Decision Science Letters 11 (2022) 455–472

Contents lists available at GrowingScience

Decision Science Letters

homepage: www.GrowingScience.com/dsl

A hybrid multi-criteria decision-making and system dynamics approach in vulnerability analysis of TNI-POLRI power

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C H R O N I C L E

Article history:
Received February 12, 2022
Received in revised format:
June 18, 2022
Accepted June 24 2022
Available online
June 24, 2022

Keywords:
Vulnerability
Indonesia Armed Forces (TNI)
Indonesia Police (Polri)
TNI-Polri Relations
Analytical Hierarchy Process (AHP)
System Dynamics

A B S T R A C T

This study analyzes the vulnerability of the power relations between the Indonesian National Armed Forces and the Indonesian National Police (*TNI-Polri* power relations) post-1998 Reform. This article employed exploratory sequential mixed methods in answering the research problem. Analytical Hierarchy Process (AHP) and System Dynamics methods were utilized in the study. Based on the research results, the variables of Socio-Economic (SE) Vulnerability and Adaptive Capacity (AC) have the highest weight value of 0.329. Meanwhile, the variable of Institutional Vulnerability has the lowest weight, 0.142. Overall, the vulnerability value of *TNI-Polri* power relations post-1998 Reform was still in the Low Vulnerability category with a value of 1,699 (33.97%). The vulnerability value of *TNI-Polri* power relations in the next five years will increase from a score of 1.66 in 2022 to 1.74 in 2027 so that it will increase by 5% with the same category level, namely Low Vulnerability. This study is expected to strengthen *TNI-Polri* power relations in maintaining national political stability.

1. Introduction

Polri officers involve other agencies, including the Indonesian National Armed Forces (hereinafter referred to as *TNI*) (Widodo et al., 2022). The *TNI-Polri* synergy also occurs to secure riots or social conflicts at the grassroots. Specifically, the pursuit operation of the Santoso Group in Poso and the Separatist Armed Criminal Groups in Nduga, Papua, represents the support of *TNI* for the Indonesian National Police (Lubis, 2022). Apart from the positive impacts, there were also negative impacts on several occasions, such as frequent clashes between individuals of the two institutions in various regions in Indonesia. Not infrequently, these crashes result in serious injuries or death. Hence, changes in both positive and negative relations occurred during the reformation period as a consequence of the democratization of the Indonesian political system. The impact of democratization allows actors and organizations of the *TNI* and *Polri* to contest in the strategic space of the state and non-state, which has a security dimension or context with various strategies (Ubayanto et al., 2020).

Given the dynamics of new realities at the institutional and actor levels, this study explores the development of the network's role in social power sources, such as ideology, economy, military, and politics inherent in both institutions from the reformation to the current digitalization era. Based on these conditions, the *TNI-Polri* power relations are considered vulnerable to power vulnerabilities that can disrupt national political stability. How is the vulnerability analysis of *TNI-Polri* power relations post-1998 Reform? This study provides an analysis of the vulnerability of the power relations between the Indonesian National Armed Forces and the Indonesian National Police (*TNI-Polri* power relations) post-1998 Reform.

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doi: 10.5267/dsl.2022.6.004

This study must be conducted to provide input to relevant stakeholders in maintaining dynamic national stability between *TNI-Polri*.

This article employed exploratory sequential mixed methods in answering the research problem. The approach is carried out in three stages: first, this article identifies factors related to the vulnerability of the *TNI-Polri* power relations. Second, this article analyzes the weights of the related factors to assess the priority of the relations. Third, this article assesses the vulnerability of the *TNI-Polri* power relationship between post-1998 Reform. Analytical Hierarchy Process (AHP) and System Dynamics methods were utilized in the study. This study is expected to strengthen *TNI-Polri* power relations in maintaining national political stability. Second, this study is expected to provide an alternative relationship between civil society and the military to be used as a reference in policy-making for related stakeholders.

Several previous research become references in this manuscript, including Jiuhardi et al. (2021), explaining the role of the police and military in several countries to close their entire territory (lockdown), quarantine a limited area, and limit the movement of citizens during the COVID-19 pandemic. Diprose & Azca (2019) explained the role of the *TNI-Polri* in carrying out a joint operation to restore security in Poso to take firm action against the East Indonesia Mujahideen jihadists. Crouch (2017) explains the Emergency Force Expansion: Social and Military Conflict in Indonesia. Baker (2015) provides a study on the political economy of police-military relations after the change in the democratic regime in Indonesia. Sufri et al. (2020) explained the relationship and role of the *TNI-Polri* in disaster response activities. Rochadi et al. (2019) explained the role of the *TNI-Polri* in maintaining security and order in dealing with labor issues. Kosandi & Wahono (2020) explained the military reform agenda and ensured that the informal military forces became professional.

Török (2018) investigates local-scale social vulnerability to flood hazards in Romania. Potter et al. (2019) evaluate susceptibility to forest insects and disease threats in tree species conservation. Unceta et al. (2020) describe the determination of the level of regional vulnerability – social, economic, institutional, and environmental – within a regime. Mendes & Tavares (2019) describes a new social vulnerability index (SV) based on local-level data. Nicho & McDermott (2019) describes the 'Socio' Vulnerability Dimension of Advanced Persistent Threats. Alizadeh et al. (2018) estimate the value of vulnerability to earthquakes in the city of Tabriz, Iran, with the ANN approach. Joakim & Mortsch (2016) Modeling social vulnerability and resilience to coastal hazards using a system dynamics approach. Octavian et al. (2021) describe social vulnerability modeling in Southeast Asia with a system dynamics approach.

This article consists of several sections. Section 2 describes the literature review of vulnerability theory, a vulnerability in relationship, *TNI-Polri* power relations post-1998 Reform, and the conceptual framework. Section 3 describes the research methods, stages, steps, Analytical Hierarchy Process (AHP), System Dynamics, and research flow diagrams. Section 4 explains the identifying key variables of vulnerability, analyzes the relationship between variables, Weighting indicators, and its subs, and provides an assessment and analysis of the system dynamics vulnerability model of *TNI-Polri* relations. Section 5 discusses the research results. Section 6 provides conclusions for the study.

2. Literature review

2.1 Vulnerability

The evolution of vulnerability research has been significantly influenced by two different approaches: the "school of human ecology" or "behavioral paradigm" and the "structural paradigm." Since global processes strongly influence vulnerability, the conceptual model emphasizes the importance of analyzing elements of local vulnerability in a broader context, explicitly considering space, time and scale. This framework is thus able to show how the interaction of forces and the environment can lead to increased vulnerability in the event of sudden changes. However, the approach cannot avoid criticism because it lacks a clear distinction between exposure and sensitivity, making it difficult to identify where vulnerability begins and ends (Török, 2017).

According to Green (2004), vulnerability is the relationship between an intended system and its environment, in which that environment varies over time. Which environmental disturbances are significant depends on the system's objectives, as only disturbances that can hinder the achievement of these objectives are significant. In the past, the physical aspect of vulnerability – the spatial distribution of populations and infrastructure concerning flood hazards – has received more attention in hazard research (Bankoff et al., 2013). However, now, there is increasing recognition given to aspects of vulnerability. For individuals, vulnerability to harm is highly dependent on the behavior, well-being, and resources that people have to enable them to avoid and recover from harm. In turn, it is largely determined by the broader social, economic and political patterns and processes that differentiate how floods impact people and human systems. Vulnerability analysis increasingly highlights its socially constructed nature, underscoring the importance of understanding how socio-political processes can create vulnerability and thus create 'catastrophe' (Perdikaris et al., 2011).

The concept of vulnerability constantly evolves to include vulnerability, exposure, capacity to cope and adapt, and by including different thematic areas such as physical, social, economic, environmental, and institutional vulnerability (Török,

2017). Along with the widespread debate about the conceptualization of vulnerability, there has also been debate on the issue of developing methods to measure it. These difficulties are mainly related to two specific aspects: the availability of databases at different regional levels and the development of the most appropriate methodology that considers all the factors of interest, providing the necessary information on which to base political decisions. While there is still no uniquely developed set of indicators, methodologies, or indices to measure vulnerability, several successful attempts have been published on the topic in recent years. To avoid this limitation, most of the research results that have been seen in recent years have focused either on the application of different weighting methods (Frigerio & De Amicis, 2016; Mwale et al., 2015) or the development of entirely new methodologies (Armaş et al., 2017; Banica et al., 2017).

2.2 Institutional Vulnerability

In this case, institutional vulnerability is the inability to adequately communicate and coordinate various institutional levels, an expression of institutional rigidity, and a rare ability to respond to risk situations. A greater or lesser capacity to respond adequately to risk situations will be associated with a greater or lesser degree of institutional vulnerability and governance capacity (Perdikaris et al., 2011).

- Vote and Accountability: it measures the ability of citizens to participate in the election of their government, as well as freedom of expression, association, and the media.
- Government Effectiveness: it measures the Quality of public services, the bureaucracy, the Quality of public administration and the degree of independence from political pressure, the Quality of policy formulation and implementation, and the credibility of the government's commitment to the policy. Regulatory Quality: it measures the government's ability to design and implement sound policies and regulations that enable and encourage private sector development.
- Rules of Law: it measures the extent to which agents trust and respect community rules, particularly the Quality of contract enforcement, police, and courts.
- Corruption Control: it measures the extent to which public power is used for private gain, including forms of corruption, large and small, and control of the state by elites and personal interests.

