Harnessing the Capacity of Digital Globes and Satellites for Disaster and Climate Risk Management

connecting tailored tools with agencies and communities to save lives, and reduce damage and loss

- Digital globe and satellite capacities are growing rapidly and can be harnessed to help save lives, limit damage and reduce the costs to society of climate-related natural disasters
- Digital globes offer new capabilities relevant to disaster and climate risk management – capacities to span all scales, to be tailored and customised, to access near real-time data and analyse change, and for simultaneous use by institutions and communities in many locations
- The Open Digital Earth Foundation and the CRCSI are seeking partners to develop globe tools for disaster and climate risk management, tailored to meet local, national and regional priorities

Disaster and climate risk management present formidable challenges to the Asia-Pacific region. There is robust evidence that the region is disproportionately affected by natural disasters, and for several countries, including Bangladesh, the Philippines, Vietnam, and Indonesia, more than half of the total population is at relatively high risk of mortality from multiple hazards (Davis 2015). Small island states in the Pacific, including Vanuatu, Tonga, Samoa, Federated States of Micronesia and Fiji, also have extreme vulnerability to natural disasters. Floods and storms account for three-quarters of all disasters in the region, and have high human impact.

Risks from natural disasters are increasing. Industrial development, urbanisation and population concentrations are increasing in high risk zones. Sea level rise and extreme weather events from climate change will exacerbate these risks and increasingly impact on agricultural production, physical assets, livelihoods, fresh water availability, food security, and ecosystem resilience. The magnitude of recent impacts and trends, and of future projections, highlight the need to better anticipate and prepare for disaster and climate risks.

Opportunity to now better harness geospatial information

Geospatial data assists disaster and climate risk management in numerous ways including the delineation of hazard zones; mapping of evacuation routes; imagery and positioning systems to assess damage and locate people or structures; and to target recovery actions. Post-event satellite and aircraft images created the map of Haiti, for example, used by rescue and recovery teams to access the city and to assess infrastructure damage. US emergency teams have connected data on the population composition of affected areas (eg aged, disabled and non-English speaking) with the spatial road and block census database to better target rescue efforts. Geospatial data can help save lives, limit damage, and reduce the costs to society of response, recovery and adaptation.

High resolution satellite data is critical to understand damage and for reconstruction. It can also cost-effectively underpin resilient planning and construction

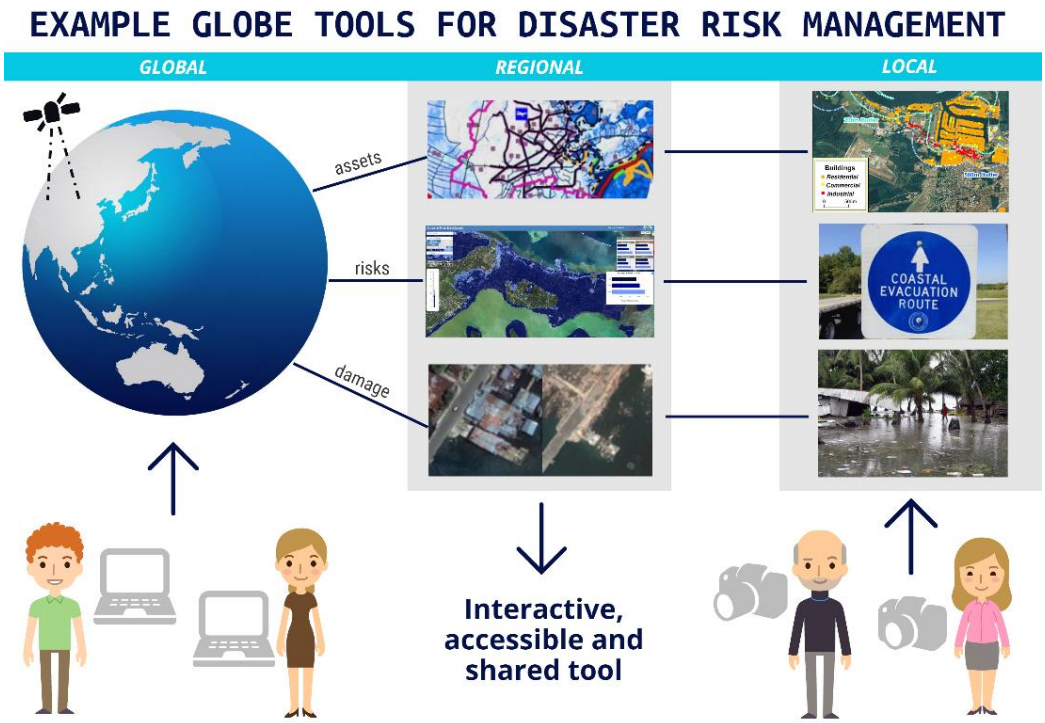
A revolution in spatial technologies is underway, and step-change improvements in data and tools can be expected. Three thousand satellites will be launched in coming years, both imaging and GPS-like satellites, which together will deliver precise data and mapping (with centimetre scale accuracy) around Earth at near real-time. There is an opportunity now to much better harness and utilise current and emerging satellite and geospatial tool capacity in addressing societal challenges.

