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Contested causes of flooding in poor urban areas in Accra, Ghana: an actor-oriented perspective

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Abstract
It is well known that urbanisation and climate change are likely to induce more floods in existing flood-prone African cities. Previous contributions on the causes of flooding in urban areas mostly do not consider the actors involved in adaptation and do not acknowledge the diversity of knowledge they possess. In this study, the causes of urban floods in an African city are explored from an actor-oriented perspective. The Kendall coefficient of concordance method is used to analyse interviews with household members and community leaders living in flood-prone communities as well as technocrats involved in public flood adaptation at the metropolitan level. The level of agreement on the causes of flooding is low among the actors, making the case for integrating informal actors into the formal flood adaptation structures at the metropolitan level. This will harness the diversity of knowledge on how flood risk unfolds for the purpose of local adaptation to urban floods in African cities.

Keywords Flooding · Actors · Knowledge · Interest · Urban poverty

1 Introduction

Floods and tropical cyclones are major causes of disasters globally (Di Baldassarre et al. 2010; Tschakert et al. 2010; Costello et al. 2009). Several studies have associated rapid urbanisation and climate change/variability with rising intensity and frequency of floods (Seneviratne et al. 2012; Sakijege et al. 2012; Rain et al. 2011; Costello et al. 2009; McCarthy et al. 2001; Andjelkovic 2001). African cities, with a large concentration of poor people living in substandard housing in hazardous areas, are no exception to the increasing flood risk (Birkmann et al. 2016; Fatti and Patel 2013; Heinrichs et al. 2012; Hochrainer-Stigler and Mechler 2011; Jabeen et al. 2010; Songsore et al. 2009; Douglas et al. 2008 Yankson and Owusu 2007).

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This study investigates what different actors in Accra, a rapidly urbanising low-income city in Africa, perceive as the causes of flooding in the city and analyses the level of convergence of the actor perceptions. The study uses the actor-oriented approach, which focuses on actors and their role in reproducing knowledge based on their perceptions and interest. This is pertinent because flood adaptation requires coordination among actors within various institutions (Adger 2003, 2000). In addition, actor perceptions on how disasters, including floods, are also known to influence risk behaviour and, hence, adaptation (Demski et al. 2017; Heitz et al. 2009; Ho et al. 2008; Bankoff et al. 2004). More importantly, prescribing flood adaptation measures without an understanding of the causes of flooding is likely to generate maladaptive responses (Lebel et al. 2009). Finally, a convergence of actor knowledge on the causes of flooding is a prerequisite for cooperative flood governance (Fatti and Patel 2013).

The need for studies on flood risks that mainstream actors' perceptions and knowledge has become imperative due to the contested and fragmented conclusions from studies rooted in the natural sciences, which have dominated this field of enquiry (Appeaning-Addo and Adeyemi 2013; Nartey et al. 2012; Amoani et al. 2012; Houston et al. 2011; Kwaku and Duke 2007; Karikari et al. 2006; Boadi and Kuitunen 2002; Nyarko 2000; Cuny 1991). Apart from this, social science scholarship (Amoako and Inkoom 2017; Codjoe and Afuduo 2015; Amoako and Frimpong 2015; Aboagye 2012; Bubeck et al. 2012; Kellens et al. 2011; Adelekan 2011; Braun and Aßheuer 2011; Adelekan 2010; Miceli et al. 2008; Siegrist and Gutscher 2006; Afeku 2005; Blaikie et al. 2004; Pelling 1997, 1999) with an over-bearing interest in political ecology of flooding and flood vulnerability as well as risk behaviour relegates actors and the knowledge they possess to the background. Actors reproduce knowledge, and we explore this subject matter in the next section using an actor-oriented approach.

2 Actors and the formation of knowledge

The point has been made in the literature that actors and structures influence the reproduction of knowledge and human actions (Wegerich 2001; Giddens 1984; Commons 1934). Nonetheless, the role of actors in reproducing knowledge in time and space has been associated with the sociologists of the phenomenological and hermeneutic traditions. Scholars belonging to these traditions argue that knowledge is borne out of experience and interaction among actors (Schütz 1967). More recently, proponents of the actor-oriented paradigm have emphasised the dominant role of everyday life experiences of actors together with perceptions in shaping knowledge and engendering social change (Arce and Long 1992; Long and Ploeg 1989).

