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An Explanatory Sequential Mixed-Methods Evaluation of Consecutive Dry Day Information Dissemination for Forest and Land Fire Disaster Risk Reduction in West Kotawaringin

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Abstract

Forest and land fires frequently occur in Indonesian tropical peatlands due to prolonged dry periods. Although the Indonesian Meteorology, Climatology, and Geophysics Agency (BMKG) routinely disseminates consecutive dry day (HTH) information, its effectiveness in supporting forest and land fire prevention has received limited attention. This study evaluated the relationship between HTH and hotspot occurrence and assessed the effectiveness of HTH information dissemination using an explanatory sequential mixed-methods approach. Pearson correlation analysis was applied to HTH and hotspot data collected during 2023-2024, while stakeholder perceptions were evaluated through questionnaires involving 43 respondents and supported by semi-structured interviews. The results revealed a positive relationship between HTH and hotspot occurrence, with a stronger correlation during the 2023 El Niño period than in 2024. Stakeholders showed a very high perception of HTH information dissemination, with an overall mean score of 4.239 and excellent questionnaire reliability (Cronbach's α = 0.9862). However, qualitative findings indicated that institutional coordination and differences in technical understanding affected the operational use of HTH information. These findings demonstrate that effective forest and land fire early warning systems require not only reliable climate indicators but also effective dissemination and institutional coordination to support timely mitigation. Overall, this study demonstrates that HTH-based consecutive dry day information dissemination constitutes an integral component of a science-based Disaster Risk Reduction (DRR) and Disaster Management strategy, bridging meteorological monitoring with multi-stakeholder preventive action in tropical peatland fire-prone regions.

Keywords: **C**onsecutive dry days (hth); Hotspot; Forest and land fire; Early warning system; Tropical peatland; Disaster risk reduction; Disaster management.

1. Introduction

Forest and land fires (FLFs) have become one of the most recurrent environmental disasters in Southeast Asia, particularly in Indonesia, where extensive tropical peatlands are highly susceptible to prolonged dry conditions. Besides causing severe ecological degradation, forest and land fires generate substantial economic losses, threaten public health through transboundary haze pollution, and contribute significantly to global greenhouse gas emissions. Previous studies have demonstrated that climate variability, particularly prolonged drought associated with El Niño events, substantially increases fire occurrence by reducing soil moisture and accelerating peatland (Kiely et al., 2021; Taufik et al., 2023; Usup & Hayasaka, 2023). Consequently, effective early warning systems have become an essential component of forest fire prevention strategies.

Indonesia possesses one of the world's largest tropical peatland ecosystems, with a considerable proportion located in Central Kalimantan. Among the regencies in this province, West Kotawaringin is recognized as one of the areas with the highest forest and land fire susceptibility because of its extensive peatland, plantation areas, and degraded vegetation. Historical records indicate considerable annual

fluctuations in fire occurrence, with an exceptional increase during the 2023 dry season when 196 fire incidents affected approximately 924.8 ha, compared with only 24 incidents recorded in 2022. This significant increase coincided with the strong El Niño event, highlighting the critical influence of prolonged dry periods on fire occurrence.

Among various meteorological drought indicators, Consecutive Dry Days (CDD), locally referred to as Hari Tanpa Hujan (HTH), is one of the operational climate products routinely generated by the Indonesian Agency for Meteorology, Climatology, and Geophysics (BMKG). HTH represents the number of consecutive days without measurable rainfall (<1 mm day^{-1}) and serves as an indicator of progressive vegetation and peat fuel drying before fire ignition. Previous studies have consistently demonstrated a significant relationship between increasing CDD duration and hotspot occurrence in Indonesian peatlands. (Asima Nainggolan et al., 2020) reported that hotspot probability exceeded 50% when CDD surpassed approximately 13 days in Riau peatlands, while Suwarman et al. (2025) observed strong positive correlations between CDD duration and hotspot density. Similar findings were also reported in West Kalimantan, confirming that prolonged dry periods are reliable indicators of increasing fire risk.

Despite the scientific reliability of HTH as an early warning indicator, its operational effectiveness depends not only on the accuracy of climate information but also on how the information is disseminated, interpreted, and utilized by stakeholders responsible for forest fire prevention. BMKG routinely distributes HTH information through various communication channels, including official climate bulletins, websites, WhatsApp groups, and early warning platforms. However, previous studies have suggested that meteorological information is frequently underutilized because of limited data literacy, communication barriers, inadequate institutional coordination, and the absence of operational procedures that explicitly incorporate climate-based warning indicators into preventive actions (Bradley et al., 2014; Morss et al., 2008). As a result, scientifically valid climate information does not always translate into effective field-level decision making.

