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Vulnerability in Asia

Oliver Fall
Executive Coordinator, Asian Disaster Preparedness Center

The world is currently experiencing a new space race, although different in nature from the first races that put man into space and on the moon the current level of activity and competition is unprecedented since the days of SPUTNIK fifty years ago. Russian and American space dominance is now directly challenged by China and the European Space Agency, but also faces increasing pressures from the efforts of other smaller countries such as South Korea, Iran, Malaysia, Pakistan, Turkey, Israel, Taiwan, Japan and Brazil; all of whom are striving to develop their own independent launch capacities. With good reason, the beneficial spin-offs from space technologies have widespread and lucrative applications throughout the commercial, scientific, communication, military and remote sensing sectors. The application of these technologies to disaster management is of unquestioned value, but in what context is this technology being applied and how does it relate to communities on the front line of disaster risk management? Local level initiatives are often overlooked when scientific advances are applied to their intended field of study, but within Asia this technology is only one tool and part of a much larger process within disaster management. Through this paper I will give space-based technologies some context to its application in Asia.

The Situation in Asia today (Figures quoted from the OFDA-CRED International Disaster Database (EM-DAT) Nov. 2007)

Natural disasters are a familiar Asian affliction. In the twentieth century fifty-five of the worst one hundred disasters took place in Asia, accounting for 35.6 million fatalities. Of these one hundred worst disasters Asia accounted for twenty-two of the worst thirty-three, in which 27.7 million people were killed.

This historical trend continues into contemporary records with seven of the ten most disaster affected countries of 2006 in Asia. Between 2000-2005 Asia accounted for eighty-three percent of all fatalities in disasters, even removing unprecedented disaster events and the statistical 'anomalies' that they present, such as the 2004 tsunami, this does little to alleviate Asia's profile; in 2006 seventy-five percent of all fatalities were in Asia. At this point it is prudent to recognise that this dataset focuses on natural disasters and excludes other factors such as diseases and health, but if we consider the secondary impacts of these disaster events, to which I will return later, the true scale of the casualties is much larger.

If we examine records for the period 2000-2007 we may glimpse the reality of the situation. In these seven years the most commonly occurring disasters were floods (thirty-eight percent of all incidents), wind-storms (i.e. cyclones/typhoons, twenty-four percent) and earthquakes (eleven percent) followed closely by epidemics (nine percent). However, the most lethal events in this period were wave-storms that accounted for fifty percent of all fatalities. Even allowing for the statistical anomaly caused by the tsunami, is this symptomatic of one of the greatest threats in Asia? Perhaps, but consider the next most

lethal hazard, earthquakes, accounting for thirty-four percent of all fatalities; casualties are not caused by the earthquake in so much as the collapse of buildings during the event – the secondary hazards. Only when we consider both the primary and secondary hazards of disasters, compiling not only the fatalities, but also data on the number of casualties and persons affected can we see the magnitude of the problem that Asia faces every year.

Floods are the principal hazard in Asia affecting over seven hundred and eighty million people in this seven year period alone; equivalent to forty-six percent of all persons affected. Drought is the second most prevalent affecting five hundred and eighty-five million people, equal to thirty-four percent. In comparison, earthquakes are indeed lethal, but in this period affected twenty-five million, a comparatively low figure. As emergency response agencies will testify to, as indeed it is interesting to note will military tacticians, it is not the dead that require help and resources, but the dispossessed and injured. Hydro-meteorological hazards are accordingly the principle hazard in Asia.

