



FEASIBILITY STUDY: SUPPORTING FOREST AND PEAT FIRE MANAGEMENT USING SOCIAL MEDIA



UNORCID

PARTNERS: UN OFFICE FOR REDD+ COORDINATION IN INDONESIA (UNORCID)

PROGRAMME AREA: CLIMATE & RESILIENCE

SUMMARY

A feasibility study was conducted by Pulse Lab Jakarta on the use of real-time information from social media during forest and peat fires haze events to support emergency response management in Indonesia. Specifically, the study sought to explore early signals from Twitter relating to major forest fires or haze events with a view to understanding the relation between communications trends and on-the-ground events. The results of the study demonstrated that Indonesians tweet significantly more about haze during and immediately after major fire events. During the February to March 2014 haze crisis in Riau, people tended to tweet mostly about the status of fires and support from the government. It is recommended that further research be conducted to find additional ways to extract useful information from social media, combine social media signals with other sources of digital data for real-time insights on disaster impact and human wellbeing, and integrate real-time social media data with current operational information flows used during disaster response to support more timely and effective emergency response and recovery efforts.

FOREST AND PEAT FIRES IN INDONESIA

Every year, forest and peatland fires spread across Kalimantan and Sumatra, particularly as a result of peatland drainage and conversion of land to palm oil cultivation. Besides the damage caused to biodiversity and the function of forest and peatland ecosystems, these fires have health and financial implications.

Fires on peatland are the cause of the widely observed 'brown cloud,' which extends from Indonesia over neighbouring Southeast Asian countries. This cloud consists of suspended particulate matter (haze), which is linked to significant respiratory health problems, premature death from exposure, biodiversity loss and tremendous release of carbon dioxide into the atmosphere.

Over 10 million people in Southeast Asia are affected by haze, and 700,000 die every year due to air pollution in the region (Xu, 2013). One of the most damaging haze events in history, the Indonesian forest and peat fires in 1997–1998, are estimated to have caused over \$4.5 billion in damage across the region, most of this attributed to health costs (Frankenburg et al. 2005).

During haze events, it is critical for emergency response agencies and government organisations to have timely information about affected populations. Previous studies have found that social media can be an effective channel for both gathering and disseminating information during disasters (Vieweg, 2012; Tresoldi, 2013; Nigam, 2010; Morgan, 2010). As an initial step towards employing social media analysis as a means of supporting emergency response in Indonesia, Pulse Lab Jakarta set up a baseline study of social media conversations on Twitter during and immediately after three fire-related haze events in Indonesia between 2011 and 2014. This study was supported by the UN Office for REDD+ Coordination in Indonesia (UNORCID).

HOW TO CITE THIS DOCUMENT:

UN Global Pulse, 'Feasibility Study: Supporting Forest and Peat Fire Management Using Social Media', Global Pulse Project Series, no.10, 2014.

ANALYSING SOCIAL MEDIA DURING FIRES

This study analysed tweets during the following forest and peatland fire events in two provinces in Sumatra and Kalimantan that took place between 2011 and 2014. 1) **CENTRAL KALIMANTAN** (August–September 2011) 2) **RIAU** (June 2013) 3) **RIAU** (February–March 2014)



The above image shows peat land fires in Pulang Pisau, Central Kalimantan

Pulse Lab Jakarta identified keywords in Bahasa Indonesia to explore the cause, event, impact and emergency response effort related to a specific fire/haze event in Riau (Sumatra) or Palangka Raya (Kalimantan Tengah). Examples of these keywords include:

- CAUSE OF DISASTER** (e.g. logging, El-Niño, global warming) *OR*
- EVENT OF DISASTER** (e.g. forest fire, peat fire, haze disaster) *OR*
- DISASTER IMPACT** (e.g. respiratory infection, wildlife threat, forest damage, air pollution) *OR*
- EMERGENCY RESPONSE EFFORT** (e.g. law, emergency) *AND*
- LOCATION** (e.g. Sumatra, Riau, Kalimantan, Palangka Raya)

