

## Adaptive Governance Frameworks for Disaster Risk Reduction in Coastal Ternate

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### ABSTRACT

**Purpose:** This take a look at examines the position of adaptive governance frameworks in catastrophe chance reduction efforts in coastal Ternate and the village of Pangkalan Jati in Sumatra, Indonesia.

**Subjects and Methods:** Through a combined-methods technique integrating qualitative interviews and quantitative surveys, the study explores the effectiveness of governance systems and their effect on network resilience. Descriptive records reveal demographic characteristics, perceptions of governance effectiveness, and stages of catastrophe preparedness among individuals. Inferential analyses, which includes paired-samples *t*-checks, regression analyses, ANCOVA, and Pearson correlational analyses, elucidate the relationships between governance effectiveness, socio-economic elements, and disaster preparedness rankings.

**Results:** The findings underscore the significance of transparency, network engagement, adaptability, income, and education level in selling catastrophe resilience.

**Conclusions:** Ultimately, implementing adaptive governance frameworks that foster collaboration and inclusivity is essential for mitigating catastrophe risks and building sustainable groups in coastal regions.

### INTRODUCTION

Coastal areas international face escalating demanding situations due to the impacts of climate trade, environmental degradation, and the growing frequency of natural disasters (Scheffran & Battaglini, 2011). Among those prone regions is Ternate, an island metropolis in Indonesia, located within the coronary heart of the Coral Triangle. Ternate, with its wealthy biodiversity and coastal groups, is particularly liable to the negative effects of weather alternate and faces a heightened danger of failures inclusive of typhoons, floods, and tsunamis. In light of these demanding situations, the vital for effective governance mechanisms that may adapt to the dynamic nature of environmental changes and reduce catastrophe dangers turns into paramount (Camacho, 2009).

Adaptive governance, a conceptual framework that emphasizes flexibility, collaboration, and getting to know in decision-making strategies, is gaining reputation as a critical method to deal with the complexity of environmental control (Renn, 2020; Shao et al., 2020). This paper makes a speciality of exploring adaptive governance frameworks specially tailor-made for catastrophe hazard discount in the coastal context of Ternate, as well as within the village of Pangkalan Jati in Sumatra. The intention is to expand techniques that now not only mitigate the effect of screw ups however additionally beautify the resilience of the nearby communities and ecosystems (Ramezani & Camarinha-Matos, 2020).

Ternate's vulnerability to weather-associated failures has been exacerbated in recent years. Rising sea levels, excessive climate activities, and the degradation of coastal ecosystems have heightened the city's susceptibility to failures (Najafi et al., 2021; Youssef et al., 2021). In reaction to those demanding situations, it's miles imperative to rethink existing governance structures and regulations to ensure they're adaptable and attentive to the evolving environmental context (Woods et al., 2020). This aligns with the principles of adaptive governance, which advocates for iterative selection-making, collaboration, and the mixing of various understanding structures (Menéndez-Pedriza et al., 2023).

To contextualize the want for adaptive governance in Ternate and Pangkalan Jati, it is critical to recognize the specific socio-ecological traits of the areas. Ternate's coastal communities closely depend on marine assets for their livelihoods, and any disruption due to environmental screw ups at once affects their properly-being (Boston, 2023; Puli & Sagi, 2022). Additionally, the cultural and ancient importance of Ternate in addition accentuates the urgency of maintaining its herbal surroundings (Carey, 2021; Singh, 2022). Similarly, Pangkalan Jati, nestled alongside Sumatra's coastline, faces similar demanding situations of weather change impacts, emphasizing the broader necessity for adaptive governance beyond Ternate.

Recent research spotlight the inadequacy of traditional governance systems in addressing the complexity of environmental demanding situations. For example, studies by Zhaohong (2022) emphasizes the restrictions of top-down control tactics in fostering resilience, advocating for more adaptive and decentralized strategies. Similarly, the work of Olutola (2023) underscores the significance of adaptive co-control, in which neighborhood groups actively take part in choice-making techniques, acknowledging the importance of local expertise.

In the precise context of catastrophe risk discount, the Sendai Framework for Disaster Risk Reduction 2015-2030 emphasizes the significance of governance in managing disaster hazard (Osorio Piñeros, 2020; Mendes et al., 2021). It calls for the combination of danger reduction into rules, plans, and packages and highlights the want for a people-centered and multi-hazard technique. This aligns with the adaptive governance framework, which emphasizes the importance of network participation and a holistic information of dangers (Brass & Sowell, 2021).

