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Volcanic crisis communication: The case of the Mt. Merapi eruption emergency response

Arif Herfianto[a,*], Basuki Agus Suparno[b], Subhan Afifi[c]

[a] *Department of Broadcasting, Akademi Komunikasi Radya Binatama, Yogyakarta, 55281, Indonesia*
[b]*Department of Communication, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Yogyakarta 55281, Indonesia*
[c]*Department of Communication, Universitas Islam Indonesia, Yogyakarta 55584, Indonesia*

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Abstract

This study aims to explore the local government's implementation of volcanic crisis communication during the emergency response to the eruption of Mount Merapi in Sleman, Yogyakarta, Indonesia. This research used a case study method with a qualitative-descriptive approach and data were collected through interviews, field observations, and documentation. The results of study showed that the implementation of volcanic crisis communication can be explained in terms of information sources, message production and distribution, communication channels, and the affordability and speed of information. During the emergency response period, the Regional Disaster Management Agency has implemented a volcano crisis communication model based on the established standard operating procedures; however, several field findings showed a number of weaknesses in its implementation, such as in the flow of information and communication, which was still very bureaucratic and inflexible, and the lack of complete and fast information. On the other hand, the community has a more straightforward and flexible communication and information system to meet their own information needs regarding the Mount Merapi Eruption disaster. The communication pattern is supported by local wisdom and the role of religious and community leaders who are still believed to be credible sources of information. Communities have also succeeded in establishing independent communication channels to share disaster information by leveraging social networks and traditional media. This research provides an academic and practical contribution to develop the volcanic crisis communication studies in Indonesia.

Keywords: volcanic crisis communication; disaster communication; emergency response

1. Introduction

Volcanic Crisis Communication is one of the studies in communication science that specifically examines the phenomenon of crisis communication management when a volcanic disaster occurs. Fearnley et al. (2017b) explained that volcanic crisis communication is a term used to cover all forms of communication during a volcanic crisis: communication between monitoring equipment and scientists, interpretation, decision-making between scientists, and communication between various parties.

Volcanic disasters significantly impact people's lives, such as being risky to claim many lives and injuries and social and economic disruption, including damage to populations and infrastructure (Fearnley et al., 2017a). Volcanic crisis communication manages the flow of information and communication related to risk assessment, probabilistic analysis, early warning systems, and information management during and after a disaster. It assists the related parties in making decisions and responding to society's ever-changing demands and needs. Effective volcanic crisis communication is fundamental to disaster mitigation, disaster management, and risk reduction (Fearnley et al., 2017b).

Clear Communication is a critical factor in volcanic crisis communication (Fearnley et al., 2017a). Much information is also insufficient to make people aware of the dangers of a threatening disaster. How to convey information must also be properly done. The lack of accuracy in sharing information can lead to uncertainty, exacerbating the situation (Mulyana, 2007). Communication is essential in disaster mitigation, preparedness, response, and post-disaster recovery (Haddow & Haddow, 2008). The ability to disseminate accurate information to public, policymakers, and media might reduce risk, save life and property, and accelerate recovery. Disaster mitigation communication is necessary to reduce uncertainty in the community environment enabling them to act effectively.

Uncertainty reduction is a crucial element in communication. The communication process carried out by the communication participants aims to reduce uncertainty. In addition, communication requires ethical enforcement. Communication ethics is a field of communication studies that discusses how a person creates a relationships guided by moral guidelines and values (Afifi & Setiawan, 2021). Communication that reduces uncertainty and applies ethics can increase the trust of various parties in the sources of information. Trust is a critical element in assessing the credibility of the communicator. Haynes, Barclay & Pidgeon

* Corresponding author.
Email: arifhervianto27@gmail.com
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(2008) found in their research that trust in scientists, government authorities, and risk management teams is critical to the success of the ongoing volcanic crisis communication management. However, political, cultural, and institutional barriers to manage crisis communication exist.

According to Haddow & Haddow (2008), four focuses need to be considered in crisis communication management, those are public information services, leadership commitment, situational awareness in the form of effective communication, and media partnerships. The media is an essential element in crisis communication. In the Indonesian context, the mass media continues to develop following the era of disruption, say, how television develops a multiplatform broadcasting management by determining the target audience of a packaged program. User interface strategies using multiple platforms allow an interaction with the audience (Setiadi, Afifi, & Suparno, 2021). Media innovation plays an essential role in managing volcanic crisis communications.