Actor-oriented theorists argue that a phenomenon can be understood from the point of view of actors involved in the event. Therefore, knowledge is subjective and personal in nature (Hopper and Powell 1985; Burrell and Morgan 1979). Knowledge is conceived as how people classify, process and interpret their experiences about a phenomenon (Long 1999, 2004; Arce and Long 1992). Furthermore, some form of knowledge is embedded in all forms of social institutions and these are usually linked to power relations and resource allocation (Long 1999).

Arce and Long (1992) and Long (2004) propounded the concept 'battlefields of knowledge' to suggest that actors' understanding, interests and values are contested and shaped within a certain social context and within this same arena struggles over social meanings

(knowledge) occur among various actors. The 'battlefields of knowledge' vary and include a multiplicity of social actors with their diverse cultural and political interests as well as multiple social realities (Long 1999, 2004; Arce and Long 1992). Knowledge, therefore, emerges out of the complex interplay of social, cognitive, cultural, institutional and situational elements among actors rather than a simple accumulation of logical facts (Long 2004). Different knowledge domains exist on various phenomena and in the case of flood risk; the modernist, disaster governance as well as local or 'people' knowledge have been discussed as the broad domains that encapsulate how disaster risk unfolds (Hilhorst 2003, 2013). They further indicate that knowledge domains reflect the interest and experience of actors.

Sabatier and Jenkins-Smith (1999) and Sabatier (1998) as well as Baumgartner and Jones (1993) allude to the role of actors and actor interests in their extensive discussion on policy change. In the Advocacy Coalition Framework, Sabatier and Jenkins Smith attribute the emergence of knowledge and policy change to competing 'coalitions' consisting various of actors with similar shared beliefs. Baumgartner and Jones (1993) explain that knowledge in the policy space is engendered through long periods of incremental change and more rapidly during punctuated short spells in which acts opposing the dominant knowledge domain or policy manage to adopt new 'images' and avenues to accelerate the introduction of their knowledge domain or policy into the policy space.

3 The study area

The Accra Metropolitan Area is located between longitude 0°.03′ and 0°.15′ West and latitude 5°.30′ and 5°.53′ North. Administratively, the city covers an area of 229 km^2 (Abraham et al. 2006). The city has a history of both coastal and inland flooding with associated loss of lives and property (Appeaning-Addo and Adeyemi 2013; Amoani et al. 2012; UNEP/OCHA 2011; Rain et al. 2011; Dasgupta et al. 2009; Karley 2009). About 25% of the city's population live in areas liable to flood, and almost half of its large mass has been designated as a flood-risk zone (Karley 2009; Nyarko 2000). General circulation models (GCM) predict more flood events within the coastal belt of West Africa, where the metropolis is located (Christiansen et al. 2007).

Three communities in Accra Metropolitan Area were purposively selected for the study based on flood typology, settlement characteristics and morphology. The three communities were selected from the pool of low-income indigenous sectors and high-density migrant enclaves which accommodate the urban poor in Accra (Songsore et al. 2009; Amuzu and Leitmann 1994) that are also located within areas designated by Nyarko (2000) as very high flood-risk zones. The selected communities are Glefe, Mpoase and Agbogbloshie (see Fig. 1 for their location in the context of Accra Metropolitan Area). Glefe experiences coastal, pluvial and fluvial flooding (Amoani et al. 2012; Oteng-Ababio et al. 2011), while Mpoase experiences fluvial and pluvial flooding than that of Agbogbloshie is limited to pluvial flooding (Codjoe et al. 2014).

Glefe is located on a two (2) kilometre long sand bar traversing Accra's west coast. Behind the sand bar are two lagoons, Gbegbu and Gyatakpo (Amoani et al. 2012). The lagoons act as boundaries between the community and Mpoase to the north. The Gulf of Guinea is south of Glefe. Gbegbeyise is to the east, and Panbros Salt Manufacturing Ghana Limited's salt ponds are found west of the community. Glefe is a permanent heterogeneous community with Ga Dangmes and migrants notably Ewes and Akans (Oteng-Ababio et al.

Fig. 1 Location of the study communities

2011). Mpoase is an indigenous Ga community located north of Glefe. The community shares a boundary with Glefe to the south and Dansoman Estate to the north. Gbegbeysie is to the east of the community while the Panbros Salt Manufacturing Limited concession and the Lafa tributary are to the west of the community (see Fig. 2). The population of the community was 13,450 in 2010 (Ghana Statistical Service 2013).