Forest fire prevention in West Kotawaringin involves multiple institutions with different operational responsibilities, including BMKG as the climate information provider, the Regional Disaster Management Agency (BPBD), Manggala Agni, Community Fire Care Groups (MPA), Disaster Resilient Villages (Destana), local governments, and plantation managers. The effectiveness of HTH dissemination therefore depends on the successful transfer of information through multiple organizational levels before preventive actions such as intensified patrols, peatland rewetting, public awareness campaigns, and fire prevention activities can be implemented. Any interruption within this communication chain may reduce the overall effectiveness of the early warning system.

Most previous studies have primarily focused on evaluating the physical relationship between meteorological drought indicators and hotspot occurrence or on developing climate-based fire prediction models. Comparatively little attention has been devoted to understanding how HTH information is operationally disseminated, interpreted, and transformed into preventive actions by multiple stakeholders involved in forest and land fire management. This limitation represents an important research gap because the success of an early warning system ultimately depends not only on forecasting accuracy but also on effective communication and stakeholder response.

Therefore, this study aims to (1) analyze the relationship between consecutive dry days and hotspot occurrence in West Kotawaringin Regency, (2) evaluate stakeholders' understanding and utilization of HTH information for forest and land fire prevention, and (3) assess the effectiveness of HTH information dissemination as a component of climate-based early warning systems for supporting proactive forest and land fire prevention.

2. Material and Methods

2.1 Study Area

This study was conducted in West Kotawaringin Regency, Central Kalimantan Province, Indonesia (Figure 1). The regency is characterized by extensive tropical peatlands, plantations, secondary forests, and shrublands, making it highly vulnerable to forest and land fires during prolonged dry periods. Recurrent fire events, particularly during the 2023 El Niño, highlight the importance of climate-based early warning systems for fire prevention. Meteorological observations and hotspot records from 2023-2024 were analyzed to examine the relationship between consecutive dry days (HTH) and fire occurrence. Stakeholder surveys and interviews were also conducted with BMKG, BPBD, Manggala Agni, Community Fire Care Groups (MPA), and Disaster Resilient Villages (Destana) to evaluate the operational use of HTH information in supporting forest and land fire prevention.

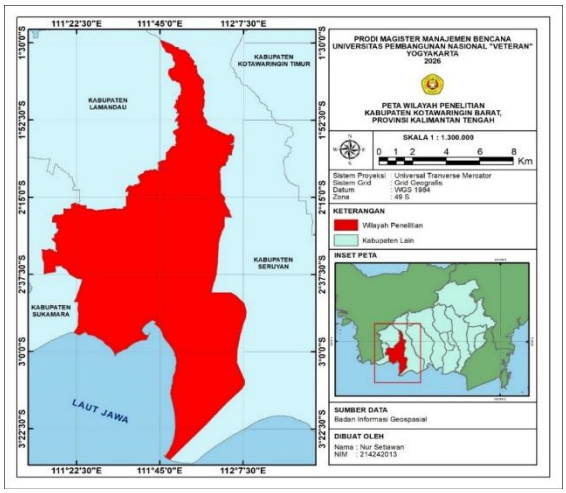

Fig 1. Study Area

2.2 Research Design

2.2.1 Research Framework

This study employed a mixed-methods approach using an explanatory sequential design. Quantitative analysis was first conducted to examine the relationship between consecutive dry days (HTH) and hotspot occurrence and to assess stakeholders' perceptions through structured questionnaires. The quantitative findings were subsequently complemented by qualitative interviews to obtain a deeper understanding of the dissemination process, stakeholder responses, and operational challenges associated with HTH information. The overall research framework is presented in Figure 2.

