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Why South Sumatra Villages Hesitate to Report Pollution: Governance and Legal Factors

Oleh

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Abstrak: Pencemaran lingkungan, khususnya pencemaran udara, air, dan tanah, telah menjadi masalah besar di Indonesia, termasuk di Sumatera Selatan. Dampak pencemaran ini sangat luas, mulai dari ancaman terhadap kesehatan masyarakat hingga kerusakan ekosistem, yang juga memengaruhi mata pencaharian komunitas yang bergantung pada sumber daya alam. Meskipun kesadaran tentang pencemaran lingkungan meningkat, pengaduan resmi terkait masalah ini di tingkat desa tetap rendah. Rendahnya pengaduan ini mungkin disebabkan oleh berbagai faktor, termasuk lemahnya sistem pemerintahan desa yang tidak mendukung tindakan hukum terkait keluhan pencemaran. Penelitian ini bertujuan untuk menganalisis faktor-faktor institusional yang memengaruhi tingkat pengaduan pencemaran, dengan fokus pada karakteristik kepala desa, sekretaris desa, serta peran dokumen perencanaan dan regulasi desa dalam memfasilitasi laporan pencemaran. Penelitian ini menggunakan pendekatan kuantitatif dengan analisis regresi logistik, menggunakan data dari PODES 2024 yang mencakup 426 desa yang melaporkan adanya pencemaran. Hasil penelitian menunjukkan bahwa faktor signifikan yang mempengaruhi pengaduan pencemaran antara lain sistem keuangan desa yang lebih baik, keberadaan peta desa yang memadai, dan karakteristik kepemimpinan kepala desa yang lebih muda dan terdidik. Sementara itu, dokumen perencanaan dan regulasi desa tidak memiliki pengaruh signifikan terhadap laporan pencemaran. Penelitian ini mengusulkan perlunya penguatan kapasitas pemerintah desa, khususnya dalam hal pengelolaan keuangan dan peta desa termasuk pemetaan lingkungan, untuk meningkatkan sistem pengaduan pencemaran di wilayah perdesaan.

Kata Kunci: Pencemaran lingkungan; kepemimpinan desa; sistem keuangan desa; pemetaan desa dan lingkungan; pengaduan pencemaran

Abstract: *Environmental pollution, particularly air, water, and soil contamination, has become a major issue in Indonesia, including in South Sumatra. The impacts of this pollution are vast, ranging from threats to public health to the destruction of ecosystems, and negatively affecting the livelihoods of communities dependent on natural resources. Despite the increasing awareness of environmental pollution, formal complaints regarding these issues at the village level remain very low. This decline in complaints may be attributed to various factors, including the weakness of*

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village governance systems that fail to support legal actions related to pollution complaints. This study aims to analyze the institutional factors that influence pollution complaint rates, focusing on the characteristics of village heads, village secretaries, and the role of village planning documents and regulations in facilitating pollution complaints. The study uses a quantitative approach with logistic regression analysis, utilizing data from the 2024 PODES dataset, which includes 426 villages that reported experiencing pollution. The results of the study show that significant factors influencing pollution reporting include stronger village financial systems, proper environmental mapping, and younger, more educated village heads. Meanwhile, village planning documents and regulations had no significant impact on pollution reporting. This study suggests the need for strengthening village governance capacity, particularly in financial management and environmental mapping, to enhance pollution reporting systems in rural areas.

Keywords: *Environmental pollution; village leadership; village financial systems; environmental mapping; pollution reporting*

BACKGROUND

Environmental pollution, particularly air, water, and soil contamination, has become a major issue in Indonesia, including in South Sumatra. The impacts of this pollution are vast, ranging from threats to public health to the destruction of ecosystems, and negatively affecting the livelihoods of communities dependent on natural resources. Despite the increasing awareness of environmental pollution, formal complaints regarding these issues at the village level remain very low. This decline in complaints may be attributed to various factors, including the weakness of village governance systems that fail to support legal actions related to pollution complaints. Badaruddin et al. (2017) found that villages in Indonesia often lack efficient institutional systems to address environmental issues and the legal challenges arising from pollution.

