Measuring the Disaster Resilience of Municipalities in Nepal: A Case Study of Rampur Municipality, Palpa

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Abstract

After the formulation of new constitution in 2015, Nepal has adopted three layers of government system. As per the local government operation act 2074, disaster risk reduction is a main authority of local government, and also as a shared authority between federal, provincial and local governments. It shows that the elected representatives of these local governments are at the forefront of dealing with the impact of disasters. Thus, this paper aimed to study the baseline condition of resilience at Rampur municipality identifying the gaps and limitations.Many approaches have been developed to measure the resilience of local governments through different agencies working in the field of disaster risk reduction. However, analyzing the different tools and methods regarding their basic features through literature review, the research have adopted the disaster resilience scorecard developed by the United Nation's Office for Disaster Risk Reduction. The scorecard uses the ten essentials necessary to achieve the disaster resiliency under the resilient cities campaign. The primary data were collected through the workshop and validated through the key informant interviews and secondary data coordinating with the local government. The study has identified the present conditions of different essentials of resilience in the municipality. The lackings and achievements in terms of different essentials of resilience were presented in the form of radar chart for easy comparison and understanding to layman.

Keywords

Resilience, Scorecard, Local government

1. Introduction

1.1 Background

Located in the lap of the Himalaya range, Nepal is regarded as one of the most disaster prone countries in the world due to its diverse topography and climatic condition. Earthquakes, landslides, floods, fire, thunderbolts are the major hazards that caused major damage in the past, weakening the fragile ecosystem of the country. Economic Vulnerability Analysis report shows that Nepal exhibits the largest losses due to large exposure, vulnerability and the high level of hazards. As a matter of these phenomena not only cause loss of lives and properties, but also pose severe threats to physical infrastructure, and also disrupt economic development [1]. In addition, Nepal is severely affected by monsoons, fires and high winds every year and has been identified as one of the most susceptible countries to the impacts of climate change [2]. Therefore, resilience is a multi-dimensional concept, visible at multiple levels of the community.
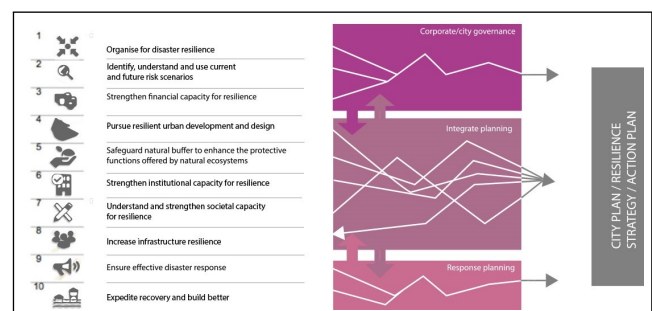

Figure 1: Ten essentials for Resilient city as per the UNDRR

Building resilience in every local bodies require an understanding of the systems that build up the municipality and the interdependencies of the risks within these systems. It is within this context that the

understanding the resilience of cities to natural hazards and disasters being one of the important factor to be considered by all. There seems to be continuing intensification of patterns of risk in urban and semi urban environments as witnessed by an ever-increasing frequency of billion-dollar loss events such as Hurricanes Harvey, Katrina, the Gorkha, and Christchurch Earthquakes [3].

Till the date, various indicator frameworks have been developed to benchmark and measure the resilience, e.g. the Baseline Resilience Indicators for Communities, IBM-AECOM Resilience Scorecard, Torrens Scorecard, or the Municipality Resilience Framework . Most of these tools rely on prescribed approach that gives a broad picture of performance along a set of questions or resilience dimensions[3]. No single model or approach for measuring resiliency has been universally accepted, and due to the diversity and unique requirements of different organizations and stakeholders, it seems like no single approach will ever do the job. Sharifi [4] has offered a critical review of resilience assessment tools emphasizing the need to account for spatio-temporal dynamics. To capture local processes for decision-making and the formation of relevant indicators and targets for producing actionable information, different types of indicators that represent the local knowledge, conditions, and context are needed. Since, these types of indicators cannot be determined from publicly available databases, the design of targeted surveys with a specific audience in mind is required.

1.2 Study area

Rampur Municipality is located at 65 km north east from the Tansen (district headquarter) of Palpa district in Lumbini Province. As per the Nepal Disaster Risk Reduction portal [5], 1.9 million of economic loss has been occurred in Rampur municipality within last 2 years (Dec.2017- Dec.2019) due to various types of hazards. Fire, thunderbolt and heavy rainfall has caused serious problems resulting economic and other losses. As per the Illaka police station, Rampur, 7 people have been found dead and missing by drowning in Kaligandaki River within first 7 months of 2019.