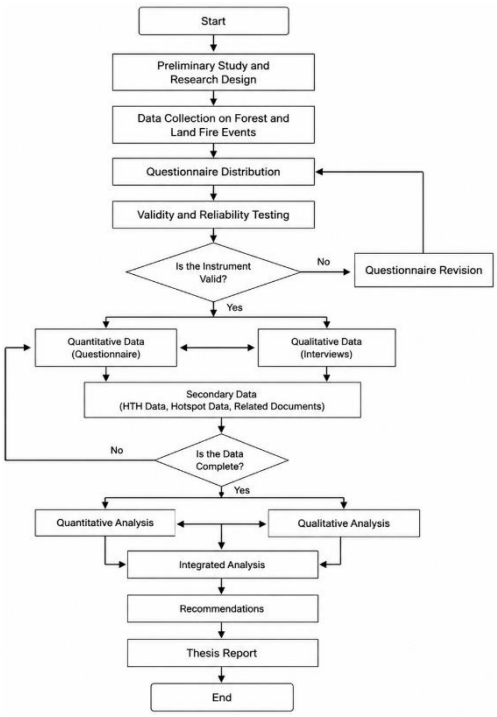

Fig 2. Research Framework

2.2.2 Data Collection

This study employed both primary and secondary data using a mixed-methods approach (Table 1). Secondary data consisted of consecutive dry day (HTH) records obtained from the Indonesian Agency for Meteorology, Climatology, and Geophysics (BMKG), hotspot data collected from the forest and land fire monitoring system, and historical forest and land fire records in West Kotawaringin Regency during the 2023-2024 period. These datasets were used to examine the temporal relationship between HTH conditions and hotspot occurrence.

Primary data were collected through structured questionnaires and semi-structured interviews involving 43 respondents responsible for forest and land fire prevention. The respondents included representatives from BMKG, the Regional Disaster Management Agency (BPBD), Manggala Agni, Community Fire Care Groups (MPA), Disaster Resilient Villages (Destana), and local government institutions. The questionnaire was designed using a five-point Likert scale to evaluate stakeholders' perceptions regarding the dissemination, understanding, and utilization of HTH information, while interviews were conducted to explore operational practices and challenges in implementing climate-based early warning information.

Table 1. Data used in this study

Data	Source	Period	Purpose
Consecutive Dry Days (HTH)	BMKG	2023–2024	Analyze drought conditions and early warning information
Hotspot Data	Forest and Land Fire Monitoring System	2023–2024	Assess fire occurrence and correlation with HTH
Forest and Land Fire Records	BPBD West Kotawaringin	2023–2024	Validate fire events and support temporal analysis
Questionnaire Responses	BMKG, BPBD, Manggala Agni, MPA, Destana	Survey period	Assess stakeholder perceptions of HTH dissemination
Semi-structured Interviews	Key stakeholders	Survey period	Explore operational implementation and dissemination challenges

2.3 Data Analysis

2.3.1 HTH–Hotspot Analysis

The relationship between consecutive dry days (HTH) and hotspot occurrence was evaluated using the Pearson product-moment correlation coefficient (PCC), which quantifies the strength and direction of the linear relationship between two continuous variables. Pearson correlation remains one of the most widely adopted statistical approaches in environmental and geospatial studies because of its simplicity and effectiveness in assessing linear associations between climate variables and environmental responses. Recent studies have also emphasized that Pearson correlation provides reliable results when the variables satisfy linearity assumptions and serves as a robust baseline for environmental data analysis(Díaz-Vallejo et al., 2024).

The analysis was performed using paired HTH and hotspot observations during the 2023-2024 study period. Correlation coefficients were calculated for the complete dataset and separately for each year to evaluate the influence of different climatic conditions on forest and land fire occurrence. The statistical significance of the correlation was assessed at the 95% confidence level ($p < 0.05$)(Schober et al., 2018).

$$r = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^{n}(X_i - \bar{X})^2 \sum_{i=1}^{n}(Y_i - \bar{Y})^2}} \quad (1)$$

Where;

r = Pearson correlation coefficient;
Xi = consecutive dry day (HTH);
Yi = hotspot occurrence;
$\bar{X}$ = mean HTH;
$\bar{Y}$ = mean hotspot;
n = total number of observations.

The analysis produced the Pearson correlation coefficient (r), significance value (p), and correlation strength, which were subsequently interpreted to identify the relationship between HTH and hotspot occurrence.

2.3.2 Questionnaire Analysis

Stakeholders' perceptions regarding the dissemination and utilization of consecutive dry day (HTH) information were assessed using a structured questionnaire based on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire consisted of statements designed to evaluate respondents' understanding of HTH information, accessibility of dissemination channels, operational utilization, and perceived effectiveness in supporting forest and land fire prevention. The Likert scale is widely employed in social and disaster management research because it enables the quantitative measurement of attitudes and perceptions while maintaining simplicity and consistency in data interpretation (Joshi et al., 2015).