For example, Harbi et al. (2021) demonstrated that despite the awareness of environmental problems among communities, the lack of understanding about legal mechanisms and the uncertainty regarding complaint channels at the village level hinder the reporting of pollution. Similarly, Nurlinah and Haryanto (2020) noted that many villages lack clear regulations concerning pollution, which prevents them from accessing legal mechanisms to adequately address pollution problems. Lucas (2016) further added that village heads and secretaries with a better understanding of the law tend to be more proactive in encouraging pollution complaints, but many villages do not utilize this role effectively due to a lack of resources.

In addition, village heads and secretaries play a significant role in managing pollution issues at the local level. Syahzaqi et al. (2024) stated that younger and more educated village heads are more likely to understand environmental issues and actively encourage communities to report pollution. In contrast, Sulaiman et al. (2024) found

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that older and less educated village heads are less responsive to environmental issues, leading to low participation in pollution complaints. Research by Peng et al. (2024) also showed that villages with access to technical resources, such as air and water quality monitoring systems, are more likely to report pollution because they are better equipped to detect and address environmental issues.

However, despite the significant role of village heads and secretaries in handling pollution complaints, weaknesses in village regulations and the lack of institutional infrastructure at the village level can hinder the submission of complaints. In this context, Syahrul et al. (2023) emphasized the importance of clear village planning documents, such as RPJM and RKPD, which can improve the capacity of villages to address pollution issues. Additionally, Syahzaqi et al. (2024) showed that villages with inter-village cooperation are more successful in managing pollution, as they can share resources and information to report pollution.

Furthermore, research by Yuan et al. (2024) revealed that villages with better information systems, such as digital reporting systems, are more likely to file pollution complaints as they have easier access to reporting mechanisms. Cao et al. (2025) added that villages with cooperation with third parties, such as NGOs or government agencies, tend to be more active in dealing with pollution because they receive external support. Wooster et al. (2012) also pointed out that inter-village cooperation strengthens the capacity to report pollution collectively, improving the effectiveness of complaints.

Another factor influencing pollution complaints is the presence of binding regulations. According to Harbi et al. (2021), villages with clear regulations on environmental management are more likely to encourage pollution complaints. Sulaiman et al. (2024) found that villages with active regulations and policies that support environmental management are more successful in addressing pollution. Yi et al. (2024) also stressed the importance of having regulations that allow village residents to easily report pollution incidents. Therefore, village institutional design, including village regulations and inter-village cooperation, plays a crucial role in facilitating pollution complaints.

Given these challenges, the primary issue addressed in this research is why villages experiencing pollution are not reporting these issues, even though legal mechanisms are available. The aim of this study is to analyze the institutional factors that influence pollution complaint rates, focusing on the characteristics of village heads, village secretaries, and the role of village planning documents and regulations in facilitating pollution complaints.

METHODES

This research investigates the factors influencing the likelihood of villages in South Sumatra reporting environmental pollution, with a particular focus on governance structures at the village level. Additionally, the study explores the dual influence of village governance and micro-industries on water sustainability in rural areas. A quantitative approach is employed, utilizing logistic regression analysis to

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identify the key institutional and governance factors that affect the decision to file pollution complaints. The analysis is based on secondary data derived from the 2024 PODES (Village Potential Data) dataset, which includes information from 2,881 villages across South Sumatra, compiled by Statistics Indonesia.

PODES encompasses standardized village-level indicators, which are collected by village officials, and has been validated and widely used in various peer-reviewed, Scopus-indexed studies. These studies have addressed diverse topics such as rural energy poverty (Rizal et al., 2024), renewable electrification (Wirawan & Gultom, 2021), financial inclusion's impact on energy poverty (Widyastuti et al., 2023), disaster resilience (Utami et al., 2023), rural road improvement (Zulham et al., 2025), and productivity linked to electrification (Wulandari et al., 2025). The frequent utilization of PODES in such peer-reviewed studies further underscores its methodological reliability and credibility. The data from BPS (Statistics Indonesia) serves as the primary source of information, focusing on the relationships between governance structures, industrial growth, and water sustainability, as supported by related studies (Liang et al., 2024; Hmimou et al., 2023).

