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An integrated approach to enhance community resilience in disaster response in Sri Lanka

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Climate-related extreme geophysical events are among critical global challenges, and Sri Lanka is the second most-affected nation. To minimize disaster impacts and enhance the livability of human settlements, the concept of building community resilience has become crucial in disaster management and preparedness. This paper presents key results and recommendations from an integrated approach to post-disaster recovery interventions and improvements in preparedness activities, to reduce the impact of future disasters and associated risks. We tackled this goal by undertaking a reflective assessment using a case of post-disaster recovery interventions after the floods and landslides of May 2017 in three districts of Sri Lanka. This study emphasizes the need for capitalizing the immediate post-disaster response period to integrate risk reduction and resilience-building activities from the early stages of the recovery timeline. Preparedness and resilience enhancement activities need to align with the Sri Lanka Community Resilience Framework as it can help optimally utilize time and resources to enhance resilience in resources-limited contexts.

Key words—Climate-related disasters, Sri Lanka, disaster preparedness, disaster risk reduction, community resilience.

1. INTRODUCTION

Among the most critical global challenges at present, natural disasters have become one of the most prompting global development challenges that result in significant damages to human lives, properties, and livelihoods at large (Ranjan and Abenayake, 2014). The Global Climate Risk Index 2019 indicates Sri Lanka as the second most affected country due to climate-related extreme weather events globally. Due to repeated tragic occurrences of cyclones, droughts, landslides, and floods, Sri Lanka is one of the key hotspots for climate-related extreme events (Eckstein et al., 2019). Among these disasters, the most destructive and frequent types are floods and landslides. The 2017 floods and landslides were the most severe disasters of the past decade on the record, causing enormous damage to existing infrastructures, including those related to water, sanitation, hygiene, and cultivated lands (DMC, 2017). According to ibid., by the end of May 2017, 630,082 people (163,889 families) were affected by floods or/and landslides in the 15 most-affected districts in South-Western Sri Lanka, and 73,561 people (19,019 families) were living in over 300 temporary evacuation centers. Disaster Management Centre (DMC) confirmed that 203 people lost their lives, and 96 people were missing. According to DMC (2017), approximately 0.7 million individuals were affected by these disaster events in 2017, while Ratnapura, Kalutara, and Matara districts dominated as the profoundly affected districts.

The field assessment carried out by multi-agencies, including United Nations (UN), Red Cross, and international non-governmental organizations, confirmed that emergency needs prevailed in emergency shelter, water, sanitation and hygiene, and health service sectors in the worst-hit districts. In order to address the identified sectoral needs, the response plan was prepared by the UN Resident Coordinator Office on behalf of the Humanitarian Country Team in June 2017 (MDM, 2017). Considering flooding and landslides from 2006 -2017 and their impact on the communities, a key challenge in disaster management has been the equal attention to all the sectors both nationally and globally (Wanninayake, 2018). For mitigation of future disaster impacts, the key focus has been in the disaster preparedness and disaster risk reduction related aspects aligned with the emphasis on the resilience concept in the UN Sendai Framework 2015-2030 for Disaster Risk Management. Resilience is the process of adjusting well to the aspects of adversity, trauma, tragedy, threats, or even substantial sources of stress (American Psychological Association, 2014).

The existing literature on community participation and community-led recovery indicates different ways have evolved over the past years to achieve post-disaster recovery (Mulligan, 2013). However, past research did not capture much of the lessons in disaster recovery and disaster preparedness (Pathirage et al., 2015). It is essential to understand that the disaster recovery phase after a disaster is also the phase for preparedness for an emerging future disaster risk (Hoong and Marthandan, 2014). Disaster management authorities and agencies often focus more on recovery interventions after a disaster rather than future disaster risks, as there are few institutions with the resources available and the capacity to implement recovery interventions at scale (Tafti and Tomlinson, 2015). Making use of recovery intervention as an opportunity to build the resilience of communities by integrating disaster risk reduction from the outset is one of the significant areas that require proper attention (Twigg, 2004).

