



Reframing Disaster Risk Governance through Soft Systems Methodology: An Inclusive Multi-Level Model for Women with Disabilities in North Lombok Regency

Hendra Puji Saputra^{1*}, Rizwan Rizkiandi², Hulwatul Izmi³

¹ Department of Sociology, Faculty of Social and Political Sciences, University of Indonesia, Depok, Indonesia

² Department of Management, Faculty of Economics and Business, University of Islam Syekh Yusuf, Tangerang, Indonesia

³ Magister of Disaster Mitigation, Postgraduate University of Mataram, Mataram, Indonesia

Received: 20 April 2026

Revised: 29 April 2026

Accepted: 30 April 2026

Published: 30 April 2026

Corresponding Author:

Author Name:

Hendra Puji Saputra

Email:

hendra.sociology@gmail.com

DOI:

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Phone*: +6287745957808

Abstract: The mainstreaming of social inclusion within Disaster Risk Reduction (DRR) continues to face various implementation challenges, resulting in disproportionately higher levels of risk and disaster impacts among vulnerable groups, particularly persons with disabilities. This study examines governance issues in inclusive DRR for women with disabilities in Pemenang Barat Village, Pemenang Sub-district, North Lombok Regency, Indonesia. From a disaster sociology perspective, the study offers a novel contribution by developing a more equitable, just, and accessible DRR governance model for women with disabilities. This research adopts an action research design employing Soft Systems Methodology (SSM), combined with mind mapping techniques. The study is also informed by New Institutionalism (Nee, 2005), which is used to examine the relationship between formal and informal institutions in DRR practices. The findings indicate that weak enforcement of both formal and informal rules has hindered the integration of social inclusion within DRR governance at macro, meso, and micro levels. This condition is subsequently addressed through Root Definition, producing three conceptual models to respond to the complexity of real-world problems. At the macro level, the establishment of a Disability Service Unit is proposed through a Regent Decree issued by the North Lombok Government. At the meso level, strengthening social networks and partnerships within the Village Disaster Preparedness Team (TSBD) is emphasized. At the micro level, capacity building for families and women with disabilities is conducted through community discussion forums. These three levels are interconnected through a systemic mechanism that links formal and informal institutional elements within a more inclusive DRR governance system.

Keywords: Governance, Disaster Risk Reduction, Social Inclusion, Women with Disabilities.

Introduction

During the period 2018–2021, the frequency of natural disasters in Indonesia exhibited a significant upward trend. Data from the National Disaster Management Agency (BNPB) indicate that disaster occurrences increased from 3,397 events in 2018 to 3,814 in 2019, 4,650 in 2020, and reached 5,402 events in 2021 (BNPB, 2022). This escalation has contributed to a paradigm shift in disaster management in Indonesia, moving from a reactive emergency response approach

toward a preventive approach that emphasizes disaster risk reduction (Azad et al., 2020). This shift has further strengthened community-based strategies that promote active public participation in disaster risk management.

Community-based approaches are considered essential for building inclusive resilience, particularly for vulnerable groups such as women with disabilities. This group tends to experience disproportionate disaster impacts due to limited capacity and unequal access to resources (UNDRR, 2022). A substantial body of

How to Cite:

Saputra, H.P., Rizkiandi, R., & Izmi, H. (2026). Reframing Disaster Risk Governance through Soft Systems Methodology: An Inclusive Multi-Level Model for Women with Disabilities in North Lombok Regency. *Journal of Disaster Mitigation Research*, 1(1), 7–18.

literature confirms that persons with disabilities experience higher vulnerability across various disaster events, including the Aceh tsunami (Doocy et al., 2009), Yogyakarta earthquake (Itriyati, 2020), West Sumatra earthquake (Sudaryo et al., 2012), Great East Japan Earthquake (Tomata et al., 2015), Haiti earthquake (Danquah et al., 2015), Wenchuan earthquake in China (Fong et al., 2022), and the non-natural disaster of COVID-19 (Lebrasseur et al., 2021; Jashinsky et al., 2021; Doyle, 2021; Courtenay & Perera, 2020). These studies collectively demonstrate that disaster risk is not determined by social background, including gender or disability status.

Gatrell et al. (2020) further argue that women with disabilities constitute one of the most vulnerable groups due to limited access to institutional support during preparedness, emergency response, and post-disaster recovery phases. This condition is often exacerbated by increased exposure to post-disaster violence. Nevertheless, the rights and protection of persons with disabilities have been internationally recognized through the United Nations Convention on the Rights of Persons with Disabilities and the Sendai Framework for Disaster Risk Reduction 2015–2030 (Villeneuve et al., 2021; Calgaro et al., 2020; Pertiwi et al., 2019), which emphasize equality and human rights-based approaches in disaster governance (Calgaro et al., 2020).

In Indonesia, these international commitments have been ratified through Law No. 19 of 2011, which is further operationalized by BNPB Regulation No. 14 of 2014 concerning the protection, management, and participation of persons with disabilities in disaster management (BNPB, 2016). However, the implementation of these policies remains challenging, particularly in ensuring meaningful inclusion and justice (Calgaro et al., 2020; Weibgen, 2015). Women with disabilities continue to be marginalized and insufficiently involved in disaster risk reduction processes, thereby limiting their capacity to respond effectively to disasters (Gatrell et al., 2020).

