

SLURC/DPU Action-Learning Alliance

Understanding urban risk traps in Freetown

MSc Environment and Sustainable Development

Practice Module 2017-18

POLICY BRIEF No 3. Landslides and Building Collapse

Key points

- Occurrence of landslides and building collapses within Freetown are concentrated in hillside settlements with steep topography, however, impacts manifest spatially and temporally beyond the event. Although formal and informal settlements are vulnerable to large scale landslide and building collapse, communities with a lower capacity to act in informal settlements have a disproportionate burden of risk to small scale events.
- Limited capacity of urban planning within Freetown creates unequal access to formal housing markets, driving unauthorised development of protected forested areas. Both unauthorised and authorised encroachment of forested areas for housing and economic activity are influencing environmental conditions and contributing to the accumulation of landslide risk.
- The national government's reactive and short-term focus on responding to large scale landslide events underrepresents the extent of the cumulative impact of frequent small scale landslide and building collapse events. Relief from government and aid agencies emphasise assistance exclusively on large scale events, prioritizing crisis response efforts rather than long-term risk reduction.
- Harnessing existing capacities of communities is essential to raising awareness of landslide hazards in order to reduce risks. Increased coordination and shared learning between government and non-government actors can increase understanding of risk traps and risk reduction strategies.



August 2017 Landslide. Photo Credit: Getty Images 2017.

Summary

Unstable slopes can create movements of soil and rock, resulting in landslides and building collapse. These events occur with differing scale, and therefore differing socio-economic impacts. Residents of hilly areas of Freetown are at greater risk of landslides, although social, economic, and spatial impacts can spread beyond the event. Vulnerable social groups living in stressed environmental conditions have a limited capacity to change their housing location and improve their built environment to reduce risk. Domestic and international relief tend to be focused on large scale landslide crisis response rather than risk reduction for those living in landslide prone areas. Establishing disaster management committees and the enhancing engagement with existing community structures offer a means to empower those living at risk by including vulnerable groups within political decision-making and setting of urban development policy.

Key Words

Landslide, Building collapse, deforestation, urban density, protected areas, hills, cyclical risk traps, social vulnerability.

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Landslides occur when slopes become unstable, resulting in the movement of soil and rock down a slope. Changes in slope stability can be caused by natural conditions such as groundwater reduction, loss of soil structure, erosion, and slope saturation from heavy rainfall can destabilise slopes (FCC, 2014a).