In a disaster situation, media plays a significant role to present the development of events to save society, reduce the number of victims and losses and alleviate the suffering of victims, including easing an atmosphere of panic, confusion, disorganization, and uncertainty. Media can also play a role in encouraging community empowerment and early warning dissemination widely and quickly.

The role of the media is essential in communicating the volcanic crisis. However, there is a tendency to prefer to cover controversial events in their reporting (Heyer, 1995) including the propensity to report a disaster event excessively to attract the audience's attention (Cobb & David, 2003). The media is criticized for not presenting disaster journalism that can educate the public to be better prepared to deal with disasters.

Understanding crisis patterns will greatly assist communicators in anticipating problems and responding to crises effectively. The crisis communication strategy is implemented in a planned and systematic manner in 3 crisis phases: pre-crisis, crisis, and post-crisis. The stages consist of the initial stage, maintenance stage, and resolution stage. In the initial stage, everyone makes basic safety and survival as the priority. Information is required to protect and save their lives, so accurate and transparent data is required as well. At the maintenance stage, information is necessary to facilitate coordination with the government, private sector/NGOs, and the community in recovery and at the resolution stage, communication is carried out to work together to meet crisis recovery needs by improving a system (Puspitasari & Afifi, 2022).

This study aims to explore communication strategies for volcanic crises with a case study of Mount Merapi in Yogyakarta, Indonesia, particularly in the eruption emergency response program. Specifically, this research aims to determine how the volcanic crisis communication is implemented by the Regional Disaster Management Agency (*Badan Penanggulangan Bencana Daerah*/ BPBD) Sleman during the emergency response to the eruption of Mount Merapi.

Disaster Emergency Response is a series of activities carried out as soon as possible when a disaster occurs to overcome adverse impacts. BPBD is an agency established by the regional government to handle various disasters, including volcanic disasters. In a disaster situation, the BPBD is tasked with managing the rescue and evacuation of victims, property, basic needs fulfillment, protection and management of refugees, and recovery. It is also responsible for managing disaster risk reduction through disaster mitigation - a series of efforts to reduce disaster risk through physical development and increasing awareness and capacity to deal with disaster threats.

Gunung Merapi, located in Sleman district, Special Region of Yogyakarta, is one of the most active volcanoes in the world. The hazard of volcanic eruptions consists of primary and secondary hazards. Immediate risks from lava, pyroclastic flow, or ejected gravel directly affect the population when an explosion occurs. At the same time, the secondary hazard is the impact felt indirectly after the eruption, such as damage to agricultural land, infrastructure, and others. Apart from the potential danger in the event of an explosion, Mount Merapi is one of the attractive tourism potentials in Yogyakarta, well known for its various natural and cultural tourism objects, which continue to develop and are promoted with creative digital marketing communication strategies (Ghaisani & Afifi, 2022).

The last two eruptions of Merapi occurred in 2006 and 2010. The 2006 eruption damaged farming communities and caused volcanic ash to form in several towns nearby. The 2010 eruption was one of the most significant eruptions in the last century100 years, which claimed 337 fatalities, damaged dozens of villages, and made 200 thousand of residents evacuated (Rachman, 2022). In the 2018-2021 period, Mount Merapi showed various visual, seismic, and volcanic activities. It is necessary and exciting to examine the implementation of communication management during the emergency response to Mount Merapi's eruption to enrich the knowledge of volcanic crisis communication studies.

2. Methodology

This qualitative research used a case-study method with an aim to understand the phenomena experienced by research subjects by holistically examining behavior, perceptions, motivations, or actions. The results are in the form of descriptions of words and language in specific contexts using the scientific method.

As a case study, this study examined the strategy implementation, effectiveness, and impact of volcanic crisis communication at BPBD Sleman, particularly in handling the emergency response to the eruption of Mount Merapi. Researchers used in-depth interviews, observations, and document analysis as the techniques in data collection. Participants interviewed in this study were those who were directly involved in volcanic crisis communication during the emergency response period.