This limited access is rooted in long-standing processes of social exclusion, driven by unequal access to resources prior to disasters (Cooper et al., 2021; Calgaro, 2021; Ton et al., 2019). Structural barriers such as poverty, discrimination, marginalization, and political exclusion further exacerbate these conditions (Gatrell et al., 2020; King et al., 2019; Pyke & Wilton, 2020; Probosiwi, 2013). These constraints operate across multiple levels, ranging from individuals to formal and informal institutions (Hastuti et al., 2020).

From a broader development perspective, Indonesia continues to face significant challenges in achieving inclusiveness. The Global Inclusion Index 2020 ranks Indonesia 125th with a score of 26.50, far below developed countries such as the Netherlands,

New Zealand, and Sweden, as well as several ASEAN countries including the Philippines, Vietnam, Singapore, and Thailand (Measuring Global Inclusion & Marginality, 2020).

The number of persons with disabilities in Indonesia is also substantial. The Central Statistics Agency (BPS, 2020) reports approximately 22.5 million persons with disabilities, while the National Socioeconomic Survey (Susenas, 2020) estimates 28.05 million. The World Health Organization further estimates that around 10% of Indonesia's population, or approximately 27.3 million people, are persons with disabilities (Kompas, 2023). In West Nusa Tenggara Province (NTB), this group remains highly vulnerable, with a poverty rate of 17.18% (ranked fifth nationally) and health insurance coverage of only 36.92% (second lowest nationally) (Yulaswati et al., 2021). These conditions significantly increase their vulnerability in disaster contexts.

The 2018 Lombok earthquake provides an empirical illustration of the heightened vulnerability of women with disabilities in terms of both safety and disaster response capacity (Yuwanto, 2022). Other studies also highlight increased risks of mortality, injury, and economic loss among this group (Aldrich & Benson, 2008; Sheehy et al., 2022; Wiligen et al., 2002; Phibbs et al., 2015). Weak disaster mitigation outcomes are influenced by limited policy support, gender bias, low empowerment, and weak trust in the capabilities of persons with disabilities (Yuwanto, 2022).

In addition to formal disaster governance through BNPB, Lombok communities possess indigenous knowledge for disaster mitigation, such as earthquake-resistant Sasak traditional houses, kentongan (wooden slit drums) as early warning systems, and lontar manuscripts documenting historical disaster knowledge (Mustafa et al., 2019). Local communities also possess ecological knowledge for interpreting natural warning signs (Saputra, 2023). However, rapid social change has contributed to the erosion of these local mitigation practices, including for persons with disabilities.

At the local level, inclusion issues in disaster risk reduction are evident in Pemenang Barat Village, North Lombok Regency. Drawing on Nee's (2005) new institutionalism framework, these problems emerge across three levels. At the macro level, institutions such as BPBD, Bappeda, and the Social Affairs Office represent formal actors responsible for disaster management and social inclusion in North Lombok. At the meso level, the Village Disaster Preparedness Team (TSBD) plays a key role in implementation. At the micro level, the issue relates to the capacity of individuals and families of persons with disabilities. This complexity is further intensified by multiple disaster hazards, including earthquakes, tsunamis, flash floods, tidal

floods, and coastal abrasion (KONSEPSI NTB, 2022), which increase vulnerability when not accompanied by meaningful inclusion.

Based on this problem context, this study argues that the heightened vulnerability and risk experienced by women with disabilities are driven by complex and interrelated dynamics across multiple social layers. Using Nee's (2005) new institutionalism perspective, the governance challenges faced by women with disabilities in disaster risk reduction are understood as interconnected across macro, meso, and micro levels. Therefore, this study focuses on Pemenang Barat Village, Pemenang Sub-district, North Lombok Regency. This site is selected due to its high disaster vulnerability and its relatively large population of persons with disabilities, totaling 71 individuals, the majority of whom are women (HWDI NTB, 2023).

Previous studies indicate that research on disability-inclusive disaster risk reduction (DRR) has generally focused on identifying barriers, limited access, and the vulnerability of persons with disabilities across various disaster contexts. These studies highlight constraints in access to information and institutional support (Gatrell et al., 2020; Cooper et al., 2021), the presence of structural barriers and social stigma that exacerbate vulnerability (King et al., 2019), as well as the limited role of disability organizations within disaster management systems (Pertwi et al., 2019). Other studies extend the focus to inclusive education, capability approaches, and individual preparedness (Sheehy et al., 2022; Villeneuve et al., 2020; Ton et al., 2018), as well as institutional strengthening in DRR governance (Hardjosoekarto et al., 2013; Calgaro et al., 2021). However, these studies tend to remain sectoral in nature, are not fully integrated, and do not specifically examine the dynamics of social inclusion of women with disabilities in DRR through a disaster sociology perspective that simultaneously links institutional, social, and multi-level interactions. Accordingly, there remains a clear research gap that calls for a more comprehensive and integrative approach. Therefore, this study offers a novelty by combining New Institutionalism (Nee, 2005) with the disaster pentahelix concept, and employing Soft Systems Methodology integrated with mind mapping as an analytical approach to more holistically understand inclusive DRR governance for women with disabilities.