Prior to the analysis, the questionnaire instrument was evaluated through validity and reliability tests to ensure measurement quality. Item validity was assessed using the Pearson product-moment correlation, where each item's correlation coefficient was compared with the critical value at a significance level of α = 0.05. Items with significant positive correlations were considered valid for further analysis (Schober et al., 2018).

The internal consistency of the questionnaire was evaluated using Cronbach's alpha coefficient, which is one of the most widely accepted indicators for assessing reliability in survey-based studies. A Cronbach's alpha value of 0.70 or higher was considered acceptable, indicating satisfactory internal consistency among questionnaire items (Taber, 2018). After confirming the validity and reliability of the instrument, descriptive statistics were used to summarize stakeholders' responses by calculating the mean score for each indicator and interpreting the overall perception toward HTH information dissemination. The Cronbach's alpha coefficient was calculated using Equation (2):

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_i^2}{\sigma_T^2}\right) \quad (2)$$

Where;

α = Cronbach's alpha coefficient;
k = number of questionnaire items;
σ_i^2 = variance of each item;
σ_T^2 = total variance of the questionnaire.

2.3.3 Qualitative Analysis

Qualitative data obtained from semi-structured interviews were analyzed using the interactive analysis model developed by Miles, Huberman, and Saldaña, which consists of three iterative processes: data condensation, data display, and conclusion drawing and verification (Miles et al., 2020). This analytical framework is widely applied in mixed-methods research because it enables researchers to systematically organize qualitative information while maintaining a continuous interaction between data reduction, interpretation, and verification throughout the analysis process (Creswell & Creswell, 2023).

During the data condensation stage, interview transcripts were reviewed, coded, and grouped into themes related to HTH information dissemination, stakeholder understanding, operational utilization, and implementation challenges. The coded data were subsequently organized into thematic matrices during the data display stage to facilitate comparison among stakeholder groups and identify recurring patterns. Finally, conclusion drawing and verification were conducted by integrating qualitative findings with quantitative results to improve the credibility and consistency of the overall interpretation. Integrating qualitative and quantitative evidence is recommended in mixed-methods research because it strengthens the validity of research findings through methodological triangulation (Creswell & Plano Clark, 2018; Shorten & Smith, 2017).

To enhance the trustworthiness of the qualitative findings, triangulation was performed by comparing interview results with questionnaire responses and supporting documentary evidence. This approach reduces potential researcher bias and improves the credibility of qualitative interpretations, particularly in disaster management and environmental research (Lincoln & Guba, 1985; Moon et al., 2016).

3. Result and Discussion

3.1 Characteristics of HTH and Hotspot Occurrence

The monthly distribution of consecutive dry days (HTH) and hotspot occurrence in West Kotawaringin Regency during the 2023-2024 observation period is presented in Table 2. This temporal pattern indicates that prolonged dry conditions play an important role in controlling fire occurrence within the study area. It is important to note that hotspot data represent thermal anomaly detections derived from satellite imagery and do not necessarily correspond to confirmed physical fire incidents; therefore, the total number of hotspots is considerably larger than the number of fire incidents recorded by the Regional Disaster Management Agency (BPBD). Hotspot counts reflect areas with elevated surface temperatures consistent with burning conditions, whereas fire incident records capture only events formally verified and reported

through ground-based monitoring. This distinction is highlighted to ensure accurate interpretation of the comparative magnitudes presented in this study.

Table 2. Monthly distribution of consecutive dry days (HTH) and hotspot occurrence in West Kotawaringin during 2023-2024.

Month	Total HTH (days)	Hotspots (2023)	Hotspots (2024)	Difference
July	13	55	8	47
August	19	43	8	35
September	16	964	37	927
Total	**48**	**1,062**	**53**	**1,009**

As illustrated in Figure 3, hotspot occurrence generally followed the seasonal evolution of HTH. The number of hotspots gradually increased as the duration of consecutive dry days became longer, reaching its maximum during the peak dry season before declining following the onset of rainfall. Conversely, months characterized by relatively short HTH durations consistently exhibited lower hotspot activity. This seasonal synchronization suggests that HTH provides a useful climatic indicator for identifying periods with elevated forest and land fire potential.

