

Paper:

# Assessing the Intermediate Function of Local Academic Institutions During the Rehabilitation and Reconstruction of Aceh, Indonesia

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There is great scholarly and practical interest in local academic institutions' potential contributions to community rehabilitation and reconstruction in the wake of disasters. Using survey data, this study seeks to quantitatively verify the intermediate function of local academic institutions in building mutual understanding and consensus between local residents and external actors during disaster recovery efforts. The survey measured Indonesians' perceptions of disaster relief efforts following the Sumatran earthquake and Indian Ocean tsunami of 2004. It was conducted by Syiah Kuala University Aceh, Indonesia, between July and October 2020. The authors applied parametric methods to analyze the data, including regression analysis, factor analysis, and structural equation modeling (SEM). The analysis results reveal a relationship between the intermediate function of local academic institutions, and residents' overall satisfaction with disaster recovery efforts. The findings suggest that the institutions' expected intermediate functions may be influenced by regional factors, and that future policymakers should consider regional characteristics to improve the efficacy of local disaster response and recovery efforts.

**Keywords:** Aceh, intermediate function, quantitative approach, Indonesia, disaster response and recovery

## 1. Introduction

On December 26, 2004, the Sumatra earthquake and Indian Ocean tsunami caused unprecedented damage to the Indonesian province of Aceh. According to a report by the Indonesian government, a total of 126,741 people died, and another 93,285 people were reported missing [1]. The report also estimates that about 500,000 people lost their homes, and 750,000 people lost their livelihoods [1]. In the aftermath of this catastrophe, the In-

donesian government established a reconstruction agency, the Badan Rehabilitasi dan Rekonstruksi (BRR), on April 16, 2005. The BRR was tasked with coordinating community-driven reconstruction programs, and had a staff of nearly 1,600 at its peak [1]. Disaster response and recovery efforts were also assisted by United Nations (UN) agencies, national donors, and international non-governmental organizations (NGOs). Local academic institutions like the Syiah Kuala University (SKU) also participated actively in reconstruction efforts, such as the "Syiah Kuala University for Aceh Reconstruction" initiative in 2005, as well as facilitating interactions between the Indonesian government and local communities during reconstruction efforts. SKU also established the Tsunami and Disaster Mitigation Research Center (TDMRC), an organization dedicated to promoting research on disaster risk reduction (DRR) [2]. SKU's actions greatly aided local disaster recovery efforts.

DRR research has blossomed into a field of international study and significance in recent years. Important trends have emerged in the field in recent years. For example, the field is heavily influenced by 187 UN member states' adoption of the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR). The framework was adopted during the Third United Nations World Conference on Disaster Risk Reduction held in Sendai, Japan, in March 2015 [3]. The SFDRR makes understanding disaster risk a top priority, and sets global targets for increasing the availability of DRR. It also emphasizes enhancing DRR education to preserve the memory of disasters. Moreover, the SFDRR birthed a new approach to DRR based in quantitative analysis [4–11]. The SFDRR's practical bent has also increased scholarly interest in local academic institutions' potential role in local disaster response and recovery efforts. Although some studies have examined coordination among stakeholders in disaster recovery in Indonesia [12–14], few have utilized quantitative analysis.

This study seeks to quantitatively verify and clarify the intermediate function of local academic institutions in



building mutual understanding and consensus between local residents and external actors during disaster recovery efforts. It uses survey data regarding disaster relief efforts following the 2004 Sumatran earthquake. It contributes to the literature by reporting the fruit of international collaboration between Indonesian and Japanese researchers, and by providing quantitative analysis of the intermediate functions local academic institutions might play during disaster recovery efforts. The study results were initially presented at the 31st Annual Conference of the Japan Society for International Development in Japanese, and expanded into this paper for a more general readership [15].

## 2. Materials and Methods

This study is based on survey data. The survey was conducted by SKU between July and October 2020 [16]. The survey was largely carried out via telephone in Bahasa, Indonesia. The authors targeted 200 people for the survey. Nearly half of the survey targets were local residents, while one-sixth were government officials, university staff, and staff of NGOs or non-profit organizations (NPOs). The main questions asked respondents' overall satisfaction with the disaster recovery efforts following the 2004 Sumatra earthquake and Indian Ocean tsunami, and their perceptions of different actors' (government agencies, donors, etc.) contributions using a 5-point Likert scale. A total of 108 people responded to our calls, so the survey response rate was 54.0%. The area covered by the survey is shown in **Fig. 1** below.

