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Climate change and humanitarian action in the face of urban flooding in Mali: Household perceptions and stakeholder responses in Commune VI of the District of Bamako

Youssouf Guindo[1], Mariam M Bore[2]
[1] Higher Teacher Training College of Bamako (ENSup), Bamako, Mali
[2] BAZO University, Bamako, Mali
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Abstract
In Bamako, rainy-season flooding has become a recurrent problem, and Commune VI is among the most affected areas. This study examines how households in two exposed neighbourhoods, Missabougou and Yirimadio, perceive the manifestations of climate change, the consequences of the floods they experience, and the response provided by the State and humanitarian organisations. A mixed-methods design was used: a questionnaire administered to 50 households between 4 and 13 March 2026, and semi-structured interviews with five key informants involved in disaster prevention and management. Quantitative data were analysed descriptively with Excel and SPSS, and interviews through thematic analysis. Households describe a warming climate (98% report rising heat) and less frequent rainfall (64%), yet floods with heavy impacts: strongly disrupted economic activities (86%), hampered mobility (82%), disorganised waste management (94%) and frequent illnesses ranging from malaria to diarrhoeal diseases. Prevention measures are considered of limited effectiveness by 82% of respondents, and State and NGO interventions insufficient by 80%. Key informants acknowledge progress in coordination but point to insufficient and delayed funding and targeting difficulties. The study concludes that humanitarian action remains mainly reactive and calls for a shift towards anticipation: maintained drainage, early warning, control of settlement in flood-prone zones and community participation.

Keywords: Climate change, urban flooding, humanitarian action, resilience, Bamako

Introduction

The latest IPCC Synthesis Report reiterates that human-induced warming is intensifying the water cycle and making extreme precipitation events more likely in many regions of the world (IPCC, 2023). In West Africa, this trend combines with strong interannual rainfall variability, itself modulated by major climate modes such as ENSO and the North Atlantic Oscillation (Cassou and Guilyardi, 2007) [1]. For Sahelian cities, the outcome is paradoxical: rainy seasons that are sometimes shorter or more irregular, yet punctuated by violent downpours that drainage networks are unable to absorb.

Mali experienced this first-hand in 2024 [9]. From July onwards, the country received rainfall on a scale unprecedented since 1967, affecting almost every region: nearly 260,000 people were affected, more than 70% of them women and children, and dozens died (OCHA, 2024). Bamako was not spared. The events of May 2019 [2] had already exposed the fragility of the capital and led the Government and its partners to draw up a recovery framework centred on drainage, risk education and the strengthening of local capacities (GFDRR and World Bank, 2019) [6].