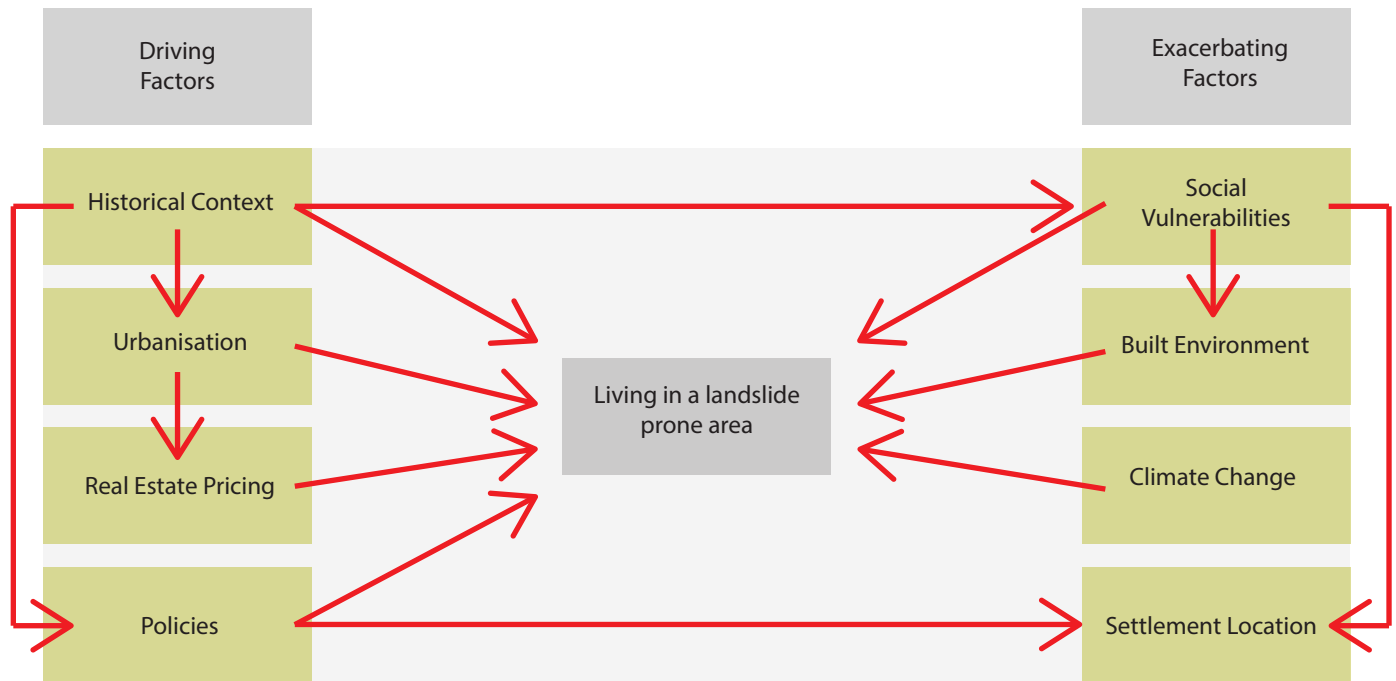
Urban Risk of Landslides

Landslide and building collapse risk conditions can be exacerbated by human activity which expose the surface such as deforestation, unmanaged settlement construction, and mining of hillsides. Destabilised slopes and saturated soils can undermine structure integrity and can cause building collapse to occur (FCC, 2014a). The level of landslide risk is defined by the susceptibility of an area to be destabilised, and is difficult to predict (Brabb, 1984).

Landslides manifest in a range of scales, from large-scale (10 or more killed, 100 or more injured), to small-scale (1-3 people killed, 1-9 people injured) (Brown, 2017). Large-scale landslides and resulting building collapses, such as the recent August 2017 event (see box 2 on page 5), typically receive more domestic and international documentation, news coverage and aid relief. However, the cumulative impacts of small-scale landslides and building collapse on gradual slopes are underreported and

receive almost no aid or external attention. Differing scales of landslide events pose differing consequences, impacted populations, and financial losses. With limited data on the impact of small-scale landslides on formal databases, it is hard to accurately quantify the damages and who is impacted, this information would bring insight on how to mitigate future hazards.

Freetown residents exposed to the threat of landslide are often living in those areas due to a limited capacity to change their



Factors that perpetuate living in a Landslide prone area. Diagram Credit: by authors

dwelling location as a consequence of social and economic vulnerabilities. Risk traps develop over a period of time and through various conditions, and often result in an eroded capacity to act, especially in low income communities (Allen et al, 2017). The definition of risk trap used here is the “sum over time of the articulation and reproduction of vulnerability and daily and episodic dangers or threats coupled with eroded capacity to act” (Allen et al, 2017). The risk trap cycle relating to living in a landslide prone area is characterised by drivers of why people live in landslide risk areas, with exacerbating

factors which worsen environmental conditions and limit available assets. Diagram #1 maps this policy brief, seeking to understand on how risk traps form in relation to landslides, and can accumulate depending on environmental stresses and social vulnerabilities.

Defining why, where, and to whom landslides occur interrogates the driving factors of the risk trap cycle of living in a landslide prone area. Historical context, the resulting rapid and unplanned urbanisation and high real estate pricing are highly related as indicated by the

arrows in Diagram #1. The “driving factors” column indicates pressures on disadvantaged residents to reside in landslide prone lands while the “exacerbating factors” further marginalise community members, increasing their likelihood of living in risky areas. Interconnected elements of social vulnerabilities, inadequate housing resources, and living in or around a landslide risk area exacerbate the driving factors of those living in high risk areas. Additionally, climate change amplifies existing environmental conditions, making landslide and building collapse more likely to occur.

Landslide Risk Accumulation Cycles and Why they Happen

In Freetown, hills can vary from 30 percent slope in the hillsides to 5 percent slope near the coastline, leaving limited space for development. Without proper grading and construction methods, hillside dwellers are at risk to landslides (FCC, 2014a). Erosion of soil from deforestation, heavy rainfall, and poor land-use control, in addition to steep slopes add to the risk of landslides and building collapse.

Areas of Freetown particularly vulnerable to landslides and building collapse due to stressed environmental conditions are highlighted on Map 2 in purple. These areas include the administrative boundaries of Tengbeh Town and New England-Hill C within box 1 highlighting Moyiba. (See box 1 for more insight on Moyiba.) The landslide of August 2017 is shown in brown, with the box 2, highlighting the affected areas, including in the districts of Lumley, Malama/Kamayama, Juba/Kaningo within freetown, in addition to Regent outside of the city boundaries. As shown in Map 2, the affected areas spread far beyond the landslide event, therefore necessitating landslide risk reduction to areas outside of the immediate landslide prone areas. Landslides also impact coastally located planned areas within Freetown such as Kingtom (Dai, 2002).

Climate change exacerbates the environmental conditions of landslide risk as an

increased intensity and unpredictability of rainfall events further exposes soil surfaces and destabilised soils (De Zeeuw, 2011). Unpredictable rainfall adds additional burdens to lower-income residents as there is more uncertainty surrounding any possible application of practical measures to protect themselves. Additionally, as burdens manifest temporally and spatially beyond the landslide and building collapse event, climate change stress can impact those outside of landslide prone areas.

Historical Context

Since Freetown was founded in 1787, development of the city has largely focused on its port and related industries. As a consequence, Freetown exhibits a spatial configuration built around the colonial pattern of a "motherland" a city center acting as the commercial and administrative hub for the country, growing inland as the population grew (Gleave, 1997).

