FREETOWN LANDSLIDE AND FLOODS ANALYSIS OF EARLY RECOVERY NEEDS

OCTOBER 2017

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1. OVERVIEW

Freetown, the capital city of Sierra Leone, is home to approximately 1.25 million people (21 percent of the total population)[1], an increase of 166 percent from 1985 (13.3 percent of the population at the time).[2] The rapid urbanisation of Freetown can be attributed, in part, to the high rural-to-urban migration resulting from a decade-long civil war that plagued the country from 1991 to 2002. Rural households have also continued to migrate to Freetown in search of better economic opportunities. This rapid urbanisation has resulted in a strain on the city's infrastructure and an influx of households moving to disaster-prone areas such as flood plains and mountain slopes, valleys, and coastal areas, leaving these households vulnerable to the impacts of floods and increasing the risk of mudslides. Urban planning systems have failed to cope with the increasing population growth.

According to the Environmental Assessment and Evaluation of Natural Disaster Risk and Mitigation in Freetown[3] (European Union all slums along the coastline in Freetown experience flooding more than once in any given year, generally caused by heavy and prolonged rainfalls, high sea levels, and storms. Construction in flood-prone areas, inefficient rainwater drainage systems, blocked draining systems, and restricted water flows in rivers and creeks (due to encroachments of buildings) represent unsustainable man-made reasons for flooding. Flood mitigation strategies generally include both administrative and construction aspects of which preventive development control and building inspection are by far the most powerful. No building or construction should be allowed in flood-prone areas, which are areas less than 4 metres above the average daily seawater level.

[1] 2015 Population and Housing Census

[2] 1985 Population and Housing Census (population of Freetown: 469,776)

[3] European Union-financed Urban Planning Project 2011-2014

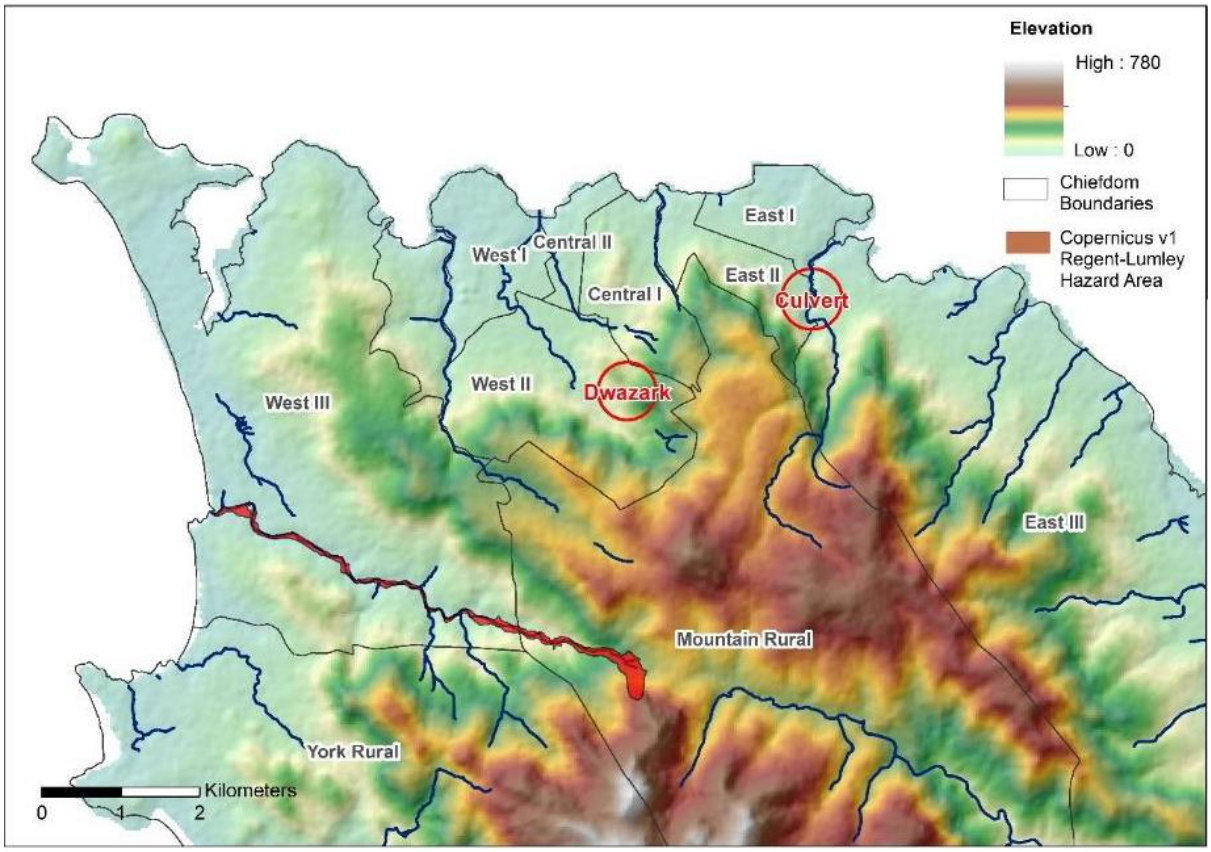

Figure 1: Topographic elevation of Western area and location of the Regent Landslide (shown in red) and the flooded areas in Dwazark and Culvert (circled in red).

Source: DaLA Report, 2017

1.1. KEY DRIVERS OF VULNERABILITIES

Socio-economic: Freetown is densely populated and congested. A high proportion of the population lives in poor-quality and overcrowded housing in slum settlements, and many work in informal economy as petty traders. Poor infrastructure and drainage systems including unsustainable land use exacerbate risk from natural hazards. According to the United Nations Development Programme (UNDP) 2016 Human Development Report, 77.5 percent of the population (4.7 million people) are multi-dimensionally poor even though income poverty of $1.25 per day is 52.3 percent. In Freetown, poverty increased from 13.6 percent in 2003 to 20.7 percent in 2011.[4]Poverty compounds the vulnerability of poor communities and their resilience building capacities to mitigate or recover from the effect and impact of shocks, including natural disasters. The primary cause of flooding in Freetown is a lack of urban planning combined with insufficient drainages and this has often impacted fragile communities in riverine areas.

Environmental and ecosystems: Deforestation and the loss of biodiversity are significant contributing factors for flooding, mudslides, landslides, erosion, and water shortage. Saturation of

[4] A Poverty Profile for Sierra Leone, The World Bank, Poverty Reduction & Economic Management Unit, Statistics Sierra Leone, 2014

soil is also likely to cause landslide or ground failure with implications for damage or loss of property, injury or loss of life including environmental assets (Tarawalli 2012). Poor solid waste management is contributing to a multitude of risks and impacts: Low efficiency of waste collection is leading to open dumping of household waste in the streets, clogging drains and passageways, and leading to flooding in flat and low-lying areas. The two main dumping areas, Kissy Culvert/Bomeh and Kingtom, are both located in small river estuaries, both effectively blocking the flow of water in the rivers.

Figure 2: Settlement (right) next to Kingtom dumpsite (left), Freetown Source: MSB/UNDP October 2017

Leachate generated and emitted by dumpsites contains high concentrations of heavy metals, toxic organic substances, and high concentrations of bacteria such as E. coli and constitutes a serious direct health hazard to anybody coming in contact with it.

Due to this blockages by the waste dumpsites the river water accumulates, flooding houses and hand dug wells, contaminating drinking water, promoting vector borne diseases such as malaria, dengue, and yellow fever; as well as rat-borne diseases such as leptospirosis, lymphocytic choriomeningitis, provides a potential breeding ground for bubonic plague.

Sewage deposited on the dumpsite is a serious health risk not only for the workers on site. Chicken, pigs and other livestock feeding on the waste are potential distributors for trichinosis, salmonellosis etc. through consumption of meat products.

Inhabitants living downstream are permanently exposed to health risks, and are frequently involved in epidemics.

Current waste management malpractice also contributes to global warming, especially through the uncontrolled generation of landfill gas (methane) in uncontrolled dumpsites, and to the global problem of marine debris by municipal solid waste being washed into the sea from uncontrolled dumpsites and through open drains in settlements.

Geological hazards: According to the EPA/UNDP report 'Analysis of the Causal and Trigger Factors of the August 2017 Landslide in Freetown: towards a Sustainable Landslide Risk Management in Sierra Leone; the last landslide occurred in Charlotte in 1945. Geological hazards are mainly based on the fact that the landscape is characterised by steep slopes, deep weathering of bedrock, unstable soil and soil creeping on the slopes.

Human settlements increasingly encroaching on protected areas with steeper slopes are increasingly exposing inhabitants to landslide occurrences in the country. These activities are combined with deforestation, cultivation, mining and construction on the already-fragile slopes, increasing erosion due to slash-and-burn agriculture, artisanal charcoal production and unsustainable agricultural practices. The removal of deep-rooted vegetation that binds soil to bedrock in shallow soils, and the

construction, agricultural or forestry activities (logging) change the amount of water which infiltrates the soil.[5] The construction of retention walls and channels increase the speed of runoff, increasing the load of soil in the flood waters, and the amount of water accumulating in flood prone area in a shorter amount of time.

Climate and weather related risks: The primary cause of flooding in Freetown is the tropical rains. Many of the large rivers have floodplains, which are subject to seasonal flooding during the raining seasons. The country is highly prone to flood, landslide and coastal erosion, tropical storms and sea level rise hazards. However, human activities in high-risk areas not taking into account protective measures lead to higher exposure and higher vulnerability.