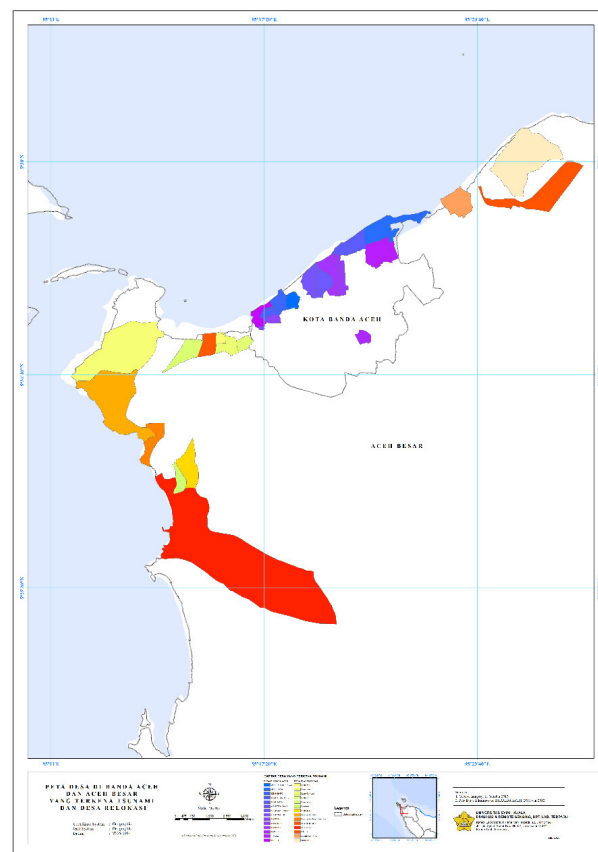
This study analyzed the survey data described above using parametric methods such as regression analysis, factor analysis, and structural equation modeling (SEM). The authors used IBM's SPSS Statistics 25 and Amos 25 software for the analysis, and R software for the regression diagnosis.

## 3. Results

### 3.1. Simple Aggregate Results

**Figure 2** displays the educational backgrounds of the survey respondents. The blue color represents respondents who graduated from a vocational school or junior college without a four-year degree (two respondents, or about 2% of the sample). The red color represents respondents who had a four-year college degree (23, 21%); the green color represents respondents who had a graduate degree (48, 44%); and the orange color represents respondents who had a doctoral degree (35, 32%). Most of this study's respondents were highly educated – over two-thirds of them had a graduate or doctoral degree.

**Figure 3** shows respondents' perceptions of the damage caused by the 2004 Sumatra earthquake and Indian Ocean tsunami on a Likert-type scale from 1 (*very slight*) to 5 (*very heavy*). Twenty respondents (19% of the sample) answered 5, and 12 (11%) answered 4. Therefore,