2.3 TNI-Polri Powers Relations Post-1998 Reform

Historically, the presence of the police in various countries in the world cannot be separated from the military. The convergence of functions has strong roots so that the symbols and traditions of militarism are attached to the police, and the military often performs police duties. The military is always involved when forming a police institution or maintaining an area's internal security. The involvement can be in the trainers (instructors). It can also be in the resources recruited to become the police (Enloe, 1976; Lamb, 2018).

After more than 30 years under the Indonesian National Armed Forces, the police have become a separate institution from the military post-1998 Reform. The separation process of the police from the military did not occur alone but paralleled the partial reforms within the Indonesian National Armed Forces *(TNI)*. For instance, the military dismissed Dwi Functions of ABRI by the military, and the *TNI* supervision is under the Ministry of Defence. The police are institutions that are directly under the control of the President. With a democratic political system and the division of government authority from the center to the regions (decentralization), security and defense matters remain under the central government's authority. Several scholars then tried to analyze the relationship between the military and the police due to changes in Indonesia's post-reform national political system.

Three studies on the *TNI-Polri* relationship post-reform represent three different trends. The first is the conflictual tendency in observing at *TNI-Polri* relations. The second is the tendency for cooperation and competition (Jansen, 2008), and the last is the tendency for oligarchic power relations to dominate the two institutions (Baker, 2015). Among the three trends in the study of the Indonesian National Armed Forces *(TNI)* and Indonesian National Police *(Polri)* which have different theoretical bases, this study suspects that all three are continuing. It means that both conflictual tendencies, competition in terms of meeting the state budget shortfall for the two institutions, and harmonious forms of synergy are still taking place simultaneously in different strategic contexts and different strategic spaces. It can happen because, in post-authoritarian Indonesia, strategic spaces are widely open in which the two institutions are still often involved, even though the portion of influence varies from one space to another.

3. Material/methods and procedure

3.1 Method/Stage

This study is a research with an exploratory sequential mixed method. This exploratory sequential design is a mixed-method research design at different times and sequentially, starting with qualitative research, then followed by quantitative research (Hanson et al., 2005; Taguchi, 2018). The data collected in this study is divided into two categories: primary data and secondary data. Primary data: it is sourced from Military Experts and Police Experts; Commission I DPR-RI; Ministry of

Defence; Coordinating Ministry for Political, Legal, and Security Affairs of the Republic of Indonesia; Ministries and Institutions that have MoUs in Cooperation with the *TNI*/*POLRI*; *TNI* and *POLRI* leaders, as well as retired *TNI* and *POLRI*. Secondary data: it is sourced from news and information in print media, findings in previous research, online media, archives, regulations, and policies, official institutional documents, and official social media accounts.

Under normal circumstances, this study will be conducted in Jakarta and several areas where cases occur representing a pattern of cooperative relations, conflict, or competition between the military and the police. However, during the COVID-19 pandemic situation, this study has the potential only to be carried out in Jakarta and surrounding areas. This research was conducted from August 2020 to February 2022 around the Jakarta Metropolitan Area. However, observations related to the relationship between the *TNI* and *POLRI* have been the focus of researchers for a long time. From a theoretical point of view, the discourse on the military-police relationship is not as busy as the discourse on the civil-military relationship. In Indonesia, there are very few serious studies on the military-police relationship compared to studies on the civil-military relationship. Therefore, researchers still see a great chance or opportunity to enter and make a theoretical contribution.

3.2 Analytical Hierarchy Process (AHP)

AHP describes complex multi-factor or multi-criteria problems into a hierarchy. According to Saaty, hierarchy is defined as a representation of a complex issue in a multi-level structure, where the first level is the goal, followed by the level of factors, criteria, and sub-criteria to the last level of alternatives with a hierarchy of a complex problem that can be described in groups which are then arranged into a hierarchy as the problem will appear to be more structured systematically.

One of the main advantages of AHP that distinguishes it from other decision-making models is that there is no absolute consistency requirement. Hence, the existing problems can be felt and observed, but the completeness of the numerical data does not support the quantitative modeling of the problem.

Seven pillars are used and must be considered in the AHP modeling, including 1) Ratio scale, a comparison of two values (a/b) where the values of a and b are the same type (unit); 2) Pairwise comparisons; 3) The conditions for the sensitivity of the eigenvectors; 4) Homogeneity and clustering; 5) Synthesis; 6) Maintaining and reversing the order of weighting and ordering in the hierarchy; 7) Group considerations.

Humans instinctively can estimate simple quantities through their senses. The easiest process is to compare two things with a reliable comparison accuracy. For that, Saaty set a quantitative scale of 1 to 9 to assess the comparison of the importance of one element to another.

Table 1
AHP Rating Scale

Interest Scale	Definition	Explanation
1	**Equally Important**	Two activities contribute equally strongly to the goal
3	**Slightly More Important**	An activity is slightly more important than the other
5	**Important**	One activity is more important than the other
7	**Very important**	One activity is very important compared to other activities
9	**Critically Important**	One activity is critically important compared to other activities
2, 4, 6, 8	**Median value**	
Reciprocal	Describing the dominance of the second alternative over the first alternative	

The steps of the AHP method include:

a. Create a pairwise comparison matrix.

$$A = a_{im} = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ \frac{1}{a_{12}} & 1 & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & 1 \end{bmatrix} \quad \text{i, m = 1, 2, ... , n = related criteria index.} \qquad (1)$$

b. Create a criterion value matrix.

c. Create a Sum Matrix for Each Row.

d. Assessment of Consistency Index (CI) and Consistency Ratio (CR).

$$\text{CI} = \frac{\lambda maks - n}{n}; \qquad (2)$$

$$\mathrm{CR} = \frac{CI}{RI} \tag{3}$$

N = Number of Elements,
RI = Random Consistency Index.

If the CR ratio is 0.1 (i.e., 10%), the matrix is said to be consistent, and the decision W is accepted. On the other hand, CR beyond that implies too many contradictions in the matrix. Anticipation for the latter situation is to review the matrix, then revise the weights loaded by the vector.

Table 2
Random Consistency Index Value.

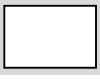
1	2	3	4	5	6	7	8	9	10
0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

4. System dynamics

Modeling is a way to solve problems that occur in the real world. Modeling occurs when direct implementation or experimentation is too expensive or difficult to perform. Modeling allows you to optimize your system before implementing it in the real world (Schoenenberger et al., 2021). Modeling involves mapping a real-world problem; modeling is based on a world model (the process of abstraction), analyzing and optimizing to get a solution that can be implemented in the real world (Sweeney & Sterman, 2007). Simulation is the operation of the system model. Simulation is employed before anything changes in an existing system to reduce the impact of failure, eliminate unexpected bottlenecks, prevent excessive use of resources, and optimize system performance (J. Forrester, 2009).

The System Dynamics Society provides an up-to-date definition with the help of usage, stating that SD is "a method for acquiring knowledge and dealing with complex comment structures." System dynamics were first brought out using Jay W. Forrester, in the 1950s, as a way to fix a complex problem that arose due to the tendency of reason and the influence of various variables in the device. The gadget dynamics approach was the first to control problems, including stock fluctuations, activity volatility, and declining company market share (Schoenenberger et al., 2021). From the dynamics version of the gadget in the form of a centralized diagram, a flow chart is built to show the simulation variables and parameterization, and a system version is prepared to be simulated (J. W. Forrester, 2010). Variables in dynamic structures are defined in
Table 3.

Table 3
Symbol of system dynamics.

Variable	Symbol	Explanation
Level		Presenting the accumulated quantity that accumulates over time, its value can change in line with changes in the rate.
Rate		Presenting a flow rate that can change the level value
Auxiliary		Presenting auxiliary variables containing formulations that can be input to the rate.

Sources: (Forrester, 2009; Morshedi & Kashani, 2020; Octavian et al., 2021; Sweeney & Sterman, 2007)

The type of System Dynamics model representing the structure of the feedback diagram can be in the form of a causal diagram or commonly called a causative loop diagram (CLD). This diagram shows the modification direction of the variable flow and its polarity. The flow polarity, as stated above, is divided into positive and negative. A Flowchart is another form of a diagram that together describes the structure of the system dynamics model. Flowcharts represent the relationships between variables created during a cause and additional impact diagrams, exploiting bound symbols for the various variables concerned (Sushil, 1993).

Causative Loop Diagram (CLD) in a type of drawing language relates various variables, like a pie chart. The use of arrows can indicate cause and/or effect variables. The head of the arrow indicates the cause, while the arrow's tip indicates the effect. Every modeler must first understand the processes in the universe (real world) so that the logical model will agree with reality. The method of understanding is carried out by characterizing the causal variables and/or distinguishing between the dependent and independent variables (Sterman et al., 2007). In this study, system dynamics analysis using Stella 9 software.

