reduction policy

Contrary to the previous policies, the RR policy has improved significantly and gradually from 2017 to 2020 (RMI_{RR} = 0.791 - 1.606). This finding could be explained by a progressive consideration of risk analyses in local development programmes, efforts to protect the natural environment, notably wetlands and key ecological areas, as well as some disaster mitigation actions. Despite that, many challenges need to be addressed in

that policy, and existing findings lead to emphasise that disaster managers were making some progress. However, as interviewees mentioned, people's reluctance to obey the laws, financial issues, and poor land use planning may be obstacles to the success of RR activities in Guinea. As proof, people living in areas susceptible to damage induced-natural hazards continue to live there despite tangible risks, and their limited access to climate information could be detrimental to their well-being if appropriate urgent measures are not applied.

Disaster management policy

Similarly to the RR policy, activities related to the DM policy have improved significantly from 2017 to 2020 with the highest index score in 2020 (RMI_{DM} = 1.934) and the lowest score in 2017 (RMI_{DM} = 0.600). These findings could be explained by some progress in activities related to local drills for disaster response and the existence of a local contingency plan, combined with

the support from development partners. However, a multiplicity of government offices are involved in DRM but with uncoordinated actions. Such a situation may not lead to effective and appropriate responses to disasters since inter-institutional arrangements are still biased by a lack of communication and means, including tools, equipment, and infrastructure for disaster responses.

Institutional barriers to disaster risk management in Guinea

The institutional barriers to DRM discussed in this paper, come from approaches including bibliographic surveys, key informant interviews, field observations, and the results drawn from this study.

Fig. 3 shows that Guinea's risk management system is characterised by unidirectional decision-making from the highest to the lowest level. The study suggests that this type of risk governance does not allow any participation of vulnerable communities in the decision-making process regarding disaster management. Moreover, there is lack of a coherent coordination between the various stakeholders in the management of risks and disasters, as well as the presence of duplicate mandates, functions and responsibilities between such institutions. These constitute an obstacle to effective disaster risk management in Guinea, particularly in vulnerable areas leading to poor disaster response.

Fig. 4 shows that Guinea's DRM institutional and policy framework encompasses many ministries and policy frameworks. Through these various institutions, Guinea aims to reduce disaster risks across the country and establish a better living environment for all its citizens. Although institutional and political commitment toward DRR continues to increase, progress is still limited. This could be linked to the low mobilisation of funds both at the national and local levels, not to mention the limited access to information on hazards and vulnerabilities due to the lack of tools and equipment to strengthen capacities for alerts and early warning information.

Guinea's interventions remain mostly focused on responses rather than risk reduction and prevention actions, due to multiple and varied factors inherent to the country's socio-economic and cultural settings. Among others, there are:

Socio-political crises

Since its independence in 1958, Guinea's governance system has been marked by endless changes to its governance system due to political crises that negatively affect its socio-economic stability and political climate (International Monetary Fund, 2013). The most salient facts contributing to political crises in the country include, among others, a high level of corruption and im-

punity at all levels in the public administration, lack of transparency in public funds and natural resources benefice, the stubbornness of leaders to remain in power against democratic rules, as well as electoral intercourses regularly polarised by ethnic divisions. These factors continue to fuel socio-economic tensions and damage Guinea's prospects for peace and security building (International Monetary Fund, 2015). Therefore, the study suggests that political and institutional instabilities are not suitable for DRM activities.

Poor governance

Any effective governance system makes DRR one of the political priorities and therefore allocates adequate and sufficient resources, fosters relevant stakeholders' effective participation, and leads a successful implementation of plans, programmes, and policies (Twigg, 2015). Guinea state's ineffectiveness in achieving its development objectives is mostly related to poor governance and corruption, which seriously affect the public sector, the public resources management, and the inequality in access to services (Open Society Initiative for West Africa, 2013). The poor governance has resulted in the exposure of the country to major fragility factors in several sectors, especially in politics with its interminable riots and in the socio-economic sphere due to the limited capacity of the state to satisfy people's basic needs. Large-scale corruption in public affairs and the absence of transparency in the budget may reduce the capacity of projects and programme put into place to tackle shocks and stresses.

Disease outbreaks

The disease outbreaks in Guinea, like the case of Ebola between 2013 and 2020, cholera in 2012, and the COVID-19 virus in 2020, constituted an unprecedented shock and a heavy burden on Guinea's government. According to the National coordination against Ebola, from March 2014 to December 2015, a total of 3,804 cases were confirmed of which 2,536 died. Guinea's economic and financial sectors were deeply affected, the economic growth rate fell to 1.1% in 2014, against a forecast of 4.5%, and the projected growth for 2015 was zero. Accordingly, cholera affected 25,358 people, of which 952 were dead across the country between 2003 and 2013 (United Nations Development Programme, 2016). On March 13th, 2020, Guinea's first case of COVID-19 was reported. About 13,143 cases were confirmed from March 13th to the first of December 2020, from which 12,154 were recovered and 76 were dead and Conakry constituted till now the epicentre of Guinea's pandemic (United Nations International Children's Emergency Fund, 2020). The study suggests that these aforementioned issues have affected Guinea's ability to face activities related to DRM.