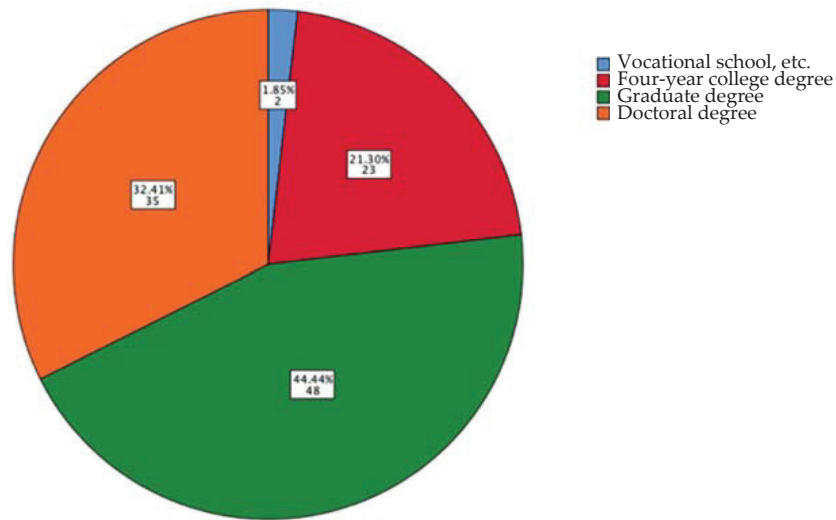


**Fig. 1.** Survey area (source: SKU).

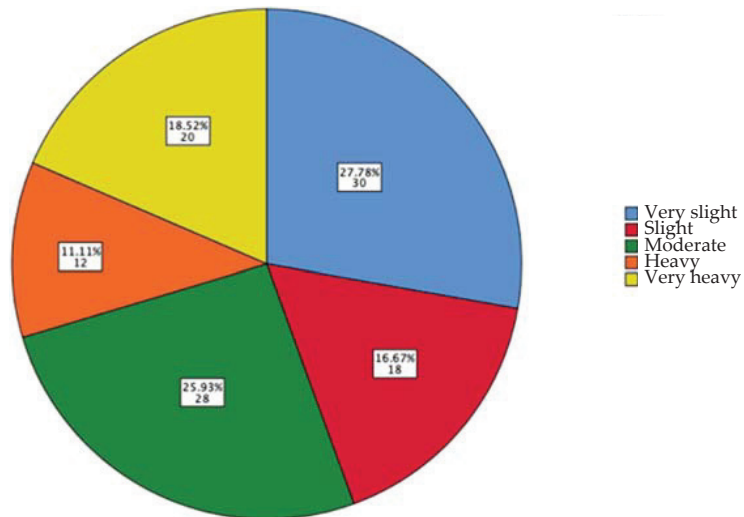
about 30% of all respondents were severely affected by the 2004 earthquake and subsequent tsunami. On the other hand, 30 respondents (28%) answered 1, and 18 (17%) answered 2, so nearly half of the survey respondents were only marginally affected.

**Figure 4** shows respondents' overall level of satisfaction with disaster recovery efforts relating to the 2004 earthquake. In English, the relevant survey question translates to: "On the whole, I am satisfied with the rehabilitation and reconstruction after the 2004 Indian Ocean tsunami." Respondents answered on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*), with 3 = *neutral*. Fifty-six (52%) respondents answered 4 (*agree*). The mean response to this question was 3.72, and the standard deviation was 0.884. This indicates that most respondents were generally satisfied with the disaster recovery efforts following the Sumatran earthquake of 2004.

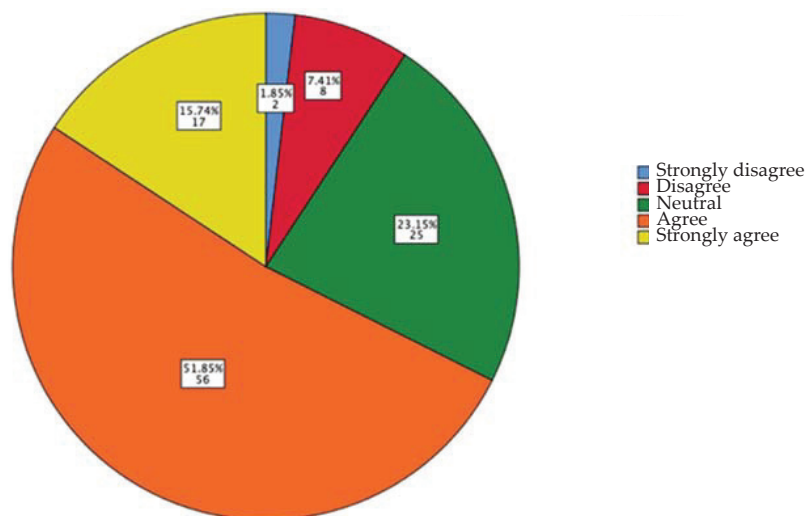
**Figure 5** shows respondents' evaluation of local academic institutions' daily work performance in Aceh. Fifty-one respondents, or almost half of our total respondents, answered agree on the scale of 1–5. This shows that most of the respondents evaluated the daily work performance of local academic institutions in Aceh rather highly.