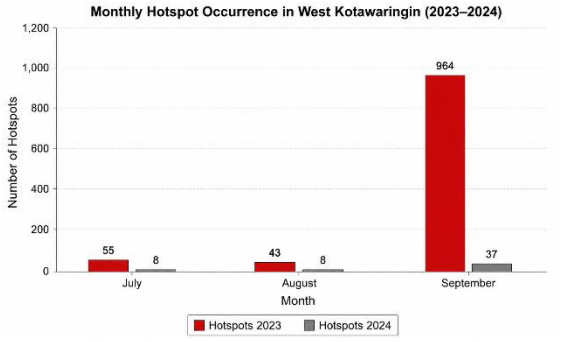

Fig 3. Monthly variation of consecutive dry days (HTH) and hotspot occurrence during 2023-2024.

Interannual comparison further demonstrated distinct climatic characteristics between 2023 and 2024. The 2023 observation period, which coincided with a strong El Niño event, experienced longer dry periods accompanied by substantially higher hotspot occurrence than 2024. In contrast, relatively wetter conditions during 2024 resulted in fewer hotspot events despite the occurrence of seasonal dry periods. These observations indicate that climatic variability considerably influenced fire activity and provide an initial basis for the correlation analysis presented in the following section.

3.2 Relationship between HTH and Hotspot

The Pearson correlation analysis revealed a positive relationship between consecutive dry days (HTH) and hotspot occurrence under all observation scenarios (Table 3). The strongest correlation was observed during 2023 (r = 0.756), followed by the combined dataset (r = 0.684), whereas the 2024 observation period exhibited a moderate positive correlation (r = 0.501). These results indicate that increasing HTH duration was consistently associated with increasing hotspot occurrence in West Kotawaringin Regency.

Table 3. Pearson correlation between HTH and hotspot occurrence

Variable Pair	r	Correlation Strength	Interpretation
HTH vs Hotspot (2023)	0.756	Strong Positive	El Niño enhanced fire occurrence
HTH vs Hotspot (2024)	0.501	Moderate Positive	Normal climatic condition
Combined Dataset	0.684	Strong Positive	Consistent relationship

The relationship was considerably stronger during 2023, which coincided with a strong El Niño event affecting most parts of Indonesia. Under these conditions, prolonged dry periods accelerated peatland drying and increased fuel availability, thereby strengthening the influence of HTH on hotspot occurrence. As shown in Figure 4, hotspot occurrence increased markedly with increasing HTH duration, indicating a strong linear association between the two variables. These findings are consistent with previous studies reporting that prolonged consecutive dry days substantially increase forest and land fire susceptibility in tropical peatland ecosystems.

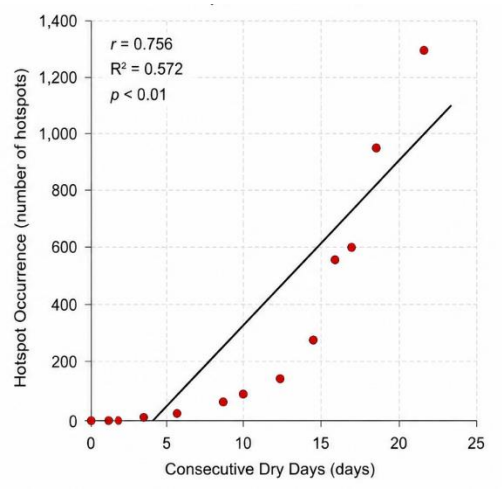

Fig 4. Scatter plot and linear regression of consecutive dry days (HTH) and hotspot occurane in 2023

In contrast, the correlation observed during 2024 was noticeably weaker (Figure 5). Although hotspot occurrence still tended to increase with longer HTH duration, the relationship became less pronounced because fire activity remained relatively low throughout the observation period. This suggests that HTH alone cannot fully explain fire occurrence under normal climatic conditions and that additional

environmental factors, including antecedent soil moisture, groundwater level, vegetation condition, and human activities, may also influence fire ignition and propagation.

