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RESEARCH

The Temporality of Disaster: Data, the Emergency, and Climate Change

Caroline Compton

Climate change threatens to destabilise existing humanitarian temporalities, particularly the idea of 'building back better'. Building back better, which involves reducing vulnerability to future harm, depends on our being able to predict, to at least some extent, what the future will be like. Climate change, destabilises our predictive abilities and thus limits our ability to adequately respond to future risk. In response, there is an increased humanitarian emphasis on resilience, adaptive capacity, and self-survival. At the same time, the data tools used by humanitarian actors to manage environmental risk focus attention on the present moment, rather than understanding the historical drivers of risk or invigorating new imaginings of the future. Thus climate change and humanitarian digital data tools reinforce a focus on an always unfolding present with implications for ways we might reimagine the future. If humanitarians involved in disaster recovery want to be more than emergency technicians in a world of worsening and increasing need, they have to reimagine the world, their role in it, and the temporal resister(s) with which they engage.

Keywords: climate change; big data; temporality; humanitarianism; resilience; build back better

When Typhoon Haiyan hit the Philippines in November 2013, at least 6,300 people died and over 1,000 remain missing. Four million people were displaced and the storm totally or partially destroyed over a million houses (Philippines National Disaster Risk Reduction and Management Council 2013). The storm was so severe that it exceeded the most common satellite intensity scale of measurement (United States National Oceanic and Atmospheric Administration 2013). The United Nations Inter-Agency Standing Committee rated Haiyan as a Level Three Emergency, triggering a Humanitarian System-Wide Emergency Activation, an 'exceptional measure only to be applied for exceptional circumstances where the gravity justifies mobilisation beyond normally expected levels' (Inter-Agency Standing Committee 2012: 1). The storm made six landfalls across the Visayas region of the country and the government response reached 171 municipalities in fourteen provinces and six regions (Philippines Department of the Interior and Local Government 2013).

Perhaps you can imagine it: a not so distant future when the Philippine Islands are annually buffeted by multiple level 5 typhoons. The storms, made more intense and frequent as a result of climate change, leave ever-growing numbers of people displaced, and the ambitious and difficult relocations that followed Haiyan become increasingly unrealistic. The magnitude of the humanitarian response to these storms is but a shadow of that which followed Haiyan,[1] as – given similar magnitude disaster events now occur frequently around the globe – resources are stretched thin. What humanitarian response is undertaken is informed by data analysis platforms, that alert actors to *where* and *how* they need to act. These constantly updating platforms have long since displaced traditional methods of determining need; in disaster situations, humanitarians need to get in, save lives, and get out, to move onto the next emergency.

This paper responds to the call of Sandvik et al. to look beyond 'what technology does *for* humanitarian action to asking what technology does *to* humanitarian action' (Sandvik et al. 2014: 222 emphases in the original). As our ecological context changes, the way we *see* humanitarian need, particularly climate-induced need, is also changing. A range of newly developed digital tools direct humanitarian attention to the management of the present moment. These tools do not offer a re-temporalisation of humanitarian activity. Instead, they reinforce the temporal challenge that climate change poses for disaster recovery – if climate change reduces our ability to predict future need, it necessarily limits our ability to usefully implement future-oriented disaster recovery. The lines of sight generated by real and near-real time digital tools reinforce the constrained sightlines of a climate-change transformed world, with an emphasis on survival in any given present an increasingly important feature of post-disaster humanitarian assistance.

The first section of this paper describes traditional temporalities of humanitarian assistance and the impact of climate change on the same. Humanitarianism traditionally responds to an emergency event – a ruptural break with the past that presupposes there is a normal order to be reset (Calhoun 2010). However, natural

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disaster occurs at the intersection between hazard and susceptibility to harm. As they result from pre-existing vulnerability to harm, these events do not break with the past but instead are very much produced by it. There have been attempts to ameliorate the impact of this emergency framing in the natural disaster context through the growth of 'build back better' recovery programs (Kennedy et al. 2008; Khasalamwa 2009; Mannakkara & Wilkinson 2014), which incorporate disaster risk reduction (DRR) to reduce vulnerability to future hazard. In effect, the normal order being reset is instead imagined as an improvement on the past. However, climate change, bringing potentially unknowable future harms, makes 'better' a far more difficult proposition. What does it mean to build back better in a world where better may no longer be possible? Given this conundrum, recovery and risk reduction practice places increasing emphasis on developing communities resilient and adaptive enough to respond to their particular changing circumstances – effectively assisting people to manage a continually unfolding present moment in lieu of a vision of a better future.

The second section of the paper explains how new humanitarian data management techniques – specifically, those involving the use of digital data – impose temporal constraints on humanitarian practice. While collecting and analysing data is a vital part of disaster management, the quality and timeliness of data has always been a problem. It can take days, weeks even, to find out about the impact of a disaster event in remote areas. When there is knowledge of an impending ecological event like a major storm, pre-emptive distribution of that information can be a challenge, and where information is distributed, recipients might not understand what it means.[2] Enormous efforts are being made to improve the quality, timeliness, and accessibility of information through endeavours as diverse as the UN OCHA Humanitarian Data Exchange,[3] Humanitarian OpenStreetMap,[4] and the development of mobility maps using mobile phone data (see, for example, Bengtsson et al. 2011; UN Global Pulse 2014b). At the same time, the impacts of climate change are increasingly apparent, including the exacerbation of meteorological and climatic hazards (Stott 2016). Moreover, we have no idea exactly *how* climate change will unfold: not its magnitude, impact, or second, third, or fourth-order effects (Hopkin 2007). Policy decisions responding to climate change – at every level – will further impact what the future looks like, potentially compounding climate change damage or displacing the worst impacts onto particular populations.

Humanitarian technologies drawing on big data and computer-based data analysis could potentially present alternative temporalities through which to view this unfolding crisis. Instead, the temporal lines of sight created by these platforms ensure a relentless focus on an ever-unfolding present. The temporal framing offered by these platforms restates the challenges of climate change: the relentless quest for survival in the moment can displace aspirational visions for the future (Chandler 2018; Duffield 2019a). As such, rather than offer new ways of navigating a climate change impacted future, these platforms continue to orient humanitarianism to the constantly unfolding present moment.

To illustrate how humanitarian digital platforms appear to increasingly focus on the present moment, the third section of the paper presents three data platforms to exemplify how data platforms use and shape time. The platforms were developed by Pulse Lab Jakarta, part of the UN Global Pulse project which was created to showcase and accelerate the 'development and scaled adoption of big data innovation for sustainable development and humanitarian action' to put 'real-time information and feedback into the hands of policymakers and development and humanitarian professionals' (UN Global Pulse 2014a, 2018). The first platform, VAMPIRE, was developed with the World Food Program (WFP), to improve agency and government responses to food shortages in Indonesia, and later, Sri Lanka. The second, CycloMon, facilitated pre-disaster event preparedness and the initial response to cyclone events in the Pacific. The third, MIND, an heir of the CycloMon platform, was developed to promote the use of non-traditional data sources in emergency response. MIND has a worldwide scope and, while in prototype form reports on earthquake events only, is being developed to support a range of disaster types. The paper closes by reading these three platforms alongside each other, to demonstrate how they reinforce the primacy of the present, rather than either engaging with the risk and vulnerability factors underlying emergency events or articulating a vision for a climate-changed future.