Agbogbloshie is a *Ga* village with residents tracing its existence before the 1960s (Codjoe et al. 2014). With the construction of the Agbogbloshie market, a regional market, the settlement has been transformed into a heterogeneous, densely populated community with a combination of wooden and permanent structures. It is bordered in the north by Graphic Road, west by the Odaw River/Korle Lagoon and east by the Accra terminal of the Ghana Railway Corporation. Old Fadama, a squatter community popularly referred to as Sodom and Gomorrah, is south of Agbogbloshie (Codjoe et al. 2014).

4 Data collection methods and analytical tools

In the study communities, one focus group discussion was held with community leaders in Agbogbloshie and another with community leaders in Glefe and Mpoase. Community leaders from Glefe and Mpoase were combined because most of them double up for both communities. The community leaders consisted of traditional rulers, elected councillors and leadership of local residents and community-based associations. All the members were literate in numeracy and in English language. There were 15 members in each of the focus groups. The community leaders' focus group in Glefe/Mpoase had six females while that of Agbogbloshie had seven females. The number of participants in the focus groups is in line with the proposition of less than 20 but greater than 8 suggested by Sarantakos (1998). During the focus group discussions, participants were asked to list and describe the causes of flooding in their communities. Subsequently, each member was asked to score the three most important causes of flooding

Fig. 2 Arial view of Glefe and Mpoase showing Panbros Embankment

in descending order. These individual scorings were then aggregated to arrive at the relative importance of the various causes of flooding in the study communities from the perspective of the community leaders.

Data on household perceptions on the causes of flooding were obtained through a simple random sampling of 330 households living within areas liable to flood in the three study communities. The study adopted steps for selecting samples as outlined in Sarantakos (1998). In order to obtain a sampling frame in each of the study communities, houses in the delineated flood zones were listed and assigned identification numbers. The names of household heads in each of the houses were also recorded during the listing exercise and linked to the house identification numbers. The heads of households were then assigned numbers from one up to the target population. A computer program was used to select households for interview by matching computer-generated random numbers to the corresponding names of the household head. Enumerators were assigned to the selected households to interview any adult (more than 18 years) member of the household. Where 'no response' was encountered, the household was replaced.

Compared to systematic and other types of probability sampling techniques, simple random sample is less convenient in terms of time and resources. This notwithstanding, simple random sampling eliminates biases and ensures that parameter estimates are representative of the survey population (Frankfort-Nachmias and Nachmias 1996). This sampling technique was also well suited for the study communities as no clear geographical, social or economic sub-categories were observed in these communities that could form the basis of stratification or clustering.

The sample size was determined using the formula in Miller and Brewer (2003). This is summarised as:

$$n = N/\left(1 + \left(\alpha^2\right)N\right)$$

Table 1 Appropriate sample size for study localities

Summary parameters	Glefe	Mpoase	Agbogbloshie
Total number of households living in flood zones (N)	1057	3034	527
Margin of error (α)	0.09	0.09	0.09
Sample size (n)	110	120	100

where n = sample size, N = total population (total number of households in the demarcated flood zone) and α = margin of error (0.000–0.1)

Based on the formula, the appropriate sample sizes (n) for the three respective localities are presented in Table 1.

Finally, the directors of 13 public organisations involved in flood mitigation in the Accra Metropolitan Area were purposively selected and interviewed for their perspectives on the causes of flooding in the city. The organisations are National Disaster Management Organisation-Accra Metropolitan Assembly Directorate, Metropolitan Health Management Team, Accra Metropolitan Environmental Health Department, Waste Management Department and Ghana Meteorological Agency, Metropolitan Physical Planning Department, Metropolitan Works Department, Accra Metropolitan Roads Department and the Hydrological Service Department of the Ministry of Water Resources, Works and Housing. Others are Environmental Protection Agency and Water Resources Commission. These agencies were identified from the literature (Okyere et al. 2013; ILGS and IWMI 2011; Karley 2009). Apart from these, one organisation was identified through snowball sampling (Sarantakos 1998), that is, the Drains Maintenance Unit of the Accra Metropolitan Assembly. This unit was mentioned during discussions with the Waste Management Department as being involved in flood adaptation actions in the city of Accra. The heads of these organisations were also asked to score the three most important causes of flooding in Accra in the order of merit and to provide explanations for their choices. The outcomes were also aggregated and ranked in the order of merit.

All the respondents who took part in the study were made to thumbprint or sign an informed consent form. The form introduced the research team and stated the title, purpose and duration of the study to the respondents. Further, it explained the procedures for the study and the fact that the study had no risks associated with it. Respondents were informed that their participation was entirely voluntary, and they were at liberty to terminate the interview at any time. If they chose to terminate, all their responses will be deleted. However, if they consented to the interview, all the information they provided will remain confidential. Contacts of the research team leaders were given to each respondent in case they have any concerns.