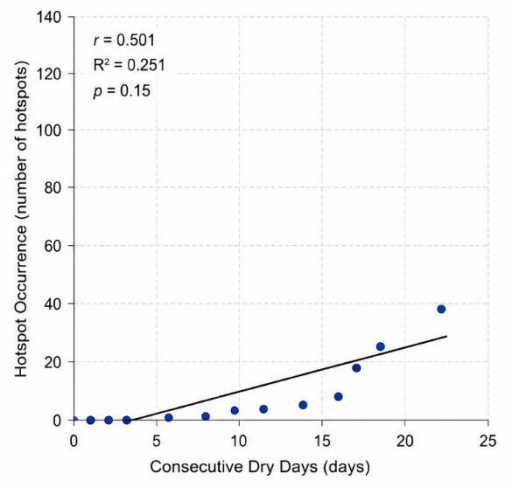

Fig 5. Scatter plot and linear regression of consecutive dry days (HTH) and hotspot occurane in 2025

Overall, the combined analysis confirms that HTH is a reliable climatic indicator for identifying periods with elevated forest and land fire risk. Nevertheless, the contrasting correlation strengths observed between 2023 and 2024 demonstrate that the predictive capability of HTH is substantially influenced by large-scale climate anomalies such as El Niño. Consequently, HTH information should be interpreted together with broader climatic conditions to improve the effectiveness of forest and land fire early warning systems.

3.3 Stakeholder Perception toward HTH Information

The questionnaire results indicate that the instrument demonstrated excellent validity and reliability, with all 28 questionnaire items meeting the validity criteria and an overall Cronbach's alpha of 0.9862, indicating excellent internal consistency (Table 4). The Cronbach's alpha values for the seven indicators ranged from 0.9009 to 0.9621, confirming that each construct reliably measured stakeholders' perceptions regarding the dissemination of consecutive dry day (HTH) information.

Table 4. Validity, reliability, and descriptive statistics of the questionnaire

Indicator	Items	Mean Score	Cronbach's α	Reliability	Valid Items
Information Reception	4	4.198	0.9151	Excellent	4/4
Information Understanding	4	4.157	0.9367	Excellent	4/4
Information Clarity	4	4.174	0.9479	Excellent	4/4
Accuracy and Reliability	4	4.227	0.9009	Excellent	4/4
Information Relevance	4	4.291	0.9418	Excellent	4/4
Information Utilization	4	4.331	0.9621	Excellent	4/4
Impact on Mitigation Actions	4	4.297	0.9198	Excellent	4/4
Overall (28 items)	**28**	**4.239**	**0.9862**	**Excellent**	**28/28**

Overall, stakeholders exhibited a very high level of positive perception toward HTH information dissemination, with an average score of 4.239 on a five-point Likert scale. Among the evaluated indicators, Information Utilization obtained the highest mean score (4.331), followed by Impact on Mitigation Actions (4.297) and Information Relevance (4.291). These findings suggest that stakeholders considered HTH information highly useful in supporting preparedness and decision-making for forest and land fire prevention. Conversely, Information Understanding recorded the lowest mean score (4.157), although it remained within the very high category, indicating that opportunities still exist to strengthen stakeholders' comprehension of HTH information.

An interesting pattern emerged from the descriptive analysis. Although stakeholders reported the highest perception for Information Utilization, the mean score for Information Understanding was comparatively lower. This finding suggests that HTH information has been widely adopted in operational activities even though the technical understanding of the information may not be uniformly shared among stakeholders. This discrepancy motivated the subsequent qualitative analysis to explore the underlying factors influencing the effectiveness of HTH information dissemination.

3.4 Effectiveness of HTH Dissemination for Forest Fire Prevention

The effectiveness of HTH information dissemination was evaluated by integrating the quantitative and qualitative findings obtained in this study. The quantitative results demonstrated that HTH is strongly associated with hotspot occurrence and that stakeholders generally perceived the dissemination process positively. The qualitative interviews further explained how HTH information is utilized in operational forest and land fire prevention activities and identified several institutional factors

affecting its implementation. The integrated findings are summarized in Table 5.

Table 5. Integrated findings on the effectiveness of HTH information dissemination

Aspect	Quantitative Findings	Qualitative Evidence	Interpretation
Scientific validity	Strong positive HTH-hotspot correlation	Stakeholders acknowledged HTH as an effective early warning indicator	HTH is scientifically reliable for fire risk monitoring.
Accessibility	High perception score	Information is routinely disseminated through BMKG channels	Dissemination channels are functioning effectively.
Understanding	Slightly lower than utilization	Operational thresholds vary among institutions	Technical understanding remains inconsistent.
Operational utilization	Highest perception score	HTH information supports patrols and preparedness activities	Information has been incorporated into operational practices.
Main challenge	Variation in responses	Differences in institutional capacity and coordination	Stronger integration and standard operating procedures are required.