Sierra Leone's Civil War, lasting 11 years and ending in 2002, caused a significant shift in Freetown's development. During this period, it is estimated that over 500,000 people were displaced and moved into camps situated on the fringes of Freetown (Johnson, 2009, pg. 3). A large proportion of the displaced population

chose to stay permanently in Freetown, rather than return to their rural homes. This sudden rise in permanent population, quickly escalated the demand for housing, resulting in steep price increases in the urban centre. As land prices in the city rose, settlement formations were established on the hills at the city's outskirts, encroaching on the forests of the Freetown peninsula. Weak governance in the wake of the war led to a struggle to properly enforce building regulations. Many residents faced prolonged economic stagnation and were compelled to move to land known to be unsuitable for housing and prone to natural disasters, to be in closer proximity to their communities and employment (Kallon, 2008). As a result of this, more vulnerable residents are exposed to landslide hazards and building collapse.

Policy and Institutional Environment

Interrogating existing domestic policies and institutional frameworks gives insight as to how the local and national government is structured, and the role institutions in place have in the production of landslide risk traps.

Broadly it can be highlighted that domestic policies and institutions have not been successful at addressing systemic capacity deficiencies. Within Sierra Leone, as with many African nations in the past decade,



Landslide and Building Collapse. Photo Credit: World Bank Assessment on Landslides and Floods in the Western Area, 2017.

there has been the promotion of decentralisation of land-use planning and urban planning to local government level. In Sierra Leone, these guidelines were established through the Local Government Act of 2004. However, no urban development plan existed to guide the planning department of Freetown City Council (FCC) leading to uncontrolled housing and urban spatial configuration. A key issue that can be highlighted is that Sierra Leone has no policy specifically related to informal settlements, indicating the limited recognition of these residents in formal planning decisions (Macarthy & Koroma, 2016).

Landslides, along with other risks are framed as a security issue within policy documents. This reflects the establishment of the Department of Disaster Management (DMD) after the civil war, and its placement within the Office for National Security (ONS). The DMD is the responsible agency for the coordination of all stakeholders involved in disaster risk management. Actions within policies are therefore directed towards response to large-scale disasters rather than consideration towards the reduction of everyday risks and small-scale episodic disasters (Macarthy, 2017).

In addition, the governance framework in place for Disaster Risk Management (DRM) adopts a decentralised approach with the lowest tier of government DRM structure sitting at the chiefdom level, who feed into district disaster management committees. In Freetown, a network of community based disaster management committees

(CBDMC) has been established, however these are not legally recognised within the government framework, therefore, their role is seen as information dissemination rather than as participants within decision-making (Macarthy, 2017). CBDMCs are vital for communicating information and knowledge around disaster risk, however, without legal acknowledgement and support by the government, communities encounter an eroded capacity to act within the institutional framework. A limited capacity to act to change settlement location or disaster preparedness can further trap hillside residents in a landslide and building collapse risk cycle.

Rapid urbanisation and unaffordable land pricing

Lack of access to safe and affordable land within Freetown is a major driver compelling people to live in landslide risky areas. Rapid urbanisation and resulting high real estate pricing since the civil war has caused much of the safer, non-landslide risk prone areas to be densely populated and highly valued, therefore, unavailable to those who cannot afford to rent or purchase the limited space. As the city population has grown, planning policies have not been updated and have retained a promotion of colonial spatial configuration. The limited regulation of existing policies has allowed those who are marginalised to occupy and 'land grab' landslide prone areas (Macarthy & Koroma, 2016). Those who could not afford the rising housing prices in the developed

areas of the city had to relocate to informal settlements sometimes built on previously forested areas or transformed wetland zones (Mansaray, Huang & Kamara, 2016). As shown in Map 1, the topography of these forests and woodlands is steep and not appropriate for building structures.

Deforestation and accumulation of risk trap cycles

Deforestation is a significant contributor to landslide risk in Freetown, as it reinforces the aggregation of risk in areas of steep topography, which contributes to the accumulation of a risk trap for residents located on these hillsides. Without tree roots to absorb heavy rainfall, the soil on steep slopes becomes oversaturated and loses friction. The resulting flow of water down the hills dislodges soil and boulders, putting residents and buildings located below at risk. Urban development is prohibited within forested areas within FCC, through their designation as a part of the of the larger Western Area Peninsula National Park (WAP-NP) - a protected conservation area. This is managed at a national level by the Forest Division (FD) within the Ministry of Agriculture, Forestry and Food Security (MAFFS). Urban encroachment is often acknowledged as the key driver of deforestation of the WAP-NP (Munro, 2009). Figure 1, indicates the loss of forested area of the Western Peninsula since 1980 through development of the built environment.