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This paper presents critical lessons from the process of an integrated approach of a post-disaster recovery intervention and the improvements in preparedness activities to reduce the impact of future disaster risks by undertaking a reflective assessment using the case of post-disaster recovery intervention after the floods and landslides in May 2017 in three districts of Sri Lanka. This study's overall objective was to take stock of lessons from disaster recovery interventions after 2017 floods and landslides in Sri Lanka and to understand the immediate improvement in disaster preparedness of the communities living in the landslide-prone areas. In this context, the study explored the following four specific objectives:

a. *How the early warning dissemination on a landslide to most vulnerable communities has improved compared to past*;

b. *The perceived level of improvement of the disaster management capacities of the government, partners, and community groups*;

c. *The improvements in disaster response capacity of village disaster management committees*;

d. *How the vulnerable community adapted coping strategies to reduce the impact of disasters and to increase their resilience?*

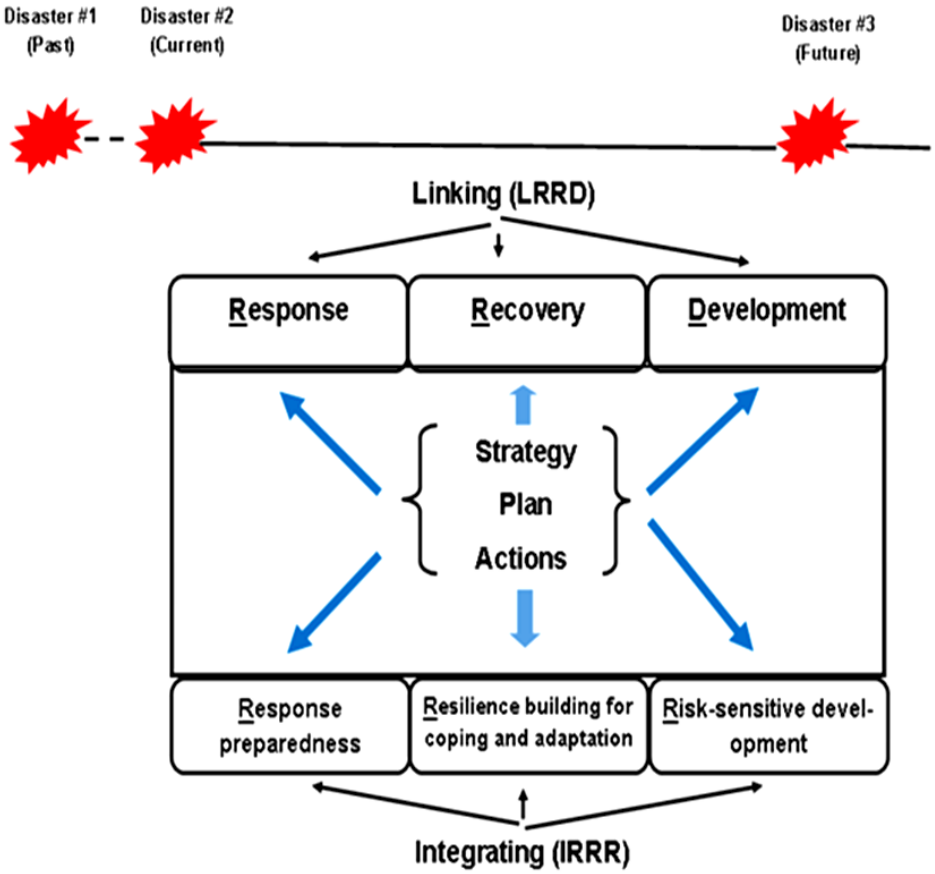

Figure 1: LRRD and IRRR framework in key disaster phases.