Rampur municipality suffered no casualties during the Gorkha Earthquake, 2015 but many houses were destroyed fully or partially. As per the Office of Municipal Executive, 343 no. of houses were reported by national reconstruction authority as the affected houses. Out of them, 272 houses were recommended

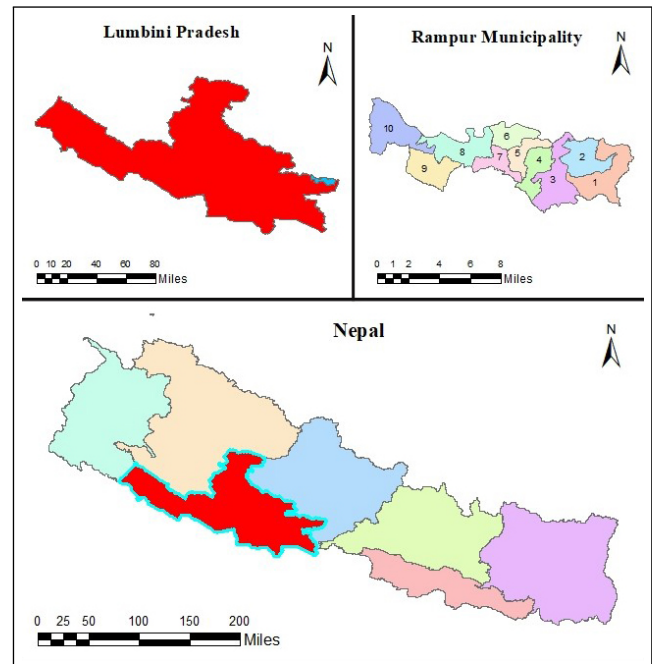for reconstruction by National Reconstruction Authority.

Figure 2: Map of study area i.e. Rampur Municipality

2. Literature Review

2.1 Measuring the Disaster resilence

Resilience of any community or municipality in case of natural hazards and disasters has been defined as the ability of communities exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential structures and functions. Resilience at present has become the de facto framework for decreasing disaster risk and enhancing community level disaster preparedness, response, and recovery capacities [6].

Holling[7] was the first to introduce the resilience concept to some prominence within the field of Ecology. As per the Holling, resilience is the ability of an ecological system to absorb change and disturbance, and still maintain the same relationships that control the system's behavior. Since the publication of the work of Holling, the concept of resilience has been widely used and accepted in a variety of fields, and conceptual models used to describe and assess resilience within the literature are so many in number. Researchers and practitioners

have proposed different methodologies and frameworks for measuring disaster resilience employing qualitative and quantitative approaches at the community, regional, and national levels [8]. For monitoring the progress of communities across space and time, these studies focuses on establishing baseline resilience conditions.

A review of applied approaches so far can be broadly classified into two categories: qualitative and quantitative. Qualitative approaches are generally adopted in a small-scale study to understand underlying vulnerability and community capacity, and determine how a specific community prioritizes their risks and perspectives on resilience factors. Numerical information can be utilized to empirically measure or characterize places: quantitative measures often result in indices (quantifying variables of selected characteristics), scorecards (evaluating progress toward a goal), and tools (modeling simplified representation of systems) that are built from secondary data or survey results [9].

Various metrics and methods have been developed in recent years in order to evaluate different types and numerous interpretations of resilience. Some of the methods for assessing disaster resilience in Nepal as per the DFID [10] are as follows:

- Quantifying 'Resilience Dividends' Using CBA

- Tracking Resilience Using Scorecard-Based Indicators

- Measuring Resilience Using Secondary Data

- Measuring Resilience Based On Recovery Times

2.2 Making City Resilient Campaign by UNDRR

In 2010, the Making Cities Resilient: "My city is getting ready campaign" was launched "to support sustainable urban development by promoting resilience activities and increasing local level understandings of risk" [11]. The Campaign was guided by three central themes: to Know More, Invest Wiser, and Build Safer. These are set out in the "Ten Essentials for Making Cities Resilient," that were developed in line with the Five Priorities of the Hyogo Framework for Action (HFA) 2005-2015. Local governments that sign up with the Campaign, commit to lead the pursuit of risk reduction activities

following the Ten Essentials. In 2015, to support the implementation of the new DRR Framework, the Sendai Framework UNDRR, along with a group of over 100 distinguished municipality and expert partners has updated the "Ten Essentials." The New "Ten Essentials," building upon the previous set, focuses on initiating advocacy activities towards urban resilience [12].

