International Journal of Safety and Security Engineering
Vol. 15, No. 8, August, 2025, pp. 1541-1555
Journal homepage: http://iieta.org/journals/ijsse

Policy Design for Strengthening the Institutional Framework of Disaster Risk Governance in Padang City, Indonesia

Zikri Alhadi[1*], Ory Riandini[2], Rahmadani Yusran[1], Fitri Eriyanti[1], Yuliarti[1], Artha Dini Akmal[1], Hidayatul Fajri[1], Azhari Syarief[3]

[1] Department of Public Administration & Research Center for Policy, Governance, Development, and Empowerment, Universitas Negeri Padang, Padang 25132, Indonesia
[2] Padang City Government & Research Center for Policy, Governance, Development, and Empowerment, Universitas Negeri Padang, Padang 25132, Indonesia
[3] Department of Geography, Universitas Negeri Padang, Padang 25132, Indonesia

Corresponding Author Email: zikrialhadi@fis.unp.ac.id

https://doi.org/10.18280/ijsse.150801

Received: 7 August 2024
Revised: 21 January 2025
Accepted: 12 February 2025
Available online: 31 August 2025

Keywords:
policy design, disaster risk governance, institutional framework

ABSTRACT

This scholarly investigation is directed towards several objectives as delineated below: firstly, to conduct a thorough analysis of the prevailing conditions pertaining to the institutional governance framework for disaster risk reduction (DRR). Secondly, to formulate a policy design aimed at reinforcing the institutional governance framework dedicated to DRR. Lastly, to evaluate the efficacy of the proposed policies intended to enhance the institutional governance framework for DRR. This study was executed in Padang City utilizing qualitative research methodologies. The research employs the NVivo 12 Plus software application for the purpose of data analysis and the assessment of research outcomes. The results indicate that within the dimensions of the Institutional Framework, the analysis reveals a hierarchy of descriptors ranked from highest to lowest significance, commencing with coordination and partnership, followed by disaster knowledge, communication, monitoring and warning, accountability, and justice. Additionally, this study presents a policy design intended to fortify the institutional governance framework for DRR in Padang City, grounded in the aforementioned dimensions. Furthermore, this policy design received endorsement from the stakeholders engaged in DRR efforts in Padang City, subsequent to the completion of the design evaluation. The proposed policy framework has the potential to serve as a valuable recommendation for policymakers engaged in the formulation of strategies aimed at mitigating the risk of tsunami disasters in Padang City.

1. INTRODUCTION

Mayunga [1], a researcher specializing in disaster studies at Texas A & M University, articulated that the occurrences of the Indian Ocean tsunami in 2004, Hurricanes Katrina and Rita in 2005, along with the phenomenon of global warming, exemplify the increasing susceptibility of communities and individuals to natural calamities. It has been estimated that within the past decade, disasters have adversely impacted over 3 billion individuals, resulted in the fatalities of more than 750,000 individuals, and incurred financial losses exceeding US $ 600 billion. The observed trends in both the loss of human lives and the destruction of property indicate that contemporary society lacks adequate resilience in the face of natural disasters [2, 3]. Throughout recent decades, numerous scholars have underscored the imperative of integrating the concept of resilience into research and policy frameworks as a manifestation of the disaster risk reduction (DRR) paradigm [4-6]. The disasters that have afflicted various regions of Indonesia in the past decade, particularly the Lombok earthquake and the Southeast Sulawesi and Sunda Strait tsunamis, have illuminated the critical deficiencies inherent in disaster management policies. Indonesia, classified as a "disaster self-sufficient" nation, continues to confront significant challenges. Mitigating risks and vulnerabilities while enhancing disaster resilience proves to be a complex undertaking [7-9]. Furthermore, given the potential for a multitude of disasters in Indonesia exacerbated by climate change, environmental degradation, unchecked population growth, and social inequities, the Indonesian government is confronted with challenges of considerable magnitude [10-13].

Following the seismic event and subsequent tsunami that transpired in Aceh on December 25, 2004, there has been a marked increase in public apprehension regarding the potential for similar geological phenomena occurring along the western seaboard of Sumatra Island. Research conducted by the Indonesian Institute of Sciences under the auspices of geophysicist [14] indicates that the western coastline of Sumatra Island is among the regions exhibiting the highest susceptibility to seismic and tsunami-related disasters within Indonesia. This heightened vulnerability is attributed to the

convergence of two tectonically active plates, specifically the Euro-Asian and Indo-Australian plates, compounded by the fact that a significant portion of the population resides in areas that are prone to such disasters, particularly in coastal regions. The tectonic structure known as the Mentawai Megathrust possesses considerable potential for initiating tectonic-related catastrophes.

In this context, an examination of the topographical features of Padang City reveals an abundance of potential hazards, including but not limited to flooding, landslides, tornadoes, storms, coastal erosion, earthquakes, and tsunamis, all of which pose significant risks to both the societal fabric and the environment. This apprehension is deemed justifiable, given that Padang City has direct exposure to the vast expanse of the Indonesian Ocean. According to data derived from digitization efforts, it is ascertained that the coastline of Padang City extends to approximately 68.126 kilometers, thereby indicating that residents residing in proximity to this coastline are particularly susceptible to the dangers posed by tsunami events. A minimum of eight sub-districts within Padang City are anticipated to experience the immediate repercussions of a tsunami disaster. The magnitude of disaster risk within Padang City is illustrated in the accompanying figure, which is extracted from the contingency planning documentation and is in Table 1.

Table 1. Disaster hazard assessment in Padang City

Type of Danger Threat	Probability	Danger Level
Tsunami	4	5
Earthquake	4	4
Flash floods	4	2
Flood	3	1
Landslide	3	1
Storm	3	1

Source: Data processing

From the data presented in Table 1, it is evident that Padang City is characterized by a significantly elevated risk of tsunami disasters, as indicated by a probability rating of level 4 marked in red, alongside an impact assessment at level 5 also highlighted in red. It has been elucidated that an increase in the level corresponds to an augmented probability and severity of the disaster. Furthermore, the color coding serves to distinguish risk levels, wherein red denotes perilous conditions, yellow signifies a state of alert, and green indicates safety. Given the substantial probability and potential repercussions of tsunami disasters, a transformative approach in disaster risk management is imperative to address the inherent vulnerabilities to such calamities. This transformative approach entails enhancing the execution of disaster risk governance, transitioning from a focus on "response and recovery" to an emphasis on "prevention and preparedness" [15-17].

Within contemporary management institutions, the endeavors associated with DRR represent a formidable challenge for all stakeholders engaged in the process [18-21]. These efforts are perceived as a crucial component in the realization of sustainable development, which necessitates the active participation of all stakeholders within the framework of disaster risk governance. The preceding description raises questions regarding the extent of involvement of local communities as active participants in DRR initiatives. To date, the engagement of community members has not been adequately integrated into the execution of disaster risk management in Indonesia, particularly within Padang City. The various DRR initiatives that have been implemented to date have predominantly involved local communities solely as executors, rather than as contributors during the initiation and planning phases of the programs themselves [22-24]. In the context of disparate DRR policies at both the national and regional levels, it is essential that the inclusion of local communities be regarded as a fundamental component in the formulation of disaster risk management policies across Indonesia. The regulatory frameworks outline the institutional mechanisms by delineating the disaster management authorities and responsibilities assigned to each institution. Law Number 24 of 2007 illustrates that, within specific regions, a noticeable decline in the capacity to prevent, mitigate, prepare for, and respond to emergencies has occurred over a defined timeframe, attributable to the prevailing local conditions [25, 26]. It is imperative for the government and all stakeholders to fortify disaster risk governance within every strategic plan, policy, and development program [15, 25].

The Padang City Government has issued a Regional Regulation as part of public policy in disaster management: Regional Regulation No. 3 of 2008 concerning Disaster Management and Local Regulation No. 9 of 2009 concerning the Establishment of the Regional Disaster Management Agency of Padang City. From the initial analysis and observations, the role of disaster risk governance institutions led by the Regional Disaster Management Agency of Padang City is the leading sector. In strengthening disaster risk governance, several main issues are gaps in this research: The Regional Disaster Management Agency of Padang City does not yet have an optimal role in supporting disaster risk governance for disaster risk in building disaster resilience. The limitations of this institution include its focus on partial emergency response, minimal implementation of DRR programs, minimal budget, lack of effective coordination and communication patterns with related institutions, and programs run by both central and regional governments. This still focuses on the stages of overcoming rather than preventing and mitigating.

The Disaster Management Plan of Padang City delineates that the execution of DRR initiatives within Padang City, recognized as a national priority, necessitates robust institutional backing. In light of the aforementioned issues, the institutional dimension is pivotal in addressing this challenge. The Regional Disaster Management Agency of Padang City currently lacks substantial institutional capacity, despite its designation as the principal agency responsible for disaster risk governance. In this context, the function of Regional Disaster Management Agency of Padang City as the leading entity in disaster risk governance is hampered by constraints within the institutional paradigm, particularly regarding the enhancement of coordination and oversight roles in disaster risk governance. This deficiency stems from the fact that the Regional Disaster Management Agency of Padang City is limited to a coordinative function, resulting in frequently ineffective synergy when interfacing with other vertical and regional governmental bodies. With respect to pre-disaster policies, which constitute a focal point for DRR, collaborative efforts with Non-Governmental Organizations (NGOs) have led to the formulation of various programs aimed at bolstering

preparedness and executing mitigation activities [26].

An additional issue that emerges is that the allocation of a budget for DRR remains a secondary consideration for pertinent stakeholders, particularly from both central and local government entities. The prioritization of budgetary allocations for DRR has not been a central focus during the budget formulation processes undertaken by both the executive and legislative branches at both national and regional levels. The grievances articulated by the Regional Disaster Management Agency of Padang City underscore that their financial resources are significantly inadequate relative to their responsibilities as the principal agency in disaster risk governance. In response to this situation, the Regional Disaster Management Agency of Padang City, along with other entities engaged in disaster risk governance, has opted to implement a prioritization framework that emphasizes the emergency response components of disasters over the allocation of funds for DRR initiatives, including strategies aimed at fortifying institutional frameworks. The comprehensive disaster risk governance policy in Padang City has the potential to substantially reduce the number of casualties resulting from disasters.