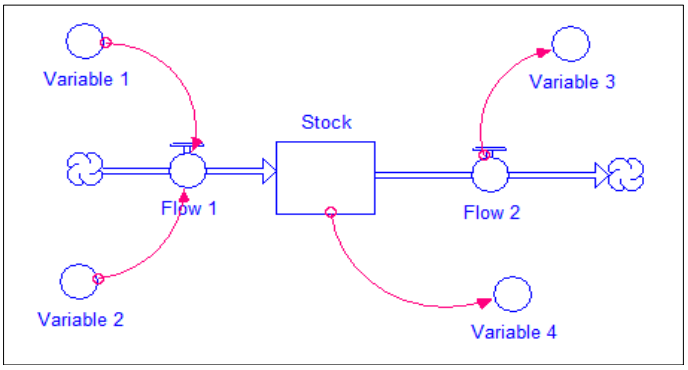


Fig. 1. The minimal stock-and-flow diagram in System Dynamics
(Forrester, 2009; Joakim & Mortsch, 2016; Morshedi & Kashani, 2020; Schoenenberger et al., 2021).

Table 4
Research experts

No	Subject	Code
1	Major General *TNI* Ret. Tb Hasanuddin	E-1
2	Inspector-General of Police. Ret. Sisno Adiwinoto	E-2
3	Poengky Indarti as a human rights activist and member of the National Police Commission	E-3
4	Dr. Susetyaningtyas N.H. Kertopati as an intelligence observer	E-4
5	Lt. Gen. Ret. Dr. M. Munir, as Head of the BIN Strategic Analysis Board	E-5
6	*TNI* General Ret. Agum Gumelar	E-6

4.1 Flow diagram

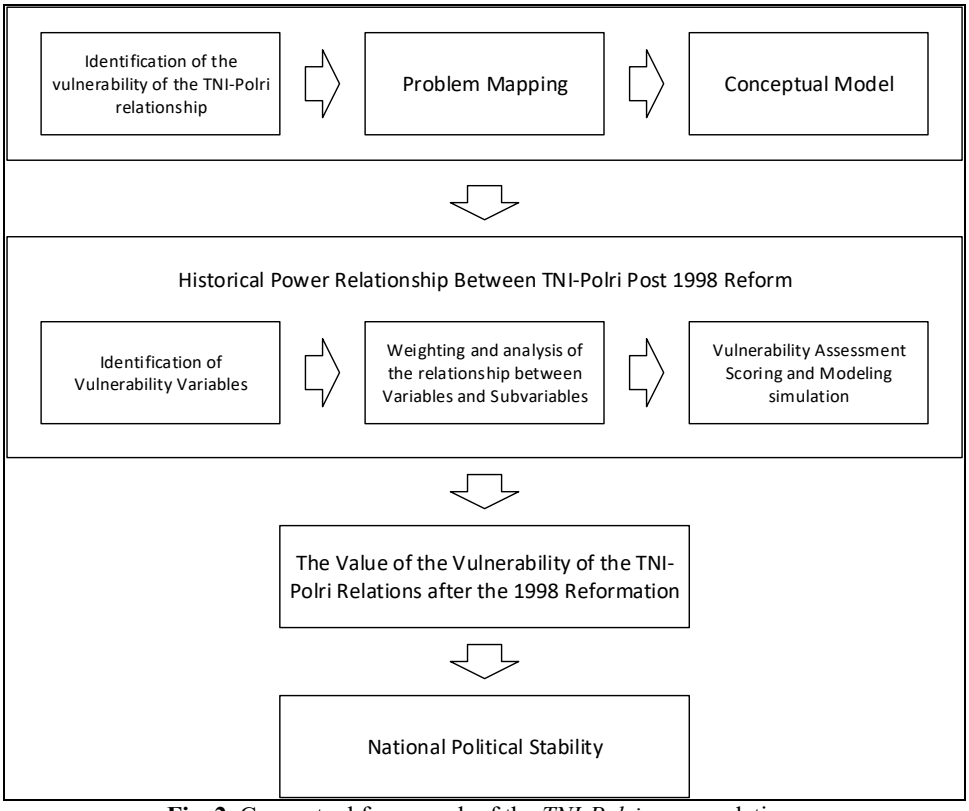


Fig. 2. Conceptual framework of the *TNI-Polri* power relations

The study presented here specifically discusses the vulnerability of the *TNI-Polri* power relations post-1998 Reform, divided into three stages. The first stage employs a literature approach from previous manuscripts, brainstorming, and focus group discussions (FGD), and it is supported by expert assessments to identify key variables. Moreover, in the first stage, it analyzes the interrelationships between variables in the vulnerability of the *TNI-Polri* power relations. Second, the

measurement uses weighting and Likert score assessment. Weighting employs the AHP method with data from selected experts from relevant stakeholders. Furthermore, a scoring assessment is carried out using a Likert scale. Third, provide an analysis of the evaluation modeling of the vulnerability of the *TNI-Polri* power relations post-1998 Reform that has an impact on national political stability.

In the assessment of the vulnerability analysis of the *TNI-Polri* power relations, first, it calculates the average score of the vulnerability dimension across all the sub-variables on the variables that have been identified. Second, calculate each variable's overall vulnerability rating, and the experts' sub-variables are weighted as determined. These experts have been asked to allocate a total weight of 100 among the variables and sub-variables. Therefore, the vulnerability rating was calculated as described by Potter et al. (2019):

$$V = \frac{(Variable\ 1 * weight) + (Variable\ 2 * Weight) + (Variabel\ x * weigth)}{100} \quad (4)$$

Table 5
AHP and Likert scale values and the Value of Vulnerability

AHP Score	Likert Score	Value	Categories	Colour
1-2	1	0-20	Very Low Vulnerability	
3-4	2	21-40	Low Vulnerability	
5-6	3	41-60	Medium Vulnerability	
7-8	4	61-80	High Vulnerability	
9	5	81-100	Very High Vulnerability	

Sources: Thabane (2015); Török (2018); Octavian et al. (2021); Aksha et al. (2019)

5. Result and discussion

5.1 Identifying key variables of vulnerability and analyzing the relationship between variables

The generic concept of determining vulnerability factors may conflict with specific hazards and contexts. It can be useful if we wish to conduct a comparative vulnerability assessment at the national level. While the indicators do not represent a complete vulnerability description, on the one hand, they will show substantial differentiation. A "general" vulnerability assessment can tell us how well a country's institutions are in power relations (Brooks et al., 2005). This stage aims to identify key indicators of the vulnerability of *TNI*-PPLRI power relations post-1998 Reform, representing the national level in maintaining the country's political stability.

Table 6
Selected Variables for relationship Vulnerability assessment between *TNI-Polri*.

Coding	Sub-variables	Variables/Authors	Structural
HF	Housing facilities	Socio-Economic Vulnerability (SE)	Vulnerability of Relationship for *TNI-Polri*
QL	Quality of living		
DV	Demographic vitality and ethnicity	(Nicho & McDermott, 2019; Török, 2018)	
EA	Education and accessibility		
VA	Voice and Accountability	Institutional Vulnerability (IV)	
GE	Governmental effectiveness		
RQ	Regulatory Quality	(Unceta et al., 2020)	
RL	The rule of law	(Banica et al., 2017)	
CC	Control of corruption		
TU	Technology use	Adaptive Capacity Vulnerability (AC)	
IS	information and skills	(Anwar Al-Gamal et al., 2009)	
IF	infrastructure	(Armaş et al., 2017)	
SC	social capital and equity	(Unceta et al., 2020)	
CF	Conflict	Governance Capability Vulnerability (GC)	
EP	Effectiveness Of Policies		
IP	Influence On Political Process	(Brooks et al., 2005)	
PD	Participatory Decision Making	(Brady et al., 2021)	
BA	Barriers To Adaptation	(Adu et al., 2018)	

When selecting indicators, this article considers the context and framework established by the research's main objective: to identify the most vulnerable areas by considering the selected variables. Some modifications must be made to adapt them to the context of the *TNI-Polri* power relations. Therefore, the variables in the context of vulnerability generally have not been considered representative of having been removed or replaced with other more relevant variables. In other cases, where data cannot be found, the respective dataset has been replaced with a similar indicator. This expert focus group is often used to gather specific improvement information and generate new data and ideas through direct interaction among participants (Morgan, 1996). The approach here is to use expert judgment as a tool for broad validation of the empirical determination

of the indicators described above. Each expert was asked to define their area of expertise in the *TNI-Polri* power relations post-1998 Reform.

After selecting the vulnerability variables and sub-variables, the next step is to make the relationship between variables and sub-variables using causal loop diagrams to identify causal relationships between variables and sub-variables. This stage aims to form a quantitative model for model simulation. Modeling is carried out by translating every relationship between the variables and components that make up the system model into a mathematical equation so that the simulation program can operate it. The steps of the quantitative model include: selecting the general quantitative structure of the model, the basic time unit for simulation, identifying the functional forms of the model equation, estimating the parameters of the model equation, entering the equation into the simulation program, running the reference simulation, and establishing the model equation. This step uses expert opinion that has been validated previously. The results of the analysis of the relationship can be seen in Fig. 3.

