



# Assessment of Disaster Preparedness Parameters and Disaster Resilience Measures for Local Government Results-Based Monitoring and Evaluation

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## Abstract

The 2015 Sendai Framework for Disaster Risk Reduction (SFDRR) calls for a more robust assessment of local disaster risk reduction efforts against resiliency targets to foster greater accountability in building resilience. However, resilience is a complex concept that does not neatly square with accountability. Often, it challenges established disaster risk management (DRM) performance assessments due to diverse interpretations and analytical measures. This study examined the Department of Interior and Local Government (DILG) annual Disaster Preparedness Audit (DPA) and its potential to measure resilience. It compared current disaster preparedness parameters against widely applied measures of disaster resilience. Different concepts of community resilience and assessment models surfaced conceptual and methodological requisites that can benefit the DPA model. The DILG and other DRM agencies validated the results, which point to the absence of a common analytical language and the high mutability of performance metrics that lack a logical structure. Findings suggest that local governments mediate community risk reduction through a network-driven approach. Further collective risk management strategies can be contractible despite their diversity, provided these are structured to deliver minimum measurable results. This study recommends a conceptual boundary for local government resilience and the operational considerations to inform the configuration of current assessment practices for Local Government Unit (LGU) disaster preparedness while fostering accountability.

*Key words: local government, disaster resilience, risk governance, organizational capacity, measurement*

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## 1. Introduction

Disaster resilience largely rests on managing the uncertainties of natural hazards at the community level by mitigating underlying risk drivers (Alexander, 2013). In 2015, the United Nations Office for Disaster Risk Reduction (UNDRR) asserted that resilience-building efforts should run alongside promoting greater accountability through robust assessments against resiliency targets (Malalgoda, Amaratunga, and Haigh, 2015). This assertion holds local public agents of DRM accountable for the outcomes of disaster resilience efforts, thereby requiring robust governance systems and institutions (MacAskill and Guthrie, 2014). The role of local governments as the primary disaster resilience agents draws on the principle of subsidiarity (Zurita, Cook, Harms, and March, 2015). This premise argues that "where practical, governing functions should be devolved to the lowest levels to ensure they are exercised as close as possible to those affected" (Zurita et al., 2015).

Furthermore, it assumes that local governments with greater autonomy (Malalgoda, Amaratunga, and Haigh, 2015) are more effective in reducing the size and frequency of crises (Shaw, 2012). However, the pathways to local resilience are diverse in context, scope, and scale -- making accountability challenging to track. One reason is the different interpretations and measures of resilience. Another is the limited studies on the resilience of local governments as organizations.

Different agencies assess local government performance in disaster risk management for various purposes. Some ascertain the effectiveness of specific programs to benchmark performance and identify entry points for local capacity improvement. Others examine compliance with mandates as a basis for incentivizing and stimulating better performance, like the DPA of the DILG. This diagnostic tool annually tracks local government compliance with disaster preparedness mandates, specifically governance inputs like hazard information, organizational preparedness, emergency preparation, and utilization of DRRM funds.

In 2010, the agency envisioned local government organizations as disaster-resilient (DILG, 2016). However, operationalizing this policy proved complicated due to insufficient guidance on what constitutes a disaster-resilient LGU and its minimum measures. Thus far, performance parameters come from policies of different disaster management agencies without any logical structure or reference to specific outcomes. This situation affirms the challenge of squaring accountability with disaster resilience observed in international policy discourse (Davoudi et al., 2012; Tiernan et al., 2019).