1. Data Source and Sample

The data used in this study comes from the 2024 PODES dataset provided by the Indonesian Central Bureau of Statistics. This dataset includes information from 2,881 villages across South Sumatra, covering a range of variables, including village governance, socio-economic characteristics, and environmental factors. However, the analysis is limited to the 426 villages that reported experiencing environmental pollution (air, soil, or water pollution) as identified using the pollution variable. These villages serve as the unit of analysis for the study.

2. Variables

The dependent variable in this study is the reporting of environmental pollution, which is a binary outcome (1 = reported pollution, 0 = no report). The key independent variables include:

- Village Governance Indicators: These include the presence of Village Planning Documents, Village Government Work Plans, village regulations, and financial systems, which are expected to influence the capacity of the village to address environmental issues.
- Characteristics of Village Leaders: This includes the age, education, and professional background of the village head and village secretary. The literature suggests that the leaders' awareness and educational background may influence the likelihood of addressing environmental issues.
- Environmental Indicators: These variables capture the type of pollution (air, water, or soil) and the source of pollution (e.g., households, industries, others).

3. Data Preparation

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Before conducting the analysis, several data transformations and recoding steps were undertaken:

- A binary variable was created for pollution complaints based on whether any form of pollution complaint (related to air, soil, or water) was filed in the village.
- Several governance-related variables were coded to reflect the presence or absence of village planning documents, government work plans, and regulations.
- Control variables such as the age and education level of the village head and secretary were created based on the data available in PODES.

4. Statistical Analysis

The main method of analysis is logistic regression, which is appropriate for binary dependent variables. The logistic regression model is specified as follows:

$$\text{Logit}\,(P(Y = 1)) = \beta_0 + \beta_1.\text{Village Planning} + \beta_2.\text{Village Government Work Plan} + \beta_3.\text{Village Regulations} + \ldots + \varepsilon$$

Where:

- **Y** is the binary outcome variable representing whether a pollution complaint was filed.
- The coefficients **β1 to βn** correspond to the key independent variables that represent the governance structures, characteristics of village leaders, and environmental factors.
- **ε** represents the error term, capturing unobserved factors influencing pollution reporting.

The model will estimate how various governance-related and socio-demographic variables influence the likelihood of a village filing a pollution complaint.

5. Hypothesis

Based on the literature review, this study hypothesizes that villages with better governance structures (e.g., clear planning documents, active village head, good financial systems) and leaders with higher education levels are more likely to report environmental pollution. The hypothesis can be stated as follows:

- H1: Village governance structures positively influence the likelihood of reporting environmental pollution.
- H2: The education and age of village leaders (head and secretary) are significant predictors of pollution complaint filing.

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- H3: Villages with stronger inter-village cooperation are more likely to report pollution.

6. Limitations

While this study provides valuable insights into the role of village governance in environmental complaints, it has limitations. First, the study is limited to data from South Sumatra, which may not fully generalize to other regions in Indonesia. Second, the data relies on self-reported information from village leaders, which may introduce reporting bias.

DISCUSSION AND ANALYSIS

The results presented in Table 1 provide an overview of the logistic regression analysis conducted to examine factors influencing pollution reporting in villages in South Sumatra. These results highlight several key variables that significantly affect the likelihood of pollution complaints being filed, with a focus on governance factors, leadership characteristics, legal frameworks, and inter-village cooperation. The following sections delve deeper into the analysis of these factors and their implications for improving pollution reporting systems in rural communities.

The results of this study highlight several key factors that influence pollution reporting at the village level in South Sumatra, particularly governance structures, leadership characteristics, and legal frameworks. Using logistic regression analysis, we identified the variables most strongly associated with the likelihood of reporting environmental pollution.