Human settlements encroaching on wetlands, conversion of mangrove into settlements or agricultural areas are reducing the potential of the mangrove to counteract floods, storm surges, erosion and sea level rise. A similar situation occurs in low-lying areas. Due to the increase in demand in construction space, especially low-income families are increasingly building their houses in zones that have historically been prone to annual flooding during the rainy season. Increasing construction activities in the hills have led to increased terracing with unstable slopes, at the same time removing vegetation from the surface, further increasing erosion , which itself increases the risk of landslides.

These circumstances are clearly evident in the hilly and low lying areas of the Western Areas and along the coastal areas in the Western Area, as well as certain inland areas in the Northern and Southern Provinces of Sierra Leone.

Epidemics: Common diseases or illnesses include malaria, lassa fever, diarrhoea, schistosomiasis and typhoid. Water pollution resulting from poor solid waste management has potential for causing health risks. There is a correlation between epidemic outbreaks such as malaria and cholera and poor and unsustainable environmental sanitisation. The fact that sewage is being treated on the Kingtom dumpsite, led to the effect that the "[…] recent cholera epidemic in Sierra Leone recorded greater incidences in the neighbourhoods closer to the solid-waste dump sites than in other areas"[6]. This can be compounded by flooding which occurs annually during the peak of the rainy season. Sierra Leone has a generalized HIV epidemic which has stabilized since 2008 at a prevalence of 1.5% (2013, SLDHS), with women having a prevalence of 1.7% and men 1.3%. During a humanitarian emergency, already vulnerable groups which include people living with HIV (PLHIV) reside in high risk and now flooded areas. Because of the disaster and displacement of families, many HIV positive people are now living in temporary makeshift accommodation, such as unfinished buildings or simply on the street. For many PLHIV with a weakened immune system, the unrelenting heat and driving rain makes them even more vulnerable to communicable and non-communicable disease. The evidence shows that unprotected sexual liaisons in these situations— forced, consensual and/or transactional—will likely lead to an increase in the spread of HIV.

[5] Analysis of the Causal and Trigger Factors of the August 2017 Landslide in Freetown: towards a Sustainable Landslide Risk Management in Sierra Leone, Environmental Protection Agency/UNDP, 2017

[6] Urban Planning Project 2011-2014, Freetown City Council, Environmental Assessment and Evaluation of Natural Disaster Risk and Mitigation in Freetown (GOPA, January 2014)

Legal and Institutional: Weak legislative and institutional capacities for disaster risk management (DRM) have resulted in inadequate policy reform and implementation of preparedness and mitigation interventions. There is no adequate national Early Warning System covering all the socio-economic and natural hazards faced by the country. Poor land use planning and lack of enforcement are facilitating the encroachment of protected areas such as mangroves and forests. This encroachment leads to deforestation, loss of soil, increased erosion, and increased vulnerability to storm surges and increased risks of landslides. Increasingly more families, especially with a low family income, are settling in flood prone areas such as the Malama River, Kingtom, or the Kissy area. The National Protected Area Authority Act (NPAAA) of 2012 prohibits encroachment into protected areas but its enforcement has been weak resulting in settlements encroaching into protected areas.

1.2. ABOUT THIS REPORT

The report presents an analysis of socio-economic early recovery livelihood needs conducted by UN Agencies following the devastating landslide and floods in and around Freetown on 14 August 2017, which affected over 7,000 people. The Government of Sierra Leone announced its plan to resettle people currently living in high-risk disaster zones in Freetown to the Mile 6 area on the outskirts of the capital. The concurrent floods also affected the livelihoods of about 6474 farmers households in Eight districts namely: Bo (776), Bonthe (2706), Kailahun (887), Kenema (1125), Kono (165), Pujehun (228), Tonkolili (280) and Western Area (307) (FAO 2017). The report also includes analysis of environmental risk triggered or exacerbated by the disaster.

The socio-economic early recovery livelihood analysis was conducted as a building block towards laying the foundation for long-term, sustainable and resilient recovery aligned to the national sustainable development trajectory for Sierra Leone, as outlined in the *Agenda for Prosperity*.

The report is divided into 5 sections. Section 1 presents an overview of Freetown, which is the main geographical risk context of the analysis. This section also presents an overview of the concurrent flooding in 7 districts of the country. Key drivers of the vulnerabilities related to disaster risk management, socio-economic, environmental, geological, climate and weather, epidemic, legal and institutional factors are also presented.

Section 2 describes the approach and methodology used to analyse the socio-economic early recovery needs of the affected population including the early recovery conceptual framework. Early recovery is predominantly transitional and it uses development principles during humanitarian settings in order to augment the ongoing humanitarian response. The rationale for early recovery is discussed linked to the need to promote measures that foster self-sustaining, nationally-owned and resilient processes vis-à-vis to the country development trajectory.

Section 3, presents socio-economic issues identified in the World Bank Rapid Damage and Loss Assessment (DaLA) report that require further attention. Additionally, various urgent concerns given the imminent closure of internally displaced persons (IDP) camps on 15 November 2017 are presented. This is followed by an analysis of early recovery needs by sectors in section 4, and lastly section 5 covers cross-cutting issues. While all efforts were taken to integrate cross-cutting issues, close attention should be taken during the development of the recovery action plan in order to ensure their integration and synergy across all sectors.

2. APPROACH AND METHODOLOGY

Drawing from the DaLA report and using sector assessment reports on the mudslide and floods disaster event including relevant baseline reports, UN Agencies conducted a desk sector analysis (Figure 3). The analysis identified short-to-medium term socio-economic early recovery livelihood needs of the affected population over a 12-month period. The outcomes of this report will be used to inform the development of the Recovery and Risk Management Action Plan (RRMAP), a short-to-medium term action-oriented plan for addressing the transitional socio-economic early recovery livelihood needs of the affected population. Special focus was put on the recovery needs and potential risks affecting the most vulnerable social groups such as women, children, youth, people living with disability and people living with HIV[7].

Figure 3: Early Recovery Needs Analysis Approach leading to the development of the RRMAP

2.1. EARLY RECOVERY CONCEPTUAL FRAMEWORK

Early recovery interventions begin in the humanitarian settings. Early recovery is guided by development principles that seek to build on humanitarian programmes and to catalyse sustainable development opportunities (IASC 2007). It aims to generate self-sustaining, nationally owned, resilient processes for post crisis recovery. Early recovery translates development principles into relief operations and seizes the opportunity to go beyond saving lives to contribute to the restoration of national capacity, basic services, environment, shelter, livelihoods, and human security (IASC 2007). Early recovery is both an approach to humanitarian response which, through enhanced coordination, focuses on strengthening resilience, re-building or strengthening capacity, and contributing to solving rather than exacerbating long standing problems which have contributed to a crisis). Thus, early recovery interventions are designed as building blocks for long-term, sustainable recovery and resilience building. Three resilience dimensions that underpin the early recovery concept are illustrated in figure 3:

Resistance capacity

The severity of the impact of a shock (e.g. earthquake) on the built environment is directly related to its vulnerability or its ability to resist the shock. If the vulnerability of the built environment is

[7] Women, Children, Elderly, PLWD, PLWHIV & Youth

reduced by increasing its resistance capacity then the impact of the event will be reduced. As risk is a function of vulnerability and resistance it clearly ties the concept of risk and resilience together. The higher the resistance capacity of the built environment is the lower your vulnerability and therefore the greater your resilience (the converse is also true). The figure displays this concept as the depth of the development curve following a shock or stress event.

If we understand what hazard events could occur and the likelihood of them occurring, we can predict the likely consequences on the built environment. This information will then allow us to make key decisions based on the possible outcomes:

a. We do nothing and accept the possibility that there will be a catastrophic failure of the built environment should a hazard occur. This is commonly known as a failure to exercise a duty of care.
b. We take actions to reduce risk and increase the resistance capacity of the build environment based on the understanding of what the likely hazards are and what the consequences would be should they eventuate. These actions can be both proactive (new construction) and retrospective (upgrading/retrofitting). In term of risk management these actions are commonly known as risk mitigation measures.

Adaptive capacity

The second dimension of resilience is the adaptive capacity of the built environment – i.e. its ability to recover from the shocks and stresses to continue to develop. This concept is represented on the figure as the slope of the curve from the depth of the impact to recovering to the previous level of development (or better).

Once the hazard event has occurred there are a number of possibilities:

a. The built environment fails completely and never recovers (slope of 0)
b. It fails to a large extent and recovers very slowly over a long period of time (very shallow slope)
c. There is minimal damage and it recovers quite quickly (steep slope)

Of the three possibilities outlined above the third is the one that is the most desirable. When a hazard occurs it is the most beneficial for there to be minimal damage and recover as quickly as possible. How can this be achieved? The extent or scale of damage as noted above can be managed by applying good risk management strategies and approaches to mitigate risk as far as is practically possible. If we have a clear understanding of any mitigation measures taken and how the risk has been altered this will enable us to determine the residual risk. That is – despite mitigation efforts, what could still happen if the hazard occurs? Once we understand this we can put in place 'people centred' disaster management strategies to deal with the residual impacts so we can protect lives and livelihoods and recover as quickly as possible. The scope of impact and speed of recovery is thus directly related to our understanding of residual risk and how well prepared we are to deal with shock events.

Reflective capacity

Emphasises is on interrogating the root causes of why the hazard had the impact it caused. Reflective capacity helps us to draw lessons from experience from development losses and deaths with a view to inform the development of measures to prevent future losses from similar events.