Natural Disaster, the Temporality of Humanitarian Assistance and Climate Change

All human activity unfolds within particular temporal frames, be it the school year, the tax year, the daily report, the crop cycle, or the humanitarian emergency. In the following section, the paper introduces the temporal frames that have, over many decades, structured humanitarian activity in the wake of natural disaster. While all organising frames are, unquestionably, contested and contestable (Butler 2010; Wagner-Pacifici 2010), the humanitarian emergency and 'building back better' are introduced as temporal archetypes, to help the reader understand the way humanitarians understand and structure time, to facilitate action.

The Emergency And Humanitarian Assistance

In the immediate wake of natural disaster, humanitarian assistance responds to urgent human needs created or exacerbated by the disaster event. For example, in the wake of Typhoon Haiyan, Médecins Sans Frontières assisted by providing emergency medical treatment and helping stabilise damaged health facilities through the provision of personnel and medical supplies (Médecins Sans Frontières 2016). The Centers for Disease Control and Prevention responded to vaccine shortages, a measles outbreak, and assisted in the prevention of infectious disease outbreaks including cholera and dengue, the risk of which was exacerbated by the storm (Centers for Disease Control and Prevention 2015). Organisations

like Catholic Relief Services (CRS) and Oxfam delivered 'transitional housing' (Hardy 2014; World Habitat 2017), intended to be used in the short to mid-term. Each of these services were delivered within relatively short timeframes, with most humanitarian actors completing their projects before the first anniversary of the storm (interviews with the author 2015). They were intended to assist survivors 'resume their livelihoods' (Oxfam 2014: 6) following the ruptural emergency event, the typhoon.

These activities responded to a traditional temporal frame that organises humanitarian activity, the humanitarian emergency. Within this frame, the emergency is treated as a sudden, unpredictable event that unfolds against a background of perceived normality, which causes widespread suffering or danger and demands an urgent response (Calhoun 2010). The humanitarian emergency frame is perpetuated by humanitarian actors and practices, even as they are cognisant of its shortcomings. The idea and temporality of the humanitarian emergency holds enormous influence over humanitarian practice and the nature of disaster response. In particular, this emergency framing generates a response that is time-bound and geared towards the provision of short-term, finite material relief, with the emphasis put squarely on saving lives (Nasr 2016).

The emergency imaginary renders humanitarian response – that is to say, a morally compelled response focused on the alleviation of immediate human suffering (Fassin 2012) – akin to firefighting. The emergency, like the fire, must be contained and extinguished. It presupposes there is a normal order to be reset, and humanitarian reason does not demand a transformation of this order itself, meaning by definition, 'there are no humanitarian solutions to humanitarian problems' (Tan 2005, see also Rieff 2002), only an alleviation of their worst effects. Indeed, the international humanitarian movement is predicated on saving the individual by relieving their suffering, not by transforming the situation that led to the suffering they experienced (Barnett 2005; Fassin 2007).

Humanitarian reason is not limited to humanitarian actors – it is a way of thinking about the world and problems that renders humanitarian concerns moral rather than political (Barnett 2005; Fassin 2007). When we understand humanitarian problems as moral issues, 'inequality is replaced by exclusion, domination is transformed into misfortune, injustice is articulated as suffering, violence is expressed in terms of trauma' (Fassin 2012: 6). Yet charitable intervention on moral grounds cannot address underlying disaster vulnerability.[5] Most disasters are explainable in terms of the normal social order (Hewitt 2019), and natural disaster events disproportionately impact the economically and socially marginal (Squires & Hartman, 2013). In reality, disaster events are 'enmeshed in a … tangle of causal factors that are political, socio-economic and demographic in nature' (Gaillard, Liamzon & Villanueva 2007: 263) – in effect, they are the product of political and distributional choices. Recognising the highly contingent nature of disasters, humanitarian practitioners aim to 'build back better' as part of the disaster recovery, seeking to ameliorate vulnerability to future disaster events.

Building Back Better and the Challenge of Climate Change

The meaning of building back better depends on the particular context in which disaster recovery takes place. For example, following Typhoon Haiyan, the national government of the Philippines planned to relocate a quarter of a million households away from dangerous land along the shoreline (Philippines Office of the Presidential Assistant for Reconstruction and Recovery 2014). The focus on building back better attempts to reorient humanitarian activity away from the emergency – the ruptural event – into a trajectory towards a safer future. Instead of managing disaster events, such a recovery engages with the vulnerability factors that caused the disaster to occur and increase the chance of future harm. The importance of this forward-looking orientation can be seen in the voluntary international agreements that inform disaster risk reduction (DRR) at the international level. The 2005 Hyogo Framework for Action prioritised risk assessment, disaster preparedness, early warning, and response (United Nations 2005); the 2015 Sendai Framework has shifted focus away from risk management to risk mitigation (United Nations 2015), requiring a holistic focus on a range of development inputs.

This approach is predicated on a future that has some continuity with the past, albeit with a heightened intensity of disaster.[6] As Davis & Alexander observe, to date, most natural disasters are, more or less, similar to those that preceded them (Davis and Alexander 2015). However, climate change is 'generating disasters of increasing complexity and uncertainty' (UNESCAP 2019: ii). Climate change suggests a very different set of possibilities, meaning there is no assurance the disasterscape will remain unchanged (Bouwer 2011). Climate change poses such a challenge to our ecological systems that some fear our predictive capacity will be outstripped by the profound environmental changes that climate change will cause (see, for example, Stephenson et al. 2012). If climate change represents a break from the past and heralds an unknown future, the traditional development and risk reduction imaginaries (of either a better world or a greater ability to survive in a similar or somewhat worse future) are inadequate. Just as climate change destabilises existing and possible futures, demanding new ways of being human, it requires a reimagining of development and disaster practice. How can it be possible to build back better, when what might constitute better is both potentially unknowable and unviable?