Recent experience shows that much more could be done to improve geospatial readiness for climate-related disasters. Steps are needed to enhance data interoperability, enable effective technical collaboration, establish automated techniques to track change from satellite data, embed open accessibility mechanisms, and deliver training in data use.

Digital globes enable a dramatic improvement in the accessibility of geospatial data and tools, allowing a wide range of users to explore the Earth in ways that had only previously been available to technical professionals. Key benefits of globe tools include a seamless shift across scales, simultaneous access to all users from communities to international experts, a capacity for individuals to add their own data and applications, and a direct ability to harness the burgeoning analytic power of higher resolution satellites.

The capacity of digital globes for disaster risk management

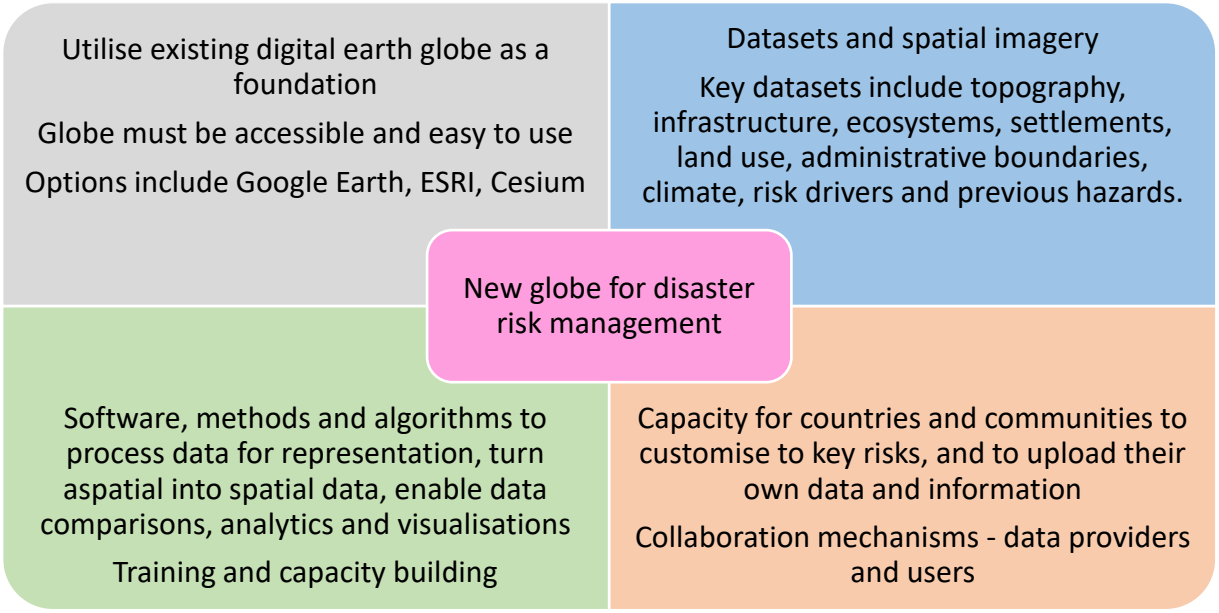
A digital earth globe tool developed to assist disaster and climate risk management could be tailored to highly vulnerable regions and address critical regional data and technical capacity gaps, and foster collaboration and preparedness at global, regional and local scales.



A regional globe for disaster and climate risk management could:

- Organise and make accessible data essential to understand risk and the climate change context, underpin training and capacity building, and support targeted disaster response. Data specifications would ensure appropriate resolution, and comparability across space and time;
- Locate critical infrastructure assets and optimal resource movement pathways;
- For priority regions provide detailed linked information on hazards, risk drivers such as population and urbanisation trends, and scenarios of the spatial footprint of sea level rise, and flooding and cyclone events;
- Be accessible to, and foster synergies between, all relevant agencies spanning governments, multilateral organisations, NGOs and community interests;
- Harness the growing power of high resolution satellite data for risk mapping and analysis, tracking of change, and disaster response and recovery.

While “one size does not fit all” in disaster and climate risk management, a range of standard framework and foundation data sets, and a wide capacity to access and interpret them, will be required for any event. The following graphic illustrated key components of a digital globe for disaster and climate risk management.