## 2. Methodology

The study sought to elucidate the concept of resilience applicable to local governments and explored potential resilience performance measures suited for their scale of operation. This study critically reviewed the applicability of resilience elements in local government settings and the measures used in applied resilience assessment frameworks. It examined open-access journal articles and guidance documents on disaster resilience measurement published from 2010-2017. The review parameters drew on different ontological views of resilience capacity relevant to local public organizations. The literature search in February 2018 yielded 429 peer-reviewed articles and guidance documents (i.e., toolkits, policy papers, manuals) on field-tested resilience measurements. Ninety-four (94) articles focused on natural hazards and community-scale risk management capacity. Contextual screening further narrowed the selection to 23 based on these criteria, namely: (a) inclusion of planning authorities and policymakers as among the units, (b) demonstrated application of the method, and (c) inclusion of governance or institutional dimension of resilience. In addition, the author conducted an in-depth review of 26 resilience assessment methods, with the addition of the Climate Change and Disaster Risk Assessment (CDRA) of the Housing and Land Use Regulatory Board (HLURB) and two recently published tools at the time of the study namely, UNDRR Disaster Resilience Scorecard and GEM RPS (Global Earthquake Model Resilience Performance Scorecard).

This review focused on (a) how resilience manifests at the local government level, (b) the minimum elements of resilience assessment that align with performance measurement, and (c) the methodological considerations for assessing resilience.

## 3. Disaster resilience: catchphrase or realistic target?

Resilience is intuitively a good policy agenda, and there is no debate over the merit of measuring the success of a policy (Schipper and Langston, 2015). However, quantifying the concept faces enormous challenges as it continuously evolves in heuristic and normative disciplines. Moreover, conceptual clarity and practical relevance are needed (Brand & Jax, 2007) in empirical work (Gunderson & Holling,

2002) if policies want to avoid the pitfall of overstretched generality.

In disaster risk management, resilience anchors on human security framing, which underscores social resilience. It centers on how social systems "absorb and bounce back" from a disturbance or shock of various origins, whether human-induced or natural. This ideation characterizes a system's behavior in the face of impending or materializing threat draws (Alexander, 2013; Bogardi and Fekete, 2018; Chandler, 2014; Sharifi and Yamagata, 2016). The concept significantly departs from the precursor framing in ecology as a "condition for ecosystems' sustainability" (Brand & Jax, 2007; Carpenter et al., 2001) but partly aligns with engineering resilience.

Gunderson and Holling (2001) define ecological resilience as a system's capacity to undergo disturbance and maintain its functions and controls through persistence and variability (Brand and Jax 2007). Such capacity is a function of the magnitude of disturbance a natural system can absorb and its ability to assume multiple stable states, including system collapse. On the other hand, engineering resilience focuses on managed socio-technical systems (i.e., transportation, water supply), emphasizing the control of system performance to avoid failure. This paradigm suggests (Bach et al., 2013) that resilience is about efficiency and robustness. A resilient engineered system rapidly resumes its pre-disturbance functions after crossing a tolerable threshold (Sharifi, 2016) following a disruption.

Despite the unpredictability of a social system's reaction to disturbance, public and civil organizations adopt the social resilience paradigm. It describes disaster resilience as a set of capacities to protect and ensure the survival of human systems (Table 1). These definitions agree that disaster resilience capacity is a set of multi-phased and hazard-dependent processes (Table 2) with different outcomes (Asadzadeh, Kötter, Salehi, and Birkmann, 2017; Béné et al., 2012; Matyas et al., 2015). It emerges from tractable resources and an organization's latent capacity to absorb shocks, reorganize amid escalating impacts, and stabilize.

Absorbing, reorganizing, and stabilizing a socio-ecological or socio-technical system refer to broad risk management phases. These all draw on multi-tiered actors, resources, institutional systems, and latent attributes. However, these characteristics are not readily applicable to local governments, owing to their dual nature as an administrative and political subsidiary organization of the national government. Further, resilience outcomes are notably associated with aggregated costs to societal welfare, and communities are identified as the locus of such outcomes. In most studies on community resilience, measures typically scale to the affected or at-risk population's capacities, such as household attributes, resources, and actions.

However, when one envisions disaster-resilient local governments, it presupposes these organizations assume a role and a set of capacities distinct from their constituent community. As administrative and political subsidiaries of

the national government, local governments can reduce risk factors external to their constituents by mediating or restraining a community's capacity to respond.

