

HUMANITARIAN TECHNOLOGY SURVEY

Policy Report
May 2017

Edited by
Alistair D. B. Cook and
Ennio V. Picucci

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EXECUTIVE SUMMARY

This is the first volume of Humanitarian Technology Survey, which draws on the discussions and presentations at the 1-day workshop on “Assessing the Technological Turn in Humanitarian Action.” The workshop took place on the 15th of February 2017 at the S. Rajaratnam School of International Studies (RSIS), Nanyang Technological University in Singapore. It was organized by the Humanitarian Assistance and Disaster Relief (HADR) Programme at Centre for Non-Traditional Security Studies (NTS Centre) in RSIS. The workshop brought together 30 practitioners, experts and researchers in the field of humanitarian affairs. With nine speakers from different countries, the workshop aimed to create a better understanding about past, current and future initiatives and ways in which technology was deployed in humanitarian settings with a focus on the Asia-Pacific region. The workshop was split into three sessions on (1) global developments in humanitarian technology; (2) humanitarian technology in the Asia-Pacific; and (3) the future directions in humanitarian technology.

Panel 1: Global Developments in Humanitarian Technology

The topic of the first session was the trends that are currently observed in humanitarian technology. During the presentations and discussions of the first session it was showcased that robots bear great potential to make search and rescue operations and post disaster mapping faster, more efficient and cheaper. To date, several types of robots have been used in dozens of disaster response and relief efforts all over the world. Currently, the new frontier is to use robots for saving lives at sea, more specifically with an eye on the “refugee crisis” in Southern Europe. A point that arose is that technological innovations are sometimes too sophisticated and practitioners in the field cannot exploit their potential to the full extent. An example of this are drones that produce high resolution images that are often too large to process quickly. As a result, the images are of little added value to the practitioners in the field who prefer easily transferable data. The underlying message of these lessons is that technology should always focus on solving the problem and the specific needs of the practitioners.

A concrete example of how Unmanned Aerial Vehicles (UAVs) can successfully be used was demonstrated during the Nepal earthquake in 2015. In Nepal, drones were needed because the extensive cloud cover made it impossible to use satellite images. The UAVs also provided much higher resolution information than the images taken by satellites. The lessons learned in Nepal showcase that technology in emergencies must be easy to use and that success often depends on the speed and simplicity with which humanitarian technologies

can be deployed. For that reason, the consensus was that there is a need to build local capacity within the affected communities to make their own maps, and establish where aid is needed the most. The idea of building local capacity through local flying labs such as those run by WeRobotics is in line with what the World Humanitarian Summit of 2016 highlighted as the “localization of humanitarian aid”.

In relation to the use of drones in Nepal it was discussed how the actual “revolution” is not necessarily the use of technology for humanitarian operations but the increasing relevance of Artificial Intelligence (AI). Drones, as an example, are preprogrammed to map a certain area and can take off and land on their own. Artificial Intelligence opens new doors to the use of technologies for humanitarian action.

Panel 2: Humanitarian Technology and Implications for the Asia-Pacific

The second session acknowledged that the military remains an important actor in the humanitarian space. It was highlighted that many vital technologies for humanitarian operations derive from the military (e.g. GPS). The way technologies such as GPS are used in the Asia-Pacific was illustrated through a case study of the Philippines. Sensors are used across the archipelago to monitor the weather and feed information into a live-updated online system that combines weather forecasts with real time information. The discussion highlighted that technology should empower local populations, but is constrained by the need for long term investment in education about hazards, risks and the role of technology. A consensus emerged that technology can support humanitarian efforts but that the people involved in the humanitarian space are still the most important factor for success. In line with empowering local communities in the Asia-Pacific region through technological innovations, the workshop debated the issue of electrical power disruption during and in the aftermath of disasters. Electricity was identified as vital for communities affected by disasters. A solution to this issue through a sustainable approach was explained through a project that enables medium to long-term rehabilitation by establishing micro grids for temporary use at the community level. Some of these micro grids can work with solar panels while others are located on floating systems in rivers. A general takeaway was that humanitarian technologies should be easy to use and work efficiently even under difficult circumstances.

Panel 3: Future Directions in Humanitarian Technology & Critical Questions

The third session focused on the use of Big Data, humanitarian innovation and the implications on and for humanitarian action. The session first addressed the data revolution, such as data innovation and ecosystems, and engaging with regulators and private sector individuals to develop these ecosystems. There are several opportunities for big data in the World Humanitarian Summit outcome document and Sustainable Development Goals. One of the challenges at present is the need to engage the private sector in a sustainable way over the longer term and not just in the aftermath of a disaster. For example, in Mexico, financial transaction data was used to measure the impact of natural disasters and to understand recovery patterns after disaster. In another setting microfinance institutions helped to understand the effects of severe flooding on livelihoods and how long it took people to adapt in Cambodia.

The session then addressed the innovative use of technology, and in particular the use of unmanned vehicles for use on land, in the air and sea, namely unmanned aerial, land and maritime vehicles (UAVs, ULVs and UMLVs). In the Asia-Pacific, these vehicles are used for logistics to transport and provide supplies, and focused on the example of Papua New Guinea, where there are logistical constraints to working in remote communities. UAVs allowed organizations working in such remote communities to pick up sputum samples for TB testing despite difficult access. These UAVs carried up to 3 kilograms and provide opportunities to transport blood, vaccines, anti-venom, lab samples and oxytocin. However, the use of UAVs presents several issues including questions over governance and operational concerns such as maintenance, range and remote control. There are significant risks associated with the use of unmanned vehicles particularly when used for military or dangerous activities. There is therefore a need for risk mitigation, especially when unmanned vehicles can be a dual-use technology and used in non-humanitarian activities. It was recognized that military use and terrorism-related concerns were very real and why some governments have blocked the use of such technologies. Likewise, some humanitarian organisations only deploy such technologies to low risk countries in remote areas. This allows for trusting relationships to be built between humanitarian technology operators and local communities to use UAVs for humanitarian activities.

Another challenge for the humanitarian field was demonstrated by the 70 years it has taken the sector to reconsider shelter design and implement change. This demonstrated that it is important to harness innovation to focus on foresight, bottom-up innovation, and acceleration in humanitarian technology, including among others, the use of 3D printing. In response to questions about data, it was shared that perhaps it was more about power and politics, which data should be used and which is more credible and legitimate. Some concern was raised over

the need for high data utilization in a bid to ensure more effective humanitarian assistance. It was also raised that while technological advancements had been made globally, these technologies had not yet transferred to the region. A notable example was that cyclone monitoring systems have not yet been transferred to the Asia-Pacific although it is being developed with OCHA and the UNDP. In sum, while the use of new technologies is shaping how we can deliver humanitarian assistance and protection, it is also important to recognize that new technology will impact on the humanitarian field.

WHAT MAKES TECHNOLOGY HUMANITARIAN?

Ennio V. Picucci

Since the middle of the twentieth century the world has experienced the use of electronics and information technology to automate production. More recently we have seen the emergence of a digital revolution that builds on the developments over the past half century. These developments have created a new technological turn in humanitarian action. While technology has always been used for humanitarian purposes, some of the emerging technological innovations have the potential to change the way humanitarian actors operate. When technology is used for humanitarian purposes it is now often referred to as *Humanitarian Technology* or *HUMTECH*.