Method

1. Research Approach and Methodology

This study employs Soft Systems Methodology (SSM), which views social problems as complex, dynamic, and multi-perspective systems requiring a flexible approach to understanding problematic situations (Checkland & Poulter in Augustsson et al.,

2019). SSM is part of Action Research, which enables systematic identification, analysis, and learning processes to generate new knowledge (Checkland, 1999; Marshall & McKay, 2001).

This research focuses on *theoretical research interest*, namely the development of knowledge in disaster sociology without direct implementation in practical problem-solving contexts (*problem solving interest*). This focus is relevant for examining inclusive disaster risk reduction (DRR) governance for women with disabilities, which involves multi-actor interactions at the macro, meso, and micro levels (Adnan et al., 2022).

SSM is combined with mind mapping to explore and visualize the complexity of the problem based on stakeholders' perspectives. This technique is used in the initial stage of SSM to enrich the understanding of problematic situations based on in-depth interview data.

SSM is applied up to stage 6, namely: (1) identifying the unstructured problem situation, (2) expressing the problem situation, (3) developing root definitions, (4) building conceptual models, (5) comparing models with real-world situations, and (6) debating with stakeholders. The implementation stage (stage 7) is not conducted because this study is purely academic in nature.

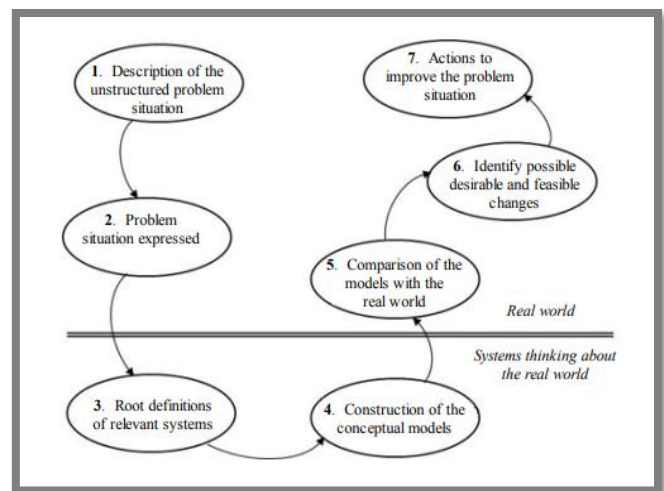


Figure 1. Checkland's SSM Model Stages, adapted from Antunes et al. (2016).

2. Unit of Analysis and Problem Owners

The unit of analysis in this study consists of disaster pentahelix actors, including local government institutions (BPBD, Bappeda, Social Affairs Office), village-level institutions (TSBD), and families and women with disabilities in Pemenang Barat Village, North Lombok Regency.

Problem owners refer to stakeholders who are directly involved and knowledgeable about inclusive DRR governance for persons with disabilities. These include government actors, village organizations,

NGOs, GEDSI experts, as well as women with disabilities and their families. A total of 12 informants were selected purposively based on their roles and relevance to the research issue.

3. Data Collection Techniques

Data were collected using three main techniques: observation, in-depth interviews, and documentation. Observation was conducted to understand the social context and inclusive DRR practices in the field. In-depth interviews were carried out with problem owners at the macro, meso, and micro levels to obtain comprehensive empirical data. Documentation was used to strengthen primary data through various sources such as policy documents, program reports, and academic literature (Sugiyono, 2017).

4. Data Validation and Analysis

Data validation was conducted using triangulation techniques by comparing findings from observations, interviews, and documentation to ensure data credibility. Data analysis followed the six stages of SSM (1-6) to examine both real-world and conceptual situations related to inclusive DRR governance for women with disabilities. These stages include problem identification, situation mapping (rich picture), root definition formulation, conceptual model development, comparison with real-world conditions, and stakeholder discussions to achieve a holistic understanding.

Result and Discussion

1. Overview of Inclusive Disaster Risk Reduction Governance for Women with Disabilities.

1.1 Articulating the Unstructured Problem Situation

Based on the Regional Disaster Management Plan (Rencana Penanggulangan Bencana/RPB) of North Lombok Regency for 2023–2027, one of the key strategic issues is the inadequate protection, inclusion, and empowerment of vulnerable groups in disaster risk reduction (DRR). Normatively, various regulations at both national and regional levels have addressed the fulfillment of the rights of vulnerable groups in disaster management. In the context of North Lombok Regency, this commitment is explicitly reflected in Regional Regulation No. 5 of 2013 on Disaster Management Implementation and Regional Regulation No. 2 of 2020 on the Protection and Fulfillment of the Rights of Persons with Disabilities in DRR.

However, the implementation of these policies continues to face complex and dynamic challenges, resulting in the suboptimal realization of inclusive DRR governance.