Table 1 Definitions of Resilience Capacity in Disaster Risk Management

Scale	Scale of Application	How Resilience Occurs
1. (UNDRR, 2019; UNISDR, 2017; UNISDR & WMO, 2012) (Field et al., 2012) (for IPCC)	System and its components, community or society to exposed hazards; essential basic structures and functions	Ability to resist, absorb, accommodate, adapt to, transform, and recover from the effects of a hazard in a timely and efficient manner, including the preservation, improvement, and restoration of essential basic structures and functions through risk management
2. Meerow et al., 2016	Cities, urban systems, and constituent socio-ecological and socio-technical networks across temporal and spatial scales	Ability to maintain or return to desired functions after a disturbance, adapt to change, and rapidly transform system elements that limit current or future adaptive capacity
3. FSIN, 2014	Human or social system attributes, processes, and structures created by humans	Multi-dimensional human-centric capacity
4. ADB and Bender & Benson, 2013	Countries, communities, businesses, and individual households	Ability to resist, absorb, recover from, and reorganize in response to natural hazard events without compromising their sustained socio-economic advancement and development
5. Twigg, J. 2009	System or community, certain core functions, and structures	Ability to anticipate, minimize, and absorb potential stresses or destructive forces through adaptation or resistance manage or maintain certain essential functions and structures during disastrous events and recover or "bounce back" after an event
6. Cutter et al., 2010	Social system	A system's ability and internal conditions to cope, absorb, respond, and recover from disaster impacts and post-event stresses. This involves adaptive processes that facilitate the ability to reorganize, change, and learn with every response to a threat.
7. Norris et al., 2008	Community, social system	A process that links a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance

Source: Adapted from Bahadur et al. (2017)

Table 2 Stages and Outcomes of Resilience Capacity

Resilience Capacity	Risk-Orientation	DRRM Phase	Outcome
Absorb and Coping	immediate threats tactical and short-term impacts	During and after impact (response and early recovery)	<ul style="list-style-type: none"> <li>• Withstand or endure an impact without collapse,</li> <li>• Limit damage from disturbances and maintain functions</li> <li>• Restore essential services</li> </ul>
Adaptive	Prospective risks based on past events and projections/ scenarios	Before and after impact (preparedness, prevention, and mitigation)	<ul style="list-style-type: none"> <li>• Prevent or reduce adverse impacts in the future</li> <li>• Generate lessons from past events, foster learning for adjustments</li> <li>• Adjust current condition for future risk</li> <li>• Increase buffer capacity, redesign functions and structure</li> </ul>
Transformative/ Participative Capacities	Prospective risks based on past events and projections/ scenarios		<ul style="list-style-type: none"> <li>• Enhance people's well-being in the face of present and future risks</li> <li>• Advance progressive change and sustainable development</li> <li>• Foster societal robustness toward managing change in the face of future risks</li> </ul>

Source: Adapted from Bene et al. (2012)

Moreover, such processes challenge context-appropriate measurements with a well-structured accountability thread. Two interpretations exist. One refers to liability for sub-optimal performance results, and the other concerns shared responsibility. Liability sits well with performance audits, where normative prescriptions exist for organizational

processes. The latter appeals to civic responsibility, where local governments steer and enable a network of other resilience agents (Figure 1).

The slew of administrative guidance on how LGUs manage and reduce disaster risks, often embodied in toolkits and playbooks, helps local governments organize their efforts. However, compliance implies a pre-determined pathway or a prescribed set of actions of a central authority leads to reduced disaster loss or damage—a flawed logic due to the uncertainties of disaster impacts. Moreover, the more subdued view of accountability departs from the risk governance lens, which bids that all resilience stakeholders create a networked system of resources. Hence,

accountability is shared. A proposed compromise between these interpretations is to align resilience capacity with the local government operations toward organizational effectiveness. This approach mainstreams risk management elements into existing contractible results of public efforts that communities can benefit from and validate. Furthermore, institutionalizing the inclusion of other resilience actors into the local government response structure leverages shared accountability.