The perspectives of the various actors were scored and analysed for their convergence or otherwise using the Kendall coefficient of concordance (W) method. This is a statistical procedure used in measuring the degree of agreement or disagreement among parameters (Robinson 1957). The statistic, according to Siegel and Castellan (1988), is denoted as:

$$W = \frac{12s}{p^2\left(n^3 - n\right) - pT}$$

where n represents the number of objects (various causes of flooding), p is the number of judges (households, community leaders and technocrats) and T is a correction factor for

tied ranks. The value of W lies between 0 and 1 ($0 \leq W \leq 1$). It assumes 1 when there is a perfect agreement and zero (0) when there is a perfect divergence between actors on the perceived causes of flooding.

The coefficient of concordance (W) was tested for significance using the F-distribution. F test is a significance test used for comparing means of 3 or more samples/treatments, to avoid the error inherent in performing multiple t tests. If the calculated F value exceeds the tabulated value at a given degree of freedom, the null hypothesis (Ho) is rejected and the alternative hypothesis (H_1) is accepted. On the other hand, if the F calculated is less than the tabulated value at a given degree of freedom, the null hypothesis is accepted and the alternative hypothesis rejected by default.

5 Actor perspectives on the causes of flooding in Accra

The perspectives were obtained from 330 households and 27 community leaders in the three study communities as well as senior technocrats in 13 public organisations involved in flood adaptation in Accra (see Fig. 3a, b).

5.1 Technocrats perspectives on flooding

From Fig. 3a, the thirteen (13) experts interviewed collectively scored inadequate drainage infrastructure, poor refuse management and housing development in flood zones (encroachment of wetlands and waterways) as the three major causes of flooding in the study localities. One of the technocrats aptly captures how inadequate drainage infrastructure leads to flooding in Accra as follows:

> In most of these areas [that flood in Accra] storm drains are unavailable and when you have a sudden gush of voluminous water and there are no large drains to accommodate the water and channel it in the right directions to move without destroying things, then it tends to find its own level, move into peoples' rooms and destroy things in the affected communities. [Senior Official Metropolitan Health Department, Accra Metropolitan Assembly. July 5, 2013]

The link between poor drainage systems and flooding in Accra and the study communities in particular can be rationalised within the context of a huge deficit in Accra's drainage infrastructure. SNC Lavalin International Inc. and Comptran Engineering and Planning Associates (1997) identified twenty-six (26) priority storm drains, totalling almost 70 km requiring interventions in the city based on the 1991 Drainage Master Plan of Accra. By 2007, engineering designs and construction of less than half (about 25 km) were ongoing under the Second Urban Environmental Sanitation Project (Watertech 2006). More recently, Adank et al. (2011) report that two of the six major drainage systems in Accra, namely the Densu and Mokose systems, are not lined and the others have only been partially lined or engineered.

The technocrats in Accra also scored poor refuse management as the second major cause of flooding in the study communities. Evidence of heavily silted drains and lagoons is rife in the study communities. The technocrats indicated that the problem is due to poor public attitude towards waste management, open dumping into drains and water bodies.

For the technocrats, housing development in flood zones is the third most important reason why the metropolis floods. In their view, the problem is directly attributable to

