

GIS

Professional



sponsored by
THE ASSOCIATION
FOR **GEOGRAPHIC**
INFORMATION

issue 72 : October 2016

...joining the geography jigsaw



GNSS speeds utility data capture to GIS

Progress on INSPIRE but Brexit looms

FOSS4G in Bonn sparkles

Drone aids Ireland's top angling river

Map tracks Zika virus across the US

American Red Cross maps the vulnerable

Geospatial analysis finds health worries

Pen and paper data collection?

Available NOW: K-Mobile data capture software

- Works on Android™ phones making it an affordable solution
- Fully customisable software
- Supplied with OS Street View® maps as standard



Now there really is **no excuse!**



www.korecgroup.com

info@korecgroup.com

tel UK: 0345 603 1214 IRE: 01 456 4702



our mission . . .

to help grow the business for the whole GIS community by providing an effective, reliable and timely medium for news, information and comment.

Editor: Stephen Booth

Publisher: Durk Haarsma

Advertising: Sharon Robson

Subscriptions: Jason Poole

Editorial advisory board:

- James Kavanagh
- Dr Muki Haklay
- Adena Schutzberg
- Dr Suchith Anand
- Chris Holcroft
- Steven Ramage

Editorial and advertising:

Geomares Publishing UK Ltd
Unit A2 Mindenhall Court
High Street
Stevenage
Hertfordshire SG1 3BG
United Kingdom
Tel: +44 (0) 1438 352617
e-mail: editor@pvpubs.demon.co.uk
web: www.gisprofessional.co.uk

Material to be Published: All submissions will be handled with reasonable care, but the publishers assume no responsibility for safety of photographs or manuscripts. Every precaution is taken to ensure accuracy, but publishers cannot accept responsibility for the accuracy of information published or for any opinion expressed.

Reprints: Reprints of all articles are available. Call 01438 352617 for details.

Advertising: Information about advertisement rates, schedules etc. are available in a media pack. Go to www.gisprofessional.co.uk or call 01438 352617

Publishers: Geomares Publishing UK Ltd
No material may be reproduced in whole or in part without the written permission of the publishers. © 2016 ISSN 1748-3646

Printing: The Manson Group, St Albans



p. 10

Implementing INSPIRE

EU governmental and public organisations have been busy implementing the INSPIRE Directive. Professor **Ian Masser** comments on the progress.



p. 14

Open geospatial in Bonn attracts 900 GI people

FOSS4G 2016 attracted some 900 delegates to hear and discuss the latest developments in open source geospatial software. **Codrina Ilie** reports.



p. 17

BIG MAP feature: Tracking Zika across the US

The Zika virus which caused much concern to athletes in the run-up to the Olympics in Rio de Janeiro continues to worry public health officials.



p. 18

When the GNSS mapping app you want doesn't exist. . .

It used to take Questar Gas inspectors half an hour to collect pipeline assets. Today, using GNSS technology, data collection takes 10 minutes.



p. 20

Drone survey helps angling paradise

Drone technology is helping Ireland's River Moy retain its status as the country's premier salmon river. **Cian Gallagher** explains.



p. 22

Taking tools to people for offline mapping

Dan Joseph and colleagues explain how the American Red Cross use maps to understand populations at risk from natural disasters and health emergencies.



p. 25

Spatio-temporal geography and medical data: part 2

Authors **David R. Green** and **Jan O. Jansen** show how GIS adds value to analysis of medical data on the mapping of Hepatitis C.

> GISPro's COLUMNS

- p.13 **Adena Schutzberg** – How far have you travelled on your bike?
- p.28 **AGI** – #GeoCom16 is the hashtag to note for this year's conference

> GISPro's STANDFASTS

- | | | | |
|------|---------------------|------|--------------|
| p.05 | Editorial | p.30 | GIS Calendar |
| p.06 | News & People | p.31 | Classifieds |
| p.29 | Products & Services | | |

Next Issue: December 2016

Copy dates **Editorial:** 14 November

Advertising: 22 November

COVER: Capturing positional data with Trimble's ProExplorer GNSS technology is helping a gas utility speed up its mapping outputs. **To read more, turn to p.18.**



to subscribe to GISPro, go to
www.pvpubs.com/GISProfessionalHome

read on . . .

The ZenoCollector

Ready to work when you are



Simplifying high accuracy data collection

The ZenoCollector combines the hardware excellence of Leica Geosystems with the world's leading GIS software from Esri to deliver high accuracy data collection in ArcGIS.

The solution delivers sub-metre or centimetre survey grade position accuracy into Esri's industry leading Collector for ArcGIS app. This uses the Leica Zeno 20, the world's first handheld with Android operating system, enabling field data collection and editing in a simple, user-friendly interface on an ultra-rugged device.

To find out more information about the ZenoCollector, please contact:

uk.sales@leica-geosystems.com

Or visit:

www.esri.com/zenocollector

Leica Geosystems Ltd
Hexagon House, Michigan Drive, Tongwell,
Milton Keynes, MK15 8HT
Tel: 01908 513464
uk.sales@leica-geosystems.com
www.leica-geosystems.co.uk





welcome. . .

to the October 2016 issue of *GIS Professional*. . .

Brexit and geospatial: could it spur better services?

The uncertainties created by the Brexit vote seem to have receded for the moment. The dire economic warnings that preceded the referendum have not happened (yet) and the UK seems to be enjoying not only unseasonably good weather but an economic Indian Summer too. But this is not to say that there are not many in our sector who face a worrying future, either because their job depends on EU projects or funding, or are themselves citizens from continental Europe working in the UK. As **David Hannay**, our former ambassador to the EU points out, "Why not assume that it was all over on 23 June, like some sporting fixture, and that there is nothing more worth talking about? Because that is simply not so. Most of the hard choices remain to be made and none of them were properly aired in the campaign that preceded the referendum."



... this may stimulate people to actually make datasets and modern lightweight services that work the way more and more people work today...



An example is the EU's Erasmus programme which has enabled thousands of young people to study in Europe. More than 200,000 students have benefited from the scheme since it was launched in 1987. In the last academic year alone, 15,500 UK students participated. **David Davis**, the Brexit Secretary, is being urged to protect this £112m EU funded exchange scheme. It is difficult to imagine that anything positive could come from its loss for Britain's young people.

And what of INSPIRE, the EU scheme to harmonise geospatial data? With all the effort put in by local and national government to date it would surely be foolish not to complete the project. Prof **Ian Masser** in his article on INSPIRE progress (page 10) observed, "it is essential that these benefits are not lost in a post Brexit Britain."

We asked several industry watchers what their thoughts were about the UK's impending departure from the EU. **Gary Gale** thought the consequences were two-fold. "I can imagine a lot of people going "whoopie, we don't need any EU directives like INSPIRE anymore" and making plans to that effect, which will waste time and potentially squander existing investment. But on the other hand, this may stimulate people to actually make datasets and modern lightweight services that work the way more and more people work today and that might not be a bad thing."

Those in consultancy are worried that work from EU countries will no longer go to the UK. **Andy Coote** observed that "I have started to hear stories of work being won by Irish consultancies over British ones, where the customer has European owners, driven in part by uncertainty over trading tariffs."

And then there's the common agricultural policy. **Steven Ramage** reminded me that the CAP is nearly 40% of the EU's budget at 58bn a year and provides financial support to approximately 12m farmers across Europe. He comments, "From a geospatial industry perspective I wonder about the knock-on effect of less funding (unless matched by the UK Government ad infinitum) for software and services provided by individual consultants, small to medium-sized enterprises and multi-national geospatial organisations with offices in the UK. It will require guidance and feedback from organisations, such as the Rural Payments Agency and Defra once the terms and conditions of Brexit are better understood and plans are in place for future funding, but this is only one sector impacted by EU policy and there are many others that could be impacted."

These are all serious and deeply concerning issues, which I expect we will return to in these pages. In the meantime, we have an issue with serious heft: a report on FOSS4G in Bonn; a highly topical Big Map feature; how data-collection technology is speeding mapping for a US utility company; how a drone is helping preserve an Irish angling river; how the American Red Cross is helping map vulnerable communities; and in the second part of Dr **David Green's** article on Spatio-Temporal Geography for Analysis of Medical Data, how analysis is revealing some worrying conclusions, especially for schools close to heavy traffic routes.

Stephen Booth, Editor

Profitable street mapping in India



Indian geospatial service provider AAM Group has reported an increase in both profit and team capacity following the introduction of the mobile mapping system StreetMapper. AAM began using 3D Laser Mapping's technology at the end of 2015 after similar success for the company's South African office, which had been a user since 2011.

StreetMapper's high levels of accuracy have provided an important difference in India's growing road-surveying sector, resulting in AAM securing a number of government and private road contracts. By reducing the time taken to complete projects by 70%, compared to traditional surveying methods, AAM's team capacity has dramatically increased, allowing them to take on more work.

"Our StreetMapper has significantly increased the accuracy expected by the industry," commented Satish Kumar, technical head of solutions at AAM Group. "Before StreetMapper arrived, the majority of the Indian market only had inexperienced users and non-survey grade MLS units. It has allowed us to contribute towards setting a new standard."

GeoCom16 set for 23 November at the RGS

The AGI has announced details of its annual conference, GeoCom16 set for 23 November 2016, a one-day event at the prestigious Royal Geographical Society (RGS) in London. The conference team say that at #GeoCom16 you'll find us exploring People and Progress as we search for the answer to a critical question: why does location matter in data analytics? We're already moving from paper to pixels. Location data has never been more prominent in serious analytics. But what impact has it really had? Which new domains can we explore?

Over the coming weeks AGI will reveal an exciting line-up of plenary-style presentations

to help us find the answers. But already they invite people to share the stage by taking part in a Lightning Session: What challenges do you see ahead? Do you have a case study or experience you'd like to share? Submissions cannot be commercial and will be strictly 7 minutes long.

- Registration for #GeoCom16 will open shortly, so please save the date and check at www.agi.org.uk

InterGEO date for OS CEO

October sees the annual InterGEO conference and exhibition in Hamburg with a theme around Smart Cities. This year's conference includes a keynote by Ordnance Survey's CEO **Nigel Clifford**. Clifford will be describing how OS has reinvented itself many times and

argues that it is now setting new standards as a customer-oriented service provider for private and business customers. He believes that the geoindustry has an exciting future ahead of it and will be crucial for society. Clifford will be sorting and categorising. And with his many years of professional experience and a good portion of verve, he will be taking his audience on a journey through the geo IT sector and technologies.

Following will be Trimble's **Bryn Fosburgh** who will guide his audience through the cities of the future, telling them about the technological must-haves that will help prepare cities for their role as smart cities.

- InterGEO, 10-13 October, Hamburg, Germany, www.intergeo.de/intergeo-en/

Smart move for Stockholm

As part of the EU-funded GrowSmarter program, Silver Spring has announced that it has been selected to initially deploy its standards-based IPv6 platform and solutions to upgrade aging lighting infrastructure with intelligent street light controls in the capital of Sweden. The city of Stockholm will benefit from Starfish, Silver Spring's international Internet of Things (IoT) public cloud network and data service that arms commercial enterprises, cities, utilities, and developers with two-way command-and-control, near-real time telemetry and industrial-grade security to every device. Stockholm will join other cities around the world where Starfish will first be available including Bristol, Copenhagen, Glasgow, London and in Crossmolina, Ireland; in Chicago, Providence, San Antonio and San Jose in the US; and in Kolkata, India.

Orders roll in for Cadcorp
British GIS software developer

Cadcorp has seen a flurry of orders recently for its Web Map Layers application. For Warrington Borough Council mapping software has been chosen to modernise services enabling better targeting so customers can use the system to gain knowledge of their local area, pin point issues and report them online. Following a competitive tender, the council awarded the project to Cadcorp to centralise its GIS to replace the current intranet-based solution. The new system will allow the council to explore future integration into other systems with a geographic component such as refuse collection and road closures.

Cadcorp's web-based GIS mapping solution will consist of Web Map Editor, which will provide web-based editing capabilities to editors in the council whilst Web Map Layers will be used by both the general public and council staff who do not have editing requirements.

Martin McGarry, MD of Cadcorp adds: "UK local government is under huge pressure to use information technology as effectively as possible. Sometimes that means taking what is often a hard decision – to make changes to existing systems. Warrington has taken this step, but at the same time is ensuring that the council can continue to run 'business as usual' until the transition is complete."

Another user of Cadcorp's Web Map Layers will be Halton Borough Council, which has decided to migrate its intranet mapping GIS. The move follows withdrawal of support for the council's existing intranet GIS. The new application will be deployed on the council's virtualised infrastructure. Central to the decision to select Cadcorp was the ability of the technology to integrate with existing desktop GIS and SQL

*There is more news of companies and organisations on our website at www.location-source.com
To get your company featured on these pages call Sharon Robson on +44 (0)1438 352617*

Server based back office data.

Meanwhile, back in January 2016 Bracknell Forest Borough Council issued a tender under the Crown Commercial Service Local Authority Software Applications (LASA) framework for provision of a replacement corporate GIS. Cadcorp and its LASA partner, Bramble Hub won the contract following a detailed evaluation and demonstration process. Cadcorp will supply its' Web Map Layers web mapping application and Map Modeller desktop GIS together with training and associated services.

Public scientific research

Citizen Science is the process of involving the public in scientific research, usually by having them collect, collate, and/or analyze data. There is an increasingly large number of citizen science projects active around the world supporting research and decision-making on topics ranging from biodiversity conservation, to environmental regulation, to infrastructure evaluation and design.

