



Appendix 1

# Community Hazards, Risk and Vulnerability Assessment Report

Habitat for Humanity International / Liberia Country Program

**Cities Alliance**  
Cities Without Slums

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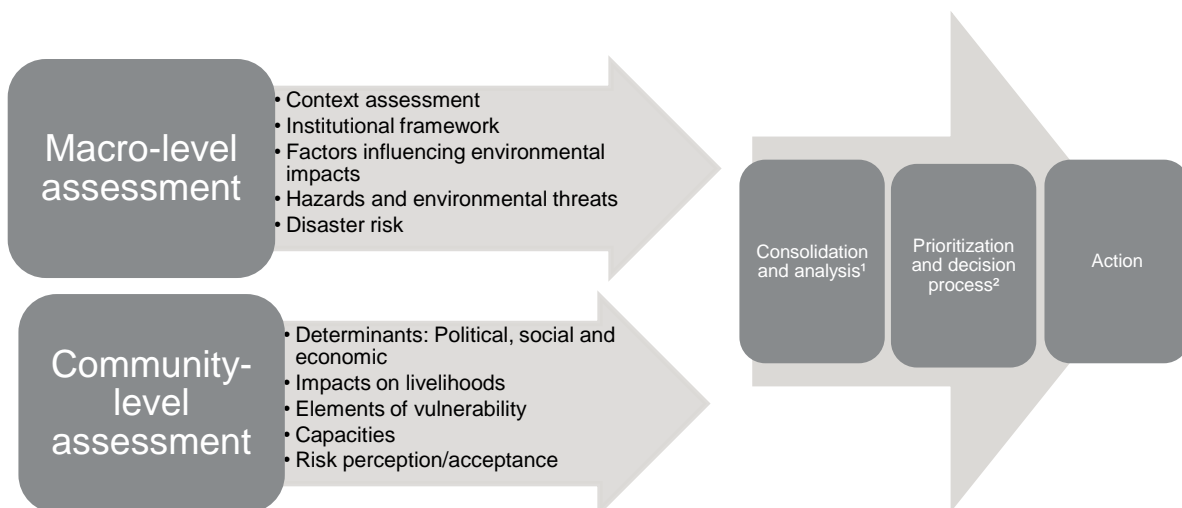
# 1. Introduction

This report presents a hazard and vulnerability assessment as part of Habitat for Humanity International’s involvement with the Cities Alliance Liberia Country Program, or LCP. The key objectives of this study were to identify critical macro- and community-level hazards and vulnerabilities impacting greater Monrovia; to identify critical actions that are required; and to analyse the impact and consequences of proposed actions in consultation with key stakeholders. This study; the housing market analysis conducted by Habitat for Humanity; and additional roundtable consultations with the public, private and community sectors serve as key inputs into the development of the Slum Upgrading and Affordable Housing Framework, including the recommendation of potential interventions.

## A. Methodology

### Habitat for Humanity’s Disaster Risk Reduction and Response

#### Hazards and Risk Assessment Process



Habitat for Humanity’s hazard and risk assessment process includes macro-level and community-level assessments that gather information directly from local stakeholders and communities and from reviews of relevant secondary data. Additional methodologies used where possible include surveys, enumerations, mapping (both new and review of existing GIS/satellite data), key informant interviews, transect walks and others, as context dictates.

1. Consolidation and analysis includes:

- Identification of critical issues.
- Identification and consensus of critical actions.
- Analysis of impacts/consequences of proposed actions.

2. The prioritization and decision process includes prioritization of actions and consensus (communities, local authorities) prior to implementation of actions. Elements of Participatory

Approach for Safe Shelter Awareness, or PASSA; Community-Based Disaster Risk Management, or CBDRM; or any other participatory process can be used as methodology.

Within this report, the following definitions will be used:

- Hazard — A danger or potential source of danger or risk.
- Vulnerability — Exposure to the possibility of harm.
- Risk — A situation involving exposure to danger.
- Impact — A marked effect or influence.

Input for the report is based on a high-level review of existing papers, reports and data sources, along with a community-level study from four neighbourhoods in Monrovia: West Point, which is at risk from coastal erosion; Peace Island, which is built on a steeply elevated hill surrounded by mangroves; Logan Town, which is affected by seasonal flooding; and Samuel Doe Community, which is located in a swamp area and affected by severe estuarine flooding.

These community studies were based on four site visits and focus group discussions that were kindly arranged and facilitated within the communities for Habitat's visit via Slum Dwellers International, or SDI, by their partners at the Young Men's Christian Association, or YMCA Liberia. The purpose of the focus group discussions was to gather information about the needs, preferences, capacities, experiences and opportunities of households to improve their homes, with a focus on what people do in preparation for or response to disasters and hazards.

The request was made to mobilise communities to host focus group discussions in two communities with "serious disaster risk" (e.g., close to large bodies of water or having a history of flooding or other significant disasters) and one or two "regular" communities with only seasonal issues.

In two communities, West Point and Samuel Doe Community, the focus group discussions were well ordered, with 12 main participants in each and representatives of female, male, elderly and youth community members. The discussions in Peace Island and Logan Town were less well-organised; about 30 community members arrived to participate, but all groups were well-represented. In these cases, it was not possible to ask people to leave to make the groups more manageable, but YMCA colleagues greatly facilitated the discussion process despite the large numbers. Maps were drawn up with the communities to illustrate the geographical areas most at risk from hazard impacts. The discussions were followed by walkthroughs of the communities to key areas of interest from a hazard perspective so that key issues could be illustrated.

Key points from all discussions are attached to this report with the annexes, along with community risk and hazard maps.

## B. Principal findings

There is very limited available data from existing sources, and the quality of data is inconsistent. These limitations present challenges to the study, and several of the underlying assumptions that the identified risks and hazards are replicated throughout all of Monrovia's informal settlements may prove incorrect, with obvious consequence for the findings of this report. The community-level assessment is based on nine days of field work conducted in September 2016, which included visits and focus group discussions in only four neighbourhoods.

Moreover, this must be considered a preliminary hazard and vulnerability assessment, and a significant caveat to the findings of this report is that it was initially intended to act as a verification exercise of the settlement profiling conducted by Slum Dwellers International, or SDI, and the Young Men's Christian Association, or YMCA, as part of the Cities Alliance LCP. However, the data was not ready until the end of December 2016 and contractually was not obliged to be submitted until June 2017. Therefore, this report is based on the findings of the initial visit, community focus group discussions, interviews and background research of secondary data. The settlement profiling data, when available, should be cross-referenced in order to test assumptions and update the findings of this report accordingly.

Based on observations and research, the primary focus of this report is on locational and climate-related hazards and vulnerability. Reference is made to broader socioeconomic issues that are prevalent in Liberia, but these are not explored in any great detail.

Most of the hazards and vulnerabilities identified in this report are common to the formal and informal city. Indeed, these conditions should not be considered separate but rather as deeply entwined entities within the city's urban fabric. However, the risk or impact of these hazards and vulnerabilities are generally most acute within informal and lower socioeconomic areas of the city.

The principal findings of this study are:

- 1. Settlement viability and relocation:** Several factors, particularly sea erosion and river flooding, fundamentally question the viability of certain settlements and areas. Notably, the ongoing erosion and reformation of the land in West Point presents a significant challenge, as manmade intervention may not be able to overcome the powerful impact of oceanic and hydrological forces (see Figure 6). Consideration should be given to relocation and densification in a similar manner to the Urban Promotion Areas and Urbanization Control Areas proposed in the 2009 master plan (Japan International Cooperation Agency, 2009).
- 2. Surface flooding:** Extreme levels of rainfall coupled with low-lying terrain and swamplike conditions are endemic to Monrovia and would require a metropolitan-scale drainage strategy to allow space for water. A detailed study of the topographic and drainage profile of the city should be conducted in order to inform this strategy. Minor improvements to drainage could be made at the local level, but any such intervention would be at risk to changes "upstream." The magnitude of investment required to mitigate this risk could be in the tens of millions if not hundreds of millions of dollars. For

reference, the Japan International Cooperation Agency, or JICA, estimated the cost to rehabilitate the existing drainage system just within central Monrovia at US\$14 million (JICA, 2009). However, there is no evidence that rehabilitation of the existing system would be adequate.

3. **Climate change adaptation:** Based on current evidence of sea level rise and storm surge, Liberia is the second most at risk country in West Africa. Unfortunately, mitigation is not a viable option for Liberia. Adaptation measures focused on even more severe flooding should be introduced to all sectors and plans, with a particular focus on the co-benefits in the transport and housing sectors. A more detailed and granular assessment of potential impacts at the metropolitan level should be conducted. Initial studies by Munich RE for this report are a step in the right direction (see Figure 10).
4. **Underlying economic conditions:** Liberia is an extremely poor country, and without a significant improvement at the national and household levels, the cost of delivering many of the required developmental improvements and required infrastructure will be unattainable. Monrovia was a successful commercial capital in the 1980s, and national GDP was approximately double what it is today (see Figure 3). Monrovia has many of the legal and institutional foundations to drive national economic growth. Any initiative or strategy to improve conditions within Monrovia's informal settlements and at an individual household level must put economic development and livelihoods at its core.

## 2. Context of Monrovia

### A. Geography

Liberia can be roughly divided into four geographical zones: the coastal plain, the rolling hills, plateau and tablelands, and northern highlands. Approximately 60 percent of Liberia's population lives along the coastal plain, which is characterized by lagoons, mangrove swamps, river-deposited sandbars, riparian and coastal vegetation. This zone extends up to 65 kilometers inland, with a maximum altitude of 50 meters above sea level (UNEP, 2004). Central Monrovia is located on a hilly peninsula between the Mesurado River and the Atlantic Ocean. The Mesurado River separates the mainland from Bushrod and Balli islands. Bushrod Island is occupied by mangrove swamps, which considerably reduces the amount of land readily available for human settlement and other related activities. The metropolitan area surrounds the Mesurado lagoon with flat land to the west and northwest, and low hills with gentle undulation along the seashore and the eastward watershed (see Figure 1). The coastal and marine environments are subjected to a variety of pressures: erosion due to sand mining, oil pollution, waste dumps, human settlement and the discharge of municipal wastewater due to the lack of proper water and sanitation facilities.

Wetlands and mangroves in and around Monrovia are extensive and provide a natural buffer that reduces the impacts of heavy rainfall, storms, flooding, high tides and sea level rise on human settlements, infrastructure and natural resources. The extent of the destruction of these mangroves is not well-documented, but it is noted that primary mangrove forest has been cleared and replaced by secondary growth that is underprotected and currently in decline because of the impact of human settlement and harvesting for fuel (UNEP, 2004).



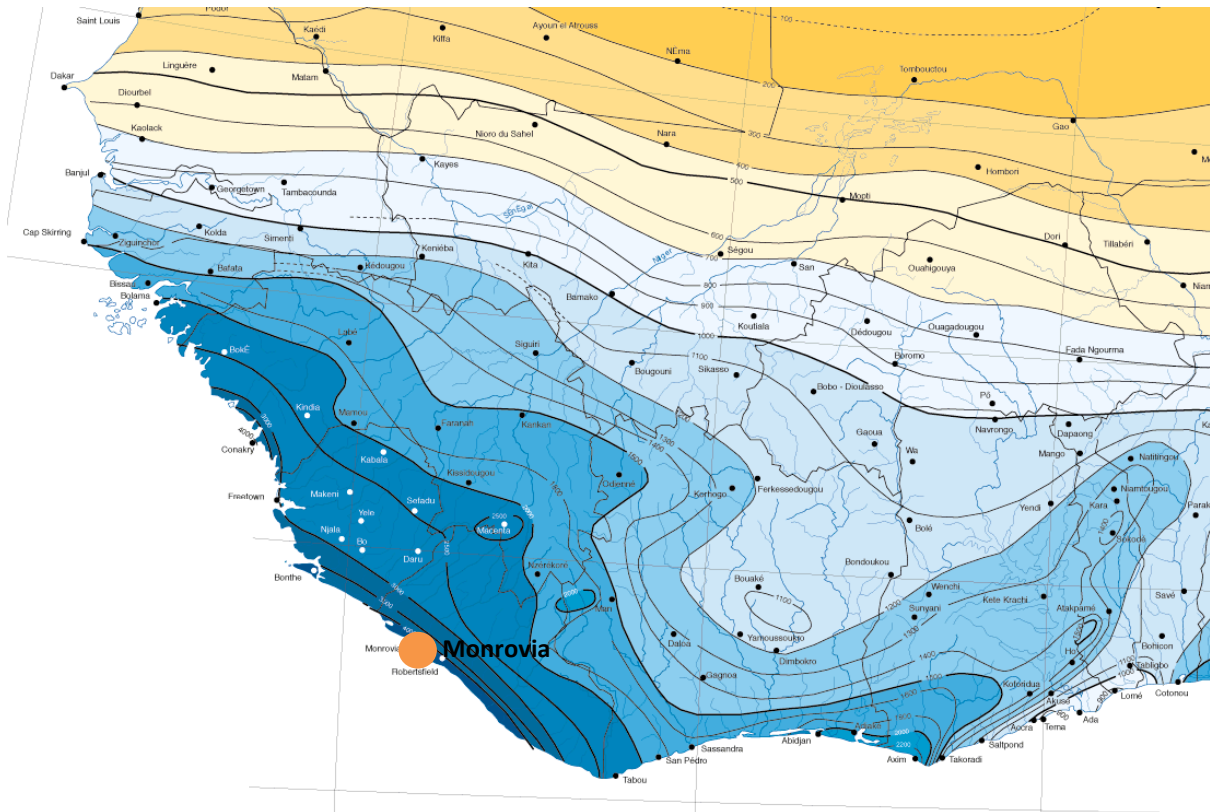


**Figure 1:** Situational map of Monrovia (Source: Defense Mapping Agency, 1990)

## B. Climate and rainfall

Liberia has a tropical and humid climate. The temperature remains uniformly high throughout the year, with an average varying between 26 and 28 degrees Celsius. There are two seasons: the rainy season starts in May and ends in October each year, while the dry season starts in November and ends in April of the following year. Annual rainfall varies from 3,500-4,600 millimeters in the south, and declines to about 1,500-2,500 millimeters in the north (see Figure 2). Most areas have a water surplus for five to eight months each year.