Future scenarios

Current trends do little to allay the potential for greater disasters. The global population has now exceeded six billion, three billion of whom are in Asia and by 2020 it is estimated that half this number will be housed in urban centers; a proportion that Thailand has itself already reached. Urban centers are the modern world's economic powerhouses and as such represent one of the front lines in combating vulnerability to disasters and no more so than in secondary cities. National development plans that evenly distribute development and growth through secondary cities has often led to the rapid and unplanned expansion of urban centers resulting in populations inhabiting areas with insufficient infrastructure and buildings with a low resilience to the surrounding environmental hazards. The landslides in Chittagong, Bangladesh in June 2007 are an often-cited example of this problem, and one that is common throughout Asia. Currently, Asia contains eighteen of the world's twenty-seven mega-cities with populations over ten million, by 2020 there will be an estimated one hundred and fifty three cities with populations of over one million, the urban population in Asia will be two billion, one billion of whom will live in slum or temporary settlements.

Each city will be affected to seperate degrees by pollution, congestion, environmental degradation and deteriorating public health, the negative costs of which, according to the Asian Development Bank, can be up to ten percent of a nation's GDP. These problems are the secondary impacts and are symptoms of the ongoing shift from agrarian societies to urban and industrial economies. For example, the industrial, maritime and urban pollution in rivers supplying water to the city of Dhaka in Bangladesh has already exceed a point beyond which viable treatment is possible. Consequently the city is reliant upon sub-surface water sources for eighty-percent of its supply and which even now is threatened by surface pollutants contaminating the water table. This is not unique.

The damage that can be wreaked by secondary impacts is encapsulated in existing climate change models. The current impact of hydro-meteorological hazards has already been noted, but if the postulated consequences of climate change are accurate the damage in South and Southeast Asia, wherein many nations have extensive coastlines and archipelegoes, are immense. India has eighteen percent of the world's population, yet only four percent of the world's water resources. Seventy percent of India's agriculture is dependent upon four months of monsoonal rains; any changes to the rainfall pattern pose vast potential consequences. Indonesia alone stands to loose over two thousand islands to predicted sea-level rises.

Current climate change models also predict a Pacific climate base resembling a permanent state of El Nino, prolonged and frequent heat waves across Asia, though not resulting in a large number of casualties directly, will result in the increased consumption of resources by animals and humans alike to survive leading to further pressure upon natural resources and production capabilities. Even the proliferation of rain-water containers can be linked to increases in vector-borne diseases by providing suitable breeding sites for carriers such as mosquitoes and if we consider that malaria kills one person every thirty seconds in Africa the potential scale of the problem is clear. Overall climate change models have postulated to a decreased nutritional status in animals and humans, an increase in water-borne, respiratory and diarrhoeal diseases (that the WHO calculates already accounts for nineteen percent of deaths in under-5s in Asia), but also declining mental health and armed conflicts over resources and migration - scenarios already given credence by the Pentagon in 2004 and existing Australian foreign policy. However, there may be some hope in that climate change models are just that, models.

But what of the context in which these disasters are occurring? Between 1997 – 2006 there was an approximate fifty percent increase in the number of globally recorded disasters from two hundred and forty to four hundred and twenty. In Asia there was the same percentile increase in this same period alone affecting over one hundred and fifty million persons annually, equivalent to ninety two percent of all people affected globally. However, the annual average costs of these disasters at twenty-nine billion US dollars accounts for only forty-three percent of total annual global losses (this global data excludes the damage from Hurricane Katrina). These figures are key to understanding vulnerability in Asia, over ninety percent of people affected, yet only forty three percent of the financial costs. Widespread poverty and an expanding population are the principal causes of vulnerability throughout this continent. The nature of disasters affecting Asia have not changed, but it is the effect of these events on a rapidly expanding population that is increasingly concentrated in urban centers that rarely have adequate resources to mitigate the risks to which they are exposed. This has led Asia to a greater frequency and intensity of disasters.

ADPC defines vulnerability as;

"*Factors or constraints of an economic, social, physical, cultural or geographic nature that reduce the ability to prepare for and cope with the impact of hazards.*"

Ultimately, vulnerability is individual to each person, family, community and nation according to their own physical environment. This can be a matter of being urban or rural residents, their social standing (affected by factors such as cultural norms, income, age, gender, caste, migrant status), whether income is derived from formal or informal economies; the (government) institutions upon which they rely and the environmental circumstances in which they live.