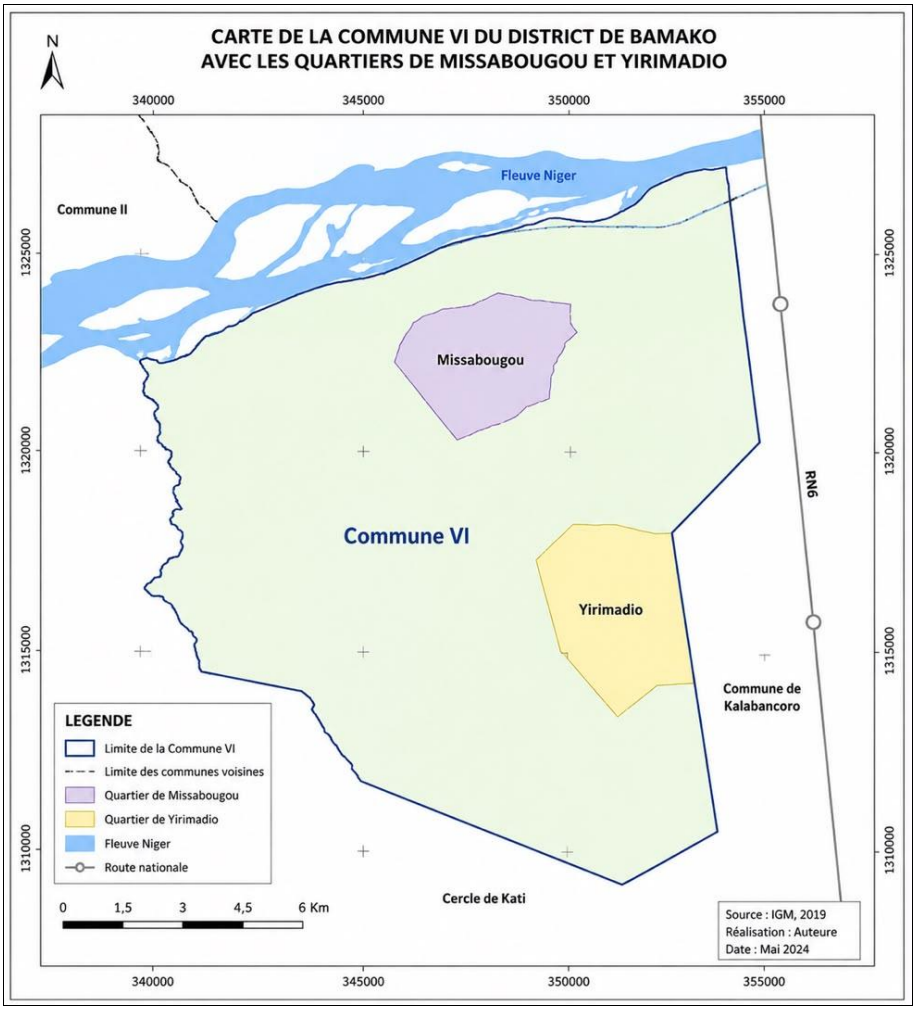
Existing studies on Bamako shed light mainly on two dimensions of the problem. The first is physical and spatial: the city's vulnerability stems from the occupation of low-lying areas, patterns of urbanisation and deficient stormwater management (Dembélé and Ouattara, 2019), while analysis of the 1982-2019 [4] rainfall series shows an increase in extreme rainfall indices and in the number of reported floods (Fofana *et al.*, 2022) [5]. The second is health-related: in Commune VI, poor sanitation and inadequate waste and wastewater management sustain an environment conducive to disease (Ibrahima *et al.*, 2023) [7], and the 2024 floods in Missabougou had direct repercussions on residents' health (Coulibaly *et al.*, 2025). Much less is known, however, about how households experience these events and assess the response they receive, and about how humanitarian actors themselves describe their own constraints.

This article starts from that observation. It draws on a survey conducted in 2026 in two neighbourhoods of Commune VI to answer a simple question: how do people perceive changes in climate and flooding, and is the humanitarian response commensurate with what they endure? The working hypothesis is that climate variability aggravates a risk already shaped by urbanisation, and that humanitarian action remains oriented more towards relief than towards prevention. Four objectives follow from this: to identify the perceived manifestations of climate change, to assess the socio-economic and environmental consequences of flooding, to examine the prevention and management mechanisms in place, and to identify ways of strengthening household resilience.

Materials and methods

1. Study area

Established by Ordinance No. 78-34/CMLN of 18 August 1978, Commune VI is the largest of the six communes of the District of Bamako, covering about 88.8 km². Located on the right bank of the Niger River, it is bounded to the north by the river, to the west by Commune V, and to the south and east by the rural commune of Kalaban-Coro (Kati cercle). It comprises ten neighbourhoods and is today one of the main fronts of urban expansion of the capital (Figure 1).



Source: IGM, 2019; map: M. M. Bore, 2024

Fig 1: Location of the Missabougou and Yirimadio neighbourhoods in Commune VI of the District of Bamako

The relief combines plains, plateaus and hills ranging from 350 to over 420 m in altitude. Areas close to the river are flat and dotted with lowlands where runoff converges. The climate is Sudanian, with a rainy season from June to October and annual rainfall generally between 900 and 1,100 mm, concentrated in July, August and September. The clay-silt soils of the low-lying areas have poor infiltration capacity, which promotes runoff, and several seasonal streams drain water towards the Niger. Their beds are often built over, and the gutters, which are insufficient, are regularly blocked. Missabougou, on the riverbank, and Yirimadio, a recently developed neighbourhood, were selected because they are among the most frequently flooded in the commune.