From a sociological perspective, drawing on the framework of new institutionalism (Nee, 2005), these

complexities arise from the interconnections among factors at the macro, meso, and micro levels. These three levels interact through both formal and informal elements that mutually influence one another within a systemic structure. Therefore, this section elaborates on the dynamics of problems across these levels based on empirical field findings.

A. Macro Level

At the macro level, the institutional environment is represented by the North Lombok Regency Government through agencies such as the Regional Disaster Management Agency (BPBD), the Regional Development Planning Agency (Bappeda), and the Social Affairs Office. These institutions play a crucial role in organizing disaster management systems, particularly those related to women with disabilities. In carrying out their functions, they rely on regional regulations and policies as guidelines for building disaster resilience.

Normatively, the political commitment of the local government to protect and fulfill the rights of persons with disabilities has been incorporated into various policies, including the Regional Medium-Term Development Plan (RPJMD) 2021–2026, which emphasizes equitable, high-quality, and disaster-resilient development.

Nevertheless, policy implementation remains constrained by differences in perspectives, interests, and priorities among stakeholders. These differences weaken the mainstreaming of inclusive DRR within regional development. Disaster-related issues, particularly those concerning vulnerable groups, are often not prioritized, resulting in limited and largely symbolic participation of women with disabilities in DRR programs.

Several key issues at this level include:

1. **Weak policy dissemination** to the village level due to limited budgets, human resource capacity, and inconsistent political commitment.
2. **Limited inclusion perspective** in program design, leading to insufficient attention to the needs of women with disabilities.
3. **Inaccessible basic services**, including public facilities, evacuation routes, and disaster information systems.
4. **Limited empowerment programs**, which predominantly focus on economic aspects and rarely address disaster preparedness capacity.
5. **A bureaucratic culture focused on outputs rather than outcomes and sustainability.**
6. **Overlapping programs and data across institutions**, reducing policy effectiveness.
7. **Non-inclusive early warning systems** that fail to reach vulnerable groups.

These challenges indicate that DRR governance at the macro level has not yet effectively integrated social inclusion principles.

B. Meso Level

At the meso level, the issues are reflected in the institutional capacity of the Village Disaster Preparedness Team (TSBD) in West Pemenang Village. This organization was established under Village Regulation No. 2 of 2021 as part of community-based disaster management efforts.

Although TSBD has conducted various DRR activities—such as awareness campaigns, education, and emergency response most of these initiatives have depended heavily on support from non-governmental organizations (NGOs), particularly KONSEPSI NTB and Mitra Samya through the SIAP SIAGA program.

In its development, TSBD faces several major challenges:

1. **High dependency on NGOs and village government** for funding and program implementation.
2. **Low member participation**, due to competing work and educational commitments.
3. **Limited support and capacity-building from BPBD**, hindering institutional strengthening.
4. **Instrumental rather than substantive inclusion** of women with disabilities.

These conditions suggest that the sustainability and independence of TSBD remain significant challenges in advancing inclusive DRR at the community level.

C. Micro Level

At the micro level, the problem is reflected in the limited access, participation, and capacity of women with disabilities in DRR activities. This group is particularly vulnerable to disaster risks compared to the general population.

Experiences from the 2018 Lombok earthquake demonstrate that women with disabilities faced significant difficulties in self-evacuation, exacerbated by panic, trauma, and limited family knowledge regarding appropriate emergency responses.

This situation reflects layered social exclusion occurring at both structural and cultural levels. Structurally, DRR policies and programs have not been fully inclusive. Culturally, stigma and stereotypes toward persons with disabilities persist, reducing their confidence and participation.

Additional challenges include:

1. Lack of reliable disaggregated data
2. Inaccessible infrastructure

3. Non-inclusive early warning systems
4. Limited disaster education for persons with disabilities

As a result, women with disabilities encounter multiple barriers in accessing information, services, and protection during disasters, increasing their overall vulnerability.

1.2 Articulating the Problem Situation through a Rich Picture.

The second stage of Soft Systems Methodology (SSM) aims to describe real-world problem situations through three levels of analysis. The first stage involves an intervention analysis by identifying three key actors in the problematic situation under study: Clients (C), Practitioners (P), and Owners of the Issues (O). The second stage focuses on social analysis to understand the institutional dimensions of disaster risk reduction (DRR) governance that is inclusive of women with disabilities, particularly by examining roles, values, and norms. The third stage addresses power analysis, emphasizing both the disposition and nature of power. These three analytical processes are essential for understanding the complexity, dynamism, and problematic nature of real-world situations.

A. Analysis One (Intervention)

Referring to Hardjosoekarto (2012), Checkland and Poulter suggest that identifying problematic real-world situations begins with determining three key stakeholders: Clients (C), Practitioners (P), and Owners of the Issues (O). Clients (C) are individuals or groups that initiate interventions in situations perceived as problematic. Practitioners (P) are those who conduct studies or research on such situations. Meanwhile, Owners of the Issues (O) are individuals or groups who have a vested interest in, and are affected by, efforts to improve these problematic conditions.