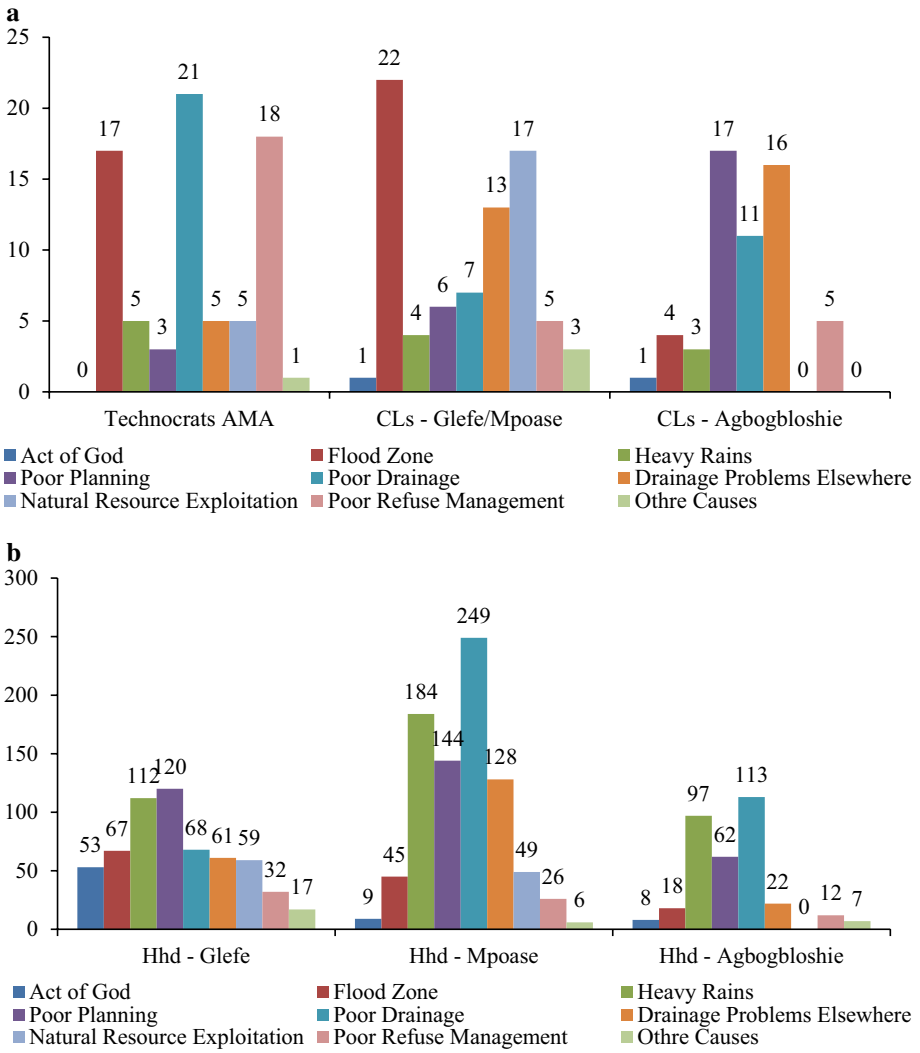

Fig. 3 Perceptions on the causes of flooding by technocrats and community leaders (**a**) and households (**b**)

indiscipline in the land market and that developers are eager to flout the zoning and building regulations. Other causes of flooding mentioned by the experts are drainage problems elsewhere, in this case storm water from the Akuapem Mountains, natural resource exploitation, notably sand mining along the coast, heavy rainfall and poor planning (high site coverage and haphazard housing development) in that order.

5.2 Community leaders perspectives on the causes of flooding

The focus group made up of community leaders from Glefe and Mpoase explained that because sections of Glefe are lower than the mean sea level, Glefe suffers from coastal

flooding especially during high tides. The Gbegbu and Gyatapko lagoons also have lower tidal levels than the mean sea level, and therefore, the lagoons overspill their banks during high tide causing neighbourhoods in Glefe and Mpoase close to the lagoons to flood.

More importantly, the community leaders in Mpoase and Glefe indicated that salt extraction activities of Panbros Salt Manufacturing Limited[1] particularly the diversion of the estuary of the Gyatakpo Lagoon and creation of an embankment are the second most important causes of flooding in the area. This is captured as natural resource exploitation in Fig. 3a (see Fig. 2 for the Panbros Embankment within the context of Glefe, Mpoase and its environs).

A member of the Glefe Development Association who was part of the opinion leaders' focus group explains:

> …… Around 1992 Panbros [Salt Manufacturing Limited] blocked the watercourse through the wetland and diverted the [Lagoon] water southwards near Glefe. So anytime it rains slightly on land we have serious problems [flooding] and then when it rains on the sea it flows back into the lagoon and floods the houses along the lagoon. [42-year-Old Resident of Glefe, Accra. 2nd June, 2013].

Panbros Salt Manufacturing Limited refutes the allegation by the community leaders that their salt extraction activities are a major cause of flooding in Glefe and Mpoase as well as their environs and puts the blame on the community leaders and metropolitan authorities. The official of Panbros Salt Manufacturing Limited interviewed as part of the study had this to say about cause of flooding in Mpoase and its environs:

> At the time we did these interventions [diversion and embankments] there wasn't much habitation along their side [Glefe and Mpoase] of the land where the water used to pass. It was all bushes. Unfortunately, for them because at one point we cut the lagoon off, the former waterway became dry and they built on it. Therefore, as I am speaking to you now they are sitting on the waterway. [Senior Manager, Engineering, Panbros Salt Manufacturing Limited, Accra. 14th May, 2014]

