

# Disasters after Disasters; Case Study Based on Spatial Distribution of Health Implications of Multiple Disasters; Sri Lanka in 2016

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## INTRODUCTION

Among the most popular burdens the world's developing countries including Sri Lanka face, the increasing incidents of Natural Disasters are taking a larger toll (Alcántara-Ayala, 2002) as they are responsible for developing countries to diminish the quality development, by hitting the economic, social and environmental aspects, which all together lead to sustainable development (Goodfellow, 2012).

According to the center for research on epidemiology of disasters, a disaster is "a situation or an event which overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering." (The Centre for Research on the Epidemiology of Disasters (CRED), 2010), and according to the federation of Red cross and Red crescent societies a disaster is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins.

## ABSTRACT

Disasters have become more devastated and frequent in occurrence worldwide whereas Sri Lanka too is also prone to multiple disasters especially to disasters with a hydro meteorological origin. Meethotamulla and Kuruniyawaththa Grama Niladhari Divisions are located in the flood plain of lower Kalani River basin which is highly prone to multiple disasters. The study was carried out to identify the prevailing disaster types and to study the spatial and temporal variation of health impacts of them. Methodology of data collection consists of a semi structured interview and a questionnaire survey, which were conducted among fifty households from each Grama Niladhari Division. For the interviews, key informants like government officials who are serving for the area were selected. Methods spatial analysis and descriptive analysis along with some statistical methods of descriptive statistics are used as the methods of data analysis and to present the findings maps and graphs have been used. According to results, people have identified epidemics as the most common disaster type and floods as the most damaging disaster type in the areas and psychiatric disorders, dengue and leptospirosis were identified as health impacts resulted by the flooding. With a great emphasis the residents warned the garbage dumping site as a hazard with a sliding risk, which had previously not been informed my government officials. A year later it, the dumping site slide submerging an entire area. So the study highlights the importance of understanding the risk especially in areas with multiple hazards in planning and decision making.

**Keywords:** Sri Lanka, Disaster, Kuruniyawaththa, Meethotamulla, Dengue

Natural disasters are sudden catastrophic events that are caused by nature or the natural processes of the earth, with no direct contribution from human being even though he could lead to increase the magnitude of impacts caused by natural disasters. They lead to a huge economic crisis (Skoufias, 2003). Today natural disasters are identified as a global issue as they occur all over the world (Alcántara-Ayala, 2002). Natural disasters can be classified into five sub categories which turn over twelve disaster types. (The Centre for Research on the Epidemiology of Disasters (CRED), 2010). They are geophysical: Events originating from solid earth, meteorological: Events caused by short-lived/small to meso-scale atmospheric processes hydrological: Events caused by deviations in the normal water cycle and/or overflow of bodies of water caused by wind set-up, climatological: Events caused by long-lived/meso- to macro-scale processes and biological: Disaster caused by the exposure of living organisms to germs and toxic substances Natural. (The Centre for Research on the Epidemiology of Disasters (CRED), 2010). And floods fall under Hydrological event.

When consider the Sri Lankan picture the most common among disasters are animal attacks (7,203 events), fire (2,704 events urban and forest fire), flood (1,397 events-riverine flood, urban flood, flash flood, rain), extreme wind events (1,263 events- Cyclone, Strong Wind, Surge, Gale), drought (285 events), landslides (1,156 events) and lightning (295 events), where the percentage of flood disaster occurrence is 9.77 (Disaster Information Management System, 2012).

As depicted by records of past 34 years, 28 million people were affected by natural disasters (Disaster Information Management System, 2012) and 92% of the people affected by natural disaster are either affected by floods (48%) or droughts (44%) with a share of climatologically disasters is 96% where floods make a percentage of 48.40% ( Disaster Management Center Sri Lanka). Even though the risk of natural disasters are increasing, Sri Lankan settings are less studied specially with, scientifically gathered and analyzed information on the nature, damage and occurrence of floods are scare. Since Meethotamulla and Kuruniyaawaththa Grama Niladharee Divisions (GNDs) are ranked in a high position among all disaster sensitive areas in the island, this research is designed to fill the above gaps and investigate much needed information in flood disaster risk studies in the country.