2. Integrated Framework for LRRD and IRRR

Disaster Risk Reduction is based fundamentally on the *living with uncertainties concept* (Collins, 2018). The compound effects of cascading disasters are being included in the disaster risk reduction aspect by regarding the increasing extreme events worldwide (Zaidi, 2018). Therefore, the lessons from the past disaster experiences emphasize that there is a need for linking and formulating an integrated framework for post and pre-disaster scenarios (Kapucu and Liou, 2014). According to *ibid*. (2014), such a framework needs to include critical strategies, plans, and actions from both sides of pre and post-disaster situations. The framework shown in Figure 1 depicts these linkages as an overarching process in disaster management phases. This framework includes the concepts of *Linking Relief, Rehabilitation, and Development* (LRRD) and *Integrating Response preparedness, Resilience building for coping and adaptive capacities, and Risk-sensitive development* (IRRR).

The concept of the relief-to-development continuum has been debated since many years ago when many policymakers started to advocate reducing relief budgets to lead a new paradigm shift to developmental relief from humanitarian aid financing (Macrae et al., 1997). Over the recent decades, the concept of LRRD has been discussed as the emergency-development continuum and has been a conceptual, institutional, and programmatic concern for the humanitarian policymakers and

aid organizations worldwide (François, 2014). During the 2004 Indian Ocean Tsunami disaster management phases, the linking between relief and rehabilitation was reasonable, but the links to longer-term development programming had been missing (Christoplos, 2006). Nevertheless, other reports found many challenges as well (Otto and Weingärtner, 2013).

An effort from reactive response and relief framing to mitigation and preparedness framing was risen with more focus on the notion of Disaster Risk Reduction (DRR) in the Sri Lankan context after the 2004 Indian Ocean Tsunami (Siriwardana et al., 2018). However, for flooding and landslides, which have been the most recurrent disasters, there has been a lack of attention on the integrated approaches on the possible connection of post-disaster recovery interventions and the improvements in preparedness activities (Dissanayake et al., 2018). When operationalizing the disaster response strategies, plans, and actions, this needs to consider response preparedness for future disasters (Niekerk, 2008; NRC, 1991). Similarly, for recovery, the coping and adaptation strategies for increasing resilience, and development, the integrations should happen for risk-sensitivity in the development plans and implementation of development projects (Saja et al., 2016; Saja et al., 2019).

Thus, in all these aspects, integrating the community vulnerable to disasters is a primary concern. The vulnerability to a disaster occurrence largely depends upon the coping capacity of a particular community and their degree of exposure to a particular disaster (Proag, 2014). Communities that are the most vulnerable to the flood hazard may be incompetent to escape from the disaster risk due to inadequate resources, specifically the knowledge of preparedness.

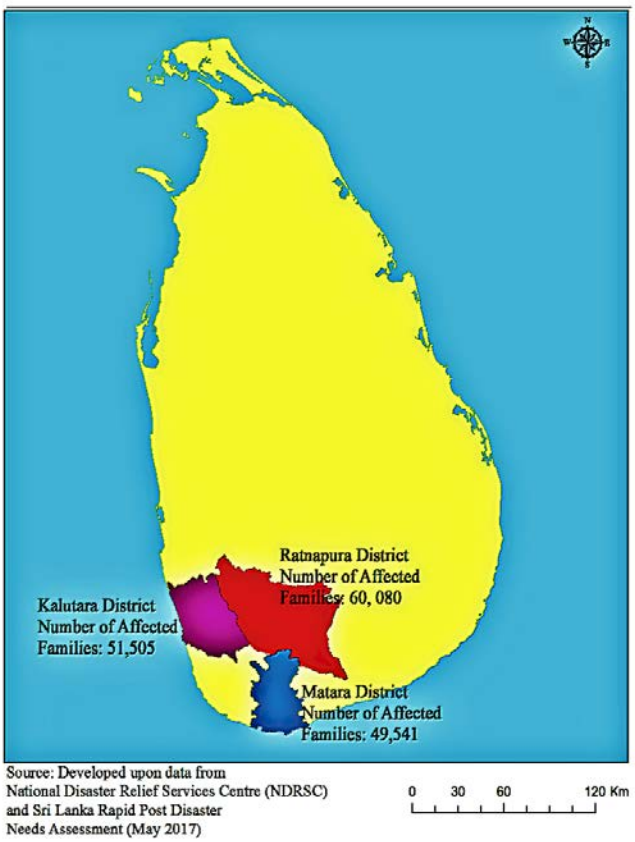

Figure 2. The Study Area: Worst-hit districts and the number of affected families in May 2017 (MDM, 2017).