Monrovia's unique location on a coast perpendicular to the prevailing winds and with an elevated backdrop makes it extremely vulnerable to the highest levels of rainfall in the region and makes it "the wettest capital city in the world" (*Economist*, 2012). These natural conditions, coupled with the inadequate and dysfunctional surface water drainage system, result in frequent and severe flooding throughout the metropolitan area.



**Figure 2:** Rainfall patterns for Liberia and surrounding region (Source: Institut de Recherche pour le Developpement)

### C. Socioeconomic conditions

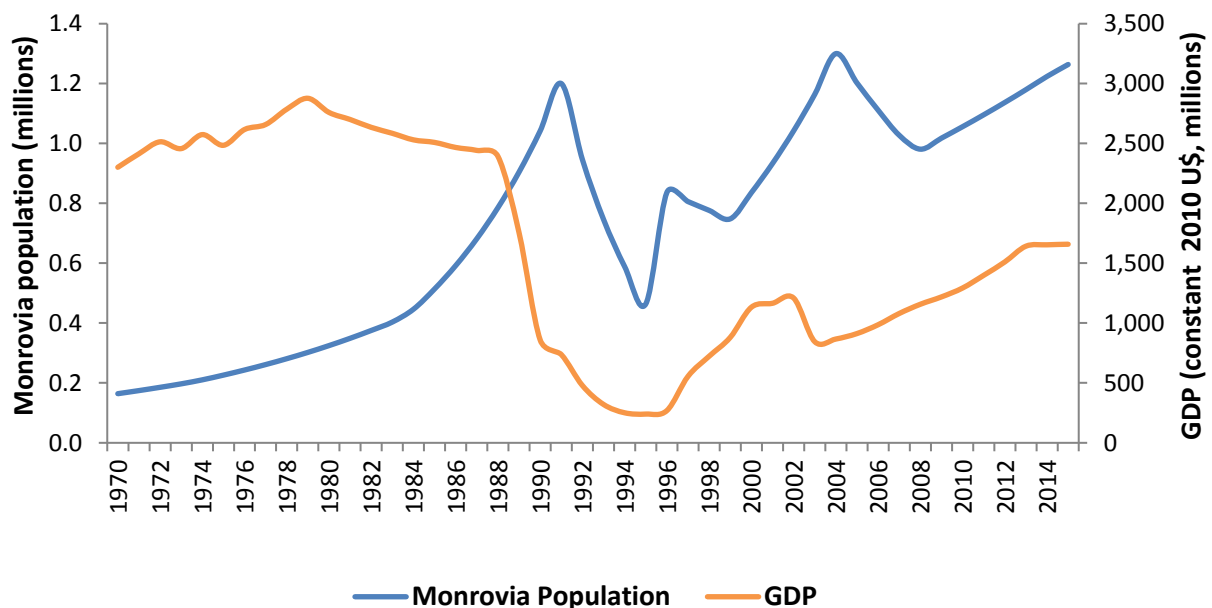
Informal settlements have existed in Monrovia since the 1950s, but the city’s current challenges with these settlements stem in large part from the 14-year civil war and accompanying economic collapse. During the conflict, over 270,000 people were killed and a further 500,000 were internally displaced in the face of widespread killing, rape, looting, destruction of property and recruitment of child soldiers (IDMC 2010). Greater Monrovia became a place of refuge for waves of internally displaced persons fleeing atrocities in rural areas and seeking protection. This population increase overwhelmed the almost negligible capacity of the city authorities to plan for and provide essential services. The war devastated the limited infrastructure present in the country and caused the collapse of Liberia’s legitimate economy.

Liberia is classified by the World Bank as a low-income country with gross domestic product per capita of US\$786 (2015, PPP, constant 2011 international \$ - World Bank). GDP growth after the civil war ranged from 5 to 9 percent per annum but has fallen below 1 percent as a consequence of the Ebola outbreak. UNDP ranks Liberia 177th of 188 on the 2015 Human Development Index, with 83 percent of the population living below US\$1.25 per day. The Gini index for 2007 was 36.48. Relative to other African countries, Liberia has a relatively high level of urbanization. It was approximately 49.7 percent urban in 2015, and urbanization is growing at a rate of 3.2 percent. (World Bank).



After the war, GDP fell by 50 percent, and the drastic changes in the composition of the economy still have ramifications today. Manufacturing and iron mining, which both had considerable urban economic benefits in terms of job creation and processing, were replaced with timber harvesting and diamond and gold mining. These latter sectors are primarily rural activities with very little value added for the domestic or urban economy. These sectors, combined with maritime registry, account for the majority of foreign exchange revenue and GDP. However, they employ very few people, which indicates a mismatch between the composition of the economy and the spatial organisation of the population.

Urban areas are concentrated along the coast. Monrovia is the political, financial, commercial and international centre of Liberia. It is a statistical outlier in relation to the system of cities, with a population of approximately 1.26 million, which represents 56 percent of the national urban population (World Bank, 2016). It has been suggested that the population of Monrovia reached 1.5 million during the civil war when people sought refuge in safer living environments. This wartime surge in population coincided with the collapse of the economy, which inhibited the expansion of urban infrastructure and overwhelmed the existing service networks (see Figure 3). The expansion of informal settlements is part of this trend. Despite limited improvements in recent years, the population living in slums is still above 65 percent, and access to basic services is extremely limited (see Figure 4).



**Figure 3:** Monrovia population against national GDP (Source: Author, based on World Bank, 2016)

Data on basic infrastructural services is inconsistent and constantly changing, with several projects in process (see Figure 4). The exact status should be confirmed with the relevant public authorities as more capacity comes online. However, the general trend for most services is very clear.

- **Water:** Water tables in Liberia are on average 7 to 13 meters below ground level and easily accessible for shallow well development. Borehole testing and aquifer assessments conducted by JICA indicate that there is sufficient volume and quality of ground water within 50 meters, and if harnessed, processed and protected adequately, it

can meet forecasted demand while remaining within the natural recharge capacity of the aquifer. Prior to 1990, approximately 45 percent of the urban population had access to safe drinking water, but conflict-related damage considerably reduced the production capacity. This has been increasing in recent years and may now exceed 45 percent. While the network should continue to be expanded, two major concerns persist. First, a significant volume of the water treated (reported as 80 percent in 2009) is lost through leaks and in the system. Secondly, the proliferation of shallow-dug private wells and latrines poses a pollution risk to the water table. JICA reported that 63 percent of the population takes water from unsafe sources.

- **Sanitation:** The existing sewerage network originates from the 1950s with a design capacity of 130,000 people. Improvements to the treatment plant and pump stations are ongoing. Only 28 percent of the population has access to improved sanitation, and the majority uses open defecation, “flying” toilets or communal latrines. With these extremely low levels of access to sanitation, the total lack of waste treatment facilities and widespread use of dangerous practises, sanitation itself presents a major health risk and hazard, especially during the rainy season.
- **Electricity:** Electricity supply has increased considerably in recent years, albeit from a low starting point. However, the transmission network is underdeveloped, and the vast majority of the population relies on diesel generators if they can afford electricity at all.

| Indicator  | 1990 | 1994 | 2004 | 2008 | 2012 | 2015 |
|--|------|------|------|------|------|------|
| Water service coverage (%) <sup>1</sup>          | 45   |      | 11   | 37   |      |      |
| Access to improved water source (%) <sup>2</sup> |      | 75   | 80   | 83   |      | 89   |
| Sewerage network coverage (%) <sup>1</sup>       | 12   |      |      | 2    |      |      |
| Access to improved sanitation (%) <sup>2</sup>   |      | 24   |      | 26   |      | 28   |
| Access to electricity (%) <sup>2</sup>           | 0    |      | 1    | 8    | 19   |      |

**Figure 4:** Statistics for basic infrastructural services in Monrovia (Source: JICA, 2009<sup>1</sup>; World Bank, 2016<sup>2</sup>)

## 3. Informal settlements and slums

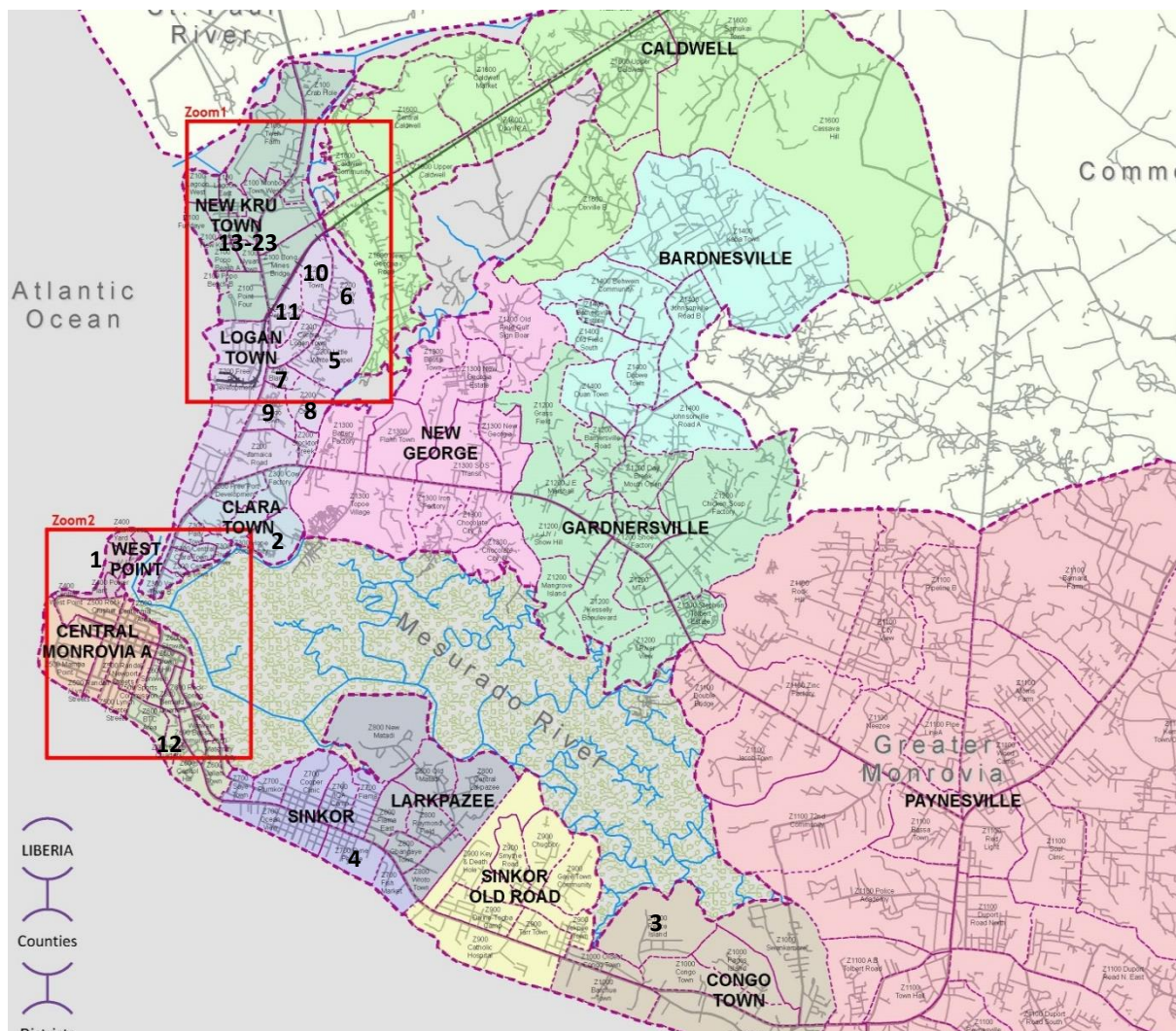
### A. Definition and parameters

The socioeconomic conditions described above, combined with the lack of access to land for the urban poor and the withdrawal of the state from social housing provision, have all contributed to a significant expansion of informal settlements across Monrovia. There is no universally agreed definition of informal settlements, or slums. Debates around this topic occur frequently in the literature, at the policy level and within communities themselves. This study adopts a broad definition proposed by UN-HABITAT as “a wide range of low-income settlements and/or poor human living conditions.” There are considerable overlaps and interdependencies among formal and informal settlements, as they are deeply entwined conditions within the urban fabric. However, the risk or impact of the hazards and vulnerabilities addressed in this report are generally most acute within informal and lower socioeconomic areas of the city. The characteristics or parameters of these areas generally include lack of basic services and poor access, substandard housing and inadequate structure, overcrowding and high density, and insecurity of tenure.

### B. Location

Monrovia’s informal settlements are generally located in marginal areas such as within coastal areas or low-lying wetland zones and reclaimed swamp areas, although others have formed on land with contested ownership and have a lower risk profile. Many areas considered informal were opened up for settlement by previous governments despite being inherently unsuitable for large-scale habitation. Both the Logan Town and Samuel Doe communities are former mangrove areas and were formed in this way, although residents do not have formal title.