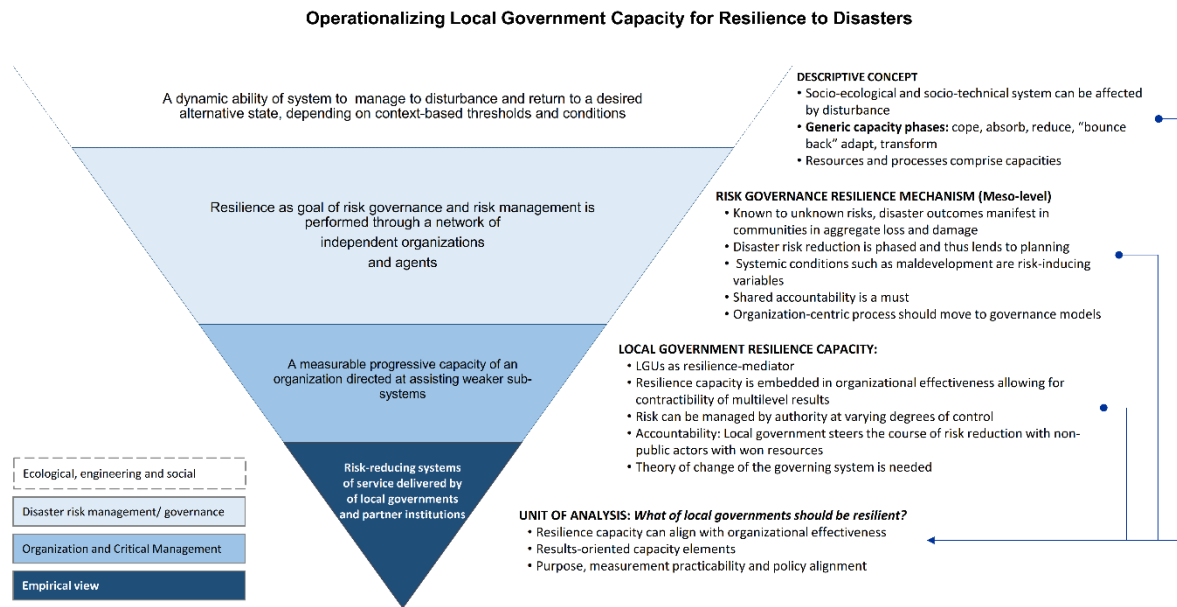


Figure 1 Deconstructing the layers of resilience capacity  
Source: Author's construct

#### 4. Measurability of resilience capacity

Although current definitions offer a springboard for capacity assessment, they fall short in guiding the identification of resilience capacity criteria. Consistent measurement mechanisms continue to fuel scientific debates, with most methods wanting empirical evidence (Asadzadeh, Kötter, Salehi, and Birkmann, 2017). Every method proposed is a variant of the resilience concept with multidimensional metrics -- ranging from engineering functionality, human-centered capitals, and place-based processes to institutional attributes. The resulting measures are an amalgam of descriptive specifications of capacity and the prescriptive facets or "what the case ought to be." Thus, methodological differences exist in the essential measurement requisites: the purpose, the scale, and the constitutive elements of resilience capacity (FSIN, 2014; Quinlan et al., 2016; van der Merwe, Biggs, and Preiser, 2018).

##### 4.1 Purpose of assessment

Generally, assessments can be formative or summative, where the utility of results varies (van der Merwe et al., 2018). Summative assessments evaluate the current level of a given performance for external reporting and

benchmarking against a set of standardized measures. In contrast, formative assessments assess the process itself to improve performance. Summative studies use outcome-based metrics to evaluate results relevant to a public value, such as well-being, level of service, and loss and damage. In contrast, formative measurement is a systematic and periodic collection and interpretation of current performance evidence to identify areas for improvement in producing intermediate results that support outcomes. When applied to resilience, formative inquiry looks at the attributes of a process, such as critical interactions among institutions, collective decision-making, and innovation (Tucker, 2010). In addition, formative probes often emphasize compliance with policy prescriptions rather than substantial changes in an adverse condition (Frey et al., 2013; Quinlan et al., 2016). As a result, such assessments can potentially erode rather than build resilience.