A change in the mindset of all relevant stakeholders is needed so that the budget for disaster risk governance is not a burden or a waste of the State Revenue and Expenditure Budget or the Regional Revenue and Expenditure Budget itself. Instead, it is a need for the welfare and protection of the people and an obligation that is the same as in other fields, such as economics, education, and so on. Based on the above, disaster risk governance carried out so far has not focused on improving the quality of disaster risk governance, especially for the highest threat of disasters, namely earthquake and tsunami disasters. For this reason, this research aims to bridge the existing factual conditions with an increased vulnerability to disasters. It focuses on designing policies to strengthen the institutional disaster risk governance framework in Padang City.

2. LITERATURE REVIEW

2.1 State of the art

This research is part of research in the field of public policy, especially in disaster risk governance. For this reason, we need to understand public policy conceptually. Anderson [27] defined policy as the behavior of several actors (officials, groups, government agencies) or a series of actors in a particular field of activity. A policy program includes the preparation of specific programs of action that must be carried out in the form of procedures that must be followed in implementation, or benchmarks that must be established in concrete decisions or programs that are implemented within a certain period. Policy is a program aimed at action designed as a response to a perceived problem. Public policies are filtered through specific policy processes, adopted, implemented through laws, regulations, government actions, and funding priorities, and enforced by public bodies [28].

Meanwhile, in Dunn's perception [29], the policy is: "A series of actions or intellectual activities carried out in the process of political activities. These political activities are carried out as a policy-making process [29] ". Furthermore, researchers explain that public policy is interpreted as actions carried out by public bodies that are directed to achieve the goals set in a series of previous decisions [30-32]. Meanwhile, from policy design, an expert [18] explained that policy design is an institutional structure consisting of identifiable elements: goals, target groups, agents, implementation structures, tools, rules, policy reasons, and assumptions.

Disaster risk governance is a theme related to the complex environmental and social management of all types of disaster risks [33], where a combination of institutions, laws, regulations, and contributions from civil society and private sector actors is required [34, 35]. Disaster risk governance is often characterized as a risk management system that is collaborative, multisectoral, and multi-level. Disaster risk governance is seen as something more innovative and accountable with various approaches in dealing with environmental and disaster problems because of its nature, adaptiveness, and problem-solving-based learning orientation [36, 37].

As delineated by the Sendai Framework, the United Nations Development Programme (UNDP) articulates that disaster risk governance encompasses "the mechanisms through which public authorities, civil servants, media, private sector entities, and civil society collaborate at community, national, and regional strata to mitigate and manage risks associated with disasters and climate change" [15]. The aforementioned definition elucidates that disaster risk governance serves as a collaborative framework for all relevant stakeholders, spanning both public and private sectors, inclusive of media and civil society, to synergistically manage and diminish the ramifications of disasters across community, national, and regional dimensions. The elements of "coordination" and "collaboration" are paramount, as the mitigation of disaster impacts cannot be solely executed by governmental entities but necessitates a collective commitment from all stakeholders involved. Concurrently, Bang [38] asserted that the role of governance in the attenuation of disaster risk is "noted that governance influences the manner in which national and subnational actors exhibit the willingness and capability to coordinate their efforts in managing and mitigating disaster-related risks" (which elucidates that governance significantly affects how national and subnational actors are prepared and equipped to harmonize their initiatives to manage and alleviate disaster-related risks) [15].

Emerging as a novel concept, disaster risk governance was incorporated in the 2004 UNDP publication entitled "Disaster Risk Reduction: Development Challenges," which fundamentally addresses the execution of economic, political, and administrative responsibilities and functions aimed at addressing disasters at all tiers of society [39]. Moreover, disaster risk governance is characterized as an amalgamation of regulatory frameworks and practical approaches directed towards risk mitigation and disaster response [39-41]. Consequently, disaster risk governance can be construed as a systemic framework that guarantees the capacity and comprehensive engagement of stakeholders to bolster resilience [42]. It constitutes a procedural mechanism within organizations and institutions designed to diminish disaster risk and manage its repercussions. This process encompasses a diverse range of actors, including government agencies, international entities, NGOs, local communities, religious figures, scholars/scientists, and the private sector, all of whom are integral to disaster risk governance. Disaster risk governance inherently involves establishing connections within a network aimed at risk reduction [12, 43]. In parallel, effective disaster risk governance assures the proficient and

efficacious realization of economic, social, and environmental decision-making outcomes. This necessitates stakeholder participation under conditions of uncertainty stemming from disasters while striving to mitigate their adverse effects [26, 42, 43].

2.2 Relevant studies

a. The paper identifies key factors for integrating DRR and climate change adaptation (CCA), emphasizing the need for coherent policy and legislative frameworks, political will, resource provision, addressing institutional barriers, and improving communication and coordination among government institutions [44].

b. The paper emphasizes that effective policy design must integrate various stakeholders and adapt institutions to address the cascading impacts of climate change, ensuring long-term management practices that consider context-specific challenges and promote collective action for disaster risk governance [45].

c. The paper emphasizes the need for decentralized disaster risk governance schemes to avoid scalar restructuring, enhance grassroots participation, and improve coordination between local and central levels, ultimately leading to more effective disaster response and management in the context of authoritarian regimes [46].

d. The paper emphasizes the need for institutionalized damage data collection and improved practices in disaster risk governance, highlighting that an advanced Information System must align with stakeholder requirements to enhance disaster risk management and support effective recovery and reconstruction efforts [47].

e. The study emphasizes the need for specific recommendations in disaster warning, emergency response plans, and resource management to strengthen institutional resilience. It highlights the importance of governance policies closely related to effective risk management during meteorological disasters [48].

f. The paper emphasizes adopting a 'whole-of-society' approach and highlights five essential risk governance parameters: transparency, risk communication, negotiation, social cohesion, and evidence-based decisions, which are crucial for strengthening the institutional framework in disaster risk governance during health emergencies [49].

g. The paper emphasizes the importance of integrating multiple co-benefits in Eco-DRR projects, suggesting that policy design should focus on enhancing social inclusion, resource governance, and access to public green spaces to strengthen disaster risk governance and community resilience [50].

h. Strong legal background, institutional support, and stakeholder collaboration are essential for integrating green and blue infrastructure in disaster risk governance. Policies must ensure ecosystem resilience, with environmental authorities leading the implementation of standards and strategies at local levels [51].

3. METHODS

In public policy analysis books, what is meant by policy research is actions intended to solve social problems [52]. Solving social problems by policymakers, in this case, is carried out based on recommendations made by policy researchers based on the results of their research. Policy here is not perceived from the perspective of government politics but rather policy as an object of study. Several qualitative methods used to search for primary data in this research include interviews, observation, and focus groups. Focus groups are one technique that can be used, where individuals are selected in groups and directed to discussions focused on pre-specific topics. Meanwhile, the policy research approach used in this research is qualitative. Therefore, this study employs subjective data, which encompasses the perspectives of the perpetrators under investigation (informants), devoid of any modifications or embellishments. This aligns with the assertion: "Qualitative methods are research procedures that yield descriptive data articulated in written or verbal form from individuals and observable behaviors." "Qualitative research necessitates guidance in developing substantive theories grounded in data" [53].

In this investigation, the researcher employed data collection techniques encompassing both library research and field research, alongside focus group discussion (FGD) and in-depth interview, which can be characterized as methodologies for data acquisition involving a small cohort of formal and temporary participants who engage in discourse, delving into a specific discussion theme [54]. This study was conducted within the jurisdiction of Padang City, targeting a diverse array of agencies, institutions, and communities that serve as stakeholders in the governance of disaster risk, including both vertical governmental bodies and regional agencies, as well as civil society organizations in the form of NGOs.

In order to acquire primary data for this research, the investigators identified individuals or informants deemed knowledgeable and credible to serve as key informants pertinent to the research subject. The informant selection process was carried out using purposive sampling, which was based on the consideration that the selected informants had responsibility, authority, and an active role in implementing disaster risk management policies in Padang City. Table 2 presents a roster of informants for this study.

Table 2. List of research informants

No.	Informant Institute
1	National Disaster Management Agency
2	Regional Disaster Management Agency of West Sumatra Province (Regional/Local Disaster Management Agency)
3	National SAR Agency)
4	Regional Research and Development Agency of West Sumatra Province
5	Regional Disaster Management Agency of Padang City
6	Meteorology and Geophysics Agency
7	NGO KOGAMI
8	Disaster Preparedness Group Forum of Padang City
9	DRR Forum of Padang City
10	Indonesian Red Cross of Padang City
11	NGO Mercy Corps

The methodology employed in this investigation utilizes Computer-Assisted Qualitative Data Analysis Software (CAQDAS), specifically NVivo 12 Plus, to facilitate the coding process. This coding process is characterized by interactivity, wherein researchers construct data classifications predicated on the concepts manifested within the data, juxtapose ideas and data categories, and subsequently integrate all pertinent concepts and data categories [55]. As articulated by the study [56], a coding system serves as a mechanism to designate specific facets of data and to organize

information into distinct classifications. Data processing in this research was carried out using the triangulation method. This method focuses on checking and establishing the validity of data by analyzing it from various perspectives.

The limitations of this research, which was carried out using a qualitative approach, are that it is sometimes subjective. It might influence data analysis and drawing conclusions as a result of the research. Next, qualitative research tends to be unrepresentative or unrepresentative. It is called that because in the data collection process, researchers will take several samples, which are sometimes not considered to represent all data and information needs.