Technologies that are commonly associated with the term *humanitarian* are unmanned (aerial, land and maritime) vehicles, the analysis of big data, high tech ICTs (Information and Communication Technologies) and are already well established among humanitarian actors. Others, such as 3D printing, rescue robotics and animal-machine hybrids are currently under exploration and have been deployed only in a few humanitarian test cases. Technologies used in humanitarian action are becoming increasingly sophisticated. Sometimes this sophistication comes at the price of technologies being too complex to be used by many traditional humanitarian actors such as Non-Governmental Organizations (NGOs) and local communities. Most technologies used in humanitarian action are developed and produced by the private sector and were not necessarily intended for humanitarian purposes. Humanitarian agencies rarely have the capacity and resources to invest in research and development to develop complex innovations themselves, which is a significant reason why they cooperate with the private sector. It is therefore no surprise that the private sector's involvement and importance in humanitarian action is increasing. The role of the private sector continues to develop in cooperation with traditional humanitarian actors and independently of them in the field.

The role of the private sector in humanitarian action and disaster risk management are highlighted in Priority 3 of the SFDRR (Sendai Framework for Disaster Risk Reduction). A greater involvement of the private sector does however bring some challenges. First of all, it feeds into the expanding number of actors in an increasingly crowded humanitarian space. It comes with the difficulty to ensure effective coexistence, cooperation and coordination between a large number of actors with different mandates and capabilities. Furthermore, it must be remembered that every action during humanitarian operations can lead to far reaching consequences some of which might be unwanted and lead to negative impacts on the affected population. It is therefore important to recognise the importance of the humanitarian principles of humanity, impartiality, neutrality

and operational independence with a commitment to “do no harm.” This is particularly important for new actors in the humanitarian space. A common fear of traditional humanitarian actors is that the action of other actors involved in providing any type of assistance is potentially harmful and jeopardizes the credibility of all humanitarian actors. This is particularly salient when considering new technologies which are often developed and deployed quickly oftentimes before the long term impacts on the affected population are appreciated.

Some humanitarian practitioners perceive this as a pressing issue and have designed guidelines for the humanitarian use of technology. One of the most remarkable efforts is UAViators’ Humanitarian UAV Code of Conduct; a guideline that was later renamed the Drone Code of Conduct for Social Good by WeRobotics and reminds practitioners how UAVs should be deployed to *do no harm*. Such codes of conduct are a necessity but remain absent for most emerging technologies that are being applied in the field. However, even with codes of conduct it must be remembered that humanitarian assistance is context specific. For those who deploy new technologies it is not always possible to gain insight into the local context and predict the long term impact their actions may have on communities. It is therefore important to engage with local actors to understand specific dynamics to better estimate the long term effects of their action.

With that said, it could be argued that technology is only really *humanitarian technology* when used along the lines of the humanitarian principles, standards and guidelines and when traditional humanitarian actors are involved and consulted to shape the deployment of technology based on the context at the local level. Looking ahead, the challenge is to include local communities in the implementation of humanitarian technology for more effective action. Only through a truly participatory approach to humanitarian technology can some of the most urgent issues to make humanitarian action faster, cheaper and more impactful.

The Asia-Pacific offers both a wide range of opportunities to deploy humanitarian technologies due to reoccurring disasters and humanitarian crises, and a wide variety of local contexts that vary and to which humanitarian action must be tailored. At present what is needed is a better understanding of the landscape of all actors in the humanitarian space that aim to integrate technology into their operations, and to develop a platform where knowledge of best practices and lessons learned in context specific situations can be transferred between the myriad actors operating in an increasingly crowded humanitarian field.

Ennio V. Picucci is a Research Associate in the Humanitarian Assistance and Disaster Relief (HADR) programme at the Centre for Non-Traditional Security Studies (NTS Centre) at S. Rajaratnam School of International Studies (RSIS) in Singapore.



HUMANITARIAN ROBOTICS: THE \$15 BILLION QUESTION?

Patrick Meier

The International Community spends around \$25 Billion per year to provide lifesaving assistance to people devastated by wars and natural disasters. According to the United Nations, this is \$15 Billion *short* of what is urgently needed; that's \$15 Billion short *every year*. So how do we double the impact of humanitarian efforts and do so at half the cost?

Perhaps one way to deal with this stunning 40% gap in funding is to scale the positive impact of the aid industry by radically increasing the efficiency (time-savings) and productivity (cost-savings) of humanitarian efforts. This is where Artificial Intelligence (AI) and Autonomous Robotics come in. The World Economic Forum refers to this powerful new combination as the 4th Industrial Revolution. Amazon, Facebook, Google and other Top 100 Fortune companies are powering this revolution with billions of dollars in R&D. So whether we like it or not, the robotics arms race *will* impact the humanitarian industry just like it is impacting other industries: through radical gains in efficiency & productivity.

Take Amazon, for example. The company uses some 30,000 Kiva robots in its warehouses across the globe (pictured below). These ground-based, terrestrial robotics solutions have already reduced Amazon's operating expenses by no less than 20%. And each new warehouse that integrates these self-driving robots will save the company around \$22 million in fulfillment expenses alone. According to Deutsche Bank, "Bringing the Kivas to the 100 or so distribution centers that still haven't implemented the tech would save Amazon a further \$2.5 billion." As is well known, the company is also experimenting with *aerial* robotics (drones). A recent study titled *Clarity from Above* by PwC in May 2016 notes that "the labor costs and services that can be replaced by the use of these devices account for about \$127 billion today, and that the main sectors that will be affected are infrastructure, agriculture, and transportation."

Meanwhile, Walmart and others are finally starting to enter the robotics arms race. The former is using ground-based robots to ship apparel and is actively exploring the use of aerial robotics to "photograph ware-house shelves as part of an effort to reduce the time it takes to catalogue inventory."

What makes this new industrial revolution different from those that preceded it is the fundamental shift from manually controlled technologies—a world we're all very familiar with—to a world powered by increasingly intelligent and autonomous systems—an entirely different kind of world. One might describe this as a shift towards extreme automation. And whether extreme automation powers aerial robotics, terrestrial robotics or maritime robots is beside the

point. The disruption here is the *one-way* shift towards increasingly intelligent and autonomous systems.

Why does this fundamental shift matter to those of us working in humanitarian aid? For at least two reasons: the collection of humanitarian information and the transportation of humanitarian cargo. Whether we like it or not, the rise of increasingly autonomous systems *will* impact both the way we collect data and transport cargo by making these processes faster, safer and more cost-effective. Naturally, this won't happen overnight: disruption is a process.

Humanitarian organizations cannot stop the 4th Industrial Revolution. But they can apply their humanitarian principles and ideals to inform how autonomous robotics are used in humanitarian contexts. Take the importance of localizing aid, for example, a priority that gained unanimous support at the recent World Humanitarian Summit. If we apply this priority to humanitarian robotics, the question becomes: how can access to appropriate robotics solutions be localized so that local partners can double the positive impact of their own humanitarian efforts? In other words, how do we *democratize* the 4th Industrial Revolution? Doing so may be an important step towards closing the \$15 billion gap. It could render the humanitarian industry more efficient and productive while localizing aid and creating local jobs in new industries.

Think Global, Fly Local: The Future of Aerial Robotics for Disaster Response

First responders during disasters are *not* the United Nations or the Red Cross. The real first responders, by definition, are the local communities; always have been, always will be. So the question is: can robotics empower local communities to respond and recover both faster and better? I believe the answer is Yes.