Resilience, Adaptive Capacity and Surviving Climate Change

What role then should humanitarians embrace in a climate change impacted future? There has been an increased emphasis on developing resilience and adaptive capacity through DRR and disaster response projects. Resilience is the ability to 'absorb disturbances while retaining

the same basic structure and ways of functioning, the capacity for self-organisation, and … to adapt to stress and change' (Core Writing Team, Pachauri & Reisinger, 2007: 86). The lionisation of resilience by humanitarians abdicates imagining a better future in favour of a perpetual present, where resilient and adaptive actors simply survive in perpetuity (Duffield 2019b). Similarly, if we cannot anticipate or plan for climate change, then it will be those who can best navigate change that will be best able to survive and thrive in the future. This means 'a system that has more adaptive capacity will tend to be less vulnerable' (Smit & Wandel 2006: 286). In climate adaptation scholarship and practice this has resulted in what Eakin calls the 'turn to capacity' (Eakin 2014). This has led to a distinction between adaptation work that responds to a particular set of changed circumstances and building adaptive capacity – developing the capacities that people need to respond to an unknown future (Adams 2019). Adaptation thus becomes not an act in time – for example, by building back better – but instead involves a 'a continuous stream of activities, actions, decisions, and attitudes' (Nelson, Adger & Brown 2007: 397) that must be undertaken by individuals on the ground.

The role of humanitarian assistance in preparing for this perpetually unfolding present is to assist beneficiaries to increase their adaptive capacity. An individual or community's ability to navigate a constantly emerging, risk-filled present, without committing to a static or aspirational vision of the future, becomes an objectively desirable endpoint.

It is important to note that these temporal frames do not displace their predecessors. Just as the humanitarian emergency continues to shape project timelines and objectives, significant emphasis is placed on structural adaptation for a safer future as humanitarians assist survivors to rebuild their lives in the wake of disaster. Each temporal frame directs humanitarian conduct to particular ends and demands certain types of action. Importantly, climate change destabilises our line of sight into the future, orienting humanitarian assistance to developing human capacity in the present moment.

Big Data and Humanitarian Action

Climate change may be destabilising our ability to predict the future, yet it is not the only force shaping – or limiting – our line of sight into natural disaster events. Recent decades have seen an explosion in the use of digital data in many aspects of our lives. One example of this is how web search data is being used to develop insights into adverse drug reactions (White et al. 2013; Nikfarjam et al. 2015; Salathé 2016). Humanitarians, too, have moved to develop new techniques and tools to improve their data practices. This section of the paper introduces the appeal of humanitarian data tools. It pays particular attention to how those tools direct attention in temporal ways, in particular, the emphasis they place on the present moment. Given these tools are used to understand and manage disaster, their temporal focus effectively reinforces a limited vision of the threat of climate change. Rather than opening up new ways of acting in time, they further narrow action that might be possible within the context of a climate change impacted future.

The Promises of the Data for Good Movement

In many ways, incorporating big data and digital data into humanitarian practice is helpful and necessary. Disaster recovery is extraordinarily difficult, presenting deeply practical problems, and those involved – professional humanitarians, local and national governments, and locals – are often faced with seemingly insurmountable hurdles. Managing information is a perennial challenge: identifying and collecting relevant data in the wake of disaster events is difficult in wealthy and 'developed' countries; it is much harder in countries with limited infrastructure and potentially significantly out-of-date official statistics.

The ability to use digital data for good has been heralded by some as representing a fundamental transformation for humanitarian practice (for a polemic, see Meier 2015). The use of big data promises 'big impact' (Vital Wave Consulting, n.d.). Advocates of the Data for Good movement argue all aspects of life will be impacted, and digital data will lead to sustainable development and economic growth (Can & Alatas 2017), improved health outcomes (Wyber et al. 2015), and greater gender equity (Bapu Vaitla et al. 2017). These beliefs arise from an assumption that placing the 'analytic treatment of data … at the forefront of intelligent decision-making' (Hilbert, 2013: 4) will radically transform policy outcomes for the better. In effect, the argument is that this use of digital data will create new insights into human needs and behaviour, with better outcomes necessarily falling out of these new insights. The UN Secretary General's Independent Expert Advisory Group on a Data Revolution for Sustainable Development argues that new technologies, data sources, analytic techniques, and insights will lead to 'more empowered people, better policies, better decisions and greater participation and accountability, leading to better outcomes for people and the planet' (UN Secretary General's Independent Expert Advisory Group on a Data Revolution for Sustainable Development, 2014: 6).

Humanitarian Data Tools

The new lines of sight into natural disaster response arise from the belief that more data, delivered faster, will improve humanitarian decision making (and thus action). According to the United Nations Office for the Coordination of Humanitarian Affairs:

> access to near real-time information can help humanitarian organizations provide more targeted assistance and become more responsive to needs as they evolve. It could even help the humanitarian community pre-empt crises, or respond to them more quickly. (OCHA 2017)

Certainly, better, more up to date information can provide enormous assistance to the delivery of critical emergency assistance. This is particularly the case when you consider the traditional alternative of often significantly out of date or inaccurate census data – of little use when trying to assess immediate need. Knowing how many people require certain medical treatment or where disaster survivors might be found could improve a range of humanitarian outcomes (Meier 2015). Being able to track the movement of displaced people could ensure that adequate provision could be made; call detail records can suggest patterns of human movement and need after an emergency event.

Yet many of these tools assert a temporal frame, where management of the moment displaces, or at least supersedes, concerns about the future and the past. The three platforms the paper discusses below grapple with problems that will be exacerbated by climate change, and thus are deeply concerned with the contingency of risk in the Anthropocene. However, their temporal and geographic focus necessarily limits the possibilities of capturing and responding to certain contingencies. Data management and knowledge production render a world legible for action, as insofar as data analysis and visualisation tools construct the world in useful ways, they offer a means to act in the world. Such a rendering can be attractive to natural disaster responders, whose work is beset by practical challenges and who often face a pressing need to *act*. Thus, the lens that data tools – like those discussed below – lay over the world to make it legible presuppose and iterate a particular temporal frame.

In the case of many of the tools developed to assist humanitarians and states act in relation to natural disaster, the temporal focus is the present moment. The particular value of real or near real time data is exactly that: the ability to illuminate aspects of the present moment. I do not suggest the present is not a vitally important temporality for humanitarianism and disaster response. The present moment is the moment of the emergency, it is when and where people require assistance. Yet emergency and disaster vulnerability are often symptomatic of historical contingency, with those most vulnerable and at risk most exposed to harm (see, for example, Klinenberg 1999; Allen 2006; Squires & Hartman 2013). How then can humanitarianism and disaster relief meaningfully grapple with historically contingent and future harms arising from environmental hazard and disaster, when the tools used to manage them channel the focus to the present, and not the past and the future?

The Challenges of a Focus on the Present

As outlined earlier in the paper, our inability to know what a climate change impacted world will look like, in part, has led to an emphasis on increasing disaster survivors resilience and adaptive capacity, to enable them to better navigate what the future might bring. What Duffield calls 'post-humanitarianism' is assistance without structural ambition: the world can only be, must be, taken as it is (Duffield 2019b). Digital data tools, too, demand we take the world as is.