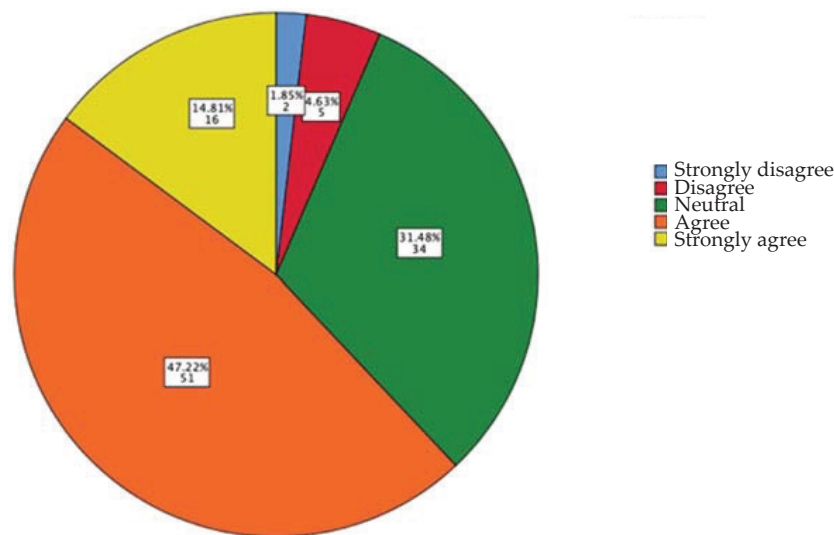
**Fig. 2.** Respondents' education level.



**Fig. 3.** Respondents' perceptions of damage caused by the Sumatran earthquake of 2004.



**Fig. 4.** Respondents' overall satisfaction with disaster recovery efforts relating to the Sumatran earthquake of 2004.



**Fig. 5.** Respondents' evaluation of local academic institutions' daily work performance.

**Table 1.** Results of regression analysis.

	<i>B</i>	(SE)	VIF
(Constant)	.770 <sup>†</sup>	(.447)	
BRR	.480**	(.100)	1.070
Local academic institutions	.276**	(.084)	1.070
<i>N</i>		108	
Adjusted <i>R</i> <sup>2</sup>		.286	

\*\**p* < .01, <sup>†</sup>*p* < .1

### 3.2. Regression Analysis

**Table 1** shows the results of the regression analysis. This analysis used respondents' overall satisfaction with disaster recovery as the dependent variable, and respondents' perception of the intermediate functions of each actor (the BRR, local governments, bilateral and multilateral international aid agencies, NGOs, UN agencies, local academic institutions, and local communities) as independent variables. The authors adopted the model with a larger adjusted *R*<sup>2</sup> of the two models obtained by the stepwise method. The adjusted *R*<sup>2</sup> of the adopted model was 0.286, and that of the other model was 0.220.

The Variance Inflation Factors (VIFs) were all less than 10.0, and there was no problem with multicollinearity. The residuals are shown in **Fig. 6**. The upper-left plot depicts residuals against fitted values, and the lower left plot depicts the square root of the absolute value of standardized residuals against fitted values. A few outliers can be observed in the small areas of the predictions; however, the assumption of linearity and homogeneity of variance does not appear to be a problem. In addition, the Q-Q plot on the upper right shows that the observed data are almost aligned in a straight line. Therefore, there is no problem with normality in our analysis. These results led the authors to assume that the preconditions for the regression analysis had been satisfied.

The results of the regression analysis indicate that there is a significant relationship between respondents' overall satisfaction with disaster recovery efforts, and their perceptions of the intermediate function played by the BRR and local academic institutions. The partial regression coefficients for respondents' perception of the intermediate function played by BRR and local academic institutions are 0.480 and 0.276, respectively. Both of these are at a 1% level of significance.

### 3.3. Factor Analysis

The authors conducted a factor analysis to explore common factors in the respondents' expectations of each actor's intermediate function. The factor analysis was based on the maximum likelihood method and Promax rotation. **Table 2** shows the factor pattern after the Promax rotation. As this factor analysis was conducted with an exploratory aim, the authors interpreted the factors in such a way that they could be well characterized based on the factor loadings shown in **Table 2**.

Regarding the first factor, high factor loadings were found for international aid agencies (both bilateral and multilateral), NGOs, and UN agencies. These are so-called external actors who are internationally active. Therefore, the first factor is related to "internationality." For the second factor, local academic institutions and local communities had high factor loadings. Since all of these actors are rooted in the local community, the second factor is related to "regionality." With regard to the sum of the explained variances, the initial eigenvalues were 3.868, 1.303, and 0.95 for the first three factors. According to the Kaiser–Guttman criterion of adopting factors with eigenvalues greater than 1 in determining the number of factors, we adopted two factors. In addition, considering a scree plot in which the eigenvalues are plotted, the authors concluded that a two-factor structure is appropriate for the analysis.