2. Approach and sampling

The study is based on a mixed-methods approach. The quantitative component covered 50 households living in Missabougou and Yirimadio, surveyed using a structured questionnaire. Households were selected on the basis of their exposure to flooding, without probability sampling: the sample aims to document experiences and perceptions, not to produce estimates that can be generalised to the whole commune. The qualitative component involved five key informants, purposively selected for their role in prevention, risk management or humanitarian action at local level, particularly within humanitarian organisations working in Commune VI.

3. Data collection

The questionnaire comprised 25 questions grouped into four blocks corresponding to the study objectives: socio-demographic characteristics, perception of climate manifestations, consequences of flooding, and finally prevention, management and household expectations. Several questions allowed multiple responses (illnesses observed, vulnerable groups, measures to be strengthened). The interview guide covered, in ten questions, changes in flooding, its drivers, preparedness actions, interventions carried out, difficulties encountered and stakeholders' recommendations. Data were collected from 4 to 13 March 2026, after a letter of introduction had been delivered to the organisations concerned. Each participant was informed of the study objectives and gave consent; anonymity was guaranteed, and key informants are referred to in the text by their initials.

4. Data processing and analysis

After consistency checks, the questionnaires were coded, entered and processed in Microsoft Excel and SPSS. The analysis is descriptive and based on frequencies and percentages. For multiple-response questions, each response option is expressed relative to the total of 50 households, so the percentages do not add up to 100. The interviews were transcribed and then analysed thematically according to the headings of the guide, noting convergences and divergences between stakeholders. Excerpts are quoted where they shed light on a result.

Results

1. Profile of surveyed households

The sample is predominantly female (64%) and young: 44% of respondents are aged 20 to 39 and 36% are aged 40 to 59. Married people predominate (72%), followed by widowers and widows (18%). The most striking feature, however, is length of residence: four out of five respondents have lived in their neighbourhood for less than ten years, and only one has lived there for more than twenty years (Table 1). The population studied is therefore essentially a recently settled one, which limits the time depth of the perceptions collected.

Table 1: Socio-demographic characteristics of surveyed households (n = 50)

Variable and category	Frequency	%
Sex		
Female	32	64
Male	18	36
Age		
20 to 39 years	22	44
40 to 59 years	18	36
60 to 79 years	9	18
80 years and over	1	2
Marital status		
Married	36	72
Widowed	9	18
Single	3	6
Divorced	2	4
Length of residence in the neighbourhood		
0 to 9 years	40	80
10 to 19 years	9	18
20 years and over	1	2

Source: field survey, 2026.

2. Perception of the manifestations of climate change

All households report perceiving a change in climate: 68% consider it strong and 32% moderate; none consider it weak. Rising heat is cited almost unanimously (98%), as are stronger winds (86%). The rainfall regime is perceived in a more nuanced way. Nearly two out of three respondents (64%) believe that rainfall has become less frequent, whereas three quarters (74%) consider that the length of the rainy season has not changed. For the dry season, 80% of respondents chose the option “decreased” (Table 2). Finally, these changes are perceived as recent: 84% of households say they have noticed them for less than five years and 16% for five to ten years.

Table 2: Households’ perception of changes in climate parameters (n = 50)

Parameter and category	Frequency	%
Perceived intensity of climate change		
Strong	34	68
Moderate	16	32
Weak	0	0
Temperature (heat)		
Increased	49	98
Unchanged	1	2
Wind strength		
Strongly increased	43	86
Unchanged	6	12
Decreased	1	2
Rainfall frequency		
Decreased	32	64
Unchanged	17	34
Increased	1	2
Length of the rainy season		
Unchanged	37	74
Decreased	10	20
Increased	3	6
Length of the dry season		
Decreased	40	80
Unchanged	9	18
Increased	1	2

Source: field survey, 2026.