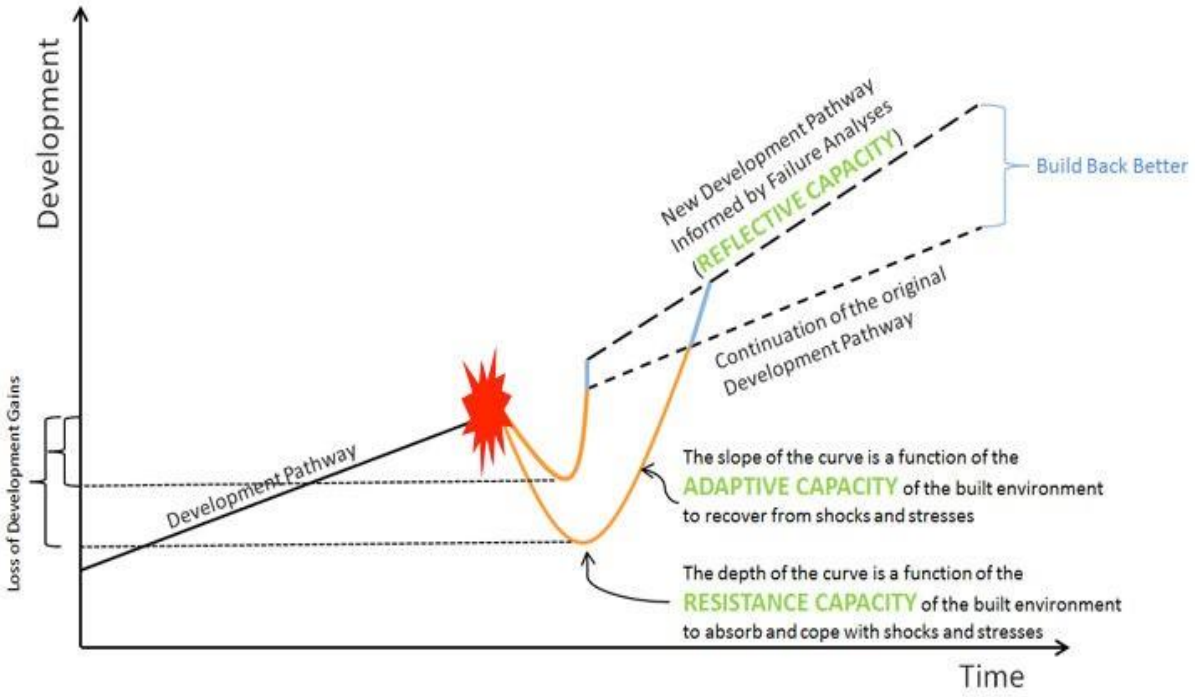

Figure 4: Resilience pathways

Source: UNOPS 2017

Summarising resilience dimensions

A number of scenarios are likely to occur to normal development path when the system is subjected to a shock:

Scenario 1: The impacts to the development pathway may be shallow with minimal development losses and rapid recovery back to the development pathway. This is usually associated with a high level of system resilience.

Scenario 2: The impacts may be significant (deep) with extensive development losses and a long recovery back to the original development pathway. These traits directly reflect low levels of resilience underpinned by high levels of risk exposure and vulnerability.

Scenario 3: The reasons for the failure (regardless of the losses to development gains - depth) of the system may remain unknown and thus limit the trajectory of the new development pathway. This will restrict “build back better” opportunities and the ability to strengthen resilience to future shocks.

3. SYNTHESIS OF SOCIO-ECONOMIC LIVELIHOOD ISSUES

3.1. SOCIO-ECONOMIC ISSUES REQUIRING STRENGTHENING IDENTIFIED IN DALA REPORT

Social Protection	▪ Strengthen Social Safety Net (SSN) systems in order to expand SSN Programme (SSN) covering the Western Urban Area. ▪ Augment current institutional capacity in the Social Protection (SP) sector to facilitate rapid registration and verification of beneficiaries. The lengthy registration and verification of beneficiaries in the ongoing emergency response to affected communities has been prolonged for two months, which could impact the planned closure of the IDP camps on 15 November 2017. ▪ Replace lost personal documents (IDs, educational certificates etc.) as this may be costly to replace and thus has implications for IDPs wishing to access opportunities such as school enrolments and employment, which require such documents.
Livelihoods	▪ Need for a comprehensive livelihood assessment in order to develop targeted interventions given differentiated needs of affected communities. ▪ Comprehensive analysis of losses e.g. productive assets / stocks which has implications for the ability of individuals to earn a living in the longer term. ▪ Specific livelihood support needs not be fully captured under ongoing and planned Social Protection programs. ▪ Loss of livelihood source e.g. housing, trading stock especially those selling items out of their homes or those keeping their stock at home at night and selling by day from a market stall or on foot.
Education	▪ Undertaking repair/ rehabilitation of damaged schools including repairing of other critical learning infrastructure – outside of the high risk and 'No Build' zones.
Governance & coordination	▪ Governance system during recovery phase not adequately addressed. Overlaps in mandates amongst some MDAs create challenges for effective decision making during the recovery phase.
Gender	▪ Analysis of gender in order to facilitate gender responsive interventions
DRR	▪ Gender responsive DRM interventions
HIV/AIDS	▪ Identify non-functioning health facilities and prepare an inclusive reconstruction plan for the provision of HIV medication. ▪ Map PLHIV directly affected by the disaster and detail immediate their needs to ensure continuation of HIV test and treat services and mitigation of the epidemic. ▪ Link affected PLHIV to critical support mechanisms, including emergency food and nutrition, clean water, safe housing and general health services. ▪ Ensure quality and provision of Antiretroviral Therapy (ART) for PLHIV through carrying out an inventory of stocks and availability. ▪ Advocate for confidential HIV services for PLHIV among health personnel and through involving networks of PLHIV to avoid stigma and

	discrimination and social exclusion. Proactive and sensitive measures to be taken to facilitate access by PLHIV to psycho-social and trauma services. ▪ Provision of commodities, including male and female condoms, to affected populations to prevent unwanted pregnancies and HIV infection; including making supplies of Post Exposure Prophylaxis (PEP) immediately available at health facilities. ▪ Promote rule of law and means to legal redress for victims of sexual and gender based violence.

3.2. IMMEDIATE TIME CRITICAL EARLY RECOVERY CONCERNS

3.2.1. RELOCATION/ RESETTLEMENT OF IDPS

According to the Office of National Security (ONS), IDP camps will be closed on 15 November 2017. To date, it is not clear how many IDPs have taken up the early recovery package and have left the camp and or were willing to take up the recovery package. With only one month left, there is potential crisis if IDPs will still be in camp given the possibility that some of them may face difficulty to find places to rent, schools for their children and basically to re-establish their livelihoods immediately after living camp. Thus transitional recovery options are necessary as building blocks to long-term sustainable resilient socio-economic recovery.

Sector	**Education**				
Location	JSS- Boys	JSS- Girls	SSS- Boys	SSS-Girls	Total
Juba	7	9	4	7	27
Old Skool	9	7	6	6	28
Total	16	16	10	13	57

Recommended Actions

Re-location/ settlement of IDPs	▪ Provide assistance to the most vulnerable IDPs in order to meet their basic needs (e.g. shelter, food, WASH, health & education) after camp closure. ▪ Develop a sex age disaggregated data (SADD) of IDPs willing to leave camp but require assistance to find accommodation. ▪ Support institutional capacity strengthening for the registration pillar in order to fast track conclusion of the registration of affected beneficiaries. ▪ Promote Do-No-Harm principles of IDPs who may be settled at the new Mile 6 settlement site in order to prevent tension/ conflict between IDPs settled at adjacent site following the 2015 floods. ▪ Prioritize the most vulnerable social groups such as women, children, youth, people living with disability and people living with HIV in the resettlement process. ▪ Ensure the safety of potential sites by designing shelter that decreases vulnerability to HIV and that accommodate the needs of people living with HIV.
Livelihoods	▪ Provide comprehensive livelihood options to address the different needs of IDPs especially women, children, elderly, people with disability and people living with HIV etc. ▪ Make available basic social services including livelihood recovery opportunities to promote sustainable livelihood re-establishment at Mile 6.

	▪ Expand financial inclusion to help households revamp their depleted revolving Village Savings and Loan Schemes, establish bank accounts to mitigate loss of assets in the event of another shock and integrate them into the formal financial system. ▪ Recovery activities (e.g. cash for work based demolition and repair programme for the impacted communities). ▪ Provide supplementary feeding to those moderately malnourished and/or provide increased food rations to those at risk of malnutrition, including PLHIV and TB on treatment. ▪ Provide targeted support to meet specific needs of children, pregnant women and lactating mothers.
Social Protection	▪ Expand social safety nets (SSN) and ensure continuous monitoring of the food security situation of the most vulnerable especially during lean season peaks (January for Urban areas and August for rural areas). ▪ Replace lost personal documents (IDs, Educational certificates etc.) as this may be costly to replace thus has implications for IDPs wishing to access opportunities such as school enrolments and employment, which require such documents. ▪ Provision of HIV prevention services and monitor settlements to prevent and treat victims of rape, gender-based violence, sexual assaults and human right violations. ▪ Ensure inclusion of PLHIV in the National Master List of affected persons.
Gender	▪ Strengthen capacities in collection and use of sex and age disaggregated data by clusters including women's participation in decision-making committees. ▪ Gender responsive interventions.
Disaster Risk Management (DRM)	▪ Support the establishment of the central technical capacity being developed by the government (Technical Pillar). This will be a critical resource for ER. ▪ Strengthen coordination and governance during recovery phase given the existence of overlaps in mandates amongst some MDAs, which may be detrimental to effective decision-making during the recovery phase. ▪ Demolition of critically damaged houses and recovery of reusable construction materials. ▪ Surface stabilization at Regent in order to prevent further slumping and sliding as well as to prevent erosion through growing of vegetation. ▪ Ensure environmental sustainability (e.g. by including sewage treatment, waste collection, recycling, composting in Mile 6) after camps are closed. ▪ Advocate for strengthened enforcement of policy decision on evacuation of households residing in disaster prone areas. There is the need to ensure that IDPs do not go back to their disaster prone areas.
Education	▪ Facilitate access to education for children affected and infected by HIV whose family were affected by the mudslide
HIV/AIDS	▪ Inclusion of the most vulnerable social groups such as women, children, youth, people living with disability and people living with HIV in the national relief packages and resettlement process ▪ Supplementary feeding to those moderately malnourished and/or provide increased food rations to those at risk of malnutrition, including PLHIV and TB on treatment