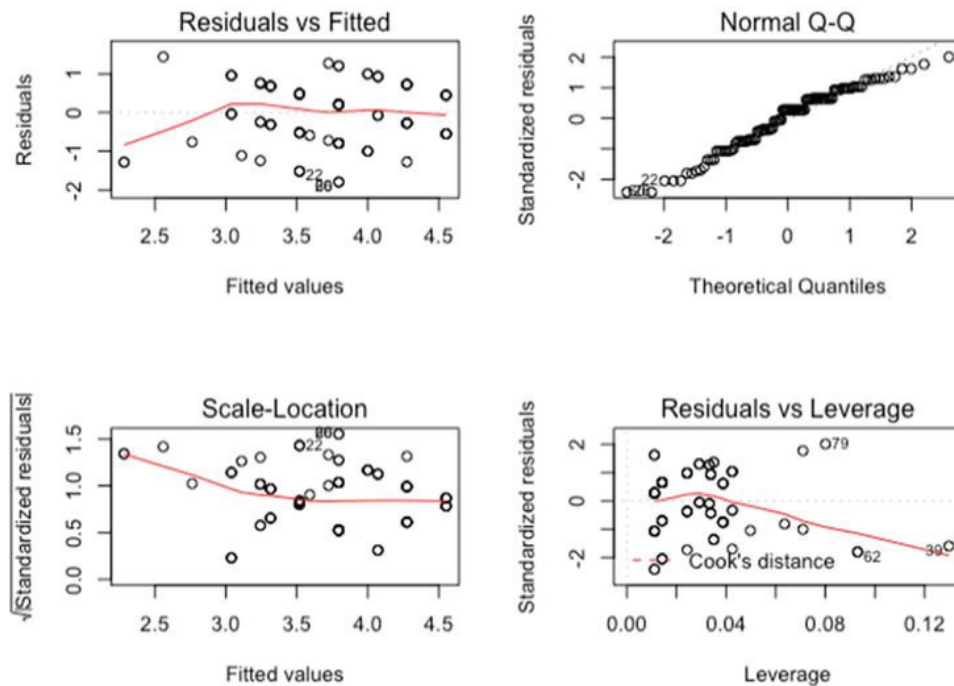


Fig. 6. Regression diagnosis.

Table 2. Factor pattern after Promax rotation.

	Factor	
	1	2
Indonesian government agencies	0.019	0.315
Local government agencies	0.267	0.163
Bilateral donors	<b>0.874</b>	0.017
Multilateral donors	<b>1.064</b>	-0.169
NGOs	<b>0.782</b>	0.074
UN agencies	<b>0.592</b>	0.273
Local academic institutions	0.106	<b>0.630</b>
Local communities	-0.052	<b>0.819</b>
Inter-factor correlation	1	2
1	-	0.490
2	0.490	-

Thus, the two extracted factors are those related to “internationality” and “regionality.” Since the inter-factor correlation was 0.49, a certain degree of correlation was found between these factors. Incidentally, the Kaiser–Meyer–Olkin measure of sample adequacy is 0.805, and the result of Bartlett’s sphericity test is also significant; therefore, the authors considered the preconditions for the factor analysis to be satisfied.

Figure 7 shows a factor plot in factor space after the rotation. The horizontal axis represents factor 1 (“internationality”), and the vertical axis represents factor 2 (“regionality”). International aid agencies (both bilateral and multilateral), NGOs, and UN agencies are plotted on the lower right, while local academic institutions and local communities are plotted on the upper left, showing similar factor loadings.

Based on the results of the factor analysis, we infer that, unlike international aid agencies and NGOs, local academic institutions are expected to perform an intermediate function by coordinating other actors’ responses to disasters. They can do this by utilizing local networks with an emphasis on local characteristics.

### 3.4. Structural Equation Modeling

SEM has been widely used in the social sciences to explore causal relationships among variables. Several previous DRR studies have applied SEM [7, 11]. According to [17], latent variables can be measured indirectly, mostly with the use of a set of observable variables, and observation of the causal effects in SEM. In statistics, latent variables refer to variables that are not directly observed, but are inferred from other observed variables. Providing a brief overview of SEM, the authors of [17] developed their understanding of SEM’s status as a respected methodology in social sciences. They also consulted the literature for detailed discussions of SEM [18–22]. Based on the above results, we conducted SEM to verify our confirmatory factor analysis. In other words, we reorganized the relationship between our two factors (“internationality” and “regionality”) and each observed variable using a path diagram. We also examined the relationship between respondents’ overall level of satisfaction with disaster recovery efforts and the factor “regionality” related to local academic institutions, considering the results of the regression analysis.