Disasters are attributable to vulnerability, the vulnerability of populations to the environment or habitat that surrounds them and we should see vulnerability, and therefore disasters, as principally a problem attributable to development issues. Though we remain unable to control the trigger events to many natural hazards, disasters themselves only exist and occur where there is a vulnerable population at risk. The factors that make this population vulnerable are within our means to control.

This is perhaps already apparent, but it is the complexity of the individuality of circumstances that dictates the stratagem that ADPC has employed in its work to mitigate disasters in Asia and the Pacific over the past twenty years.

Community Based Disaster Risk Management (CBDRM) has been pioneered and developed by ADPC since 1986 and remains the keystone of many of ADPC's programme strategies as the key to sustainability and the development of appropriate mitigation strategies.

CBDRM initiatives actively employ indigenous knowledge and inherent community social support structures that can be overlooked by top-down approaches. By working directly with the communities, supported by the local authorities in capacity building activities resilience to their surrounding hazards may be strengthened. The communities' inclusion is ensured through several stages that commence with consultation meetings voluntarily attended by all members (young, old, male, female, migrants, foreigners), participatory planning meetings in which strategies and planned activities are discussed and finalised with the community leading to the development and implementation of action plans. Local volunteer committees are also formed to monitor and maintain activities with the support of local governments.

Local, intra-community resources are finite and in order to ensure sustainability the support of local level authorities within these activities is essential. 'Good Governance' strategies are often targeted in parallel with CBDRM. There are many definitions to what may be considered as 'good governance,' terms such as sustainability, subsidiary, equity, efficiency, transparency, accountability, civic engagement, citizenship and last but not least, security are used to classify it. However, the essence of good governance is that the authorities are responsive and responsible to the population that they serve. The initiatives of Patong Municipality in Phuket post-tsunami and the national strategic action plan launched by the Government of Sri Lanka entitled '*Road map to a Safer Sri Lanka*,' (2005) are often-cited key examples of good governance in Asia at the local and national levels. (Both documents can be downloaded from ADPC's website).

Space-based technologies and its applications to disaster management in Asia are but part of a greater process that links top-down and bottom-up initiatives. We should consider ADPC's ongoing implementation of the *Regional Tsunami and Multi-hazard Early-Warning System for Southeast Asia and the Indian Ocean* in this.

In January 2005 ADPC was nominated by the Royal Thai Government to lead efforts in the establishment of tsunami early-warning capacities in the Indian Ocean and Southeast Asia. In the three years since twenty-two countries have joined from across the Indian Ocean rim and SE Asia; all of which have agreed to share hydro-meteorological data with the system partners through ADPC.

The framework for the Indian Ocean was originally envisaged by many as solely intended for tsunami, but the establishment of a system based on infrequent and rare hazards is not financially sustainable. Accordingly, the system was designed to focus not on the relatively rare, yet higher-profile tsunami events, but on the more commonly occurring hydro-meteorological hazards including flash floods, cyclones, storm surges and drought.

This system relies upon scientific data received from broadband seismic centers located in Thailand, Vietnam and the Philippines; sea-level stations with satellite transceivers, radar sensors and data recorders on fifteen or one minute data transmission cycles (located in Myanmar, Thailand, Vietnam and the Philippines) linked through the WMO's Global Telecommunications System to the Regional Early Warning Center (REWC) at ADPC's offices in Bangkok and in turn to its system partners including the nominated agencies of the member countries, the University of Hawaii Sea-level Center, USGS Albuquerque

and the Global Sea-Level Observation System (GLOSS).

An IBM supercomputer installed at the REWC enables ADPC to support the member-states by generating longer lead-time, high-resolution, localized severe weather forecast information with a resolution of upto three kilometres. ADPC is already providing forecast information to the Government of Cambodia in this respect. The REWC also provides data modelling and tsunami advisories to member countries in the event of future seismic activity.