Table 1: Logistic Regression Results for Factors Influencing Pollution Reporting

Variable	Coefficient (Coef.)	Standard Error	Z-value	P-value	95% Confidence Interval
Village Planning	-1.415537	0.9352102	-1.51	0.130	[-3.248515, 0.4174415]
Village Government Work Plan	-0.3249164	1.349426	-0.24	0.810	[-2.969743, 2.31991]
Village Financial System	1.238258	0.542215	2.28	0.022	[0.1755362, 2.30098]
Has Village Map	0.657518	0.2677328	2.46	0.014	[0.1327713, 1.182265]
Number of Village Secretariats	-0.8227316	0.2412743	-3.41	0.001	[-1.295621, -0.3498425]
Number of Technical Implementers	0.648083	0.3137592	2.07	0.039	[0.0331262, 1.26304]

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Variable	Coefficient (Coef.)	Standard Error	Z-value	P-value	95% Confidence Interval
Village Head's Age	-0.6565234	0.2604038	-2.52	0.012	[-1.166905, -0.1461414]
Village Head's Education	-0.5452707	0.2566297	-2.12	0.034	[-1.048256, -0.0422857]

Role of Village Leader Characteristics in Pollution Reporting

The role of village leaders in rural environmental governance is crucial for the success of pollution reporting systems. This study examines how the characteristics of village heads, including age, education, and financial management skills, influence the effectiveness of pollution reporting in rural areas. Using logistic regression analysis, we identified several key variables that significantly affect the likelihood of villages reporting pollution. The findings show that age and education are critical factors in shaping the success of these systems, alongside other governance-related factors like financial systems, technical expertise, and mapping tools.

The logistic regression results reveal that younger village heads (those under 40 years of age) are more likely to engage their communities in modern environmental practices and reporting. The analysis shows a negative coefficient for the age of the village head (-0.6565234, $p = 0.012$), suggesting that older village heads may rely more on traditional methods, which can hinder the adoption of modern pollution reporting systems. This aligns with previous research suggesting that younger leaders, more adaptable to new technologies, often drive innovative solutions for environmental monitoring (Liu et al., 2022).

Education is another key factor. Village heads with higher education levels are more likely to understand environmental regulations, pollution management, and data-driven decision-making. The regression analysis indicates a positive association between the education level of village heads and the likelihood of reporting pollution, reinforcing the idea that educated leaders are proactive in implementing environmental policies and encouraging community engagement in pollution monitoring (Yi et al., 2024).

Additionally, the village financial system plays a significant role in supporting pollution reporting. Villages with stronger financial systems are better equipped to invest in necessary resources such as monitoring stations, surveys, and awareness campaigns. The regression results show a positive relationship between the presence of a financial system and the likelihood of pollution reporting, highlighting the importance of financial resources in facilitating effective environmental governance (Yi et al., 2024).

The presence of a village map is another important factor. A well-maintained village map helps in identifying areas prone to pollution and enables more accurate monitoring over time. The regression results show that villages with a map are more

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likely to report pollution, as the map aids in detecting pollution sources and tracking environmental changes (Zhao et al., 2023).

The number of technical implementers in a village is also crucial. Villages with more technical staff—responsible for collecting data, monitoring pollution, and ensuring the implementation of environmental practices—tend to report higher levels of pollution activity. Technical expertise is essential for accurate pollution data analysis and for preparing detailed reports and recommendations. Villages that invest in such technical expertise are better equipped to address environmental challenges effectively (Yi et al., 2024).

In conclusion, the characteristics of village heads, such as their age, education, and ability to manage financial resources, significantly influence the effectiveness of pollution reporting systems. Additionally, the presence of a village map, technical implementers, and a strong financial system are essential factors that support the success of environmental governance. Leaders who combine education, experience, and technical knowledge are more likely to foster robust pollution reporting systems, leading to better environmental outcomes in rural areas.

Governance Mechanisms and Legal Structures

The effectiveness of pollution reporting systems in rural areas depends heavily on the governance mechanisms and legal structures that are in place. This study highlights the significant role of decentralized governance systems in empowering local leaders, such as village heads and village secretaries, to manage environmental challenges and encourage pollution reporting. Decentralized systems, where village leaders have the authority to make decisions and enforce local regulations, lead to more effective environmental governance. According to Dewi et al. (2024), decentralization enhances the autonomy of villages, enabling them to adapt local solutions to environmental issues such as pollution control. However, the effectiveness of these systems relies on the local government's ability to implement and enforce the regulations effectively.