Given the prevalence of these conditions and the limited size of the formal economy in Monrovia, it is fair to say that such locations exist throughout the city. There is no one area that can be demarcated as the informal settlement. Moreover, land in these locations can be used successfully to provide high-quality environments if the right investment strategy can be implemented. This study and the broader Cities Alliance Monrovia Project that it sits within have identified approximately 23 neighbourhoods that exhibit these characteristics (see Figure 5).



| No. | Name of neighbourhood                         | No.   | Name of neighbourhood                    |
|-----|---|-------|--|
| 1   | West Point                                    | 8     | Zinc Camp                                |
| 2   | S.K. Doe Community                            | 9     | Zondo Town (Logan Town)                  |
| 3   | Peace Island                                  | 10    | Gbandi Town (Logan Town)                 |
| 4   | People United Community (behind JFK Hospital) | 11    | King Peter Town (Logan Town)             |
| 5   | Little White Chapel (Logan Town)              | 12    | Buzzy Quarter (Central Monrovia)         |
| 6   | Vicky Spot (Logan Town)                       | 13-23 | Borough of New Kru Town (22 communities) |
| 7   | Blamo Town (Logan Town)                       |       |  |

**Figure 5:** Location and names of neighbourhoods being profiled by SDI as part of the Cities Alliance Monrovia Project (Source: MSF, n.d.; Cities Alliance, 2016)



## 4. Risks and hazards

### A. Locational

Many of the risk, hazard and vulnerability parameters, such as vulnerability to high levels of rainfall, are common across the metropolitan area. However, there are distinct locational characteristics that influence the hierarchy of these parameters on any individual neighbourhood, such as topography, elevation or proximity to swamps, the sea or rivers. Many of these characteristics are not mutually exclusive, but if present, they considerably increase the reported risk profile of the settlement. These locational characteristics are:

**Sea erosion:** The shifting hydrological patterns and erosion capacity of the Atlantic Ocean have a considerable bearing along the Liberian coastline. Coastal retreat in the region can average several meters per year, with extreme instances of up to 25 meters reported. Land is also periodically reformed by similar processes and, in some cases, quickly occupied on an informal basis. West Point is the most emblematic neighbourhood in this category. The impact of sea erosion and the reformatting of the land itself were reported as the defining risks in the neighbourhood. The extent of these changes can be seen in the satellite imagery and photographs below (see figures 6 and 7), which illustrate how much the “land” on which the settlement of West Point is built changes over a relatively short period. The ongoing impact of sea erosion raises fundamental concerns about the viability of any settlement in such exposed locations.



**Figure 6:** Changing coastline at West Point (Source: Author, 2016). The red lines represent roads.



**Figure 7:** Sea erosion along the coast of West Point (Source: Author, September 2016). Erosion had reached the seaward side road six months after the satellite image in Figure 6 was taken.

**River flooding:** The delta and lagoonlike or swamplike conditions have a disproportionate effect on the risk profile. Settlements along the banks of these features are susceptible to more frequent flooding and generally have inferior subsoil conditions due to the high water table. This was particularly noticeable in the Samuel Doe Community, where a differential residential rent gradient and lower school fees were reported closer to the river (see Figure 8). Controlling or modifying these natural hydrological processes requires an enormous magnitude of investment and management at the locations in question but also upstream. These issues cannot be addressed only at the local level.



**Figure 8:** Proximity of river levels to settlement levels at Samuel Doe Community (Source: Author, 2016).

**Land reclamation:** Where this was identified, it was reported that waste was used extensively to build up the level of the land. This is in stark contrast to more formal, engineered solutions to land reclamation. This means informal land reclamation is extremely dangerous, as it is liable to collapse abruptly, provides fundamentally unstable subsoil conditions for construction, and may be a health risk. The Samuel Doe Community identified this location problem along a river that had been made narrower but also deeper through sand mining. In West Point, a similar issue was presented where natural water courses and drainage lines had been built over. These locations were known in the community to be higher risk and more prone to flooding.

**Access/isolation:** Poor access and internal mobility are general characteristics of informal settlements. Extremes of this condition can result in the complete isolation of a neighbourhood. In the case of Peace Island, it was reported that the solitary access road to the island becomes flooded and impassable every year for up to several weeks. During this time, the neighbourhood is completely cut off from the rest of the city. This is both an everyday inconvenience for workers or schoolchildren who can't leave the area, but is also a more fundamental risk in terms of emergency access and provision of supplies. Similar situations exist in two of the other settlements visited and appears to be a problem during the height of the rainy season for many parts of the city – and indeed the country.



## B. Climatic

While several of the locational issues above are strongly connected to climatic patterns, there are also a few generic climatic hazards to consider. They are:

**Surface flooding and drainage:** Given the high levels of precipitation, the low-lying nature of the territory, and the limited capacity of the drainage network, surface flooding is a consistent risk identified throughout the assessed neighbourhoods. Specific areas of localised flooding were identified (see Figure 9). However, this was reported as a broader, more pervasive issue in all neighbourhoods. The frequency and intensity of flooding is most severe in the wet season but especially during August and September. The impact of flooding is varied but includes reduced accessibility, damage to property, closure of schools and workplaces, and an increase in health problems. A metropolitanwide strategy to provide space for flooding in particular zones would help to encourage and discourage settlement in appropriate locations.



**Figure 9:** Localised surface flooding along United Nations Drive between downtown Monrovia and West Point (Source: Author, 2016).

**Wind and storms:** This was a less serious and frequent concern than flooding. It was reported in all four neighbourhoods but was more prevalent in more exposed areas immediately on the coast (e.g., West Point) or elevated areas (e.g., Peace Island). The impacts identified were mostly limited to damage to building roofs. Liberia is not in a hurricane zone, so theoretically this problem could be easily mitigated through improved construction.

**Lightning:** The risk of lightning strikes and the resulting fires was not reported in every neighbourhood. It was an infrequent occurrence during severe storms with fairly minor impacts.



## C. Nonclimatic

**Tenure:** Land ownership and tenure is a spectrum that remains quite unclear across much of Monrovia. However, there are specific instances where high insecurity is known and directly associated with a communitywide lack of ownership or tenure. Peace Island is one example where it is known that the land is privately rather than publicly owned and the inhabitants are all squatters. The identity of the private owner is unknown, and it is unclear whether the state recognizes this ownership. This legal condition significantly increases the risk profile of the neighbourhood.

**Fire:** This was reported in several neighbourhoods as an infrequent risk that might affect a few properties a year. The cause was generally attributed to candles used for lighting and mosquito repellent coils, and to oil fires from cooking. Given the proximity of buildings and the predominant wooden roof construction, fire tends to spread locally to surrounding buildings.

**Hygiene and sanitation:** The overarching lack of improved sanitation systems is a chronic concern<sup>1</sup>. Initial profiling of West Point in 2015 indicated 22 latrines for a population in excess of 60,000 people. Almost no households in the communities visited have toilets, and communal facilities serving slum communities are too few and of poor quality with no capacity to empty septic tanks. The vast majority of people resort to open defecation, or when they can afford it use communal toilets that simply empty into drainage channels or overflow during the rainy season. The resulting pollution of ground and surface water from raw sewage and solid waste was widely reported and immediately visible. It is difficult to fully quantify the impact of this hazard on public health within this report, but a correlation clearly exists. Monrovia City Corporation was running a waste collection service that reportedly improved the situation and was instrumental in dealing with the Ebola outbreak. However, this service has ceased because of a lack of funding. The issue of sanitation is perhaps more pervasive, as it requires more complex technical solutions and sociocultural buy-in.

**Infestation and disease vectors:** The presence of rodents and insects was also reported as a low-level hazard. The wet season and stagnant water were identified as focal points for infestation. Given the prevalence of malaria, this is an obvious risk, and diseases from rodents and other insects present other transmission routes. The direct impacts were not immediately attributed or quantified.

## D. Broader socioeconomic conditions

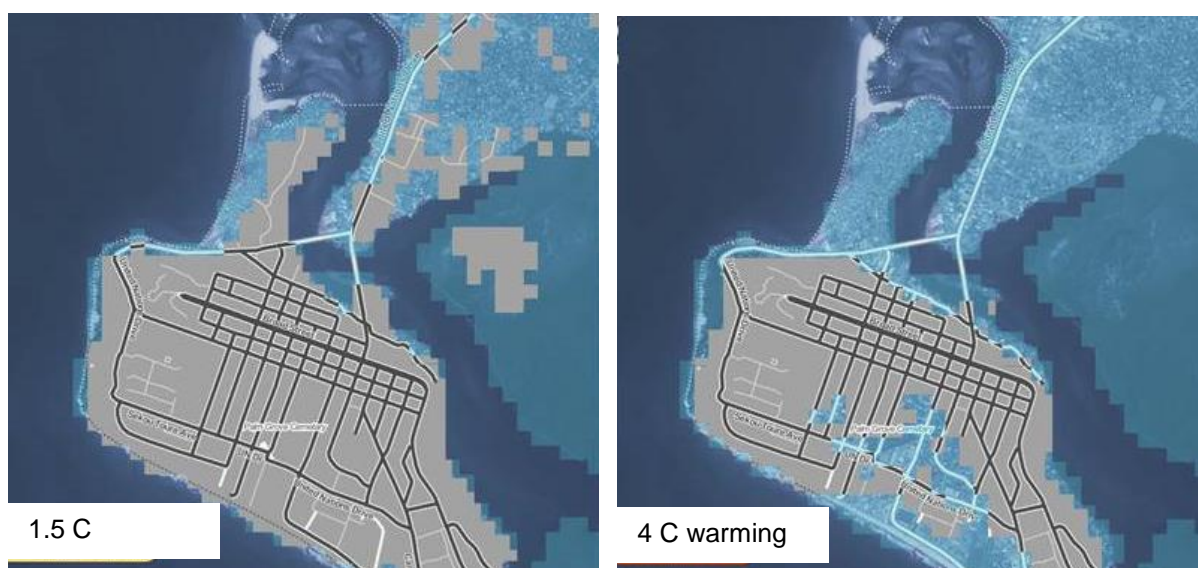
Underlying socioeconomic conditions exacerbate the vulnerabilities associated with the risks and hazards identified above. Food insecurity was a frequently reported concern and is a clear indicator of the economic vulnerability associated with poverty. When asked, several neighbourhood groups identified food, education and health as their main priorities for potential additional spending. The underlying reality of limited economic development, unemployment or underemployment, and a lack of savings all contribute to low-level resilience.

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<sup>1</sup>.Initial profiling of West Point in 2015 indicated 22 latrines for a population in excess of 60,000 people.

## 5. Climate change

Given the prevalence of climate-related risks and the exposure of Monrovia to climate change, potential impacts and adaptation measures must be considered. The available data projections associated with climate change exposure in Liberia are coarse and uncertain. Further research and particularly more granular assessments (e.g., see Figure 10) should be carried out. Several identified risks, such as increased flooding and erosion, will be exacerbated by climate change and should be considered in all future planning and development work.



**Figure 10:** Estimated impact on Central Monrovia, West Point and Clara Town of sea level rise by 2200 based on NATHAN Risk Suite (Source: Prepared on request by Munich RE, 2016).

The above diagrams show which areas of Central Monrovia will be inundated by predicted sea level rises as climate-change-induced sea level rises occur. By 2200, all but the highest areas of Central Monrovia and most areas occupied by informal settlements will be underwater. West Point is the area top centre, and the Samuel Doe Community is at the top left.

### A. Data and exposure

The most informative climate change source identified during this assessment was published by USAID in October 2014, titled *Mapping the Exposure of Socio-economic and Natural Systems of West Africa to Coastal Climate Stressors*. The data are primarily limited by the quality of satellite imagery to ascertain topography and questions over the accuracy of certain surveys, particularly the road network. Moreover, the area covered is vast and stretches from Cameroon to Guinea-Bissau. A Social Vulnerability Index, or SVI, and Economic Systems Index, or ESI are used to quantify the projected impacts of climate-related stressors. For the purposes of this report, the SVI is used primarily as it represents the “population exposure to coastal impacts as well as the poverty, education, and conflict levels that might indicate higher levels of ‘defenselessness.’” In contrast, the ESI is heavily influenced by Liberia’s low level of capital assets.

Three key points are noted in relation to exposure around Monrovia. Firstly, the coastal zone is defined as a 200-kilometer strip from the coastline inland. As the authors state, “The areas covered are somewhat larger than what might normally be construed as ‘coastal,’ but we have included a larger area in recognition of the fact that the economic impacts of climate change in the coastal zone will not be confined to the coastline itself, but will extend further inland. This is especially the case if one considers not only direct impacts but also secondary impacts on livelihoods and economies tied to coastal cities” (see Figure 12). Secondly, in relation to climate change, Liberia is currently ranked within the top 15 most vulnerable countries in Africa, and sixth in West Africa in absolute numbers of people exposed to climate change risk. However, Liberia is a small country, and when taken as a percentage of the population, Liberia rises to second, with 25 percent of the population exposed. Thirdly, in projections across West Africa to 2050, Liberia rises to second in absolute numbers, which is alarming given that only one country in the study has a smaller total population (see Figure 11).

Thus, by comparison to neighbouring countries, it appears that Liberia is uniquely exposed to climate change risk.

| Country       | 0-5 meters (2010) | 0-5 meters (2050) | Exposed population |
|---------------|-------------------|-------------------|--------------------|
| Benin         | 1,290,406         | 2,302,618         | 12%                |
| Cameroon      | 822,134           | 1,692,305         | 3%                 |
| Ghana         | 536,922           | 864,562           | 2%                 |
| Guinea        | 1,033,318         | 1,731,232         | 9%                 |
| Guinea-Bissau | 303,377           | 510,810           | 17%                |
| Cote d'Ivoire | 663,636           | 1,690,100         | 3%                 |
| Liberia       | 704,139           | 4,797,432         | 16%                |
| Nigeria       | 9,463,101         | 41,577,719        | 5%                 |
| Sierra Leone  | 307,686           | 499,025           | 5%                 |
| Togo          | 277,135           | 988,469           | 4%                 |

**Figure 11:** Populations located within 5 meters of sea level (Source: Author, based on USAID, 2014)



**Figure 12:** Social Vulnerability Index map (Source: Author, based on USAID, 2014)

## B. Consequences and potential impacts

The consequences of climate change are principally sea level rise and increasing storm surge. Regional climate models over Liberia project mean annual temperature will increase by 1.3 degrees Celsius and annual rainfall by 3 percent by 2050. The resulting sea level rise is projected to be 0.4 to 0.7 meters by 2100 (see Figure 13). Storm surge can greatly expand the area affected by seaward impacts. Monrovia already faces storm surges with high winds and intense wave action, and this pattern is likely to increase and perhaps intensify as a result of higher sea surface temperatures.

