

Supplementary A1

Key informant institutional interviews

	Institutions	Actor roles in climate change and informalurbanisation	Number of staff
1	National Disaster Management Organization (NADMO)	Implementation and disaster relief response	3
2	Town and Country Planning Department (TCPD)	Physical planning and development control	2
3	Environmental Protection Agency (EPA)	Research, enforcement of environmental laws and regulations	1
4	Ghana Meteorological Agency (GMA)	Generation of climate data, research, and communication	2
5	Accra Metropolitan Assembly (AMA)	Overall development of Accra	4
6	Ministry of Environment, Science and Technology (MEST)	Policy formulation, monitoring, and evaluation of environmental issues	1
7	Ministry of Local Government and Rural Development (MLGRD)	Policy formulation, monitoring, and evaluation of urban development issues	1
8	Asiedu Keteke Sub-metropolitan District Coordinator	Implementation of development interventions, enforcing environmental bye-laws and development control	2
9	Gamashie Development Agency (GAMADA)	Coordinating development interventions in the Gamashie Area	1
10	People's Dialogue on Human Settlement (PD)	Capacity building of informal dwellers and traders, education, sensitisation and advocacy	1
11	Ghana Federation of the Urban Poor (GHAFUP)	Capacity building of informal dwellers and traders, education, sensitisation and advocacy	1
12	Global Communities	Capacity building of informal dwellers and traders, education, sensitisation and advocacy	1
13	The traditional ruler of Gbegbeyise	Land management	1
14	Old Fadama Development Association	Community mobilisation and advocacy in Old Fadama	2
15	Paradeso Youth Club	Community mobilisation	1
16	Gamashie Slum Upgrading Facility	Funding slum upgrade in Gamashie	1
	Total number of interviews		25

Supplementary A2

HOUSEHOLD SURVEY QUESTIONNAIRE

ADAPTATION TO CLIMATE CHANGE IN COASTAL URBAN INFORMAL SETTLEMENTS IN ACCRA

Questionnaire Number:

Name of Interviewer:.....Date

Telephone Number of Interviewee (if available):..... House address/or any means of identification (if possible):

Name of Community:.....

Part I: Perception, knowledge and experience of environmental changes and climate change/variability

1. What is your household's (represented by your opinion, considering the rest) view on possible observed changes in the following environmental and climate-related phenomena/issues in this settlement (in terms of magnitude and/or timing/frequency)? [Instruction: Tick [√] as appropriate].

	There have been changes/shifts/increases	There have not been changes/shifts/increases
i. Slow events:		
Temperature / excessive heat		
Coastal erosion		
Sea level rise		
Salt water intrusion/groundwater salinity		
Rainfall patterns		
ii. Sudden events:		
Flooding		
Storms (<i>rain and/or wind storms</i>)		

2. Do you (on behalf of the household) perceive some (or any) relationship between any or all of such long-term environmental changes above and climate change/variability in this community and city?
a. Yes [] b. No [].

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3. What do you (represented by your opinion, considering the rest) perceive is the main cause of changes in the climate (long-term changes in weather) of this community and city?
 4. Act of God b. Community/local level environmental pollution activities c. Global industrial activities d. Other . Explain.....
 5. What has been your household's main mode of transfer/source of local knowledge about climate change and variability?
 - a. Peer to peer b. Personal c. Kinship d. Other Specify.....
 6. What has been the single most frequent climate change-related hazard that affects your household in this community (using the most recent one that affected you most over the last one to two years)?
 - a. Temperature and excessive heat
 - b. Fire hazard
 - c. Coastal Erosion
 - d. Sea level rise
 - e. Salt water intrusion
 - f. Floods
 - g. Storms
 7. What is the timing of your experience with the following climate-related events in your community and city: (**Tick as applied**)
 - a. Excessive Heat Stress: a. December-March b. April-August c. Not very sure d. the whole year
 - b. Floods: a. May-October b. November-April c. Not very sure d. the whole year
 - c. Storms: a. May-October b. November-April c. Not very sure d. The whole year other , Specify
 - d. Rainfall Patterns/Timing of Rainfall: a. December-March b. April-August c. Not very sure d. the whole year
 8. To what extent do you perceive your household as socio-economically, politically, institutionally and ecologically (including climate change-related) vulnerable? a. Vulnerable b. Not Vulnerable
Please explain your response.....
 9. What do you perceive as the most important thing to your household which has been affected by the last most frequently experienced climate change-related hazard?
 - a. Health b. Housing c. Production assets d. Lives e. Livelihood activity
 10. How frequently do your household members fall ill in a year (averagely)? a. once , b. twice , c. three times , d. More than three , e. None