Key informants confirm this reading and extend it to the floods themselves. All of them describe a phenomenon that has become recurrent, whose frequency, intensity and extent are increasing, with rainfall that is sometimes less frequent but more violent.

“We are seeing an increase in the frequency, intensity and extent of flooding.” (A. D., head of a humanitarian organisation, 2026)

Their account does not, however, stop at climate. Asked about the causes of the worsening situation, stakeholders cite in the same breath rapid and poorly planned urbanisation, the occupation of flood-prone areas and natural waterways, the lack of gutter maintenance before the rainy season, the dumping of waste in drainage structures, non-compliance with planning regulations and the limited resources of local authorities.

“Several factors explain this worsening: the effects of climate change leading to more intense and irregular rainfall, rapid and often unplanned urbanisation, the occupation of flood-prone areas, inadequate or poorly maintained drainage networks, particularly before the start of the rainy season, the dumping of waste in gutters and the weak enforcement of urban planning and risk management regulations.” (A. D., 2026)

3. Socio-economic and environmental consequences of flooding

Flooding weighs first and foremost on economic life and mobility. For 86% of households, it strongly affects their economic activities, and 82% say their movements are severely disrupted: submerged streets and difficult access to work, school or health centres. Its effects extend beyond the rainfall event itself, as 44% of respondents report standing water for five days or more, including 16% for at least ten days. Waste management is disrupted for 94% of households, as floodwaters scatter rubbish and block gutters. Damage to infrastructure is considered more limited: 70% consider it minor, 20% moderate and 10% severe (Table 3).

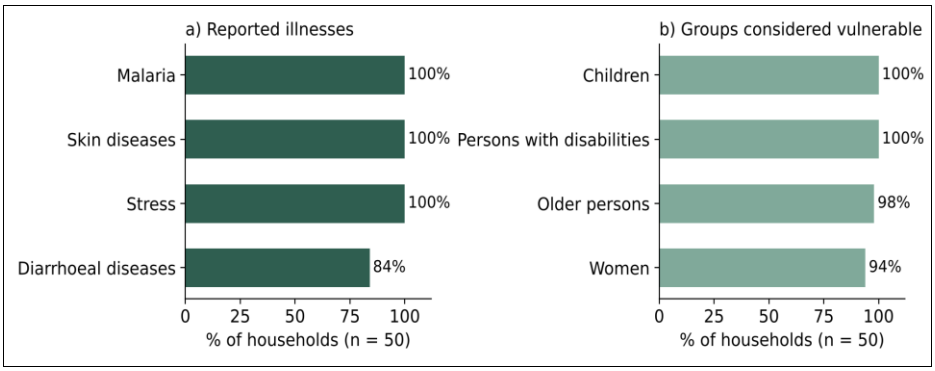
Table 3: Consequences of flooding reported by households (n = 50)

Consequence and category	Frequency	%
Economic activities affected		
Strongly	43	86
Moderately	5	10
Slightly	2	4
Mobility affected		
Strongly	41	82
Moderately	6	12
Slightly	3	6
Duration of standing water		
Short (1 to 4 days)	28	56
Medium (5 to 9 days)	14	28

Long (10 days or more)	8	16
Waste management disrupted		
Strongly	47	94
Slightly	3	6
Damage to infrastructure		
Minor	35	70
Moderate	10	20
Severe	5	10

Source: field survey, 2026.

In terms of health, all households associate flooding with malaria, skin diseases and stress, and 84% with diarrhoeal diseases (Figure 2a). These responses reflect what households observe around them rather than an epidemiological measurement, but their convergence is striking. Respondents also identify, almost unanimously, children and persons with disabilities as the most exposed, ahead of older persons and women (Figure 2b).



Source: field survey, 2026. Multiple responses.

Fig 2: Illnesses associated with flooding (a) and groups considered most vulnerable (b), as % of households

Flooding also tests social ties, in both directions. Three quarters of households (76%) say they observed acts of solidarity after the floods: neighbours taking in affected families, shared meals and help with cleaning up. Conversely, a quarter (24%) report tensions between neighbours, most often arising from the drainage of water, as each household tries to empty its own courtyard at the expense of the one next door.