But let's look at the alternative. As we've seen from recent disasters, the majority of teams that deploy with aerial robotics (UAVs) do so from the US, Europe and Australia. The mobilization costs involved in flying a professional team across the world—not to mention their robotics equipment—is *not* insignificant. And this doesn't even include the hotel costs for a multi-person team over the course of a mission. When you factor in these costs on top of the consulting fees owed to professional international robotics teams, then of course the use of aerial robotics versus space robotics (satellites) becomes harder to justify.

There is also an important time factor. The time it takes for international teams to obtain the necessary export/import permits and customs clearance can be highly unpredictable. More than one international UAV team that (self) deployed to Nepal after the tragic 2015 Earthquake had their robotics platforms held up

in customs for days. And of course there's the question of getting regulatory approval for robotics flights. Lastly, international teams (especially companies and start-ups) may have little to *no* prior experience working in the country they're deploying to; they may not know the culture or speak the language. This too creates friction and can slow down a humanitarian robotics mission.

What if you had fully trained teams on the ground already? Not an international team, but a local expert robotics team that obviously speaks the local language, understands local customs and already has a relationship with the country's Civil Aviation Authority. A local team does not need to waste time with export/import permits or customs clearance; doesn't need expensive international flights or weeks' worth of hotel accommodations. They're on site, and ready to deploy at a moment's notice. Not only would this response be faster, it would be orders of magnitudes cheaper and more sustainable to carry through to the recovery and reconstruction phase.

In sum, we need to co-create local Flying Labs with local partners including universities, NGOs, companies and government partners. Not only would these Labs be far more agile and rapid vis-a-vis disaster response efforts, they would also be far more sustainable and their impact more scalable than deploying international robotics teams. This is one of the main reasons why my team and I at WeRobotics are looking to co-create and connect a number of Flying Labs in disaster prone countries across Asia, Africa and Latin America. With these Flying Labs in place, the cost of rapidly acquiring high quality aerial imagery will fall significantly. Think Global, Fly Local.

Dr. Patrick Meier is the Executive Director and Co-Founder of WeRobotics, which scales the positive impact of humanitarian aid, development and environmental projects through the use and localization of appropriate robotics solutions. He is also the author of the highly praised book, Digital Humanitarians.

UAV NETWORK FOR TB DIAGNOSTICS DELIVERY IN GULF PROVINCE, PAPUA NEW GUINEA

Oriol Lopez, Eric Boivin, and Eric Pujo

Medecins Sans Frontières (MSF) and the Ministry of Health (MoH) of Papua New Guinea (PNG) are partners fighting Tuberculosis (TB) in the Gulf Province. To improve the diagnosis in areas of difficult access, in 2014 Medecins Sans Frontières conducted a feasibility study using unmanned aerial vehicles to bring back TB samples to the central laboratory of the Kerema General Hospital. The feasibility study showed promising developments but due to range limitations and technical constraints, the study could not be continued as expected. In 2015 and 2016, MSF have worked to address these limitations with technical solutions through new providers. The solution should maintain the simplicity and safety of the previous test but extend the range of transportation to 65km for a load of up to 2kg.

Beyond the transportation of TB samples, this capacity will MSF and the MOH to supply emergency medicine on demand or essential drugs upon a stock outage. To validate the concept, MSF is planning a 3 week test campaign in the first half of 2017 between the locations of Kerema-Ihu and Kerema-Malalaua. This test phase needs to be coordinated between MSF, the MoH, the Civil Aviation Safety Authority (CASA) and the UAV provider. It is essential to ensure the adherence to all the national regulations.

Papua New Guinea (PNG) is a country in Oceania that occupies the eastern half of the island of New Guinea and its offshore islands in Melanesia. With an area of 462,840 km², the country's geography is diverse and highly covered with tropical rainforest. Some areas, especially during the rainy season, can only be accessed on foot or by aeroplane. With an estimated population of 7 million, of which 87% lives in rural areas, the logistics and distribution of healthcare assistance are a great challenge. PNG has twenty provinces of different sizes and populations. The MOH provides services through a 7-level health system comprising an estimated 22 provincial hospitals, 69 urban clinics, 14 district and rural hospitals, 629 rural clinics and 2,672 aid posts. Nevertheless, access to healthcare is a major problem due to clinics being several days walk for much of the population and facing severe shortages of trained staff, with an average of 5.3 nurses and 1 doctor per 10,000 people.

In addition, Tuberculosis (TB) prevalence in PNG has risen among the highest in the Western Pacific region, becoming the third cause of hospital admission in the country. With limited diagnostic capacity, low access to medical care and high rates of "lost to follow-up" patients, current programs haven't succeeded

in improving TB detection and treatment rates. As a result, the population is facing a higher risk of TB exposure and infection and an increased likelihood of developing drug-resistant TB (DRTB).

This prompted the PNG government to establish an emergency task force with MSF to contain the TB epidemic. After identifying a rise of DRTB in the Gulf Province area, MSF and the MOH started the implementation of a TB project. Due to the rainforest geography, and the poor road conditions during the rainy season, road-based transportation is very unreliable. This is a constraint to the correct diagnosis and the follow up of TB treatment which requires regular sputum samples to be analyzed with specialized laboratory equipment. This equipment is only available at the central hospital of Kerema.

Problem Summary

- TB epidemic in PNG with the highest rates of DR-TB in the Gulf Province.
- Healthcare services mainly provided through rural healthcare facilities with limited diagnostics capability and staff.
- Access to TB diagnostics and treatment is hindered by difficult terrain and poor road infrastructure.
- Strong need for effective and reliable transportation of TB samples from rural outposts to the Kerema General Hospital Lab for analysis.

The use of UAVs

In order to provide an effective and reliable transportation of TB samples with a solution that does not have an ecological impact and respects community life, MSF has evaluated the use of UAVs to transport diagnostic samples from rural clinics to a lab established at the Kerema General Hospital.

Operational Requirements

- Automatic flight
- Minimum of 60 km range & 2 kg payload
- 2 way transport (dropping is not valid)
- Simple user interface & operations
- Low & Easy Maintenance
- Secure & reliable
- Environmentally friendly

Technical Requirements

- Electric motors: reliability, security, low maintenance & ecology
- VTOL (Vertical Takeoff & Landing): safe & automatic flight
- Fixed Wing Plane: long range
- Small or protected propellers: security
- Satellite GPS Tracker: position tracked on real time

Test campaign in PNG

The objective is to conduct a test campaign of 3 weeks in early 2017 to demonstrate the feasibility of using the cargo UAVs for regular transport of: sputum TB samples or medical items between the Kerema Hospital and the health centers located in the region such as Ihu or Malalaua in a radius of 65 km. During the feasibility campaign, only dummy samples or non-hazardous medical items will be transported. The test will follow as much as possible the real protocols of TB sample transport using a UN3373 triple packaging of biological substance category B. It's important to note that TB sputum samples are harmless unless they are aerosolized (e.g. cough, sneeze).

The test aim is for a total of 20 two-way trips between the locations of Kerema-Ihu or Kerema-Malalaua using 2 UAVs. If the weather is good and the teams are ready, each working day a UAV will depart early in the morning from Kerema, land in Ihu/Malalaua (<1h), charge at destination (1h) and be sent back to the origin (<1h). If the UAVs are healthy, after the morning flight, a 2ⁿ attempt should demonstrate high capacity and flexibility of operations in one single day. The proposed flight routes have been agreed with the civil aviation and the local authorities at Kerema. To ensure the safety of the population, in this proposal the UAVs do not fly over populated areas and uses an aerodrome conveniently located near the Hospital. To avoid mixing with commercial aviation, the UAVs should fly at a constant altitude of 400ft (122m) above the ground level in straight lines between the coordinate waypoints.

