British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL
Arolwg Daearegol Prydain
CYNGOR YMCHWILYR AMGYLCHEDD NATURIOL

A Review of Attitudes towards Sharing Geotechnical Data and the use of Geospatial Data Portals in Hong Kong and the UK: Lessons for Europe

Patton, A.M.(1)

(1) British Geological Survey, Columbus House, Village Way, Greenmeadow Springs, Tongwynlais, Cardiff. UK.

1. Introduction

Reusing subsurface data cuts time & financial costs of site investigations & reduces uncertainty about ground conditions that can result in delays & overspend.

Hong Kong has a data sharing culture. Consultants deposit GI data with GEO who make this & other datasets publically available for desk studies. Existing knowledge about an area prior to site-specific works provides for preliminary conceptual ground models & allows targeted GI.

The UK has recently seen a rise in data sharing. BGS holds donated GI data & makes boreholes available online. Establishing ASK networks has increased collaboration but reticence still exists.

2. The Geotechnical Engineering Office (GEO)

GEO, part of the Civil Engineering Development Department (CEDD), was formed in 1977 as a regulatory body concerned with planning, construction & maintenance of slopes (Ho & Lau, 2008) & responsible for geotechnical engineering activities related to development & land use.

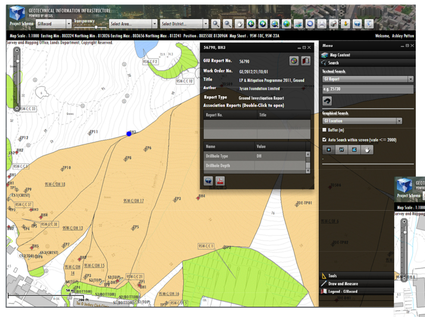
3. Data Availability

The Civil Engineering Library at GEO contains >164,000 items including periodicals, books, manuals, standards, codes of practice, geotechnical reports, maps, & public/private development documents. The Geotechnical Information Unit houses geotechnical data from GIs carried out for public/private developments. GEO's Aerial Photograph Library contains >310,000 black & white, colour & infrared images dating back to 1924, with annual coverage from 1972.(CEDD, 2014)

4. Online Portal

Geotechnical Information Infrastructure (GInfo) is GEO's online spatial data portal. A GIS-based system, it is searchable by data type & geographical area, & provides users with existing data about their sites.

5. Available Datasets



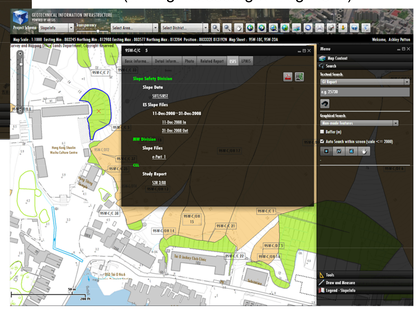


Fig. 1. (above) GInfo login page. **Fig. 2.** GInfo screens showing available boreholes (top) & locations of engineered slopes (bottom) (www.ginfo.cedd.gov.hk/ginfoint)

- Ground investigation (GI) reports
- Borehole logs
- AGS data
- Geophysical surveys
- Laboratory test data
- Piezometric monitoring data
- Landslip record cards
- Natural Terrain Landslide Inventory
- Historical Landslide Catchments
- Boulder field inventory
- As built & engineered slope records
- Engineers' slope maintenance records
- LiDAR data
- Aerial photographs
- Geology maps

6. Geological Modelling System

A GIS for integration & interpretation of data with access to raw data & interpretation. It is used to create thematic maps & geological/terrain models & identify geohazard conditions. (CEDD, 2014)

7. The British Geological Survey (BGS)

Unlike GEO, BGS is not a regulator but provides the UK with impartial expertise about geoscience. BGS is a custodian for geoscientific data deposited by public & private sectors (usually voluntarily) & where possible makes these available to a range of users. Some datasets are accessible through the Geology of Britain Viewer (Fig. 3) & BGS apps

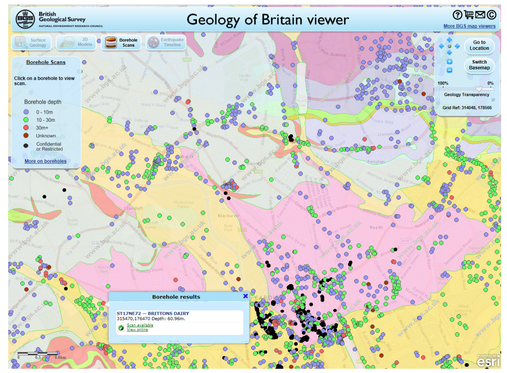


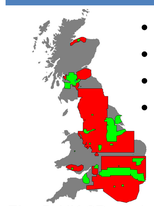
Fig. 3. Geology of Britain Viewer (http://mapapps.bgs.ac.uk/geologyofBritain/home.html)

8. Accessing Subsurface Knowledge (ASK) Networks

- ASK Networks are free, regional partnerships between BGS, local authorities & industry providing a platform for subsurface knowledge exchange between partners
- Glasgow was the first area of the UK to have an ASK Network. Cardiff followed in 2015
- ASK Networks facilitate data deposition, flow & re-use between member organisations
- Signed-up members who deposit data have access to data deposited by others
- Establishes a standardised data transfer to a central repository (GSPEC), based on AGS
- Updated, attributed BGS 3D geological models visible to member organisations
- Users can influence outputs from the models, improving usability
- Integration of geotechnical data & models within BIM