The community leaders in Glefe and Mpoase also scored cumulative effects of drainage problems from elsewhere as the third most important cause of flooding in the two communities with a score of 13 in Fig. 3a. The improvement in the drainage network in Dansoman under the Mamponse Infrastructure Upgrading Project from the perspective of the opinion leaders has compounded the flooding problems of the two communities. Although under this project the Gyatapko and Gbegbu lagoons were used as outfalls for all drains from Dansoman and other upstream communities, no complementary civil works were undertaken to improve the efficiency of the lagoons in terms of storage capacity and discharge velocity into the sea. Other causes mentioned by the focus group of community leaders in

[1] Panbros Salt Manufacturing Company Limited is a leading salt manufacturing firm in West Africa with the capacity to produce 45,000 tonnes per annum. The company owns and operates an 11,000-ha concession in the Densu Ramsar site in the western part of Accra. The concession shares a common boundary with Glefe and Mpoase in the east at the Gyatakpo lagoon. In 1992, the company created an embankment around its salt ponds and undertook diversionary works at the estuary of the Gyatakpo lagoon. As part of the civil works, a cross-culvert was created within the embankment near Glefe to allow excess seawater backfill into the Gyatakpo lagoon during high tide in order to balance the flow in the salt ponds. The culvert was blocked during low tide to prevent reverse flow of contaminated lagoon water into the salt ponds. These measures were to protect their operations from pollution from the residents of Glefe, Mpoase and other communities in the catchment, which was contaminating their flows and salt.

Glefe/Mpoase are lack of drains within the community, poor refuse management, heavy rainfall and Act of God.

The community leaders in Agbogbloshie perceive that flooding in the community is largely as a result of poor planning and the burden of drainage problems outside their community. In addition, the community leaders in Agbogbloshie explained that underdeveloped drainage systems in their community make storm water and run-off conveyance into the Odaw River for onward discharge into the sea problematic. On the issue of poor settlement planning and development control, which the community leaders assigned the highest score (17) in Fig. 3a, one male focus group participant contrasts the layout of Agbogbloshie in his formative years to the current situation. He recalls with nostalgia:

> When I came to Agbogbloshie I was about six years old and this was in 1962. The town was well laid out with well-demarcated streets, parks and avenue tree. The population density was low. Now the town is congested and people have built in unauthorised places. The town looks like a shantytown and we are classified as squatters because wooden shacks have taken over the community. However, I do not blame the developers; it is the fault of the landowners, who sell [lease out] the land to prospective developers without a plan. Because of these things when it rains we suffer from flooding. [59 years, Opinion leader Agbogbloshie, Agbogbloshie, 14th July 2013]

The uncontrolled development of housing in Agbogbloshie has been linked to the construction of a regional market close to the residential quarters and the proximity of the community to the Kokomba (Yam) market along the Abossey Okai road. These developments increased the demand for land to accommodate the traders and ancillary workers at the market. Trading activities have also spilled over into the residential areas.

Similar to the community leaders in Glefe/Mpoase, those in Agbogbloshie are of the opinion that their community suffers from the staggered effect of drainage problems carried from communities upstream, that is, the Odaw River. This factor was ranked second by the opinion leaders in Agbogbloshie with a score of 16 in Fig. 3a. The cumulative effect of poor upstream management practises becomes an externality for communities in the lower catchment of major rivers in Accra like Agbogbloshie located within the lower Odaw catchment. Other causes of flooding mentioned by the opinion leaders of Agbogbloshie, ranked in descending order, are: poor drainage, poor refuse management in the community, building in flood zone, heavy rainfall and Act of God.

5.3 Households' perspective on the causes of flooding

As shown in Fig. 3b, households in the three communities perceive that the most important causes of flooding in their communities are poor drainage network, poor planning (haphazard housing development) and heavy rainfall. Households in Agbogbloshie and Mpoase scored poor drainage as the highest among the numerous causes of flooding in their community. It was also the third most important cause of flooding according to household members surveyed in Glefe. During the study, only 12.9%, 24.9% and 45.0% of the households surveyed in Glefe, Mpoase and Agbogbloshie, respectively, lived in houses with a concrete public drain in front. Of these, 46.2%, 35.5% and 70.4% observed that the drains were choked while 15.5%, 19.4% and 14.8% indicated that the drains in front of their homes were cracked.