4. RESULTS AND DISCUSSION

4.1 Policy design for strengthening the institutional framework for disaster risk governance in Padang City

Based on the comprehensive analysis of research data amassed through various data collection methodologies, specifically observation, interviews/focus group discussions (FGD), and documentation studies, a thorough examination of the current conditions pertaining to governance enhancement policies was conducted. This investigation pertains to the disaster risk factors prevalent in Padang City. This analysis is anchored in the research conceptual framework previously established, delineating each descriptor to augment the analytical outcomes and the policy recommendations that are to be proposed. The subsequent section presents the findings derived from the descriptor analysis of policy formulation aimed at bolstering governance in mitigating disaster risks in Padang City, employing the NVivo 12 Plus software for qualitative data analysis. The analysis of research findings is grounded in the institutional framework articulated by the study [57]. Numerous descriptors have been employed to elucidate these findings, with detailed information illustrated in Figure 1.

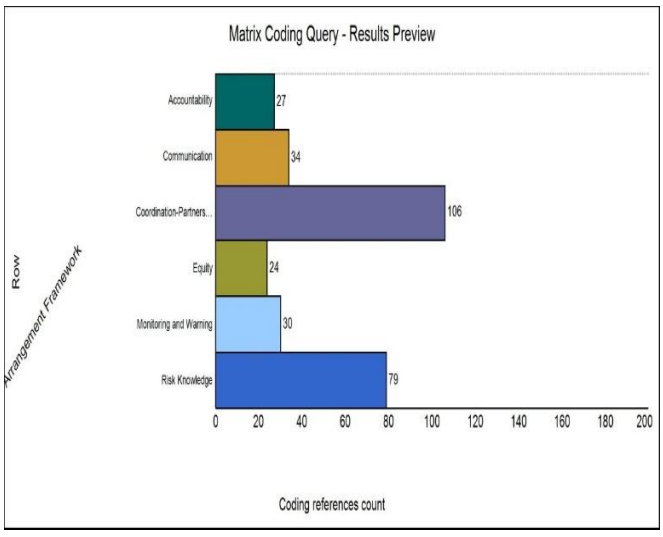

Figure 1. Matrix coding results for the dimension of the institutional framework

As explained in Figure 1 above, the matrix coding results carried out an analysis of the descriptors that form the framework for institutional arrangements for DRR in Padang City.

4.2 Descriptor of coordination and partnership

Based on the aforementioned figure, the elucidations regarding coordination and partnership presented below attained the highest scores as delineated by the matrix coding of research findings, which accumulated a total of 106 points. This assertion corroborates the explanation provided by a researcher [49] that coordination and partnerships play a pivotal role in the establishment of an institutional framework aimed at mitigating disaster risks in Indonesia. The mechanisms for coordination and partnership, integral to the governmental institutional framework for DRR within Padang City, have been functioning adequately, albeit not to their fullest potential. The partnership was established by the Regional Disaster Management Agency of Padang City, which serves as the primary sector in disaster risk governance, even prior to the official founding of the Regional Disaster Management Agency of Padang City in 2008. Prior to the establishment of the Regional Disaster Management Agency of Padang City, which was mandated by Law No. 24 of 2007 concerning Disaster Management, the specific institution tasked with coordination was the Disaster and Refugee Management Implementation Unit of Padang City. The limitation of the institution lies in its coordination and partnership function, which does not operate at an optimal level due to its structure being confined to a coordination team across governmental agencies, lacking any subordinate authority in terms of oversight and evaluation.

Bottom-up local initiatives and delegation of authority in disaster risk governance mechanisms to stakeholders, those closest to vulnerable communities. This concept is the basis for forming formal institutions for regional disaster risk governance. The factor of knowledge of current conditions and fast response is the basis for part of the authority for disaster risk governance to be handed over to regional governments. One of the primary objectives that catalyzed the establishment of the Regional Disaster Management Agency of Padang City, serving as the principal agency in the governance of disaster risk, is the enhancement of partnership and coordination among stakeholders within the region. The institution of the Regional Disaster Management Agency of Padang City, as delineated in Regional Regulation No. 18 of 2008, pertaining to the processes of coordination and partnership, has rendered these processes significantly more accessible. The authority, responsibilities, and functions allocated to the Regional Disaster Management Agency of Padang City within the Regional Regulations are executed through coordinated and partnered initiatives with relevant institutions, encompassing a variety of DRR programs. These programs include the formulation of Fixed Procedures/Operational Standards and procedures for disaster risk governance, comprehensive disaster management plans, regional action plans, as well as contingency and emergency plans for disasters occurring in Padang City. Subsequently, based on the analytical outcomes of the research findings, the elements characterizing coordination and partnership within DRR institutions in Padang City have been distilled into several sub-descriptors, which are illustrated in the coding matrix depicted in Figure 2.

Based on the data presented in Figure 2, it is elucidated that the multisectoral sub-descriptor occupies the primary position, with matrix coding outcomes attaining a score of 83 points, thereby facilitating the achievement of coordination and partnerships aimed at mitigating disaster risks in Padang City. The internal mechanisms for DRR in Padang City are

predicated upon a multisectoral institutional framework. From an institutional perspective, the vision and mission associated with disaster risk governance in Padang City are likely to encounter significant challenges if they are not executed with the involvement of all relevant stakeholders, alongside the establishment of effective coordination and collaborative partnerships. In contrast, the subsequent position, as indicated by matrix coding results of 36 points, pertains to the advocacy sub-descriptor. This indicates that the institutional frameworks for DRR must be orchestrated through the collaborative efforts of all pertinent entities. The mechanism of assistance alluded to encompasses the responsibilities of each stakeholder in the domains of planning, executing, monitoring, and evaluating disaster risk governance and associated programs.

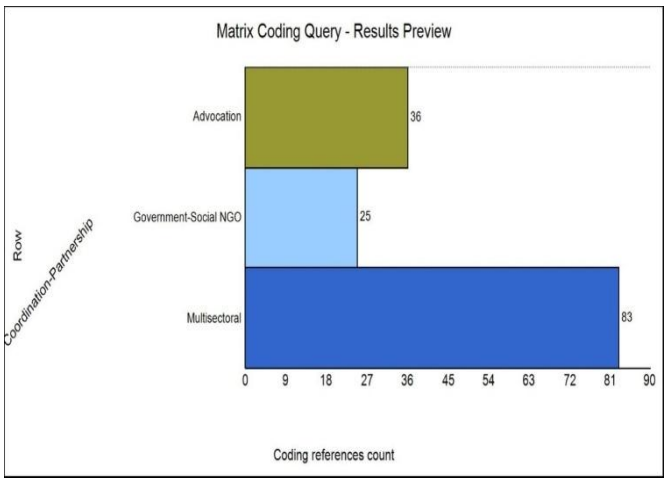

Figure 2. Matrix coding results for the descriptor of coordination and partnership

Subdescriptors of Government and social NGOs are in the third position in the descriptor of coordination and partnership, with matrix coding results of 25 points. Collaboration between the Government and NGOs has been going on for a long time, and some of it has been institutionalized in the form of partnerships such as the DRR Forum of Padang City. Most risk reduction policies and programs in Padang City are currently processed through partnerships between the government and related NGOs.

The main problem in improving coordination and partnerships in strengthening the institutional framework for disaster management is the lack of communication and synergy in carrying out the duties and functions of each institution. For this reason, more intensive communication efforts between institutions are needed by holding regular meetings and discussions.

4.3 Descriptor of disaster knowledge

The descriptor of disaster knowledge serves as a fundamental component within the institutional framework for DRR, yielding matrix coding results that achieve a score of 79 points. Disaster knowledge encompasses an understanding of disasters, alongside strategies for mitigating and alleviating the adverse effects associated with such risks in the event of a disaster. Generally, the disaster knowledge possessed by various stakeholders involved in disaster risk governance within Padang City pertains to the roles, functions, and authorities delineated by pertinent regulations.

The dissemination of disaster knowledge concerning the risks of disasters in the City of Padang commenced following the catastrophic earthquake and tsunami that impacted Aceh in 2004. Initially, the dissemination of disaster knowledge was predominantly spearheaded by local, national, and international NGOs as part of broader DRR initiatives. The transformation in the paradigm of disaster risk governance towards a focus on risk reduction was catalyzed by the consensus established in the Hyogo Framework in 2005, subsequent to the earthquake and tsunami that affected the Aceh region and its neighboring areas. This paradigm shift concerning risk emphasizes a transition from emergency response to risk governance, transitioning from isolated cognitive frameworks to a collective responsibility for safeguarding community rights, thereby implicating both governmental and communal accountability [58]. Consequently, with this paradigm shift, the governance of disaster risk is framed not solely as a governmental duty but also as an obligation shared across all societal strata. Therefore, it is imperative that communities are empowered to enhance their capacity and resilience in the face of disasters, as well as augment the capacity and resilience of institutions responsible for disaster risk governance. Furthermore, the descriptor of disaster knowledge, as derived from the analytical findings of the research, has been distilled into several sub-descriptors, as illustrated in Figure 3.

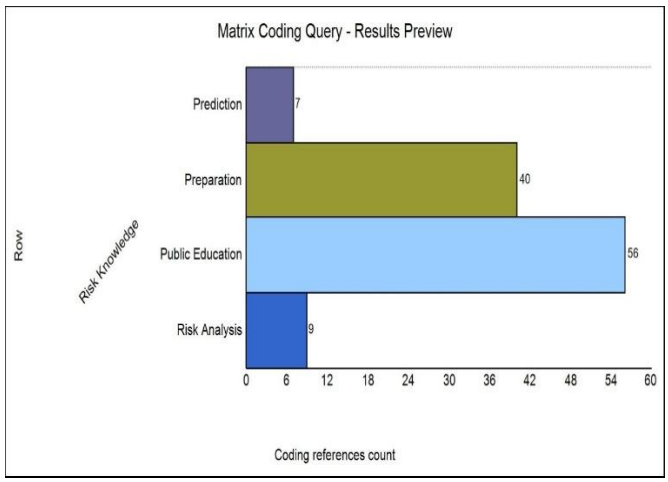

Figure 3. Matrix coding results for the descriptor of disaster knowledge

Based on the illustration presented in Figure 3, a thorough elucidation of the sub-descriptors pertaining to disaster knowledge can be conducted. The empirical findings of the research exhibit a pronounced emphasis on public education, with matrix coding results attaining a score of 86 points. This particular sub-descriptor garnered the highest score as a result of the analytical data, underscoring the critical role of disaster education in mitigating risks associated with disasters for the populace. The myriad challenges encountered in public education initiatives implemented by institutions responsible for disaster risk governance serve as a foundational rationale for the emergence of this sub-descriptor as a pivotal element in the discourse of disaster knowledge. The ongoing commitment to public education is perceived as a significant aspiration among various stakeholders to enhance operational efficacy and diminish the potential for disasters within Padang City.