Sea-level rise and storm surge will likely result in inundation, erosion and saltwater intrusion. In some areas, coastal wetlands will migrate inland as a result. According to Parry, et al., “In the Gulf of Guinea, sea-level rise could induce overtopping and even destruction of the low-barrier beaches that limit the coastal lagoons, while changes in precipitation could affect the discharges of rivers feeding them.” The risk associated with coastal erosion is that it will lead to a reinforcing cycle if the natural defensive buffers become compromised.





**Figure 13:** Urban areas and Low Elevation Coastal Zone (Source: USAID, 2014)

In more immediate terms, research in the region by Agbola and Agunbiade indicates that the frequency and magnitude of urban flooding and its impacts have more than doubled recently, owing to population growth and settlement in flood-prone areas, and the more intense and frequent rainstorms potentially associated with climate change. Epidemics are associated with rainfall in Liberia, and most diseases are prevalent during the rainy season. Projected increases in rainfall and floods, combined with poor access to health facilities, poor hygienic practices, and lack of access to safe drinking water will cause increasing susceptibility to disease outbreaks of malaria, cholera and diarrheal diseases.

## 6. Possible responses and solutions

### A. National and municipal level

- Conduct a detailed metropolitan scale analysis of the topography and drainage options in order to guide development. Adopt Urban Promotion Areas and Urbanization Control Areas similar to those proposed by JICA. Useful examples where flood zones are accommodated in parks with floodable programming can be found in Beira, Mozambique, or in Curitiba and Bogota, Colombia.
- Make maps of climate impact and potential sea erosion exposure in order to identify a spectrum of appropriate settlement locations, from nonviable locations that require relocation to high-risk-investment locations that require significant public- or private-

sector redevelopment, to lower-risk-investment locations that could be densified and accommodate relocated populations.

- Promote the incorporation of climate change adaptation measures into all planning and development processes. In particular, the co-benefits for other sectors (especially transport and housing) should be strongly considered.
- Research and implement an economic development strategy with a core focus on livelihoods.
- Build capacity at MCC, particularly among the technical staff, to mainstream climate change measures, expand finance and guide the varied processes of slum upgrading.
- Expand and promote significant investment in basic urban infrastructure, including housing. This should be considered in terms of economic stimulus or job creation, not just as service provision projects.

## B. Settlement level

- Conduct relocation studies for the most hazard-prone and high-risk settlements in consultation with residents. In particular, this should focus on moving away from natural drainage lines and flood zones. Such studies should in particular consider sea level rises as a result of climate change and the costs quantified against these predictions.
- Establish livelihood programs with a view toward reinvigorating the manufacturing and production sectors — potential links to market programming.
- Improve drainage and other basic infrastructure, including access and sanitation in settlements that are not at immediate risk and do not need to be relocated. Such upgrading should be “future proofed” against predicted environmental changes.
- Improve waste management in an effort to reduce health impacts.
- Collect survey data on the current issues and predicted impacts across settlements in order to lobby and inform decision-making processes.

## C. Housing sector

The biggest concern with housing is not the buildings themselves but where and how they are located.

- Relocate from the worst areas and promote consolidation in areas that can sustain higher density.
- Establish greater variance between internal floor levels and outside drainage levels by raising floors and deepening drainage. Additionally raising septic systems is essential when considering household sanitation, although the cost would be significant.
- Foster better materials and construction techniques by expanding finance and credit.
- Improved construction guide — there might be some limited scope for this — a short guide on the cost and benefits of higher floor levels, alternative foundation design, improved roof fixings, and other topics. However, this probably remains primarily an economic obstacle rather than a technical one.

## 7. Conclusion

This report has presented initial findings of an hazard and vulnerability assessment of greater Monrovia based on a macro review of existing data and informed by focus group discussions held in four neighbourhoods. Greater Monrovia is a high-risk environment that faces challenges compounded by low levels of economic development and exacerbated by the impact of climate change.

The most alarming risks are experienced in low-income informal, or slum, communities. At the local level, several strategies could be pursued to reduce these risks, including:

- **Settlement planning:** Minimise construction in and around natural drainage lines and flood zones and consider reopening or rehabilitating historical natural channels.
- **Waste management:** Clear drainage lines more frequently and encourage use of collective waste sites.
- **Sanitation:** Expand and promote the use of sanitation facilities.
- **Fire mitigation:** Promote safer practices and consider a voluntary community-level fire service.
- **Improved construction:** There may be scope for training in improved construction techniques, though this probably remains primarily an economic obstacle rather than a technical one.
- **Livelihoods:** Identify potential industries and trades that could be developed at the local level in order to serve the domestic market.

However, the systemic nature of the risks identified and the scale of investment required means that a community-level response will have limited impact without a metropolitan scale strategy, which could include the following:

- **Relocate and densify:** The viability of certain areas is questionable, and others are underdeveloped. A zoning strategy for areas of urban promotion and urbanization control would help to guide settlement patterns. This should take account of proximity to economic opportunities, sea erosion, flooding and climate change impacts.
- **Infrastructure development:** The expansion of access to basic services (roads, water, sanitation, electricity, etc.) would improve the developmental trajectories of the population and mitigate risk. Potential investments are relatively well-quantified by JICA and should be considered in terms of economic stimulus or job creation, not just as service provision projects.

There are several gaps in the data used for this study and areas where further work is required. These include but are not limited to:

- **Community profile data:** This was unavailable at time of writing and should be reviewed upon receipt from SDI. This data may alter the underlying assumptions of this assessment.
- **GIS data:** LISGIS has a repository of geospatial data for Monrovia that was not available for this assessment. This data should be sourced, reviewed and analysed to inform future strategies. In particular, vector-based topographic datasets would help to inform decision-making.

- **Topographic and drainage study:** Given the levels of rainfall, low-lying land and flooding, a detailed topographic and drainage study for the metropolitan area would greatly assist with future planning.
- **Climate change impacts:** A granular impact study of sea level rise and storm surge would help to inform decisions on where to promote and discourage settlement, and focus adaptation investments.



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## 9. Annexes

- A. Logan Town Focus Group Discussion Notes and Maps
- B. Peace Island Focus Group Discussion Notes and Maps
- C. Samuel Doe Focus Group Discussion Notes and Maps
- D. West Point Focus Group Discussion Notes and Maps

## A. Logan Town Focus Group Discussion Notes and Maps

### Interview Guide Focus Group Discussion for Community Hazards and Risk Vulnerability Assessment — Blameh Town — Part of Logan Town

#### Introduction

Presentation of the program:

- Working as part of the Cities Alliance Project — intended to complement other aspects of the project, such as the analysis of current housing value chains.
- Interested to see what kind of problems affect communities — fire, flooding, etc. — and whether these are seasonal or changing and getting worse.

#### **Record of interview:**

**Date of interview:** 09 Sept 2016\_\_\_\_\_      **Interviewers:** Jake Zarins and Darren Gill\_\_\_\_\_

***Initial individual interview — data recorded in Excel from each person before starting the group interview, as they arrive. No more than five minutes.***

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| <p><b><i>Personal information.</i></b></p> | <ul style="list-style-type: none"> <li>• Name and occupation.</li> <li>• How many people live in your home?</li> <li>• Location of home in settlement (approximate mark on map).</li> <li>• How long have you and/or your family lived in this settlement?</li> </ul> <p>Blameh Town is a subdivision of the Logan Town settlement made up of six “blocks” and home to approximately 6,000 people (as per last census).</p> <p><b>Attendance:</b> This group was too large to be considered a focus group; it was more like a community meeting. Facilitation of the meeting arrangements may not have been clear enough, but it was not possible to ask people to leave without causing considerable issues and misunderstanding.</p> <p>Approximately 50-60 people were present (vast majority female). Thirty people introduced themselves (27 female, three male).</p> |
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***Focus group discussion introduction***

- Thanks for coming. We are grateful for your time.
- On behalf of Habitat and Cities Alliance, we have organized these discussion groups to try to know and better understand the hazards and risks that your community faces.
- We ask your permission to take notes of this discussion. Please do not worry, and feel free to share your views.
- We will first introduce ourselves.

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| <p><b><i>Climate- and weather-related hazards and risks</i></b></p>   |  |
| <p>From a climate or weather perspective, what are the main issues or events that take place in the locality every year?</p> <p>Issues might include (i) flooding, (ii) heavy rainfall, (iii) drought, (iv)</p> | <p>Flooding.</p> <p>Wind storms.</p> <p>Dry water wells in the dry season.</p> |

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| storms/cyclone, (v) landslides, (vi) riverbank erosion, (vii) sea encroachment.   |   |
| When do they take place (approximately what month or frequency and for how long)?   | <p>Wind storms occur for one to two months every year around October/November.</p> <p>Flooding occurs during the wet season (April-October) but the worst flooding is normally during July, August and September, when it rains for days at a time and floods the area for one to two days per week.</p> <p>Wells can dry up around February/March as water table drops.</p>  |
| What areas in the community are most affected (show on map)?  | Wind storms and flooding affect the entire community – and apparently the whole of Logan Town, which is built in a former mangrove swamp. As well as surface flooding, water sometimes comes up as the water table rises.   |
| What are the effects on the broader community?  | <p>Wind storms can destroy the roofs of houses and leave people exposed.</p> <p>Flooding:</p> <ul style="list-style-type: none"> <li>• Water can be ankle- or knee-deep, and about half the community have flooding into their homes.</li> <li>• Ground is moving and sinking, so buildings crack and are eroded but generally don't collapse.</li> <li>• Houses must be repaired every year because of physical damaged caused by flooding, but only half the community can afford to make these repairs.</li> <li>• Health consequences caused by damp conditions include infections, disease, malaria, etc.</li> <li>• Movement is restricted, as people must stay in their homes until the flooding recedes. This reduces the ability for people to get to work, which affects their livelihood. It also reduces the number of customers in the area, which is bad for local businesses.</li> <li>• Access for food, drinking water, materials and products is restricted during floods. Products must be sold for the same price, so profit margins are lower which affects businesses in the area.</li> <li>• Rental charges in flood-prone areas are lower, which is bad for landlords.</li> <li>• Schools close when flooded.</li> </ul> <p>Lack of water supply means people must travel outside the community and carry water back.</p> |
| <b>Climate/weather changes</b>  |   |
| What are the main changes (if any) in climate-related hazards that have taken place in the community over the last few years? | Increased flooding – the wet season is longer now than it used to be and can stretch into December/January.   |
| How are they different from the original situation?   | See above.  |
| When did you first notice the change (year, if possible) and where?<br>How can you measure the change?                        | Last three to five years.   |