The ten essentials for making cities resilient checklist includes:

- Essential 1: Organize for disaster resilience.

- Essential 2: Identify, understand, and use current and future risk scenarios.

- Essential 3: Strengthen financial capacity for resilience.

- Essential 4: Pursue resilient urban development and design.

- Essential 5: Safeguard natural buffers to enhance the protective functions offered by natural ecosystems.

- Essential 6: Strengthen institutional capacity for resilience.

- Essential 7: Understand and strengthen societal capacity for resilience.

- Essential 8: Increase infrastructure resilience.

- Essential 9: Ensure effective preparedness and disaster response.

- Essential 10: Expedite recovery and build back better.

2.3 DRRM in context of New Local Governments in Nepal

In 2015, Nepal adopted a new Constitution. As the fundamental law and policy framework for governance, the Constitution of Nepal introduced a federal system "Internalizing the people's sovereign right and right to autonomy and self-rule, while maintaining the freedom, sovereignty, territorial integrity, national unity, independence and dignity of Nepal". Article 56 of the Constitution has defined "the structure of the Federal Democratic Republic of Nepal shall be of three levels, namely the Federation,

the State and the Local level" and "the Federation, State and Local levels shall exercise the power of State of Nepal pursuant to the Constitution and law"[13].

For local governments to fully exercise their DRRM authority and to achieve the commitments of the DRRM Act 2074, it is necessary for them to be able to identify the lacking in the capacity that they need to develop. Different study and past experiences shows that the entire country is at risk of earthquakes. Similarly, according to the disaster database managed by MoHA, every local government in Nepal seems to face multiple disaster risks as the multiple hazards prevails in them. Also it is to be considered that the level of risk is differentiated by geographic disparities, level of exposure and sensitivity, cultural practices, and socio-economic conditions [14].

DRRM is included in new constitution in Schedule 7, Schedule 8 and Schedule 9, implying that DRRM falls under the sole authority of local government, along with shared authority between federal, provincial and local levels [13]. However, the Constitution directs that laws made by local government to exercise any authority shall not be inconsistent with federal laws or any laws made by the province or the National Assembly. Similarly, the laws made by provincial government cannot defy federal laws. This could bring confusion and contradiction in disaster risk reduction programs and management interventions.

3. Research Methodology

A review of the literature on existing approaches and tools to measure resilience was undertaken. Relevant sources were drawn from an extensive time span. It includes library search, electronic magazines and academic journals, internet, books, conference proceedings, and different reports and related documents.

From the desk study, different types of literature were reviewed to select the appropriate method for measuring the disaster resilience in case of Nepal. Selection of the relevant disaster resilience measuring tool was carried out based on the following components:

1. Scale, i.e. micro (household to community), small (ward to Rural Municipality or equivalent), meso (districts & municipalities), large (national), or multiple;

2. Type of resilience, i.e. hard (i.e. infrastructural), soft (i.e. non-infrastructural) or mixed;

3. Framing, i.e. general/multi-hazard, disaster risk reduction (DRR), climate change adaptation (CCA), or economic;

4. Area of applicability, i.e. calculation of avoided losses, addressing climate risk management, DRR and responsiveness, infrastructural resilience, general population or societal resilience, or multiple applications.

5. Level of use of tool i.e. user friendliness, transparency, level of difficulty to operate regarding time, effort, resources and calculation etc.

The Government of Nepal, together with major development partners, had launched the Nepal Risk Reduction Consortium (NRRC) in 2009. Among 5 Flagship Programmes of the NRRC, the Flagship 4 Program focused on Community-Based Disaster Risk Reduction (CBDRR). It initiated this work to define disaster resilience by developing the nine minimum characteristics reflecting a disaster resilient community [14].

As Nepal's overarching framework for disaster risk reduction is guided by the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030 [15] and regarding the above 9 characteristics of NRRC, the most promising tool for assessing resilience at the municipality/municipal level in Nepal was found to be the Disaster Resilience Scorecard for Cities, which offers a good balance between user-friendliness and comprehensiveness. This consists of scorecard-based indicators grouped under 10 'Essentials for Making Cities Resilient', representing 47 indicators that can be used for a preliminary or detailed assessment of resilience. This tool is found to be more transparent, user-friendly and addressing the context of municipalities in Nepal.