Part of the governance response to the recent emphasis on the world as-is has been a turn away from modernist practices of imposing an administrative grid onto society (Scott 1998) which reify 'top-down, expert-driven, bird's-eye-view epistemology' (Valverde 2011). This includes the adoption of techniques from business, including minimally viable products and prototyping (Johns 2019), to avoid over-investment in interventions that may prove unsuccessful. Chandler calls these interventions 'hacks': hyper-local interventions designed to work 'in the actuality of the moment rather than in a linear temporal framing' (Chandler 2018: 165). As with Duffield's post-humanitarianism, the focus is on cultivating self-actualised subjects who are 'confident and at home with contingency and the unexpected' (Chandler 2018: 142). Digital tools designed to assist humanitarians navigate the world reinforce this orientation: it could be said their objective is to facilitate the self-actualised humanitarian, best able to navigate the contingent and unexpected world that unfolds before us.

Data Platforms

In order to ground the above discussion in an empirical context, this section of the paper introduces three humanitarian data platforms, developed by Pulse Lab Jakarta, to demonstrate how they construct disaster events. As the platforms demonstrate, the construction of the emergency event by the digital platforms does not invigorate possibilities for thriving in the Anthropocene so much as reinforce the primacy of the present and simple survival in the face of change. The following section is descriptive, to facilitate the interrogation of the platforms in the final section of the paper.

The platforms are introduced in the order in which they were developed. The three platforms grapple with problems due to be exacerbated by climate change. The first platform, VAMPIRE, was developed with the World Food Program (WFP), to improve agency and government response to food shortages in Indonesia. The second, CycloMon, facilitated pre-disaster event preparedness and early response, focusing on the Pacific. The third, MIND, an heir to the CycloMon platform, was developed to promote the use of non-traditional disaster sources in emergency response.

VAMPIRE

The VAMPIRE platform – VAMPIRE stands for Vulnerability Analysis Monitoring Platform for Impact of Regional Events – was developed in partnership between PLJ and the WFP. It presently provides government and WFP officials insights into food security in Indonesia and Sri Lanka. The Sri Lankan module is concerned with flooding, while the Indonesian module tracks drought conditions. The platform was developed because the WFP had received requests from the Indonesian Ministry of Agriculture and Food Security, and the National Map Bureau, to respond to concerns related to the very slow, manual process

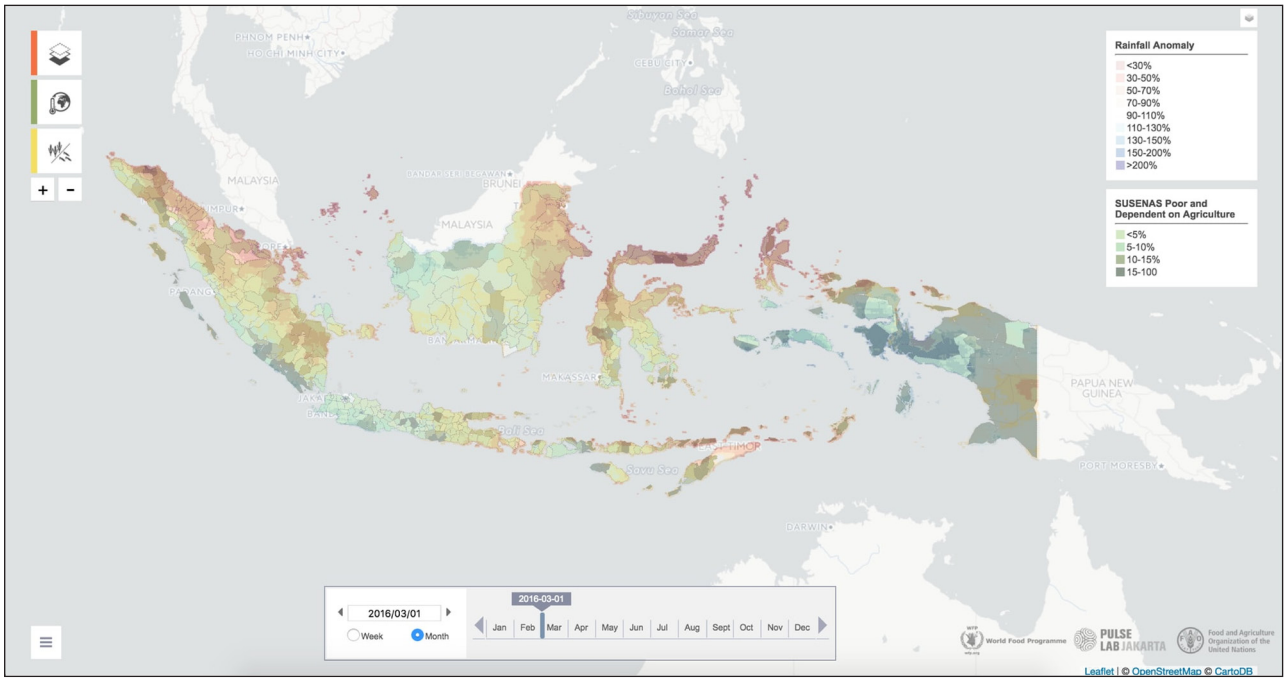

Figure 1: VAMPIRE display (VAMPIRE n.d., reproduced with permission of Pulse Lab Jakarta).

for reporting food shortages in particular. The platform was developed between 2014 and 2016 and reflects the then focus on El Niño by the Indonesian government (Participant A, 2018). It was available online to the general public until early 2020.

The interface comprises a map with three layers, with baseline data including population and socio-economic data, and food security survey results. There is also a climate layer and an impact layer, which reports on economic vulnerability and exposure to drought. The platform streams in data on a pixel level (250m – 5km per pixel) (Participant E(2), 2018); this data is then aggregated to the district and province level (**Figure 1**). The platform uses Open Street Maps GIS information for the map of Indonesia. Baseline economic and population data was developed especially for the platform. Using the census category: 'poor and dependent on agriculture' (Participant E, 2018), census maps were used to identify 'small-scale farmers who were living below or close to the poverty line and without irrigation' (Pulse Lab Jakarta, 2018: 8). WFP then conducted a one-off survey of approximately 2,000 households in eight vulnerable districts (Pulse Lab Jakarta 2018) which was used to develop a food security measurement. The WFP in Indonesia does not usually do primary data collection, and the food security survey results have not been updated since the platform was launched. Attempts to crowdsource and incorporate data on food prices in local markets were short-lived, lasting only a few months. (Pulse Lab Jakarta 2018: 26)

The climate layer data is pulled from CHIRPS,[7] developed by the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA), and includes rainfall predictions for up to the next six days.[8] The impact layer shows drought impact, and thus food scarcity, at the province level by a colour coding system overlaid onto the map. Drought impact is determined by the number of people classified as 'poor and dependent on agriculture' and the level of the drought (Participant E, 2018). Prior to the introduction of VAMPIRE, the national food security map was updated annually. As of December 2018, it was apparently updated every few weeks, and at least 26 times per year (Participant B, 2019).