Part II: Adaptive Responses/Practices

11. To what extent do you (represented by your opinion, considering the rest) have knowledge of state disaster management-related institutions and their performance in this community/settlement?
[Instruction: tick X as appropriate]

Name	Aware of and Satisfactory	Aware of and unsatisfactory	Not aware
NADMO			
Ghana Fire Service			
Meteorological Agency			

12. Is there any traditional/local way of monitoring climate change that you (represented by your opinion, considering the rest) sometimes resort to or apply in your daily life? a. Yes [] .b No [] If yes, please mention them here.....

13. What adaptive measure is often adopted by your household against the main climatic affects that you suffered from (using the most memorable recent and significant event over the last one to two years) ?
 a. Flooding: a. Took action/modify structure/climate proof [] b. Relocate [] c. Do nothing []
 b. Excessive heat/heat wave: a. Took action/modify structure/climate proof [] b. Sleep outside [] c. Do nothing []
 c. Storms (rain/windstorms): a. Took action/modify structure/climate proof [] b. Relocate [] c. Do nothing [] Please provide a brief explanation here.....

14. If your household has been responding to the climate-related hazards, what do you do **before, during** and **after** the events?

Climate effect and impact	Action before the impact occurs	Action during the impact	Action after impact (Reconstruction)

15. Based on respondent's answers to question 12, did respondent take a structural mitigation/adaptive measure in response to each of the most recent and significant storm (rain/windstorm), heat wave, and flooding experienced the household in this community)?
 a. Yes [] b No []. **[Instruction: tick X as appropriate].**

16. Have you received an early warning on climate-related issues from external sources (all sources excluding from friends and family), over the last 1 to 2 years? a. Yes [] .b No []
 If yes, please mention the source.....

17. What is the main source of early warning received by your household over the last 1 to 2 years? a. Radio [] b. TV. [] c. Self/friends/relatives [] d. Community-based groups [] . e. Government officials []

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18. What has typically been your (represented by your opinion, considering the rest) main consideration in taking an adaptive response to climate change-related hazard (this should be based on the most recent adaptive decision mentioned in question 12)? a. Finance [] b. Perceived effectiveness of the option [] c. Knowledge of climate change []
19. What do you consider as the single main source of funding and/or support that was available often depended upon and applied to minimise your most important climate change-related and/or social vulnerabilities (economic or land tenure), over the past one to two years in the study communities? a. Personal/household resources/savings [], b. From group/joint contribution with others [] c. CBO/Trade Association [], d. Government/institution [], e. Micro-finance institutions-MFI/local loans/Susu [], f. Other (National/International NGOs, etc) [] Specify the form of this funding and or support.....

Part III: Associational Life and Governance

20. Do you as head of household or rep, belong to any social group? a. Yes [] b. No []
Please provide the details here, if yes
21. Do you as head of household or rep feel involved in the governance of the city of Accra?
a. Yes [] b. No [] Please explain your response.....
22. Are you aware of building regulations and the development permitting process in this city?
a. Yes [] b. Not []. Please explain your response.....

Part IV: General Household Information and Demographic Characteristics

23. Gender of respondent: (Household head) a. Male [] b. Female []
24. Age of respondent: (Household head) a. 18 – 25yrs [] b. 26 - 35years [] c. 36 - 45years [] d. 46 - 55yrs [] e. 56 – 60 yrs [] f. 61+ yrs []
25. Level of education? (Household head) a. Primary [] b. JHS [] c. MSLC [] d. SHS [] e. Vocational/Technical [] f. Tertiary [] g. Professional (specify) h. None []
26. Ethnicity of household head: (Household head) a. Ga [] b. Akan [] c. Ewe [] d. Guan [] e. Gurma [] f. Mole-Dabgani [] g. Grusi [] h. Mande [] i. Other, specify []

27. Please provide the names and ages of all members of your household including yourself.
 [Instruction: Indicate the head of household with a tick X by the name]