Regional and country needs

In all areas of the world there are significant challenges in accessing and using geospatial data and tools in the management of disaster and climate risk. A report by the US National Research Council found numerous impediments to the effective use of data for disaster management, and a lack of investment in resources, training and coordination. For many developing countries in the Asia-Pacific region the challenge is much larger. Key issues include:

- The cost to access and use high resolution satellite data to inform risk prevention measures is often prohibitive (in contrast to data availability post-disaster)
- Limited technical capacity to realise and explore the inter-connectedness between spatial data layers, and deep information silos which constrain the sharing of data across agencies
- Inadequate training in the use of geospatial data and tools, and skills limited to few individuals, so that early opportunities to reduce impacts not fully harnessed
- A proliferation of data providers offering specialised products that are inadequately standardised and not able to be integrated with local data or GIS systems.

There are many country policies that identify the need for better information and tools to support disaster and climate risk management, for example regarding vulnerable island states in the Pacific:

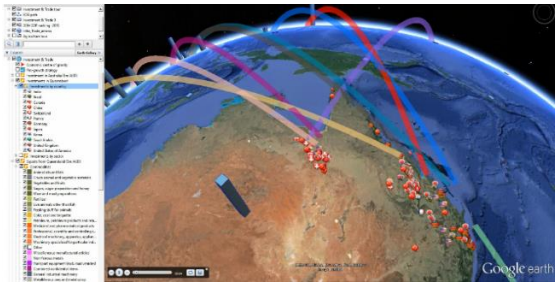
- Solomon Islands National Climate Change Policy (2012-2017) seeks to develop a “coordinated and geo-referenced national information system covering assets that can be used to identify sensitivities to climate change and disaster risk reduction and management
- Fiji’s 2012 National Climate Change Policy calls for innovative and sustainable approached to data management, and to develop and make accessible hazard maps to guide development
- Tuvalu’s National Strategic Action Plan for Climate Change and Disaster Risk Management 2012-2016 seeks to improve application of data, and to develop a shared database for information to be used by all sectors in decision-making.

Capacity of the Open Digital Earth Foundation (ODEF)

The ODEF aims to build collaborative partnerships to support progressive digital earth globe technologies for societal benefit. The ODEF is a not for profit corporation that values open data, tools that deliver measurable benefits for ready to use applications, and capacity building in developing countries (www.digitalearthglobe.org). Core partnerships and capability follow.

Innovative economic globe for the 2014 G20 (Australia)

The 2014 G20 globe geographically details supply chains in six economic sectors comprising agriculture, construction, resources, tourism, science and innovation and education and training, involving dozens of countries and many thousands of enterprises around the world. It is underpinned by new open data partnerships between industry and government.



Demand for spatial data from the G20 globe was high, and involved more than 170 million downloads in the month of January 2015 alone (see map on right above).

Australia and New Zealand Cooperative Research Centre for Spatial Information (CRCSI)

The CRCSI delivered the 2015 UN *Momentum for Change* award-winning Vanuatu Globe. This Globe drew on high resolution elevation data for inundation modelling and was used by international aid and recovery agencies, the Government of Vanuatu, and communities in the recovery from Cyclone Pam. The existing open Globe enabled a rapid Crisis Map that could be accessed simultaneously by users at all scales to ensure that recovery efforts were efficient, targeted, and engaged communities.

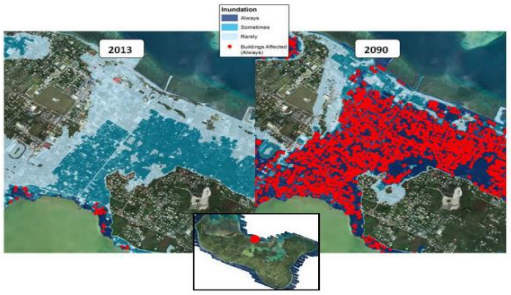
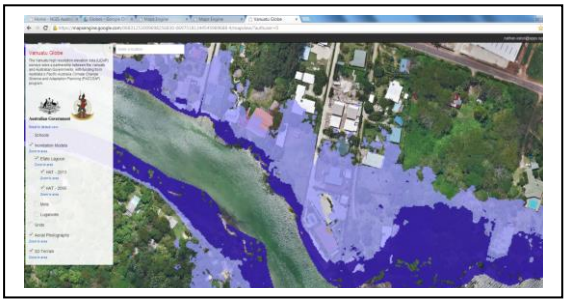


Figure 1 - Map of inundation against buildings for different scenarios in Nuku'alofa, Tonga



Cr8 Global

Cr8Global is an international innovation, knowledge and investment company with a vision to bring great innovations to global markets to improve health and happiness. Cr8 Global has offices in Los Angeles, Stockholm and Bangkok.

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