An increased need for housing is not the only driver of deforestation, forested land has also been removed for construction,

Box 1: Moyiba Case Study

Through the lens of Moyiba, risk can be examined on small, everyday episodic levels. Moyiba is located on the Eastern central part of Freetown, indicated by figure 2 in map 2 on page 6 of this policy brief, and has been noted as a key area of risk of landslides. Although there is a lack of reliable data regarding small scale landslides, there have been reports of a series of smaller landslides such as the one which took place in the early hours of August 3rd 2011, in which one schoolgirl was killed and four others were seriously injured (Sesay, no date). Prolonged periods of heavy rain drive these series of landslides, which are further exacerbated by the exposure of the unstable soil due to activities such as deforestation and mining taking place at the uppermost part of Moyiba.

Moyiba is an area with informal settlement and includes a quarry for stone used in construction (Walker, 2017). Quarrying activities destabilise land in combination with clearing of vegetation and unplanned development on the sloped landscape (FCC, 2014a) places Moyiba at high risk for landslides. The risk trap is fuelled by the lack of government intervention in the planning process of Moyiba. As it rains, landslides have become more frequent due to the risk accumulated through land erosion in Moyiba. Both economic and housing activity in Moyiba provides a case study of risks which create smaller landslides as well as risk accumulation due to limited intervention as the area expanded.

commercial wood sale, agriculture and mining (Mansaray, Huang & Kamara, 2016, p. 4). However, deforestation through housing development and economic activity is occurring both legally and illegally (Jackson, 2015). Enforcement and monitoring of protection regulations are limited due to constraints in FCC resources. However, conflicting mandates and weak inter-sectoral cooperation of government agencies are leading to authorised land-use change of protected areas. The illegal allocation of land and building permits by the Ministry of Lands, Housing, Country Planning and the Environment (MLHCP) to wealthy residents is permitting the development of middle and higher-income housing (Munro, 2009). Yet, blame for deforestation and land-use change is centred around those living illegally, even though authorised land-use change is contributing to the accumulation of risk. Therefore, further interrogation into who is controlling boundary demarcation is necessary.

Built Environment

The built environment, both in terms of housing and community infrastructure, can greatly influence the vulnerability of residents to landslides and building collapse. The typology of structures and land tenure arrangement are key considerations in understanding the distribution of

burden of risk to landslides.

As seen in Map 2, informal settlements within Freetown are predominantly located close to the coast or on the hills where urban poor residents have occupied marginalised land. Unplanned settlements are characterised by poorly constructed, self-built structures termed ‘pan-bodies’ that are built with materials and methods that are more susceptible to collapse from the stresses associated to landslides hazards (Rogers, 2016). Overcrowding in these areas, coupled with inadequate foundations are further reinforcing vulnerability of households to the effects of surface water run-off.

Housing considered to be of higher value has also been constructed upon hilly areas within formal areas. These tend to be constructed with more robust materials using methods that are able to withstand higher impacts from hazards. However, these materials are not able to fully mitigate against the risk of large-scale landslides and heavier structures contribute to the overall instability of slopes. Furthermore, unregulated and unauthorised construction occurs within formal areas as well as informal. FCC recognises the need of safe construction and has produced a set of technical guidelines and regulations for new construction and for improvements to existing dwellings. However, these are not enforced or widely

understood by the public (MLCPE & FCC, 2014).

Informality is reinforced by landslide events due to the restraints the FCC imposes on NGOs who are responding to emergency events in informal settlements. This generates challenges for organisations (such as the YMCA) trying to provide infrastructure such as community halls, toilets or markets since they are prohibited by the government to do so. The FCCs reasoning behind this is the desire to prevent informal settlements extending beyond their current borders and stopping them from building upon more unauthorised land. Furthermore, they believe this will force the dwellers to move out of these unauthorised locations. A cycle of informality is then reproduced since urban poor residents are compelled to rebuild their own housing and built environment (Macarthy, et al. 2017).

Social Vulnerabilities

Social vulnerabilities can exacerbate the aforementioned driving factors, and accumulate to reinforce the risk trap cycle experienced by residents who are susceptible to landslides and building collapses. Landslides can occur in a matter of minutes or seconds, consequently, those who generally spend the most amount of time within the home are more likely to be affected by building collapse (FCC, 2014a).

Box 2: August 2017 Landslide Case Study

Three days of massive rainfall triggered the collapse of a mountain valley side slope in the Regent area below Sugar Loaf, the highest peak in the north of the Western Area Peninsula, on August 14th, 2017 (World Bank, 2017). A major landslide quickly followed the collapse, and clayey soil and boulders of all sizes tumbled down the slope and into the city of Freetown with tremendous momentum - the debris pushing flood water in front of it in a “tidal wave” of material, causing flooding and mudslides at lower elevations of the city (World Bank, 2017).

By August 22nd, the total number of registered people affected by the landslides and resulting floods stood at 5,905 (UNICEF, 2017). Out of the 5,905 affected people, 2,607 were children, and of the 493 deceased, 157 were children (UNICEF, 2017). The landslide also caused major destruction in infrastructure, including buildings, bridges, schools and health facilities both in Freetown proper and its surrounding areas, in the Regent, Malama/Kamayama, Juba/Kaningo, and Lumley districts (World Bank, 2017).