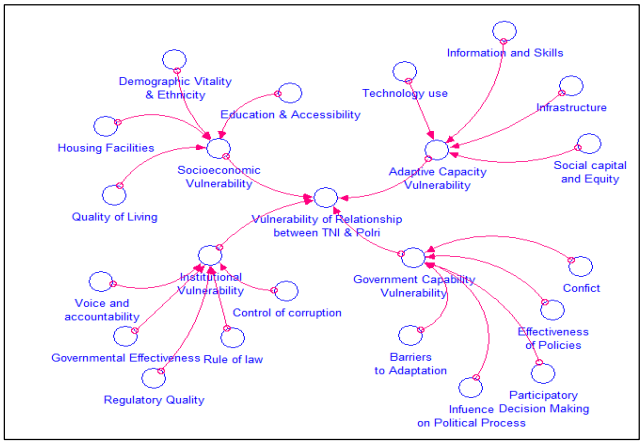


Fig. 3. Causal Loop Diagram on the vulnerability of the *TNI-Polri* Relations

5.2 Variable and Sub-variable Weighting

In this article, each expert is asked to consider which key indicators they feel are "most important" in defining or predicting vulnerability and then rank them according to importance, based on their experience in various areas of vulnerability assessment. Experts are allowed to perform several different ranked exercises. Experts were also asked whether they felt a distinction could be made between the key indicators representing vulnerability. The weighting is carried out using the Analytical Hierarchy Process (AHP) method, which has a time scale according to the criteria for the relationship between variables and sub-variables.

The output of this model, the input of which will differ based on the problem being examined, will be a vector containing the local weights of the alternatives considered for each sub-criterion. These local vectors containing the sub-criteria weights are then normalized and multiplied by the global vectors containing the weights for the higher-level criteria. It will lead to the final vector of the decision problem as in the study by Improta et al. (2018). To summarize, each criterion in the hierarchy will be simulated, taking into account all the interdependencies between the sub-criteria associated with the same parent criterion and their variability over time as in dynamic system modeling.

Finally, the scenarios' rating can be determined based on the criteria's weight. Hence, certain decision vectors can be obtained at each time step of the simulation process. In this way, the static behavior of the conventional AHP approach can be overcome, and time-varying decision-making processes can be implemented. This AHP formula is applied to each criterion and sub-criteria and compared with the simulation results from the Stella 9 Software model. As a result of the decision-making process, the best scenario, i.e., the best combination of parameters, can be selected. The weighting results can be seen in Fig. 4 and Table 12.

Table 7
Pairwise comparison matrix aggregation for Vulnerability Variables.

Criteria	SE	IV	AC	GC	Weight
SE	1	2	1	2	0,329
IV	1/2	1	1/2	1/2	0,142
AC	1	2	1	2	0,329
GC	1/2	2	1/2	1	0,200
CR = 0,023					1,000

Table 8
Pairwise comparison matrix aggregation for Socio-economics Vulnerability.

Criteria	HF	QL	DV	EA	Weight
HF	1	1/3	2	1/2	0,185
QL	3	1	2	2	0,417
DV	1/2	1/2	1	1	0,170
EA	2	1/2	1	1	0,228
CR = 0,078					1,000

Table 9
Pairwise comparison matrix aggregation for Institutional Vulnerability.

Criteria	VA	GE	RQ	RL	CC	Weight
VA	1	2	1/2	1/2	1/3	0,131
GE	1/2	1	1	1/2	1/2	0,125
RQ	2	2	1	1	1/2	0,208
RL	2	2	1	1	1	0,238
CC	3	2	2	1	1	0,298
CR= 0,074						1,000

Table 10
Pairwise comparison matrix aggregation for Adaptive Capacity Vulnerability.

Criteria	TU	IS	IF	SC	Weight
TU	1	1/2	1	1/2	0,174
IS	2	1	1	1/2	0,243
IF	1	1	1	1	0,243
SC	2	2	1	1	0,340
CR= 0,045					1,000

Table 11
Pairwise comparison matrix aggregation for Governance Capability Vulnerability.

Criteria	CF	EP	IP	PD	BA	Weight
CF	1	2	1/2	2	2	0,260
EP	1/2	1	1	1/2	2	0,178
IP	1/2	2	1	2	2	0,255
PD	1/2	2	1/2	1	2	0,193
BA	1/2	1/2	1/2	1/2	1	0,114
CR= 0,034						1,000

From Table 7, it can be seen that the criterion variables that become the priority are the Socio-Economic Vulnerability (SE) and Adaptive Capacity (AC) variables with a weight value of 0.329. Meanwhile, the variable of Institutional Vulnerability has the lowest weight, 0.142. The social science community has agreed on socio-economic factors influencing vulnerability to a hazard. Considering the dynamics of these vulnerabilities and the non-linear interactions between socio-economic and physical factors in any community are key to mechanisms for mitigating and adapting to hazards (Mavhura, 2019). Gomez et al. (2020) explained that the community's vulnerability does not depend entirely on the physical characteristics of the hazard but also on the socio-economic status. Respondents ' socio-economic and demographic attributes influence vulnerability to flooding (Shah et al., 2020). Nguyen et al. (2019) explained that adaptive capacity is a component that affects vulnerability. The adaptive capacity of communities and institutions declines over time, increasing collective vulnerability to change (Huynh & Stringer, 2018). Based on these results, the socio-economic vulnerability and adaptive capacity variables can be concluded as the most influential variables in the vulnerability of the *TNI-Polri* power relations.

In the socio-economic vulnerability aspect of Table 8, the Quality of Life (QL) sub-variable becomes the main priority with a weight of 0.417. The sub-variable Demographic vitality and ethnicity (DV) weight are 0.170 as the sub-variable with the lowest weight. Aspects of Institutional Vulnerability In Table 9, the Control of Corruption (CC) sub-variable is the main priority with a weight of 0.298. The governmental effectiveness (GE) sub-variable weights are 0.125, the sub-variable with

the lowest weight. Furthermore, in the aspect of Adaptive Capacity vulnerability in Table 10, the sub-variable of social capital and equity (SC) becomes the main priority with a weight of 0.340. The technology use (TU) sub-variable weights 0.174 as the sub-variable with the lowest weight. Aspects of Governance Capability vulnerability in Table 11, the Influence On Political Process (IP) sub-variable is a top priority with a weight of 0.255. The Barriers to Adaptation (BA) sub-variable weights 0.114 as the sub-variable with the lowest weight.

5.3 The results of the consistency test

To determine the consistency of the data from the filled-out questionnaire, a consistency test of the comparison matrix was carried out for each method before calculating the total weight of each variable/criterion. The consistency test in the AHP method is denoted by CR (Consistency Ratio). The data will be consistent if the CR value is 0.1, and if it is more than 0.1, then the data is inconsistent (Arora et al., 2020; Maletič et al., 2021; Sharma et al., 2019). Based on the calculation results, it can be seen that the consistency test using the AHP method was found that each variable and sub-variable (Table 7; Table 8; Table 9; Table 10; Table 11) had a CR value of < 0.1, so the results of pairwise comparisons were declared consistent.

Table 12
Local Weight and Global Weight for each Variable and Sub-variable of the Vulnerability of the *TNI-Polri* Power Relations

Variable	Weight	Sub-variables	Coding	Local Weight	Global Weight	Rank
Socio-Economic Vulnerability (SE)	0.3290	Housing facilities	HF	0,185	0,061	6
		Quality of living	QL	0,417	0,137	1
		Demographic vitality and ethnicity	DV	0,170	0,056	8
		Education and accessibility	EA	0,228	0,075	5
Institutional Vulnerability (IV)	0.1418	Voice and Accountability	VA	0,131	0,019	17
		Governmental effectiveness	GE	0,125	0,018	18
		Regulatory Quality	RQ	0,208	0,029	15
		The rule of law	RL	0,238	0,034	14
		Control of corruption	CC	0,298	0,042	11
Adaptive Capacity Vulnerability (AC)	0.3290	Technology use	TU	0,174	0,057	7
		information and skills	IS	0,243	0,080	3
		infrastructure	IF	0,243	0,080	3
		social capital and equity	SC	0,340	0,112	2
Governance Capability Vulnerability (GC)	0.2002	Conflict	CF	0,260	0,052	9
		Effectiveness Of Policies	EP	0,178	0,036	13
		Influence On Political Process	IP	0,255	0,051	10
		Participatory Decision Making	PD	0,193	0,039	12
		Barriers To Adaptation	BA	0,114	0,023	16

Weights can be obtained with flat or hierarchical weights. In flat (or bottom-up) weighting, weights are assigned directly to the lowest-level criteria. In hierarchical (or top-down) weighting, the weights are obtained separately at each level and branch of the value tree. By normalizing the sum of the weights in each branch to one, one gets the local weights of each criterion below the top-level criterion. The global weight of each lowest level criterion is obtained by multiplying its local weight by the local weight of all the previous criteria in the value tree. In practice, the acquisition of weights can be made by asking for the weights directly. In this case, it is important to ensure that the weights also reflect the range of criteria values researched by Mustajoki et al. (2020).