The subsequent sub-descriptor identified through the analysis of research outcomes pertains to readiness or preparedness, which is reflected in matrix coding results totaling 40 points. The preparedness is predominantly concerned with the domains of knowledge, disaster emergency planning, communication, and information dissemination. These three components have been incorporated into a variety of DRR initiatives within Padang City; however, they are not being optimally executed at the institutional level to fortify disaster risk governance. In contrast, the sub-descriptor of risk analysis constitutes the third focal point within the framework of disaster knowledge, evidenced by matrix coding results amounting to 9 points. The research findings indicate that risk analysis has not been accorded primary importance in the establishment of an institutional framework aimed at mitigating disaster risks. It is paramount that risk analysis serves as a foundational element for the formulation of policies across all tiers of government, including the preparation of a Standard Operating Procedure (SOP) for disaster risk governance.

Furthermore, the sub-descriptor of prediction, with matrix coding results registering at 7 points, contributes to the reinforcement of descriptors of disaster knowledge within the context of disaster risk governance institutions in Padang City. This sub-descriptor is concentrated on forecasting the magnitude and scope of potential disasters through comprehensive analytical modeling conducted by disaster geologists. The development of several alternative predictive models for Padang City will furnish pertinent stakeholders with the necessary insights to craft informed policies and issue warnings to the public regarding imminent risks. From an institutional perspective, both governmental bodies and civil society have the capacity to cultivate preparedness measures aimed at diminishing the consequences of disaster risks should they materialize, predicated upon the acquisition of accurate predictive assessments.

A sub-descriptor of prediction has been realized in the Padang City disaster contingency plan document, which has become a reference in institutional disaster emergency operations by each stakeholder. As part of the DRR program, the disaster contingency plan functions as follows:

a. The basis for carrying out initial response operations for disaster events, such as Search, Rescue, and Evacuation (SRE) operations, before the Disaster Emergency risk governance Command Structure is established. In Padang City, this mechanism has not been comprehensively trained as an institution for disaster risk governance, so it is very doubtful that its readiness in the event of a disaster follows the simulated predictions.

b. The basis for determining Disaster Status is the primary verification material for the results of the rapid assessment that has been carried out. This is often a debate regarding the authority for disaster emergency response at each level of government. The standard categories are district/city, provincial, and national disasters. It is not uncommon for disaster risk governance authorities to have difficulty determining the category level, whether at the regional or central level. The problem of deciding authority categories becomes increasingly difficult when determining the budget that will be used for disaster risk governance. This difference in perception regarding standards for determining authority categories is a factor in the slowness in handling disaster emergencies and distributing aid to victims.

c. The basis for preparing an Emergency Response Operation Plan is to facilitate the needs of the Emergency Response Operation Plan. With predictions built based on modeling simulations of disasters that might occur, a gap emerged between needs and available resources in the Padang City disaster contingency plan document. However, the fact is that since this contingency plan was designed with a worst-case scenario, there has been no comprehensive institutional effort to improve the availability of the required resources. Detailed figures for the necessary resources for the contingency plan have not been met. Evaluation of institutional compliance in providing these resources has also never been carried out.

The main obstacle in increasing disaster knowledge to strengthen the institutional framework in disaster risk management is the lack of structured and regular training and provision for the apparatus involved in disaster management. For this reason, a consistent training and capacity building program for the apparatus is needed in accordance with the duties and functions of each institution.

4.4 Descriptor of monitoring and warning

The preceding illustration elucidated that the institutional framework aimed at mitigating disaster risk within Padang City operates at a specific level. Subsequently, the matter of monitoring and warning is represented by a matrix coding outcome comprising 30 points. The issues pertaining to monitoring and warning are intrinsically linked to the operational efficacy of the early warning system within the City of Padang. Consequently, the institutional mechanism responsible for overseeing the disaster early warning system in Padang City remains a subject of uncertainty. The primary factor contributing to the inadequacy of institutional preparedness concerning the monitoring and warning dimensions is the significant presence of damaged or lost disaster early warning system equipment. Among these are BUOY tsunami early detection instruments and sirens designed to disseminate tsunami early warning information in Padang City, many of which are currently inoperative.

Limited budget and technological capacity require improvements, and the development of disaster early warning systems for monitoring and warning institutionally is the main problem. So, efforts to disseminate disaster early warning information to the public are hampered, and self-rescue efforts become more complex. Institutionally, monitoring and warning aspects are fundamental in strengthening disaster risk governance in Padang City. The effectiveness of institutional performance will significantly depend on the functionality of the disaster early warning system in Padang City.

4.5 Descriptor of communication

Communication emerged as the pivotal descriptor associated with the fourth trend regarding challenges in establishing an institutional framework aimed at mitigating disaster risks in Padang City, as indicated by a matrix coding outcome of 34 points. According to the findings of Seng [57], it is articulated that "the absence of a regional dissemination and communication system was the key reason why Indonesia and all the Indian Ocean countries were not alerted promptly," which signifies a critical failure in addressing the natural disaster in the Indian Ocean region in 2014, attributable to the dysfunctionality of communication systems. The results of the

analysis are predicated on coding. Drawing from the research outcomes, this descriptor emphasizes institutional communication mechanisms that are essential for enhancing disaster risk governance in Padang City. The communication processes involved in the design and execution of disaster risk governance initiatives have not been effectively operationalized, primarily due to entrenched structural egos and the lack of an institutional priority framework for determining which programs should be prioritized for implementation. Furthermore, the evaluation and testing of institutional mechanisms aimed at fostering stakeholder communication remain insufficient. The communication efforts have not yielded an optimal impact on the reduction of disaster risk. The deficiency of integrated DRR initiatives and multisectoral policies engaging all stakeholders underscores the inadequacy of institutional communication in overseeing DRR programs.

The Regional Disaster Management Agency of Padang City, alongside its partner NGOs, predominantly spearheads and executes DRR initiatives. Conversely, the involvement of other regional apparatus organizations in DRR remains limited, as it is perceived as lacking priority, despite the Disaster Risk Governance Plan of Padang City having delineated responsibilities among various agencies. Consequently, the establishment of effective communication within the institutional framework for DRR continues to pose significant challenges in Padang City. The analysis of the research findings further elucidates that the communication descriptor related to DRR in Padang City is operationalized through two distinct communication mechanisms: formal and non-formal. This delineation subsequently generates two sub-descriptors, with analytical outcomes derived from matrix coding.

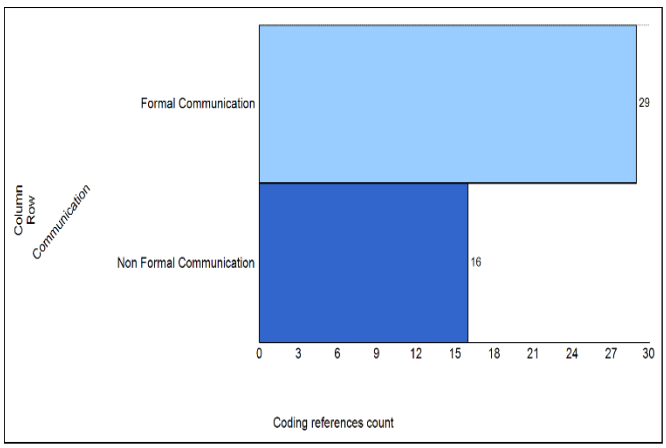

Figure 4. Matrix coding results for descriptors of communication

From the analysis presented in Figure 4, it can be inferred that the sub-descriptor pertaining to formal communication has achieved the highest score, as evidenced by the coding outcomes of the research findings, which yielded a matrix coding result of 29 points. The role of formal communication has proven to be pivotal in establishing an institutional framework aimed at mitigating disaster risk within Padang City. This mechanism of formal communication is executed in accordance with the respective duties, functions, and authorities of each institution, as well as in compliance with prevailing regulations. The central component of this formal communication process is the Regional Disaster Management Agency of Padang City, which serves as the principal sector. Thus, it is essential. The proficiency of the Regional Disaster Management Agency of Padang City in fostering internal institutional communication with the Padang City Government, Vertical Government Agencies, NGOs, and the local community is expected to significantly enhance the efficacy of disaster governance within the DRR initiative.

The challenges that emerge from the analysis of the findings indicate that, although formal communication mechanisms are established under existing regulations, they have not been utilized to their fullest potential by the relevant stakeholders, particularly the Regional Disaster Management Agency of Padang City, to guarantee the effective implementation of disaster risk governance programs. Variations in comprehension regarding the delineation of authority among stakeholders involved in DRR can be attributed, at least in part, to the ineffective operation of institutional communication mechanisms. Consequently, the Regional Disaster Management Agency of Padang City frequently encounters challenges in ensuring that the DRR programs that have been formulated are executed by the stakeholders. The modalities of formal communication include the establishment of the DRR Forum, the Disaster Preparedness Group Forum, the Disaster Preparedness Journalists, and various other coordinating entities. In addition to serving as elements of advocacy for the municipal government, these forums function as formal institutional communication mechanisms.

Subsequently, non-formal communication is positioned at the second tier, with matrix coding results of 16 points, thereby reinforcing the institutional framework for DRR in Padang City. According to the analysis of the research findings, informal communication among stakeholders has transpired during various leadership periods at the Regional Disaster Management Agency of Padang City. As the leading sector, the Regional Disaster Management Agency of Padang City is currently spearheading a range of routine non-formal communication initiatives, exemplified by monthly coffee morning gatherings that involve all officials, activists, and disaster advocates in Padang City, aimed at fostering communication and harmonizing perceptions concerning disaster risk governance in the region. This agenda, which is characterized as a routine activity, conceptually aligns with non-formal communication, representing an endeavor to overcome the rigidity often associated with formal communication constrained by stringent institutional and regulatory frameworks. Furthermore, multiple WhatsApp groups have been established, comprising actors engaged in disaster risk governance, with the objective of facilitating non-formal communication. These WhatsApp groups play a significant role in disseminating information and enabling prompt responses from stakeholders, unimpeded by the limitations of existing bureaucratic processes.

