

# Haze Gazer: A Crisis Analysis and Visualization Tool to Better Inform Peatland Fire and Haze Management

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## ABSTRACT

Peatland fires and haze events in Indonesia are disasters with national and international implications. The phenomena lead to direct damage to local assets, as well as broader economic, social and environmental losses. Despite the extensive efforts of many organizations, the situation persists. At present, Indonesian disaster management authorities manage peatland fire and haze events based on satellite data as well as static data on population density and distribution. But to better support affected populations, the Government is looking for more timely data and more information on the dynamics of the disaster, especially the situation on the ground. Pulse Lab Jakarta's HAZE GAZER<sup>1</sup> enhances disaster risk management efforts by providing real-time situational information from diverse data sources, including insights on the response strategies of haze-affected communities, in order to better protect vulnerable populations and the environment.

## 1. INTRODUCTION

Forest and peatland fires in Indonesia continue to affect many parts of Southeast Asia on what is now an annual basis, resulting in extensive environmental destruction, increasing health problems, school closures and transport cancellations. Fires begin and spread for many reasons, so it is misleading to think of fires as the problem, or even as a single problem. Complex socio-economic, ecological and governance factors are involved, meaning that the drivers, and the solutions, go beyond who actually lights the match.<sup>2</sup> Indonesian disaster management authorities manage peatland fire and haze crisis utilizing hotspot data mined from satellite imagery and baseline information including population density and distribution and locations of hospitals and

<sup>1</sup><http://unglobalpulse.org/blog/haze-gazer-crisis-analysis-tool>

[http://www.youtube.com/watch?v=tcuH6Mu\\_CmM](http://www.youtube.com/watch?v=tcuH6Mu_CmM)

<sup>2</sup><http://www.cifor.org/fire-and-haze/research/context/>



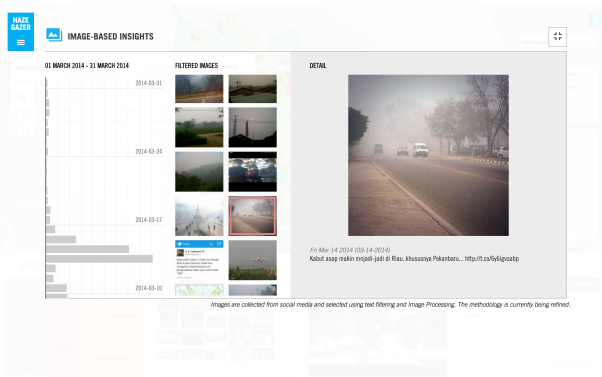
Figure 1: A screenshot of a main window of Haze Gazer, not only to visualize baseline information but also to provide various insights from different kinds of big data (text-, image-, video-, and radio-based insights)

schools. In order to support affected populations better, however, the Government looks for situational information on the dynamics of the disaster on the ground.

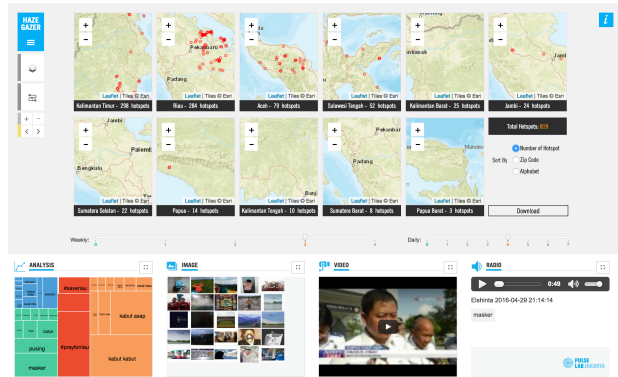
Based on our previous feasibility studies on understanding haze crisis dynamics<sup>3</sup>, Pulse Lab Jakarta has developed HAZE GAZER, a web-based crisis analysis and visualization system which harnesses multiple sources of data including open data (fire hotspot information from satellites and baseline information on population density and distribution), citizen-generated data (the national complaint system in Indonesia called LAPOR; citizen journalism video uploads to an online news channel) and real-time big data (text-, image- and video-oriented social media), all already accessible through Open APIs and Public-Private Partnerships, to provide insights on haze disaster dynamics for disaster management authorities.

HAZE GAZER uses advanced data analytics and data science to mine open data, citizen-generated data, real-time big data. For instance, Figure 1 shows a screenshot of the main window of Haze Gazer, presenting (i) hotspot locations with red dots, a vulnerable population distribution by the area coloring with the green color, and mobility patterns with arrows, on the map and (ii) insights generated by Twitter, Instagram and YouTube as well as a community radio channel in the bottom panels. Moreover, one can find detail

<sup>3</sup><http://unglobalpulse.org/projects/forest-and-peat-fire-management-social-media>



(a) A Detail View of Image-based Insights



(b) Geographical Hotspot Distribution

**Figure 2: Detail Views of Image-based Insights and Spatial Distributions of Fire Hotspots**

information of new insights generated from big data, e.g., Figure 2(a) showing image-based insights from Instagram photos filtered by the tags related to haze situations. Moreover, for easy adoption, the dashboard integrates the existing functionalities of the current information system used by the Indonesian disaster management authorities, namely insights on the locations of hotspots, as shown in the upper panel of Figure 2(b).

The following three features makes HAZE GAZER innovative and distinguishable from existing approaches. First, it offers real-time insights on the response strategies of haze-affected populations. Second, alongside disaster response efforts, it informs longer term development interventions by capturing insights on health-related concerns and issues. Third, for easy adoption, it integrates the existing functionalities of the current system used by the Indonesian disaster management authorities and adds new functions and insights based on multiple new digital data sources.

## 2. WHAT'S NEXT?

The dashboard is being tested with and improved based on feedback from disaster management practitioners. It enables Indonesia's local (BPBD) and national (BNPB) disaster management authorities to target their interventions and to align their efforts with those of affected populations. This more targeted and agile approach by national and local disaster management authorities is expected to increase community resilience.

Alongside the testing and improvement of the tool, PLJ is continuing to search for alternative digital data sources that can be analyzed for greater insights into haze crises. The tool itself has four areas in which it can scale.

First, because haze affects many countries in Southeast Asia, the platform has strong potential to scale as a regional tool to inform haze-related humanitarian efforts and to improve regional resilience. Second, it can scale in terms of insights, based on the integration of richer data sources, such as data from sensors. Third, if Indonesian disaster management authorities agree to publish their operational practices, the platform will capture insights on both operational potential and real-world haze crisis dynamics. Finally the underlying mechanism of HAZE GAZER, that is, to collect and mine new digital sources and visualize the insights generated, can be applied to other types of disasters or sus-

tainable human development themes.