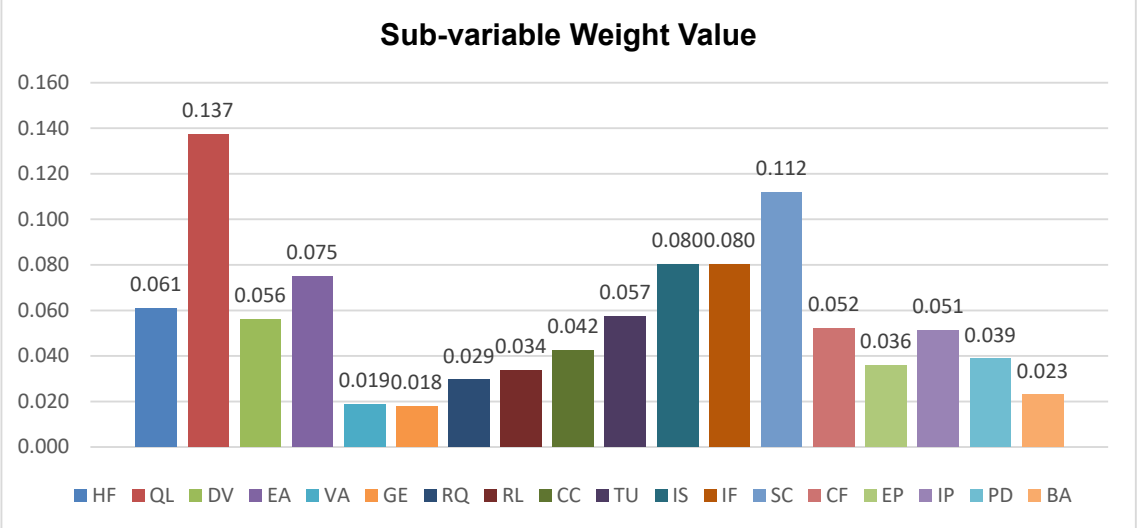


Fig. 4. Global weight of Sub-variable vulnerability of *TNI-Polri* Relations

Based on the analysis results in Fig. **4** and Table 12, the global weight which is the highest priority in the vulnerability of the *TNI-Polri* power relations sub-variable is the Quality of living (QL) sub-variable with a global weight of 0.137. Bhanjee & Zhang (2021) explained that lower Quality of life and mobility would lead to greater social vulnerability. Chapman et al. (2019) explain the relationship between perceived cognitive function, emotional vulnerability, and Quality of life. Furthermore, Islam et al. (2019) explained that social neglect and decreased Quality of life made them more vulnerable in society. In this study, Quality of life affects the vulnerability of the *TNI-Polri* power relations. Second, the social capital and equity (SC) sub-variable as the second priority in the global weighting is 0.112. Social capital is a social institution that can improve cooperative relationships between individuals or organizations. The resilience of organizational relationships will be easily achieved through strengthening social capital and equity (SC). Social capital and equity (SC) is not a single entity but multiple entities containing two elements. First, social capital and equity (SC) covers several aspects of social structure. Second, social capital and equity (SC) facilitate certain actors' actions in the structure. Social capital and equity (SC) is a social investment including social resources such as networks, beliefs, values , and norms, as well as the driving force in the structure of social relations to achieve individual and or group goals efficiently and effectively with other capital. Therefore, social capital is an important part of the power relationship of an organization, *TNI-Polri*.

The governmental effectiveness (GE) sub-variable has the lowest weight, 0.018. This condition explains that the Voice and accountability (VA) sub-variable and Barriers to Adaptation (BA) sub-variable have a greater effect than the (GA) sub-variable. Furthermore, the Rule of law (RL) sub-variable is above the Regulatory quality (RQ) sub-variable. As explained by Modugu & Dempere (2020), the Quality of government in terms of the rule of law impacts political stability. However, Regulatory quality (RQ) and the rule of law (RL) have the same role. As Wu (2021) explained, the Quality of regulations and the rule of law positively impact the governance of relations between organizations or institutions.

5.4 Assessment and simulation of system dynamics vulnerability model of the TNI-Polri relations

The assessment of the vulnerability of the *TNI-Polri* relations is implemented using a simulation model. Each developed model represents the value of the variables and sub-variables of the decision problem using the AHP weighting method and Likert scale assessment. Furthermore, it is possible to build a simulation model for each criterion in the dynamic system hierarchy. Each simulation model's input is a vector whose size equals the number of alternatives considered in the decision problem. Each row vector represents an alternative/preference that refers to the decision problem and contains all data related to the alternative (Octavian et al., 2021). Model simulation can be seen in Fig. 6. The main purpose of the simulation model developed is to support the assessment of the vulnerability of the *TNI-Polri* power relations. The model simulation results can be seen in Fig. 7 and Table 18.

Table 13
Vulnerability evaluation scores for power relationship of *TNI-Polri* in Socio-economic variable.

Sub-variables	Weight	Score	Result	%	Categories
Housing facilities	0,185	1,167	0,216	23,333	Low Vulnerability
Quality of living	0,417	1,500	0,625	30,000	Low Vulnerability
Demographic vitality and ethnicity	0,170	1,333	0,227	26,667	Low Vulnerability
Education and accessibility	0,228	1,167	0,266	23,333	Low Vulnerability
Socioeconomic Vulnerability	1,000		**1,334**	26,680	Low Vulnerability

Evaluation of the vulnerability of the *TNI-Polri* power relations on the socio-economic vulnerability variable consists of four sub-variables, namely the Housing Facilities (HF) sub-variable with a vulnerability value of 0.216 (23%). The Quality of living (QL) sub-variable has a vulnerability value of 0.625 (30%).

Table 14
Vulnerability evaluation scores for power relationship of *TNI-Polri* in Institutional variable.

Sub-variables	Weight	Score	Result	%	Explanation
Voice and accountability	0,131	1,333	0,175	26,667	Low Vulnerability
Governmental effectiveness	0,125	1,833	0,230	36,667	Low Vulnerability
Regulatory quality	0,208	1,667	0,346	33,333	Low Vulnerability
Rule of law	0,238	1,667	0,396	33,333	Low Vulnerability
Control of corruption	0,298	2,000	0,596	40,000	Low Vulnerability
Institutional Vulnerability	1,000		**1,743**	34,862	Low Vulnerability

The Demographic vitality and ethnicity (DV) sub-variable has a vulnerability value of 0.227 (26.67%). The Demographic vitality and ethnicity (DV) sub-variable has a vulnerability value of 0.227 (26.67%). The education and accessibility (EA) sub-variable has a vulnerability value of 0.266 (23.34%)

Evaluation of the vulnerability of the *TNI-Polri* power relations on the Institutional vulnerability variable consists of five sub-variables, namely the Voice and Accountability (VA) sub-variable with a vulnerability value of 0.175 (26.67%). The Governmental effectiveness (GE) sub-variable has a vulnerability value of 0.230 (36.67%). The Regulatory Quality (RQ) sub-variable has a vulnerability value of 0.346 (33.34%). The Rule of law (RL) sub-variable has a vulnerability value of 0.396 (33.34%). The Control of corruption (CC) sub-variable has a vulnerability value of 0.596 (40%).

Table 15
Vulnerability evaluation scores for power relationship of *TNI-Polri* in Adaptive Capacity variable.

Sub-variables	Weight	Score	Result	%	Explanation
Technology use	0,174	1,167	0,203	23,333	Low Vulnerability
information and skills	0,243	1,500	0,365	30,000	Low Vulnerability
infrastructure	0,243	2,000	0,486	40,000	Low Vulnerability
Social Capital and Equity	0,340	1,833	0,624	36,667	Low Vulnerability
Adaptive Capacity Vulnerability (AC)	1,000		**1,677**	33,542	Low Vulnerability

Evaluation of the vulnerability of the *TNI-Polri* power relations on Adaptive Capacity (AC) vulnerability variable consists of four sub-variables, namely the Technology use accountability (TU) sub-variable with a vulnerability value of 0.203 (23.34%). The Information and Skills (IS) sub-variable has a vulnerability value of 0.365 (30%), The infrastructure (IF) sub-variable has a vulnerability value of 0.486 (40%), The Social Capital and Equity (SC) sub-variable has a vulnerability value of 0.625 (36.67%).

Table 16
Vulnerability evaluation scores for power relationship of *TNI-Polri* in Governance Capability variable.

Sub-variables	Weight	Score	Result	%	Explanation
Conflict	0,260	2,667	0,692	53,333	Medium Vulnerability
Effectiveness Of Policies	0,178	1,500	0,267	30,000	Low Vulnerability
Influence On Political Process	0,255	2,000	0,510	40,000	Low Vulnerability
Participatory Decision Making	0,193	2,167	0,418	43,333	Medium Vulnerability
Barriers To Adaptation	0,114	1,333	0,152	26,667	Low Vulnerability
Governance Capability Vulnerability (GC)	1,000		**2,040**	40,802	Low Vulnerability

Evaluation of the vulnerability of the *TNI-Polri* power relations on Governance Capability (GC) vulnerability variable consists of five sub-variables, namely the Conflict (CF) sub-variable with a vulnerability value of 0.692 (53.34%) in the medium category. The Effectiveness of Policies (EP) sub-variable has a vulnerability value of 0.267 (30%). The Influence On Political Process (IP) sub-variable has a vulnerability value of 0.510 (40%). The Participatory Decision Making (PD) sub-variable has a vulnerability value of 0.418 (43.34%) in the medium category. The Barriers To Adaptation (BA) sub-variable has a vulnerability value of 0.152 (26.67%).

Table 17
Vulnerability evaluation scores for power relationship of *TNI-Polri* post-1998 reformation era.