##### 4.2 Scale of resilience capacity: Network-mediated or organizational resilience?

Measuring resilience to exact accountability in disaster risk management raises the question, "who should be held accountable for what?" Unfortunately, the answer eludes linear logic as there are different assumptions about the scale where capacity sits and how it manifests.

For example, some sector's view capacity from an organizational scale, where a bounded management system defines clear lines of accountability. Another approach is through a network perspective and shared governance of complex risk management work, where accountability is collectively owned rather than allocated among participating stakeholders.

The Sendai Framework promotes disaster risk governance as a critical area that needs strengthening towards resilience, with a specific call on the public sector to steer the course. The UNISDR (2017) asserts that disasters result from inadequate handling of public organizations of pre-existing systemic risks -- wanting prevention and reduction. Huitema et al. (2009), Ikeda and Nagasaka (2011), and Selby and Jiwanji (2016) agree that risk governance first requires shared recognition of risk among system custodians led by public organizations. They further stress the co-management of disaster risk factors through collaborative learning and novel resource management to better help a system buffer and recover from shocks.

Galperin and Wilkinson (2015) likewise share that a common understanding of risk enables system managers to create flexible rules and norms that aid individuals in coping and thriving through a crisis. Galeprin et al. call this adaptive management, a mechanism to create an enabling environment for community resilience. Selby and Jiwanji (2016) extended this premise and suggested a systematic combination of more concrete inputs. These include people (i.e., multiple actors, leadership, organizational capacity, and knowledge), mechanisms (i.e., institutional arrangements, partnerships, coordination networks, and legal and policy framework), and processes (i.e., procedures and products for development such as planning and budgeting).

Despite efforts to operationalize risk governance to imply resilience, some scholars remain cautious, stating "it is still largely idyllic, which outcome has yet to be proven" (Bach et al., 2013; Bristow et al., 2013; Cai et al., 2018; Djalante et al., 2011). Concurring resilience scholars describe risk governance as an "upgraded but nascent version of integrated risk management" or an organization's capacity to anticipate risks and promote multiple stakeholder collaborations (Ikeda & Nagasaka, 2011; Shaw & Maythorne, 2013). Bogardi and Fekete (2018) observed that risk governance remains a common substitute for disaster resilience measures for government agencies. However, too many governance features mute "what needs to be resilient" and muddle the scale of measured capacity elements. They highlighted that all assessments must strive for more scientific rigor to narrow the resilience concept and increase confidence in results and practical utility.

Organizational and management disciplines endorse a more pared-down scope of risk governance that distinguishes the "system that governs" from the "governed system" (Andrew, 2009; Gall et al., 2014; Jung, 2017; Ruiz-Martin et al., 2018). The former refers to organizational

structures authorized to act towards a well-defined goal, coordinate critical resources, and mobilize a network of actors to lessen disruptions in more fragile communities. In disaster resilience, communities are "wards" aided by higher systems like local government units. The critical resource consists of service networks (Figure 2) under local governments' direct supervision or substantial influence, such as infrastructure, supply chain, and businesses (Kahan et al., 2009; Ruiz-Martin et al., 2018). However, this does not mean the demarcation among these system agents and social groups is absolute and hierarchical. Andrew (2009) suggests establishing inter-jurisdictional agreements among local governments and systems agents to formalize unique relations and manifest contractual ties crucial for regional integration and broader resilience actions. While these agreements may overlap with multiple activities and specialized agencies, these can also foster a culture of reciprocity among the organizations.