**METHODOLOGY**

Methodology of this study can be segmented in to three as data collection, data analysis and data visualization. This study is mainly focusing on collecting depth information to identify the prevailing disaster types and to study the spatial and temporal variation of health impacts of them. Therefore, main methods of data collection were a questionnaire survey and semi structured interviews, conducted in both (Grama Niladharee divisions) GN divisions. Fifty questionnaires were filled in each GND by the enumerators themselves, which helped to uncover many new aspects on the given scenario. Semi structured interviews were conducted for the government officials. Secondary statistics on diseases resulted by floods were collected from the weekly records of diseases at Medical Officers of Health office, Kolonnawa and Kaduwela Divisional Secretariat divisions.

Overlay analysis, methods of central tendency and dispersion along with regression with spatial analysis techniques were used in analysis. Arc GIS 10.1 and SPSS statistical package were used as the main tools of analysis. Data visualization is mainly based on maps and graphs.

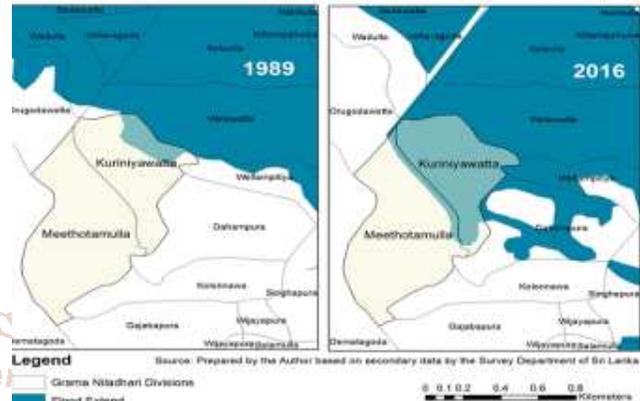
**RESULTS**

The section highlights the results obtained for the questioner survey and semi-structured interviews which assessed the community perception of disaster risk in selected Grama Niladharee Divisions.

The analysis of the questioner discovered that, the disaster with the highest frequency of occurrence in Meethotamulla and Kuruniyawaththa GNDs is epidemic diseases with 80% of the community's mention. Another 15% stated that mosquitoes are the highest occurring disaster, where as 5% had identified floods as the disaster with the highest frequency of occurrence. With concern to impacts (social and economic) 75% stated that, highest health impacts had been caused by floods. Another 22% stated that mosquitoes have

caused the highest health impact, due to the death of a girl in the area.

Further analysis was carried for floods, as floods had created many health implications. After the flood extents of 1989 and 2016 were overlaid on the selected GNDs per actual distribution, it was identified that the flood inundation extent and distribution of 2016 is great in comparison to 1989 (figure 3.1), even though the community indicated that, flood extent and distribution of 1989 was greater than that of 2016. Further the community stated that, the duration of floods in 2016 is greater than that of 1989.

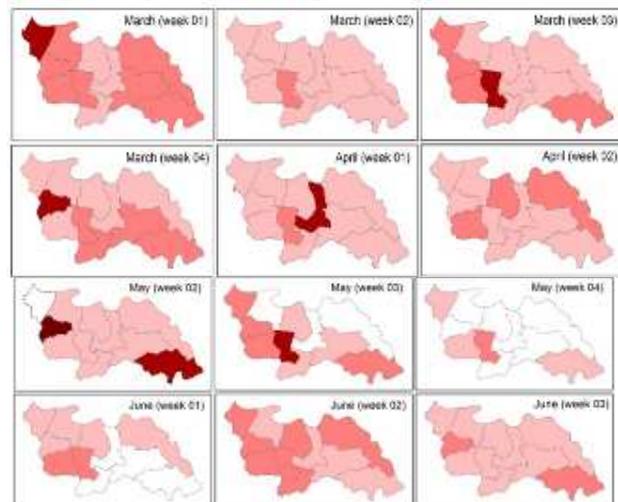


3. Figur3.1 Flood Extend of Kalani River in Study area during 1989 and 2016 floods

Even though many impacts were associated with floods, the significant impact was flood related diseases. Dengue fever leptospirosis and psychiatric disorders were the most observable heath consequences after foods.