Criteria	Result	%	Explanation
Socio-Economic Vulnerability (SE)	1,334	26,680	Low Vulnerability
Institutional Vulnerability (IV)	1,743	34,862	Low Vulnerability
Adaptive Capacity Vulnerability (AC)	1,677	33,542	Low Vulnerability
Governance Capability Vulnerability (GC)	2,040	40,802	Low Vulnerability
Vulnerability Result	**1,699**	**33,971**	**Low Vulnerability**

Based on Fig. 5 and Table 17, the evaluation of the vulnerability of the *TNI-Polri* power relations post-1998 Reform consists of four main variables. The socioeconomic (SE) variable has a vulnerability value of 1.334 (26.68%) in the Low Vulnerability category. The institutional (IV) variable has a vulnerability value of 1.743 (34.86%) in the Low Vulnerability category. The Adaptive Capacity (AC) variable has a vulnerability value of 1,677 (33.542%) in the Low Vulnerability category. The Governance Capability (GC) variable has a vulnerability value of 2,040 (40.80%) in the Low Vulnerability

category. The Governance Capability (GC) variable is the variable that has the highest vulnerability value. However, the overall Vulnerability Value of the *TNI-Polri* power relations post-1998 Reform is still in the Low Vulnerability category with a value of 1,699 (33.97%). According to Janssen et al. (2020), organizations are increasingly developing advanced Governance Capability data to address vulnerability challenges. Matin et al. (2018) also explain environmental governance that integrates scientific resources and Governance Capability in a way that brings about organizational social change.

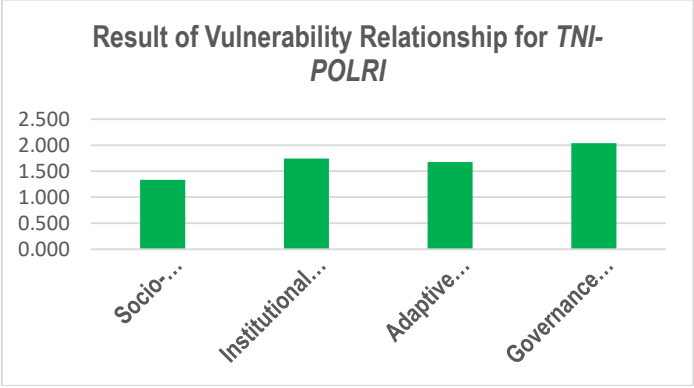


Fig. 5. Graph of Vulnerability evaluation scores for *TNI-Polri* power relations post-1998 reformation era.

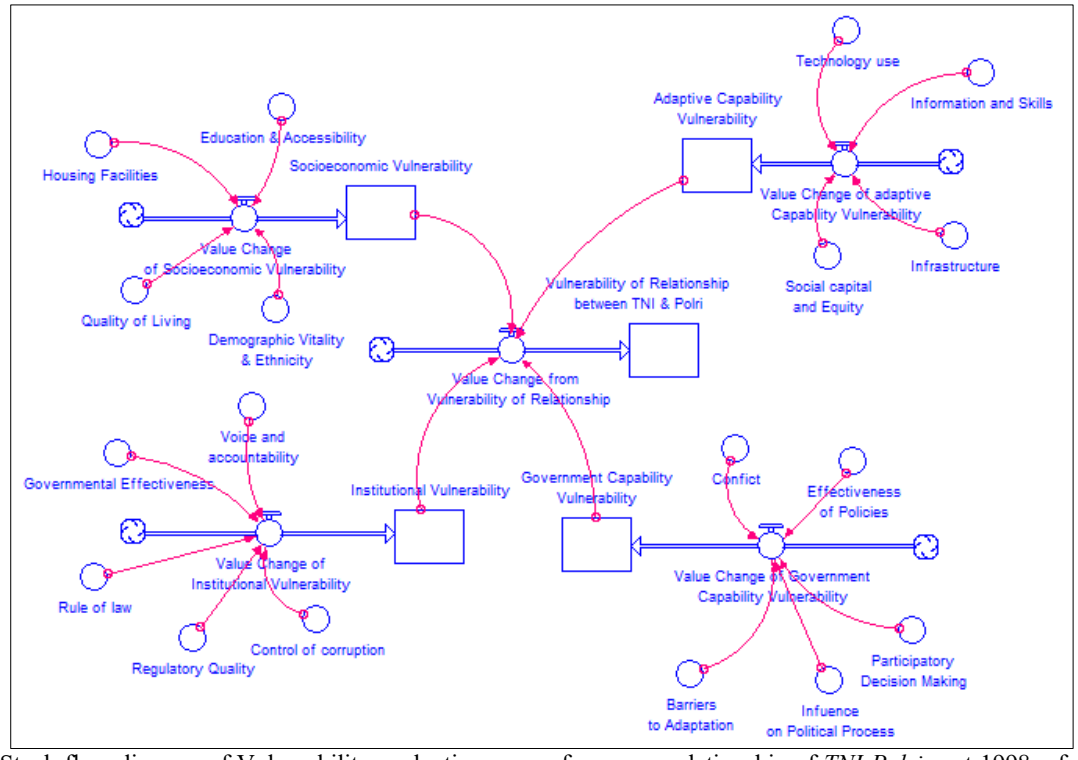


Fig. 6. Stock flow diagram of Vulnerability evaluation scores for power relationship of *TNI-Polri* post-1998 reformation era.

System dynamics modeling of the evaluation of the vulnerability of the *TNI-Polri* power relations post-1998 Reform was carried out by referring to the objectives and scenarios of each model. This scenario is assumed to result from a simulation without intervention or activities to strengthen national political stability. It illustrates that the *TNI-Polri* power relations post-1998 Reform and its impact on vulnerability are closely related to Socioeconomics, Institutional, Adaptive Capacity (AC), and Governance Capability. The development of the model is carried out to determine the pattern of behavior and the relationship between variables that determine the model's suitability with reality (Octavian et al., 2021).

With this modeling, the value of the social vulnerability of the Southeast Asian community can be analyzed. System dynamics modeling simulation was carried out using Stella 9. Model simulations were carried out to provide a mechanism for investigating the extent to which vulnerabilities change during the simulation period. The timeline for the simulation model is extended from 2022 to 2027, and the model is run at annual time steps. Fig. 7 illustrates the results of the simulation

analysis. This figure allows for a contrast between changes in the value of the vulnerability of the *TNI-Polri* power relations and other key variables.

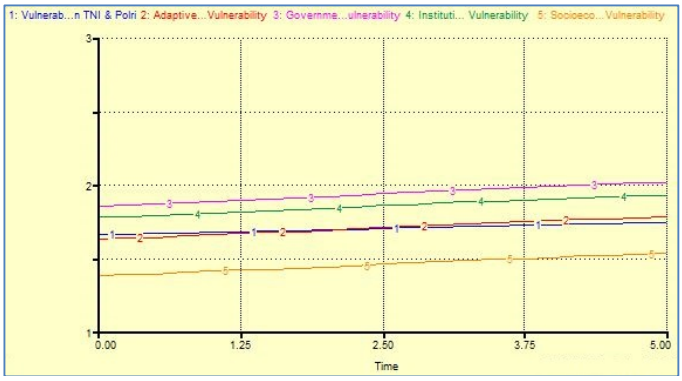


Fig. 7. Value of Relationship vulnerability index for *TNI*-POST post-1998 reformation era.

Table 18
Observation and simulation value of Relationship vulnerability index for *TNI-Polri* post-1998 reformation era.

Time	Socio	AC	GC	IV	Result of Relationship Vulnerability	Explanation
0	1.38	1.63	1.85	1.77	1.66	Low Vulnerability
1	1.39	1.64	1.86	1.78	1.66	Low Vulnerability
2	1.44	1.69	1.92	1.84	1.69	Low Vulnerability
3	1.48	1.73	1.96	1.88	1.71	Low Vulnerability
4	1.5	1.76	1.99	1.91	1.73	Low Vulnerability
5	1.53	1.78	2.02	1.93	1.74	Low Vulnerability

Fig. 1 and Table 18 show a movement with an increasing trend in the value of the vulnerability of the *TNI-Polri* power relations. Meanwhile, the change in the value of the vulnerability of the power relations in the next five years is predicted not to experience a significant increase in value. The value of the vulnerability of the *TNI-Polri* power relations in the next five years on the Socio-economics (SC) variable will increase by 10% from 2022 with a value of 1.38 to 1.53 with the same category level, Low Vulnerability. Second, the variable Adaptive Capacity (AC), Governance Capability (GC), and Institutional Vulnerability (IV) in the next five years, from 2022 to 2027, will increase by 8% with the same level of Low Vulnerability.

Overall, the value of the vulnerability of the *TNI-Polri* power relations in the next five years will increase from a score of 1.66 in 2022 to 1.74 in 2027, so that it will increase by 5% with the same category level, Low Vulnerability. This value indicates that the security system of inter-organizational relations is still solid enough to impact good national stability. However, if this value is assumed, there will be no significant fluctuation in several main variables. On the other hand, the addition of graphs that continue to increase slowly over a long period if there is no future intervention will have an impact on national political stability, considering that there will be an election in 2024, causing a change in national political leadership which does not rule out the possibility of participants from the *TNI* and *POLRI* having an impact on power relationship between the two institutions.

6. Conclusion

The impact of democratization allows actors and organizations of the *TNI* and *POLRI* to contest in the strategic space of the state and non-state, which has a security dimension or context with various strategies. This article provides an analysis of the vulnerability of the power relations between the Indonesian National Armed Forces and the Indonesian National Police (*TNI-Polri* power relations) post-1998 Reform. Based on the research results from related experts, this article describes four aspects of the main variables and eighteen sub-variables that affect the vulnerability of the *TNI-Polri* power relationship.

