

## The Power of Digital Globes for Education

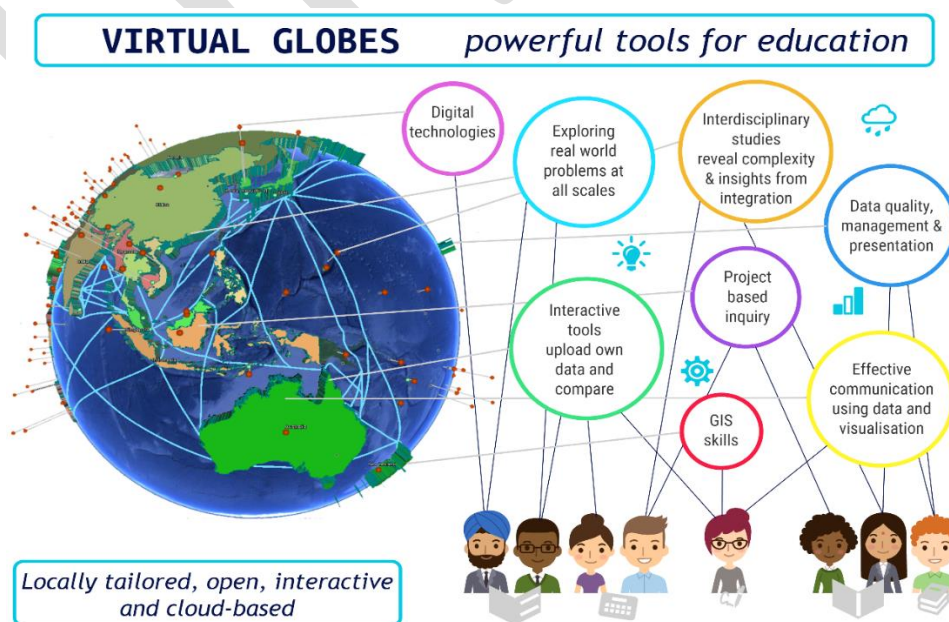
- Digital globes for education can build student skills in digital and spatial technologies as well as in critical thinking, communication and integrated learning
- Digital globes offer capabilities relevant to exploring real-world problems – capacities to span all scales, to be tailored and customised, to access real-time data and data over time, and for simultaneous use by students in many locations
- The Open Digital Earth Foundation and the CRCSI are seeking partners to develop innovative digital globe tools for education, tailored to meet local and national priorities

Spatial and digital technologies are two of the fastest growing disciplines and sectors worldwide, and there is a growing and unmet demand for skills in these technologies in workplaces. Applications from spatial and digital technologies are increasingly being integrated into industries and professions, and with three thousand satellites expected to be launched in the next decade, there will be a further step-change in precision and capability of spatial data. Digital and spatial technologies will underpin future development pathways, including in developing countries, and will contribute to the goals of sustainable development. A strong focus on these technologies in education curricula will bolster the employment-readiness of students, and will help build skills for decision-making in our interconnected and knowledge-based world.

Globes draw on spatial and digital technologies in a virtual tool that spans the planet and supports inquiry into many of the complex challenges at the interface of human activities and the environment. Through visualisation and analysis of environmental, social and economic information in a geographic context, the capacity to shift seamlessly across scales and be simultaneously used in multiple locations, globe students can build skills and gain insights into real-world issues.

### Digital globe tools for education

Globe tools can help students understand the world around them, particularly the nature of connections between physical and human systems, how those connections are changing, and how and where their community is positioned.