Interview results revealed that HTH information has become an important component of forest and land fire preparedness in West Kotawaringin. Stakeholders reported that BMKG routinely disseminates HTH information through official bulletins and digital communication platforms, enabling relevant institutions to strengthen field patrols, increase preparedness, and coordinate preventive actions before the peak fire season. These findings are consistent with the high perception scores observed for information utilization (4.331) and information relevance (4.291), indicating that HTH information is widely recognized as operationally useful. Despite these positive findings, the interviews also identified several challenges limiting the effectiveness of HTH dissemination. Differences in institutional capacity, technical understanding of HTH thresholds, and operational procedures resulted in varying interpretations of climate information among stakeholders. In addition, the translation of meteorological information into field-level decisions remained dependent on institutional coordination and local experience rather than standardized operational guidelines. These findings explain why stakeholders reported slightly lower scores for information understanding despite demonstrating high levels of information utilization.

3.5 Discussion

The results demonstrate that consecutive dry days (HTH) are strongly associated with hotspot occurrence, particularly during the 2023 El Niño event. In addition, the mixed-method analysis revealed that although stakeholders perceived HTH information positively, its operational effectiveness depended on institutional coordination and stakeholders' understanding. These findings indicate that climate-based early warning systems require both reliable meteorological indicators and effective dissemination mechanisms.

The positive relationship between HTH and hotspot occurrence observed in this study is consistent with (Suwarman et al., 2025), who reported that increasing consecutive dry days significantly increased hotspot occurrence in Indonesian peatlands, particularly at an optimal spatial scale of 50 km around meteorological stations. Similarly, Taufik et al. (2023) demonstrated that hydrological drought substantially amplified burned areas in humid tropical peatlands by reducing peat moisture and increasing fuel availability. Comparable findings were also reported by (Kartiwa et al., 2025), who showed that peat hydrological conditions combined with consecutive dry days provide reliable thresholds for peat fire early warning systems. Furthermore, Musa et al. (2026) emphasized that drought indicators alone are insufficient unless they are integrated with institutional preparedness, fire suppression strategies, and stakeholder coordination in peatland fire management.

Compared with these previous studies, the present study provides a broader perspective by integrating climatological analysis with stakeholder perception and dissemination effectiveness. While earlier studies mainly focused on the physical relationship between drought and fire occurrence or on peatland fire management strategies, this study demonstrates that scientifically reliable HTH information does not automatically lead to effective mitigation unless stakeholders are able to interpret and utilize the information consistently. This integrated evaluation highlights that strengthening institutional coordination and improving the operational use of HTH information are as important as improving the accuracy of climate-based fire prediction. This study has several limitations. The correlation analysis was conducted using only two years of observations, which may not fully represent long-term climatic variability. In addition, the qualitative evaluation involved stakeholders from West Kotawaringin only. Future studies should

incorporate longer climate records and broader stakeholder representation to improve the generalizability of the findings.

4. Conclusion

This study evaluated the relationship between consecutive dry days (HTH), hotspot occurrence, and the effectiveness of HTH information dissemination for forest and land fire prevention in West Kotawaringin Regency using an explanatory sequential mixed-methods approach. The results demonstrate that HTH is positively associated with hotspot occurrence, with a stronger correlation observed during the 2023 El Niño event than under the relatively normal climatic conditions of 2024. These findings confirm that HTH is a reliable climatic indicator for supporting forest and land fire early warning systems.

Stakeholder perception analysis indicated a very high level of acceptance and utilization of HTH information. However, qualitative findings revealed that the operational effectiveness of HTH dissemination is influenced not only by the scientific reliability of meteorological information but also by differences in institutional coordination, technical understanding, and operational implementation among stakeholders.

Strengthening inter-agency coordination, standardizing operational procedures, and enhancing stakeholder capacity are therefore recommended to improve the effectiveness of HTH-based forest and land fire prevention. Collectively, these findings position HTH-based consecutive dry day information dissemination as an integral element of Disaster Risk Reduction (DRR) and Disaster Management strategy in tropical peatland-dominated regions, directly contributing to the enhancement of climate-based early warning systems and multi-stakeholder preparedness for forest and land fire hazards.

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