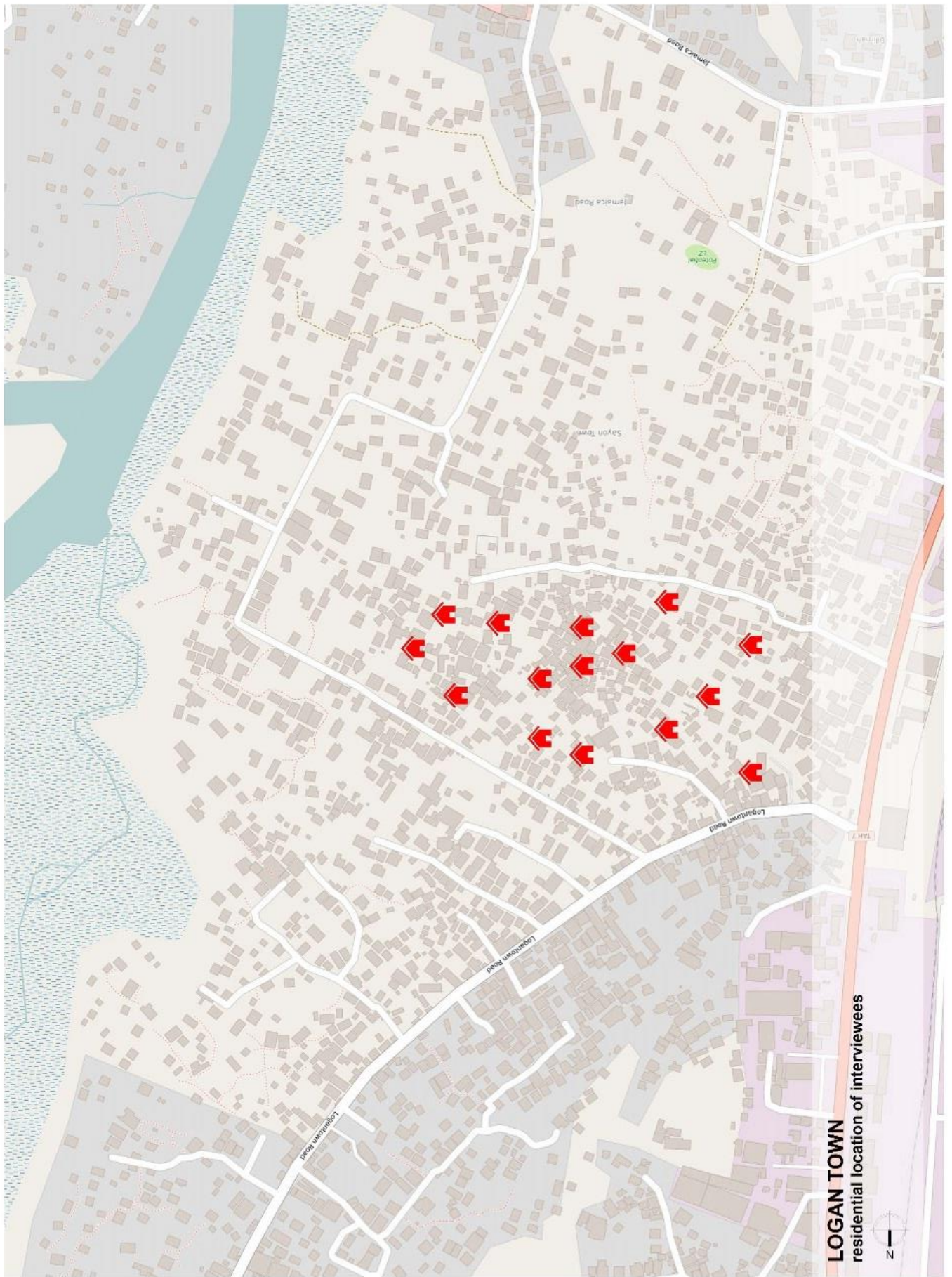


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| What areas in the community are vulnerable to this change (show on map)?   | Uniform surface flooding across the community.  |
| What do you think are the main causes or reasons for the change?   | Unsure. Potentially climate change.   |
| What are the effects of the change that you have seen so far?  | More homes and businesses are flooded and more frequently, which exacerbates the effects described above.   |
| What aspects of personal and community life are vulnerable to this change?   | Business profits are lower in the wet season, so people now make less money.  |
| What do you think will be the likely effects in the medium to long term? How would you rate the consequence of this change (not bad, bad, very bad)?                                     | Unknown. But assume it will get worse.  |
| <b>Nonclimatic hazards</b>   |   |
| What are the main nonclimatic hazards, issues or events that take place?<br><br>Issues could include fire, hygiene (sanitation/waste related or other), social (crime, violence etc.).   | Garbage: There is no waste disposal system in the community so the area is dirty and the drainage lines get blocked.<br><br>Toilets: No household toilets, and existing community toilets are inadequate and can overflow.<br><br>Water: There's no water service other than a few wells, which can be dry in the dry season and polluted in the wet season.<br><br>There were no reports of fire in the community over the last 12 months. |
| What areas in the community are most affected (show on map)?   | Uniform effects across the area.  |
| What are the causes of these issues?   | Low incomes.<br><br>Lack of infrastructure and services — there is no municipal garbage collection.<br><br>Septic tanks aren't cleaned out.<br><br>Water table varies from as deep as 6 feet in the wet season to 15 feet in the dry season.<br><br>Community cohesion appears weak between different areas of Logan Town.  |
| What are the effects on the community?   | Increased illness, particularly malaria and stomach problems.   |
| <b>Negative community practices</b>  |   |
| What practices contribute to <u>increase</u> the vulnerability of the neighborhood/community?  | Dumping of waste into drainage and other communal areas. Some people refuse to clear out the drainage lines or to help maintain communal cleanliness. Real lack of "communal" approaches to solving issues.<br><br>Open defecation.   |
| What can be done to raise awareness of the negative effects or prevent such practices?   | Objections should be raised with the community chairman to get more equitable coverage.   |
| <b>Positive community practices</b>  |   |
| What practices, cultural values and institutional arrangements could contribute to increasing the resilience of the neighbourhood/community to the impacts of climate and other changes? | Groups do mobilize in some areas to clear out the drainage lines periodically. It takes three to six months for the drainage lines to become blocked again.<br><br>Government support for tools/food needed to make this happen.  |
| What should government do? What should community groups do (specify)?  | The government or NGOs should fix the toilets, provide housing, put in water supply and do garbage collection.  |

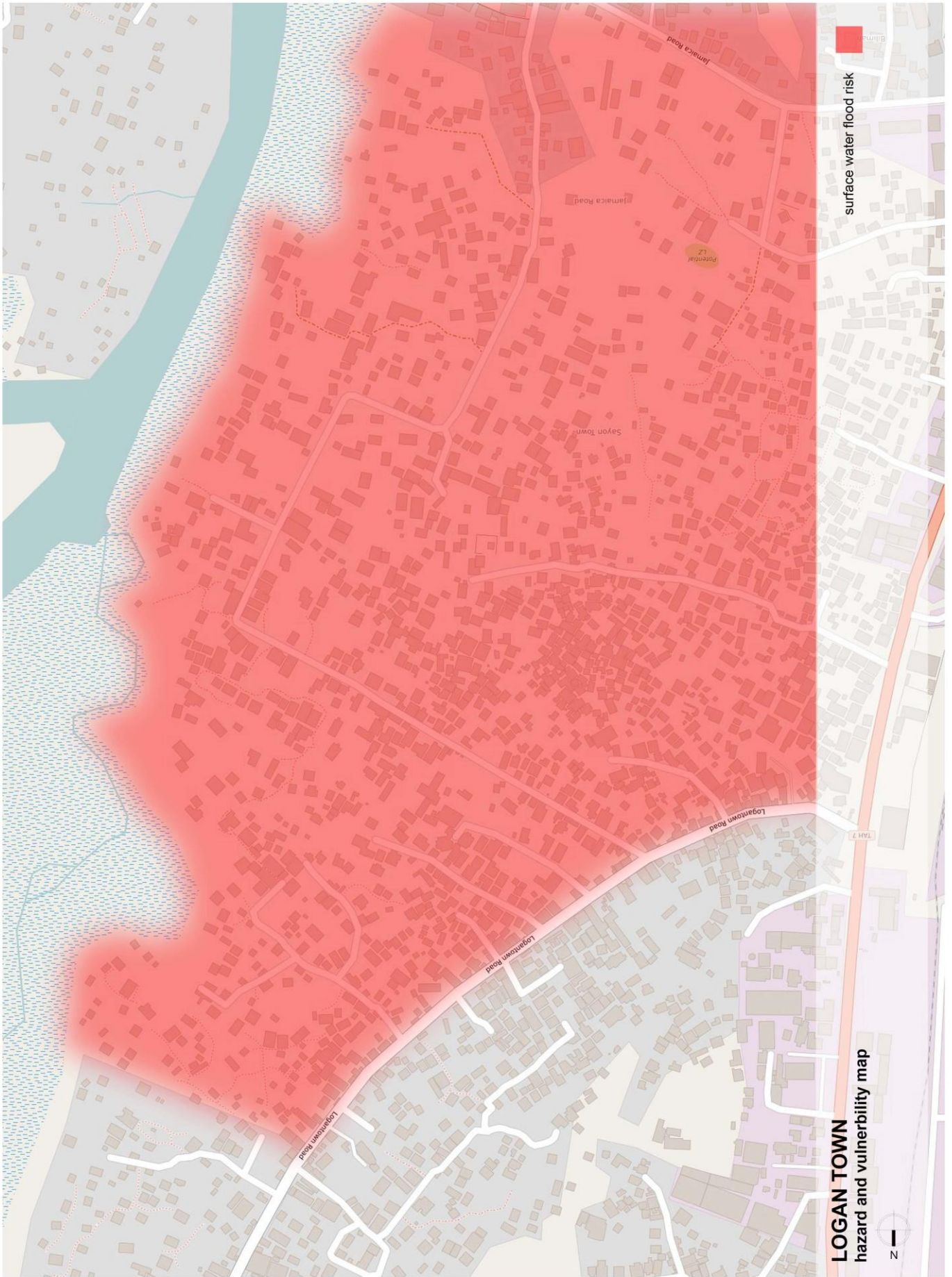
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| What should family/individuals do? How have people coped with such change(s) in the past?                   |   |
| Can such traditional coping mechanisms be applied in the present context (Elaborate)?                       | The area is quite territorial, so only some areas are mobilized to clear drains. This must be changed so all areas can be addressed.  |
| <b>Final comments</b>   |   |
| Of the risks and hazards you've identified, which are of most concern to you (climate, social or economic)? | If we had more money, we would prioritize education, businesses, health and then housing. There are very few jobs in this area and no public schools.   |
| Do you have any comments or suggestions for us?   | All owners have "squatters rights" forms of tenure. No deeds, etc.<br>Rent for block house = US\$10-15.<br>Rent for tin sheet shack = US\$6-10.<br>Material and size dictate cost rather than location. |

Attendance list (year of arrival in community/tenure status)

1. 1980/owner
2. 1972/owner
3. 1980/owner
4. 1986/renter
5. 1984/owner
6. 2001/renter
7. Born there/renter (approximately 24-28 years)
8. 2002/owner
9. 2014/renter
10. 1978/renter
11. 1994/renter
12. 1997/renter
13. 1989/owner
14. 1994/owner
15. 2007/renter
16. 2001/owner
17. 1986/owner
18. 1997/renter
19. 1991/owner
20. 2006/owner
21. 1990/owner
22. 1996/owner
23. 2000/owner
24. 1988/owner
25. 1990/owner
26. 1978/owner
27. 2000/owner
28. 1981/owner









## B. Peace Island Focus Group Discussion Notes and Maps

### Interview Guide Focus Group Discussion for Community Hazards and Risk Vulnerability Assessment -- Peace Island

#### Introduction

Presentation of the program:

- Working as part of the Cities Alliance Project — intended to complement other aspects of the project, such as the analysis of current housing value chains.
- Interested to see what kind of problems affect communities — fire, flooding, etc. — and whether these are seasonal or changing and getting worse.

#### **Record of interview:**

**Date of interview:** 12 September 2016 \_\_\_\_\_ **Interviewers:** Jake Zarins and Darren Gill

***Initial individual interview — data recorded in Excel from each person before starting the group interview, as they arrive. No more than five minutes.***

#### ***Personal information.***

- Name and occupation.
- How many people live in your home?
- Location of home in settlement (approximate mark on map).
- How long have you and/or your family lived in this settlement?

**Attendance:** 26-28 people (five women) and mix of elders and youth.

Peace Island was settled in the last 10 years and is a large island surrounded by mangrove swamps with significant elevation at its highest point and of rock/laterite. Access is via one bridge of infill and rubble through the swamp.

#### ***Focus group discussion introduction***

- Thanks for coming. We are grateful for your time.
- On behalf of Habitat and Cities Alliance, we have organized these discussion groups to try to know and better understand the hazards and risks that your community faces.
- We ask your permission to take notes of this discussion. Please do not worry, and feel free to share your views.
- We will first introduce ourselves.

#### ***Climate- and weather-related hazards and risks***

From a climate or weather perspective, what are the main issues or events that take place in the locality every year?

Issues might include (i) flooding, (ii) heavy rainfall, (iii) drought, (iv) storms/cyclone, (v) landslides, (vi) riverbank erosion, (vii) sea encroachment.

- **Flooding:** During rainy season around the perimeter of the community where Peace Island meets the swamp.
- **Erosion:** During the rainy season and due to the slopes, this is a problem across the community. The community was settled quickly (land invasion), and people are now building across space left for access or drainage, which makes the erosion worse.
- **Storms (wind):** Can occur throughout the year but used to be traditionally around March-May.
- **Water table:** Due to elevation, the table drops significantly in the dry season and the wells run dry. In the wet season, the wells become polluted from flooding, as they are mainly at the

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|   | <p>lower points of the settlement; well-digging is impossible at higher elevations due to the bedrock.</p> <ul style="list-style-type: none"> <li>• Lightning: Due to elevated position, lightning strikes can occur and hit buildings in the area.</li> </ul>  |
| When do they take place (approximately what month or frequency and for how long)?   | <ul style="list-style-type: none"> <li>• Flooding and erosion: Worst months are August and September.</li> <li>• Storms: Traditionally March-May but now at any time.</li> <li>• Water table: Driest months are March-April.</li> </ul>   |
| What areas in the community are most affected (show on map)?  | <ul style="list-style-type: none"> <li>• See map — flooding mostly around the perimeter.</li> <li>• Storms mostly affect areas of higher ground.</li> </ul>   |
| What are the effects on the broader community?  | <ul style="list-style-type: none"> <li>• Houses can be damaged and destroyed by flooding and erosion. Everyone needs to repair homes every year after the rainy season, but not everyone can afford to. Erosion undercuts the buildings and damages the roads.</li> <li>• Water flowing down the hill washes waste through homes, and dirty water enters the wells.</li> <li>• Storms can lift off the roofs of houses.</li> <li>• The entrance road can be blocked by floods — normally about once a year for a week or so. This makes it harder to bring in resources (food, products, materials, etc.) and for people to get out to work and school.</li> <li>• Storms mostly affect areas of higher ground.</li> <li>• When the road is bad, access is reduced and costs increase, children can't go to school, etc.</li> </ul> |
| <b>Climate/weather changes</b>  |   |
| What are the main changes (if any) in climate-related hazards that have taken place in the community over the last few years? | <ul style="list-style-type: none"> <li>• Rainfall has been heavier, which results in worse flooding and more erosion.</li> <li>• Storms now happen throughout the year — not just in March-May.</li> </ul>  |
| How are they different from the original situation?   |   |
| When did you first notice the change (year, if possible) and where?<br>How can you measure the change?                        | <ul style="list-style-type: none"> <li>• Around the year 2000.</li> </ul>   |
| What areas in the community are vulnerable to this change (show on map)?  | <ul style="list-style-type: none"> <li>• Flooding is more of a problem around the perimeter near the swamp.</li> <li>• Storms are mostly a problem at the central/high-elevation points of Peace Island.</li> </ul>   |
| What do you think are the main causes or reasons for the change?  | <ul style="list-style-type: none"> <li>• Unknown. Potentially climate change.</li> <li>• Effects of the storms are worse because we've cut down trees for fuel, so there's less protection from the winds.</li> </ul>   |
| What are the effects of the change that you have seen so far?   | <ul style="list-style-type: none"> <li>• Entrance road was blocked for a week. That's never happened before.</li> <li>• More houses damaged by storms.</li> </ul>   |