The Socio-Economic Vulnerability (SE) and Adaptive Capacity (AC) variables have the highest weight value of 0.329. Meanwhile, the variable of Institutional Vulnerability has the lowest weight, 0.142. However, overall, the global weight that becomes the highest priority on the vulnerability of the *TNI-Polri* power relations sub-variable is the Quality of living (QL) sub-variable with a global weight of 0.137. Second, the social capital and equity (SC) sub-variable as the second priority in the global weighting is 0.112. The governmental effectiveness (GE) sub-variable has the lowest weight, 0.018. In evaluating the vulnerability of the *TNI-Polri* relations, the Governance Capability (GC) variable is the variable with the

highest vulnerability value. However, the overall Vulnerability Value of the *TNI-Polri* relations post1998 Reform is still in the Low Vulnerability category with a value of 1,699 (33.97%).

Furthermore, the change in the value of the vulnerability of the power relations in the next five years is not predicted to experience a significant increase in value. The value of the vulnerability of the *TNI-Polri* power relations in the next five years on the Socio-economics (SC) variable will increase by 10% from 2022 with a value of 1.38 to 1.53 with the same category level, Low Vulnerability. Second, the variable Adaptive Capacity (AC), Governance Capability (GC), and Institutional Vulnerability (IV) in the next five years, from 2022 to 2027, will increase by 8% with the same level of Low Vulnerability. Overall, the value of the vulnerability of the *TNI-Polri* power relations in the next five years will increase from a score of 1.66 in 2022 to 1.74 in 2027, so that it will increase by 5% with the same category level, Low Vulnerability.

7. Limitation and Future Work

Prediction of the tendency of vulnerability values to continue to increase in the next five years requires an intervention strategy, especially in welcoming the change of political leadership in 2024. This study has not discussed the sustainability of the strategy in providing interventions to the vulnerability value. It is the next gap in future research.

Second, this study does not discuss the risk value of the *TNI-Polri* power relations. After identifying the factors and values of vulnerability, future research can analyze the risk of inter-organizational relationships and their influence on national political stability using a quantitative method approach.

Acknowledgement

Indonesia University and Indonesia Defense University supported this study.

References

Adu, D. T., Kuwornu, J. K. M., Anim-Somuah, H., & Sasaki, N. (2018). Application of livelihood vulnerability index in assessing smallholder maize farming households' vulnerability to climate change in Brong-Ahafo region of Ghana. *Kasetsart Journal of Social Sciences*, *39*(1), 22–32. https://doi.org/10.1016/j.kjss.2017.06.009

Aksha, S. K., Juran, L., Resler, L. M., & Zhang, Y. (2019). An Analysis of Social Vulnerability to Natural Hazards in Nepal Using a Modified Social Vulnerability Index. *International Journal of Disaster Risk Science*, *10*(1), 103–116. https://doi.org/10.1007/s13753-018-0192-7

Alizadeh, M., Alizadeh, E., Kotenaee, S. A., Shahabi, H., Pour, A. B., Panahi, M., Bin Ahmad, B., & Saro, L. (2018). Social vulnerability assessment using artificial neural network (ANN) model for earthquake hazard in Tabriz city, Iran. *Sustainability (Switzerland)*, *10*(10). https://doi.org/10.3390/su10103376

Anwar Al-Gamal, S., Sokona, Y., & Dodo, A. K. (2009). Climatic changes and groundwater resources in Africa. *International Journal of Climate Change Strategies and Management*, *1*(2), 133–145. https://doi.org/10.1108/17568690910955603

Armaş, I., Toma-Danila, D., Ionescu, R., & Gavriş, A. (2017). Vulnerability to Earthquake Hazard: Bucharest Case Study, Romania. *International Journal of Disaster Risk Science*, *8*(2), 182–195. https://doi.org/10.1007/S13753-017-0132-Y/FIGURES/7

Arora, A., Jain, J., Gupta, S., & Sharma, A. (2020). Identifying sustainability drivers in higher education through fuzzy AHP. *Higher Education, Skills and Work-Based Learning*, *11*(4), 823–836. https://doi.org/10.1108/HESWBL-03-2020-0051

Baker, J. (2015). The Rhizome State: Democratizing Indonesia's Off-Budget Economy. *Critical Asian Studies*, *47*(2), 309–336. https://doi.org/10.1080/14672715.2015.1041282

Banica, A., Rosu, L., Muntele, I., & Grozavu, A. (2017). Towards Urban Resilience: A Multi-Criteria Analysis of Seismic Vulnerability in Iasi City (Romania). *Sustainability 9*(2), 270. https://doi.org/10.3390/SU9020270

Bankoff, G., Frerks, G., & Hilhorst, D. (2013). Mapping vulnerability: Disasters, development and people. *Mapping Vulnerability: Disasters, Development and People*, 1–236. https://doi.org/10.4324/9781849771924

Bhanjee, S., & Zhang, S. (2021). Do urban planning and sprawl affect social vulnerability? An assessment of Dar es Salaam. *Development Southern Africa*, *38*(2), 189–207. https://doi.org/10.1080/0376835X.2020.1818549

Brady, P. J., Askelson, N. M., Ashida, S., Nothwehr, F., Janssen, B., & Frisvold, D. (2021). The relationship between political, economic, social, and cultural vulnerability and food insecurity among adults aged 50 years and older. *Nutrients*, *13*(11), 1–14. https://doi.org/10.3390/nu13113896

Brooks, N., Adger, W. N., & Kelly, P. M. (2005). The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global Environmental Change*, *15*(2), 151–163. https://doi.org/10.1016/j.gloenvcha.2004.12.006

Chapman, B., Helmrath, S., & Derakshan, N. (2019). Perceived cognitive functioning and its influence on emotional vulnerability in breast cancer. *Health Psychology Open*, *6*(2). https://doi.org/10.1177/2055102919871661

Crouch, M. (2017). The Expansion of Emergency Powers: Social Conflict and the Military in Indonesia. *Asian Studies*

Review, *41*(3), 459–475. https://doi.org/10.1080/10357823.2017.1332005

Diprose, R., & Azca, M. N. (2019). Past Communal Conflict and Contemporary Security Debates in Indonesia. *Journal of Contemporary Asia*, *49*(5), 780–805. https://doi.org/10.1080/00472336.2019.1619186

Enloe, C. H. (1976). Ethnicity and militarization: Factors shaping the roles of police in Third World Nations. *Studies in Comparative International Development 1976 11:3*, *11*(3), 25–38. https://doi.org/10.1007/BF03041097

Forrester, J. (2009). Some basic concepts in system dynamics. *Sloan School of Management, …*, 1–17. http://www.systemsmodelbook.org/uploadedfile/238_63f73156-02df-4d87-b0c6-c286a7beec26_SomeBasicConcepts.pdf

Forrester, J. W. (2009). *Learning through System Dynamics as Preparation for the 21st Century Working in K-12 education to develop Systems Citizens Permission granted for copying and for electronic distribution for non-commercial educational purposes*. 1–24. www.clexchange.org

Forrester, J. W. (2010). *Available at www.clexchange.org Working in K-12 education to develop Systems Citizens Permission granted for copying and for electronic distribution for non-commercial educational purposes System Dynamics*. (http://static.clexchange.org/ftp/documents/system-dynamics/SD2011-01SDFoundationunderST.pdf

Frigerio, I., & De Amicis, M. (2016). Mapping social vulnerability to natural hazards in Italy: A suitable tool for risk mitigation strategies. *Environmental Science & Policy*, *63*, 187–196. https://doi.org/10.1016/J.ENVSCI.2016.06.001

Gomez, M. L. A., Adelegan, O. J., Ntajal, J., & Trawally, D. (2020). Vulnerability to coastal erosion in The Gambia: Empirical experience from Gunjur. *International Journal of Disaster Risk Reduction*, *45*(December 2019), 101439. https://doi.org/10.1016/j.ijdrr.2019.101439

Green, C. (2004). The evaluation of vulnerability to flooding. *Disaster Prevention and Management: An International Journal*, *13*(4), 323–329. https://doi.org/10.1108/09653560410556546

Hanson, W. E., Plano Clark, V. L., Petska, K. S., Creswell, J. W., & Creswell, J. D. (2005). Mixed methods research designs in counseling psychology. *Journal of Counseling Psychology*, *52*(2), 224–235. https://doi.org/10.1037/0022-0167.52.2.224

Huynh, L. T. M., & Stringer, L. C. (2018). Multi-scale assessment of social vulnerability to climate change: An empirical study in coastal Vietnam. *Climate Risk Management*, *20*(February), 165–180. https://doi.org/10.1016/j.crm.2018.02.003

Improta, G., Russo, M. A., Triassi, M., Converso, G., Murino, T., & Santillo, L. C. (2018). Use of the AHP methodology in system dynamics: Modelling and simulation for health technology assessments to determine the correct prosthesis choice for hernia diseases. *Mathematical Biosciences*, *299*(February), 19–27. https://doi.org/10.1016/j.mbs.2018.03.004

Islam, T., Azman, A., Singh, P., Ali, I., Akhtar, T., Rafatullah, M., Ismail, N., & Hossain, K. (2019). Socio-economic vulnerability of riverbank erosion of displacees: Case study of coastal villages in Bangladesh. *Indian Journal of Ecology*, *46*(1), 34–38.