Oriol López is a research and development specialist; Eric Boivin is a research and development manager; and Eric Pujo is a Project Manager for Doctors Without Borders (MSF).



NATIONWIDE OPERATIONAL ASSESSMENT OF HAZARDS (NOAH): A RESPONSIVE PROGRAM FOR DISASTER RISK REDUCTION IN THE PHILIPPINES

Alfredo Mahar Lagmay

The Nationwide Operational Assessment of Hazards (Project NOAH) is currently the premier disaster science research and development program for disaster prevention and mitigation in the Philippines. It takes a multidisciplinary approach in developing systems, tools, and other technologies that is operationalized in the disaster efforts of the country providing the government and other stakeholders with actionable information that helped mitigate and outright avert massive loss of lives in at least 15 major severe weather events since its inception. NOAH has established itself as a vital producer and provider of Climate Change Adaptation and Disaster Risk Reduction (CCA-DRR) information that empowers communities. In the case of extreme weather events, Project NOAH believes that there are two things that can help prevent them from becoming disasters:

1. Highly detailed hazard maps that policy makers can use for identification of safe areas for resettlement, establishment of evacuation centers, and planning for disaster and climate change resilient communities. These hazard maps are necessary to elicit appropriate response to government warnings on imminent danger from floods, landslides and storm surges.
2. Early warning systems that will help stakeholders, at the vertical and horizontal level, detect incoming severe weather threats. It is important that these information must be accurate, reliable, understandable, and more importantly, timely.

Project NOAH endeavored to provide the Philippines with these two essential elements in reducing our risks to disasters through Open Data. The model is to empower communities through open access rather than to control public data that are critical to the safety and well-being of the people. Hazard maps tell you where it is dangerous during times when there are typhoons. In the past, the available hazard maps were of low resolution and showed that every square meter in the Philippines is prone to flood and rain-triggered landslide hazards. This defeats the purpose of hazard maps, which is really made to identify the safest and most suitable areas for resettlement, establishment of evacuation centers, and planning for disaster and climate change resilient communities. Project NOAH has begun generating high resolution hazard maps with a vertical accuracy of plus-minus 15 centimeters and a horizontal resolution of one meter. Maps at this scale allows distinction of the level of hazard's exposure from household to household. *Figures 1 is an example of a hazard map developed*

by Project NOAH, which completed all the high-resolution hazard maps for storm surges and landslides for the entire Philippines. However, only 43% of the flood hazard maps have been completed.

These maps can be used for Local Climate Change Action Plans (LCCAP), Local DRRM Contingency Plans, Comprehensive Land Use Plans (CLUP), and Comprehensive Development Plans (CDP). Disaster risk is an unresolved problem of development. In order to prepare for hazards, and to become resilient against climate change impacts, it is necessary for the communities to plan using hazard maps generated by Project NOAH. NOAH maps are multi-scenario for every meteorological hazard and include projections of possible scenarios that may not yet have been experienced by communities. These maps serve as a basis for better planning.

Project NOAH also developed a web-based disaster management platform for Local Government Units (LGUs), emergency responders and the general public alike. The website (<http://noah.dost.gov.ph>; <http://noah.up.edu.ph>) contains various near-real time information regarding weather and the hazards it can bring. The combination of all these information allows us not only to receive information regarding the weather but also on its consequences. Using rainfall and high-resolution hazard maps, areas likely to be affected by flooding and landslides are readily identified. The usefulness of near real-time data and high-resolution hazard maps was recognized by the NDRRMC and has since incorporated the tools and information that NOAH provides. They also included Project NOAH to the PDRA, a protocol that the NDRRMC activates whenever the Philippines is threatened by extreme weather events.

Since its implementation in 2012, NOAH has been instrumental in increasing the government's capacity to prevent and mitigate the impact of disasters from hydrometeorological hazards. As part of the PDRA Core group of NDRRMC, the Project NOAH team's area-focused, time-bound and hazards-specific advisories provided NDRRMC preparedness and response agencies with actionable information that helped mitigate massive loss of lives (Figure 2).

Taking It a Step Further

In recognition of its efforts since its launch on 6 July 2012, NOAH has won 15 awards, 9 of which are international with 6 bestowed by national agencies/institutions. Most recently, NOAH won the 2016 IDC's Smart City Asia Pacific Awards (SCAPA) and the USAID-sponsored Harnessing Data for Resilience Recognition Award. NOAH also garnered the 2015 Manuel L. Quezon Gawad Parangal Award for Outstanding Institution for its efforts in disaster risk reduction.

The award recognizes exemplary, responsible partners in building the city and the country whose standards of service and performance are largely unsurpassed.

NOAH was also recognized for its products and services like its mobile applications. Arko, developed with Pointwest Technologies, won the 2014 UN World Summit Award for Inclusion and Empowerment in the mobile category. The coveted World Summit Awards (WSA) 2014 under the m-Inclusion and Empowerment category showcases the world's best practices in mobile innovation. In spite of the great strides Project NOAH has taken in its path towards disaster resilience, there is still more work to be done. Natural hazards are here to stay and there will always be lessons that can be learned from every disaster. Mistakes should not be repeated and continuous learning should be applied or put into operation immediately. There is a need to create an army of scientists and maintain those that have been trained to continue the work that Project NOAH started. Recognizing the value of scientific human resource in disaster risk reduction and building resilient communities, the University of the Philippines System, the country's National State University, adopted Project NOAH on 23 February 2017, through the establishment of the University of the Philippines NOAH Center.

Alfredo Mahar Francisco A. Lagmay is a professor and University Scientist at the National Institute of Geological Sciences, University of the Philippines; and Executive director of Project NOAH (Nationwide Operational Assessment Hazards). Project NOAH is a flagship program for disaster risk reduction and management by the Department of Science and Technology.

ENERGY IN POST-DISASTER SCENARIOS: INSIGHTS ON APPROPRIATE TECHNOLOGIES AND INITIATIVES

Michael Lochinvar Abundo

There are various appropriate and suitable actions and various appropriate technologies to augment these actions, for different stages associated with disaster efforts: Readiness, Response, Relief, Recovery, Rehabilitation, and Reconstruction. Each phase will have particular needs and objectives. Most post-disaster actions focus on the response and relief phases – addressing immediate needs. In all these phases, the need for energy, electricity in particular, is either given a lower priority than the basic needs (food, water, shelter, and medicine). It may be time now to include energy as part of the post-disaster action package and from the onset of planning for either disaster preparedness or post-disaster interventions; the efforts must imbibe the character of sustainability. Some of our observations in our post-disaster experience around Typhoon Haiyan, 1 month after the super typhoon hit the Philippines, include unaddressed immediate needs for communication and lighting. We've observed some locations charging PHP20 (~USD0.4) per cellphone recharge – which borders on extortion – and individuals need to walk for more than 4km (losing an hour of their day one-way) just to charge their communication device. We also have noted that a clustering of survivors leads to pooling of resources. For the Filipino people, the concept of “Bayanihan” (the spirit of communal unity, work and cooperation to achieve a particular goal) was very much practiced during the post-disaster recovery phase.