3. Study Area

The study locations included the three Sri Lanka districts: Kalutara, Ratnapura, and Matara, three worst-affected districts in 2017 floods and landslides. Figure 2 shows the geographic boundaries of these profoundly affected districts due to heavy rain in May 2017. As per the data released by the National Disaster Relief Services Centre (NDRSC) of the Disaster Management Centre (DMC), 60,080 families were affected in Ratnapura district, 51,505 in Kalutara, and 49,541 families in Matara districts (MDM 2017).

All three districts are located in the South and South-Western parts of Sri Lanka and belong in the country's Wet Zone. The worst-hit district Ratnapura is in the Sabaragamuwa Province, Kalutara District belongs to the Western Province, while the Matara District to the Southern Province. All the districts receive rainfall mainly from the South-Western monsoon from May to September annually. There is considerable precipitation due to convective rains during the remaining months of the year as well. The average annual temperature levels vary from 24 °C to 35 °C within this region, with the average annual rainfall of 3679 mm in Ratnapura District, about 2998 mm in Kalutara District, and 2147 mm in Matara District.

4. Methodology

4.1 Data collection methods

Questionnaire Survey (QS): QS was used to identify how people attempted to improve disaster recovery and to prepare for future emerging disasters. The probing questions in the survey helped to gain insights into each of the objectives in this study. We conducted the QS in the three districts, with between 35 to 50 participants in each location. The total number of survey participants was 127 across three districts, with 20% male and 80% female participants. Table 1 shows the breakdown of survey participants in each location and gender-wise. We grouped survey questions into the four key sections:

1. *Participant profile details such as gender, type of assistance received, and whether member of the disaster management committee*;
2. *Participation in the early warning mechanisms*;
3. *Changes in the disaster preparedness actions*;
4. *The utilization of cash grant assistance*.

Table 1. Survey participants profile.

Survey Participants	Study locations			Total	% of total
	Kalutara	Ratnapura	Matara		
Male	6	8	11	25	20
Female	36	27	39	102	80
Total	42	35	50	127	
% of total	33	28	39		

The average time for completing the survey was between 20-30 minutes. We selected the questionnaire survey participants from the attendees of a meeting organized by the Emergency Response Support team, which operated in the post-flood and landslide project in Ratnapura, Matara, and Kalutara districts. The participants were also beneficiaries of the Emergency Response Support projects in those districts.

Key Informant Interview (KIIs): We used KIIs primarily to gather insights from stakeholder groups in disaster response and preparedness interventions after 2017 floods and landslides. We conducted KIIs with government organizations and non-government organizations at the district level. There were fourteen KIIs with stakeholders conducted in total. The key informants were mainly from key disaster management organizations and departments at the district level, including the government departments such as district disaster management center, divisional/district secretariat administration office, Sri Lanka Red Cross Society, and community-based organizations worked in the disaster management projects. The KIIs gathered evidence and stories to support the findings from the questionnaire survey. We used Semi-Structured Interview Questions (SSIQ) primarily to probe the responses for the study objectives. The study team gathered evidence and stories to support the responses to the study's unbiased questions. We also prepared an SSIQ guide to make the questions consistent across all KII.

Key informants and members of QSs gave their verbal informed consent before data collection. The data collection took place during the second week of August 2018. The study limitations included the bias of responses in the survey; the crucial informant interviews helped overcome these biases by cross-checking the uncertainties with the key stakeholders.

4.2 Data analysis

To collect stories and lessons from experience, highlighting the essence of accounts of responding and recovering from May 2017, flood and landslides in Sri Lanka, we applied the Most Significant Change (MSC) method (Dart and Davies, 2003). To identify response categories and patterns and to identify emergent themes and contextual factors, we used the content and comparative analysis. The data obtained from QS and KIIs were analyzed to capture any differing perspectives or experiences among groups. The findings are presented in a simple descriptive statistical information such as percentages in a tabular form and supported with the test data obtained from the KII responses. Although our findings are case-specific, the lessons learned in this study can help understand different dynamics and models in similar contexts and how models vary for different disaster and socioeconomic contexts.