The participants in this study were grouped as Participant A (Head of Emergency and Logistics BPBD Sleman), Participant B (Community Leader on the Slopes of Merapi), and Participant C (Residents of the Community on the Slopes of Merapi). Research data were analyzed interactively through the stages of data reduction, data presentation in the form of narrative text, verification, and conclusion (Sugiyono, 2007: 91).

3. Results and Discussion

BPBD Sleman is a regional apparatus organization formed on 22 December 2011 based on Sleman Regency Regional Regulation Number 12 of 2011. It has tasks that are divided into several stages of a disaster, namely pre-disaster, emergency response, and post-disaster.

Communities are expected to have understanding, preparedness, and vigilance in dealing with disasters that can occur at any time. During the pre-disaster period, BPBD is responsible for collecting, processing, and presenting data as initial information about the disaster, which helps to educate the community regarding the potential for catastrophe in the area where they are living in.

When a disaster occurs, the BPBD coordinates emergency response activities to directly handle disaster situations by providing assistance and managing the necessary information. During the post-disaster period, the BPBD is in charge of managing the implementation of rehabilitation and reconstruction, including providing data and information required to anticipate the possibility of the next disaster.

In carrying out its duties, BPBD has several functions: (1) receiving, processing, and distributing disaster information as education and outreaching to the public, (2) receiving process and conveying early warnings to relevant agencies and community, (3) carrying out the emergency response function by becoming a facilitator who mobilizes resources to handle disaster emergency response quickly, precisely, efficiently and effectively, and (4) making coordination, communication and synchronization of disaster management.

3.1. Information sources

The official sources of information on the management of volcanic crisis communication on Mount Merapi are the Research and Development Center for Geological Disaster Technology (Balai Penyelidikan dan Pengembangan Teknologi Kebencanaan Geolog / BPPTKG) and BPBD of Sleman Regency. In addition, community leaders and people who live around Mount Merapi become informants by seeing natural signs as local wisdom. This primary source of information is responsible for conveying messages about disaster emergency response. BPPTKG has an authority to declare a disaster situation, which is then submitted to BPBD to be disseminated to the public.

BPBD Sleman has a structure for publishing disaster information on Mount Merapi, including the Emergency and Logistics Division, which forms the Control and Operations Center when a disaster occurs. This division will process data originating from the BPPTKG, immediately coordinate, and disseminate to the public if necessary. BPBD Sleman has the roles of carrying out disaster management and sharing disaster information to the community, as explained by Participant A:

"We coordinate continuously regarding the status of Merapi with the BPPTKG because they have a technological equipment to monitor the activity of Mount Merapi. We only receive information, and then we process it. If it needs a handling, we immediately coordinate through it; after that, we process it. If it needs handling, we will directly coordinate with the Control and Operations Center Team" (Interview with Participant A in 2019).

One critical information in a disaster situation is about the volcano alert level status as issued by the BPPTKG. The alert level for Mount Merapi consists of 4 levels, namely: Level I (Normal), Level II (Advisory), Level III (Watch), and Level IV (Warning).

At level I, there is no significant increase in volcanic activity. Humans at this level can carry out their daily activities. Whereas at Level II, the results of visual and instrumental observations begin to show an increasing level of activity, which can cause eruptions. The community can still act by increasing alertness, but it is advised not to carry out activities around volcanic craters. At Level III, the volcano shows more real activity or is currently experiencing an eruption. The threat of eruption hazard can spread but does not threaten human settlements. The community is raising awareness by not carrying out activities around the river valley that originates at the peak area and is preparing to evacuate. At Level IV, the volcano erupted. The threat of eruption hazards can spread and threaten human settlements. The community are immediately evacuated based on orders from the local government.

In addition to official information from government agencies, the sources of information on volcanic crisis communication come from traditional sources consisting of representatives of the Kraton of Yogyakarta and local community leaders with local knowledge and wisdom about the volcanic disaster situation.

The Kraton of Yogyakarta (Yogyakarta Palace) has assigned a royal servant (*Abdi Dalem*) to traditionally monitor Merapi's activities. One of the caretakers of Merapi that is widely known to the public is Raden Ngabehi Surakso Hargo (Mbah Maridjan), who died during the eruption of Merapi on 26 October 2010. One of the duties of Merapi's caretaker is to monitor Mount Merapi's activities, convey information to the public, and increase public awareness, love, and adapt to nature.