CYCLOMON

The CycloMon platform extended PLJ's earlier work on a platform tracking the responses to smog across the Indonesian archipelago (UN Global Pulse 2016). That platform, Haze Gazer, was developed at the behest of the Indonesian Ministry of National Development and Planning, Bappenas (Pulse Lab Jakarta 2018). Wanting to take advantage of the effort invested in the development of that platform, the PLJ team decided to utilise the underlying architecture to address other issues (Pulse Lab Jakarta 2018). CycloMon (**Figure 2**) tracks cyclones and storm events, focusing on the Pacific Island states: Fiji, Vanuatu, Micronesia, Kiribati, Marshall Islands, Nauru, Niue, Palau, Samoa, Solomon Islands, Cook Islands, Tonga, Tuvalu and Tokelau (Participant B, 2018). Until July 2018, CycloMon pulled windspeed data from NOAA and cyclone-trajectory maps from Unisys (Participant B, 2018). However, NOAA eliminated the relevant feeds from their API, and Unisys began to charge for their maps, rendering CycloMon temporarily inoperable (Participant B, 2018).

The platform pulls geolocated tweets from the Twitter firehose, using an English lexicon that includes keywords 'cyclone', 'typhoon', 'hurricane', 'tropical cyclone', 'tornado', 'tropical depression' and 'tropical storm'. The lexicon was developed by staff of PLJ (Participant B, 2018). These tweets are presented in an aggregated form, clustered by type (**Figure 3**). This approach is based on research undertaken by PLJ which suggested that the

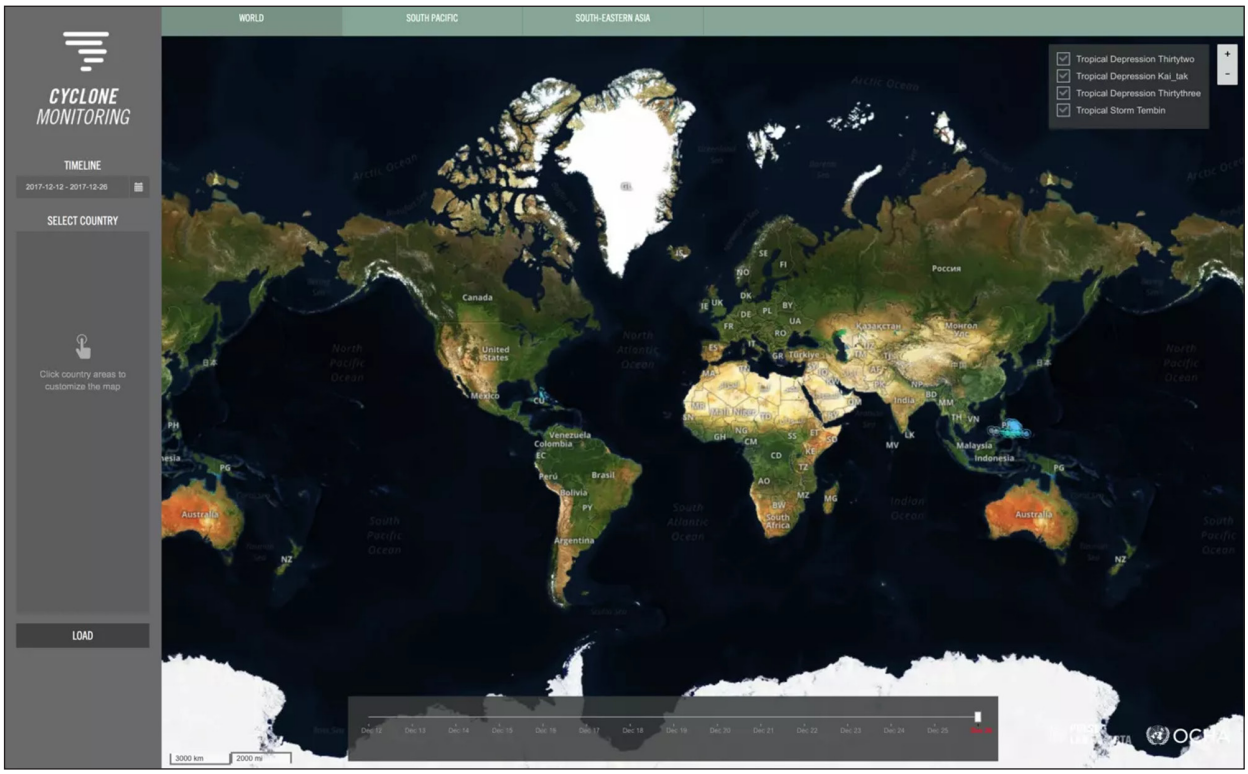

Figure 2: CycloMon first screen (CycloMon n.d., reproduced with permission of Pulse Lab Jakarta).

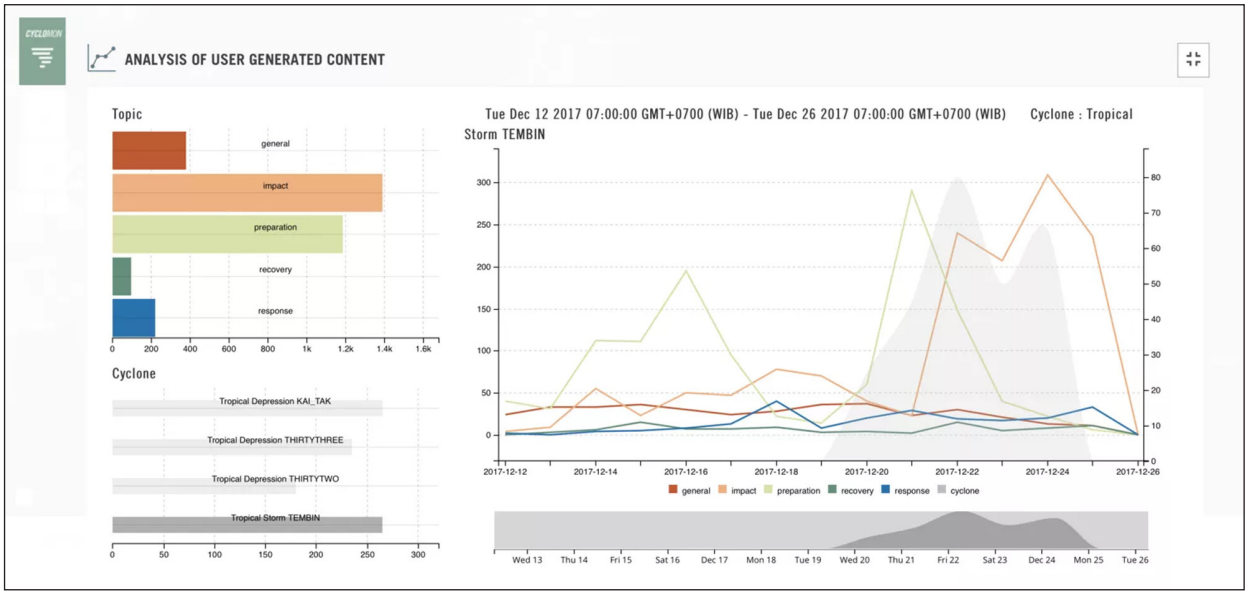

Figure 3: CycloMon tweet analysis interface (CycloMon n.d., reproduced with permission of Pulse Lab Jakarta).

frequency of tweets about haze correlated with intensity of haze events (Kibanov et al. 2017). The platform assumes that this relationship can be assumed in this different event and social context. All data is overlayed on maps imported from Leaflet Maps, which itself incorporates data from OpenStreetMap (Leaflet FAQ 2018).