5. Main Results

5.1 Early warning dissemination on a landslide to most vulnerable communities

In general, most of the vulnerable households rely on national media or announcement from police for accessing disaster early warning messages. People felt a need for better coordination between different dissemination entities such as police and media. However, some of the participants indicated that they use their experience as an early warning mechanism, such as forecasting different flood inundation levels by assessing the speed of water and assessing the inundation level of different trees in river banks during rainy seasons.

People participated in the landslide awareness programs conducted by the National Building Research Organization and appreciated the usefulness of the programs. These mechanisms improved access to timely lifesaving messages so that the most vulnerable community members can evacuate or be evacuated promptly in case of impending landslide risk in the future. The stakeholder opinion about community participation in the study areas revealed that around 78% felt it was “very good” and 23% rated as just “good”. A respondent who participated in the Landslide awareness program shared his opinion that "*–My house was constructed in a landslide-prone area. We have invested our lifelong earnings in building it. If we had an opportunity to learn this earlier, probably we would not be investing in housing in this location*".

5.2 Disaster management capacities of key stakeholders

The awareness program has involved disaster management officials and other staff, such as economic development officers and village administrators (called GN in the local language, for *Grama Niladhari*), who were exposed to risk reduction concepts against the response approaches. The study participants expressed a feeling that the series of disaster preparedness training programs conducted after 2017 floods and landslides improved their skills and knowledge on disaster preparedness. Notably, the preparedness kits (which included hygiene items and tarpaulin sheets for emergency shelter) introduced in Kalutara and Ratnapura were welcome as very useful to the communities and government officials.

Our study has revealed that the continuous efforts of the Sri Lankan health services at the local level during non-emergency periods have contributed to creating positive health-related behavioral changes in communities. A hygiene promotion program organized in the camps during disasters complemented government efforts. The administrative government counterpart at the community level, which are divisional and district secretariats, did not have any special allocation to meet the immediate needs to provide camp cleaning kits and garbage bins during emergencies. However, in the Sri Lankan context, the local authorities have the responsibility of road cleaning and maintaining the environment. Local authorities should be pleaded with to play an essential role in maintaining camps and surroundings. Due to the lack of clear roles and responsibilities in times of disaster, local authorities hardly play a key role in disaster response.

Table 2. Members of the village disaster management committee (before and after) – district and gender-wise responses.

District	Members before 2017 disasters				Members after 2017 disasters			
	Yes		No		Yes		No	
	M	F	M	F	M	F	M	F
Kalutara	0	0	3	31	1	10	2	21
Ratnapura	2	8	6	19	4	19	4	8
Matara	0	2	11	37	0	3	11	36
Total	2	10	20	87	5	32	17	65

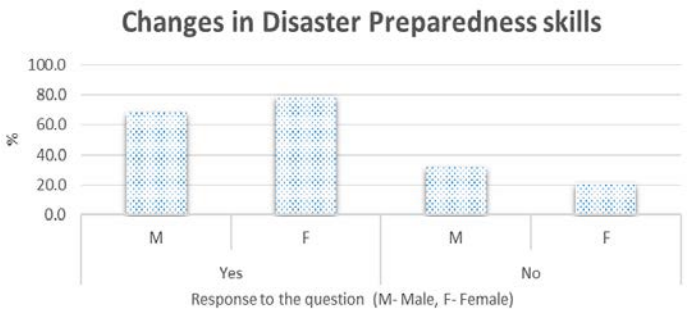

Figure 3. Changes in disaster preparedness skills (Gender-wise).