These taxonomies were used to filter tweets during a specific haze event during the period of 1 January 2011 through 30 June 2014. The following are examples of relevant tweets in Bahasa Indonesia with English translation:

- “Polda Riau Usut Pembalakan Liar di Hutan Konservasi Harimau” (Riau Police Department investigates illegal logging in the Tiger conservation forest)
- “Laju kerusakan Hutan Riau 188 Ribu Hektar per Tahun” (The deforestation in Riau reach to 188K hectare per year)
- “Suhu di Riau 36 Derajat Celcius, Picu 9 Titik Api” (The temperature in Riau reaches 36 Degrees C, triggering 9 hotspots)

The extracted tweets were then classified into the following three categories based on the type of situational awareness, and then further divided into topics of discussion:

1. **PHYSICAL ENVIRONMENT** (included topics such as status of haze, hotspots and air pollution)
2. **SOCIAL ENVIRONMENT** (included topics such as related deaths/injuries, personal status/health of affected persons, crime activity, public health threats and need for food/water)
3. **SUPPORT** (included topics such as government or NGO support, community assistance and private sector funding)

INSIGHTS & OUTCOMES

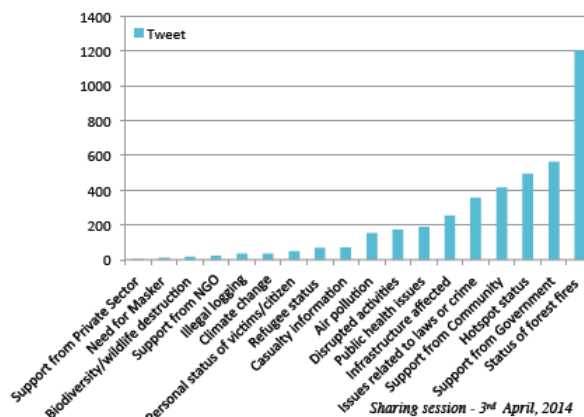
The results of this study showed an increased volume of relevant tweets during significant forest and peat fire-related haze events in the timeframe analysed. Specifically, a topical analysis of over 4,000 tweets was conducted to understand which topics were most frequently mentioned during the February–March 2014 haze event in Riau. This analysis revealed common patterns between tweets and hotspots during a fire event.

Overall, 53 per cent of the relevant tweets during this topical analysis were categorised as ‘physical environment’ awareness, 22 per cent as ‘social environment’ awareness and 25 per cent as ‘support’ awareness. The most frequently discussed topics focused on the status of forest fires, government support, hotspot status, support from the community and issues relating to law and crime.

CONCLUSIONS

This study demonstrated that Indonesians increasingly use social media during forest and peat fire-related haze events. The topical analysis demonstrated the potential for social media data to support emergency response efforts by providing real-time insights relating to public concerns and conversations.

Combining Twitter analysis with other real-time data sources such as remote sensing, mobile phone calls to emergency phone numbers or mobility traces could provide additional insights on disaster impact and recovery on the ground. Further research could be conducted to assess how Twitter can be used to verify information channels or serve as an early warning mechanism for improved emergency response and management. In addition, future work could explore how social media analytics can be used to inform disaster risk mitigation systems by providing additional information on community behaviour and elucidating factors that contribute to vulnerability of communities to forest and peat fire events.



The figure above shows discussion topics of tweets during the February to March 2014 haze event in Riau Province.

IMPLICATIONS & RECOMMENDATIONS

- This study showed that the volume of tweets about haze in Indonesia increased significantly during forest and peat fire haze events. Comparing the dynamics of time-series hotspot data and twitter posts during the February–March 2014 Riau haze event revealed similar patterns.
- Further analysis revealed several popular topics led Twitter communications during the February–March 2014 Riau haze event. This information could be used as a potential alternative means to develop timely situational analysis during disaster response phase.
- In addition to extracting useful information from social media during emergencies, it is recommended to integrate real-time information from social media into current information sources during emergency response.
- There is a potential to combine the real-time fires/haze disaster information from satellite imagery data, which can provide early warnings about hotspots using spatial information with communication data, the latter serving as ‘information verification’ relating to what happens in real-time on the ground.

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