Disaster Risk Reduction
Towards Landslide Resilience in Balangoda, Sri Lanka

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Key Messages

- Landslides pose the most significant threat to Balangoda, and it is anticipated that its impacts would be further exacerbated under projected climate scenarios
- The city requires a climate-sensitive Disaster Risk Reduction (DRR) plan, with a focus on landslide management, that can draw on the assessments of loss and damage at the national and provincial level
- Balangoda's DRR plan, should integrate strategies on natural resource management, effective landuse management and improved stakeholder engagement through active participation

City Introduction

Balangoda (Figure 1) is situated in Ratnapura District in Sri Lanka and is governed by an urban council. Seventy five percent of the terrain is hilly and the remaining 25 percent is classified as rivers and flat terrain. It is a relatively small town with a total population of 16,875. Private sector employment forms the major economic base (35 percent), followed by agriculture (22 percent).

Figure 1: Location of Balangoda in Sri Lanka

Photo Credit: Google image

Approach

Data available from online national disaster loss and damage database (http://www.desinventar.lk) was analysed. The database was established with UNDP support and is now maintained by the Disaster Management Centre of the Government of Sri Lanka. The data analysis aimed at correlating trends in loss and damage from disasters to the country and district levels to assess whether these could help prepare resilience strategies for cities. The database was used to identify the most impacted districts and a prominent city within each was selected for further analysis.

Impact on human life due to natural disasters was considered of prime concern while prioritizing the impacts and was given the highest weightage, followed by the number of injured people, followed by the number of victims (a wider population that incurred varying range of losses) and finally the damage to and

destruction of houses due to the disaster. Districts were thus prioritized and two top ones were selected. A prominent city in each was taken up for detailed study. The steps followed are summarized in the figure below:

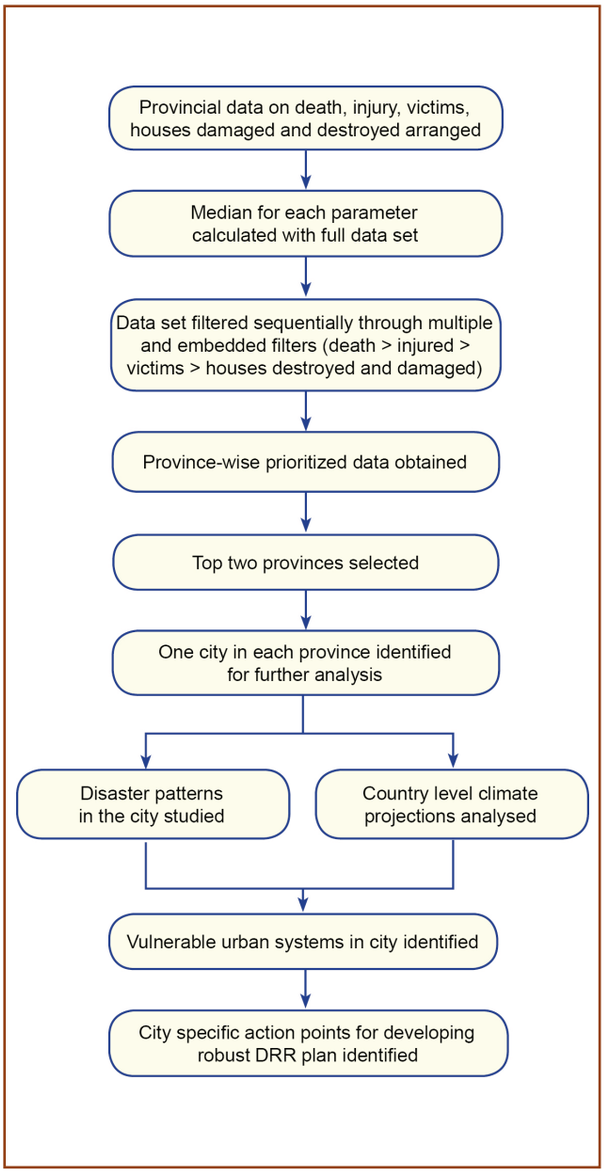

Figure 2: Detailed Methodology

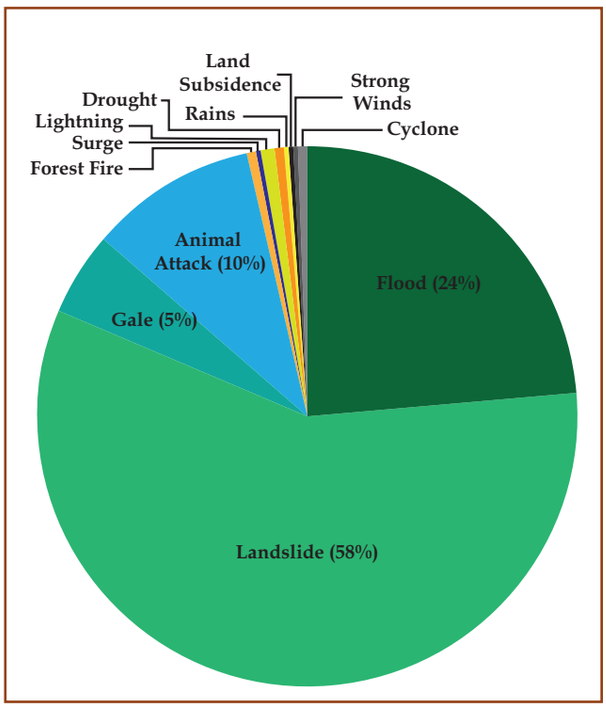

Figure 3: Frequency of natural disasters in Sri Lanka

Correlating Disaster Patterns and Impacts

At the national level, the analysis of loss and damage data show that landslides are most frequent (58 percent), followed by floods which have a frequency of 24 percent (refer Figure 3).

At the district level, the analysis corroborates with the national trend with landslides having the greatest impact followed by floods. Table 1 details the events, along with their relative frequency and impact in Ratnapura district (in percent), as compared to the frequency and impacts at national level.

The trend is similar at the city level. According to the Ministry of Environment and Natural Resources, landslides and floods are the most prominent disasters in the Balangoda area. Unstable steep slopes and fragile geological formation, compounded by heavy rainfall lead to a scenario where the occurrence of

Table 1: Events and their Relative Impact

District	Event	Relative Frequency	Percent Impact				
			Deaths	Injured	Houses Destroyed	Houses Damaged	Victims
Ratnapura	Flood	1.68	0.75	0	0.07	14.80	6.48
	Landslides	6.75	99.24	81.81	3.56	67.74	92.78
	Gale	10.42	0	0	0.14	0.20	0.69
	Cyclone	50	0	18.18	0	0	0.037

these disasters is accelerated. These disasters have contributed to loss of human life and livestock as well as economic losses in the area. Since Balangoda is located in an area which has critical climate conditions and sensitive natural forms, it is more vulnerable to hazards in the future. In addition, climate change, a growing urban population and urbanization have contributed to make the situation worse.

Looking at Disasters through the Lens of Climate Change

The analysis of past patterns of disasters was then reviewed through the lens of anticipated climate change impacts. In the absence of downscaled climate impacts for Balangoda, the country level projections for Sri Lanka were reviewed (refer Practical Action, 2011). It was found that there would be:

- An unevenly distributed increase in precipitation by 2100
- A significant warming in most parts of the country, with an increase in the mean annual temperature by 0.9-4°C by 2100
- A minimum rise of sea level by 40 cm by 2100

The report also finds that the city of Balangoda has been experiencing a rise in temperature and an amplified frequency of high intensity rainfall. These trends fall in line with the national and district level projections.

Considering that landslides are currently a natural disaster with the maximum impact in Balangoda, and that climate projections highlight a scenario of increased precipitation, there is a high probability of increased incidences of landslides with greater adverse impacts in the city.