The Open Geospatial Consortium (OGC) is therefore calling for public participation in its Citizen Science Domain

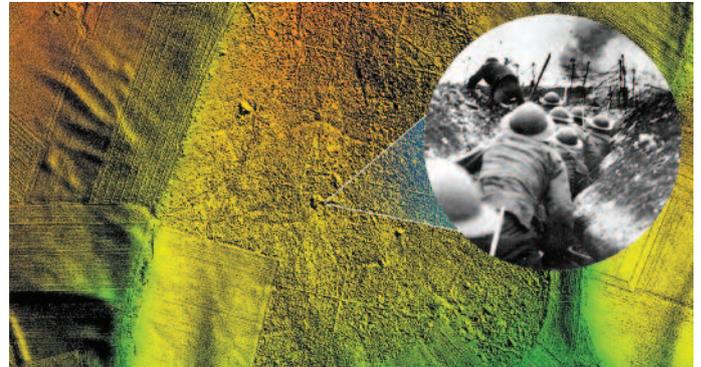
Working Group (Citizen Science DWG), which provides a forum for demonstrating and increasing understanding of the use of open standards. Interested parties can join the email list at: lists.opengeospatial.org/mailman/listinfo/citizen-science.dwg.

Linking to become illegal?

The Court of Justice of the European Union (CJEU) has ruled that the act of linking to copyrighted content can be a breach of copyright in all 28 EU nations. This is an unfortunate contrast to what CJEU's Advocate General stated earlier this year that the act of linking should not be illegal.

Small businesses and bloggers will especially feel the heavy burden of the new law, as they will be forced to check the copyright status of each link they are using, despite the promise that some publishers might benefit from the law. According to CJEU, "when hyperlinks are posted for profit, it may be expected that the person who posted such a link should carry out the checks necessary to ensure that the work concerned is not illegally published."

Revealing the Somme's secrets



A LIDAR survey has revealed previously undiscovered evidence that might potentially help to resolve accusations of a lack of determination by Welsh soldiers during the first Battle of the Somme in the Great War of 1914-1918. Bluesky flew an area in northern France called Mametz Wood, capturing accurate 3D measurements of the terrain and ground cover. Specially commissioned by Bearhug TV, the survey revealed two distinct and previously unrecorded topographies for further investigation and analysis.

The data was stripped of tree cover and other features to reveal two crater-like features, pre-war quarries, with rectangular sides, which were not on any other map. To the east of these anomalies was another, more subtle feature, also not depicted on wartime maps or in reconnaissance information. A series of deep interconnected German trenches was discovered, which experts say was incomparable on the entire Somme battlefield. This was a major new discovery that would never have been made without the LIDAR data.

"The Internet was born with the idea to connect people and to freely share information. The new law threatens to stall the growth of

innovation and to harm online businesses, which are the driving force of our modern digital economy," says **Marty P. Kamden**, CMO of NordVPN.

Think **LIDAR** Think 

The UK's largest LiDAR database available for instant download www.bluesky-world.com

Call us with your **LiDAR** survey requirements
The highly accurate and cost-effective survey solution

 www.bluesky-world.com

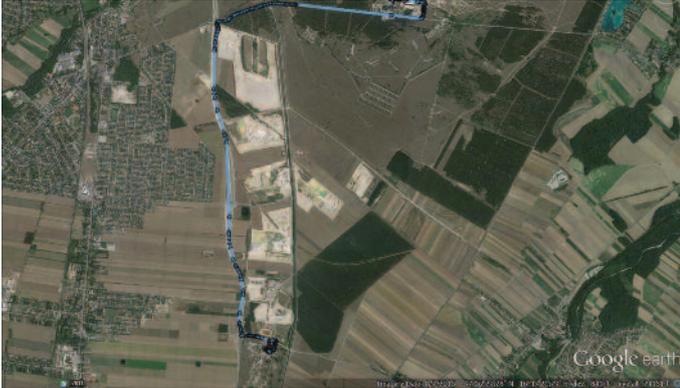
 **01530 518 518**

 info@bluesky-world.com

BS0152AD/GISPRO/1016

GiSProfessional

Integrated disaster management



The EU's SPARTACUS project, "Satellite Based Asset Tracking for Supporting Emergency Management in Crisis Operations" was successfully launched three years ago and concludes in October 2016, having achieved the objective of creating an integrated system of spatial and terrestrial technologies to manage emergency and disaster scenarios.

Developed by D'Appolonia SpA, part of the RINA Group, the project aims to provide accurate tracking and positioning (mapping) of target objects like rail vehicles and wagons, vans and trucks used by emergency teams, as well as first responders helping on the ground during emergency situations. Roberto Carpaneto, CEO at D'Appolonia explains, "The key challenge that faced us was integrating the wide variety of tools, standards and protocols used across what, inevitable is an equally wide range of applications. Tracking vehicles was a key consideration. . . we were acutely aware that getting aid and personnel quickly into a disaster location can be the difference between life and death for some victims and that responsibility was foremost in our minds when developing the system".

SPARTACUS has generated a lot of interest at a local, European and international level. Many international aid agencies including the Red Cross are testing, evaluating and validating SPARTACUS. Going forward, D'Appolonia will be at the forefront acting as the application configurator of SPARTACUS for customers. In that role, D'Appolonia will liaise with those companies providing each of the individual components in order to provide a world-class integrated emergency asset tracking and communication platform, based on open data and cloud services.

CityGML interoperability improved

OGC has also released the results of the CityGML Quality Interoperability Experiment. The CityGML QIE improves the interoperability of CityGML data by removing some ambiguities from the current standard, and formally defining data quality requirements for a general CityGML data standard.

CityGML is an open data model and XML-based format for the storage and exchange

of virtual 3D city models. It defines the basic entities, attributes, and relations of a 3D city model. This is especially important with respect to the cost-effective sustainable maintenance of 3D city models, allowing the reuse of the same data in different application fields.

The Engineering Report is available for free at: portal.opengeospatial.org/files/?artifact_id=68821, specifies the results and findings of the CityGML QIE.

Arizona opts for Brit technology

The Arizona Department of Transport has chosen UK-based 1Spatial's technology to validate its state-wide road network. The company's 1Integrate technology will enable the DoT to automatically quality assure the information it receives from the combination of fifteen counties and seventeen public-safety answering points (PSAPs) by validating it against a set of pre-defined business rules. They will also be able to match new data submissions against the current version of the road network to identify changes in geometry and other attributes, and apply these changes. This new process will save them a significant amount of time and money over a manual process and also ensure the accuracy of the state-wide data map.

Hexagon joins G-Cloud 8

Hexagon Safety & Infrastructure has been listed on the G-Cloud 8 framework within the Crown Commercial Service (CCS) Digital Marketplace, providing UK public sector organisations easier access to Hexagon's geospatial software and services. Listed under its legal entity, Intergraph (UK) Ltd., offerings are available in the Software-as-a-Service and Specialist Cloud Services areas.

CCS acts on behalf of the Crown to drive savings for the taxpayer and improve the quality of commercial and procurement activity. The G-Cloud framework is an agreement between the government and suppliers who provide cloud-based services.

French choose Blue Marble

Blue Marble Geographics and their partner in France Alain Olivier Geomatique have signed a three-year agreement with the French Military of Defense

(Ministère de la Défense) to deploy Global Mapper throughout all of branches of the country's armed forces. An enterprise licence provides unlimited access to Global Mapper's powerful geospatial data processing and analysis functionality for all frontline and support defence personnel. The agreement also includes the use of the Global Mapper LiDAR Module, The Global Mapper Software Development Kit (SDK), as well as customized training and implementation services.

BRIEFS

The Open Geospatial Consortium has adopted SensorThings API Part 1: Sensing as an official standard to provide an open, geospatially enabled way to interconnect Internet of Things (IoT) devices, data, and applications over the Web.

Readers are invited to take part in a YouGov survey regarding the use of Ordnance Survey products and services and the intrinsic value of the data to organisations and individuals. Do please send this on to any colleagues that you think might be interested and answer the short survey at the url below. <https://start.yougov.com/refer/vwsz2VhWwTwCLC>

OGC is also considering a new work item for Community Standard: 3D Tiles, a publicly available open specification for streaming massive heterogeneous 3D geospatial datasets for visualization. To expand on existing 2D and 2.5D streaming of map tiles and terrain, 3D Tiles support 3D models such as buildings (exterior and interior), trees, point clouds, TIN terrain, and vector data use cases. The public is requested to comment on this work item proposal at requests@opengeospatial.org

*There is more news of companies and organisations on our website at www.location-source.com
To get your company featured on these pages call Sharon Robson on +44 (0)1438 352617*

PEOPLE

Three new faces at GeoPlace

GeoPlace has announced three new appointments into key positions. **Luke Studden** joins in a newly created position of supplier liaison manager while **Martin Barnes** is the new National Address Gazetteer (NAG) Coordinator and **Jason Houghton** is his deputy. Studden brings considerable expertise of data management

to GeoPlace having previously worked at the London Borough of Harrow as the senior address data custodian and GIS officer, winning several awards at GeoPlace's annual conference.

Martin Barnes' role requires him to manage and support the receipt, analysis and incorporation of all data inputs required in the production and maintenance of the NAG dataset, together with ensuring quality controls and testing.

Jason Houghton has worked for local government for the past 11 years in the roles of GIS officer, LLPG custodian and the street name and numbering officer.

Ramage joins the team at GiSPro



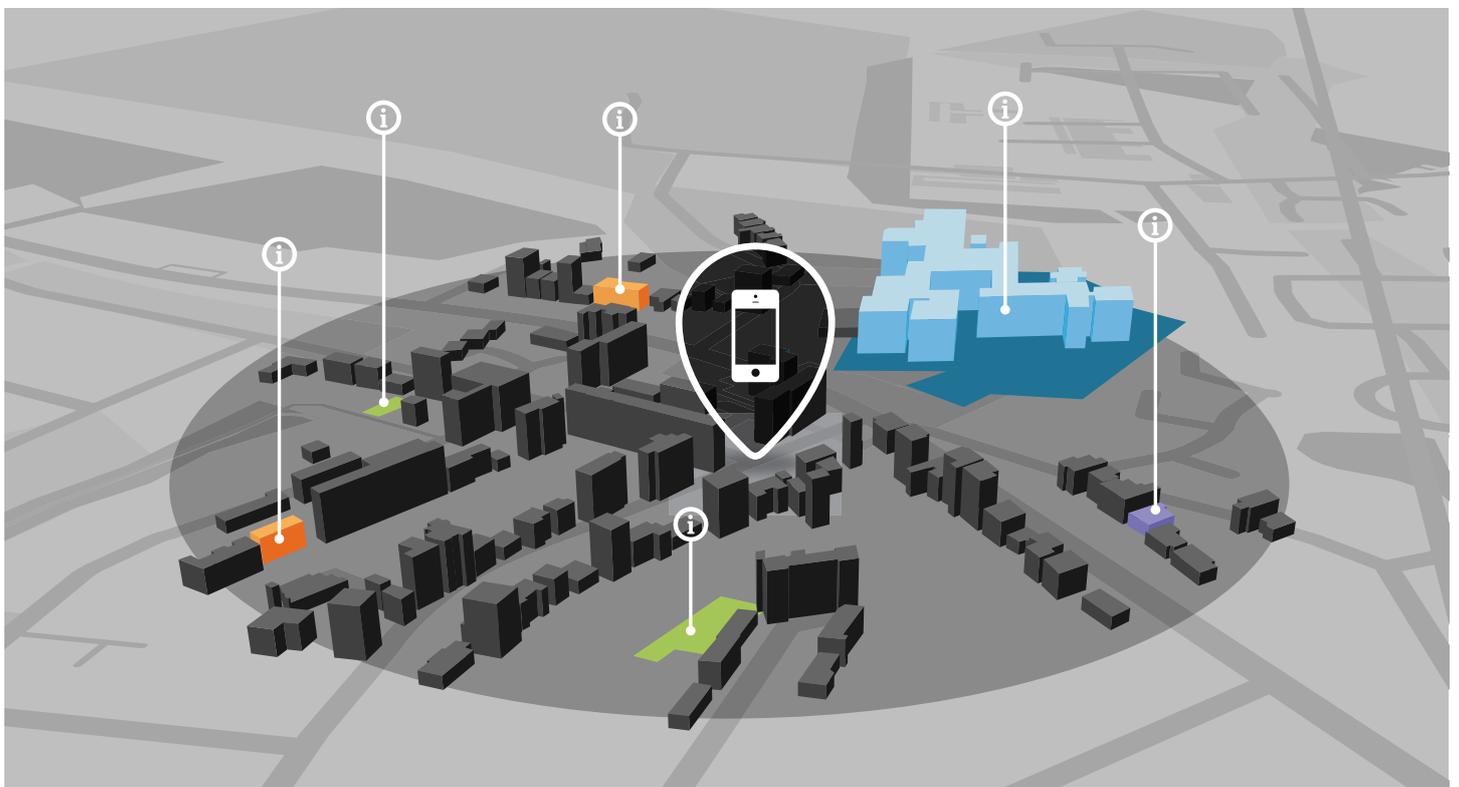
Steven Ramage has joined the editorial board of GIS Professional and will be acting in an advisory capacity as technical editor. Steven joins from a long background working in the geospatial sector

with many different organisations including Here, 1Spatial, OGC, OS and what3words. Steven has also been involved for several years in the United Nations activity to develop UN-GGIM, the initiative on Global Geospatial Information Management acting as a consultant and has done some open geospatial standards work for the World Bank.

He plans to take on a new role heading external relations for GEO (the Group on Earth Observations) from 1 November 2016. Steven is a SASNet Fellow at the University of Glasgow, Urban Big Data Centre, a Visiting Professor at the Institute for Future Cities at the University of Strathclyde also in Glasgow, a member of the OGC Global Advisory Council and a Fellow of the Royal Geographical Society (RGS).



Left: GeoPlace's three new appointments. From left to right: Luke Studden, Martin Barnes and Jason Houghton.