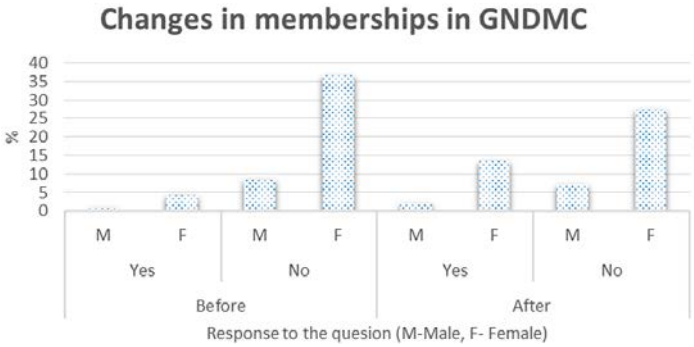

Figure 4. Changes in memberships on the disaster management committee (Gender-wise).

As shown in Figure 3, around 68% of male and 79% of female beneficiaries reported (Answered Yes for the question – do they see changes in disaster preparedness skills) that the participation in post-disaster recovery and preparedness work has changed the way of practicing disaster management. Most of the participants indicated that this was the first time they were attending disaster preparedness programs, and confirmed that those programs provided many techniques for improving their preparedness and resilience for future disasters. However, there is a correlation of participation in preparedness awareness programs or involvement in disaster management committees and the frequency of disaster events. For example, as shown in Table 2, the number of members in village disaster management committees has seen a sharp increase in a particular district that experienced frequent disasters (Ratnapura/Kalutara) compared to other districts that experienced less frequent disaster events (Matara). Hence, the Ratnapura district revealed a higher preparedness level, where frequent incidents of disaster impact occur. However, lower preparedness levels of people shown in the Matara could be due to the smaller frequency of disaster events.

5.3 Disaster response capacity of village disaster management committees

There was an increase in memberships on Village (GN) Disaster Management Committee (GNDMC) after the 2017 flood response intervention. Memberships of male respondents were increased by 1.2%, and female respondents by 9.2%. The women showed more interest in disaster management activities in their villages. Women's ordinary memberships in GNDMC increased by 5.9%, with a 23.5% increase in active participation in GNDMCs. Figure 4 shows the percentages of respondents who had answered the question of whether they had a membership in GNDMC before and after (Yes/No). There was a 20.6% increase in a leadership position among women beneficiaries after the flood response intervention (Figure 5). When compared to men's memberships, active participation, and leadership position, there was significant positive empowerment visible among women. Almost all of the participants have indicated that they are aware of the safe locations for evacuation during disasters.

5.4 Coping strategies of the vulnerable communities

As Table 3 shows, 76% of respondents from cash-for-livelihood reported that their livelihood assets were fully damaged, 12% reported partial damage, 4% reported they could not access their livelihoods, and 8% reported they could not continue their livelihoods due to the disaster.

Table 3. Damage to the livelihood assets.

Nature of Damage (% of total)	Male	Female	Total
Fully damaged	12	64	76
Partially damaged		12	12
Not damaged			
Could not access		4	4
Could not continue	8		8
Total	20	80	100

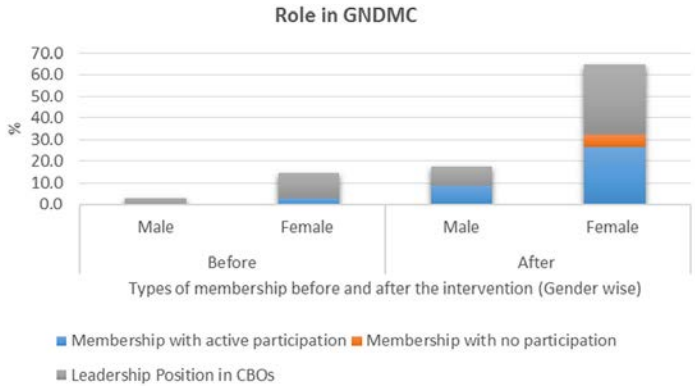

Figure 5. Changes in a role in the disaster management committee (Gender-wise).

Around 52% of the examined who received some form of (unconditional) cash grants have stated that they had used the grant for renovating the damaged household, 18% used it for medical requirements, and 12 % for livelihood improvements; see Table 4 for different types of utilization. As they cannot obtain gainful employment, the most vulnerable individuals or families were the most often unconditional cash support recipients. This situation is apparent as the one in five from the target group, who otherwise may not be able to work, spent the grant on medical expenses.