4. Prevention, management and assessment of the response

Most households (78%) say they are aware of flood prevention measures, but very few consider them effective: 82% regard them as of little effectiveness and only 8% as effective. Risk information circulates irregularly, as 86% of respondents receive it only "sometimes". State and NGO interventions are considered insufficient by 80% of households, and none consider them sufficient. Finally, residents' own engagement remains modest: none report participating actively in prevention activities and 60% say they participate little (Table 4).

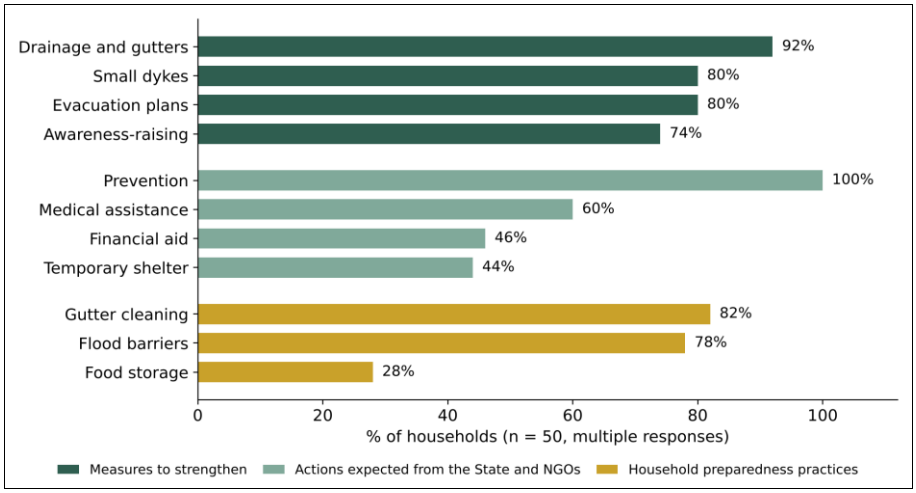
Table 4: Households' assessment of prevention measures and interventions (n = 50)

Indicator and category	Frequency	%
Awareness of prevention measures		
Yes	39	78
No	11	22
Perceived effectiveness of prevention measures		
Effective	4	8
Moderately effective	5	10
Of little effectiveness	41	82
Frequency of risk information		
Often	5	10
Sometimes	43	86
Never	2	4
State and NGO interventions		
Moderately sufficient	10	20
Insufficient	40	80
Sufficient	0	0
Residents' participation in prevention		
Moderate	18	36
Low	30	60
None	2	4
Active	0	0

Source: field survey, 2026.

To explain this dissatisfaction, several respondents mention an inequitable distribution of aid, and even alleged misappropriation by some community intermediaries. These claims could not be verified within the scope of the study, but they reveal something about the lack of trust surrounding the distribution of assistance.

Asked what should be strengthened, households put drainage and gutter maintenance first (92%), followed by small dykes and evacuation plans (80% each) and awareness-raising (74%). When asked what the State and NGOs should prioritise, prevention is cited by all, far ahead of medical assistance (60%), financial aid (46%) and temporary shelters (44%). Households are not passive, however: 82% take part in cleaning gutters and 78% build barriers in front of their homes, whereas storing food in anticipation of a disaster concerns only 28% of them (Figure 3).



Source: field survey, 2026. Multiple responses.

Fig 3: Measures to be strengthened, expected priority actions and household preparedness practices

5. The perspective of flood management stakeholders

The interviews describe a preparedness system that exists on paper and, in part, on the ground. Before the rainy season, the most involved organisations assess risks and vulnerabilities, review their preparedness and response plans, train local disaster management committees and take part, together with technical services, in clearing gutters and freeing waterways. Pre-positioning of emergency stocks is mentioned as a desirable rather than a systematic practice.