Despite the all too well-established links between energy and security, energy and the alleviation of poverty, energy and the acceleration of community development, during post-disaster period, energy can be both a necessity and a luxury... but, even so, we must all agree that energy is an enabler. However, there is a lack of energy-centric initiatives in post-disaster efforts. A ‘trial’ of an energy-centric initiative was formulated. Project EnKindle is a medium to long-term rehabilitation initiative to augment the efforts of Yolanda (Typhoon Haiyan) survivors. We recognize the need for interim alleviation and long term sustainability; therefore transition plans for stewardships and integration for a micro grid community are also in place. This led to the development of appropriate technologies using off-the-shelf products and systems (e.g. solar, batteries, LED lights, cellphones) with most components locally-sourced. The impact of 1 working communication device (e.g. a cellphone) with a renewable energy-enabled power supply has led to the feeding and sustainable supply of food, water, and medicine for 200 families.

There is a strong case to include renewable energy into disaster preparedness and readiness campaigns and kits. There is a need for training in such

technologies. There is a must in terms of community or cluster survival that leverage on the use of renewable energy kits for lighting, communications, and small-device charging. The mentality of including sustainable energy into the pre/post disaster schemes allows for better preparedness and faster rehabilitation not limited to the physical sense but also in the sociological, economical, and spiritual sense. We have observed the ‘healing’ of such communities to have been accelerated by a symbol of hope (i.e. light) and a boost in morale to cooperate (i.e. because of the clustered nature of the intervention, sharing a common system rather than distributing flashlights to each individual).

Other lessons we’ve learned highlight the need for *de-centralized capability for post-disaster management*. Distributed power generation is a plus – where micro-grids for carious islands, communities, and regions are catered to by the use of multiple energy resources (Renewable and conventional). Leveraging the sea is also another possibility for these interventions: from logistics (using vessels) to energy (using marine renewable energy devices to produce electricity from the currents and waves) to water production (desalination) to livelihood (fishing and ice making). Looking at island nations, there is much to be harnessed from the sea. From an infrastructure perspective, there is merit in looking at buried transmission and distribution cables/wires rather than over-the-air (with poles) lines. This builds some form of resilience to strong winds and may improve the energy resilience of typhoon-prone areas. There is also a need to re-emphasize the benefits of inclusive planning and implementation. This means inclusive training of the local communities who are prone to disasters. The survivors are the allies of those who involve themselves in humanitarian aid and action, this attitude echoes the cry of ‘helping them help themselves’ which in the long term is the sustainable path forward.

Perhaps there is need to review various groups who specialize in humanitarian action and equip them with the best practices from all these lessons learned in past experiences and share the knowledge and materials for a more prepared, more resilient society. It is our belief that empowering the ‘empowering organizations’ – such as the Red Cross, World Vision, NGOs on the ground, or those that coordinate such humanitarian action – will be more efficient in securing the effective impact of future actions related to disaster readiness and post-disaster intervention. Technical experts in various fields can participate and the venue for improving the technologies used in such applications must go beyond forums, roundtables, conferences. There must be concrete global, regional, national, and local communication and workshops. We urge all humanitarian aid efforts in their intervention planning and especially for disaster-related actions to consider and include execution the need for energy/electricity.

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BIG DATA FOR HUMANITARIAN ACTION

Derval Usher

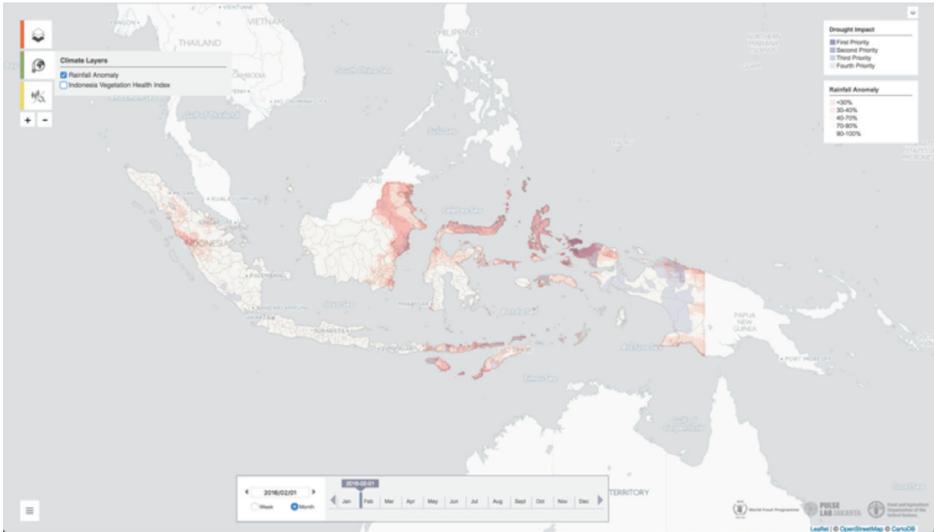
Over the past decade, the digital transformation of society has brought us to the point that many disaster-affected communities are prolific producers of big data – before, during and after the onset of an emergency, and the humanitarian community has become increasingly interested in integration of real time data analytics into field operations. This is especially true in the Asia Pacific region which has been quick to embrace the data revolution.

Pulse Lab Jakarta is a data innovation lab; a joint initiative of the Government of Indonesia and the United Nations harnessing new digital data sources for development and humanitarian action. The projects that we have produced with partners in our lab are all designed to experiment with new data sources to produce new tools and platforms that can be used for policy making.

New Vulnerability Monitoring Platform to Assist Drought-Affected Populations in Indonesia

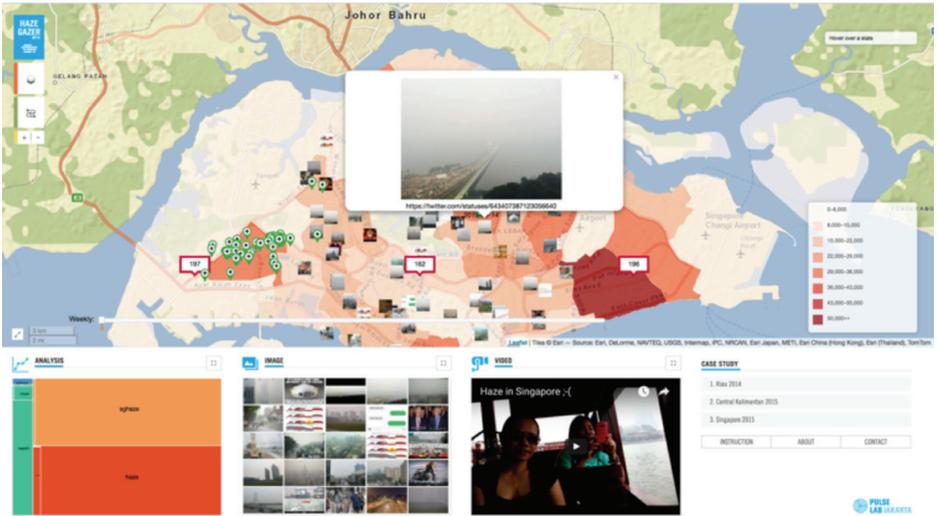
One such example is our Vulnerability Analysis Monitoring Platform for the Impact of Regional Events (VAMPIRE) which is a platform that produced together with the World Food Programme (WFP) and Food & Agriculture Organisation (FAO) in Indonesia. VAMPIRE is a tool that can be used to understand the evolving nature of slow onset phenomena like El Nino in near real-time to better target assistance from government and international organisations to vulnerable populations. The platform combines and provides analytics of several layers of data, including integrated map based visualisations that show the extent of drought-affected areas, the impacts on markets, and the coping strategies and resilience of affected populations. The system is designed to integrate additional data sources and features and has been installed in the Office of the President of the Government of Indonesia. Collecting data on rainfall anomalies and food security is not a new or unique activity for governments. However, the platform adds value by dramatically reducing the time required to bring this information together and visualize it in high resolution and in near real time.