Web Map Layers from Cadcorp

Sharing Local Knowledge™
Available on **desktop, tablet and mobile devices**



Discover more at cadcorp.com

INSPIRE implementation

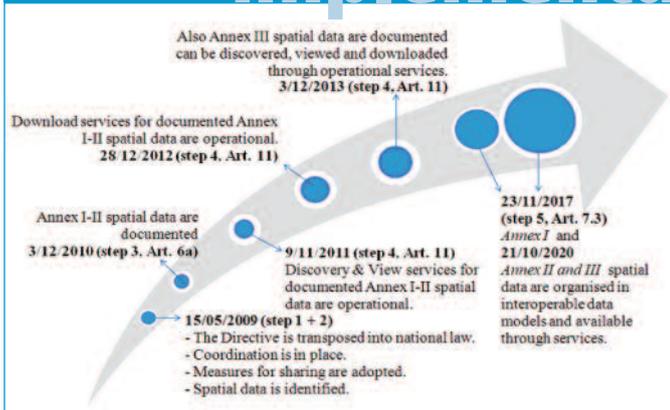


Figure 1 INSPIRE implementation road map – major milestones.

IT IS ALWAYS MUCH MORE DIFFICULT to implement something as against conceiving it. This is particularly the case where multinational, multi-agency, multi-objective programmes such as INSPIRE are concerned. This is why the publication of a 13-page report which has been approved by the

section describes the findings of the evaluation which was carried out with respect to the Commission's own Regulatory Fitness and Performance Programme (REFIT) (EC 2012) to assess whether the Directive remains fit for purpose at the halfway mark of its implementation.

The accompanying Staff Working Document is also in the public domain on the INSPIRE website at (www.inspire.ec.europa.eu). It contains the findings of the detailed evaluation that underpins the main review report. This report is divided into six sections which essentially mirror those of the main report. The first three contain a short introduction, a brief outline of the background and the process, methodology and limitations. The fourth chapter discusses the implementation results and the fifth chapter, which accounts for more than half of the body of text (apart from the appendices) and deals at length with INSPIRE in the context of the five key issues defined by the REFIT model i.e. – effectiveness,

Implementing INSPIRE: EU Council and European Parliament responds

Across the EU governmental and public organisations have been busy (some more so than others) implementing the INSPIRE Directive. So what progress has been made towards the full implementation date of 2020? Professor **Ian Masser** reports on the EU's recent review of progress.

European Council and the European Parliament on the implementation of the INSPIRE Directive (European Commission 2016a) is so interesting.

The report, together with its accompanying 81-page Staff Working Document (European Commission 2016b), makes very interesting reading for those people who have been following the regular monitoring and reporting activities of the national member states with respect to its implementation. These two documents are the Commission's own response to the evaluation of the first seven years of INSPIRE implementation (European Environment Agency 2014) which was carried out by the Joint Research Centre and the European Environment Agency and was reviewed in the February 2015 issue of *GiSPro* by the author (An autobiography? The first seven years of INSPIRE implementation).

The Commission's main report is divided into six parts. The first two provide brief summaries of the issues involved and the background to the report. These are followed by two sections describing the findings with respect to implementation and regulatory fitness respectively. These constitute the heart of the document while the last two sections contain the conclusions and the recommendations for the next stages of implementation. The implementation section discusses the findings of the materials collected during the INSPIRE monitoring and reporting process while the regulatory fitness

efficiency, relevance, coherence and EC added value. This is followed by a short final section summarising the conclusions of the evaluation.

Implementation This section of the main report considers the progress that has been made in implementing the Directive with respect to five main deadline tasks (Figure 1) which are essentially sequential in nature:

1. **set up coordination structures and adopt and implement legal measures to remove procedural obstacles to the sharing of spatial data;**
2. **identify their spatial data relevance to environmental policies; and policies and actions with an environmental impact according to themes listed in the annexes of the Directive,**
3. **document the spatial data so that they can be accessed on the Internet together with information on aspects such as their source, geographical coverage, quality and conditions of use, in line with the metadata specifications,**
4. **implement interoperable online services allowing the discovery, visualisation and download of spatial data,**
5. **gradually organise and publish the spatial data according to common data models for greater interoperability and improved productivity. (pp.34).**



... the most environmentally relevant data... are often not yet accessible.



INSPIRE implementation

Consequently, it must be recognised that the cumulative effect of a delay in meeting the deadlines for the completion of the work required for each of these steps has a knock-on effect on all subsequent steps. As a result, it comes as no surprise that the main finding of the report is that none of the deadlines imposed on Member States has been met by all of them although some progress has been made throughout the whole implementation process.

With respect to coordination and data-sharing tasks (task 1) the report notes that the Directive covers a broad range of spatial data managed by a large number of public authorities at national, regional and local level. The necessary coordination structures and data-sharing policies are generally in place although the effectiveness of national coordination efforts varies. National data policies for sharing data are also very variable in character. Most Member States still report problems in this area and existing policies range from fully open and free access and use, to full cost recovery, raising revenue and various types of public-private partnerships.

All the digital spatial datasets falling under the 34 spatial data themes listed in the Directive should have been identified, documented and made available online through services by December 2013 (task 2). In practice, although more than 56,000 datasets had been identified the report concludes that 'the most environmentally relevant data (mostly covered by Annex III) are often not yet accessible.' (p. 5). This is likely to create problems for making these data interoperable.

Considerable progress has been made on the documentation of spatial data (task 3). However, the report notes that 'Although the number of documented spatial datasets has grown steadily, in 2013 only 12 Member States had over 80% of their documentation in conformity, against a target of 100 % for all Member States.' (p. 5) (Fig.2).

Task 4 requires that all Member States should have online services for discovery, view and downloading in place on the Internet for all of their documented spatial datasets by the end of 2013. The report notes that 15 Member States had provided discovery services for 80 to 100% of their documented spatial datasets by the deadline. However, only about half of Member States had published 60 to 100% of their reported spatial datasets through view services and only about a quarter of Member States had 60 to 100% of their reported spatial data accessible for download (Figure 3).

The last of the five tasks concerning the transformation of spatial data to conform to common data models is the most challenging and Member States have until 2020 at the latest to complete this step. Consequently then it comes as no surprise to find that 'At this early implementation stage, the low conformity level of spatial data is not surprising.' (p. 7).

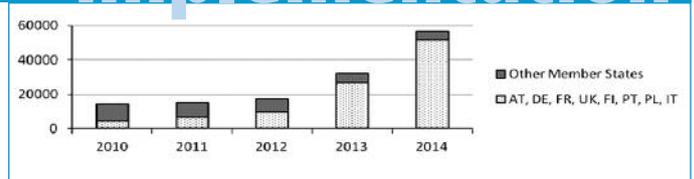


Figure 2: Total volume of spatial datasets (all annexes) reported by Member States.

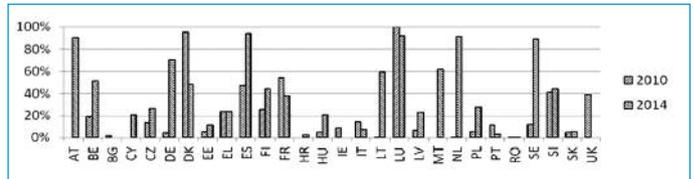


Figure 3 2010-2013 trends — % of spatial datasets with download services.

Regulatory Fitness These findings are evaluated in the next section of the main report with respect to the regulatory fitness of the INSPIRE implementation so far with respect to the following criteria: effectiveness, efficiency, relevance, coherence, and EC added value.

The section on effectiveness shows that the number of spatial datasets which are available across all Member States has increased to more than 56,000 as against nearly 1400 in 2007, but progress is very uneven. It notes that 'The requirements and timelines of the Directive did not pose fundamental problems for the eight Member States that identified over 90 % of the total datasets. For many Member States however, progress against the defined steps and timetable has not met expectations.' (p.7) This is largely due to complex and diverse data policies 'which create an additional, unnecessary administrative burden compared with a broader open data policy' (p. 8).

Efficiency is best measured by a quantitative evaluation of the costs and benefits arising from implementation but given the current stage 'most of the currently available studies are based on estimates or predictions, and quantified benefits data are scarce.' (p.8). However, likely benefits arising from INSPIRE implementation included more efficient access to information, an improved evidence base for policy development, better cooperation between public authorities and sectors, and building up technological skills.

The report considers that the objectives of the INSPIRE Directive 'have become increasingly relevant over time, and are included in Commission priorities relating to the 2015 EU Digital Single Market strategy' (p. 10) and that they 'identified the need to increase cross-sector interoperability in the public sector (with the revision of the European Interoperability Framework) where INSPIRE is of major relevance. Promoting eGovernment services and the need to apply the 'digital by default' and 'use once' principles are all enshrined in the INSPIRE Directive.' (p.10)

continued over page

“
... the number of spatial datasets... has increased to more than 56,000 as against nearly 1400 in 2007...
 ”

The report concludes that 'The internal coherence of the Directive has proven to be sound because Member States largely follow its steps.' (p.10) However, 'specific issues that may need 'attention include consistency of access to data policies, also set out the Public Sector Information Directive. This relates to broader issues on the free flow of data, identified as a priority issue for the Digital Single Market.' (p.10-11)

Assessing the EU added value arising from INSPIRE implementation is not possible given the timing of the report but nevertheless it notes that 'The potential improvements in EU and cross-border spatial data management offered by the INSPIRE Directive remain significant, not just in the environmental field. Whether it is sharing data on air quality or flood risk management, environmental solutions often need cross-border collaboration.' (p.11) However, 'collaboration between the Commission and Member States has generally been seen as positive but can be strengthened further by, for example, developing implementing tools and components together rather than each Member State 'reinventing the wheel'. (p.11)

Conclusions and recommendations The conclusions of the main report summarise the findings reached in the previous section while the final section contains a number of recommendations for both Member States and the EU level. The most important recommendation is that

'As a prerequisite, all Member States need to step up their efforts in implementing (e.g. on their coordination activities) and critically reviewing the effectiveness of their data policies. This applies in particular to those Member States lagging behind the most if they are to meet future implementation deadlines.' (p.12)

This means that Member States should give priority to environmental datasets and improving coordination between national INSPIRE implementation efforts and eGovernment, open data and other related activities.

To complement these national efforts it is recommended that the Commission carry out four tasks:

- A. evaluate the shortcomings of the national data policies in relation to Article 17 of the Directive in more detail and explore synergies with the 'free flow of data' initiative under the Digital Single Market with the view to resolving these issues through that;
- B. review, and possibly revise, the INSPIRE rules, in particular on spatial data harmonisation, to take into account the implementing risks and complexities with a view to reducing them (simplifying requirements);
- C. assist Member States in applying and

implementing the INSPIRE Directive (simplification of use), e.g. by the use of common tools, and promote priority setting together with the Member States.

- D. work closely with Member States to explore opportunities arising from the use of existing EU-level funding programmes to help capacity building and close the INSPIRE implementation gaps (e.g. through the Interoperability Solutions Administrations).' (pp. 12-13)

Discussion This Commission-wide review is an important step in the INSPIRE implementation process and it will be interesting to see how its recommendations are embodied in future practices. Already there are signs that the Commission will issue a number of recommendations and actions which it will implement in close collaboration with the Member States. One important development is the preliminary agreement that has already been reached on a Draft Maintenance and Implementation Work Programme (2016-2020) (INSPIRE 2016) and it may be expected that further measures will be formulated over the next few months.

On a broader front it must be hoped that the report will help raise overall awareness of INSPIRE in the EU as a whole and within the Member States. The INSPIRE programme is already having an impact on environmental policy making and SDI development throughout the EU and it is essential that these benefits are not lost in a post Brexit Britain.

References

- European Commission, 2012. Communication from the Commission to the European Parliament, the Council European Economic and Social Committee and the Committee of the regions: EU Regulatory Fitness, COM (2012) 746 final.
- European Commission, 2016a. Report from the Commission to the Council and the European Parliament on the implementation of Directive 2007/2/EC of March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) pursuant to article 23, COM (2016) 478 final/2
- European Commission, 2016b. Commission staff working document: evaluation accompanying the document Report from the Commission to the Council and the European Parliament on the implementation of Directive 2007/2/EC of March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) pursuant to article 23, SWD (2016) 273 final/2.
- European Environment Agency, 2014. Mid-Term Evaluation report on INSPIRE implementation: joint EEA-JRC report, EEA Technical Report 12/2014, Luxembourg: Publications Office of the European Union.
- Ian Masser, 2015. An autobiography? The first seven years of INSPIRE implementation, *Gis Professional* 62, 20-22, 2015
- INSPIRE, 2016. Towards a Maintenance and Implementation work programme for the period from 2016-2020, Maintenance and Implementation Working Party 2016-2020 www.inspire.ec.europa.eu



... Member States should give priority to environmental datasets and improving coordination between national INSPIRE implementation efforts and eGovernment, open data and other related activities.





Adena Schutzberg has worked in geospatial technologies for more than 25 years. She is a member of the Esri Education Team.

ON A LOVELY LATE SUMMER DAY in September, 6000 cyclists traversed two courses, one ten miles, one forty miles, around the City of Boston, Massachusetts. It was the eleventh annual event celebrating bicycling in the city. I am pleased to report that I saw enough evidence among these non-geographers to be cautiously optimistic about the public's knowledge of geography and geographic tech. There is, of course, still room for improvement.

The Good The organizers had prepared the routes ahead of time and offered them for download on two platforms: Strava and MapMyRide. They also offered a "gas station" type fold-up paper map of the route. And, there were purple cardboard arrow signs attached to posts along the route. I was very happy to hear a conversation nearby where one rider was explaining to another that sometimes the app said to "turn left off of River Street onto River Street" because the system saw the two segments as unique and not the same street. That's a solid understanding of geographic navigation base data!

to the point of carrying a backup! That's a solid understanding of the challenges of tech in general, and of type "A" geographic data gatherers, in particular.

The Bad The two routes started together along a car-free (closed for the event) stretch of road along the Charles River. Everyone near me was grinning ear to ear at getting a chance to ride relatively fast on Storrow Drive, known for daily traffic jams. Unfortunately, the key exit off the road, the one the riders of the 10-mile route were to take, was not well-marked. I didn't even notice it and was told later that the "signage" consisted of a single volunteer shouting "10 miles this way, 40 miles this way." Many, many people missed the turn. Part of the explanation for the situation may be that riders were confident that organizers would tell them everything they needed to know and that organizers thought that riders would have used technology to tell them everything they needed to know.