"Before each rainy season, Islamic Relief Mali implements several preparedness actions, including risk and vulnerability assessments through the review of the emergency preparedness and response plan, training of disaster risk management committees […] and the development of action plans." (A. S., head of a humanitarian organisation, 2026)

Coordination is described as genuine: organisations work with administrative and municipal authorities, the Directorate General of Civil Protection, State technical services and United Nations agencies. Stakeholders point out that the State remains the central actor and that NGOs provide support when public capacities are overwhelmed. Not all the organisations interviewed are involved to the same degree; one of them does not intervene directly in flood management.

When they do intervene, organisations act mainly after the disaster: rapid needs assessment, food and cash assistance, distribution of hygiene kits and household items, water, sanitation and hygiene interventions and, more rarely, housing rehabilitation. Islamic Relief Mali thus reports having supported the rehabilitation of 112 houses and equipped around 150 affected households in Niamakoro during the 2021-2022 floods. The difficulties cited converge: insufficient and late-mobilised funding, imperfect coordination, difficult targeting of beneficiaries, weak involvement of part of the population, and an increasing number of disasters in a context of declining humanitarian resources.

"The existing mechanisms can be considered worthwhile […]. However, they remain limited and their direct application on the ground is still insufficient." (A. D., 2026)

Stakeholders' recommendations largely match those of households: investing in drainage and its maintenance, strengthening early warning and the rapid dissemination of information, enforcing land-use plans by prohibiting the occupation of high-risk areas, and increasing the resources devoted to anticipatory action.

Discussion

1. Less rain, more flooding: an apparent paradox

Households perceive less frequent rainfall, a rainy season of stable length and yet more severe flooding. This combination is by no means contradictory. It corresponds fairly closely to what the Bamako rainfall series for 1982-2019 [2] show: most extreme rainfall indices are increasing, while the number of consecutive wet days is decreasing (Fofana *et al.*, 2022) [5]. In other words, it rains less often, but more heavily. This finding is consistent with the IPCC's general assessment of the intensification of extreme precipitation (IPCC, 2023) [8], and lends credibility to residents' perceptions, even though they are not based on measurements.

The same study adds a useful nuance: most of the floods recorded in Bamako were triggered by rainfall that can be described as normal, not by exceptional events (Fofana *et al.*, 2022) [5]. This result echoes the views of the stakeholders interviewed, who place urbanisation, the occupation of lowlands and the blockage of gutters on the same level as climate. In Commune VI, climate change thus acts as an amplifier of a risk largely produced by the city itself, as Dembélé and Ouattara (2019) [4] had already emphasised at the scale of the District. Our first hypothesis is thus confirmed, but in a more nuanced form: climate variability is a decisive factor, but not the only one.

Two caveats are in order. The perception of a change "within the last five years" is probably linked to respondents' length of residence, 80% of whom have lived in the area for less than ten years, and to the very recent memory of 2024. In addition, some responses on the dry season call for caution, as the question on its length may have been understood in several ways. These perceptions should therefore be read as an indicator of the lived experience of risk rather than as a measure of climate.

2. Consequences that extend beyond the event

The results show that flooding is not limited to a few hours of water in the streets. Nearly half of households live with standing water for five days or more, and it is during this period that the reported health effects arise: larval breeding sites and malaria, prolonged contact with contaminated

water and skin conditions, contamination of water points and diarrhoea. These mechanisms are well described by the WHO, which associates flooding with waterborne and vector-borne diseases as well as with mental health effects. They take on particular significance in Commune VI, where sanitation deficiencies had already created an environment conducive to disease (Ibrahima *et al.*, 2023) [7] and where the 2024 floods had documented health repercussions in Missabougou (Coulibaly *et al.*, 2025).

The disruption of waste management, reported by almost all households, deserves particular attention because it is both a consequence and a cause. Floodwaters scatter rubbish, which blocks gutters, which in turn overflow more easily at the next rainfall. This vicious circle partly explains why prevention measures seem so ineffective to residents. The contrast between damage to infrastructure, considered rather minor, and highly disrupted economic activities suggests that most of the cost of flooding is borne by households in the form of lost working days, impeded movements and health expenditure, rather than by public assets. The second hypothesis, which posited significant negative effects on health, housing and livelihoods, is therefore largely supported, with a greater weight for health and livelihoods than for housing.