	▪ HIV prevention services and monitoring at the camps and settlements to prevent and treat victims of rape, gender-based violence, sexual assaults ▪ Support educational needs of HIV+ children or children of person living with HIV ▪ Provision of appropriate, confidential and sensitive test and treat services at the health clinics in the camps or nearby health facilities including eMTCT services to HIV+ pregnant women and lactating mothers

4. EARLY RECOVERY NEEDS ANALYSIS BY SECTORS

4.1. PHYSICAL INFRASTRUCTURE

4.1.1. SITUATION OVERVIEW

The Mudslide caused damage or destruction to physical infrastructure such as roads, bridges, electricity and communication, health, school, WASH. Connectivity and accessibility in the Regent, Malama/ Kamayama, Juba/ Kaningo and Lumley areas was disrupted due to damaged roads and bridges. According to the DaLA Report (2017), about 5.5 km of feeder roads were damaged and the electricity supply to 372 HHs was interrupted.

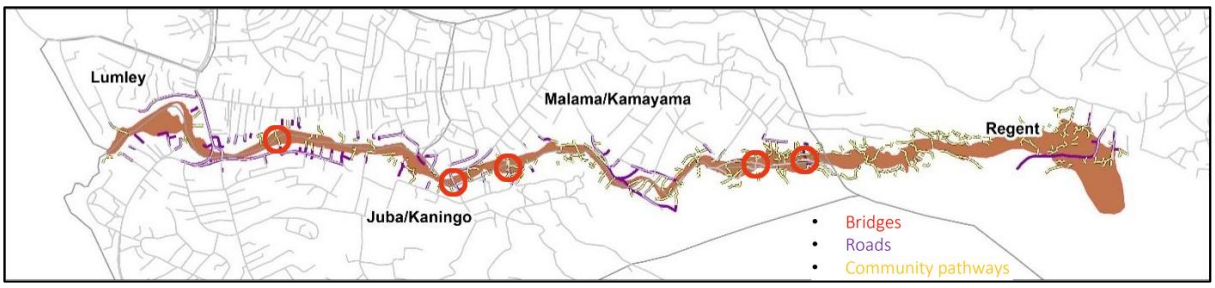

Figure 5: Impact of the flood on various types of transport networks (bridges, roads & community pathways) along the path of the mudslide

4.1.2. KEY VULNERABILITIES & RISKS

- Physical Infrastructure not resilient to disaster risk posed by flooding and landslides
- Physical Infrastructure neither non-compliant to building codes nor risk-informed (to flood and landslide risks)
- Weak capacity with regards to maintenance of critical infrastructure
- Lack of centralised urban planning and national infrastructure development plan and their implementation and enforcement

4.1.3. EARLY RECOVERY NEEDS

- Reconstruction efforts should firstly focus upon a functional review of the transport infrastructure system prior to any repair, replacement or reinforcement of damaged or destroyed assets (such as roads and bridges). Moreover, the effective integration of relief culverts at locations within the transport infrastructure system should be considered to improve drainage and reduce future impact from floods.
- Rehabilitation of prioritised roads and bridges in order to facilitate connectivity and accessibility between communities (Regent, Malama/ Kamayama, Juba/Kaningo) destroyed by mudslide or floods
- Strengthening capacity for resilient infrastructure planning through support to the technical pillar.

4.1.4. RECOVERY INTERVENTIONS

- Support the establishment of a Technical pillar within the government response mechanism
- Support development and implementation of a building standards office (BSO)
- Support the development of a central design capacity to enable Build Back Better (BBB) principles
- Technical and implementation support to government in recovery infrastructure projects
- Support establishment of a central capacity for urban and master planning in infrastructure

- Support to establish a technical pillar within the government response mechanism
- Support development of resilient building codes to address multi-risks
- Capacity building to demarcate hazard zones and awareness of high-risk areas
- Demarcate flood and other disaster-prone areas and prevent inhabitants from settling there
- Advocate for enforcement of regulations

4.2. HOUSING & SETTLEMENT

4.2.1. SITUATION OVERVIEW

The built-up area in Freetown is expanding into the Western Area Rural due to low density unplanned sprawl. The landslide occurred in the Western Area Rural on 14 August 2017 during the heavy rains. Some of the factors that exacerbate exposure and vulnerability to natural hazards alongside climate change are: the city's topography; proximity to waterways; rapid increase in infrastructure in excavated locations on deforested hillsides upstream of natural drainage channels; downstream construction in vacant land in flood plains; the use of unsafe construction techniques most often in high-risk areas.

They are also exacerbated by highly fragmented governance in the urban area, making not only urban development, but also effective response to shocks and recovery difficult. Many municipal functions are managed by multiple central agencies. This impedes both effective management of networked capital-intensive infrastructure, as well as the coordination of multi-faceted urban development operations.

Effects of Disaster

The most devastating impact of the landslide was experienced in Western Area Rural in Regent, but communities in Western Area Urban, located downstream of Sugar Loaf Mountain were gravely impacted by the landslide. The floods with accompanying debris affected buildings and households in the Kamayama/Malama Juba/Kaningo and Lumley neighbourhoods along the river channel.

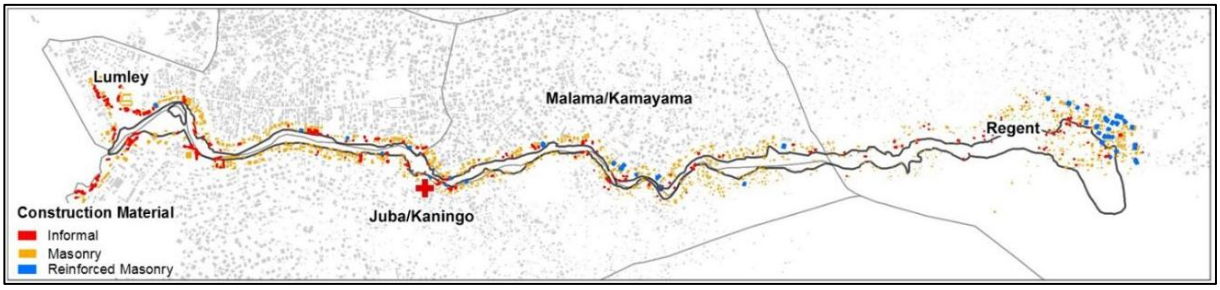

Figure 6: Impact of the flood on various types of buildings along the path of the mudslide

Flash floods occurred the same day in Western Area Urban in the neighbourhoods of Dwarzak and Culvert. Given the typology of construction in this area coupled with their location on low-lying land at the mouth of the river, multiple families shared these modest "shocks."

Housing Typology and type of Occupancy

Detached single-family homes in this area make up 37 percent of the residential building stock, of which almost half are owner-occupied homes inside private compounds. Building walls are predominantly constructed with cement blocks or mud bricks, while the roofing is

made of CGI sheets. In Western Area Urban, a number of residential buildings are made of less durable construction materials and are predominantly shared (with an average of more than 10 people living in a single dwelling). According to the 2015 Comprehensive Food Security and Vulnerability Analysis chiefdom-level report, 94 percent of households in Western Area Urban slums have 1-2 persons per room per house and in Western Area Urban (central, east and west), the average is between 1-2 and 3-5 persons per room per house. Almost 60 percent of the households are renters. About 40 percent of the housing stock is made with cement block walls and 35 percent have walls made from mud bricks. The roofing material used is predominantly CGI Sheets.

Extent of Damage

901 buildings (residential/ mixed-use/ public/ commercial) covering 116,766 square meters, from Sugar Loaf Mountain to Lumley Creek (DaLA 2017) were damaged.

4.2.2. KEY VULNERABILITIES & RISKS

Human encroachment in disaster prone areas

Residential buildings in the Western Area Rural are made of more durable construction materials, and are predominantly not shared units – most of these have been built in the last fifteen years, however most of them have been built on improper sites making them more vulnerable to natural disasters. Unfortunately, there is no existence of any risk informed land-use plan which people can refer to or is enforced by government.

Weak enforcement of regulations and conflicting governance of settlements

The legal status by way of land or, construction permits (split between two ministries, MLCPE & MWHI) remains unclear. The National Protected Areas Act (NPAA) of 2012 prohibits encroachment into protected areas but its enforcement has been weak.

Poverty

Nearly all the poor in the entire Western Area live in slums, with almost 60 percent of neighbourhoods with extremely deficient municipal infrastructure and services. The slums are a manifestation of the trade-offs made by residents between available shelter options that can be afforded and locations that allow them to earn their livelihoods. Therefore, people choose to stay in less durable residential floor space in neighbourhoods where living conditions pose health and safety risks.

4.2.3. EARLY RECOVERY NEEDS

Provision of temporary shelter for the most vulnerable

This should adequately be linked with other sectors (health, education, WASH, Protection and psychosocial and food security & livelihood) until the displaced households have found permanent housing in safe areas in or outside of Freetown (at least for 6 months). An all sector support package will be required to enable a dignified and safe transition from the camp closures for 3 months.