Urban systems are comprised of the processes by which life in a city is organised and operated. An analysis

Table 2: Fragile urban systems in Balangoda

Urban System	Current Status	Climate Scenario: Increased Precipitation Potential Impacts
Water Supply	Drinking water supply is not fully piped and does not cover the entire city	Increased landslides resulting in breakages in the piped water supply network and contamination of potable water
Sanitation: Solid Waste and Waste Water Management	Drainage network covers only 2/3rd of the city and there is lack of appropriate waste treatment mechanism and lack of infrastructure for piped transport of sewage	Increased landslides and potential water logging resulting in unhygienic conditions, mixing of sewage and drinking water and health hazards due to increased incidences of water-borne diseases
Food Supply	Increase in population density is putting additional pressure on the agricultural supplies and food security	Increased precipitation would lead to landslides, water logging and erosion of fertile top soil, thereby leading to agricultural losses and decrease in food supply to the city
Ecosystem	Loss of riverine species	Excessive precipitation will lead to change in riverine ecology impacting survival and regeneration of local flora and fauna
Health	City's unpreparedness to address large scale outbreak of epidemics	Increased precipitation would lead to landslides and water logging which will increase chances of water/vector-borne communicable diseases and disruption of health services due to infrastructure damage




of the urban systems in Balangoda considering the anticipated increase in precipitation reveals that 5 city systems are vulnerable (Table 2). These fragile urban systems need to be focussed on, on a priority basis in order to reduce the impacts of damage caused due to landslides in Balangoda.

Way Forward

Increase in population density, lack of public awareness on building regulations, low public participation in development planning and lack of linkages and coordination with national level rules and regulations together result in increasing the vulnerability of Balangoda to landslides. An improved understanding of climate risks, especially in terms of increased precipitation, and the preparation of a City Resilience Strategy is critical towards building Balangoda's resilience to disasters and climate change. Steps which the city needs to take in order to build a robust DRR plan are summarized in Table 3.

References

- Practical Action. 2011. Promoting adaptation to climate change in Sri Lanka.
- Sri Lanka National Disaster Loss and Damage Database, Disaster Management Centre, http://www.desinventar.lk

Table 3: Towards Disaster Resilience

City Specific Action Points					
	Urban Systems				
	Water Supply	Sanitation	Food Supply	Health	Ecosystem
Infrastructural Measures	• Improvement in the piped water supply infrastructure to ensure 100 percent city coverage • Installation of rain water harvesting systems • Allocating green spaces	• Improvement in garbage collection infrastructure to cater to entire city • Development of sanitary landfill • Installation of sewerage system in the city	• Improved storage facilities (cold storage) in the city using renewable energy / clean energy • Allocating land for urban agriculture	Improved health facilities in the city	• Plantation of riverine trees • Introduction of native aquatic flora and fauna
Social Empowerment	Capacity building of city officials and community members in water conservation, rain water harvesting, water purification	Capacity building of city officials and community members in waste segregation; maintenance of sewerage system	Capacity building of city officials and community members in roof top gardens; vertical farming	Capacity building of city officials and community members on importance of hygiene and measures to maintain the same	Capacity building of city officials and community members on importance of riverine ecosystem and the need to conserve the same
Strengthening disaster preparedness and response	• Developing hazard maps, socio-economic profile maps • Usage of GIS based planning tools • Access to climate projection data at provincial and city levels • Development of early warning systems to address floods • Intensification of research on development of climate resilient crop varieties				
Risk reduction through continuous assessment and monitoring **Blue: data already being collected by city** **Red: data collection required by city**	• Per capita water supplied (lpcd) • Quality of water: total number of tests passed/total number of tests conducted	• Percent waste water treated • Efficiency of solid waste collection (%) • Scientific solid waste disposal (%) • Extent of recovery (% treated / recycled)	Food shortage duration (Nil; 0-2 days; 3-5 days; more than 5 days)	• Mortality (numbers) • Morbidity (numbers)	• Total area of the water body • Species monitoring (density and diversity)

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