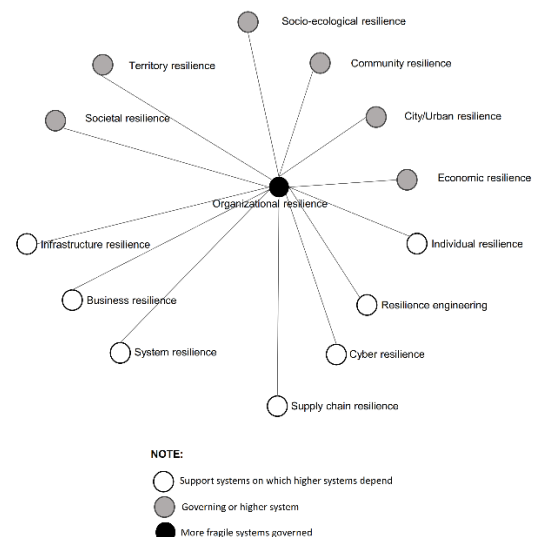


Figure 2 Relations between resilience concepts and organizational resilience  
Source: Ruiz-Martin et al., 2018

#### 4.3 Performance measurement and local accountability

The widespread attempts to attribute loss and damage as resilience outcomes to local risk management bring a deluge of capacity elements to assess. However, the measurement approach is far from straightforward because these elements are held in and produced through social interactions, even at an organizational scale. Bogardi et al. (2018) stress that the ebb and surge of organizational responses to risks and disasters often consist of overlapping actions that blur the synthetic divide among operational actors in an imprecise interaction space. Accordingly, the ambiguity between risk reduction and management phases fueled the diversity of capacity elements to be measured.

Recent assessment tools focus on changes in enabling conditions such as municipal planning processes, business environment, the extent of public services delivered, and regulatory mechanisms to approximate accountability and local government-mediated resilience (Bozza, Asprone, and Manfredi, 2015).

These initiatives essentially square local government's resilience capacity with organizational performance, which underlies its missions and subjects its internal and external goals to formative and summative assessment. As such, efforts and results align with organizational effectiveness because they are problem-driven rather than theory-driven constructs (Sudnickas, 2016; Henri, 2004).

Longstaff, Armstrong, Perrin, May, and Hidek (2010) propose to limit the scope of the organizational performance of disaster management organizations to resilience-building processes associated with the robustness of resources accessible to them. They define resources as "objects, conditions, characteristics, and energies that people value in different ways across geographic scales, cultures, and hazard contexts (Longstaff et al., 2010). These include shelters, hospitals, lifeline utilities like water supply, or facilities that promote social cohesion and economic wealth. Other tools consider leadership, information, and technical competencies as organizational resources.

All these resources can support logic-based measurements that assess a sequence of observable attributes, actions, conditions, and outcomes that lend to empirical testing (FSIN, 2014). This observation is consistent with results-based monitoring and evaluation and organizational performance measurement – a practice common to the private sector and recently adopted in public sector organizations.

Diefenbach (2009) defines performance measurement as the "systematic, regular, and comprehensive monitoring and assessment of vital aspects of organizational performance based on explicit targets, standards, indicators, and measurement and control systems." It appraises the status of performance and tracks change over time to complement more in-depth assessments. However, performance measurements cannot demonstrate attribution (Seville, 2009) of outcomes to specific interventions. At best, empirical evidence from performance measurement generally supports improved overall organizational productivity in the private sector. Diefenbach (2009) explains that, unlike private organizations, public entities like local governments have multifaceted goals directed at different public needs, resulting in elaborate service delivery processes. The most significant challenge for performance measurement in public organizations is the integration of various aspects of organizational performance, often measured with incomparable indicators (Balabonienė and Večerskienė, 2015; Speklé and Verbeeten, 2009; Sudnickas, 2016). This situation applies to measuring disaster risk governance, where local authorities manage densely

networked institutions with diverse responsibilities that span multiple jurisdictional scales within and beyond administrative territory. Process-oriented assessments thus become too complicated and fuzzy and less preferred over output or outcome-based measurements (Frey et al., 2013; Henri, 2004; Summermatter and Siegel, 2008).