In this study, the identified actors are as follows:

- a. Clients (C): Department of Sociology, Graduate Program, Faculty of Social and Political Sciences, Universitas Indonesia
- b. Practitioners (P): Researcher (Hendra Puji Saputra).
- c. Owners of the Issues (O):
 - Macro level: Regional Disaster Management Agency (BPBD), Regional Development Planning Agency (Bappeda), and Social Affairs Office.
 - Meso level: TSBD organization.
 - Micro level: Families and women with disabilities.

B. Analysis Two (Social Analysis)

Following the intervention analysis, the second stage involves social analysis to develop a comprehensive understanding of the real-world situation. According to Checkland and Poulter (in Hardjosoekarto, 2012), this stage emphasizes three interrelated elements: roles, values, and norms. These elements are dynamic and evolve alongside the complexity of real-world conditions.

In this research, social analysis was conducted through document reviews of policies and regulations, as well as in-depth interviews with problem owners at macro, meso, and micro levels. This approach aims to capture the dynamic, complex, and often unstructured relationships across these levels. A clear understanding of roles, values, and norms at each level provides a foundation for designing relevant human activity systems in the subsequent SSM stage.

a. Roles, Values, and Norms at the Macro Level.

At the macro level, efforts to establish inclusive DRR governance for women with disabilities are closely related to the functions of three institutions: BPBD, Bappeda, and the Social Affairs Office. As part of the institutional environment, it is crucial to examine their roles, values, and norms.

BPBD (Regional Disaster Management Agency)

- *Roles*: BPBD functions as coordinator, commander, and implementer of disaster management at the district level. It is responsible for developing regulations, strengthening institutional capacity, coordinating cross-sectoral stakeholders, ensuring disaster risk assessments, early warning systems, and preparedness mechanisms, among others.
- *Values*: Humanity, justice, transparency, accountability, prioritization, non-discrimination, voluntarism, local wisdom, empowerment, partnership, and solidarity.
- *Norms*: Governed by regional regulations on disaster management and disability inclusion, which provide legal legitimacy for its operations.

Despite its formal authority, overlapping roles and sectoral ego among institutions often reduce effectiveness, indicating gaps between planning and implementation.

Bappeda (Regional Development Planning Agency)

- *Roles*: Coordinates development planning and ensures integration of DRR into planning and budgeting documents. It also promotes inclusive participatory planning processes.
- *Values*: Professionalism, service orientation, integrity, transparency, and accountability.

- *Norms*: Based on regional regulations and disaster management planning documents.

However, DRR planning has not yet fully mainstreamed inclusion, and remains reliant on external actors such as NGOs.

Social Affairs Office

- *Roles*: Focuses on social protection programs for vulnerable groups, including persons with disabilities, particularly in disaster contexts.
- *Values*: Professionalism, service, integrity, transparency, and accountability.
- *Norms*: Guided by regulations on social services and disability-inclusive disaster management.

Challenges include limited budgets, inconsistent data, and restricted access to disability-related information.

b. Roles, Values, and Norms at the Meso Level.

At the meso level, the analysis focuses on the TSBD organization and the Pemenang Barat Village Government.

TSBD (Village-Based Disaster Management Team)

- *Roles*: A voluntary organization responsible for strengthening community resilience, promoting local wisdom, developing community action plans, and raising disaster awareness.
- *Values*: Humanity, justice, balance, harmony, mutual cooperation, empowerment, non-discrimination, legal certainty, environmental sustainability, and local wisdom.
- *Norms*: Based on village regulations and organizational statutes.

c. Roles, Values, and Norms at the Micro Level.

At the micro level, the focus is on families and women with disabilities.

- *Roles*: Families act as support systems, while women with disabilities serve as focal points in advocating for their rights and needs in DRR.
- *Values*: Inclusivity, equality, empowerment, and justice.
- *Norms*: Informal agreements and shared understandings within communities.

C. Analysis Three (Power Analysis)

Macro Level

- *Disposition of Power*: Held by the regional government, with BPBD as the leading authority.
- *Nature of Power*: Authority to formulate policies and implement programs such as disaster-resilient villages.

Meso Level

- *Disposition of Power:* Held by TSBD as the primary disaster management body at the village level.
- *Nature of Power:* Capacity to develop participatory disaster preparedness documents and programs.

Micro Level

- *Disposition of Power:* Held by families and women with disabilities.
- *Nature of Power:* Ability to advocate for their needs and influence decision-making processes.

D. Rich Picture

The Rich Picture in this study is developed based on Nee’s (2005) new institutionalism framework, which explains the interconnections between macro, meso, and micro levels. It serves as a tool to visualize complex real-world problem situations, including structures, processes, relationships, and key issues.

At the macro level, although policies exist, inclusive DRR governance remains suboptimal due to institutional complexities. This condition affects the meso level, where TSBD struggles to achieve sustainability and independence. Consequently, at the micro level, families and women with disabilities remain vulnerable and face challenges in preparedness, adaptation, and post-disaster recovery.