From the experience of repeated eruptions of Merapi, the people on the slopes of Merapi generally have ecological knowledge and wisdom in predicting and mitigating natural disasters in their area. This local knowledge is commonly obtained from rich empirical experience interacting with ecosystems. For example, seeing natural signs from the surrounding environment, such as flora and fauna, showing certain symptoms if Merapi is about to erupt, as stated by Participant B, a community leader in Kepuh Harjo hamlet near Mount Merapi.

"When Merapi erupted in 2010, we felt the air was hotter than usual. The animals that were on the mountain moved down. Plants and trees looked withered. This phenomenon is a sign that Merapi will erupt. We then gathered in the village to anticipate if Merapi erupts." (Interview with Participant B 2019).

3.2. Messages production and distribution

Disaster-related information is a significant reference for the community in taking an action and making decisions. The

various sources of information, especially from social media, often make the community panicky. Here, the role of the government through BPBD is required in providing the official information to prevent public panic.

BPBD Sleman relies on human resources under its bureaucratic basis in gathering information. Besides having a paternalistic line that is too long within government agencies, BPBD Sleman also needs to pay attention to the psychological aspect of human resources under its bureaucratic base, most of which are disaster victims. This fact causes BPBD Sleman to be slow in providing information, and the data obtained is often invalid. The minimum number of experts deployed in data collection has resulted in minimal variation of the resulting information. Also, the bureaucratic system has made BPBD Sleman less responsive in clarifying issues or spreading fake news. Bureaucracy frequently makes coordination with various parties related to disaster anticipation complicated. As stated by Participant A follows:

"*There is indeed a bureaucratic process that must be carried out. For example, during the 2010 eruption, when Merapi's status was raised to "Watch Level", we had to prepare contingency documents. Those involved in preparing the document will perform their roles according to their respective focus and position. Then, we communicate this status to everyone involved in the document. Once the status was raised to Warning level," they started to take an action on the ground. (Interview with Participant A in 2019)*

Based on the research results in the field, this bureaucratic flow has shown several weaknesses. BPBD felt that it has coordinated only to activate the contingency document so that various parties must work based upon their respective roles. This reality is less relevant to this condition, bearing in mind that the 2010 disaster did not match the predictions in the contingency documents, so more intense coordination was needed.

BPBD Sleman was also seen only coordinating with its bureaucratic lines, which were psychologically many victims, making coordination less effective. Coordination with volunteers or other community organizations was found not optimal. The bureaucracy's reluctance to coordinate with private institutions or volunteers who have not been registered with the BPBD was an obstacle to the integration of disaster management in which disaster communication carried out by BPBD Sleman has become hindered. The use of media and the quality of the message conveyed also became a problem in itself.

On the other hand, the messages of information circulating among the public from community leaders and members of the community themselves was found able to be produced more quickly and naturally. Communities nearby Mount Merapi have a life philosophy and local wisdom that has been passed down from generation to generation. These include generosity, togetherness, exemplary, surrender, struggle, leadership, purity, cooperation, loyalty, and sacrifice. These values greatly influence people's attitudes in dealing with the threat of Merapi eruption disaster. They included the attitude and daily behavior when living side by side with Merapi in harmony by preserving the surrounding environment. The information circulating among them is related to the latest information about the situation of Mount Merapi they see directly and anticipate if the worst problem occurs.

The community also highly trusts the information conveyed by religious leaders and community leaders. The credibility of information sources originating from community leaders is not only related to trustworthiness, expertise, and attractiveness but also several supporting factors such as openness, calmness, friendliness, and charisma of information sources.

3.3. Communication channels

The communication channels used to coordinate and distribute data and information vertically on the bureaucratic media during the disaster emergency response were via Whatsapp, Handy Talky, and face-to-face meetings. The data collected from each village was collated through the sub-districts and presented to the districts at daily meetings at the field command center. As conveyed by Participant A:

"During the emergency eruption response in 2010, we updated the information daily. There were meetings every day at the field command center to discuss information updates related to the number of victims, the condition of the victims, their needs, and the resources they have." (Interview with Participant A in 2019).