The SEM results are shown in Fig. 8. The path diagram depicts the observed variables (survey responses) as squares, and the latent variables (factors) as circles. In addition, each observed variable had its own residuals.



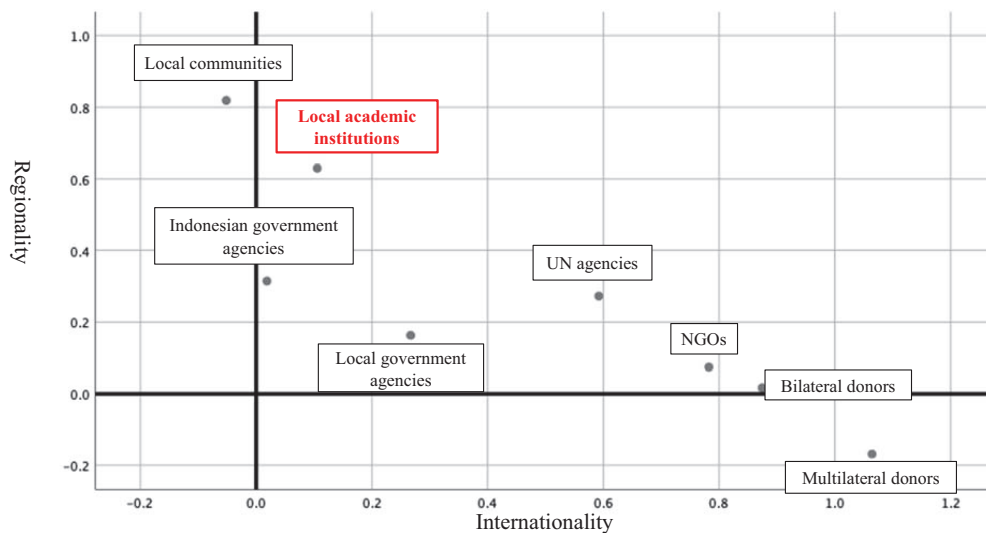


Fig. 7. Factor plot.

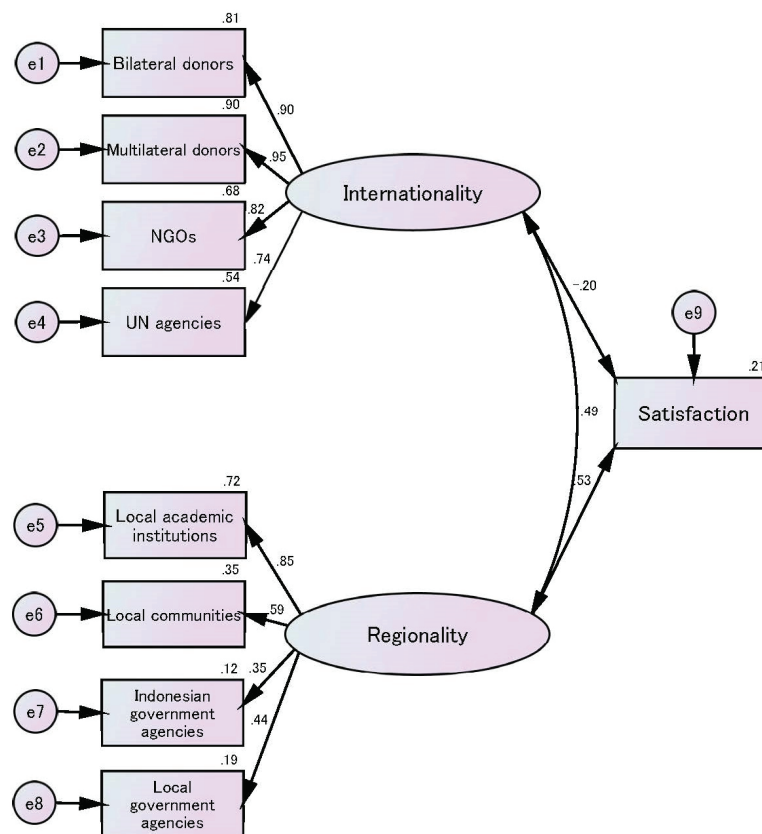


Fig. 8. Path diagram.

**Fig. 8** shows that bilateral donors, multilateral donors, NGOs, and UN agencies are related to the “internationality” factor, and local academic institutions, local communities, Indonesian government agencies, and local government agencies are related to the “regionality” factor.