The perception of greater vulnerability among children, persons with disabilities, older persons and women is consistent with the composition of those affected in 2024 at national level, mostly women and children (OCHA, 2024). It calls for more finely targeted assistance, especially since the sample, two-thirds female, probably reflects the fact that it is women who deal with the consequences of flooding in the household on a daily basis. Poor households should also be added, as they have fewer means to protect themselves, carry out repairs or resettle elsewhere.

3. Humanitarian action still focused on emergency response

The clearest result of the study lies in the gap between the existence of mechanisms and their perceived effectiveness. Households are aware of prevention measures, stakeholders describe preparedness plans and genuine coordination, and yet more than eight out of ten households consider prevention to be of little effectiveness and assistance insufficient. The interviews shed light on this gap: most of what organisations actually do takes place after the flood, while preparedness remains dependent on late funding. This finding supports the third hypothesis, according to which humanitarian action is more reactive than proactive.

Households, for their part, have already made up their minds: all of them put prevention at the top of their expectations, far ahead of conventional forms of emergency aid. This preference is in line with the orientations of the Bamako Flood Recovery Framework, which made drainage, risk education and local capacity building the priorities after 2019 (GFDRR and World Bank, 2019) [2, 6], and more broadly with the Sendai Framework, which calls for investment in disaster risk reduction rather than in disaster management alone (UNISDR, 2015). It also argues for early warning, whose value and limits in Bamako were demonstrated by the experience of May 2019 [2]: a hydrological model was able to locate most of the overflows, but in the absence of suitable weather forecasts and discharge measurements, the warning could not be issued in time (Chahinian *et al.*, 2023).

Residents' low participation in collective action may seem to contradict their individual protective practices, such as cleaning the gutters in front of their compounds or installing barriers. In reality, the two results describe the same situation: adaptation at plot level, without organisation at neighbourhood level. The tensions between neighbours over the drainage of water are the logical consequence, as each household protects its courtyard by diverting the water to its neighbour. The fourth hypothesis, which made better coordination between local actors and NGOs a condition for risk reduction, finds an extension here: coordination needs to reach down to the neighbourhood level, with risk management committees, community evacuation plans and collective maintenance of drainage structures. The suspicions expressed about the distribution of aid reinforce this need: transparent targeting, involving residents in identifying beneficiaries and followed up after distribution, would strengthen both the fairness of assistance and trust in those providing it.

4. Limitations of the study

The study is based on a sample of 50 households, selected without random sampling, in only two neighbourhoods. Its results describe perceptions and cannot be extrapolated to the whole of Commune VI. The analysis is descriptive and does not allow the relationships between household profiles and risk perception to be tested statistically. The key informants are mostly from the humanitarian sector, and the perspective of municipal services and Civil Protection would merit further investigation. Finally, the survey was conducted during the dry season, which may have attenuated, or conversely reconstructed after the fact, memories of the floods. A future study would benefit from cross-referencing these perceptions with rainfall data and detailed mapping of flooded areas.

Conclusion

In Commune VI, households describe a warming climate and rainfall that is less regular but more violent, producing floods with lasting consequences for health, mobility, the household economy and the environment. This risk is not only climatic: it arises from the interaction between more intense rainfall and urbanisation that occupies lowlands, obstructs runoff pathways and fails to maintain them.

A response exists, but it remains primarily an emergency response. In the eyes of residents, the preparedness and coordination mechanisms put in place by the State and humanitarian organisations are not sufficient to reduce risk, and stakeholders themselves acknowledge that their application on the ground remains limited. Rebalancing action towards anticipation requires acting on several levers at once: systematic maintenance of drainage before each rainy season, effective control of settlement in flood-prone areas, an early warning system connected to neighbourhoods, pre-positioning of stocks, transparent targeting of aid and community-based organisation of prevention. Residents are ready for this, as all of them put prevention at the top of their expectations. They still need to be given the means to move from plot-by-plot protection to collective risk management.

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