3.0.1 Structure of the Scorecard and scoring system

The purpose of the development and application of the UNDRR Disaster Resilience Scorecard for cities is to provide a tool that can capture the key functional and organizational areas for urban resilience with communities and local government officials as the targeted decision-making body. In this regard, the structure of the Scorecard was developed considering

the dimensions of 10 essentials for resilient cities. Each dimension was divided a set of 47 indicators (questions) were produced. Specific questions of the scorecard can be adjusted for the local context of the area being analyzed [16]. For each indicator, a set of targets (answer schemes) are established to track progress pertaining directly to understanding gaps in disaster resilience in a municipality. The targets were initially defined by using four main categories as per the UNDRR guidelines:

0-Almost none: "Little or no awareness"

This level represents little or no awareness, understanding, and mainstreaming disaster risk within a community or municipality. There is no institutional policy or process for incorporating risk reduction within the functions and operations of the municipality or its communities.

1-Low: "Need of awareness"

This level refers to an early stage of awareness and mainstreaming risk. The municipality or community has a growing level of awareness, and there is little support for disaster reduction among the policy makers. The municipality and its communities may have activities, and dedicated efforts for preparedness but these are simply limited to response.

2-Moderate: "Engagement and Commitment."

This third category is refered to a high level of participation, understanding and commitment to Disaster Risk Reduction (DDR). However, the policies and systems may not have been fully established yet. The municipality/community may not have a deep understanding of the mainstreaming process and requirements, and there may still be limited capacity to increase resilience, but overall there is a willingness to take some action; commitment for change, and in particular to shift from response only to mainstreaming DRR.

3-High: "Full integration"

This level refers to a situation where risk reduction and resilience is fully absorbed into planning and development processes as well as core services. The municipality/community places high importance on reducing disaster risks in a sustainable program of action at multiple levels and within multiple sectors, and there is a comprehensive demonstration of practice. This level describes a situation where disaster risk reduction is "institutionalized".

3.1 Data capture

The UNDRR Disaster Resilience Scorecard exercise on-site involves mainly but not only staff from the local government office but also the stakeholders from the diverse fields and communities. Person chosen for workshop needs to be the local residents working in municipality for long time as a staff or representative, socially & politically active, member of the municipal disaster management committee or one working in the NGOs and INGOs active at the place for humanitarian activities since a long time like Red Cross and so on. This kind of workshops also requires staff from Information Technologies (IT), communications, engineering and the administrative department [16].

It is essential for the exercise that somebody who speaks the local language follows and delivers a written report of the discussion. It would be recommendable to record the discussion also in audio and video when it is possible. It is also necessary to take photographs of the group during the exercise, the local supporting organization and interested participants. It would be ideal that this workshop will be undertaken at the beginning and at the end of their tenure by elected representatives, to measure the impacts of their activities to enhance resilience.

Figure 3: Workshop organized for filling up scorecard at the premises of Rampur Municipality

The Scorecard may not address all the disaster resilience issues facing any municipality. If in doubt, advice can be taken from the experts in risk management or another relevant discipline. Consulting citizen groups after the completion of the Scorecard can improve the quality of the results drawn from the workshop. Being as accurate and realistic as possible will help identify areas of vulnerability,

enabling their prioritization for attention and funding. Each scores can be verified and reviewed through District profile, Municipal profile, Population Census Data 2011, Budget allocation of the latest fiscal years, Program and policies reviews, Hazard and Risk Map.

3.1.1 Data process

The results of this assessments can be displayed using 'radar' or 'cobweb' diagrams. This diagram represents all the dimensions of resilience and reveal how these are changing over time. This can provide a rapid and powerful means of illustrating where resilience is static or in decline, and thus demonstrate where action to build resilience is most urgently needed. Conversely, where resilience is improving, the measures taken to address that particular dimension of resilience can be identified and interrogated to assess their contribution.

A radar chart is a graphical method of displaying multivariate data in the form of a two-dimensional chart for multiple quantitative variables represented on axes starting from the same point. The relative position and angle of the axes is typically uninformative. It consists of a sequence of equi-angular spokes, called radii, and each of the spoke represents one of the variables. The data length of a spoke is proportional to the magnitude of the variable for the data point relative to the maximum magnitude of the variable across all data points. A line is drawn connecting the data values for each spoke. This gives the plot a star-like appearance and the origin of one of the popular names for this plot.