There was a large response to the disaster from international actors including UNICEF, the Red Cross, the UK Government, WHO, WHP, and dozens more (UNICEF, 2017). Their efforts concentrated on emergency relief in the wake of the tragedy.

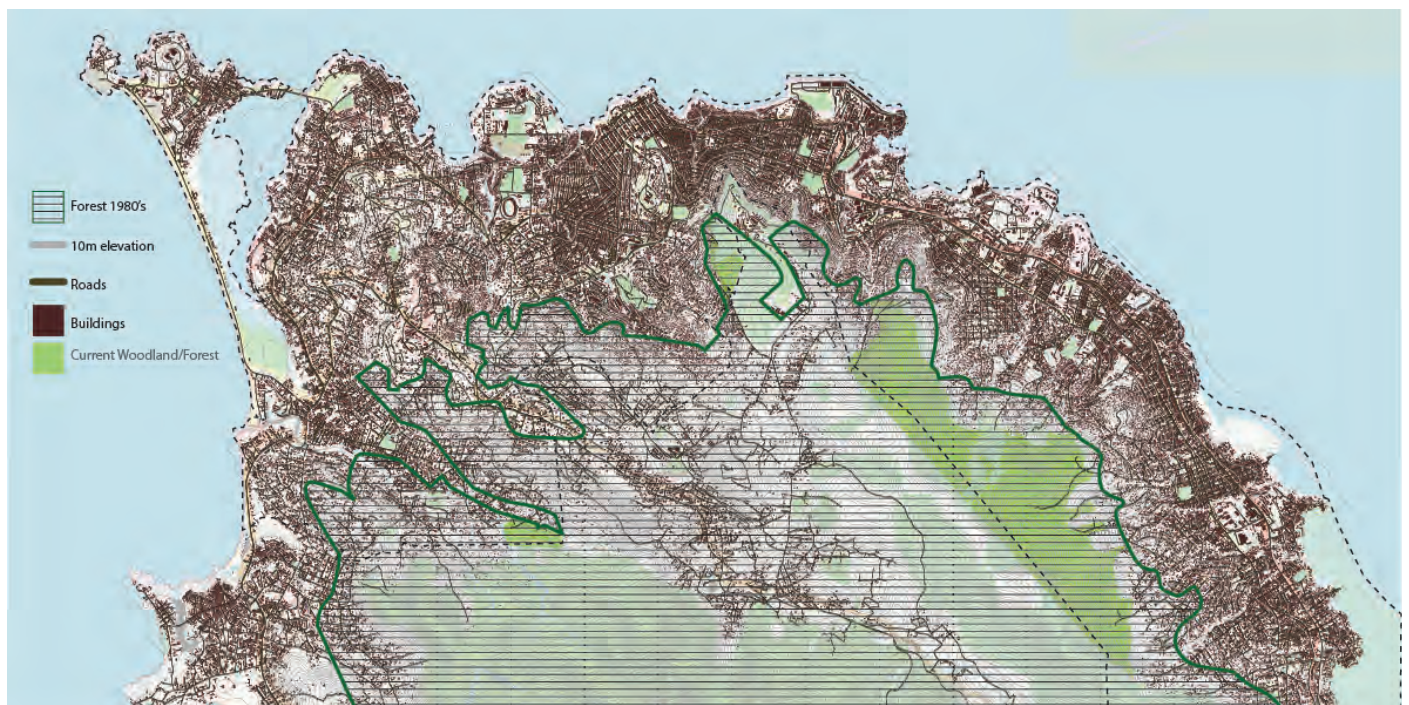


Landslide 14th August 2017. Photo Source: Al Jazeera, 2017

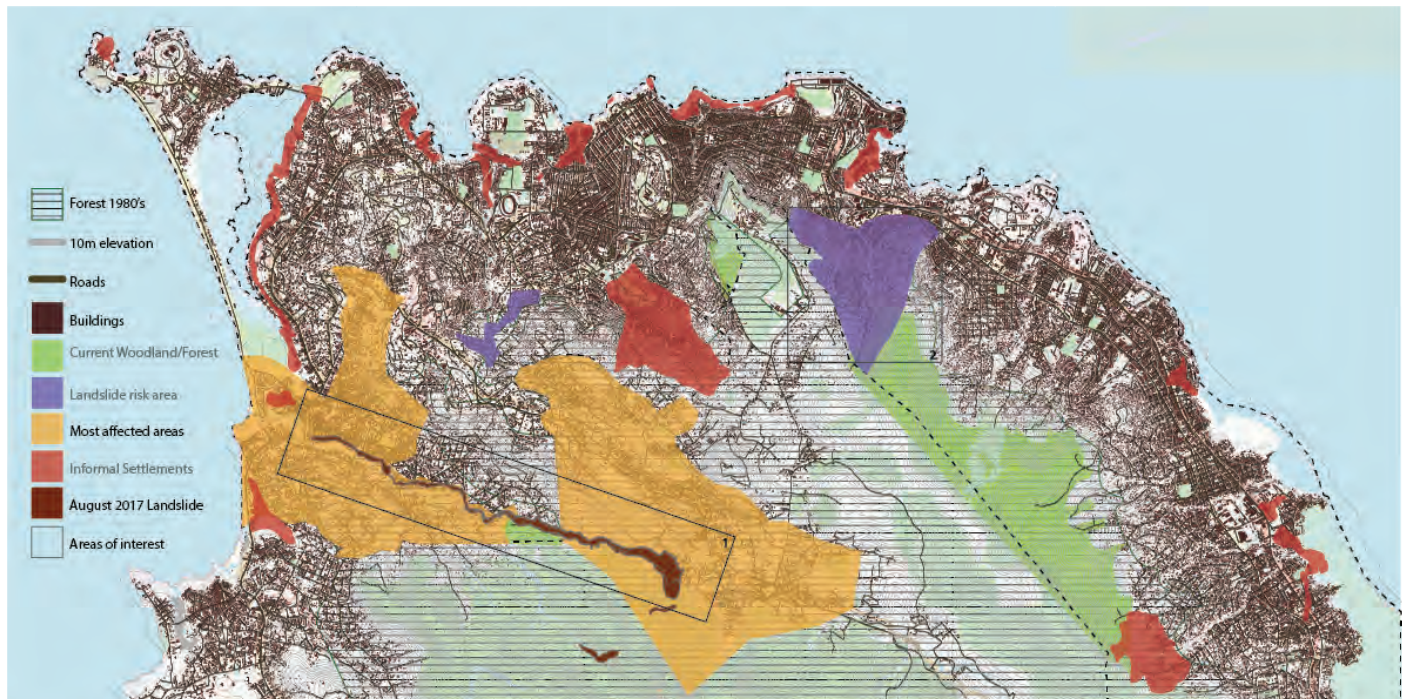
Mobility issues, including those associated with age, are a consideration for those who are particularly vulnerable. Young children and the elderly have difficulty evacuating the home and moving away from the landslide. Women often take on the role of mothers, caretakers, and homemakers, and as a result they spend more time within the household, hence this increases the likelihood of them being affected if a landslide occurs in a residential settlement. Many of the areas of Freetown identified to be at risk to landslides or impacted by previous landslides include housing for the

urban poor in informal settlements. The complex nature of social and spatial marginalisation is poorly understood, resulting in a knowledge gap between social vulnerabilities and land tenure (Macarthy & Koroma, 2016). However, it is known that informal settlers are primarily employed in the informal sector, although it is unclear in which jobs they engage. Informal settlements tend to be ideally located to provide ease of access to markets which support their livelihoods (Macarthy & Koroma, 2016).

Urban poor populations settling upon illegal land face the looming threat of eviction which hampers their ability to organize collectively and adopt means of improving the quality of their housing (Allen et al., 2017). Their informal status has traditionally rendered dwellers politically invisible, leaving them prone to authorities using their informal nature as a justification for denying provisions of key infrastructure and services such as access to drainage, electricity and waste disposal significantly increases the risks facing the inhabitants of these settlements (FEDURP, YMCA and FCC, 2011).



Map 1: Mapping Informal Settlements Related to Landslide Risk and Previously Affected Areas. Map Credit: Data Mapped and adapted by authors