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| What aspects of personal and community life are vulnerable to this change?   | <p>Flooding and erosion:</p> <ul style="list-style-type: none"> <li>Homes and personal belongings lost.</li> <li>Access: We can't get off the island, so kids can't get to school and people can't get to work.</li> </ul>  |
| What do you think will be the likely effects in the medium to long term? How would you rate the consequence of this change (not bad, bad, very bad)?   | <ul style="list-style-type: none"> <li>It's a security concern.</li> </ul>  |
| <b>Nonclimatic hazards</b>   |   |
| <p>What are the main nonclimatic hazards, issues or events that take place?</p> <p>Issues could include fire, hygiene (sanitation/waste-related or other), social (crime, violence, etc.).</p> | <ul style="list-style-type: none"> <li>Fire: Not very frequent but happens every year – normally affects one to two houses, and shacks are more susceptible than brick houses.</li> <li>Garbage: There's no collection, so it gets dumped everywhere and particularly in the swamp.</li> <li>Toilets: Some people dig their own septic tanks, but there's not enough water for them to work properly. Other people use hanging toilets over the swamp, which pollutes the area.</li> <li>Electricity: There's virtually no supply.</li> <li>Ants (mission ants) are a particular problem. They are everywhere and bite people. They can invade your home and are particularly a problem in the rainy season.</li> </ul> |
| What areas in the community are most affected (show on map)?   | <ul style="list-style-type: none"> <li>Ubiquitous problems — happen everywhere.</li> </ul>  |
| What are the causes of these issues?   | <ul style="list-style-type: none"> <li>Fire: Accidents with candles, fuel or cooking oil. No access for fire brigade.</li> <li>Limited sanitation facilities.</li> <li>Garbage: There's never been collection here. The MCC program did not reach us, or the fees per household were too much for people to afford.</li> </ul>  |
| What are the effects on the community?   | <ul style="list-style-type: none"> <li>Fire: People lose their homes.</li> <li>Garbage, toilets and ants: Mostly health problems.</li> <li>Electricity: Safety .</li> </ul>   |
| <b>Negative community practices</b>  |   |
| What practices contribute to <u>increasing</u> the vulnerability of the neighbourhood/community?   | <ul style="list-style-type: none"> <li>Waste dumping — people leave rubbish everywhere.</li> <li>Open defecation.</li> </ul>  |
| What can be done to raise awareness of the negative effects or prevent such practices?   |   |
| <b>Positive community practices</b>  |   |
| What practices, cultural values and institutional arrangements could contribute to increasing the resilience of the neighbourhood/community to the impacts of climate and other changes?       | <ul style="list-style-type: none"> <li>Garbage collection: The community organizes groups of people three to four times a year to clear up the area.</li> <li>Road fixing: The community patches up the entrance road once or twice a year. This helps but is not a sustainable solution.</li> <li>Above usually done through mobilization of the youth.</li> </ul>   |
| What should government do? What should community groups do (specify)?  | <ul style="list-style-type: none"> <li>Water: Piped water or drill proper wells so we have year-round access to water.</li> <li>Electricity.</li> </ul>   |

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|   | <ul style="list-style-type: none"> <li>• Provide a health center.</li> <li>• Toilets/sanitation.</li> </ul>                                   |
| What should families/individuals do?<br>How have people coped with such changes in the past?                | <ul style="list-style-type: none"> <li>• Not throw their garbage everywhere or open defecate. But there are no facilities.</li> </ul>         |
| Can such traditional coping mechanisms be applied in the present context (elaborate)?                       |   |
| <b>Final comments</b>   |   |
| Of the risks and hazards you've identified, which are of most concern to you (climate, social or economic)? | <ul style="list-style-type: none"> <li>• Priorities for residents if we have more money are food, education, health, then housing.</li> </ul> |
| Do you have any comments or suggestions for us?   | <ul style="list-style-type: none"> <li>• Do something so we can live a decent life as real members of this city.</li> </ul>                   |

Attendance (name/position/time living in community)

1. Noah N. Doyah (Sec Gen Govt House) – 11 years
2. G. Dougbay Yeomay – 10 years (renter)
3. Alphous Slesseh – 5 years
4. Paul T. Summah (Chairman Block Forum for Development) – 6 years (renter)
5. Linda P. Kolleh – 5 years (renter)
6. Augustine GB Weah Jr. – 1 year (renter)
7. Solomon G. Kuoh (Rep Maryland County Govt House)
8. Samuel Doggolea
9. Edward Zeah
10. Mary D. Touleh – 6 years
11. Beatrice Dahn – 5 years (renter)
12. Benjamin Potter (Liberia Yanna Association) – 9 years
13. M.C. Mangoah (Elder Spokesman) – 10 years
14. Roland Barroke – 10 years
15. Irene Toweh
16. Patrick Brown – 9 years
17. Richard Giah – 11 years
18. Youtha K. Mangoal – 8 years
19. Alice Mahn
20. Abednego L. Miah
21. Gray Menyong Zuu
22. Peter W. Gbein – 11 years
23. Kame Kake – 10 years
24. Cyrus G. Touch – 5 years
25. Michael Winpea – 8 years
26. James Peter





**PEACE ISLAND**  
residential location of interviewees





**PEACE ISLAND**  
hazard and vulnerability map

surface water flood risk

## C. Samuel Doe Focus Group Discussion Notes and Maps

### Interview Guide Focus Group Discussion for Community Hazards and Risk Vulnerability Assessment – Samuel Doe Community

#### Introduction

Presentation of the program:

- Working as part of the Cities Alliance Project — intended to complement other aspects of the project, such as the analysis of current housing value chains.
- Interested to see what kind of problems affect communities — fire, flooding, etc. — and whether these are seasonal or changing and getting worse.

#### **Record of interview:**

**Date of interview:** 8 September 2016\_\_\_\_\_ **Interviewers:** Jake Zarins and Darren Gill\_\_\_\_\_

***Initial individual interview — data recorded in Excel from each person before starting the group interview, as they arrive. No more than five minutes.***

|                                     |  |
|-------------------------------------|--|
| <b><i>Personal information.</i></b> | <ul style="list-style-type: none"> <li>• Name and occupation.</li> <li>• How many people live in your home?</li> <li>• Location of home in settlement (approximate mark on map).</li> <li>• How long have you and/or your family lived in this settlement?</li> </ul> <p><b>Attendance:</b> 12 people (10 women, two men).</p> |
|-------------------------------------|--|

***Focus group discussion introduction***

- Thanks for coming. We are grateful for your time.
- On behalf of Habitat and Cities Alliance, we have organized these discussion groups to try to know and better understand the hazards and risks that your community faces.
- We ask your permission to take notes of this discussion. Please do not worry, and feel free to share your views.
- We will first introduce ourselves.

|   |   |
|---|---|
| <b><i>Climate- and weather-related hazards and risks</i></b>  |   |
| From a climate or weather perspective, what are the main issues or events that take place in the locality every year?                                       | Wind storms.<br><br>Flooding: Heavy rain and river/water table rising.  |
| Issues might include (i) flooding, (ii) heavy rainfall, (iii) drought, (iv) storms/cyclone, (v) landslides, (vi) riverbank erosion, (vii) sea encroachment. |   |
| When do they take place (approximately what month or frequency and for how long)?   | Wind storms occur for one to two months every year around October/November.<br><br>Flooding occurs during the wet season (April–October), but the worst flooding is normally during August and September. |
| What areas in the community are most affected (show on map)?  | Wind storms affect the entire community.<br><br>Flooding is concentrated in the bow along the river (see map), and along roads and historical drainage channels.  |



|  |  |
|--|--|
| <p>What are the effects on the broader community?</p>  | <p>Wind storms can destroy the roofs of houses and leave people exposed.</p> <p>Flooding:</p> <ul style="list-style-type: none"> <li>• Covers the internal floor of houses so people must shelter on tables, raised platforms, etc.</li> <li>• Ground is moving and sinking, so buildings crack and are eroded.</li> <li>• Houses must be repaired every year due to physical damaged caused by flooding.</li> <li>• People confined to houses for long periods – children can't go out, etc.</li> <li>• Riverbanks collapse, but generally houses do not. These are repaired with sand bags/rubbish each year when near housing.</li> <li>• Health consequences due to damp conditions include infections, disease, etc. Skin disease/fungus is an issue.</li> <li>• Movement is restricted, as people must stay in their homes until the flooding recedes. This reduces the ability for people to get to work, which affects their livelihood. It also reduces the number of customers in the area, which is bad for local businesses.</li> <li>• Access for food, drinking water, materials and products is restricted during floods. Products must be sold for the same price so profit margins are lower, which affects businesses in the area.</li> <li>• Rental charges in flood-prone areas are lower, which is bad for landlords. During flooding, some families leave, meaning no rental income.</li> <li>• Hygiene is bad. Human waste floods into houses and contaminates floodwaters. Only one septic tank in community, as the water table is just below the surface in most areas.</li> <li>• Rats are more visible during the rainy season as floods force them into homes. Mosquitos also are very bad.</li> <li>• Schools are at risk and often close or flood.</li> </ul> |
| <p><b>Climate/weather changes</b></p>  |  |
| <p>What are the main changes (if any) in climate-related hazards that have taken place in the community over the last few years?</p> | <p>Temperature: It has gotten colder in recent years during rainy season.</p> <p>Unpredictable weather: The rain, wind and dry weather has been less predictable. If anything, there has been less rain in recent years.</p> <p>Increased flooding: Five natural waterways and drainage used to keep the area free of flooding. These fed to the “football field,” which was a flood plain/seasonal pond, which is now filled in.</p> <p>Water moves down to the river from Cemenco and Somalia drive.</p> <p>The river has narrowed as people have filled the edges with rubbish and other material. Sand is dredged by hand from the river and piled onto the rubbish to help land reclamation.</p>  |

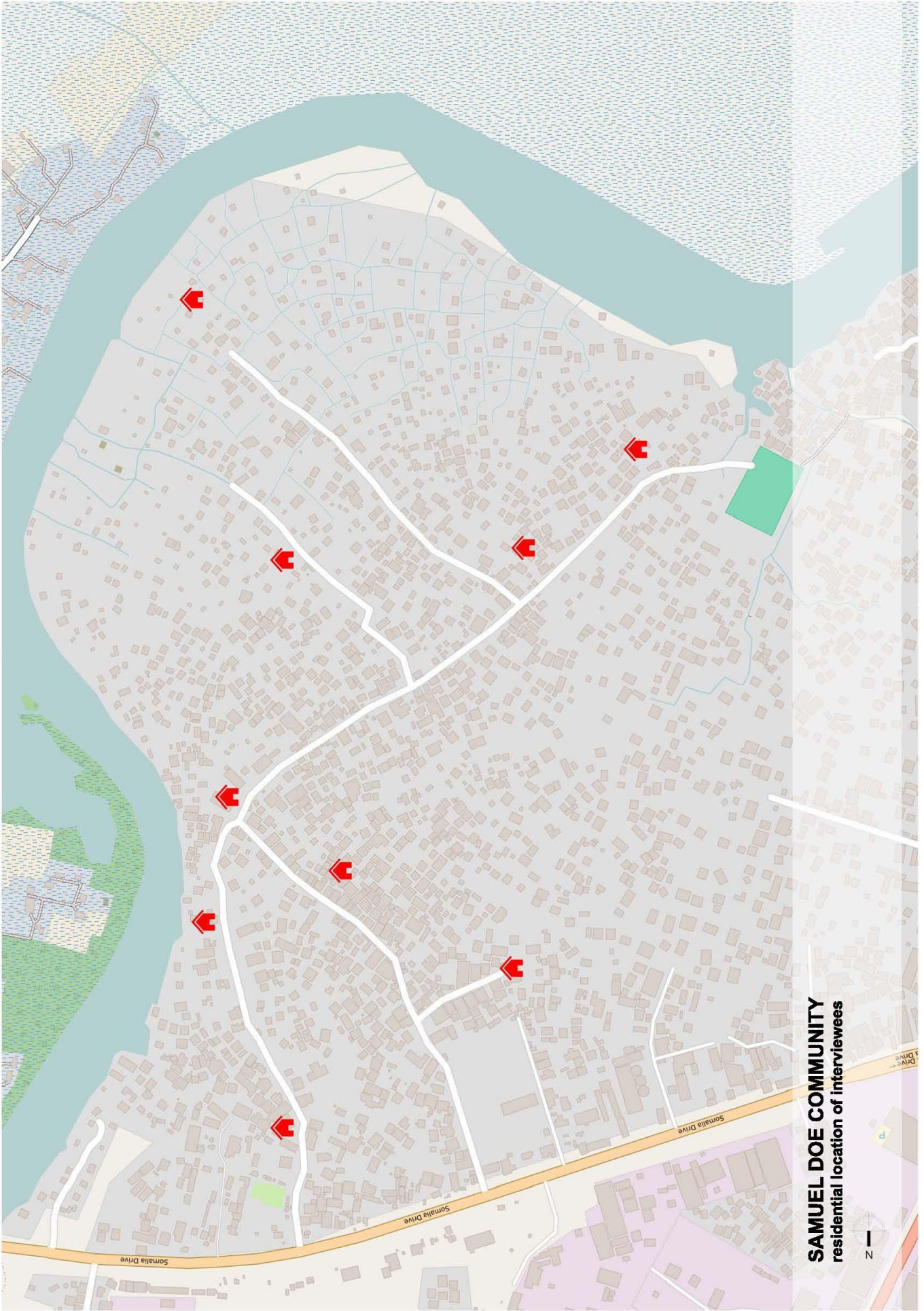
|   |   |
|---|---|
| How are they different from the original situation?   | See above.  |
| When did you first notice the change (year, if possible) and where?<br>How can you measure the change?  | Temperature and unpredictable weather within the last five years.<br><br>Flooding is noticeably different since the mid-1980s. Natural water channels were filled in and built over and flooding started – wasn't an issue prior to this on the separate "islands" originally settled.  |
| What areas in the community are vulnerable to this change (show on map)?  | Uniform effect across the community, but flooding most noticeable closer to the river.  |
| What do you think are the main causes or reasons for the change?  | Temperature and unpredictable weather is unknown. Potentially climate change.<br><br>Increased flooding is a result of more people and houses in the area. Houses are now built on the waterways and drainage lines. Also, rubbish dumping is blocking the drainage lines.  |
| What are the effects of the change that you have seen so far?   | More illness due to colder conditions.<br><br>More homes are flooded and more frequently, which exacerbates the effects described above.  |
| What aspects of personal and community life are vulnerable to this change?  | The young and old are more exposed to colder conditions.<br><br>Everyone is affected by increased flooding.   |
| What do you think will be the likely effects in the medium to long term? How would you rate the consequence of this change (not bad, bad, very bad)?                                    | Unknown.  |
| <b>Nonclimatic hazards</b>  |   |
| What are the main nonclimatic hazards, issues or events that take place?<br><br>Issues could include fire, hygiene (sanitation/waste related or other), social (crime, violence, etc.). | Poverty: People struggle to afford enough food for their families, and cannot send all their children to school.<br><br>Fire occurs three to four times a year and generally affects two to three houses each time there is a fire.<br><br>Rats, mosquitos and cockroaches are problems.  |
| What areas in the community are most affected (show on map)?  | Fire can occur anywhere.<br><br>Rats and cockroaches are mostly a problem closer to the river.<br><br>Mosquitos are everywhere.   |
| What are the causes of these issues?  | Fire is caused by candles used to protect against mosquitos, and electrical problems.<br><br>Rats and cockroaches feed off the garbage and are driven inland away from the river when it floods.  |
| What are the effects on the community?  | Fire results in loss of property and possessions.<br><br>Rats, mosquitos and cockroaches cause health problems.   |
| <b>Negative community practices</b>   |   |
| What practices contribute to <u>increase</u> the vulnerability of the neighbourhood/community?  | Building on the drainage lines and dumping rubbish; there is a huge problem created by bad behaviour in the community.<br><br>The river has also gotten deeper but narrower, which may or may not affect the absorption capacity and flooding. It's deeper due to dredging of sand for construction. It's narrower due to rubbish dumping along the banks of the river. |
| What can be done to raise awareness of the negative effects or prevent such practices?  | We clear the drainage lines sometimes (maybe once a year), and this demonstrates the impact of bad behaviour because the flooding isn't as bad when the drainage lines have been cleared.   |