A 52% of the respondents were suffering from Post-Traumatic Stress Disorder (PTSD), which was indicated by flash-backs. The other 48% of recorded psychiatric disorders were shared between, respondents suffering from depressive disorder, addition to drugs and alcohol, long time anxiety and phobia. One person out of the interviewed was identified with dementia. As victims described the worst disaster consequence was, the mental trauma. They mentioned this lasts for a long time.

With respect to temporal and spatial distribution of dengue in Kolonnawa Divisional Secretariat Division (DSD) (figure 3.2, figure 3.1), several findings were apparent.



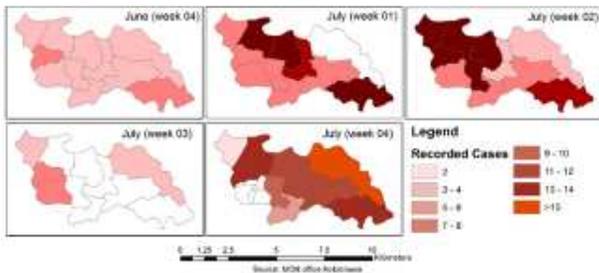


Figure 03.2:- Spatial and temporal distribution of recorded Dengue cases of Kolonnawa Divisional Secretariat Division.



Figure 03.3:- Temporal distribution of recorded Dengue cases of Kolonnawa Divisional Secretariat Division.

They are, an increase of dengue records during the south west monsoon period (May –September), a remarkable decrease of recorded cases soon after the floods, an exponential increase of recorded cases in four to five weeks of floods, fully inundated PHI areas recording zero of Dengue cases until four weeks floods, highest number of cases being recorded from Kolonnawa PHI area which is 44 cases per week and second highest is being from Orugodawatta which is 20 cases per week. The same pattern of spatial and temporal distribution of dengue is followed by the Kaduwela DSD. The highest number of recorded cases of Kaduwela are from Hokandara PHI area which is 30 cases.

Compared to Dengue, Leptospirosis cases also indicates an increasing trend after the floods. In figure 03.4 it clearly indicates that the cases of leptospirosis have increased after floods during second week of June to second week of July 2016. After the month of August, leptospirosis have no records.

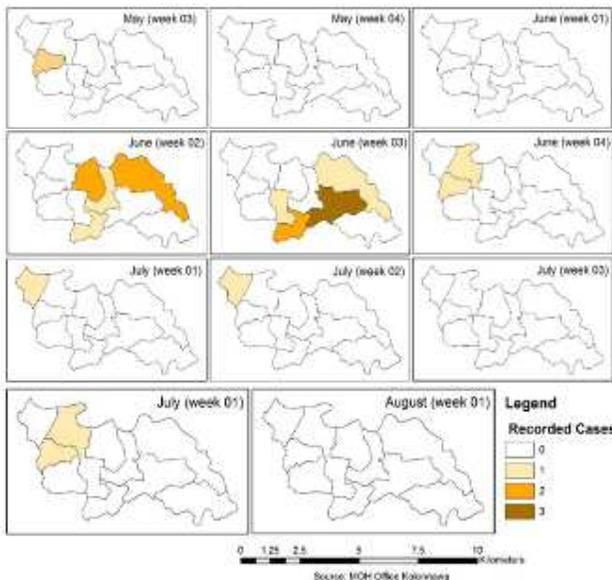


Figure 03.4: - Recorded cases of Leptospirosis in Kolonnawa Divisional Secretariat Division

Another major finding of the questioner survey was regarding the possible causes for the occurrence of disasters, epidemics, floods and mosquitoes. Per residents and governmental officials (97%), it was found that the garbage dumping site in Meethotamulla is the reason for all the above types of disaster occurrence. Several residents stated that, mismanagement of land use and wetland alteration had been the cause for the occurrence of multiple hazards. Several months after the survey a landslide happened in the same area disturbing the social, economic and ecological aspects of the area. During the survey and semi structured interviews, several residents, before the landslide, complained of the garbage dump sloping towards South West sides.

### DISCUSSION

According to the study of disease spread in relation to flood distribution, it can be clearly concluded that, a vibrant relationship is observed with the occurrence of floods. When analyze records of diseases, three months before and during floods a rapid decrease of Dengue and Leptospirosis were observed, whereas a dramatic increase was observed in June and July, respectively one and two months later.