Map 2: Mapping Informal Settlements Related to Landslide Risk and Previously Affected Areas. Map Credit: Data Mapped and adapted by authors

Understanding the intersectionalities which exist with different members of the communities living in landslide prone areas is vital to comprehending the capacities and limits they face in their lives and to act in the community. There is a known capacity gap within informal settlements role in participating in civic engagement, and is an area for expanded research.

Harnessing Existing Practices

In the past there has been a large response to major landslide events from international actors, but their efforts were concentrated only on emergency relief. Even with the international media attention brought to Freetown in the wake of the latest tragedy, few international actors remained to address the risk of future landslides (UNICEF, 2017). However, the UN Country Team is supporting the Ministry of Finance and Economic Development at a national level to create a Risk Management and Recovery Action Plan drawing on "sector-specific assessments, multi-hazards mapping and other relevant reports." The goal is to support the national government and partners in making cross-sectoral, evidence-based decisions that address immediate and long term risk and to provide an urban plan to protect settlements from future landslide disasters (UN Development Programme & UN Country

Team in Sierra Leone, 2017).

Engaging with governmental and community capacities is vital to shift disaster management from crisis reaction to a focus on risk reduction in order to disrupt risk traps. The participation of civil society plays a key role in representing the interests of the urban poor politically. The Federation of the Urban and Rural Poor, YMCA and other community based organisations have made concerted efforts to lobby for changes in urban planning in order to create more equitable conditions for informal settlers. Moreover, these organised community structures have also provided a means of pooling limited resources through saving groups which can be of assistance in response to hazards such as landslides (Reffell, 2017). CBOs and community structures such as the CDMCs offer a channel of communication between government agencies to existing community networks and practices.