In the process of developing root definitions, Checkland and Poulter, as cited in Hardjosoekarto (2012), propose the PQR formulation, namely: doing P through Q to achieve R. In this study, the construction of root definitions is grounded in the perspective of Nee’s (2005) new institutionalism, which explains institutional causal relationships at the macro, meso, and micro levels.

Furthermore, the formulated root definitions are analyzed using the CATWOE approach as a foundation for developing the conceptual model. The results of the root definition formulation based on Nee’s (2005) framework are presented as follows.

a. Macro-Level Root Definition

“A system managed by the Regional Government of North Lombok Regency to drive disaster risk reduction transformation (P) through the issuance of a Regent Decree on the establishment of a Disability Service Unit (ULD) within the Regional Disaster Management Agency (BPBD) (Q), in order to achieve disability-inclusive DRR governance for women with disabilities (R).”

At the macro level, this system is selected to address the need for a disaster risk reduction governance model based on social inclusion. The complexity of issues at this level indicates that inclusion has not yet become a mainstream agenda in disaster management policies in North Lombok Regency. Therefore, systemic transformation is required to ensure that DRR governance becomes more inclusive and responsive to vulnerable groups.

The CATWOE analysis indicates that the main actors at this level are the BPBD of North Lombok and pentahelix stakeholders, consisting of government, academia, the private sector through CSR, NGOs, communities, and the media. The pentahelix approach is considered essential, as disaster management cannot be conducted in a fragmented manner but requires cross-sectoral collaboration.

The proposed transformation involves the issuance of a Regent Decree to establish the ULD as an institutional platform for participation and advocacy for women with disabilities. The absence of such an institutional mechanism has limited their access to DRR policy planning processes, thereby increasing their vulnerability to disaster risks.

In addition, the transformation process is strongly influenced by the capacity of pentahelix actors and environmental factors such as weak political commitment, complex bureaucracy, sectoral ego, and limited budget allocation. These conditions represent major challenges in achieving inclusive DRR governance.

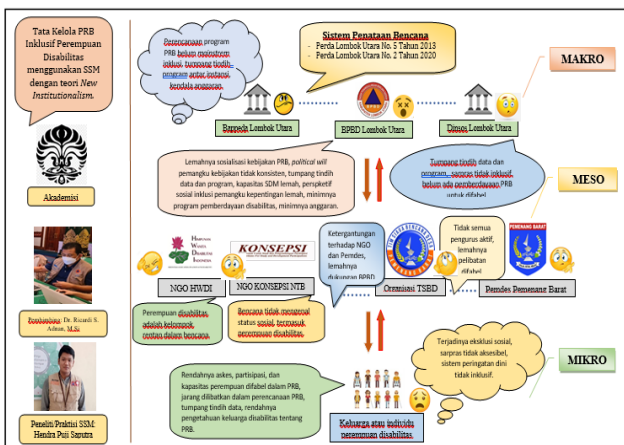


Figure 2. Rich Picture

1. Systems Thinking in Disability-Inclusive Disaster Risk Reduction Governance.

1.1 Naming and Selection of Relevant Root Definitions in Disability-Inclusive Disaster Risk Reduction Governance.

At this stage, the researcher identifies and establishes relevant root definitions concerning disaster risk reduction (DRR) governance that is inclusive of women with disabilities.

b. Meso-Level Root Definition

"A system operated by the Village Disaster Response Team (TSBD) to drive disaster risk reduction transformation (P) through strengthening social networks and institutional partnerships (Q), in order to support disability-inclusive DRR governance (R)."

At the meso level, the system focuses on strengthening the capacity of the TSBD organization. As a volunteer-based organization, TSBD faces limitations in terms of independence and sustainability, particularly due to weak partnership networks.

The CATWOE analysis identifies TSBD and local pentahelix actors as the primary stakeholders. The expected transformation is the strengthening of social networks and partnerships, enabling TSBD to function optimally as a community-based disaster risk reduction actor.

The main constraint at this level is the low level of participation among some TSBD members in organizational activities, influenced by its voluntary nature and the absence of regular incentives.

c. Micro-Level Root Definition

"A system operated by families or women with disabilities to drive disaster risk reduction transformation (P) through empowerment and capacity building via discussion forums (Q), in order to achieve inclusive DRR governance (R)."

At the micro level, the system focuses on empowering families and women with disabilities, who are highly vulnerable in disaster situations. Limited capacity at both individual and household levels, which function as the primary support system, leads to low levels of disaster preparedness.

Therefore, the transformation is directed toward capacity enhancement through discussion forums and training activities to foster social resilience at the household level. This approach is crucial, as families represent the primary actors in providing immediate protection during disasters.

Key barriers at this level include social stigma, stereotypes, as well as structural and cultural constraints that limit the participation of women with disabilities in DRR decision-making processes.

2. Disaster Risk Reduction Governance Management and Transformation for Inclusive Participation of Women with Disabilities.

2.1 Comparison of the Conceptual Model with Real-World Conditions.

The fifth stage of Soft Systems Methodology (SSM) involves comparing the previously developed conceptual model with empirical conditions in the real world, which are considered problematic. This stage is

crucial because a conceptual model does not necessarily fully represent real-world conditions, which are dynamic, complex, and often unstructured. Instead, the model is a construct derived from the researcher's system thinking, based on a relevant human activity system.