The dashboard above shows the rainfall anomaly and the drought impact in Indonesia. The image shows that the eastern part of Indonesia (West Papua and East Timor) are classified as the first priority area for support.

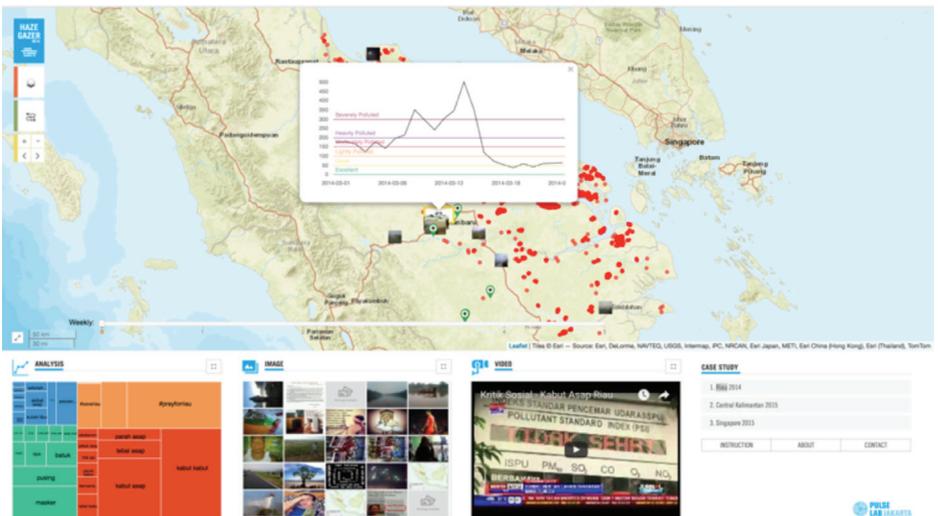


Haze Gazer: An Analysis and Visualisation Tool for Haze Crisis Management

Forest and peatland fires in Indonesia continue to affect many parts of Southeast Asia on an almost annual basis, resulting in extensive environmental destruction, increasingly health problems, school closures and cancelled transportation services. The platform Haze Gazer (<http://hazegazer.org>) is another of Pulse Lab Jakarta's tools that has been installed in Government of Indonesia systems. This supports timely data and more information on the dynamics of the haze disaster, especially the situation on the ground. The platform enhances disaster management efforts by providing real-time insights on the location of fire and haze hotspots; strength of haze in population centres; locations of the most vulnerable cohorts of the population; and most importantly, the response strategies of affected populations, including movement patterns and in-situ behavioural changes. The dashboard of Haze Gazer integrates the existing functionalities of the current information system used by the Indonesian disaster management authorities, namely insights on the locations of hotspots, and adds new functions based on multiple digital data sources.



The Haze Gazer dashboard shows the incidences of haze in Singapore 2015. It shows the real-time information captured from citizens' social media posts, real-time air quality from the National Environment Agency Singapore and the location of hospitals from OSM.

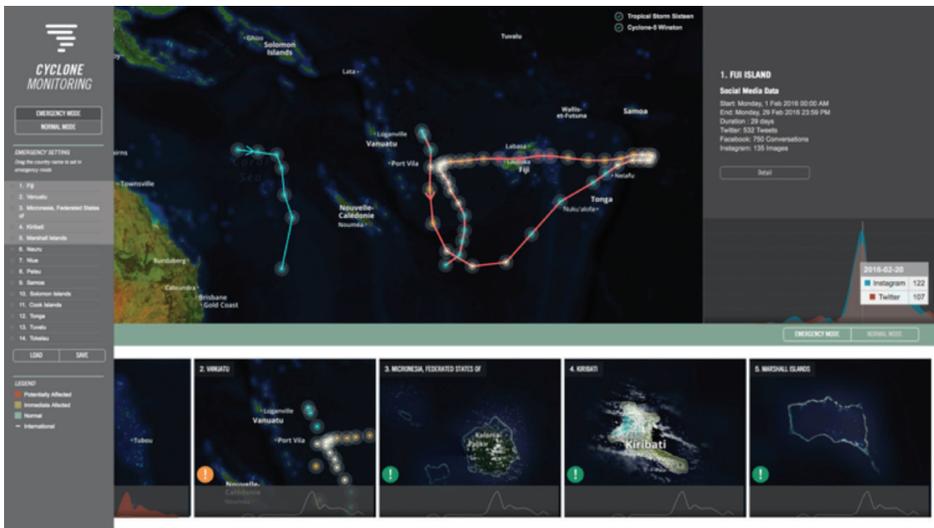


Highlighting the incidences of haze in Riau during 2014, the dashboard above shows the dynamics of air quality during that time, ground-truth information from social media and the hotspot location and quantity from satellite imagery.

Cyclone Monitoring System in the Pacific

The South Pacific was affected by devastating cyclones in Fiji and Vanuatu in recent years and the geographical scale of the Pacific renders disaster preparedness and resilience efforts by the Governments difficult. However, the youthful population scattered across the South Pacific combined with an increase in the usage of digital technologies including social media is a clear opportunity to leverage this digital data which contains clear signals about the dynamic state of a population before, during and after a crisis.

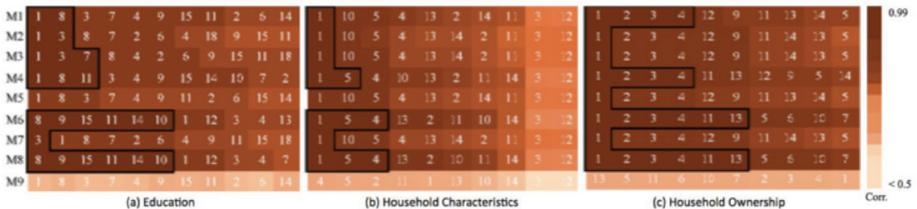
Pulse Lab Jakarta worked with the UN's Office for the Coordination of Humanitarian Affairs to build a very early concept of a dashboard that aims to assist with cyclone management in the South Pacific. The dashboard monitors the social response of citizens before/during and after cyclones across 14 countries by collecting, analyzing and visualizing multiple sources of information. Community resilience efforts are showcased by analyzing social media posts identifying the exact affects of a disaster thus better focusing a government's response strategy. Emergency mode on the CycloMon dashboard shows the cyclone trajectory, the emergency status of each country and digital signals captured from social media.



Analysing Anonymised Mobile Data for Indicators of Socio-Economic Well Being in the South Pacific

Pulse Lab Jakarta has developed a solid partnership with a major regional mobile network operator (MNO) which has a strong presence across the Pacific Islands. PLJ and the MNO are currently collaborating to develop proof-of-concepts on the value of mobile network data for businesses, governments and development organisations by analysing how the data can be used to understand real-world social and economic trends. The MNO has given PLJ access to anonymised mobile phone data from Vanuatu and PLJ is using advanced data analytics to investigate the economic impact of the cyclone in 2015 and the economic resilience of communities. The research compares data from before and after the cyclone to understand how long it takes for microeconomic activity to recover to pre-disaster levels and, in the process, to inform the response to similar disasters in future. The research will use call detail records to understand mass mobility patterns and the ‘interconnectedness’ of communities (as a proxy for economic activity) and mobile airtime purchases to understand economic resilience. The correlation matrix between anonymized mobile data and indicators from official statistics below represents higher correlations the darker the colour.