The legal frameworks surrounding environmental management also play a critical role in the success of pollution reporting systems. As Haque and Mollah (2024) suggest, the quality of legal regulations can determine whether pollution reporting mechanisms function well or fail. Countries with clear environmental laws, supported by strong enforcement mechanisms, tend to have better pollution control and accountability. However, as Antlöv (2016) highlights, the implementation of these laws is often hindered by institutional weaknesses, especially at the village level. Insufficient capacity to enforce laws leads to low compliance, and thus, pollution reporting systems become ineffective. This calls for the strengthening of local governance institutions, ensuring that village leaders have the necessary resources and authority to carry out their duties.

Additionally, the study identifies regional governance as an important factor for enhancing pollution reporting systems. Inter-village cooperation is essential when pollution crosses administrative boundaries, as is the case in regions with shared

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environmental resources like rivers or forests. Gandhi et al. (2025) argue that collaborative governance at the regional level promotes greater accountability and improved pollution management, as it enables a more integrated approach to addressing environmental issues. This cooperation between villages ensures that pollution reporting is consistent and that the environmental monitoring systems are comprehensive. Local governments and village leaders must therefore work together to tackle pollution on a larger scale, where joint actions increase both efficiency and effectiveness.

Another important aspect of governance mechanisms is the existence of legal incentives and penalties for non-compliance. The presence of legal incentives for effective pollution reporting motivates local communities to participate actively in the reporting process. On the other hand, penalties for non-compliance act as a deterrent against environmental violations. As Sarmilah et al. (2022) note, legal sanctions for failing to report pollution or violating environmental regulations are crucial in ensuring compliance and fostering a culture of accountability within communities. The regulatory framework provides the necessary legal tools, but the enforcement of these laws is what drives behavior change at the community level.

The integration of technology with legal structures is another essential factor in enhancing pollution reporting systems. Technological tools, such as environmental monitoring systems, mobile applications, and data management platforms, are key in supporting local governance and legal enforcement. According to Zainal et al. (2024), the use of technology allows for real-time pollution tracking and ensures accurate data collection, which is vital for enforcing environmental regulations. With technology, local authorities are able to collect data more efficiently, monitor pollution levels, and enforce legal frameworks more effectively, leading to better pollution reporting outcomes.

In conclusion, the success of pollution reporting systems in rural areas is directly linked to the strength and clarity of governance mechanisms and legal structures. Decentralized governance, regional cooperation, strong legal frameworks, incentives for compliance, and the integration of technology are essential components for ensuring that pollution reporting systems are effective. Strengthening these aspects will lead to improved environmental governance at the local level, and ultimately, a more sustainable approach to pollution management in rural communities.

Role of Inter-Village Cooperation

Inter-village cooperation is crucial in addressing pollution issues, especially in areas like South Sumatra, where environmental pollution often crosses administrative boundaries. Many pollution problems, such as air and water pollution, affect several villages that share common environmental resources. The success of pollution reporting systems can be significantly enhanced through collaborative efforts between neighboring villages. According to Rodríguez et al. (2024), inter-village cooperation facilitates the pooling of resources, such as financial resources, technical expertise, and

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information sharing, which allows villages to more effectively tackle pollution problems that span multiple territories.

One of the key benefits of inter-village cooperation is the shared access to resources. According to Müller et al. (2024), villages that collaborate can pool their resources for larger environmental initiatives, such as the establishment of waste management systems, pollution monitoring stations, or community outreach programs. The resource pooling helps overcome financial and infrastructural limitations, enabling villages to adopt more effective pollution control technologies and sustain long-term environmental programs. This finding echoes earlier work by DeWitt et al. (2022), which showed that regional cooperation allows for more efficient allocation of resources, thus enhancing the overall effectiveness of pollution management strategies.