Good communication between institution is the key to improving the institutional framework for better disaster risk management. This communication can be done formally or informally at every level of the organization that is a stakeholder in disaster management to build synergy.

4.6 Descriptor of accountability

Next is the descriptor of accountability with matrix coding results of 27 points in the institutional framework for reducing the disaster risk in Padang City. Based on the analysis, accountability is how each disaster risk governance agency

involved has a strong commitment and responsibility in carrying out its duties and functions. Accountability Judging from the data found in current conditions, it is still a significant problem in institutional dynamics, primarily related to the DRR function. Even though the policy design based on existing regulations has regulated duties and authorities according to each institution's core business, many institutions still have not implemented their DRR function optimally and integratively. For example, in preparing the Disaster Management Plan Document, Regional Action Plan, and Disaster Contingency Plan in the City of Padang, almost all relevant agencies, including regional organizations, vertical agencies, academics, NGOs, and community representatives, were invited and involved. The mechanism used in formulating policies related to this document is standardized and includes stakeholder participation, a critical point. The resulting policy document becomes the leading guide and procedure regarding " who does what" in disaster risk governance.

Nevertheless, in light of the prevailing circumstances regarding the execution of this document, the level of institutional dedication remains inadequate in ensuring the effective realization of DRR policies and programs through tangible activities and interventions. Consequently, the evidence indicates that the Regional Disaster Management Agency of Padang City appears to function autonomously with scant support from relevant institutions, particularly in the domain of disaster risk mitigation. This issue is similarly observed across numerous DRR initiatives in Padang City, including the Disaster Smart School Program, Disaster Smart Families, the Establishment of the Community Disaster Preparedness Group, the Enhancement of Structural and Non-Structural Mitigation, alongside an array of other policies and programs.

The minimal backing from pertinent stakeholders has led to challenges in both effectiveness and sustainability. Achieving success in these programs and policies presents considerable complexities. Nonetheless, the contributions from local NGOs are noteworthy in their assistance to the Regional Disaster Management Agency of Padang City, which serves as the principal agency in DRR. Collaborative efforts between NGOs and the Regional Disaster Management Agency of Padang City are progressing positively, resulting in numerous programs forming partnerships with these NGOs.

4.7 Descriptor of equity

At the subsequent tier resides the characterization of equity, which is a concept that research informants frequently articulate, evidenced by a matrix coding output of 24 points. Concerning the extant regulatory frameworks and mandates, the government is obligated to furnish protection and services to the entirety of the community, particularly in relation to disaster risk mitigation. The stipulations delineated in the Minister of Home Affairs Regulation Number 101 pertaining to Minimum Service Standards for Sub-Disaster Affairs dictate that several criteria must be met by Regional Governments in delivering sub-disaster services, specifically encompassing disaster-prone information services, disaster prevention and preparedness initiatives, as well as the rescue and evacuation of individuals affected by disasters. In the domain of DRR within Padang City, the responsibility incumbent upon the local government entails the dissemination of information regarding disaster risks alongside measures for disaster prevention and preparedness. Institutionally, the provision of information pertaining to hazards has been vigorously pursued by pertinent institutions, which include the city government, vertical agencies, NGOs, mass media, and the engaged communities.

Media conveying information have been carried conventionally, such as counseling, mass media, and disaster information boards/banners spread across Padang City. Disaster vulnerability information can also be accessed through the available application (Ina RISK) and official social media from related institutions. This information has been disseminated even though it has not yet reached all communities vulnerable to the disaster in Padang City. From the aspect of disaster prevention and preparedness in Padang City, the descriptor of equity has not been achieved optimally based on research findings. This condition occurs because not all affected societal levels have experienced structural and non-structural mitigation programs and policies. As explained by the researchers [59, 60], there are two types of mitigation: the first, which focuses on building reconstruction, building walls/barriers, and various structural approaches. Other. Second, non-structural mitigation focuses on emergency preparedness, early warning systems, disaster mitigation mapping, and increasing human resource/community capacity.

If analyzed based on these two types of mitigation, then the justice institutional framework for disaster risk governance is categorized as not yet achieved evenly in Padang City. For structural mitigation, the relevant disaster risk governance agency has not implemented structural programs to prevent the risk of disasters optimally. This is proven by the lack of strengthening and construction of physical barriers developed and built by the government along the disaster red zone. Meanwhile, in terms of non-structural mitigation, justice cannot be achieved optimally because the preparedness programs that have been carried out are still not sustainable and have not yet reached all communities in the disaster red zone.

Based on the above, the government and other stakeholders can carry out mitigation more evenly through programs in each institution. The design and implementation of programs should be able to involve the community as a subject in improving the quality of disaster risk governance.

4.8 Policy design for strengthening the institutional framework of disaster risk governance in Padang City

Based on the results of data analysis from research findings, a robust institutional framework is needed to strengthen governance and reduce the risk of disasters in Padang City. For this reason, policies must be designed to ensure that the institutional framework becomes the basis for improving institutional performance in disaster risk governance. The policy design derived from the project map analysis can be summarized as follows.

Based on Figure 5, it is elucidated that the formulation of policies pertaining to the institutional framework aimed at mitigating disaster risk within the City commences with the fortification of the equity descriptor as an integral component of constructing an institutional framework. One manifestation of the reinforcement of the aforementioned equity descriptor involves ensuring that the allocation for DRR emerges as a prominent priority within the budgeting process, given that it has historically garnered insufficient attention. The equity

descriptor may also be enhanced through the establishment of collaborative partnerships with various institutions, including NGOs and the private sector, via corporate social responsibility (CSR) initiatives to attract financial resources for sustainable DRR programs. A legal framework is requisite at both the central and regional levels to serve as a foundation for mobilizing non-governmental financial contributions towards DRR, while concurrently mitigating its adverse effects. Subsequently, the formulation of policies to fortify the accountability descriptor is essential for the development of an institutional framework aimed at diminishing disaster risk in Padang City. The proposed program is structured and executed to bolster accountability through the enactment of regulations that mandate all relevant Regional Apparatus Organizations involved in DRR to implement all established programs. This obligation is further reinforced by the execution of regular program evaluations, serving as a mechanism of accountability to the public.

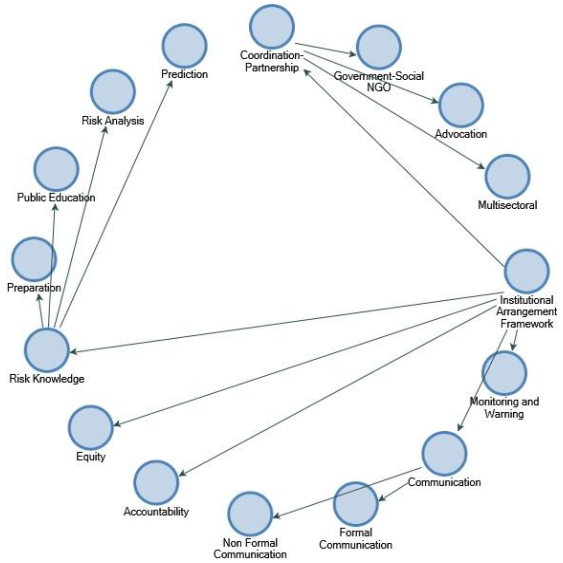

Figure 5. Policy design for strengthening the institutional framework of disaster risk governance

An illustrative instance is the imposition of obligations and sanctions for regional apparatus organizations that fail to execute the ratified DRR policy documents, which have been codified as Regional Regulations/Mayor Regulations. Furthermore, an additional measure to ensure accountability entails incorporating compliance with the implementation of DRR policies as a key performance indicator for the pertinent Regional Apparatus Organizations. Subsequently, policies must be designed to reinforce the monitoring and warning descriptor. This policy is executed through the enhancement and modernization of the disaster early warning system apparatus within Padang City.

The budgeting framework that may be employed encompasses the Regional Revenue and Expenditure Budget mechanism for Padang City and, in addition to facilitating communication with the Central Government/Vertical Governance through the Special Allocation Fund/Assistance Task scheme deriving from National Budget resources. Additionally, efforts may also be directed towards establishing partnerships with international institutions/donors focused on DRR to aid in the development of both hardware and software for the disaster early warning system in Padang City. An alternative strategy that could be employed is the implementation of an environmental development program (CSR) aimed at fostering public-private partnerships and mitigating disaster risk within Padang City.

The subsequent phase involves fortifying the communicative descriptors as a pivotal component of the Padang City Government's initiatives aimed at mitigating disaster risk. A formalized communication policy that warrants implementation encompasses the development of a multisectoral integrated communication SOP specifically designed for DRR, representing a more nuanced iteration of the disaster risk governance plan documentation. Given that Padang City has instituted the DRR Forum, this coordinating entity can be effectively leveraged in the formulation of Communication SOPs and can function as an SOP implementer, thereby ensuring that inter-stakeholder communication is facilitated efficiently. Concurrently, non-formal communication may be enhanced through the intensification of social media efforts to foster comprehension and integration among stakeholders in the endeavor to diminish disaster risk within Padang City. Informal communication serves as a conduit to bolster institutional endeavors aimed at DRR in Padang City, particularly when formal communication pathways face impediments due to the rigidity inherent in government bureaucratic dynamics, which often exhibit limited agility in addressing emergent issues. Nonetheless, non-formal communication necessitates a robust commitment and proactive engagement from stakeholders to effectively tackle challenges that arise in the context of DRR.