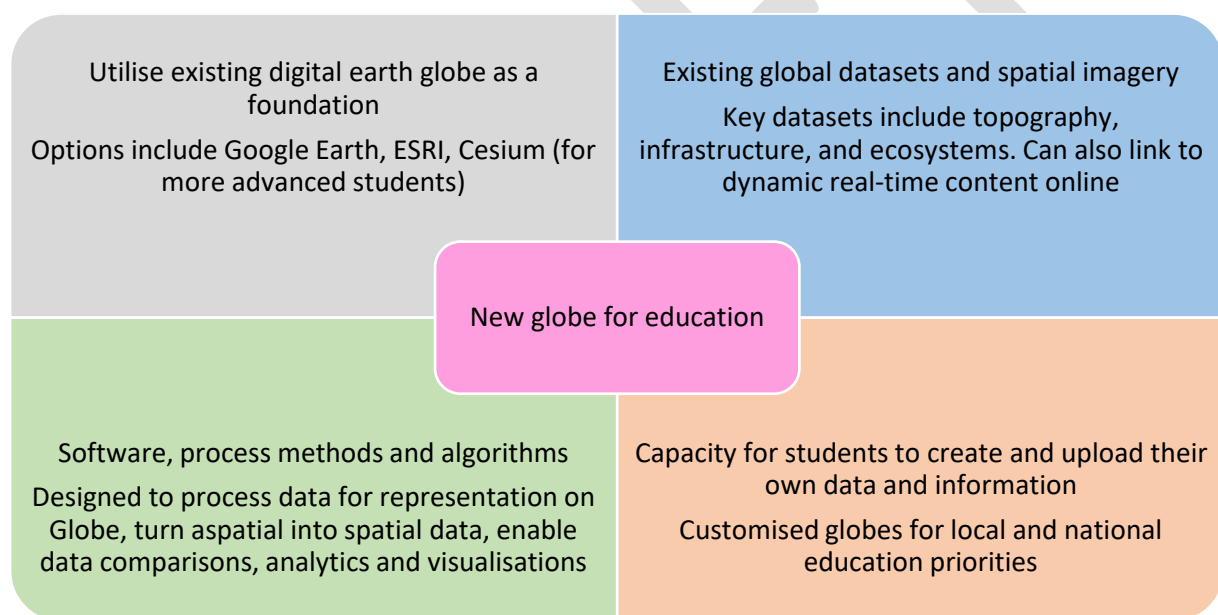


Through such a focus, globe tools can help students at all levels engage in studies that promote critical thinking, communication and integrated learning.

The benefits of digital globes for education include:

1. Globes have direct application to the range of subjects that have spatial dimensions, either directly such as geography and environmental studies, or in subjects where spatial dimensions can significantly add value and insights. These include economics, science, design and planning, agriculture, health, climate change, and information technology.
2. In a world that is increasingly global, digitised and automated, it is valuable for students to be educated in information and space technology, along with GIS skills, to be well positioned to contribute to solving societal challenges.
3. There are strong learning opportunities from the ability to tailor and customise globes, with students able to select relevant data layers for their project, upload and integrate their own or local data for comparison or analysis, and collaborate with others.
4. Globe tools are well suited to exploring spatial interconnections and complexity, and the ability to design visualisations can be powerful for communicating ideas and information.

The following graphic illustrates key components of a spatial globe developed for education.



### Potential education and learning outcomes

Spatial globes can provide students with learning challenges at the interface of information and digital technologies, spatial science, and geography. Their use is relevant at all education levels, including vocational. Strands of learning that can be fostered using globes are described in the following table.

Learning area	Characteristics of skill development
Digital technologies	Digital technologies helps students to become creators of digital solutions, effective users of digital systems and informed consumers of information conveyed by digital systems. Globes are powerful tools on which to build digital technologies skills which include problem solving, data management and computational skills such as data interpretation.

Spatial technologies and GIS	The spatial sciences relate to where things are. They are about measuring and representing the world around us. Spatial technologies underpin a range of professions and help students to build skills to understand, assess and make decisions relevant to many vocations. The study of GIS enables students to understand how to bring together and analyse a range of datasets, and how to use tools to derive information outputs.
Globe technologies (applications and solutions)	Globe technologies utilise and build on digital and spatial technologies by enabling students to learn on a 3D digital globe, including combining 2D and 3D tools. Digital globes are well suited to allow students to explore real-world problems, and they allow for customisation and tailoring of data, accessing of satellite data to track change over time, rapid analysis, and the spanning of scales to explore different dimensions of a problem. Many areas of digital globes are the subject of active research, and advanced students can contribute to globe development and applications in such areas as broad-scale change monitoring, data fusion and simulation, automated analytics, globe customisation, and big data use.