When an eruption occurred, people still used traditional tools such as *kentongan* (drum made from bamboo) to convey information. In general, families living on the slopes of Merapi have *kentongan*. Besides, Handy Talky (HT) and mobile phones (mobile/HP) were used. In disaster management efforts, HT and HP are more efficient in conveying information than Kentongan. However, from a psychological point of view, Kentongan has a more significant psychological influence on mobilizing the community if a disaster occurs.

Urgent information and orders were conveyed through HT. Each village was equipped with communication facilities in the form of HT for coordination, as described by the following 2 participants:

"When a disaster occurred, the community monitored and patrolled. Important information was immediately conveyed via HT that was a popular communication media close to the community." (Interview with Participant B in 2019).

"From the latest data, there have been 1400 HT in the entire Merapi area. We are sure that various important and emergency information about disasters will be conveyed to the community through community representatives who hold HT and are in the villages." (Interview with Participant A in 2019).

So far, people use media such as HT to get information on disaster messages with a frequency range of 20-30 km. HT is still widely trusted to be used because it is felt to have an urgency in obtaining the latest information about the status of Merapi apart from relying on early warning sirens.

In addition, a popular communication medium for rural communities around Merapi is the mosque's sound system using loudspeakers. Emergency information, such as death news or calls for alertness and evacuation when a disaster occurs, is conveyed through this media. As stated by the following participant:

"Important information through the district government, which is conveyed through the sub-district office, is disseminated to the village community through loudspeakers in mosques." (Interview of Participant B in 2019)

In addition to television media (local, private and government television station), newspapers and several local community radio stations in Yogyakarta and its surroundings, social media such as Facebook, Twitter, and Whatsapp messages are also widely used by the community in accessing the information about disaster including outdoor media in the form of billboards, banners, and evacuation signs. In this case, social media is currently the most widely accessed source of information by the public. BPBD has updated social media channels to share information in disaster situations. Data is also distributed through the mass media in the form of providing information to journalists through press conferences, making press releases, and serving requests for media interviews.

The community, especially young people, immediately access information on social media to get the latest news. However, communication via social media is often constrained due to internet signal problems in mountainous areas, which are disrupted due to internet signal issues.

3.4. Affordability and speed of information

During the emergency response period, BPBD Sleman coordinated with various stakeholders, such as the Indonesian National Armed Forces, Indonesian Police, Search and Rescue Team, Indonesian Red Cross, and registered NGOs. Coordination between stakeholders in disaster communication to distribute information to the public and aid various disaster victim posts. Collaboration with companies and industries through their Corporate Social Responsibility (CSR) programs to help with disaster management was also seen essential. Multiple companies with their CSR programs are the important stakeholders in managing crisis communications. Companies with CSR programs that describe their company's social performance can be invited to work together to overcome crises (Setiawan, Suparno, & Afifi, 2021).

The research results showed that information and coordination systems that are too bureaucratic and rigid have made some NGOs reluctant to cooperate with BPBD Sleman. Due to a strict and inflexible bureaucratic system, various stakeholders felt that they did not need to coordinate with the government.

Each disaster phase shows a different pattern of processing and receiving messages in disaster communication. General information about Mount Merapi is conveyed through normal bureaucratic channels during regular times or before a disaster. Information from BPPTKG Yogyakarta is officially sent by official letter by e-mail or fax to BPBD Sleman. This information will then be conveyed to the Regency Government, the District Government, Village Government, and various existing communities. Communities usually publicize information to residents through handy talkies, mosque loudspeakers, chain SMS, Whatsapp, community radio, and community forums.

During the Mount Merapi emergency response, sending and receiving information was relatively the same as during regular or pre-disaster times, so the information conveyed was often not as fast as information from other sources. This reality, as a consequence, has affected the affordability and speed of communication.

Research findings showed that coordination between BPBD Sleman and the community in emergency response situations often encounters obstacles. During the 2010 eruption, for example, based on information from research participants, there was a condition where BPBD coordination with residents in hamlets that were very close to Merapi did not go well. Information about the eruption and the evacuation location they were going to was too late, causing panic in the community. For this, they managed to save themselves independently.

Optimizing community potential and disaster management capacity is essential in volcanic crisis communication. The community is increasingly aware of the importance of increasing emergency response capabilities in dealing with disasters in view of the experience of dealing with disasters in the past. Based on the research results, the researchers found that during the emergency response period, the government had not maximized the potential and capacity of the community to cope with disasters.