Then, to build an institutional framework for reducing the risk of disasters in Padang City, a policy of strengthening descriptors is needed for disaster knowledge (risk knowledge). The policy in question is how to create capacity-building programs for disaster risk governance stakeholders. Policies related to strengthening disaster knowledge can be divided into three categories: programs to strengthen preparedness, predictions, and public education. Readiness supporting policy can take the form of a sustainable preparedness program for stakeholders, including the community, in reducing disaster risk, such as evacuation simulations and regular emergency response. Next, predictions will be strengthened by conducting a joint research program between the government, universities, and NGOs to find innovations to predict disaster events more accurately. Finally, public education can be strengthened by conducting educational programs for all levels of society, such as at the neighborhood association/community association, sub-district, and city levels. As well as implementing public education in schools, hospitals, and other public/social facilities.

Next is strengthening risk analysis as part of the descriptor of disaster risk knowledge. The risk analysis program design is carried out by periodically revising DRR policy documents such as disaster risk governance plans, regional action plans, and especially disaster contingency plans, which contain risk analysis based on worst-case scenario simulations. What cannot be forgotten is the need to map and anticipate the danger of liquefaction disasters due to the earthquake and tsunami in the City of Padang. Mapping the disaster risk analysis with the worst scenario will be used as a reference for strengthening stakeholders' capacity and institutional resources in disaster risk governance.

The subsequent phase entails the fortification of mentoring (advocacy) in the execution and assessment of DRR policies and programs within Padang City. Advocacy endeavors may be conducted by providing comprehensive support to the

established policies and programs, thereby facilitating their optimal implementation. A pertinent illustration is the Disaster Smart School initiative spearheaded by the Regional Disaster Management Agency of Padang City, which necessitates assistance from relevant stakeholders, particularly the Education Department, which has, to date, not assumed a pivotal role. Furthermore, the ultimate objective is to enhance coordination and partnerships in DRR efforts. This process commences with the formulation of policies or programs aimed at strengthening collaborative coordination among the Government, NGOs, the private sector, and community entities. An initial measure that may be undertaken involves the revision of regulatory frameworks concerning the participation of NGOs, the private sector, and communities, which, thus far, have not been thoroughly articulated across various legal foundations for disaster risk governance. Specifically, NGOs, as integral components of civil society, necessitate a defined role within pertinent regulatory frameworks. Through the establishment of such regulations, the collaborative dynamics between NGOs and the Government can be rendered more focused, directed, and integrated, particularly in relation to the budgeting of associated programs. Furthermore, robust coordination and partnerships are imperative among the private sector and other stakeholders. A legal framework is essential that mandates the private sector's involvement in DRR endeavors commensurate with their respective capacities. Concurrently, coordination and partnership with community entities are vital for enhancing capacity in DRR. The formulation of appropriate policy designs can significantly augment both the quality and quantity of coordination and collaboration among stakeholders.

Subsequently, attention must be directed towards reinforcing the sub-descriptor of multisectoral approaches in the mitigation of disaster risks within Padang City. As an integral facet of coordination and partnership, a program aimed at strengthening multisectoral participation in DRR can be initiated by the development of SOPs pertinent to disaster risk mitigation in Padang City. The SOPs that have been devised to date have predominantly concentrated on emergency response aspects, thereby neglecting to adequately refine the SOPs for DRR. The establishment of SOPs specifically for DRR will delineate "who does what" for the involved stakeholders. Following the design and establishment of the SOP for DRR, the ensuing step is to implement oversight mechanisms to ensure proper adherence to the SOP by each stakeholder. The draft SOP for multisectoral DRR may be derived from the policy documents comprising the Disaster Management Plan and the Padang City Regional Action Plan.

Based on the analysis of research findings, steps to strengthen the institutional framework in governance policies in reducing disaster risk can be carried out through several policies, namely, Fulfilling the resource needs of the Regional Disaster Management Agency of Padang City and other regional apparatus involved in disaster risk governance (budget, facilities, infrastructure, personnel) both in terms of quantity and quality. This is necessary to strengthen all descriptors in the institutional framework dimensions of disaster risk governance in Padang City.

Furthermore, it ensures that the Regional Disaster Management Agency of Padang City's organizational structure (directing and implementing elements) is fulfilled following statutory regulations to strengthen institutions in disaster risk governance. So far, there has been no division of tasks between the directing and implementing elements in the Regional Disaster Management Agency of Padang City, as the leading sector in disaster risk governance in Padang City. If the Regional Disaster Management Agency of Padang City is equipped, it will facilitate institutional performance in disaster risk governance because it is hoped that there will be a check and balance mechanism between the directing and implementing elements.

In terms of strengthening institutions in society, regularly intensifying the socialization of disaster prevention and preparedness, and reaching all levels of society in every sub-district using standardized materials. This strengthening can also be elaborated with existing local wisdom, such as utilizing the existence of mosques as centers for building community institutional capacity in disaster risk governance. The involvement of religious, traditional, and community leaders is crucial in implementing this policy. Apart from that, the empowerment of Neighborhood Associations and Community Associations in disaster risk governance institutions in the community is also expected to expand access to increased levels of preparedness.

Next, in order to enhance the institutional framework pertaining to disaster risk governance, it is imperative to execute a dissemination policy regarding the disaster contingency plans that have been formulated for all relevant stakeholders. As articulated by Alhadi et al. [25], disaster contingency planning serves as a crucial risk governance instrument that encompasses all sectors to guarantee prompt and effective humanitarian assistance to the individuals most affected when a disaster transpires. The efficacy of monitoring and warning systems can be augmented through the regular and systematic testing of the disaster early warning mechanism. This process should also be complemented by periodic simulations to ascertain institutional preparedness. Concurrently, to augment the understanding of disaster risk, it is essential to revise the outcomes of disaster risk assessments in accordance with the insights derived from pertinent research conducted in collaboration with researchers and academics possessing relevant expertise. The findings of this research should subsequently serve as the foundation for formulating policies and decisions related to disaster risk governance with a greater degree of precision and efficiency.

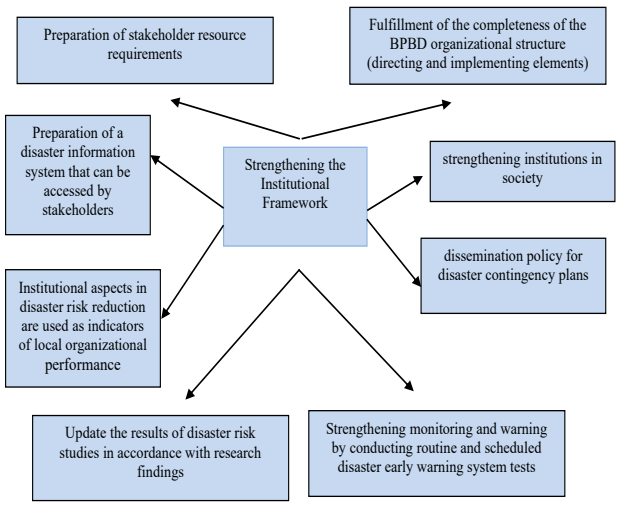

Figure 6. Policy for strengthening the institutional framework

From an institutional standpoint, DRR ought to be utilized as a metric for assessing the performance of Regional Apparatus Organizations. This necessitates the development of pertinent indicators to ensure that performance is accurately measured and serves as a catalyst for enhancing effectiveness. The Regional Apparatus Organizations, as stakeholder, are incentivized by their performance in the administration of disaster risk within Padang City. If deemed necessary, a system of rewards and sanctions may be instituted to reinforce the accountability framework enacted by the regional leadership, thereby promoting improved performance of the Regional Apparatus Organizations. To fortify the institutional framework for disaster risk governance in Padang City, a variety of policies may be adopted by stakeholders, as elucidated in Figure 6.

Based on Figure 6, various policies can enhance the dimensions of the institutional framework aimed at mitigating the risk of disasters within the City of Padang. The initial step involves the fulfillment of stakeholder resources in both quantity and quality, which includes the provision of equipment and supplies essential for disaster preparedness and emergency response, the augmentation and refinement of disaster early warning system apparatus and dissemination channels, as well as the assurance of budgetary allocations to enhance human resource capacity in order to mitigate disaster risk.

Furthermore, it is imperative to establish a disaster information system that is accessible to all stakeholders. The objective of this system is to ensure the rapidity and precision of information acquired pertaining to preparedness against disaster risks. With reliable information, it is anticipated that stakeholders will be able to undertake the requisite actions promptly. Thirdly, it is vital to incorporate the institutional dimensions of DRR as a performance indicator for Regional Apparatus Organizations. This approach will endow the Regional Apparatus Organizations with the responsibility and motivation to enhance performance in DRR in accordance with its designated duties, functions, and authority. The assessment of these performance indicators will be conducted by evaluating the Regional Apparatus Organizations' adherence to regulations pertinent to disaster risk governance, such as the Disaster Management Plan, Regional Action Plan, Contingency Plan, and other relevant statutes.

Fourth, updating disaster risk studies based on research results conducted by competent institutions/experts is necessary. Disaster risk studies must be updated periodically because they will be used as a basis for making relevant policies. Having an up-to-date disaster risk study will make the produced policies more measurable and targeted according to the existing risk spectrum. Fifth, it is necessary to regularly strengthen and test the disaster early warning system and schedule. Strengthening is done by increasing the early warning system's capacity, quantity, and quality. Meanwhile, regular testing is aimed at ensuring the system's readiness so that it functions optimally when a disaster occurs in Padang City.

Sixth, disseminate the disaster contingency plan to ensure all stakeholders know their role in a disaster emergency. This policy is carried out periodically, including coordination meetings, training, and other formal or non-formal agendas. Seventh, strengthening societal institutions down to the lowest level, namely, the community association level. In its implementation, efforts to increase community capacity in the lowest-level areas were achieved by involving local community leaders. Several stages can be completed by gathering community commitment, forming a community association-based disaster preparedness group, carrying out an independent risk assessment and monitoring, designing community action to reduce disaster risk as part of the Padang City regional action plan, and creating collaboration between stakeholders. The Government, NGOs, and the private sector were conducting community-based preparedness training, designing independent dissemination of early warning systems, and conducting disaster emergency training.