Table 4: Pattern of utilization of cash received as unconditional cash grant after 2017 floods and landslides as part of disaster recovery intervention

Utilization Pattern (% of people)	Male	Female	Total
Daily consumption (food, clothes etc.)	0	0	0
Renovation of damaged household	18	34	52
Savings	0	0	0
Loan payment	0	6	6
Children's educational needs	6	0	6
Livelihood improvement	6	6	12
Purchasing new household items	0	0	0
Meeting the medicinal requirements	6	12	18
Family functions	0	6	6
No idea	0	0	0
Other	0	0	0
Total	36	64	100

On the other hand, people who completed some work on conditions - such as *Cash for Work* (CFW) – received cash support. The work is conditional such as the collective community work, but the cash received for the work can be spent unconditionally. Around 22% of beneficiaries under cash-for-work utilized the funds for daily consumption, and the same amount of people utilized it for children's education. Around 13% of beneficiaries used it for the renovation of a damaged household. Table 5 shows other types of utilization of the grant. In both coping capacity interventions through grant support, a significant number of individuals or families allocated the support to renovating their damaged houses, and essential consumption needs such as food, clothes, and children's education.

Table 5: Pattern of utilization of cash received from cash support for conditional work such as cash-for-work

Utilization Pattern (% of people)	Male	Female	Total
Daily consumption (food, clothes etc.)	2	20	22
Renovation of damaged household	0	13	13
Savings	0	0	0
Loan payment	0	8	8
Children's educational needs	0	22	22
Livelihood improvement	3	5	8
Purchasing new household items	0	0	0
Meeting the medicinal requirements	0	3	3
Family functions	0	3	3
No idea	0	0	0
Other	2	17	19
Total	7	91	100

6. Discussion

6.1 Disaster preparedness strategies in response and recovery phases

In terms of preparedness for future disasters, this study has shown that there is a correlation between the interest in active participation in disaster preparedness awareness programs, and the frequency of disaster events. The higher the rate of disaster events, the larger the interest of people to attend and learn about disaster preparedness. However, although the disaster severity can be the same with fewer disasters, the interest is more strongly correlated with the frequency than the severity in floods and landslides. Future studies need to explore and measure the linkages and the degree of correlation between disaster frequency, severity, and the level of importance given by the community exposed to disaster risks.

The early warning available at the community level should link community-based approaches to the sub-national or national systems. The effectiveness of end-to-end and people-centered early warning system depends on many technological and social factors. It includes information on disaster risk obtained through the systematic data collection process, monitoring and forecasting of hazards, reliable communication source, and community level preparedness to respond to the warnings received. Greater coordination is needed between critical components of an early warning system within the sector and across multiple inter-related sectors through effective coordination platforms at the middle level (divisional and district levels in the sub-national state structure). Early warning systems should link multiple early warning levels and include a feedback mechanism for further upgrading (WMO, 2017). The whole system may fail when one of the components become ineffective or lack proper coordination.

Disaster preparedness activities could be expanded to include intensive community-based awareness, mock drills, and development of contingency preparedness plans. These activeties should be strategically combined to maximize post-disaster intervention outcomes. This effort requires a planning exercise with the district/divisional disaster management center. Similarly, the immediate post-disaster phase can also be used to build the divisional disaster management committee's capacity, so that the sustainability of disaster recovery interventions can be further strengthened by linking of relief, recovery, and development in the subsequent phases of a disaster.

The perception of risk varied from district to district, thus as the culture of disaster preparedness. In the districts where the landslides and floods are frequent, such as the Ratnapura district, the community's level of interest in the disaster preparedness activities is higher. However, there is a lack of interest in disaster preparedness in the Matara district as the disaster risk is not seen as high by the population, although severely affected by floods in 2017. Hence, different approaches are required in the districts with a lesser frequency of disasters but subjected to a more substantial impact with one-off disaster events such as the 2017 flooding.