Community participation should be legally required, as previously when only offered as a recommendation within policy framing, it has been ignored by government and international aid agencies (Macarthy et al, 2017). Recent institutional support for urban planning within FCC, has led to a shift in policy framing, with the explicit intention for stakeholder consultation within the process of developing an urban plan for Freetown

and Local Area plans. In particular, this framing indicates a move beyond actions centred on demolition of dwellings on landslide risk prone sites to the involvement of communities in identifying alternative areas for settlement (MLCPE & FCC, 2014). However, this has been influenced by internationally set guidelines, tied to funding from external actors (FCC, 2014b). Multi-stakeholder involvement within local planning processes allows for the recognition of diverse perspectives. This offers an opportunity to create spaces of collaboration to increase urban stakeholder's capacity to participate.

Conclusion

In order to disrupt the risk traps of landslides, the extent and complexity of risk needs to be recognised and captured. A focus on gathering data and knowledge on the cumulative impacts of everyday risk and small-scale events will better inform urban planning. Recognising the maldistributed burden of risk on marginalised communities is central to empower and improve at risk residents' response capacity. Furthermore, actions taken towards landslides and building collapse should strengthen the connection between community networks and institutional practices.



Landslide and Building Collapse. Photo Credit: World Bank Assessment on Landslides and Floods in the Western Area, 2017.