As I headed out of the finish line celebration, I

The state of geography and geographic technology knowledge: evidence from one bike ride

How do you know how far you've travelled if you're on a bike? Would a smartphone or sat-nav help? Maybe you'd check the bike's odometer, assuming you've got one. Or maybe you'd have a strong feeling in your body, the "friction of distance" as **Adena Schutzberg** calls it.

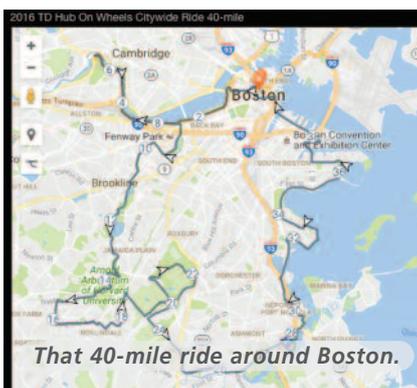
My group chose not to stop at the first water stop but after about 75 minutes of riding we were ready to refill our water bottles and get some snacks. A rider, without a GPS stated, as we rode along, "We're about mile 22 now." There were no mile markers on the route, but she was right on it: my odometer said 21.5 miles. Either she looked at the map of course and recalled where we were or she had a sense of what 22 miles "felt like" to her body. Either way, she showed a solid internalization of geographic ideas, including, perhaps, the friction of distance.

When we completed the ride, a rider with the GPS that "gave out" along the way, stated confidently that we'd ridden 40.5 miles and ticked off a few more stats. His phone had captured just about everything the GPS would have. "I always carry a backup," he noted. The quantified self, in particular, the quantified geographic self, is mature

conferred with a gaggle of teen volunteers. I asked them how to get to a public transit station. They did not know. I asked the name of the street we were on. They did not know. I'm not sure they even knew they were at City Hall Plaza. I wondered how they travelled to the event and why they had no information on, and no interest in, their location. And, perhaps more telling, none of them pulled out their phones to consult a map or app. They were channeling, even if they did not realize it, that at that moment, to them, geography did not matter.

The Reality These experiences suggest to me that one group of people are tuning into geography either by using their "old fashioned" tools of brain and body, or digging into and understanding the intricacies of today's technology. A second group continues to somewhat blindly move forward confident that others will have access to and share relevant geographic information when it's needed. What strikes me about this conclusion, as a geographic practitioner? I'm a member of both groups!

Credit: © Hub on Wheels
<http://tdhubonwheels.com>



FOSS4G 2016



Open geospatial in Bonn attracts 900 GI people

With a theme of Building Bridges, FOSS4G 2016 attracted some 900 delegates to hear and discuss the latest developments in open source geospatial software around four key topics: Land Information, Disaster Management, Remote Sensing for Earth Observation and Open Data. **Codrina Ilie** reports.

BETWEEN THE 24TH AND THE 26TH OF AUGUST 2016, the city of Bonn, Germany was host for approximately 900 GI people, arriving from more than 50 different countries to attend the Open Source Geospatial Foundation (OSGeo) annual global conference Free and Open Source Software for Geospatial – FOSS4G 2016.

This year, OSGeo celebrated its 10th successful flagship gathering. The event has constantly expanded from a few hundred people to approximately 1000 (<https://wiki.osgeo.org/wiki/FOSS4G>), portraying the steady expansion of interest in free and open source software for processing and visualizing geospatial data. The event has traditionally been a high-tech one for geospatial software professionals, but with the increase of geospatial data usage, the conference has grown diverse, spanning pure software development to power users case studies, from scientific to operational and now seeps through all domains and permeating every imaginable work flow. The founder, the Open Source Geospatial Foundation (OSGeo) (www.osgeo.org/) is a not-for-profit organization with the mission to foster global adoption of open geospatial technology by being an inclusive software foundation devoted to an open philosophy and participatory community driven development.

The selected conference chairman for 2016 was **Till Adams** from terrestris GmbH (www.terrestris.de/en/), whom, together with a dedicated team of 20 enthusiastic people, shaped FOSS4G2016 Bonn. Regularly, each such event is comprised of a number of meetings and seminars with various scopes and

configurations. This year's FOSS4G was no exception. The core conference was embedded within three types of different manifestations.

Code Sprint A code sprint is part of all FOSS4G events. It is a gathering of software developers, power users, users of a certain software that get together and actively contribute to improve the software and its documentation. The code sprints are crucial in the advancement of the software, as the events are usually guided by the core developers of the software. Even more, at code sprints that reunite a significant number of community contributors, there are high objectives set. As an example, at FOSS4G 2016, the GRASS team released the last GRASS GIS 6 version on Sunday (<https://grass.osgeo.org/news/58/15/GRASS-GIS-6-4-6-released/>). They planned next releases, fixed a number of bugs, backported numerous features, cleaned outdated tickets, added new features, developed a new add-on, wrote a complete tutorial on working with time series and Sentinel-2 satellite data, discussed the new website for the project and prepared a new flyer for GRASS.

This year's code sprint was split into two parts: before and after the conference, summing up a total of five complete days. Over one hundred participants were working on various projects such as: OSGeo-Live, GRASS GIS, GeoTool, GeoServer, QGIS, PyWPS, GIS.lab, Mapbender, MapServer, OpenLayers, EOxServer and more.

Workshops Workshops offer hands-on experience of



... code sprints are crucial in the advancement of the software, as the events are usually guided by the core developers. . .



the power of FOSS4G, guided by experienced members of the free and open source geospatial community, very often by the actual developers of the software used. Workshops run for half-day and provide the unique opportunity to learn and interact with the best in the field. FOSS4G 2016 hosted 30 workshops, with various topics: from web mapping to complex spatial analysis and with different complexity ranges, from introductory workshops (e.g. Introduction to GeoTools, Introduction to OpenLayers, GeoNetwork from scratch, Introduction to MapFish Print 3: Maps, Templates and Reports etc.) to highly specialized seminars (e.g. Beyond GeoServer Basics, Advanced spatial analysis with the QGIS Processing framework, Hook your own customizations into GeoNetwork etc.).

B2B – business to business This type of activity was new in the current form, acknowledging the importance of the FOSS4G role of business and as a networking platform. Even though, the professional element has always been present, the 2016 B2B meeting proposed a framework that would allow an equal amount of attention to all participants in an organized manner. Everyone got a chance to present their business – in exactly five minutes (not six!), with exactly 20 slides which remained on screen for 15 seconds each. At the end, all participants voted and determined the best presentation and asked the presenter to give another five-minute talk, based on the organizer's slides.

Thus, the complete event of Free and Open Source Software for Geospatial 2016 Bonn, spanned from Sunday the 21st to Sunday the 28th. The core conference developed over three days under the Building Bridges theme, having the classic topics enhanced with four key ones: Land Information, Disaster Management, Remote Sensing for Earth Observation and Open Data. True to its motto, the event was shaped with the clear scope of bringing together all geospatial users, developers, fans, from professional to absolute beginner, from business to university teachers, from non-profits to public institutions.

The core conference was composed out of keynotes, traditional 20 minutes talks, and a new form of interaction: the topic talk.

FOSS4G 2016 had an impressive seven keynote speakers coming from various backgrounds and contributing to different topics, but deeply related to geospatial intelligence. Participants had the pleasure to listen to:

- **Andreas Veispak**, the head of unit for Space Data for Societal Challenges and Growth at the European Commission,
- **Bianca Hoersch**, third party mission manager at ESA's Earth Observation,
- **Klaus Deininger**, a lead economist at the Development Research Group of the World Bank
- **Ton Zijlstra**
- **Peter Kusterer**, head of corporate citizenship & corporate affairs in IBM Germany



- **Dirk Frigne**, founder and CEO of Geosparc, vice-president of OSGeo
- **Thomas Zerweck**, co-founder and managing director of ZEBRIS, Geoinformation Systems and Consulting

Above: Delegates hard at work!

FOSS4G 2016 initiated a new kind of interaction: the topic talk. Within the conference days, the Lab was the place to foster new ideas and encourage discussions around subjects such as: the intertwine between open source and open standards, led by **Athina Trakas** and **Ingo Simonis** from OGC; how to best couple land information and open source led by **Arnulf Christl** from metaspatial and **John Gitau** from UN-Habitat - United Nations Human Settlements Programme. The Land Information Topic Talk brought Land experts and the Open Source Geospatial community together. **Chrit Lemmen** from Kadaster, Netherlands gave an introduction to the topic from the perspective of the Global Land Tool Network (www.gltn.net). Athina Trakas presented the new OGC DWG in formation "Land Administration" and Arnulf Christl introduced the Social Tenure Domain Model (STDM www.stdm.gltn.net/), a broadly accepted fit-for-purpose implementation of the ISO standard LADM based on Open Source tools (QGIS, PostGIS, Mapbender, OpenLayers) initiated by UN Habitat and GLTN. The Topic Talk was a great opportunity to interact for players from both domains and underlined the tagline of the conference: Building Bridges.

Markus Neteler from mundialis GmbH & Co and **Christian Strobl** from the German Aerospace Center (DLR) engaged in how open source and open data translates into the Copernicus Program. There were seven topic talks in total.

As the community is the bedrock of the rise, the development and the expansion of free and open source software, its role in all OSGeo activities is crucial. Therefore, the geospatial community had a high



... the geospatial community had a high influence in selecting the programme of the conference, through a voting mechanism.



influence in selecting the programme of the conference, through a voting mechanism. Out of 289 submitted talks, 180 were selected and split over seven tracks, in three days. Additional events offered opportunities to interact with GI professionals, developers and users even outside the conference halls through the social events put together such as the gala dinner.

For information on all FOSS4G events you can access <https://wiki.osgeo.org/wiki/FOSS4G> or direct archived page of each event <http://year.foss4g.org/>.

All talks have been recorded and archived at <http://video.foss4g.org/foss4g2016/videos/index.html>

Regional FOSS4G events all over the world

Alongside the global annual FOSS4G conference, there are many regional and local FOSS4G events taking place all over the globe. OSGeo has provided the community with the possibility of keeping track of all such gatherings around the world through the OSGeo events calendar (www.osgeo.org/event/2016/09/01/month/all/all/1).

The week after FOSS4G Bonn, FOSS4G Norway in Oslo (<http://foss4g.no/>) took place. The conference organized by geomatics students from NTNU in Trondheim, attracted approximately 80 attendees - GI professionals from a wide range of industries. All talks from FOSS4G Norway are available online at

<https://vimeo.com/album/4125736>.

September will end with Maptember in Brussels, clustering with five big events focusing on the open geo movement:

- FOSS4G.be
- "HOT" (Humanitarian OpenStreetMap Team)
- Missing Maps Mapathon
- "State of the map" the yearly worldwide conference of the OpenStreetMap (www.openstreetmap.org)
- OSM/OSGeo HACKDAY (<http://maptember.brussels/>)

A complete overview of global events can be found here: https://wiki.osgeo.org/wiki/Global_conferences_overview

The next global OSGeo event, FOSS4G 2017 has been awarded to Boston (United States) and will unfold in 14th-18th August. <http://2017.foss4g.org/>.

About the author

Codrina Ilie has been part of the FOSS4G 2016 Local Organizing Committee. She has been an OSGeo Charter Member since 2013. She is the Vice-President of the Romanian OSGeo Local Chapter, geo-spatial.org. Codrina is a technical geographer and an active advocate and supporter for the open geodata initiative.



DISTANCE LEARNING GIS PROGRAMMES

UNIGIS UK

Study for a postgraduate qualification in GIS by online distance learning

UNIGIS UK has been at the forefront of GIS education for over 20 years, providing online distance learning-based postgraduate education and training in Geographical Information Systems and Science. Our part-time programmes support the personal and career development of GI professionals and those seeking to enter the GI industry. We support you with personal tutors, online resources and web collaboration software for surgeries and tutorials. There are no examinations, our courses are delivered through our bespoke VLE, and are 100% coursework assessed.

"The material covered in this course is relevant and up to date. I landed the GIS job I always wished for only 2 months after completing the UNIGIS programme".