According to Checkland and Poulter in Hardjosoekarto (2012), the comparison process is not intended to evaluate the shortcomings of reality against an idealized conceptual model. Rather, the conceptual model should be understood as an analytical tool developed through system thinking, while real-world conditions reflect complexity shaped by multiple perspectives in interpreting a problem.

In comparing the conceptual model with reality, Checkland and Poulter (in Hardjosoekarto, 2012) propose four approaches: informal discussion, formal discussion, scenario building, and real-world modeling. In this study, the comparison is conducted through descriptions of activities and empirical outputs, which are then reflected upon using the framework of new institutionalism proposed by Nee (2005).

a. Comparison of the Conceptual Model and Real-World Conditions at the Macro Level.

At the macro level, the conceptual model focuses on the establishment of the Disability Service Unit (ULD) through a Regent Decree as the primary institutional instrument for strengthening inclusive disaster risk reduction (DRR) governance. The ULD is positioned as a space for advocacy, participation, and communication for persons with disabilities within the disaster management system.

From the perspective of new institutionalism (Nee, 2005), the ULD represents an institutional mechanism that enables collective action while strengthening relationships among actors. The establishment of this institution also addresses the absence of representation space for persons with disabilities in DRR policymaking.

Furthermore, the formation of the ULD is not merely a formal reform, but also a transformation of institutional structures involving interests, norms, and power distribution within the disaster management system. Therefore, institutional change requires synergy between local government and pentahelix actors.

The ULD also plays a role in developing standard operating procedures (SOPs), improving data governance, and ensuring the availability of inclusive early warning systems and disaster education. These elements collectively contribute to strengthening mitigation, preparedness, and more equitable disaster response for persons with disabilities.

b. Comparison of the Conceptual Model and Real-World Conditions at the Meso Level.

At the meso level, the main focus is on strengthening the social networks and partnerships of the Village Disaster Preparedness Team (TSBD) as a volunteer-based organization. Dependence on external actors indicates that the organization's independence in implementing DRR programs is still limited.

Within the framework of new institutionalism, TSBD functions as a social institution that enables collective action to achieve shared interests, particularly in promoting inclusive DRR. Therefore, strengthening relationships with BPBD (macro level) and disability communities (micro level) is essential to establish systemic linkages across institutional levels.

In addition, TSBD needs to develop community-based mitigation strategies through education, disaster awareness campaigns, and the formulation of inclusive contingency plans as instruments for collective preparedness.

c. Comparison of the Conceptual Model and Real-World Conditions at the Micro Level.

At the micro level, the main focus is on strengthening the capacity of families and women with disabilities as the most vulnerable group in disaster situations. Limited access to information, participation, and skills makes them highly susceptible to disaster impacts.

Therefore, capacity building is carried out through a participatory approach involving pentahelix actors to build a shared understanding of the importance of inclusion in DRR. Women with disabilities should also be involved as focal points so that their voices can be integrated into village development planning.

In addition, access to inclusive disaster information is a crucial aspect, particularly in response to the shift toward technology-based early warning systems that are not yet fully accessible to persons with disabilities. The revitalization of local wisdom serves as an important alternative because it is more accessible and easily understood by vulnerable groups.

Inclusive disaster simulations are also essential strategies to strengthen adaptive and responsive capacities of persons with disabilities, while reinforcing the relationship between formal and informal institutions within the disaster management system.

Overall, these capacity-building efforts form part of a mitigation strategy aimed at strengthening social resilience, enabling women with disabilities to become active agents throughout the disaster management cycle.

2.2 Transformation in Inclusive Disaster Risk Reduction Governance for Women with Disabilities.

This section represents the sixth stage of the Soft Systems Methodology (SSM), which focuses on structured discussion and debate concerning the previously developed conceptual model. The purpose of this stage is to formulate the desired changes or transformations as perceived by the problem owner. The structured discussion is intended to accommodate multiple stakeholder perspectives in order to generate recommendations for improvement, refinement, or systemic change.

However, due to time constraints in this study, the discussion and debate process was conducted through the thesis examination forum involving the supervisor, academic reviewer, and academic advisor.

In this study, the expected transformation is the realization of inclusive disaster risk reduction (DRR) governance for women with disabilities. Through a social inclusion approach, the benefits of disaster management are expected to be distributed fairly and equitably, particularly for women with disabilities. This transformation model is designed to improve problematic empirical conditions toward more desirable ones by considering the principles of systemically desirable and culturally feasible changes (Hardjosoekarto, 2012).

From the perspective of Nee's new institutionalism (2005), transformation toward inclusive DRR governance should be understood as a causal relationship integrated within a single system across macro, meso, and micro levels. Each level operates through distinct yet interconnected mechanisms, forming a cohesive institutional system. In this configuration, the government represents the macro level, organizations operate at the meso level, while social groups and individuals are positioned at the micro level. The interaction among these levels forms an institutional framework that guides actors' behavior.