The inter-factor correlation (or the correlation coefficient between “internationality” and “regionality”) is 0.49. This value is consistent with the results of the factor

analysis described above. The path coefficients from “internationality” and “regionality” to the overall level of satisfaction with disaster recovery were  $-0.20$  and  $0.53$ , respectively. The path coefficients were all significant at the 1% level, with one exception: The path coefficient from “internationality” to respondents’ overall level of satisfaction with the disaster recovery efforts was both negative and significant at the 10% level. This result confirms that

there is a certain relationship between “regionality” and respondents’ overall level of satisfaction with disaster recovery efforts. The path diagram also shows that local academic institutions are closely associated with “regionality.” Thus, the SEM results support the results of the regression analysis described above.

The fitness of the model is as follows. The goodness of fit index (GFI), root mean square error of approximation (RMSEA), and comparative fit index (CFI) were 0.910, 0.092, and 0.947, respectively. We found that there were no serious problems with the fitness of the model.

## 4. Conclusions

This study examined local academic institutions’ intermediate functions during disaster recovery efforts following the 2004 Sumatra earthquake and Indian Ocean tsunami, finding a certain relationship between local academic institutions’ intermediate function, and survey respondents’ overall satisfaction with disaster recovery efforts. Its findings suggest that local academic institutions in Aceh effectively acted as a bridge between local residents and external actors in 2005 and beyond, and that their work in fostering mutual understanding between local residents and external actors was key to effective disaster recovery.

This study contributes to the literature by quantitatively confirming the significance of the intermediate function, which has so far been discussed qualitatively in the literature. It also contributes to the realization of evidence-based policy making by providing quantitative evidence. Due to the importance of “regionality” in local academic institutions’ intermediate function in disaster recovery efforts, we recommend that policy-makers assess and consider regional characteristics when designing policies to prevent and counteract the impacts of disasters in the future. Future researchers could build on this study by further analyzing the details of inter-factor correlations, and conducting similar research in and beyond the Indonesian context.