MSc GIS Student 2013

unigis@mmu.ac.uk
+44 (0) 161 247 1581

- part-time online, distance learning
- flexible entry requirements
- one year for the PgC, two years for the PgD, and three years to complete the Masters
- specialist pathways in GIS, Applied GIS, and GI Technologies
- degrees awarded either by Manchester Metropolitan University or the University of Salford
- recognition by the UK Association for Geographical Information (AGI) for continuing professional development
- annual intake in September
- competitive fees with instalment options
- key textbook and industry standard software included

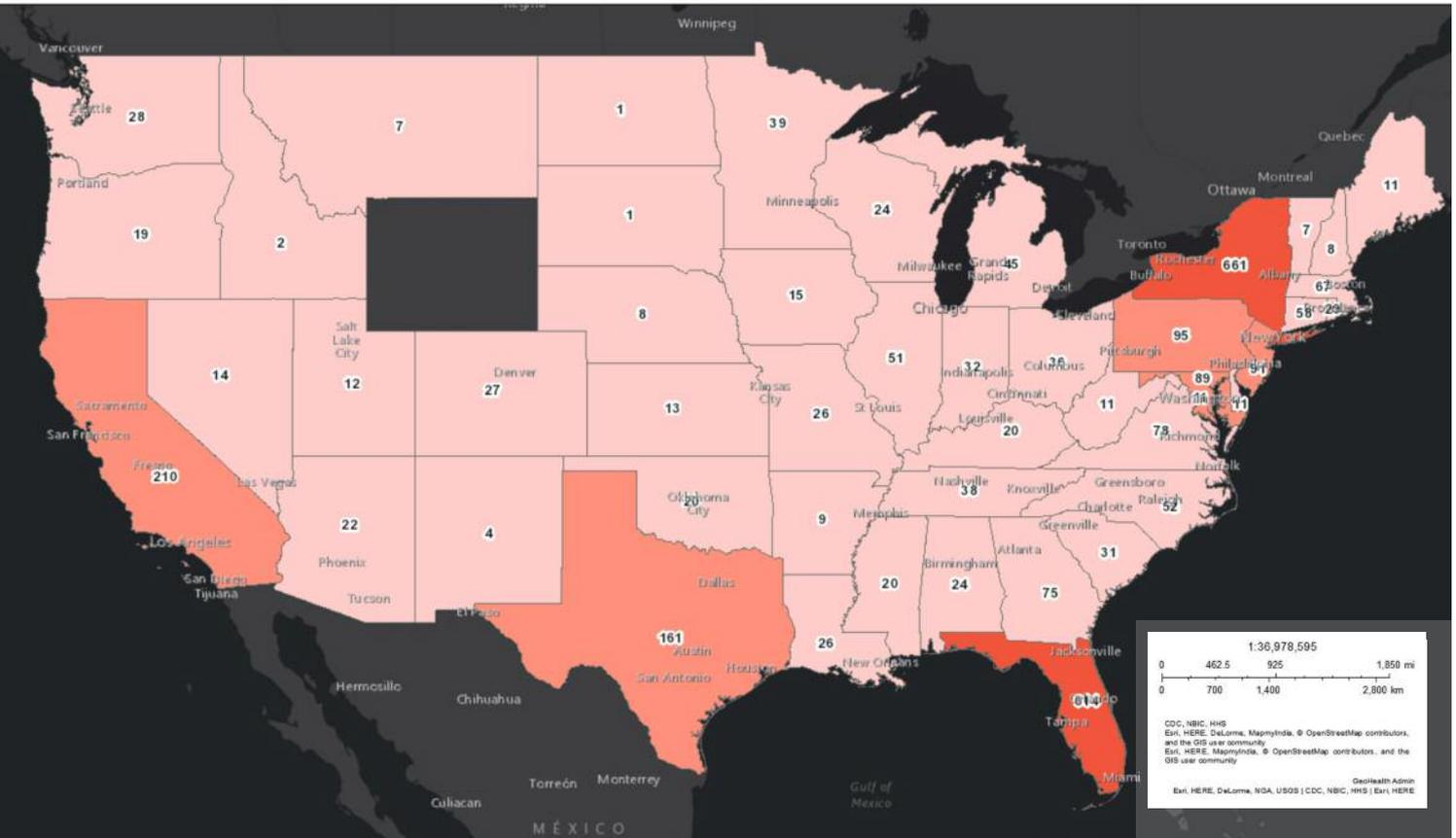
Educating GIS Professionals Worldwide



www.unigis.org

Tracking Zika across the United States

2016 Zika Virus affected States and Counties



The map shows the incidence of cases by state at 20 September 2016.

“
With more than 300 Zika virus cases reported in Florida to date, the state has become a top focus in the public health battle. . .
 ”

The Zika virus which caused much concern to athletes in the run-up to the Olympics in Rio de Janeiro continues to worry public health officials in the US and beyond.

Florida is home to more than 3.6 million women aged 15 to 44 years. With more than 300 Zika virus cases reported in Florida to date, the state has become a top focus in the public health battle to curb the spread of infection in the US. Gathering and mapping such data using GIS software from Esri is part of the US Government’s effort to combat this growing health risk domestically and internationally.

Drawing on US Census data, Esri is showing experts where best to target information and reach women of child-bearing age and their partners. To plan for the assistance that states may need, agencies are using Esri software to monitor the spread of the virus across the US and in 34 other countries where infections have been found. A publicly available interactive map that shows the number of cases in

each state is shown above. The information is automatically updated weekly so keep checking at:

<http://geohealth.hhs.gov/arcgis/home/webmap/viewer.html?webmap=02a5756e3bcf4f02b34e0579402cbb36&extent=-129.2945,21.8015,-64.3872,51.0007>

The Zika virus is spread to people primarily through the bites of infected *Aedes aegypti* mosquitoes; however, the virus has also been found to be transmitted sexually. The virus can cause Guillain-Barré syndrome in adults and children and can cause a serious birth defect called microcephaly. “Prevention is the first course of action in protecting public health, but people need information to make decisions about what preventive actions to take,” said Este Geraghty, chief medical officer and health solutions director, Esri. “Using GIS technology to locate the most vulnerable populations is a first step in educating people on the risks of the Zika virus and about actions that can protect health and curb the spread of disease.”

UTILITIES data capture



Left: Trimble GeoExplorer GNSS is used to capture every detail for the GIS.

QUESTAR GAS IS A NATURAL GAS DISTRIBUTION company in the US servicing Utah, southwestern Wyoming and a small portion of southeastern Idaho. The company employs approximately 880 people. **Tren Giles** is operations supervisor of the GPS support/inspection group of 15 gas inspectors.

With a population of about 2.9 million people, Utah is one of the fastest growing states in the US, with one of the lowest rates of unemployment. So, Questar Gas must meet a constant demand for piping in new residential and commercial developments, as

Tape and sketch – three times! Until recently, in order to produce as-built maps, Questar's inspectors were obliged to first measure distances using a tape, then roughly hand sketch a map on the job. Later, often from the company vehicle, they drew the map a second time in simple CAD software on a laptop. This version was sent to a post-mapping team, which drew the map a third time. The entire process was labour-intensive and lengthy, taking approximately eight weeks, and was vulnerable to human error.

One particular down side of the long process was the inability to quickly communicate asset location to third parties. On a big project it could take months to deliver a map to third-party contractors, e.g. to companies that mark utility locations where people have indicated they want to dig. The lack of information caused considerable delays on other companies' projects.

At the time of data collection, inspectors would attempt to "tie" the location of pipes to local features such as buildings, curbs or fences. This practice was problematic; over time the environment

When the GNSS mapping app you want doesn't exist... make one!

It used to take Questar Gas inspectors half an hour to collect pipeline assets on a site and then eight weeks to produce a final map of the work. Today, using GNSS technology, data collection takes 10 minutes and the map is available instantly, reports **Vivienne Wallace**.

well as replacing aging existing pipework.

A critical aspect of Questar Gas asset management is accurately tracking, locating and recording pipelines. The company uses as-built information to better manage maintenance and to communicate accurately to other parties where assets are located. "We need to record where pipes are. Although we run a copper tracer wire along the pipe, the wire can get broken so we still need to do an as-built," explains Giles. Questar Gas also uses as-built information to accurately pay contractors.

The consequences of not knowing precisely where gas pipelines are located are well known:

Questar Gas crews, or third parties, are unable to prevent damage from occurring or to respond quickly to repair faulty or damaged pipes. Time is wasted searching for pipelines. "We simply have to be able to locate that line," says Giles.

could change causing the feature to be displaced or moved. For example, if a street was widened, then curbs would no longer be the same distance from the pipe recorded during mapping.

A workflow that works Questar Gas wanted to improve its accuracy and produce maps faster by developing a workflow to collect positioning information with GNSS. It would then integrate the new data with existing data in the company's Esri database. However, when they decided to introduce this change, no software solutions were available to fully meet its needs.

Questar Gas reached out to CartoPac, a software development team in Fort Collins, Colo., to help them create a mobile application for mapping gas pipelines. CartoPac has expertise in using Trimble GPS Pathfinder tools to create GIS applications.

The project included not only workflow and application development; they also trained gas inspectors to be mapping experts. Within a few months Questar Gas had a working model, which has been steadily updated ever since. The company now uses GNSS technology to map its services, mains and structures. The data they capture – accurate to within 10 to 15 centimetres – is standardized and is

Below: every detail of the location is captured by the Trimble GNSS system.



immediately accessible in the company's Esri GIS database by third-parties like support personnel, construction contractors, location specialists and leak survey inspectors.

Questar Gas runs its mapping application on a mix of Trimble GeoExplorer 6000 and the more recent Geo 7X handhelds. "I appreciate our Trimble equipment," Giles says. "We use it as hard as, or harder than, anyone. Most of our systems are used eight to 10 hours a day, five to six days per week." The handhelds are run on a rover pole with a Trimble Zephyr antenna. If inspectors are unable to collect a point by positioning the rover pole over it — for example, at the corner of a building — then they use a laser rangefinder, also attached to the pole, to reach the point.

Questar Gas connects to Utah's Trimble VRS network, which provides real-time, 10-cm accuracy through a network of land-based reference stations. Where the network is not available, GNSS data is postprocessed for 10-15cm accuracy by the next day. "We went with a real-time workflow so we could collect data and know what was being collected straight away," Giles says. When pipe is laid, Questar Gas inspectors take their equipment to the job site to measure the as-built construction of pipelines before burial. At that time inspectors are required to map, in Giles' words, "everything."

"The company is very particular about its maps," he says. "So they don't just measure mains. They include every pipe, every fitting and every structure the gas is run to. They also tie the location to as many features as they can, including fire hydrants and street lights, etc."

During mapping, the CartoPac software requires inspectors to complete data-collection forms that cannot be exited until the workflow is completed. This constraint ensures all data is traceable, verifiable and complete; ensuring quality and peace of mind. "Our chief compliance officer loves what we're doing with GNSS," Giles adds. "He's one of our biggest supporters." Because data collection is now standardized and consistent, the results are not open to interpretation further ensuring data accuracy.

Georeferenced photos Another important feature of the mapping application is its ability to take georeferenced photos. "I have to say, the photos are one of my favourite aspects of using GNSS," Giles says. "The camera is in the tip of the unit, so in the CartoPac-built workflow our inspectors can take a wide view of the riser location and then the service tap. It's really nice to have this picture because it lets you know what's in the ground." Giles adds that the photos are insurance against claims made against the company for transgressions such as window breakages or incorrectly installed equipment. They can simply e-mail a copy of the photo to the claimant to prove Questar Gas is not at fault.



Results Since 2012, Questar Gas has used its new application to map 49,853 services and 2,583 kilometres of mains, all within an accuracy of 10cms.

"It's a simple fact that we now know where our gas line is buried," Giles says. "Plus we've dramatically improved our productivity, information accuracy, compliance practice, safety and overall asset management. We optimally manage our pipelines from laying to retirement." Giles adds that it's hard to quantify the benefits or the increased productivity. "Inspectors used to collect data by hand and draw it by hand," he says. "Now we can spend more time on detailed inspection, ensuring a higher-quality job."

Another unexpected benefit of the new mapping system is that most Questar employees love it. Much of the company's workforce is aging, but despite some anxiety about technology, the system has been adopted with enthusiasm because it makes the job so much easier and more enjoyable. One employee even plans to postpone his retirement as a result of his work days being so transformed.

Into the future "We're constantly developing new workflows – we have lots of areas of interest to explore" Giles says, "and the program now does stuff that even I had no idea it could do."

Pipeline management at Questar Gas is also set to be enhanced with the barcoding of all pipes at the time of manufacture. When a pipe is barcoded, the company can scan it when it is laid. The pipe's information, including date of manufacture and attribute detail, is then integrated with the other data collected and communicated on the final map.

"We aren't using barcoding today full time because not all pipes are coming through with the barcodes yet, but we've done all the testing and are now just waiting for barcodes to be supplied on every pipe as standard," Giles says.

The Questar Gas brand is built on a promise to provide safe, reliable natural gas service at the lowest possible price. By creating a mapping solution to increase its efficiency, accuracy and productivity so significantly, the company is well-positioned to continue delivering on that promise.

Above: GNSS data is captured to create highly detailed and accurate as-built maps of pipe locations..



Pipeline management ... is also set to be enhanced with the barcoding of all pipes at the time of manufacture.



RIVER drone survey



Above: Cian Gallagher of Aerial Agri Tech with the eBee Ag.

STRADDLING THE COUNTIES of Mayo and Sligo, the Moy offers a wide variety of angling and has long been famous as Ireland's premier salmon river. Approximately one hundred kilometres long, the Moy attracts visiting anglers from around the world who consider the west of Ireland a salmon fishing paradise.

The Ballina 'canal stretch' of this productive river is owned by The Ballina Salmon Anglers Association which works hard to ensure that the area retains its angling value and offers those fishing it a rewarding experience. However, this

part of the river is particularly susceptible to native pond weeds such as Curly Pondweed (*Potamogeton crispus*) and Perfoliate Pondweed (*Potamogeton*

extent of the problem by providing data from which the surface of raised sediment can be calculated and a 3D profile of the river banks created.

Meeting objectives Aerial Agri Tech, a company that specialises in providing high-resolution spatial and temporal data across a range of industries, was commissioned to do the work under the guidance of its GIS and remote sensing technician, Cian Gallagher. The company aimed to meet the Association's objectives by supplying the following services:

- a drone survey of the Moy River
- deliverables - geoTIFF orthomosaic and KML tiles (Google Earth)
- a calculation of surface area cover of weed and raised beds of sediment
- deliverables: NDVI*, land classification map, land class shapefiles and surface area calculation
- an elevation model displaying river bank heights and river profile
- deliverables: digital surface model, 3D point cloud (X,Y,Z), volumetric calculation and contour lines

For this project, Aerial Agri Tech used a senseFly eBee Ag that it had purchased from Irish distributor

Drone survey helps angling paradise

Drone technology is helping Ireland's River Moy retain its status as the country's premier salmon river. Using a senseFly Ag UAV, **Cian Gallagher** was able to capture data far quicker than by using traditional survey techniques.

Perfoliatus) which have become problematic due to the settlement of fine sediment on the river bed from the upper catchment. Consequently, the open water has become choked by the mostly submerged leaves of these weeds which have also created conditions that support the proliferation of the invasive fish species, roach. Curly and Perfoliate pond weed are therefore considered noxious and, in this case, sufficiently troublesome for the Association to commission a full intensive survey of the canal stretch. The survey would determine the

KOREC. In seeking a surveying drone that could provide high-resolution multiband images, Cian selected the eBee Ag rather than a multirotor drone, finding it more suitable for the larger areas he would be surveying in agricultural environments and also for its flexible lightweight frame making it easy to carry – a small but important factor.