Organizational outputs are quantifiable results tied to service delivery efficiency and quality. Goals are specific, and performance measures tailback an organization's objectives and targets. Organizational actors know and control the processes, transforming efforts into definitive results (Speklé and Verbeeten, 2009). Conversely, outcomes pertain to the benefits that clients derive from organizational outputs but with much more control. Marchant and Stevens (2017) contend that outcome-focused assessments decrease overall performance when metrics that drive incentive and sanction are challenging to specify. Different actors within and outside the organization share accountability. Such is the institutional setting for local disaster risk reduction. The more avenues for procedural and substantive resilience-building actions exist, the weaker the attribution of outcomes to risk governance. Outcomes can be contractible in public sector organizations when the desired risk governance results are sufficiently defined beforehand in clear and enforceable terms and processes. However, public organizations' complex risk management actions change over time with every occurrence of an impact (Kirschenbaum, 2004; Patterson, Voogt, and Sapiains, 2019).

As human service organizations, local governments define their goals within the purview of their autonomy. Two (2) motivations usually emerge from their activities that outline their performance areas. The first is improving service efficiency (delivery-oriented) through inputs and processes such as budget utilization, staff competency, and functionality of internal operating structures. The other goal concerns the effect of work systems on community safety and well-being (constituency-oriented). Life-saving and recovery-facilitating measures include shelters, emergency alert systems, rescue and relief operations, and subsidies.

Delivery- and constituency-oriented actions give local disaster risk governance a verifiable form, provided these can logically demonstrate priorities and the intended change that involves multiple actors. Hence, local resilience capacity can evolve into contractible and measurable organizational performance results.

Ruiz-Martin et al. (2018) define organizational resilience as the measurable combination of characteristics and capability of an organization to maintain critical operations in the face of known and unknown disturbances. They add that organizations recover from shocks by assuming the costs of coordinating their essential functions. They also draw upon other service institutions to maintain stability and provide weaker organizations with resources, templates, and structures to prevent a complete institutional collapse.

Jung (2017) agrees and describes such organizations as production systems and enabling structures guided by performance scripts to reduce the complexity and uncertainty of the environment, but adds two critical points needing clarification: (a) the locus and centrality of decision-making for resilience and (b) the quality of risk management processes.

Perhaps this scale suits local governments as they perform distinct and more complex roles than households or private organizations. Depending on the tier they operate in and the authority over risk management, the operational space of local governments for disaster risk management can overlap or rely on other administrative units. Lacambra et al. (2015) and Chandler (2014) describe these institutional limits as a "social character of risk," which argues that disruptions in society from natural hazards result from some governance failure. The situation occurs when institutional decision-making processes inadvertently create barriers to valuable learning from risks and impacts, including unintended policy outcomes. Therefore, local governments can reduce systemic risks by partnering with non-public actors to resolve maldevelopment issues that amplify disaster risks to vulnerable populations and assets.

### 5. A proposed concept of disaster resilience at the local government level

Disaster risk reduction significantly recognizes uncertainties about how natural hazards can evolve into security threats relative to changing capacities to respond and recover. This view tempers conventional assumptions on

the linearity between disaster risk management capacity and outcomes. While definitions of disaster resilience vary, all assume some systemic weakness or vulnerability that makes a social system susceptible to adverse impacts on well-being and security. The emphasis on capacities directed at systemic conditions that tend to give rise to risks acknowledges that what reduces vulnerability increases resilience. However, the credence of risk-reducing strategies diminishes when resilience assessments fall short of policy expectations. As Cutter (2014) succinctly sums up, the conceptual tensions on resilience are not an issue per se, but the disparate assumptions and approaches to operationalize the construct make assessments contentious.

This paper proposes a synthesized concept of local government resilience capacity as a starting attribute or end-point condition referenced to the timing of the disturbance and the extent of inherent system vulnerabilities (Figure 3a). It locates resilience capacity in formal organizations (i.e., LGUs) that enable communities to mitigate risks and recover from impacts. Their risk governance strategies that mediate community disaster preparedness contain measurable features, albeit indicative. Such a view underscores the contractibility of these measures due to local governments' control over resources to achieve resilience goals. Control manifests in an organization's internal choices regarding the tractable resources and capabilities to improve operational efficiency or produce societal benefits. With risk governance as the demonstration of resilience capacity, local governments can influence other disaster management actors and institutions to help ensure risk reduction outcomes. An organization adopting risk governance better supports weaker social systems (i.e., settlements exposed to risks).