References

- Allen, A., Koroma, B., Osuteye, E., & Rigon, A. (2017). Urban Risk in Freetown Informal Settlements: Making visible the invisible. Sierra Leone Urban Research Center Policy Brief Vol 1. Available at http://www.slurc.org/uploads/1/6/9/1/16915440/slurc_policy_brief.pdf [Accessed 10 Jan. 2017].
- Brown, D. (2017). Lecture BU6 Session 1, Adapted from Bull-Kamanga et al 2003
- Bloch, R. and Sesay, I. M. (2014) A Spatial Development Strategy for Sierra Leone. Forkuor, G. and Cofie, O. (2011) 'Dynamics of land-use and land-cover change in Freetown, Sierra Leone and its effects on urban and peri-urban agriculture - a remote sensing approach'. *International Journal of Remote Sensing* 32(4), pp. 1017–1037. doi: 10.1080/01431160903505302.
- Brabb, E.E. (1984). Innovative Approaches to Landslide Hazard and Risk Mapping. IV International Symposium on Landslides 1, pp. 307-323.
- Dai, F. C., Lee, C. F. and Ngai, Y. Y. (2002). Landslide risk assessment and management: an overview. *Engineering geology*, 64(1), pp. 77.
- De Zeeuw, H. (2011). Cities, climate change and urban agriculture. *Urban Agriculture Magazine* 25: 39-42.
- FEDURP, YMCA & Freetown City Council. (2011). Towards a Pro-poor Agenda for Change: Adopting an Inclusive Approach to City and Urban Planning. NATIONAL CONFERENCE ON URBAN SLUMS AND INFORMAL SETTLEMENTS. Available at http://www.slurc.org/uploads/1/6/9/1/16915440/conference_on_urban_slums_2.pdf [Accessed 10 Jan. 2017].
- Freetown City Council. (2014a). Environmental Assessment and Evaluation of Natural Disaster Risk and Mitigation in Freetown. Urban Planning Project 2011-2014.
- Freetown City Council (FCC). (2014b) Resettlement Manual: A guide to the resettlement of communities living in risk prone areas of Freetown. Urban Planning Project 2011-2014.
- Gleave, M. (1997). Port Activities and the Spatial Structure of Cities: The Case of Freetown, Sierra Leone. *Journal of Transport Geography*, 5(4), pp. 257-275.
- Jackson, E. and Abraham, A. (2015). Negotiating New Dimensions for Forests Conservation in Sierra Leone. *Journal of Applied Thought* 2. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2805850 [Accessed 10 Jan. 2017].
- Johnson, M., (2009). An Assessment of the Urban Conditions and Systemic Issues Contributing to Slum Development in Freetown, Sierra Leone, s.l.: Cities Alliance
- Kallon, S.B. (2008). Pollution and Sanitation Problems as Setbacks to Sustainable Water Resources Management in Freetown. *Journal of environmental health* 71(5), pp. 34-7.
- Kelly, J., Barrie, M., Ross, R., Temple, B., Moses, L. and Bausch, D. (2013). Housing equity for health equity: a rights-based approach to the control of Lassa fever in post-war Sierra Leone. *BMC International Health and Human Rights*, 13(1).
- Macarthy, J.M., Frediani, A., Kamara, S., and Morgado, M. (2017) Exploring the role of empowerment in urban humanitarian responses in Freetown. Available at: <http://pubs.iied.org/10845IIED%0Awww.iied.org%0Awww.facebook.com/thelIIED>. [Accessed 10 Jan. 2017].
- Macarthy, J. M. and Koroma, B., (2016). 'Towards Meeting the Knowledge and Capacity Building Gaps for Equitable Urban Development in Freetown'. SLURC Publication.
- Mansaray, L. R., Huang, J. and Kamara, A. A. (2016) 'Mapping deforestation and urban expansion in Freetown, Sierra Leone, from pre- to post-war economic recovery'. *Environmental Monitoring and Assessment* 188(8). doi: 10.1007/s10661-016-5469-y. Njoh Ministry of Lands, Country Planning and the Environment (MLCPE) and Freetown City Council (FCC). (2014). The Environmental Assessment and Evaluation of Natural Disaster Risk and Mitigation in Freetown. Urban Planning Project 2011–14. Available at http://www.slurc.org/uploads/1/6/9/1/16915440/environmental_assessment_and_evaluation_of_natural.pdf [Accessed 10 Jan. 2017].
- Ministry of Land, Country Planning and the Environment (MLCPE) and Freetown City Council (FCC). (2014b). Freetown Structure Plan 2013 – 2028 Main development issues and analysis.
- Munro, P. (2009). "Deforestation: Constructing Problems and Solutions on Sierra Leone's Freetown Peninsula." *Journal of Political Ecology*. 16. 104–22.
- Njoh, A. J. and Akiwumi, F. (2012) 'Colonial legacies, land policies and the millennium development goals: Lessons from Cameroon and Sierra Leone'. *Habitat International* 36(2), pp. 210–218. doi: 10.1016/j.habitat.2011.08.002.
- Reffell, F. (2017). YMCA Empowers Freetown Youths for Socio-economic Transformation. Sierra Leone Urban Research Center Policy Brief Vol 3. Available at http://www.slurc.org/uploads/1/6/9/1/16915440/slurc_newsletter_3.pdf [Accessed 10 Jan. 2017].
- Rogers, S. N. (2016) 'Rethinking "expert sense" in international development: the case of Sierra Leone's housing policy'. *Review of African Political Economy* 43(150), pp. 576–591. doi: 10.1080/03056244.2016.1169163.
- Rogers, S. N. (2012). Housing, capitalism and underdevelopment in Sub-Saharan Africa: an analysis of Sierra Leone's housing market and its developmental challenges. University of Texas. Available at <https://uta-ir.tdl.org/uta-ir/handle/10106/11096> [Accessed 10 Jan. 2017].
- Sesay, M. (no date). "Landslide left one school pupil dead in Freetown Sierra Leone". *Standard Times Press*. <http://standardtimespress.org/?p=378>. [Accessed 10 Jan. 2017].
- Walker, J. (2017). Gender and Informal Livelihoods, Sierra Leone Urban Research Centre in Freetown (Internet), 2017 June (cited 2017 Jan 1). Available at: <http://www.slurc.org/urban-livelihood-and-gender.html> [Accessed 20 Dec. 2017]
- Williams, S and Obredola-Davies, P. (2006). Land and Pro-Poor Change in Sierra Leone. DFID. UN Development Programme, UN Country Team in Sierra Leone (2017). Bulletin # 1, 12 September 2017. Sierra Leone: Landslide and Floods Recovery. [online] ReliefWeb. Available at: <https://reliefweb.int/report/sierra-leone/sierra-leone-landslide-and-floods-recovery-bulletin-1-12-september-2017> [Accessed 20 Dec. 2017].
- UNICEF. (2017). Situation Report No. 1-10. Sierra Leone Floods and Landslides. UNICEF [online] . Available at: https://www.unicef.org/appeals/other_emergencies.html#sierraleone [Accessed 20 Dec. 2017].
- World Bank. (2017). Sierra Leone Rapid Damage and Loss Assessment of August 14th, 2017 - Landslides and Floods in the Western Area. Relief Web [online]. Available at: <https://reliefweb.int/report/sierra-leone/sierra-leone-rapid-damage-and-loss-assessment-august-14th-2017-landslides-and> [Accessed 20 Dec. 2017].

Map References

- European Commission. (2017). Mudflow in Freetown, Sierra Leone | COPERNICUS EMERGENCY MANAGEMENT SERVICE. Available at: <http://emergency.copernicus.eu/mapping/ems/mudflow-freetown-sierra-leone> [Accessed: 10 January. 2018].
- Map Action. (2017). Sierra Leone Landslides, August 2017 - MapAction. Available at: <https://maps.mapaction.org/event/sierra-leone-landslides> [Accessed: 10 January. 2018].
- Slum Areas In Freetown. (2017). Map provided by SLURC.
- Schwarz Plan. (n.d.). Site Plan & Figure Ground Plan of Freetown for download as PDF, DXF. Available at: <https://www.schwarzplan.eu/en/product/siteplan-figure-ground-plan-freetown/> [Accessed: 10 January. 2018].