The urgency of enforcing adaptive governance in Ternate and Pangkalan Jati is further underscored by the worldwide discourse on sustainable development. The United Nations Sustainable Development Goals (SDGs) spotlight the interconnectedness of environmental, social, and financial dimensions and strain the want for inclusive and sustainable governance (Shulla et al., 2021). An adaptive governance framework for Ternate and Pangkalan Jati aligns with those international aspirations, imparting a localized and context-particular pathway to gain the SDGs.

## **METHODOLOGY**

The have a look at hired a blended-techniques technique to analyze the effectiveness of adaptive governance frameworks for disaster risk discount in coastal Ternate and the village of Pangkalan Jati in Sumatra. Purposive sampling became used to select contributors for qualitative interviews with key informants and quantitative surveys dispensed among families. Semi-structured interviews and based questionnaires served as instruments for facts collection, with pilot trying out carried out to make certain clarity and relevance. Content and construct validity had been mounted for the questionnaire through expert session and component analysis. Descriptive statistics summarized sample characteristics, while inferential records which includes t-tests, regression analysis, and ANOVA had been employed to test hypotheses concerning governance effectiveness and disaster preparedness. Additionally, correlation evaluation explored relationships between adaptive governance variables and community resilience. Ethical concerns, which includes acquiring informed consent and making sure confidentiality, have been prioritized all through the take a look at. Overall, the blended-methods technique furnished complete insights into adaptive governance's role in catastrophe threat discount, imparting treasured implications for coverage and practice in environmental governance and catastrophe management.

## **RESULTS AND DISCUSSION**

Before discussing the analysis results further, it is important to provide a general overview of the demographic characteristics of the respondents in this study. Table 1 below presents the demographic characteristics of respondents by gender, age, and education level from the two different locations, providing initial insight into the backgrounds of the respondents involved in this study.

Table 1. Summary of Demographic Characteristics

Variable	Ternate (n=150)	Pangkalan Jati (n=120)
Gender (Male)	75	60
Gender (Female)	75	60
Age (years)	Mean: 35.2 SD: 8.4	Mean: 42.6 SD: 10.1
Education Level		
High School	45	30
College	65	50
Graduate	40	40

The demographic characteristics of the participants in both Ternate and Pangkalan Jati reveal a balanced distribution in terms of gender, with an equal number of males and females in both locations. The age distribution in Ternate is relatively homogeneous, while Pangkalan Jati shows a wider variation in age, with participants tending to be slightly older on average. Regarding educational background, the majority of participants in both areas have completed some level of higher education, with similar proportions of high school graduates, college attendees, and graduate-level participants. These demographic insights provide a foundational understanding of the participant pool and help contextualize the study's findings.

Table 2. Perception of Governance Effectiveness

Variable	Mean Score (Ternate)	Mean Score (Pangkalan Jati)
Governance Structure	4.2	3.8
Community Engagement	4.5	3.6
Policy Flexibility	4.3	3.9

The perceptions of governance effectiveness in Ternate and Pangkalan Jati show notable differences. In Ternate, participants viewed the governance structure and community engagement positively, indicating a strong sense of confidence in these areas. However, there was some room for improvement in policy flexibility, though it was still rated relatively well. In contrast, perceptions in Pangkalan Jati were generally lower, with less favorable views on governance structure, community engagement, and policy flexibility. These findings suggest that adaptive governance frameworks may be more effective in Ternate, but improvements are needed in Pangkalan Jati to align governance practices with the expectations and needs of the community.

Table 3. Paired-Samples t-test for Pre- and Post-Intervention Disaster Preparedness Scores

Variable	Pre-Intervention	Post-Intervention	Difference (Post-Pre)	t-value	p-value
Disaster Preparedness Score	70%	80%	+10%	3.21	0.004

The results of the paired-samples t-test indicate a significant improvement in disaster preparedness scores following the intervention. Participants reported a notable increase in their preparedness levels after the intervention, with the difference in scores being statistically significant. This suggests that the intervention effectively enhanced participants' disaster preparedness. The statistical significance further supports the conclusion that the intervention had a meaningful impact on improving the participants' ability to respond to disasters, reinforcing the importance of such programs in enhancing disaster readiness.

Table 4. Regression Analysis Results for Factors Affecting Disaster Preparedness Scores

Predictor Variable	Coefficient (β)	Standard Error	t-value	p-value
Transparency and Accountability	0.25	0.08	3.12	0.003

Community Engagement	0.18	0.05	3.60	0.001
Adaptability to Environmental Changes	0.12	0.06	2.05	0.042
Income	0.05	0.02	2.20	0.031
Education Level (Master's)	0.30	0.12	2.50	0.015
Constant	65.2	5.0	13.04	<0.001

The regression analysis identifies key factors influencing disaster preparedness scores, including transparency and accountability, community engagement, adaptability to environmental changes, income, and education level. Higher levels of transparency, community involvement, and adaptability are associated with better disaster preparedness, as are higher income and possessing a Master's degree. The overall model is statistically significant, indicating that these variables collectively explain a substantial portion of the variance in preparedness scores. This highlights the importance of not only economic and educational factors but also the role of governance and community engagement in building disaster resilience.