Poor planning (haphazard housing development) was also identified by the households surveyed in Glefe as the major cause of flooding in Glefe with a total score of 120, and the

Table 2 Level of actor agreement on the causes of flooding

Actors/stakeholders	Coefficient (*W*)	*p* value
Households versus households		
Glefe–Mpoase	0.722***	0.007
Glefe–Agbogbloshie	0.873***	0.001
Mpoase–Agbogbloshie	0.704***	0.009
Household versus community leaders		
Glefe	0.278	0.297
Mpoase	0.222	0.409
Agbogbloshie	0.432	0.116
Experts at AMA versus households		
Glefe	0.085	0.753
Mpoase	0.222	0.404
Agbogbloshie	0.389	0.144
Experts at AMA versus community leaders		
Glefe/Mpoase	0.444*	0.095
Agbogbloshie	0.278	0.297

***$p < 0.01 = 1\%$ level of significance; **$p < 0.05 = 5\%$ level of significance; *$p < 0.1 = 10\%$ level of significance

third in Agbogbloshie with a score of 62. The rationale for this outcome is not far-fetched. Housing development in the two communities has been haphazard and dense with virtually no open spaces and nature reserves. In addition, most building plots are as small as 100 m^2 far lower than the minimum standard of 450 m^2 stipulated in Part 1 Section 14(1) of The National Building Regulations (L.I.1630 1992).

Heavy rainfall with a score of 112, 184 and 97 in Glefe, Mpoase and Agbogbloshie, respectively, was second in the household scoring of the three study communities in Fig. 3b. Although the empirical evidence associating flooding in Accra to increasing rainfall intensity and volume is not very convincing, most of the major floods in Accra are occasioned by rainfall with intensities of more than 50 mm/h. However, households living in these communities' experience flooding even under moderate rainfall. Other causes of flooding enumerated during the household survey were building in flood zones and drainage problems elsewhere.

6 Level of agreement on causes of flooding among actors in flood adaptation in Accra

The results of investigations into the level of agreement/disagreement on the views shared in Fig. 3a, b with respect to the causes of flooding by households, community leaders and experts in the public sector in Accra are presented in Table 2.

From Table 2, households in the three study communities seem to share similar opinions on the relative importance of factors that cause flooding in their various communities as shown by the scores of the Kendall coefficient of concordance (*W*), i.e., Glefe–Agbogbloshie ($W = 0.873$, $p = 0.001$) Agbogbloshie–Mpoase ($W = 0.704$, $p = 0.009$) and Glefe–Mpoase ($W = 0.722$, $p = 0.007$). This implies that there was an 87.3% level of

agreement on the causes of flooding between the households in Glefe and Agbogbloshie. Between the households surveyed in Agbogbloshie and Mpoase and those of Glefe and Mpoase, the degree of agreement was 70.4% and 72.2%, respectively. The levels of agreement were statistically significant at 1%. Underlying this strong agreement on the perceived causes of flooding among the households in the three communities is similar spatial and socio-economic characteristics.

Opinions on the causes of flooding between household and community leaders' in various communities also did not coincide. For Agbogbloshie, Glefe and Mpoase, the level of agreement in Table 2 was 43.2% ($W=0.432$; $p=0.116$), 27.8% ($W=0.278$; $p=0.297$) and 22.2% ($W=0.222$; $p=0.409$). These were not statistically significant. In an ideal situation, such low level of agreement between community leaders and households should not have arisen, as views of the opinion leaders should be representative of that of the households. Nonetheless, there are some explanations under this circumstance. The community leaders were more interested in the remote causes of the problem, whereas the households are generally interested in the immediate causes of flooding, getting run-off and storm water out of their compounds and immediate surroundings.

A more insightful revelation in Table 2 is the observed disagreement between the experts interviewed on the one hand, and the community leaders and households on the other hand. The estimated level of agreement between experts interviewed and households in Glefe, Mpoase and Agbogbloshie is as low as 8.5% ($W=0.085$; $p=0.753$), 22.2% ($W=0.222$; $p=0.404$) and 38.9% ($W=0.389$; $p=0.144$), respectively. Similarly, between the experts consulted and opinion leaders in the respective communities, opinions on the causes of flooding also differed. The degree of agreement was moderate, 44.4% ($W=0.444$; $p=0.095$) for Mpoase/Glefe, and low, 27.8% in the case of Agbogbloshie ($W=0.278$; $p=0.297$). The level of agreement between the expert opinion on the causes of flooding and the community leaders at Glefe/Mpoase was statistically significant at 10%. In the case of Agbogbloshie, it was not statistically significant.