6.2 Community resilience in the early recovery phase

The CFW program is highly recommended as a disaster response strategy, as it brings multiple benefits not only for the affected population but also increasing the resilience of the communities for future disaster risks. The selection of activities for cash-for-work programs needs to be well thought-through while taking into account to address all potential cross-cutting themes such as gender, disaster risk reduction, reviving the local markets, and environmental concerns. Such an efficient selection of CFW activities will help integrate risk-sensitivity, even at the beginning of an early recovery stage (Saja et al., 2019). Mostly in Sri Lanka, the work assigned in the CFW programs have been community work, which can also aim to increase the social cohesion and build skills such as teamwork and mutual trust. However, new ways of doing CFW can be explored; for example, in Japan, people were also assigned to office work if they have required skills, which can provide them with an opportunity to find sustainable employment by gaining more experience (Nagamatsu, 2014).

The cash-for-work programs were used to provide cash to affected families while obtaining their support in fulfilling immediate community recovery needs. However, the post-disaster response and recovery interventions need to establish close working relationships with local authorities to provide heavy machinery to support the people involved in cash-for-work programs, especially in a location that requires an immediate restoration of services like rural hospitals, water treatment plants, and schools. If the state lacks resources to address these unmet needs, other possibilities should be pursued, like providing support from the local businesses/private sector. The selection of the most vulnerable families for cash-for-work programs sometimes hindered their participation in other preparedness activities, since they are of limited physical capacity. Their priority was to meet essential needs rather than attending awareness and preparedness sessions. Under this scenario, unconditional cash grants for flexible work, like participation in awareness programs, should be encouraged. Unconditional cash grants after disasters increase the choice for people to spend cash on their priorities. As revealed in this study, it allowed almost one-fifth of the population who received assistance to support their urgent medical needs, while half of the population used it for renovating damaged housing.

6.3 Integration of Response preparedness, Resilience and Risk -sensitivity (IRRR)

A key challenge identified in this study is that the communities tend to give much less focus to the preparedness components at the later recovery stage. The perception of risk varied from district to district due to the culture of disaster preparedness. This study further highlighted the need for innovative methods to integrate disaster preparedness and resilience-building activities successfully. They should also be mainstreamed from the beginning of the response timeline before the memory of the latest disaster fades.

6.4 Linking Relief, Rehabilitation, and Development (LRRD)

The local engagement and partnerships at the community levels have sometimes been more effective, linking shorter and longer-term strategies. The cash transfer programs in the humanitarian response have been advocated instead of direct food aid or livelihood assistance to fulfill the immediate humanitarian needs but also to build resilience (Hinds 2015). Further, more influential advocacy component with all key relevant stakeholders should be part of the comprehensive disaster response strategy for linking relief, recovery, and development.

6.5 Coordination in times of disasters across all the phases

Joint progress-review meetings could be organized quarterly with respective district disaster management units and disaster management stakeholders. Cash-for-work and cash grant programs could be used to raise awareness on disaster preparedness rather than seeing them as mere livelihood support. Since those most vulnerable to disaster risks always set their fundamental needs as the top priority, any activity implemented should integrate disaster risk reduction and awareness on disaster preparedness. The sustainability of the disaster recovery interventions should be ensured by advocating the key stakeholders from the state departments and non-state actors to prioritize strengthening preparedness during non-disaster periods.

7. Conclusions

This study emphasized the need to capitalize on the immediate post-disaster response period to integrate risk reduction and resilience-building activities from the early stages of the recovery timeline. As recovery needs diminish, the courage to drive disaster preparedness and resilience enhancement activities further deteriorate until the next disaster strikes. The recovery time can be more efficient than the development period to optimize the outcomes in risk-sensitive interventions since the felt-needs exist at a higher level compared to the development period. This study will assist key disaster management stakeholders at the policy decision level to devise an integrated framework of disaster response to align with the resilience investment and activities. The future post-disaster driven preparedness and resilience enhancement activities need to align with the existing Sri Lanka Community Resilience Framework as it can optimally utilize time and resources to enhance resilience in resource-limited contexts. Future research can focus on longitudinal studies that can investigate similar lessons over time following the same methodology.

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