Surveying the River Moy and dealing with water reflection A flight plan was created utilising the default difficult terrain setting with an 85% lateral and 75% longitudinal overlap and the camera set to take images at a 15° angle. These settings ensured all relevant features were captured.

The survey was conducted at 5:30am as conditions were calm with little or no wind and Cian believed that an early survey would minimise any reflection issues that may have been experienced on the surface of the water if the sun was directly overhead. The total survey took Cian approximately 80mins (4x 20 minute flights), 2 with the RGB camera and 2 with the NIR camera along the same flight plan. Using both cameras allowed Cian to record as much data as possible and to stack the layers in any array he wished to create a multispectral image.

Below: The heart of the problem - weeds.



A period of ground truthing was carried out once the imagery had successfully been captured. The collection of ground-truth data enabled calibration of remote-sensing data and aided in the interpretation and analysis of what was being sensed. This was done by walking the river banks and noting characteristics along the water surface. Photographs were also stored as a reference.

Cian then spent 20 minutes carrying out an initial rapid processing of the imagery to ensure that the images were suitable and the entire survey area had been captured to avoid revisits.

However, despite Aerial Agri Tech's best efforts to minimise the reflection of the water surface, there were issues during the classification of the imagery. Therefore, in order to reduce the reflection, each image was individually analysed and a selection of the best images chosen and processed.

The river was then divided up into 200m sections and the NIR camera recalibrated, based on each section. This gave more accurate results for detecting weed, especially when running an NVDI process.

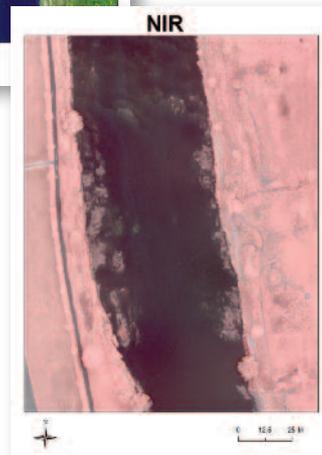
Deliverables and using the imagery Once analysed and processed, the images were passed on to the client in a map format. Statistics on weed area and distribution were also calculated and passed to the client.

The imagery was divided into specific land classes with each land class division based on its spectral properties. Using the specialised NIR camera, weed was detected and classified which was particularly effective along the river given the stark contrast between the spectral properties of water and vegetation. Similarly, the raised beds of sediment displayed contrasting spectral values compared to their surroundings.

The Normalized Difference Vegetation Index (NDVI) was used to detect plant "greenness" or photosynthetic activity within each land class. This index is based on the observation that different surfaces reflect different types of light. The NDVI is measured on a scale of -1 to 1, where -1 represents areas with no vegetation and 1 represents areas of dense vegetation.

Once the weed and sediment classes had been detected and analysed, the imagery was imported into a GIS environment and the land classes were converted into a polygon format. The GIS allowed the areas of these classes to be accurately calculated providing the client with exactly the information it needed to plan its eradication of both weed types.

Cian concludes, "The eBee Ag was the perfect solution for this project enabling me to capture images in a range of formats in an efficient and user-friendly manner. Flight plan, flying and post processing can all be done in less than a working day



Moy Survey



leaving plenty of time for post processing. The technology has so much potential and in KOREC I have a partner that's as enthusiastic as I am to explore the eBee's potential."

All information was kindly supplied by Cian Gallagher of Aerial Agri Tech who would like to thank **Ross Macklin**, Senior Ecologist & Fisheries Scientist at Triturus Environmental Services and **Gerhard Seck**, Club Secretary of Moy Anglers, for their assistance with this project. www.aerialagritech.ie

Above: Survey of the River Moy. Top Inset: 1m contours of the river banks. Bottom Inset: Near infrared imagery.

Traditional method vs Ebee; Cian Gallagher comments

It's hard for me to put an exact time on the traditional method of surveying. I believe I would have taken at least four days, the river would have to be divided into grids and then surveyed by wading into the river using a depth probe to record sediment and visually analysing the presence of weed. There's also the difficulty of getting correctly orientated in order to accurately record findings on the map, all while submerged waist deep in water. Alternatively, the survey would be done with a boat (along areas where it is too deep to wade in) challenges here arise when trying to keep the boat stationary against a strong current.

The pressure was very much on to get the survey complete within a limited time. The river was now at its shallowest, due to a prolonged dry period, which meant weed and sediment could easily be identified, also rain was forecast for the coming days. I believe the traditional methods would have struggled to finish the project within this time frame.



Credit: Jenelle Eli/American Red Cross

Above: Red Cross volunteers examining maps.

MUCH OF THE GLOBAL NORTH has been mapped with incredible detail and is accessible through the smartphones in our pockets. This is not the reality for billions of people around the globe, however.

corporations who are interested in bringing people together to trace buildings and roads from satellite imagery in order to map a vulnerable area.

Basemaps in days Outside of mapping parties, volunteers also remotely contribute to mapping tasks. These efforts very quickly result in basemap data for the area of interest. Over a matter of days, a community can go from a blank spot on the map to a detailed collection of buildings and roads. This gives humanitarian agencies the necessary data to plan and organize their community development and disaster

preparedness/response activities.

Remote mapping rapidly produces data but faces certain limits. Building and road outlines provide a baseline of essential information for humanitarians,

Taking tools to people for offline mapping

Accurate maps play a critical role in understanding communities, particularly for populations at risk of natural disasters and health emergencies. **Dan Joseph** and colleagues explain how the American Red Cross has mobilized thousands of volunteers to help map vulnerable communities around the world.

Families and individuals often do not exist to decision-makers because their communities do not exist on maps. Without maps, disaster responders often cannot access neighbourhoods or assess community scale, proximity, infrastructure, demographics, or hazards – preventing lifesaving resources from finding those most in need.

Recognizing this need, the American Red Cross, in partnership with the Humanitarian OpenStreetMap Team (HOT), the British Red Cross, and Médecins Sans Frontières UK, launched an innovative project called Missing Maps, which aims to put 200 million vulnerable people on the map by 2021. This involves adding the communities where people live to OpenStreetMap (OSM), where the data is openly available for use and revision.

Missing Maps has engaged more than 12,500 digital volunteers in this humanitarian effort. In the 20 months since its launch in November 2014, the project has mapped communities of an estimated 20 million people. The majority of this progress was made possible through remote mapping efforts where the Red Cross and its partners host mapping parties (“mapathons”) in cities around the world. We often work with university groups or even private

but additional information is necessary to make the map more complete and useful. It is impossible to tell from satellite imagery where hospitals, schools, water and sanitation facilities, community landmarks, and physical hazards are located. Moreover, local community engagement is important in order to promote sustainability and a sense of ownership over the map data. Therefore, the American Red Cross has put increasing focus on field mapping efforts.

Mapping 6000+ villages in West Africa This past year, the American Red Cross undertook its biggest field effort to date: launching a mapping hub in West Africa and training local volunteers to field map more than 6,000 villages in the border regions of Liberia, Guinea, and Sierra Leone. Covering an area nearly as large as Switzerland, this project was a massive effort to scale up our Missing Maps field efforts in a rural region full of technical challenges: no internet connectivity, extremely poor roads, lack of electricity, dispersed volunteers, etc. This project required us to take a serious look at what was needed to take existing mapping tools and make them usable at scale in such a remote area.



Over a matter of days, a community can go from a blank spot on the map to a detailed collection of buildings and roads.



Preferred tool A combination of high- and low-tech tools facilitate field mapping. Our preferred tool is OpenMapKit, an Android app developed by the American Red Cross that enables a user to pre-download the OSM map of an area, shows the user's GPS location, and with a simple tap on a building or road in order to add information about the location. When a feature is tapped, a brief set of questions will appear, asking the user to identify the feature (e.g. school, residential building, health facility) and for any other relevant information. When the use of mobile phones presents security concerns, or other factors necessitate an alternative method, the American Red Cross uses paper-based mapping tools (such as FieldPapers, a tool which enables users to print map pages for an area, annotate the pages by hand, and then scan/edit/upload the annotated information to OpenStreetMap).

Humanitarians in general have become increasingly reliant on cloud-based tools for use in remote areas. For mapping projects specifically, users previously needed an internet connection in order to download map areas at the beginning of a project, and then to upload data into OSM at the end of each day. FieldPapers also requires an internet connection to prepare map atlases. Reliable internet access on a daily basis is not realistic for many areas in which the Red Cross works.

We needed to be able to map and use our tools without internet connectivity. Portable OSM (POSM) was our solution. It brings together a suite of tools that unite field data collection with editing OpenStreetMap in a disconnected, offline environment. We have built POSM to run on a cheap, low-powered computer called the Intel NUC. Running Ubuntu Linux, the Intel NUC broadcasts a Wi-Fi hot spot from which we have integrated a local instance of OpenStreetMap along with OpenMapKit and Field Papers. Users are able to download an area of interest, easily configure the portable server, work offline in the field, and then return to a connected environment and sync all changes back to OpenStreetMap.

Aerial imagery Satellite or aerial imagery can be an important component in a mapping workflow, as it provides raw material for tracing features and focusing field enumeration activities. Converting acquired imagery to an online Tiled Map Service (TMS) which can be used with existing web tools requires a number of steps and a high bandwidth internet connection.

As an augmentation to satellite and other aerial imagery, the detailed, cloud-free view that small unmanned aerial systems (sUASs) provide is useful for disaster preparedness, has great potential for



**PORTABLE
OPEN
STREET
MAP**

field tactics, is helpful for allocation of resources during relief coordination and is an excellent input to OSM mapping work flows. Currently there is no open source workflow that allows American Red Cross to deploy to the field fully offline, fly a sUAS to collect aerial imagery, process the imagery and allow for editing of OSM data over the processed orthorectified aerial imagery.

American Red Cross has partnered with the Cleveland Metroparks and Stamen to implement OpenDroneMap (ODM) as a field deployable module for use on POSM devices. This development will bring an open source sUAS imagery processing tool chain to the other mapping tools that have already been incorporated into POSM.

The American Red Cross – together with its partner organizations and Red Cross societies in other countries – has been working to map disaster-prone communities around the world. By supporting mapping in vulnerable communities, humanitarians are able to share better analysis of hazards, mitigations, and response capacity in communities, enabling stronger disaster response efforts and programme planning in the future.

We focus on open data, open source tools, and community engagement, evolving new methods and tools to meet challenges experienced along the way. These same goals and experiences are evident in the volunteer and open source communities we enjoy being part of. Beyond being consumers of OSM data and FOSS4G software, we strive to contribute back. This project is being developed in the open on GitHub and we welcome feedback and help. <https://github.com/AmericanRedCross/posm>

About the authors

American Red Cross's GIS team is deeply involved in international disaster response and disaster preparedness programmes throughout the world. We are encouraging Red Cross and Red Crescent societies in countries around the globe to take advantage of open-source geospatial technologies for better aid delivery, project management and reporting.



Credit: Dan Joseph/American Red Cross

Above: People can check their local environment against a map, adding information where necessary.



Currently there is no open source workflow that allows American Red Cross to deploy to the field fully offline. . .



**REGISTER
FOR FREE***

Image © Blom Aerofilms - Stand K11

GEO
BUSINESS 2017
LONDON • UK 23 - 24 MAY

Keep one step ahead at the
**fastest growing geospatial
event in the industry**

Register to attend the world class **exhibition**, cutting edge **conference**, commercial **workshops**, associated **meetings** and innovative **networking** and **social** events

GeoBusinessShow.com



GEO Business

@GEOBusinessShow #geobiz

Organised by:

diversified
COMMUNICATIONS • UK

In collaboration with:



*The exhibition and workshops are free to attend. There is a nominal fee to attend the conference.

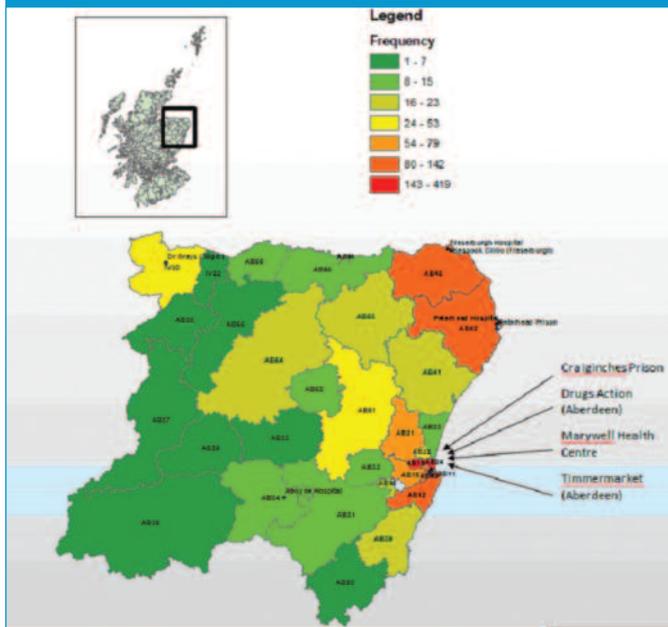


Figure 1: Map of North East Scotland showing the number of Hepatitis C cases in each postcode sector and the location of Outreach Centres.

IN THE LAST ISSUE OF *GISPRO* (August 2016) the authors examined three examples of how GIS functionality provides more than just a digital mapping toolbox: it can include spatial and network

source of environmental information to correlate with health data. Terrain data provides the means to consider the influence of both natural and man-made surface topography on local climate such as temperature, wind direction and speed, and on observed air and noise pollution patterns. Spatial data can also be used in GIS-based pollution models.