Training of masons and artisans (or, unemployed youths) on disaster resilient and cost-effective construction technologies using local resources

- Construction workshops with local stones & mud/ wattle & daub, mud blocks (including production of stabilized mud blocks, which will provide many with livelihood options) with disaster resilient features
- Construction of technology demonstration units using all the above mentioned technologies

- Helping artisans set up business units that can provide them with income generating options

4.2.4. RECOVERY INTERVENTIONS

- Multi-hazard zonation and raising awareness among community members
- Enforcement of the zonation maps (high and medium hazard zones) with appropriate guidelines to be provided to each ward where illegal construction is ongoing
- Preserve flood plains created by floods and encourage their use for urban agriculture
- Develop resilient recovery framework for housing based on final multi-hazard risk assessment
- Develop site-specific local mitigation measures including soft measures

4.3. WATER SANITATION & HYGIENE

4.3.1. SITUATION OVERVIEW

The Water, Sanitation and Hygiene (WASH) sector was significantly affected by the mudslide and flood disaster. About 65 percent of households in affected areas rely on drinking water from dug wells (34 percent were protected and 29 percent were unprotected wells or springs). Only 13-14 percent of households in Freetown have direct water connection (only 28 percent household connections in affected area). Piped coverage due to illegal "spaghetti" pipes is common. A service interruption due to damage to the piped water network affected 737 households. The flooding cracked the reservoir of the Barbadorie water treatment system, entering the Charlotte water system. Almost three-quarters (72 percent) of affected households reported a damaged water source from the flooding (Mobile survey of 2,000 people) (DaLA Report 2017).

4.3.2. KEY VULNERABILITIES & RISKS

- Limited access to improved water sources and sanitation facilities
- Majority of people using surface water and open traditional wells
- Limited water network from the GUMA supply. The Guma dam was designed to provide for 300,000 people but is currently providing for over 1 million
- Open defecation practices pose high health risks resulting in disease outbreaks
- Poor hygiene practices including lack of hand washing with soap
- Limited institutional capacity – both technical and resources/investment in WASH systems
- Burden on girls, women and exposure to abuse while retrieving water and to access sanitation facilities (toilets and latrines)
- Possible conflict and contamination of the existing unprotected sources

4.3.3. EARLY RECOVERY NEEDS

- Provision of adequate sanitation and hygiene promotion
- Access to safe water (drinking and cooking)
- Improved sanitary facilities and waste management to reduce contamination of drinking water sources

4.3.4. RECOVERY INTERVENTIONS

- Improving water sources in the affected communities for the people not living in camps
- Institutional capacity to improve water, sanitation and hygiene restored and further developed at national and local levels
- Agreement on type of technology to be adopted – hand dug wells or drilled boreholes with networks to nearby communities

- WASH infrastructure work, re-deepening of wells and new constructions need to be undertaken during dry spell
- Construction/ installation of households/ communal rain harvest technologies
- Development of gravity schemes/ spring boxes in settlement areas with natural water sources
- Explore options for connections to national water pipeline network, where possible and where there are no viable alternatives
- Promotion of sanitation and hygiene in affected communities with emphasis on hand-washing and health safety, safe household water treatment and storage, and distribution of sanitation and hygiene emergency items
- Capacity strengthening of community hygiene practices
- Provision of WASH emergency supplies/ hygiene kits
- Strengthen coordination capacity with health cluster for hygiene in both health facilities and at community levels
- Improved land use planning and human settlements around water sources

4.4. HEALTH AND NUTRITION

4.4.1. SITUATION OVERVIEW

There were moderate impacts to this sector. Six health facilities need repair or relocation including emergency response to control diseases outbreak and provide temporal health care in affected areas (DaLA Report 2017).

4.4.2. KEY VULNERABILITIES & RISKS

Availability of clean water and safe sanitation is a major factor affecting the health status of the population. Almost half of the population has no access to safe drinking water, and only 13 percent have access to improved non-shared sanitation facilities. The situation is worse in rural areas than in urban communities, with rural communities having 34 percent of safe water access compared to coverage of 84 percent for urban communities.

Health care costs remain very high in Sierra Leone, resulting in poor utilization (on average 0.5 visits per person per year). Out of pocket expenses of about 70 percent remain among the highest in Africa (NHA Report, 2007). Although provision has been made for disaster affected survivors to access health services, considerations to ensure continued access to basic health services to this group of people after camps are closed is important. There are challenges regarding determining the destinations of the IDPs.

There have been existing problems on Sexual and Reproductive Health (SRH) in Sierra Leone prior disaster and the condition might be worsening during and post-disaster. The country has one of the highest Maternal Mortality Ratios (MMR) in the world with 1,360 maternal deaths per 100,000 live births (WHO MMEIG, 2015). About 47 percent of maternal mortality were among teenagers and one fourth of maternal deaths are due to unsafe abortions among adolescents. Other health, nutrition and demographic indicators include: (i) high total fertility (4.9) with low contraceptive use (16 percent) and high unmet family planning needs for currently married women (25 percent) which is even higher for the age group 15-19 (30.7 percent) (SLDHS, 2013). The SRH needs and challenges continue to exist during and post-disaster.

4.4.3. EARLY RECOVERY NEEDS

- Provision of quality essential health services including sexual and reproductive health services, and nutrition services to affected populations (both at facility and community levels), particularly women/girls and vulnerable groups
- Safe water and sanitation services in affected areas, particularly at the health facilities

4.4.4. RECOVERY INTERVENTIONS

- Maintain readiness and preparedness for future public health events
- Maintain routine monitoring, detection and reporting of events through IDSR
- Strengthen health systems (management of MAM and SAM, disease surveillance and response, health promotion and provision of essential health services including SRH services) in affected areas and roll out to the rest of the country
- Continue capacity building for health workers in surveillance, IPC, laboratory capacity, emergency preparedness, and on the Minimum Initial Service Package (MISP) for reproductive health in emergency situations
- Integration of MISP into the national health emergency preparedness and response system as part of Disaster Risk Reduction programme (strengthening coordination for MISP implementation, development of guideline and SOP, capacity building, logistic management etc.)
- Improve the quality of Sexual and Reproductive Health (SRH) services of health facilities at the affected areas through a) provision of adequate supplies, equipment and commodities b) access to basic infrastructures (electricity, running water, incinerator) c) provision of qualified human resources for specific SRH services (as part of building back better efforts)
- Nutrition stabilization and food security at household and community levels
- Collaborate with WASH to ensure availability of WASH services (both at health facilities and community levels)

4.5. EDUCATION

4.5.1. SITUATION OVERVIEW

The education sector like other sectors is perennial affected by flooding events. In the August 14th Mudslide and Floods, about 59 schools in 41 buildings were affected. One school completely destroyed, while 34 schools (23 facilities) incurred damage to the buildings, 38 schools (29 facilities) to WASH, 35 schools (24 facilities) to furniture, 36 schools (26 facilities) to teaching materials, and 42 schools (30 facilities) to learning materials. Six schools were used as shelters for 172 IDPs. About 3,190 school-going children were affected. The main focus of the education sector response has been to ensure the provision of learning spaces for affected children. ECD recreation kits were provided to establish safe spaces for children including psychosocial support (PSS) as well as community engagement through social mobilization activities. Temporal learning spaces (TLS) were established at Old School and Juba in partnership with Save the Children and MEST.

4.5.2. KEY VULNERABILITIES & RISKS

- Uncertainty on timelines for continued support to children in camp schools at Juba and Old school
- Lack of clarity on long term plans to support affected children after relocation from camps
- Education for children at JSS and SSS in camps as current intervention only addresses primary school going children
- Lack of clarity on plans for schools in areas marked as high risk

- Families likely to return to disaster prone areas with advent of dry season
- Unsustainability of cash transfers/bursaries to parents to support children's education

4.5.3. EARLY RECOVERY NEEDS

- Rehabilitation and supply of furniture to damaged schools
- Strengthen linkages with ONS to determine schools in safe areas for potential rehabilitation
- Placement of children attending camp schools into regular schools after relocation from the camp
- Social mobilisation to raise awareness for affected children to reintegrate into schools
- Placement of approved teachers from schools that are closed into other schools
- Psychosocial support for children and teachers in collaboration with MSWGCA
- Early learning access (ECD) for children 3-5years integrated into recovery interventions.

4.5.4. RECOVERY INTERVENTIONS

- Assessment of schools marked to be in high risk areas and development long-term plans to address the situation
- Rehabilitation of physical educational infrastructure to ensure safe and resilient learning environments
- Sustainable supply of teaching and learning materials to ensure quality learning for all children in affected schools
- Prepositioning of teaching and learning materials for future emergencies
- Capacity building of MEST and schools on education in emergencies, preparedness and response to build resilience
- The potential to link with UNFPA and WFP on sexual reproductive health education and school feeding respectively for affected children
- Review of cash transfer/social protection in emergencies and impact on keeping children in school

4.6. FOOD SECURITY AND LIVELIHOODS

4.6.1. SITUATION OVERVIEW

The Registration Pillar registered 1,905 households affected by the mudslide and flash floods. Of this total, 1,183 households (62 percent) were along the path of the landslide from Regent to Juba, while 722 households were affected by localized flooding (MSWGCA/WFP 2017). About 26 percent of the affected households are female-headed and 74 percent male-headed. The floods also affected the livelihoods of about 6474 farmers' households in eight districts namely: Bo (776), Bonthe (2706), Kailahun (887), Kenema (1125) Kono (165), Pujehun (228), Tonkolili (280) and Western Area (307) (FAO 2017). The damage and losses caused by the disaster event are stated below:

6474 farmers households in eight districts affected by floods	
Bo 776 HHs	Tonkolili 280 HHs
Kailahun 887 HHs	Bonthe 2706 HHs
Kenema 1125 HHs	Pujehun 228 HHs
Kono 165 HHs	Western Area 307 HHs