| <b>Positive community practices</b>  |   |
|--|---|
| What practices, cultural values and institutional arrangements could contribute to increasing the resilience of the neighbourhood/community to the impacts of climate and other changes? | The community leadership has formed numerous councils that bring people together to discuss problems and reach agreements on what to do. This also helps identify locations for services, e.g., the new health clinic currently under construction is on land provided by the community. We are trying to find space for a public school and rubbish dump.<br><br>People make repairs every year to their housing if they can. Skills/knowledge not an issue. |
| What should government do? What should community groups do (specify)?  | The government should fix the road and dig proper drainage channels — including moving houses built on these channels.<br><br>The community should reinstate the drainage lines and keep them clear by not building on them or dumping rubbish in them.   |
| What should families/individuals do? How have people coped with such change(s) in the past?  |   |
| Can such traditional coping mechanisms be applied in the present context (elaborate)?  | It is difficult because the building and rubbish dumping frequently takes place at night, so we can't control it.   |
| <b>Final comments</b>  |   |
| Of the risks and hazards you've identified, which are of most concern to you (climate, social or economic)?  | The issue is money. If we had more money, we would prioritize food, education, health and then housing. There are very few jobs in this area and no public schools.   |
| Do you have any comments or suggestions for us?  | Stopping flood is a priority along with road promised by the president.   |

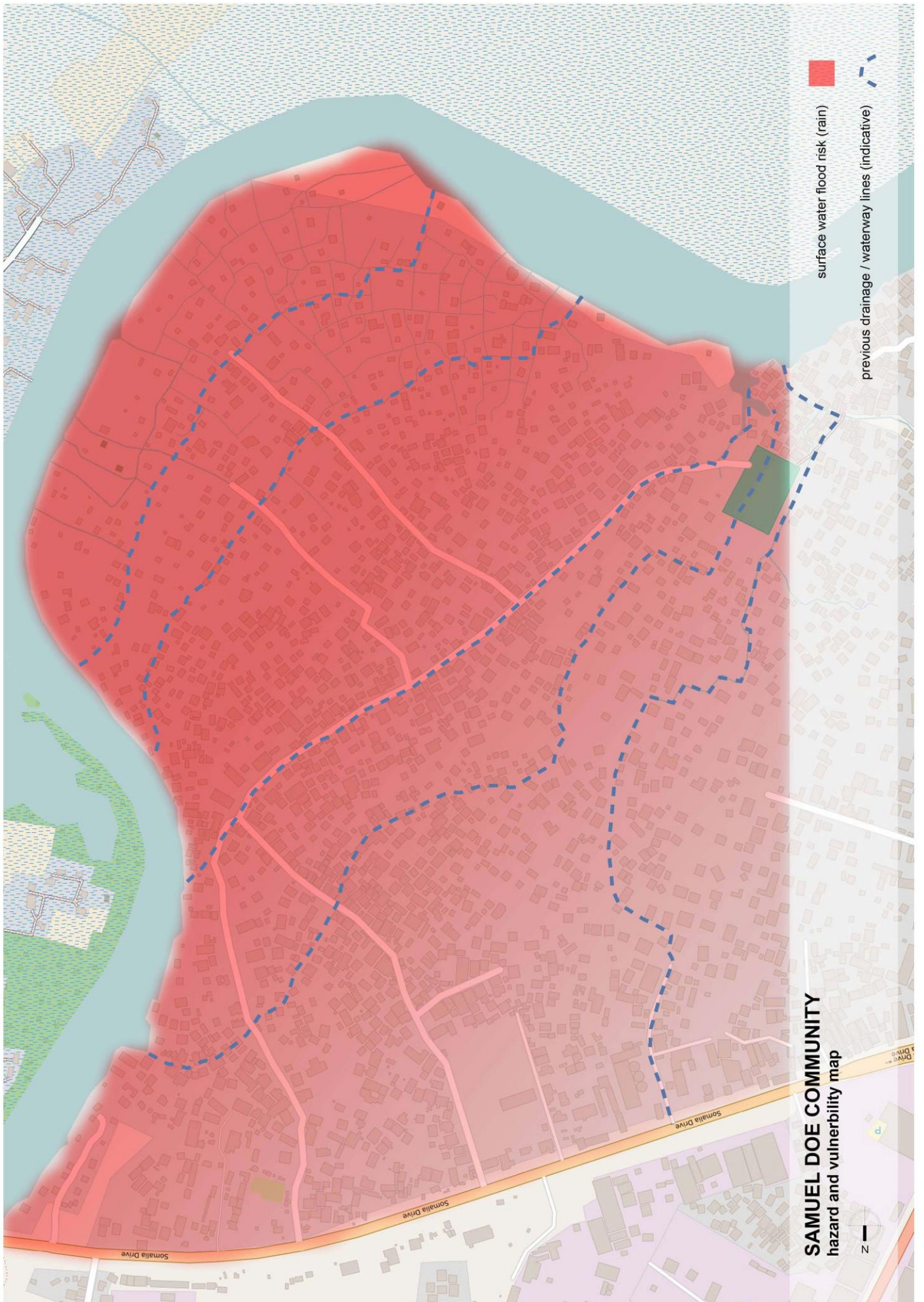
Attendance (name/position/time living in community)

1. Doris Kettor – 15 yrs
2. Mariah K. Abu (Chair lady) – 17 years
3. Sarah Wayan – 24 years
4. Josiah M. Cooper (Head and Tribal Chairman) – 31 years
5. Rudolph S. Buiman – 16 years
6. Amelia Massaquoi (Womens Group Leader) – 10 years
7. Bindu Yango – 30 years
8. Cecelia Sleonwon – 19 years
9. Mamie Page – 30 years
10. Benetta Dargba – 10 years
11. Precila Dolo – 15 years
12. Mary Varney – 36 years
13. Mary Sio – 12 years









## D. West Point Focus Group Discussion Notes and Maps

### Interview Guide Focus Group Discussion for Community Hazards & Risk Vulnerability Assessment -- West Point

#### Introduction

Presentation of the program:

- Working as part of the Cities Alliance Project — intended to complement other aspects of the project, such as the analysis of current housing value chains.
- Interested to see what kind of problems affect communities — fire, flooding, etc. — and whether these are seasonal or changing and getting worse.

#### **Record of interview:**

**Date of interview:** 7 September 2016\_\_\_\_\_ **Interviewers:** Jake Zarins and Darren Gill

***Initial individual interview — data recorded in Excel from each person before starting the group interview, as they arrive. No more than five minutes.***

|                                     |   |
|-------------------------------------|---|
| <b><i>Personal information.</i></b> | <ul style="list-style-type: none"> <li>• Name and occupation.</li> <li>• How many people live in your home?</li> <li>• Location of home in settlement (approximate mark on map).</li> <li>• How long have you and/or your family lived in this settlement?</li> </ul> <p style="text-align: center;">Attendance: 12 people (four women, eight men).</p> |
|-------------------------------------|---|

#### ***Focus group discussion introduction***

- Thanks for coming. We are grateful for your time.
- On behalf of Habitat and Cities Alliance, we have organized these discussion groups to try to know and better understand the hazards and risks that your community faces.
- We ask your permission to take notes of this discussion. Please do not worry, and feel free to share your views.
- We will first introduce ourselves.

|   |  |
|---|--|
| <b><i>Climate- and weather-related hazards and risks</i></b>  |  |
| <p>From a climate or weather perspective, what are the main issues or events that take place in the locality every year?</p> <p>Issues might include (i) flooding, (ii) heavy rainfall, (iii) drought, (iv) storms/cyclone, (v) landslides, (vi) riverbank erosion, (vii) sea encroachment.</p> | <ul style="list-style-type: none"> <li>• Flooding; during the rainy season, the river on the land side of WP gets very high and floods into the settlement.</li> <li>• Additionally, when it rains heavily there is often standing water and localized flooding (up to 1 foot deep and stays for several hours).</li> <li>• Erosion; during rainy season, the sea erodes land along the seaward side of WP.</li> <li>• All exasperated during high tides.</li> </ul> |
| <p>When do they take place (approximately what month or frequency and for how long)?</p>  | <ul style="list-style-type: none"> <li>• All flood/erosion risks occur during the rainy season (May-September), although issues really start in June and continue into October.</li> <li>• Erosion is more pronounced during spring/new moon tides.</li> </ul>   |
| <p>What areas in the community are most affected (show on map)?</p>   | <ul style="list-style-type: none"> <li>• See map: Coast side = erosion and riverside = flooding.</li> </ul>  |

|   |   |
|---|---|
|   | <ul style="list-style-type: none"> <li>• Sea flooding can be up to 1 meter deep.</li> <li>• Rainfall flooding can be up to 1 foot deep and generally lasts for three to four hours after the rain stops.</li> <li>• Also, areas near drainage channels are more prone to flooding, as these are often blocked with rubbish or construction and so back up with volume of water.</li> <li>• The central area (between the roads) is generally only affected by rainfall flooding due to poor drainage.</li> </ul>  |
| What are the effects on the broader community?  |   |
| <b>Climate/weather changes</b>  |   |
| What are the main changes (if any) in climate-related hazards that have taken place in the community over the last few years? | <ul style="list-style-type: none"> <li>• Seasonal weather pattern has been much less predictable in the last four to five years (start/end of rainy/dry seasons).</li> <li>• Erosion: This has gotten much worse since approximately 2014. Previously, the beach would be eroded to some degree but then would return to its original position. Some variation over the past 30-plus years, but certainly more pronounced recently.</li> <li>• Erosion and sea flooding gets worse when the sand bar is closed.</li> </ul>  |
| How are they different from the original situation?   |   |
| When did you first notice the change (year, if possible) and where?<br>How can you measure the change?                        | <p>2014</p> <ul style="list-style-type: none"> <li>• A number of focus group discussion participants have lived in WP since the '70s and explained there had been events of flooding/land loss at certain times but that these were one-off events whereas now it is continually worsening.</li> </ul>  |
| What areas in the community are vulnerable to this change (show on map)?  | <p>See map.</p> <ul style="list-style-type: none"> <li>• Wells are very vulnerable to seawater intrusion.</li> </ul>  |
| What do you think are the main causes or reasons for the change?  | <p>Erosion:</p> <ul style="list-style-type: none"> <li>• Climate change.</li> <li>• Lack of dredging — port entrance was dredged from mid-'70s until the war. Dredgers would dump sand out to sea – area not known.</li> <li>• Dumping of garbage, etc., into both sea and river sides of the settlement have reduced depth of water – increased speed/power of waves.</li> <li>• There used to be a river/waterway connecting the beach side to the river side near the bridge, which helped to regulate the water level and flooding, but that has been replaced by a road so now there is no “release valve.”</li> <li>• The sea bar opens and closes every four to five years in response to hydrological changes.</li> </ul> <p>Flooding:</p> <ul style="list-style-type: none"> <li>• Lack of rubbish collection – blocks drainage and floods.</li> </ul> |
| What are the effects of the change that you have seen so far?   | <ul style="list-style-type: none"> <li>• Road washed away along with houses and shops (300?).</li> <li>• Increased frequency and impacts.</li> </ul>  |