Mobile Phone Data Indicators			Household Characteristics			Household Ownership		
M1	Total Number of Calls and SMSs	E7	Education completed - Form 3 certificate	H5	HH with main source of lighting from generator	H05	HH owning freezer	
M2	Total Duration of Calls	E8	Education completed - Year 10 leaving certificate	H6	HH with main source of lighting from solar	H06	HH owning computer	
M3	Number of Unique Customers from Topup Records	E9	Education completed - Senior secondary certificate	H7	HH with main source of lighting from kerosene	H07	HH owning internet	
M4	Total Number of Topup Transactions	E10	Education completed - University entrance	H8	HH with main source of lighting from gas	H08	HH owning generator	
M5	Number of Unique Customers from CDUs	E11	Education completed - College	H9	HH with main source of lighting from Coleman	H09	HH owning mobile phone	
M6	Total Number of SMSs	E12	Education completed - Bachelor degree	H10	HH with main source of cooking energy from kerosene	H10	HH owning telephone	
M7	Total Number of Calls	E13	Education completed - Master degree	H11	HH with main source of cooking energy from electricity	H11	HH owning gas stove	
M8	Total Amount of Topup	E14	Education completed - Vocational certificate	H12	HH with main source of cooking energy from wood	H12	HH owning boats	
M9	Average Amount of Topup per User	E15	Education completed - Others	H13	HH with main source of drinking water from piped private	H13	HH owning/motor vehicle	
Education			E16	Population currently attending formal educational institution	H14	HH with main source of drinking water from piped shared	H14	HH owning motorbike
E1	English literacy	E17	Population attending formal educational institutions - full time	H15	HH with main source of drinking water from HH tank	H15	HH owning canoe	
E2	French literacy	E18	Population attending formal educational institution - part time	H16	HH with main source of drinking water from village tank	H16	HH having chickens as livestock	
E3	Bislama literacy	Household Characteristics			Household Ownership			
E4	Other language literacy	H01	# HH - Rent free	H01	HH owning radio	H17	HH having pigs as livestock	
E5	Education completed - Some primary education	H02	# HH - Rent	H02	HH owning TV screen	H18	HH having horses as livestock	
E6	Education completed - Primary leaving certificate	H03	# HH - Owned	H03	HH owning DVD	H19	HH having cattle as livestock	
		H04	# HH with main source of lighting from electricity main grid	H04	HH owning mower	H20	HH having goats as livestock	



Data Privacy is Paramount

In the midst of this data revolution, however, current frameworks for data and privacy protection have not kept pace with advances in technology and often do not account for big data. Use of data for public good cannot be done without proper data privacy and data protection frameworks and risk mitigation mechanisms

implemented from the start. While certain data protection frameworks exist around the world, a solution on how to utilize big data in international development and humanitarian contexts has yet to be found.

Part of the UN Global Pulse network's mandate is around developing the ecosystem surrounding the use of big data for public good. To unlock the value of data safely and responsibly, Global Pulse has developed a set of privacy principles for applications of big data and separately, in collaboration with the Privacy Advisory Group which is a group of experts from the private sector, public sector, academia and civil society. The aim is to strengthen the overall understanding of how privacy protected analysis of big data can contribute to sustainable development and humanitarian action.

Derval Usher is Head of Office for Pulse Lab Jakarta, part of the United Nations Global Pulse, a flagship innovation initiative of United Nations Secretary-General Ban Ki-Moon on big data.

HUMANITARIAN TECHNOLOGY – IMPLICATIONS FOR POLICY RESEARCH IN THE ASIA-PACIFIC

Alistair D. B. Cook

The World Humanitarian Summit [WHS] was initiated by the UN Secretary – General in 2013 to ‘leverage new partnerships, technologies, and ways of working to improve global response to natural and man-made disasters’. It was held three years later in Istanbul, Turkey, in May 2016 and set an agenda to reform the global humanitarian system to respond to the changing humanitarian landscape of greater needs, more diverse actors, new technologies, and political and economic shifts. The summit brought new technologies and humanitarianism to a wider global audience.

Humanitarian technology as a community of professionals began organising in 2012 with the inaugural and annual IEEE Global Humanitarian Technology Conference. Its mission is to advance technology for the benefit of humanity. It aims to foster this through ‘the exchange of information, networking and cooperation in the humanitarian field and focus the attention of businesses on emerging market opportunities and related technology enablers’. It further commits ‘to promote science, engineering and technology as key to the development of solutions for disadvantaged communities and to attract young people to these professional fields’.

However, a community of scholars focused on investigating critical questions on the impact of new technologies on communities affected by disasters and the field of humanitarian affairs has been much more limited. The literature on humanitarian technology remains constrained to operational reports and individual case studies of using new technology to facilitate logistics, inform needs assessments, and enhance communication strategies. The literature points to two broad themes of activity: hardware and software. There is a strong need for independent evaluations of the use of new technologies in humanitarian activities to understand their impact on affected communities and responders. As we have seen more broadly, shifts in research are moving beyond the confines of individual disciplines towards more collaboration between disciplines as well as with practitioners.

This broad shift needs to move further towards establishing multidisciplinary work drawing on the expertise of scientists and social scientists to develop a holistic approach towards humanitarian technology. As part of such an effort, it will remain important to identify the gaps and connections between the thick descriptive data and the quantitative data that lends itself to single case studies, and the Big Data available on humanitarian technology to save lives and mitigate disasters. Furthermore it will be important to make sense of this data and its

implications for affected communities, responders and others engaged in using new technology for humanitarian action. It will be important to further understand the use of new technologies, the levels of access different social groups and state institutions have to it, and to create a more comprehensive picture of multiple case studies, approaches and the broader implications they have on humanitarian action. This will provide important insights into local ownership, capacity, and the use of communication systems like social media, SMS and smart phones in disaster settings.

Data Governance

Within the emerging field there is a discussion on data governance with a current normative push for open data as the best way for people to innovate and maximise its use. Data is also an important site of contestation and power where ownership of data signals the policy brokers involved in disaster management. While there is a progressive push for open data, control of data remains contested between state and non-state actors, particularly those who invest in data collection and analysis or governments' sensitivity to the implications data may have. This debate mirrors the debate over public, private or a combination of funders for humanitarian projects. There is concern about the data market between and within governments where different government agencies sell data to one another or are reluctant to share the information at all, particularly with non-state actors. Further investigation into an individual country's capacity to analyse large amounts of data and the motivations behind keeping it within a particular government or agency is warranted.

It is also important to further understand how to best utilise the data collected, how to make sense of the data, what data to collect, its value in facilitating predictive analysis, and its empowerment potential and compatibility or disruptive potential in different systems across and within the local, national, regional or international levels. Furthermore the knowledge transfer from one country to another of the skills to collect data also remains contested with much of the knowledge held in developed countries with varying degrees of access for developing countries. Secondly, data ownership plays an important part of the impact of new technologies on humanitarian action where responding entities collect data in an affected state without the government subsequently having unhindered access to the data, which has important implications for sovereignty and human security.