Source: FAO 2017

Damage and Loss
365 households lost a family member (70% in Regent)
1,141 deaths and 500 casualties were recovered and buried
42% reported houses were totally damaged and 41% lost households assets
52% petty trading
18% skilled labour
7% salaried work

Source: WFP 2017

Damage and loss from Floods in 8 Districts	
District	Damage and Loss in (Billions SLL)
Bo	4.60
Bonthe	5.30
Kailahun	
Kenema	
Kono	3.00
Pujehun	3.13
Tonkolili	5.85
Western Area	23.10 (including 12.08 forestry)

Source: FAO 2017

4.6.2. KEY VULNERABILITIES & RISKS

- Food insecurity in Freetown's urban slums is 57 percent (above the national average of 50 percent). Food insecurity in Western Area Rural (including Regent, site of mudslide) doubled from 22 percent to 42 percent between 2010 and 2015.
- In flood prone areas in the Southern and Eastern Provinces (Bo, Bonthe, Kailahun, Kono and Pujehun) moderate household food insecurity ranges from 29 percent (Bo) to 63 percent (Kailahun), averaging 47 percent (national rural average is 48 percent). These rural districts are also characterized by high levels of deforestation and experience cyclical food insecurity and loss of livelihoods as a result of flooding (see Map).
- Households spend, on average, 3 hours or travel over 10 miles to reach the nearest functioning market. Market access is often disrupted during the rainy season due to poor road conditions. Additionally, the increased cost of transportation resulting from the removal of the fuel subsidy has restricted households' ability to travel further distances for markets and access to healthcare.
- Negative coping mechanisms (e.g. reduction in food and non-food expenditures including health and education, selling assets, withdrawing children from school, etc.) in the face of another shock such as flooding/fire.
- The most common livelihood in Western Area Urban and Rural is petty trading, which is largely informal in nature as characterized by low profit margins and high competition. Over half of affected households cited loss of assets as the main reason for not returning to work following the disaster.
- About 6474 farming households living in riverine areas at risk of perennial flooding.
- Urban slums host the highest concentration of poor households (39 percent), but the poverty rate is twice as high amongst rural households. From 2010 to 2015 there has been a dramatic increase in urban households that fall into the lowest wealth quintile.

- In Western Area Urban only 18 percent of households have access to improved sanitation (well below the national average of 44 percent) and in Western Area Rural one-quarter of households use rivers/ponds/streams as their main source of their drinking water. This poses a major health risk and could lead to deterioration in nutrition security.
- In rural areas, 77 percent of the population is engaged in agriculture as their main livelihood. However, lack of mechanization of production, labour shortages, low quality seeds, unavailability of agricultural inputs and high post-harvest losses have led to low production inhibited the sector from transitioning from subsistence to commercial farming.
- Pujehun district faces chronic food insecurity, likely the result of insufficient demand for agricultural produce, high cost of production and low yields from traditional farming practices
- Livestock rearing is relatively low in Sierra Leone, with 29 percent of rural households reportedly owning farm animals, the majority of which are goat and chickens.

4.6.3. EARLY RECOVERY NEEDS

- Augmented Social Safety Nets and support to revise the Government's Social Protection Policy
- Continued food assistance to meet the food needs of extremely vulnerable households, including orphans, those headed by a female and/or child, elderly, disabled, etc.
- Livelihood re-establishment for resettled households
- Creation of community productive assets
- Provision of agricultural inputs including seeds, fertilizers and tools
- Restocking lost livestock head
- Rebuilding productive assets and stocks to support the ability of affected individuals to earn a living in the longer term
- Training in non-environmentally degrading farming techniques
- Rehabilitation and creation of community assets in resettled areas and disaster-prone areas to support livelihoods and promote community-level resilience to flooding

4.6.4. RECOVERY INTERVENTIONS

- Support livelihood re-establishment for resettled households through e.g. FFA/FFW or cash based transfer, (for labour intensive rehabilitation) programmes to build resilience among communities or cash based transfer
- Strengthen early warning and food & nutrition security monitoring systems.
- Monitor food security situation through monthly mVAM and market price monitoring
- Expand social safety nets through food assistance in the form of cash for two months to affected households relocating from the camps or disaster prone areas, school feeding for children in camps or schools with high proportion of affected children
- Support the creation of productive community assets (e.g. drain clearing, mangrove replanting, reforestation, etc.) through food assistance in the form of cash transfers
- Support cash grants to buy agriculture inputs, tools and other necessary products to resume livelihoods in both urban and rural areas. Emphasis should be given to promoting disaster/climate resilient livelihood practices.
- Financial inclusion to help households revamp/establish their depleted revolving Village Savings and Loan Schemes, establish bank accounts to mitigate loss of assets in the event of another shock and integrate them into the formal financial system
- Facilitate market linkages for both agriculture dependent and urban trading based livelihoods
- Agriculture systems, through diversification and climate-smart agriculture linked to better nutrition

- Support livestock farming households to restock lost head.
- Strengthen government coordination capacity amongst charities, NGOs and UN agencies that are willing to provide food and livelihood support
- Timely collection and sharing of sex and age disaggregated data
- Establish joint targeting, communications and programme interventions
- Advocacy campaigns to improve communication and coordination amongst humanitarian actors and the community

4.7. PROTECTION AND PSYCHOSOCIAL

4.7.1 SITUATION OVERVIEW

- 1,905 HHs affected (10 percent reported losing the head of HH)
- 16 percent of those affected were 5 years or younger and 26 percent between 6 and 14 years
- 35 percent of HHs reported that shelter was their main concern and 34 percent were concerned about re-starting work/business

Source: DaLA Report 2017

4.7.2 KEY VULNERABILITIES & RISKS

- Vulnerable people who may need continued follow up and/or referral in terms of PSS and mental health care need to be clearly identified during and beyond the emergency response and recovery phases
- There has been a challenge in identifying the actual number of UASC as a result of the emergency, as there are children who had already been unaccompanied/ separated due to other reasons
- Lack of clarity on long term plans to support affected children after relocation from camps

High prevalence of GBV in pre disaster situation (national indicator: SL DHS 2013)

- >50% of women and men age 15-49 have experienced physical violence at some point since age 15
- 27% of women and 23% of men experienced physical violence in the 12 months before the survey
- 11% of women age 15-49 have ever experienced sexual violence
- 9% of men age 15-49 have ever experienced sexual violence
- 8% of women experienced violence while pregnant
- Half of ever-married women age 15-49 (51%) have experienced physical, sexual or emotional violence committed by a husband or partner
- One-third of ever-married men age 15-49 (33%) have experienced physical, sexual or emotional violence committed by wife or partner

GBV data from Rainbo Initiative (January – May 2017)

- 1,080 reported rape cases at Rainbo centers
- 178 reported pregnancy due to sexual assaults
- 73 reported physical assaults

The GBV risks are increased during disaster because of following reasons:

- During the evacuation process, families are separated from their community. The vulnerable groups such as women, girls and children are often separated from their families

- The community social protection system breaks down and community members cannot protect each other
- The IDPs must live in overcrowded camps with limited security and lack of privacy
- Inability to meet basic survival needs and access supplies such as bathing, washing and hygiene materials; lack of electricity in many affected areas; deteriorating food security; loss of livelihoods and large-scale economic vulnerability
- Disruption of livelihood activities, particularly for men, can cause feelings of powerlessness that often stimulates violent behaviour by men

4.7.3 EARLY RECOVERY NEEDS

- Family Tracing and Reunification (FTR) support for unaccompanied and separated children (UASC)
- Follow-up and referral mechanisms for those who may require continued PSS and mental health care support
- Provision of Dignity kits; protection of pregnant women from life threatening complications through provision of comprehensive antenatal care; and orientation of GBV in recovery programmes
- Access to protection services provided by the Family Support Unit (FSU) through its community outreach visits for prevention and investigation of and response to child protection-related issues and GBV

4.7.4 RECOVERY INTERVENTIONS

- Provide comprehensive protection services including community sensitisation and awareness on GBV, improved data management and reporting at health, referral and police offices.
- Strengthen coordination between the psychosocial support providers and mental health care providers, namely the mental health nurses (MHN).
- Set up and strengthen existing GBV coordination mechanism at district level.
- Ensure functioning referral pathway for GBV survivors though provision of comprehensive services for the survivors including necessary medicine and supplies for clinical management.
- Strengthen data collection and documentation of GBV cases during disasters using the standard tools and apply Standard Operating Procedure (SOP) and develop the data base on GBV
- Capacity building for community organizations and NGOs for male engagement to support GBV prevention and response in emergency situations.
- Promote the use of Sex and Age Disaggregated Data (SADD), equal participation for all groups (women, girls, men and boys) in recovery interventions.
- Promote the inclusion of GBV prevention and response as well as women and men equal participation recovery interventions.

5 CROSS-CUTTING ISSUES

5.1 ENVIRONMENT PROTECTION

5.1.1 SITUATION OVERVIEW

Major environmental challenges in Sierra Leone include deforestation, degradation, and loss of soil fertility, a dramatic decline and loss of biodiversity, air pollution, and water pollution. Sierra Leone's urban centres (mainly in Freetown) are developing at an unprecedented rate, with increasing levels of urban dwellings, small-scale businesses and resulting pollution from sewage.

As a result, improving sanitation is faced with the challenge of rapid urbanization coupled with inadequate infrastructure and services for solid waste disposal. In urban and peri-urban areas, the mushrooming of spontaneous, unplanned settlements accommodating a huge proportion of Freetown's population (approximately 2–3 million) is compounding the problem associated with urban environmental management and planning. There is considerable urban degeneration due to poor housing.