(a) Dimensions of local government disaster resilience

(b) Operational Levels of Measurement

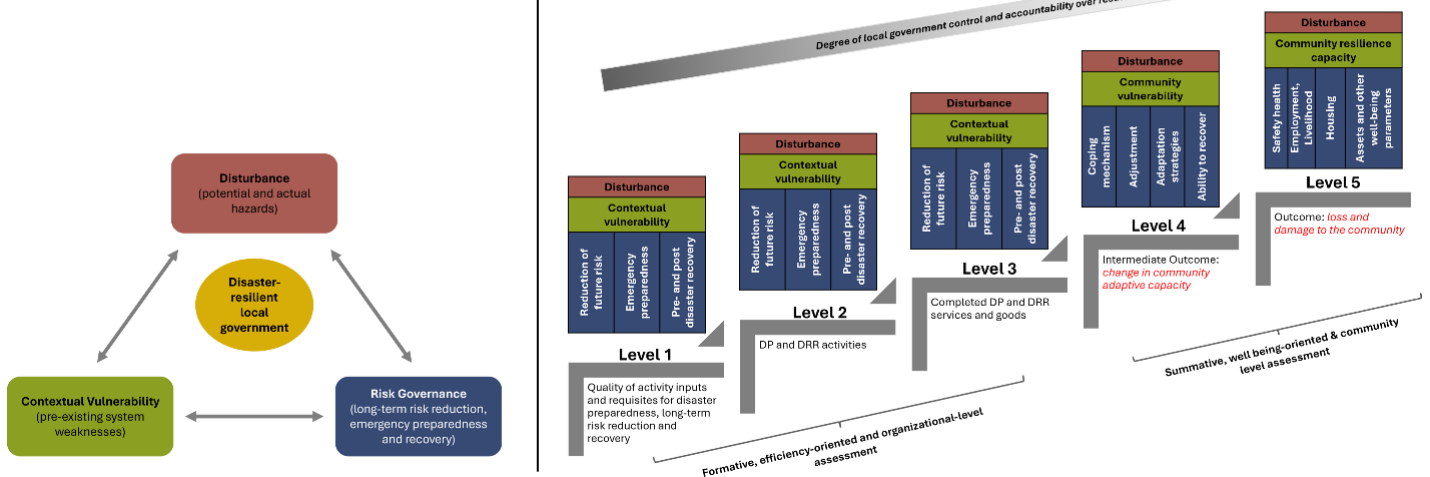


Figure 3 Proposed dimensions of local government resilience and phase of results-based measurement  
Source: Author's construct

Further, the decision center shifts from a unitary entity to a network of risk management agents. As a result, one expects a more comprehensive and integrated approach to reducing pre-event and residual risks that also allows for accountability tracking. However, local government control is likely more robust on results involving its administrative reach than outcomes that manifest at the community level.

The assessment framework for local governments should then depict a more straightforward pathway of change from the efficiency of service delivery to boosting the adaptive capacity of its constituencies. It needs to demarcate the local government as the governing system and the community at risk as the governed system. Local governments' risk-reducing services can then be the subject of periodic reviews of efficiency-related objectives to be attained over time. For instance, Level One can focus on the quality of inputs to resilience-building strategies. Level Two assessment would zero in on the progress of these interventions. Level three can track the completion of risk reduction services and program outputs. Impact assessments can follow in Levels 4 and 5 to verify how local government resilience contributed to community safety and well-being (Figure 3b). These tiers can serve as appraisal cycles with progressive performance targets or benchmarks that LGUs should satisfy.

Finally, metrics for each resilience capacity dimension should be time-sensitive. It may involve periodically modifying these parameters with stakeholders and LGUs as hazardscapes, local context, and capacity interact dynamically.

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