Jansen, D. (2008). Relations among security and law enforcement institutions in indonesia. *Contemporary Southeast Asia*, *30*(3), 429–454. https://doi.org/10.1355/cs30-3d

Janssen, M., Brous, P., Estevez, E., Barbosa, L. S., & Janowski, T. (2020). Data governance: Organizing data for trustworthy Artificial Intelligence. *Government Information Quarterly*, *37*(3), 101493. https://doi.org/10.1016/j.giq.2020.101493

Jiuhardi, J., Caisar Darma, D., & Heksarini, A. (2021). the Political-Economy Management: Indonesia'S Needs for the Covid-19 Pandemic. *Problems of Management in the 21st Century*, *16*(1), 19–27. https://doi.org/10.33225/pmc/21.16.19

Joakim, E. P., & Mortsch, L. (2016). *Using system dynamics to model social vulnerability and resilience to coastal hazards Greg Oulahen Deborah Harford and Yaheli Klein Kirstin Damude Kathy Tang*. *12*(4), 366–391.

Kosandi, M., & Wahono, S. (2020). Military Reform in the Post-New Order Indonesia: A Transitional or a New Subtle Role in Indonesian Democracy? *Asian Politics and Policy*, *12*(2), 224–241. https://doi.org/10.1111/aspp.12534

Lamb, G. (2018). Police militarisation and the 'war on crime' in South Africa. *Journal of Southern African Studies*, *44*(5), 933–949. https://doi.org/10.1080/03057070.2018.1503831

Lubis, A. F. (2022). Efforts to Overcome Juridical Constraints in Countering Terrorism in Indonesia by The Indonesian National Armed Forces. *Journal of Sosial Science*, *3*(3), 460–468. https://doi.org/10.46799/JSS.V3I3.344

Maletič, D., Pačaiová, H., Nagyová, A., Gomišček, B., & Maletič, M. (2021). Framework development of an asset manager selection based on risk management and performance improvement competences. *Safety*, *7*(1). https://doi.org/10.3390/safety7010010

Matin, N., Forrester, J., & Ensor, J. (2018). What is equitable resilience? *World Development*, *109*, 197–205. https://doi.org/10.1016/j.worlddev.2018.04.020

Mavhura, E. (2019). Analysing drivers of vulnerability to flooding: a systems approach. *South African Geographical Journal*, *101*(1), 72–90. https://doi.org/10.1080/03736245.2018.1541020

Mendes, J. M., & Tavares, A. O. (2019). *Social vulnerability and local level assessments : a new approach for planning*. 15–43. https://doi.org/10.1108/IJDRBE-10-2019-0069

Modugu, K. P., & Dempere, J. (2020). Country-level governance quality and stock market performance of GCC countries. *Journal of Asian Finance, Economics and Business*, *7*(8), 185–195. https://doi.org/10.13106/JAFEB.2020.VOL7.NO8.185

Morgan, D. L. (1996). Focus groups. *Annual Review of Sociology*, *22*, 129–152. https://doi.org/10.1146/ANNUREV.SOC.22.1.129

Morshedi, M. A., & Kashani, H. (2020). A system dynamics model to evaluate the housing market response to vulnerability reduction promotion policies. *International Journal of Disaster Risk Reduction*, 101438.

https://doi.org/10.1016/j.ijdrr.2019.101438
Mustajoki, J., Saarikoski, H., Belton, V., Hjerppe, T., & Marttunen, M. (2020). Utilizing ecosystem service classifications in multi-criteria decision analysis – Experiences of peat extraction case in Finland. *Ecosystem Services*, *41*(April 2019), 101049. https://doi.org/10.1016/j.ecoser.2019.101049
Mwale, F. D., Adeloye, A. J., & Beevers, L. (2015). Quantifying vulnerability of rural communities to flooding in SSA: A contemporary disaster management perspective applied to the Lower Shire Valley, Malawi. *International Journal of Disaster Risk Reduction*, *12*, 172–187. https://doi.org/10.1016/J.IJDRR.2015.01.003
Nguyen, K. A., Liou, Y. A., & Terry, J. P. (2019). Vulnerability of Vietnam to typhoons: A spatial assessment based on hazards, exposure and adaptive capacity. *Science of the Total Environment*, *682*, 31–46. https://doi.org/10.1016/j.scitotenv.2019.04.069
Nicho, M., & McDermott, C. D. (2019). Dimensions of "socio" vulnerabilities of advanced persistent threats. *2019 27th International Conference on Software, Telecommunications and Computer Networks, SoftCOM 2019*, 1–5. https://doi.org/10.23919/SOFTCOM.2019.8903788
Octavian, A., Widjayanto, J., Putra, I. N., Purwantoro, S. A., Salleh, M. Z., Rahman, A. A. A., Ismail, A., & Baker, R. (2021). Combined multi-criteria decision making and system dynamics simulation of social vulnerability in southeast Asia. *Decision Science Letters*, *10*(3), 323–336. https://doi.org/10.5267/j.dsl.2021.2.005
Perdikaris, J., Gharabaghi, B., & Mcbean, E. (2011). A methodology for undertaking vulnerability assessments of flood susceptible communities. *International Journal of Safety and Security Engineering*, *1*(2), 126–146. https://doi.org/10.2495/SAFE-V1-N2-126-146
Potter, K., Potter, K. M., Escanferla, M. E., Jetton, R. M., & Man, G. (2019). Prioritizing the conservation needs of United States tree species : Evaluating vulnerability to forest insect and disease threats Prioritizing the conservation needs of United States tree species : Evaluating vulnerability to forest insect and disease thr. *Global Ecology and Conservation*, *18*(June), e00622. https://doi.org/10.1016/j.gecco.2019.e00622
Rochadi, A. S., Pramanti, A., & Sulaiman, A. (2019). *The Declining Pancasila Industrial Relations and the Increasing Industrial Conflicts: Research Findings from Karawang- Indonesia*. *292*, 166–173. https://doi.org/10.2991/agc-18.2019.25
Schoenenberger, L., Schmid, A., Tanase, R., Beck, M., & Schwaninger, M. (2021). Structural Analysis of System Dynamics Models. *Simulation Modelling Practice and Theory*, *110*(April), 102333. https://doi.org/10.1016/j.simpat.2021.102333
Shah, A. A., Ye, J., Shaw, R., Ullah, R., & Ali, M. (2020). Factors affecting flood-induced household vulnerability and health risks in Pakistan: The case of Khyber Pakhtunkhwa (KP) Province. *International Journal of Disaster Risk Reduction*, *42*(September), 101341. https://doi.org/10.1016/j.ijdrr.2019.101341
Sharma, V., Gidwani, B. D., Sharma, V., & Meena, M. L. (2019). Implementation model for cellular manufacturing system using AHP and ANP approach. *Benchmarking*, *26*(5), 1605–1630. https://doi.org/10.1108/BIJ-08-2018-0253
Sufri, S., Dwirahmadi, F., Phung, D., & Rutherford, S. (2020). Progress in the early warning system in Aceh province, Indonesia since the 2004 earthquake-tsunami. *Environmental Hazards*, *19*(5), 463–487. https://doi.org/10.1080/17477891.2019.1653816
Sweeney, L. B., & Sterman, J. D. (2007). Thinking about systems: Student and teacher conceptions of natural and social systems. *System Dynamics Review*, *23*(2–3), 285–311. https://doi.org/10.1002/sdr.366
Taguchi, N. (2018). Description and explanation of pragmatic development: Quantitative, qualitative, and mixed methods research. *System*, *75*, 23–32. https://doi.org/10.1016/j.system.2018.03.010
Thabane, K. (2015). Determinants of Vulnerability to Livelihood Insecurity at Household Level: Evidence from Maphutseng, Lesotho. *Journal of Agricultural Extension*, *19*(2), 1. https://doi.org/10.4314/jae.v19i2.1
Török, I. (2017). Assessment of social vulnerability to natural hazards in Romania. *Carpathian Journal of Earth and Environmental Sciences*, *12*(2), 549–562.
Török, I. (2018). Qualitative assessment of social vulnerability to flood hazards in Romania. *Sustainability (Switzerland)*, *10*(10). https://doi.org/10.3390/su10103780
Ubayanto, T., Sudarsono, S., Permadi, I., & Widagdo, S. (2020). Legal Implications of the Arrangement of Authority of the Indonesian National Army in Overcoming the Armed Separatist Movement, Armed Insurgency and Terrorism. *Journal of Arts and Humanities*, *9*(5), 26–38.
Unceta, A., Luna, Á., Castro, J., & Wintjes, R. (2020). Social Innovation Regime: an integrated approach to measure social innovation. *European Planning Studies*, *28*(5), 906–924. https://doi.org/10.1080/09654313.2019.1578338
Widodo, A., Hadianto, M., & Widjayanto, J. (2022). THE ROLE OF INDONESIAN ARMY (TNI) IN REDUCING THE 2001'S SAMPIT CONFLICT AS NATIONAL DEFENSE. *International Journal of Law Reconstruction*, *6*(1), 1–12. https://doi.org/10.26532/IJLR.V6I1.20997
Wu, C.-H. (2021). On the Moderating Effects of Country Governance on the Relationships between Corporate Governance and Firm Performance. *Journal of Risk and Financial Management*, *14*(3), 140. https://doi.org/10.3390/jrfm14030140