There were still many weaknesses in preparing refugee camps in the form of sister villages, especially in managing population data to determine the village's capacity to be the evacuation location and the transportation issues. On the other hand, people at the grassroots needed the availability of complete and fast information to deal with disasters. This hope was also related to the psychological burden and trauma they felt due to the eruption of Merapi in earlier times. As stated by a resident as a participant in this study:

"Every time I hear a roar, I am traumatized. I still remember the Merapi eruption in 2010. This is my former house which was destroyed by the eruption; the foundation is still there." (Interview with Participant C in 2019)

The presentation of the research results above showed various problems that came out in the implementation of volcanic crisis communication carried out by BPBD Sleman in managing the emergency response situation of the Merapi eruption. The main problem was found in relation to the availability of complete and fast information in disaster situations, including building public trust in the available information. As explained by Haynes, Barclay & Pidgeon (2008) that belief in scientists, government authorities, and risk management teams is critical to the successful management of ongoing volcanic crisis communication.

In an organizational context, the unavailability of complete and fast quality information as the main task of the organization to provide it can be caused by the organization's internal and external communication systems (Hardjana, 2000), strategic management carried out by the organization (Solihin, 2012), and leadership problem (Wibowo, 2017).

In the context of the paradigm, the quality of information obtained by the public characterizes an information society (Abrar, 2008) and the state's obligation to regulate social life (Nugroho, 2008). This concept can be applied in disaster situations. On the other hand, planning in the volcanic crisis communication process is essential to maintain the quality of the information. Communication planning allocates communication resources to achieve organizational goals

(Cangara, 2014).

The various problems in implementing the Mount Merapi crisis communication during the emergency response period indicated that there were still coordination constraints between the multiple parties involved. Communication is one of the most critical factors in the success of disaster mitigation, preparedness, response, and post-disaster recovery (Haddow & Haddow, 2008). Fearnley et al. (2017b) explained that volcanic crisis communication is the management of information flow and communication related to risk assessment, probabilistic analysis, early warning systems, and information management during and after a disaster occurs. This concept requires clear communication (Fearnley et al., 2017a) and quality message content that reduces uncertainty (Mulyana, 2007). These various issues have become an essential agenda for improving the quality of volcanic crisis communication in the future of the Indonesian context.

4. Conclusion

The study results showed that the implementation of volcanic crisis communication carried out by BPBD Sleman during the emergency response period has been carried out according to predetermined standard operational procedures. However, several field findings showed some limitations and weaknesses in implementation, such as the flow of information and communication that were still so bureaucratic and inflexible and the lack of availability of complete and fast data.

On the other hand, the community has a more straightforward and flexible communication and information system to meet their own information needs regarding the Mount Merapi Eruption disaster. This strength has been supported by local wisdom and the role of religious leaders and community leaders still believed to be the credible sources of information. Communities have also succeeded in establishing independent communication channels to share disaster information by utilizing social networks and traditional media.

Based on the results of research on volcanic crisis communication, several recommendations are recommended for related parties. For the Government of Sleman, it is suggested to establish a Sleman Disaster Information Center, which focuses on communication in crisis or disaster conditions, completed with supporting facilities and infrastructure, such as a fast internet connection and competent human resources in information and communication technology. This team may consist of the representatives from BPBD Sleman, NGOs, mass media, and local communities focusing on disaster communication management.

This recommendation aims to facilitate coordination in disseminating information, including appointing a credible spokesperson to convey information. In addition, it is better if contingency documents in disaster management can be used as a trigger for further studies, not as a rigid benchmark in disaster management that may unnecessarily follow the simulation predictions contained in the document. BPBD Sleman is also expected to be able to change the communication model that seems bureaucratic and rigid in disaster management, especially when communicating with people in disaster-prone areas, including shortening the flow of bureaucracy in handling disaster victims.

BPBD Sleman is also expected to further optimize the community's potential in disaster management, including providing more expansive space for gatherings and NGOs to contribute to disaster management without prioritizing sectorial egos. It is hoped that future researchers can develop further research related to volcanic crisis communication in more detail with the case studies of volcanic disasters in different places and contexts.

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