According to the World Health Organization the breeding cycle of *Aedes Aegypti* takes more than one week and the incubation period takes 7-10 days. During the floods, breeding grounds of the mosquito is disturbed. In some parts of Kolonnawa the flooded water was accumulated up to two weeks. Therefore, a decline of Dengue as soon after floods could be due to the declining of mosquito breeding sites, But in two weeks the flood disappeared and the breeding grounds for mosquitos reappeared. Also remaining inundated water was accumulated facilitating the breeding of *Aedes Aegypti*. So an increase of dengue in four weeks could be evident.

Even though this pattern of spread and occurrence is observed due to Dengue and Leptospirosis epidemics which fall under vector borne diseases of floods, a different pattern could be observed with an analysis of diseases such as Shigella dysentery, Typhoid and Hepatitis A related to overcrowding and contaminations. As there were no secondary records of them, the presented study was limited to vector borne diseases, but it could be developed with a primary field data collection through a survey and semi structured interviews. questionnaire

Leptospirosis is an infection caused by bacteria called *Leptospira*. According to WHO human become infected through direct contact with the urine of infected animals or with a urine contaminated environment. The bacteria enter the body through cuts and abrasions of skins or through the mucus membranes of the mouth, nose and eyes. Therefore, during flood area there is a high possibility to create the infected urine contaminated environment. In figure 03.4 it clearly indicates that the cases of leptospirosis have increased after floods in the weeks of second week of June to second week of July 2016. After the month of August, the recorded cases of leptospirosis have no records.

The collapse of Meethotamulla garbage dump was one of the most devastating man-made environmental events in the history of the country. The event is a significant eye opener for environmental hazards in Sri Lanka that has brought about changes in attitudes and practices both in the communities as well as in the government.

One important aspect of solid waste issue in the country is attitudes of the communities when the government took a decision to look for alternative sites and move solid waste dumping sites away from the cities to suburbs or remote areas. The mind-set of the people, in general, seems not to accept garbage from elsewhere to their residential areas. Some unsatisfied parties went to the extent of seeking legal remedies to stop dumping solid waste generated by the dwellers in other parts of the country to their villages or residential areas. After Meethotamulla incident, communities were significantly expressing their displeasure and fear about dumping sites. Considering numerous court cases filed by the resident of an alternative site at Karadiyana, the district court limited the amount and granted permission to the municipal authorities to dump only a maximum of 350 tons of solid wastes. Yet, a group at the Karadiyana turned back several garbage trucks and protested against the decision. Similarly, people of Veyangoda and Dompe which are remote areas followed law suit against the disposal of garbage collected from Colombo. Protests were also staged in Uswetikeiyawa, Wattala against the disposal of garbage in marshy lands in Muthurajawela (Fernando, 2017).

Following the collapse, a new era of solid waste disposal awareness, policy and regulations were initiated. Many forums were organized by the government, community organizations and private sector parties to discuss options for proper solid waste management and strong media campaigns were started to raise public awareness on effective waste management including reducing, reusing and recycling wastes.

After the collapse of the garbage mound, the government took several proactive initiatives to manage solid waste disposal in a more efficient and secure manner. One such step to remove the garbage collected from the Colombo Municipal Council (CMC) area to Karadiyana and Dompe solid-waste processing centres, which were operating in a small scale previously. Initiation of new waste management facilities too were apparent. A new facility at the Thambovila, Karadiyana which is capable of processing up to 500 tons solid waste per day was initiated. Another key policy was the formulation of regulations to segregate garbage by household or commercial level, which is now being practiced effectively in many parts of the country.

Nevertheless, garbage dumps are creating continuous problems due to many years of ad hoc practices, inadequate public participation as well as institutional policy failures: the most recent local example is fire at Mawanella garbage dump in Kandy, which took place on 16th February 2018 destroying four acres of rubber plantation.

As sound management policies, technologies, and attitudes could offer a wide array of environmental and social benefits (Shang et al., 2010), including climate change mitigation (Vergara and Tchobanoglous, 2012), both government and communities should now work together to provide sustainable solution for solid waste management challenges.

Specially the respective officials should include appropriate mechanisms in minimizing the spread of deadly diseases, such as dengue, leptospirosis after floods and should include proper counselling to help victims of psychiatric disorders because, the health consequences of disasters as disasters after disasters.

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