Personal and environmental data can now also be gathered using small GPS based sensors to track an individual and their health condition over both space and time. Witness also the rapid growth in wearable technologies such as monitoring devices in the form of smart watches, GPS trackers, and fit-bit devices. Subsequently this information can all be integrated into a GIS with other spatial datasets that may help in an explanatory capacity. Spatio-temporal relationships can also be studied using visualisation tools for data exploration and the generation of map animations that visually alert the viewer to any hotspots of change over time.

Whilst the mapping and visualisation of datasets remains the most common and obvious visual (both hard- and softcopy) output from a GIS and the related geospatial technologies, the real power of GIS lies with the potential to generate new datasets, explore spatio-temporal data, utilise techniques and tools for spatial analysis, and to interface with

Spatio-temporal geography and medical data: part 2

Authors **David R. Green** and **Jan O. Jansen**

demonstrate how GIS can add explanatory value to the analysis of medical data on the mapping of Hepatitis C and high traffic density near schools contributes towards wheezing.

Note: the introduction to the examples below and the Conclusion paragraph are the same as that published in the August issue of *GiSPRO*.



... the real power of GIS lies with the potential to generate new datasets, explore spatio-temporal data, utilise techniques and tools for spatial analysis, and to interface with modelling and simulation tools.



analysis, 3D visualisation, and modelling. GIS can also handle data from many disparate sources, including remote sensing and GPS or GNSS. The latter providing accurate capture of spatial locations and an array of attributes including ground-based photographic records, text descriptions, and environmental sensor data. Recent developments in this technology have also led to decision-support systems (DSS), online Internet mapping capability, mash-ups, and real-time environmental monitoring, providing powerful and flexible ways to manage resources, access information, and to engage with the public.

Many GIS-based medical and health applications have been reported including mapping applications, for exploratory data analysis; studies analysing the distribution and spread of disease; studies of exposure to pollution sources, such as factories, roads and airports; cluster analysis and to identify the significance and sources of disease outbreaks, and the links between health and pollution; and the use of spatial techniques such as Kriging to generate surfaces.

Remotely sensed data has also been used as a

modelling and simulation tools. This is already being significantly enhanced by the addition of further utilities, specialised functionality, spatial statistics, and modelling tools.

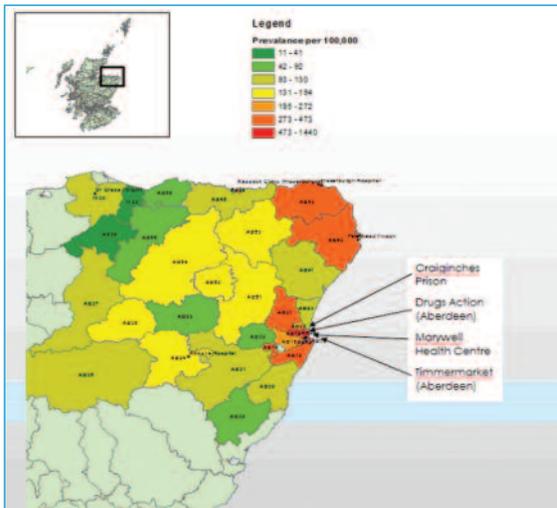
In the last issue of *GiSPRO* the authors presented three examples: *Feasibility and Utility of Population-Level Geospatial Injury Profiling: Prospective, National Cohort Study*; *Access to Specialist Care: Optimising the Geographical Configuration of Trauma Systems*; *An exploratory analysis of the geospatial distribution of the incidence of injury requiring ambulance service attendance in Scotland*.

In this issue they present two further examples which outline, with illustrations, just how spatio-temporal data can be analysed and modelled to provide decision makers and budget holders with the key information they need.

Geographical Mapping of Hepatitis C infection in North East Scotland using GIS

Chronic HCV infection affects around 37,500 people in Scotland. A GIS allows exploratory data

GIS and medical data



Left: Figure 2, Map of North East Scotland showing prevalence of Hepatitis C per 100,000 of the population. The Outreach Centres are also shown

analysis (EDA), mapping and visualisation of geographical data. GIS can be used to illustrate the geographical patterns and distribution of HCV infection to aid on the planning services for treatment of patients.

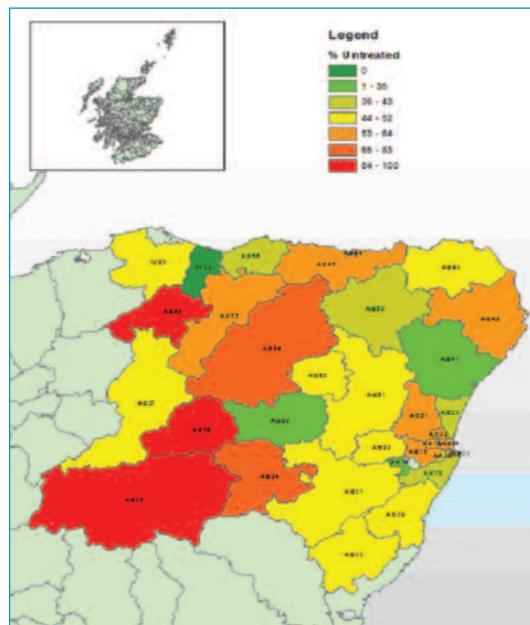
Data was extracted from the local NHS Grampian Hepatitis C database between 2002 and 2013. For confidentiality, each case was mapped utilising the first half of their postcodes. The treatment status for each individual was also noted. This data was edited and input to the ArcGIS. The Scottish Index of Multiple Deprivation (SIMD) 2012 was used to calculate the average deprivation score for each postcode sector. Exploratory data and statistical analysis were undertaken using Spearman's rank correlation coefficient between prevalence, treatment status and average deprivation score.

For confidentiality, each case was mapped utilising the first half of their postcodes. The Scottish Index of Multiple Deprivation was used to calculate the average deprivation score for each postcode sector. Exploratory data and statistical analysis were undertaken using Spearman's rank correlation coefficient.

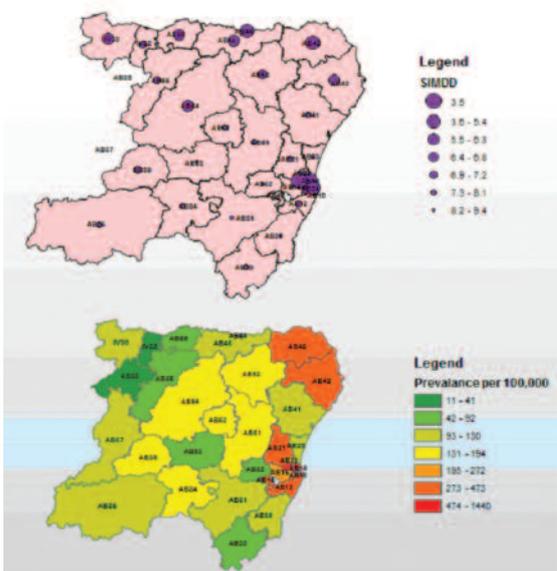
A total of 2114 patients with hepatitis C were identified from the local NHS Grampian Hepatitis C database. The overall prevalence of hepatitis C in the Grampian region was 523 cases per 100,000 population. The highest rate of hepatitis C was from AB11 in Aberdeen city, with 1440/100,000 individuals. The area with the lowest occurrence was AB38 in rural Aberdeen with 21/100,000 individuals. The higher prevalence areas corresponded to Aberdeen city and the towns of Peterhead and Fraserburgh. Outreach centres for treatment of hepatitis C were adequately stationed in high prevalence areas. The most deprived post code, AB16 in Aberdeen city, had a rate of 940/100,000 populations. There was no statistical significance between the diagnosis of hepatitis C infection and deprivation scores of the post codes studied.

There was a significant correlation between the percentage of untreated patients and average deprivation score with a correlation coefficient of -0.333 ($p < 0.05$).

In this study GIS is useful to explore, visualise and present the data in a spatial context, highlighting areas with high prevalence and where individuals are being treated and where they are not. The Outreach centres were shown to be appropriately located. The higher prevalence in urban regions mirrors risk factors like drug usage in these areas. A statistically significant correlation, albeit not very high, was shown between the percentage of untreated patients and levels of deprivation. This may mean that more emphasis needs be placed on assisting those individuals who live in the most deprived areas to gain access to the treatment programmes which are available.



Right: Figure 3, Map of the North East of Scotland showing the percentage of individuals with Hepatitis C infection who have not undergone treatment



Left; Figure 4, Map of the North East of Scotland showing (top) average deprivation score for each postcode sector and (bottom) Hepatitis C prevalence per 100,000.

Aberdeen Royal Infirmary is the only referral hospital for the treatment of hepatitis C and it is likely that the study underestimates the true prevalence of the infection due to a referral bias.

Paper Authors: Lee Nisbet, David R Green, Anne-Marie Sinclair, Pauline Dundas, Shirley English, Lindsay McLeman, Balasubramanian Vijayan, Andrew Fraser, Ashis Mukhopadhyaya.

Proximity of high-density truck traffic near schools but not homes is associated with childhood wheezing

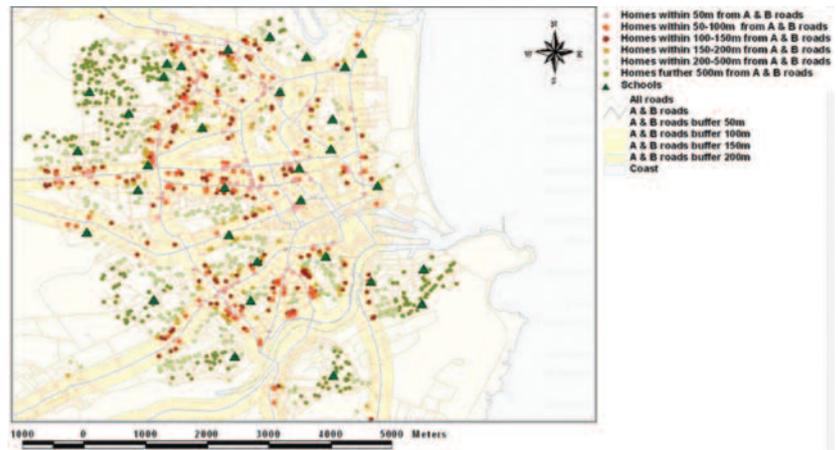
To investigate associations among exposure to road traffic near homes and schools and childhood wheezing. Population-based study of Aberdeen primary school children aged 7-12 yrs. Proximity of homes and/or attended schools to the nearest road and traffic density for all vehicles and for heavy goods vehicles (HGVs) used as measures of exposure.

Questionnaires were returned by 3271 children (57%). Geo-referenced home and school addresses were available in 1347 (41%) of respondents. No association with reported wheeze was found for location of homes or attended schools. However, wheeze prevalence increased with increasing HGV traffic within 100m of schools ($\chi^2_{13.59}$ $p < 0.001$), an association that remained after adjustment for confounders (OR for highest to lowest density 2.68 95% CI 1.14-6.47).

School exposure to HGV related air pollution increases the risk of childhood wheeze, and is of greater relevance than place of residence or other measures of vehicle traffic density.

Paper Authors: Nara Tagiyeva, David Green, Geraldine McNeill, Peter J Helms, Jon G Ayres.

Conclusions These examples demonstrate that there are many different ways in which spatial data can be used to develop an understanding of the



Above: Figure 1, ArcView 3.3 map of the Aberdeen city area with homes and schools of children participating in Aberdeen Asthma Survey 2004.

geographical dimensions of medical datasets. Although nearly all output from a GIS or GIS-based analysis results in a map, GIS also provides many geospatial tools and techniques to help spatially analyse medical datasets, e.g. to produce a surface using Kriging, or the use of cluster analysis to produce a map of hotspots. Furthermore, spatial data can be analysed using techniques from other disciplines. Network analysis often requires conflicting objectives to be considered, but conventional techniques frequently do not address this problem well. Multi-objective optimisation – pioneered in engineering and financial risk analysis – permits new insights. As desktop GIS, WebGIS, and mobile GIS technology continue to evolve there will be many new opportunities for individuals to capture environmental data using wearable technologies including miniaturised sensors, smart technologies and even phone apps, as well as being able to share information and to access publicly available information through the Internet.

About the principal authors

David R. Green works in the Department of Geography and Environment, School of Geosciences, College of Physical Sciences, St. Mary's, Elphinstone Road, Aberdeen, AB24 3UF, Scotland, UK tel: +44 01224 272324 email: d.r.green@abdn.ac.uk

Jan O. Jansen works in the Department of Surgery and Intensive Care Medicine, Ward 505, Aberdeen Royal Infirmary, Aberdeen, Scotland, UK

Tel. +44 01224 552956 | Email: jan.jansen@abdn.ac.uk

Geo-matching.com

The world's largest product database for surveying, navigation and machine guidance

Add your products to Geo-matching.com by registering online today!

www.Geo-matching.com

JOIN US!

AGI GeoCom 2016



We Are delighted to announce that the AGI's Annual Conference will be held at the prestigious Royal Geographical Society (RGS) in London this year, on 23rd November 2016. At **#GeoCom16** you'll find us exploring two aspects of this critical question.

career, whichever industry you're in, the AGI is here to support you – we want you to take part and hear your thoughts!

#GeoCom16 – event details Who is it for?

#GeoCom16 is for everyone with an interest in location data, and how critical it's become in deriving deeper insights from data analytics. That means retail specialists, traffic modellers, urban planners and even health delivery professionals – there'll be something for everyone.

Where and when? #GeoCom16 will take place on 23rd November 2016 in the inspiring surroundings at the Royal Geographical Society's headquarters, which are easily accessible in South Kensington, London.

RGS is home to many professional geographers and explorers, past and present. It's hard to imagine a more inspiring place to network with AGI colleagues, old and new.

#GeoCom16 – why location matters in data analytics...

A new format, new ideas and a great venue at the heart of geography all characterise the AGI's 2016 GeoCom conference. Here's what's on offer and this is what the AGI has to say.

People: the work of our fellow geospatial professionals, their challenges and ambitions – and **Progress:** the influence of location data on our emerging digital economy.