Full Name	Occupation for members aged 18 years and above	Educational Status 1 = No education 2 = Pre-School 3 = Primary 3 = Middle 4 = JHS 5 = SHS 6 = Voc/Tec h7 = Tertiary 8 = Professional 8 = Other (specify)	Age 1 = 0-5 yrs 2 = 6-10 yrs 3 = 11-15 yrs 4 = 16-25 yrs 5 = 26-35 yrs 6 = 36-45 yrs 7 = 46-55 yrs 8 = 56-60 yrs 9 = 61+ yrs	Sex 1 = M 2 = F	Ethnicity 1 = Ga 2 = Akan 3 = Ewe 4 = Gurma 5 = Mole-Dabgani 6 = Grusi 7 = Mande 10 = Other, specify []

28. What is the main reason for your household's settlement in this community/ settlement?

- a. Economic/financial considerations [] b. Maintain family ties [] c. Originate from community/settlement [] d. Government intervention [] g. Other [] specify.....

29. How long have your household been leaving in this community/settlement? a. Less than 10 years [] b. 10-20 years [] c. 21-30 years [] d. Over 30 years []

30. What is the residential tenancy status of your household? a. Landlord [] b. Renter/Tenants []

31. Do other people challenge your household's ownership status of your land/space (threats of eviction)? a. Yes [] b. No [] If yes to Q31, in what form?

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32. What would you say best describes your household's source of security of tenure or form ownership/use right on this land/space in this community?

- a. Customary arrangement? [] b. Leasehold [] c. Freehold [] d. State [] g. Informal arrangement [] . Other [] .

Part V: Household Economy

33. What is your economic activity now?: Fishing and fish mongering b. Food Vending
c. Trading d. Agriculture e. Carpentry f. Production and Processing g. Other artisans
h. Other services i. E-waste j. Portage (head portage and push cart) k. Unemployed .
Other (Specify).....
34. Is your economic household main economic activity? a. Yes b. No
If No, specify: a. Fishing and fish mongering b. Food Vending c. Trading d. Agriculture e.
Carpentry f. Production and Processing g. Other artisans h. Other services i. E-waste j.
Portage (head portage and push cart) k. Unemployed . Other (Specify).....
35. What was your household's economic activity 1-5 years ago?
a. Fishing and fish mongering b. Food Vending c. Trading d. Agriculture e.
Carpentry f. Production and Processing g. Other artisans h. Other services
i. E-waste j. Portage (head portage and pushcart) k. Unemployed . Other
(Specify).....
36. Have you (head of household) had an alternative livelihood (minor) activity during the last 1
to 5 years? a. Yes b. No . Specify
37. If you (head of household) have had an alternative livelihood (minor) activity, was this
arrangement meant to take advantage of any climate-related hazard in this community for
minimising your economic vulnerability? a. Yes b. No . Specify
38. What do you perceive as the most significant livelihood-related challenge to your
household (including the past when you worked, if currently unemployed)?
a. Prohibitive laws/regulations b. Access to credit c. Access to land/space
d. Exploitation by employers or others e. Physical harassment in place of work
f. Lack of state legal recognition and support , g. Low demand for wares/services [
], h. other
39. Is your main work/economic activity officially registered or recognised and monitored by state
agencies? a. Yes b. No , c. Not applicable .
40. Are there any benefits associated with the registration status of your economic activity?
b. Yes b. No , please specify.....
41. Are there any benefits associated with the registration status of your economic activity?
a. Yes b. No , please specify
42. Where do you presently carry out your work or when you worked (if presently
unemployed)? a. Within community b. Outside community

43. How much money did your household spend last year (approximately)? **[Instruction:** Collect estimates on weekly or bi-weekly or monthly, or any frequency convenient to household].

Description	Last year (2016) GH¢
Total:	
Amount on food:	
Amount on water:	
Amount on health:	
Amount on sanitation:	
Amount on climate proofing housing/infrastructure:	

44. How much money did your household earn (aggregation for entire household, including remittances) last year?

Last year (2016): GH¢.....

45. Do you (household head) have another source of livelihood other than the main one? a. Yes [] b. No [], If yes, specify
If Yes, is this related to climate changes and variability in anyway a? Yes [] b. No []. If yes, how?.....