Municipal solid waste (MSW) collection and management in Freetown is a general problem. At a population of 1.05 million (Western Area Urban) and 0.44 million (Western Area Rural) in 2015[8] the daily production of municipal solid waste can be estimated at 750 metric tons (2,500 - 3,000 m³) per day, or 274,000 metric tons (1,000,000 m³) per year. Roughly estimated, this would require a large engineered landfill including a segregation plant, recycling facilities and composting plant.[9]

5.1.2 KEY VULNERABILITIES & RISKS

The key drivers of vulnerabilities are: population; settlements in flood plains and steep slopes; deforestation which due to lack of law enforcement, has left only the heart of the Western Area Peninsula with green forest. Urban expansion into the hills and mountainous green forest area is widely recognised by the authorities and the general population, but action to address these issues according to the law is still lacking. The causes of deforestation in Freetown are attributable to human activities. If not addressed efficiently and constantly, deforestation results in the destruction of forest, a loss in biodiversity and ecological function, erosion, risk of landslide, and destruction of the drinking-water catchment areas so vital for the city. The mudslide and floods has implications for environmental sustainability given the immense challenges of solid waste management.

[8] 2015 Population and Housing Census, Statistics Sierra Leone, December 2016 (https://www.statistics.sl/wp-content/uploads/2017/01/final-results_-2015_population_and_housing_census.pdf)

[9] The disposal sites at Kissy/Bomeh and at Kingtom – according to international standards – are not landfills but uncontrolled dumpsites since there is neither fencing, nor access control, nor daily cover, nor leachate and landfill gas control and treatment, nor prevention of open fires and slope collapses. This would be required to operate a controlled dumpsite. An engineered landfill would require base lining, segregation of recyclables, composting area, and other technical installations. Both would require specialised equipment, trained staff and a site management and safety plan. Landfills also should meet requirements such as minimum distance to human settlements, open water bodies, drinking water wells, protected areas etc.

For complete coverage of waste collection 1.5 - 2 collection vehicles per 10,000 inhabitants, Freetown would require 150 to 200 collection vehicles. The current status is that MASADA is operating four or five waste collection vehicles, with an unknown number of collection skips on approximately 40 collection points. According to MASADA, their customer base includes 2,000 paying households.

Considering that the waste pickers at Kingtom dumpsite are renting out approximately 100 hand carts to freelance waste collectors each day, this would probably add another 2,000 households to the waste collection service. Assuming an average 5.5 persons per household, approximately 22,000 persons (2.1% of the population) would be served by waste collection in Western Area Urban.

The dumpsites in Kissy/Bomeh and Kingtom are contaminating the surrounding environment by producing toxic leachate. Leachate from municipal solid waste usually contains high concentrations of heavy metals, pesticides, chlorinated compounds and other highly toxic, carcinogen, mutagen or otherwise dangerous chemicals. Counts of coliforms and E. coli are usually in the millions per cm^3. Therefore both dumpsites can be assumed to contaminating close by drinking water wells, streams, rivers and during floods even gardens and homes.

Figure 7: Bomeh dumpsite (viewed from Kissy community) is forming a dam across the river, forming a dam in the rainy season, flooding a settlement upstream; at the same time river water seeping through the dumpsite, washing out toxic materials and solid waste, contaminating downstream Kissy community (Photo: MSB/UNDP)

In Western Area Urban, only 2.1%, or 5,800 t or 23,000 m^3 of household waste are reaching the dumpsites annually, this also means that approximately 268,000 t or more than 1,000,000 $m^3$of waste are being dumped in rivers, drains, the ocean, in illegal dumpsites or even directly in the ocean. This amount of waste seriously impacts on mangroves, coastlines and reefs, impacting local livelihoods such as fisheries, and causing loss of coastal protection against storm surges and sea level rise.

The current disaster should be considered a starting point to implement municipal solid waste management in a relevant scale, targeting at least a coverage of 60-80% of the population of Western Area Urban. To achieve this, the number of collection trucks would need to be increased to

approximately 120-150, with a corresponding increase of lift skips or roll-on-roll-off skips. The current collection system involving youths with collection tricycles is an example of livelihoods in waste collection that should be extended accordingly. Cost recovery will be a challenge and will need some awareness raising in the population.

Parallel to the extension of the waste collection service, there is a need to find a location for a new disposal site outside the populated areas. The site should be sufficient to accommodate a controlled dumpsite, later an engineered landfill. Space should be sufficient to accept waste for approximately 20 years. By implementing segregation at source and on the disposal site for recycling and composting, the landfill lifespan can be extended.

On opening of the new landfill, the sites at Kingtom and Kissy/Bomeh will need to be rehabilitated. Waste blocking water ways will need to be removed, the dumpsites reshaped and covered. Some of the waste will have to be relocated, suitable technologies may include waste mining. The closed sites will not be fit for settlements or urban agriculture, but can be converted into parks and playgrounds.

If 500 households are to be resettled, the 2,750 persons living there will produce 1.4 tons (6 m^3) of municipal solid waste will be generated per day, or 511 tons (2,000 m^3) per year. This amount of waste will be increased by the number of persons already living there. The construction of Mile 6 offers the opportunity in the sense of Building Back Better, to introduce a simple waste management system that will be able to reduce the waste quantities and the environmental impact of solid waste drastically. By introducing segregation of compostables and recyclables, the waste quantity could be reduced by >50%.

Hazardous waste management (including medical waste, chemical waste) appears to be weak. Corresponding policies, laws and regulations should be developed, implemented and enforced.

5.1.3 EARLY RECOVERY NEEDS

- Demolition of unsafe houses and recovery of reusable and recyclable materials;
- Clearing of drains from waste and sediments
- Assessment of the water quality in streams, rivers, drinking water wells, and around the Bomeh/Kissy and Kingtom dump sites
- Assessment of the efficiency of the waste collection services, carry out a waste analysis and characterisation study (WACS), support to the local waste pickers to increase their efficiency as well as their and their families' health and safety.
- Municipal solid waste collection in the new camp at Mile No. 6 needs to be addressed.

5.1.4 RECOVERY INTERVENTIONS

- Stabilisation of the mudslide affected areas
- Protection of the banks where streams and river are causing erosion of river banks (e.g. with gabions)
- Reforestation of the affected areas, coupled with community forest management strategies
- Strengthen livelihoods in waste management, especially in waste collection and recycling, but also in the re-use of electric appliances and electronic devices.
- Mid- to long-term interventions should include waste management infrastructure

5.2 DISASTER RISK MANAGEMENT (DRM)

5.2.1 SITUATION OVERVIEW

Strengthening disaster risk management (DRM) will play the critical role in enabling an effective resilient recovery; 'building back better' reconstruction that in turn will better resist and reduce the impacts of future shocks and stresses in Sierra Leone. A recurrent observation within this report, throughout all sectors, has been the complexities of institutional systems management that cause weaknesses in the overall resilience of these systems to shocks. To better manage risks in this multi-hazard environment, the government needs to simplify and strengthen institutional arrangements, in turn to improve the disaster risk knowledge, better implement risk reduction and preparedness, and improve the overall emergency response mechanisms.

Reports from past years, for example the Urban Planning Project 2011-2014 report (Freetown City Council Environmental Assessment and Evaluation of Natural Disaster Risk and Mitigation in Freetown) published in January 2014, include already a multitude of potential measures addressing DRM. One issue to be addressed is the implementation and enforcement of the respective laws.

As long as it is possible to obtain a construction license in a protected area, such as the Regent area, landslides like the Regent landslide with fatalities will occur again in the future.

Another significant issue is the application of unsustainable soil management practices. Generating three centimeters of top soil takes 1,000 years[10], and generating three meters, as is the case in some parts of Sierra Leone and in Western Region, takes one hundred thousand years. To ensure the future of agriculture it is necessary to protect soil from erosion. Without soil, there no agriculture is possible. According to the above article, the FAO estimates that in many regions of this planet the soil will have been eroded completely within the next 60 years, or two to three generations.

The current agricultural practices (inhabitants cutting trees for artisanal charcoal making, practicing slash-and-burn for local agriculture, weeding large areas and exposing them to heavy rain, furrows following the drop of the slopes, tolerating gully erosion etc.) in Western Region are promoting erosion and soil loss. As a consequence, the grandchildren of today's farmers may have no livelihoods left because instead of today's fertile soil there may only be rocks left, without any soil to grow crops on.

5.2.2 KEY VULNERABILITIES & RISKS

- Urban sprawl triggering environmental degradation
- Land use change resulting from rapid urbanisation
- Lack of knowledge about adequate land use techniques to reduce erosion and landslide hazards
- Intense rainfall due to climate variability and change
- Weak landslide hazard management. Non-existence of landslide hazard zonation
- Weak enforcement of building regulations in protected areas
- Lack of knowledge in the local population about selection of landslide safe and flood safe building spaces and resilient construction types

[10] Only 60 Years of Farming Left If Soil Degradation Continues
(https://www.scientificamerican.com/article/only-60-years-of-farming-left-if-soil-degradation-continues)

- Lack of awareness that erosion is causing soil loss that will reduce the landowners' income over the next two or three generations
- Informal settlements in high disaster areas/ construction in flood-prone areas along the creeks and coasts
- Lack of legislation pertaining to enforcing risk management
- Inadequate and inefficient rainwater drainage systems on plots and in the streets of Freetown
- Blocked drainage systems as a result of soil erosion and waste deposits
- Restricted water flows in rivers and creeks due to encroachment of buildings.
- Inadequate coordination among relevant MDAs

5.2.3 EARLY RECOVERY NEEDS

- Rehabilitation of storm sewers, ditches, and culverts in a manner that efficiently transports the water away;
- Rehabilitation/construction of sufficiently wide drainage systems to transport receiving storm water from uphill;
- Open existing blocked drainage; and provide landscaping and reforest area to reduce run-off.

