

Disaster Risk Reduction Towards Flood and Landslide Resilience in Ratnapura, Sri Lanka



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Key Messages

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

City Introduction

Ratnapura is a major city in Sri Lanka. It is the capital city of Ratnapura district, Sabaragamuwa Province (refer Figure 1). The city is 21m above sea level and has a population density of 2,474/km². The city is known for the long-established industry of precious stone mining, including rubies, sapphires, and other



Figure 1: Location of Ratnapura in Sri Lanka



Photo Credit: Google images

gems. Apart from gem mining, the city is known for rice and fruit cultivations.

Approach

Data available from an 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 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 selected. The capital city of each was taken up for detailed study. The steps followed are summarized in the figure below.

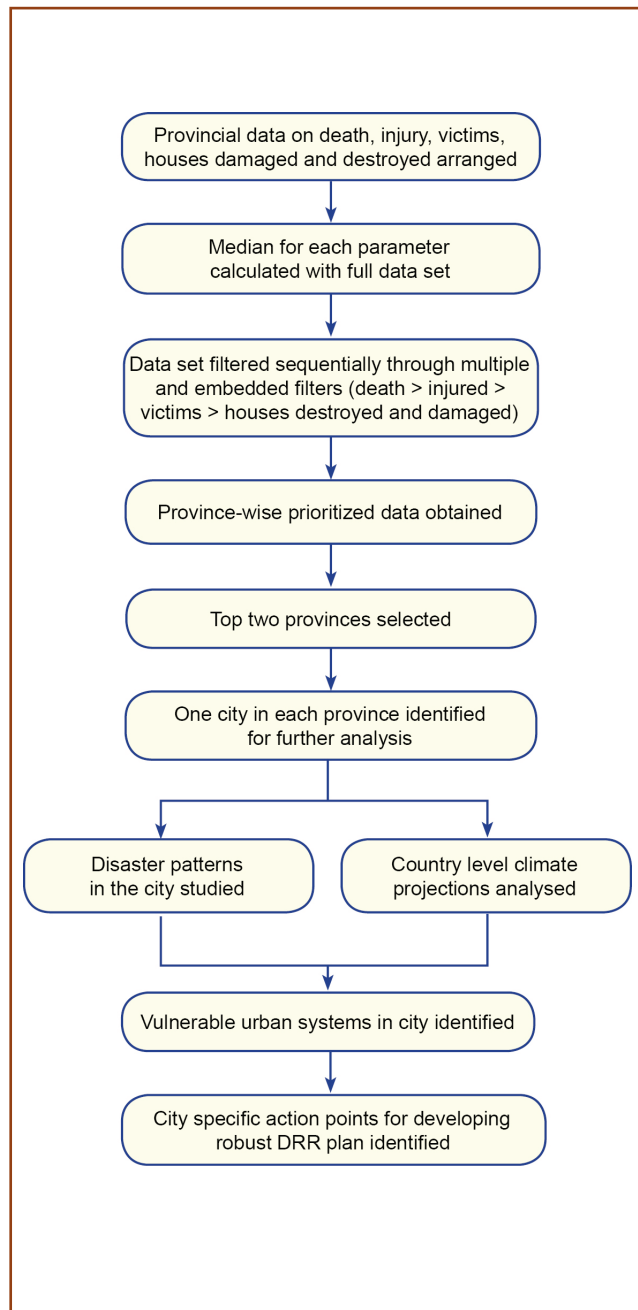


Figure 2: Detailed Methodology

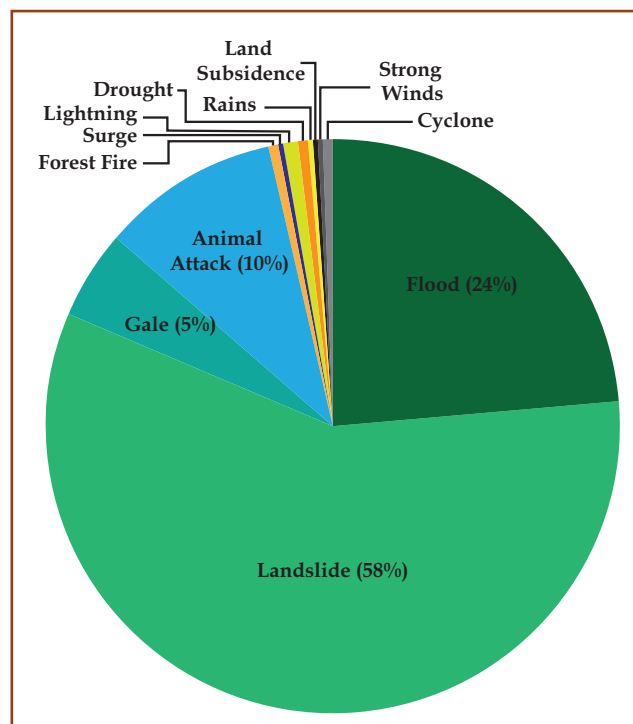


Figure 3: Frequency of Natural disasters in Sri Lanka

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 this national trend with landslides having the greatest impact, (refer Table 1) followed by floods. Enquiries at the city level revealed that disasters in the city of Ratnapura affect more than one-third of the total area that falls under the jurisdiction of the municipal corporation. Ratnapura is highly prone to floods and landslides. Situated on the flooding plains of river Kalu, the city experiences regular floods usually in the month of May. The absence of any large dam across river Kalu intensifies the damage caused due to the floods every year in the city. The city has been experiencing floods regularly and the most recent one was in the year 2013.