### Resources relevant to education

Geospatial Revolution – short documentaries showcasing the benefits of spatial technologies in society – useful for classroom demonstration (<http://geospatialrevolution.psu.edu/>)

ESRI's Education Community – ESRI have this site as a portal for educators interested in spatial technologies. Links to information, careers, data lessons as well as ESRI's freely available spatial tools (<http://edcommunity.esri.com/> or <http://www.esri.com/industries/education/schools>)

NASA's WorldWind - Resources relevant for education can be found at <https://goworldwind.org/>

National Geographic Education – National Geographic's website has sections for teachers and informal educators. National Geographic Education's work targets geo-literacy and education outreach (<http://nationalgeographic.org/education/multimedia/interactive/maps-tools-gis-action/>)

Google Earth for Education – Information on how teachers can use Google Earth. It includes information resources and curriculum ideas for students of different grades and ages (<https://sites.google.com/site/gtaresources/events/2012-04-04/maps>)

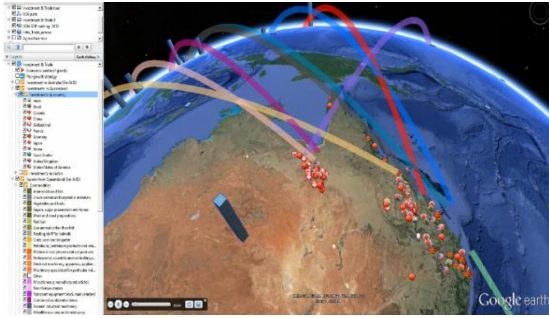
Geography Teachers Associations – check your local Association for further resources.

### Capacity of the Open Digital Earth Foundation (ODEF)

The ODEF aims to build collaborative partnerships to support innovative digital earth globe technologies for societal benefit. The ODEF is a not for profit corporation that values open data and approaches, research excellence that delivers measurable benefits for ready to use applications, and building capacity in developing countries (see [www.digitalearthglobe.org](http://www.digitalearthglobe.org)). The Foundation has core partnerships and capability including the following.

#### *Queensland Globe for the 2014 G20*

The Queensland Government developed an innovative globe for the G20 (2014) which geographically detailed supply chains in the agriculture, construction, resources, tourism, science and innovation, and education and training, sectors. The globe linked resources of the state, through economic and trading pathways, with dozens of countries and thousands of enterprises around the world, and was 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 from around the world.

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

The CRCSI has more than 100 partner agencies from industry, research and government, and is at the cutting-edge of research to deliver measurable outcomes to such sectors as defence, the built environment and natural resource management.

The CRCSI delivered the 2015 UN *Momentum for Change* award-winning Vanuatu Globe, with funding from the Australian Government. This Globe showed inundation risk using high resolution elevation data and was used by international aid and recovery agencies, the Government of Vanuatu, and communities in the recovery from Cyclone Pam. Having an open Vanuatu Globe enabled a rapid geographic Crisis Map (2D) that could be accessed simultaneously by users at all scales to ensure that recovery efforts were efficient, well targeted, and engaging of communities.

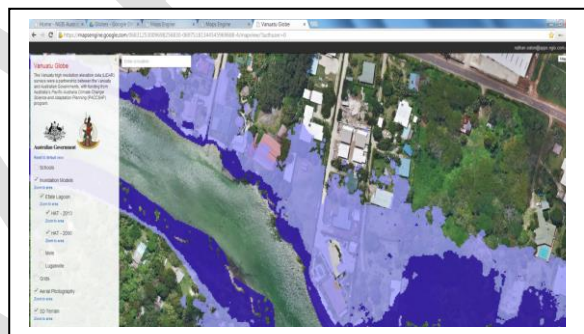
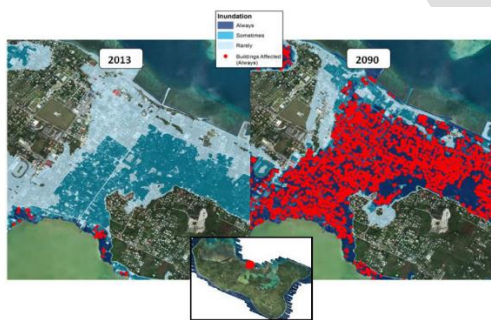


Figure 1 - Map of inundation against buildings for different scenarios in Nuku'alofa, Tonga

*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.

*World-class science advisers*

Professor Nicholas Chrisman is dedicated to connecting the technical details of GIS to larger issues of philosophy and culture. He is a leader in the application of Digital Earth globes, with a career in spatial science at universities in the USA, Canada and Australia.

Professor Manfred Ehlers has world-standing in integrated geographic analysis, modelling and data-fusion techniques, automated methods for change detection and advanced concepts for Digital Earth. He is the current Chair of the European Chapter of the International Society for Digital Earth.