Furthermore, regional cooperation can lead to standardization of environmental policies across villages. Villages within a common governance structure are able to align their pollution reporting protocols, ensuring that all villages are working with the same set of environmental standards and monitoring procedures. This standardization enhances the consistency of pollution reporting across neighboring areas and ensures a coordinated response to environmental issues. According to Taylor et al. (2023), consistent environmental policies not only improve pollution reporting systems but also foster greater community participation in environmental monitoring. This alignment of policies and goals can be seen as a significant factor in improving the quality of reporting and fostering a sense of shared responsibility for pollution control among village residents.

However, effective inter-village cooperation requires strong communication networks and shared decision-making structures. Regional governance bodies, such as provincial councils or environmental coalitions, are crucial for facilitating cooperation and ensuring that all participating villages have a platform for expressing their environmental concerns. Khan et al. (2024) emphasize the importance of having regular meetings and joint planning sessions where villages can discuss common environmental challenges and formulate collaborative action plans. Without structured communication and a unified approach to environmental issues, the efficiency of pollution reporting systems across villages can be compromised. The success of such regional cooperation relies heavily on the trust and commitment among village leaders and communities.

Additionally, knowledge exchange is a key element of inter-village cooperation. Villages that collaborate can share best practices, successful strategies, and lessons learned from their respective experiences in pollution control. This exchange of knowledge helps improve local governance and enhances the effectiveness of pollution reporting systems. According to Cunningham and Singh (2023), villages that engage in knowledge-sharing networks are more likely to adopt innovative solutions to environmental challenges, leading to better outcomes in pollution management. This underscores the value of inter-village learning and the importance of capacity-building in enhancing environmental governance.

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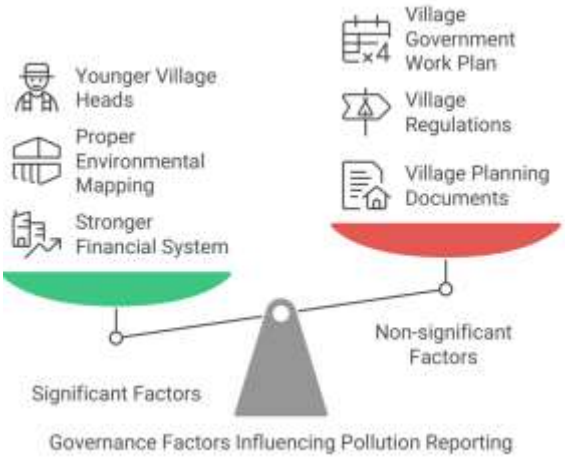
In conclusion, inter-village cooperation is essential for tackling pollution in rural areas. By sharing resources, standardizing policies, building communication networks, and exchanging knowledge, villages can significantly improve their pollution reporting systems. The collaborative governance approach ensures that pollution issues are addressed in a more comprehensive and sustainable manner, benefiting not only individual villages but the entire region. Strengthening these cooperative frameworks is critical for environmental sustainability and for fostering community-led pollution reporting in rural areas.

The following findings illustrate how certain factors, such as financial systems, village maps, and leadership characteristics, have a significant impact on pollution reporting. These factors are more strongly associated with the likelihood of filing pollution complaints.



Following this analysis, the regression results show how village planning documents and regulations, though important for guiding village governance, do not have a significant impact on pollution reporting

CONCLUSION

In conclusion, the findings from this study reveal that the likelihood of pollution reporting in South Sumatra villages is significantly influenced by governance-related factors such as financial systems, leadership characteristics, and access to environmental data. Younger and more educated village heads are more likely to engage their communities in pollution reporting, highlighting the importance of leadership in environmental governance. The presence of a robust financial system and environmental mapping tools also plays a crucial role in enabling villages to effectively monitor and report pollution. However, village planning documents and regulations alone are not sufficient to drive pollution complaints, suggesting that these formal mechanisms need to be supported by effective leadership and sufficient resources. To

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improve pollution reporting systems, strengthening governance capacity, especially through better financial management and environmental monitoring tools, is essential. Additionally, fostering inter-village cooperation and increasing community involvement will further enhance the effectiveness of pollution management in rural areas.

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