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

The multi-level analysis of past disaster patterns indicate that floods are the major natural disaster at the national, provincial and city level. Another natural disaster which is very prominent at the national, provincial and city levels is landslides, triggered by the floods. Therefore, resilience building strategies for flood and landslide proofing at the national and provincial level can also inform and guide the necessary city level strategies.

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 Ratnapura, the country level projections for Sri Lanka were reviewed (refer Practical Action, 2011). It was found that the following impacts could be expected:

- 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 the 2100

In addition, a review of existing literature as well as inputs with city level representatives were undertaken to capture the perceptions on climate change impacts

at the city level. It was analysed that the city of Ratnapura has been experiencing a rise in temperature and an amplified frequency of high intensity rainfall events. These trends fall in line with the national level projections.

Considering that landslides are currently the natural disaster with the maximum impact in Ratnapura, and that climate projections and local perceptions highlight a scenario of increased precipitation, there is a high probability of increased incidences of floods with greater adverse impacts in the city. Urban systems are comprised of the processes by which life in a city is organised and operated. These include ecosystems and infrastructure systems along with the knowledge required to manage, maintain and develop them. City level interactions revealed that five urban systems in Ratnapura (water supply, sanitation, food supply, health and transport) have been previously impacted by floods and are thus particularly vulnerable to the impacts of increased precipitation (refer Table 2).

Way Forward

The city of Ratnapura has taken some steps to build city resilience to disasters. With support from UN Habitat, a plan on disaster risk reduction and preparedness is being developed. The city development plan also incorporates disaster resilience policies. The city government is also taking steps to promote urban

Table 2: Fragile urban systems in Ratnapura

Urban System	Current Status	Climate Scenario: Increased Precipitation
		Potential Impacts
Water Supply	City drinking water supply is not fully piped and does not cover the entire city.	Increased flooding situations resulting in contamination of potable water
Sanitation: Solid Waste Management	Lack of adequate infrastructure and facilities to address the solid waste management issues of the city	Heightened unhygienic conditions and health hazards due to increased incidences of water borne diseases
Food Supply	City has extensive rice and fruit cultivations, which ensures agricultural supplies and food security	Increased precipitation could lead to landslides, water logging and erosion of fertile top soil, thereby leading to agricultural losses and decrease in food productivity
Health	City's unpreparedness to address large scale outbreak of epidemics	Increased precipitation could lead floods and water logging which will increase chances of water/vector-borne communicable diseases and disruption of services due to infrastructure damage
Transport	The roads in low lying areas and along the river front are highly vulnerable to damage during floods	Flooding situation leading to increased congestion and in extreme cases loss of connectivity/access

horticulture and rain water harvesting and is taking measures to introduce a community flood early warning system. However, the city needs to carry out extensive capacity building drives among the citizens on disaster risk reduction. In addition, an improved understanding of climate risks, especially in terms of increased precipitation, and the preparation of a City Resilience Strategy with implementable actions that target the impacted urban systems as well as the social groups that would be most affected would be an important step towards building Ratnapura's resilience to disasters and climate change. The city also needs to introduce city development and construction

policies based on the city disaster map. Some strategic directions on which Ratnapura needs to focus in order to develop as a flood resilient city 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	Transport
Infrastructural Measures	<ul style="list-style-type: none"> Improvement in the piped water supply infrastructure to ensure 100 percent city coverage Installation of rain water harvesting systems Allocating green spaces 	<ul style="list-style-type: none"> Improvement in garbage collection infrastructure to cater to entire city Development of sanitary landfill Scouting possibilities with neighbouring cities for development of common landfill site 	Improved storage facilities (cold storage) in the city using renewable energy/ clean energy	<ul style="list-style-type: none"> Improved health facilities in the city Promotion of buildings with white roofs 	Road construction at elevated heights using permeable material
Social Empowerment	Capacity building of city officials and community members on water conservation, rain water harvesting.	Capacity building of city officials and community members in waste segregation	Capacity building of city officials and community members in roof top gardens; vertical farming; urban farming	Capacity building of city officials and community members on importance of hygiene and measures to maintain the same; capacity building on handling flood situation; development of disaster preparedness kits	Capacity building of city officials and community members on the significance of usage of public transport and non-motorized transport.
Strengthening disaster preparedness and response	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Per capita water supplied (lpcd) Quality of water: total number of tests passed/total number of tests conducted 	<ul style="list-style-type: none"> 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 5days)	<ul style="list-style-type: none"> Mortality (numbers) Morbidity (numbers) 	<ul style="list-style-type: none"> Length of roads destroyed (km) Duration of access lost (hrs) Incidence of waterlogging and flooding (numbers)

For more information, please contact:



ICLEI - Local Governments for Sustainability, South Asia

Ground Floor, NSIC-STP Complex, NSIC Bhawan

Okhla Industrial Estate, New Delhi - 110020, India

Tel: +91-11-4106 7220; Fax: +91-11-4106 7221

E-mail: iclei-southasia@iclei.org; Web: <http://southasia.iclei.org/>

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