4. Result and Discussion

Rampur municipality seems to lack far behind in the path of resiliency. Some of the good initiations like implementation of building codes and preparing the municipal land plans are being recently implemented. Ambulance and fire brigades have been arranged. But most of the participants of workshop and key informant survey agreed that it has a lot to do for institutional, financial and public participation regarding disaster and preparedness activities. No hazard map has been prepared so far and no exact data exist for risk scenarios. The elected representative seems to be unaware of disaster resiliency. The overall result obtained from findings from the field work and workshop and calculated through the scorecard was plotted in the radar chart and presented in a figure 4.
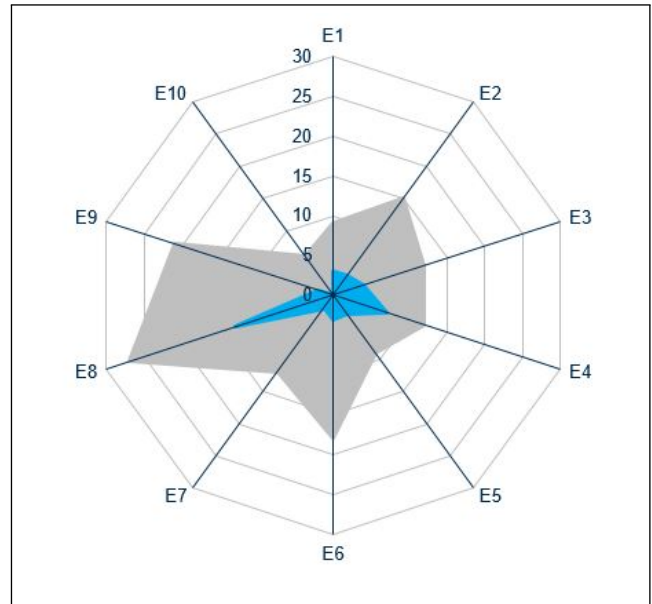

Figure 4: Overall result of the scorecard in Radar Diagram

The figure 4 shows the municipality is strong resilient urban development and design (essential 4). Municipality is weakest to expedite recovery and build back better (essential 10). Essential 1 (understanding of risk), essential 4 (pursue resilient urban development and design) and Essential 8 (increase infrastructure resilience) seems to be better than other essentials. Essential 2 (identify, understand and use future risk scenarios), Essential 7 (understand and strengthen societal capacity) and essential 10 (expedite recovery and build back better) seems to be worst and need to be prioritized to increase resilience. Rampur municipality scored 40 out of 141 according to the resilient scorecard which is below the satisfactory performance in terms of resilience.

5. Conclusions and Recommendations

This study presented the theoretical background, methodology and application of the disaster resilience scorecard in Rampur Municipality. The scorecard is useful in evaluating the status, gaps and current achievements of key resilience dimensions and can be applied at multiple levels of geography. Disaster resilience scorecard by UNDRR can also be applied through the initial customization process, the indicators within each dimension can be modified to include all hazards that may threaten a given municipality and its communities. The selection of which hazards to include as part of the scorecard is framed within the preparatory stage of the scorecard

design with local authorities and is based on the intended use of the scorecard (e.g.multi-hazard approach or focus on single scenarios).

Some of the recommendations to increase resilience in Rampur Municipality are as follows:

- It needs to have interim arrangements for damaged facilities, locations and sources of temporary housing, triage policies for inspection, repairs and debris removal, counseling and personal support arrangements, community support arrangements, economic reboot arrangements Improvement to city layout and operation as rebuilding takes place.

- Rampur Municipality needs to identify the existing hazards and possible consequences as 'most probable' and 'most severe.' It needs to have prepared the hazards, capacity and vulnerability maps. It needs to have multi agency forum that assess issues of infrastructure and operational resilience. Also it needs to have comprehensive inventory map of all critical infrastructure.

- Regular training programs, practices and drills are needed to be provided to the most vulnerable populations. Citizen engagement and communication in relation to DRR most be made effective.

- It needs to have a plan or standard operating procedure to act on early warnings and forecasts. Disaster management/preparedness and emergency response plan needs to be prepared and periodically updated.

- Sufficient fund, equipment, supply needs and staffs must be arranged for disaster management authority.

- Community organizations and youth must be encouraged to participate in risk reduction and post event response for each neighborhood.

- Municipality must prioritize and encourage for resilient building and construction works.

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