Conflict of responsibility

While concerted and effective actions from all parties involved in DRM lead to achieving goals, this may not be the case in Guinea. Results show numerous DRM institutions in Guinea, as DRR and management policies. This confuses development partners in providing support to the country since institutions involved in DRR are multiple with uncoordinated actions. Moreover, most DRM institutions are underequipped with a huge lack of relevant human resources and data for forecasting purposes. While numerous institutions have no clearly defined responsibility, there is an evident lack of financial resources likely to support plans and programmes. These impediments will likely make several issued policies and commitments to DRR in Guinea ineffective.

Lack of early warning systems

Early Warning Systems (EWS) are crucial to assess and monitor risks. However, Guinea lacks efficient EWS, which renders DRM difficult and the implementation of adequate preparation and response plans. Although there are meteorological and hydrological services, communities in vulnerable areas have no access to their services except to their traditional knowledge systems. For instance, the climate information offered by the National Directorate of Meteorology is not tailored to farmers' farming needs in vulnerable areas, while a large number of them have no basic education to use available information such as temperature level, rainy days, sunrise and sundown of the sun, and sea level rise. However, there is no information on the onset of farming activities, the agricultural calendar, or disaster events.

Financial challenges

Findings reveal that Guinea faces serious financial issues regarding DRM (Green Climate Fund, 2018; National Strategy for Disaster Risk Reduction, 2019). According to the coordinators of humanitarian actions, there is no specific fund allocated for DRR in Guinea. Funds are earmarked for development projects with little or indirect focus on DRR and management. Most DRM activities are reactive rather than active, and funds in the form of aid are often from development partners and in-country NGOs. Foreign aid should allow Guinea to minimise its dependence on external actors through investments and not be permanently dependent on such aid. This financial issue impedes the functioning of local institutions involved in DRM as well as conducting climate-related research in the country.

Research gaps

Guinea has several public and private higher education

institutions that offer training programmes in several fields. However, no institutions have a curriculum exclusively focused on DRR and management. Those that offer disaster-based education in their curriculum include the Centre of studies and research in environmental sciences (CÉRE) hosted at the Gamal Abdel Nasser University of Conakry, the Scientific Research Centre of Conakry Rogbanè (CERESCOR), and the University of N'Zérékoré (UZ) in forest Guinea through its department of Natural Resources Management (GRN). Moreover, Guinean educational institutions are characterised by a very poor number of senior lecturers and professors, while there are many academic lecturers with only a master's degree. Poor research infrastructure and lack of funds for scientific research are major factors hampering research progress in Guinea (African Development Bank Group, 2018).

Poor risk consideration in development programmes

Documentary analyses show that in Guinea, human-induced-disasters and risks associated with climate change are widely mentioned in the strategic frameworks for development planning, particularly in the sectors considered as the country's priority development areas such as agriculture employing over 80% of the population (20% of the GDP), fishing (2.5% of the GDP), livestock breeding (4.5% of the GDP) and mining (27% of the GDP). However, the practical translation of theoretical frameworks into practices is challenging due to financial issues and poor organisational capacity (African Development Bank Group, 2018). Consequently, these sectors continue to harm the natural environment in Guinea combined with the incapacity of DMA to relocate disaster-affected households to appropriate areas out of risk. And people's reluctance to follow the law, impunity and uncontrolled urbanisation are additional sources of damage.

Poor access to energy

The hydroelectric potential of Guinea is estimated at 6,000 MW, but only 6 per cent were developed, including Garafiri, Kaleta and more probably Souapiti, which is under construction for 5 years ago and is still yet unproductive. Besides, the average annual irradiation of solar energy is estimated at 4.8 kWh / m². With these potentials, Guinea might be capable of serving a large part of the Western African sub-region if they were to be efficiently exploited. But, despite many efforts, Guinea remains the darkest country in SSA. Energy consumption is mainly based on the utilisation of wood (97% of households) and charcoal (78 per cent of energy), which cause enormous pressure on forest resources. Petroleum products which are from importation, concern 18% of people, and electricity supply (4%)

(African Development Bank Group, 2018). The low electrification rate and the imbalance between supply and demand are some of the main obstacles to the country's economic take-off.

Conclusion

The RMI was used to measure Guinea's risk management system effectiveness in Guinea Savanna communities, a region prone to droughts and floods. Results revealed that the activities related to the overall four public policies that make up the RMI are still incipient and need to be improved. Among the public policies, activities to provide financial provisions and those designed to risk identification policies have shown the lowest performance, while activities related to risk management and risk reduction have shown little progress between 2017 to 2020. This low quality of RMI in Guinea Savanna communities could result from long-term political crises with socio-economic consequences that have characterised Guinea's governance system during these last five years. The findings emphasise the need to change Guinea's approach to disaster risk management from a narrow response orientation to more holistic risk identification and financial mechanisms.

Considering these results, it is evident that DRM in Guinea Savanna from 2017 to 2020 remained poor and raised concerns about the future. To date, natural disasters and their impacts on vulnerable people's livelihoods, notably small-scale farmers, remain a serious handicap to food security and a threat to human life to be urgently addressed. However, this may not be easy as long as adaptation and mitigation measures are not accompanied by appropriate financial resources, adequate tools, equipment, and relevant human resources. Therefore, this study provides an opportunity for local decision-makers and managers to understand their level of achievement and shortcomings too. While Guinea is susceptible to numerous climate-induced disasters, this study recommends that local authorities pay particular attention to FP and RI policies to improve the performance of the country's risk management system.

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Conflict of interest

The authors declare that they have no conflict of interest.

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