These low levels of agreement between the households surveyed, community leaders and technocrats observed in Table 2 are supported by some revelations from Fig. 3a, b. For example, the community leaders in Glefe/Mpoase scored the natural resources extraction as the second most important cause of flooding in the two communities but this did not feature prominently as far as the technocrats at the Metropolitan Assembly are concerned. Apart from this, the experts interviewed at the metropolitan level put a high premium on poor refuse management in the city, including the study communities as a cause of flooding but the households and community leaders in the various study communities did not score it among the first three causes of flooding in their respective communities.

The difference between the opinions of the technocrats and 'local' knowledge on the causes of flooding can be attributed to the fact that opinion leaders and households are more in tune with local dynamics of flooding in their respective communities than the experts operating at the metropolitan level. These differences also confirm the observation that flooding in most African cities is a localised problem (Adelekan and Ayisanbi 2016; Douglas et al. 2008).

Some level of externalisation of responsibility and blame (Kamrowski et al. 2015; Lorenzoni et al. 2007) can also be inferred from the narratives ensuing from Fig. 3a, b and Table 2. Both the household surveyed and community leaders explained that flooding is largely as a result of exogenous factors like heavy rainfall, activities of Panbros Salt Manufacturing Industries Limited and drainage challenges elsewhere, obfuscating their own contribution to the problem in the form of poor attitude towards refuse management, encroachment of waterways and haphazard housing development. The officers in

the public organisations surveyed also emphasised poor drainage systems, poor planning and poor refuse management as the major causes of flooding in the study communities. Their explanation of how these factors lead to flooding in the city absorbs them of any blame and lays the blame on indiscipline on the part of community leaders and households who flout building and zoning regulations and dump refuse into open drains, lagoons and in their neighbourhoods. Externalisation of blame can act as a barrier to public adaptation to floods. This is because it constraints cooperative governance required for adaptation (Anderson et al. 2008).

Within the study communities, the level of agreement on the causes of flooding between community leaders and households also differed considerably. This reveals that knowledge domains on how disaster risks unfold are devise and sometimes conflicting even at the local community level (Hilhorst 2013). As noted by Hilhorst (2013: 11), 'local knowledge cannot be represented as an accumulating and homogeneous community stock'.

7 Conclusion

Views and knowledge about a phenomenon are diverse even at the local level (Hilhorst 2013; Arce and Long 1992). Perceptions and actor interests influence these diversities in knowledge expressed by the actors surveyed in this study. The level of agreement on the relative importance of each of the perceived causes of flooding differed from each of the three groups of actors surveyed. The differences in perceptions may be seen as a spring board for the coalitions who are likely to compete for dominance within the policy space. This notwithstanding, the diversity of opinions at metropolitan level can be harnessed in the search for adaptation measures for urban floods in Accra. It also provides opportunities of participatory learning and planning in building capacity for flood adaptation in Accra and other Southern cities.

Trust has been identified as a key ingredient in building resilience to urban floods, especially in the local context (Seebauer and Babcicky 2018; Lo et al. 2015). Nonetheless, the study revealed that mistrust and externalisation of blame among the actors surveyed. To resolve this problem which militates against cooperative flood governance in Accra, there is the need for a partial integration of informal institutions into the formal metropolitan structure. This can begin with coopting the leaderships of these institutions, notably traditional authority, development and landlords' associations and other local collations, into some committees of the assembly that relate to flood zoning and risk management as ex officio members. The advantage of such an arrangement is that both formal and informal actors in flood adaptation expand their knowledge on how flood risks unfold at the local level; hence, more appropriate and mutually acceptable abatement measures can be fashioned out for the city. For example, haphazard housing development and housing development in flood-prone areas were identified as causes of flooding in this study. Yeboah and Shaw (2013) propose education and then sanctioning of chiefs and tribal elites who engage in land transactions outside the formal planning system as a remedy. This study takes the position that their recommendation will only be effective, if it evolves from the collaborative effort of both informal and formal actors in flood adaptation in Accra.

Furthermore, Amoako and Frimpong (2015) call for an integrated approach to urban flood management in Accra and other southern cities. Their framework hinges on improving the hydrology of river channels, enhanced flood abatement infrastructure, managing urban growth and improving institutional capacity. This study shows that the three groups

of actors involved in flood adaption in Accra who were surveyed had views on the causes of flooding in Accra which were not converging. For the integrated approach proposed by Amoako and Frimpong (2015) to succeed, there is the need for the approach to recognise and accommodate the diverse opinions of the actors.

These notwithstanding, the question remains, does these differences in perception on the causes of flooding influence adaptation choices and actions among the various actors in flood adaptation within Southern cities?

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