MIND

I turn now to the final platform. MIND (Managing Information for Natural Disasters) is an online dashboard to provide up-to-the-minute information for decision-making around the management of disaster events worldwide. The platform should be understood as a work-in-progress. A prototype released in September 2019 responds to earthquakes and, as discussed below, the ability to report on other natural disaster events is being developed. The objective behind MIND is to provide humanitarian organisations data beyond the census and other forms of traditional data (Participant D, 2019), thus encouraging the use of non-traditional data by reducing the work involved in accessing and processing the same.

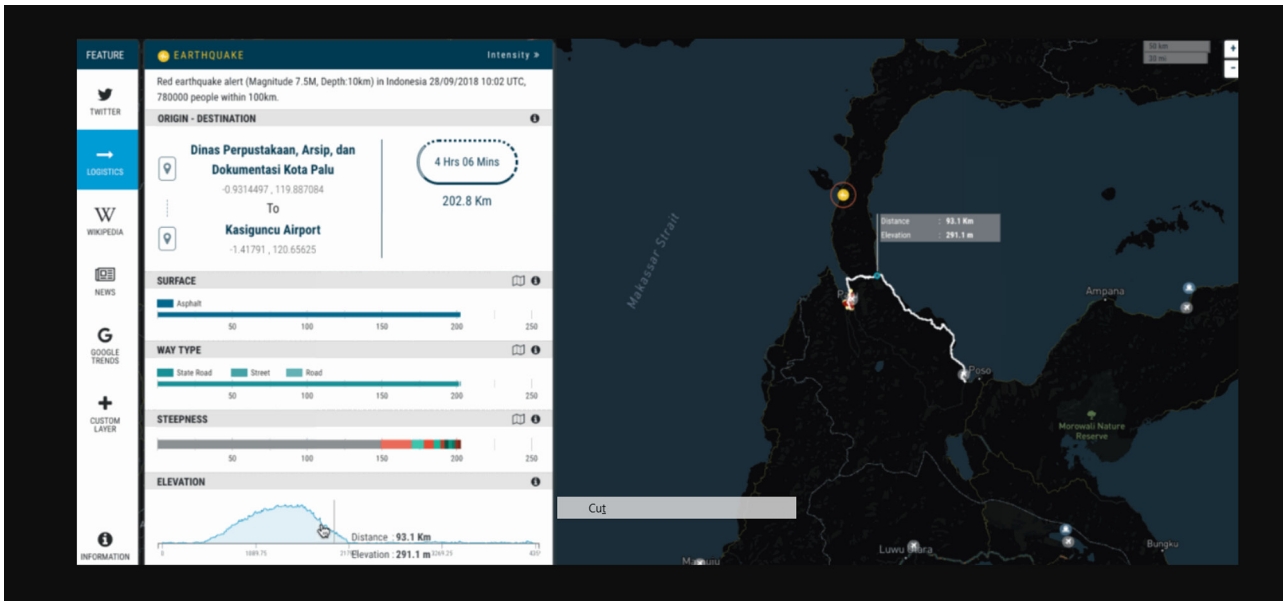

Figure 4: MIND route mapping function (Pulse Lab Jakarta 2019, reproduced with permission of Pulse Lab Jakarta).

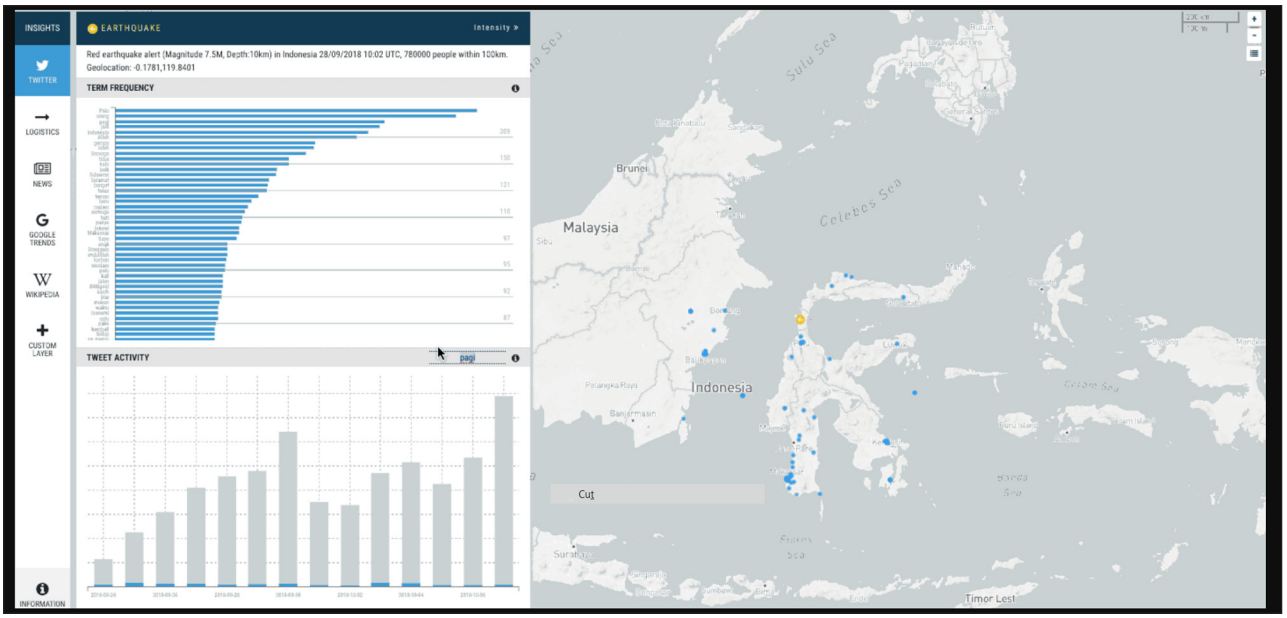

Figure 5: MIND Tweet analysis interface (Pulse Lab Jakarta 2019, reproduced with permission of Pulse Lab Jakarta).

The platform streams data from a range of non-traditional sources. The data collection process begins on receipt of an automatic alert from the Global Disaster Alert Coordinating System. The information received in the alert generates a 'bounding box' (Participant D, 2019), effectively, a geographical bounding of the disaster event, which determines the geographical scope of information relevant to the system. In the first instance, the bonding box triggers the import of information from the OpenStreetMap, which is used to identify the location of airports and points of interest. Data from OpenRoute Service is also incorporated to identify routes that can be used to transport aid resources (**Figure 4**).