Implementation is supported by a Regional Steering Committee providing strategic guidance, policy and monitoring the implementation of all activities with the assistance of a Regional Technical Committee, that provides international expert advice and guidance. This is in turn supported at the national level through National Steering and National Technical Committees that support the same functions with emphasis within their own borders and specific local level sites. Alongside these efforts ADPC works to identify and bridge the gaps between institutional mechanisms with particular emphasis on the 'last-mile' of communications.

At high-risk local level sites ADPC also provides training to at-risk communities. Within Thailand the support of the Royal Thai Government's Department of Disaster Prevention and Mitigation, provincial and *tambon* level authorities have been key to the success of a three-year programme supported by UNDP-Thailand. Within this programme communities were employed to create risk maps of their locale identifying their known hazards, evacuation routes and households that may require assistance in an emergency; for example those with senior residents and poor mobility. These were then developed to engineer appropriate mitigation and response strategies with the community for the locale's known and previously unidentified hazards. Further training is provided on 'Basic Emergency Response' first aid, 'Damage Analysis and Needs Assessment' for the immediate aftermath of an event and local volunteer committees are established to ensure continuity of the activities. Individuals from each community also receive 'Training of Trainers' instruction that will be used to pass on their knowledge and skills to neighbouring communities. These activities are supported by the local government and sustained through the voluntary participation of the communities and through the holding of annual evacuation drills.

The combination of all these three international, national and local elements in an end-to-end framework has won the support of governments across the region and in the Intergovernmental Oceanographic Commission's ICG Indian Ocean Tsunami Warning System meeting (IOC-IOTWS) held earlier this year, the IOC recognised ADPC's design, framework and system as having moved into the gap left by the original planning of the IOTWS and providing a means for the Indian Ocean to have an independent warning system.

Effective forecasting, hazard assessment and the provision of warnings require the three tiers of international/ regional, national and local capacities to be developed in parallel. Observation and data analysis from space-based and terrestrial technologies feed into national action plans in which it is critical that the warning mechanisms employed are both locally relevant and actionable. Space-based, or indeed any technology employed in isolation or without suitable translation for use in the 'last-mile' of communications can be quickly rendered redundant in a disaster scenario.

In the context of disaster risk management, although forecasting and hazard awareness through terrestrial and space based technologies are some of the strongest tools we have in identifying hazards, preventing and monitoring disasters, we cannot ignore that

adaptation of populations and societies to these hazards is as important as prevention. To encourage this we must target vulnerabilities through social and participatory initiatives at every level, from the top-down and the bottom-up.

Without the participatory engagement of communities and the relevant authorities the social mechanisms on which all technology inherently relies will not function. Nowhere is this more important than at the community level, a failure to convey forecasts and hazard awareness at this level, the 'last-mile' of communication, is a failure of systems as a whole. If we consider the context in which the greater percentile of the Asian populace live, practitioners of space-based technologies in disaster management must not loose perspective on who the end-users of their information are.

Disaster Management should be approached not only through targeting problems that may be foreseen with space-based technologies, but must be incorporated into strategies that utilize awareness, education and participatory community engagement. Given the context of Asia today only a combination of disciplines can be effective in mitigating hazards.

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The Asian Disaster Preparedness Center (ADPC) was founded in 1986 at the initiative of the WMO, UN-UNDRO and UNDP, making ADPC one of the longest disaster management institutions in Asia and the world. An international NGO, ADPC is a non-profit organization supporting the advancement of safer communities and sustainable development, through implementing programs and projects that reduce the impact of disasters upon countries and communities in Asia and the Pacific and is entirely self-funded through the provision of consultancies, training courses and the implementation of programmes and projects. ADPC specialises in four key thematic areas: Public health in Emergencies; Urban Disaster Risk Management; Disaster Management Systems; and Climate Risk Management. Its mission is "Safer Communities and Sustainable Development through Disaster Reduction."
For more information please visit www.adpc.net.