New Technologies

At present there is a general trend towards an increasing use of unmanned aerial, ground and maritime vehicles in disaster response. These new technologies allow for remote use and are justified based on four impacts as identified by Professor Robin Murphy: saving lives, improving the long-term health and recovery of survivors, mitigation, and accelerated economic recovery. As far as research on disaster robotics, the primary barrier to deploying robots is not a technical issue but an issue of governance. Are the systems in place in affected states fit for purpose to govern the use of UAVs, UGVs, and UMMVs? With the increasing use of these new technologies, there is a need for governance systems to adapt and change to new realities. Beyond the use of UAVs, UGVs, and UMMVs, a second emerging trend is in the use of renewable energy in disaster settings. As discussed elsewhere in this collection, renewable energy can offer a sustainable source of power supply in the emergency phase. A third emerging trend is the use of 3D printing in humanitarian activities from prosthetics to plastic pipe components as a way to overcome supply chain challenges.

Within the Asia-Pacific, there are affected states, which have experienced the use of these technologies and there is a need to consolidate these to determine what went well and what did not. These experiences can inform how states can cooperate at the regional level to share knowledge and experience or better understand why a state acted in a particular way. The use of new technologies also necessitates the shift towards the engagement of a more comprehensive humanitarian community to include non-traditional actors to assist in bridging the gaps between practitioners and policymakers. With the recent technological advances made, it is important to provide a robust assessment of how technological advances impact our response capabilities and how we provide humanitarian assistance and protection. From a brief survey of the field, it is clear that there is an emerging research agenda needed to investigate the impacts of new technologies on humanitarian action in the Asia-Pacific.

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HUMANITARIAN ASSISTANCE AND DISASTER RELIEF PROGRAMME

The **Asia Pacific** is the most disaster prone region of the world. Between 2004 and 2013, more than **40% of natural disasters** occurred in the Asia-Pacific region. In the last ten years, **80% of deaths due to disasters** happened in Asia and the Pacific (ADB). By 2025, seven of the world's top ten mega-cities will be in Asia. Rapid urbanization and **climate change have led to more frequent and recurring disasters** with greater impact. (McKinsey & Co.)



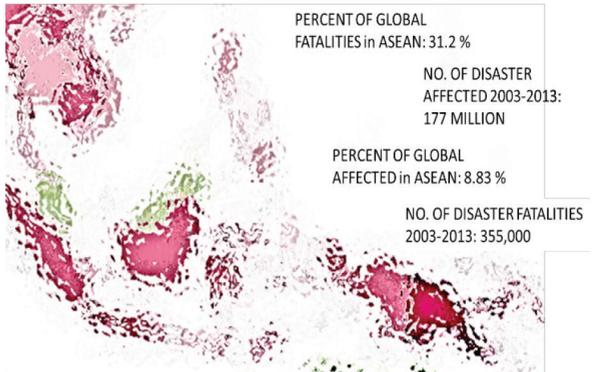
Foreign military forces assisted the Philippine government's relief efforts in the aftermath of Typhoon Haiyan in 2013.



Typhoon Haiyan killed at least 7,000 people and flattened many impoverished communities, triggering massive international humanitarian relief operations in the Philippines in 2013.



Natural Disasters: Humanitarian Response in ASEAN



Key Mechanisms:

- ASEAN Agreement on Disaster Management and Emergency Response (AADMER)
- ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre)
- ASEAN Disaster Emergency Response Simulation Exercises (ARDEX)
- Emergency Rapid Assessment Team (ERAT)
- Changi Regional Humanitarian Assistance and Disaster Relief (HADR) Coordination Centre
- Disaster Emergency Logistic System for ASEAN

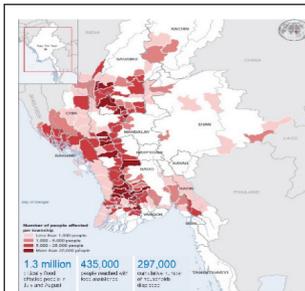


Figure 1. Number of people affected by recent flood in Myanmar
Source: www.unocha.org/myanmar

Myanmar Flood 2015

Heavy rains have caused floods and landslides in several parts of the country during the last two weeks of July. Cyclone Komen, that made landfall in Bangladesh on 30 July, has brought strong winds, heavy rains resulting in floods and landslides in several states and regions in Myanmar



Photos of recent flood in Myanmar. The flood is regarded as one of the worst disasters in decades

(Credit: www.channelnewsasia.com, www.flicker.com)

ABOUT THE CENTRE FOR NON-TRADITIONAL SECURITY STUDIES (NTS CENTRE)

The **Centre for Non-Traditional Security Studies (NTS Centre)** conducts research and produces policy-relevant analyses aimed at furthering awareness, and building the capacity to address NTS issues and challenges in Asia. The centre addresses knowledge gaps, facilitates discussions and analyses, engages policymakers and contributes to building institutional capacity in the following areas: Humanitarian Assistance and Disaster Relief; Food, Health and Energy Security; Climate Change, Resilience and Sustainable Development; and Peace and Human Security. The NTS Centre brings together myriad NTS stakeholders in regular workshops and roundtable discussions, as well as provides a networking platform for NTS research institutions in the Asia Pacific through the NTS-Asia Consortium. More information on NTS Centre and a complete list of available publications, policy briefs and reports can be found here: www.rsis.edu.sg/research/nts-centre.

ABOUT THE S. RAJARATNAM SCHOOL OF INTERNATIONAL STUDIES

The **S. Rajaratnam School of International Studies (RSIS)** is a professional graduate school of international affairs at the Nanyang Technological University, Singapore. RSIS' mission is to develop a community of scholars and policy analysts at the forefront of security studies and international affairs. Its core functions are research, graduate education and networking. It produces cutting-edge research on Asia Pacific Security, Multilateralism and Regionalism, Conflict Studies, Non-Traditional Security, International Political Economy, and Country and Region Studies. RSIS' activities are aimed at assisting policymakers to develop comprehensive approaches to strategic thinking on issues related to security and stability in the Asia Pacific. For more information about RSIS, please visit www.rsis.edu.sg

ABOUT THE INSTITUTE OF DEFENCE AND STRATEGIC STUDIES (IDSS)

The **Institute of Defence and Strategic Studies (IDSS)** is a key research component of the S. Rajaratnam School of International Studies (RSIS). It focuses on defence and security research to serve national needs. IDSS faculty and research staff conducts both academic and policy-oriented research on security-related issues and developments affecting Southeast Asia and the Asia Pacific. IDSS is divided into three research clusters: (i) The Asia Pacific cluster – comprising the China, South Asia, United States, and Regional Security Architecture programmes; (ii) The Malay Archipelago cluster – comprising the Indonesia and Malaysia programmes; and (iii) The Military and Security cluster – comprising the Military Transformations, Maritime Security, and Humanitarian Assistance and Disaster Relief (HADR) programmes. Finally, the Military Studies Programme, the wing that provides military education, is also a part of IDSS. For more information about IDSS, please visit www.rsis.edu.sg/research/idss.

The Consortium of Non-Traditional Security Studies in Asia was re-launched in February 2016. The NTS Centre at RSIS leads and coordinates this Consortium. The aims of the consortium are as follows:

- To develop a platform for networking and intellectual exchange between regional NTS scholars and analysts
- To build long-term and sustainable regional capacity for research on NTS issues
- To mainstream and advance the field of non-traditional security studies in Asia
- To collate and manage a regional database of NTS publications and other resources

For more information on the consortium, please visit the
NTS-Asia website: www.rsis-ntsasia.org/





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