The bounding box is used pull relevant intensity information from the United States Geological Service (USGS). Intensity data describes 'the severity of an earthquake in terms of its effects on the earth's surface and on humans and their structures' (USGS Earthquake Glossary, n.d.). While magnitude measures the amount of energy that an earthquake releases at its centre, intensity measures the amount of shaking that occurs over all areas where an earthquake is felt (USGS, n.d.). The USGS compares the observed effects of the earthquake against the modified Mercalli intensity scale (MM/MMI) to produce an Isoseismal map which shows the severity of the earthquake, which usually becomes less severe further from the epicentre.

The location information also triggers the import of International Aid Transparency Initiative (IATI) country data from the United Nations Office for the Coordination

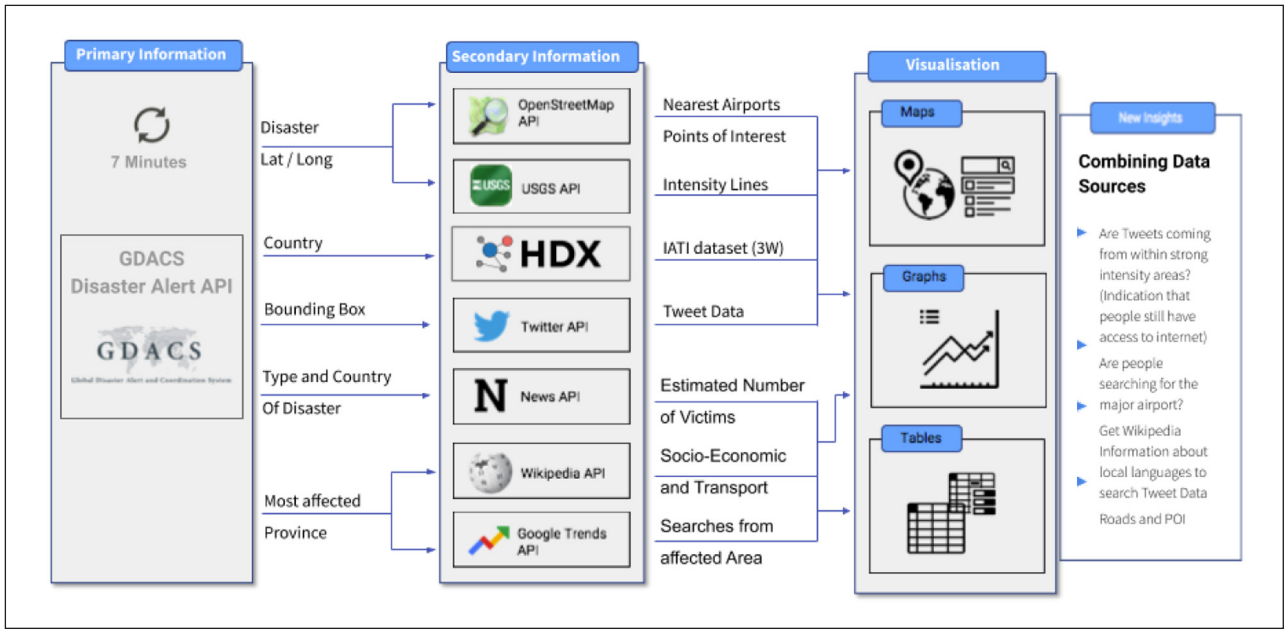

Figure 6: Data inputs to the MIND platform (Pulse Lab Jakarta 2019, reproduced with permission of Pulse Lab Jakarta).

of Humanitarian Affairs' Humanitarian Data Exchange. The country level data set includes information provided to the IATI by different humanitarian and development organisations, and hopefully includes reports and information on 'finances, location, sector, results, and any conditions' of humanitarian or development activity, the scope of which is defined by the contributing organisation (IATI Standard, n.d.). This is to help humanitarians understand what work other organisations are doing in the area.

Information on the type of disaster, and the country it occurred in, triggers the streaming of information from news from a 'credible' news API (Pulse Lab Jakarta 2019). Using keywords including victims, fatalities and deaths as proxies, an algorithm extracts figures to determine casualty numbers (Participant D, 2019).[9] These numbers are analysed daily and plotted on a graph to monitor changes over time. Twitter data from the relevant geographical area is also pulled, and a word map displays word frequency (Participant D, 2019). Rather than using a lexicon, the platform instead displays the most frequently used words that appear in geographically relevant Twitter posts (see **Figure 5**). PLJ decided to highlight word frequency so the platform could be used anywhere in the world, as otherwise they would have had to develop a lexicon for each context in which the platform would be used (Participant D, 2019). Clicking on a keyword marks each tweet containing the word on a map with a dot; clicking on each dot allows users to see the tweet in full.

The platform then pulls, information about local socio-economic conditions and transport systems at the first level administrative unit level from Wikipedia, and information from Google Trends about search patterns in the affected area. PLJ considers Google Trends an 'important communication tool', that can assist 'government disaster authorities to better contextualise the information they share with the public throughout the disaster response phase' (Pulse Lab Jakarta 2019). Finally, the platform (see **Figure 6**) also allows user organisations to add additional data layers, to tailor the platform to meet their particular needs.

Reading the Tools Alongside Each Other

Having described how these platforms operate and make meaning, the paper turns to try to understand what this meaning making 'does *to* humanitarian action' (Sandvik et al. 2014: emphasis in the original). Attention is paid to the way the platforms reflect, iterate, and extend the turn to the present in humanitarianism, DRR, and climate change responsiveness. This focus on the present translates into a future where resilience and adaptive capacity are prioritised as central tools against the unknowable hazards of climate change.

Purpose and Scale of the Platforms

The VAMPIRE platform was designed to help the Indonesian government anticipate food shortage problems that might arise as a result of drought. VAMPIRE's timing seems slow – the socio-economic data does not update, and the government food security map produced is updated approximately once a fortnight – until it is compared against the manual method of determining food security in Indonesia, which used to occur annually. The data coming into the system is relatively limited: the platform cannot account for local adaptations to drought, which would most obviously include out-migration. The platform focuses on two drivers of food security: drought in Indonesia and flood in Sri Lanka.

CycloMon also focuses on a single disaster type – cyclone events, and specifically, cyclone events in the Pacific. Geographically, VAMPIRE targets two discrete countries. CycloMon was developed for regional use, and as such relies on an English language lexicon. Yet while English is widely spoken in the Pacific, it is only one of

the many languages spoken across the region (Lynch 2017), and the vernacular of (relatively) few. The intended audience for the platform also expanded: CycloMon, while primarily for government, could also assist humanitarians responding after the event.