5.2.4 RECOVERY INTERVENTIONS

- Strengthen national coordination systems for ER
- Capacity strengthening for ER planning and programming by ER sectors/pillars to promote integration and synergy of DRM across sectors/pillars
- Advocacy on early recovery with emphasis on basic service delivery
- Setting up a reliable early warning system (EWS)
- Rehabilitation and reforestation of degraded habitats in disaster prone zones
- Enforcement of legislation against construction, felling of trees for artisanal charcoal production, or conversion of protected forest land into agricultural land
- Drainage clearing and culverts rehabilitation
- Including simple household-level waste management in recovery projects (especially recycling, composting, etc.)
- Protect soil from erosion including urban and peri-urban gardening in recovery projects

5.3 HIV/AIDS

5.3.1 SITUATION OVERVIEW

In addition to the broader impact, the disaster also disrupted access and provision of HIV services and also affected people living with HIV (PLHIV) in the affected location. It is a well-known fact that in every humanitarian emergency, the sub-population groups most affected are the vulnerable groups, including people living with HIV resided in the flooded areas. The outcome of the rapid assessment conducted by the HIV Sector after the disaster shows that a total of 145 households of people living with HIV, TB and key populations and 314 of their dependents were found to be severally affected by the disaster (see details in table 1 and 2 below). Collapse of infrastructure affected their access to food, water and essential medication such as ARVs. It was also observed that PLHIV on treatment experienced treatment interruption and with limited access to food and nutrition and non-food items. PLHIV, TB and KAP also experienced high stigma and discrimination heightened social exclusion. Many PLHIV actually stayed away from formal health care facilities and

community centers where relief materials were being distributed. Most PLHIV, TB and KAP are not open about their status, hence may not have benefited from the community support mechanisms that are providing psychosocial and trauma mitigation services. Many HIV positive people now live in temporary accommodation, within unfinished buildings or on the street, where their weakened immunity, and unrelenting heat and rain makes them more vulnerable to diseases. Unprotected sex in these situations—both forced, transactional and consensual—may well increase the spread of HIV. Table 1 and 2 below provides detailed information on the findings from the assessment.

Table 1: PLHIV impacted by Disaster

PLHIV affected by flood and mudslide disaster	
Total Number of Known HIV positive Households traced	145
No. of PLHIVs pregnant women	1
No. of PLHIV lactating mothers	3
No. of PLHIVs children and orphaned	14
No. of PLHIV and family members deceased	78
No. of dependents	314

Table 2: Loss of properties

Property damage and losses	
PLHIV Households with total damage of houses	80
PLHIV Households with loss of properties	110
No. of PLHIV with loss of Drug supplies	110

5.3.2 KEY VULNERABILITIES & RISKS

- Most PLHIV and KAP affected by the disaster are residing in host families with limited access to benefits shared in the camps
- Stigma and discrimination against PLHIV and KAP
- Affected PLHIV and KAP not included in the master list of beneficiaries
- Potential increase in HIV infection due to transactional sex in the camps and communities
- Lack of adequate food for PLHIV will affect their adherence
- Poor adherence of PLHIV/TB to treatment as many lost their drugs during the disaster
- Young girls and women became more vulnerable to sexual harassment and abuse
- PLHIV were exposed to other diseases that could impair their health
- Facilities providing HIV services in the affected areas were destroyed or damaged
- Support groups and safe places for PLHIV and KAPs were destroyed or damaged

5.3.3 EARLY RECOVERY NEEDS

- Inclusion of the most vulnerable social groups such as women, children, youth, people living with disability and people living with HIV in the national relief packages and resettlement process

- Supplementary feeding to those moderately malnourished and/or provide increased food rations to those at risk of malnutrition, including PLHIV and TB on treatment
- HIV prevention services and monitoring at the camps and settlements to prevent and treat victims of rape, gender-based violence, sexual assaults
- Support educational needs of HIV+ children or children of person living with HIV
- Provision of appropriate, confidential and sensitive test and treat services at the health clinics in the camps or nearby health facilities including eMTCT services to HIV+ pregnant women and lactating mothers

5.3.4 RECOVERY INTERVENTIONS

- Conduct regular monitoring of the impact of the disaster on people living with HIV and TB; and facilities providing TB/HIV services.
- Provide HIV prevention commodities that were included in dignity kits supplied by UNWOMEN and UNAIDS and made available at health clinics at the camps.
- Provide Information, Education and Communication (IEC) materials on HIV/AIDS at the health clinics in the camps.
- Provide immediate needs for PLHIV affected by the disaster.
- Strengthen networks of people living with HIV and key affected populations through provision of psychosocial support to PLHIV/TB affected by the disaster.
- Technical support to government agencies and civil society organizations responsible for HIV/Aids and Tuberculosis.
- Participation in Inter-Agency Task Team on Recovery Process to provide update and collaborate with other agencies on interventions during the recovery process.
- Technical assistance (TA) in recovery action planning, and programmes/projects.
- Resource mobilisation for the HIV Sector recovery response.
- Monitoring of HIV service restoration in the affected areas.
- Strengthening of logistic management systems for commodity security.
- Strengthening of Health Management Information System (HMIS) especially on HIV services.
- Support to network of PLHIV for adherence monitoring including retention in care.

5.4 GENDER

5.4.1 SITUATION OVERVIEW

The impact of the mudslide and flooding goes beyond the immediate mortality. The destruction is having a significant impact on the livelihoods of those who survived or lost loved ones, houses, other personal properties and production materials. This includes women who are engaged in small-scale farming or petty trading. With several schools utilized as shelters, as well as the potential for orphaned children or widowed families, women and girls can potentially find themselves exposed to a heightened risk of GBV and sexual exploitation and abuse. This is in a context where GBV and sexual exploitation rates are already high and police resources are stretched thin due to the many protection and logistical tasks arising as a result of the emergency. The Multi-Sectoral Gender Impact Study Report carried out in Sierra Leone by UN Women/Statistics Sierra Leone and the MSWGCA provided ample examples of the additional vulnerabilities faced by women and girls during the Ebola Virus Disease Outbreak and Crisis in Sierra Leone. The focus on gender is to meet the immediate

needs of women, men, girls and boys affected by the Mudslide and Flood disaster in a way that also addresses the underlying causes of their vulnerability, especially as a result and cause of gender inequality.

Health Care

Surviving women, men, girls and boys go through extreme trauma both psychological and physical. Therefore, immediate psychosocial counselling by trained counselors is urgent and must be provided as soon as possible and concomitantly with the other basic life-saving services. Serious attention must be given to implementing the approved gender sensitive and responsive psychosocial counselling methodologies and services primed on a **rights-based approach**. Specific attention must also be given for psychosocial to special categories of people including persons living with HIV, pregnant and lactating mothers, girls in general including adolescent girls; the youth who played a lead role in the excavation and burial of their family and friends; widows, female headed households etc. In addition, it is essential that where ever feasible, standard quality health services – in particular antenatal, postnatal care and delivery services including emergency obstetric and newborn care – are continued.

Food security and Livelihoods

The mudslide is having a significant impact on the ability of the affected populations to continue the work activities they had before the mudslide; small-holder farmers (predominantly women) have lost crops and livestock. As a consequence, their food security is severely affected. This is especially true amongst the female- and child-headed households.

5.4.2 KEY VULNERABILITIES & RISKS

- Women are more likely to be front-line responders and health facility service delivery personnel as nurses and other care-giving medical personnel.
- Norms and customs dictate that women and girls play the role of caretakers for ill/incapacitated family members.
- Gender inequality resulting from patriarchal society.
- Pre-crisis gender norms, entrenched gender-related stereotypes, and gendered power dynamics are often reflected and amplified in humanitarian contexts, affecting women's and girl's access to life-saving information and much needed humanitarian services, as well as impacting their right to participate in decision-making processes to ensure their rights and needs are addressed.
- Invalidated numerous numbers of estimated thousands of families have been left homeless and the temporary housing situations (shelters, schools or vacant buildings) which were used provide little or no protection from sexual and gender-based violence particularly for women and girls when seeking services/support for their own families particularly those widowed or separated, or unaccompanied and separated girls, by such natural disasters/emergency crisis.

5.4.3 EARLY RECOVERY NEEDS

- Provision of medical supplies, food, care, social protection measures and psychosocial services with particular attention to pregnant and nursing women.
- Continuous monitoring and PSS services to women and girls who might have or continue to experience additional trauma such as pressure for sex or GBV whether in host family situations or in temporary shelters during the emergency response period.
- Specific attention must also be given for psychosocial to special categories of people including persons living with HIV, pregnant and lactating mothers, girls in general including adolescent

girls; the youth who played a lead role in the excavation and burial of their family and friends; widows, female headed households etc.

- The provision of NFI must include adequate supplies and dispersal of dignity kits, sanitary materials and other materials related reproductive health.

5.4.4 RECOVERY INTERVENTIONS

- Prioritise women in the provision of medical supplies, food, care, social protection measures and psychosocial services with particular attention to pregnant and nursing women.
- The provision of NFI must include adequate supplies and dispersal of dignity kits, sanitary materials and other materials related reproductive health.
- Distribution should be accompanied with sensitization on the safe disposal of sanitary materials to counter potential increased stigma around menstruation.
- Dignity for patients attending health centers must be maintained - particularly for women and girls with separate ablutions, toilets and privacy screens as well as safe disposal bins for used sanitary items.