4.9 Policy design for strengthening the institutional framework test results

Through a systematic coding process executed by researchers on the responses provided by participants in the FGDs, the degree of acceptance regarding the policy aimed at reinforcing the dimensions of the institutional framework was ascertained. Following the analysis of these responses, an evaluative assessment was conducted to elucidate the level of acceptance concerning the policy design intended for the enhancement of the institutional framework within the context of risk governance pertaining to disaster management in Padang City. The findings are illustrated in Figure 7.

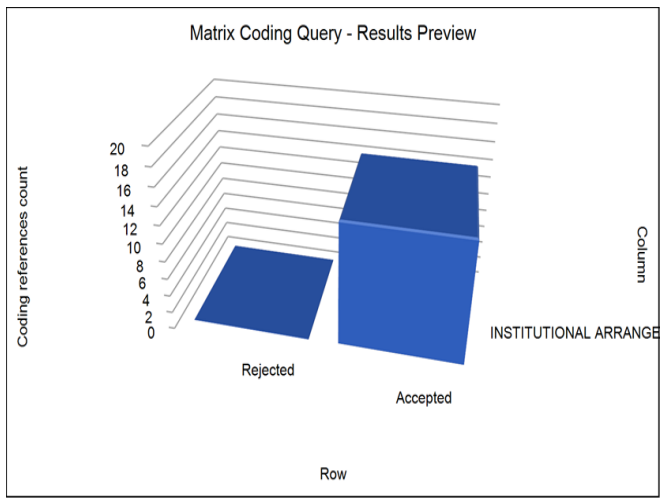

Figure 7. Matrix coding results of policy design for the institutional framework of disaster risk governance test

From the aforementioned figure, the findings indicate that all 13 stakeholders who participated in the FGD conducted by the researcher concurred on the necessity to fortify the dimensions of the institutional framework. This consensus aligns with the descriptors and sub-descriptors integral to the policy formulation aimed at enhancing governance to mitigate disaster risk in Padang City.

5. CONCLUSIONS

Based on the findings and discourse stemming from the research, it can be inferred that the policy design aimed at fortifying the institutional framework for mitigating disaster risks in Padang City is characterized by several key conclusions: Firstly, the descriptor pertaining to coordination and partnership has garnered the highest trend points within the institutional framework dimension pertinent to DRR in Padang City. This descriptor is categorized into three sub-

descriptors ranked in descending order of significance: multisector collaboration, assistance, and the relationship between government entities and NGOs. The central tenet in enhancing governance of disaster risk lies in the effective implementation of coordination and partnership mechanisms. Secondly, the descriptor of disaster knowledge occupies the second position when evaluated against the trends within the institutional framework dimension concerning DRR in Padang City, primarily attributable to the insufficient institutional comprehension of disaster risk. Notably, the sub-descriptors related to public education, preparedness, risk analysis, and predictive capabilities sequentially highlight the challenges inherent within the disaster knowledge descriptor. Thirdly, the descriptor of monitoring and warning ranks third in terms of trends within the institutional framework for DRR in Padang City. This positioning is a consequence of the suboptimal functionality of the early warning system in Padang City. Fourthly, the descriptor of communication holds the fourth trend position, reflecting challenges associated with the development of an institutional framework for disaster risk mitigation in Padang City. This is chiefly due to the inadequate communication strategies among stakeholders engaged in the design and implementation of DRR initiatives in Padang City. In terms of sub-descriptor tendencies, formal communication is prioritized first, while non-formal communication is ranked second. Fifthly, the descriptor of accountability is situated in the fifth position concerning the challenges faced within the institutional framework for DRR in Padang City, predominantly due to the low levels of institutional accountability, particularly regarding the execution of duties, functions, and authority in disaster risk mitigation efforts. Lastly, the descriptor of equity also occupies the fifth position concerning the trend of challenges within the institutional framework aimed at reducing disaster risk in Padang City. The underlying issue is that the DRR programs implemented by various stakeholders remain disproportionate in their approach to disaster management.

Based on the findings derived from the research and ensuing discourse, it can be inferred that the process of strengthening initiates in a sequential manner from the descriptors of equity, accountability, monitoring and warning, communication, disaster knowledge, coordination, and partnership. This process of strengthening is executed through the formulation of policies pertinent to institutional regulatory frameworks, which are predicated upon each of the aforementioned descriptors, as elucidated in the discourse of this study. Following the assessment of policy design aimed at reinforcing governance to mitigate disaster risk in Padang City, the outcomes indicated that the enhancement of the actor dimension, the institutional framework dimension, and the Sendai Framework for Action dimension were deemed acceptable by stakeholders as a foundational structure within the policy design. This indicates that the policy designs have been predicated on the enhancement of governance to attenuate disaster risks in Padang City. In light of the conclusions drawn from the analysis of research findings and discussions, the researcher advocates for the fortification of the institutional framework dimension in the context of DRR in Padang City through the formulation and implementation of policies and programs that pertain to the facets of coordination and partnership, monitoring and warning, accountability, equity, and communication.

The implications of the results of this research theoretically are expected to be a study material to enrich the concept of disaster risk management from the perspective of institutional frameworks. Meanwhile, from a practical perspective, the implications of the results of this research can be used as a basis for the government and other stakeholders to design and implement policies based on strengthening the institutional framework for better disaster risk management.

ACKNOWLEDGMENT

The Research Team appreciates and is most grateful to LPDP, BRIN and Universitas Negeri Padang for conducting this research - Cooperation Agreement: Number:36/IV/KS/02/2025 (BRIN) & Number: 1113/UN35.15/KS/2025).

REFERENCES

[1] Mayunga, J.S. (2007). Understanding and applying the concept of community disaster resilience: A capital-based approach. Summer Academy for Social Vulnerability and Resilience Building, 1(1): 1-16.

[2] Alhadi, Z., Riandini, O., Eriyanti, F., Yusran, R., Permana, I. (2024). Analysis of the effectiveness and efficiency of tsunami disaster contingency planning policies in the province of West Sumatra, Indonesia. International Journal of Safety & Security Engineering, 14(4): 1087-1098. https://doi.org/10.18280/ijsse.140407

[3] Alhadi, Z., Riandini, O., Yusran, R., Eriyanti, F., Putera, R.E. (2024). Policy design for strengthening disaster risk reduction based on Sendai Framework for action in West Sumatera province, Indonesia. International Journal of Safety & Security Engineering, 14(6): 1895-1905. https://doi.org/10.18280/ijsse.140623

[4] Wang, T., Liu, Y., Li, Q., Du, P., et al. (2023). State-of-the-art review of the resilience of urban bridge networks. Sustainability, 15(2): 989. https://doi.org/10.3390/su15020989

[5] Galderisi, A., Altay-Kaya, D. (2021). A new framework for a resilience-based disaster risk management. In Handbook of Disaster Risk Reduction for Resilience, pp. 131-156. https://doi.org/10.1007/978-3-030-61278-8_6

[6] Munoz, A., Billsberry, J., Ambrosini, V. (2022). Resilience, robustness, and antifragility: Towards an appreciation of distinct organizational responses to adversity. International Journal of Management Reviews, 24(2): 181-187. https://doi.org/10.1111/ijmr.12289

[7] Latvakoski, J., Öörni, R., Lusikka, T., Keränen, J. (2022). Evaluation of emerging technological opportunities for improving risk awareness and resilience of vulnerable people in disasters. International Journal of Disaster Risk Reduction, 80: 103173. https://doi.org/10.1016/j.ijdrr.2022.103173

[8] Cantelmi, R., Steen, R., Di Gravio, G., Patriarca, R. (2022). Resilience in emergency management: Learning from COVID-19 in oil and gas platforms. International Journal of Disaster Risk Reduction, 76: 103026. https://doi.org/10.1016/j.ijdrr.2022.103026

[9] Smith, J.F. (2024). Using return on investment and resiliency return on investment for preparedness. Public Administration Review, 84(2): 213-217. https://doi.org/10.1111/puar.13677