Fig. 4. GSPEC front page for data deposition (http://afar.bgs.ac.uk/gspec)

9. BGS 3D Geological Models



- 3D models show geological units
- Attributable with material properties
- Cross sections & slices drawn across models
- Predictive boreholes made from the data

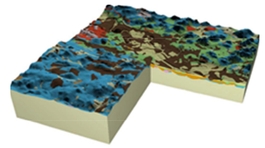


Fig. 5. UK 3D model coverage at 1:1M, 1:250K & 1:50K (www.bgs.ac.uk/services/3Dgeology/3Dservices).

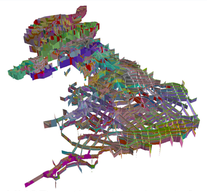


Fig. 7. UK3D national bedrock fence diagram (www.bgs.ac.uk/research/ukgeology/nationalGeological Model/GB3D)

Fig. 6. ASK Glasgow - Clyde 3D superficial model (Campbell, *et al.*, 2010)

10. Data Sharing in Europe & Beyond

- City regions exist throughout Europe
- 36 COST countries - European framework cooperation of researchers, linking science & policy
- INSPIRE/PSI Directive - EU spatial data infrastructure for public sector data
- OneGeology - aims: supply global geoscience data, increase geology profile & skills exchange
- OneGeologyEurope - Aims by 2020 to make geological data from European geological surveys accessible & sharable through a common European Geological Knowledge Base
- EGDI - a structure for harmonising & utilising data from European geological surveys for policy, industry & public stakeholders , including raw & interpreted data
- Many countries have their own local data sharing initiatives/portals

11. Volunteered Geographic Information (VGI)

VGI is the use of the Internet to collect & disseminate geographic information supplied by users voluntarily (Goodchild, 2007). A form of citizen science, demonstrated by OpenStreetMap, contributors supply georeferenced data & suggest interpretations, made visible to other users.

12. Conclusions

- Reuse reduces time, cost & unforeseen ground conditions whilst increasing knowledge
- Land pressures & landslide risk in Hong Kong have required subsurface knowledge of good quality & quantity to be readily available. 40 years of data make it an example of best practice
- Data sharing & ASK Networks are gaining momentum in the UK
- BGS working to get subsurface data recognised in national planning & procurement processes
- Work with Scottish Government to develop the UK's first subsurface planning guidance
- Montreal, Helsinki & Singapore have subsurface planning but there has been no national adoption of planning approaches & data use so reservations are still present
- EU is working well to develop data sharing but it is sometimes focused on public sector only
- Reluctance to share data comes from issues surrounding confidentiality, competition & time
- Hong Kong realises denoting data provides access to much more data from others
- Developing data hubs is 'an endeavour to change institutional culture' & some 'who might be sceptical in sharing data in the past, are more willing to share their data… after seeing the benefits of the common geospatial information platform.' - Tsoi, 2007
- Some countries are better than others but a combined approach may yield best results
- VGI may provide a fast method of data sharing as it requires less manual processing
- Attitudes vary but necessity & regulation have developed a data sharing culture in Hong Kong

References: Campbell, S.D.G. & Bonsor, H. (2013). *The ASK Network: Glasgow Specification of Data Capture.* [Impact Policy] | Campbell, S.D.G., Merritt, J.E., O Dochartaigh, B.E., Mansour, M., Hughes, A.G., Fordyce, F.M., Entwisle, D.C., Monaghan, A.A., Loughlin, S.C. (2010) *3D Geological Models & their Hydrogeological Applications: Supporting Urban Development: a Case Study in Glasgow-Clyde, UK*, Zeitschrift der Deutschen Gesellschaft fur Geowissenschaften, 161 (2), 251-262 | Goodchild, M.F. (2007). *Citizens as Sensors: the World of Volunteered Geography.* GeoJournal 69 (4), 211-221 | Ho, K.K.S. & Lau, T.M.F. (2008). The Systematic Landslide Investigation Programme in Hong Kong. *Landslides & Engineered Slopes - Chen et al (eds)* Taylor & Francis Group, London | Tsoi, C.W. (2007) *HKSAR Geospatial Information Hub (GIH) - A Common Geospatial Information Platform & Spatial Data Portal.* Strategic Integration of Surveying Services FIG Working Week 2007 | http://inspire.ec.europa.eu/index.cfm/pageid/48 | www.bgs.ac.uk/research/engineeringGeology/urbanGeoscience/Clyde/askNetwork/home.html | www.cedd.gov.hk/eng/about/organisation/org_geo_pln_serv.html | www.cedd.gov.hk/eng/services/library/index.html | www.egdi-scope.eu | www.eurogeosurveys.org/projects/onegeology-europe/ | www.onegeology.org. | **Acknowledgements:** Helen Bonsor, BGS & Corn Chan, CEDD

Contact information: Ashley Patton e-mail: ashleyp@bgs.ac.uk tel: +44 (0)29 2052 1962