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## References

- [1] Executing Agency of Rehabilitation and Reconstruction for Aceh and Nias (BRR), BRR Book Series, Banda Aceh, Indonesia, 2009.
- [2] Tsunami and Disaster Mitigation Research Center (TDMRC) (n.d.), About-Tsunami and Disaster Mitigation Research Center (TDMRC), <http://tdmrc.unsyiah.ac.id/about/> [accessed January 28, 2021]
- [3] United Nations Office for Disaster Risk Reduction (UNISDR), “Sendai Framework for Disaster Risk Reduction 2015–2030,” 2015.
- [4] D. Sasaki, K. Moriyama, and Y. Ono, “Main features of the existing literature concerning disaster statistics,” *Int. J. of Disaster Risk Reduction*, Vol.43, Article No.101382, doi: 10.1016/j.ijdrr.2019.101382, 2020.
- [5] D. Sasaki, “Analysis of the Attitude Within Asia-Pacific Countries Towards Disaster Risk Reduction: Text Mining of the Official Statements of 2018 Asian Ministerial Conference on Disaster Risk Reduction,” *J. Disaster Res.*, Vol.14, No.8, pp. 1024–1029, doi: 10.20965/jdr.2019.p1024, 2019.
- [6] D. Sasaki and Y. Ono, “Overview of the Special Issue on the Development of Disaster Statistics Part 2,” *J. Disaster Res.*, Vol.14, No.8, pp. 1010–1013, doi: 10.20965/jdr.2019.p1010, 2019.
- [7] D. Sasaki, I. Taafaki, T. Uakeia, J. Seru, Y. McKay, and H. Lajar, “Influence of Religion, Culture and Education on Perception of Climate Change and its Implications: Applying Structural Equation Modeling (SEM),” *J. Disaster Res.*, Vol.14, No.9, pp. 1303–1308, doi: 10.20965/jdr.2019.p1303, 2019.
- [8] S. Egawa, Y. Jibiki, D. Sasaki, Y. Ono, Y. Nakamura, T. Suda, and H. Sasaki, “The Correlation Between Life Expectancy and Disaster Risk,” *J. Disaster Res.*, Vol.13, No.6, pp. 1049–1061, doi: 10.20965/jdr.2018.p1049, 2018.
- [9] K. Moriyama, D. Sasaki, and Y. Ono, “Comparison of Global Databases for Disaster Loss and Damage Data,” *J. Disaster Res.*, Vol.13, No.6, pp. 1007–1014, doi: 10.20965/jdr.2018.p1007, 2018.
- [10] D. Sasaki and Y. Ono, “Overview of the Special Issue on the Development of Disaster Statistics,” *J. Disaster Res.*, Vol.13, No.6, pp. 1002–1006, doi: 10.20965/jdr.2018.p1002, 2018.
- [11] D. Sasaki, K. Moriyama, and Y. Ono, “Hidden Common Factors in Disaster Loss Statistics: A Case Study Analyzing the Data of Nepal,” *J. Disaster Res.*, Vol.13, No.6, pp. 1032–1038, doi: 10.20965/jdr.2018.p1032, 2018.
- [12] Asia Pacific Institute of Research (APIR), “Report of the Comprehensive Policy Research on Disaster Recovery Study Group (FY2016),” 2017 (in Japanese).
- [13] M. Affan, S. Koshimura, F. Imamura, H. Sofyan, S. Agustina, N. Nizamuddin, and N. Fadli, “Lessons Learned from Two Villages in the Tsunami Most Affected Area of Banda Aceh City: A Review of the Housing Reconstruction and the Current State of Village Development,” V. Santiago-Fandiño, Y. A. Kontar, and Y. Kaneda (Eds.), “Post-Tsunami Hazard,” pp. 59–72, Springer, doi: 10.1007/978-3-319-10202-3\_5, 2015.
- [14] R. I. Syamsidik, S. Arief, K. Munadi, and E. Melianda, “Disaster risk reduction policies and regulations in Aceh after the 2004 Indian Ocean Tsunami,” *IOP Conference Series: Earth And Environmental Science*, 10th Aceh Int. Workshop and Expo on Sustainable Tsunami Disaster Recovery (AIWEST-DR 2016), Vol.56, doi: 10.1088/1755-1315/56/1/012022, 2017.
- [15] D. Sasaki, “Intermediate Function of Local Academic Institutions at the Time of Rehabilitation and Reconstruction in Aceh,” *Digests of the 31st Japan Society for Int. Development Annual Conf.*, 2020.
- [16] Syiah Kuala University, “Brief Summary of the Survey Data Regarding Recovery After Tsunami in Aceh, Indonesia,” Syiah Kuala University, 2020.
- [17] P. Tarka, “An overview of structural equation modeling: Its beginnings, historical development, usefulness and controversies in the social sciences,” *Quality & Quantity*, Vol.52, No.1, pp. 313–354, doi: 10.1007/s11135-017-0469-8, 2018.
- [18] R. P. Bagozzi and Y. Yi, “Specification, evaluation, and interpretation of structural equation models,” *J. of The Academy of Marketing Science*, Vol.40, No.1, pp. 8–34, doi: 10.1007/s11747-011-0278-x, 2011.
- [19] J. Arbuckle, “Computer announcement Amos: Analysis of moment structures,” *Psychometrika*, Vol.59, No.1, pp. 135–137, doi: 10.1007/bf02294272, 1994.
- [20] K. A. Bollen and J. Scott Long, “Tests for Structural Equation Models,” *Sociological Methods & Research*, Vol.21, No.2, pp. 123–131, doi: 10.1177/004912419201002001, 1992.
- [21] S. Mulaik, L. James, J. Van Alstine, N. Bennett, S. Lind, and C. Stilwell, “Evaluation of goodness-of-fit indices for structural equation models,” *Psychological Bulletin*, Vol.105, No.3, pp. 430–445, doi: 10.1037/0033-2909.105.3.430, 1989.
- [22] J. Anderson and D. Gerbing, “Structural equation modeling in practice: A review and recommended two-step approach,” *Psychological Bulletin*, Vol.103, No.3, pp. 411–423, doi: 10.1037/0033-2909.103.3.411, 1988.



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- "Hidden Common Factors in Disaster Loss Statistics: A Case Study Analyzing the Data of Nepal," J. Disaster Res., Vol.13, No.6, pp. 1032-1038, 2018.
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- “Integrated model for earthquake risk assessment using neural network and analytic hierarchy process: Aceh Province, Indonesia,” Geoscience Frontiers, Vol.11, No.2, pp. 613-634, 2020.
- “Archaeological evidence that a late 14th-century tsunami devastated the coast of northern Sumatra and redirected history,” Proc. of the National Academy of Sciences of the United States of America, Vol.116, doi: 10.1073/pnas.1902241116 , 2019.

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