|   |  |
|---|--|
|   | <ul style="list-style-type: none"> <li>No power – all from generators in shops. High cost.</li> </ul>  |
| <p>What aspects of personal and community life are vulnerable to this change?</p>   | <p>Erosion:</p> <ul style="list-style-type: none"> <li>Homes and personal belongings lost.</li> <li>Increases overcrowding.</li> <li>Workers lose materials, tools, possessions, which reduces their ability to work as they may no longer have the materials/tools required.</li> <li>Business affected; assets/shops/warehouses hit; landlords lose income; access for supplies impacted and commodity costs increase; power and other services cut or impacted.</li> <li>Health: People are more crowded and sleep on streets.</li> <li>Education: Schools are at risk of falling into the sea (ATA and vocational schools threatened). People are worried to pay fees in case these close; they can't get kids into other schools as they need all fees up front and don't know administrations to make staged payments. Students lose books, uniforms, etc., and so may not be able to attend school.</li> <li>Housing on the beach side is no cheaper than it used to be in response to concerns about constant flooding and potential erosion.</li> <li>Flooding puts more pressure on the housing in the central area, which drives up prices and density.</li> </ul> <p>Floods/heavy rainfall:</p> <ul style="list-style-type: none"> <li>Exasperates overcrowding.</li> <li>Social issues — domestic violence, teenage pregnancy.</li> </ul> |
| <p>What do you think will be the likely effects in the medium to long term? How would you rate the consequence of this change (not bad, bad, very bad)?</p>                                   | <ul style="list-style-type: none"> <li>Community very worried.</li> <li>Have no option to go elsewhere due to low income.</li> <li>Want to relocate, but need services and housing in decent area.</li> </ul>  |
| <p><b>Nonclimatic hazards</b></p>   |  |
| <p>What are the main nonclimatic hazards, issues or events that take place?</p> <p>Issues could include fire, hygiene (sanitation/waste related or other), social (crime, violence, etc.)</p> | <ul style="list-style-type: none"> <li>Fire from accidents with candles, fuel or cooking oil.</li> <li>Usually affects three to 10 houses at a time. Ten to 15 incidents a year.</li> <li>Hygiene: Waste collection is an issue at municipal level now that the grant is finished – not collected from communities, so people taken to dumping.</li> <li>Sanitation: There are very few toilets, so many people use the beach, river or flying toilets.</li> <li>Teenage pregnancy: It is felt that this has increased in recent years due to the increase in density and frequency of house sharing due to cycles of homelessness.</li> <li>Domestic violence: Similar to teenage pregnancy, this is an issue due to density and frequency of house sharing due to cycles of homelessness.</li> <li>Crime is not a real concern. (Note: It was observed that most homes and shops had security bars or mesh on their windows, which would appear to contradict this statement.)</li> </ul>  |

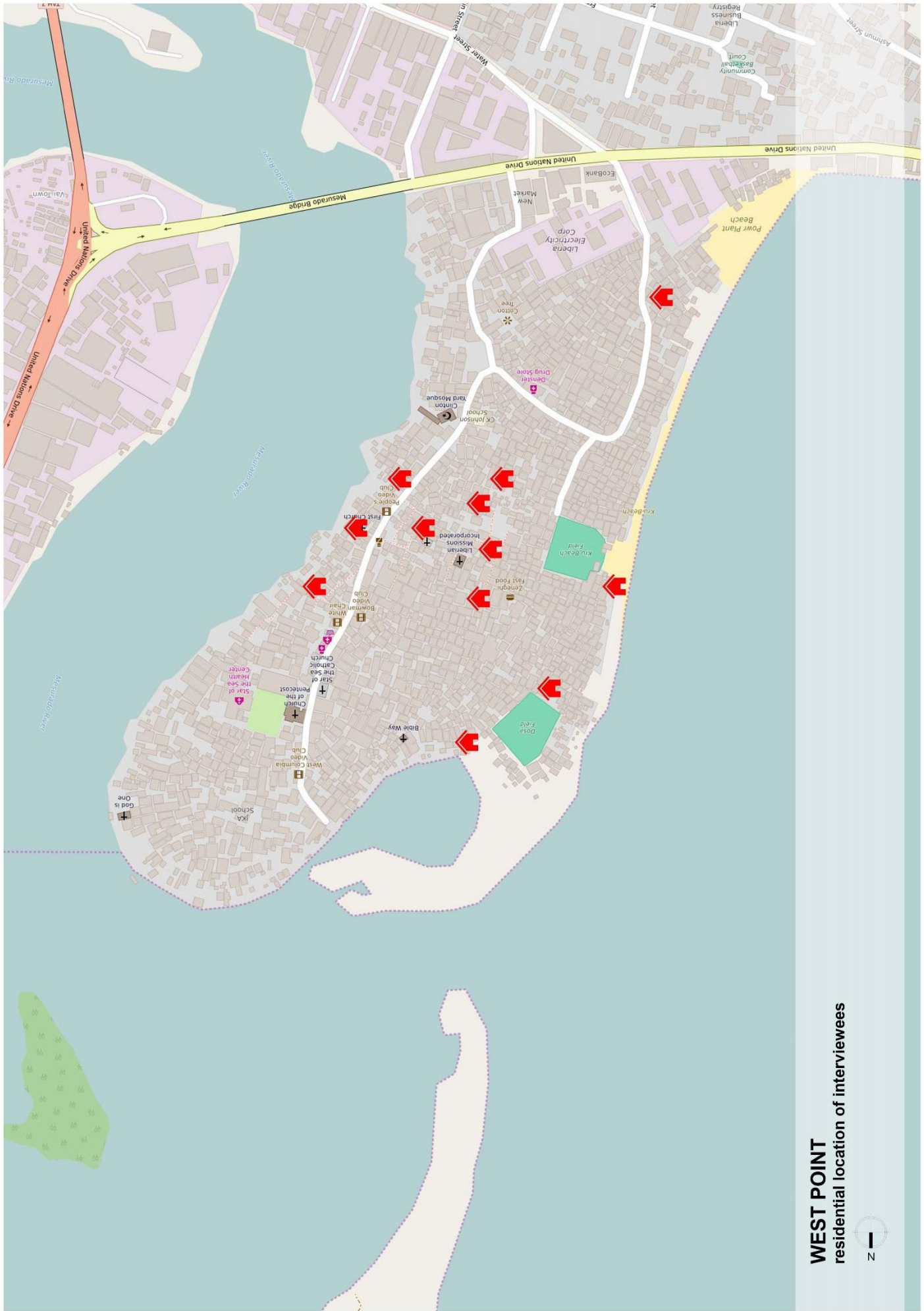


|  |   |
|--|---|
| What areas in the community are most affected (show on map)?   |   |
| What are the causes of these issues?   | <ul style="list-style-type: none"> <li>• Accidents with candles, fuel or cooking oil.</li> <li>• No access for fire brigade.</li> </ul>   |
| What are the effects on the community?   |   |
| <b>Negative community practices</b>  |   |
| What practices contribute to <u>increasing</u> the vulnerability of the neighbourhood/community?   | <ul style="list-style-type: none"> <li>• Waste dumping – but issue stems from higher levels and the costs.</li> </ul>   |
| What can be done to raise awareness of the negative effects or prevent such practices?   | <ul style="list-style-type: none"> <li>• People who don't keep their area clean and contribute to flying toilets can be arrested.</li> </ul>  |
| <b>Positive community practices</b>  |   |
| What practices, cultural values and institutional arrangements could contribute to increasing the resilience of the neighbourhood/community to the impacts of climate and other changes? | <ul style="list-style-type: none"> <li>• The social support for homeless families is very positive.</li> <li>• Firefighting.</li> <li>• Community policing of sanitation: Frequent monitoring and oversight to ensure waste is removed and open defecation is reduced.</li> <li>• After the sea recedes, there is a scramble to claim land for new housing. This is not always for families that were displaced, but the town commissioner must give permission for people to set up new houses.</li> </ul> |
| What should government do? What should community groups do (specify)?  | <ul style="list-style-type: none"> <li>• Do more than policy development; implement own policy and enforce.</li> <li>• Deliver on disaster management policies (Kyoto?).</li> <li>• Facilitate relocation: People want to move but need services, etc. "Give us the keys." Yes, there are some fishermen here, and they might not want to leave, but that is not the majority of the community.</li> </ul>  |
| What should families/individuals do? How have people coped with such changes in the past?  |   |
| Can such traditional coping mechanisms be applied in the present context (elaborate)?  |   |
| <b>Final comments</b>  |   |
| Of the risks and hazards you've identified, which are of most concern to you (climate, social or economic)?  |   |
| Do you have any comments or suggestions for us?  | <ul style="list-style-type: none"> <li>• Do something ...</li> </ul>  |

Attendance (name/position/time living in community)

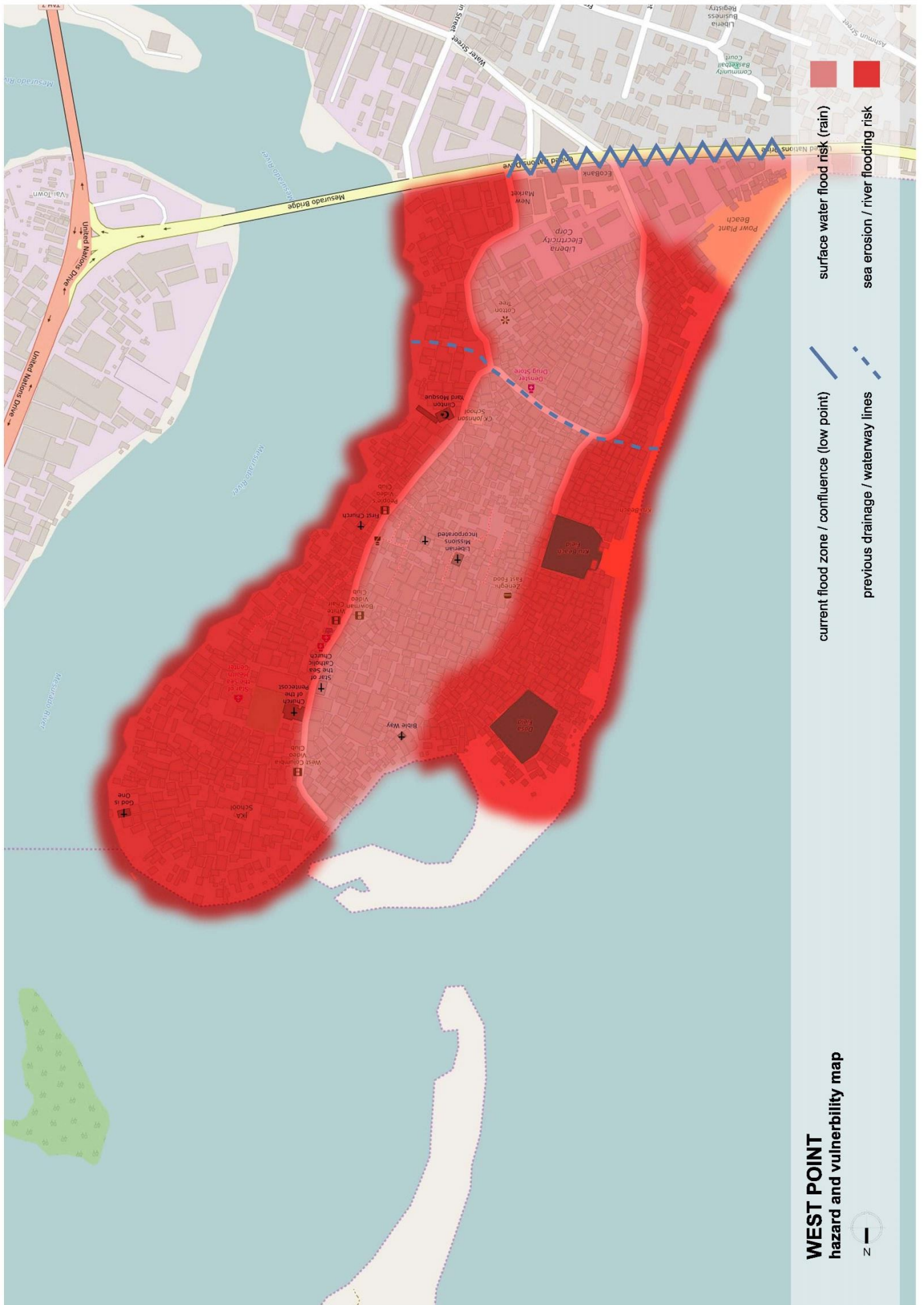
1. Thomas Tweh (CEO/WPHSO) – 29 years
2. Henry Y. Richards (West Point town clerk/commissioner office)
3. Willie Toe (Elder Council Chair)
4. Jayou Kiela – 16 years
5. Lily B. Tallawford – 2016(?)
6. Samuel J. Saryenneh – born in west point
7. Jackson W. Toe – 36 years
8. Darlington Ugah – 19 years

9. Daniel L. Grant – 34 years
10. Juah Gitor – 26 years
11. Tete George – 32 years
12. Abraham V. Conneh (DVA) – 25 years
13. Tete P. Nyewan (SDI/YMCA Alliance) 26 years



**WEST POINT**  
residential location of interviewees







**every  
hand  
makes a difference**



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