46. Which of these do you have in your household, if any?

a. Savings []. How much over the last year (2016)?.. GH¢.....

b. Credit []. How much over the last year (2016)?.. GH¢.....

c. Insurance []. How much over the last year (2016)?.. GH¢ and for

what adaptive response (a. economic [] or b. climactic hazard [])?.

47. Which of the following items do you have in your household ? **[Instruction: Tick X as applied]**.

Items	Tick	Items	Tick	Item	Tick
Television		Video deck		Motor Bike	
Radio		DVD		Fan	
Mobile Phone		Car		Refrigerator	
Electric Iron		Bicycle		Computer	

Cooking utensils		Box Iron			
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Part VI: Housing Conditions [Instruction: Observe and tick in question 47]

48. What is the housing type? a. Compound House b. Semi-detached c. Detached
 d. f. temporal structure (kiosk, container, etc) g. Other (specify).....

49. Which is the **main** source of accessing the following services for your household?:
Water: a. Borehole/well b. public standpipes c. commercial water points
 d. Tanker delivery services household connection f. Other, specify []

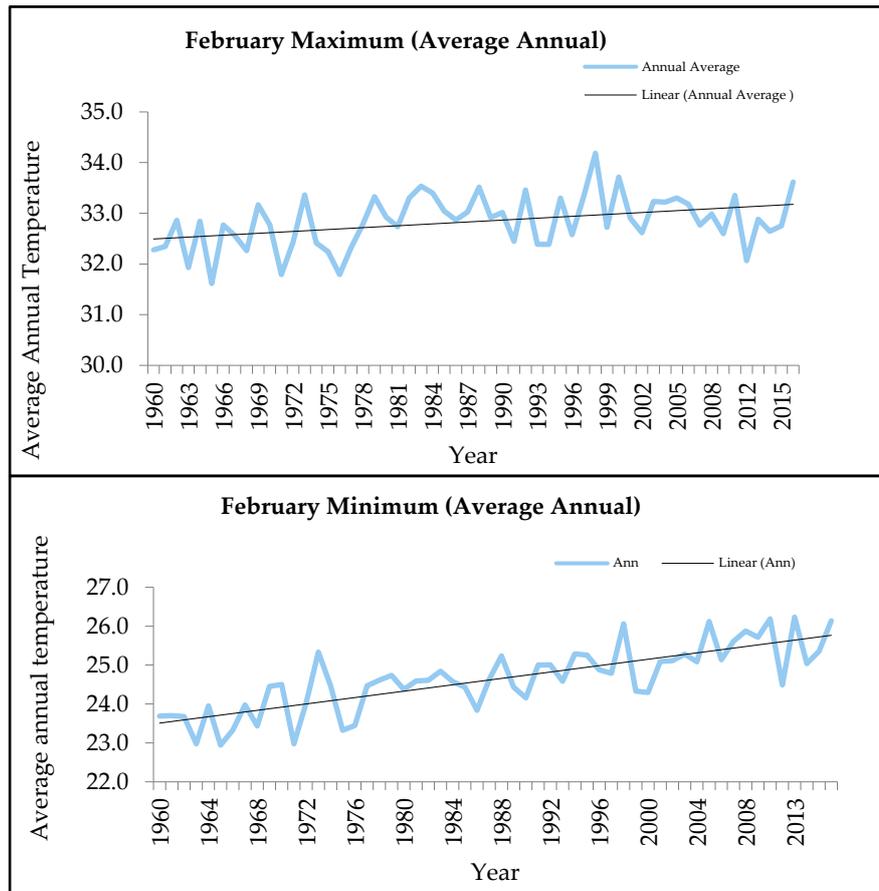
Sanitation/Toilet: a. Public toilet b. Neighbor's toilet c. sea shore/open space
 d. private toilet e. Other, specify []

Garbage Disposal: a. Drains b. Sea shore/bush/open c. Burning d. Dump in SkipContainer e. personal bin f. informal community group
 h. Other, specify[].

50. What do you suggest could be done to improve upon the situation of people who live in informal settlements and facing challenges from climate change/variability?.....

Thank you for your time.

Supplementary A3



Monthly Maximum and Minimum Temperature in Degrees Celsius, February (1960- 2015). Source: Authors' construct based on data collected from Ghana Meteorological Agency.