Table 5. ANCOVA Results for the Effect of Governance Effectiveness on Disaster Preparedness Scores, Controlling for Income

Source	Sum of Squares	df	Mean Square	F-value	p-value
Between-Groups (Governance)	145.23	2	72.62	4.12	0.018
Covariate (Income)	12.45	1	12.45	0.71	0.402
Residual	320.78	96	3.34		
Total	478.46	99			

The ANCOVA results show that governance effectiveness has a significant impact on disaster preparedness scores, with participants in groups reflecting different levels of governance effectiveness showing notable variations in preparedness. This suggests that the effectiveness of governance plays a crucial role in enhancing disaster readiness among participants. However, when controlling for income as a covariate, the analysis reveals that income does not significantly influence disaster preparedness scores, indicating that the variations in preparedness are primarily driven by governance effectiveness rather than income differences. These findings emphasize the importance of strong governance in improving disaster preparedness, regardless of participants' income levels.

Table 6. Pearson Correlation Analysis Results for Relationships between Variables

Variable 1	Variable 2	Pearson Correlation	p-value
Transparency and Accountability	Disaster Preparedness Score	0.45	<0.001
Community Engagement	Disaster Preparedness Score	0.38	0.002
Adaptability to Environmental Changes	Disaster Preparedness Score	0.28	0.021
Income	Disaster Preparedness Score	0.20	0.085
Education Level (Master's)	Disaster Preparedness Score	0.32	0.008

The Pearson correlation analysis reveals several important relationships between key variables and disaster preparedness scores. Transparency and accountability show a relatively strong positive correlation, indicating that higher levels of transparency and accountability are linked to better preparedness. Community engagement also demonstrates a positive relationship, suggesting that more active involvement in the community correlates with higher preparedness levels. Adaptability to environmental changes is moderately correlated with disaster preparedness, highlighting the importance of flexibility in responding to environmental challenges. While income shows a weak positive correlation with preparedness, it is not statistically significant at the conventional level. Education level, particularly having a Master's degree, is positively correlated with disaster preparedness, suggesting that individuals with higher educational attainment are more likely to be better prepared. These findings underline the

importance of transparency, community engagement, adaptability, and education in enhancing disaster preparedness.

## Discussion

The results of this study provide in-depth insights into the factors influencing the level of disaster preparedness among communities. One key finding worth noting is the role of transparency and accountability in improving disaster preparedness (Liswanty & Prabowo, 2021; Koliba et al., 2011). Regression analysis results indicate that higher levels of transparency and accountability are significantly associated with improved disaster preparedness scores. This suggests that when governments or disaster management institutions demonstrate transparency in their decision-making processes and accountability in policy implementation, communities tend to be better prepared for disasters. Therefore, increasing transparency and accountability is a crucial factor in enhancing the effectiveness of disaster management systems. Correlation analysis indicates a significant relationship between community engagement and disaster preparedness scores. Higher community engagement is associated with better preparedness, highlighting the importance of active participation in disaster mitigation efforts. Communities directly involved in the planning and implementation of disaster mitigation activities tend to have better knowledge and skills in dealing with potential disasters. Therefore, increasing community awareness and empowerment through programs that encourage community involvement in disaster risk management can significantly improve their preparedness. This finding suggests that while income can play a role in facilitating preparedness through better access to resources, factors such as government transparency and community engagement are more dominant in determining the level of community preparedness. This suggests that policy interventions that focus on improving social and institutional factors, such as increasing community engagement and the effectiveness of governance factors, have a greater impact on improving disaster preparedness than relying solely on economic factors.

## CONCLUSION

From the findings revealed in this take a look at, it can be concluded that the software of an adaptive governance framework has an vital function in improving disaster danger reduction efforts, specially in the coastal areas of Ternate and Pangkalan Jati village in Sumatra. Through a blended technique that consists of qualitative interviews and quantitative surveys, numerous key insights have emerged. Findings display that transparency, network involvement, and flexibility to environmental modifications are key elements that are undoubtedly associated with disaster preparedness scores. Additionally, the regression technique and Pearson correlation analysis underscore the importance of profits and schooling stage in predicting disaster preparedness, while ANCOVA analysis indicates a great impact of governance effectiveness on disaster preparedness rankings. Thus, implementing an adaptive governance framework that promotes transparency, inclusiveness and collaboration is anticipated to mitigate disaster dangers and build more resilient and sustainable groups in Ternate, Pangkalan Jati and some other place.

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