MIND, however, seems to point to a future where harm might occur but where the location and the magnitude of the event are potentially unknowable. The platform suggests natural disaster is an event unbound in either a temporal or geographic scope and unpredictable from historical patterns (Beck 1992). But for the very recent past, what has gone before is invisible to users of the platform, even as it remains embedded in underlying assumptions coded into incoming data streams, for example embedded in weather intensity information from USGS (Edwards & Bowker 2010). Moreover, the platform does not embrace established methods for identifying harm, like house to house surveys or more recent techniques which compare images of disaster-affected area to images taken before a disaster event,[10] instead suggesting that the intensity of activity on certain types of social media or internet use can serve as a proxy indicator.[11]

Platform Temporalities and Geographies

VAMPIRE, the earliest of the three platforms, helps users to identify drought and potential food scarcity in Indonesia. While the platform's baseline layer incorporates census and single point-in-time food insecurity, the climate layer compares rainfall over a given period to long-term averages. The impact layer, which identifies potential food insecurity, highlights present moment correlations between these two layers. In Sri Lanka, however, the temporal focus on the platform is tighter, as the platform only makes rainfall predictions for six days in advance, meaning correlations the impact layer identifies are even more closely tied to the present moment.

MIND, like CycloMon, does *not* try to anticipate future need. Instead, these platforms are designed to manage an eternally unfolding present. Ways of identifying harm which compare pre- and post-event information are replaced with a concern for data intensity in the moment. The *present* becomes the explicit focus of the interface, even if determining the boundaries of the present is a challenge.

In the case of the MIND platform, the temporal focus on the moment is also tied to a loosening of geographical constraints. Doing away with the historical geography of risk and replacing it with a universalized sphere of possible harm represents a 'different way of conceptualizing the world and the "life" chances, the chances of survival within it' (Beck, 2015: 76). The decision not to deploy a keyword lexicon to identify Twitter posts, as was done in CycloMon, and instead to focus on word frequency, allows the platform to be used to understand public sentiment in any linguistic community (Participant D, 2019), insofar as keyword frequency is indicative of public sentiment. While precursors of the MIND platform were geographically specific, MIND purports to report on and facilitate response to disaster on a global scale. Hazard, the precursor to natural disaster, is now everywhere, the platform seems to suggest, and constant vigilance is imperative to manage the unfolding events.

Acting in the Present

While two of the platforms incorporate subjective information produced on social media the platforms continue to emphasise 'facts', broadly construed. Even the subjectivity of Twitter posts is de-emphasized by their presentation in the aggregate. Yet all of the data in the various platforms – from the limited food security baseline to the reliability of data inputted to Wikipedia; from storm intensity data to figures in news reports – result from decision making, infrastructural capacity, and human choice, long before they become part of the platforms. Their treatment within the platform – as technical, neutral fact – seems to suggest the platforms themselves are apolitical. Yet all aspects of their design choices which make them invisible, cement certain understandings of the world.[12]

These platforms also increasingly move towards the reification of individual agency to respond to disaster. MIND and CycloMon rely on disaster victims to take ownership of their own disaster experience through use of social media and allow their adaptation strategies – at least those reported on social media – to be tracked. VAMPIRE does not incorporate adaptive action, because efforts to incorporate such information, like food pricing, have been unsuccessful. The PLJ team has expressed interest in incorporating mobile phone data as a possible source of information on out-migration (Participant B, 2018). However, as Sophie Adams observes, agency, which she identifies as the ability to act strategically in response to changing circumstance is fundamental to adaptive – and responsive – capacity (Adams 2019). Such strategic action necessarily depends on access to information and the availability of options – neither of which is assured.

Conclusion

What does this current focus on the *present moment*, as the site of human need, do to humanitarianism, and how we understand natural disaster events? As this paper observes, this focus on the present moment makes it harder to envisage and think strategically towards alternative futures. What it means to be a humanitarian, and modes of humanitarian engagement, have changed over the years. The Biafra famine, the Balkans conflict, and the Rwandan genocide – amongst others – challenged the way humanitarians thought about themselves (Fox 2001). The 2004 Indian Ocean Tsunami was a significant moment for natural disaster response, and it was during that recovery that 'building back better' (Clinton 2006) became a byword for good humanitarian response after natural disaster.[13] Climate change, taking place alongside the uptake of data tools facilitating contemporary lines of vision, too, may come to represent a watershed for future change.

Given the temporal impact of climate change, the temporal focus on data management tools, and the emergent emphasis on adaptive capacity, this paper suggests humanitarians need to examine their objectives

in a climate-changed future, and to reimagine the possibilities presented by big data. As building back better renders recovery practices future-facing, it presupposes a 'better' is possible. The options made visible by these platforms seems to suggest – at most – a more resilient, adaptive emergent present, not an equitable or just 'better'. If humanitarians involved in disaster recovery want to be more than emergency technicians in a world of worsening and increasing need, they have to re-imagine the world, their role in it, and the temporal resister(s) with which they engage.

Notes

[1] The UN budget was US$788 million (60% funded) see: (Hanley et al. 2014: v) and the Philippines Government budget US$ 8,177.10 million for reconstruction work. See: (Philippines Government 2013: 7). Substantial additional expenditures were made by INGOs and NGOs.

[2] For example, while Filipinos received early warnings about a possible 'tidal surge' before Typhoon Haiyan, many later reported being unfamiliar with the term. They suggested had the word 'tsunami' been used, they would have appreciated the meaning of the warning.

[3] See: https://data.humdata.org.

[4] See: https://www.hotosm.org.

[5] The following texts represent a small number of works linking environmental injustice and disaster vulnerability to class, ethnicity, and race. (Pastor et al. 2006; Bullard & Wright 2009; Walker & Burningham 2011; Squires & Hartman 2013; Bolin & Kurtz 2018).

[6] For example, the Tacloban City recovery plan, developed in the wake of Typhoon Haiyan in late 2013, used 100-year flood levels and height above sea level to determine what land was safe. (Personal interviews, 2015 and 2016).

[7] CHIRPS Daily: Climate Hazards Group InfraRed Precipitation with Station Data.

[8] Flood prediction, which is important for the Sri Lankan model, is based on historical events where flood in a given region is predicted from the rainfall, after satellite rainfall from images is calibrated with observed rainfall in certain areas.

[9] The API is called 'News API'. It streams news media from newapi.org.

[10] See, for example, work undertaken by Humanitarian Open Street Map.

[11] HazeGazer, a precursor of MIND, replicated insights from research mapping haze-related tweets (for more information, see Kibanov et al. 2017). These techniques are incorporated into MIND.

[12] Beyond the parameters of the discussion, but considerations include – how poverty and vulnerability is defined, the use of location tagging on Twitter, choice of lexicon, what data is treated as reliable, the proscribed format of tweets and so forth.

[13] This is not to say that disaster recovery and preparedness was unaware or unresponsive to the need to reduce vulnerability to future harm, rather that it was at this point that the humanitarian movement fully embraced the concept.

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Competing Interests

The author has no competing interests to declare.

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