At the macro level, the Regional Government of North Lombok Regency represented by the Disaster Management Agency (BPBD), the Development Planning Agency (Bappeda), and the Social Affairs Office functions as the institutional environment governing disaster management systems and services for persons with disabilities. This function is implemented through formal regulations that shape incentive structures and policy direction (Nee, 2005). In this context, formal regulations already exist, such as Regional Regulation No. 5/2013 and Regional Regulation No. 2/2020 of North Lombok Regency, which explicitly mandate the protection of persons with disabilities as a vulnerable group in disaster situations.

To strengthen the implementation of these regulations, the issuance of a Regent's Decree (SK Bupati) on the establishment of a Disability Services Unit (ULD) is required. The ULD serves as an institutional

platform to promote participation, advocacy, and the strengthening of disability rights in disaster management. Without the existence of the ULD, the implementation of inclusive DRR governance risks lacking an operational mechanism that genuinely favors vulnerable groups, despite its normative presence in formal regulations.

In practice, DRR planning at the macro level remains insufficiently inclusive, which affects program design, data systems, basic services, and early warning mechanisms that are not fully accessible to persons with disabilities. This condition ultimately increases the vulnerability of women with disabilities to disaster risks.

Therefore, BPBD as part of the institutional environment needs to initiate the establishment of the ULD through formal authorization by the Regent's Decree, so that the protection and fulfillment of the rights of persons with disabilities across pre-disaster, emergency response, and post-disaster phases can be better coordinated and systematized. Beyond serving as a participatory space, the ULD also functions as a policy advocacy platform and a coordination mechanism for improving and synchronizing disability data, which has often been fragmented across agencies. Accurate and integrated data is essential for policy and program planning that reflects the actual needs of women with disabilities across all disaster management phases.

At the meso level, transformation is directed toward strengthening the social networks and partnerships of TSBD as the only volunteer disaster management organization in Pemenang Barat Village. In Nee's new institutionalism perspective (2005), TSBD functions as a social institution that facilitates collective action to achieve shared goals, particularly inclusive DRR governance. Therefore, TSBD must strengthen its interaction with BPBD at the macro level while simultaneously building relationships with women with disabilities at the micro level for capacity building, empowerment, and needs-based advocacy.

In this context, social norms and values play a crucial role in interacting with formal rules in shaping collective action. These norms function as informal mechanisms that provide motivation, facilitation, and coordination of social interactions within groups (Nee, 2005). Thus, transformation in DRR governance does not rely solely on formal state institutions but also on the involvement of informal actors through a broader pentahelix approach that shapes the institutional environment.

At the micro level, families and women with disabilities need strengthened socio-economic capacity as well as policy and financial support to enable them to respond, adapt, and recover after disasters. This requires support from macro-level institutions (BPBD) and meso-level organizations (TSBD), as the interaction between

formal institutions and informal social groups significantly influences policy implementation effectiveness.

Through such capacity strengthening, women with disabilities are expected to enhance their preparedness and resilience in facing disasters, thereby shifting their position from passive beneficiaries to active agents within an inclusive disaster risk reduction system.

Conclusion

The main challenge in disaster risk reduction (DRR) governance in North Lombok Regency lies in the inadequate protection and fulfillment of the rights of persons with disabilities, particularly women with disabilities. Although inclusion has been prioritized in policy documents, its implementation remains suboptimal due to weak cross-sectoral collaboration among stakeholders.

Through the application of Soft Systems Methodology (SSM) combined with mind mapping, this study demonstrates that the complexity of inclusive DRR issues is shaped by interactions across three levels: macro, meso, and micro, as articulated in the perspective of new institutionalism (Nee, 2005).

At the macro level, policies have not been implemented inclusively due to sectoral approaches, weak coordination, and issues related to inaccessible data and services. At the meso level, the Village Disaster Preparedness Team (TSBD) lacks institutional independence due to dependence on external actors, limited organizational capacity, and the absence of substantive participation from persons with disabilities. At the micro level, women with disabilities continue to experience structural and cultural exclusion, which constrains their capacity, access to information, and participation.

Accordingly, this study proposes three key transformation pathways: the establishment of a Disability Services Unit (ULD) at the macro level, the strengthening of TSBD networks and partnerships at the meso level, and the enhancement of capacity among women with disabilities at the micro level. These transformations must be implemented in an integrated manner through collaboration between formal and informal actors.

Acknowledgments

The author would like to express sincere gratitude to all research informants, including representatives from the Regional Disaster Management Agency (BPBD), the Social Affairs Office, the Regional Development Planning Agency (Bappeda) of North Lombok, the Government of Pemenang Barat Village, the Village Disaster Preparedness Team (TSBD), and persons with disabilities, for their valuable data, information, and insights provided throughout the research process.

Author Contributions

The first author was responsible for conceptualizing the study, including developing the research idea, theoretical framework, and methodology, as well as conducting data collection, data analysis, and manuscript preparation. The second and third authors contributed to the data collection process, data description, and manuscript writing.

Conflicts of Interest

The authors declare no conflict of interest.

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