[10] Martin, J.D. (2018). Indonesia Disaster Management Reference Handbook. In The Center for Excellence in Disaster Management and Humanitarian Assistance, pp. 12-16.
[11] UNOCHA. (2017). Major natural hazards in Asia and the Pacific (4 August 2017). https://reliefweb.int/map/world/major-natural-hazards-asia-and-pacific-0#:~:text=The%20Asia%2DPacific%20region%20is,millions%20of%20people%20every%20year.
[12] Trias, A.P.L., Cook, A.D. (2021). Future directions in disaster governance: Insights from the 2018 Central Sulawesi Earthquake and Tsunami response. International Journal of Disaster Risk Reduction, 58: 102180. https://doi.org/10.1016/j.ijdrr.2021.102180
[13] Alhadi, Z., Sasmita, S., Yulfa, A., Fatimah, S., et al. (2023). The coping strategies patterns based on local wisdom and resilience capital in facing natural disaster risk in Nagari Mandeh, Indonesia. International Journal of Sustainable Development & Planning, 18(1): 315-325. https://doi.org/10.18280/ijsdp.180133
[14] Natawidjaja, D.H., Triyoso, W. (2007). The Sumatran fault zone—From source to hazard. Journal of Earthquake and Tsunami, 1(1): 21-47. https://doi.org/10.1142/S1793431107000031
[15] Jones, S., Manyena, B., Walsh, S. (2015). Disaster risk governance: Evolution and influences. In Hazards, Risks and Disasters in Society, pp. 45-61. https://doi.org/10.1016/B978-0-12-396451-9.00004-4
[16] Wisner, B., Blaikie, P., Cannon, T., Davies, I. (2004). At Risk: People's Vulnerability, Hazards and Disasters (2nd ed.). Routledge, London. https://doi.org/10.4324/9780203714775
[17] Bankoff, G. (2013). The historical geography of disaster: 'Vulnerability' and 'local knowledge' in western Discourse 1. In Mapping Vulnerability, pp. 25-36. Routledge.
[18] Otwori, D., Nyandiko, N. (2024). Challenges against the achievement of disaster risk reduction strategies in African states. https://doi.org/10.62049/jkncu.v4i1.61
[19] Crosweller, M. (2022). Disaster management and the need for a relational leadership framework founded upon compassion, care, and justice. Climate Risk Management, 35: 100404. https://doi.org/10.1016/j.crm.2022.100404
[20] Javadpour, A., AliPour, F.S., Sangaiah, A.K., Zhang, W., et al. (2023). An IoE blockchain-based network knowledge management model for resilient disaster frameworks. Journal of Innovation & Knowledge, 8(3): 100400. https://doi.org/10.1016/j.jik.2023.100400
[21] Al-Humaiqani, M.M., Al-Ghamdi, S.G. (2023). Assessing the built environment's reflectivity, flexibility, resourcefulness, and rapidity resilience qualities against climate change impacts from the perspective of different stakeholders. Sustainability, 15(6): 5055. https://doi.org/10.3390/su15065055
[22] Quader, M.A., Khan, A.U., Malak, M.A., Kervyn, M. (2023). Mainstreaming decentralization and collaboration in disaster risk management: Insights from coastal Bangladesh. International Journal of Disaster Risk Science, 14(3): 382-397. https://doi.org/10.1007/s13753-023-00495-w
[23] Hadlos, A., Opdyke, A., Hadigheh, S.A. (2022). Where does local and indigenous knowledge in disaster risk reduction go from here? A systematic literature review. International Journal of Disaster Risk Reduction, 79: 103160. https://doi.org/10.1016/j.ijdrr.2022.103160
[24] Johnson, C., Osuteye, E., Ndezi, T., Makoba, F. (2022). Co-producing knowledge to address disaster risks in informal settlements in Dar es Salaam, Tanzania: Pathways toward urban equality? Environment and Urbanization, 34(2): 349-371. https://doi.org/10.1177/09562478221112256
[25] Alhadi, Z., Maani, K.D., Nurhabibi, P., Syarief, A. (2018). An analysis of problem in composing of tsunami contingency plan in Padang City. MATEC Web of Conferences, 229: 03007. https://doi.org/10.1051/matecconf/201822903007
[26] Alhadi, Z., Riandini, O., Maani, K.D. (2023). Involvement and design of strengthening policy actors in tsunami disaster risk governance in Padang City. Jurnal Borneo Administrator, 19(3): 285-300. https://doi.org/10.24258/jba.v19i3.1164
[27] Anderson, J.E. (1984). Public Policy and Politics in America. Harcourt Brace.
[28] Cochran, C.L., Malone, E.F. (2005). Public Policy: Perspectives and Choices. Lynne Rienner. https://www.rienner.com/uploads/47d95b0891600.pdf.
[29] Dunn, W.N. (2000). Introduction to Public Policy Analysis. Gadjah Mada University Press.
[30] Winarno, B. (2007). Public policy: Theory and Process. Yogyakarta: Media Pressindo.
[31] Mulyadi, D. (2015). Public Policy and Public Service Studies: Concepts and Applications of Public Policy and Public Service Processes. Bandung: Alfabeta CV. https://senayan.iain-palangkaraya.ac.id/index.php?p=show_detail&id=12287&keywords=.
[32] Fadhil, M., Khaidir, A. (2019). Padang pariaman delivery service licensing implementation program. JISPO: Journal of Social and Political Sciences, 9(1): 198-206. https://doi.org/10.15575/jispo.v9i1.4153
[33] Sidney, M.S. (2006). Policy formulation: Design and tools. In Handbook of Public Policy Analysis, pp. 105-114. Routledge.
[34] Renn, O. (2015). Stakeholder and public involvement in risk governance. International Journal of Disaster Risk Science, 6(1): 8-20. https://doi.org/10.1007/s13753-015-0037-6
[35] Brunner, R.D., Steelman, T.A., Coe-Juell, L., Cromley, C.M., et al. (2005). Adaptive Governance: Integrating Science, Policy, and Decision Making. Columbia University Press.
[36] Djalante, R., Holley, C., Thomalla, F., Carnegie, M. (2013). Pathways for adaptive and integrated disaster resilience. Natural hazards, 69: 2105-2135. https://doi.org/10.1007/s11069-013-0797-5
[37] UNISDR. (2006). NGOs and disaster risk reduction: A preliminary review of initiatives and progress made. Background paper for a consultative meeting on "A global network of NGOs for community resilience to disasters", Geneva 25e26 Oct 2006. United Nations. https://www.unisdr.org/2008/partner-netw/ngos/meeting1-october-2006/NGOs_and_DRR_Background_Paper.pdf.
[38] Bang, H.N. (2013). Governance of disaster risk reduction in Cameroon: The need to empower local government. Jàmbá: Journal of Disaster Risk Studies, 5(2): 1-10.

https://doi.org/10.4102/jamba.v5i2.77
[39] Vij, S., Russell, C., Clark, J., Parajuli, B.P., et al. (2020). Evolving disaster governance paradigms in Nepal. International Journal of Disaster Risk Reduction, 50: 101911. https://doi.org/10.1016/j.ijdrr.2020.101911
[40] Miller, M.A., Douglass, M. (2015). Disaster governance in an urbanising world region. In Disaster Governance in Urbanising Asia, pp. 1-12. https://doi.org/10.1007/978-981-287-649-2_1
[41] Daly, P., Ninglekhu, S., Hollenbach, P., Duyne Barenstein, J., et al. (2017). Situating local stakeholders within national disaster governance structures: Rebuilding urban neighbourhoods following the 2015 Nepal earthquake. Environment and Urbanisation, 29(2): 403-424. https://doi.org/10.1177/0956247817721403
[42] Hemachandra, K., Amaratunga, D., Haigh, R. (2020). Factors affecting the women's empowerment in disaster risk governance structure in Sri Lanka. International Journal of Disaster Risk Reduction, 51: 101779. https://doi.org/10.1016/j.ijdrr.2020.101779
[43] Renn, O. (2008). White paper on risk governance: Toward an integrative framework. In Global Risk Governance, pp. 3-73. https://doi.org/10.1007/978-1-4020-6799-0_1
[44] Nemakonde, L.D., Van Niekerk, D. (2023). Enabling conditions for integrating government institutions for disaster risk reduction and climate change adaptation in the SADC region and beyond. Risk, Hazards & Crisis in Public Policy, 14(1): 6-26. https://doi.org/10.1002/rhc3.12246
[45] Ghorbani, A., Siddiki, S., Bravo, G. (2023). Institutional adaptation and transformation for climate resilience. Frontiers in Environmental Science, 11: 1159923. https://doi.org/10.3389/fenvs.2023.1159923
[46] González, D.P. (2022). Disaster risk governance as assemblage: The Chilean framework of the 1985 San Antonio earthquake. International Journal of Disaster Risk Science, 13(6): 878-889. https://doi.org/10.1007/s13753-022-00453-y
[47] Faiella, A., Menoni, S., Boni, M.P., Panoutsopoulou, M., et al. (2022). Enabling knowledge through structured disaster damage & loss data management system. Sustainability, 14(10): 6187. https://doi.org/10.3390/su14106187
[48] Xie, Z., Peng, B. (2023). A framework for resilient city governance in response to sudden weather disasters: A perspective based on accident causation theories. Sustainability, 15(3): 2387. https://doi.org/10.3390/su15032387
[49] Di Giulio, G.M., Mendes, I.M., Campos, F.D.R., Nunes, J. (2023). Risk governance in the response to global health emergencies: Understanding the governance of chaos in Brazil's handling of the Covid-19 pandemic. Health Policy and Planning, 38(5): 593-608. https://doi.org/10.1093/heapol/czad016
[50] Chabba, M., Bhat, M.G., Sarmiento, J.P. (2022). Risk-based benefit-cost analysis of ecosystem-based disaster risk reduction with considerations of co-benefits, equity, and sustainability. Ecological Economics, 198: 107462. https://doi.org/10.1016/j.ecolecon.2022.107462
[51] De Silva, A., Amaratunga, D., Haigh, R. (2022). Green and blue infrastructure as nature-based better preparedness solutions for disaster risk reduction: Key policy aspects. Sustainability, 14(23): 16155. https://doi.org/10.3390/su142316155
[52] Fischer, F., Miller, G.J., Sidney, M.S. (2017). Handbook of Public Policy Analysis: Theory, Politics and Methods. Routledge.
[53] Lexy, J.M. (2011). Qualitative Research Methods. Bandung: Rosda Karya.
[54] Sarosa, S. (2017). Qualitative Research: The Basics. PT. Indeks, Jakarta. https://openlibrary.telkomuniversity.ac.id/pustaka/141657/penelitian-kualitatif-dasar-dasar-edisi-2.html.
[55] Bandur, A. (2016). Qualitative research: Methodology, design, and data analysis techniques with NVIVO 11 Plus. Jakarta: Mitra Discourse Media.
[56] Walsh, M. (2003). Teaching qualitative analysis using QSR NVivo. The Qualitative Report, 8(2): 251-256. https://maaz.ihmc.us/rid=1GXNJDKX9-1VVYTHV-DGJ/nvivo.pdf.
[57] Seng, D.S.C. (2013). Tsunami resilience: Multi-level institutional arrangements, architectures and system of governance for disaster risk preparedness in Indonesia. Environmental science & policy, 29: 57-70. https://doi.org/10.1016/j.envsci.2012.12.009
[58] Eisele, S.D. (2023). Accountability in disaster governance. In International Handbook of Disaster Research, pp. 1-13. https://doi.org/10.1007/978-981-16-8800-3_2-1
[59] Hidayati, Z., Noviana, M. (2018). Non-structural measures for landslide (creeping type) in Selili Hill Samarinda. AIP Conference Proceedings, 1977(1): 040006. https://doi.org/10.1063/1.5042976
[60] Wikantiyoso, R. (2010). Disaster mitigation in urban areas; adaptation or anticipation of urban planning and design? (Potential of local wisdom in urban planning and design for disaster mitigation efforts). Local Wisdom: Jurnal Ilmiah Kajian Kearifan Lokal, 2(1): 18-29. https://doi.org/10.26905/lw.v2i1.1368