Why? Not sure if #GeoCom16 is for you? If you're interested in location data and how it can shape so much of our future, we encourage you to come along. At #GeoCom16 you will also:

#GeoCom16 – our progress Significant momentum is driving the move from paper to pixels already, and we know location data is taking more prominence in serious analytics. But what impact has geospatial data really had? Which new domains can we still explore, and how can we ensure the importance of location analytics stays embedded in emerging disciplines such as Big Data?

These are large questions: over the coming weeks we'll reveal an exciting line-up of plenary-style presentations to help us explore the answers. In the meantime. Search for **#GeoCom16** on Twitter to find all the latest news

#GeoCom16 – our people The work of the AGI revolves around you. As you'll see, we're streamlining **#GeoCom16** this year, making it a one-day event. This way, we believe many more members can join the discussions on the matters we all care about most. What's more, in addition to great networking opportunities, why not share your views? Take to the same stage as plenary speakers for a 7-minute slot as part of our Lightning Session*.

What challenges do you see ahead? Do you have a case study you're proud of or an experience you'd like to share? Whatever stage you're at in your

- **Have a chance to share your thoughts in our Lightning Session**
- **Make valuable new connections in and around the industry**
- **Get exciting insights about our future from the widest range of speakers**
- **And catch up with all of your existing contacts in the AGI network**

What? The AGI champions the value of geospatial information for our economy, for businesses, and people too. We support practitioners in the industry, we help develop the awareness of geospatial information and all it has to offer, and offer support that will hopefully educate and inspire a new generation of geographers to join us.

Our Annual Conference is the ideal place to look at how we can best serve the interests of our members – and we hope you'll join us there. Please save the date, registration will be opening soon!

- **Submit your ideas now for the Lightning Stream**

**Lightning Session submissions cannot be commercial, and will be strictly 7 minutes long.*



Significant momentum is driving the move from paper to pixels already, and we know location data is taking more prominence in serious analytics.



There is more news of products and services on our website at www.pvpubs.com
To get your company featured on this page call Sharon Robson on +44 (0)1438 352617

Trimble's TDC100 handheld data collector

An entry-level GNSS aimed at GIS applications has been launched by Trimble. The TDC100 combines both smartphone and ruggedised (IP-67) data collection capabilities in a single, mobile device. The Android-based TDC100 has a sunlight readable display and user replaceable batteries. A built-in GNSS receiver provides real-time accuracy and the device can run commercially available or in-house developed applications.

The Trimble TDC100 is available in two models for the budget-conscious GIS professional. Both are available with an Android operating system and wi-fi, with an optional 4G LTE cellular version. Outfitted with a bright, high-resolution 5.3 inch display, an 8 Mpx (wi-fi model) or 13 Mpx (4G LTE model) camera, and Li-Ion batteries in standard (3100mAh) or enhanced (4800mAh) capacity, the TDC100 supports GPS, GLONASS and BeiDou as well as Satellite-Based Augmentation System (SBAS) capabilities to improve real-time accuracy.

"GIS professionals using GNSS handheld devices for a wide range of data collection applications are expressing a desire for smartphone like capabilities" said **Ron Bisio**, vice president of Trimble's geospatial division. "We believe the TDC100 will be a workhorse. It has been designed for mobile workers who need a functional field computer that is tougher than a consumer-grade device, while providing easy-to-use features and convenience that people have come to expect.

Ruggedised smartphone controller

Spectra Precision has announced MobileMapper 50 GNSS, a handheld device for simple GIS data collection or for use as a data controller for Spectra Precision's SP60 and SP80 GNSS receivers. Available with an Android OS, the

MobileMapper 50 combines smartphone capabilities with a ruggedised design to improve positioning accuracy. The company has also introduced an Android OS version of its MobileMapper Field software and Survey Mobile software to control SP60 and SP80 GNSS receivers.

Three words to Rio

what3word's unique 3 word addressing system has been integrated into numerous mapping and navigation services, from the award-winning RioGo app (which won the Rio Olympics Transport Challenge) to Navmii, the biggest offline satnav app in the world. Getting around can be complex. Specifying exactly where to meet, or where to go in a pop-up venue like the Olympic park can be difficult. For example, there are four entrances to the Aquatic stadium and were named, expired.stud.cucumber, carbon.padding.puddles, ducks.hillside.frocks and saying. rosette.slogged. Simples yes?

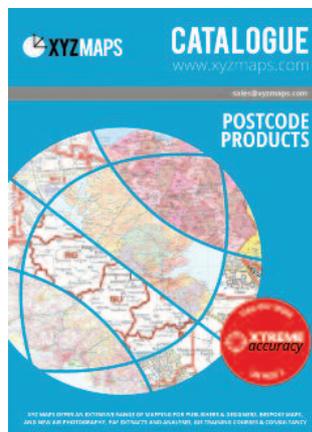
Community-led data management

The next phase of miso's DataFlow, a community-led data management solution, has been launched. Initially introduced as a replacement for miso's InterPOSe software, it follows the vision that not only did miso want a way for their customers to automate OSMM data processes; they wanted to automate a huge range of other data management tasks too.

DataFlow has been developed as an app-based system that tackles many different data management challenges, working in a very similar way to a smartphone.

More apps for Luciad

Luciad, a provider of technology which connects geospatial data to deliver real-time situational awareness, has launched version 2016.1 suite of its geospatial



Postcode mapping

XYZ Maps has published a new catalogue of its online Postcode Products for the UK. The catalogue contains details of a wide range of postcode maps including areas, districts, sectors and cities. Also available is Royal Mail's PAF data including travel time and distance matrix. Find out more at xyzmaps.com

software solutions. The new release continues Luciad's R&D focus on four strategic pillars: 3-D in the browser, developer and user experience, data and application integration and visual analytics.

New Android handheld

The Nautiz X2 enterprise handheld integrates a high-quality scanner, camera and mobile phone while offering a compact and ergonomic form factor. The X2, recently announced by the Handheld Group, is an all-in-one mobile computer that can handle all the tasks of a day's work. Built-in ruggedness enables it to cope with challenging outdoor environments that have moisture, dust, extreme high or low temperatures and potential drops. It weighs in at 230g.

CAA quals enable monthly UAS demos

Leica Geosystems has now achieved the PFAW certificate (Permission for Aerial Work) which allows it to fly and operate sub 7kg UAVs commercially in the UK. **Robert Heaver**, Technical Specialist UAS at Leica Geosystems said: "For us as a company who want to showcase not only our UAS abilities but also our commitment to lawful and responsible flying, completing all mandated qualifications set by the CAA was something we were happy to do. This commitment along with our close relationship with RUSTA (Rheinmetall Unmanned Systems Training Academy) will also enable us to give industry leading training, support and advice to our customers ..." Leica now holds monthly Aibot X6 demonstration days at Hawk in Shropshire.



Caledonian Air Surveys Limited
Specialists in medium format aerial photography and photogrammetry throughout the UK and Ireland



Ness Horizons Centre, Kintail House, Beechwood Business Park, Inverness IV2 3BW
Tel: 01463 732566
email: info@caledonianairsurveys.co.uk
www.caledonianairsurveys.co.uk

| seminars | conferences | exhibitions | courses | events | workshops | symposiums |

We welcome advance details of conferences, seminars, exhibitions and other events which are likely to be of interest to the GIS community. Please mention the name of the event, venue, date and point of contact for further information and send to Jason Poole *GISPro*, Unit A2 Mindenhall Court, High Street, Stevenage, Hertfordshire, SG1 3BG, UK or e-mail: jason@pvpubs.demon.co.uk.

OCTOBER 2016

Intergeo 2016
11-13th October 2016, Hamburg, Germany
www.intergeo.de/intergeo-en/index.php

GeoDATA 2016 Brussels
19th October 2016, Brussels, Belgium
www.geoaware.info/#!/geodata-seminars/c23xn

The Commercial UAV Show 2016
19-20th October 2016, London, UK
www.terrapinn.com/exhibition/the-commercial-uav-show/index.stm

British Information Modelling Event
24th October 2016, Arup HQ, London, UK
www.eventbrite.co.uk/e/british-information-modelling-tickets-27771172324

Commercial UAV Expo 2016
31st October-2nd November 2016, MGM Grand, Las Vegas, USA
www.expouav.com/

GIS-Pro 2016: URISA's 54th Annual Conference
31 October-3rd November 2016, Toronto, Canada
www.urisa.org/education-events/gis-pro-2016-urisa-s-54th-annual-conference/

NOVEMBER 2016

Trimble Dimensions 2016 User Conference
7-9th November 2016, The Venetian, Las Vegas, USA
www.trimbledimensions.com/

GISAfrica Conference 2016
16-17th November 2016, Park Inn by Radisson Abeokuta, Nigeria
www.gisrafrica.org/index.html

GeoCom2016
23rd November 2016, London, UK
www.agi.org.uk

GeoBIM Europe 2016
24-25th November 2016, Amsterdam City, The Netherlands
www.geo-bim.org/Europe

DECEMBER 2016

GeoDATA Showcase 2016 London
1st December 2016, ILEC Conference Centre, London, UK
www.geoaware.info/#!/geodata-seminars/c23xn

#GeoCom16

WHEN:

23rd November 2016

WHERE:Royal Geographical Society (RGS)
in Central London**INFO:**www.agi.org.uk/events/geocom16

THE ASSOCIATION
FOR **GEOGRAPHIC**
INFORMATION

1 Kensington Gore, London SW7 2AR

Tel. +44 (0) 20 7591 3190

www.agi.org.uk

**Why
location
matters**
in data analytics

Classified

To reserve space in the next issue call Sharon Robson on +44 (0)1438 352617

DISTANCE LEARNING GIS PROGRAMMES

UNIGIS UK

MSc/PgDip/PgCert courses in GIS by distance learning

Jointly delivered by Manchester Metropolitan University and the University of Salford

New Masters in

- GIS
- Applied GIS
- GI Technologies

Designed to meet the needs of GIS professionals and those new to the industry.

See our website for further details:

www.unigis.org

+44 (0)161 247 1581

unigis@mmu.ac.uk

Educating tomorrow's GIS professionals



DROP IT, DRENCH IT, POUND IT!

NAUTIZ X8 THE NEW ULTRA-RUGGED FIELD PDA

handheld
www.handheldgroup.com



XYZMAPS

Xtreme Accuracy Postcode Boundaries
Royal Mail Postcode PAF Data

MAPublisher & Geographic Imager + Training
MapInfo Pro Software and Training

sales@xyzmaps.com
0131 454 0426

XTREME accuracy



thinkWhere

One of the UK's leading geospatial consultancies

www.thinkwhere.com

ADVERTISERS INDEX

AGI	p.30
Bluesky	p.07
Cadcorp	p.09
Caledonian	p.29
Geo Business	p.24
Geo-matching	p.27
GiS Professional	p.31
KOREC	Inside front cover
Leica Geosystems	p.04
Trimble	Back cover
UNIGIS	p.16



Cadcorp
WORLD LEADING GIS SOFTWARE

Open technology and standards-based solutions for sharing spatial data

www.cadcorp.com



www.appsincadd.co.uk

Applications in CADD Ltd.

**Surveying - Mapping
Modelling - Design**

Complete 30 days free trial, no restrictions
Discounts for multiple systems

t: +44 (0)1509 504501 f: +44(0)1509 600079 e: enquiries@appsincadd.co.uk
21 Britannia Street Shepshed Leicestershire LE12 9AE United Kingdom

SUBSCRIBE • SUBSCRIBE • SUBSCRIBE • SUBSCRIBE • SUBSCRIBE



RECENT FEATURES:

- cloud based GIS
- the Internet of Things
- consumer segmentation
- virtual cities & BIM
- open geo standards
- mapping fire safety
- GIS and gaming
- big data and location
- address management
- INSPIRE
- GI and insurance
- precision flood models
- geospatial convergence
- emergency mapping

Join the geography jigsaw today!

DON'T JUST TAKE OUR WORD FOR IT:
"...the latest GIS Pro... it's a great edition, with a lot of content that's really relevant to my role." SENIOR MANAGER IN GOVERNMENT

Subscribe today... get the next issue absolutely FREE!

Whether you're a user, manager, developer, consultant, data collector, sensor or system developer, an academic or researcher, **GiSPro** is for everyone who works in geospatial data application, collection and processing, interrogation, development and information management.

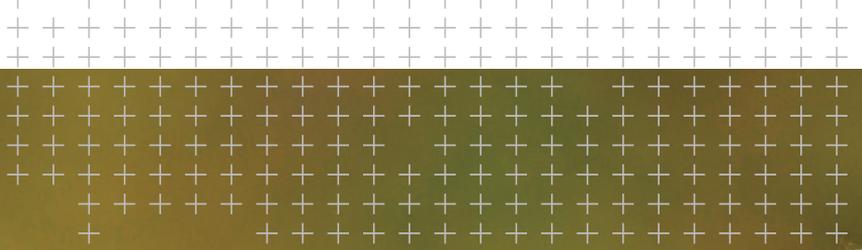
- TO VIEW THE LATEST ISSUE GO TO www.gisprofessional.co.uk

All subscribers get free password access to over 10 years of back issues. Subscribe for one year (6 issues, £34.95 UK) and get an extra issue completely free of charge! To take up this offer, either:

- Call +44 (0)1438 352617 or go to:
<http://www.pvpubs.com/GISProfessional/OnlinePayment>

Conditions apply: payment by credit/debit card only. This offer is valid for an individual subscription lasting one year. We will ask for your full name, address as well as email contact as subscribers also receive links to the digital issue.





Trimble TDC100 Series Handheld.

Are you still juggling multiple devices on the job?

With the Trimble® TDC100 series handheld you get the convenience of a smartphone and the precision of Trimble GNSS data collection technology. All in one rugged professional-grade device.

Find out more at trimble.com/TDC100

Visit us at **Intergeo Hall A4, Booth # E4.045**

A smart choice for GIS professionals.